APPLE VALLEY 84

TRAFFIC ANALYSIS

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Town of Apple Valley

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LIST OF ABBREVIATED TERMS

(1)	Reference
ADT	Average Daily Traffic
CAMUTCD	California Manual on Uniform Traffic Control Devices
Caltrans	California Department of Transportation
CMP	Congestion Management Program
DIF	Development Impact Fee
HCM	Highway Capacity Manual
HDM	Highway Design Manual
ITE	Institute of Transportation Engineers
LOS	Level of Service
NP	No (Without) Project
PCE	Passenger Car Equivalent
PHF	Peak Hour Factor
Project	Apple Valley 84
SBCTA	San Bernardino County Transportation Authority
TA	Traffic Analysis
V/C	Volume-to-Capacity Ratio
vphgpl	Vehicles per Hour Green per Lane
VVTA	Victor Valley Transit Authority
WP	With Project

1 SUMMARY OF FINDINGS

This report presents the results of the Traffic Analysis (TA) for the Apple Valley 84 (**Project**), which is located north of Stoddard Wells Road and south of Johnson Road in the Town of Apple Valley, as shown in Exhibit 1-1.

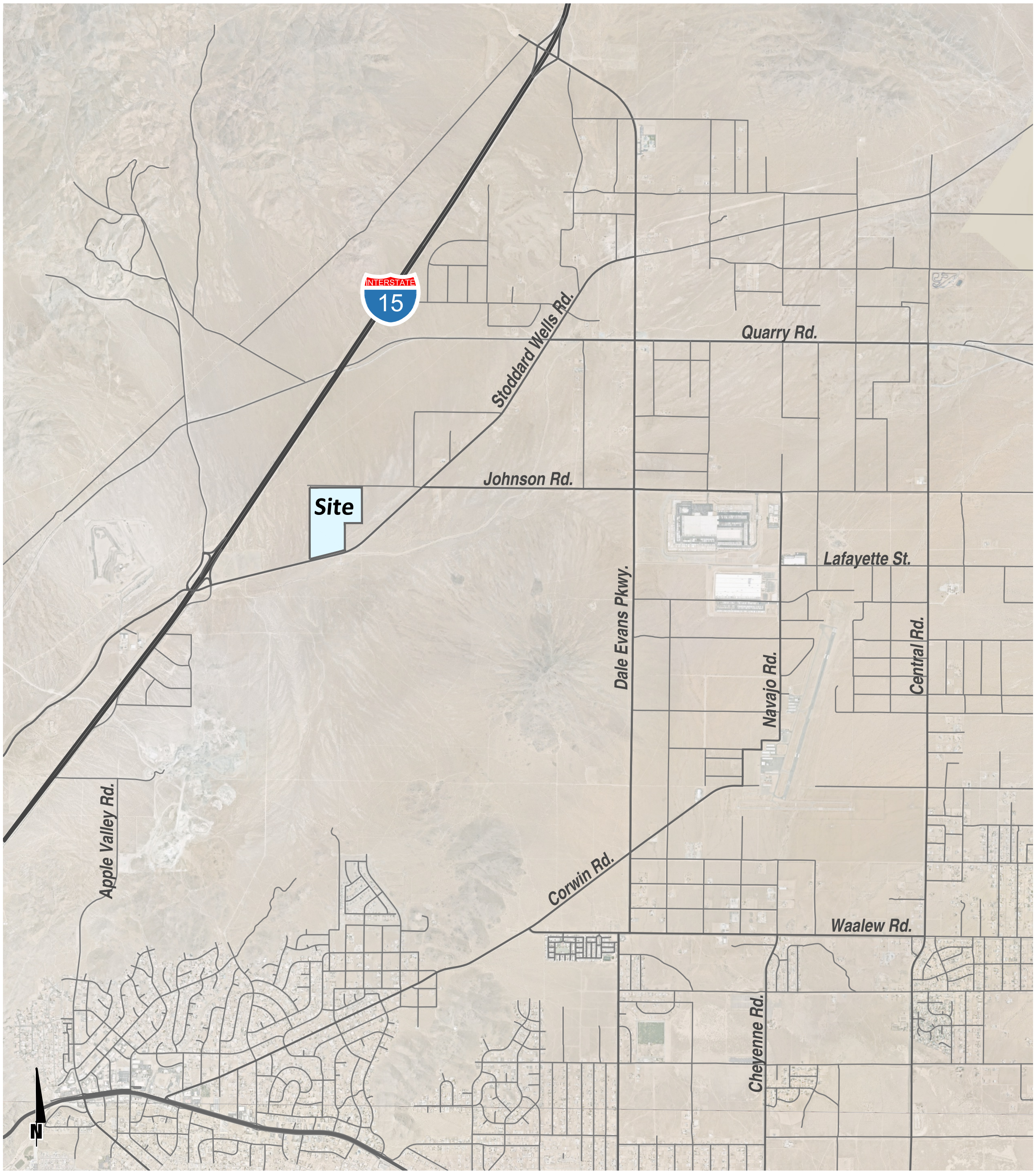
The purpose of this TA is to evaluate the potential circulation system deficiencies that may result when the Project is developed and where circulation system (intersection and/or roadway) improvements are needed to maintain acceptable levels of service consistent with General Plan level of service goals and policies. This traffic study has been prepared in accordance with the San Bernardino County Transportation Impact Study Guidelines (**County Guidelines**, dated July 9, 2019), and consultation with Town staff during the traffic study scoping process. (1) The TA Scoping Agreement is included in Appendix 1.1 and has been reviewed and approved by the Town of Apple Valley.

The Project is to construct the following improvements as design features in conjunction with development of the site:

- Project to construct one driveway (Driveway 1) on Stoddard Wells Road. Driveway 1 will be stop-controlled and assume right-in/right-out access only. Other access points to be provided along Wrangler Road, north of Stoddard Wells Road.
- Project to construct Stoddard Wells Road along the Project's frontage at their interim half-section width according to the Town of Apple Valley General Plan and consistent with the Town's standards.
- Although the Project would construct its ultimate half-section, the pavement would need to be striped out in the interim until such time Stoddard Wells Road is widened to the west of Wrangler Road to accommodate the new westbound receiving lanes.

Additional details and intersection lane geometrics are provided in Section 1.5 *Recommendations*. The Project Applicant's responsibility for the Project's contributions towards deficient off-site intersections is fulfilled through payment into pre-existing fee programs (if applicable) that would be assigned to the future construction of any future local/regional improvement needs. The Project Applicant would be required to pay requisite fees consistent with the Town's requirements (see Section 6 *Local and Regional Funding Mechanisms*).

EXHIBIT 1-1 : LOCATION MAP



1.1 PROJECT OVERVIEW

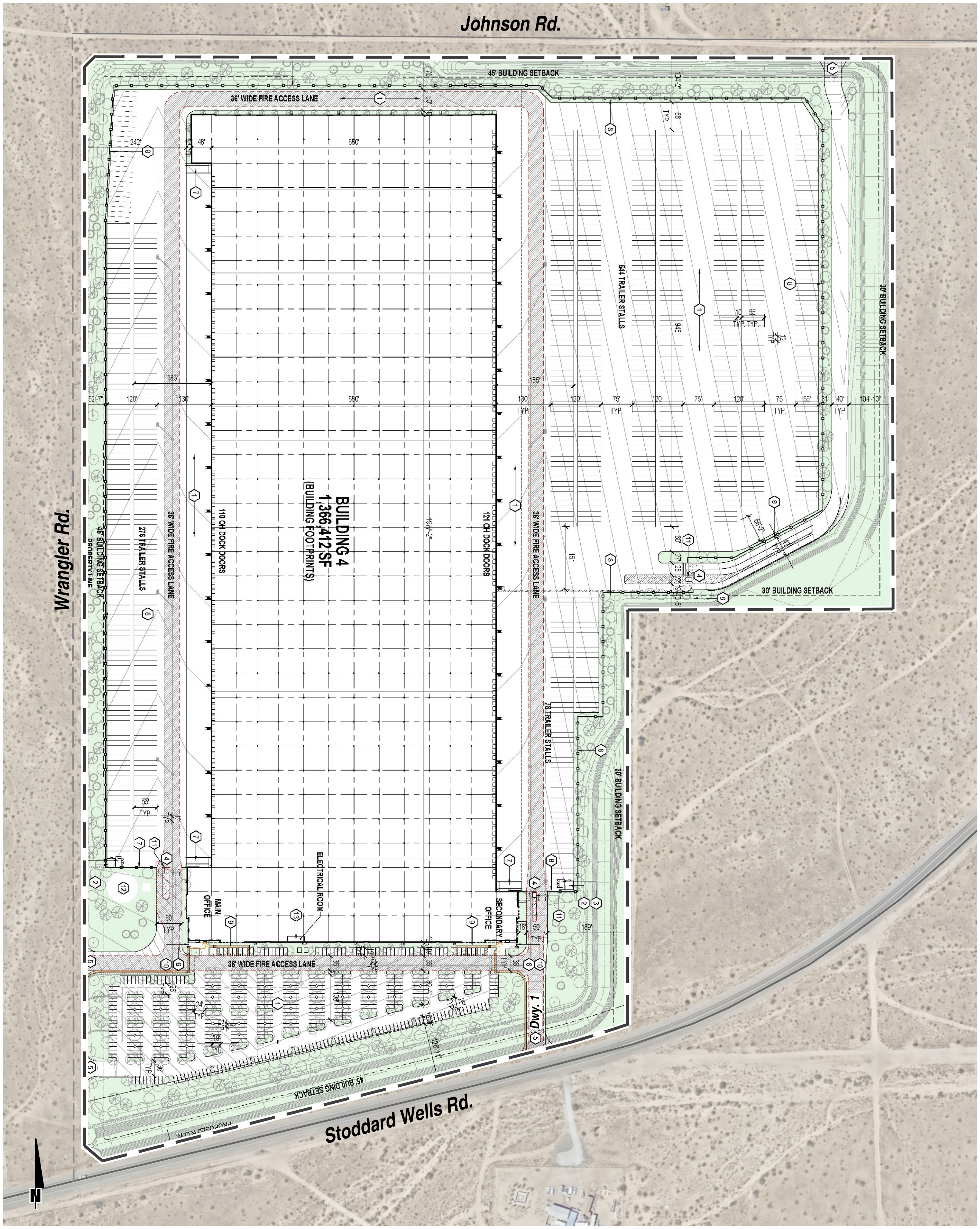
1.1.1 Land Use

A preliminary site plan for the proposed Project is shown in Exhibit 1-2. The Project is proposed to consist of the development of one industrial warehouse and distribution building totaling 1,381,412 square feet. For the purposes of the traffic study, it is proposed that the Project mix will assume 10% General Light Industrial use, 15% High-Cube Cold Storage Warehouse use, and 75% High-Cube Fulfillment (Non-Sort) Center Warehouse use. Access to the building will be accommodated via two new driveways along Wrangler Road which is a new north/south roadway connecting the future extension of Johnson Road to Stoddard Wells Road. There is one additional driveway proposed along the southern Project boundary on Stoddard Wells Road. All driveways are assumed to allow for full access (no turn restrictions) with the exception of the access point on Stoddard Wells Road which will assume right-in/right-out access only. The Project is anticipated to have an Opening Year of 2028.

1.1.2 Trip Generation

In order to develop the traffic characteristics of the proposed Project, trip-generation statistics published in the Institute of Transportation Engineers (ITE) Trip Generation Manual (12th Edition, 2025) were used to estimate the trip generation. (2) The Project is anticipated to generate a net total of 2,798 two-way trips per day with 212 AM peak hour trips and 234 PM peak hour trips (actual vehicles). The assumptions and methods used to estimate the Project's trip generation characteristics are discussed in greater detail in Section 4.1 *Project Trip Generation*.

Exhibit 1-2 : Site Plan



1.2 ANALYSIS SCENARIOS

For the purposes of this TA, peak hour intersection operations have been evaluated for each of the following traffic conditions:

- Existing (2025) Conditions
- Opening Year Cumulative (2028) Without Project Conditions
- Opening Year Cumulative (2028) With Project Conditions

1.2.1 Existing (2025) Conditions

Traffic counts were conducted on April 22, 2025 (Tuesday) when local schools were in session and operating under normal bell schedules. Information for Existing (2025) conditions is disclosed to represent the baseline traffic conditions as they existed at the time this report was prepared.

1.2.2 Opening Year Cumulative (2028) Conditions

The Opening Year Cumulative (2028) traffic conditions analysis determines the potential near-term cumulative circulation system deficiencies. The roadway network is similar to Existing conditions except for new connections to be constructed by the Project. To account for background traffic growth, an ambient growth factor from Existing (2025) conditions of 6.12% (2.0 percent per year over 3 years) is included for Opening Year Cumulative (2028) traffic conditions. Conservatively, this TA estimates the ambient traffic growth and then adds traffic generated by other known or probable related projects. These related projects are at least in part already accounted for in the assumed ambient growth rates; and some of these related projects may not be implemented and operational within the 2028 Opening Year time frame assumed for the Project. The resulting traffic growth utilized in the TA (ambient growth factor plus traffic generated by related projects) would therefore tend to overstate rather than understate background cumulative traffic deficiencies under 2028 traffic conditions.

1.3 STUDY AREA

To ensure that this TA satisfies the Town of Apple Valley's traffic study requirements, Urban Crossroads, Inc. prepared a Project traffic study scoping package for review by Town of Apple Valley staff prior to the preparation of this report. This agreement provides an outline of the Project study area, trip generation, trip distribution, and analysis methodology. The scoping agreement is included in Appendix 1.1.

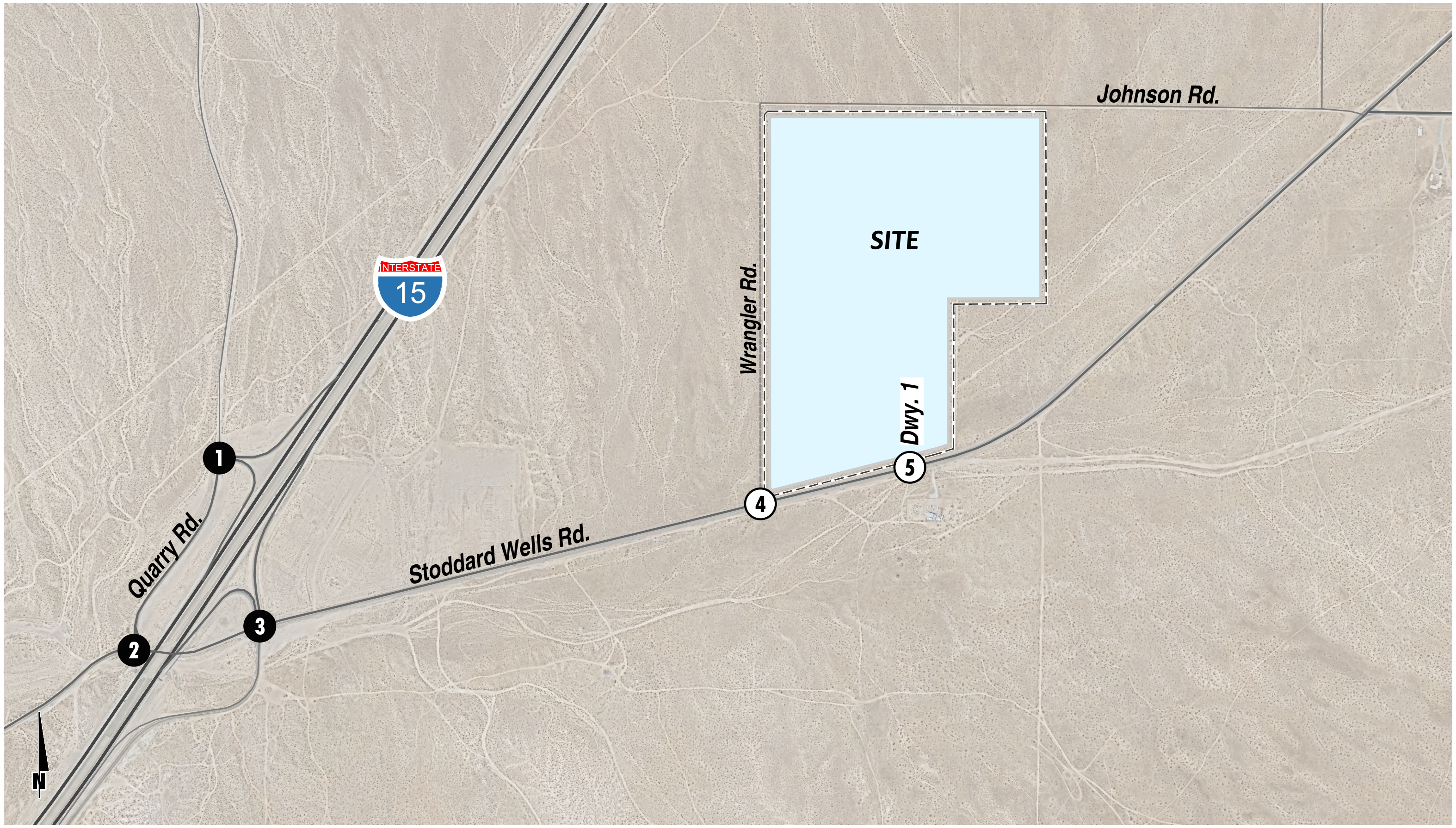
The six study area intersections shown in Exhibit 1-3 and listed in Table 1-1 were selected for evaluation in this TA based on consultation with Town of Apple Valley staff. At a minimum, the study area includes intersections where the Project is anticipated to contribute 50 or more peak hour trips per the County's Guidelines. (1) The "50 peak hour trip" criterion represents a minimum number of trips at which a typical intersection would have the potential to be affected by a given development proposal. The 50 peak hour trip criterion is a traffic engineering rule of thumb that is accepted and widely used within San Bernardino County (including the Town of Apple Valley) for estimating a potential area of influence (i.e., study area).

The intent of a Congestion Management Program (CMP) is to link land use, transportation, and air quality, thereby prompting reasonable growth management programs that will effectively utilize new transportation funds, alleviate traffic congestion and related deficiencies, and improve air quality. The County of San Bernardino CMP became effective with the passage of Proposition 111 in 1990 and was most recently updated in 2016 with an updated Nexus study completed in 2023. (3) There are no study area intersections identified as a County of San Bernardino CMP location.

TABLE 1-1: INTERSECTION ANALYSIS LOCATIONS

#	Intersection	Jurisdiction	CMP Location?
1	Quarry Rd. & I-15 SB Ramps	Caltrans, County	No
2	Quarry Rd. & Stoddard Wells Rd.	County	No
3	I-15 NB Ramps & Stoddard Wells Rd.	Caltrans, Apple Valley	No
4	Wrangler Rd. & Stoddard Wells Rd.	Apple Valley	No
5	Driveway 1 & Stoddard Wells Rd.	Apple Valley	No

Exhibit 1-3 : Study Area



LEGEND:

0 = *Existing Intersection Analysis Location*

0 = *Future Intersection Analysis Location*

1.4 DEFICIENCIES

This section provides a summary of deficiencies by analysis scenario. Section 2 *Methodologies* provides information on the methodologies used in the analysis and Section 3 *Area Conditions* and Section 5 *Opening Year Cumulative (2028) Traffic Conditions* includes the detailed analysis. A summary of LOS results for all analysis scenarios is presented in Table 1-2.

1.4.1 Existing (2025) Conditions

Intersections

The study area intersections are currently operating at an acceptable LOS during the peak hours.

Off-Ramp Queues

There are no movements that currently experience off-ramp queuing issues during the weekday AM or weekday PM peak 95th percentile traffic flows for Existing (2025) traffic conditions.

1.4.2 Opening Year Cumulative (2028)

Intersections

The following study area intersections are anticipated to operate at an unacceptable LOS under Opening Year Cumulative (2028) Without Project traffic conditions (i.e., LOS D or better):

- Quarry Road & I-15 SB Ramps (#1) – LOS F PM peak hour only
- Quarry Road & Stoddard Wells Road (#2) – LOS F PM peak hour only
- I-15 NB Ramps & Stoddard Wells Road (#3) – LOS F AM and PM peak hours

No additional intersections are anticipated to operate at an unacceptable LOS with the addition of Project traffic under Opening Year Cumulative (2028) With Project traffic conditions.

Off-Ramp Queues

The following movement is anticipated to experience off-ramp queuing issues during the weekday AM or weekday PM 95th percentile traffic flows under Opening Year Cumulative (2028) Without Project traffic conditions:

- I-15 NB Ramps & Stoddard Wells Road (#3) Southbound shared left-through-right – AM and PM peak hours

The addition of Project traffic is not anticipated to result in any additional off-ramp queuing issues during the weekday AM or weekday PM peak 95th percentile traffic flows under Opening Year Cumulative (2028) With Project traffic conditions.

Table 1-2 : Summary of LOS

		Existing	OYC (2028) NP	OYC (2028) WP
1	Quarry Rd. & I-15 SB Ramps	Green	Green (AM) / Red (PM)	Green (AM) / Red (PM)
2	Quarry Rd. & Stoddard Wells Rd.	Green	Green (AM) / Red (PM)	Green (AM) / Red (PM)
3	I-15 NB Ramps & Stoddard Wells Rd.	Green	Red	Red
4	Wrangler Rd. & Stoddard Wells Rd.	N/A	N/A	Green
5	Driveway 1 & Stoddard Wells Rd.	N/A	N/A	Green

LEGEND:

- ◖ = *AM Peak Hour*
- ◗ = *PM Peak Hour*
- Green = *A-D*
- Yellow = *E*
- Red = *F*

1.5 RECOMMENDATIONS

1.5.1 Site Adjacent and Site Access Recommendations

The following recommendations are based on the minimum improvements needed to accommodate site access and maintain acceptable peak hour operations for the proposed Project. The site adjacent recommendations are shown in Exhibit 1-4.

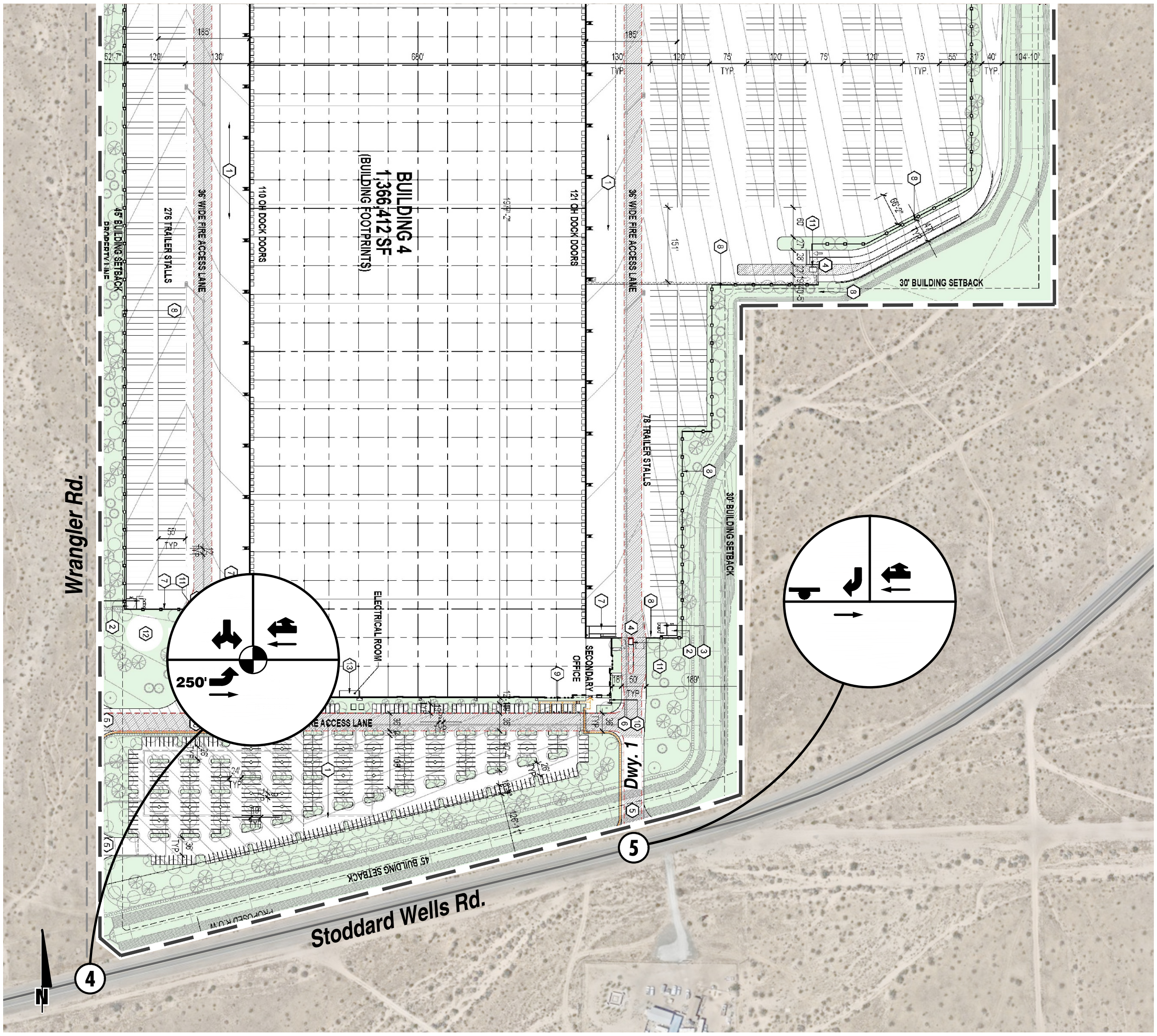
Recommendation 1 – Wrangler Road & Stoddard Wells Road (#4) – The following improvements are necessary to accommodate site access for both the proposed Project and the adjacent Apple Valley 143 development which lies north of Stoddard Wells Road and west of Wrangler Road (costs for improvements to be implemented to this location shall be shared between the projects utilizing the same point for access):

- Project to install a traffic signal.
- Project to construct a southbound shared left-right turn lane.
- Project to construct an eastbound left turn lane with protected left turn phasing.
- Project to construct a westbound shared through-right turn.

Recommendation 2 – Driveway 1 & Stoddard Wells Road (#5) – The following improvements are necessary to accommodate site access:

- Project to install a stop control on the southbound approach and construct a right turn lane (Project driveway).
- Project to construct a westbound shared through-right turn lane.

Exhibit 1-4 : Site Access Recommendations



LEGEND:

(0) = *Future Intersection Analysis Location*

= *Future Traffic Signal*

= *Proposed Stop Sign*

= *Existing Lane*

= *Proposed Lane*

1.5.2 Off-Site Recommendations

The recommended improvements needed to address the cumulative deficiencies are summarized in Table 1-3. For those improvements listed in Table 1-3 and not constructed as part of the Project, the Project Applicant's responsibility for the Project's contributions towards deficient intersections is fulfilled through payment of fees or fair share that would be assigned to construction of the identified recommended improvements.

1.5.3 Queuing Analysis at Project Driveways

A queuing analysis was conducted at the study area intersections for Opening Year Cumulative (2028) With Project traffic conditions to determine the turn pocket lengths necessary to accommodate 95th percentile queues. The analysis was conducted for the weekday AM and weekday PM peak hours. The results have been provided in Appendix 1.2 and are summarized in Table 1-4.

SimTraffic is designed to model networks of signalized and unsignalized intersections, with the primary purpose of checking and fine-tuning signal operations. SimTraffic uses the input parameters from Synchro to generate random simulations. The 95th percentile queue is derived from the average queue plus 1.65 standard deviations. The 95th percentile queue is not necessarily ever observed; it is simply based on statistical calculations (or Average Queue plus 1.65 standard deviations). Many agencies utilize the 95th percentile queues for design purposes. A vehicle is considered queued whenever it is traveling at less than 10 feet/second. The random simulations generated by SimTraffic have been utilized to determine the 95th percentile queue lengths observed for each turn movement. A SimTraffic simulation has been recorded five (5) times, during the weekday AM and weekday PM peak hours, and has been seeded for 30-minute periods with 60-minute recording intervals.

TABLE 1-3: SUMMARY OF IMPROVEMENTS

Intersection Location	Jurisdiction	Analysis Scenario: Existing (2025)	2028 Without Project	2028 With Project	Improvements included in Fee Program?[1]	Project Responsibility[2]	Fair Share %[3]
1 Quarry Rd. & I-15 SB Ramps	Caltrans, County	None	Add NB right turn lane	Same	No	Fair Share	11.7%
2 Quarry Rd. & Stoddard Wells Rd.	County	None	Add WB right turn lane	Same	No	Fair Share	11.4%
3 I-15 NB Ramps & Stoddard Wells Rd.	Caltrans, Apple Valley	None	Install a traffic signal Add two SB left turn lanes Add 2nd WB through lane Add EB left turn lane Add WB left turn lane	Same Same Same Same Same	No No No No No	Fair Share Fair Share Fair Share Fair Share Fair Share	9.3%

1 Improvements included in the Town of Apple Valley DIF program.

2 Identifies the Project's responsibility to construct an improvement or contribute fair share or fee payment towards the implementation of the improvements shown.

3 Program improvements constructed may be eligible for fee credit, at discretion of the Town. See Table 7-1 for Fair Share Calculations.

TABLE 1-4: SUMMARY OF QUEUING ANALYSIS

Intersection	Movement	Available Stacking Distance (Feet)	2028 With Project Simtraffic: 95th Percentile Queue (Feet)		Acceptable?	
			AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
4 Wrangler Rd. & Stoddard Wells Rd.	EBL	**250**	183	86	Yes	Yes
	WBT/R	--	158	964	Yes	Yes
5 Driveway 1 & Stoddard Wells Rd.	WBT/R	--	0	325	Yes	Yes

[1] Stacking Distance is acceptable if the required stacking distance is less than or equal to the stacking distance provided for the 95th percentile queue only.

[2] **100** = Site Access Recommendations

2 METHODOLOGIES

This section of the report presents the methodologies used to perform this TA. The methodologies described are consistent with County Guidelines. (1)

2.1 LEVEL OF SERVICE

Traffic operations of roadway facilities are described using the term "Level of Service" (LOS). LOS is a qualitative description of traffic flow based on several factors, such as speed, travel time, delay, and freedom to maneuver. Six levels are typically defined ranging from LOS A, representing completely free-flow conditions, to LOS F, representing a breakdown in flow resulting in stop-and-go conditions. LOS E represents operations at or near capacity, an unstable level where vehicles are operating with the minimum spacing for maintaining uniform flow.

2.2 INTERSECTION CAPACITY ANALYSIS

The definitions of LOS for interrupted traffic flow (flow restrained by the existence of traffic signals and other traffic control devices) differ slightly depending on the type of traffic control. The LOS is typically dependent on the quality of traffic flow at the intersections along a roadway. The 7th Edition Highway Capacity Manual (HCM) methodology expresses LOS at an intersection in terms of delay time for the various intersection approaches. (4) The HCM uses different procedures depending on the type of intersection control.

2.2.1 Signalized Intersections

The Town of Apple Valley requires signalized intersection operations analysis based on the methodology described in the HCM. (4) Intersection LOS operations are based on an intersection's average control delay. Control delays include initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. For signalized intersections, LOS is related to the average control delay per vehicle and is correlated to a LOS designation as described in Table 2-1. The saturation flow rates utilized are consistent with the rates identified in the San Bernardino County's CMP.

The traffic modeling and signal timing optimization software package Synchro (Version 12) has been utilized to analyze signalized intersections. Synchro is a macroscopic traffic software program that is based on the signalized intersection capacity analysis as specified in the HCM. Macroscopic level models represent traffic in terms of aggregate measures for each movement at the study intersections. Equations are used to determine measures of effectiveness such as delay and queue length. The level of service and capacity analysis performed by Synchro takes into consideration optimization and coordination of signalized intersections within a network.

TABLE 2-1: SIGNALIZED INTERSECTION LOS THRESHOLDS

Description	Average Control Delay (Seconds), V/C ≤ 1.0	Level of Service V/C ≤ 1.0[1]
Operations with very low delay occurring with favorable progression and/or short cycle length.	0 to 10.00	A
Operations with low delay occurring with good progression and/or short cycle lengths.	10.01 to 20.00	B
Operations with average delays resulting from fair progression and/or longer cycle lengths. Individual cycle failures begin to appear.	20.01 to 35.00	C
Operations with longer delays due to a combination of unfavorable progression, long cycle lengths, or high V/C ratios. Many vehicles stop and individual cycle failures are noticeable.	35.01 to 55.00	D
Operations with high delay values indicating poor progression, long cycle lengths, and high V/C ratios. Individual cycle failures are frequent occurrences. This is considered to be the limit of acceptable delay.	55.01 to 80.00	E
Operations with delays unacceptable to most drivers occurring due to over saturation, poor progression, or very long cycle lengths.	80.01 and up	F

Source: HCM, 7th Edition
[1] If V/C is greater than 1.0, then LOS is F per HCM

Consistent with Appendix B of the San Bernardino County CMP, the following saturation flow rates, in vehicles per hour green per lane (vphgpl), will be utilized in the traffic analysis for signalized intersections:

The peak hour traffic volumes have been adjusted using a peak hour factor (PHF) to reflect peak 15-minute volumes. Customary practice for LOS analysis is to use a peak 15-minute rate of flow. However, flow rates are typically expressed in vehicles per hour. The PHF is the relationship between the peak 15-minute flow rate and the full hourly volume (e.g., PHF = [Hourly Volume] / [4 x Peak 15-minute Flow Rate]). The use of a 15-minute PHF produces a more detailed analysis as compared to analyzing vehicles per hour. Existing PHFs have been used for all analysis scenarios. Per the HCM, PHF values over 0.95 often are indicative of high traffic volumes with capacity constraints on peak hour flows while lower PHF values are indicative of greater variability of flow during the peak hour. (4)

2.2.2 Unsignalized Intersections

The Town of Apple Valley requires the operations of unsignalized intersections to be evaluated using the methodology described in the HCM. (4) The LOS rating is based on the weighted average control delay expressed in seconds per vehicle (see Table 2-2). At two-way or side-street stop-controlled intersections, LOS is calculated for each controlled movement and for the left turn movement from the major street, as well as for the intersection as a whole. For approaches composed of a single lane, the delay is computed as the average of all movements in that lane. Delay for the intersection is reported for the worst individual movement at a two-way stop-controlled intersection. For all-way stop-controlled intersections, LOS is computed for the intersection as a whole (average delay).

TABLE 2-2: UNSIGNALIZED INTERSECTION LOS THRESHOLDS

Description	Average Control Delay (Seconds), V/C ≤ 1.0	Level of Service V/C ≤ 1.0[1]
Little or no delays.	0 to 10.00	A
Short traffic delays.	10.01 to 15.00	B
Average traffic delays.	15.01 to 25.00	C
Long traffic delays.	25.01 to 35.00	D
Very long traffic delays.	35.01 to 50.00	E
Extreme traffic delays with intersection capacity exceeded.	> 50.00	F

Source: HCM, 7th Edition
[1] If V/C is greater than 1.0, then LOS is F per HCM

2.3 TRAFFIC SIGNAL WARRANT ANALYSIS METHODOLOGY

The term "signal warrants" refers to the list of established criteria used by Caltrans and other public agencies to quantitatively justify or determine the potential need for installation of a traffic signal at an otherwise unsignalized intersection. This TA uses the signal warrant criteria presented in the latest edition of the Caltrans California Manual on Uniform Traffic Control Devices (CA MUTCD). (5)

The signal warrant criteria for Existing study area intersections are based upon several factors, including volume of vehicular and pedestrian traffic, frequency of accidents, and location of school areas. The CA MUTCD indicates that the installation of a traffic signal should be considered if one or more of the signal warrants are met. (5) Specifically, this TA utilizes the Peak Hour Volume-based Warrant 3 as the appropriate representative traffic signal warrant analysis for existing traffic conditions and for all future analysis scenarios for existing unsignalized intersections. Warrant 3 is appropriate to use for this TA because it provides specialized warrant criteria for intersections with rural characteristics. For the purposes of this study, the speed limit was the basis for determining whether Urban or Rural warrants were used for a given intersection. Rural warrants have been used where posted speed limits on the major roadways with unsignalized intersections are over 40 miles per hour while urban warrants have been used where speeds are 40 miles per hour or below.

Future intersections that do not currently exist have been assessed regarding the potential need for new traffic signals based on future average daily traffic (ADT) volumes, using the Caltrans planning level ADT-based signal warrant analysis worksheets. Similarly, the speed limit has been used as the basis for determining the use of Urban and Rural warrants. Traffic signal warrant analyses were performed for the study area intersections shown in Table 2-3.

TABLE 2-3: TRAFFIC SIGNAL WARRANT ANALYSIS LOCATIONS

#	Intersection
1	Quarry Rd. & Stoddard Wells Rd.
2	Quarry Rd. & Stoddard Wells Rd.
3	I-15 NB Ramps & Stoddard Wells Rd.
4	Wrangler Rd. & Stoddard Wells Rd.

Although unsignalized, the study area intersection of Driveway 1 & Stoddard Wells Road (#5) has not been evaluated for traffic signal warrants as the intersection is restricted access (right-in/right-out only).

The traffic signal warrant analyses are presented in Section 3 *Area Conditions* and Section 5 *Opening Year Cumulative (2028) Traffic Conditions*. It is important to note that a signal warrant defines the minimum condition under which the installation of a traffic signal might be warranted. Meeting this threshold condition does not require that a traffic control signal be installed at a particular location, but rather, that other traffic factors and conditions be evaluated in order to determine whether the signal is truly justified. It should also be noted that signal warrants do not necessarily correlate with LOS. An intersection may satisfy a signal warrant condition and operate at or above acceptable LOS or operate below acceptable LOS and not meet a signal warrant.

2.4 QUEUING ANALYSIS

Consistent with Caltrans requirements, the 95th percentile queuing of vehicles has been assessed at the off-ramps to determine potential queuing deficiencies at the freeway ramp intersections at the I-15 Freeway at Quarry Road, Stoddard Wells Road, and Dale Evans Parkway interchanges. Specifically, the queuing analysis is utilized to identify any potential and "spill back" onto the I-15 Freeway mainline from the off-ramps or out of the turn pockets.

The traffic progression analysis tool and HCM intersection analysis program, Synchro, has been used to assess the potential deficiencies/needs of the intersections with traffic added from the proposed Project. Storage (turn-pocket) length recommendations at the ramps have been based upon the 95th percentile queue resulting from the Synchro progression analysis. There are two footnotes which appear on the Synchro outputs. One footnote indicates if the 95th percentile cycle exceeds capacity. Traffic is simulated for two complete cycles of the 95th percentile traffic in Synchro in order to account for the effects of spillover between cycles. In practice, the 95th percentile queue shown will rarely be exceeded and the queues shown with the footnote are acceptable for the design of storage bays. The other footnote indicates whether or not the volume for the 95th percentile queue is metered by an upstream signal. If the upstream intersection is at or near capacity, the 50th percentile queue represents the maximum queue experienced.

2.5 MINIMUM ACCEPTABLE LEVELS OF SERVICE (LOS)

According to the Town of Apple Valley's General Plan, LOS C or better is preferable, but LOS D is the minimum acceptable condition that should be maintained during the peak commute hours, where feasible. Therefore, for the purposes of this traffic analysis, LOS D has also been considered the acceptable threshold for all study area intersections.

2.6 Deficiency Criteria

This section outlines the methodology used in this analysis related to identifying circulation system deficiencies. Per the County Guidelines: In accordance with the Town's General Plan Circulation Element, at intersections where the LOS falls below, or is expected to fall below an acceptable threshold with or without the addition of the Project, feasible measures shall be identified to mitigate the Project's impacts for all Project scenario conditions.

2.7 Project Fair Share Calculation Methodology

In cases where this TA identifies that the Project would contribute additional traffic volumes to traffic deficiencies, Project fair share costs of improvements necessary to address deficiencies have been identified. The Project's fair share cost of improvements is determined based on the following equation, which is the ratio of Project traffic to new future traffic, and new future traffic is project traffic plus future development traffic:

Project Fair Share % = Project AM/PM Traffic / (2028 With Project AM/PM Total Traffic – Existing AM/PM Traffic)

The project fair share percentage has been calculated for both the AM peak hour and PM peak hour and the higher of the two has been selected. The Project fair share contribution calculations are presented in Section 6 *Local and Regional Funding Mechanisms*.

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3 AREA CONDITIONS

This section provides a summary of the existing circulation network, the Town of Apple Valley General Plan Circulation Network, and a review of existing peak hour intersection operations, traffic signal warrant, and freeway off-ramp queuing analyses.

3.1 EXISTING CIRCULATION NETWORK

Pursuant to the agreement with Town of Apple Valley staff (Appendix 1.1), the study area includes a total of five existing and future intersections as shown previously in Exhibit 1-3. Exhibit 3-1 illustrates the study area intersections located near the proposed Project and identifies the number of through traffic lanes for existing roadways and intersection traffic controls.

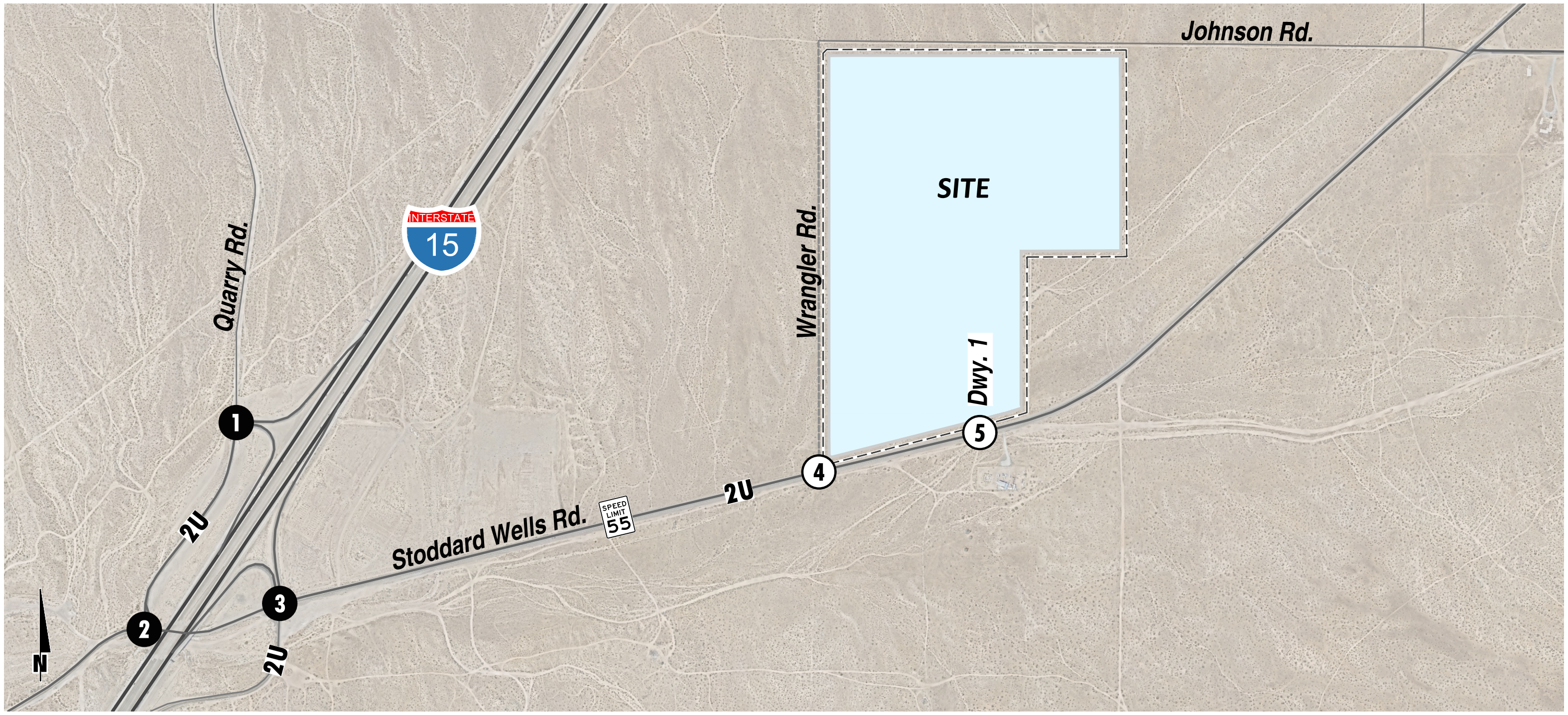
3.2 TOWN OF APPLE VALLEY GENERAL PLAN CIRCULATION ELEMENT

The roadway classifications and planned (ultimate) roadway cross-sections of the major roadways within the study area, as identified on the Town of Apple Valley General Plan Circulation Element, are described subsequently. Exhibit 3-2 shows the Town of Apple Valley General Plan Circulation Element.

Major Divided Arterials are designed to accommodate six travel lanes with a center turn lane or median and a 10-foot bike or parking lane on each side of the roadway, within a 128-foot right-of-way. The following study area roadways within the Town of Apple Valley are classified as Major Divided Arterials:

- Quarry Road, west of Stoddard Wells Road
- Stoddard Wells Road, south of Johnson Road

EXHIBIT 3-1 : EXISTING NUMBER OF THROUGH LANES AND INTERSECTION CONTROLS



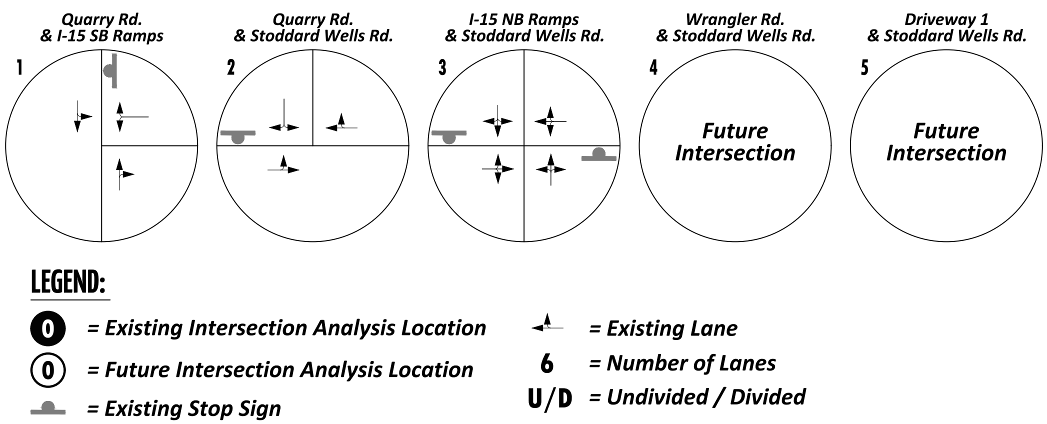
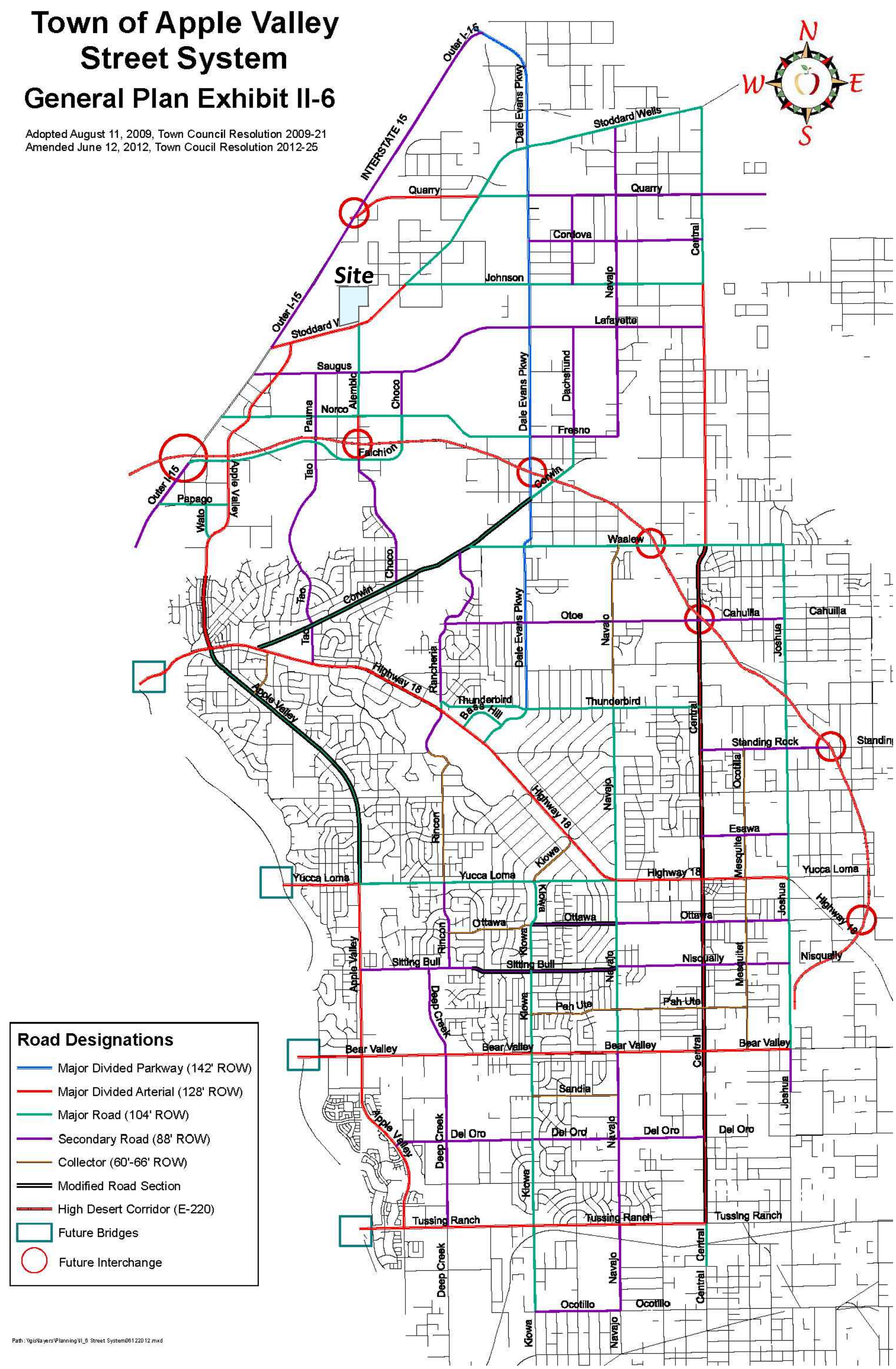


EXHIBIT 3-2 : TOWN OF APPLE VALLEY GENERAL PLAN CIRCULATION ELEMENT



3.3 BICYCLE AND PEDESTRIAN FACILITIES

Exhibit 3-3 illustrates the Town of Apple Valley bike paths. As shown in Exhibit 3-3, there are Class I bike paths along Stoddard Wells Road. There are no pedestrian facilities in close proximity to the Project. Field observations indicate nominal pedestrian and bicycle activity within the study area.

3.4 TRANSIT SERVICE

The study area is currently served by Victor Valley Transit Authority (VVTA), a public transit agency serving various jurisdictions within San Bernardino County. The existing transit routes within the study area are shown on Exhibit 3-4.

Transit service is reviewed and updated by VVTA periodically to address ridership, budget, and community demand needs. Changes in land use can affect these periodic adjustments which may lead to either enhanced or reduced service where appropriate. As such, it is recommended that the applicant work in conjunction with VVTA to potentially provide bus service to the site.

3.5 TRUCK ROUTES

The Town of Apple Valley truck routes are shown on Exhibit 3-5. Through truck routes are included along Outer Highway I-15 and Quarry Road, and Local truck routes are also included on Stoddard Wells Road. These designated truck routes have been utilized for both the proposed Project and future cumulative development projects for the purposes of this TA.

3.6 EXISTING (2025) TRAFFIC COUNTS

The intersection LOS analysis is based on the traffic volumes observed during the peak hour conditions using traffic count data collected in April 2025. The following peak hours were selected for analysis:

- Weekday AM Peak Hour (peak hour between 7:00 AM and 9:00 AM)
- Weekday PM Peak Hour (peak hour between 4:00 PM and 6:00 PM)

The 2025 weekday AM and weekday PM peak hour count data is representative of typical weekday peak hour traffic conditions in the study area. There were no observations made in the field that would indicate atypical traffic conditions on the count dates, such as construction activity or detour routes and near-by schools were in session and operating on normal schedules. The raw manual peak hour turning movement traffic count data sheets are included in Appendix 3.1. Existing weekday ADT volumes are shown on Exhibit 3-6. Where actual 24-hour tube count data was not available, Existing ADT volumes were based upon factored intersection peak hour counts collected by Urban Crossroads, Inc. using the following formula for each intersection leg:

Weekday PM Peak Hour (Approach Volume + Exit Volume) x 9.20 = Leg Volume

A comparison of the PM peak hour and daily traffic volumes of various roadway segments within the study area indicated that the peak-to-daily relationship is approximately 10.87 percent. As such, the above equation utilizing a factor of 9.20 estimates the ADT volumes on the study area roadway segments assuming a peak-to-daily relationship of 10.87 percent (i.e., 1/0.1087 = 9.20) and was assumed to sufficiently estimate ADT volumes for planning-level analyses. Existing weekday AM and weekday PM peak hour intersection volumes, in actual vehicles, are also shown on Exhibit 3-6.

To represent the effect large trucks, buses, and recreational vehicles have on traffic flow, all trucks were converted into passenger car equivalent (PCE). By their size alone, these vehicles occupy the same space as two or more passenger cars. In addition, the time it takes for them to accelerate and slowdown is also much longer than for passenger cars and varies depending on the type of vehicle and number of axles. For this analysis, the following PCE factors have been used to estimate each turning movement: 1.5 for 2-axle trucks, 2.0 for 3-axle trucks, and 3.0 for 4+-axle trucks. These factors are consistent with the values recommended for use in the County Guidelines.

3.7 Intersection Operations Analysis

Existing peak hour traffic operations have been evaluated for the study area intersections based on the analysis methodologies presented in Section 2.2 *Intersection Capacity Analysis.* The intersection operations analysis results are summarized in Table 3-1, which indicates that all the study area intersections are currently operating at an acceptable LOS during the peak hours. The intersection analysis worksheets are included in Appendix 3.2.

3.8 Traffic Signal Warrant Analysis

Traffic signal warrants for Existing traffic conditions are based on existing peak hour intersection turning volumes. There are no unsignalized study area intersections that currently warrant a traffic signal for Existing traffic conditions. Existing conditions traffic signal warrant analysis worksheets are provided in Appendix 3.3.

3.9 Queuing Analysis

Queuing analysis findings are presented in Table 3-2. As shown in Table 3-2, there are currently no study area off-ramps experiencing queuing issues during the peak hours under Existing (2025) traffic conditions. Worksheets for Existing traffic conditions queuing analysis are provided in Appendix 3.4.

