Appendix P – Transportation Assessment and Peer Review

FEHR & PEERS

TECHNICAL MEMORANDUM

Date: July 21, 2021

To: Troy Bourne, Spieker Senior Development
Dick Loewke, Loewke Planning Associates

From: Bill Burton, PE, Fehr & Peers

Subject: Spieker Walnut Creek – Draft Transportation Assessment

WC20-3699.00

This technical memorandum has been prepared to document our assessment of the potential transportation related impacts of your proposal to develop a continuing care retirement facility in Contra Costa County (adjacent Heather Farms Park in Walnut Creek). The project proposes the construction of 454 units on a 30.4-acre site accessed exclusively from Kinross Drive west of Ygnacio Valley Road. Of the units, 354 would be independent living units with 100 being health care center units (mixture of assisted living, skilled nursing, and memory care). Two gated emergency access (EVA) points would be provided, one connecting to North San Carlos Drive at the northerly end of the project site, and a second connecting to the extension of Seven Hills Ranch Road at the southwest end of the project site.

This study has been prepared in accordance with the methodology and requirements of Contra Costa County's *Transportation Analysis Guidelines* (Conservation and Development Department, Public Works Department, June 23, 2020). These new guidelines are consistent with the requirements of Senate Bill SB 743 which took full effect on July 1, 2020. The implementation of SB 743 eliminated the use of criteria such as auto delay, level of service, and similar measures of vehicle capacity of traffic congestion as the basis for determining significant impacts as part of California Environmental Quality Act (CEQA) compliance.

While no longer required as part of CEQA, Contra Costa County's *Transportation Analysis Guidelines* indicate that Level of Service (LOS) analysis may be required for the following conditions:

- Development projects that generate 100 or more net new peak hour trips,
- Development projects that add 50 or more net new peak hour trips to an intersection, or
- Development projects that create operational or safety concerns.

The proposed project was not found to satisfy any of these three conditions. Nevertheless, to provide information to the applicant and decision makers relative to the potential transportation related consequences of the project, focused analyses of area intersections have been undertaken in accordance with the County's guidelines. These analyses include both LOS and safety related assessments.

Project Description

The project proposes the development of a 454 unit continuing care retirement facility in unincorporated Contra Costa County. The 30.4-acre site would be located west of Ygnacio Valley Road just south of Heather Farms Park. **Figure 1** illustrates the project's proposed site plan. All vehicular access to the project site would be provided via Kinross Drive just west of the Marchbanks Drive intersection. A total of 594 on-site parking spaces would be provided in garages and surface parking lots located at various locations throughout the site. Gated emergency vehicle access points would be provided connecting to North San Carlos Drive on the site's north end and to an extension of Seven Hills Ranch Road near the site's southwestern corner. Pedestrians and bicyclists would also be able to use these EVA's for ingress and egress from the project site. Internal access within the project would be provided by an internal loop roadway system, as shown on Figure 1.

At full capacity, 560 total residents would live at the project site. A total of 225 employees would work at the site, and the following work shifts are anticipated:

- Early Morning Shift (7 AM to 3 PM) – 25%
- Standard Shift (9 AM to 5 PM) – 45%
- Late Afternoon Shift (3 PM to 11 AM) – 20%
- Night Shift (11 PM to 7 AM) – 10%

The project would provide a free shuttle system for project residents. The shuttle system would provide service connecting residents to the Walnut Creek BART Station as well as local retail establishments. While the exact shuttle service will change and evolve to meet the specific needs of the site's residents, the following services are anticipated based on typical provisions at other sites and the local landscape:

- Monday, Wednesday, and Friday early afternoon scheduled free service to six or more local shopping destinations within a 15-mile radius using a combination of small and large vans
- Monday through Friday free shuttle service for medical appointments using passenger vehicles
- Sunday free shuttle service to local places of worship using large vans
- Additional free shuttle service to museums, the theatre and sporting events on a scheduled basis using large vans
- Additional on-demand fee-for-service transportation for personal errands provided via Lyft

Existing Transportation System

Roadway Network

Ygnacio Valley Road

Ygnacio Valley Road is a six-lane, east-west divided arterial that extends from I-680 to Clayton Road, where it continues as Kirker Pass Road. The Central Contra Costa County Action Plan identifies Ygnacio Valley Road as a Route of Regional Significance. The posted speed limit on Ygnacio Valley Road in the Plan Area is 30 miles per hour (mph). Sidewalks are provided on both sides of the street through the study area; bicycles are allowed to ride on the sidewalk as Ygnacio Valley Road is a designated enhanced Class III bicycle route. No parking is permitted on this roadway.

Kinross Drive

Kinross Drive is a two-lane residential roadway running on a north-south curvilinear alignment. It connects Ygnacio Valley Road with Marchbanks Drive. Most of the roadway is a private facility passing through the Heather Farms residential development. This private roadway has a posted speed limit of 15 miles per hour which is reinforced through the presence of speed humps. On-street parking is not allowed on the private portion of Kinross Drive, but it is allowed on the short public portion (approximately 250 feet) on the Ygnacio Valley Road approach.

Marchbanks Drive

Marchbanks Drive is a two-lane collector roadway forming a loop north of Ygnacio Valley Road. It extends from its intersection at Ygnacio Valley Road/Tampico in the south to a tee-intersection with Ygnacio Valley Road approximately one-half mile to the northeast. On-street parking is permitted along Marchbanks Drive, which has a posted speed limit of 30 miles per hour. The roadway also provides a striped Class II bicycle lane for its extent.

Transit Service

County Connection

Fixed route bus transit service in the vicinity of the project site is provided by the County Connection. The County Connection provides bus transit service to communities throughout central Contra Costa County, including the cities of Pleasant Hill and Walnut Creek. County Connection is also a paratransit service provider. The study area is served by Routes 1, 92X, 93X, and 311. The routes connect the site to the Walnut Creek BART Station, Pleasant Hill BART Station, Concord BART Station, Antioch BART Station, Pleasanton ACE Station, San Ramon Transit Center, and many other local facilities and attractions. At the BART stations, connections to numerous other County Connection routes and other transit service providers are available. The closest bus stops to the project site are located at the intersections of Ygnacio Valley Road/Kinross Drive and Ygnacio Valley Road/Marchbanks Drive/Tampico.

Paratransit service within Contra Costa County is provided by the County Connection through LINK Paratransit. LINK Paratransit provides on-demand door-to-door service for eligible ADA patrons within the project's vicinity.

Bay Area Rapid Transit

Regional transit service in the study area is provided by the San Francisco Bay Area Rapid Transit (BART). The Walnut Creek BART station is located roughly 1.5 miles southwest of the project site, north of Ygnacio Valley Road and west of North California Boulevard. The station is on the Pittsburg/Bay Point line, providing direct service to downtown San Francisco. Passengers travelling to or from destinations on the Fremont, Richmond, or Dublin/Pleasanton lines are required to transfer, generally at the MacArthur BART station. Trains operate approximately between 4:30 a.m. and midnight on weekdays. Train frequency varies from 20 minutes on weekends, to 15 minutes during off-peak weekday, to 5 to 8 minutes during the peak commute hours.

The Pleasant Hill/Contra Costa Centre BART Station is also located in the vicinity of the project site and will serve project generated trips. The station is located just north of Treat Boulevard at Oak Road and can be directly accessed from the project site via the Iron Horse Trail by bicyclists and pedestrians. BART service at the station is like that provided at Walnut Creek as it is also on the Pittsburg/Bay Point line.

Pedestrian Facilities

Walkability is defined as the ability to travel easily and safely between various origins and destinations without having to rely on automobiles or other motorized travel. The ideal "walkable" community includes wide sidewalks, a mix of land uses such as residential, employment, and shopping opportunities, a limited number of conflict points with vehicle traffic, and easy access to transit facilities and services. Pedestrian facilities consist of crosswalks, sidewalks, pedestrian signals, and off-street paths, which provide safe and convenient routes for pedestrians to access the destinations such as institutions, businesses, public transportation, and recreation facilities. This section identifies pedestrian facilities in the transportation study area.

Pedestrian facilities in the study area include sidewalks, crosswalks, and pedestrian signals. A fairly complete system of sidewalks is provided to the east of the site; Marchbanks Drive, Ygnacio Valley Road and the public portions of Kinross Drive provide City standard sidewalks along both sides of the roadway. The private portion of Kinross Drive between Marchbanks Drive and Ygnacio Valley Road provides discontinuous sidewalks along one-side of the roadway (alternating sides in locations). Project related pedestrian travel could also access Seven Hills Ranch Road and North San Carlos Drive via the EVAs proposed on the northern and southern ends of the project site. Neither Seven Hills Ranch Road nor North San Carlos Drive provide sidewalks on the sections abutting the project site.

Bicycle Facilities

The City of Walnut Creek, which surrounds the project site, has a bicycle network that runs throughout the City. Bicycle facilities in the City of Walnut Creek include the following:

- Class I Bikeway (Bike Path) provides a completely separate right-of-way and are designated for the exclusive use of people riding bicycles and walking with minimal cross-flow traffic. Such paths can be well situated along creeks, canals, and rail lines. Class I Bikeways can also offer opportunities not provided by the road system by serving as both recreational areas and/or desirable commuter routes.
- Class II Bikeway (Bike Lane) provides designated street space for bicyclists, typically adjacent to the outer vehicle travel lanes. Bike lanes include special lane markings, pavement legends, and signage. Bike lanes may be enhanced with painted buffers between vehicle lanes and/or parking, and green paint at conflict zones (such as driveways or intersections).

- Class III Bikeway (Bike Route) provides enhanced mixed-traffic conditions for bicyclists through signage, striping, and/or traffic calming treatments, and to provide continuity to a bikeway network. Bike routes are typically designated along gaps between bike trails or bike lanes, or along low-volume, low-speed streets. Bicycle boulevards provide further enhancements to bike routes to encourage slow speeds and discourage non-local vehicle traffic via traffic diverters, chicanes, traffic circles, and/or speed tables. Bicycle boulevards can also feature special wayfinding signage to nearby destinations or other bikeways.

In the immediate vicinity of the project site, designated bicycle facilities area provided on Marchbanks Drive and Ygnacio Valley Road. Marchbanks Drive provides a striped Class II bicycle lane for its entire length. Bicycles are allowed to ride on the sidewalk as Ygnacio Valley Road is a designated enhanced Class III bicycle route. Bicycles are permitted to use all other roadway facilities near the project site.

The Iron Horse Regional Trail is a Class I multi-use path located approximately one-quarter mile west of the project site (and accessible via Seven Hills Ranch Road) that spans a distance of 32 miles and connects East Bay cities including Concord, Walnut Creek, Alamo, Danville, and San Ramon. This trail provides a direct linkage to the Pleasant Hill BART Station.

The Contra Costa Canal Trail, located just north of the project site, parallels the Contra Costa Canal, following a horseshoe-shaped path through central Contra Costa County. The trail intercepts a number of local parks in Pleasant Hill (Las Juntas Park), Walnut Creek (Larkey Park, Heather Farm Park), and Concord (Lime Ridge). It also makes connections to a number of regional trails, including the California State Riding and Hiking Trail, Briones-to-Mt. Diablo Trail, and the Iron Horse Trail.

Standards of Significance

This study incorporates the standards of significance of Contra Costa County as described in their *Transportation Analysis Guidelines* (Conservation and Development Department, Public Works Department, June 23, 2020).

VMT Screening Criteria

Absent substantial evidence indicating that a project would generate a potentially significant level of VMT, the following types of projects should be expected to cause a less-than-significant impact under CEQA and do not require further VMT analysis:

- Projects that:

- Generate or attract fewer than 110 daily vehicle trips; or,
- Projects of 10,000 square feet or less of non-residential space or 20 residential units or less, or otherwise generating less than 836 VMT per day.

- Residential, retail, office projects, or mixed-use projects proposed within ½ mile of an existing major transit stop[1] or an existing stop along a high-quality transit corridor[2].
- Residential projects (home-based VMT) at 15% or below the baseline County-wide home-based average VMT per capita, or employment projects (employee VMT) at 15% or below the baseline Bay Area average commute VMT per employee in areas with low VMT that incorporate similar VMT reducing features (i.e., density, mix of uses, transit accessibility).
- Public facilities (e.g. emergency services, passive parks (low-intensity recreation, open space), libraries, community centers, public utilities) and government buildings.

VMT Thresholds of Significance

For projects that do not meet the screening criteria, a proposed project should be considered to have a significant impact if project VMT is greater than:

- Residential Projects: 15 percent below the Countywide average home-based VMT per capita.
- Employment Projects (office, industrial and institutional projects): 15 percent below the Bay Area average commute VMT per employee.
- Regional Retail (>50,000 square feet): 15% below Bay Area average total VMT per service population.
- Mixed-Use Projects: 15 percent below the Countywide average total VMT per service population.

Additionally, Senate Bill 743 establishes the significance of a project's impact if it:

- Conflicts with a plan, ordinance, or policy addressing the safety or performance of the circulation system, including transit, roadways, bicycle lanes, and pedestrian paths (except for automobile level of service or other measures of vehicle delay).

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[1] Pub. Resources Code, § 21064.3 ("'Major transit stop' means a site containing an existing rail transit station, a ferry terminal served by either a bus or rail transit service, or the intersection of two or more major bus routes with a frequency of service interval of 15 minutes or less during the morning and afternoon peak commute periods.").

[2] Pub. Resources Code, § 21155 ("For purposes of this section, a high-quality transit corridor means a corridor with fixed route bus service with service intervals no longer than 15 minutes during peak commute hours.").

- Substantially induces additional automobile travel by increasing physical roadway capacity in congested areas (i.e., by adding new mixed-flow lanes) or by adding new roadways to the network.

Cumulative VMT Impacts

Cumulative impacts should be evaluated for consistency with the County General Plan (Envision 2040). For example, if a project is consistent with the County General Plan (Envision 2040) and the General Plan remains consistent with its VMT projections as originally analyzed, the project's cumulative impacts shall be less-than significant. However, if the project is inconsistent with the adopted County General Plan, then the analysis should evaluate the project's cumulative VMT impacts and determine if the Countywide VMT increases or decreases with the proposed project relative to the VMT generated by full General Plan buildout.

If the Cumulative plus Project analysis indicates that total VMT remains at or below the VMT generated by full General Plan buildout and the project is aligned with the County General Plan's relevant goals and policies, then the project would be considered to have a less-than significant cumulative impact. Alternatively, a significant impact would occur if the proposed project increases total VMT compared to the County General Plan (Envision 2040) assumptions.

Intersection Levels of Service

While not required as part of the project's CEQA assessment, the County can require development projects to perform intersection level of service analysis. As previously indicated, the project does not satisfy the County's criteria for LOS analysis (it generates less than 100 peak hour trips and does not add 50 or more trips to any significant intersection. However, to provide information, a focused level of service and safety assessment has been performed.

When evaluating the effects of development projects on the performance of the unincorporated County's transportation facilities, the County applies operational standards to ensure the levels of growth and development provided in the County General Plan Land Use Element are sufficiently accommodated.

Identifying improvements to address operational deficiencies would be required under the following circumstances:

- Development projects where the addition of project traffic to an intersection(s) results in the degradation of intersection operations from acceptable LOS D or better to unacceptable operations (LOS E or LOS F), except for intersections within Priority Development Areas ("PDA") where the minimum acceptable operational standard is LOS E;

- Development projects where the addition of project traffic to an intersection(s) operating unacceptably before the addition of project trips results in the exacerbation of unacceptable operations, and increases the average control delay (for signalized and all-way stop-controlled intersections) or worst movement/approach delay (for side-street stop-controlled intersections) at the intersection by 5.0 seconds or more

Vehicle Miles of Travel

The project is a combination of residential and employment uses. While its primary function is to serve as a place of residence for its occupants, it will also employ a substantial number of people, some of which will choose to drive to the site as their mode of arrival. To holistically evaluate and assess the project's potential impacts on Vehicle Miles of Travel it has been treated as a "mixed-use" project. Within this category, all VMT associated with the project is captured, including that which is generated by both residents and employees. This VMT per "service population," which includes both residents and employees can then be compared to the Countywide average per service population to determine the project's potential impacts. **Table 1** presents a summary of the project's VMT calculations.

Table 1: Project VMT Summary

Land Use	Baseline VMT/Service Population	15% Below Baseline VMT/Service Population	2040 VMT/Service Population	15% Below 2040 VMT/Service Population	Project VMT/Service Population
454 Units Continuing Care Retirement Facility, 560 Residents, 225 Employees	30.3	25.8	29.4	25.0	21.5[1]

[1] – (Daily Trip Generation x Service Population Trip Length)/(Total Service Population) = (1,090 * 15.5)/785 = 21.5
Daily trip generation from Institute of Transportation Engineers, 10th Edition average trip rates for Land Use Code 255 Continuing Care
Sources: Contra Costa County Travel Demand Model, Fehr & Peers, 2021.