Exhibit 3-3 : Town of Apple Valley Bike Paths

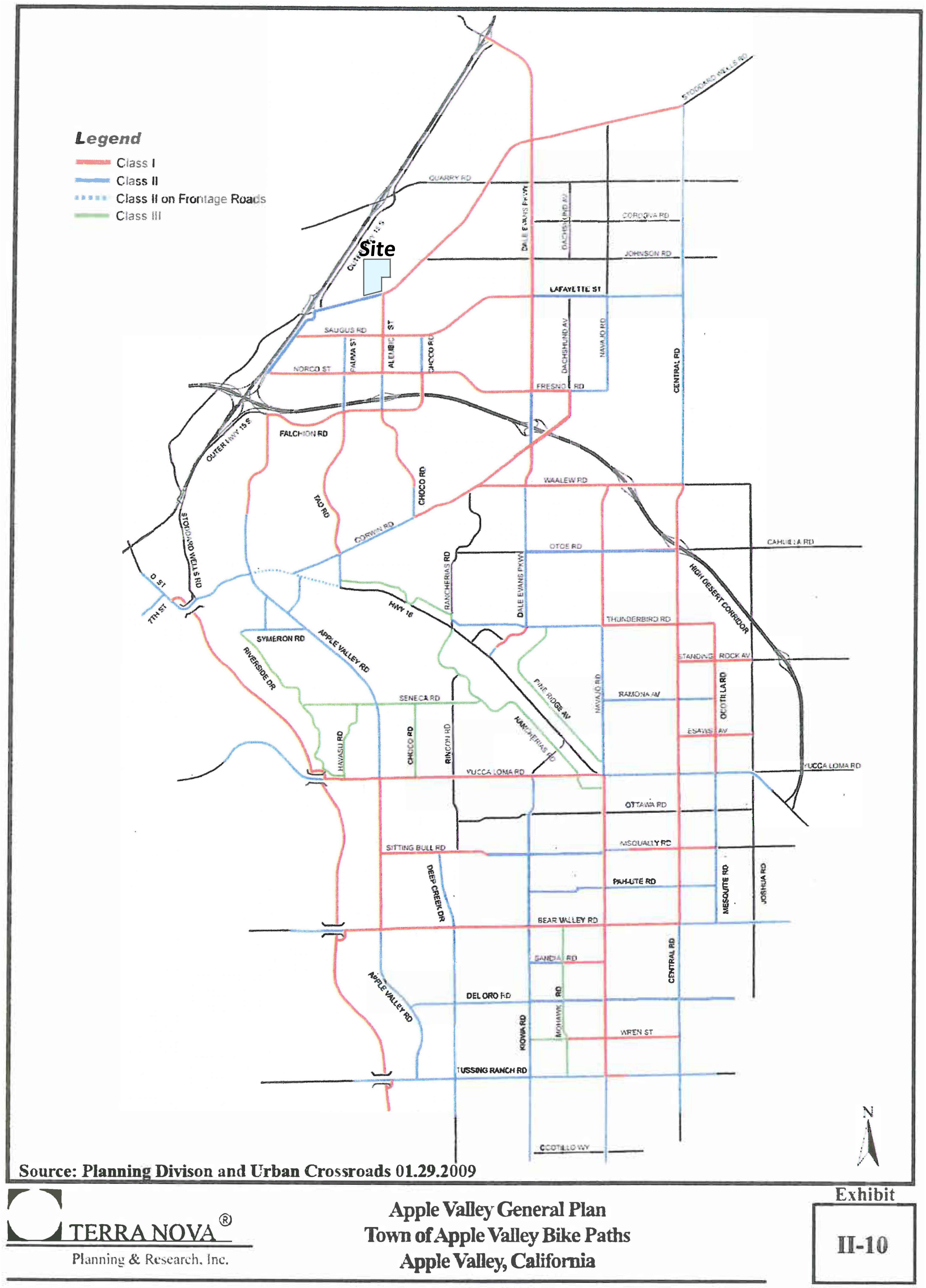
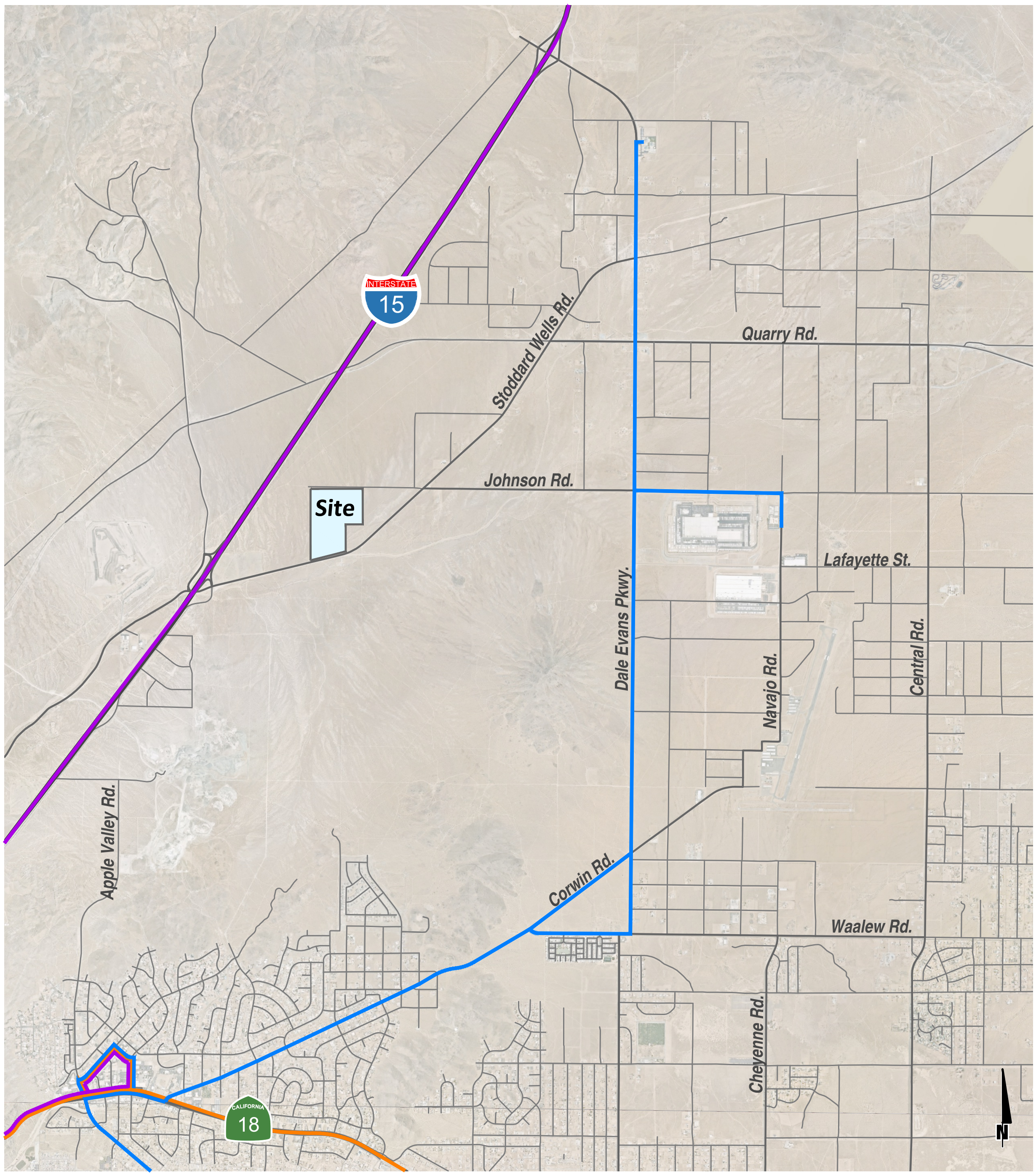


EXHIBIT 3-4 : TRANSIT ROUTES



LEGEND:

- *= Victor Valley Transit Route 15*
- *= Victor Valley Transit Route 41*
- *= Victor Valley Transit Route 42*

Exhibit 3-5 : Town of Apple Valley Truck Routes

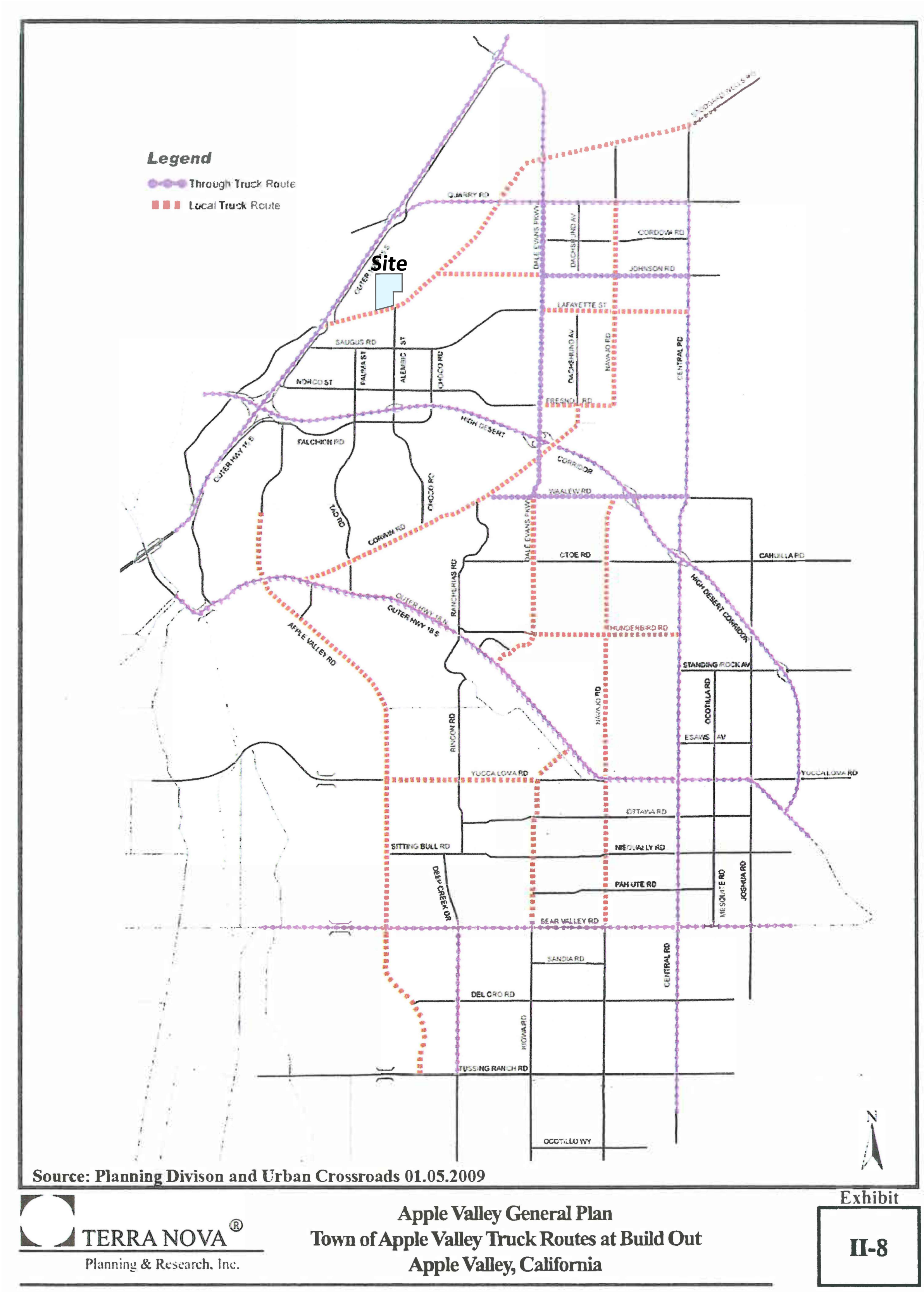
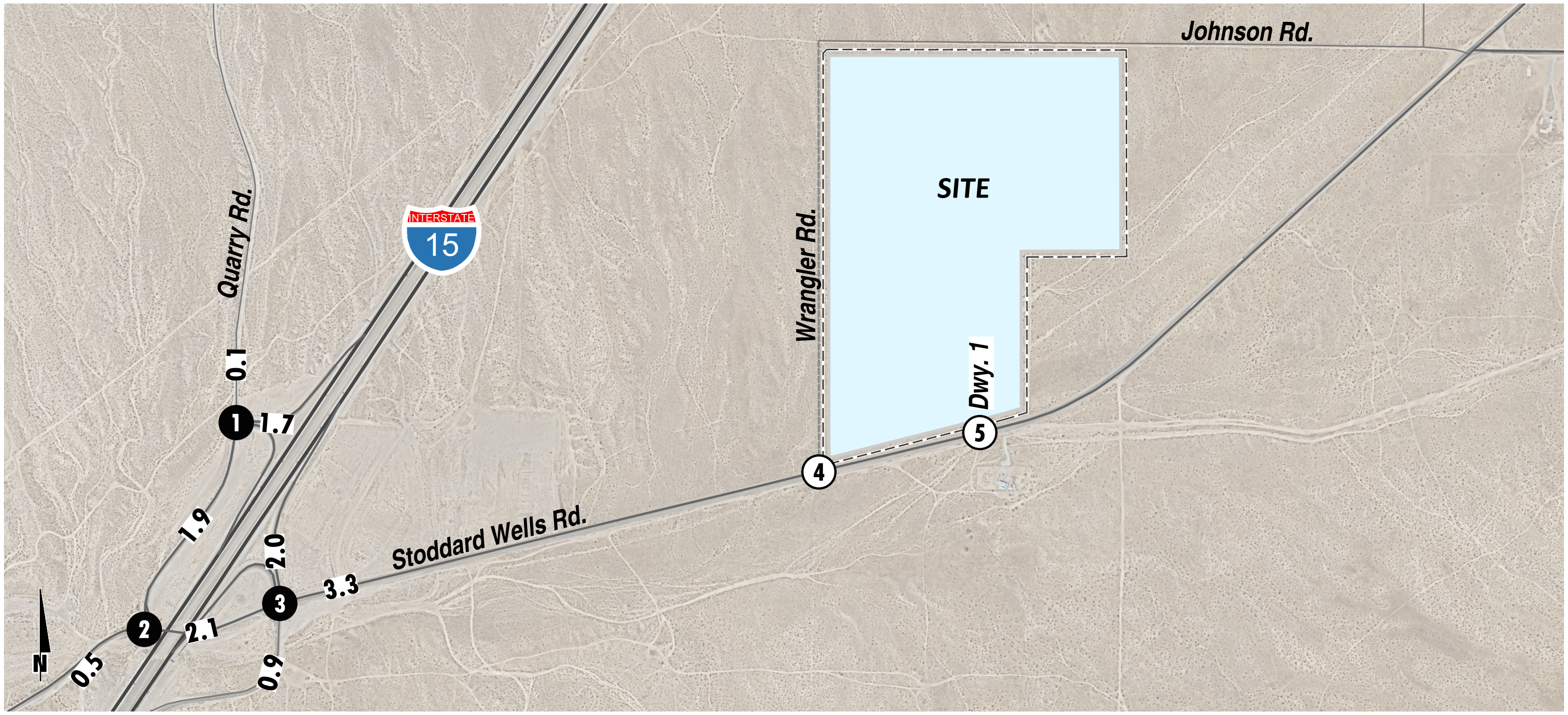
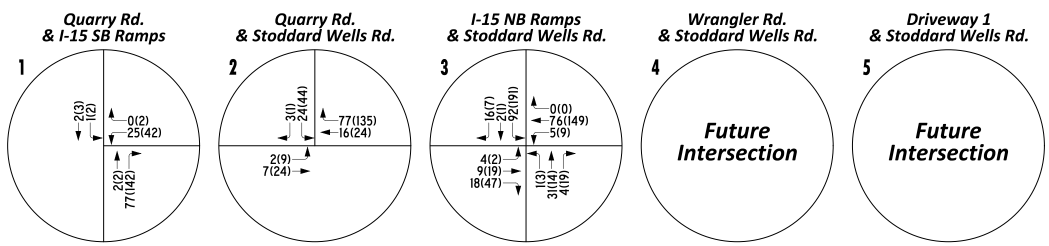


Exhibit 3-6 : Existing (2025) Traffic Volumes (Actual Volumes)





LEGEND:

- **0** (filled circle) = Existing Intersection Analysis Location
- **0** (open circle) = Future Intersection Analysis Location
- 00(00) = Peak Hour Volume AM(PM)
- **00** = Average Daily Traffic (ADT) In Thousands

TABLE 3-1: EXISTING (2025) INTERSECTION ANALYSIS

#	Intersection	Traffic Control[2]	Existing (2025)			
			Delay[1] (Secs.)		Level of Service	
			AM	PM	AM	PM
1	Quarry Rd. & I-15 SB Ramps	CSS	9.1	9.5	A	A
2	Quarry Rd. & Stoddard Wells Rd.	CSS	9.6	10.8	A	B
3	I-15 NB Ramps & Stoddard Wells Rd.	CSS	12.7	16.5	B	C
4	Wrangler Rd. & Stoddard Wells Rd.	--	Future Intersection			
5	Driveway 1 & Stoddard Wells Rd.	--	Future Intersection			

[1] Per the Highway Capacity Manual (7th Edition), overall average intersection delay and level of service are shown for intersections with a traffic signal, or all way stop control. For intersections with cross street stop control, the delay and level of service for the worst individual movement (or movements sharing a single lane) are shown. HCM delay reported in seconds.

[2] TS = Traffic Signal; AWS = All-way Stop; CSS = Cross-street Stop

TABLE 3-2: EXISTING (2025) QUEUING SUMMARY

#	Intersection	Movement	Available Stacking Distance (Feet)	95th Percentile Queue (Feet)		Acceptable? [1]	
				AM Peak Hour	PM Peak Hour	AM	PM
1	Quarry Rd. & I-15 SB Ramps	WBL/R	1,000	3	5	Yes	Yes
3	I-15 NB Ramps & Stoddard Wells Rd.	SBL/T/T	1,000	35	68	Yes	Yes

[1] Stacking Distance is acceptable if the required stacking distance is less than or equal to the stacking distance provided. An additional 25 feet of stacking which is assumed to be provided in the transition for turn pockets is reflected in the stacking distance shown on this table, where applicable.

4 PROJECTED FUTURE TRAFFIC

This section presents the traffic volumes estimated to be generated by the Project, as well as the Project's trip assignment onto the study area roadway network. The Project is proposing to develop one industrial warehouse and distribution buildings totaling 1,381,412 square feet. For the purposes of the traffic study, it is proposed that the Project mix will assume 10% General Light Industrial use, 15% High-Cube Cold Storage Warehouse use, and 75% High-Cube Fulfillment (Non-Sort) Center Warehouse use. Access to the building will be accommodated via two new driveways along Wrangler Road which is a new north/south roadway connecting the future extension of Johnson Road to Stoddard Wells Road. There is one additional driveway proposed along the southern Project boundary on Stoddard Wells Road. All driveways are assumed to allow for full access (no turn restrictions) with the exception of the access point on Stoddard Wells Road which will assume right-in/right-out access only. The Project is anticipated to have an Opening Year of 2028.

4.1 PROJECT TRIP GENERATION

Trip generation represents the amount of traffic which is both attracted to, and produced by, a land use project. Determining traffic generation for a specific project is therefore based upon forecasting the amount of traffic that is expected to be both attracted to, and produced by, the specific land uses being proposed for a given development.

In order to develop the traffic characteristics of the proposed Project, trip generation statistics published in the ITE Trip Generation Manual (12th Edition, 2025) were used to estimate the trip generation. (2) The following ITE land use codes and vehicle mix will be utilized for the proposed Project (trip generation rates for the Project are shown in Table 4-1):

- ITE land use code 110 (General Light Industrial) has been used to derive site specific trip generation estimates for up to 138,141 square feet (10% of the total square footage) of the proposed Project. A light industrial facility is a free-standing facility devoted to a single use that has an emphasis on activities other than manufacturing. Typically, there is minimum office space. The vehicle mix has been obtained from the ITE's Trip Generation Manual. The truck percentages were further broken down by axle type per the following South Coast Air Quality Management District (SCAQMD) recommended truck mix: 2-Axle = 16.7%; 3-Axle = 20.7%; 4+-Axle = 62.6%.
- High-Cube Cold Storage Warehouse (ITE Land Use Code 157) has been used to derive site-specific trip generation estimates for up to 207,212 square feet (15% of the total square footage). High-cube cold storage warehouses include warehouses characterized by the storage and/or consolidation of manufactured goods (and to a lesser extent, raw materials) prior to their distribution to retail locations or other warehouses. High-cube cold storage warehouses are facilities typified by temperature-controlled environments for frozen food or other perishable products. The High-Cube Cold Storage Warehouse vehicle mix (passenger cars versus trucks) has been obtained from the ITE's Trip Generation Manual. The truck percentages were further broken down by axle type per the following SCAQMD recommended truck mix: 2-Axle = 34.7%; 3-Axle = 11.0%; 4+-Axle = 54.3%.
- High-Cube Fulfillment Center Warehouse (ITE Land Use Code 155) has been used to derive site-specific trip generation estimates for up to 1,036,059 square feet of the proposed Project (75% of the total square footage). The ITE Trip Generation Manual has trip generation rates for high-cube fulfillment center use for both non-sort and sort facilities (ITE Land Use Code 155). As

defined by ITE, a high-cube warehouse is a building that typically has at least 200,000 gross square feet of floor area, has a ceiling height of 24 feet or more, and is used primarily for the storage and/or consolidation of manufactured goods (and to a lesser extent, raw materials) prior to their distribution to retail locations or other warehouses. A typical high-cube warehouse has a high level of on-site automation and logistics management. The automation and logistics enable highly-efficient processing of goods through the high-cube warehouse. The ITE Trip Generation Manual has two subcategories for the High-Cube Fulfillment Center use: sort and non-sort. ITE describes a sort facility as a fulfillment center that ships out smaller items, requiring extensive sorting, typically by manual means. In comparison, a non-sort facility is a fulfillment center that ships large box items that are processed primarily with automation rather than through manual means. Some limited assembly and repackaging may occur within the facility. The non-source facility sub-land use category has been assumed for the purposes of calculating trip generation for the Project consistent with other surrounding projects in the vicinity. The High-Cube Fulfillment Center Warehouse vehicle mix (passenger cars versus trucks) has been obtained from the ITE's Trip Generation Manual. The truck percentages were further broken down by axle type per the following SCAQMD recommended truck mix: 2-Axle = 16.7%; 3-Axle = 20.7%; 4+-Axle = 62.6%.

Passenger car equivalent (PCE) factors were applied to the trip generation rates for heavy trucks (large 2-axles, 3-axles, 4+-axles). PCEs allow the typical "real-world" mix of vehicle types to be represented as a single, standardized unit, such as the passenger car, to be used for the purposes of capacity and level of service analyses. The PCE factors are consistent with the recommended PCE factors in Appendix B of the County Guidelines.

Table 4-2 shows the resulting Project trip generation summary, which shows the Project is anticipated to generate a net total of 2,798 two-way vehicle trip-ends per day with 212 AM peak hour trips and 234 PM peak hour trips (actual vehicles). As shown in Table 4-3, the Project is anticipated to generate a net total of 3,656 two-way vehicle trip-ends per day with 257 AM peak hour trips and 263 PM peak hour trips (PCE vehicles). Consistent with the County requirements, the peak hour intersection operations analysis will be conducted using the PCE volumes shown in Table 4-3.

TABLE 4-1: TRIP GENERATION RATES

Land Use[1]	Units[2]	ITE LU Code	AM Peak Hour			PM Peak Hour			Daily
			In	Out	Total	In	Out	Total	
General Light Industrial[3]	TSF	110	0.422	0.058	0.480	0.069	0.421	0.490	3.600
Passenger Cars			0.416	0.054	0.470	0.064	0.416	0.480	3.350
2-Axle Trucks			0.001	0.001	0.002	0.001	0.001	0.002	0.042
3-Axle Trucks			0.001	0.001	0.002	0.001	0.001	0.002	0.052
4+-Axle Trucks			0.004	0.002	0.006	0.003	0.003	0.006	0.157
High-Cube Fulfillment Center (Non-Sort)[3]	TSF	155	0.090	0.030	0.120	0.057	0.083	0.140	1.770
Passenger Cars			0.080	0.020	0.100	0.052	0.078	0.130	1.430
2-Axle Trucks			0.002	0.001	0.003	0.001	0.001	0.002	0.057
3-Axle Trucks			0.002	0.002	0.004	0.001	0.001	0.002	0.070
4+-Axle Trucks			0.006	0.007	0.013	0.003	0.003	0.006	0.213
High-Cube Cold Storage Warehouse[3]	TSF	157	0.069	0.041	0.110	0.050	0.060	0.110	2.230
Passenger Cars			0.060	0.020	0.080	0.035	0.045	0.080	1.430
2-Axle Trucks			0.003	0.007	0.010	0.005	0.005	0.010	0.278
3-Axle Trucks			0.001	0.002	0.003	0.002	0.001	0.003	0.088
4+-Axle Trucks			0.005	0.011	0.016	0.008	0.008	0.016	0.434
Passenger Car Equivalent (PCE):									
General Light Industrial[3]	TSF	110	0.422	0.058	0.480	0.069	0.421	0.490	3.600
Passenger Cars			0.416	0.054	0.470	0.064	0.416	0.480	3.350
2-Axle Trucks (PCE = 1.5)			0.002	0.001	0.003	0.002	0.001	0.003	0.063
3-Axle Trucks (PCE = 2.0)			0.002	0.002	0.004	0.002	0.002	0.004	0.104
4+-Axle Trucks (PCE = 3.0)			0.012	0.007	0.019	0.009	0.010	0.019	0.470
High-Cube Fulfillment Center (Non-Sort)[3]	TSF	155	0.090	0.030	0.120	0.057	0.083	0.140	1.770
Passenger Cars			0.080	0.020	0.100	0.052	0.078	0.130	1.430
2-Axle Trucks (PCE = 1.5)			0.003	0.002	0.005	0.002	0.001	0.003	0.085
3-Axle Trucks (PCE = 2.0)			0.005	0.005	0.010	0.003	0.003	0.005	0.176
4+-Axle Trucks (PCE = 3.0)			0.018	0.020	0.038	0.009	0.010	0.019	0.639
High-Cube Cold Storage Warehouse[3]	TSF	157	0.069	0.041	0.110	0.050	0.060	0.110	2.230
Passenger Cars			0.060	0.020	0.080	0.035	0.045	0.080	1.430
2-Axle Trucks (PCE = 1.5)			0.005	0.011	0.016	0.008	0.008	0.016	0.416
3-Axle Trucks (PCE = 2.0)			0.002	0.005	0.007	0.004	0.003	0.007	0.176
4+-Axle Trucks (PCE = 3.0)			0.015	0.034	0.049	0.024	0.025	0.049	1.303

1 Trip Generation & Vehicle Mix Source: Institute of Transportation Engineers (ITE), Trip Generation Manual, 12th Edition (2025).

2 TSF = thousand square feet

3 Truck Mix: South Coast Air Quality Management District's (SCAQMD) recommended truck mix, by axle type.
Normalized % - Without Cold Storage: 16.7% 2-Axle trucks, 20.7% 3-Axle trucks, 62.6% 4-Axle trucks.
Normalized % - With Cold Storage: 34.7% 2-Axle trucks, 11.0% 3-Axle trucks, 54.3% 4-Axle trucks.

Table 4-2: Project Trip Generation (Actual Vehicles)

Land Use	Quantity	Units[1]	AM Peak Hour			PM Peak Hour			Daily
			In	Out	Total	In	Out	Total	
Actual Vehicles:									
General Light Industrial	138.141	TSF							
Passenger Cars:			58	7	65	9	58	67	462
2-axle Trucks:			0	0	0	0	0	0	6
3-axle Trucks:			0	0	0	0	0	0	8
4+-axle Trucks:			1	0	1	0	0	0	22
Total Truck Trips (Actual Vehicles):			1	0	1	0	0	0	36
Total Trips (Actual Vehicles)[2]			59	7	66	9	58	67	498
High-Cube Cold Storage	207.212	TSF							
Passenger Cars:			12	4	16	7	9	16	296
2-axle Trucks:			1	2	3	1	1	2	58
3-axle Trucks:			0	0	0	0	0	0	18
4+-axle Trucks:			1	2	3	2	2	4	90
Total Truck Trips (Actual Vehicles):			2	4	6	3	3	6	166
Total Trips (Actual Vehicles)[2]			14	8	22	10	12	22	462
High-Cube Fulfillment (Non-Sort)	1,036.059	TSF							
Passenger Cars:			83	21	104	54	81	135	1,482
2-axle Trucks:			2	1	3	1	1	2	60
3-axle Trucks:			2	2	4	1	1	2	74
4+-axle Trucks:			6	7	13	3	3	6	222
Total Truck Trips (Actual Vehicles):			10	10	20	5	5	10	356
Total Trips (Actual Vehicles)[2]			93	31	124	59	86	145	1,838
Passenger Cars			153	32	185	70	148	218	2,240
Trucks			13	14	27	8	8	16	558
Total Trips (Actual Vehicles)[2]			**166**	**46**	**212**	**78**	**156**	**234**	**2,798**

[1] TSF = thousand square feet

[2] Total Trips = Passenger Cars + Truck Trips.

TABLE 4-3: PROJECT TRIP GENERATION (PCE)

Land Use	Quantity	Units[1]	AM Peak Hour			PM Peak Hour			Daily
			In	Out	Total	In	Out	Total	
Passenger Car Equivalent (PCE):									
General Light Industrial	138.141	TSF							
Passenger Cars:			58	7	65	9	58	66	464
2-axle Trucks:			0	0	0	0	0	0	10
3-axle Trucks:			0	0	1	0	0	1	14
4+-axle Trucks:			2	1	3	1	1	3	66
Total Truck Trips (PCE):			2	1	3	1	1	2	90
Total Trips (PCE)[2]			60	8	68	10	59	68	554
High-Cube Cold Storage	207.212	TSF							
Passenger Cars:			12	4	16	7	9	16	296
2-axle Trucks:			1	2	3	2	2	4	86
3-axle Trucks:			0	1	1	1	1	2	36
4+-axle Trucks:			3	7	10	5	5	10	270
Total Truck Trips (PCE):			4	10	14	8	8	16	392
Total Trips (PCE)[2]			16	14	30	15	17	32	688
High-Cube Fulfillment (Non-Sort)	1,036.059	TSF							
Passenger Cars:			83	21	104	54	81	135	1,482
2-axle Trucks:			3	2	5	2	1	3	88
3-axle Trucks:			5	6	11	3	3	5	182
4+-axle Trucks:			19	20	39	9	10	19	662
Total Truck Trips (PCE):			27	28	55	14	14	28	932
Total Trips (PCE)[2]			110	49	159	68	95	163	2,414
Passenger Cars			153	32	185	70	148	217	2,242
Trucks			33	39	72	23	23	46	1,414
Total Trips (PCE)[2]			**186**	**71**	**257**	**93**	**171**	**263**	**3,656**

[1] TSF = thousand square feet

[2] Total Trips = Passenger Cars + Truck Trips.

4.2 PROJECT TRIP DISTRIBUTION

The Project trip distribution represents the directional orientation of traffic to and from the Project site. Trip distribution is the process of identifying the probable destinations, directions, or traffic routes that will be utilized by Project traffic. The potential interaction between the planned land uses and surrounding regional access routes are considered, to identify the route where the Project traffic would distribute. The Project trip distributions are shown on Exhibit 4-1 for trucks and Exhibit 4-2 for passenger cars.

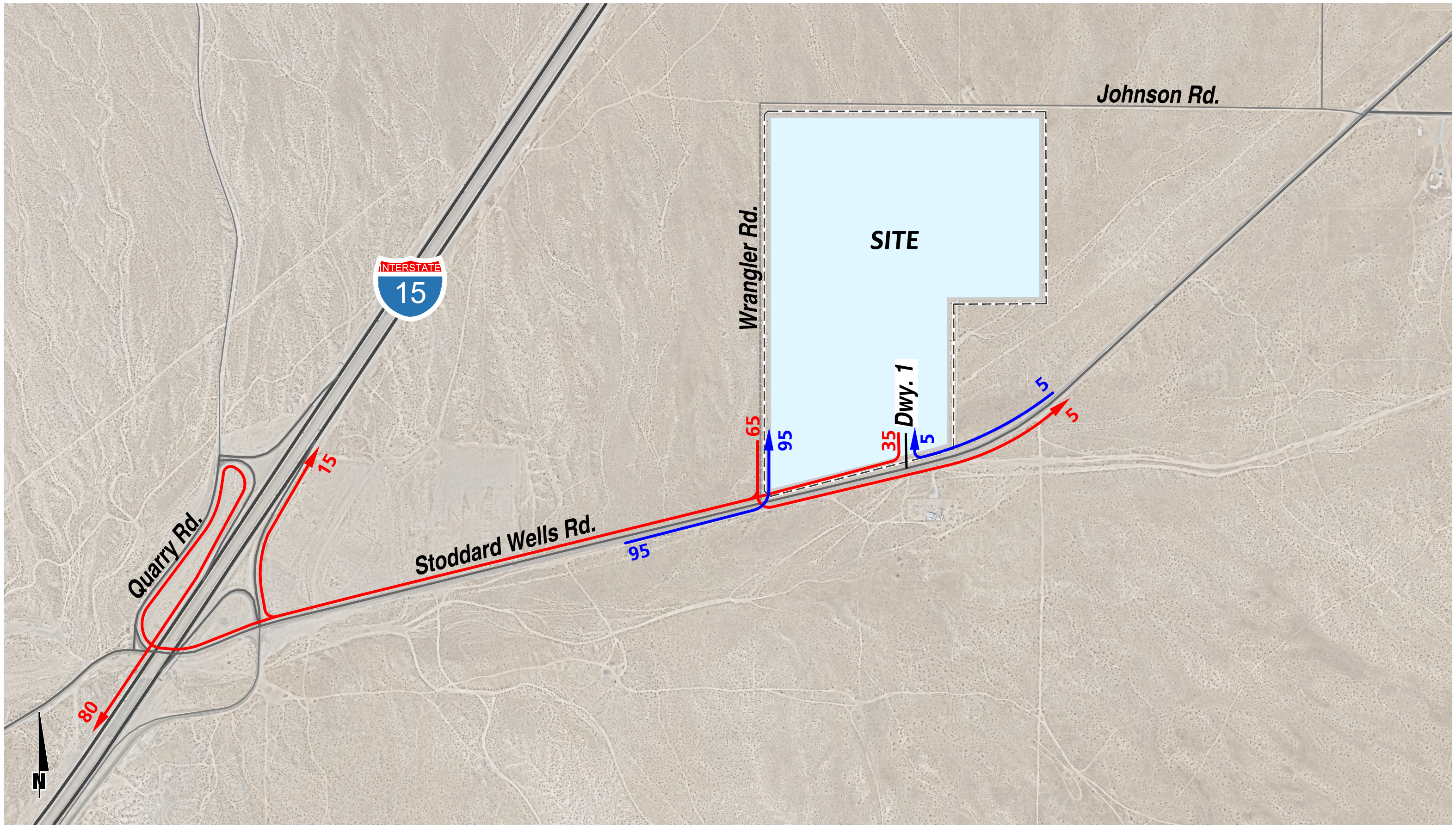
4.3 MODAL SPLIT

The potential for Project trips to be reduced by the use of public transit, walking, or bicycling has not been included as part of the Project's estimated trip generation. Essentially, the Project's traffic projections are "conservative" in that these alternative travel modes would reduce the forecasted traffic volumes.

4.4 PROJECT TRIP ASSIGNMENT

The assignment of traffic from the Project area to the adjoining roadway system is based upon the Project trip generation, trip distribution, and the arterial highway and local street system improvements that would be in place by the time of initial occupancy of the Project. Based on the identified Project traffic generation and trip distribution patterns, Project weekday ADT and weekday peak hour intersection turning movement volumes are shown in Exhibit 4-3.

Exhibit 4-1 : Project (Truck) Trip Distribution



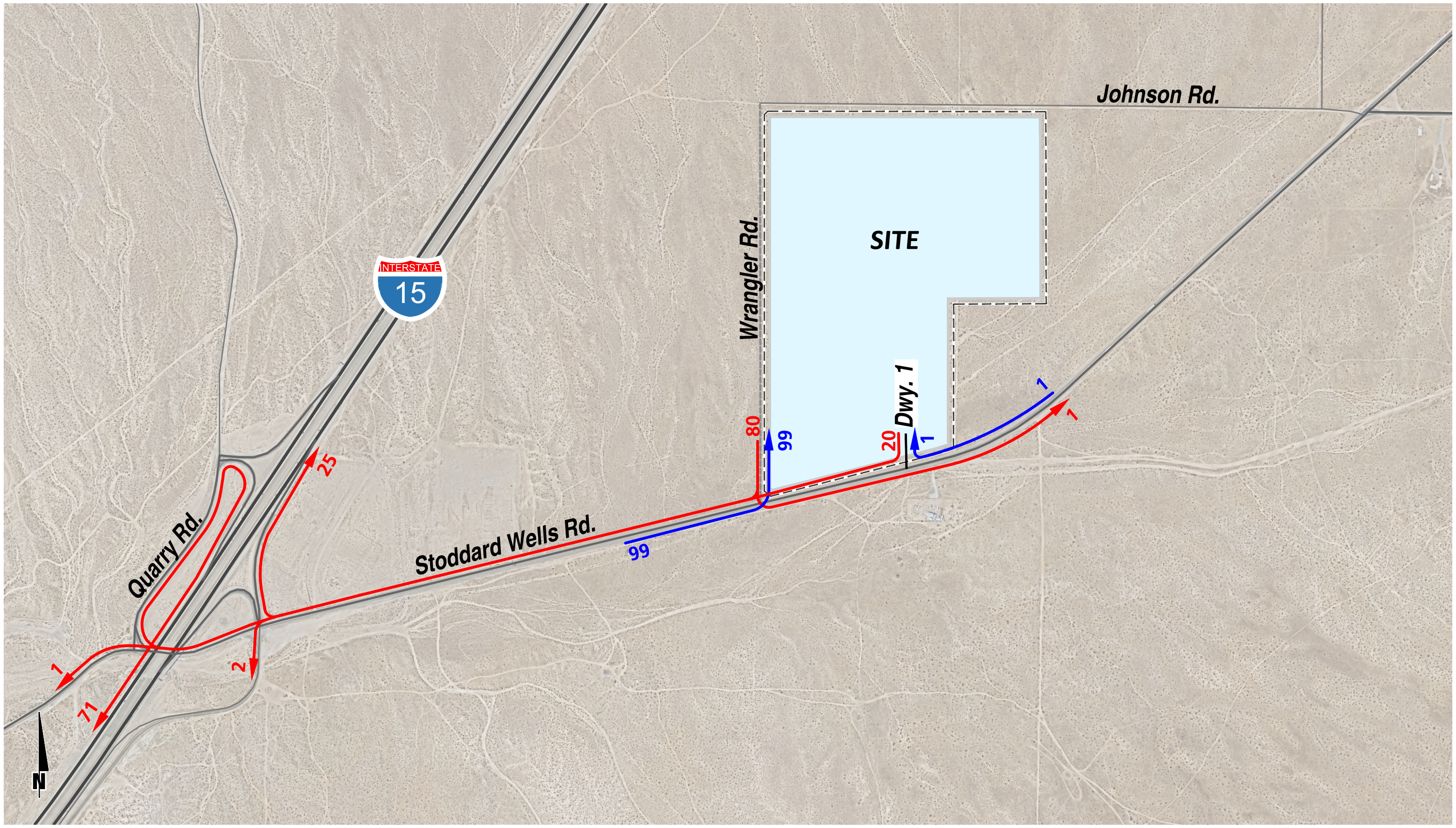
LEGEND:

10 *= Truck Percent To/From Project*

= Inbound

= Outbound

EXHIBIT 4-2 : PROJECT (PASSENGER CAR) TRIP DISTRIBUTION



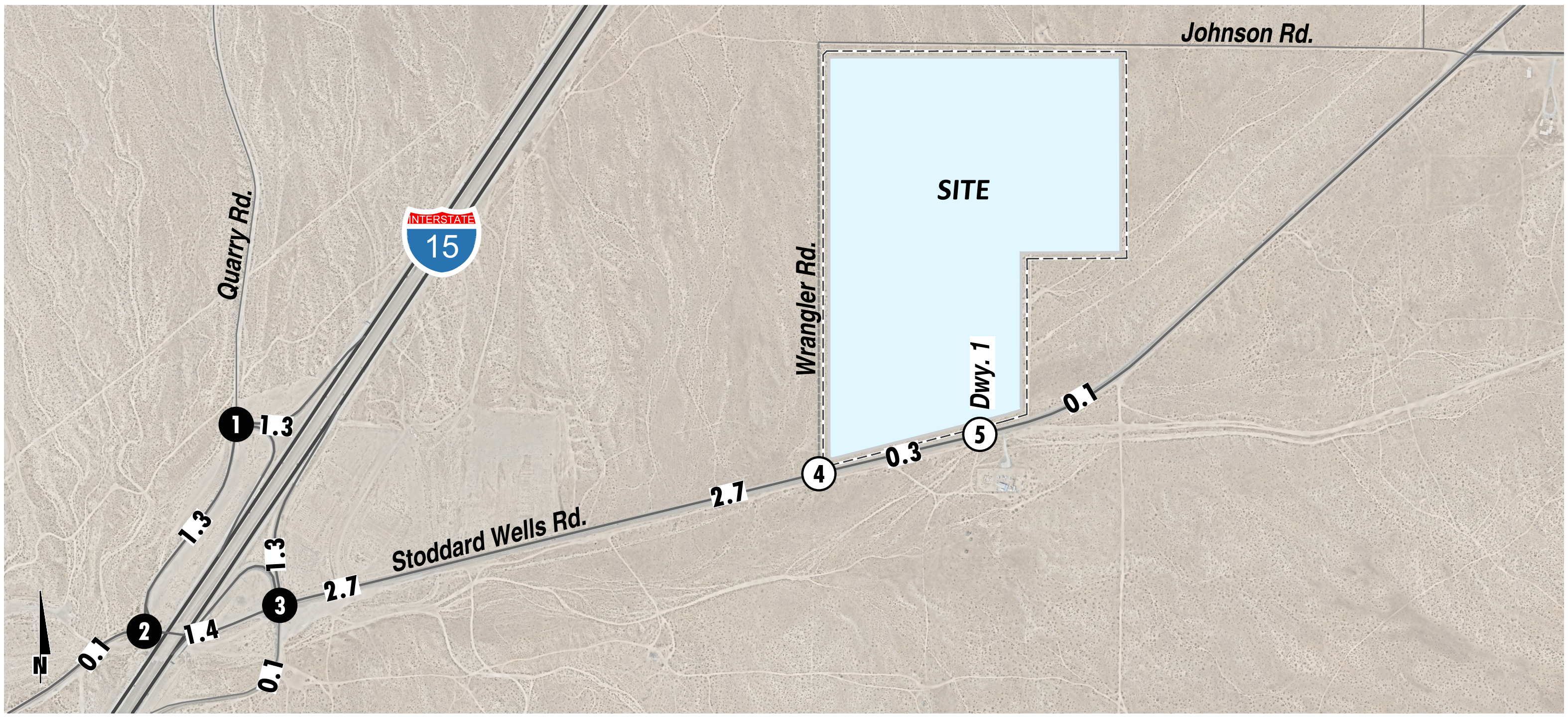
LEGEND:

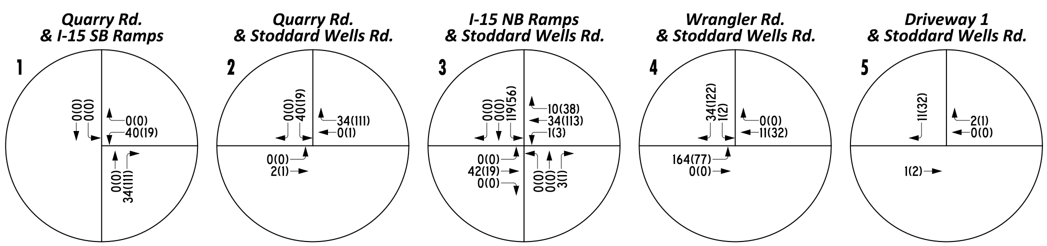
10 = *Car Percent To/From Project*

= *Inbound*

= *Outbound*

EXHIBIT 4-3: PROJECT ONLY TRAFFIC VOLUMES (ACTUAL VOLUMES)





LEGEND:

- **0** = *Existing Intersection Analysis Location*
- **(0)** = *Future Intersection Analysis Location*
- 00(00) = *Peak Hour Volume AM(PM)*
- **00** = *Average Daily Traffic (ADT) In Thousands*

4.5 BACKGROUND TRAFFIC

Opening year traffic forecasts have been based upon background (ambient) growth at 2.0% per year, compounded annually, for 2028 traffic conditions. The total ambient growth is 6.12% for 2028 traffic conditions. The ambient growth factor is intended to approximate regional traffic growth. This ambient growth rate is added to existing traffic volumes to account for area-wide growth not reflected by cumulative development projects. Ambient growth has been added to daily and peak hour traffic volumes on surrounding roadways, in conjunction with traffic generated by the development of future projects that have been approved but not yet built and/or for which development applications have been filed and are under consideration by governing agencies. The traffic generated by the Project is manually added to the base volume to determine Opening Year Cumulative forecasts.

The traffic analysis included the following traffic conditions, with the various traffic components:

- Opening Year Cumulative (2028) Without Project
    - Existing 2025 volumes
    - Ambient growth traffic (6.12%)
    - Cumulative development traffic
- Opening Year Cumulative (2028) With Project
    - Existing 2025 volumes
    - Ambient growth traffic (6.12%)
    - Cumulative development traffic
    - Project traffic

4.6 CUMULATIVE DEVELOPMENT TRAFFIC

A cumulative project list was developed for the purposes of this analysis through consultation with planning and engineering staff from the Town of Apple Valley. The cumulative projects listed are those that would generate traffic and would contribute traffic to study area intersections. Exhibit 4-4 illustrates the cumulative development location map. A summary of cumulative development projects and their proposed land uses are shown in Table 4-4. If applicable, the traffic generated by individual cumulative projects was manually added to the Opening Year Cumulative (2028) forecasts to ensure that traffic generated by the listed cumulative development projects in Table 4-4 is reflected as part of the background traffic. In an effort to conduct a conservative analysis, the cumulative projects are added in conjunction with the ambient growth identified in Section 4.5 *Background Traffic*. Cumulative peak hour intersection turning movement volumes and ADT are shown on Exhibit 4-5.

EXHIBIT 4-4 : CUMULATIVE DEVELOPMENT LOCATION MAP

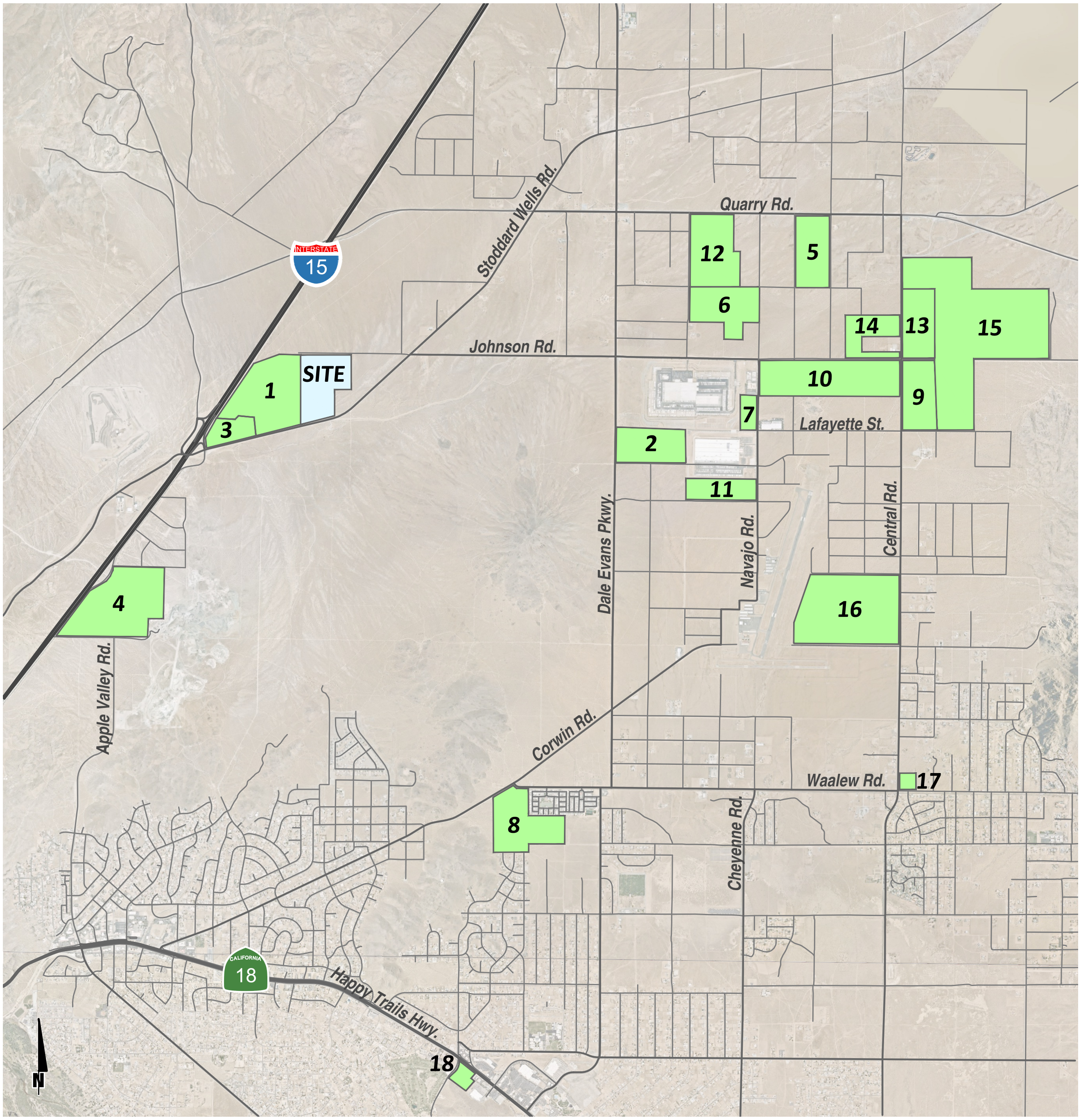
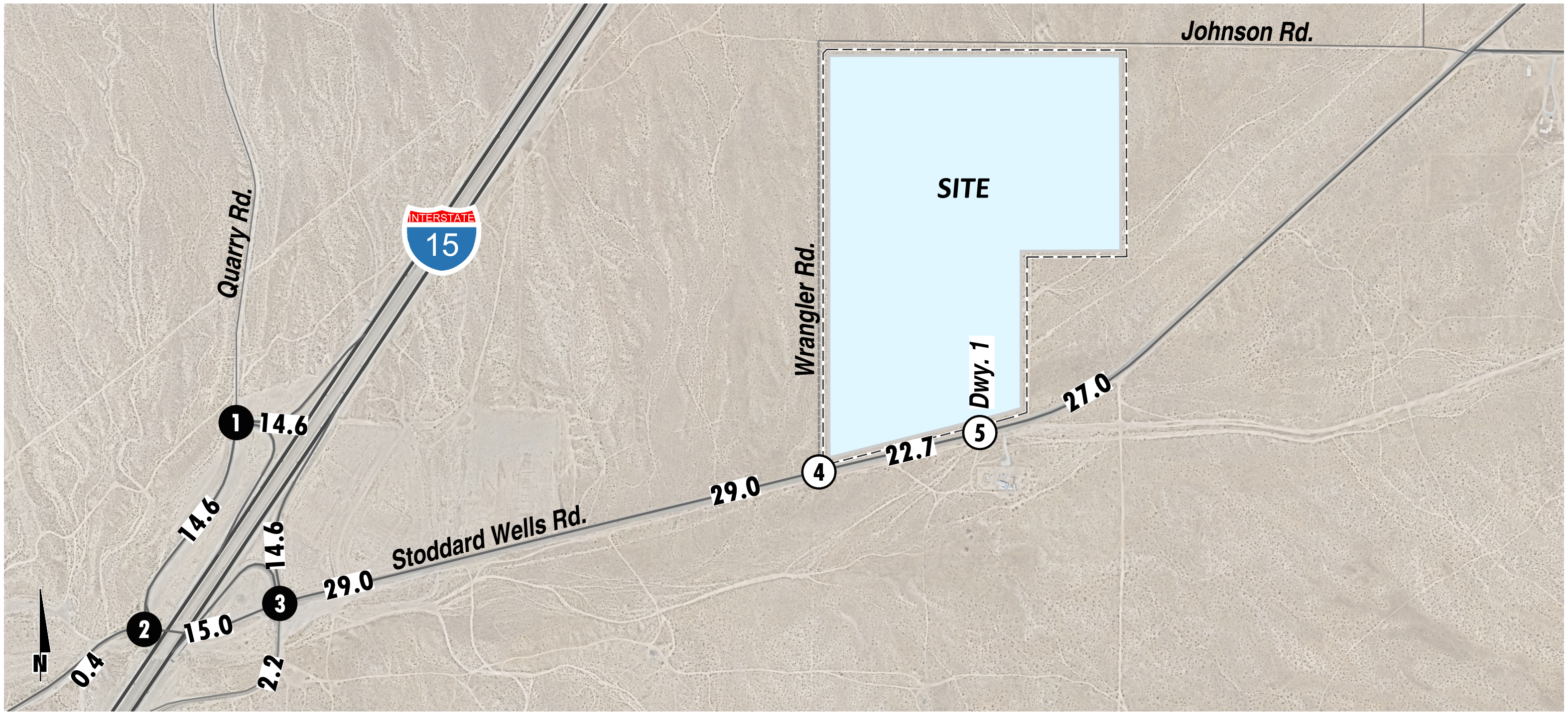
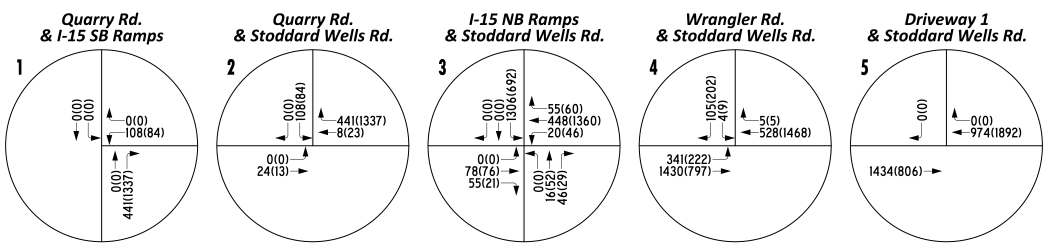


EXHIBIT 4-5 : CUMULATIVE ONLY TRAFFIC VOLUMES (ACTUAL VOLUMES)





LEGEND:

0 = Existing Intersection Analysis Location

(0) = Future Intersection Analysis Location

00(00) = Peak Hour Volume AM(PM)

00 = Average Daily Traffic (ADT) In Thousands

TABLE 4-4: CUMULATIVE DEVELOPMENT LAND USE SUMMARY

ID	Project Name	Land Use	Quantity	Units[1]
1	Apple Valley 143 (Covington)	High-Cube Fulfillment Center	2,518.500	TSF
2	Lafayette Street Logistics Facility (Redwood Industrial)	High-Cube Fulfillment Center	1,026.412	TSF
		High-Cube Cold Storage	181.132	TSF
3	Love's Travel Center	Travel Center	25	VFP
		Recreational Vehicle Stop	80	Spaces
4	Inland Empire Logistics Center	High-Cube Fulfillment Center	2,600.000	TSF
5	Quarry Pawnee Complex	High-Cube Fulfillment Center	1,460.000	TSF
6	Cordova Complex	High-Cube Fulfillment Center	1,560.000	TSF
7	Green Trucking Solutions Cold Storage	High-Cube Cold Storage	385.004	TSF
8	TTM No. 20306	Single Family Detached Residential	160	DU
9	1M Warehouse	High-Cube Fulfillment Center	1,080.000	TSF
10	Watson High Desert Logistics - East	High-Cube Fulfillment (Non-Sort)	2,800.000	TSF
11	Watson High Desert Logistics - West	High-Cube Fulfillment (Non-Sort)	900.000	TSF
12	Cordova Road Logistics Facility (Redwood West Cordova)	High-Cube Fulfillment Center	1,144.330	TSF
		High-Cube Cold Storage	201.940	TSF
13	Central Business Center (AV 3PL Site 1)	Warehousing	2,134.000	TSF
14	AV 3PL Site 2	Warehousing	2,134.000	TSF
15	North Apple Valley Industrial Park	Warehousing	5,821.709	TSF
16	Lake Creek Logistics	General Light Industrial	348.074	TSF
		High-Cube Cold Storage	348.074	TSF
		High-Cube Fulfillment Center	2,784.588	TSF
17	Commercial Center (APN 0437-193-26)	Gas Station With Convenience Market	12	VFP
		Retail	19.343	TSF
18	Buffalo Trading Post Plaza	Supermarket	20.599	TSF
		Tire Store	5.700	TSF
		Fast Food With Drive Thru	2.305	TSF
		Coffee Shop With Drive Thru	0.950	TSF
		Car Wash	1	Tunnel
		Gas Station	12	VFP
		Restaurant	7.650	TSF
		Strip Retail Plaza	35.000	TSF

[1] DU = Dwelling Units; TSF = Thousand Square Feet; VFP = Vehicle Fueling Positions

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5 OPENING YEAR CUMULATIVE (2028) TRAFFIC CONDITIONS

This section discusses the traffic forecasts for Opening Year Cumulative (2028) Without and With Project traffic forecasts, and the resulting intersection operations, traffic signal warrant, and freeway off-ramp queuing analyses.