Using the daily trip generation calculations (Table 4), the number of residents and employees on site and service population trip lengths for the project's Traffic Analysis Zone (TAZ) from the CCTA travel demand model, the project's daily VMT per service population was calculated to be 21.5. The service population trip length from the project's TAZ is 15.5 miles. The project VMT/service population is 15% below the Countywide baseline VMT per service population and 15% below the

Countywide 2040 VMT per service population. Thus, per the County's recently established standards of significance, the project is expected to have a less than significant impact pertaining to VMT.

Cumulative VMT

The current County General Plan designation for the project site is "Single Family Residential Medium Density." This designation permits single family residential development at a density up to 4.9 dwelling units per acre, which would equate to 144 homes on the 29.5-acre site (net site area). An additional 15 percent density bonus is allowable under the General Plan to account for mandatory inclusionary units. Thus, a total of 166 single family residential homes would be permitted on the site under the current General Plan designation. The daily vehicle trip generation of 166 single family homes would be approximately 1,567 trips. In comparison, the proposed Continuing Care Retirement Community project's daily trip generation is anticipated to be 1,090 trips. Thus, the project's cumulative effect on Vehicle Miles of Travel is expected to be beneficial as it is expected to generate less daily travel and less VMT than that anticipated under current General Plan buildout. **Table 2** presents a summary comparison of the daily VMT forecast to be generated by the proposed project versus that which would be generated by the land use allowable under the current General Plan designation.

Table 2: Cumulative VMT Comparison – Project vs General Plan Allowable

Project Daily Trips	Project Daily VMT	General Plan Designation Daily Trips	General Plan Designation Daily VMT
1,090	16,895	1,567	24,289

Sources: Contra Costa County Travel Demand Model, Fehr & Peers, 2021.

Intersection Operations Analysis

Study Area and Analysis Scenarios

The transportation analysis evaluates the weekday morning (7:00 to 9:00 AM) and evening (4:00 to 6:00 PM) peak period intersection operations at the following intersections:

1. Marchbanks Drive/Tampico and Ygnacio Valley Road
2. Kinross Drive and Ygnacio Valley Road
3. San Carlos Drive and Ygnacio Valley Road
4. Kinross Drive and Marchbanks Drive

Figure 2 illustrates the locations of the four study intersections with respect to the project site. Peak-hour intersection operations were evaluated for the following scenarios using the Transportation Research Board's *2010 Highway Capacity Manual* method for vehicles, as calculated by the Synchro 10.0 software:

- Existing – Based on existing traffic counts
- Existing with Project – Existing traffic counts with traffic expected to be generated by the project.
- Cumulative – Forecasts for the cumulative scenario are based on traffic growth trends as described in the applicable General Plans and supplemented by a check of traffic forecasts for the study area in the 2040 Contra Costa Countywide travel demand model.
- Cumulative with Project – Cumulative forecasts plus traffic expected to be generated by the project.

It should be noted that due to the COVID-19 pandemic, manual turning movement counts in the spring of 2020 were not possible. Turning movement counts from the Streetlight data turning movement count product were obtained for use in the study. Data from the fall of 2019 was incorporated into the assessment. The count data was compared to historical counts (2015 and 2016) on Ygnacio Valley Road from previous traffic impact studies conducted in the area and found to be similar. **Figure 3** presents summaries of the existing traffic counts at the four study intersections.

Analysis Methodology

The analysis results include a descriptive term known as level of service (LOS). LOS is a measure of traffic operating conditions, which varies from LOS A (indicating free-flow traffic conditions with little or no delay) to LOS F (representing over-saturated conditions where traffic flows exceed design capacity resulting in long queues and delays). These grades represent the perspective of drivers and are an indication of the comfort and convenience associated with driving. The LOS standard for intersections in the study area is LOS D.

Table 3 summarizes the relationship between the average control delay per vehicle and LOS at unsignalized intersections. The intersection average delay and highest movement/approach delay are reported for side-street stop-controlled intersections. At side-street stop-controlled intersections, the delay is calculated for each stop-controlled movement and the left-turn movement from the major street, as well as the average delay for the intersection.

Table 3: Unsignalized Intersection Level of Service Thresholds

Level of Service	Unsignalized Intersection Control Delay (sec/veh)[1]	General Description
A	0 – 10.0	Little to no congestion or delays.
B	10.1 – 15.0	Limited congestion. Short delays.
C	15.1 – 25.0	Some congestion with average delays.
D	25.1 – 35.0	Significant congestion and delays.
E	35.1 – 50.0	Severe congestion and delays.
F	> 50.0	Total breakdown with extreme delays.

[1] Control delay includes initial deceleration delay, queue move-up time, stopped delay, and acceleration delay.
Source: *Highway Capacity Manual,* Chapter 20 and 21 (Unsignalized Intersections), Transportation Research Board, 2010.

Traffic conditions at signalized intersections were evaluated using methods developed by the Transportation Research Board, as documented in the 2010 Highway Capacity Manual. This method calculates control delay at an intersection based on inputs such as traffic volumes, lane geometry, signal phasing and timing, pedestrian crossing times, and peak hour factors. Control delay is defined as the delay directly associated with the traffic control device (i.e., a stop sign or a traffic signal) and specifically includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. The relationship between LOS and control delay for signalized intersections is summarized in **Table 4.**

Table 4: Signalized Intersection LOS Criteria

Level of Service	Description	Delay in Seconds
A	Progression is extremely favorable, and most vehicles arrive during the green phase. Most vehicles do not stop at all. Short cycle lengths may also contribute to low delay.	< 10.0
B	Progression is good, cycle lengths are short, or both. More vehicles stop than with LOS A, causing higher levels of average delay.	> 10.0 to 20.0
C	Higher congestion may result from fair progression, longer cycle lengths, or both. Individual cycle failures may begin to appear at this level, though many still pass through the intersection without stopping.	> 20.0 to 35.0
D	The influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high V/C ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.	> 35.0 to 55.0
E	This level is considered by many agencies to be the limit of acceptable delay. These high delay values generally indicate poor progression, long cycle lengths, and high V/C ratios. Individual cycle failures are frequent occurrences.	> 55.0 to 80.0
F	This level is considered unacceptable with oversaturation, which is when arrival flow rates exceed the capacity of the intersection. This level may also occur at high V/C ratios below 1.0 with many individual cycle failures. Poor progression and long cycle lengths may also be contributing factors to such delay levels.	> 80.0

Source: *Highway Capacity Manual, 2010.*

Project Trip Generation

The number of vehicle trips that would be generated by the proposed project were estimated through a trip generation analysis. Anticipated trip generation rates associated with the proposed land use were taken from the Institute of Transportation Engineers (ITE) *Trip Generation, 10th Edition* reference. This manual is a national compilation of trip generation statistics for land-uses of various sizes and types. Our assessment makes use of data compiled for the "Continuing Care Retirement Community" land use (ITE Code 255). Rates from this reference were used to assess the total number of trips associated with the proposed project. The trip generation manual provides rates for two independent variables (total units and occupied units) for the Continuing Care Retirement Community Land Use; the number of total units was used as the independent variable within this assessment. **Table 5** presents the results of the trip generation analysis performed for the proposed project.

Table 5: Weekday Project Vehicle Trip Generation

Land Use/Size	Size	Daily Trips	AM Peak Hour Trips		PM Peak Hour Trips	
			Inbound	Outbound	Inbound	Outbound
Continuing Care Retirement Community	454 Units	1,090	41	23	28	45

Source: Institute of Transportation Engineers, 10th Edition average trip rates for Land Use Code 255 Continuing Care Retirement Community (total units as independent variable) – General urban/suburban area.

The ITE *Trip Generation Manual* describes Land Use Code 255 (Continuing Care Retirement Community) as follows: *"A continuing care retirement community is a land use that provides multiple elements of senior adult living. CCRCs combine aspects of independent living with increased care, as lifestyle needs change with time. Housing options may include various combinations of senior adult (detached), senior adult (attached), congregate care, assisted living, and skilled nursing care – aimed at allowing the residents to live in one community as their medical needs change. The communities may also contain special services such as medical, dining, recreational, and some limited supporting retail facilities. CCRCs are usually self-contained villages."* This description precisely fits what the project proposes and is the ITE land-use most appropriate for project evaluation. Disaggregating the component parts of the proposed project for individual treatment within the trip generation calculations would not be appropriate and has not been done.

Project Trip Distribution

Project trip distribution refers to the directions of approach and departure that vehicles would take to access and leave the site. Estimates of regional project trip distribution were developed based on existing travel patterns in the area, a select zone analysis using the Contra Costa Transportation Authority (CCTA) travel demand model, and the location of complementary land uses. **Figure 4** illustrates the anticipated directions of approach and departure for project related vehicle trips. Roughly 70 percent of project related traffic is expected to arrive and depart to the west on Ygnacio Valley Road with the remaining 30 percent having origins and destinations to the east. Using the trip distribution pattern presented in Figure 4 and the trip generation calculations summarized in Table 5, project trips were assigned to the local study network. **Figure 5** presents the project trip assignment at the four study intersections and **Figure 6** presents the resulting volumes for the Existing plus Project condition.

Existing and Existing Plus Project Conditions

Table 6 presents the results of the weekday morning and evening peak hour Existing and Existing plus Project intersection level of service analysis at the four study intersections. As previously discussed, this analysis is based on the methodologies of the Transportation Research Board's *2010 Highway Capacity Manual*, using the Synchro 10.0 software. The existing conditions analysis incorporates existing signal timing, phasing, and control. Historical observed peak hour factors by intersection approach were incorporated from previous traffic counts.

As presented in Table 6, the traffic associated with the proposed project would result in minor increases in delay at the four study intersections. Levels of service are expected to remain unchanged with the addition of project related traffic.

Table 6: Existing Conditions AM and PM Peak Hour Intersection Delay / LOS

Intersection	Control[1]	Peak Hour	Delay / LOS[2]	
			Existing	Existing Plus Project
Marchbanks Dr & Ygnacio Valley Rd	Signal	AM PM	25.5 / C 19.4 / B	27.1 / C 22.3 / C
Kinross Dr & Ygnacio Valley Rd	Signal	AM PM	15.9 / B 18.2 / B	16.7 / B 18.5 / B
San Carlos Dr & Ygnacio Valley Rd	Signal	AM PM	73.7 / E 62.5 / E	74.7 / E 63.6 / E
Kinross Dr & Marchbanks Dr	All-way Stop-control	AM PM	7.3 / A 7.7 / A	7.5 / A 8.0 / A

Notes:
1. Signal=Signalized intersection; AWSC=All-way Stop-controlled intersection
2. Delay (seconds per vehicle)/Level of Service

Source: Fehr & Peers, 2021

Cumulative and Cumulative Plus Project Conditions

Cumulative forecasts for the study intersections were developed using growth rates from the CCTA travel demand model. The model forecasts future traffic volumes in the area for the year 2040 assuming buildout of the County and local City general plans. To develop traffic volumes for the Cumulative plus Project condition, traffic associated with the project, as illustrated in Figure 5, was added to the Cumulative baseline scenario. **Figure 7** illustrates Cumulative baseline traffic volumes and **Figure 8** illustrates Cumulative plus Project traffic volumes. **Table 7** illustrates the results of the

Cumulative and Cumulative plus Project intersection level of service analysis. Within the cumulative conditions' assessment, a uniform intersection peak hour factor was applied based on the highest observed movement peak hour factor by intersection. These peak hour factors ranged from 0.94 to 0.98 depending on the level of congestion.

As presented in Table 7, the traffic associated with the proposed project would result in minor increases in delay at the four study intersections in the Cumulative scenarios.

Table 7: Cumulative Conditions AM and PM Peak Hour Intersection Delay / LOS

Intersection	Control[1]	Peak Hour	Delay / LOS[2]	
			Cumulative	Cumulative Plus Project
Marchbanks Dr & Ygnacio Valley Rd	Signal	AM PM	28.8 / C 27.2 / C	30.4 / C 28.9 / C
Kinross Dr & Ygnacio Valley Rd	Signal	AM PM	17.5 / C 19.9 / B	18.1 / C 20.2 / C
San Carlos Dr & Ygnacio Valley Rd	Signal	AM PM	86.2 / F 65.2 / E	86.9 / F 65.5 / E
Kinross Dr & Marchbanks Dr	All-way Stop-control	AM PM	7.3 / A 7.7 / A	7.5 / A 8.0 / A

Notes:
1. Signal=Signalized intersection; AWSC=All-way Stop-controlled intersection
2. Delay (seconds per vehicle)/Level of Service

Source: Fehr & Peers, 2021

As illustrated in Tables 6 and 7, the project is not anticipated to have a detrimental or material effect on the four study intersections.

Multimodal Transportation Service Objectives

Pursuant to the Central County Action Plan (TRANSPAC, September 2017) the project's effects on designated Multimodal Transportation Service Objectives (MTSOs) were assessed. The identified Route of Regional Significance for MTSO measurement closest to the project site is Ygnacio Valley Road. Since the section of Ygnacio Valley Road closest to the project is in the City of Walnut Creek, the project's effects on the intersections of Ygnacio Valley Road/Civic Drive and Ygnacio Valley Road/Bancroft Road were assessed. The MTSO applied to the intersections is Level of Service and the MTSO for the two intersections is LOS F. **Table 8** and **Table 9** illustrate the project's anticipated effects on the MTSO at these two locations. Baseline existing volumes and Cumulative (2040) forecasts for the two MTSO intersections were obtained from traffic studies performed for the *Walnut Creek North Downtown Specific Plan* (October 15, 2019).

Table 8: MTSO - Existing Conditions AM and PM Peak Hour

Intersection	Control[1]	Peak Hour	Delay / LOS[2]	
			Existing	Existing Plus Project
Civic Drive & Ygnacio Valley Rd	Signal	AM PM	50.9 / D 99.4 / F	50.9 / D 99.5 / F
Bancroft Road & Ygnacio Valley Rd	Signal	AM PM	75.6 / E 50.9 / D	76.6 / E 51.0 / D

Notes:
1. Signal=Signalized intersection; AWSC=All-way Stop-controlled intersection
2. Delay (seconds per vehicle)/Level of Service

Source: Fehr & Peers, 2021

Table 9: MTSO - Cumulative Conditions AM and PM Peak Hour

Intersection	Control[1]	Peak Hour	Delay / LOS[2]	
			Cumulative	Cumulative Plus Project
Civic Drive & Ygnacio Valley Rd	Signal	AM PM	61.6 / E 125.3 / F	61.6 / E 126.2 / F
Bancroft Road & Ygnacio Valley Rd	Signal	AM PM	122.3 / F 88.8 / F	122.3 / F 89.6 / F

Notes:
1. Signal=Signalized intersection; AWSC=All-way Stop-controlled intersection
2. Delay (seconds per vehicle)/Level of Service

Source: Fehr & Peers, 2021

As illustrated in Tables 8 and 9, the project is not anticipated to have a detrimental or material effect on the two evaluated MTSO intersections.

Collisions Summary and Analysis

Statewide Integrated Traffic Records System (SWITRS) collision data for the study intersections are summarized in the tables below for the years 2013 to 2017. The collisions by type are summarized in **Table 10**; collisions by severity are summarized in **Table 11**; and collisions by primary collision factor are summarized in **Table 12**.

As shown in Table 10, there were a total of 46 collision records at the study intersections over the five years evaluated. The intersection at Marchbanks Drive and Ygnacio Valley Road had 12 collisions, including one pedestrian collision which was the fault of the driver. The intersection at Kinross Drive and Ygnacio Valley Road experienced five collisions. The intersection at San Carlos Drive and Ygnacio Valley Road had 26 collisions, including one bicycle collision at the fault of the bicyclist. The intersection at Kinross Drive and Marchbanks Drive had three collisions. Most of the collisions were rear ends and broadside crashes at this location. The collisions resulted in moderate injuries, minor injuries, or property damage only, and no severe or fatal crashes were noted, as shown in Table 11.

The three primary collision factors with the highest number of collisions were "Unsafe Speed", "Following Too Closely", and "Traffic Signals/Signs", as shown in Table 12. Collisions resulting from "Unsafe Speeds" and "Following Too Closely" occurred mainly on Ygnacio Valley Road during peak travel times.