5.1 ROADWAY IMPROVEMENTS

The lane configurations and traffic controls assumed to be in place for Opening Year Cumulative (2028) conditions are consistent with those shown previously in Exhibit 3-1, with the exception of the following:

- Project driveways and those facilities assumed to be constructed by the Project to provide site access are also assumed to be in place for Opening Year Cumulative conditions only (e.g., intersection and roadway improvements along the Project's frontage and driveways).
- If applicable, driveways and those facilities assumed to be constructed by cumulative developments to provide site access are also assumed to be in place for Opening Year Cumulative conditions only.

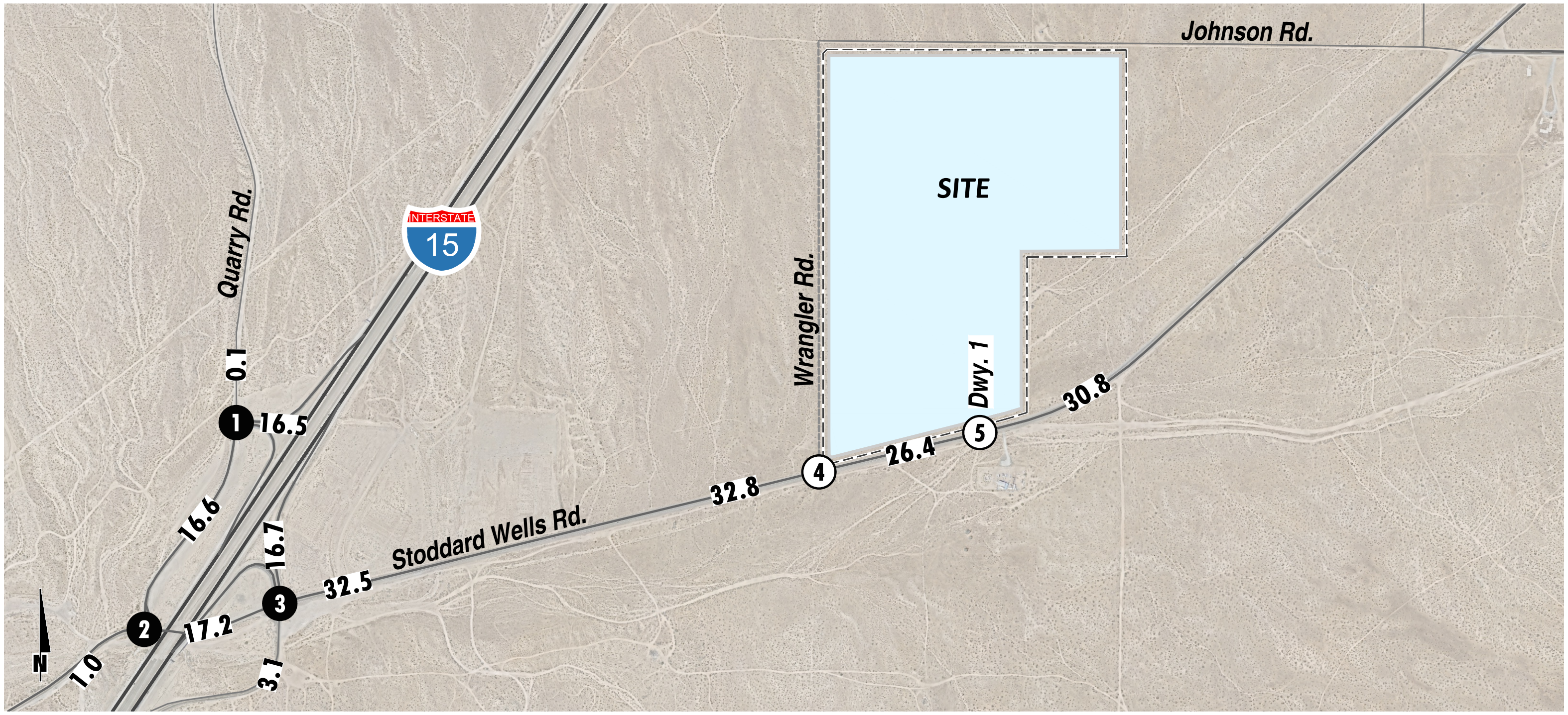
5.2 WITHOUT PROJECT GROWTH TRAFFIC VOLUME FORECASTS

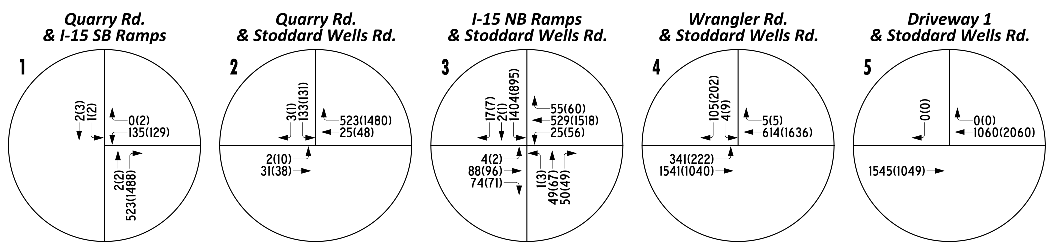
This scenario includes Existing (2025) traffic volumes plus an ambient growth rate of 6.12% and the addition of traffic generated by known cumulative development projects. The weekday AM and PM peak hour volumes which can be expected for Opening Year Cumulative (2028) Without Project traffic conditions are shown in Exhibit 5-1.

5.3 WITH PROJECT TRAFFIC VOLUME FORECASTS

This scenario includes Opening Year Cumulative (2028) Without Project traffic with the addition of Project traffic. The weekday AM and PM peak hour volumes which can be expected for Opening Year Cumulative (2028) With Project traffic conditions are shown in Exhibit 5-2.

EXHIBIT 5-1 : OPENING YEAR CUMULATIVE (2028) WITHOUT PROJECT TRAFFIC VOLUMES





LEGEND:

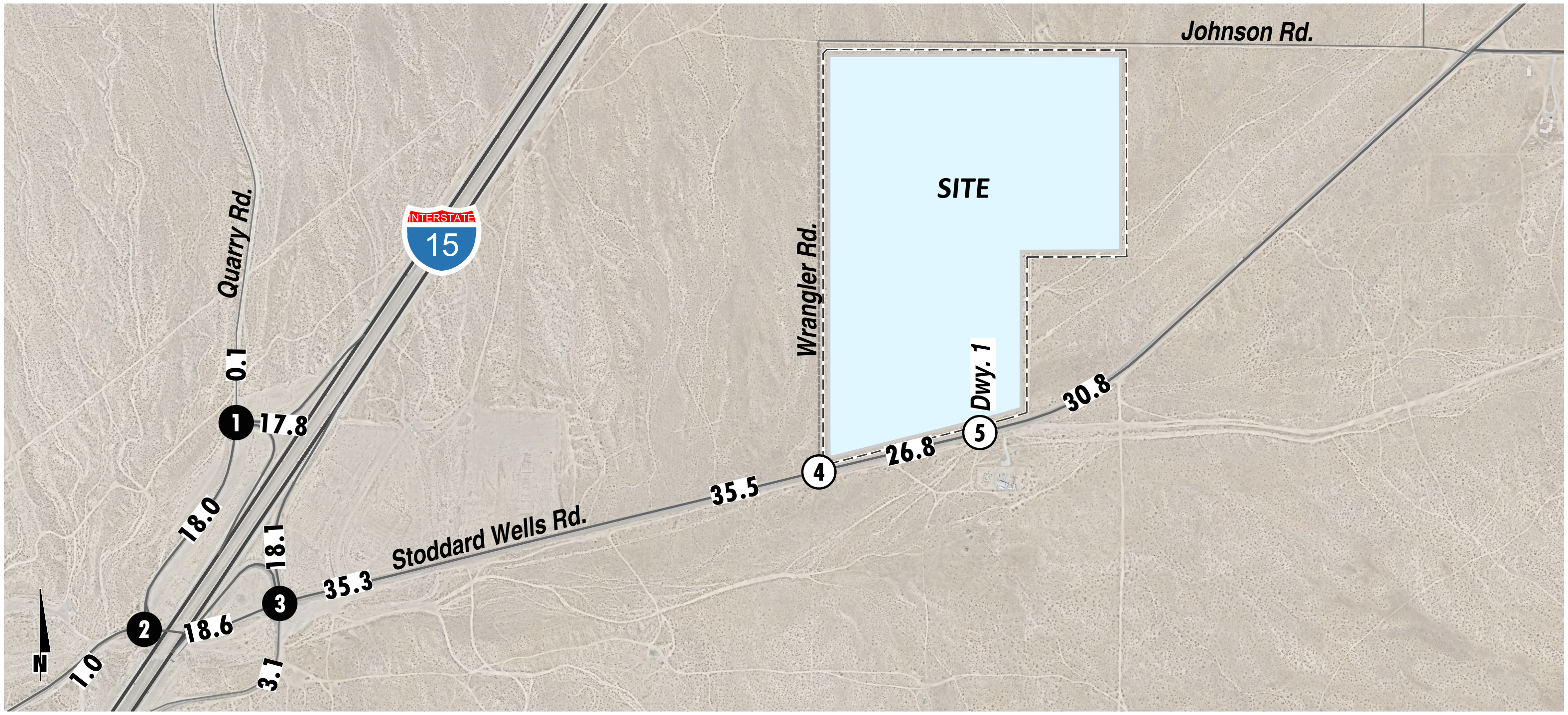
0 = Existing Intersection Analysis Location

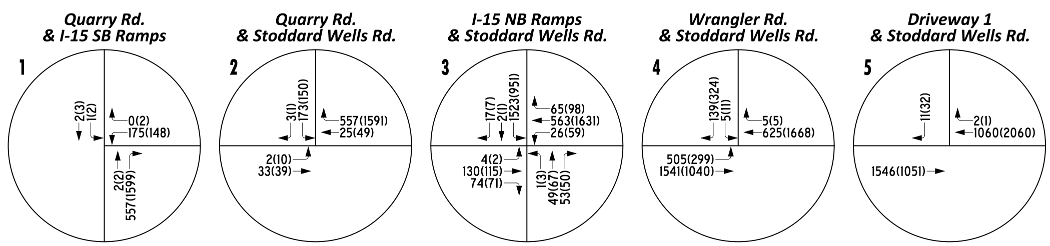
0 = Future Intersection Analysis Location

00(00) = Peak Hour Volume AM(PM)

00 = Average Daily Traffic (ADT) In Thousands

EXHIBIT 5-2 : OPENING YEAR CUMULATIVE (2028) WITH PROJECT TRAFFIC VOLUMES





LEGEND:

- 0 = Existing Intersection Analysis Location
- 0 = Future Intersection Analysis Location
- 00(00) = Peak Hour Volume AM(PM)
- **00** = Average Daily Traffic (ADT) In Thousands

5.4 INTERSECTION OPERATIONS ANALYSIS

Opening Year Cumulative (2028) peak hour traffic operations have been evaluated for the study area intersections based on the analysis methodologies presented in Section 2 *Methodologies*. The intersection analysis results are summarized in Table 5-1 for Opening Year Cumulative (2028) traffic conditions.

5.4.1 Opening Year Cumulative (2028) Without Project Traffic Conditions

LOS calculations were conducted for the study intersections to evaluate their operations under Opening Year Cumulative (2028) Without Project conditions with roadway and intersection geometrics consistent with Section 5.1 *Roadway Improvements*. As shown in Table 5-1, the following study area intersections are anticipated to operate at an unacceptable LOS under Opening Year Cumulative (2028) Without Project traffic conditions:

- Quarry Road & I-15 SB Ramps (#1) – LOS F PM peak hour only
- Quarry Road & Stoddard Wells Road (#2) – LOS F PM peak hour only
- I-15 NB Ramps & Stoddard Wells Road (#3) – LOS F AM and PM peak hours

The intersection operations analysis worksheets for Opening Year Cumulative (2028) Without Project traffic conditions are included in Appendix 5.1.

5.4.2 Opening Year Cumulative (2028) With Project Traffic Conditions

As shown in Table 5-1, no additional study area intersections are anticipated to operate at an unacceptable LOS with the addition of Project traffic. The intersection operations analysis worksheets for Opening Year Cumulative (2028) With Project traffic conditions are included in Appendix 5.2.

5.5 TRAFFIC SIGNAL WARRANTS ANALYSIS

Traffic signal warrants have been performed for Opening Year Cumulative (2028) traffic conditions based on peak hour intersection turning movements volumes or planning level (ADT) volumes. The following study area intersections are anticipated to meet a traffic signal warrant under Opening Year Cumulative (2029) Without Project traffic conditions:

- Quarry Road & I-15 SB Ramps (#1)
- Quarry Road & Stoddard Wells Road (#2)
- I-15 NB Ramps & Stoddard Wells Road (#3)
- Wrangler Road & Stoddard Wells Road (#4)

With the addition of Project traffic, no additional study area intersections are anticipated to meet a traffic signal warrant as they are all warranted under Opening Year Cumulative (2028) Without Project traffic conditions. The Opening Year Cumulative (2028) Without Project traffic conditions traffic signal warrant analysis worksheets are provided in Appendix 5.3.

TABLE 5-1: OYC (2028) INTERSECTION ANALYSIS

#	Intersection	Traffic Control[2]	2028 Without Project				2028 With Project			
			Delay[1] (Secs.)		Level of Service		Delay[1] (Secs.)		Level of Service	
			AM	PM	AM	PM	AM	PM	AM	PM
1	Quarry Rd. & I-15 SB Ramps	CSS	14.6	**75.5**	B	**F**	17.4	**>100**	C	**F**
2	Quarry Rd. & Stoddard Wells Rd.	CSS	20.8	**>100**	C	**F**	31.4	**>100**	D	**F**
3	I-15 NB Ramps & Stoddard Wells Rd.	CSS	**>100**	**>100**	**F**	**F**	**>100**	**>100**	**F**	**F**
4	Wrangler Rd. & Stoddard Wells Rd.	**TS**	Future Intersection				50.5	40.2	D	D
5	Driveway 1 & Stoddard Wells Rd.	**CSS**	Future Intersection				14.0	28.0	B	D

* **BOLD** = Level of Service (LOS) does not meet the applicable jurisdictional requirements (i.e., unacceptable LOS).

1 Per the Highway Capacity Manual (7th Edition), overall average intersection delay and level of service are shown for intersections with a traffic signal or all way stop control. For intersections with cross street stop control, the delay and level of service for the worst individual movement (or movements sharing a single lane) are shown. HCM delay reported in seconds.

2 TS = Traffic Signal; AWS = All-way Stop; CSS = Cross-street Stop

5.6 OFF-RAMP QUEUING ANALYSIS

Queuing analysis findings for Opening Year Cumulative (2028) Without and With Project are presented in Table 5-2. As shown in Table 5-2, the following movement is anticipated to experience off-ramp queuing issues during the weekday AM or weekday PM 95th percentile traffic flows under Opening Year Cumulative (2028) Without Project traffic conditions:

- I-15 NB Ramps & Stoddard Wells Road (#3) Southbound shared left-through-right – AM and PM peak hours

With the addition of Project traffic, no additional movements are anticipated to experience off-ramp queuing issues under Opening Year Cumulative (2028) With Project traffic conditions. Worksheets for Opening Year Cumulative (2028) Without Project and With Project traffic conditions queuing analysis are provided in Appendices 5.4 and 5.5, respectively.

TABLE 5-2: OYC (2028) QUEUING SUMMARY

#	Intersection	Movement	Available Stacking Distance (Feet)	2028 Without Project				2028 With Project			
				95th Percentile Queue (Feet)[3]		Acceptable?[1]		95th Percentile Queue (Feet)[3]		Acceptable?[1]	
				AM Peak Hour	PM Peak Hour	AM	PM	AM Peak Hour	PM Peak Hour	AM	PM
1	Quarry Rd. & I-15 SB Ramps	WBL/R	1,000	38	168	Yes	Yes	63	270	Yes	Yes
3	I-15 NB Ramps & Stoddard Wells Rd.	SBL/T/R	1,000	**5,960**	**--** [3]	**No**	**No**	**6,608**	**--** [3]	**No**	**No**

[1] Stacking Distance is acceptable if the required stacking distance is less than or equal to the stacking distance provided. An additional 25 feet of stacking which is assumed to be provided in the transition for turn pockets is reflected in the stacking distance shown on this table, where applicable.

[2] 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.

[3] Overflow of vehicles, no queue reported in Synchro and assumed to exceed available storage.

5.7 PROJECT DEFICIENCIES AND RECOMMENDED IMPROVEMENTS

5.7.1 Recommended Improvements to Address Deficiencies at Intersections

The effectiveness of the recommended improvement strategies to address Opening Year Cumulative (2028) traffic deficiencies are presented in Table 5-3 to achieve LOS D or better. Worksheets for Opening Year Cumulative (2028) With Project conditions, with improvements, HCM calculation worksheets are provided in Appendix 5.6.

5.7.2 Recommended Improvements to Address Deficiencies for Off-Ramp Queues

The effectiveness of the recommended improvement strategies to address Opening Year Cumulative (2028) off-ramp deficiencies are presented in Table 5-4. The improvements are consistent with the intersection improvements identified in Table 5-3. Worksheets for Opening Year Cumulative (2028) With Project conditions, with improvements, off-ramp queuing analysis worksheets are provided in Appendix 5.7.

TABLE 5-3: OYC (2028) INTERSECTION ANALYSIS WITH IMPROVEMENTS

#	Intersection	Traffic Control[3]	Intersection Approach Lanes[1]												Delay[2] (secs.)		Level of Service	
			Northbound			Southbound			Eastbound			Westbound						
			L	T	R	L	T	R	L	T	R	L	T	R	AM	PM	AM	PM
1	Quarry Rd. & I-15 SB Ramps																	
	Without Improvements:	CSS	0	1	0	0	1	0	0	0	0	0	1	0	17.4	**>100**	C	**F**
	With Improvements:	CSS	0	1	**1**	0	1	0	0	0	0	0	1	0	10.0	23.7	A	C
2	Quarry Rd. & Stoddard Wells Rd.																	
	Without Improvements:	CSS	0	0	0	0	1	0	0	1	0	0	1	0	**31.4**	**>100**	**D**	**F**
	With Improvements:	CSS	0	0	0	0	1	0	0	1	**1**	0	1	0	11.3	33.3	B	D
3	I-15 NB Ramps & Stoddard Wells Rd.																	
	Without Improvements:	CSS	0	1	0	0	1	0	0	1	0	0	1	0	**>100**	**>100**	**F**	**F**
	With Improvements:	**TS**	**1**	1	0	**2**	1	0	**1**	1	0	**1**	**2**	0	38.9	50.2	D	D

* **BOLD** = LOS does not meet the applicable jurisdictional requirements (i.e., unacceptable LOS).

1 When a right turn is designated, the lane can either be striped or unstriped. To function as a right turn lane there must be sufficient width for right turning vehicles to travel outside the through lanes.

L = Left; T = Through; R = Right; >> = Free-Right Turn Lane; > = Right-Turn Overlap Phasing; **1** = Improvement

2 Per the Highway Capacity Manual 7th Edition, overall average intersection delay and level of service are shown for intersections with a traffic signal or all way stop control. For intersections with cross street stop control, the delay and level of service for the worst individual movement (or movements sharing a single lane) are shown.

3 TS = Traffic Signal

TABLE 5-4: OYC (2028) QUEUING SUMMARY WITH IMPROVEMENTS

#	Intersection	Movement	Available Stacking Distance (Feet)	2028 With Project			
				95th Percentile Queue (Feet)[3]		Acceptable? [1]	
				AM Peak Hour	PM Peak Hour	AM	PM
1	Quarry Rd. & I-15 SB Ramps	WBL/R	1,000	25	20	Yes	Yes
3	I-15 NB Ramps & Stoddard Wells Rd.	SBL	1,000	845 [2]	606 [2]	Yes	Yes
		SBT/R	1,000	14	15	Yes	Yes

Underline = Improvement

[1] Stacking Distance is acceptable if the required stacking distance is less than or equal to the stacking distance provided. An additional 25 feet of stacking which is assumed to be provided in the transition for turn pockets is reflected in the stacking distance shown on this table, where applicable.

[2] 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.

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6 LOCAL AND REGIONAL FUNDING MECHANISMS

Transportation improvements within the Town of Apple Valley are funded through a combination of direct project mitigation, development impact fee programs or fair share contributions, such as the Town of Apple Valley Development Impact Fee (DIF) program. Identification and timing of needed improvements is generally determined through local jurisdictions based upon a variety of factors.

6.1 Town of Apple Valley Development Impact Fee Program

The Town of Apple Valley has implemented a DIF program. This program collects fees from new single-family residential, multi-family residential, commercial, office use, and industrial developments. These fees serve to fund compliant regional facilities as well as local facilities such as law enforcement, storm drainage, sanitary sewer, and general government fees. Fees are also allocated to finance parks and Apple Valley Fire Protection District. Under the town's DIF program, the Town may grant developers construct certain facilities and landscaped medians identified in the list of improvements funded by the DIF program.

It is recommended that the Project Applicant coordinate with Town of Apple Valley DIF program to enter into a formal credit reimbursement agreement prior to remitting fee payments and/or initiating construction of any program facilities. Establishing such an agreement is essential to allow the Town of Apple Valley sufficient opportunity to review the proposed construction plans and implementation schedule. This review enables the agency to determine the eligibility of specific improvements for fee program credit amount in accordance with the program's guidelines.

6.2 Measure "I" Funds

In 2004, the voters of San Bernardino County approved the 30-year extension of Measure "I", a one-half of one percent sales tax on retail transactions, through the year 2040, for transportation projects including, but not limited to, infrastructure improvements, commuter rail, public transit, and other identified improvements. The Measure "I" extension requires that a regional traffic impact fee be created to ensure development is paying its fair share. A regional Nexus study was prepared by the San Bernardino County Transportation Authority (SBCTA) and concluded that each jurisdiction should include a regional fee component in their local programs in order to meet the Measure "I" requirement. The regional component assigns specific facilities and cost sharing formulas to each jurisdiction and was most recently updated in March 2019. Revenues collected through these programs are used in tandem with the Town's DIF funds to deliver projects identified in the Nexus Study. While Measure "I" is a self-executing sales tax administered by SBCTA, it bears discussion here because the funds raised through Measure "I" have funded in the past and will continue to fund new transportation facilities in San Bernardino County, including within the Town of Apple Valley.

6.3 Fair Share Contribution

Project improvements may include a combination of fee payments to established programs, construction of specific improvements, payment of a fair share contribution toward future improvements or a combination of these approaches. Improvements constructed by development may be eligible for a fee credit or reimbursement through the program where appropriate (to be determined at the Town's discretion).

When off-site improvements are identified with a minor share of responsibility assigned to proposed development, the approving jurisdiction may elect to collect a fair share contribution or require the development to construct improvements. Detailed fair share calculations, for each peak hour, have been provided in Table 6-1 for the applicable deficient study area intersections.

TABLE 6-1: PROJECT FAIR SHARE CALCULATIONS

#	Intersection		Existing (2025)	Project	2028 With Project	Total New Traffic	Project % of New Traffic[1]
1	Quarry Rd. & I-15 SB Ramps						
		AM:	107	74	737	630	**11.7%**
		PM:	193	130	1,756	1,563	8.3%
2	Quarry Rd. & Stoddard Wells Rd.						
		AM:	129	76	794	665	**11.4%**
		PM:	237	132	1,841	1,604	8.2%
3	I-15 NB Ramps & Stoddard Wells Rd.						
		AM:	258	209	2,507	2,249	**9.3%**
		PM:	461	230	3,055	2,594	8.9%

[1] **BOLD =** Highest fair share percentage is highlighted.

7 REFERENCES

1. **County of San Bernardino.** *County of San Bernardino Transportation Impact Study Guidelines.* July 2019.

2. **Institute of Transportation Engineers.** *Trip Generation Manual.* 12th Edition. 2025.

3. **San Bernardino Associated Governments.** *Congestion Management Program for County of San Bernardino.* County of San Bernardino : s.n., Updated 2023.

4. **Transportation Research Board.** *Highway Capacity Manual (HCM).* 7th Edition. s.l. : National Academy of Sciences, 2022.

5. **California Department of Transportation.** California Manual on Uniform Traffic Control Devices (CA MUTCD). [book auth.] California Department of Transportation. *California Manual on Uniform Traffic Control Devices (CA MUTCD).* 2014, Updated March 30, 2021 (Revision 6).

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8 CERTIFICATION

The contents of this Traffic Analysis represent an accurate depiction of the transportation environment and deficiencies associated with the proposed Apple Valley 84 Project. The information contained in this Traffic Analysis is based on the best available data at the time of preparation. If you have any questions, please contact me directly at (949) 861-0177.

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Education

Bachelor of Science in Civil Engineering
University of California, Irvine • June 2004

Professional Registrations

PE – Registered Professional Traffic Engineer – TR 2414 • January 2007

Professional Affiliations

ITE – Institute of Transportation Engineers
WTS – Women's Transportation Seminar

Appendix 1.1:

Approved Scoping Agreement

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SCOPING AGREEMENT

DATE: May 14, 2025
TO: Richard Hirsch, Town of Apple Valley
FROM: Charlene So, Urban Crossroads, Inc.
JOB NO: 16408-03 TA Scope

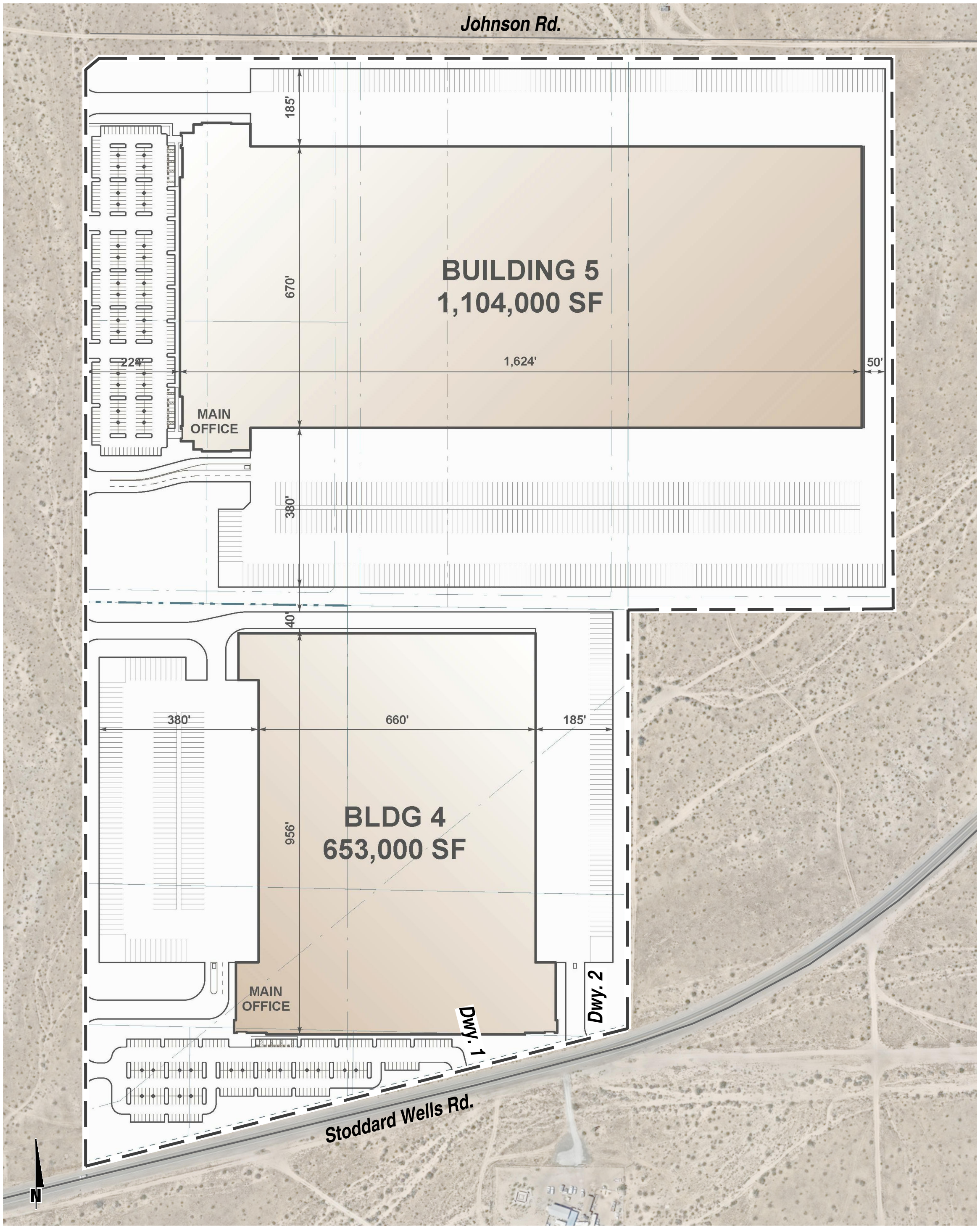
SUBJECT: BELL MOUNTAIN COMMERCE CENTER TRAFFIC STUDY SCOPING AGREEMENT

Urban Crossroads, Inc. has prepared the following Traffic Study Scoping Agreement for the Bell Mountain Commerce Center (Project), which is located north of Stoddard Wells Road and south of Johnson Road in the Town of Apple Valley. This letter describes the proposed Project trip generation, trip distribution, and analysis methodology, which have been used to establish the draft proposed Project study area and analysis locations. The following scoping agreement has been prepared in accordance with the County's Transportation Impact Study Guidelines, dated July 9, 2019 (since the Town does not have their own adopted guidelines).

PROJECT DESCRIPTION

The Project consists of the development of two industrial warehouse and distribution buildings totaling 1,757,000 square feet. For the purposes of the traffic study, it is proposed that the Project mix will assume 15% High-Cube Cold Storage Warehouse use and 85% High-Cube Fulfillment (Non-Sort) Center Warehouse use. A preliminary site plan for the proposed Project is shown on Exhibit 1. The Project is anticipated to have an Opening Year of 2028. Access to both buildings will be accommodated via seven new driveways along New Public Street which is a new north/south roadway connecting Johnson Road to Stoddard Wells Road. Building 4 has two additional driveways proposed on Stoddard Wells Road. All driveways are assumed to allow for full access (no turn restrictions) with the exception of the access points on Stoddard Wells Road which will assume right-in/right-out access only.

EXHIBIT 1: PRELIMINARY SITE PLAN



TRIP GENERATION

Trip generation represents the amount of traffic which is both attracted to and produced by a development. Determining traffic generation for a specific project is therefore based upon forecasting the amount of traffic that is expected to be both attracted to and produced by the specific land uses being proposed for a given development. In order to develop the traffic characteristics of the proposed Project, trip-generation statistics published in the Institute of Transportation Engineers (ITE) Trip Generation Manual (11th Edition, 2021) was used. The following ITE land use codes and vehicle mixes will be utilized for the proposed Project (Table 1 presents the trip generation rates):

- High-Cube Cold Storage Warehouse (ITE Land Use Code 157) has been used to derive site specific trip generation estimates for up to 263,550 square feet (15% of the total square footage). High-cube cold storage warehouses include warehouses characterized by the storage and/or consolidation of manufactured goods (and to a lesser extent, raw materials) prior to their distribution to retail locations or other warehouses. High-cube cold storage warehouses are facilities typified by temperature-controlled environments for frozen food or other perishable products. The High-Cube Cold Storage Warehouse vehicle mix (passenger cars versus trucks) has been obtained from the ITE's Trip Generation Manual. The truck percentages were further broken down by axle type per the following South Coast Air Quality Management District (SCAQMD) recommended truck mix: 2-Axle = 34.7%; 3-Axle = 11.0%; 4+-Axle = 54.3%.
- High-Cube Fulfillment Center Warehouse has been used to derive site specific trip generation estimates for up to 1,493,450 square feet of the proposed Project (85% of the total square footage). The ITE Trip Generation Manual has trip generation rates for high-cube fulfillment center use for both non-sort and sort facilities (ITE land use code 155). As defined by ITE, *a high-cube warehouse is a building that typically has at least 200,000 gross square feet of floor area, has a ceiling height of 24 feet or more, and is used primarily for the storage and/or consolidation of manufactured goods (and to a lesser extent, raw materials) prior to their distribution to retail locations or other warehouses. A typical high-cube warehouse has a high level of on-site automation and logistics management. The automation and logistics enable highly-efficient processing of goods through the high-cube warehouse.* The ITE Trip Generation Manual has two subcategories for the High-Cube Fulfillment Center use: sort and non-sort. ITE describes a sort facility as a *fulfillment center that ships out smaller items, requiring extensive sorting, typically by manual means*. In comparison, *a non-sort facility is a fulfillment center that ships large box items that are processed primarily with automation rather than through manual means*. Some limited assembly and repackaging may occur within the facility. The non-sort facility sub-land use category has been assumed for the purposes of calculating trip generation for the Project consistent with other surrounding projects in the vicinity. The vehicle mix (passenger cars versus trucks) has been obtained from the ITE's Trip Generation Manual. The truck percentages were further broken down by axle type per the following SCAQMD recommended truck mix: 2-Axle = 16.7%; 3-Axle = 20.7%; 4+-Axle = 62.6%.

Table 2 shows the resulting Project trip generation summary, which shows the Project is anticipated to generate a net total of 3,268 two-way vehicle trip-ends per day with 253 AM peak hour trips and 269 PM peak hour trips (actual vehicles).

Passenger car equivalent (PCE) factors were applied to the trip generation rates for heavy trucks (large 2-axles, 3-axles, 4+-axles). PCEs allow the typical "real-world" mix of vehicle types to be represented as a single, standardized unit, such as the passenger car, to be used for the purposes of capacity and level of service analyses. The PCE factors are consistent with the recommended PCE factors in the County's Guidelines. Table 3 shows the resulting Project trip generation summary in PCE, which shows the Project is anticipated to generate a net total of 4,102 two-way PCE vehicle trip-ends per day with 312 PCE AM peak hour trips and 307 PCE PM peak hour trips. Consistent with the County requirements, the peak hour intersection operations analysis will be conducted using the PCE volumes shown in Table 3.

TRIP DISTRIBUTION

The Project trip distribution represents the directional orientation of traffic to and from the Project site. Trip distribution is the process of identifying the probable destinations, directions or traffic routes that will be utilized by Project traffic. The potential interaction between the planned land uses and surrounding regional access routes are considered, to identify the route where the Project traffic would distribute. The Project trip distribution represents the directional orientation of traffic to and from the Project site. The proposed Project trip distributions are shown on Exhibit 2 for passenger cars and Exhibit 3 for trucks. The Project truck trip distribution patterns adhere to the Town's approved truck routes.

Table 1: Trip Generation Rates

Land Use[1]	Units[2]	ITE LU Code	AM Peak Hour			PM Peak Hour			Daily
			In	Out	Total	In	Out	Total	
Actual Vehicle Trip Generation Rates									
High-Cube Fulfillment Center (Non-Sort)[3]	TSF	155	0.122	0.028	0.150	0.062	0.098	0.160	1.810
Passenger Cars			0.112	0.018	0.130	0.057	0.093	0.150	1.580
2-Axle Trucks			0.002	0.001	0.003	0.001	0.001	0.002	0.038
3-Axle Trucks			0.002	0.002	0.004	0.001	0.001	0.002	0.048
4+-Axle Trucks			0.006	0.007	0.013	0.003	0.003	0.006	0.144
High-Cube Cold Storage Warehouse[3]	TSF	157	0.085	0.025	0.110	0.034	0.086	0.120	2.120
Passenger Cars			0.076	0.004	0.080	0.019	0.071	0.090	1.370
2-Axle Trucks			0.003	0.007	0.010	0.005	0.005	0.010	0.260
3-Axle Trucks			0.001	0.002	0.003	0.002	0.001	0.003	0.083
4+-Axle Trucks			0.005	0.011	0.016	0.008	0.008	0.016	0.407
PCE Trip Generation Rates									
High-Cube Fulfillment Center (Non-Sort)[3]	TSF	155	0.122	0.028	0.150	0.062	0.098	0.160	1.810
Passenger Cars			0.112	0.018	0.130	0.057	0.093	0.150	1.580
2-Axle Trucks (PCE = 1.5)			0.003	0.002	0.005	0.002	0.001	0.003	0.058
3-Axle Trucks (PCE = 2.0)			0.005	0.005	0.010	0.003	0.003	0.005	0.119
4+-Axle Trucks (PCE = 3.0)			0.018	0.020	0.038	0.009	0.010	0.019	0.432
High-Cube Cold Storage Warehouse[3]	TSF	157	0.085	0.025	0.110	0.034	0.086	0.120	2.120
Passenger Cars			0.076	0.004	0.080	0.019	0.071	0.090	1.370
2-Axle Trucks (PCE = 1.5)			0.005	0.011	0.016	0.008	0.008	0.016	0.390
3-Axle Trucks (PCE = 2.0)			0.002	0.005	0.007	0.004	0.003	0.007	0.165
4+-Axle Trucks (PCE = 3.0)			0.015	0.034	0.049	0.024	0.025	0.049	1.222

[1] Trip Generation & Vehicle Mix Source: Institute of Transportation Engineers (ITE), Trip Generation Manual, 11th Edition (2021).
[2] TSF = thousand square feet
[3] Truck Mix: South Coast Air Quality Management District's (SCAQMD) recommended truck mix, by axle type.
Normalized % - Without Cold Storage: 16.7% 2-Axle trucks, 20.7% 3-Axle trucks, 62.6% 4-Axle trucks.
Normalized % - With Cold Storage: 34.7% 2-Axle trucks, 11.0% 3-Axle trucks, 54.3% 4-Axle trucks.

TABLE 2: PROJECT TRIP GENERATION (ACTUAL VEHICLES)

Land Use	Quantity	Units[1]	AM Peak Hour			PM Peak Hour			Daily
			In	Out	Total	In	Out	Total	
Actual Vehicles:									
High-Cube Fulfillment (Non-Sort)	1,493.450	TSF							
Passenger Cars:			167	27	194	85	139	224	2,360
2-axle Trucks:			3	2	5	1	1	2	58
3-axle Trucks:			3	3	6	1	2	3	72
4+-axle Trucks:			9	10	19	4	5	9	216
Total Truck Trips:			15	15	30	6	8	14	346
Total Trips (Actual Vehicles)[2]			182	42	224	91	147	238	2,706
High-Cube Cold Storage	263.550	TSF							
Passenger Cars:			20	1	21	5	19	24	362
2-axle Trucks:			1	2	3	1	1	2	70
3-axle Trucks:			0	1	1	1	0	1	22
4+-axle Trucks:			1	3	4	2	2	4	108
Total Truck Trips:			2	6	8	4	3	7	200
Total Trips (Actual Vehicles)[2]			22	7	29	9	22	31	562
Passenger Cars			187	28	215	90	158	248	2,722
Trucks			17	21	38	10	11	21	546
Total Trips (Actual Vehicles)[2]			**204**	**49**	**253**	**100**	**169**	**269**	**3,268**

[1] TSF = thousand square feet

[2] Total Trips = Passenger Cars + Truck Trips.

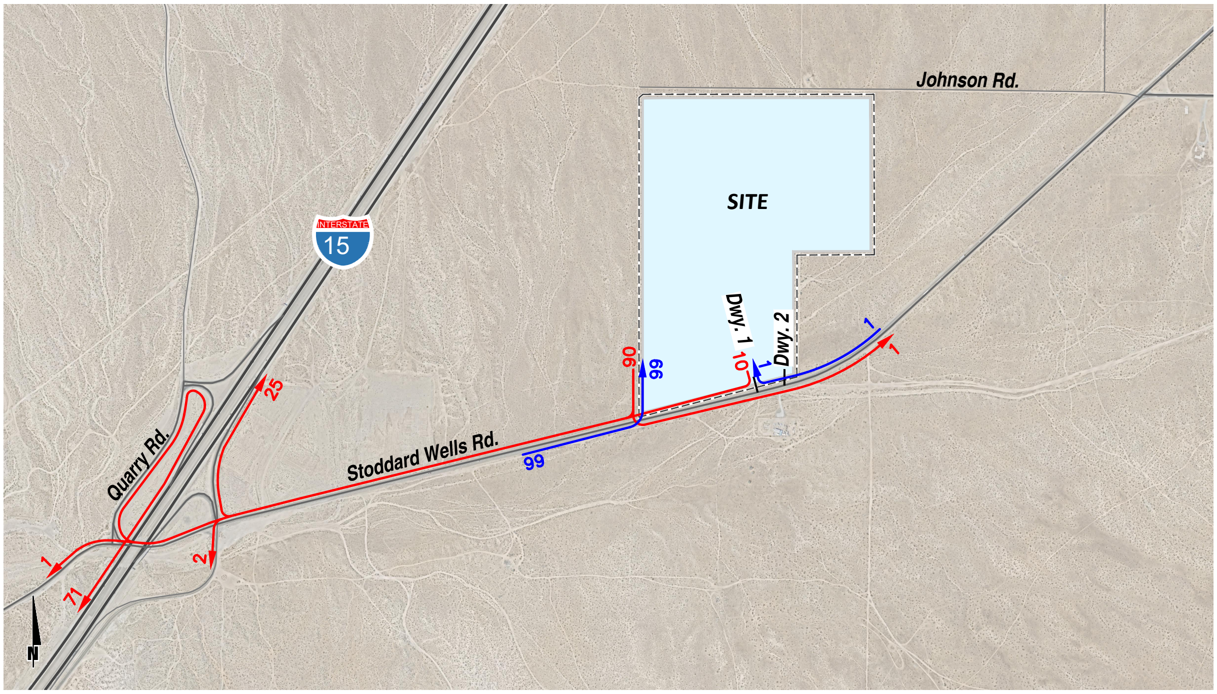
Table 3: Project Trip Generation (PCE)

Land Use	Quantity	Units[1]	AM Peak Hour			PM Peak Hour			Daily
			In	Out	Total	In	Out	Total	
Passenger Car Equivalent (PCE):									
High-Cube Fulfillment (Non-Sort)	1,493.450	TSF							
Passenger Cars:			167	27	194	85	139	224	2,360
2-axle Trucks:			4	3	7	2	2	4	86
3-axle Trucks:			7	8	15	4	4	8	178
4+-axle Trucks:			27	29	56	13	15	28	646
Total Truck Trips (PCE):			38	40	78	19	21	40	910
Total Trips (PCE)[2]			205	67	272	104	160	264	3,270
High-Cube Cold Storage	263.550	TSF							
Passenger Cars:			20	1	21	5	19	24	362
2-axle Trucks:			1	3	4	2	2	4	104
3-axle Trucks:			1	1	2	1	1	2	44
4+-axle Trucks:			4	9	13	6	7	13	322
Total Truck Trips (PCE):			6	13	19	9	10	19	470
Total Trips (PCE)[2]			26	14	40	14	29	43	832
Passenger Cars			187	28	215	90	158	248	2,722
Trucks			44	53	97	28	31	59	1,380
Total Trips (PCE)[2]			**231**	**81**	**312**	**118**	**189**	**307**	**4,102**

[1] TSF = thousand square feet

[2] Total Trips = Passenger Cars + Truck Trips.

EXHIBIT 2: PROJECT (PASSENGER CAR) TRIP DISTRIBUTION



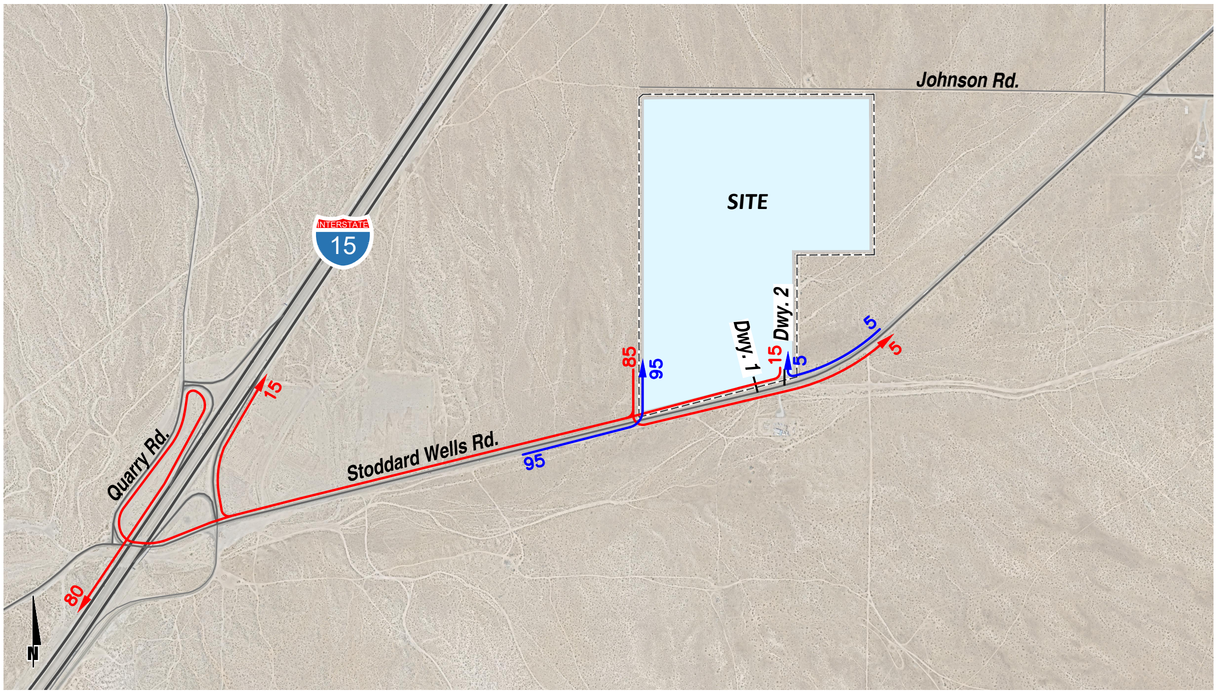
LEGEND:

10 = *Car Percent To/From Project*

= *Inbound*

= *Outbound*

EXHIBIT 3: PROJECT (TRUCK) TRIP DISTRIBUTION



LEGEND:

10 = *Truck Percent To/From Project*

= *Inbound*

= *Outbound*

ANALYSIS SCENARIOS

Consistent with the County's Guidelines, intersection analysis will be provided for the following analysis scenarios:

- Existing (2025) Conditions
- Opening Year Cumulative (2028) Without Project Conditions
- Opening Year Cumulative (2028) With Project Conditions

All study area intersections will be evaluated using the Highway Capacity Manual (HCM) 7th Edition analysis methodology. The study area that is proposed to be evaluated is shown on Exhibit 4 and is listed in Table 4.

TABLE 4: STUDY AREA INTERSECTIONS

ID	Intersection Location	Jurisdiction
1	Quarry Rd. & I-15 SB Ramps	Caltrans, County
2	Quarry Rd. & Stoddard Wells Rd.	County
3	I-15 NB Ramps & Stoddard Wells Rd.	Caltrans, Apple Valley
4	New Outer I-15 Hwy & Stoddard Wells Rd.	Apple Valley
5	Driveway 1 & Stoddard Wells Rd.	Apple Valley
6	Driveway 2 & Stoddard Wells Rd.	Apple Valley

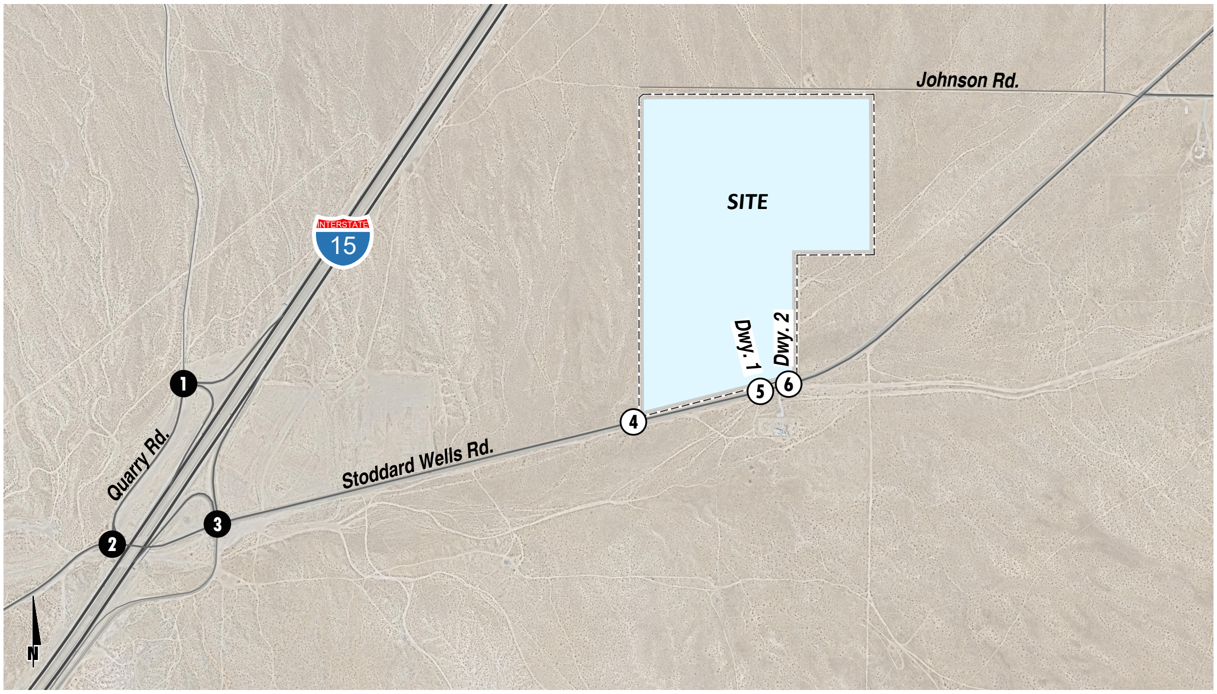
TRAFFIC COUNTS

New traffic counts will be conducted during a typical weekday when local schools are in session and operating on a typical bell schedule. No adjustments are proposed to the traffic counts for the baseline traffic condition with the exception of volume balancing between closely spaced intersections. Traffic counts will be conducted once the scoping agreement has been approved.

AMBIENT GROWTH

Future year traffic forecasts will include background (ambient) growth at 2.0% per year, compounded annually. The total ambient growth is 6.12% for 2028 traffic conditions. The ambient growth factor is intended to approximate regional traffic growth. This ambient growth rate will be added to existing traffic volumes to account for area-wide growth not reflected by cumulative development projects.

EXHIBIT 4: STUDY AREA



LEGEND:

0 = *Existing Intersection Analysis Location*

0 = *Future Intersection Analysis Location*

CUMULATIVE PROJECTS

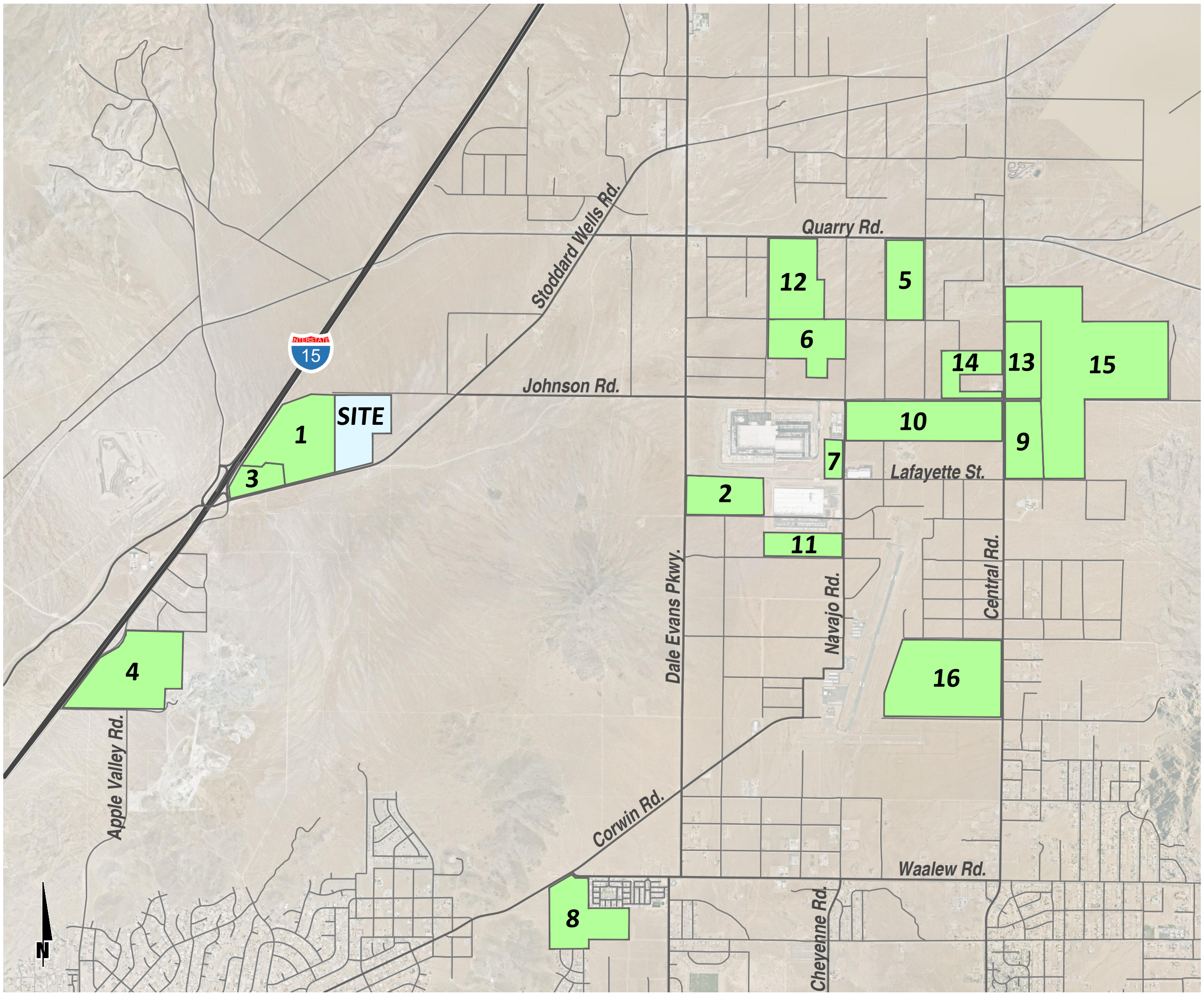
Exhibit 5 shows the locations of the cumulative projects listed on Table 5. It is requested that the Town review the list and also provide any additional current cumulative projects within the study area for inclusion in Traffic Analysis.

TABLE 5: LIST OF CUMULATIVE DEVELOPMENTS

ID	Project Name	Land Use	Quantity	Units[1]
1	Apple Valley 143 (Covington)	High-Cube Fulfillment Center	2,518.500	TSF
2	Lafayette Street Logistics Facility (Redwood Industrial)	High-Cube Fulfillment Center	1,026.412	TSF
		High-Cube Cold Storage	181.132	TSF
3	Love's Travel Center	Travel Center	25	VFP
		Recreational Vehicle Stop	80	Spaces
4	Inland Empire Logistics Center	High-Cube Fulfillment Center	2,600.000	TSF
5	Quarry Pawnee Complex	High-Cube Fulfillment Center	1,460.000	TSF
6	Cordova Complex	High-Cube Fulfillment Center	1,560.000	TSF
7	Green Trucking Solutions Cold Storage	High-Cube Cold Storage	385.004	TSF
8	TTM No. 20306	Single Family Detached Residential	160	DU
9	1M Warehouse	High-Cube Fulfillment Center	1,080.000	TSF
10	Watson High Desert Logistics - East	High-Cube Fulfillment (Non-Sort)	2,800.000	TSF
11	Watson High Desert Logistics - West	High-Cube Fulfillment (Non-Sort)	900.000	TSF
12	Cordova Road Logistics Facility (Redwood West Cordova)	High-Cube Fulfillment Center	1,144.330	TSF
		High-Cube Cold Storage	201.940	TSF
13	Central Business Center (AV 3PL Site 1)	Warehousing	2,134.000	TSF
14	AV 3PL Site 2	Warehousing	2,134.000	TSF
15	North Apple Valley Industrial Park	Warehousing	5,821.709	TSF
16	Lake Creek Logistics	General Light Industrial	348.074	TSF
		High-Cube Cold Storage	348.074	TSF
		High-Cube Fulfillment Center	2,784.588	TSF

[1] DU = Dwelling Units; TSF = Thousand Square Feet; VFP = Vehicle Fueling Positions

Exhibit 5: Cumulative Project Location Map



IDENTIFYING DEFICIENCIES

The identification of project deficiencies is designed to identify potential level of service (LOS) problems and to address them before they occur. This will provide a framework for establishing transportation-related project conditions by the Town.

A project deficiency occurs when a signalized or unsignalized intersection is forecast to degrade intersection operations below the Town's acceptable LOS standard, which is identified in the Town's Circulation Element, or if a project adds five seconds of delay or more to an intersection that operates below acceptable standards without the addition of project traffic.

Additionally, all unsignalized intersections shall be evaluated for a peak hour traffic signal warrant based on the California Manual on Uniform Transportation Control Devices (MUTCD). Any unsignalized intersection that meets the peak hour signal warrant is considered deficient.

IDENTIFYING IMPROVEMENTS AND COST ESTIMATES

Physical improvements shall be identified at all intersections that are forecast to operate deficiently. Improvements under future year conditions must bring intersection operations to acceptable standards, while improvements under opening year conditions must bring intersection operations to better than pre-project conditions.

Opening year improvement costs are the sole responsibility of the project, and future year improvement costs are based on a fair share contribution calculation. The project's fair share contribution for future year improvements can be estimated using the following equation:

$$Fair\ Share\ Percentage = \frac{Project\ Trips}{Future\ Year\ With\ Project - Existing}$$

SITE ACCESS AND CHARACTERISTICS

LOS shall be estimated at all project driveways to ensure they are sized accordingly. The site should be reviewed to ensure that it does not have any design characteristics that would promote inefficient circulation. For example, proposed driveways should provide sufficient length so that vehicles entering the site will not cause subsequent vehicles entering the site to spill back into the Town transportation system. Additionally, driveways should have adequate space between existing/proposed driveways and other existing intersections to limit adverse effects at adjacent facilities and discourage weaving. Finally, the project's parking supply shall satisfy the requirements set forth by the Town.

SPECIAL ISSUES

The following special issues will also be addressed:

- **Vehicle Miles Traveled (VMT):** Per SB743, a VMT analysis will be prepared per the Town's guidelines. This analysis will be prepared under separate cover and will be prepared concurrently to the LOS-based traffic study.
- **Queuing Analysis:** Conduct 95th percentile queuing assessment to ensure turn pockets can accommodate the anticipated peak hour queues at the Project driveways and at the freeway off-ramps.
- **Traffic Signal Warrant Analysis:** Conduct traffic signal warrant analysis for all existing and future unsignalized study area intersections, which also includes all new intersections with full access.

SIGNAL TIMING

It is requested that the Town provide signal timing for any signalized Town-controlled intersections.

If you have any questions, please contact me directly at cso@urbanxroads.com.

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Appendix 1.2:

Site Adjacent Queues

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Intersection: 4: Stoddard Wells Rd. & New Outer I-15 Hwy

Movement	EB	EB	WB	WB	SB
Directions Served	L	T	T	TR	LR
Maximum Queue (ft)	227	370	260	224	101
Average Queue (ft)	90	179	114	71	45
95th Queue (ft)	183	330	200	158	81
Link Distance (ft)		1463	948	948	564
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	250				
Storage Blk Time (%)		3			
Queuing Penalty (veh)		18			

Intersection: 5: Stoddard Wells Rd. & Driveway 1

Movement	SB
Directions Served	R
Maximum Queue (ft)	27
Average Queue (ft)	10
95th Queue (ft)	28
Link Distance (ft)	474
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Zone Summary

Zone wide Queuing Penalty: 18

Intersection: 4: Stoddard Wells Rd. & New Outer I-15 Hwy

Movement	EB	EB	WB	WB	SB
Directions Served	L	T	T	TR	LR
Maximum Queue (ft)	102	221	965	965	579
Average Queue (ft)	45	80	955	955	559
95th Queue (ft)	86	174	964	964	650
Link Distance (ft)		1458	948	948	564
Upstream Blk Time (%)			20	17	76
Queuing Penalty (veh)			217	184	0
Storage Bay Dist (ft)	250				
Storage Blk Time (%)		0			
Queuing Penalty (veh)		1			

Intersection: 5: Stoddard Wells Rd. & Driveway 1

Movement	WB	WB	SB
Directions Served	T	TR	R
Maximum Queue (ft)	326	325	483
Average Queue (ft)	325	325	381
95th Queue (ft)	326	325	597
Link Distance (ft)	310	310	474
Upstream Blk Time (%)	82	70	54
Queuing Penalty (veh)	0	0	0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Zone Summary

Zone wide Queuing Penalty: 402

Appendix 3.1:

Traffic Counts

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INTERSECTION TURNING MOVEMENT COUNTS

PREPARED BY: AimTD LLC. tel: 714 253 7888 cs@aimtd.com

DATE:	LOCATION:	Apple Valley	PROJECT #:	SC5337
Tue, Apr 22, 25	NORTH & SOUTH:	Quarry Rd	LOCATION #:	1
	EAST & WEST:	I-15 SB Ramps	CONTROL:	STOP W

NOTES:

AM PM MD OTHER OTHER ▲ N ◄ W E ► S ▼

		NORTHBOUND Quarry Rd			SOUTHBOUND Quarry Rd			EASTBOUND I-15 SB Ramps			WESTBOUND I-15 SB Ramps			
		NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
	LANES:	X	1	0	0	1	X	X	X	X	0	X	0	
AM	7:00 AM	0	0	12	0	0	0	0	0	0	6	0	0	18
	7:15 AM	0	0	12	0	0	0	0	0	0	4	0	0	16
	7:30 AM	0	1	10	0	0	0	0	0	0	2	0	0	13
	7:45 AM	0	1	11	0	0	0	0	0	0	9	0	0	21
	8:00 AM	0	0	16	0	2	0	0	0	0	5	0	0	23
	8:15 AM	0	1	12	1	0	0	0	0	0	6	0	0	20
	8:30 AM	0	1	15	0	0	0	0	0	0	5	0	0	21
	8:45 AM	0	0	26	0	0	0	0	0	0	8	0	0	34
	VOLUMES	0	4	114	1	2	0	0	0	0	45	0	0	166
	APPROACH %	0%	3%	97%	33%	67%	0%	0%	0%	0%	100%	0%	0%	
	APP/DEPART	118	/	4	3	/	47	0	/	115	45	/	0	0
	BEGIN PEAK HR		8:00 AM											
	VOLUMES	0	2	69	1	2	0	0	0	0	24	0	0	98
	APPROACH %	0%	3%	97%	33%	67%	0%	0%	0%	0%	100%	0%	0%	
	PEAK HR FACTOR		0.683			0.375			0.000			0.750		0.721
	APP/DEPART	71	/	2	3	/	26	0	/	70	24	/	0	0
PM	4:00 PM	0	2	56	0	1	0	0	0	0	9	0	0	68
	4:15 PM	0	0	37	1	1	0	0	0	0	11	0	1	51
	4:30 PM	0	0	23	1	1	0	0	0	0	10	0	1	36
	4:45 PM	0	0	21	0	0	0	0	0	0	12	0	0	33
	5:00 PM	0	0	22	0	0	0	0	0	0	11	0	0	33
	5:15 PM	0	1	25	1	0	0	0	0	0	7	0	1	35
	5:30 PM	0	0	15	0	0	0	0	0	0	14	0	0	29
	5:45 PM	0	0	18	1	1	0	0	0	0	9	0	0	29
	VOLUMES	0	3	217	4	4	0	0	0	0	83	0	3	316
	APPROACH %	0%	1%	99%	50%	50%	0%	0%	0%	0%	94%	0%	3%	
	APP/DEPART	220	/	6	8	/	87	0	/	223	88	/	0	0
	BEGIN PEAK HR		4:00 PM											
	VOLUMES	0	2	137	2	3	0	0	0	0	42	0	2	190
	APPROACH %	0%	1%	99%	40%	60%	0%	0%	0%	0%	91%	0%	4%	
	PEAK HR FACTOR		0.599			0.625			0.000			0.958		0.688
	APP/DEPART	139	/	4	5	/	45	0	/	141	46	/	0	0

U-TURNS					
	NB	SB	EB	WB	TTL
	0	0	0	0	
7:00 AM	0	0	0	0	0
7:15 AM	0	0	0	0	0
7:30 AM	0	0	0	0	0
7:45 AM	0	0	0	0	0
8:00 AM	0	0	0	0	0
8:15 AM	0	0	0	0	0
8:30 AM	0	0	0	0	0
8:45 AM	0	0	0	0	0
VOLUMES	0	0	0	0	0
PEAK HR VOLUMES	0	0	0	0	
4:00 PM	0	0	0	1	1
4:15 PM	0	0	0	0	0
4:30 PM	0	0	0	1	1
4:45 PM	0	0	0	0	0
5:00 PM	0	0	0	0	0
5:15 PM	0	0	0	0	0
5:30 PM	0	0	0	0	0
5:45 PM	0	0	0	0	0
VOLUMES	0	0	0	2	2
PEAK HR VOLUMES	0	0	0	2	

RTOR				
	NRR	SRR	ERR	WRR
	X	X	X	X
7:00 AM	0	0	0	0
7:15 AM	0	0	0	0
7:30 AM	0	0	0	0
7:45 AM	0	0	0	0
8:00 AM	0	0	0	0
8:15 AM	0	0	0	0
8:30 AM	0	0	0	0
8:45 AM	0	0	0	0
VOLUMES	0	0	0	0
PEAK HR VOLUMES	0	0	0	0
4:00 PM	0	0	0	0
4:15 PM	0	0	0	0
4:30 PM	0	0	0	0
4:45 PM	0	0	0	0
5:00 PM	0	0	0	0
5:15 PM	0	0	0	0
5:30 PM	0	0	0	0
5:45 PM	0	0	0	0
VOLUMES	0	0	0	0
PEAK HR VOLUMES	0	0	0	0

Quarry Rd

NORTH LEG

I-15 SB Ramps WEST LEG EAST LEG **I-15 SB Ramps**

SOUTH LEG

Quarry Rd

		ALL PED + BIKE & SCOOTER					PEDESTRIAN CROSSINGS					BICYCLE & SCOOTER CROSSINGS				
		E LEG	W LEG	S LEG	N LEG	TOTAL	E LEG	W LEG	S LEG	N LEG	TOTAL	EL	WL	SL	NL	TOTAL
AM	7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PM	4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

INTERSECTION TUR

PREPARED BY: AimTD LL

DATE: 4/22/25 TUESDAY	LOCATION:	Apple Valley
	NORTH & SOUTH:	Quarry Rd
	EAST & WEST:	I-15 SB Ramps

	NOTES:				
PCE Adjusted	Class	1	2	3	4
	Factor	1	1.5	2	3

		NORTHBOUND Quarry Rd		SOUTHBOUNI Quarry Rd	
	NL	NT	NR	SL	ST
LANES:	X	1	0	0	1
AM					
7:00 AM	0	0	22	0	0
7:15 AM	0	0	22	0	0
7:30 AM	0	3	16	0	0
7:45 AM	0	2	15	0	0
8:00 AM	0	0	24	0	5
8:15 AM	0	1	17	1	0
8:30 AM	0	3	23	0	0
8:45 AM	0	0	43	0	0
VOLUMES	0	9	181	1	5
APPROACH %	0%	4%	96%	18%	82%
APP/DEPART	190	/	9	6	/
BEGIN PEAK HR		8:00 AM			
VOLUMES	0	4	107	1	5
APPROACH %	0%	4%	96%	18%	82%
PEAK HR FACTOR		0.642			0.306
APP/DEPART	111	/	4	6	/
PM					
4:00 PM	0	2	59	0	1
4:15 PM	0	0	44	1	1
4:30 PM	0	0	25	1	1
4:45 PM	0	0	23	0	0
5:00 PM	0	0	24	0	0
5:15 PM	0	1	29	1	0
5:30 PM	0	0	15	0	0
5:45 PM	0	0	20	1	1
VOLUMES	0	3	238	4	4
APPROACH %	0%	1%	99%	50%	50%
APP/DEPART	241	/	6	8	/

BEGIN PEAK HR	4:00 PM				
VOLUMES	0	2	150	2	3
APPROACH %	0%	1%	99%	40%	60%
PEAK HR FACTOR	0.628				0.625
APP/DEPART	152	/	4	5	/

I-15 SB Ramps WEST SIDE

;NING MOVEMENT COUNTS

.C. tel: 714 253 7888 cs@aimtd.com

PROJECT #: SC5337
LOCATION #: 1
CONTROL: STOP W

				AM
5	6			PM
2	2			MD
				OTHER
				OTHER

▲ N
◄ W
E ►
S ▼

⊃	EASTBOUND I-15 SB Ramps			WESTBOUND I-15 SB Ramps			
SR X	EL X	ET X	ER X	WL 0	WT X	WR 0	TOTAL
0	0	0	0	9	0	0	31
0	0	0	0	4	0	0	26
0	0	0	0	2	0	0	21
0	0	0	0	13	0	0	30
0	0	0	0	5	0	0	33
0	0	0	0	6	0	0	25
0	0	0	0	8	0	0	34
0	0	0	0	8	0	0	51
0	0	0	0	55	0	0	250
0%	0%	0%	0%	100%	0%	0%	
60	0	/	182	55	/	0	0
0	0	0	0	27	0	0	143
0%	0%	0%	0%	100%	0%	0%	
		0.000			0.844		0.701
32	0	/	108	27	/	0	0
0	0	0	0	9	0	0	71
0	0	0	0	11	0	1	58
0	0	0	0	10	0	1	38
0	0	0	0	13	0	0	36
0	0	0	0	12	0	0	36
0	0	0	0	7	0	1	39
0	0	0	0	14	0	0	29
0	0	0	0	10	0	0	32
0	0	0	0	85	0	3	337
0%	0%	0%	0%	97%	0%	3%	
89	0	/	242	88	/	0	0

0 0%	0 0%	0 0% 0.000	0 0%	43 96%	0 0% 0.890	2 4%	202 0.715
46	0	/	152	45	/	0	0

Quarry Rd

NORTH SIDE

EAST SIDE **I-15 SB Ramps**

SOUTH SIDE

Quarry Rd

U-TURNS				
NB	SB	EB	WB	TTL
				0
				0
				0
				0
				0
				0
				0
				0
0	0	0	0	0
				0
				0
				0
				0
				0
				0
				0
				0
0	0	0	0	0

INTERSECTION TURNING MOVEMENT COUNTS

PREPARED BY: AimTD LLC. tel: 714 253 7888 cs@aimtd.com

DATE:	LOCATION:	Apple Valley	PROJECT #:	SC5337
4/22/25	NORTH & SOUTH:	Quarry Rd	LOCATION #:	1
TUESDAY	EAST & WEST:	I-15 SB Ramps	CONTROL:	STOP W

CLASS 2: 2-AXLE WORK VEHICLES/ TRUCKS

NOTES:

AM PM MD OTHER OTHER

▲ N ◄ W E ► S ▼

		NORTHBOUND Quarry Rd			SOUTHBOUND Quarry Rd			EASTBOUND I-15 SB Ramps			WESTBOUND I-15 SB Ramps			
		NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
	LANES:	X	1	0	0	1	X	X	X	X	0	X	0	
AM	7:00 AM	0	0	3	0	0	0	0	0	0	0	0	0	3
	7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
	7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
	7:45 AM	0	1	0	0	0	0	0	0	0	0	0	0	1
	8:00 AM	0	0	1	0	1	0	0	0	0	0	0	0	2
	8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
	8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
	8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
	VOLUMES	0	1	4	0	1	0	0	0	0	0	0	0	6
	APPROACH %	0%	20%	80%	0%	100%	0%	0%	0%	0%	0%	0%	0%	
	APP/DEPART	5	/	1	1	/	1	0	/	4	0	/	0	0
	BEGIN PEAK HR		8:00 AM											
	VOLUMES	0	0	1	0	1	0	0	0	0	0	0	0	2
	APPROACH %	0%	0%	100%	0%	100%	0%	0%	0%	0%	0%	0%	0%	
	PEAK HR FACTOR		0.250			0.250			0.000			0.000		0.250
	APP/DEPART	1	/	0	1	/	1	0	/	1	0	/	0	0
PM	4:00 PM	0	0	1	0	0	0	0	0	0	0	0	0	1
	4:15 PM	0	0	1	0	0	0	0	0	0	0	0	0	1
	4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
	4:45 PM	0	0	0	0	0	0	0	0	0	1	0	0	1
	5:00 PM	0	0	0	0	0	0	0	0	0	1	0	0	1
	5:15 PM	0	0	3	0	0	0	0	0	0	0	0	0	3
	5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
	5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
	VOLUMES	0	0	5	0	0	0	0	0	0	2	0	0	7
	APPROACH %	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%	0%	0%	
	APP/DEPART	5	/	0	0	/	2	0	/	5	2	/	0	0
	BEGIN PEAK HR		4:00 PM											
	VOLUMES	0	0	2	0	0	0	0	0	0	1	0	0	3
	APPROACH %	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%	0%	0%	
	PEAK HR FACTOR		0.500			0.000			0.000			0.250		0.750
	APP/DEPART	2	/	0	0	/	1	0	/	2	1	/	0	0

	U-TURNS					RTOR			
	NB	SB	EB	WB	TTL	NRR	SRR	ERR	WRR
LANES						X	X	X	X
7:00 AM	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0
VOLUMES	0	0	0	0	0	0	0	0	0
PEAK HR VOLUMES	0	0	0	0		0	0	0	0
4:00 PM	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0
VOLUMES	0	0	0	0	0	0	0	0	0
PEAK HR VOLUMES	0	0	0	0		0	0	0	0

Quarry Rd

NORTH SIDE

I-15 SB Ramps WEST SIDE

EAST SIDE **I-15 SB Ramps**

SOUTH SIDE

Quarry Rd

INTERSECTION TURNING MOVEMENT COUNTS

PREPARED BY: AimTD LLC. tel: 714 253 7888 cs@aimtd.com

DATE:	LOCATION:	Apple Valley	PROJECT #:	SC5337
4/22/25	NORTH & SOUTH:	Quarry Rd	LOCATION #:	1
TUESDAY	EAST & WEST:	I-15 SB Ramps	CONTROL:	STOP W

CLASS 3: 3-AXLE TRUCKS

NOTES:

AM PM MD OTHER OTHER

▲ N ◄ W E ► S ▼

	NORTHBOUND Quarry Rd			SOUTHBOUND Quarry Rd			EASTBOUND I-15 SB Ramps			WESTBOUND I-15 SB Ramps			
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
LANES:	X	1	0	0	1	X	X	X	X	0	X	0	
AM 7:00 AM	0	0	0	0	0	0	0	0	0	3	0	0	3
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	2	0	0	0	0	0	0	0	0	0	2
7:45 AM	0	0	0	0	0	0	0	0	0	2	0	0	2
8:00 AM	0	0	1	0	0	0	0	0	0	0	0	0	1
8:15 AM	0	0	1	0	0	0	0	0	0	0	0	0	1
8:30 AM	0	0	0	0	0	0	0	0	0	1	0	0	1
8:45 AM	0	0	3	0	0	0	0	0	0	0	0	0	3
VOLUMES	0	0	7	0	0	0	0	0	0	6	0	0	13
APPROACH %	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%	0%	0%	
APP/DEPART	7	/	0	0	/	6	0	/	7	6	/	0	0
BEGIN PEAK HR		8:00 AM											
VOLUMES	0	0	5	0	0	0	0	0	0	1	0	0	6
APPROACH %	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%	0%	0%	
PEAK HR FACTOR		0.417			0.000			0.000			0.250		0.500
APP/DEPART	5	/	0	0	/	1	0	/	5	1	/	0	0
PM 4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	1	0	0	1
VOLUMES	0	0	0	0	0	0	0	0	0	1	0	0	1
APPROACH %	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	
APP/DEPART	0	/	0	0	/	1	0	/	0	1	/	0	0
BEGIN PEAK HR		4:00 PM											
VOLUMES	0	0	0	0	0	0	0	0	0	0	0	0	0
APPROACH %	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
PEAK HR FACTOR		0.000			0.000			0.000			0.000		0.000
APP/DEPART	0	/	0	0	/	0	0	/	0	0	/	0	0

U-TURNS

	NB	SB	EB	WB	TTL
7:00 AM	0	0	0	0	0
7:15 AM	0	0	0	0	0
7:30 AM	0	0	0	0	0
7:45 AM	0	0	0	0	0
8:00 AM	0	0	0	0	0
8:15 AM	0	0	0	0	0
8:30 AM	0	0	0	0	0
8:45 AM	0	0	0	0	0
VOLUMES	0	0	0	0	0
PEAK HR VOLUMES	0	0	0	0	
4:00 PM	0	0	0	0	0
4:15 PM	0	0	0	0	0
4:30 PM	0	0	0	0	0
4:45 PM	0	0	0	0	0
5:00 PM	0	0	0	0	0
5:15 PM	0	0	0	0	0
5:30 PM	0	0	0	0	0
5:45 PM	0	0	0	0	0
VOLUMES	0	0	0	0	0
PEAK HR VOLUMES	0	0	0	0	

RTOR

	NRR	SRR	ERR	WRR
LANES:	X	X	X	X
7:00 AM	0	0	0	0
7:15 AM	0	0	0	0
7:30 AM	0	0	0	0
7:45 AM	0	0	0	0
8:00 AM	0	0	0	0
8:15 AM	0	0	0	0
8:30 AM	0	0	0	0
8:45 AM	0	0	0	0
VOLUMES	0	0	0	0
PEAK HR VOLUMES	0	0	0	0
4:00 PM	0	0	0	0
4:15 PM	0	0	0	0
4:30 PM	0	0	0	0
4:45 PM	0	0	0	0
5:00 PM	0	0	0	0
5:15 PM	0	0	0	0
5:30 PM	0	0	0	0
5:45 PM	0	0	0	0
VOLUMES	0	0	0	0
PEAK HR VOLUMES	0	0	0	0

Quarry Rd

NORTH SIDE

I-15 SB Ramps WEST SIDE EAST SIDE **I-15 SB Ramps**

SOUTH SIDE

Quarry Rd

INTERSECTION TURNING MOVEMENT COUNTS

PREPARED BY: AimTD LLC. tel: 714 253 7888 cs@aimtd.com

DATE:	LOCATION:	Apple Valley	PROJECT #:	SC5337
4/22/25	NORTH & SOUTH:	Quarry Rd	LOCATION #:	1
TUESDAY	EAST & WEST:	I-15 SB Ramps	CONTROL:	STOP W

CLASS 4: 4 OR MORE AXLE TRUCKS

NOTES:

AM / PM / MD / OTHER / OTHER

▲ N / ◄ W / E ► / S ▼

		NORTHBOUND Quarry Rd			SOUTHBOUND Quarry Rd			EASTBOUND I-15 SB Ramps			WESTBOUND I-15 SB Ramps			
		NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
	LANES:	X	1	0	0	1	X	X	X	X	0	X	0	
AM	7:00 AM	0	0	4	0	0	0	0	0	0	0	0	0	4
	7:15 AM	0	0	5	0	0	0	0	0	0	0	0	0	5
	7:30 AM	0	1	2	0	0	0	0	0	0	0	0	0	3
	7:45 AM	0	0	2	0	0	0	0	0	0	1	0	0	3
	8:00 AM	0	0	3	0	1	0	0	0	0	0	0	0	4
	8:15 AM	0	0	2	0	0	0	0	0	0	0	0	0	2
	8:30 AM	0	1	4	0	0	0	0	0	0	1	0	0	6
	8:45 AM	0	0	7	0	0	0	0	0	0	0	0	0	7
	VOLUMES	0	2	29	0	1	0	0	0	0	2	0	0	34
	APPROACH %	0%	6%	94%	0%	100%	0%	0%	0%	0%	100%	0%	0%	
	APP/DEPART	31	/	2	1	/	3	0	/	29	2	/	0	0
	BEGIN PEAK HR		8:00 AM											
	VOLUMES	0	1	16	0	1	0	0	0	0	1	0	0	19
	APPROACH %	0%	6%	94%	0%	100%	0%	0%	0%	0%	100%	0%	0%	
	PEAK HR FACTOR		0.607			0.250			0.000			0.250		0.679
	APP/DEPART	17	/	1	1	/	2	0	/	16	1	/	0	0
PM	4:00 PM	0	0	1	0	0	0	0	0	0	0	0	0	1
	4:15 PM	0	0	3	0	0	0	0	0	0	0	0	0	3
	4:30 PM	0	0	1	0	0	0	0	0	0	0	0	0	1
	4:45 PM	0	0	1	0	0	0	0	0	0	0	0	0	1
	5:00 PM	0	0	1	0	0	0	0	0	0	0	0	0	1
	5:15 PM	0	0	1	0	0	0	0	0	0	0	0	0	1
	5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
	5:45 PM	0	0	1	0	0	0	0	0	0	0	0	0	1
	VOLUMES	0	0	9	0	0	0	0	0	0	0	0	0	10
	APPROACH %	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
	APP/DEPART	9	/	0	0	/	0	0	/	10	1	/	0	0
	BEGIN PEAK HR		4:00 PM											
	VOLUMES	0	0	6	0	0	0	0	0	0	0	0	0	7
	APPROACH %	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
	PEAK HR FACTOR		0.500			0.000			0.000			0.250		0.583
	APP/DEPART	6	/	0	0	/	0	0	/	7	1	/	0	0

		U-TURNS					RTOR			
		NB	SB	EB	WB	TTL	NRR	SRR	ERR	WRR
	LANES:						X	X	X	X
AM	7:00 AM	0	0	0	0	0	0	0	0	0
	7:15 AM	0	0	0	0	0	0	0	0	0
	7:30 AM	0	0	0	0	0	0	0	0	0
	7:45 AM	0	0	0	0	0	0	0	0	0
	8:00 AM	0	0	0	0	0	0	0	0	0
	8:15 AM	0	0	0	0	0	0	0	0	0
	8:30 AM	0	0	0	0	0	0	0	0	0
	8:45 AM	0	0	0	0	0	0	0	0	0
	VOLUMES	0	0	0	0	0	0	0	0	0
	PEAK HR VOLUMES	0	0	0	0		0	0	0	0
PM	4:00 PM	0	0	0	1	1	0	0	0	0
	4:15 PM	0	0	0	0	0	0	0	0	0
	4:30 PM	0	0	0	0	0	0	0	0	0
	4:45 PM	0	0	0	0	0	0	0	0	0
	5:00 PM	0	0	0	0	0	0	0	0	0
	5:15 PM	0	0	0	0	0	0	0	0	0
	5:30 PM	0	0	0	0	0	0	0	0	0
	5:45 PM	0	0	0	0	0	0	0	0	0
	VOLUMES	0	0	0	1	1	0	0	0	0
	PEAK HR VOLUMES	0	0	0	1		0	0	0	0

Quarry Rd

NORTH SIDE

I-15 SB Ramps WEST SIDE

EAST SIDE **I-15 SB Ramps**

SOUTH SIDE

Quarry Rd

INTERSECTION TURNING MOVEMENT COUNTS

T020624

PREPARED BY: AimTD LLC. tel: 714 253 7888 cs@aimtd.com

DATE:	LOCATION:	Apple Valley	PROJECT #:	SC5337
Tue, Apr 22, 25	NORTH & SOUTH:	Quarry Rd	LOCATION #:	2
	EAST & WEST:	Stoddard Wells Rd	CONTROL:	STOP S

NOTES:

AM / PM / MD / OTHER / OTHER

▲ N ◄ W E ► S ▼

	NORTHBOUND Quarry Rd			SOUTHBOUND Quarry Rd			EASTBOUND Stoddard Wells Rd			WESTBOUND Stoddard Wells Rd			
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
LANES:	X	X	X	0	X	0	0	1	X	X	1	0	
AM 7:00 AM	0	0	0	5	0	1	0	0	0	0	5	16	27
7:15 AM	0	0	0	4	0	0	0	2	0	0	1	9	16
7:30 AM	0	0	0	1	0	0	0	2	0	0	6	11	20
7:45 AM	0	0	0	8	0	0	2	3	0	0	8	8	29
8:00 AM	0	0	0	6	0	2	1	1	0	0	4	15	29
8:15 AM	0	0	0	6	0	0	0	0	0	0	4	12	22
8:30 AM	0	0	0	4	0	1	1	2	0	0	4	15	27
8:45 AM	0	0	0	8	0	0	0	4	0	0	4	35	51
VOLUMES	0	0	0	42	0	4	4	14	0	0	36	121	221
APPROACH %	0%	0%	0%	91%	0%	9%	22%	78%	0%	0%	23%	77%	
APP/DEPART	0	/	125	46	/	0	18	/	56	157	/	40	0
BEGIN PEAK HR		8:00 AM											
VOLUMES	0	0	0	24	0	3	2	7	0	0	16	77	129
APPROACH %	0%	0%	0%	89%	0%	11%	22%	78%	0%	0%	17%	83%	
PEAK HR FACTOR		0.000			0.844			0.563			0.596		0.632
APP/DEPART	0	/	79	27	/	0	9	/	31	93	/	19	0
PM 4:00 PM	0	0	0	10	0	1	4	5	0	0	7	68	95
4:15 PM	0	0	0	12	0	0	1	5	0	0	8	27	53
4:30 PM	0	0	0	10	0	0	1	9	0	0	4	21	45
4:45 PM	0	0	0	11	0	0	3	5	0	0	5	19	43
5:00 PM	0	0	0	11	0	0	3	5	0	0	3	17	39
5:15 PM	0	0	0	6	0	1	1	1	0	0	0	24	33
5:30 PM	0	0	0	14	0	0	1	2	0	0	1	19	37
5:45 PM	0	0	0	8	0	2	1	1	0	0	2	15	29
VOLUMES	0	0	0	82	0	4	15	33	0	0	30	210	374
APPROACH %	0%	0%	0%	95%	0%	5%	31%	69%	0%	0%	13%	88%	
APP/DEPART	0	/	225	86	/	0	48	/	115	240	/	34	0
BEGIN PEAK HR		4:00 PM											
VOLUMES	0	0	0	43	0	1	9	24	0	0	24	135	236
APPROACH %	0%	0%	0%	98%	0%	2%	27%	73%	0%	0%	15%	85%	
PEAK HR FACTOR		0.000			0.917			0.825			0.530		0.621
APP/DEPART	0	/	144	44	/	0	33	/	67	159	/	25	0

	U-TURNS					RTOR			
	NB	SB	EB	WB	TTL	NRR	SRR	ERR	WRR
LANES:	0	0	0	0		X	X	X	X
7:00 AM	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0
VOLUMES	0	0	0	0	0	0	0	0	0
PEAK HR VOLUMES	0	0	0	0		0	0	0	0
4:00 PM	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0
VOLUMES	0	0	0	0	0	0	0	0	0
PEAK HR VOLUMES	0	0	0	0		0	0	0	0

Quarry Rd

NORTH LEG

Stoddard Wells Rd WEST LEG EAST LEG **Stoddard Wells Rd**

SOUTH LEG

Quarry Rd

	ALL PED + BIKE & SCOOTER					PEDESTRIAN CROSSINGS					BICYCLE & SCOOTER CROSSINGS				
	E LEG	W LEG	S LEG	N LEG	TOTAL	E LEG	W LEG	S LEG	N LEG	TOTAL	EL	WL	SL	NL	TOTAL
AM 7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PM 4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

INTERSECTION TUR

PREPARED BY: AimTD LL

DATE: 4/22/25 TUESDAY	LOCATION:	Apple Valley
	NORTH & SOUTH:	Quarry Rd
	EAST & WEST:	Stoddard Wells Rd

	NOTES:				
PCE Adjusted	Class	1	2	3	4
	Factor	1	1.5	2	3

	NORTHBOUND Quarry Rd			SOUTHBOUNI Quarry Rd	
	NL	NT	NR	SL	ST
LANES:	X	X	X	0	X
AM					
7:00 AM	0	0	0	9	0
7:15 AM	0	0	0	4	0
7:30 AM	0	0	0	1	0
7:45 AM	0	0	0	10	0
8:00 AM	0	0	0	10	0
8:15 AM	0	0	0	6	0
8:30 AM	0	0	0	4	0
8:45 AM	0	0	0	8	0
VOLUMES	0	0	0	52	0
APPROACH %	0%	0%	0%	89%	0%
APP/DEPART	0	/	200	59	/
BEGIN PEAK HR		8:00 AM			
VOLUMES	0	0	0	28	0
APPROACH %	0%	0%	0%	86%	0%
PEAK HR FACTOR		0.000			0.650
APP/DEPART	0	/	122	33	/
PM					
4:00 PM	0	0	0	10	0
4:15 PM	0	0	0	12	0
4:30 PM	0	0	0	11	0
4:45 PM	0	0	0	11	0
5:00 PM	0	0	0	12	0
5:15 PM	0	0	0	6	0
5:30 PM	0	0	0	14	0
5:45 PM	0	0	0	9	0
VOLUMES	0	0	0	84	0
APPROACH %	0%	0%	0%	95%	0%
APP/DEPART	0	/	248	88	/

BEGIN PEAK HR		4:00 PM			
VOLUMES	0	0	0	44	0
APPROACH %	0%	0%	0%	98%	0%
PEAK HR FACTOR		0.000			0.927
APP/DEPART	0	/	159	45	/

Stoddard Wells Rd WEST SIDE

ꞦNING MOVEMENT COUNTS

.C. tel: 714 253 7888 cs@aimtd.com

PROJECT #: SC5337
LOCATION #: 2
CONTROL: STOP S

5	6		AM	
2	2		PM	▲ N
			MD	◀ W E ▶
			OTHER	S ▼
			OTHER	

Ɔ	EASTBOUND Stoddard Wells Rd			WESTBOUND Stoddard Wells Rd			
SR 0	EL 0	ET 1	ER X	WL X	WT 1	WR 0	TOTAL
2	0	0	0	0	5	28	44
0	0	2	0	0	1	19	26
0	0	3	0	0	12	19	35
0	5	4	0	0	10	8	36
3	1	1	0	0	7	23	44
0	0	0	0	0	6	17	29
2	3	2	0	0	8	23	42
0	0	6	0	0	9	56	78
7	9	18	0	0	56	192	332
11%	33%	67%	0%	0%	22%	78%	
0	26	/	70	247	/	62	0
5	4	9	0	0	29	118	192
14%	32%	68%	0%	0%	19%	81%	
		0.568			0.572		0.618
0	13	/	37	147	/	33	0
1	7	8	0	0	11	73	109
0	3	7	0	0	11	29	62
0	3	17	0	0	6	21	58
0	3	8	0	0	10	21	53
0	3	7	0	0	7	19	48
1	1	1	0	0	0	28	37
0	1	2	0	0	2	19	38
2	1	3	0	0	3	17	35
4	22	53	0	0	50	226	439
5%	29%	71%	0%	0%	18%	82%	
0	75	/	137	276	/	54	0

1	16	40	0	0	38	144	282
2%	28%	72%	0%	0%	21%	79%	
		0.694			0.543		0.646
0	56	/	84	182	/	39	0

Quarry Rd

NORTH SIDE

EAST SIDE **Stoddard Wells Rd**

SOUTH SIDE

Quarry Rd

U-TURNS				
NB	SB	EB	WB	TTL
				0
				0
				0
				0
				0
				0
				0
				0
0	0	0	0	0
				0
				0
				0
				0
				0
				0
				0
				0
0	0	0	0	0

INTERSECTION TURNING MOVEMENT COUNTS

PREPARED BY: AimTD LLC. tel: 714 253 7888 cs@aimtd.com

DATE:	LOCATION:	Apple Valley	PROJECT #:	SC5337
4/22/25	NORTH & SOUTH:	Quarry Rd	LOCATION #:	2
TUESDAY	EAST & WEST:	Stoddard Wells Rd	CONTROL:	STOP S

CLASS 2: 2-AXLE WORK VEHICLES/ TRUCKS

NOTES:

AM PM MD OTHER OTHER

▲ N ◄ W E ► S ▼

	NORTHBOUND Quarry Rd			SOUTHBOUND Quarry Rd			EASTBOUND Stoddard Wells Rd			WESTBOUND Stoddard Wells Rd			
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
LANES:	X	X	X	0	X	0	0	1	X	X	1	0	
AM													
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	3	3
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	1	0	1
7:45 AM	0	0	0	0	0	0	1	0	0	0	1	0	2
8:00 AM	0	0	0	0	0	1	0	0	0	0	1	1	3
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	1	0	1
8:45 AM	0	0	0	0	0	0	0	1	0	0	1	1	3
VOLUMES	0	0	0	0	0	1	1	1	0	0	5	5	13
APPROACH %	0%	0%	0%	0%	0%	100%	50%	50%	0%	0%	50%	50%	
APP/DEPART	0	/	6	1	/	0	2	/	1	10	/	6	0
BEGIN PEAK HR		8:00 AM											
VOLUMES	0	0	0	0	0	1	0	1	0	0	3	2	7
APPROACH %	0%	0%	0%	0%	0%	100%	0%	100%	0%	0%	60%	40%	
PEAK HR FACTOR		0.000			0.250			0.250			0.625		0.583
APP/DEPART	0	/	2	1	/	0	1	/	1	5	/	4	0
PM													
4:00 PM	0	0	0	0	0	0	1	0	0	0	0	1	2
4:15 PM	0	0	0	0	0	0	0	0	0	0	2	0	2
4:30 PM	0	0	0	1	0	0	0	0	0	0	0	0	1
4:45 PM	0	0	0	0	0	0	0	2	0	0	0	0	2
5:00 PM	0	0	0	1	0	0	0	0	0	0	0	0	1
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	3	3
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
VOLUMES	0	0	0	2	0	0	1	2	0	0	2	4	11
APPROACH %	0%	0%	0%	100%	0%	0%	33%	67%	0%	0%	33%	67%	
APP/DEPART	0	/	5	2	/	0	3	/	4	6	/	2	0
BEGIN PEAK HR		4:00 PM											
VOLUMES	0	0	0	1	0	0	1	2	0	0	2	1	7
APPROACH %	0%	0%	0%	100%	0%	0%	33%	67%	0%	0%	67%	33%	
PEAK HR FACTOR		0.000			0.250			0.375			0.375		0.875
APP/DEPART	0	/	2	1	/	0	3	/	3	3	/	2	0

	U-TURNS					RTOR			
	NB	SB	EB	WB	TTL	NRR	SRR	ERR	WRR
LANES:						X	X	X	X
7:00 AM	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0
VOLUMES	0	0	0	0	0	0	0	0	0
AM PEAK VOLUMES	0	0	0	0		0	0	0	0
4:00 PM	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0
VOLUMES	0	0	0	0	0	0	0	0	0
PM PEAK VOLUMES	0	0	0	0		0	0	0	0

Quarry Rd

NORTH SIDE

Stoddard Wells Rd WEST SIDE

EAST SIDE **Stoddard Wells Rd**

SOUTH SIDE

Quarry Rd

INTERSECTION TURNING MOVEMENT COUNTS

PREPARED BY: AimTD LLC. tel: 714 253 7888 cs@aimtd.com

DATE: 4/22/25 TUESDAY	LOCATION:	Apple Valley	PROJECT #:	SC5337
	NORTH & SOUTH:	Quarry Rd	LOCATION #:	2
	EAST & WEST:	Stoddard Wells Rd	CONTROL:	STOP S

CLASS 3: 3-AXLE TRUCKS

NOTES:

AM PM MD OTHER OTHER

▲ N S ▼ ◄ W E ►

	NORTHBOUND Quarry Rd			SOUTHBOUND Quarry Rd			EASTBOUND Stoddard Wells Rd			WESTBOUND Stoddard Wells Rd			
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
LANES:	X	X	X	0	X	0	0	1	X	X	1	0	
AM 7:00 AM	0	0	0	2	0	1	0	0	0	0	0	0	3
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	1	0	0	1	2	4
7:45 AM	0	0	0	2	0	0	0	1	0	0	1	0	4
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	1	1
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	1	1
8:30 AM	0	0	0	0	0	1	0	0	0	0	1	0	2
8:45 AM	0	0	0	0	0	0	0	1	0	0	0	3	4
VOLUMES	0	0	0	4	0	2	0	3	0	0	3	7	19
APPROACH %	0%	0%	0%	67%	0%	33%	0%	100%	0%	0%	30%	70%	
APP/DEPART	0	/	7	6	/	0	3	/	7	10	/	5	0
BEGIN PEAK HR		8:00 AM											
VOLUMES	0	0	0	0	0	1	0	1	0	0	1	5	8
APPROACH %	0%	0%	0%	0%	0%	100%	0%	100%	0%	0%	17%	83%	
PEAK HR FACTOR		0.000			0.250			0.250			0.500		0.500
APP/DEPART	0	/	5	1	/	0	1	/	1	6	/	2	0
PM 4:00 PM	0	0	0	0	0	0	0	1	0	0	2	0	3
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	2	0	2
4:45 PM	0	0	0	0	0	0	0	0	0	0	1	0	1
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	1	0	1
5:45 PM	0	0	0	1	0	0	0	0	0	0	1	0	2
VOLUMES	0	0	0	1	0	0	0	1	0	0	7	0	9
APPROACH %	0%	0%	0%	100%	0%	0%	0%	100%	0%	0%	100%	0%	
APP/DEPART	0	/	0	1	/	0	1	/	2	7	/	7	0
BEGIN PEAK HR		4:00 PM											
VOLUMES	0	0	0	0	0	0	0	1	0	0	5	0	6
APPROACH %	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	100%	0%	
PEAK HR FACTOR		0.000			0.000			0.250			0.625		0.500
APP/DEPART	0	/	0	0	/	0	1	/	1	5	/	5	0

	U-TURNS					RTOR			
	NB	SB	EB	WB	TTL	NRR	SRR	ERR	WRR
LANES:						X	X	X	X
7:00 AM	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0
VOLUMES	0	0	0	0	0	0	0	0	0
AM PEAK HR VOLUMES	0	0	0	0		0	0	0	0
4:00 PM	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0
VOLUMES	0	0	0	0	0	0	0	0	0
PM PEAK HR VOLUMES	0	0	0	0		0	0	0	0

Quarry Rd

NORTH SIDE

Stoddard Wells Rd WEST SIDE

EAST SIDE **Stoddard Wells Rd**

SOUTH SIDE

Quarry Rd

INTERSECTION TURNING MOVEMENT COUNTS

PREPARED BY: AimTD LLC. tel: 714 253 7888 cs@aimtd.com

DATE:	LOCATION:	Apple Valley	PROJECT #:	SC5337
4/22/25	NORTH & SOUTH:	Quarry Rd	LOCATION #:	2
TUESDAY	EAST & WEST:	Stoddard Wells Rd	CONTROL:	STOP S

CLASS 4: 4 OR MORE AXLE TRUCKS

NOTES:

AM / PM / MD / OTHER / OTHER

▲ N ◄ W E ► S ▼

		NORTHBOUND Quarry Rd			SOUTHBOUND Quarry Rd			EASTBOUND Stoddard Wells Rd			WESTBOUND Stoddard Wells Rd			
		NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
	LANES:	X	X	X	0	X	0	0	1	X	X	1	0	
AM	7:00 AM	0	0	0	1	0	0	0	0	0	0	0	5	6
	7:15 AM	0	0	0	0	0	0	0	0	0	0	0	5	5
	7:30 AM	0	0	0	0	0	0	0	0	0	0	2	3	5
	7:45 AM	0	0	0	0	0	0	1	0	0	0	0	0	1
	8:00 AM	0	0	0	2	0	0	0	0	0	0	1	3	6
	8:15 AM	0	0	0	0	0	0	0	0	0	0	1	2	3
	8:30 AM	0	0	0	0	0	0	1	0	0	0	1	4	6
	8:45 AM	0	0	0	0	0	0	0	0	0	0	2	8	10
	VOLUMES	0	0	0	3	0	0	2	0	0	0	7	30	42
	APPROACH %	0%	0%	0%	100%	0%	0%	100%	0%	0%	0%	19%	81%	
	APP/DEPART	0	/	32	3	/	0	2	/	3	37	/	7	0
	BEGIN PEAK HR		8:00 AM											
	VOLUMES	0	0	0	2	0	0	1	0	0	0	5	17	25
	APPROACH %	0%	0%	0%	100%	0%	0%	100%	0%	0%	0%	23%	77%	
	PEAK HR FACTOR		0.000			0.250			0.250			0.550		0.625
	APP/DEPART	0	/	18	2	/	0	1	/	2	22	/	5	0
PM	4:00 PM	0	0	0	0	0	0	1	1	0	0	1	2	5
	4:15 PM	0	0	0	0	0	0	1	1	0	0	1	1	4
	4:30 PM	0	0	0	0	0	0	1	4	0	0	0	0	5
	4:45 PM	0	0	0	0	0	0	0	1	0	0	2	1	4
	5:00 PM	0	0	0	0	0	0	0	1	0	0	2	1	4
	5:15 PM	0	0	0	0	0	0	0	0	0	0	0	1	1
	5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
	5:45 PM	0	0	0	0	0	0	0	1	0	0	0	1	2
	VOLUMES	0	0	0	0	0	0	3	9	0	0	6	7	25
	APPROACH %	0%	0%	0%	0%	0%	0%	25%	75%	0%	0%	46%	54%	
	APP/DEPART	0	/	10	0	/	0	12	/	9	13	/	6	0
	BEGIN PEAK HR		4:00 PM											
	VOLUMES	0	0	0	0	0	0	3	7	0	0	4	4	18
	APPROACH %	0%	0%	0%	0%	0%	0%	30%	70%	0%	0%	50%	50%	
	PEAK HR FACTOR		0.000			0.000			0.500			0.667		0.900
	APP/DEPART	0	/	7	0	/	0	10	/	7	8	/	4	0

	U-TURNS					RTOR			
	NB	SB	EB	WB	TTL	NRR	SRR	ERR	WRR
LANES						X	X	X	X
7:00 AM	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0
VOLUMES	0	0	0	0	0	0	0	0	0
PEAK HR VOLUMES	0	0	0	0		0	0	0	0
4:00 PM	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0
VOLUMES	0	0	0	0	0	0	0	0	0
PEAK HR VOLUMES	0	0	0	0		0	0	0	0

Quarry Rd

NORTH SIDE

Stoddard Wells Rd WEST SIDE

EAST SIDE **Stoddard Wells Rd**

SOUTH SIDE

Quarry Rd

INTERSECTION TURNING MOVEMENT COUNTS

T020624

PREPARED BY: AimTD LLC. tel: 714 253 7888 cs@aimtd.com

DATE:	LOCATION:	Apple Valley	PROJECT #:	SC5337
Tue, Apr 22, 25	NORTH & SOUTH:	I-15 NB Ramps	LOCATION #:	3
	EAST & WEST:	Stoddard Wells Rd	CONTROL:	STOP N/S

NOTES:

AM / PM / MD / OTHER / OTHER

▲ N ◄ W E ► S ▼

	NORTHBOUND I-15 NB Ramps			SOUTHBOUND I-15 NB Ramps			EASTBOUND Stoddard Wells Rd			WESTBOUND Stoddard Wells Rd			
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
LANES:	0	1	0	0	1	0	0	1	0	0	1	0	
AM 7:00 AM	0	5	1	18	1	3	0	0	5	0	18	0	51
7:15 AM	0	9	1	20	0	1	1	1	4	0	9	0	46
7:30 AM	2	8	0	34	0	3	2	0	1	1	12	0	63
7:45 AM	1	6	2	32	0	5	3	1	7	1	12	0	70
8:00 AM	0	3	0	18	0	5	1	1	5	2	14	0	49
8:15 AM	0	12	2	25	0	3	1	3	2	1	13	0	62
8:30 AM	0	12	2	25	0	3	1	1	4	0	16	0	64
8:45 AM	1	4	0	24	2	5	1	4	6	2	33	0	82
VOLUMES	4	59	8	196	3	28	10	11	34	7	127	0	487
APPROACH %	6%	83%	11%	86%	1%	12%	18%	20%	62%	5%	95%	0%	
APP/DEPART	71	/	69	227	/	44	55	/	215	134	/	159	0
BEGIN PEAK HR		8:00 AM											
VOLUMES	1	31	4	92	2	16	4	9	17	5	76	0	257
APPROACH %	3%	86%	11%	84%	2%	15%	13%	30%	57%	6%	94%	0%	
PEAK HR FACTOR		0.643			0.887			0.682			0.579		0.784
APP/DEPART	36	/	35	110	/	24	30	/	105	81	/	93	0
PM 4:00 PM	1	2	5	51	0	2	0	5	10	3	72	0	151
4:15 PM	1	5	7	76	1	1	0	4	13	3	33	0	144
4:30 PM	0	3	4	33	0	2	2	5	12	1	23	0	85
4:45 PM	1	4	3	31	0	2	0	5	11	2	21	0	80
5:00 PM	0	6	1	25	1	2	1	5	9	0	21	0	71
5:15 PM	0	4	1	21	1	1	1	1	5	0	23	0	58
5:30 PM	0	6	3	24	0	0	0	1	15	1	20	0	70
5:45 PM	0	3	0	18	0	2	0	1	8	1	15	0	48
VOLUMES	3	33	24	279	3	12	4	27	83	11	228	0	707
APPROACH %	5%	55%	40%	95%	1%	4%	4%	24%	73%	5%	95%	0%	
APP/DEPART	60	/	37	294	/	97	114	/	330	239	/	243	0
BEGIN PEAK HR		4:00 PM											
VOLUMES	3	14	19	191	1	7	2	19	46	9	149	0	460
APPROACH %	8%	39%	53%	96%	1%	4%	3%	28%	69%	6%	94%	0%	
PEAK HR FACTOR		0.692			0.638			0.882			0.527		0.762
APP/DEPART	36	/	16	199	/	56	67	/	229	158	/	159	0

U-TURNS

	NB	SB	EB	WB	TTL
LANES	0	0	0	0	
7:00 AM	0	0	0	0	0
7:15 AM	0	0	0	0	0
7:30 AM	0	0	0	0	0
7:45 AM	0	0	0	0	0
8:00 AM	0	0	0	0	0
8:15 AM	0	0	0	0	0
8:30 AM	0	0	0	0	0
8:45 AM	0	0	0	0	0
VOLUMES	0	0	0	0	0
AM PEAK HR VOLUMES	0	0	0	0	
4:00 PM	0	0	0	0	0
4:15 PM	0	0	0	0	0
4:30 PM	0	0	0	0	0
4:45 PM	0	0	0	0	0
5:00 PM	0	0	0	0	0
5:15 PM	0	0	0	0	0
5:30 PM	0	0	0	0	0
5:45 PM	0	0	0	0	0
VOLUMES	0	0	0	0	0
PM PEAK HR VOLUMES	0	0	0	0	

RTOR

	NRR	SRR	ERR	WRR
LANES	X	X	X	X
7:00 AM	0	0	0	0
7:15 AM	0	0	0	0
7:30 AM	0	0	0	0
7:45 AM	0	0	0	0
8:00 AM	0	0	0	0
8:15 AM	0	0	0	0
8:30 AM	0	0	0	0
8:45 AM	0	0	0	0
VOLUMES	0	0	0	0
AM PEAK HR VOLUMES	0	0	0	0
4:00 PM	0	0	0	0
4:15 PM	0	0	0	0
4:30 PM	0	0	0	0
4:45 PM	0	0	0	0
5:00 PM	0	0	0	0
5:15 PM	0	0	0	0
5:30 PM	0	0	0	0
5:45 PM	0	0	0	0
VOLUMES	0	0	0	0
PM PEAK HR VOLUMES	0	0	0	0