The top three primary collision factors were related to driver behavior. The collision data did not reveal collision trends due to inadequate infrastructure or design issues. Study intersection traffic signals are relatively new and have good visibility and modern infrastructure.

Table 13 presents a summary of the predicted collision frequencies at the study intersections versus the actual observed collision rates. Predicted collision frequencies were calculated at the four study intersections using the methodology of the Highway Safety Manual (AASHTO 2010). This reference provides a methodology to predict the number of collisions for intersections and street segments based on roadway and intersection characteristics, such as vehicle and pedestrian volumes, number of lanes, signal phasing, on-street parking, and number of driveways. As presented in Table 13, the four study intersections have actual collision frequencies less than or equivalent to their predicted values. This is an indication that they are relatively safe compared to similar facilities nationwide.

Table 10: Collisions by Type

Intersection	Control	Crash Type							Total	Ped	Bike
		Head-On	Side-swipe	Rear End	Broad-side	Hit Object	Over-turned	Ped			
Marchbanks Dr & Ygnacio Valley Rd	Signalized	0	2	6	0	3	0	1	12	1	0
Kinross Dr & Ygnacio Valley Rd	Signalized	0	1	3	1	0	0	0	5	0	0
San Carlos Dr & Ygnacio Valley Rd	Signalized	2	1	15	8	0	0	0	26	0	1
Kinross Dr & Marchbanks Dr	Unsignalized	0	1	2	0	0	0	0	3	0	0
Total		**2**	**5**	**26**	**9**	**3**	**0**	**1**	**46**	**1**	**1**

Source: Fehr & Peers, 2021.

Table 11: Collisions by Severity

Intersection	All Collisions Severity					Ped Collisions Severity					Bike Collisions Severity					Auto Collisions Severity				
	Fatal	Severe	Moderate	Minor	PDO	Fatal	Severe	Moderate	Minor	PDO	Fatal	Severe	Moderate	Minor	PDO	Fatal	Severe	Moderate	Minor	PDO
Marchbanks Dr & Ygnacio Valley Rd	0	0	3	4	5	0	0	1	0	0	0	0	0	0	0	0	0	2	4	5
Kinross Dr & Ygnacio Valley Rd	0	0	0	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	4	1
San Carlos Dr & Ygnacio Valley Rd	0	0	2	13	11	0	0	0	0	0	0	0	0	1	0	0	0	2	12	11
Kinross Dr & Marchbanks Dr	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Total	**0**	**0**	**5**	**21**	**20**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**4**	**20**	**20**

PDO = Property Damage Only, Source: Fehr & Peers, 2021.

Table 12: Collisions by Primary Collision Factor

Intersection	Primary Collision Factor										
	DUI	Unsafe Speed	Following Too Closely	Wrong Side of the Road	Unsafe Lane Change	Improper Turning	Auto Right of Way	Ped Right of Way	Traffic Signals/ Signs	Unsafe Starting/ Backing	Not Stated
Marchbanks Dr & Ygnacio Valley Rd	1	4	1	0	2	2	0	1	0	1	0
Kinross Dr & Ygnacio Valley Rd	0	0	3	0	0	1	0	0	1	0	0
San Carlos Dr & Ygnacio Valley Rd	3	9	1	1	0	0	3	0	5	1	3
Kinross Dr & Marchbanks Dr	0	1	0	0	0	1	0	0	0	1	0
Total	**4**	**14**	**5**	**1**	**2**	**4**	**3**	**1**	**6**	**3**	**3**

DUI = Driving Under the Influence, Source: Fehr & Peers, 2021.

Table 13: Predicted Collision Frequencies versus Actual

Intersection	Type[1]	AADT[2] (major)	AADT[2] (minor)	Total Collisions (Actual)[3]	Collisions per year (Actual)	Predicted Collision Frequency	Difference[4]
Marchbanks Dr & Ygnacio Valley Rd	4SG	51,210	4,700	12	2.5	7.9	-5.4
Kinross Dr & Ygnacio Valley Rd	4SG	48,580	6,020	5	1.0	6.7	-5.7
San Carlos Dr & Ygnacio Valley Rd	4SG	51,490	7,010	26	5.2	7.7	-2.5
Kinross Dr & Marchbanks Dr	4ST	1,900	1,100	3	0.6	0.5	0.1

Notes:
1. 4SG = 4 leg signalized intersection; 4ST = 4 leg unsignalized intersection
2. Average annual daily traffic (AADT) was estimated using the existing PM peak hour counts collected in 2019 multiplied by ten.
3. Collision data obtained from SWITRS for the four intersections between 2013 and 2017.
4. Negative values indicate that the actual collision frequency is less than the predicted collision frequency for a typical intersection with similar attributes. Positive values indicate that the actual collision frequency is greater than the predicted collision frequency for a typical intersection with similar attributes.

Source: Fehr & Peers, 2021.

Pedestrian Facilities

The project proposes a City standard sidewalk along the northern side of the extension of Kinross Drive from Marchbanks Drive into the project site. A sidewalk on the southern side of the Kinross Drive extension is not recommended as it would not provide overall connectivity to the pedestrian network outside of the project site. A sidewalk on the southern side of the extension would terminate at the Kinross Drive/Club View Terrace intersection, which would result in unnecessary mid-block pedestrian crossings, if provided. Additional on-site pedestrian facilities would be installed through the project, as illustrated on Figure 1. The EVA access points located on the north and south ends of the project site would be equipped with gates allowing pedestrian and bicycle access. Residents and employees would be provided with keycards allowing for access via these gates.

The project proposes no features that would be hazardous to pedestrians, nor is it forecast to generate pedestrian demand that would exceed the capacity of the area's pedestrian network. Observations at other similar Spieker properties throughout California have found that few off-site pedestrian trips occur. As the average resident age is greater than 80 years, most pedestrian activity is typically confined to the project site. No features are proposed by the project that would conflict with City or regional plans, policies or ordinances pertaining to pedestrian facilities or travel. No significant environmental impacts to pedestrian facilities are anticipated.

Recommendation Trans-1 – Pedestrian Facilities

Although not required to mitigate an environmental impact, the following recommendations are provided to improve pedestrian access and circulation:

- Install striped crosswalks and ADA compliant curb ramps in all corners at primary internal intersections. In particular, these improvements should be induced at the Kinross Drive intersection with the main internal access roadway and main building traffic circle located immediately on entry to the site.

Bicycle Facilities

The project proposes no bicycle specific on-site circulation amenities (routes, paths, or lanes); however, bicycles would not be prohibited from using any of the on-site roadways. On-site wayfinding signage for bicycles and pedestrians would be provided along internal routes directing people to internal (tennis court, pool, gym, community garden, etc) and external (trails, parks, etc) destinations.

The amount of bicycle parking required for developments within Contra Costa County is stipulated in Municipal Code Section 82-16.412. While the Code provides specific bicycle parking requirements for traditional residential, educational, commercial, and industrial land uses, no directly applicable requirement is provided for a Continuing Care Retirement Community such as the project. In the absence of a specific requirement, the County may rely on the Planned Unit District (P-1) regulations as outlined in Code Section 84-66.1404. This section allows the County, through Planning Commission approval latitude in regulations, including how the Code requirements for vehicle and bicycle parking are applied.

If the project were treated as a traditional "Multi-Family Dwelling without private garage," Code Section 82-16.412 would require 115 long term bicycle parking spaces and 57 short term bicycle parking spaces. **Table 14** presents a summary of these requirements if the project was treated as this land use. It should be noted that the average age of a project resident would be more than 80 years and that the facility will require substantially lower levels of bicycle parking than a typical multi-family housing development. Long term bicycle parking refers to a covered access-controlled enclosure or room that includes permanently anchored bicycle racks or individually lockable bicycle lockers. Short term bicycle parking refers to permanently anchor bicycle racks that are covered or uncovered, or lockable individual bicycle lockers. Given the nature of the project and the expected demographic profile of its residents, the application of the traditional multi-family development requirement likely overstates the necessary amount of bicycle parking.

The project proposes nine racks (for 18 bicycles) in the garage under the Independent Living Building, three racks (for six bicycles) at the Health Care Center's back entrance and one rack (for two bicycles) at the rear of the Maintenance Building. A total of 13 bicycle racks with a combined capacity for 26 bicycles are proposed. Specific bicycle parking requirements are not specified in the County Code for the proposed land use.

Table 14: Bicycle Parking Summary – Code Requirements

Parking Type	County Code[1]	Code Requirement[1]	Proposed Supply
Long Term Bike Parking	Spaces for 15 percent of the number of bedrooms, or two spaces, whichever is greater.	115	0
Short Term Bike Parking	Spaces for five percent of the number of bedrooms, or two spaces, whichever is greater.	57	26

[1] Contra Costa Municipal Code Section 82-16.412 - "Multi-Family Dwelling without private garage,"
Source: Fehr & Peers, 2021; Contra Costa County Municipal Code

While the project would not meet County Code requirements for the "Multi-Family Dwelling without private garage" category, it is important to note that it is a different land-use and is expected to have different needs for bicycle parking. To establish a more appropriate rate for the proposed Continuing Care Retirement Community, observations of bicycle parking demand were performed at eight similar California facilities. Those observations found the following:

- Stoneridge Creek (565 Independent Living Units, Pleasanton, CA) = 20 parked bicycles
- University Village (367 Independent Living Units, Thousand Oaks, CA) = 4 parked bicycles
- Glen at Scripps Ranch (400 Independent Living Units, San Diego, CA) = 5 parked bicycles
- La Costa Glen (646 Independent Living Units, Carlsbad, CA) = 16 parked bicycles

- Reata Glen (480 Independent Living Units, San Juan Capistrano, CA) = 12 parked bicycles
- Morningside (324 Independent Living Units, Fullerton, CA) = 0 parked bicycles

The average peak use of bicycle parking facilities at similar facilities in California was observed to be 1 parked bicycle per 49 independent living units. At the facility displaying the greatest use of bicycle parking (Pleasanton) the usage was 1 parked bicycle per 28 residential units. As the project proposes 1 bicycle parking space per 13.5 independent living units, it is expected that adequate bicycle parking is proposed as part of the project.

The project proposes no features that would be hazardous to bicycles nor is it forecast to generate bicycle demand that would exceed the capacity of the area's bicycle network. As detailed within the observations of bicycle parking at similar facilities throughout California, the proposed land use generates less than typical demands on the local bicycle network. No features are proposed by the project that would conflict with County or regional plans, policies or ordinances pertaining to bicycle facilities or travel. No significant impacts to bicycle facilities are anticipated.

Recommendation Trans-2 – Bicycle Facilities

Although not required to mitigate an environmental impact, the following recommendation is provided to improve bicycle access and circulation:

- Work with County Planning Department staff to apply the Planned Unit District (P-1) regulations for latitude as it pertains to the provision of bicycle parking on site. Provide the level of short and long-term bicycle parking needed at similar Spieker Senior Housing developments in California. Bicycle parking should be distributed throughout the site and located near main building entrances. The bicycle parking should be visible from vehicle parking and/or pedestrian circulation areas.

Transit Access

Significant adverse impacts to fixed-route service are not expected as a result of the project. The project would not conflict with plans, policies, ordinances, or regulations pertaining to public transit. Ridership on area transit lines is not expected to exceed available capacities with the addition of the demand associated with the project.

Parking

A total of 594 on-site parking spaces would be provided in garages and surface parking lots located at various locations throughout the project site. The adequacy of the amount of parking provided has been calculated using two separate means. First, the supply has been compared to the anticipated parking demand of the project, based on statistics collected at similar facilities nationwide. Second, the County's Municipal Code requirements for off-street vehicular parking have been calculated and compared to the proposed supply. It should be noted that parking, or the lack of sufficient parking, is not considered to be a significant environmental impact under CEQA.

Off-Street Parking Demand

Anticipated parking generation rates associated with the proposed land use were taken from the Institute of Transportation Engineers (ITE) *Parking Generation Manual, 5th Edition* reference. This manual is a national compilation of parking demand statistics for land-uses of various sizes and types. Our assessment makes use of data compiled for the "Continuing Care Retirement Community" land use (ITE Code 255). Rates from this reference were used to assess the total number of off-street vehicular parking spaces needed by the proposed project. **Table 15** presents the results of the parking demand analysis performed for the proposed project.

Table 15: Project Parking Demand Summary

Land Use/Size	Size	Weekday Peak Demand	Weekend Peak Demand	Supply
Continuing Care Retirement Community	454 Units	494 spaces	381 spaces	594 spaces

Source: Institute of Transportation Engineers, Parking Generation Manual, 5th Edition average parking rates for Land Use Code 255 Continuing Care Retirement Community (total units as independent variable) – General urban/suburban area.

As presented in Table 15, the proposed parking supply will be adequate to serve the calculated demand for parking.

Municipal Code Requirements – Vehicular Parking

Like bicycle parking, the Contra Costa County Municipal Code does not have code requirements for off-street vehicular parking specific to the Continuing Care Retirement Community land use. The two land-uses specifically delineated within the Code which are most like the proposed project are likely "multi-family residential without private garage" and "Sanitariums, convalescent homes, rest homes, nursing homes." **Table 16** provides a summary of the code required parking for these two land use types compared to the project's proposed supply.

Table 16: Project Parking – Municipal Code Requirements

Land Use	Code Section	Code Language	Code Requirement	Proposed Supply
Sanitariums, convalescent homes, rest homes, nursing home	82-16.406	One space for every three beds	255 spaces	594 spaces
Multi-family residential without private garage	84-26.1202	1 space per studio unit 1.5 spaces per 1-bedroom unit 2 spaces per 2+ bedroom unit 0.25 spaces per unit for guests	792 spaces	594 spaces

Source: Contra Costa County Code Codified through Ordinance No. 2020-16, passed May 26, 2020. Fehr & Peers 2021.

As summarized in Table 16, the Code required parking for the "multi-family residential without private garage" and "Sanitariums, convalescent homes, rest homes, nursing homes" land-use categories do not accurately describe parking conditions at a Continuing Care Retirement Community facility. Since there are no specific requirements for this land use, the County may rely on the Planned Unit District (P-1) regulations as outlined in Code Section 84-66.1404. This section allows the County, through Planning Commission approval latitude in regulations, including how the Code requirements for vehicle and bicycle parking are applied. Relying on the parking demand information collected nationwide at similar facilities (Table 15) would provide the most accurate guidance for the amount of parking required at the facility.

Contra Costa County Mandatory Electric Vehicle Charging Measures

Contra Costa County's Electric Vehicle charging requirements are described within their Municipal Code (County Code Section 74-4.006 – Amendments to CGBSC – Electric Vehicle Charging Standards) and Appendix A of the *Transportation Analysis Guidelines* (Conservation and Development Department, Public Works Department, June 23, 2020), Per Section 4.106.4.1 of the County Code, 10 percent of the total number of parking spaces provided for multi-family housing uses shall be electric vehicle charging stations. Half of these spaces must be equipped with fully functioning electric vehicle charging stations. The remaining five percent shall be capable of supporting future electric vehicle charging stations. Non-residential uses are required to provide the number of electric vehicle charging stations specified in Table 5.106.5.3.3 of the County's Code, which equates a number of parking spaces to number of charging stations.

A total of 594 parking spaces are proposed as part of the project. Of these, 410 would be dedicated to the Independent Living Building, 104 to the Villas, and 80 to the Health Center. Treating the Independent Living Building and Villas as multi-family residential housing and the Health Center as a non-residential use yields the following number of electric vehicle charging stations:

- Independent Living Building (410 total parking spaces) – 21 fully functional electric vehicle charging stations and 20 spaces capable of supporting future electric vehicle charging stations
- Villas (104 total parking spaces) – 6 fully functional electric vehicle charging stations and 5 spaces capable of supporting future electric vehicle charging stations
- Health Center (80 total parking spaces) – 6 fully functional electric vehicle charging stations

The project proposes the number of electric vehicle charging stations mandated by County Code, at the required locations.

Emergency Vehicle Access

The applicable emergency vehicle access standard for the proposed project is the *2016 California Fire Code* (California Code of Regulations, Title 24, Part 9, January 1, 2017). The applicable code requirements are as follows:

- Projects having more than 200 dwelling units. Multiple-family residential projects having more than 200 dwelling units shall be provided with two separate and approved fire apparatus access roads regardless of whether they are equipped with an approved automatic sprinkler system.
- Where two fire apparatus access roads are required, they shall be placed a distance apart equal to not less than one-half of the length of the maximum overall diagonal dimension of the property or area to be served, measured in a straight line between accesses.
- Fire apparatus access roads shall have a minimum width of 20 feet with turning radii of 25 feet inside and 45 feet outside.

Based on the current site plan, the project appears to be designed to accommodate turn movements of fire trucks into, within and out of the site. Three fire apparatus access roadways are proposed as part of the project – the main entrance and EVAs located at the northern and southern ends of the site. Therefore, safe, and adequate emergency vehicle access is currently proposed as part of the project.

Security/Vehicle Access Gates

Vehicular access to some portions of the project site would be restricted with gates, as illustrated on Figure 1. Gates and access kiosks would be installed on the private internal access roadways immediately north and south of the Kinross Drive extension. All residents and employees would have key cards which would provide gate access. Guests would be able to use call boxes at the gate kiosks to obtain access. Delivery trucks would be pre-arranged and provided with their own access permissions provided at the time of delivery schedule. Turn-around areas are provided within the site plan's design which would enable any vehicle not able to obtain gate access via the kiosk to exit the gate area. Vehicles not able to obtain gate access would be able to exit the project site or park and stop at the main clubhouse where a guard will be stationed at all times.

Access to the main clubhouse and visitor center area would be unobstructed and accessible directly via the Kinross Drive extension.

Construction Traffic

Construction Schedule

Site grading, and construction of all buildings and improvements will be completed in a single "phase" over a total period of approximately 3-4 years. Grading operations will be completed in the first 12 months (months 1-12), followed by construction and occupancy of the Independent Living Units and Clubhouse facilities approximately 22 months later (months 13-34). Work on the Health Care Center will commence in month 22 and take approximately 18 months to complete (months 32-46). The overall construction timeline is subject to licensing and inspection to be carried out by the California Office of Statewide Health Planning and Development (OSHPD).

Construction Traffic and Haul Routes

The total overall project excavation volume is expected to be approximately 225,000 cubic yards (CY), with roughly 150,000 CY of fill, resulting in the potential for export of up to 75,000 CY. This represents either 7,500 single trailer truck trips or 3,750 dual trailer trips during the first 12 months of construction. All construction traffic (worker and truck traffic) will utilize Kinross Drive to Marchbanks Drive to Ygnacio Valley Road to complete site ingress and egress.

Recommendation Trans-3 – Construction Traffic Management Plan

To mitigate potential disruptions during project construction, the project should prepare and submit a Construction Traffic Management Plan for County review and approval. The plan shall include, but not be limited to, the following:

- Identification of the traffic controls and methods proposed during each phase of project construction. Provision of safe and adequate access for vehicles, transit, bicycles, and pedestrians. Traffic controls and methods employed during construction shall be in accordance with County and City of Walnut Creek standards and the requirements of the Manual of Uniform Traffic Control Devices (FHWA, 2009 MUTCD with Revisions 1 and 2, May 2012).
- Provision of notice to relevant emergency services, thereby avoiding interference with adopted emergency plans, emergency vehicle access, or emergency evacuation plans.
- A prohibition on all construction truck activity during the weekday morning and evening peak commute periods (7 to 9 AM and 4 to 6 PM).
- Preservation of emergency vehicle access.
- Identification of approved truck routes in communication with the County and City of Walnut Creek.
- Location of staging areas and the location of construction worker parking.
- Identification of the means and locations of the separation (i.e. fencing) of construction areas and adjacent active uses.
- Provision of a point of contact for adjacent residents to obtain construction information, have questions answered and convey complaints.

Please do not hesitate to call if you have any questions regarding this transportation assessment.

Attachments: Figures 1 – 8, Technical Appendix (Synchro Worksheets, Crash Prediction Evaluations)

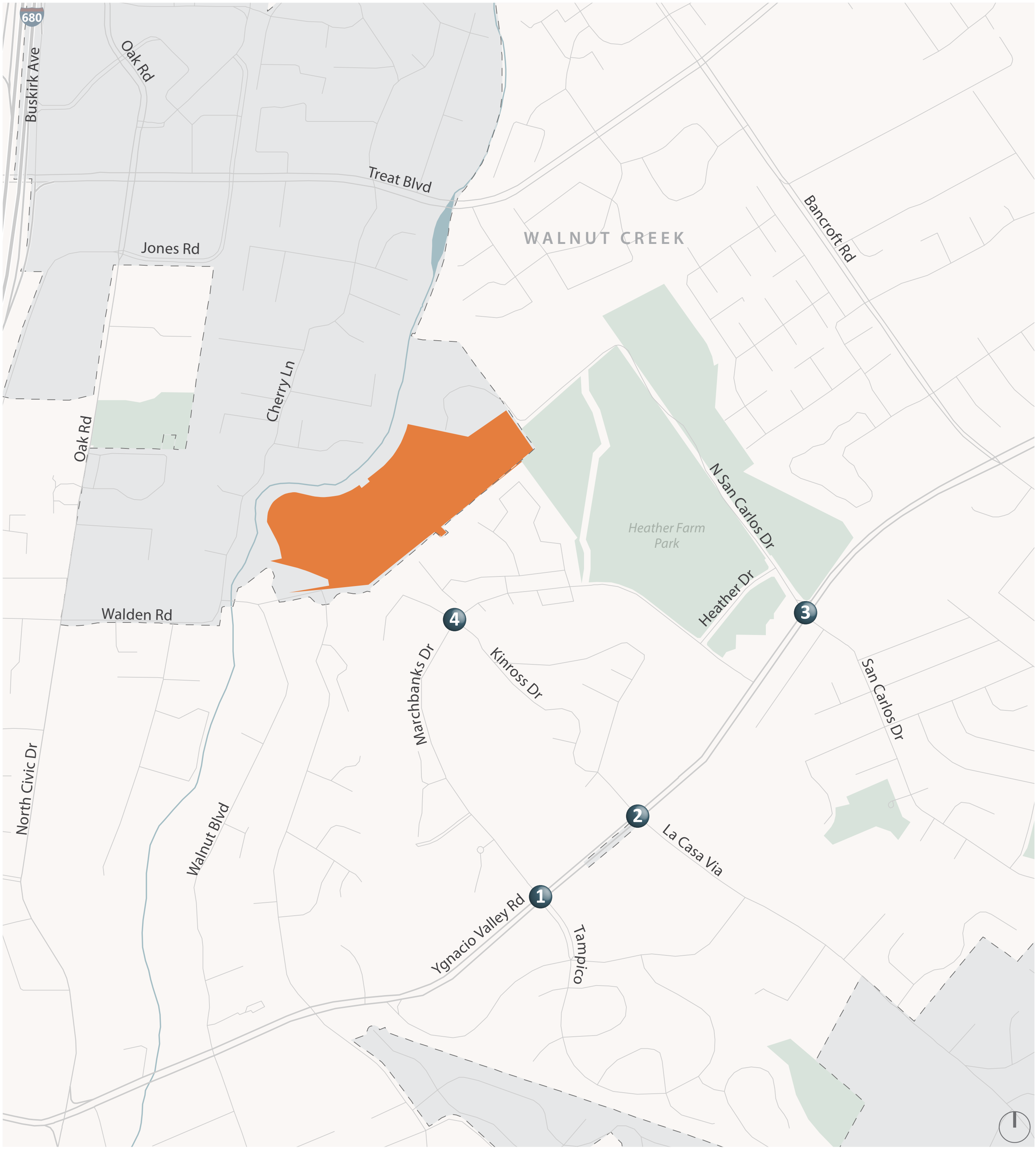
Site Plan Source: Gates + Associates, October 2020

1. Arrival Plaza
2. Entry Water Feature
3. Club House
4. Lake Courtyard
5. Auditorium
6. Multipurpose Room
7. Pool Building
8. Pool Patio
9. Bocce Courtyard
10. Podium Courtyard
11. RLU
12. Riparian Restoration Zone
13. Overlook
14. Dog Run
15. Community Garden
16. Tennis Court
17. Knoll Amenity
18. Facility Maintenance Building
19. Villas
20. Health Center
21. Existing Speimen Oak To Remain
22. Masonry Wall
23. Ornamental Metal Fence/ 42" Guardrail
24. Property Line
25. Gated EVA
26. Relocated Man-Made Ditch
27. MSE Retaining Wall
28. Porous Paving At Parking
29. Pedestrian Crossing
30. Bike Parking
31. Entry Monument Sign
32. Facility/Directory Sign (FS) (DS)
33. Entry Secured Gates

Figure 1

Project Site Plan

WC20-3699_1_SitePlan



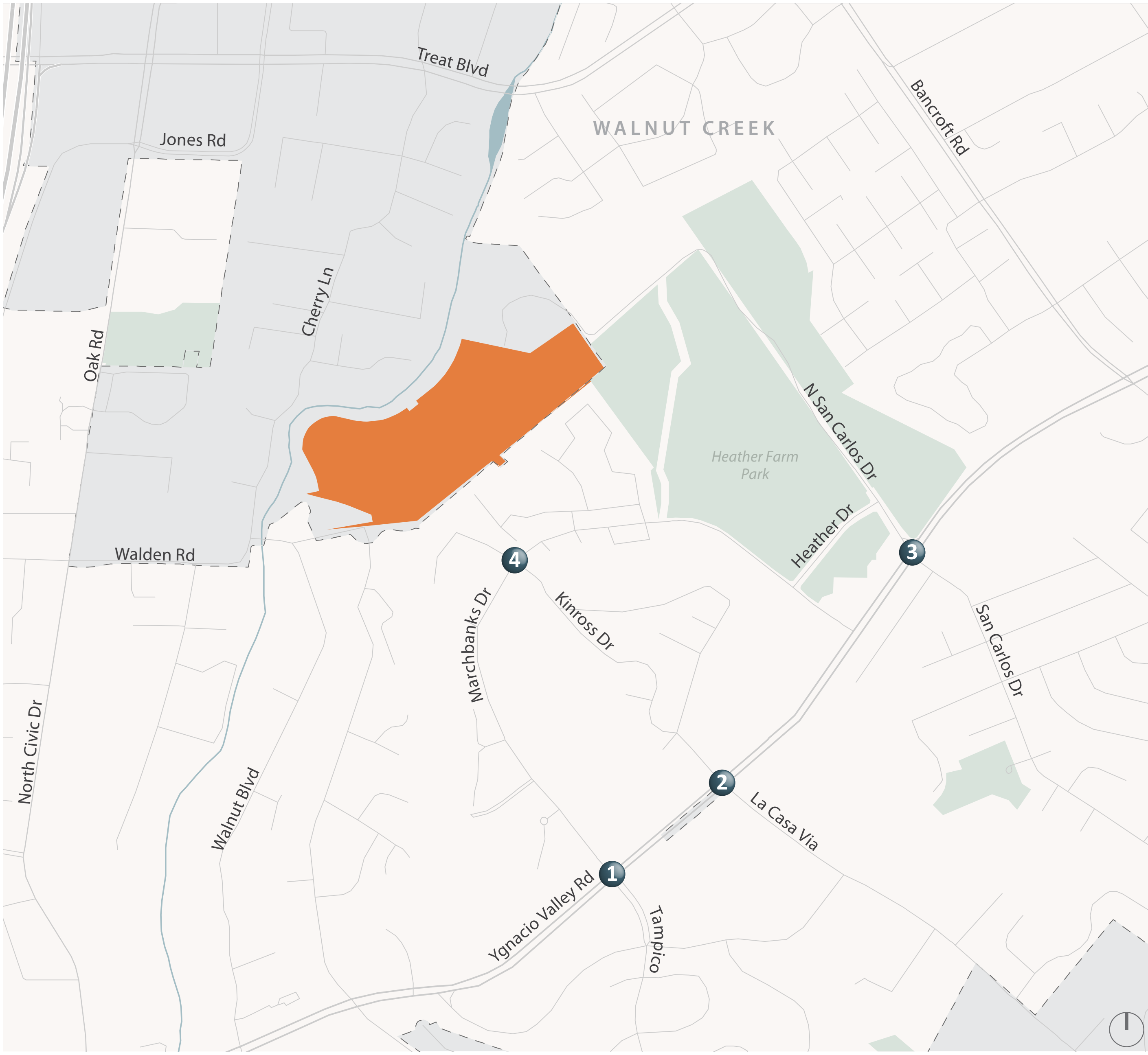
Project Site

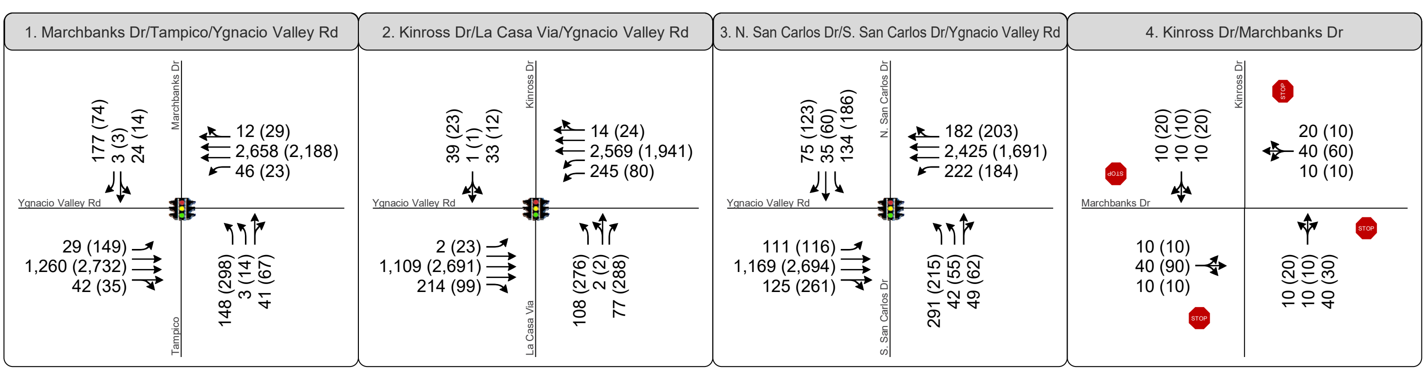
Study Intersection

Figure 2

Site Vicinity and Study Intersections

WC20-3699_2_StudyArea





Note: Turning movement counts based on StreetLight data for fall 2019.

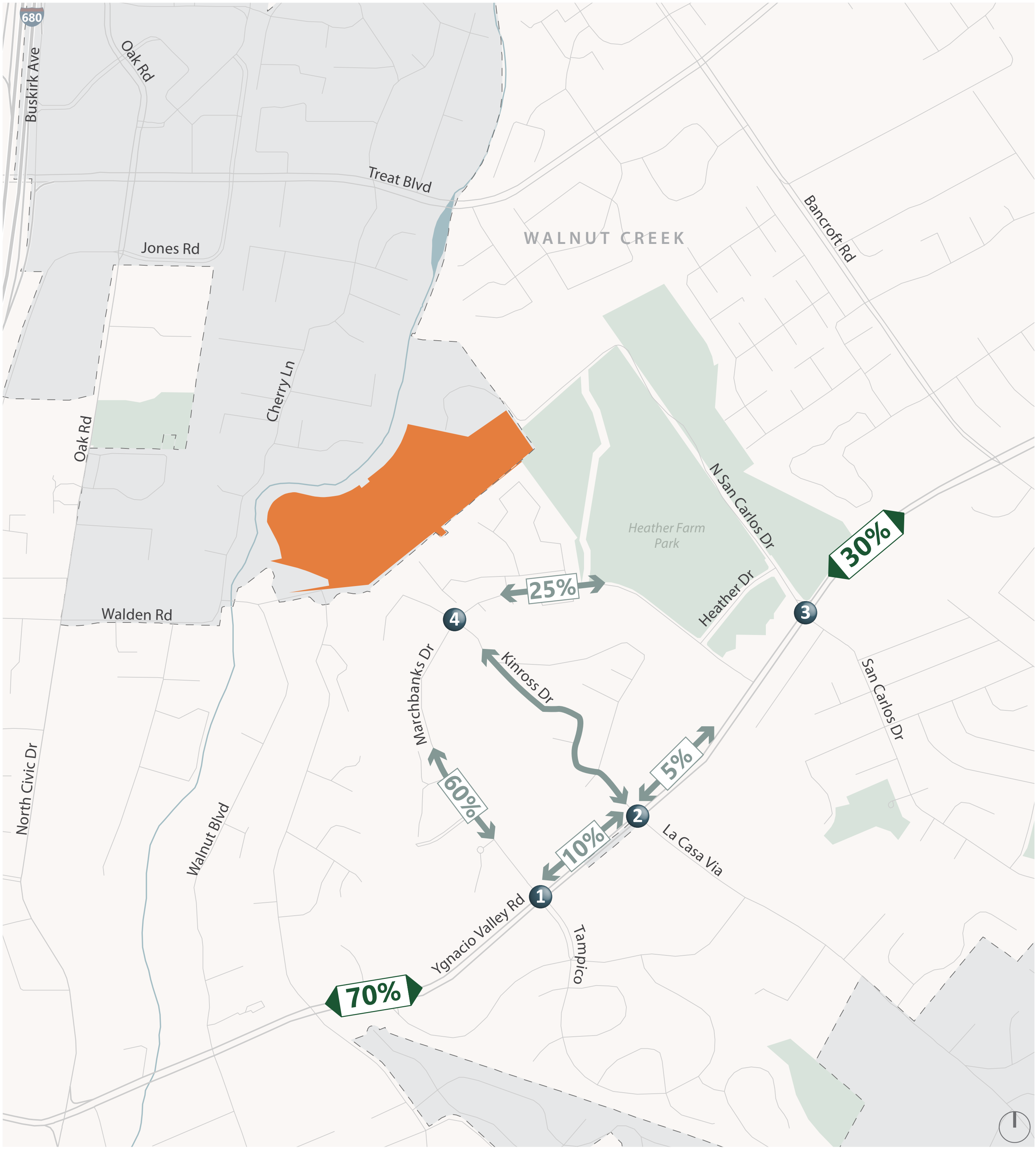
XX (YY) AM (PM) Peak Hour Traffic Volumes | Signalized Intersection | STOP Stop Sign