I-15 NB Ramps

NORTH LEG

Stoddard Wells Rd WEST LEG EAST LEG **Stoddard Wells Rd**

SOUTH LEG

I-15 NB Ramps

	ALL PED + BIKE & SCOOTER					PEDESTRIAN CROSSINGS					BICYCLE & SCOOTER CROSSINGS				
	E LEG	W LEG	S LEG	N LEG	TOTAL	E LEG	W LEG	S LEG	N LEG	TOTAL	EL	WL	SL	NL	TOTAL
AM 7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PM 4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

INTERSECTION TUR

PREPARED BY: AimTD LL

DATE: 4/22/25 TUESDAY	LOCATION:	Apple Valley
	NORTH & SOUTH:	I-15 NB Ramps
	EAST & WEST:	Stoddard Wells Rd

PCE Adjusted	NOTES:				
	Class	1	2	3	4
	Factor	1	1.5	2	3

		NORTHBOUND I-15 NB Ramps			SOUTHBOUNI I-15 NB Ramps	
	LANES:	NL 0	NT 1	NR 0	SL 0	ST 1
AM	7:00 AM	0	6	1	21	1
	7:15 AM	0	9	1	21	0
	7:30 AM	4	8	0	45	0
	7:45 AM	1	9	4	41	0
	8:00 AM	0	5	0	31	0
	8:15 AM	0	13	2	43	0
	8:30 AM	0	13	4	40	0
	8:45 AM	2	4	0	39	2
	VOLUMES	7	66	12	279	3
	APPROACH %	8%	78%	14%	86%	1%
	APP/DEPART	84	/	80	322	/
	BEGIN PEAK HR		8:00 AM			
	VOLUMES	2	35	6	152	2
	APPROACH %	4%	82%	14%	86%	1%
	PEAK HR FACTOR		0.618			0.929
	APP/DEPART	42	/	41	177	/
PM	4:00 PM	1	2	5	60	0
	4:15 PM	1	5	7	87	1
	4:30 PM	0	3	4	36	0
	4:45 PM	3	4	3	35	0
	5:00 PM	0	6	1	30	1
	5:15 PM	0	4	1	21	1
	5:30 PM	0	6	3	29	0
	5:45 PM	0	3	0	24	0
	VOLUMES	5	33	24	321	3
	APPROACH %	8%	53%	39%	94%	1%
	APP/DEPART	62	/	37	342	/

BEGIN PEAK HR		4:00 PM			
VOLUMES	5	14	19	218	1
APPROACH %	13%	37%	50%	95%	0%
PEAK HR FACTOR		0.731			0.643
APP/DEPART	38	/	16	229	/

I-

Stoddard Wells Rd WEST SIDE

I-

ʀNING MOVEMENT COUNTS

.C. tel: 714 253 7888 cs@aimtd.com

PROJECT #: SC5337
LOCATION #: 3
CONTROL: STOP N/S

				AM		▲	
5	6			PM		N	
2	2			MD	◀ W		E ▶
				OTHER		S	
				OTHER		▼	

ɔ	EASTBOUND Stoddard Wells Rd			WESTBOUND Stoddard Wells Rd			
SR 0	EL 0	ET 1	ER 0	WL 0	WT 1	WR 0	TOTAL
3	0	0	9	0	30	0	70
3	1	1	4	0	17	0	57
6	3	0	1	1	21	0	88
6	4	2	8	1	13	0	88
9	3	3	5	2	20	0	78
5	1	3	2	1	18	0	87
4	1	1	4	0	27	0	93
6	1	6	6	4	57	0	125
41	14	16	39	9	202	0	686
13%	20%	23%	57%	4%	96%	0%	
51	69	/	306	211	/	249	0
23	6	13	17	7	122	0	383
13%	17%	35%	48%	5%	95%	0%	
		0.710			0.529		0.766
26	36	/	170	129	/	147	0
4	0	8	10	3	79	0	172
1	0	6	13	5	38	0	164
2	2	12	14	1	25	0	99
3	0	8	11	2	25	0	94
4	1	8	9	0	25	0	84
2	1	1	5	0	26	0	62
0	0	1	15	1	21	0	76
2	0	3	9	1	18	0	60
18	4	46	86	13	257	0	809
5%	3%	34%	63%	5%	95%	0%	
102	136	/	391	270	/	279	0

10 4%	2 2%	34 40% 0.759	48 57%	11 6%	167 94% 0.544	0 0%	528 0.770
60	84	/	271	178	/	182	0

15 NB Ramps

NORTH SIDE

EAST SIDE **Stoddard Wells Rd**

SOUTH SIDE

15 NB Ramps

U-TURNS				
NB	SB	EB	WB	TTL
				0
				0
				0
				0
				0
				0
				0
				0
0	0	0	0	0

				0
				0
				0
				0
				0
				0
				0
				0
0	0	0	0	0

INTERSECTION TURNING MOVEMENT COUNTS

PREPARED BY: AimTD LLC. tel: 714 253 7888 cs@aimtd.com

DATE:	LOCATION:	Apple Valley	PROJECT #:	SC5337
4/22/25	NORTH & SOUTH:	I-15 NB Ramps	LOCATION #:	3
TUESDAY	EAST & WEST:	Stoddard Wells Rd	CONTROL:	STOP N/S

CLASS 2: 2-AXLE WORK VEHICLES/ TRUCKS

NOTES:

AM PM MD OTHER OTHER

▲ N ◄ W E ► S ▼

		NORTHBOUND I-15 NB Ramps			SOUTHBOUND I-15 NB Ramps			EASTBOUND Stoddard Wells Rd			WESTBOUND Stoddard Wells Rd				U-TURNS					RTOR			
		NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL	NB	SB	EB	WB	TTL	NRR	SRR	ERR	WRR
	LANES:	0	1	0	0	1	0	0	1	0	0	1	0							X	X	X	X
AM	7:00 AM	0	1	0	1	0	0	0	0	0	0	3	0	5	0	0	0	0	0	0	0	0	0
AM	7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AM	7:30 AM	0	0	0	3	0	0	0	0	0	0	1	0	4	0	0	0	0	0	0	0	0	0
AM	7:45 AM	0	1	0	2	0	1	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0
AM	8:00 AM	0	0	0	2	0	0	0	0	0	0	2	0	4	0	0	0	0	0	0	0	0	0
AM	8:15 AM	0	1	0	1	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
AM	8:30 AM	0	2	0	1	0	1	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0
AM	8:45 AM	1	0	0	1	0	1	0	1	0	0	0	0	4	0	0	0	0	0	0	0	0	0
AM	VOLUMES	1	5	0	11	0	3	0	1	0	0	6	0	27	0	0	0	0	0	0	0	0	0
AM	APPROACH %	17%	83%	0%	79%	0%	21%	0%	100%	0%	0%	100%	0%										
AM	APP/DEPART	6	/	5	14	/	0	1	/	12	6	/	10	0									
AM	BEGIN PEAK HR		8:00 AM																				
AM	VOLUMES	1	3	0	5	0	2	0	1	0	0	2	0	14	0	0	0	0		0	0	0	0
AM	APPROACH %	25%	75%	0%	71%	0%	29%	0%	100%	0%	0%	100%	0%										
AM	PEAK HR FACTOR		0.500			0.875			0.250			0.250		0.875									
AM	APP/DEPART	4	/	3	7	/	0	1	/	6	2	/	5	0									
PM	4:00 PM	0	0	0	2	0	0	0	0	0	0	1	0	3	0	0	0	0	0	0	0	0	0
PM	4:15 PM	0	0	0	2	0	0	0	0	0	0	2	0	4	0	0	0	0	0	0	0	0	0
PM	4:30 PM	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0
PM	4:45 PM	0	0	0	0	0	0	0	2	0	0	0	0	2	0	0	0	0	0	0	0	0	0
PM	5:00 PM	0	0	0	1	0	0	0	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0
PM	5:15 PM	0	0	0	0	0	1	0	0	0	0	2	0	3	0	0	0	0	0	0	0	0	0
PM	5:30 PM	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
PM	5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PM	VOLUMES	0	0	0	6	0	1	0	4	0	0	5	0	16	0	0	0	0	0	0	0	0	0
PM	APPROACH %	0%	0%	0%	86%	0%	14%	0%	100%	0%	0%	100%	0%										
PM	APP/DEPART	0	/	0	7	/	0	4	/	10	5	/	6	0									
PM	BEGIN PEAK HR		4:00 PM																				
PM	VOLUMES	0	0	0	4	0	0	0	3	0	0	3	0	10	0	0	0	0		0	0	0	0
PM	APPROACH %	0%	0%	0%	100%	0%	0%	0%	100%	0%	0%	100%	0%										
PM	PEAK HR FACTOR		0.000			0.500			0.375			0.375		0.625									
PM	APP/DEPART	0	/	0	4	/	0	3	/	7	3	/	3	0									

I-15 NB Ramps

NORTH SIDE

Stoddard Wells Rd WEST SIDE

EAST SIDE **Stoddard Wells Rd**

SOUTH SIDE

I-15 NB Ramps

INTERSECTION TURNING MOVEMENT COUNTS

PREPARED BY: AimTD LLC. tel: 714 253 7888 cs@aimtd.com

DATE:	LOCATION:	Apple Valley	PROJECT #:	SC5337
4/22/25	NORTH & SOUTH:	I-15 NB Ramps	LOCATION #:	3
TUESDAY	EAST & WEST:	Stoddard Wells Rd	CONTROL:	STOP N/S

CLASS 3: 3-AXLE TRUCKS

NOTES:

AM / PM / MD / OTHER / OTHER

▲ N / ◄ W / E ► / S ▼

		NORTHBOUND (I-15 NB Ramps)			SOUTHBOUND (I-15 NB Ramps)			EASTBOUND (Stoddard Wells Rd)			WESTBOUND (Stoddard Wells Rd)			
		NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
	LANES:	0	1	0	0	1	0	0	1	0	0	1	0	
AM	7:00 AM	0	0	0	0	0	0	0	0	2	0	0	0	2
AM	7:15 AM	0	0	0	1	0	0	0	0	0	0	0	0	1
AM	7:30 AM	0	0	0	1	0	1	1	0	0	0	2	0	5
AM	7:45 AM	0	0	0	0	0	0	1	1	1	0	1	0	4
AM	8:00 AM	0	0	0	0	0	0	0	0	0	0	1	0	1
AM	8:15 AM	0	0	0	1	0	0	0	0	0	0	1	0	2
AM	8:30 AM	0	0	0	0	0	0	0	0	0	0	1	0	1
AM	8:45 AM	0	0	0	0	0	0	0	1	0	0	3	0	4
AM	VOLUMES	0	0	0	3	0	1	2	2	3	0	9	0	20
AM	APPROACH %	0%	0%	0%	75%	0%	25%	29%	29%	43%	0%	100%	0%	
AM	APP/DEPART	0	/	2	4	/	3	7	/	5	9	/	10	0
AM	BEGIN PEAK HR		8:00 AM											
AM	VOLUMES	0	0	0	1	0	0	0	1	0	0	6	0	8
AM	APPROACH %	0%	0%	0%	100%	0%	0%	0%	100%	0%	0%	100%	0%	
AM	PEAK HR FACTOR		0.000			0.250			0.250			0.500		0.500
AM	APP/DEPART	0	/	0	1	/	0	1	/	2	6	/	6	0
PM	4:00 PM	0	0	0	0	0	0	0	1	0	0	2	0	3
PM	4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
PM	4:30 PM	0	0	0	1	0	0	0	0	0	0	2	0	3
PM	4:45 PM	0	0	0	0	0	1	0	0	0	0	0	0	1
PM	5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
PM	5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
PM	5:30 PM	0	0	0	0	0	0	0	0	0	0	1	0	1
PM	5:45 PM	0	0	0	0	0	0	0	0	1	0	1	0	2
PM	VOLUMES	0	0	0	1	0	1	0	1	1	0	6	0	10
PM	APPROACH %	0%	0%	0%	50%	0%	50%	0%	50%	50%	0%	100%	0%	
PM	APP/DEPART	0	/	0	2	/	1	2	/	2	6	/	7	0
PM	BEGIN PEAK HR		4:00 PM											
PM	VOLUMES	0	0	0	1	0	1	0	1	0	0	4	0	7
PM	APPROACH %	0%	0%	0%	50%	0%	50%	0%	100%	0%	0%	100%	0%	
PM	PEAK HR FACTOR		0.000			0.500			0.250			0.500		0.583
PM	APP/DEPART	0	/	0	2	/	0	1	/	2	4	/	5	0

U-TURNS

	NB	SB	EB	WB	TTL
7:00 AM	0	0	0	0	0
7:15 AM	0	0	0	0	0
7:30 AM	0	0	0	0	0
7:45 AM	0	0	0	0	0
8:00 AM	0	0	0	0	0
8:15 AM	0	0	0	0	0
8:30 AM	0	0	0	0	0
8:45 AM	0	0	0	0	0
AM VOLUMES	0	0	0	0	0
AM PEAK HR VOLUMES	0	0	0	0	
4:00 PM	0	0	0	0	0
4:15 PM	0	0	0	0	0
4:30 PM	0	0	0	0	0
4:45 PM	0	0	0	0	0
5:00 PM	0	0	0	0	0
5:15 PM	0	0	0	0	0
5:30 PM	0	0	0	0	0
5:45 PM	0	0	0	0	0
PM VOLUMES	0	0	0	0	0
PM PEAK HR VOLUMES	0	0	0	0	

RTOR

	NRR	SRR	ERR	WRR
LANES	X	X	X	X
7:00 AM	0	0	0	0
7:15 AM	0	0	0	0
7:30 AM	0	0	0	0
7:45 AM	0	0	0	0
8:00 AM	0	0	0	0
8:15 AM	0	0	0	0
8:30 AM	0	0	0	0
8:45 AM	0	0	0	0
AM VOLUMES	0	0	0	0
AM PEAK HR VOLUMES	0	0	0	0
4:00 PM	0	0	0	0
4:15 PM	0	0	0	0
4:30 PM	0	0	0	0
4:45 PM	0	0	0	0
5:00 PM	0	0	0	0
5:15 PM	0	0	0	0
5:30 PM	0	0	0	0
5:45 PM	0	0	0	0
PM VOLUMES	0	0	0	0
PM PEAK HR VOLUMES	0	0	0	0

I-15 NB Ramps

NORTH SIDE

Stoddard Wells Rd WEST SIDE

EAST SIDE **Stoddard Wells Rd**

SOUTH SIDE

I-15 NB Ramps

INTERSECTION TURNING MOVEMENT COUNTS

PREPARED BY: AimTD LLC. tel: 714 253 7888 cs@aimtd.com

DATE:	LOCATION:	Apple Valley	PROJECT #:	SC5337
4/22/25	NORTH & SOUTH:	I-15 NB Ramps	LOCATION #:	3
TUESDAY	EAST & WEST:	Stoddard Wells Rd	CONTROL:	STOP N/S

CLASS 4: 4 OR MORE AXLE TRUCKS

NOTES:

AM / PM / MD / OTHER / OTHER

▲ N ◄ W E ► S ▼

		NORTHBOUND I-15 NB Ramps			SOUTHBOUND I-15 NB Ramps			EASTBOUND Stoddard Wells Rd			WESTBOUND Stoddard Wells Rd			
		NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
	LANES:	0	1	0	0	1	0	0	1	0	0	1	0	
AM	7:00 AM	0	0	0	1	0	0	0	0	1	0	5	0	7
AM	7:15 AM	0	0	0	0	0	1	0	0	0	0	4	0	5
AM	7:30 AM	1	0	0	4	0	1	0	0	0	0	3	0	9
AM	7:45 AM	0	1	1	4	0	0	0	0	0	0	0	0	6
AM	8:00 AM	0	1	0	6	0	2	1	1	0	0	2	0	13
AM	8:15 AM	0	0	0	8	0	1	0	0	0	0	2	0	11
AM	8:30 AM	0	0	1	7	0	0	0	0	0	0	5	0	13
AM	8:45 AM	0	0	0	7	0	0	0	0	0	1	10	0	18
AM	VOLUMES	1	2	2	37	0	5	1	1	1	1	31	0	82
AM	APPROACH %	20%	40%	40%	88%	0%	12%	33%	33%	33%	3%	97%	0%	
AM	APP/DEPART	5	/	3	42	/	2	3	/	40	32	/	37	0
AM	BEGIN PEAK HR		8:00 AM											
AM	VOLUMES	0	1	1	28	0	3	1	1	0	1	19	0	55
AM	APPROACH %	0%	50%	50%	90%	0%	10%	50%	50%	0%	5%	95%	0%	
AM	PEAK HR FACTOR		0.500			0.861			0.250			0.455		0.764
AM	APP/DEPART	2	/	2	31	/	1	2	/	30	20	/	22	0
PM	4:00 PM	0	0	0	4	0	1	0	1	0	0	2	0	8
PM	4:15 PM	0	0	0	5	0	0	0	1	0	1	2	0	9
PM	4:30 PM	0	0	0	1	0	0	0	3	1	0	0	0	5
PM	4:45 PM	1	0	0	2	0	0	0	1	0	0	2	0	6
PM	5:00 PM	0	0	0	2	0	1	0	1	0	0	2	0	6
PM	5:15 PM	0	0	0	0	0	0	0	0	0	0	1	0	1
PM	5:30 PM	0	0	0	2	0	0	0	0	0	0	0	0	2
PM	5:45 PM	0	0	0	3	0	0	0	1	0	0	1	0	5
PM	VOLUMES	1	0	0	19	0	2	0	8	1	1	10	0	42
PM	APPROACH %	100%	0%	0%	90%	0%	10%	0%	89%	11%	9%	91%	0%	
PM	APP/DEPART	1	/	0	21	/	2	9	/	27	11	/	13	0
PM	BEGIN PEAK HR		4:00 PM											
PM	VOLUMES	1	0	0	12	0	1	0	6	1	1	6	0	28
PM	APPROACH %	100%	0%	0%	92%	0%	8%	0%	86%	14%	14%	86%	0%	
PM	PEAK HR FACTOR		0.250			0.650			0.438			0.583		0.778
PM	APP/DEPART	1	/	0	13	/	2	7	/	18	7	/	8	0

		U-TURNS					RTOR			
		NB	SB	EB	WB	TTL	NRR	SRR	ERR	WRR
	LANES:						X	X	X	X
AM	7:00 AM	0	0	0	0	0	0	0	0	0
AM	7:15 AM	0	0	0	0	0	0	0	0	0
AM	7:30 AM	0	0	0	0	0	0	0	0	0
AM	7:45 AM	0	0	0	0	0	0	0	0	0
AM	8:00 AM	0	0	0	0	0	0	0	0	0
AM	8:15 AM	0	0	0	0	0	0	0	0	0
AM	8:30 AM	0	0	0	0	0	0	0	0	0
AM	8:45 AM	0	0	0	0	0	0	0	0	0
AM	VOLUMES	0	0	0	0	0	0	0	0	0
AM	PEAK HR VOLUMES	0	0	0	0		0	0	0	0
PM	4:00 PM	0	0	0	0	0	0	0	0	0
PM	4:15 PM	0	0	0	0	0	0	0	0	0
PM	4:30 PM	0	0	0	0	0	0	0	0	0
PM	4:45 PM	0	0	0	0	0	0	0	0	0
PM	5:00 PM	0	0	0	0	0	0	0	0	0
PM	5:15 PM	0	0	0	0	0	0	0	0	0
PM	5:30 PM	0	0	0	0	0	0	0	0	0
PM	5:45 PM	0	0	0	0	0	0	0	0	0
PM	VOLUMES	0	0	0	0	0	0	0	0	0
PM	PEAK HR VOLUMES	0	0	0	0		0	0	0	0

I-15 NB Ramps

NORTH SIDE

Stoddard Wells Rd WEST SIDE

EAST SIDE **Stoddard Wells Rd**

SOUTH SIDE

I-15 NB Ramps

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APPENDIX 3.2:

EXISTING (2025) INTERSECTION ANALYSIS

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Intersection	
Int Delay, s/veh	1.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	28	0	4	117	1	5
Future Vol, veh/h	28	0	4	117	1	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	72	72	72	72	72	72
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	39	0	6	163	1	7

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	97	87	0	0	168	0
Stage 1	87	-	-	-	-	-
Stage 2	10	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	908	977	-	-	1422	-
Stage 1	942	-	-	-	-	-
Stage 2	1018	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	907	977	-	-	1422	-
Mov Cap-2 Maneuver	907	-	-	-	-	-
Stage 1	942	-	-	-	-	-
Stage 2	1017	-	-	-	-	-

Approach	WB	NB	SB
HCM Ctrl Dly, s/v	9.15	0	1.26
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	907	300	-
HCM Lane V/C Ratio	-	-	0.043	0.001	-
HCM Ctrl Dly (s/v)	-	-	9.1	7.5	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Int Delay, s/veh	1.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	4	9	29	117	28	5
Future Vol, veh/h	4	9	29	117	28	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Yield	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	63	63	63	63	63	63
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	6	14	46	186	44	8

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	46	0	-	0	166	139
Stage 1	-	-	-	-	139	-
Stage 2	-	-	-	-	27	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1575	-	-	-	829	915
Stage 1	-	-	-	-	893	-
Stage 2	-	-	-	-	1001	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1575	-	-	-	826	915
Mov Cap-2 Maneuver	-	-	-	-	826	-
Stage 1	-	-	-	-	889	-
Stage 2	-	-	-	-	1001	-

Approach	EB	WB	SB
HCM Ctrl Dly, s/v	2.24	0	9.58
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	554	-	-	-	838
HCM Lane V/C Ratio	0.004	-	-	-	0.062
HCM Ctrl Dly (s/v)	7.3	0	-	-	9.6
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection	
Int Delay, s/veh	7.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	6	13	18	7	121	0	2	35	6	152	2	23
Future Vol, veh/h	6	13	18	7	121	0	2	35	6	152	2	23
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	78	78	78	78	78	78	78	78	78	78	78	78
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	8	17	23	9	155	0	3	45	8	195	3	29

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	155	0	0	40	0	0	218	217	28	228	228	155
Stage 1	-	-	-	-	-	-	44	44	-	173	173	-
Stage 2	-	-	-	-	-	-	174	173	-	54	55	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1437	-	-	1583	-	-	743	685	1053	732	675	896
Stage 1	-	-	-	-	-	-	976	863	-	833	759	-
Stage 2	-	-	-	-	-	-	832	759	-	963	853	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1437	-	-	1583	-	-	707	677	1053	671	667	896
Mov Cap-2 Maneuver	-	-	-	-	-	-	707	677	-	671	667	-
Stage 1	-	-	-	-	-	-	970	858	-	828	755	-
Stage 2	-	-	-	-	-	-	797	755	-	901	848	-

Approach	EB	WB	NB	SB
HCM Ctrl Dly, s/v	1.22	0.4	10.46	12.69
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	714	262	-	-	98	-	-	694
HCM Lane V/C Ratio	0.077	0.005	-	-	0.006	-	-	0.327
HCM Ctrl Dly (s/v)	10.5	7.5	0	-	7.3	0	-	12.7
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.3	0	-	-	0	-	-	1.4

Intersection	
Int Delay, s/veh	2.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	43	2	2	157	2	3
Future Vol, veh/h	43	2	2	157	2	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	69	69	69	69	69	69
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	62	3	3	228	3	4

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	127	117	0	0	230	0
Stage 1	117	-	-	-	-	-
Stage 2	10	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	873	941	-	-	1349	-
Stage 1	913	-	-	-	-	-
Stage 2	1018	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	871	941	-	-	1349	-
Mov Cap-2 Maneuver	871	-	-	-	-	-
Stage 1	913	-	-	-	-	-
Stage 2	1016	-	-	-	-	-

Approach	WB	NB	SB
HCM Ctrl Dly, s/v	9.45	0	3.07
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	874	720	-
HCM Lane V/C Ratio	-	-	0.075	0.002	-
HCM Ctrl Dly (s/v)	-	-	9.5	7.7	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0	-

Intersection	
Int Delay, s/veh	2.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	16	40	38	144	45	1
Future Vol, veh/h	16	40	38	144	45	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Yield	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	62	62	62	62	62	62
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	26	65	61	232	73	2

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	61	0	-	0	294	177
Stage 1	-	-	-	-	177	-
Stage 2	-	-	-	-	116	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1555	-	-	-	702	871
Stage 1	-	-	-	-	858	-
Stage 2	-	-	-	-	914	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1555	-	-	-	690	871
Mov Cap-2 Maneuver	-	-	-	-	690	-
Stage 1	-	-	-	-	843	-
Stage 2	-	-	-	-	914	-

Approach	EB	WB	SB
HCM Ctrl Dly, s/v	2.1	0	10.82
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	514	-	-	-	693
HCM Lane V/C Ratio	0.017	-	-	-	0.107
HCM Ctrl Dly (s/v)	7.4	0	-	-	10.8
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.4

Intersection	
Int Delay, s/veh	8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	2	34	49	11	167	0	5	14	19	218	1	10
Future Vol, veh/h	2	34	49	11	167	0	5	14	19	218	1	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	76	76	76	76	76	76	76	76	76	76	76	76
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	3	45	64	14	220	0	7	18	25	287	1	13

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	220	0	0	109	0	0	332	331	77	308	363	220
Stage 1	-	-	-	-	-	-	82	82	-	249	249	-
Stage 2	-	-	-	-	-	-	249	249	-	59	114	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1362	-	-	1494	-	-	626	592	990	648	568	825
Stage 1	-	-	-	-	-	-	931	831	-	760	704	-
Stage 2	-	-	-	-	-	-	759	704	-	957	805	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1362	-	-	1494	-	-	606	584	990	604	560	825
Mov Cap-2 Maneuver	-	-	-	-	-	-	606	584	-	604	560	-
Stage 1	-	-	-	-	-	-	929	829	-	751	697	-
Stage 2	-	-	-	-	-	-	737	697	-	911	803	-

Approach	EB	WB	NB	SB
HCM Ctrl Dly, s/v	0.18	0.46	10.22	16.48
HCM LOS			B	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	739	38	-	-	111	-	-	611
HCM Lane V/C Ratio	0.068	0.002	-	-	0.01	-	-	0.493
HCM Ctrl Dly (s/v)	10.2	7.6	0	-	7.4	0	-	16.5
HCM Lane LOS	B	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	0.2	0	-	-	0	-	-	2.7

APPENDIX 3.3:

EXISTING (2025) SIGNAL WARRANTS

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Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 64 km/h OR ABOVE 40 mph ON MAJOR STREET)

Traffic Conditions = **Existing (2025) Conditions - Weekday PM Peak Hour**

Major Street Name = **Quarry Road**

Total of Both Approaches (VPH) = **149**

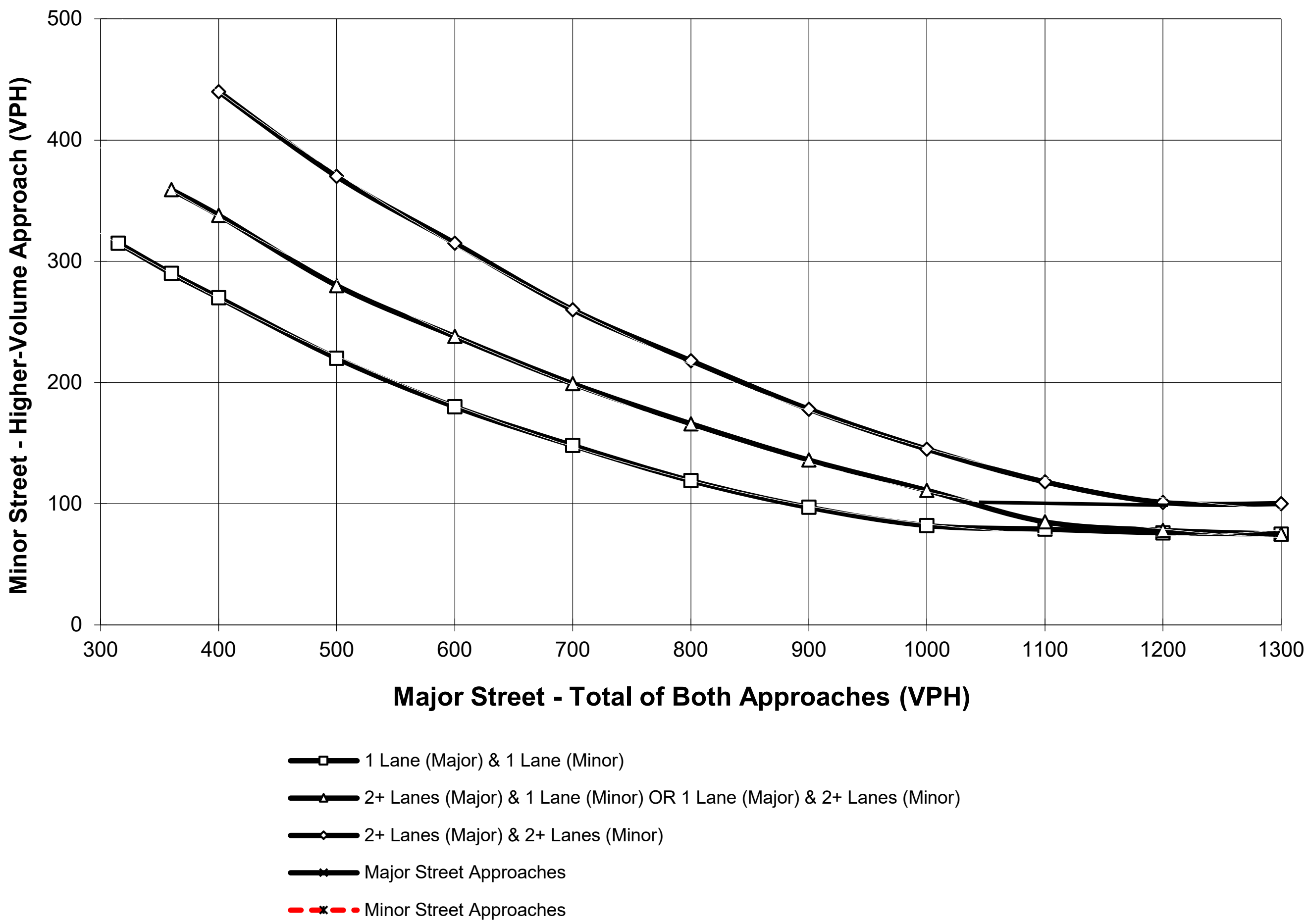
Number of Approach Lanes Major Street = **1**

Minor Street Name = **I-15 SB Ramps**

High Volume Approach (VPH) = **44**

Number of Approach Lanes Minor Street = **1**

SIGNAL WARRANT NOT SATISFIED



*Note: 100 vph applies as the lower threshold for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold for a minor-street approach with one lane

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 64 km/h OR ABOVE 40 mph ON MAJOR STREET)

Traffic Conditions = **Existing (2025) Conditions - Weekday PM Peak Hour**

Major Street Name = **Stoddard Wells Road**

Total of Both Approaches (VPH) = **192**

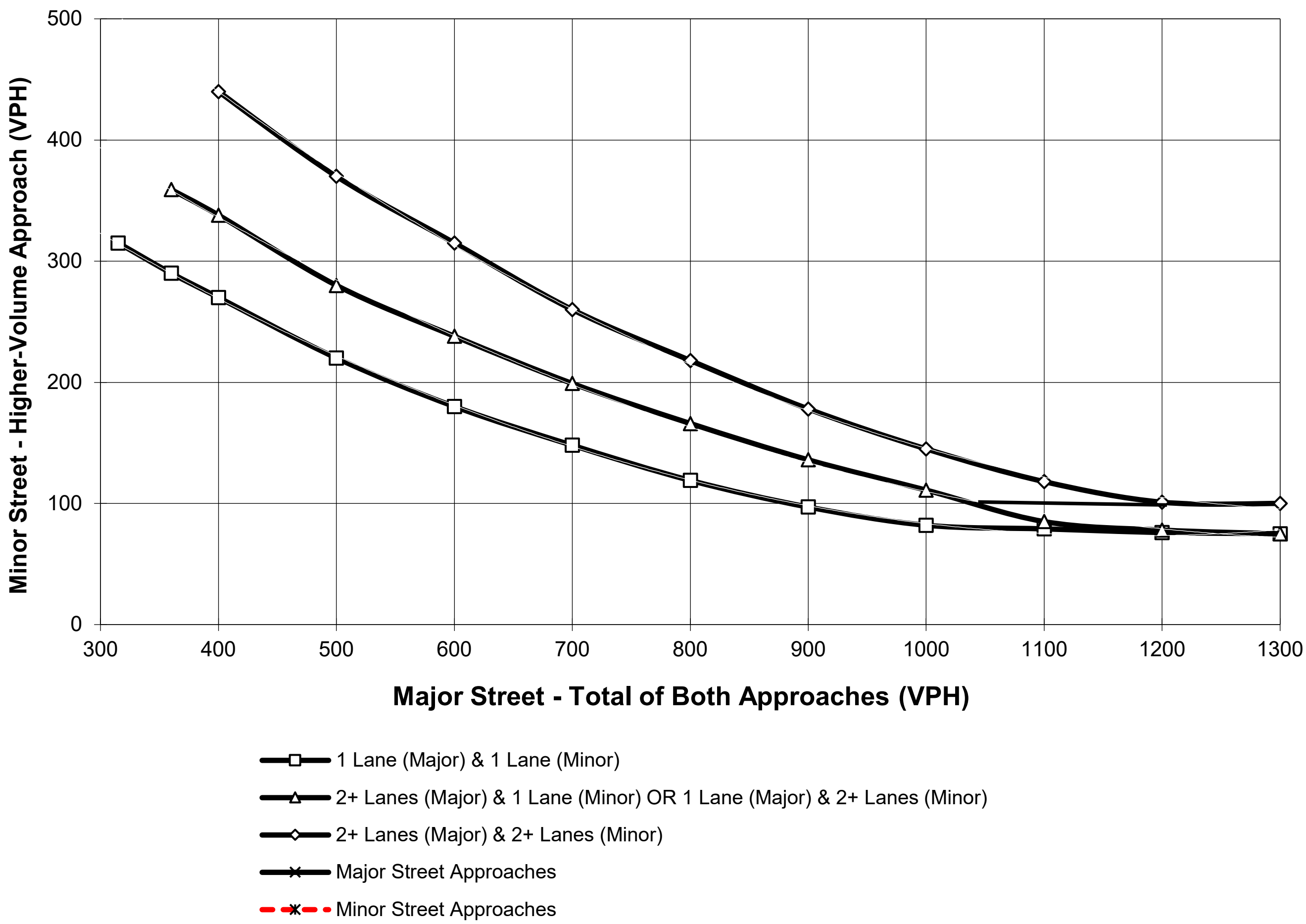
Number of Approach Lanes Major Street = **1**

Minor Street Name = **Quarry Road**

High Volume Approach (VPH) = **45**

Number of Approach Lanes Minor Street = **1**

SIGNAL WARRANT NOT SATISFIED



*Note: 100 vph applies as the lower threshold for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold for a minor-street approach with one lane

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

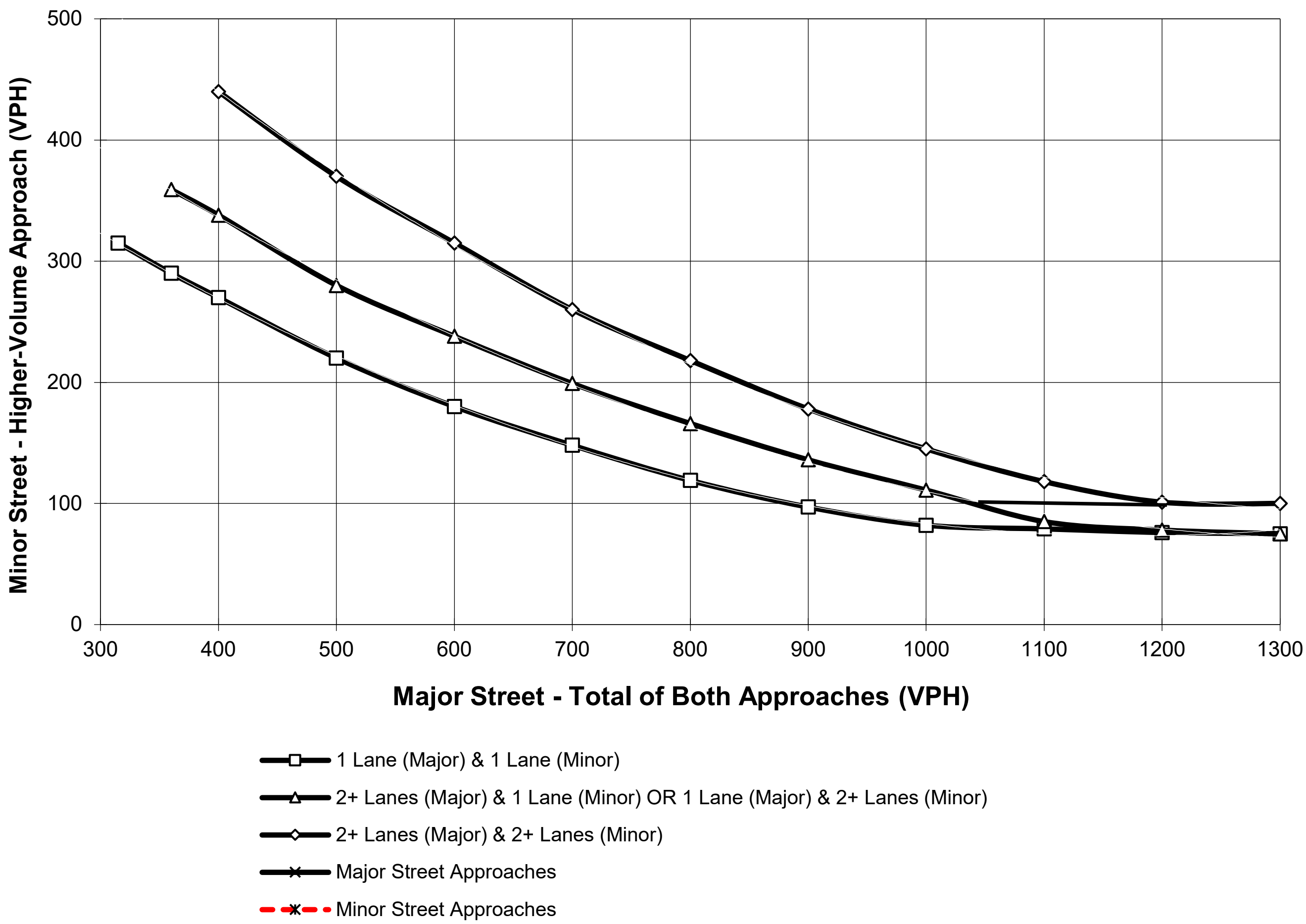
(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 64 km/h OR ABOVE 40 mph ON MAJOR STREET)

Traffic Conditions = **Existing (2025) Conditions - Weekday PM Peak Hour**

Major Street Name = **I-15 Northbound Ramps**
Total of Both Approaches (VPH) = **235**
Number of Approach Lanes Major Street = **1**

Minor Street Name = **Stoddard Wells Road**
High Volume Approach (VPH) = **226**
Number of Approach Lanes Minor Street = **1**

SIGNAL WARRANT NOT SATISFIED



*Note: 100 vph applies as the lower threshold for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold for a minor-street approach with one lane

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Appendix 3.4:

Existing (2025) Off-Ramp Queues

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Intersection	
Int Delay, s/veh	1.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	28	0	4	117	1	5
Future Vol, veh/h	28	0	4	117	1	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	72	72	72	72	72	72
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	39	0	6	163	1	7

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	97	87	0	0	168	0
Stage 1	87	-	-	-	-	-
Stage 2	10	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	908	977	-	-	1422	-
Stage 1	942	-	-	-	-	-
Stage 2	1018	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	907	977	-	-	1422	-
Mov Cap-2 Maneuver	907	-	-	-	-	-
Stage 1	942	-	-	-	-	-
Stage 2	1017	-	-	-	-	-

Approach	WB	NB	SB
HCM Ctrl Dly, s/v	9.15	0	1.26
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	907	300	-
HCM Lane V/C Ratio	-	-	0.043	0.001	-
HCM Ctrl Dly (s/v)	-	-	9.1	7.5	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Int Delay, s/veh	7.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Vol, veh/h	6	13	18	7	121	0	2	35	6	152	2	23
Future Vol, veh/h	6	13	18	7	121	0	2	35	6	152	2	23
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	78	78	78	78	78	78	78	78	78	78	78	78
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	8	17	23	9	155	0	3	45	8	195	3	29

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	155	0	0	40	0	0	218	217	28	228	228	155
Stage 1	-	-	-	-	-	-	44	44	-	173	173	-
Stage 2	-	-	-	-	-	-	174	173	-	54	55	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1437	-	-	1583	-	-	743	685	1053	732	675	896
Stage 1	-	-	-	-	-	-	976	863	-	833	759	-
Stage 2	-	-	-	-	-	-	832	759	-	963	853	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1437	-	-	1583	-	-	707	677	1053	671	667	896
Mov Cap-2 Maneuver	-	-	-	-	-	-	707	677	-	671	667	-
Stage 1	-	-	-	-	-	-	970	858	-	828	755	-
Stage 2	-	-	-	-	-	-	797	755	-	901	848	-

Approach	EB	WB	NB	SB
HCM Ctrl Dly, s/v	1.22	0.4	10.46	12.69
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	714	262	-	-	98	-	-	694
HCM Lane V/C Ratio	0.077	0.005	-	-	0.006	-	-	0.327
HCM Ctrl Dly (s/v)	10.5	7.5	0	-	7.3	0	-	12.7
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.3	0	-	-	0	-	-	1.4

Intersection	
Int Delay, s/veh	2.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	43	2	2	157	2	3
Future Vol, veh/h	43	2	2	157	2	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	69	69	69	69	69	69
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	62	3	3	228	3	4

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	127	117	0	0	230	0
Stage 1	117	-	-	-	-	-
Stage 2	10	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	873	941	-	-	1349	-
Stage 1	913	-	-	-	-	-
Stage 2	1018	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	871	941	-	-	1349	-
Mov Cap-2 Maneuver	871	-	-	-	-	-
Stage 1	913	-	-	-	-	-
Stage 2	1016	-	-	-	-	-

Approach	WB	NB	SB
HCM Ctrl Dly, s/v	9.45	0	3.07
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	874	720	-
HCM Lane V/C Ratio	-	-	0.075	0.002	-
HCM Ctrl Dly (s/v)	-	-	9.5	7.7	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0	-

Intersection	
Int Delay, s/veh	8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	2	34	49	11	167	0	5	14	19	218	1	10
Future Vol, veh/h	2	34	49	11	167	0	5	14	19	218	1	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	76	76	76	76	76	76	76	76	76	76	76	76
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	3	45	64	14	220	0	7	18	25	287	1	13

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	220	0	0	109	0	0	332	331	77	308	363	220
Stage 1	-	-	-	-	-	-	82	82	-	249	249	-
Stage 2	-	-	-	-	-	-	249	249	-	59	114	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1362	-	-	1494	-	-	626	592	990	648	568	825
Stage 1	-	-	-	-	-	-	931	831	-	760	704	-
Stage 2	-	-	-	-	-	-	759	704	-	957	805	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1362	-	-	1494	-	-	606	584	990	604	560	825
Mov Cap-2 Maneuver	-	-	-	-	-	-	606	584	-	604	560	-
Stage 1	-	-	-	-	-	-	929	829	-	751	697	-
Stage 2	-	-	-	-	-	-	737	697	-	911	803	-

Approach	EB	WB	NB	SB
HCM Ctrl Dly, s/v	0.18	0.46	10.22	16.48
HCM LOS			B	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	739	38	-	-	111	-	-	611
HCM Lane V/C Ratio	0.068	0.002	-	-	0.01	-	-	0.493
HCM Ctrl Dly (s/v)	10.2	7.6	0	-	7.4	0	-	16.5
HCM Lane LOS	B	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	0.2	0	-	-	0	-	-	2.7

APPENDIX 5.1:

OYC (2028) WITHOUT PROJECT INTERSECTION ANALYSIS

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Intersection						
Int Delay, s/veh	2.6					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	138	0	4	633	1	5
Future Vol, veh/h	138	0	4	633	1	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	72	72	72	72	72	72
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	192	0	6	879	1	7

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	455	445	0	0	885	0
Stage 1	445	-	-	-	-	-
Stage 2	10	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	567	617	-	-	773	-
Stage 1	650	-	-	-	-	-
Stage 2	1018	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	566	617	-	-	773	-
Mov Cap-2 Maneuver	566	-	-	-	-	-
Stage 1	650	-	-	-	-	-
Stage 2	1017	-	-	-	-	-

Approach	WB	NB	SB
HCM Ctrl Dly, s/v	14.58	0	1.61
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	566	300	-
HCM Lane V/C Ratio	-	-	0.339	0.002	-
HCM Ctrl Dly (s/v)	-	-	14.6	9.7	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	1.5	0	-

Intersection	
Int Delay, s/veh	3.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	4	33	38	633	138	5
Future Vol, veh/h	4	33	38	633	138	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Yield	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	63	63	63	63	63	63
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	6	52	60	1005	219	8

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	60	0	-	0	628	563
Stage 1	-	-	-	-	563	-
Stage 2	-	-	-	-	65	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1556	-	-	-	450	530
Stage 1	-	-	-	-	574	-
Stage 2	-	-	-	-	963	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1556	-	-	-	448	530
Mov Cap-2 Maneuver	-	-	-	-	448	-
Stage 1	-	-	-	-	572	-
Stage 2	-	-	-	-	963	-

Approach	EB	WB	SB
HCM Ctrl Dly, s/v	0.79	0	20.82
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	195	-	-	-	451
HCM Lane V/C Ratio	0.004	-	-	-	0.504
HCM Ctrl Dly (s/v)	7.3	0	-	-	20.8
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	2.8

Intersection	
Int Delay, s/veh	4711.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	6	91	74	27	645	55	2	53	52	1528	2	24
Future Vol, veh/h	6	91	74	27	645	55	2	53	52	1528	2	24
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	78	78	78	78	78	78	78	78	78	78	78	78
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	8	117	95	35	827	71	3	68	67	1959	3	31

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	897	0	0	212	0	0	1077	1146	164	1097	1158	862
Stage 1	-	-	-	-	-	-	179	179	-	931	931	-
Stage 2	-	-	-	-	-	-	897	967	-	166	227	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	765	-	-	1371	-	-	198	201	886	~ 192	198	358
Stage 1	-	-	-	-	-	-	827	755	-	~ 323	348	-
Stage 2	-	-	-	-	-	-	337	335	-	~ 841	720	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	765	-	-	1371	-	-	168	188	886	~ 109	185	358
Mov Cap-2 Maneuver	-	-	-	-	-	-	168	188	-	~ 109	185	-
Stage 1	-	-	-	-	-	-	817	746	-	~ 306	330	-
Stage 2	-	-	-	-	-	-	290	318	-	~ 698	712	-

Approach	EB	WB	NB	SB
HCM Ctrl Dly, s/v	0.34	0.29	26.21	$ 7755.92
HCM LOS			D	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	304	58	-	-	66	-	-	110
HCM Lane V/C Ratio	0.451	0.01	-	-	0.025	-	-	18.075
HCM Ctrl Dly (s/v)	26.2	9.8	0	-	7.7	0		$ 7755.9
HCM Lane LOS	D	A	A	-	A	A	-	F
HCM 95th %tile Q(veh)	2.2	0	-	-	0.1	-	-	238.4

Notes	
~: Volume exceeds capacity	$: Delay exceeds 300s
+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	5.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	129	2	2	1561	2	3
Future Vol, veh/h	129	2	2	1561	2	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	69	69	69	69	69	69
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	187	3	3	2262	3	4

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1144	1134	0	0	2265	0
Stage 1	1134	-	-	-	-	-
Stage 2	10	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	223	249	-	-	229	-
Stage 1	310	-	-	-	-	-
Stage 2	1018	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	220	249	-	-	229	-
Mov Cap-2 Maneuver	220	-	-	-	-	-
Stage 1	310	-	-	-	-	-
Stage 2	1005	-	-	-	-	-

Approach	WB	NB	SB
HCM Ctrl Dly, s/v	75.51	0	8.37
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	221	228	-
HCM Lane V/C Ratio	-	-	0.861	0.013	-
HCM Ctrl Dly (s/v)	-	-	75.5	20.9	0
HCM Lane LOS	-	-	F	C	A
HCM 95th %tile Q(veh)	-	-	6.7	0	-

Intersection	
Int Delay, s/veh	25.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	16	55	63	1546	131	1
Future Vol, veh/h	16	55	63	1546	131	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Yield	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	62	62	62	62	62	62
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	26	89	102	2494	211	2

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	102	0	-	0	1489	1348
Stage 1	-	-	-	-	1348	-
Stage 2	-	-	-	-	140	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1503	-	-	-	~ 138	186
Stage 1	-	-	-	-	244	-
Stage 2	-	-	-	-	891	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1503	-	-	-	~ 136	186
Mov Cap-2 Maneuver	-	-	-	-	~ 136	-
Stage 1	-	-	-	-	240	-
Stage 2	-	-	-	-	891	-

Approach	EB	WB	SB
HCM Ctrl Dly, s/v	1.68	0	$ 346.5
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	406	-	-	-	136
HCM Lane V/C Ratio	0.017	-	-	-	1.568
HCM Ctrl Dly (s/v)	7.4	0	-	-$	346.5
HCM Lane LOS	A	A	-	-	F
HCM 95th %tile Q(veh)	0.1	-	-	-	15

Notes	
~: Volume exceeds capacity	$: Delay exceeds 300s
+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	56.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	2	112	73	58	1594	60	5	67	49	975	1	11
Future Vol, veh/h	2	112	73	58	1594	60	5	67	49	975	1	11
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	76	76	76	76	76	76	76	76	76	76	76	76
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	3	147	96	76	2097	79	7	88	64	1283	1	14

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	2176	0	0	243	0	0	2451	2530	195	2486	2538	2137
Stage 1	-	-	-	-	-	-	201	201	-	2289	2289	-
Stage 2	-	-	-	-	-	-	2251	2329	-	197	249	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	248	-	-	1335	-	-	21	~ 28	851	~ 20	28	63
Stage 1	-	-	-	-	-	-	806	739	-	~ 53	75	-
Stage 2	-	-	-	-	-	-	56	~ 72	-	~ 810	704	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	248	-	-	1335	-	-	16	~ 28	851	-	27	63
Mov Cap-2 Maneuver	-	-	-	-	-	-	16	~ 28	-	-	27	-
Stage 1	-	-	-	-	-	-	796	730	-	~ 53	75	-
Stage 2	-	-	-	-	-	-	42	~ 72	-	~ 650	696	-

Approach	EB	WB	NB	SB
HCM Ctrl Dly, s/v	0.21	0.27	$ 1405.58	
HCM LOS			F	-

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	43	18	-	-	~ 61	-	-	-
HCM Lane V/C Ratio	3.693	0.011	-	-	0.057	-	-	-
HCM Ctrl Dly (s/v)	$ 1405.6	19.7	0	-	7.9	0	-	-
HCM Lane LOS	F	C	A	-	A	A	-	-
HCM 95th %tile Q(veh)	17.9	0	-	-	0.2	-	-	-

Notes	
~: Volume exceeds capacity	$: Delay exceeds 300s
+: Computation Not Defined	*: All major volume in platoon

APPENDIX 5.2:

OYC (2028) WITH PROJECT INTERSECTION ANALYSIS

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Intersection	
Int Delay, s/veh	3.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	181	0	4	687	1	5
Future Vol, veh/h	181	0	4	687	1	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	72	72	72	72	72	72
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	251	0	6	954	1	7

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	492	483	0	0	960	0
Stage 1	483	-	-	-	-	-
Stage 2	10	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	539	588	-	-	725	-
Stage 1	625	-	-	-	-	-
Stage 2	1018	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	538	588	-	-	725	-
Mov Cap-2 Maneuver	538	-	-	-	-	-
Stage 1	625	-	-	-	-	-
Stage 2	1017	-	-	-	-	-

Approach	WB	NB	SB
HCM Ctrl Dly, s/v	17.41	0	1.66
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	538	300	-
HCM Lane V/C Ratio	-	-	0.467	0.002	-
HCM Ctrl Dly (s/v)	-	-	17.4	10	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	2.5	0	-

Intersection	
Int Delay, s/veh	6.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰↑	↑		Y	
Traffic Vol, veh/h	4	35	38	687	181	5
Future Vol, veh/h	4	35	38	687	181	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	63	63	63	63	63	63
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	6	56	60	1090	287	8

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1151	0	-	0	674	606
Stage 1	-	-	-	-	606	-
Stage 2	-	-	-	-	68	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	614	-	-	-	423	501
Stage 1	-	-	-	-	549	-
Stage 2	-	-	-	-	960	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	614	-	-	-	419	501
Mov Cap-2 Maneuver	-	-	-	-	419	-
Stage 1	-	-	-	-	543	-
Stage 2	-	-	-	-	960	-

Approach	EB	WB	SB
HCM Ctrl Dly, s/v	1.12	0	31.37
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	185	-	-	-	421
HCM Lane V/C Ratio	0.01	-	-	-	0.702
HCM Ctrl Dly (s/v)	10.9	0	-	-	31.4
HCM Lane LOS	B	A	-	-	D
HCM 95th %tile Q(veh)	0	-	-	-	5.3

Intersection	
Int Delay, s/veh	7533.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	6	136	74	28	699	69	2	53	55	1663	2	24
Future Vol, veh/h	6	136	74	28	699	69	2	53	55	1663	2	24
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	78	78	78	78	78	78	78	78	78	78	78	78
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	8	174	95	36	896	88	3	68	71	2132	3	31

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	985	0	0	269	0	0	1206	1294	222	1236	1297	940
Stage 1	-	-	-	-	-	-	237	237	-	1012	1012	-
Stage 2	-	-	-	-	-	-	969	1056	-	224	285	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	710	-	-	1306	-	-	162	164	823	~ 154	163	322
Stage 1	-	-	-	-	-	-	771	713	-	~ 291	319	-
Stage 2	-	-	-	-	-	-	307	304	-	~ 783	680	-
Platoon blocked, %	1	2	1	2	2	2	1	2	2	2	1	1
Mov Cap-1 Maneuver	710	-	-	1306	-	-	133	152	823	~ 75	151	322
Mov Cap-2 Maneuver	-	-	-	-	-	-	133	152	-	~ 75	151	-
Stage 1	-	-	-	-	-	-	761	703	-	~ 273	300	-
Stage 2	-	-	-	-	-	-	259	286	-	~ 639	671	-