Project Site | # Study Intersection

Figure 3

Existing Peak Hour Intersection Traffic Volumes, Lane Configurations and Traffic Controls

WC20-3699_X_Volumes

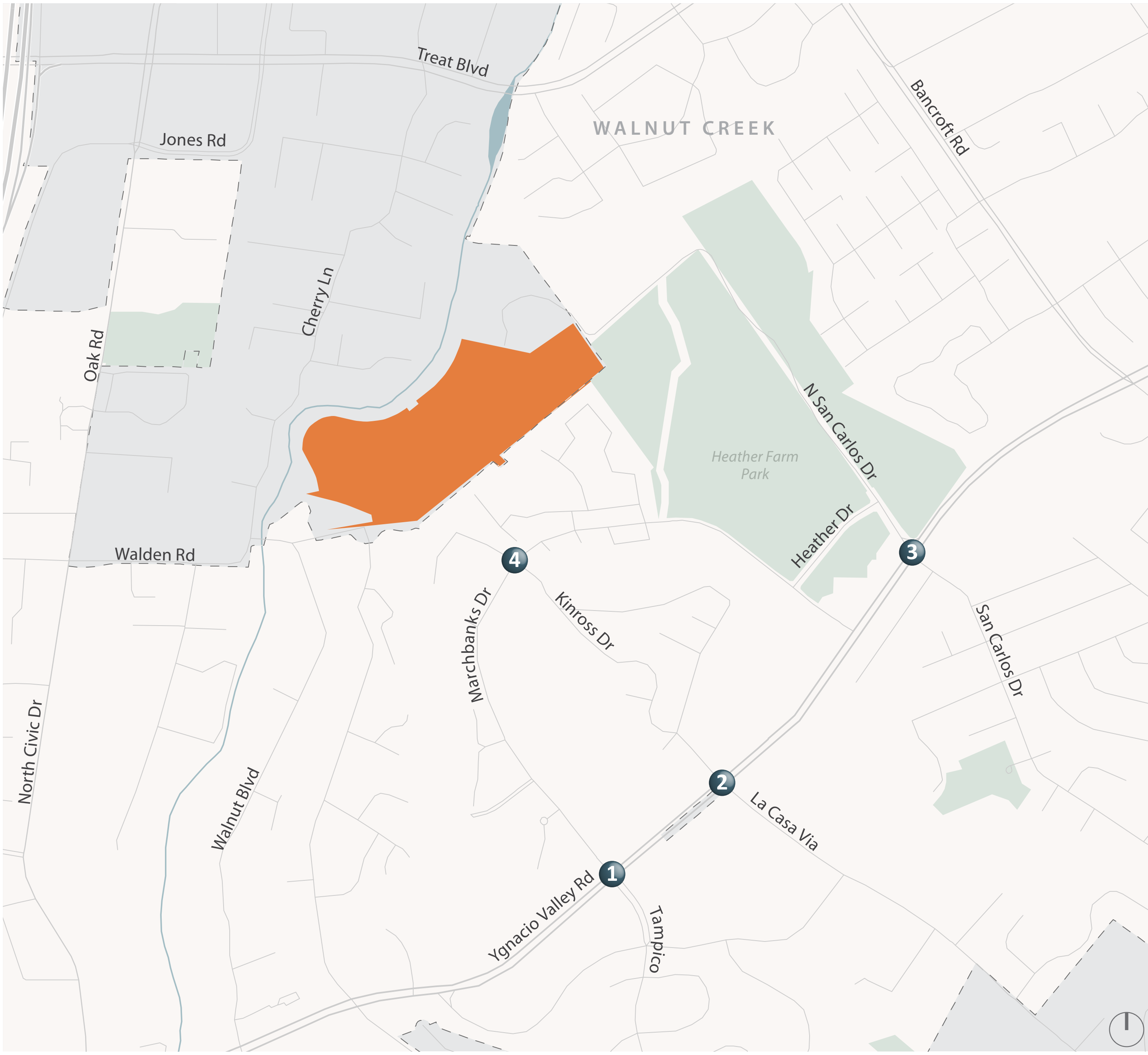


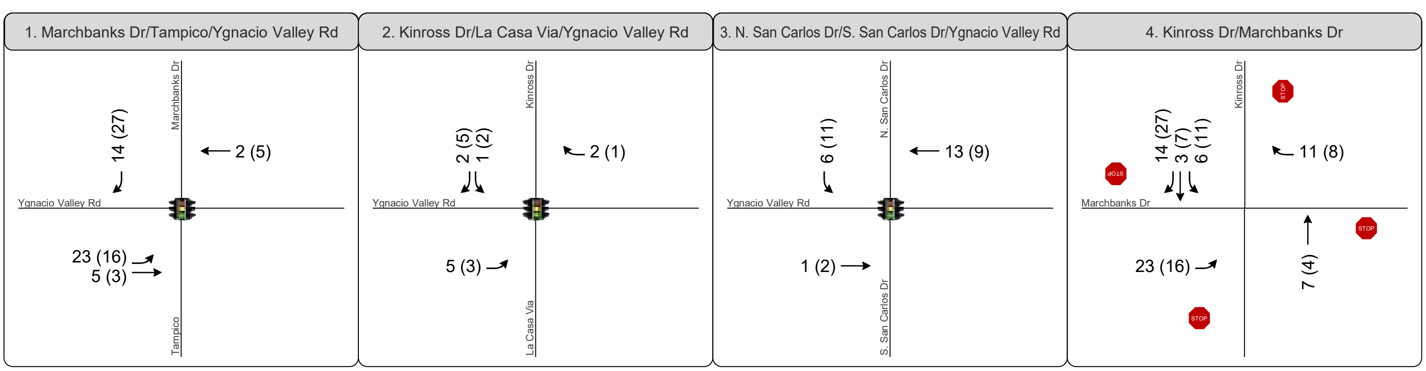
Project Site
Study Intersection
External Trip Distribution
Internal Trip Distribution

Figure 4

Project Trip Distribution

WC20-3699_4_TripDistro





XX (YY) AM (PM) Peak Hour Traffic Volumes

Signalized Intersection

Stop Sign

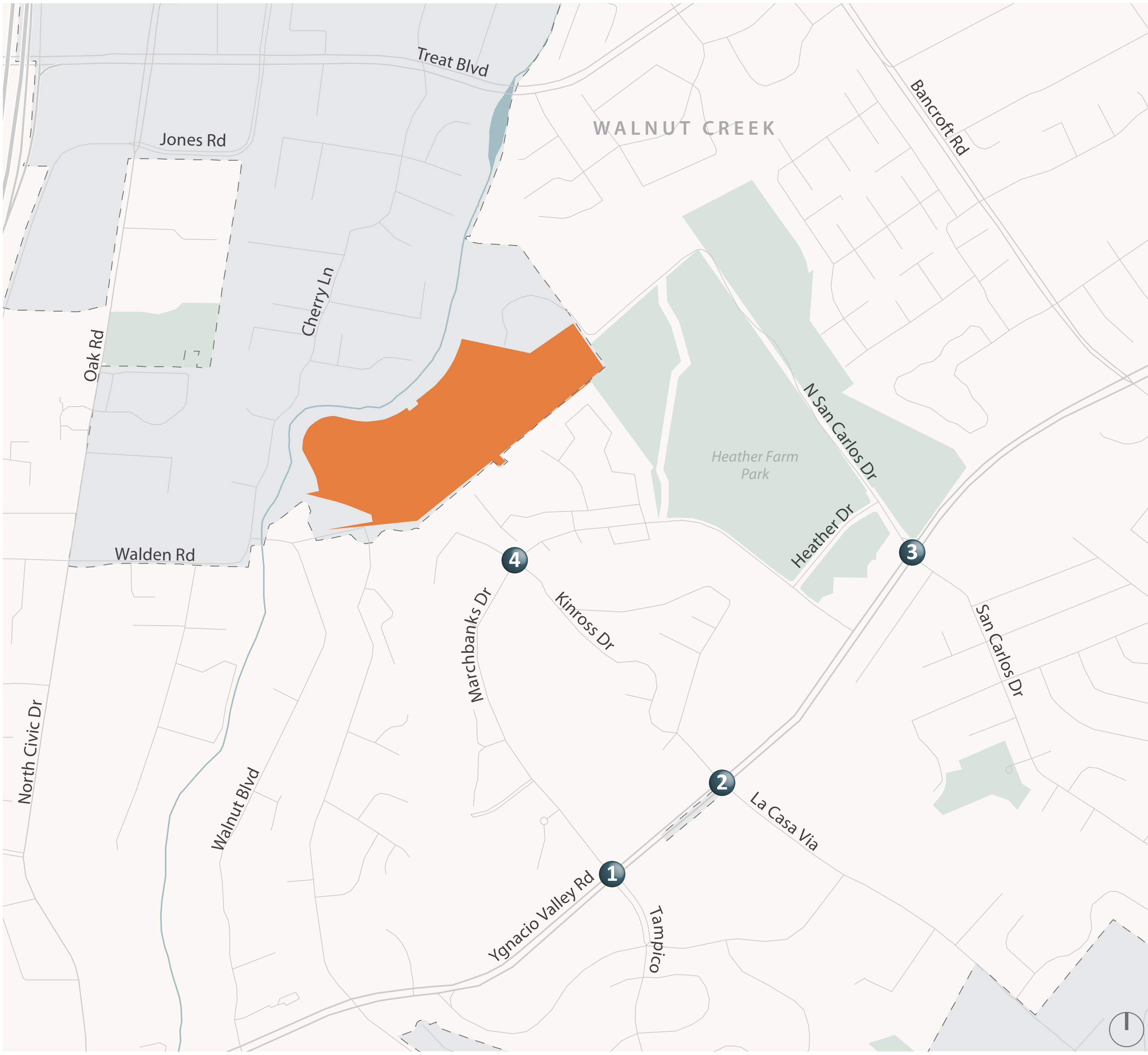
Project Site

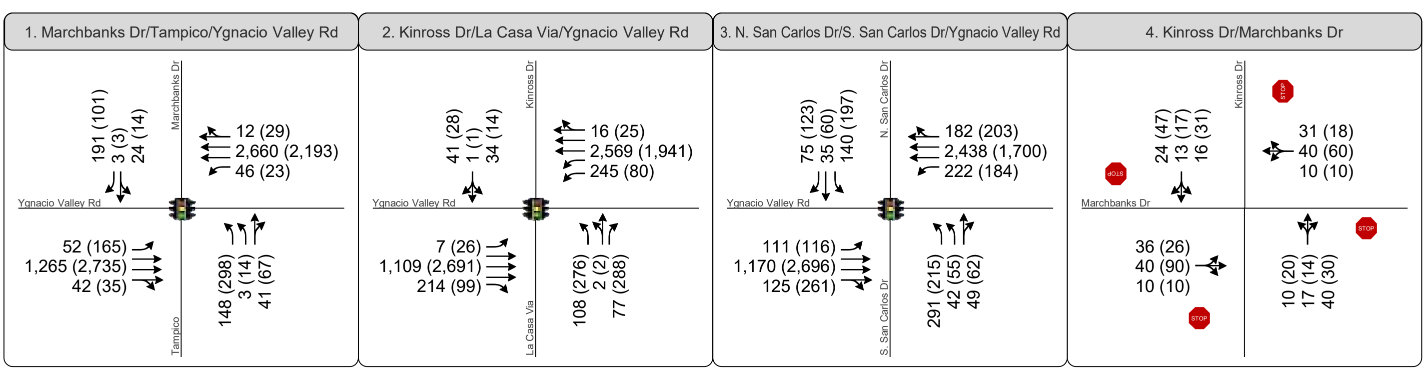
Study Intersection

Figure 5

Project Trip Assignment

WC20-3699_5_Volumes





XX (YY) AM (PM) Peak Hour Traffic Volumes

Signalized Intersection

Stop Sign

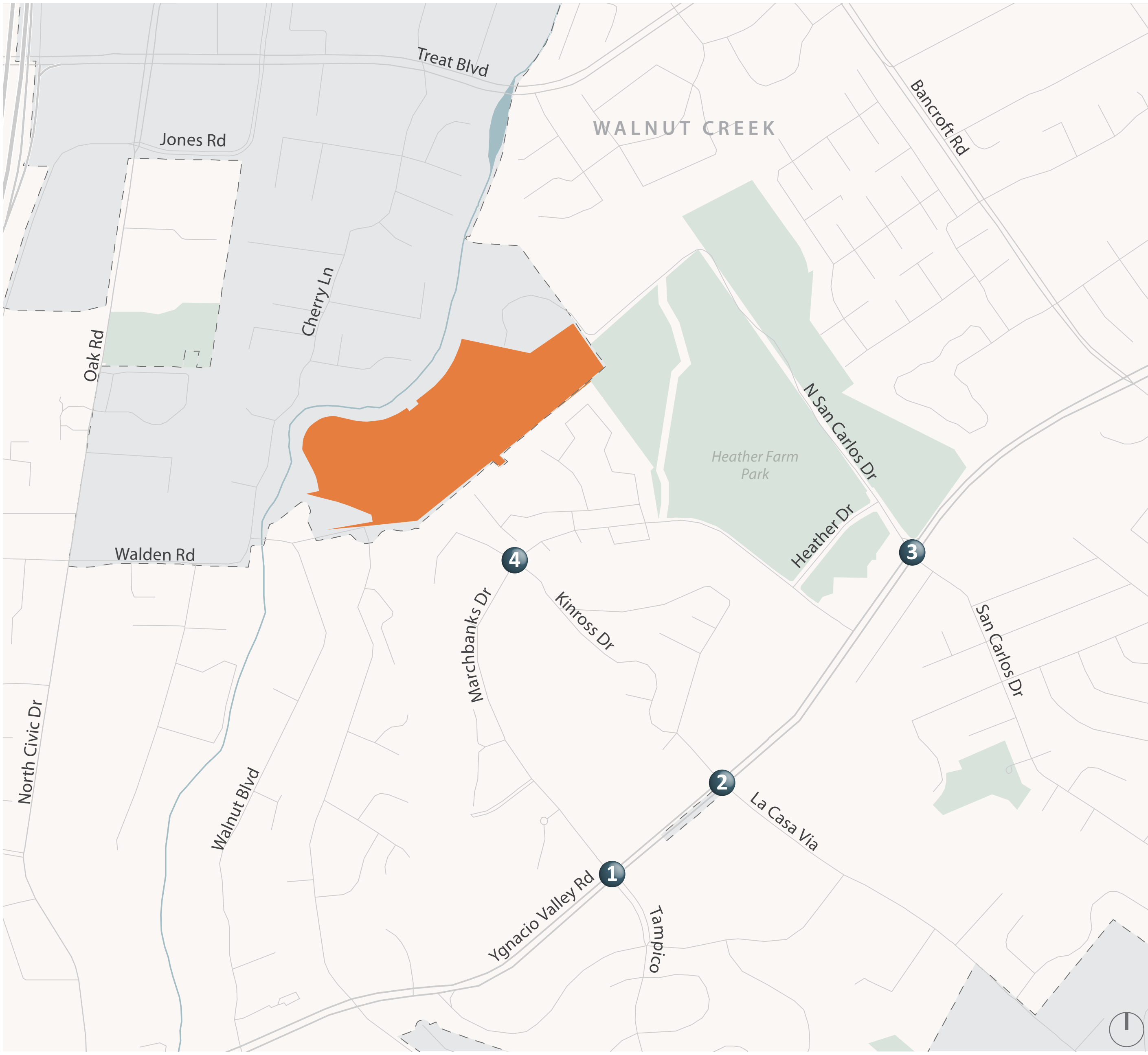
Project Site

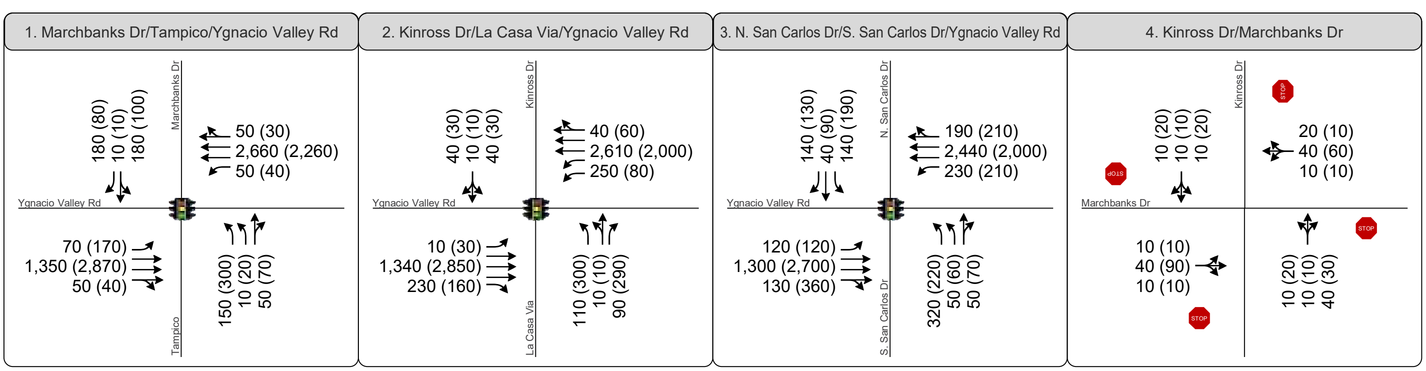
\# Study Intersection

Figure 6

Existing plus Project Peak Hour Intersection Traffic Volumes, Lane Configurations and Traffic Controls

WC20-3699_6_Volumes





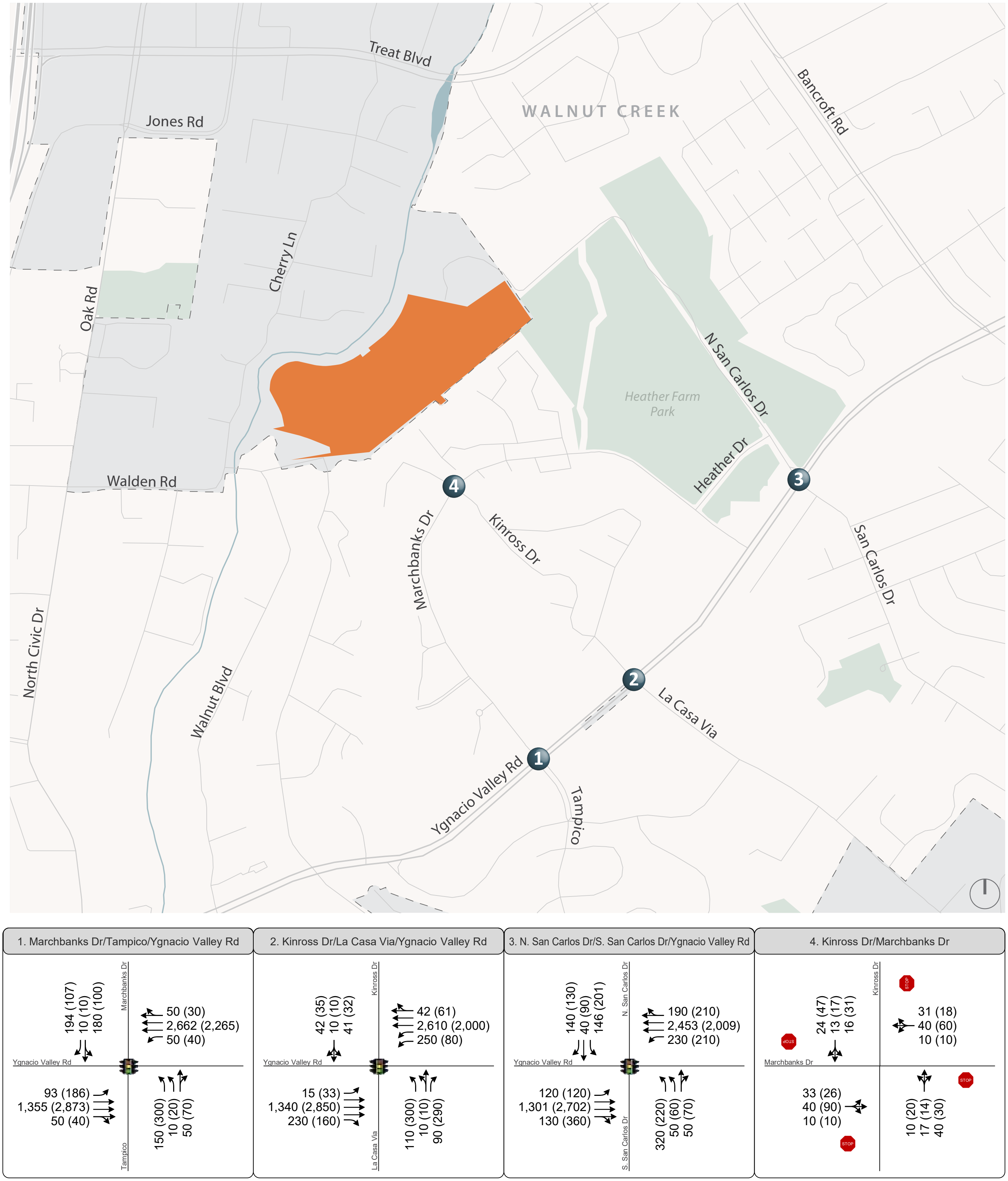
XX (YY) AM (PM) Peak Hour Traffic Volumes | Signalized Intersection | Stop Sign

Project Site | # Study Intersection

Figure 7

Cumulative Peak Hour Intersection Traffic Volumes, Lane Configurations and Traffic Controls

WC20-3699_7_Volumes



XX (YY) AM (PM) Peak Hour Traffic Volumes | Signalized Intersection | Stop Sign

Project Site | # Study Intersection

Figure 8

Cumulative plus Project Peak Hour Intersection Traffic Volumes, Lane Configurations and Traffic Controls

WC20-3699_8_Volumes

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	29	1260	42	46	2658	12	148	3	41	24	3	177
Future Volume (vph)	29	1260	42	46	2658	12	148	3	41	24	3	177
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	3.0
Lane Util. Factor	1.00	0.91		1.00	0.91		0.97	1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Frt	1.00	1.00		1.00	1.00		1.00	0.86			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.96	1.00
Satd. Flow (prot)	1863	5321		1863	5349		3686	1719			1914	1700
Flt Permitted	0.95	1.00		0.95	1.00		0.74	1.00			0.76	1.00
Satd. Flow (perm)	1863	5321		1863	5349		2862	1719			1517	1700
Peak-hour factor, PHF	0.97	0.97	0.97	0.95	0.95	0.95	0.94	0.94	0.94	0.90	0.90	0.90
Adj. Flow (vph)	30	1299	43	48	2798	13	157	3	44	27	3	197
RTOR Reduction (vph)	0	1	0	0	0	0	0	39	0	0	0	176
Lane Group Flow (vph)	30	1341	0	48	2811	0	157	8	0	0	30	21
Confl. Peds. (#/hr)	2		7	7		2						
Confl. Bikes (#/hr)						2						
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	Perm
Protected Phases	1	6		5	2			4			4	
Permitted Phases							4			4		4
Actuated Green, G (s)	4.9	115.1		7.0	117.2		13.9	13.9			13.9	13.9
Effective Green, g (s)	5.9	117.1		8.0	119.2		15.9	15.9			15.9	15.9
Actuated g/C Ratio	0.04	0.78		0.05	0.79		0.11	0.11			0.11	0.11
Clearance Time (s)	4.0	5.0		4.0	5.0		5.0	5.0			5.0	5.0
Vehicle Extension (s)	2.0	6.0		2.0	6.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	73	4153		99	4250		303	182			160	180
v/s Ratio Prot	0.02	0.25		c0.03	c0.53			0.00				
v/s Ratio Perm							c0.05				0.02	0.01
v/c Ratio	0.41	0.32		0.48	0.66		0.52	0.04			0.19	0.12
Uniform Delay, d1	70.4	4.8		69.0	6.7		63.4	60.2			61.2	60.7
Progression Factor	1.00	1.00		0.97	0.67		1.00	1.00			1.00	1.00
Incremental Delay, d2	1.4	0.2		1.0	0.6		1.5	0.1			0.6	0.3
Delay (s)	71.7	5.0		68.0	5.1		64.9	60.3			61.7	61.0
Level of Service	E	A		E	A		E	E			E	E
Approach Delay (s)		6.5			6.1			63.9			61.1	
Approach LOS		A			A			E			E	

Intersection Summary			
HCM 2000 Control Delay	11.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	77.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	1109	214	245	2569	14	108	2	77	33	1	39
Future Volume (vph)	2	1109	214	245	2569	14	108	2	77	33	1	39
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	3.0	3.0	4.0	3.0	3.0		3.0	3.0	3.0		3.0	
Lane Util. Factor	1.00	0.91	1.00	0.97	0.91		0.95	0.95	1.00		1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00		1.00	1.00	0.99		0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		0.99	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85		0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.95	1.00		0.98	
Satd. Flow (prot)	1863	5353	1627	3614	5348		1805	1812	1686		1790	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.45	0.49	1.00		0.83	
Satd. Flow (perm)	1863	5353	1627	3614	5348		855	938	1686		1511	
Peak-hour factor, PHF	0.96	0.96	0.96	0.97	0.97	0.97	0.89	0.89	0.89	0.82	0.82	0.82
Adj. Flow (vph)	2	1155	223	253	2648	14	121	2	87	40	1	48
RTOR Reduction (vph)	0	0	92	0	0	0	0	0	67	0	29	0
Lane Group Flow (vph)	2	1155	131	253	2662	0	62	61	20	0	60	0
Confl. Peds. (#/hr)			6	6					9	9		
Confl. Bikes (#/hr)						2						1
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA	Perm	Prot	NA		Perm	NA	custom	Perm	NA	
Protected Phases	1	6		5	2			3	3		4	
Permitted Phases			6				3		4	4		
Actuated Green, G (s)	2.0	86.9	86.9	13.9	98.8		20.2	20.2	30.2		10.0	
Effective Green, g (s)	3.0	88.9	87.9	14.9	100.8		22.2	22.2	34.2		12.0	
Actuated g/C Ratio	0.02	0.59	0.59	0.10	0.67		0.15	0.15	0.23		0.08	
Clearance Time (s)	4.0	5.0	5.0	4.0	5.0		5.0	5.0	5.0		5.0	
Vehicle Extension (s)	1.0	6.0	6.0	1.0	6.0		1.0	1.0	1.0		1.0	
Lane Grp Cap (vph)	37	3172	953	358	3593		126	138	418		120	
v/s Ratio Prot	0.00	0.22		c0.07	c0.50				0.01			
v/s Ratio Perm			0.08				c0.07	0.07	0.00		c0.04	
v/c Ratio	0.05	0.36	0.14	0.71	0.74		0.49	0.44	0.05		0.50	
Uniform Delay, d1	72.1	15.9	14.0	65.4	16.1		58.7	58.3	45.2		66.1	
Progression Factor	1.25	0.78	1.00	0.78	1.87		1.00	1.00	1.00		1.00	
Incremental Delay, d2	0.2	0.3	0.3	3.0	0.8		1.1	0.8	0.0		1.2	
Delay (s)	90.3	12.6	14.2	53.9	30.9		59.8	59.1	45.2		67.4	
Level of Service	F	B	B	D	C		E	E	D		E	
Approach Delay (s)		13.0			32.9			53.5			67.4	
Approach LOS		B			C			D			E	

Intersection Summary			
HCM 2000 Control Delay	28.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	79.1%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	111	1169	125	222	2425	182	291	42	49	134	35	75
Future Volume (vph)	111	1169	125	222	2425	182	291	42	49	134	35	75
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Util. Factor	1.00	0.91		1.00	0.91		0.97	1.00		1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.97		1.00	1.00	0.97
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		0.96	1.00	1.00
Frt	1.00	0.99		1.00	0.99		1.00	0.92		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1863	5274		1863	5284		3676	1774		1822	2000	1656
Flt Permitted	0.95	1.00		0.95	1.00		0.73	1.00		0.59	1.00	1.00
Satd. Flow (perm)	1863	5274		1863	5284		2821	1774		1136	2000	1656
Peak-hour factor, PHF	0.98	0.98	0.98	0.91	0.91	0.91	0.87	0.87	0.87	0.82	0.82	0.82
Growth Factor (vph)	100%	115%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Adj. Flow (vph)	113	1372	128	244	2665	200	334	48	56	163	43	91
RTOR Reduction (vph)	0	7	0	0	5	0	0	29	0	0	0	72
Lane Group Flow (vph)	113	1493	0	244	2860	0	334	75	0	163	43	19
Confl. Peds. (#/hr)	5		1	1		5	2		35	35		2
Confl. Bikes (#/hr)						2			3			10
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	Perm
Protected Phases	1	6		5	2			4			4	
Permitted Phases							4			4		4
Actuated Green, G (s)	14.6	95.4		12.0	92.8		28.6	28.6		28.6	28.6	28.6
Effective Green, g (s)	15.6	97.4		13.0	94.8		30.6	30.6		30.6	30.6	30.6
Actuated g/C Ratio	0.10	0.65		0.09	0.63		0.20	0.20		0.20	0.20	0.20
Clearance Time (s)	4.0	5.0		4.0	5.0		5.0	5.0		5.0	5.0	5.0
Vehicle Extension (s)	3.0	6.0		2.0	6.0		2.0	2.0		2.0	2.0	2.0
Lane Grp Cap (vph)	193	3424		161	3339		575	361		231	408	337
v/s Ratio Prot	c0.06	0.28		c0.13	c0.54			0.04			0.02	
v/s Ratio Perm							0.12			c0.14		0.01
v/c Ratio	0.59	0.44		1.52	0.86		0.58	0.21		0.71	0.11	0.06
Uniform Delay, d1	64.1	12.9		68.5	22.1		53.9	49.6		55.5	48.6	48.1
Progression Factor	1.29	0.35		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	4.4	0.4		261.2	3.1		1.0	0.1		7.8	0.0	0.0
Delay (s)	87.3	4.9		329.7	25.2		54.9	49.7		63.3	48.6	48.1
Level of Service	F	A		F	C		D	D		E	D	D
Approach Delay (s)		10.6			49.1			53.7			56.5	
Approach LOS		B			D			D			E	