Approach	EB	WB	NB	SB
HCM Ctrl Dly, s/v	0.28	0.28	35.17	$ 12535.2
HCM LOS			E	F

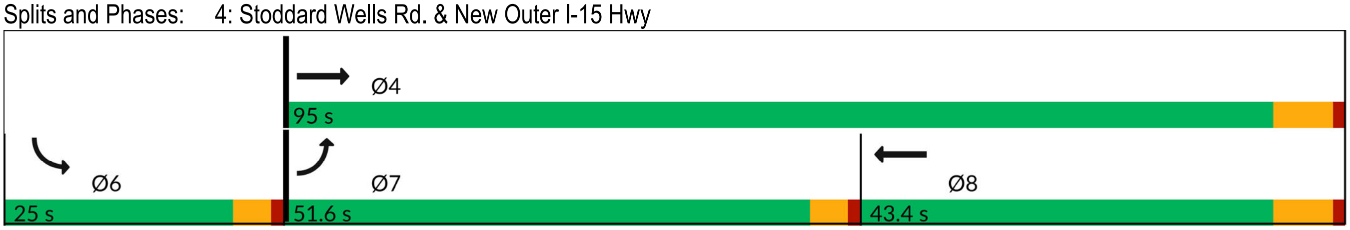
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	255	47	-	-	62	-	-	76
HCM Lane V/C Ratio	0.552	0.011	-	-	0.027	-	-	28.63
HCM Ctrl Dly (s/v)	35.2	10.1	0	-	7.8	0	-	$ 12535.2
HCM Lane LOS	E	B	A	-	A	A	-	F
HCM 95th %tile Q(veh)	3	0	-	-	0.1	-	-	264.3

Notes	
~: Volume exceeds capacity	$: Delay exceeds 300s
+: Computation Not Defined	*: All major volume in platoon

Lane Group	EBL	EBT	WBT	SBL
Lane Configurations				
Traffic Volume (vph)	524	1671	753	6
Future Volume (vph)	524	1671	753	6
Turn Type	Prot	NA	NA	Prot
Protected Phases	7	4	8	6
Permitted Phases				
Detector Phase	7	4	8	6
Switch Phase				
Minimum Initial (s)	5.0	10.0	10.0	5.0
Minimum Split (s)	9.5	24.5	24.5	22.5
Total Split (s)	51.6	95.0	43.4	25.0
Total Split (%)	43.0%	79.2%	36.2%	20.8%
Yellow Time (s)	3.5	5.5	5.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	6.5	6.5	4.5
Lead/Lag	Lead		Lag	
Lead-Lag Optimize?	Yes		Yes	
Recall Mode	None	None	None	None
Act Effct Green (s)	38.6	88.6	45.5	6.8
Actuated g/C Ratio	0.36	0.83	0.43	0.06
v/c Ratio	0.92	1.15	0.51	0.67
Control Delay (s/veh)	53.3	88.3	25.3	21.3
Queue Delay	0.0	0.0	0.0	0.0
Total Delay (s/veh)	53.3	88.3	25.3	21.3
LOS	D	F	C	C
Approach Delay (s/veh)		80.0	25.3	21.3
Approach LOS		E	C	C

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 106.4	
Natural Cycle: 150	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.15	
Intersection Signal Delay (s/veh): 63.6	Intersection LOS: E
Intersection Capacity Utilization 107.0%	ICU Level of Service G
Analysis Period (min) 15	

Splits and Phases: 4: Stoddard Wells Rd. & New Outer I-15 Hwy



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	524	1671	753	5	6	154
Future Volume (veh/h)	524	1671	753	5	6	154
Initial Q (Qb), veh	0	0	0	0	0	0
Lane Width Adj.	1.00	1.00	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1800	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	570	1816	818	5	7	64
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	0	0	0	0	0
Cap, veh/h	592	1596	1706	10	9	80
Arrive On Green	0.52	1.00	0.68	0.45	0.06	0.08
Sat Flow, veh/h	1714	1900	3773	23	159	1450
Grp Volume(v), veh/h	570	1816	412	411	72	0
Grp Sat Flow(s),veh/h/ln	1714	1900	1900	1896	1631	0
Q Serve(g_s), s	33.7	88.5	10.9	11.0	4.6	0.0
Cycle Q Clear(g_c), s	33.7	88.5	10.9	11.0	4.6	0.0
Prop In Lane	1.00			0.01	0.10	0.89
Lane Grp Cap(c), veh/h	592	1596	859	857	90	0
V/C Ratio(X)	0.96	1.14	0.48	0.48	0.80	0.00
Avail Cap(c_a), veh/h	767	1597	859	857	317	0
HCM Platoon Ratio	1.50	1.50	1.50	1.00	1.00	1.50
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	24.7	0.0	11.0	11.1	47.9	0.0
Incr Delay (d2), s/veh	19.3	70.1	0.4	0.4	5.9	0.0
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	13.1	31.1	3.6	3.6	2.0	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d), s/veh	44.0	70.1	11.5	11.6	53.8	0.0
LnGrp LOS	D	F	B	B	D	
Approach Vol, veh/h		2386	823		72	
Approach Delay, s/veh		63.9	11.5		53.8	
Approach LOS		E	B		D	

Timer - Assigned Phs	4	6	7	8
Phs Duration (G+Y+Rc), s	95.0	10.3	40.9	54.1
Change Period (Y+Rc), s	6.5	4.5	4.5	6.5
Max Green Setting (Gmax), s	88.5	20.5	47.1	36.9
Max Q Clear Time (g_c+I1), s	90.5	6.6	35.7	13.0
Green Ext Time (p_c), s	0.0	0.1	0.7	4.8

Intersection Summary	
HCM 7th Control Delay, s/veh	50.5
HCM 7th LOS	D

Intersection						
Int Delay, s/veh	0.1					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑↱			↱
Traffic Vol, veh/h	0	1677	1179	3	0	20
Future Vol, veh/h	0	1677	1179	3	0	20
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	0	1823	1282	3	0	22

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	-	642
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.9
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.3
Pot Cap-1 Maneuver	0	-	-	-	0	421
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	-	-	-	-	-	421
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	SB
HCM Ctrl Dly, s/v	0	0	14.01
HCM LOS			B

Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	421
HCM Lane V/C Ratio	-	-	-	0.052
HCM Ctrl Dly (s/v)	-	-	-	14
HCM Lane LOS	-	-	-	B
HCM 95th %tile Q(veh)	-	-	-	0.2

Intersection	
Int Delay, s/veh	12.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	150	2	2	1684	2	3
Future Vol, veh/h	150	2	2	1684	2	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	69	69	69	69	69	69
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	217	3	3	2441	3	4

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1233	1223	0	0	2443	0
Stage 1	1223	-	-	-	-	-
Stage 2	10	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	~ 197	221	-	-	195	-
Stage 1	281	-	-	-	-	-
Stage 2	1018	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	~ 194	221	-	-	195	-
Mov Cap-2 Maneuver	~ 194	-	-	-	-	-
Stage 1	281	-	-	-	-	-
Stage 2	1003	-	-	-	-	-

Approach	WB	NB	SB
HCM Ctrl Dly, s/v	155.03	0	9.5
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	194	194	-
HCM Lane V/C Ratio	-	-	1.133	0.015	-
HCM Ctrl Dly (s/v)	-	-	155	23.7	0
HCM Lane LOS	-	-	F	C	A
HCM 95th %tile Q(veh)	-	-	10.8	0	-

Notes	
~: Volume exceeds capacity	$: Delay exceeds 300s
+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	62.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	16	56	64	1669	152	1
Future Vol, veh/h	16	56	64	1669	152	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	62	62	62	62	62	62
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	26	90	103	2692	245	2

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	2795	0	-	0	1591	1449
Stage 1	-	-	-	-	1449	-
Stage 2	-	-	-	-	142	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	141	-	-	-	~ 119	162
Stage 1	-	-	-	-	~ 218	-
Stage 2	-	-	-	-	890	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	141	-	-	-	~ 97	162
Mov Cap-2 Maneuver	-	-	-	-	~ 97	-
Stage 1	-	-	-	-	~ 176	-
Stage 2	-	-	-	-	890	-

Approach	EB	WB	SB
HCM Ctrl Dly, s/v	8.01	0	$ 796.35
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	134	-	-	-	97
HCM Lane V/C Ratio	0.182	-	-	-	2.55
HCM Ctrl Dly (s/v)	36	0	-	-	$ 796.3
HCM Lane LOS	E	A	-	-	F
HCM 95th %tile Q(veh)	0.6	-	-	-	22.8

Notes	
~: Volume exceeds capacity	$: Delay exceeds 300s
+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	84.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	2	134	73	61	1719	100	5	67	50	1043	1	11
Future Vol, veh/h	2	134	73	61	1719	100	5	67	50	1043	1	11
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	76	76	76	76	76	76	76	76	76	76	76	76
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	3	176	96	80	2262	132	7	88	66	1372	1	14

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	2393	0	0	272	0	0	2653	2784	224	2714	2766	2328
Stage 1	-	-	-	-	-	-	230	230	-	2488	2488	-
Stage 2	-	-	-	-	-	-	2423	2554	-	226	278	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	204	-	-	1303	-	-	15	~ 19	820	~ 14	20	48
Stage 1	-	-	-	-	-	-	778	718	-	~ 40	59	-
Stage 2	-	-	-	-	-	-	44	~ 55	-	~ 782	684	-
Platoon blocked, %		2	-	2	2	2	2	2		2		
Mov Cap-1 Maneuver	204	-	-	1303	-	-	10	~ 19	820	-	19	48
Mov Cap-2 Maneuver	-	-	-	-	-	-	10	~ 19	-	-	19	-
Stage 1	-	-	-	-	-	-	766	707	-	~ 40	59	-
Stage 2	-	-	-	-	-	-	30	~ 55	-	~ 620	674	-

Approach	EB	WB	NB	SB
HCM Ctrl Dly, s/v	0.22	0.26	$ 2257.58	
HCM LOS			F	-

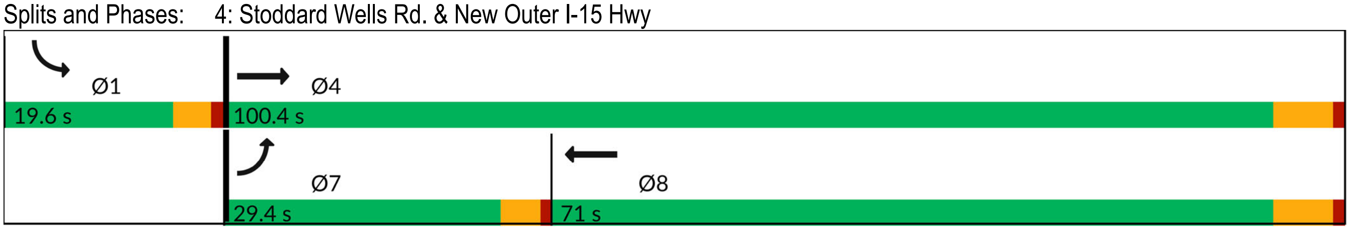
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	30	16	-	-	~ 58	-	-	-
HCM Lane V/C Ratio	5.426	0.013	-	-	0.062	-	-	-
HCM Ctrl Dly (s/v)	$ 2257.6	22.9	0	-	7.9	0	-	-
HCM Lane LOS	F	C	A	-	A	A	-	-
HCM 95th %tile Q(veh)	19.5	0	-	-	0.2	-	-	-

Notes	
~: Volume exceeds capacity	$: Delay exceeds 300s
+: Computation Not Defined	*: All major volume in platoon

Lane Group	EBL	EBT	WBT	SBL
Lane Configurations				
Traffic Volume (vph)	313	1136	1751	12
Future Volume (vph)	313	1136	1751	12
Turn Type	Prot	NA	NA	Prot
Protected Phases	7	4	8	1
Permitted Phases				
Detector Phase	7	4	8	1
Switch Phase				
Minimum Initial (s)	5.0	10.0	10.0	5.0
Minimum Split (s)	9.5	24.5	24.5	9.5
Total Split (s)	29.4	100.4	71.0	19.6
Total Split (%)	24.5%	83.7%	59.2%	16.3%
Yellow Time (s)	3.5	5.5	5.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	6.5	6.5	4.5
Lead/Lag	Lead		Lag	
Lead-Lag Optimize?	Yes		Yes	
Recall Mode	None	None	None	None
Act Effct Green (s)	24.5	93.3	64.3	10.2
Actuated g/C Ratio	0.21	0.81	0.56	0.09
v/c Ratio	0.93	0.80	0.94	0.87
Control Delay (s/veh)	78.2	11.7	34.9	32.1
Queue Delay	0.0	0.0	0.0	0.0
Total Delay (s/veh)	78.2	11.7	34.9	32.1
LOS	E	B	C	C
Approach Delay (s/veh)		26.1	34.9	32.1
Approach LOS		C	C	C

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 114.5	
Natural Cycle: 90	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.94	
Intersection Signal Delay (s/veh): 31.0	Intersection LOS: C
Intersection Capacity Utilization 101.1%	ICU Level of Service G
Analysis Period (min) 15	

Splits and Phases: 4: Stoddard Wells Rd. & New Outer I-15 Hwy



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	313	1136	1751	5	12	333
Future Volume (veh/h)	313	1136	1751	5	12	333
Initial Q (Qb), veh	0	0	0	0	0	0
Lane Width Adj.	1.00	1.00	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1800	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	340	1235	1903	5	13	171
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	0	0	0	0	0
Cap, veh/h	357	1485	1979	5	14	190
Arrive On Green	0.21	0.78	0.54	0.54	0.13	0.13
Sat Flow, veh/h	1714	1900	3789	10	114	1501
Grp Volume(v), veh/h	340	1235	930	978	185	0
Grp Sat Flow(s),veh/h/ln	1714	1900	1805	1898	1624	0
Q Serve(g_s), s	23.4	48.5	58.9	59.0	13.4	0.0
Cycle Q Clear(g_c), s	23.4	48.5	58.9	59.0	13.4	0.0
Prop In Lane	1.00			0.01	0.07	0.92
Lane Grp Cap(c), veh/h	357	1485	967	1017	205	0
V/C Ratio(X)	0.95	0.83	0.96	0.96	0.90	0.00
Avail Cap(c_a), veh/h	357	1493	974	1024	205	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	46.7	8.1	26.6	26.6	51.5	0.0
Incr Delay (d2), s/veh	34.9	4.1	20.0	19.5	36.2	0.0
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	13.1	14.8	28.1	29.4	7.5	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d), s/veh	81.6	12.3	46.6	46.1	87.7	0.0
LnGrp LOS	F	B	D	D	F	
Approach Vol, veh/h		1575	1908		185	
Approach Delay, s/veh		27.2	46.3		87.7	
Approach LOS		C	D		F	

Timer - Assigned Phs				4		6	7	8
Phs Duration (G+Y+Rc), s				99.9		19.6	29.4	70.5
Change Period (Y+Rc), s				6.5		4.5	4.5	6.5
Max Green Setting (Gmax), s				93.9		15.1	24.9	64.5
Max Q Clear Time (g_c+I1), s				50.5		15.4	25.4	61.0
Green Ext Time (p_c), s				15.3		0.0	0.0	3.0

Intersection Summary			
HCM 7th Control Delay, s/veh			40.2
HCM 7th LOS			D

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑↱			↱
Traffic Vol, veh/h	0	1148	2137	2	0	38
Future Vol, veh/h	0	1148	2137	2	0	38
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	0	1248	2323	2	0	41

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	-	1163
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.8
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.3
Pot Cap-1 Maneuver	0	-	-	-	0	197
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	-	-	-	-	-	197
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	SB
HCM Ctrl Dly, s/v	0	0	28.01
HCM LOS			D

Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	197
HCM Lane V/C Ratio	-	-	-	0.209
HCM Ctrl Dly (s/v)	-	-	-	28
HCM Lane LOS	-	-	-	D
HCM 95th %tile Q(veh)	-	-	-	0.8

APPENDIX 5.3:

OYC (2028) WITHOUT PROJECT SIGNAL WARRANTS

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Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 64 km/h OR ABOVE 40 mph ON MAJOR STREET)

Traffic Conditions = **OYC NP (2028) Conditions - Weekday PM Peak Hour**

Major Street Name = **Quarry Road**

Total of Both Approaches (VPH) = **1495**

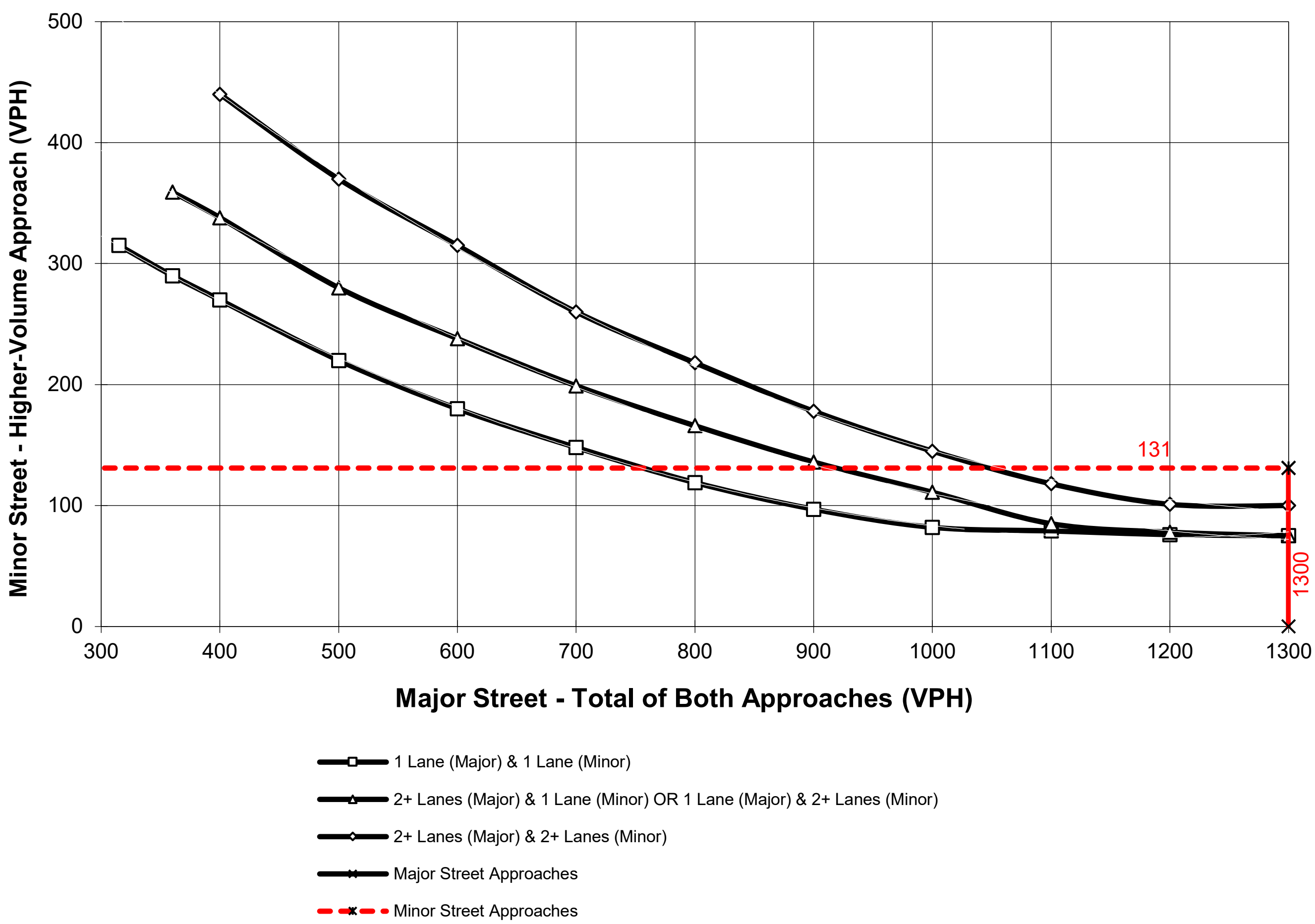
Number of Approach Lanes Major Street = **1**

Minor Street Name = **I-15 SB Ramps**

High Volume Approach (VPH) = **131**

Number of Approach Lanes Minor Street = **1**

WARRANTED FOR A SIGNAL



*Note: 100 vph applies as the lower threshold for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold for a minor-street approach with one lane

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 64 km/h OR ABOVE 40 mph ON MAJOR STREET)

Traffic Conditions = **OYC NP (2028) Conditions - Weekday PM Peak Hour**

Major Street Name = **Stoddard Wells Road**

Total of Both Approaches (VPH) = **1577**

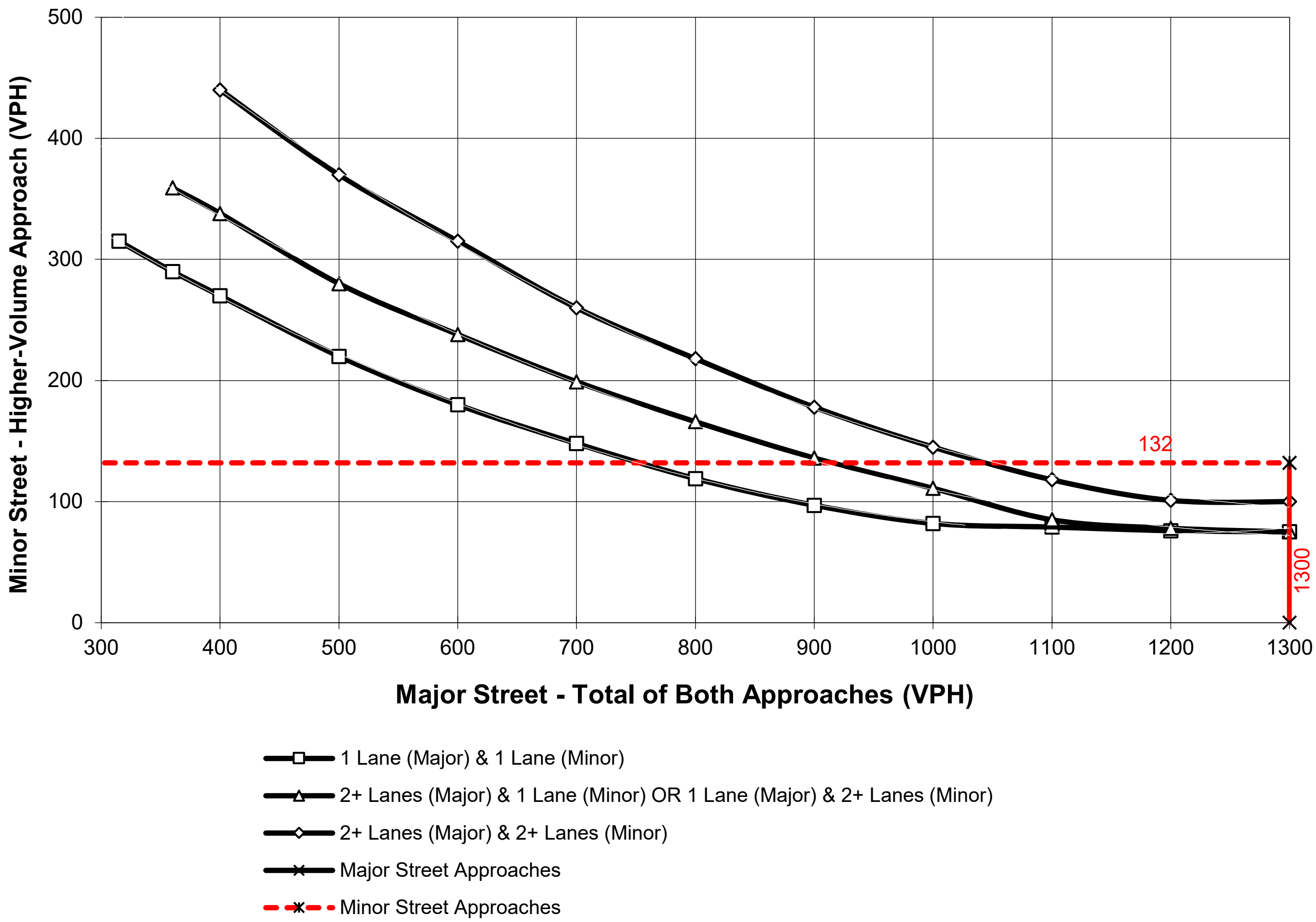
Number of Approach Lanes Major Street = **1**

Minor Street Name = **Quarry Road**

High Volume Approach (VPH) = **132**

Number of Approach Lanes Minor Street = **1**

WARRANTED FOR A SIGNAL



*Note: 100 vph applies as the lower threshold for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold for a minor-street approach with one lane

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

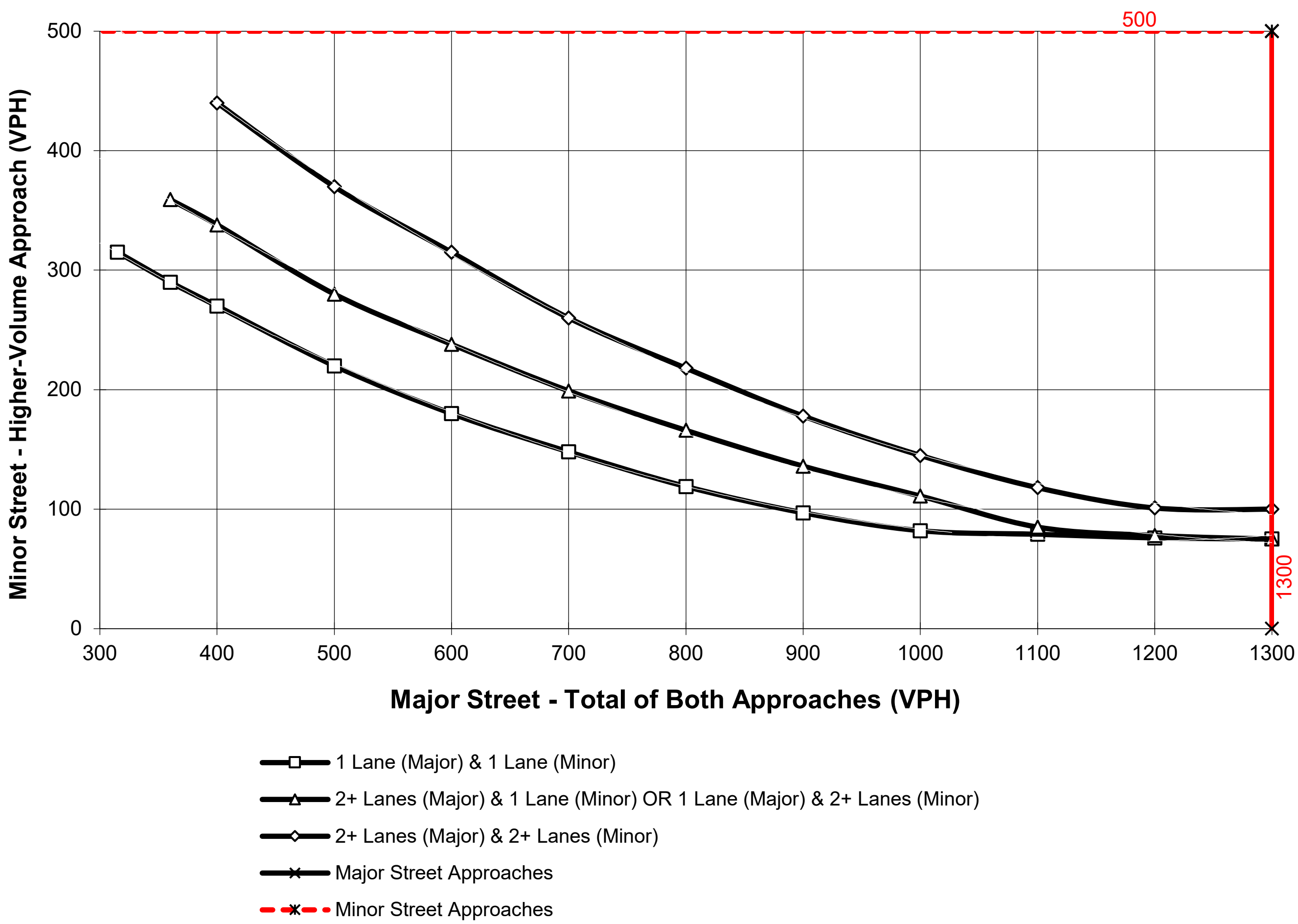
(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 64 km/h OR ABOVE 40 mph ON MAJOR STREET)

Traffic Conditions = **OYC NP (2028) Conditions - Weekday PM Peak Hour**

Major Street Name = **I-15 Northbound Ramps** Total of Both Approaches (VPH) = **1803**
Number of Approach Lanes Major Street = **1**

Minor Street Name = **Stoddard Wells Road** High Volume Approach (VPH) = **1022**
Number of Approach Lanes Minor Street = **1**

WARRANTED FOR A SIGNAL



*Note: 100 vph applies as the lower threshold for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold for a minor-street approach with one lane

Figure 4C-103 (CA). Traffic Signal Warrants Worksheet
(Average Traffic Estimate Form)

DIST	CO	RTE	PM	TRAFFIC CONDITIONS	**OYC NP (2028)**
___	___	___	___	CALC IA	DATE 06/24/25
				CHK IA	DATE 06/24/25

Jurisdiction: **Town of Apple Valley**
Major Street: **Stoddard Wells Rd.**
Minor Street: **Wrangler Rd.**
Critical Approach Speed (Major) 55 mph
Critical Approach Speed (Minor) 25 mph

Major Street Approach Lanes = **1** lane   Minor Street Approach Lanes **1** lane

Major Street Future ADT = **29,612** vpd   Minor Street Future ADT = **2,190** vpd

Speed limit or critical speed on major street traffic > 64 km/h (40 mph); .... [√]
or   **RURAL (R)**
In built up area of isolated community of < 10,000 population .... [ ]

(Based on Estimated Average Daily Traffic - See Note)

URBAN	RURAL	Minimum Requirements EADT			
	XX				
CONDITION A - Minimum Vehicular Volume		Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Higher-Volume Minor Street Approach (One Direction Only)	
Satisfied	Not Satisfied				
XX					
Number of lanes for moving traffic on each approach					
Major Street	Minor Street	Urban	Rural	Urban	Rural
1 **29,612**	1 **2,190**	8,000	5,600 *	2,400	1,680 *
2 +	1	9,600	6,720	2,400	1,680
2 +	2 +	9,600	6,720	3,200	2,240
1	2 +	8,000	5,600	3,200	2,240
CONDITION B - Interruption of Continuous Traffic		Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Higher-Volume Minor Street Approach (One Direction Only)	
Satisfied	Not Satisfied				
XX					
Number of lanes for moving traffic on each approach					
Major Street	Minor Street	Urban	Rural	Urban	Rural
1 **29,612**	1 **2,190**	12,000	8,400 *	1,200	850 *
2 +	1	14,400	10,080	1,200	850
2 +	2 +	14,400	10,080	1,600	1,120
1	2 +	12,000	8,400	1,600	1,120
Combination of CONDITIONS A + B		2 CONDITIONS 80%		2 CONDITIONS 80%	
Satisfied	Not Satisfied				
XX					
No one condition satisfied, but following conditions fulfilled 80% of more					
A 100%	B 100%				

Note: To be used only for NEW INTERSECTIONS or other locations where it is not reasonable to count actual traffic volumes.

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

APPENDIX 5.4:

OYC (2028) WITHOUT PROJECT OFF-RAMP QUEUES

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Intersection						
Int Delay, s/veh	2.6					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	138	0	4	633	1	5
Future Vol, veh/h	138	0	4	633	1	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	72	72	72	72	72	72
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	192	0	6	879	1	7

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	455	445	0	0	885	0
Stage 1	445	-	-	-	-	-
Stage 2	10	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	567	617	-	-	773	-
Stage 1	650	-	-	-	-	-
Stage 2	1018	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	566	617	-	-	773	-
Mov Cap-2 Maneuver	566	-	-	-	-	-
Stage 1	650	-	-	-	-	-
Stage 2	1017	-	-	-	-	-

Approach	WB	NB	SB
HCM Ctrl Dly, s/v	14.58	0	1.61
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	566	300	-
HCM Lane V/C Ratio	-	-	0.339	0.002	-
HCM Ctrl Dly (s/v)	-	-	14.6	9.7	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	1.5	0	-

Intersection	
Int Delay, s/veh	4711.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Traffic Vol, veh/h	6	91	74	27	645	55	2	53	52	1528	2	24
Future Vol, veh/h	6	91	74	27	645	55	2	53	52	1528	2	24
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	78	78	78	78	78	78	78	78	78	78	78	78
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	8	117	95	35	827	71	3	68	67	1959	3	31

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	897	0	0	212	0	0	1077	1146	164	1097	1158	862
Stage 1	-	-	-	-	-	-	179	179	-	931	931	-
Stage 2	-	-	-	-	-	-	897	967	-	166	227	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	765	-	-	1371	-	-	198	201	886	~ 192	198	358
Stage 1	-	-	-	-	-	-	827	755	-	~ 323	348	-
Stage 2	-	-	-	-	-	-	337	335	-	~ 841	720	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	765	-	-	1371	-	-	168	188	886	~ 109	185	358
Mov Cap-2 Maneuver	-	-	-	-	-	-	168	188	-	~ 109	185	-
Stage 1	-	-	-	-	-	-	817	746	-	~ 306	330	-
Stage 2	-	-	-	-	-	-	290	318	-	~ 698	712	-

Approach	EB	WB	NB	SB
HCM Ctrl Dly, s/v	0.34	0.29	26.21	$ 7755.92
HCM LOS			D	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	304	58	-	-	66	-	-	110
HCM Lane V/C Ratio	0.451	0.01	-	-	0.025	-	-	18.075
HCM Ctrl Dly (s/v)	26.2	9.8	0	-	7.7	0	-	$ 7755.9
HCM Lane LOS	D	A	A	-	A	A	-	F
HCM 95th %tile Q(veh)	2.2	0	-	-	0.1	-	-	238.4

Notes	
~: Volume exceeds capacity	$: Delay exceeds 300s
+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	5.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	129	2	2	1561	2	3
Future Vol, veh/h	129	2	2	1561	2	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	69	69	69	69	69	69
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	187	3	3	2262	3	4

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1144	1134	0	0	2265	0
Stage 1	1134	-	-	-	-	-
Stage 2	10	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	223	249	-	-	229	-
Stage 1	310	-	-	-	-	-
Stage 2	1018	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	220	249	-	-	229	-
Mov Cap-2 Maneuver	220	-	-	-	-	-
Stage 1	310	-	-	-	-	-
Stage 2	1005	-	-	-	-	-

Approach	WB	NB	SB
HCM Ctrl Dly, s/v	75.51	0	8.37
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	221	228	-
HCM Lane V/C Ratio	-	-	0.861	0.013	-
HCM Ctrl Dly (s/v)	-	-	75.5	20.9	0
HCM Lane LOS	-	-	F	C	A
HCM 95th %tile Q(veh)	-	-	6.7	0	-

Intersection	
Int Delay, s/veh	56.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	2	112	73	58	1594	60	5	67	49	975	1	11
Future Vol, veh/h	2	112	73	58	1594	60	5	67	49	975	1	11
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	76	76	76	76	76	76	76	76	76	76	76	76
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	3	147	96	76	2097	79	7	88	64	1283	1	14

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	2176	0	0	243	0	0	2451	2530	195	2486	2538	2137
Stage 1	-	-	-	-	-	-	201	201	-	2289	2289	-
Stage 2	-	-	-	-	-	-	2251	2329	-	197	249	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	248	-	-	1335	-	-	21	~ 28	851	~ 20	28	63
Stage 1	-	-	-	-	-	-	806	739	-	~ 53	75	-
Stage 2	-	-	-	-	-	-	56	~ 72	-	~ 810	704	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	248	-	-	1335	-	-	16	~ 28	851	-	27	63
Mov Cap-2 Maneuver	-	-	-	-	-	-	16	~ 28	-	-	27	-
Stage 1	-	-	-	-	-	-	796	730	-	~ 53	75	-
Stage 2	-	-	-	-	-	-	42	~ 72	-	~ 650	696	-

Approach	EB	WB	NB	SB
HCM Ctrl Dly, s/v	0.21	0.27	$ 1405.58	
HCM LOS			F	-

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	43	18	-	-	~ 61	-	-	-
HCM Lane V/C Ratio	3.693	0.011	-	-	0.057	-	-	-
HCM Ctrl Dly (s/v)	$ 1405.6	19.7	0	-	7.9	0	-	-
HCM Lane LOS	F	C	A	-	A	A	-	-
HCM 95th %tile Q(veh)	17.9	0	-	-	0.2	-	-	-

Notes	
~: Volume exceeds capacity	$: Delay exceeds 300s
+: Computation Not Defined	*: All major volume in platoon

APPENDIX 5.5:

OYC (2028) WITH PROJECT OFF-RAMP QUEUES

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Intersection						
Int Delay, s/veh	3.6					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	181	0	4	687	1	5
Future Vol, veh/h	181	0	4	687	1	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	72	72	72	72	72	72
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	251	0	6	954	1	7

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	492	483	0	0	960	0
Stage 1	483	-	-	-	-	-
Stage 2	10	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	539	588	-	-	725	-
Stage 1	625	-	-	-	-	-
Stage 2	1018	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	538	588	-	-	725	-
Mov Cap-2 Maneuver	538	-	-	-	-	-
Stage 1	625	-	-	-	-	-
Stage 2	1017	-	-	-	-	-

Approach	WB		NB		SB	
HCM Ctrl Dly, s/v	17.41		0		1.66	
HCM LOS	C					

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	538	300	-
HCM Lane V/C Ratio	-	-	0.467	0.002	-
HCM Ctrl Dly (s/v)	-	-	17.4	10	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	2.5	0	-

Intersection	
Int Delay, s/veh	7533.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	6	136	74	28	699	69	2	53	55	1663	2	24
Future Vol, veh/h	6	136	74	28	699	69	2	53	55	1663	2	24
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	78	78	78	78	78	78	78	78	78	78	78	78
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	8	174	95	36	896	88	3	68	71	2132	3	31

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	985	0	0	269	0	0	1206	1294	222	1236	1297	940
Stage 1	-	-	-	-	-	-	237	237	-	1012	1012	-
Stage 2	-	-	-	-	-	-	969	1056	-	224	285	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	710	-	-	1306	-	-	162	164	823	~ 154	163	322
Stage 1	-	-	-	-	-	-	771	713	-	~ 291	319	-
Stage 2	-	-	-	-	-	-	307	304	-	~ 783	680	-
Platoon blocked, %	1	2	1	2	2	2	1	2	2	2	1	1
Mov Cap-1 Maneuver	710	-	-	1306	-	-	133	152	823	~ 75	151	322
Mov Cap-2 Maneuver	-	-	-	-	-	-	133	152	-	~ 75	151	-
Stage 1	-	-	-	-	-	-	761	703	-	~ 273	300	-
Stage 2	-	-	-	-	-	-	259	286	-	~ 639	671	-

Approach	EB	WB	NB	SB
HCM Ctrl Dly, s/v	0.28	0.28	35.17	$ 12535.2
HCM LOS			E	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	255	47	-	-	62	-	-	76
HCM Lane V/C Ratio	0.552	0.011	-	-	0.027	-	-	28.63
HCM Ctrl Dly (s/v)	35.2	10.1	0	-	7.8	0	-	$ 12535.2
HCM Lane LOS	E	B	A	-	A	A	-	F
HCM 95th %tile Q(veh)	3	0	-	-	0.1	-	-	264.3

Notes	
~: Volume exceeds capacity	$: Delay exceeds 300s
+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	12.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	150	2	2	1684	2	3
Future Vol, veh/h	150	2	2	1684	2	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	69	69	69	69	69	69
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	217	3	3	2441	3	4

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1233	1223	0	0	2443	0
Stage 1	1223	-	-	-	-	-
Stage 2	10	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	~ 197	221	-	-	195	-
Stage 1	281	-	-	-	-	-
Stage 2	1018	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	~ 194	221	-	-	195	-
Mov Cap-2 Maneuver	~ 194	-	-	-	-	-
Stage 1	281	-	-	-	-	-
Stage 2	1003	-	-	-	-	-

Approach	WB	NB	SB
HCM Ctrl Dly, s/v	155.03	0	9.5
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	194	194	-
HCM Lane V/C Ratio	-	-	1.133	0.015	-
HCM Ctrl Dly (s/v)	-	-	155	23.7	0
HCM Lane LOS	-	-	F	C	A
HCM 95th %tile Q(veh)	-	-	10.8	0	-

Notes	
~: Volume exceeds capacity	$: Delay exceeds 300s
+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	84.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	2	134	73	61	1719	100	5	67	50	1043	1	11
Future Vol, veh/h	2	134	73	61	1719	100	5	67	50	1043	1	11
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	76	76	76	76	76	76	76	76	76	76	76	76
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	3	176	96	80	2262	132	7	88	66	1372	1	14

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	2393	0	0	272	0	0	2653	2784	224	2714	2766	2328
Stage 1	-	-	-	-	-	-	230	230	-	2488	2488	-
Stage 2	-	-	-	-	-	-	2423	2554	-	226	278	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	204	-	-	1303	-	-	15	~ 19	820	~ 14	20	48
Stage 1	-	-	-	-	-	-	778	718	-	~ 40	59	-
Stage 2	-	-	-	-	-	-	44	~ 55	-	~ 782	684	-
Platoon blocked, %		2	-	2	2	2	2	2		2		
Mov Cap-1 Maneuver	204	-	-	1303	-	-	10	~ 19	820	-	19	48
Mov Cap-2 Maneuver	-	-	-	-	-	-	10	~ 19	-	-	19	-
Stage 1	-	-	-	-	-	-	766	707	-	~ 40	59	-
Stage 2	-	-	-	-	-	-	30	~ 55	-	~ 620	674	-

Approach	EB	WB	NB	SB
HCM Ctrl Dly, s/v	0.22	0.26	$ 2257.58	
HCM LOS			F	-

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	30	16	-	-	~ 58	-	-	-
HCM Lane V/C Ratio	5.426	0.013	-	-	0.062	-	-	-
HCM Ctrl Dly (s/v)	$ 2257.6	22.9	0	-	7.9	0	-	-
HCM Lane LOS	F	C	A	-	A	A	-	-
HCM 95th %tile Q(veh)	19.5	0	-	-	0.2	-	-	-

Notes	
~: Volume exceeds capacity	$: Delay exceeds 300s
+: Computation Not Defined	*: All major volume in platoon

APPENDIX 5.6:

OYC (2028) WITH PROJECT INTERSECTION ANALYSIS WITH IMPROVEMENTS

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Intersection	
Int Delay, s/veh	2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	181	0	4	687	1	5
Future Vol, veh/h	181	0	4	687	1	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	0	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	72	72	72	72	72	72
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	251	0	6	954	1	7

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	15	6	0	0	960	0
Stage 1	6	-	-	-	-	-
Stage 2	10	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	1008	1083	-	-	725	-
Stage 1	1023	-	-	-	-	-
Stage 2	1018	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	1007	1083	-	-	725	-
Mov Cap-2 Maneuver	1007	-	-	-	-	-
Stage 1	1023	-	-	-	-	-
Stage 2	1017	-	-	-	-	-

Approach	WB	NB	SB
HCM Ctrl Dly, s/v	9.76	0	1.66
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	1007	300	-
HCM Lane V/C Ratio	-	-	0.25	0.002	-
HCM Ctrl Dly (s/v)	-	-	9.8	10	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	1	0	-

Intersection	
Int Delay, s/veh	2.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	4	35	38	687	181	5
Future Vol, veh/h	4	35	38	687	181	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	0	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	63	63	63	63	63	63
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	6	56	60	1090	287	8

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1151	0	-	0	129	60
Stage 1	-	-	-	-	60	-
Stage 2	-	-	-	-	68	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	614	-	-	-	871	1011
Stage 1	-	-	-	-	967	-
Stage 2	-	-	-	-	960	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	614	-	-	-	861	1011
Mov Cap-2 Maneuver	-	-	-	-	861	-
Stage 1	-	-	-	-	957	-
Stage 2	-	-	-	-	960	-

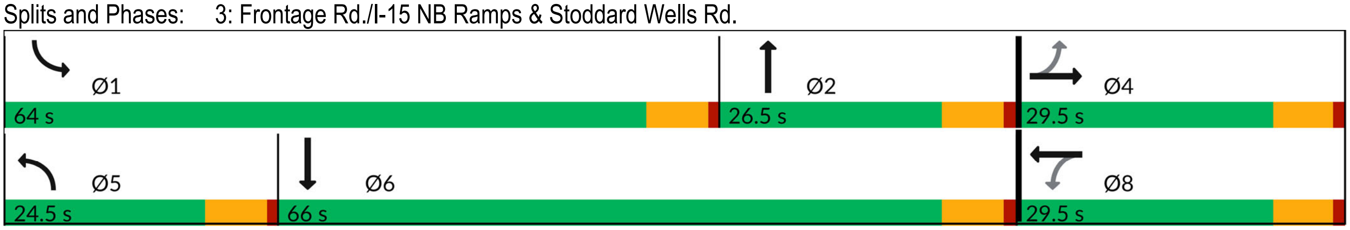
Approach	EB	WB	SB
HCM Ctrl Dly, s/v	1.12	0	11.31
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	185	-	-	-	865
HCM Lane V/C Ratio	0.01	-	-	-	0.341
HCM Ctrl Dly (s/v)	10.9	0	-	-	11.3
HCM Lane LOS	B	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	1.5

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	6	136	28	699	2	53	1663	2
Future Volume (vph)	6	136	28	699	2	53	1663	2
Turn Type	Perm	NA	Perm	NA	Prot	NA	Prot	NA
Protected Phases		4		8	5	2	1	6
Permitted Phases	4		8					
Detector Phase	4	4	8	8	5	2	1	6
Switch Phase								
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5
Total Split (s)	29.5	29.5	29.5	29.5	24.5	26.5	64.0	66.0
Total Split (%)	24.6%	24.6%	24.6%	24.6%	20.4%	22.1%	53.3%	55.0%
Yellow Time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
Lead/Lag					Lead	Lag	Lead	Lag
Lead-Lag Optimize?					Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	None	None
Act Effct Green (s)	23.0	23.0	23.0	23.0	10.0	11.4	57.5	33.2
Actuated g/C Ratio	0.21	0.21	0.21	0.21	0.09	0.10	0.52	0.30
v/c Ratio	0.11	0.55	0.18	1.00	0.01	0.52	0.99	0.05
Control Delay (s/veh)	41.8	42.2	40.5	76.4	47.5	41.0	46.6	9.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	41.8	42.2	40.5	76.4	47.5	41.0	46.6	9.2
LOS	D	D	D	E	D	D	D	A
Approach Delay (s/veh)		42.2		75.2		41.1		46.0
Approach LOS		D		E		D		D

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 111.5	
Natural Cycle: 140	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.00	
Intersection Signal Delay (s/veh): 53.8	Intersection LOS: D
Intersection Capacity Utilization 92.1%	ICU Level of Service F
Analysis Period (min) 15	

Splits and Phases: 3: Frontage Rd./I-15 NB Ramps & Stoddard Wells Rd.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	6	136	74	28	699	69	2	53	55	1663	2	24
Future Volume (veh/h)	6	136	74	28	699	69	2	53	55	1663	2	24
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width Adj.	1.00	1.04	1.04	1.00	1.04	1.04	1.00	1.04	1.04	1.04	1.04	1.04
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1800	1976	1976	1800	1976	1976	1900	1976	1976	1872	1976	1976
Adj Flow Rate, veh/h	7	148	42	30	760	37	2	58	30	1808	2	13
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	76	316	90	220	798	39	10	106	55	1852	137	889
Arrive On Green	0.32	0.32	0.32	0.32	0.32	0.32	0.01	0.13	0.13	0.78	0.90	0.60
Sat Flow, veh/h	656	1480	420	1148	3737	182	1810	1227	635	3566	228	1481
Grp Volume(v), veh/h	7	0	190	30	402	395	2	0	88	1808	0	15
Grp Sat Flow(s),veh/h/ln	656	0	1900	1148	1976	1943	1810	0	1862	1783	0	1709
Q Serve(g_s), s	1.1	0.0	8.6	2.3	21.4	21.4	0.1	0.0	4.8	50.4	0.0	0.3
Cycle Q Clear(g_c), s	22.6	0.0	8.6	11.0	21.4	21.4	0.1	0.0	4.8	50.4	0.0	0.3
Prop In Lane	1.00		0.22	1.00		0.09	1.00		0.34	1.00		0.87
Lane Grp Cap(c), veh/h	76	0	406	220	422	415	10	0	160	1852	0	1026
V/C Ratio(X)	0.09	0.00	0.47	0.14	0.95	0.95	0.20	0.00	0.55	0.98	0.00	0.01
Avail Cap(c_a), veh/h	76	0	406	220	422	415	302	0	346	1903	0	1026
HCM Platoon Ratio	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	47.1	0.0	31.7	36.1	36.1	36.1	53.2	0.0	44.9	11.3	0.0	7.8
Incr Delay (d2), s/veh	0.5	0.0	0.8	0.3	31.7	32.2	10.0	0.0	2.9	15.2	0.0	0.0
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.0	3.7	0.6	12.4	12.2	0.1	0.0	2.3	12.5	0.0	0.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	47.6	0.0	32.6	36.4	67.8	68.3	63.2	0.0	47.8	26.5	0.0	7.8
LnGrp LOS	D		C	D	E	E	E		D	C		A
Approach Vol, veh/h		197			827			90			1823	
Approach Delay, s/veh		33.1			66.9			48.2			26.4	
Approach LOS		C			E			D			C	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	62.4	15.8		29.5	7.1	71.1		29.5
Change Period (Y+Rc), s	6.5	6.5		6.5	6.5	6.5		6.5
Max Green Setting (Gmax), s	57.5	20.0		23.0	18.0	59.5		23.0
Max Q Clear Time (g_c+I1), s	52.4	6.8		24.6	2.1	2.3		23.4
Green Ext Time (p_c), s	3.5	0.3		0.0	0.0	0.1		0.0

Intersection Summary	
HCM 7th Control Delay, s/veh	38.9
HCM 7th LOS	D

Intersection	
Int Delay, s/veh	0.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	150	2	2	1684	2	3
Future Vol, veh/h	150	2	2	1684	2	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	0	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	69	69	69	69	69	69
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	217	3	3	2441	3	4

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	13	3	0	0	2443	0
Stage 1	3	-	-	-	-	-
Stage 2	10	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	1011	1087	-	-	195	-
Stage 1	1026	-	-	-	-	-
Stage 2	1018	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	996	1087	-	-	195	-
Mov Cap-2 Maneuver	996	-	-	-	-	-
Stage 1	1026	-	-	-	-	-
Stage 2	1003	-	-	-	-	-

Approach	WB		NB		SB	
HCM Ctrl Dly, s/v	9.63		0		9.5	
HCM LOS	A					

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	997	194	-
HCM Lane V/C Ratio	-	-	0.221	0.015	-
HCM Ctrl Dly (s/v)	-	-	9.6	23.7	0
HCM Lane LOS	-	-	A	C	A
HCM 95th %tile Q(veh)	-	-	0.8	0	-

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	16	56	64	1669	152	1
Future Vol, veh/h	16	56	64	1669	152	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	0	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	62	62	62	62	62	62
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	26	90	103	2692	245	2

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	2795	0	-	0	245	103
Stage 1	-	-	-	-	103	-
Stage 2	-	-	-	-	142	-
Critical Hdwy	4	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	153	-	-	-	748	957
Stage 1	-	-	-	-	926	-
Stage 2	-	-	-	-	890	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	153	-	-	-	615	957
Mov Cap-2 Maneuver	-	-	-	-	615	-
Stage 1	-	-	-	-	761	-
Stage 2	-	-	-	-	890	-

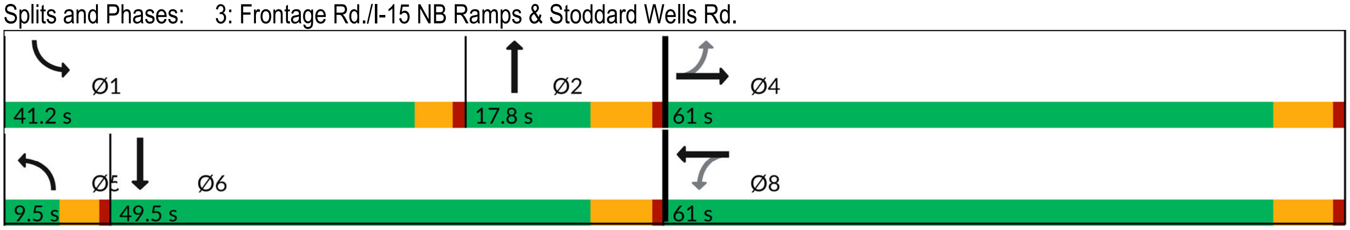
Approach	EB	WB	SB
HCM Ctrl Dly, s/v	7.39	0	14.69
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	145	-	-	-	616
HCM Lane V/C Ratio	0.169	-	-	-	0.4
HCM Ctrl Dly (s/v)	33.3	0	-	-	14.7
HCM Lane LOS	D	A	-	-	B
HCM 95th %tile Q(veh)	0.6	-	-	-	1.9

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	2	134	61	1719	5	67	1043	1
Future Volume (vph)	2	134	61	1719	5	67	1043	1
Turn Type	Perm	NA	Perm	NA	Prot	NA	Prot	NA
Protected Phases		4		8	5	2	1	6
Permitted Phases	4		8					
Detector Phase	4	4	8	8	5	2	1	6
Switch Phase								
Minimum Initial (s)	10.0	10.0	10.0	10.0	5.0	10.0	5.0	10.0
Minimum Split (s)	24.5	24.5	24.5	24.5	9.5	16.5	9.5	16.5
Total Split (s)	61.0	61.0	61.0	61.0	9.5	17.8	41.2	49.5
Total Split (%)	50.8%	50.8%	50.8%	50.8%	7.9%	14.8%	34.3%	41.3%
Yellow Time (s)	5.5	5.5	5.5	5.5	3.5	5.5	3.5	5.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	6.5	6.5	4.5	6.5	4.5	6.5
Lead/Lag					Lead	Lag	Lead	Lag
Lead-Lag Optimize?					Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	None	None
Act Effct Green (s)	54.5	54.5	54.5	54.5	5.0	10.8	36.7	25.0
Actuated g/C Ratio	0.46	0.46	0.46	0.46	0.04	0.09	0.31	0.21
v/c Ratio	0.03	0.25	0.14	1.08	0.07	0.66	1.05	0.03
Control Delay (s/veh)	20.5	18.1	20.0	76.7	57.2	59.4	80.5	12.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	20.5	18.1	20.0	76.7	57.2	59.4	80.5	12.0
LOS	C	B	C	E	E	E	F	B
Approach Delay (s/veh)		18.1		74.9		59.3		79.7
Approach LOS		B		E		E		E

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 119.5	
Natural Cycle: 150	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.08	
Intersection Signal Delay (s/veh): 72.2	Intersection LOS: E
Intersection Capacity Utilization 102.4%	ICU Level of Service G
Analysis Period (min) 15	

Splits and Phases: 3: Frontage Rd./I-15 NB Ramps & Stoddard Wells Rd.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	2	134	73	61	1719	100	5	67	50	1043	1	11
Future Volume (veh/h)	2	134	73	61	1719	100	5	67	50	1043	1	11
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width Adj.	1.00	1.04	1.04	1.00	1.04	1.04	1.00	1.04	1.00	1.04	1.04	1.04
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1800	1976	1976	1800	1976	1976	1900	1976	1900	1872	1976	1976
Adj Flow Rate, veh/h	2	146	79	66	1868	55	5	73	21	1134	1	4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	61	556	301	609	1761	52	12	119	34	1107	133	532
Arrive On Green	0.69	0.69	0.69	0.69	0.92	0.69	0.01	0.12	0.12	0.62	0.58	0.58
Sat Flow, veh/h	265	1206	653	1321	3820	112	1810	1475	424	3566	345	1382
Grp Volume(v), veh/h	2	0	225	66	962	961	5	0	94	1134	0	5
Grp Sat Flow(s),veh/h/ln	265	0	1859	1321	1976	1956	1810	0	1900	1783	0	1727
Q Serve(g_s), s	0.0	0.0	5.4	2.4	54.5	54.5	0.3	0.0	5.6	36.7	0.0	0.1
Cycle Q Clear(g_c), s	54.5	0.0	5.4	7.8	54.5	54.5	0.3	0.0	5.6	36.7	0.0	0.1
Prop In Lane	1.00		0.35	1.00		0.06	1.00		0.22	1.00		0.80
Lane Grp Cap(c), veh/h	61	0	857	609	911	901	12	0	153	1107	0	664
V/C Ratio(X)	0.03	0.00	0.26	0.11	1.06	1.07	0.43	0.00	0.61	1.02	0.00	0.01
Avail Cap(c_a), veh/h	61	0	857	609	911	901	77	0	182	1107	0	664
HCM Platoon Ratio	1.50	1.50	1.50	1.50	2.00	1.50	1.50	1.50	1.50	2.00	1.50	1.50
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	45.5	0.0	10.7	12.1	4.6	5.4	58.3	0.0	50.2	22.4	0.0	15.4
Incr Delay (d2), s/veh	0.2	0.0	0.2	0.1	45.7	49.3	23.3	0.0	4.4	33.5	0.0	0.0
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	2.0	0.6	13.6	14.7	0.2	0.0	2.8	14.9	0.0	0.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	45.7	0.0	10.8	12.2	50.3	54.7	81.7	0.0	54.6	55.9	0.0	15.4
LnGrp LOS	D		B	B	F	F	F		D	F		B
Approach Vol, veh/h		227			1989			99			1139	
Approach Delay, s/veh		11.1			51.2			56.0			55.7	
Approach LOS		B			D			E			E	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	41.2	16.0		61.0	5.3	52.0		61.0				
Change Period (Y+Rc), s	4.5	6.5		6.5	4.5	6.5		6.5				
Max Green Setting (Gmax), s	36.7	11.3		54.5	5.0	43.0		54.5				
Max Q Clear Time (g_c+I1), s	38.7	7.6		56.5	2.3	2.1		56.5				
Green Ext Time (p_c), s	0.0	0.1		0.0	0.0	0.0		0.0				

Intersection Summary			
HCM 7th Control Delay, s/veh			50.2
HCM 7th LOS			D

APPENDIX 5.7:

OYC (2028) WITH PROJECT OFF-RAMP QUEUES WITH IMPROVEMENTS

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Intersection	
Int Delay, s/veh	2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	181	0	4	687	1	5
Future Vol, veh/h	181	0	4	687	1	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	0	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	72	72	72	72	72	72
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	251	0	6	954	1	7

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	15	6	0	0	960	0
Stage 1	6	-	-	-	-	-
Stage 2	10	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	1008	1083	-	-	725	-
Stage 1	1023	-	-	-	-	-
Stage 2	1018	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	1007	1083	-	-	725	-
Mov Cap-2 Maneuver	1007	-	-	-	-	-
Stage 1	1023	-	-	-	-	-
Stage 2	1017	-	-	-	-	-

Approach	WB	NB	SB
HCM Ctrl Dly, s/v	9.76	0	1.66
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	1007	300	-
HCM Lane V/C Ratio	-	-	0.25	0.002	-
HCM Ctrl Dly (s/v)	-	-	9.8	10	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	1	0	-

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	7	228	30	835	2	118	1808	28
v/c Ratio	0.11	0.55	0.18	1.00	0.01	0.52	0.99	0.05
Control Delay (s/veh)	41.8	42.2	40.5	76.4	47.5	41.0	46.6	9.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	41.8	42.2	40.5	76.4	47.5	41.0	46.6	9.2
Queue Length 50th (ft)	4	132	18	294	1	55	601	0
Queue Length 95th (ft)	18	223	47	#453	10	114	#845	14
Internal Link Dist (ft)		809		1992		899		1124
Turn Bay Length (ft)	100		150					
Base Capacity (vph)	64	412	166	832	291	366	1823	998
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.11	0.55	0.18	1.00	0.01	0.32	0.99	0.03

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Intersection						
Int Delay, s/veh	0.8					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	150	2	2	1684	2	3
Future Vol, veh/h	150	2	2	1684	2	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	0	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	69	69	69	69	69	69
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	217	3	3	2441	3	4

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	13	3	0	0	2443	0
Stage 1	3	-	-	-	-	-
Stage 2	10	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	1011	1087	-	-	195	-
Stage 1	1026	-	-	-	-	-
Stage 2	1018	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	996	1087	-	-	195	-
Mov Cap-2 Maneuver	996	-	-	-	-	-
Stage 1	1026	-	-	-	-	-
Stage 2	1003	-	-	-	-	-

Approach	WB	NB	SB
HCM Ctrl Dly, s/v	9.63	0	9.5
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	997	194	-
HCM Lane V/C Ratio	-	-	0.221	0.015	-
HCM Ctrl Dly (s/v)	-	-	9.6	23.7	0
HCM Lane LOS	-	-	A	C	A
HCM 95th %tile Q(veh)	-	-	0.8	0	-

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	2	225	66	1977	5	127	1134	13
v/c Ratio	0.03	0.25	0.14	1.08	0.07	0.66	1.05	0.03
Control Delay (s/veh)	20.5	18.1	20.0	76.7	57.2	59.4	80.5	12.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	20.5	18.1	20.0	76.7	57.2	59.4	80.5	12.0
Queue Length 50th (ft)	1	90	29	~856	4	78	~478	1
Queue Length 95th (ft)	6	145	59	#990	18	#153	#606	15
Internal Link Dist (ft)		809		1997		899		1124
Turn Bay Length (ft)	100		150					
Base Capacity (vph)	59	891	481	1838	75	201	1085	663
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.25	0.14	1.08	0.07	0.63	1.05	0.02

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

INTERSECTION SAFETY AND OPERATIONAL ASSESSMENT PROCESS GUIDE

Division of Traffic Operations
California Department of Transportation

SEPT 2024

Contents

Introduction

The *Intersection Safety and Operational Assessment Process (ISOAP) Guide* presents a data-driven, performance-based framework incorporating the Safe System Approach to screen intersection strategies and identify optimal solutions for new or improved intersections. ISOAP objectively helps select intersection control and geometric designs for the expected users within the context of an intersection's location. Land use and place type are to be considered in determining appropriate intersection strategies. The process recognizes that support resources can be limited to develop and implement feasible strategies and is an evolution of, and successor to, the Intersection Control Evaluation (ICE) policy and procedures. This guide accompanies the memorandum establishing ISOAP and supersedes the *ICE Process Informational Guide 1.0*.