Intersection Summary			
HCM 2000 Control Delay	38.5	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	89.9%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Intersection Delay, s/veh	7.4
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	10	40	10	10	40	20	10	10	40	10	10	10
Future Vol, veh/h	10	40	10	10	40	20	10	10	40	10	10	10
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	1	1	1	1	1	1	1	1	1	1	1	1
Mvmt Flow	11	44	11	11	44	22	11	11	44	11	11	11
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	7.5	7.4	7.2	7.3
HCM LOS	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	17%	17%	14%	33%
Vol Thru, %	17%	67%	57%	33%
Vol Right, %	67%	17%	29%	33%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	60	60	70	30
LT Vol	10	10	10	10
Through Vol	10	40	40	10
RT Vol	40	10	20	10
Lane Flow Rate	67	67	78	33
Geometry Grp	1	1	1	1
Degree of Util (X)	0.071	0.076	0.086	0.038
Departure Headway (Hd)	3.824	4.084	3.999	4.084
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	925	871	890	866
Service Time	1.897	2.138	2.053	2.161
HCM Lane V/C Ratio	0.072	0.077	0.088	0.038
HCM Control Delay	7.2	7.5	7.4	7.3
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.2	0.2	0.3	0.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	149	2732	35	23	2188	29	298	14	67	14	3	74
Future Volume (vph)	149	2732	35	23	2188	29	298	14	67	14	3	74
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	3.0
Lane Util. Factor	1.00	*1.00		1.00	*0.80		0.97	1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Frt	1.00	1.00		1.00	1.00		1.00	0.88			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.96	1.00
Satd. Flow (prot)	1863	5869		1863	4695		3686	1752			1919	1700
Flt Permitted	0.95	1.00		0.95	1.00		0.75	1.00			0.81	1.00
Satd. Flow (perm)	1863	5869		1863	4695		2891	1752			1611	1700
Peak-hour factor, PHF	0.95	0.95	0.95	0.89	0.89	0.89	0.83	0.83	0.83	0.88	0.88	0.88
Adj. Flow (vph)	157	2876	37	26	2458	33	359	17	81	16	3	84
RTOR Reduction (vph)	0	1	0	0	1	0	0	66	0	0	0	69
Lane Group Flow (vph)	157	2912	0	26	2490	0	359	32	0	0	19	15
Confl. Peds. (#/hr)	3		1	1		3						
Confl. Bikes (#/hr)						2						
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	Perm
Protected Phases	1	6		5	2			4			4	
Permitted Phases							4			4		4
Actuated Green, G (s)	11.0	98.3		4.5	91.8		23.2	23.2			23.2	23.2
Effective Green, g (s)	12.0	100.3		5.5	93.8		25.2	25.2			25.2	25.2
Actuated g/C Ratio	0.09	0.72		0.04	0.67		0.18	0.18			0.18	0.18
Clearance Time (s)	4.0	5.0		4.0	5.0		5.0	5.0			5.0	5.0
Vehicle Extension (s)	2.0	6.0		2.0	6.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	159	4204		73	3145		520	315			289	306
v/s Ratio Prot	c0.08	0.50		0.01	c0.53			0.02				
v/s Ratio Perm							c0.12				0.01	0.01
v/c Ratio	0.99	0.69		0.36	0.79		0.69	0.10			0.07	0.05
Uniform Delay, d1	63.9	11.2		65.5	16.2		53.7	47.9			47.6	47.5
Progression Factor	1.00	1.00		1.12	0.42		1.00	1.00			1.00	1.00
Incremental Delay, d2	66.9	1.0		0.6	1.3		3.9	0.1			0.1	0.1
Delay (s)	130.8	12.1		73.9	8.1		57.7	48.1			47.7	47.6
Level of Service	F	B		E	A		E	D			D	D
Approach Delay (s)		18.2			8.8			55.6			47.6	
Approach LOS		B			A			E			D	

Intersection Summary			
HCM 2000 Control Delay	17.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	79.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	23	2691	99	80	1941	24	276	2	288	12	1	23
Future Volume (vph)	23	2691	99	80	1941	24	276	2	288	12	1	23
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	3.0	3.0	4.0	3.0	3.0		3.0	3.0	3.0		3.0	
Lane Util. Factor	1.00	*1.00	1.00	0.97	0.91		0.95	0.95	1.00		1.00	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85		0.91	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.95	1.00		0.98	
Satd. Flow (prot)	1863	5882	1667	3614	5341		1805	1811	1694		1774	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.33	0.33	1.00		0.84	
Satd. Flow (perm)	1863	5882	1667	3614	5341		621	628	1694		1517	
Peak-hour factor, PHF	0.97	0.97	0.97	0.89	0.89	0.89	0.79	0.79	0.79	0.73	0.73	0.73
Adj. Flow (vph)	24	2774	102	90	2181	27	349	3	365	16	1	32
RTOR Reduction (vph)	0	0	50	0	1	0	0	0	248	0	30	0
Lane Group Flow (vph)	24	2774	52	90	2207	0	174	178	117	0	19	0
Confl. Peds. (#/hr)	4					4			4	4		
Confl. Bikes (#/hr)						2						1
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA	Perm	Prot	NA		Perm	NA	custom	Perm	NA	
Protected Phases	1	6		5	2			3	3		4	
Permitted Phases			6				3		4	4		
Actuated Green, G (s)	6.0	70.0	70.0	10.0	74.0		33.0	33.0	41.0		8.0	
Effective Green, g (s)	7.0	72.0	71.0	11.0	76.0		35.0	35.0	45.0		10.0	
Actuated g/C Ratio	0.05	0.51	0.51	0.08	0.54		0.25	0.25	0.32		0.07	
Clearance Time (s)	4.0	5.0	5.0	4.0	5.0		5.0	5.0	5.0		5.0	
Vehicle Extension (s)	1.0	6.0	6.0	1.0	6.0		1.0	1.0	1.0		1.0	
Lane Grp Cap (vph)	93	3025	845	283	2899		155	157	580		108	
v/s Ratio Prot	0.01	c0.47		c0.02	c0.41				c0.05			
v/s Ratio Perm			0.03				0.28	c0.28	0.02		0.01	
v/c Ratio	0.26	0.92	0.06	0.32	0.76		1.12	1.13	0.20		0.18	
Uniform Delay, d1	64.0	31.3	17.5	61.0	24.9		52.5	52.5	34.5		61.1	
Progression Factor	1.26	0.68	0.78	1.22	0.64		1.00	1.00	1.00		1.00	
Incremental Delay, d2	0.4	4.4	0.1	0.2	1.6		109.0	112.3	0.1		0.3	
Delay (s)	80.9	25.7	13.9	74.5	17.6		161.5	164.8	34.5		61.4	
Level of Service	F	C	B	E	B		F	F	C		E	
Approach Delay (s)		25.8			19.8			97.7			61.4	
Approach LOS		C			B			F			E	

Intersection Summary			
HCM 2000 Control Delay	32.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	86.4%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	116	2694	261	184	1691	203	215	55	62	186	60	123
Future Volume (vph)	116	2694	261	184	1691	203	215	55	62	186	60	123
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Util. Factor	1.00	*1.00		1.00	0.91		0.97	1.00		1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.97		1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		0.97	1.00	1.00
Frt	1.00	0.99		1.00	0.98		1.00	0.92		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1863	5791		1863	5247		3686	1788		1844	2000	1664
Flt Permitted	0.95	1.00		0.95	1.00		0.66	1.00		0.56	1.00	1.00
Satd. Flow (perm)	1863	5791		1863	5247		2569	1788		1078	2000	1664
Peak-hour factor, PHF	0.89	0.89	0.89	0.94	0.94	0.94	0.84	0.84	0.84	0.73	0.73	0.73
Adj. Flow (vph)	130	3027	293	196	1799	216	256	65	74	255	82	168
RTOR Reduction (vph)	0	9	0	0	10	0	0	29	0	0	0	127
Lane Group Flow (vph)	130	3311	0	196	2005	0	256	110	0	255	82	41
Confl. Peds. (#/hr)	5		2	2		5			29	29		
Confl. Bikes (#/hr)						2			3			10
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	Perm
Protected Phases	1	6		5	2			4			4	
Permitted Phases							4			4		4
Actuated Green, G (s)	14.8	82.5		11.0	78.7		32.5	32.5		32.5	32.5	32.5
Effective Green, g (s)	15.8	84.5		12.0	80.7		34.5	34.5		34.5	34.5	34.5
Actuated g/C Ratio	0.11	0.60		0.09	0.58		0.25	0.25		0.25	0.25	0.25
Clearance Time (s)	4.0	5.0		4.0	5.0		5.0	5.0		5.0	5.0	5.0
Vehicle Extension (s)	3.0	6.0		2.0	6.0		2.0	2.0		2.0	2.0	2.0
Lane Grp Cap (vph)	210	3495		159	3024		633	440		265	492	410
v/s Ratio Prot	0.07	c0.57		c0.11	0.38			0.06			0.04	
v/s Ratio Perm							0.10			c0.24		0.02
v/c Ratio	0.62	0.95		1.23	0.66		0.40	0.25		0.96	0.17	0.10
Uniform Delay, d1	59.2	25.7		64.0	20.3		44.2	42.4		52.1	41.5	40.8
Progression Factor	0.76	1.50		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	3.3	4.5		147.3	1.2		0.2	0.1		44.4	0.1	0.0
Delay (s)	48.6	43.1		211.3	21.5		44.3	42.5		96.5	41.5	40.8
Level of Service	D	D		F	C		D	D		F	D	D
Approach Delay (s)		43.3			38.3			43.7			69.1	
Approach LOS		D			D			D			E	

Intersection Summary			
HCM 2000 Control Delay	43.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	95.4%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Intersection	
Intersection Delay, s/veh	7.8
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Vol, veh/h	10	90	10	10	60	10	20	10	30	20	10	20
Future Vol, veh/h	10	90	10	10	60	10	20	10	30	20	10	20
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	1	1	1	1	1	1	1	1	1	1	1	1
Mvmt Flow	11	100	11	11	67	11	22	11	33	22	11	22
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	7.9	7.8	7.6	7.6
HCM LOS	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	33%	9%	12%	40%
Vol Thru, %	17%	82%	75%	20%
Vol Right, %	50%	9%	12%	40%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	60	110	80	50
LT Vol	20	10	10	20
Through Vol	10	90	60	10
RT Vol	30	10	10	20
Lane Flow Rate	67	122	89	56
Geometry Grp	1	1	1	1
Degree of Util (X)	0.078	0.141	0.103	0.066
Departure Headway (Hd)	4.212	4.16	4.173	4.297
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	855	848	844	838
Service Time	2.214	2.252	2.272	2.299
HCM Lane V/C Ratio	0.078	0.144	0.105	0.067
HCM Control Delay	7.6	7.9	7.8	7.6
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.3	0.5	0.3	0.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	55	1265	42	46	2660	12	148	3	41	24	3	191
Future Volume (vph)	55	1265	42	46	2660	12	148	3	41	24	3	191
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	3.0
Lane Util. Factor	1.00	0.91		1.00	0.91		0.97	1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Frt	1.00	1.00		1.00	1.00		1.00	0.86			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.96	1.00
Satd. Flow (prot)	1863	5321		1863	5349		3686	1719			1914	1700
Flt Permitted	0.95	1.00		0.95	1.00		0.74	1.00			0.76	1.00
Satd. Flow (perm)	1863	5321		1863	5349		2862	1719			1517	1700
Peak-hour factor, PHF	0.97	0.97	0.97	0.95	0.95	0.95	0.94	0.94	0.94	0.90	0.90	0.90
Adj. Flow (vph)	57	1304	43	48	2800	13	157	3	44	27	3	212
RTOR Reduction (vph)	0	1	0	0	0	0	0	39	0	0	0	190
Lane Group Flow (vph)	57	1346	0	48	2813	0	157	8	0	0	30	22
Confl. Peds. (#/hr)	2		7	7		2						
Confl. Bikes (#/hr)						2						
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	Perm
Protected Phases	1	6		5	2			4			4	
Permitted Phases							4			4		4
Actuated Green, G (s)	8.0	115.1		7.0	114.1		13.9	13.9			13.9	13.9
Effective Green, g (s)	9.0	117.1		8.0	116.1		15.9	15.9			15.9	15.9
Actuated g/C Ratio	0.06	0.78		0.05	0.77		0.11	0.11			0.11	0.11
Clearance Time (s)	4.0	5.0		4.0	5.0		5.0	5.0			5.0	5.0
Vehicle Extension (s)	2.0	6.0		2.0	6.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	111	4153		99	4140		303	182			160	180
v/s Ratio Prot	c0.03	0.25		0.03	c0.53			0.00				
v/s Ratio Perm							c0.05				0.02	0.01
v/c Ratio	0.51	0.32		0.48	0.68		0.52	0.04			0.19	0.12
Uniform Delay, d1	68.4	4.8		69.0	8.1		63.4	60.2			61.2	60.7
Progression Factor	1.00	1.00		0.97	0.62		1.00	1.00			1.00	1.00
Incremental Delay, d2	1.7	0.2		1.0	0.7		1.5	0.1			0.6	0.3
Delay (s)	70.0	5.0		68.1	5.7		64.9	60.3			61.7	61.1
Level of Service	E	A		E	A		E	E			E	E
Approach Delay (s)		7.7			6.7			63.9			61.1	
Approach LOS		A			A			E			E	

Intersection Summary			
HCM 2000 Control Delay	12.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	78.6%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	7	1109	214	245	2569	16	108	2	77	34	1	41
Future Volume (vph)	7	1109	214	245	2569	16	108	2	77	34	1	41
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0		3.0	
Lane Util. Factor	1.00	0.91	1.00	0.97	0.91		0.95	0.95	1.00		1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00		1.00	1.00	0.99		0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		0.99	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85		0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.95	1.00		0.98	
Satd. Flow (prot)	1863	5353	1627	3614	5347		1805	1812	1686		1789	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.45	0.49	1.00		0.83	
Satd. Flow (perm)	1863	5353	1627	3614	5347		855	939	1686		1511	
Peak-hour factor, PHF	0.96	0.96	0.96	0.97	0.97	0.97	0.89	0.89	0.89	0.82	0.82	0.82
Adj. Flow (vph)	7	1155	223	253	2648	16	121	2	87	41	1	50
RTOR Reduction (vph)	0	0	91	0	0	0	0	0	67	0	29	0
Lane Group Flow (vph)	7	1155	132	253	2664	0	62	61	20	0	63	0
Confl. Peds. (#/hr)			6	6					9	9		
Confl. Bikes (#/hr)						2						1
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA	Perm	Prot	NA		Perm	NA	custom	Perm	NA	
Protected Phases	1	6		5	2			3	3		4	
Permitted Phases			6				3		4	4		
Actuated Green, G (s)	2.0	86.9	86.9	13.9	98.8		20.2	20.2	30.2		10.0	
Effective Green, g (s)	3.0	88.9	88.9	14.9	100.8		22.2	22.2	34.2		12.0	
Actuated g/C Ratio	0.02	0.59	0.59	0.10	0.67		0.15	0.15	0.23		0.08	
Clearance Time (s)	4.0	5.0	5.0	4.0	5.0		5.0	5.0	5.0		5.0	
Vehicle Extension (s)	1.0	6.0	6.0	1.0	6.0		1.0	1.0	1.0		1.0	
Lane Grp Cap (vph)	37	3172	964	358	3593		126	138	418		120	
v/s Ratio Prot	0.00	0.22		c0.07	c0.50				0.01			
v/s Ratio Perm			0.08				c0.07	0.06	0.00		c0.04	
v/c Ratio	0.19	0.36	0.14	0.71	0.74		0.49	0.44	0.05		0.53	
Uniform Delay, d1	72.3	15.9	13.5	65.4	16.1		58.7	58.3	45.2		66.3	
Progression Factor	1.21	0.78	1.01	0.78	1.87		1.00	1.00	1.00		1.00	
Incremental Delay, d2	0.9	0.3	0.3	3.0	0.8		1.1	0.8	0.0		1.9	
Delay (s)	88.7	12.6	14.0	53.9	30.9		59.8	59.1	45.2		68.2	
Level of Service	F	B	B	D	C		E	E	D		E	
Approach Delay (s)		13.2			32.9			53.5			68.2	
Approach LOS		B			C			D			E	

Intersection Summary			
HCM 2000 Control Delay	28.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	79.1%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
3: S. San Carlos Dr./N.San Carlos Dr. & Ygnacio Valley Rd.