Background

In 2013, Traffic Operations Policy Directive (TOPD) 13-02 established ICE as a requirement for determining traffic control at intersections to optimize all viable forms of traffic control. The ICE policy led to additional guidance, streamlined documentation and approval, provided a formalized support network, and supported successful project implementation.

The following resources support and necessitate the update of TOPD 13-02:

- Intersections are one of the 16 identified Challenge Areas in the *2020-2024 Strategic Highway Safety Plan (SHSP)*. In California over the 10-year period from 2011-2020, crashes related to intersections represented 24% of all fatalities and serious injuries, and roughly one third of these were pedestrians and bicyclists. The *2020-2024 SHSP* incorporated the following Guiding Principles that are pertinent to the ISOAP: Integrate Equity, Double Down on What Works, Accelerate Advanced Technology, and Implement the Safe System Approach.
- Director's Policy 36 (DP-36) on Road User Safety adopts the Safe System Approach as the basis for a vision of zero road fatalities and serious injuries by 2050. As stated in DP-36, the Safe System Approach aims to eliminate fatal and serious injuries for all road users through a holistic view of the road system. It further states that the policy establishes a corporate expectation to prioritize safety, and for all Divisions to align their programs, plans, policies, procedures, and practices with the Safe System Approach. In summary, there is a "Safety First" mindset prioritizing road safety.
- Director's Policy 37 (DP-37) on Complete Streets "establishes Caltrans' organizational priority to encourage and maximize walking, biking, transit, and passenger rail as a strategy to not only meet state climate, health, equity, and environmental goals but also to foster socially and economically vibrant, thriving, and resilient communities. To achieve this vision, Caltrans will maximize the use of design flexibility to provide context-sensitive solutions and networks for travelers of all ages and abilities."

The emergence of Safe System-oriented assessment tools, such as the Safe System-Based Framework and Methodology for Assessing Intersections, developed by the Federal Highway Administration (FHWA), provide an analytical basis for assessing project-level alternatives according to Safe System principles and elements.

Safe System Approach

The Safe System Approach is based on six principles:

- Eliminate death and serious injury.
- Humans make mistakes.
- Humans are vulnerable.
- Responsibility is shared.
- Redundancy is crucial.
- Safety is proactive and reactive.

The five elements of the Safe System Approach are the following:

- Safe road users
- Safe vehicles
- Safe speeds
- Safe roads
- Post-crash care

Intersection safety performance (crash frequency and severity) can be enhanced by incorporating the principles of the Safe System Approach and addressing several of the elements. Safety is considered for all road users, including those who walk, bike, drive, or ride transit. Reducing speed at locations of potential conflict lessens the likelihood of a crash and severity of crashes. Safe roads are designed to be forgiving should a driver make a mistake.

Strategies for Safe System intersections can include the following:

Minimizing and modifying conflict points.

A traditional four-legged intersection with single lane approaches has 32 vehicular conflict points, including 16 crossing, 8 merging, and 8 diverging conflicts points as shown in Figure 1. The crossing conflicts could potentially result in the most severe crash types. In comparison, a four-legged single-lane roundabout has 8 vehicular conflict points, including 4 merging and 4 diverging conflict points, as shown in Figure 2. Therefore, any crash that occurs in a roundabout would typically be less severe than in a traditional intersection

Figure 1. Traditional Four-Legged Intersection with Single Lane Approaches

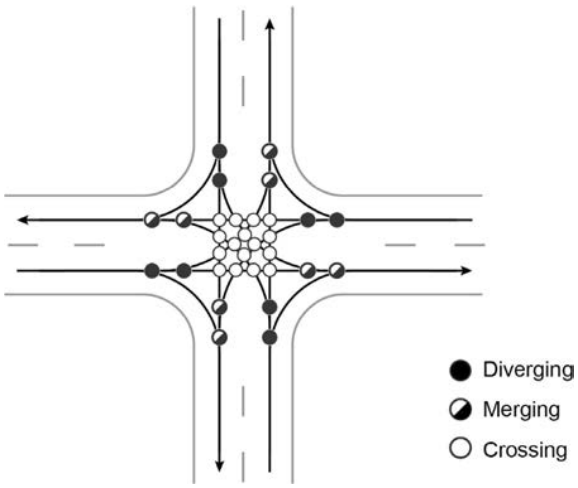
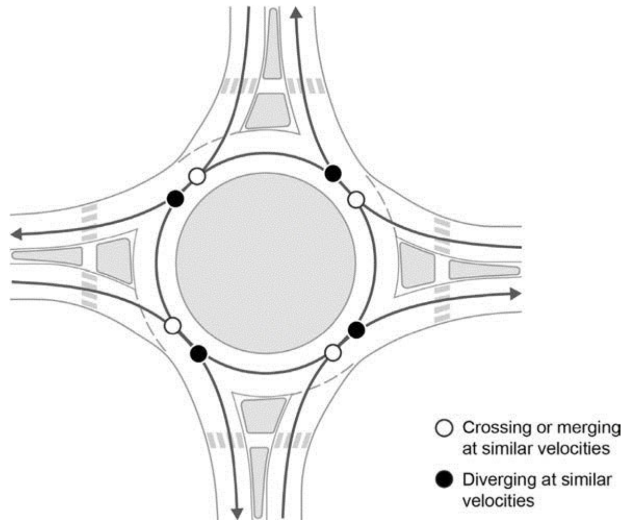


Figure 2. ***A four-legged single-lane roundabout***



Other types of alternative intersections similarly have a reduced number of conflict points when compared to a traditional intersection. Even within a traditional intersection, the number and potential severity of conflicts can be reduced by restricting movements that can result in crossing conflicts, such as through or left-turn movements, or altering the geometry to reduce speeds.

Reducing vehicle speeds.

Reducing vehicle speeds increases reaction times for drivers and decreases the kinetic forces that are transferred in any crash. The survivability for pedestrians and bicyclists in particular is highly dependent on speed. Vehicle speeds can be reduced through roadway geometry and traffic calming measures, such as those shown in the Traffic Calming Guide.

Improving visibility at intersections.

Increasing sight distances at intersections, such as by removing parking, allows greater visibility between drivers, pedestrians, and other road users so that potential conflicts can be identified earlier. Adding lighting can increase nighttime visibility of users. Refer to the Caltrans Roadway Lighting Manual for lighting requirements.

Providing space and protection for pedestrians and bicyclists.

Physically separating transportation modes traveling at different speeds reduces conflicts. Dedicated facilities, such as sidewalks, can be provided for pedestrians, and bike lanes or separated bikeways can be provided for bicyclists. Separation can also be provided with respect to time at signalized intersections by implementing leading pedestrian intervals or pedestrian scramble phases. A pedestrian hybrid beacon similarly provides exclusive crossing time for pedestrians.

Process Considerations

Performance Measures

The performance measures associated with ISOAP differ from the prior ICE process in that the level of service (LOS) is no longer a primary influence because of updated areas of focus within the state, as noted in the Background section in this document. The performance measures for which intersections are measured are safety for all users, accommodating all users, and a measure of effectiveness (MOE) for throughput, such as daily person hours of delay (DPHD).

Applicability

ISOAP applies to new intersections or the major modification of existing intersections and local street interchanges (including to state conventional highways and expressways) on the State Highway System, including but not limited to the following:

- Connecting a new public road, private road, or high-volume (average daily traffic volumes of 1,000 or greater) driveway to a state highway or a new interchange to a freeway.
- Changing the type of traffic control, such as from stop-control to signal-control or from a two-way stop to all-way stop.
- Installing a pedestrian hybrid beacon at an intersection.
- Making major physical changes to intersection approaches, including at ramp terminals, such as adding a leg to an intersection or widening to provide an additional through or turn lane.

ISOAP does not apply to the following situations:

- Changes to lane configurations at existing intersections through modifications of signing or striping without any pavement widening.
- Minor modifications to existing traffic signals, such as adding or removing signal heads, upgrading signal poles that do not meet current standards, changing controller assemblies, adding signal priority, or modifying detection.
- Changes to controller software, signal phasing, or signal timing.
- Restricting movements at an existing intersection, such as prohibiting left turns or through movements.
- Installing warning devices, such as advance flashing beacons or rectangular rapid flashing beacons.
- Low-volume driveways in which turning restrictions are not deemed necessary by district Traffic Operations and Safety staff.

While ISOAP does not apply to restriping on existing pavement, including adding or removing lanes, those changes do require analysis for safety and operational impacts, such as queuing and traffic diversion. ISOAP may be applied if there are multiple alternatives.

Design Year

The design for new facilities and reconstruction should be based on the estimated traffic volumes 20 years following the completion of construction. With justification, a shorter design period may be approved by the District Director with concurrence by the Project Delivery Coordinator for projects off the Interstate Highway System. Refer to *Highway Design Manual* (*HDM)* Index 103.2 Design Period for additional information regarding the design period.

Roundabouts should be designed for 20-year traffic volumes but can initially be configured for 10 years and then expanded with minimal cost to the 20-year configuration. Refer to *HDM* Index 405.10 Roundabouts for additional information on the design period for roundabouts.

Process Flow Charts

ISOAP consists of two stages, including a Stage 1 Screening and Initial Assessment of viable strategies and a Stage 2 Detailed Assessment. ISOAP is intended to be scalable commensurate to the amount of analysis needed at a particular intersection and the level and quality of data available for a given project development stage. Early consultation with the community and local agencies is recommended to help stakeholders understand the ISOAP process, timelines, complexity, and expectations.

Stage 1 is typically done prior to or during the Project Initiation Document (PID) phase. For instance, if an improvement to an intersection is identified during a traffic investigation or local development review, then Stage 1 of ISOAP can be completed prior to the initiation of a project. If there are multiple potential buildable strategies, Stage 2 is typically done during the Project Approval and Environmental Document (PA&ED) phase, and the performance of various strategies is quantified with a benefit-cost ratio for improvements.

There are no prescribed tools in ISOAP other than the *Highway Safety Manual (HSM)* to be used in Stage 2 if applicable. Some of the typical tools are shown below. There are other tools available that can be used for evaluating the quality of service for pedestrians, bicyclists, and transit users.

Table 1. Typical Tools Used in ISOAP

ISOAP Stage	Typical Tools Used	Project Phase
Stage 1	CAP-X, Safety Performance for Intersection Control Evaluation (SPICE), Safe System Intersection methodology	Pre-PID, PID
Stage 2	Synchro/SimTraffic, Vistro/VISSIM, SIDRA, Rodel, Highway Capacity Software, *HSM*	PA&ED

Each stage of ISOAP is documented in the corresponding ISOAP form with appropriate supporting analysis and submitted to the District ISOAP Coordinator for approval, as detailed below.

For encroachment permits and projects funded by others, the project proponent is required to complete ISOAP for any applicable proposed modifications to existing intersections or for new major connections to state highways. ISOAP should be completed prior to submitting the encroachment permit application. Permit engineers and oversight project managers should assist with communicating the ISOAP process, resource impacts, and deliverable requirements during the initial consultation phase of a project.

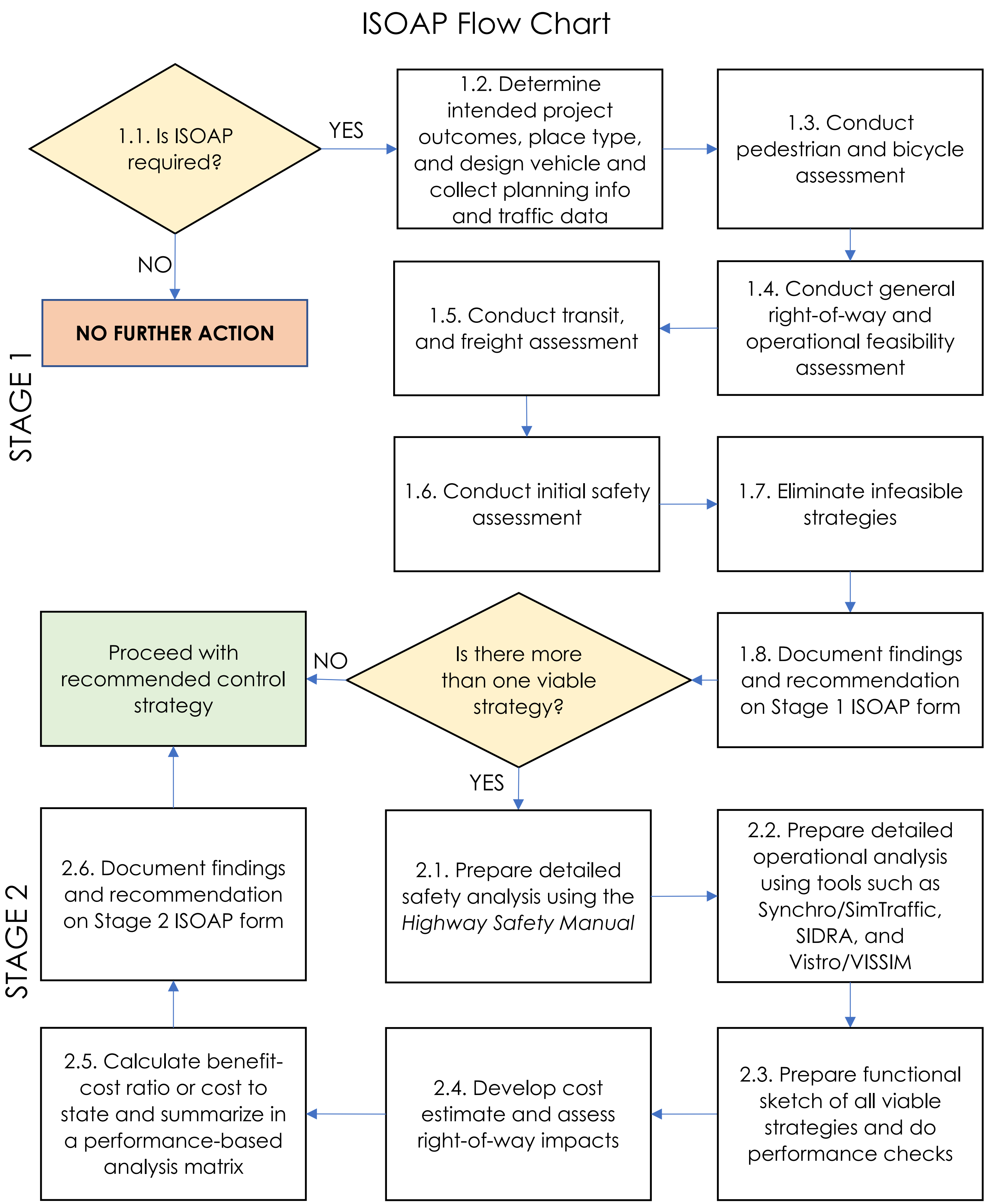
Streamlined Processes

The following situations will permit a streamlined ISOAP whereby alternative strategies need not be evaluated, and that ISOAP may conclude upon completion of Stage 1:

1. A new low-volume public road connection to a state highway in which signal warrants are not expected to be met during the 20-year design life. Alternative traffic control to a single stop sign at a T-intersection or a two-way stop at a four-legged intersection is not required unless the volume of pedestrians and/or bicyclists may merit additional controls or if the need for traffic calming may merit consideration of a roundabout.
2. A single-lane roundabout where the total of the average daily traffic for all approaches is less than 25,000 and signal warrants are projected to be satisfied within 10 years following project completion, or where there is a high number of broadside crashes, and the cost of a roundabout is comparable to signalization. If public concern is anticipated, evaluating alternative strategies may be required for the environmental process.

The ISOAP flow chart is shown in Figure 3.

Figure 3. ISOAP Flow Chart



Roles and Responsibilities

ISOAP may be performed by Caltrans staff or by others and then reviewed by Caltrans staff. The analysis may be performed by an individual or various members of a team. Coordination, technical support, and reviews are to be provided by Caltrans staff. As districts are organized differently, roles and responsibilities may vary by district. Below are the responsibilities of those involved in the analysis for ISOAP:

- **ISOAP Engineer** – The ISOAP Engineer performs the ISOAP in accordance with the ISOAP policy and associated guidance. The ISOAP Engineer considers appropriate access strategies, intersection control, and intersection configurations and consults with the District ISOAP Coordinator as needed. The ISOAP Engineer is to engage with functional units, such as Traffic Operations or Traffic Safety, as necessary for support and guidance for completing tasks.
- **Project Engineer** – The Project Engineer or Design Manager coordinates ISOAP process steps and activities when required for project initiation and/or project approval. The Project Engineer also develops geometrics for alternative strategies and cost estimates.
- **District ISOAP Coordinator** – Each district is to have a minimum of one designated District ISOAP Coordinator in a Traffic Operations functional unit to review ISOAP documents for adherence to guidance and to provide procedural and technical support. The District ISOAP Coordinator is to approve in writing each submittal of ISOAP Stages 1 or 2 unless a district has assigned that responsibility to another Traffic Operations functional manager. The District ISOAP Coordinator facilitates any exceptions to ISOAP with the Divisions of Traffic Operations and Safety Programs.
- **District Traffic Operations Engineer** – The District Traffic Operations Engineer performs, reviews, and provides guidance for operational analyses.
- **District Traffic Safety Engineer** – The District Traffic Safety Engineer provides guidance as needed for calculating the safety benefit and also reviews and concurs with the recommendations in ISOAP Stages 1 and 2.

The following are additional staff and teams involved in supporting ISOAP or project alternatives:

- **Project Development Team (PDT)** – The PDT selects the type of control and intersection configuration for State Transportation Improvement Program (STIP) and State Highway Operation and Protection Program (SHOPP) projects, as the PDT selects the preferred alternative for project approval. Decisions are documented in the Project Report or other approval document.
- **Local Development Review (LDR) Planner** – The District LDR planner coordinates reviews of local development proposals for impacts to the operation of state highways as well as reviews of local and regional transportation plans. The planners provide appropriate guidance to local agencies for future intersection

configurations, types of traffic control, and ISOAP with respect to potential improvements on state highways in coordination with the district Traffic Operations unit responsible for LDR.

- **Technical Planner** – The technical planner works with engineers to project future traffic volumes based on regional models for analyzing intersection configurations.
- **Complete Streets Coordinator** – The designated Complete Streets Coordinator in Planning and Modal Programs, Traffic Operations, or Asset Management is familiar with the Complete Streets needs for highways within their districts and plans SHOPP projects that may address these identified needs.
- **Permits Engineer** - For permit submittals through the Encroachment Permit Office Process, Encroachment Permits staff verify that ISOAP has been completed for any applicable changes to traffic control and that a Permit Engineering Evaluation Report (PEER) is completed.
- **Headquarters Traffic Operations** – Staff from the Transportation System Analysis Branch provides guidance, training, policy evaluation, technical support, and updates for ISOAP as required. Any exceptions to conducting ISOAP when applicability criteria are met will need to be approved by this branch.
- **Headquarters Safety Programs** – Staff from the Highway Safety Improvement Program (HSIP) Branch develop methodology and costs for calculating safety benefits to qualify for HSIP funding. Any exceptions to conducting ISOAP when applicability criteria are met will need to be approved by this branch.

Documentation and Forms

At the completion of each stage, the appropriate ISOAP form is to be completed and submitted with supporting documentation, such as functional sketches, cost estimates, and operational analysis, to the District ISOAP Coordinator or designated Traffic Operations functional manager for approval. Approved forms should be placed in the project development records. The ISOAP forms are contained within an Excel spreadsheet and are shown in Appendix B. The forms may be modified by the user to add control strategies or make other changes as needed.

Public Outreach

Stakeholder engagement is essential in developing transportation projects that support the needs and values of the communities in which they are located so that the intended project outcomes can be achieved. The project development process incorporates public outreach in the various phases of a project, and additional outreach specific to ISOAP should be strongly considered in most cases to ensure enough strategies are considered and analyzed in the appropriate context. Stakeholders need to be identified and could include intersection users, local agencies, transit agencies, school officials, landowners, nearby businesses, emergency responders, advocacy groups, trucking associations, farmers, and others as appropriate.

Local or regional transportation planning documents often include a public outreach process, but documents may become outdated or not reflect current policies, and additional outreach related to planning and land use may be needed.

Education may need to be provided to local officials or the public for novel or unfamiliar forms of intersections. The topics could include safety and operational characteristics, impacts to maintenance, and environmental and construction impacts.

Overview of Strategies

In this document, intersection configurations and control strategies will generally be called strategies. The strategies selected for analysis for a particular project may or may not correspond to project alternatives identified in project initiation, project approval, or environmental documents.

Strategies that may be considered for evaluation are shown and described in Appendix A.

At-Grade Intersections

At-grade intersections may be controlled with stop signs, yield signs (including at roundabouts), or traffic signals. Specific movements, often left turns, can be restricted or redirected to another intersection. Some examples of conventional intersections include the following:

- Minor road stop
- Minor road stop with turn restrictions (such as right in/right out, 3/4 movement)
- All-way stop
- Restricted crossing U-turn
- Median U-turn
- Displaced left-turn (partial or full)
- Bowtie
- Jughandle
- Thru-cut
- Quadrant
- Traffic signal
- Traffic signal with a continuous green T
- Pedestrian hybrid beacon
- Roundabout (mini, single-lane, hybrid, or multilane)

Grade Separations (Non-Interchange)

Partial grade separations are not common because of cost and right-of-way impacts, but they may be considered at high-volume intersections. Certain movements can be removed from the main intersection to reduce conflicts and provide more efficient signal phasing. Some examples of partial grade separations include the following:

- Jughandle
- Echelon intersection
- Center turn overpass

There are other possible configurations that can be used to separate certain movements. Grade separations may not be appropriate in certain urban environments, as the context needs to be considered.

Interchanges

Ramp terminal intersections at freeway interchanges can have similar types of controls as intersections at grade and are analyzed as such. Configurations that reduce the number of conflict points, especially crossing conflicts, reduce the potential for serious crashes. For instance, the partial cloverleaf interchange eliminates the left-turn movements to or from the on- or off-ramps. Particularly notable for their reduction of conflicting movements and cost-effectiveness are roundabout ramp terminal intersections and diverging diamond interchanges. More information on diverging diamond interchanges can be found in Design Information Bulletin (DIB) 90.

Stage 1 of ISOAP: Screening and Initial Assessment

Stage 1 of the ISOAP provides an initial screening of strategies so that detailed effort can be focused on the most viable strategies. The initial screening could reject strategies that have insurmountable environmental or right-of-way constraints. Strategies should also be appropriate to the context of the community in which the highway belongs.

The following are to be considered during the screening process:

- Excessive cost of improvements compared to the anticipated project budget should not in itself render any strategy nonviable, as improvements could potentially be planned or phased as funding becomes available.
- Lack of public support for a particular type of improvement is not a sufficient reason to reject a strategy.
- If there is not enough data or analysis conducted in Stage 1 to reject strategies, then the strategies are to be carried into Stage 2.
- If there is only one buildable strategy at the conclusion of Stage 1, then that strategy becomes the recommended strategy if it supports the intended project

outcomes and adequately addresses safety and operations, and ISOAP is completed for that project.

The following are the Stage 1 procedural steps as shown in Figure 3:

Step 1.1 Determine if ISOAP is required.

Use the applicability criteria provided in the Process Considerations section.

Any exception from conducting ISOAP for a proposed new or modified intersection meeting the applicability criteria will require approval from the Divisions of Traffic Operations and Safety Programs. The District ISOAP Coordinator will confer with the divisions to determine if the exception will be approved.

Step 1.2 Determine intended project outcomes, place type, and design vehicle, and then collect planning information and traffic data.

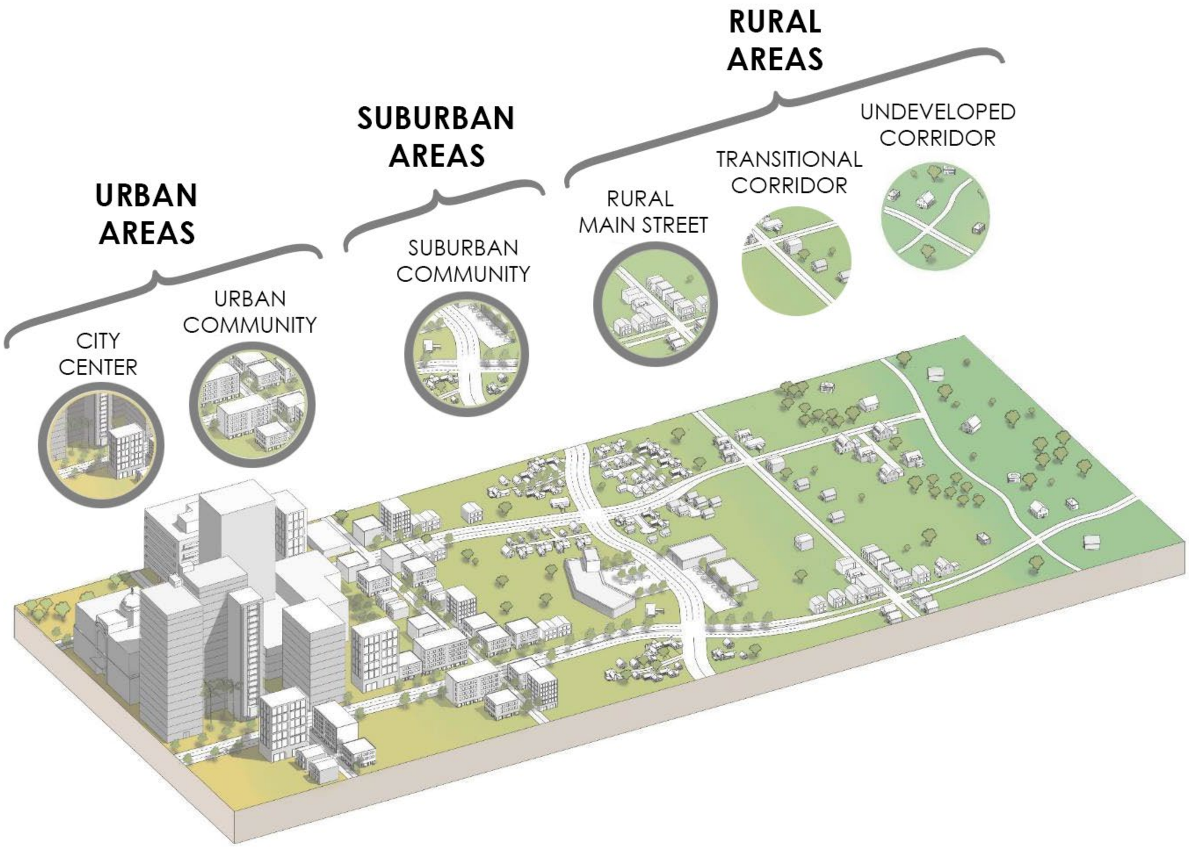
The intended project outcome is the desired result of a proposed project. For example, the intended project outcome may address a safety or operational deficiency, increase throughput for a particular mode, improve livability by calming traffic, or address transportation disparities. It is possible that the performance for some metrics may decrease over the current condition. For instance, a project to implement a road diet may result in additional delay and queuing but improve the quality of service for other modes, such as walking and biking, which may be more difficult to quantify. The intended project outcomes should be a collaborative effort with other functional units and project stakeholders.

The place type is the character, size, and density of the community. The place type should be based on existing and proposed land use. Additional information on place types can be found in *HDM* Index 81.3 Place Types and the *Smart Mobility 2010: A Call to Action for the New Decade*.

Caltrans uses the following designations for place types:

- Urban areas
    - Center cities
    - Urban communities
- Suburban areas
- Rural areas
    - Rural main streets
    - Transitional corridors
    - Undeveloped corridors
- Special use areas and protected lands

Figure 4. Place Types for Contextual Design Guidance (Source: *HDM* Index 81.3)



Refer to *HDM* Index 81.3 Place Types for information regarding the characteristics of the various place types. In general, the urban place types place stronger emphasis on pedestrians, bicycles, and transit.

An appropriate design vehicle needs to be selected based upon the type of truck network to which a route belongs. The Surface Transportation Assistance Act (STAA) truck should be the typical design vehicle, but a lesser design vehicle may be used with the concurrence of the District Truck Access Manager (DTAM) and with appropriate justification and documentation. Refer to *HDM* Topic 404 Design Vehicles for additional information.

Available system planning information are to be gathered, including Transportation Concept Reports, Comprehensive Multimodal Corridor Plans, Active Transportation Plans, and local agency planning documents. Available traffic counts (such as vehicle, truck, turning movement, pedestrian, and bicycle), existing roadway configuration, right-of-way, and collision data should also be gathered.

Step 1.3 Conduct pedestrian and bicyclist planning and feasibility assessment.

Pedestrians and bicyclists could potentially cross at any intersection on the State Highway System. DP-37 on Complete Streets states that "Accordingly, in locations with current and/or future pedestrian, bicycle, or transit needs, all transportation projects funded or overseen by Caltrans will provide comfortable, convenient, and connected complete streets facilities for people walking, biking, and taking transit or passenger rail unless an exception is documented and approved." Caltrans strives to serve users of all ages and abilities and use design flexibility to provide context-sensitive solutions. The needs of visually impaired pedestrians are also to be considered.

The existing and planned land use near an intersection should be considered in determining the type of pedestrian route or bikeway. Of particular interest are where schools and residences are on opposite sides of the intersection. As examples of how pedestrians may be considered, a project near senior housing may need to have longer pedestrian crossing times, and pedestrian scramble phasing may be appropriate at a traffic signal near a school.

Caltrans has developed extensive Complete Streets tools and guidance that can be used for developing appropriate pedestrian and bicycling facilities for the place type. The Complete Streets Toolbox and other resources can be accessed from the Division of Transportation Planning Complete Streets website.

Additional resources regarding place type include the following:

- Improving Intersections for Pedestrians and Bicyclists Informational Guide (FHWA, 2022) provides assessment techniques for various types of intersection configurations and design features and countermeasures that can be used to enhance pedestrian and bicyclist safety.
- FHWA Bikeway Selection Guide (2019).
- National Cooperative Highway Research Program (NCHRP) Report 948, Guide for Pedestrians and Bicyclist Safety at Alternative and Other Intersections and Interchanges (2021).
- NCHRP Report 834, Crossing Solutions at Roundabouts and Channelized Turn Lanes for Pedestrians with Vision Disabilities: A Guidebook (2017).
- NCHRP Report 1043, Guide for Roundabouts (2023).
- Supplement to the Application of the Highway Safety Manual Methodology for DIB 94 Eligible Projects Caltrans, 2024) for conducting a safety analysis and informing engineering judgment and discretion when balancing roadway cross-section elements for DIB 94 projects.

Step 1.4 Conduct general right-of-way and operational feasibility assessment.

Footprints for potential improvements are based on typical designs. The number of lanes can be determined by using the Capacity Analysis for Planning of Junctions (CAP-X) Tool developed by FHWA. The tool is based on an Excel spreadsheet and determines the volume-to-capacity ratio and multimodal accommodations for various intersection configurations.

The Virginia Department of Transportation has developed a tool, the Virginia Junction Screening Tool, or VJust, that may also be used to analyze various types of innovative intersections.

More advanced tools such as Synchro for signalized intersections or SIDRA for roundabouts may be used, but that level of detail is not expected until Stage 2 of ISOAP as support resources are typically limited during the PID phase. Sizing an intersection to meet a particular level of service threshold should not be a primary objective. As LOS is no longer the standard performance metric, the MOE should be documented. This may be DPHD, volume/capacity ratio, queuing, or another measure as directed by the District Traffic Operations Engineer.

The concepts developed during Stage 1 should be considered conceptual, as the more detailed operational analysis would typically be completed during Stage 2. However, if detailed operational analysis is needed before eliminating strategies, strategies should be carried over to Stage 2 unless the detailed analysis can be conducted in Stage 1.

An optional worksheet showing possible control access strategies is provided with the ISOAP forms and can be used to help select appropriate strategies.

Standard geometrics in the *HDM* and DIB 94 should be used in determining intersection footprints, including appropriate sizing of roundabouts. The footprint for a roundabout should include the proposed pedestrian route and bikeway. Roundabouts must be able to accommodate the appropriate design vehicle. Refer to Stage 1, Step 1.5 for guidance on how to accommodate freight. *HDM* Chapter 400, Index 405.10 Roundabouts provides guidance for geometric features and performance checks for roundabouts. Performance checks can be deferred to Stage 2 of ISOAP unless the viability of the roundabout is highly dependent on a precise footprint.

Where an intersection is near at-grade railroad tracks, operational impacts of a passing train will need to be evaluated to address queuing and the need for pre-signal systems.

In evaluating intersection footprints, known constraints such as environmentally sensitive areas and costly right-of-way should be noted and avoided. However, the need to acquire right-of-way or conduct additional environmental analysis should not in itself be considered constraints. Access management needs should be considered, as closing or consolidating access points and constructing channelization may have significant cost.

For proposed projects that satisfy the streamlined criteria applicable for stop control on minor legs and roundabouts for lower-volume intersections, as discussed in the Process Considerations section of this document, alternate strategies do not need to be considered for ISOAP and the remaining steps for Stage 1 are to be completed without a need to proceed to Stage 2.

Step 1.5 Conduct transit and freight assessment.

Proposed intersection designs need to accommodate buses, streetcars, and other modes of public transit as applicable. Vehicle turning templates, transit vehicle queuing, passenger queuing, transit shelters, and appropriate near side or far side placement of transit stops need to be considered. Intersections are often the transfer location of different transit routes, in which transit vehicles may park for extended periods and necessitate extended bus bays. Throughput for transit can be increased with transit-only lanes or transit signal priority.

Trucks do not necessarily need to be accommodated for all movements at an intersection, as the land use accessed by each leg of an intersection should be considered. The needs of oversize vehicles should also be assessed. Some routes may need to accommodate certain types of large agricultural equipment or other oversize loads, and the design vehicle may be a type of booster truck as specified in the *HDM*. The frequency of such loads and availability of alternate routes should also be considered. The DTAM should be consulted for appropriate truck accommodation.

Step 1.6 Conduct initial safety assessment.

The relative safety of the various potential strategies should be considered to compare with the existing condition of the intersection. The SPICE tool, Caltrans Traffic Accident Surveillance and Analysis System rate groups, crash modification factors, or other methods may be used. The SPICE tool was developed by FHWA and is an Excel spreadsheet tool that performs a predictive safety analysis for at-grade intersections of various types of control, when applicable, and is based on the *HSM* methodologies. Crash modification factors are derived from studies and measure the crash reduction potential of various types of safety improvements and can be used for a qualitative analysis.

The Safe System for Intersections (SSI) methodology developed by FHWA analyzes intersection strategies by incorporating conflict point identification and exposure, kinetic energy transfer, and intersection movement complexity to produce a score that characterizes the extent that the strategy aligns with the Safe System framework. A qualitative assessment using Safe System Approach principles detailed in the Safe System Approach section of this document can also be conducted to help eliminate infeasible strategies if deferring the quantitative safety assessment to Stage 2.

If SSI methodology cannot be employed in its entirety, a general analysis of conflict points, applicable vehicle speed reduction measures, and visibility enhancements can also be used.

Step 1.7 Eliminate infeasible strategies.

It is sufficient to reject strategies that do not satisfy the intended project outcomes, have environmental impacts that cannot be reasonably mitigated, do not adequately address road user safety performance for both crash severity and frequency, or have costs that exceed available and potentially available funding for improvements.

Step 1.8 Document findings and recommendation.

If there is more than one viable strategy, then the recommendation would be to proceed to Stage 2 of ISOAP. The most viable or highest performing strategies should be carried forward to Stage 2 if a large number of strategies remain. If there is only one viable strategy that has improved performance over the current condition, then that would become the recommended strategy.

For capital projects, if there is only one viable strategy and if the available funding is insufficient for the recommended strategy, the following potential funding sources should be considered:

- Combining with planned SHOPP work, such as rehabilitation.
- SHOPP safety funding if an existing safety deficiency has been identified.
- Congestion Mitigation and Air Quality Improvement Program (CMAQ).
- Local Highway Safety Improvement Program (HSIP).
- Active Transportation Program (ATP) grant funding.
- Minor A or B funding for components with independent utility.
- Regional Transportation Improvement Program (RTIP).
- Developer fees or mitigation.
- Local transportation sales tax measures.

The district Traffic Operations functional units, Asset Management, and district Planning division should be consulted on the potential availability of such funding.

A phased implementation of the recommended strategy could also be considered, as well as cost-effective interim improvements not necessarily compatible with future improvements.

The recommendation is documented on the completed Stage 1 ISOAP form and submitted to the district ISOAP Coordinator with applicable analysis and assessment files for review and approval by the designated Traffic Operations functional manager. One form is to be submitted for each analyzed intersection. If there is only one proposed strategy, the District Traffic Safety Engineer is to review and concur with the recommendation.

All viable strategies should be noted in the PID. For capital projects and projects that require an encroachment permit, refer to Project Development Procedures Manual (PDPM) Chapter 9, Project Initiation for further information on PIDs. For encroachment permits in which a Project Report or Design Engineering Evaluation Report (DEER) is not required, decisions are documented in the Permit Engineering Evaluation Report (PEER).

Stage 2 of ISOAP: Detailed Analysis

If more than one buildable strategy remains after Stage 1 of the ISOAP, the strategies proceed to Stage 2 for more detailed analysis.

Step 2.1 Prepare a detailed safety analysis.

A quantitative safety analysis is performed to show predicted crash frequency and severity for each strategy. The *HSM* is to be used where applicable. By utilizing Caltrans' crash costs, the predicted crashes and their severities are converted into a dollar amount that can be used in an economic analysis to determine a benefit-cost ratio or an overall cost to the state for each strategy. Note that a Stage 2 quantitative safety analysis and a Stage 1 SPICE tool analysis may result in different crash performances. The tools and methodologies described in Stage 1, Step 1.6 can also be used if the quantitative safety assessment was deferred to Stage 2.

For more information on applying the *HSM*, see the Caltrans Highway Safety Manual website.

Where the *HSM* cannot be used, a qualitative safety analysis may be performed. Although a thorough economic analysis of a strategy's safety outcomes cannot be utilized with a qualitative analysis, a general statement of the safety benefits can be provided using a specific countermeasure or crash modification factor, treatment, or strategy.

Step 2.2 Prepare a detailed operational analysis.

Intersection operational analysis tools include the following software:

- Synchro/SimTraffic
- Highway Capacity Software
- Vistro/VISSIM
- SIDRA
- Rodel
- Other less common software, such as TransModeler

Synchro/SimTraffic or other similar signal analysis software should be used for any proposed new or modified traffic signals. While Rodel can be used to analyze roundabouts, SIDRA is the preferred tool for analyzing roundabouts (Caltrans Recommended Settings and Standards for SIDRA [internal only]). For more complex intersections, networks, and innovative designs, such as turbo roundabouts, Vistro/VISSIM or other microsimulation software should be used. Analysis tool selection is dependent on project area, strategy type, complexity, and is subject to approval by the District Traffic Operations Engineer.

Operational analysis and associated transportation analysis should include the following:

- A study area that is large enough to capture all potential impacted facilities.
- Data collected during appropriate times of day, days of the week, and times of year.
- Analysis of multiple time periods may be needed to adequately assess project strategy performance.
- Data collection should include pedestrians, bicyclists, transit, and freight movements.
- Proper model calibration to existing conditions including volume and queuing calibration.
- Best practice travel forecasting methodologies, including the use of travel demand models to forecast volumes for each analysis scenario.

As LOS is no longer the standard performance metric, the MOE should be documented and may be DPHD, volume/capacity ratio, queuing, or other measure as directed by the District Traffic Operations Engineer. The operational analysis should address accommodation of queues. The summarized traffic analysis should be included in the project Traffic Operations Analysis Report (TOAR).

Quality of service for pedestrians, bicyclists, and transit users is also to be considered.

Step 2.3 Prepare functional sketches of feasible strategies and do performance checks.

A conceptual layout should be prepared for each feasible strategy based upon the number of required lanes identified by the operational analysis. The layout should show pedestrian and bicycle facilities and transit stops within the project limits. The level of detail should be sufficient to develop a cost estimate and evaluate right-of-way and potential environmental impacts. To avoid unreasonable disruptions to road users, drainage and utilities need to be considered, including the locations of maintenance access points. This work is typically done for alternatives during PA&ED and therefore would not require additional work in the project development process.

Geometric performance checks for roundabouts, including for fastest path, should be done. All intersections should be reviewed for geometric adequacy, such as having sufficient sight distance. DIB 90, Diverging Diamond Interchanges, can be used for performance checks for diverging diamond interchanges.

NCHRP Report 948, Guide for Pedestrians and Bicyclist Safety at Alternative and Other Intersections and Interchanges has a design flag assessment that can be used to evaluate pedestrian and bicycle safety, accessibility, comfort, and operational aspects across an intersection.

Step 2.4 Develop a cost estimate and assess right-of-way impacts

A cost estimate for construction and right-of-way should be developed for each viable strategy. The Project Engineer typically develops the cost estimate with input from various function units. Costs for rearranging drainage inlets and culverts, utilities, and maintenance access points determined in step 2.3 can be significant if the roadbed is widened or a median island is proposed. Cost for traffic handling can also be significant if there are multiple stages of intersection construction, construction of a detour, or extended working days. Annual maintenance costs, including electricity and other periodic maintenance costs, can also be used for calculating life-cycle costs. Crash costs are also calculated, where applicable. NCHRP Document 220 Estimating the Life-Cycle Cost of Intersection Designs may be used as a tool to estimate life-cycle costs.

Step 2.5 Prepare a performance-based analysis matrix.

Use the matrix provided on the Stage 2 ISOAP form to compare the operational and safety performance, life-cycle cost estimate, and benefit-cost ratio for each viable strategy. For construction of new facilities, the cost to the state, which is the sum of all the project costs (construction, right-of-way, environmental, and maintenance) and costs to the traveling public (crashes and delay over the life of the project) may be used as an alternative to the benefit-cost ratio.

Step 2.6 Document findings and recommendation.

The highest performing strategy that is consistent with the project type and project-specific context, and that supports the principles of the Safe System Approach, becomes the recommended strategy. The recommended strategy may or may not be the strategy with the highest benefit-cost ratio. There may also be considerations regarding equity that could favor a strategy that better serves a disadvantaged community. Bicyclist and pedestrian accommodations are documented in the recommendation as well as a description as to how the recommended strategy supports the Safe System Approach.

The selected strategy should incorporate features that make it maintainable and reduce exposure to field personnel. Some strategies may not be compatible with snow conditions.

As mentioned in Step 1.8, the cost for a recommended strategy may exceed the available funding for a project. Additional funding sources and phased implementation should be considered in such situations.

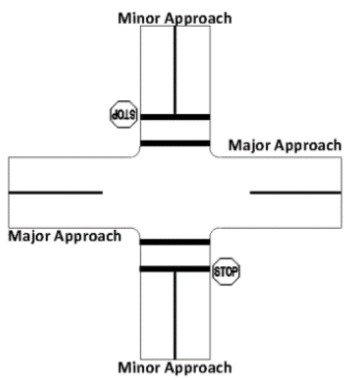
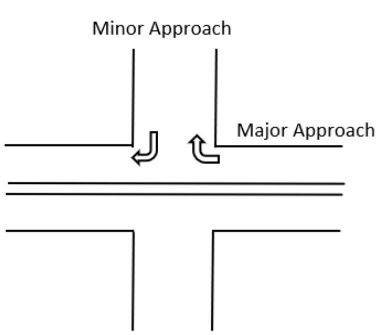
The completed Stage 2 ISOAP form is submitted to the District ISOAP Coordinator with applicable analysis and assessment files for review and approval by the designated Traffic Operations functional manager. The District Traffic Safety Engineer also reviews and concurs with the recommendation.

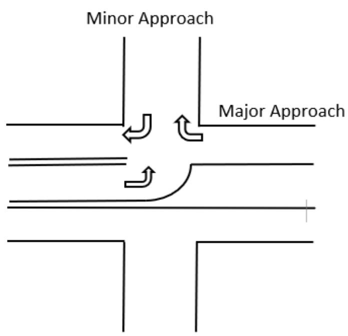
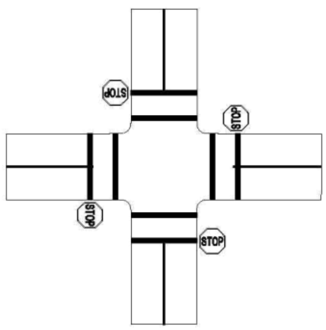
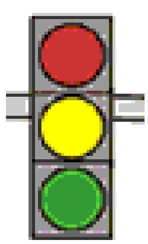
For capital projects, the PDT selects the type of traffic control or intersection configuration, and the decisions are documented in the Project Report. For projects funded by others that are subject to the Quality Management Assessment Process (QMAP), decisions are documented in the Project Report. For capital projects and projects that require an encroachment permit, refer to PDPM Chapter 9, Project Initiation.

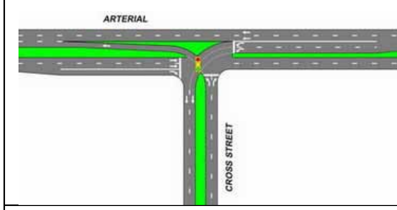
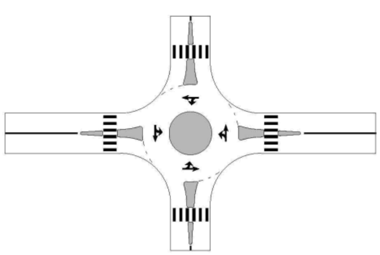
Appendix A: Intersection Types and Control Strategies

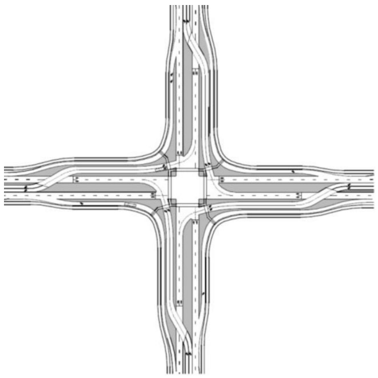
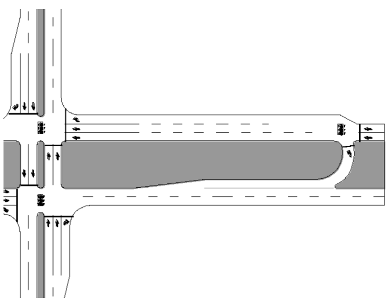
The following table highlights conventional and innovative intersection strategies touched upon within this document. This table is not all-inclusive, and additional innovative intersection strategies that serve the intended project outcomes and meet the DPHD outlined in the Process Considerations section of this document are encouraged.

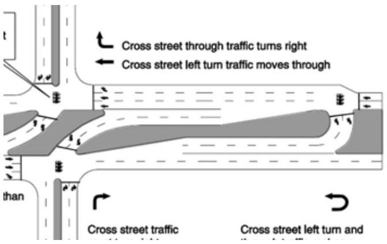
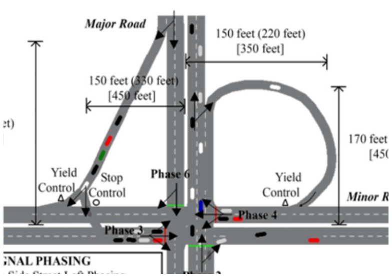
Table 2. Intersection Types and Control Strategies

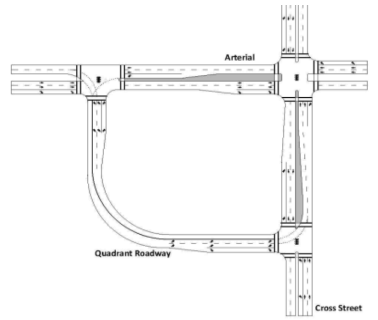
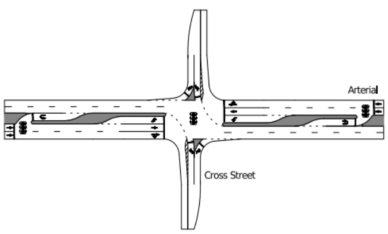
Type of Intersection Control	Description	Pedestrian Accommodation	Bicyclist Accommodation
Minor Road Only Stop 	Traffic on the minor approach stops for the major approaches.	Pedestrian facilities are typically provided in an urban or urbanizing area or rural main street. In accordance with DP-37, pedestrian facilities should also be considered in other contexts. High visibility crosswalks, rectangular rapid flashing beacons, pedestrian hybrid beacons, and curb extensions (built outs) are potential enhancements for crossings at the major approaches.	Class II bike lanes, Class IV separated bikeways, or striped shoulders can be placed on the major approaches.
Right-In/Right-Out 	This variant of a minor road only stop restricts left turns into or out of a minor road, usually by the placement of a raised median.	Same as Minor Road Only Stop above.	Class II bike lanes, Class IV separated bikeways, or striped shoulders can be placed on the major approaches.

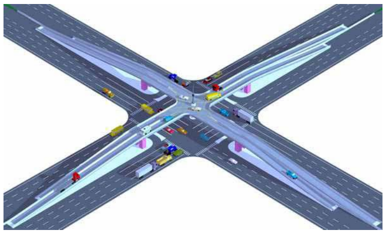
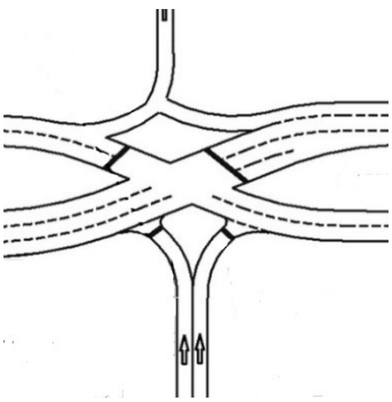
Type of Intersection Control	Description	Pedestrian Accommodation	Bicyclist Accommodation
3/4 Movement 	This variant of a minor road only stop restricts left turns from the minor road, usually by the placement of a traffic diverter (also known as a "worm").	Same as Minor Road Only Stop above.	Class II bike lanes, Class IV separated bikeways, or striped shoulders can be placed on the major approaches.
All-Way Stop 	All legs into an intersection are required to stop. An all-way stop has limited capacity and works better when the legs have balanced volumes.	Pedestrian facilities are typically provided in an urban or urbanizing area or on a rural main street. In accordance with DP-37, pedestrian facilities should also be considered in other contexts. Curb extensions are potential enhancements.	Class II bike lanes, Class IV separated bikeways, or striped shoulders can be placed on the major approaches.
Signalized Intersection 	The traffic signal is best suited for high traffic volumes or where right-of-way is constrained. The cost for signalization is highly dependent on the amount of roadwork needed and can range between $400,000 to $2 million or more.	Pedestrian signals are placed at designated crosswalks. Leading pedestrian intervals and pedestrian scramble phases can enhance the pedestrian crossings.	Bicyclists follow the vehicular signal indications. Bicycle signals can be used in conjunction with a Class IV separated bikeway. Protected intersection features can reduce conflicts with vehicles turning right.

Type of Intersection Control	Description	Pedestrian Accommodation	Bicyclist Accommodation
Continuous Green T (YouTube) 	This variation of signalized intersection, typically at a rural location, provides a continuous free through movement for the top of the T.	Typically, no pedestrian accommodations are provided to cross the major street.	Bicyclists follow the vehicular signal indications.
Pedestrian Hybrid Beacon (YouTube) 	A pedestrian hybrid beacon provides positive control to give right-of-way to pedestrians crossing a major street. Warrants for a pedestrian hybrid beacon have lower volume thresholds than for a traffic signal, and there is less disruption to traffic flow as compared to a traffic signal. A pedestrian hybrid beacon costs slightly less than a typical signal, ranging between \$300,000 to \$1.5 million.	The pedestrian experience at a pedestrian hybrid beacon is similar to that of a traffic signal.	Bicyclists can utilize a pedestrian hybrid beacon the same as pedestrians.
Roundabout (YouTube) 	All approaches have yield control, and splitter islands reduce speeds of approaching vehicles. The cost of a roundabout can vary from \$500,000 for a temporary roundabout with minimal pavement and concrete work to \$10 million or more for a multilane roundabout.	Crosswalks can be provided across all approaches of a roundabout as needed. Crossings at multilane approaches may be enhanced with the placement of rectangular rapid flashing beacons.	Bicyclists may travel through the roundabout with vehicles or on a shared used path, if provided.

Type of Intersection	Description	Pedestrian	Bicyclist
Displaced Left-Turn Intersection (YouTube) 	Left turns are relocated to the opposing side of approaching traffic with an upstream traffic signal. The main intersection is a two-phase signal. A large footprint is required. No displaced left-turn intersections are currently in California.	Multiple signalized crossings are needed to cross the legs.	Bicyclists can use a shared use path, if provided.
Median U-Turn (YouTube) 	Left turns are prohibited on both the major and minor streets and facilitated by having a U-turn movement on only the major street downstream of the intersection. This configuration is for signalized intersections, results in some out-of-direction travel, and is typically used where there is a wide center median. At narrower medians, the U-turn movement can be accommodated by using a loon to allow large vehicles turn.	Crossings are signalized and can have two stages across the major street.	Separated bikeways, shared use path, and/or bike boxes can be placed to accommodate bicyclists making left turns at the intersection.

Type of Intersection	Description	Pedestrian	Bicyclist
Restricted Crossing U-Turn 	Through and left-turn movements are prohibited from the minor street. The movements are accommodated with a U-turn movement downstream of the intersection, necessitating some out-of-direction travel. Restricted crossing U-turns can be signalized or unsignalized and are typically on expressway-type facilities.	Restricted crossing U-turns are typically in rural environments and do not have controlled crossing. A crosswalk can be placed through the median.	Bicyclists can be facilitated by having a cut-through in the median.
Jughandle (YouTube) 	Left turns are removed from the major street and redirected to the minor street with either a diamond-style ramp or loop downstream of the intersection. A large footprint may be needed to accommodate all movements, and there is out-of-direction travel for some turning movements.	Pedestrians are accommodated similarly to a conventional signalized intersection.	Bicyclists are accommodated similarly to a conventional signalized intersection.

Type of Intersection Control	Description	Pedestrian Accommodation	Bicyclist Accommodation
Quadrant Roadway (YouTube)  	All left-turn movements are eliminated at the main intersection and re-routed through a connector roadway at one quadrant of the intersection. Out-of-direction travel is required for some turning movements.	Pedestrians use conventional signalized crosswalks.	For left turns, bicyclists can use a bike box or shared use path, if provided.
Thru-Cut (YouTube)  	Through movements are prohibited from the minor street and are accommodated by making a right or left turn and then turning at the next street or by making a U-turn on the major street to travel back to the intersection to make a right turn. Thru-cuts are generally signalized.	At a signalized thru-cut, pedestrians use conventional signalized crosswalks.	At a signalized thru-cut, bicyclists may use a signalized crosswalk to cross the major street.
Echelon (YouTube)  	One approach of each street is elevated, and the result is two one-way signals with efficient two-phase operation.	Pedestrian facilities are provided along the at-grade portion of the intersection.	Bike lanes can be provided for all legs of the intersection. A shared use path can also be provided along the at-grade portion of the intersection.

Type of Intersection Control	Description	Pedestrian Accommodation	Bicyclist Accommodation
Center Turn Overpass 	The left-turn movements ascend to an elevated portion of the intersection controlled with a two-phase signal with left-turn only movements. The main portion of the intersection also operates with two phases.	Pedestrian facilities are provided along the at-grade portion of the intersection.	Bike lanes can be provided for all legs of the intersection. A shared use path can also be provided along the at-grade portion of the intersection.
Diverging Diamond Interchange (YouTube) 	The diverging diamond interchange is a high-capacity interchange design that can be cost-effective to implement for an existing diamond interchange. The signals have efficient two-phase operation. Cost can range between $20 million to $30 million for retrofitting a diamond interchange.	Either median or outer walkways can be provided. Either configuration requires four crossings of traveled ways. A grade separated shared used path can also be provided and would eliminate all vehicular crossings but would increase the distance that a pedestrian would need to travel.	Bicyclists can be accommodated in bike lanes, and the pedestrian walkways can be designed as shared use paths.

Appendix B: ISOAP Forms

The ISOAP forms below can be found on the Caltrans Intersection Safety and Operational Assessment Process web page.

Stage 1 of ISOAP: Screening and Preliminary Assessment						
Prepared by:				Date		
Cty-Rte-PM				Project EA		
Major Street		Speed Limit		ADT	Existing	
					Future	
Minor Street		Speed Limit		ADT	Existing	
					Future	
Place Type				Design Vehicle		

Project Description (scope, intended project outcome, etc.)	
Existing Conditions (intersection configuration and surrounding land use):	
Multimodal Context (describe pedestrian, bicycle, and transit activity in area)	

Strategy Feasibility (for each strategy considered, provide a summary of initial safety and operational assessments, accommodations of pedestrians and bicyclists, and/or constraints, note any impacts to transit or freight; add rows as needed for additional strategies):	
Strategy 1	
Strategy 2	
Strategy 3	
Strategy 4	

Rejected Strategies (describe any notable strategies that satisfy the Safe System Approach but were rejected):

Recommendation (discuss if there is a need to proceed to Stage 2 and with which strategies):

Include attachments as needed.

Stage 1 Control Strategy Worksheet (Optional)					
Prepared by:				Date	
Cty-Rte-PM				Project EA	
Major Street		Existing AADT		Speed Limit	
Minor Street		Existing AADT		Speed Limit	

Control Strategy	**Is it a viable strategy? (Y/N)**	Meets intended project outcomes (Y/N)	Warrants met (if applicable) (Y/N)	Performs acceptably (Y/N)	Addresses peds and bikes (Y/N)	Acceptable impacts to R/W and env. (Y/N)
Minor Road Stop						
Right In/Right Out						
3/4 Movements						
All-Way Stop						
Traffic Signal						
Continuous Tee Signal						
PHB						
Roundabout						
Displaced Left-Turn						
Median U-Turn						
RCUT						
Jughandle						
Quadrant Roadway						
Thru-Cut						
Echelon						
Center Turn Overpass						
DDI						

Stage 2 of ISOAP: Detailed Engineering Assessment						
Prepared by:				Date		
Cty-Rte-PM				Project EA		
Major Street		Speed Limit		ADT	Existing	
					Future	
Minor Street		Speed Limit		ADT	Existing	
					Future	
Place Type				Design Vehicle		

Project Description (scope, need and purpose, etc.)	
Future Conditions (surrounding land use):	
Future Multimodal Context (describe future pedestrian, bicycle, and transit activity in area)	

Operational Analysis Summary (for each viable strategy, describe performance and measure of effectiveness, such as daily person hour delay, or volume to capacity ratio, and queue accommodation):	
Strategy 1	
Strategy 2	
Strategy 3	
Strategy 4	

Safety Performance (predicted crashes):	
Strategy 1	
Strategy 2	
Strategy 3	
Strategy 4	

Performance-Based Analysis Matrix (include operational and safety performance, life-cycle cost estimate, and benefit-cost ratio or Cost to State for new facilities):

	Capital Cost	Service Life	Delay Cost	Collision Cost	Maint Cost	Life-Cycle Cost	Benefit/ Cost
Strategy 1							
Strategy 2							
Strategy 3							
Strategy 4							

Recommendation (describe recommended strategy including discussion of accommodations for bicyclists and pedestrians and how it supports the Safe System Approach):

Include attachments as needed.

Appendix C: Abbreviations

CAP-X – Capacity Analysis for Planning of Junctions

DEER – Design Engineering Evaluation Report

DIB – Design Information Bulletin

DP – Director's Policy

DPHD – Daily Person Hours of Delay

FHWA – Federal Highway Administration

HDM – Highway Design Manual

HSM – Highway Safety Manual

ICE – Intersection Control Evaluation

ISOAP – Intersection Safety and Operational Assessment Process

LDR – Local Development Review

LOS – Level of Service

MOE – Measure of Effectiveness

NCHRP – National Cooperative Highway Research Program

PA&ED – Project Approval and Environmental Document

PDPM – Project Development Procedures Manual

PEER – Permit Engineering Evaluation Report

PDT – Project Development Team

PID – Project Initiation Document

QMAP – Quality Management Assessment Process

SHOPP – State Highway Operation and Protection Program

SHSP – Strategic Highway Safety Plan

SPICE – Safety Performance for Intersection Control Evaluation

SSI – Safe System for Intersections

STAA – Surface Transportation Assistance Act

TOPD – Traffic Operations Policy Directive

Local Development Review Program

February 2024

LOCAL DEVELOPMENT REVIEW (LDR) SAFETY REVIEW PRACTITIONER'S GUIDANCE

Prepared by the Caltrans Division of Safety Programs

LOCAL DEVELOPMENT REVIEW PROGRAM

LOCAL DEVELOPMENTAL REVIEW SAFETY REVIEW PRACTITIONERS GUIDANCE

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Safety Review Screening Criteria

Developments are not required to go through a safety review if they meet **both** of the following criteria. Staff can refer to the ***LDR Safety Review Screening Guidelines (Appendix E)*** for detailed information.

- ☐ The project makes no physical modification in the State Highway System (SHS) right-of-way, and;
- ☐ The project results in zero additional trips by any mode on the SHS.

1. Purpose

This Local Development Review (LDR) Safety Review Practitioners Guidance (Guidance) provides instructions to the California Department of Transportation (Caltrans) personnel who conduct road safety reviews for proposed land use projects and plans affecting the State Highway System (SHS), within the scope of the LDR process. This Guidance replaces the guidance issued in December 2020 as part of the Traffic Safety Bulletin (TSB) #20-02-R1, titled *Interim Local Development Intergovernmental Review Safety Review Practitioners Guidance*.

This Guidance establishes the recommended transportation safety impact review process for Caltrans and lead agencies for evaluating proposed land use projects. While this Guidance is intended to be used for projects affecting the SHS, it can also be used by lead agencies, developers/applicants, and consultants as a model for analyzing the safety impacts of proposed land use projects and plans on local roadways. This Guidance prioritizes vulnerable road users (VRU)[1] and underserved communities; enhances safety for pedestrians, bicyclists, transit, and vehicular modes; and applies both reactive and systemic perspectives.

This Guidance supports the shift away from using Highway Capacity Manual Level of Service (LOS) as a metric of analysis under the California Environmental Quality Act (CEQA), in accordance with implementing *Senate Bill 743*, and complements the "***Vehicle Miles Traveled-Focused Transportation Impact Study Guide" (TISG***) (dated May 20, 2020). It is intended that the safety reviews described herein are complementary to the broader LDR process.

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[1] FHWA defines Vulnerable Road Users as non-motorists such as a pedestrian or bicyclist. The full definition can be found here: **https://highways.dot.gov/sites/fhwa.dot.gov/files/2022-10/VRU%20Safety%20Assessment%20Guidance%20FINAL_508.pdf**

This Guidance aims to improve consistency and transparency of the safety review process, as part of the LDR process, and to facilitate sustainable development while improving safety on the SHS. The safety review process, as part of the LDR Program, is not intended to replace the encroachment permit review process.

2. Background

The Caltrans LDR Program is the conduit for reviewing projects and plans that could impact the SHS. The LDR Program aims to provide recommendations that encourage land use decisions to closely align with state transportation planning priorities, goals, policies, and plans for all land uses, so that these decisions do not impact the safety of the SHS. The LDR Program also evaluates studies and reports related to proposed developments, to ensure they analyze and document impacts, and that mitigation measures or project features avoid or minimize impacts to the SHS.

Caltrans has set a goal to reach zero traffic-related fatalities and serious injuries in California by 2050, which is part of the Federal Highway Administration's (FHWA) nationwide zero fatalities goal. The implementation of safety review into the LDR process will be a key strategy to reducing these collisions. Caltrans encourages lead agencies to develop Local Roadway Safety Plans (LRSPs), Systemic Safety Analysis Reports (SSARs) or Vision Zero Plans that create a framework to systematically identify and analyze traffic safety issues and recommend traffic safety improvements. Caltrans also encourages lead agencies to complete traffic safety impact analyses as part of their CEQA review process.

This Guidance builds off existing Caltrans policy and guidance, such as *Director's Policy 36 (DP-36)* and *Deputy Directive 25 (DD-25)*. DP-36 outlines a vision to eliminate fatalities and serious injuries on California roadways by 2050. DD-25 outlines the purpose and goals of the LDR program.

This Guidance supports the *Strategic Highway Safety Plan (SHSP)* goals and guiding principles. The guiding principles of the SHSP are to Integrate Equity, Double Down on What Works, Accelerate Advanced Technology, and Implement **the Safe System Approach**. The Guidance demonstrates that Caltrans can:

- Integrate equity into the safety review process by identifying improvements beneficial to underserved populations.

- Double down on what works by prioritizing countermeasures that have been proved to reduce fatalities and severe injuries.
- Implement advanced technology on roadways where appropriate.
- Support the implementation of the Safe System Approach (SSA) in the safety review process by promoting a proactive safety process and emphasizing that safety is the responsibility of both roadway owners and users.

Working in conjunction with other statewide safety plans such as the *Highway Safety Improvement Program (HSIP)*, *the California Office of Traffic Safety (OTS) Highway Safety Plan*, and the *Commercial Vehicle Safety Plan*, the SHSP provides guidance that will influence the development of goals, strategies, and performance measures for stakeholders working to improve safety throughout California, with a goal to reduce traffic fatalities to zero. The Guidance supports Section 1.2 of the TISG by providing clarity on how to perform safety analysis in a transportation impact analysis. These LDR guidelines address how to increase safety for VRUs through Proven Safety Countermeasures.[2]

The LDR Program focuses on projects in which Caltrans serves as a reviewing or commenting agency and is not the lead approval entity. Caltrans, through LDR, is a Responsible or Commenting Agency for CEQA and National Environmental Policy Act (NEPA). Many proposals can directly or indirectly impact the SHS even if the proposed activity, project, or plan is several miles from a state facility. Off-system projects of Statewide, Regional, or Areawide Significance (See CEQA Section 15026), can impact the SHS as well as generate additional vehicle miles traveled (VMT) and increase greenhouse gas (GHG) emissions. Agencies overseeing the development of these projects submit documentation to Caltrans directly or, if acting under CEQA, via the Governor's Office of Planning and Research (OPR) State Clearinghouse website, which regularly notifies Responsible or Commenting State Agencies via email. Project information may include environmental documents, land use plans, public notices, and other CEQA/NEPA and non-CEQA/NEPA documents. **Table 1** shows some example CEQA documents often involved with the LDR process and their timelines for review.

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[2] Caltrans' Proven Safety Countermeasures can be found here: **https://dot.ca.gov/programs/safety-programs/proven-safety-countermeasures**. FHWA's Proven Safety Countermeasures can be found here: **https://highways.dot.gov/safety/proven-safety-countermeasures**

Table 1 Typical CEQA Documents and Associated Comment Periods

Document	Comment Period
Initial Study (IS)	30-day
Notice of Preparation (for DEIR)	30-day
Negative Declaration (ND)	20-to-30-day (as specified)
Environmental Impact Report (EIR)	30-to-60-day (as specified)

Caltrans' Division of Transportation Planning maintains a centralized statewide database known as the Geo-based Tracking System (GTS) that maps and stores local development projects, plans, documents, and staff recommendations.

3. Scope

The scope of the safety review is dependent on multiple factors, including the type of state highway facility affected and the relative impact of the development to the SHS. The level of impact can vary according to the proximity, scale, type of development, amount of multimodal traffic using or crossing the state facility or through direct modification of state facilities to accommodate new access, new traffic patterns, or increased traffic volume. The land use context of the facility also impacts the likely mode splits and types of conflict that will probably be introduced. The following sections outline how to use Caltrans safety challenge areas and facility types to determine the context of the safety review.

3.1 Using SHSP Challenge Areas to Determine Safety Review Context

As part of the SHSP, Caltrans has identified several safety challenge areas statewide that the Caltrans district traffic safety reviewer should consider when conducting a safety review.

The following six challenge areas were identified as high priorities in California as they represent the greatest opportunity to reduce fatalities and severe injuries:

- Lane Departures
- Impaired Driving
- Speed Management
- Pedestrians
- Bicyclists
- Intersection

The Caltrans district traffic safety reviewer should be familiar with the safety challenge areas, and the current and past initiatives related to those SHSP challenge areas. The *California SHSP Action Tracking Tool* is available for Caltrans staff to review the monitoring program results of the current statewide safety initiatives. The table titled "Potential Safety Review Considerations by SHSP Challenge Area" on page 18 of **Appendix A** outlines potential factors that safety reviewers consider depending on roadway and local area context, organized by SHSP challenge area. Not all considerations will be appropriate for all projects and locations.

3.2 Using Facility Types to Determine Safety Review Context

The type of facility can be used to determine the context of the review. The focus areas listed in **Table 2** are not intended to limit the appropriate scope of a context sensitive safety review, but to set an expectation of the most probable impacts to a given type of facility. **Table 2** summarizes the different facility types, relevant characteristics, and areas of focus during a safety review along the specific facility types. Special attention should be paid at all locations to the impacts of pedestrians, bicyclists, and transit users. Where possible, the facilities utilized by these groups should be maintained or improved.

Table 2 Facility Types, Characteristics, and Focus Areas

Facility Type	Relevant Characteristics	Safety Review Focus Areas
Rural two-lane conventional highways	Higher speeds with lower volumes, likely do not have significant bicycle or pedestrian volumes	Speed control, access management (driveways, intersections, and roundabouts), prevention of lane departures via alignment standards or delineation/signing, roadside clear recovery zone concepts, and providing rural area appropriate accommodations for bicycles and pedestrians
Suburban or urban conventional highways that may include a center two-way left-turn lane	Higher volumes and may include more multimodal traffic	Speed management, access management, accommodations for bicycles and pedestrians, traffic control devices (driveways/intersections/roundabouts), and conflict avoidance

Facility Type	Relevant Characteristics	Safety Review Focus Areas
Expressways that have been built for higher speeds and higher traffic volumes	Often accommodate bicycles and pedestrians, these facilities have high levels of traffic stress and are not comfortable for VRUs	Access management (acceleration/deceleration lanes or ramps), traffic control devices, conflict avoidance, appropriate speed control, and safer accommodation for bicycles and pedestrians, particularly at crossings
Rural multi-lane conventional highways	High volumes and high speeds	Speed management, access management (intersections and roundabouts), prevention of lane departures via alignment standards or delineation/signing, roadside clear recovery zone concepts, and providing rural area appropriate accommodations for bicycles and pedestrians, particularly at crossings
Multi-lane suburban and urban conventional highways	Higher speeds and will also include bicycle and pedestrian amenities	Speed management, accommodations for bicycles and pedestrians, traffic control devices (intersections and roundabouts), and conflict avoidance, particularly at intersections and driveways
Rural divided conventional highways (with separate alignments)	These highways often operate similarly to expressways	Access management (intersections, driveways, and roundabouts), conflict avoidance, appropriate speed control, and safer accommodation for bicycles and pedestrians, particularly at crossings
Urban divided conventional highways (with separate alignments)	Typically operate at lower speeds than rural counterparts but faster than other urban corridors	Speed management, accommodations for bicycles and pedestrians, traffic control devices (intersections and roundabouts), and conflict avoidance, particularly at intersections and driveways

Facility Type	Relevant Characteristics	Safety Review Focus Areas
Limited access freeway facilities	Designed to operate as free-flowing traffic at high speed, some freeways do permit bicycle and pedestrian access due to the lack of alternative routes, these facilities are not designed to be multimodal facilities	Points of controlled access (ramps), conflict avoidance (weaving, entering, existing maneuvers, ramp crossings), correlation between collisions and design standards such as widths and alignment, where appropriate, separation of VRUs users from vehicular traffic, and prevention of wrong-way driving

3.3 Additional Factors to Consider When Conducting Safety Reviews

The specific impact of developments to the SHS can also be determined by reviewing the following:

- Proximity of the development to the state highway facility.
- The number of multimodal trips added to the state highway facility or multimodal trips that need to cross the facility as the result of the development.
- The number of automobiles, heavy vehicles (trucks), bicycle, and pedestrian trips added to the state highway facility.
- Modification of access (including driveways and street parking), control, capacity, traffic patterns, or lane configuration to state highway facilities.
- Number of conflict points created or removed due to the development.

If an SHS facility is studied as part of a development's Transportation Impact Analysis (TIA), then a safety review is part of the LDR process and district Traffic Safety will be one of the functional reviewers.

If the initial TIA submitted to Caltrans by the developer does not include a safety analysis that provides the necessary information or considerations, the district LDR coordinator should request a safety analysis be included in the TIA, before completing the LDR review process.

Due to the varied nature of development, the difficulty of separating existing safety performance from that caused by development-related traffic, and the specific contexts of facilities across the state, there is no defined threshold of significance for assessing safety impacts. Instead, at the TIA scoping meeting, the developer/applicant, local agency, and safety reviewer must determine what safety mitigations are required through a reasonable and realistic review of the actual impacts each development will have on the SHS. The significance of impacts should be determined with careful judgment on the part of a public agency and based, to the greatest extent possible, on scientific and factual data consistent with Caltrans' CEQA guidance contained in Caltrans' Standard Environmental Reference (SER), Chapter 36, "Environmental Impact Report," the CEQA guidelines found in the California Code of Regulations, Title 14, Division 6, Chapter 3, Article 5, Section 15064(f), "Determining the Significance of the Environmental Effects Caused by a Project.", the California Association of Environmental Professionals CEQA Statue & Guidelines document, and the Highway Design Manual.

Automobile congestion or delay itself does not constitute a significant environmental impact (Public Resources Code, §21099(b)(2)), and traffic safety should not be used as a proxy for road capacity.

3.4 Freeway Congestion Safety Considerations

Freeway congestion–related crashes should not be the focus of the LDR safety review. The intent of the Guidance is to provide an outline for when queuing should be reviewed for traffic safety impacts. A review does not necessitate the need for traffic safety mitigation but is to evaluate whether a significant safety impact based on speed differential may occur. Subsequently, the significance of that traffic safety impact by the project must be determined on a case-by-case basis. The Guidance recognizes the fluid nature of freeway exit ramp queuing, and the difficulty in developing a nexus to any one project.

When there are potential safety impacts, Traffic Operations may perform or review a freeway queuing analysis, pursuant to **Appendix B**. If a potential safety impact is identified, Traffic Operations will bring it to the attention of the Safety Reviewer. See **Appendix B,** "Freeway Exit-Ramp Queuing Analysis," for additional information based on the City of Los Angeles Interim Guidance for Freeway Safety Analysis.

4. Safety Review Process, Considerations, and Roles

4.1 Safety Review Process and Considerations

When the safety reviewer uses engineering judgement to determine that no safety review is necessary, the safety reviewer will document why the safety review is not needed in the GTS and the Type IR TIR (if one is opened). This documentation should specify the reason why the safety review is not needed. Refer to Safety Review Screening Criteria previously mentioned in this Guidance.

If a safety review is determined to be necessary during the initial scoping review, the safety reviewer will provide a request and scope to the district LDR coordinator for the safety analysis to be included in the TIA and will provide the requested safety analysis procedure. This includes the application form for the developer to request the appropriate Caltrans safety database information to conduct their analysis. The district LDR coordinator will forward the requested information to the lead agency or developer/applicant. The Caltrans Safety Data Request form can be found in **Appendix C.** Requesting additional information for safety reviews does not stop the clock on the CEQA review timeframe that is set by the local agency.

In some cases, Caltrans may not require a safety analysis to be completed by the developer/applicant, and in such cases, district staff may conduct the safety analysis. The process for developing a safety analysis is included in **Appendix D.**

The developer/applicant would complete its TIA including the appropriate safety study, and work with the local agency to submit it to the Caltrans LDR team for review.

The safety reviewer will first determine that the safety analysis was conducted according to the requested scope, and if not, will request updated information as appropriate. If the study was conducted according to the requested scope, the review team will verify that the analysis findings are correct and consistent with the inputs and proposed project elements. The reviewer will also compare the proposed development plan to existing Caltrans and local safety plans for consistency and best practices.

The district safety reviewer should use the latest HSIP Guidelines from Caltrans Division of Safety Programs to identify existing safety issues. Existing traffic safety issues on the SHS should be investigated via Type O investigation for resolution by Caltrans. Locations with existing safety issues that may be affected by the proposed development project should be reviewed for additional or alternate safety improvements to mitigate the increased conflicts.

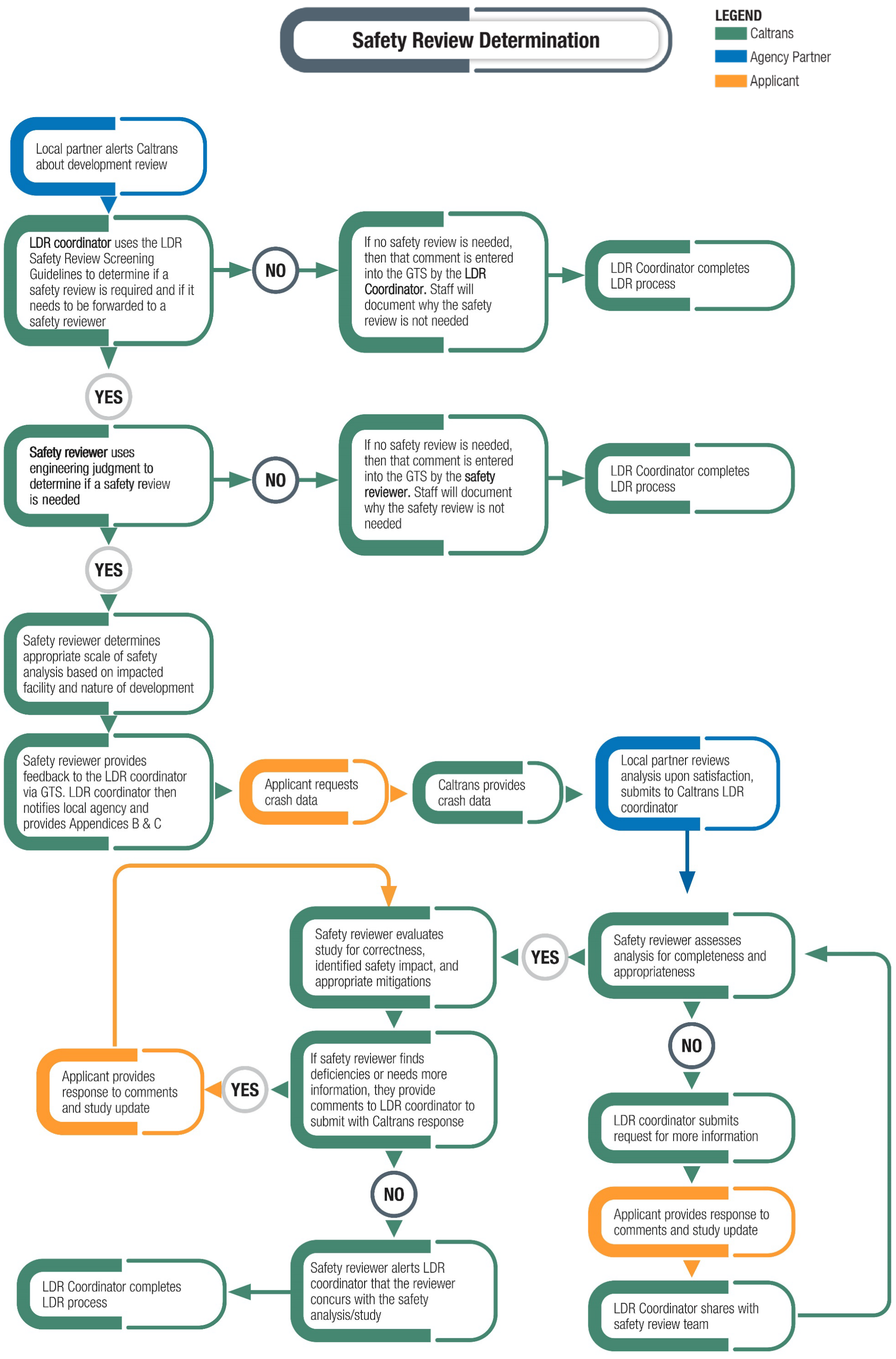
Mitigation strategies for these safety impacts should not be vehicular capacity-increasing. Mitigations should not prioritize vehicle operations over pedestrian and bicycle safety. Other mitigation strategies should not degrade safety, mobility, or accessibility for VRUs.

If significant safety impacts are identified in the TIA, the reviewer will evaluate the proposed mitigations to ensure consistency with current best practices, and that they are appropriately addressing the safety impact. For mitigation to be appropriate, the reviewer must identify a direct causal connection between the project and the impact.

The safety reviewer will then work with the LDR coordinator to incorporate any comments or requests into a response letter from Caltrans to the lead agency.

The safety review determination process is shown in **Figure 1**.

Figure 1. Safety Review Determination Process



4.2 Roles and Responsibilities

The roles and responsibilities for each party involved in the safety review process are outlined below.

The Caltrans district LDR coordinator is responsible for the following activities:

- Serve as primary point of contact with lead agency and developer/applicant as necessary. Tasks include scheduling meetings, requests for additional information, and other general correspondence
- Use the Safety Review Screening Criteria to determine if the proposed project needs to be forwarded to the safety reviewer
- Request that a safety analysis be performed, if the safety reviewer determine that it is needed, and if not included in the initial submittal
- Shares submitted materials with safety review team to receive a determination if a safety review is needed
- Provide a letter on Caltrans letterhead with scope of required safety review methodology to the lead agency and developer/applicant
- Provide a request form for Caltrans safety crash data summary (Appendix C) to the local agency to forward to the developer/applicant
- Provide safety reviewer's comments/recommendations to the lead agency

The safety reviewer is responsible for the following activities:

- Consult with Traffic Operations, Planning, and/or Design and Maintenance when pertinent to consider access management, intersection controls, capacity, travel patterns, or lane configuration on state highway facilities
- Review existing Caltrans and local safety plans for consistency and best practices, use Caltrans' latest HSIP Guidelines from the Division of Safety Programs to identify existing safety issues
- Determine if safety analysis is required and define the scope of the safety analysis
- Review safety analysis as it relates to the SHS, evaluate proposed mitigation(s) for appropriateness in addressing the safety concern(s) and for compliance with best practices

- Provide Caltrans safety database crash data summary for safety analysis to the LDR coordinator upon receiving a completed request form in Appendix C and a California Public Records Act (CPRA) request if required
- Review whether Caltrans safety database information was interpreted correctly in the TIA
- Review Caltrans current and proposed projects for any planned safety improvements in the project area
- Review the projected safety impacts for consistency with engineering standards
- Compile the results of the safety analysis into a Traffic Investigation Report (TIR) and send comments/recommendations to the district LDR coordinator for the project, via GTS

Traffic Operations is responsible for the following activities:

- Review or perform needed operational analyses (e.g., freeway exit-ramp and/or intersection queuing analysis)
- Collaborate with Planning and safety reviewer regarding access management, intersection controls, capacity, travel patterns, or lane configuration on state highway facilities

The developer/applicant is responsible for the following activities:

- Request Caltrans crash data summary for the involved SHS facilities
- Conduct a transportation impact analysis that includes a safety review

The Lead agency is responsible for the following activities:

- Determine that the safety analysis complies with local requirements
- Review overall analysis and trip generation and VMT estimates
- Ensure the project is consistent with the lead agency's current plans and local growth priorities

5. Process for Conducting Review

The LDR coordinator will work with the safety reviewer to assess the potential safety impact of the project, and whether a safety review is needed. If it appears that a safety review will be needed, the safety reviewer completes a Phase 1 screen (see **Figure 2**).

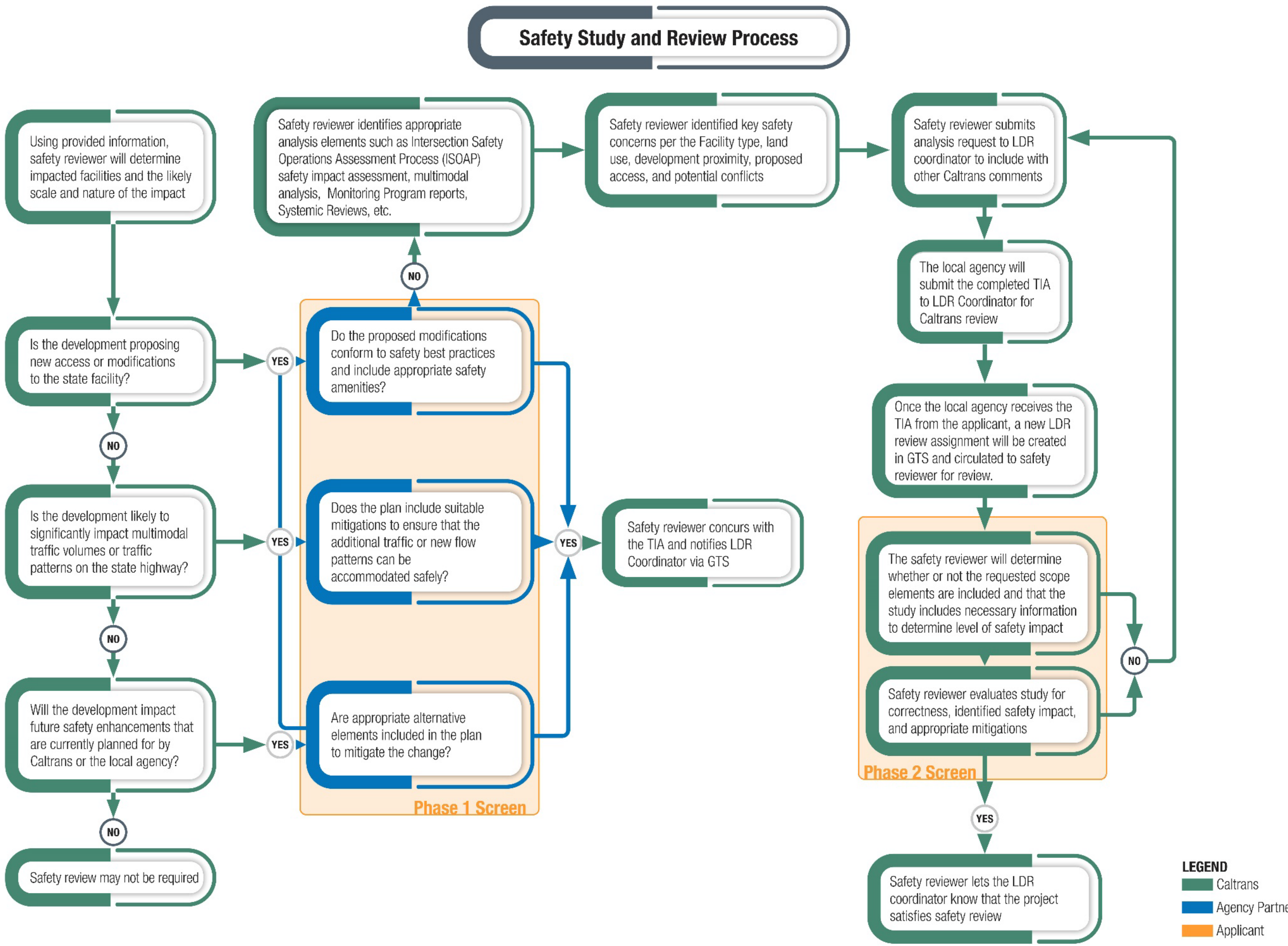
A Phase 1 screen includes the following steps:

- Check if the proposed modifications conform to safety best practices and include appropriate safety countermeasures
- Determine if the plan includes suitable mitigations to address the safety impacts

The Phase 1 screening aims to provide any initial suggestions that would make the development more likely to meet safety goals (such as reducing fatalities, serious injuries, and conflicts with pedestrians and bicyclists). If the project appears to not have the necessary considerations to manage safety risks, the safety reviewer will define the scope and recommend a safety analysis process (as shown in **Appendix D**) to include with Caltrans' response. Upon receipt of the completed TIA with the recommended safety analysis, the safety reviewer will conduct a Phase 2 screen (see **Figure 2**).

The Phase 2 screen assesses the completeness, correctness, and appropriateness of the study's proposed safety mitigations. Safety data used in this process can be from Caltrans safety database data, results from the Monitoring Program and Table C/Wet Table C Reports, or any systemic review of the area or facility (such as a Local Road Safety Plan or District Safety Plan). Safety reviewers can refer to the Caltrans State Highway Safety Improvement Program (HSIP) Guidelines and *FHWA Proven Safety Countermeasures* for current safety countermeasures for appropriate mitigations/alternatives. **Figure 2** outlines the LDR safety review process.

Figure 2. Safety Study and Review Process



6. Final Steps

Once the safety review process has been completed, the methods and results of the safety analysis are documented in the Type IR TIR, after which the recommendations are submitted to the district LDR coordinator via GTS. The safety reviewer will assist the district LDR coordinator with incorporating safety-related comments into the comment letter that will be sent to the lead agency.

Satisfactory completion of the LDR review process, including this safety review, is required before Caltrans issues encroachment permits to the developer/applicant or its contractors.

Caltrans will evaluate the LDR review process and Type IR investigations guidance in 2026 to determine if additional updates are needed.

Appendix A

Potential Safety Review Considerations by Strategic Highway Safety Plan (SHSP) Challenge Area

Table 3 Potential Safety Review Considerations by Relevant SHSP Challenge Areas

	Facility Access	Active Transportation Environment	Mode Split	Vehicle Speed	Traffic Control	Traffic Volume	New Conflicts
Bicycles	Accommodations for bikes at intersections, including bike detection, bike specific signal heads, bicycle leading interval, phase separations to prevent conflicting movements. Consider direct and exclusive bicycle access route(s) between the project and the SHS. Trail crossing(s) to facilitate access, as needed.	Reduce Level of Traffic Stress (LTS) and consider on-site amenities (secure bike parking) to encourage customers and employees to commute by bicycle.	Will the project generate or reduce the ratio of bike trips to vehicle trips?	Increase separation distance or width of bicycle lane where vehicle speeds are 35 MPH or higher.	Accommodations for bikes at intersections, including bike detection, bike specific signal heads, bicycle leading interval, phase separations to prevent conflicting movements.	Is there additional exposure for bicyclists?	Will new traffic patterns (driveways) conflict with an existing bikeway or bike lane?
Impaired Driving	Reduce the number of high severity conflict points (left turns across high speed traffic) between the project and SHS.	Are separate pedestrian and bicycle facilities available along desired paths of travel?	Alternative modal access (walking, transit, taxi/ridesharing)	Roadways with appropriate design speed	Minimize driver workload when navigating related intersections	Consider how off-peak traffic volumes affect roadway conflicts. Does reduced congestion off-peak increase prevailing traffic speeds and crash risk? Is it more difficult, or easier, for pedestrians and bikes to cross?	Highlight new conflict points that cannot otherwise be eliminated (Green conflict zones for bikeways, intersection lane markings to guide turning movements)
Intersections	Encourage project is using local roads for project access, rather than direct access to the SHS via driveways, to reduce conflict points on the SHS.	Accommodations for bikes and pedestrians, including Leading Pedestrian Intervals, high visibility crosswalks, pedestrian countdown heads. See FHWA Proven Safety Countermeasures for Pedestrian/Bicyclists and Intersections	Consider separate access points for vehicles from the other modes. Consider protected intersection designs.	Consider eliminating conflict points (crossing or turning movements) and adding speed management features.	Traffic Operations follows ICE process if appropriate to identify appropriate traffic control	Determine if roadway accounts for vehicle movements on all approaches	Traffic Operations follows ICE process if appropriate to identify any additional conflict created
Lane Departures	Site access points are designed to safely accommodate anticipated vehicle speeds	Pedestrian and bicycle facilities have adequate separation from vehicular traffic	Design speed appropriate for expected mode split	Facility design speed is appropriate for access density, curvature, and anticipated traffic patterns	Traffic control is appropriate for design speed and adequate warning indicators are included in the design	Design speed appropriate for expected volume	Design does not introduce conflicts that might require high speed maneuvers
Pedestrians	Consider direct and exclusive pedestrian access route(s) between the project and the SHS. Pedestrian crossing(s) to facilitate access, as needed.	Take note of existing pedestrian desire paths, and consider shortest distance/ paths between project and transit stops, and other pedestrian attractors (coffee shops, restaurants, convenience stores) for improvements.	Determine if there will be an increase or decrease in pedestrian volume	Separation from vehicle traffic, especially where vehicle speeds are high. Consider traffic calming measures, where appropriate	Accommodations for pedestrians at intersections with traffic control, including crosswalks and sidewalks	Identify areas with increased exposure for pedestrians	New traffic pattern where vehicles cross sidewalks or crosswalks
Speed Management	Design speed appropriate for access type and quantity	Appropriate separation for bicycles and pedestrians, such as raised crosswalk, separated bicycle lanes, and raised sidewalks	Design speed appropriate for expected mode split	Strategies to manage vehicle speed, including speed feedback signs, reduced lane widths, and changes to roadway design	Identify the traffic control appropriate for speed	Design speed appropriate for expected volume	Minimize driver workload and conflict as appropriate for design speed
Aging Drivers	Avoid uncontrolled conflict points in areas with high senior populations	Provide ADA accessible facilities for pedestrians (curb ramps, crosswalks, countdown heads)	Facility design that encourages walking and slower vehicles	Design speed is appropriate for context and land use	Provide advanced warning and minimize driver workload at intersections	Appropriate traffic control and access management for volume	Eliminate or reduce unprotected left turn movements at project access points where possible.
Commercial Vehicles	Does Commercial Vehicle (Truck) project generated trips warrant a separate access point from all other modes? Increased length acceleration and deceleration lanes needed?	Eliminate or reduce conflicts between modes by considering Speed Management, Ped/Bike, and Intersection FHWA proven safety counter-measure categories.	Identify if the development will result in an increase or decrease in commercial vehicle traffic	Design speed appropriate for expected truck volume	Traffic control and intersection design and signage directs commercial vehicles to appropriate routes and facilities	Design is appropriate for expected freight volume	Design eliminates or reduces potential for right-turn conflicts with commercial vehicles.
Distracted Driving	Access points include redundant signage and markers to attract driver attention	Active transportation facilities are well marked and separated from vehicular traffic - including raised sidewalks, raised crosswalks, separated bicycle lanes, and curb bulb-outs	Identify if the development will result in an increase or decrease in vulnerable road user traffic	Design speed is appropriate and traffic control devices are clearly visible	Traffic control includes redundancy to capture driver attention - including additional signal heads or signage	Facility design and signage captures driver attention even when volume is low	Access points include redundant signage and marker to attract driver attention
Young Drivers	Avoid uncontrolled conflict in areas such as high schools with inexperienced drivers	Provide well marked facilities for pedestrians and bicycles	Facility design encourages walking and slower driving	Design speed is appropriate for context and land use	Provide advanced warning and minimize driver workload	Appropriate traffic control and access management for volume	Avoid uncontrolled conflict in areas such as high schools with inexperienced drivers

Appendix B

Freeway Exit-Ramp Queuing Analysis

If the Project adds two or more car lengths to the ramp queue that will extend into the freeway mainline, then the location must be reviewed for traffic safety impacts. This review must evaluate speed differential between the off-ramp queue and the mainline of the freeway during the same period.

The review for traffic safety impacts is needed to determine if traffic safety mitigation is necessary. Not all instances of freeway off-ramp queueing require traffic safety mitigation.

Traffic safety mitigation shall not be requested under conditions where queuing already exists on a freeway exit ramp. This includes:

- Conditions where freeway exit-ramp queuing currently extends onto the mainline;
- Where queuing currently exceeds the length of a freeway auxiliary lane; or
- Where freeway traffic volumes currently cause freeway exit ramp turning lanes to exceed capacity.

Traffic safety mitigation may be requested if freeway exit ramp queuing does not occur under the existing condition, but project-generated traffic volumes will cause a queue to extend onto the freeway mainline, creating a speed differential of 30 mph or greater. Speed differentials in congestion related rear-end collisions that are 30 mph or greater have shown the potential to increase severe injury and fatal injuries exponentially as the speed differential increases above the 30-mph threshold[3].

The speed differential should be determined by identifying the operating speed of the freeway mainline lanes during the corresponding period during which the ramp is expected to experience project-related queue overflow. To determine the speed differential using a data-based approach, Caltrans Performance

[3] Current Understanding of the Effects of Congestion on Traffic Accidents, Angus Eugene Retallack and Bertram Ostendorf, 2019, and Relationships Between Crash Casualties and Crash Attributes, SAE International, 1997.

Measurement System (PeMS) data should be used to identify freeway operating speed(s) during the applicable period.

If reliable PeMS data are not available for the subject location(s), other sources of speed data including location-based data collection services from available sources could be used. If no reliable data can be obtained to determine speed differentials, then no traffic safety impact mitigation shall be requested.

If the speed differential between the mainline lane speeds and the ramp traffic is less than 30 mph, the project would be considered to cause a less-than-significant safety impact and no traffic safety impact mitigation shall be requested.

If the speed differential is 30 mph or more, then there is a potential safety impact. To offset this potential condition, the traffic safety review should consider requesting the following preferred traffic safety impact mitigation strategies:

- Transportation demand management program(s) to reduce the project's trip generation, which may include increased transit access, commute trip reductions such as rideshare programs, shared mobility facilities (bicycle or vehicular), increased bicycle and pedestrian infrastructure;

- Investments to existing active transportation infrastructure, or transit system amenities (or expansion) to reduce the project's trip generation; and/or

- Potential change(s) to the ramp terminal operations including, but not limited to lane reassignment, traffic signalization, signal phasing or timing modifications, turn lane extensions to accommodate the additional project traffic.

These traffic safety mitigations require Caltrans and the lead agency to coordinate early in the LDR process to discuss options, potential traffic safety mitigation, and agreement between Caltrans and the lead agency of the proposed traffic safety impact mitigation measure(s).

Appendix C

Caltrans Safety Data Request Form

Crash Data on State Highway System Request Form

Please complete this form to request crash data on the State Highway System (SHS):

1. Internal requesters shall submit this form to the respective District Traffic Safety office.
2. External requesters WORKING with Caltrans on SHS projects shall submit this form to Caltrans Engineers assigned to the projects or to the appropriate Caltrans District Public Information Office.
3. External requesters NOT WORKING on SHS projects may submit this form with a CPRA request. It is highly recommended to provide the necessary information on the form for Caltrans to process the request promptly. CPRA link: https://caltrans.mycusthelp.com/WEBAPP/_rs/(S(h2yg4jgtjvs3zld55xux1qsd))/supporthome.aspx

Per Caltrans' records retention policy for Traffic Safety and Traffic Accident Surveillance and Analysis System, crash data is only available for the most recent 10 complete calendar years plus the current year.

Requester Information:

Date Requested:		
Name	Title	Division/Office:
Address	Phone	Email

Crash Data Requested: Use the space below to describe your request and the basic data element desired. Data will be provided in PDF format only.

Request Date Range: Start Date: End Date: ☐ 1 year ☐ 3 years ☐ 5 years ☐ 10 years or Other (specify):	☐ Crash Count (# of crashes) ☐ Crash Rate
Severity Level: ☐ All **or:** ☐ Fatal ☐ Serious Injury ☐ Minor Injury ☐ Possible Injury ☐ PDO	
How data will be used (include any federal or state program): ☐ DSDD or Other (specify): Project EA# (if available):	
Location Description (*please include District, County, Route and Postmile info or lat/long): Location Tool Link: https://postmile.dot.ca.gov/PMQT/PostmileQueryTool.html?	

*If a request is for multiple locations, a separate listing can be attached to the form if needed.

If you have questions using this form, please contact crash.requests@dot.ca.gov

Last Modified: 12/1/22

Appendix D

Safety Analysis Process

SAFETY ANALYSIS PROCESS

Step 1: Data Collection

Crash Data:
3-5 years of most recent data including study areas crashes, injuries, and fatalities. This data set should include crash rates.

Volume:
Current multimodal volume on the study corridor. This should include crossing counts for bicycle, pedestrians, and a mode split breakdown.

Monitoring Reports:
This should check if the study segment or intersections have been flagged in safety monitoring reports. If so, note what issues and recommendations have been identified

Step 2: Existing Conditions

Crash Rates:

- Number of Crashes per Million Vehicle Miles Traveled
- Number of Injuries per Million Vehicle Miles Traveled
- Number of Fatalities per Million Vehicle Miles Traveled

Current Plans:
Identify any improvements from the Local Roadway Safety Plan (LRSP) or other relevant plans. Check for alternate corridor concepts in the TCR.

Known Deficiencies:
Identify facilities safety needs as noted in reference plans.

Step 3: Project Assessment

Volume:
Note expected changes in multimodal volume that would be caused by the project.

Mode Split:
Identify changes in mode split that the project is expected to make.

Physical Changes:
Identify proposed modifications to the State Facility.

Step 4: Impact Assessment

Crash Rates:
Will overall rates of injury/fatal crashes increase with proposed project? Safety reviewers can reference the TASAS rate group ADT

Modal or Vehicle Conflicts:
Will new traffic flows introduce new, or exacerbate existing conflicts between vehicles, pedestrians, and bicycles? Will the project create new unprotected vehicle movement across the State Facility?

Standards:
Are proposed changes inclusive of appropriate safety enhancements and consistent with current design standards?

Step 5: Mitigations

Site Layout and Access:
Are there alternative access and layout opportunities that could reduce a conflict and collision potential for vehicles, bicycles, and pedestrians?

Off-Site Improvements:
Are additional off-site improvements that would help site-related traffic get to and from the site more safely for all road users?

Appendix E

Safety Review Screening Guidelines

Local Development Review (LDR) Safety Review Screening Guidelines

Document Purpose

The purpose of this document is to guide LDR staff in screening a project that is subject to an LDR to determine if it needs to be forwarded to the safety reviewer. LDR staff should obtain project information from the lead agency and applicant and review the criteria below to determine if a safety review is required. The decision whether a safety review is needed and reasoning behind the decision should be recorded in the LDR Geo-based Tracking System (GTS).

Safety Review Screening Criteria

Developments are not required to go through a safety review if they meet **both** of the following criteria:

- ☐ The project makes no physical modification in the State Highway System (SHS) right-of-way
  - o Examples of physical modifications to the SHS right-of-way can include:
    - ▪ Installation of driveways, intersections, roundabouts, or other access points onto the SHS right-of-way
    - ▪ Installation of bicycle or pedestrian infrastructure on the SHS right-of-way
    - ▪ Installation of features such as signage, buildings, utility structures, or foliage on the SHS right-of-way
- ☐ The project results in zero additional trips by any mode on the SHS (Utility projects, underground infrastructure, etc.)
  - o This criterion should not only consider vehicle trips, but also trips made by pedestrians, bicyclists, and transit users
  - o The project is not expected to need a transportation impact review process or does not produce any new trips

If the project meets both criteria above, the LDR coordinator may not need to route the document to the traffic safety reviewer. The LDR coordinator should document this decision and process in the GTS with supporting documentation.

If the project does not meet both criteria above, the LDR coordinator should consult with the safety reviewer to determine the extent of the required safety review. The LDR coordinator should document this decision and process in the GTS with supporting documentation.