Existing Plus Project AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	111	1170	125	222	2438	182	291	42	49	140	35	75
Future Volume (vph)	111	1170	125	222	2438	182	291	42	49	140	35	75
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Util. Factor	1.00	0.91		1.00	0.91		0.97	1.00		1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.97		1.00	1.00	0.97
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		0.96	1.00	1.00
Frt	1.00	0.99		1.00	0.99		1.00	0.92		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1863	5274		1863	5284		3676	1774		1822	2000	1656
Flt Permitted	0.95	1.00		0.95	1.00		0.73	1.00		0.59	1.00	1.00
Satd. Flow (perm)	1863	5274		1863	5284		2821	1774		1136	2000	1656
Peak-hour factor, PHF	0.98	0.98	0.98	0.91	0.91	0.91	0.87	0.87	0.87	0.82	0.82	0.82
Growth Factor (vph)	100%	115%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Adj. Flow (vph)	113	1373	128	244	2679	200	334	48	56	171	43	91
RTOR Reduction (vph)	0	7	0	0	5	0	0	29	0	0	0	72
Lane Group Flow (vph)	113	1494	0	244	2874	0	334	75	0	171	43	19
Confl. Peds. (#/hr)	5		1	1		5	2		35	35		2
Confl. Bikes (#/hr)						2			3			10
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	Perm
Protected Phases	1	6		5	2			4			4	
Permitted Phases							4			4		4
Actuated Green, G (s)	14.6	95.4		12.0	92.8		28.6	28.6		28.6	28.6	28.6
Effective Green, g (s)	15.6	97.4		13.0	94.8		30.6	30.6		30.6	30.6	30.6
Actuated g/C Ratio	0.10	0.65		0.09	0.63		0.20	0.20		0.20	0.20	0.20
Clearance Time (s)	4.0	5.0		4.0	5.0		5.0	5.0		5.0	5.0	5.0
Vehicle Extension (s)	3.0	6.0		2.0	6.0		2.0	2.0		2.0	2.0	2.0
Lane Grp Cap (vph)	193	3424		161	3339		575	361		231	408	337
v/s Ratio Prot	c0.06	0.28		c0.13	c0.54			0.04			0.02	
v/s Ratio Perm							0.12			c0.15		0.01
v/c Ratio	0.59	0.44		1.52	0.86		0.58	0.21		0.74	0.11	0.06
Uniform Delay, d1	64.1	12.9		68.5	22.3		53.9	49.6		56.0	48.6	48.1
Progression Factor	1.29	0.35		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	4.4	0.4		261.2	3.2		1.0	0.1		10.6	0.0	0.0
Delay (s)	87.2	4.9		329.7	25.4		54.9	49.7		66.6	48.6	48.1
Level of Service	F	A		F	C		D	D		E	D	D
Approach Delay (s)		10.6			49.2			53.7			58.5	
Approach LOS		B			D			D			E	

Intersection Summary			
HCM 2000 Control Delay	38.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	90.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Intersection Delay, s/veh	7.6
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Traffic Vol, veh/h	36	40	10	10	40	31	10	17	40	16	13	24
Future Vol, veh/h	36	40	10	10	40	31	10	17	40	16	13	24
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	1	1	1	1	1	1	1	1	1	1	1	1
Mvmt Flow	40	44	11	11	44	34	11	19	44	18	14	27
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	7.9	7.6	7.4	7.5
HCM LOS	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	15%	42%	12%	30%
Vol Thru, %	25%	47%	49%	25%
Vol Right, %	60%	12%	38%	45%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	67	86	81	53
LT Vol	10	36	10	16
Through Vol	17	40	40	13
RT Vol	40	10	31	24
Lane Flow Rate	74	96	90	59
Geometry Grp	1	1	1	1
Degree of Util (X)	0.084	0.112	0.1	0.069
Departure Headway (Hd)	4.058	4.231	4.016	4.189
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	888	835	877	860
Service Time	2.06	2.317	2.109	2.191
HCM Lane V/C Ratio	0.083	0.115	0.103	0.069
HCM Control Delay	7.4	7.9	7.6	7.5
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.3	0.4	0.3	0.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	167	2735	35	23	2193	29	298	14	67	14	3	102
Future Volume (vph)	167	2735	35	23	2193	29	298	14	67	14	3	102
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	3.0
Lane Util. Factor	1.00	*1.00		1.00	*0.80		0.97	1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Frt	1.00	1.00		1.00	1.00		1.00	0.88			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.96	1.00
Satd. Flow (prot)	1863	5869		1863	4695		3686	1752			1919	1700
Flt Permitted	0.95	1.00		0.95	1.00		0.75	1.00			0.81	1.00
Satd. Flow (perm)	1863	5869		1863	4695		2891	1752			1612	1700
Peak-hour factor, PHF	0.95	0.95	0.95	0.89	0.89	0.89	0.83	0.83	0.83	0.88	0.88	0.88
Adj. Flow (vph)	176	2879	37	26	2464	33	359	17	81	16	3	116
RTOR Reduction (vph)	0	1	0	0	1	0	0	66	0	0	0	95
Lane Group Flow (vph)	176	2915	0	26	2496	0	359	32	0	0	19	21
Confl. Peds. (#/hr)	3		1	1		3						
Confl. Bikes (#/hr)						2						
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	Perm
Protected Phases	1	6		5	2			4			4	
Permitted Phases							4			4		4
Actuated Green, G (s)	11.0	98.1		4.5	91.6		23.4	23.4			23.4	23.4
Effective Green, g (s)	12.0	100.1		5.5	93.6		25.4	25.4			25.4	25.4
Actuated g/C Ratio	0.09	0.71		0.04	0.67		0.18	0.18			0.18	0.18
Clearance Time (s)	4.0	5.0		4.0	5.0		5.0	5.0			5.0	5.0
Vehicle Extension (s)	2.0	6.0		2.0	6.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	159	4196		73	3138		524	317			292	308
v/s Ratio Prot	c0.09	0.50		0.01	c0.53			0.02				
v/s Ratio Perm							c0.12				0.01	0.01
v/c Ratio	1.11	0.69		0.36	0.80		0.69	0.10			0.07	0.07
Uniform Delay, d1	64.0	11.3		65.5	16.4		53.6	47.8			47.5	47.5
Progression Factor	1.00	1.00		1.11	0.41		1.00	1.00			1.00	1.00
Incremental Delay, d2	102.9	1.0		0.6	1.3		3.7	0.1			0.1	0.1
Delay (s)	166.9	12.3		73.7	8.0		57.3	47.9			47.6	47.6
Level of Service	F	B		E	A		E	D			D	D
Approach Delay (s)		21.1			8.7			55.3			47.6	
Approach LOS		C			A			E			D	

Intersection Summary			
HCM 2000 Control Delay	19.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	79.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	26	2691	99	80	1941	25	276	2	288	14	1	28
Future Volume (vph)	26	2691	99	80	1941	25	276	2	288	14	1	28
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0		3.0	
Lane Util. Factor	1.00	*1.00	1.00	0.97	0.91		0.95	0.95	1.00		1.00	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85		0.91	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.95	1.00		0.98	
Satd. Flow (prot)	1863	5882	1667	3614	5340		1805	1811	1694		1774	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.33	0.33	1.00		0.84	
Satd. Flow (perm)	1863	5882	1667	3614	5340		621	621	1694		1506	
Peak-hour factor, PHF	0.97	0.97	0.97	0.89	0.89	0.89	0.79	0.79	0.79	0.73	0.73	0.73
Adj. Flow (vph)	27	2774	102	90	2181	28	349	3	365	19	1	38
RTOR Reduction (vph)	0	0	50	0	1	0	0	0	248	0	35	0
Lane Group Flow (vph)	27	2774	52	90	2208	0	174	178	117	0	23	0
Confl. Peds. (#/hr)	4					4			4	4		
Confl. Bikes (#/hr)						2						1
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA	Perm	Prot	NA		Perm	NA	custom	Perm	NA	
Protected Phases	1	6		5	2			3	3		4	
Permitted Phases			6				3		4	4		
Actuated Green, G (s)	6.0	70.0	70.0	10.0	74.0		33.0	33.0	41.0		8.0	
Effective Green, g (s)	7.0	72.0	72.0	11.0	76.0		35.0	35.0	45.0		10.0	
Actuated g/C Ratio	0.05	0.51	0.51	0.08	0.54		0.25	0.25	0.32		0.07	
Clearance Time (s)	4.0	5.0	5.0	4.0	5.0		5.0	5.0	5.0		5.0	
Vehicle Extension (s)	1.0	6.0	6.0	1.0	6.0		1.0	1.0	1.0		1.0	
Lane Grp Cap (vph)	93	3025	857	283	2898		155	155	580		107	
v/s Ratio Prot	0.01	c0.47		c0.02	c0.41				c0.05			
v/s Ratio Perm			0.03				0.28	c0.29	0.02		0.02	
v/c Ratio	0.29	0.92	0.06	0.32	0.76		1.12	1.15	0.20		0.21	
Uniform Delay, d1	64.1	31.3	17.1	61.0	24.9		52.5	52.5	34.5		61.3	
Progression Factor	1.25	0.68	0.74	1.22	0.64		1.00	1.00	1.00		1.00	
Incremental Delay, d2	0.5	4.3	0.1	0.2	1.6		109.0	117.7	0.1		0.4	
Delay (s)	80.9	25.6	12.7	74.6	17.5		161.5	170.2	34.5		61.6	
Level of Service	F	C	B	E	B		F	F	C		E	
Approach Delay (s)		25.7			19.7			99.0			61.6	
Approach LOS		C			B			F			E	

Intersection Summary			
HCM 2000 Control Delay	32.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	86.4%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	116	2696	261	184	1700	203	215	55	62	197	60	123
Future Volume (vph)	116	2696	261	184	1700	203	215	55	62	197	60	123
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Util. Factor	1.00	*1.00		1.00	0.91		0.97	1.00		1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.97		1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		0.97	1.00	1.00
Frt	1.00	0.99		1.00	0.98		1.00	0.92		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1863	5791		1863	5248		3686	1788		1844	2000	1664
Flt Permitted	0.95	1.00		0.95	1.00		0.66	1.00		0.56	1.00	1.00
Satd. Flow (perm)	1863	5791		1863	5248		2574	1788		1083	2000	1664
Peak-hour factor, PHF	0.89	0.89	0.89	0.94	0.94	0.94	0.84	0.84	0.84	0.73	0.73	0.73
Adj. Flow (vph)	130	3029	293	196	1809	216	256	65	74	270	82	168
RTOR Reduction (vph)	0	9	0	0	10	0	0	29	0	0	0	126
Lane Group Flow (vph)	130	3313	0	196	2015	0	256	110	0	270	82	42
Confl. Peds. (#/hr)	5		2	2		5			29	29		
Confl. Bikes (#/hr)						2			3			10
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	Perm
Protected Phases	1	6		5	2			4			4	
Permitted Phases							4			4		4
Actuated Green, G (s)	14.8	82.0		11.0	78.2		33.0	33.0		33.0	33.0	33.0
Effective Green, g (s)	15.8	84.0		12.0	80.2		35.0	35.0		35.0	35.0	35.0
Actuated g/C Ratio	0.11	0.60		0.09	0.57		0.25	0.25		0.25	0.25	0.25
Clearance Time (s)	4.0	5.0		4.0	5.0		5.0	5.0		5.0	5.0	5.0
Vehicle Extension (s)	3.0	6.0		2.0	6.0		2.0	2.0		2.0	2.0	2.0
Lane Grp Cap (vph)	210	3474		159	3006		643	447		270	500	416
v/s Ratio Prot	0.07	c0.57		c0.11	0.38			0.06			0.04	
v/s Ratio Perm							0.10			c0.25		0.03
v/c Ratio	0.62	0.95		1.23	0.67		0.40	0.25		1.00	0.16	0.10
Uniform Delay, d1	59.2	26.2		64.0	20.7		43.7	41.9		52.5	41.1	40.4
Progression Factor	0.77	1.49		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	3.3	5.0		147.3	1.2		0.1	0.1		54.8	0.1	0.0
Delay (s)	48.6	44.2		211.3	21.9		43.9	42.1		107.3	41.1	40.4
Level of Service	D	D		F	C		D	D		F	D	D
Approach Delay (s)		44.3			38.7			43.2			75.2	
Approach LOS		D			D			D			E	

Intersection Summary			
HCM 2000 Control Delay	44.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	95.5%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Intersection	
Intersection Delay, s/veh	8.1
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Traffic Vol, veh/h	28	90	10	10	60	18	20	14	30	31	17	48
Future Vol, veh/h	28	90	10	10	60	18	20	14	30	31	17	48
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	1	1	1	1	1	1	1	1	1	1	1	1
Mvmt Flow	31	100	11	11	67	20	22	16	33	34	19	53
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	8.4	8	7.8	8
HCM LOS	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	31%	22%	11%	32%
Vol Thru, %	22%	70%	68%	18%
Vol Right, %	47%	8%	20%	50%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	64	128	88	96
LT Vol	20	28	10	31
Through Vol	14	90	60	17
RT Vol	30	10	18	48
Lane Flow Rate	71	142	98	107
Geometry Grp	1	1	1	1
Degree of Util (X)	0.086	0.175	0.119	0.128
Departure Headway (Hd)	4.362	4.418	4.372	4.306
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	822	814	821	834
Service Time	2.384	2.437	2.392	2.326
HCM Lane V/C Ratio	0.086	0.174	0.119	0.128
HCM Control Delay	7.8	8.4	8	8
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.3	0.6	0.4	0.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	70	1350	50	50	2660	50	150	10	50	180	10	180
Future Volume (vph)	70	1350	50	50	2660	50	150	10	50	180	10	180
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	3.0
Lane Util. Factor	1.00	0.91		1.00	0.91		0.97	1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Frt	1.00	0.99		1.00	1.00		1.00	0.88			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.95	1.00
Satd. Flow (prot)	1863	5317		1863	5335		3686	1752			1910	1700
Flt Permitted	0.95	1.00		0.95	1.00		0.37	1.00			0.66	1.00
Satd. Flow (perm)	1863	5317		1863	5335		1417	1752			1319	1700
Peak-hour factor, PHF	0.97	0.97	0.97	0.95	0.95	0.95	0.94	0.94	0.94	0.90	0.90	0.90
Adj. Flow (vph)	72	1392	52	53	2800	53	160	11	53	200	11	200
RTOR Reduction (vph)	0	2	0	0	1	0	0	42	0	0	0	112
Lane Group Flow (vph)	72	1442	0	53	2852	0	160	22	0	0	211	88
Confl. Peds. (#/hr)	2		7	7		2						
Confl. Bikes (#/hr)						2						
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	Perm
Protected Phases	1	6		5	2			4			4	
Permitted Phases							4			4		4
Actuated Green, G (s)	10.2	100.0		7.2	97.0		28.8	28.8			28.8	28.8
Effective Green, g (s)	11.2	102.0		8.2	99.0		30.8	30.8			30.8	30.8
Actuated g/C Ratio	0.07	0.68		0.05	0.66		0.21	0.21			0.21	0.21
Clearance Time (s)	4.0	5.0		4.0	5.0		5.0	5.0			5.0	5.0
Vehicle Extension (s)	2.0	6.0		2.0	6.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	139	3615		101	3521		290	359			270	349
v/s Ratio Prot	c0.04	c0.27		0.03	c0.53			0.01				
v/s Ratio Perm							0.11				c0.16	0.05
v/c Ratio	0.52	0.40		0.52	0.81		0.55	0.06			0.78	0.25
Uniform Delay, d1	66.8	10.5		69.0	18.6		53.4	48.0			56.4	49.9
Progression Factor	1.00	1.00		1.15	0.65		1.00	1.00			1.00	1.00
Incremental Delay, d2	1.4	0.3		1.5	1.4		2.3	0.1			13.7	0.4
Delay (s)	68.2	10.9		80.9	13.5		55.7	48.0			70.1	50.3
Level of Service	E	B		F	B		E	D			E	D
Approach Delay (s)		13.6			14.8			53.5			60.5	
Approach LOS		B			B			D			E	

Intersection Summary			
HCM 2000 Control Delay	19.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	78.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	1340	230	250	2610	40	110	10	90	40	10	40
Future Volume (vph)	10	1340	230	250	2610	40	110	10	90	40	10	40
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	3.0	3.0	4.0	3.0	3.0		3.0	3.0	3.0		3.0	
Lane Util. Factor	1.00	0.91	1.00	0.97	0.91		0.95	0.95	1.00		1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00		1.00	1.00	0.99		0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85		0.94	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.96	1.00		0.98	
Satd. Flow (prot)	1863	5353	1627	3614	5339		1805	1824	1686		1818	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.45	0.53	1.00		0.82	
Satd. Flow (perm)	1863	5353	1627	3614	5339		847	1004	1686		1528	
Peak-hour factor, PHF	0.96	0.96	0.96	0.97	0.97	0.97	0.89	0.89	0.89	0.82	0.82	0.82
Adj. Flow (vph)	10	1396	240	258	2691	41	124	11	101	49	12	49
RTOR Reduction (vph)	0	0	97	0	1	0	0	0	78	0	19	0
Lane Group Flow (vph)	10	1396	143	258	2731	0	67	68	23	0	91	0
Confl. Peds. (#/hr)			6	6					9	9		
Confl. Bikes (#/hr)						2						1
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA	Perm	Prot	NA		Perm	NA	custom	Perm	NA	
Protected Phases	1	6		5	2			3	3		4	
Permitted Phases			6				3		4	4		
Actuated Green, G (s)	4.0	86.3	86.3	14.1	96.4		20.6	20.6	30.6		10.0	
Effective Green, g (s)	5.0	88.3	87.3	15.1	98.4		22.6	22.6	34.6		12.0	
Actuated g/C Ratio	0.03	0.59	0.58	0.10	0.66		0.15	0.15	0.23		0.08	
Clearance Time (s)	4.0	5.0	5.0	4.0	5.0		5.0	5.0	5.0		5.0	
Vehicle Extension (s)	1.0	6.0	6.0	1.0	6.0		1.0	1.0	1.0		1.0	
Lane Grp Cap (vph)	62	3151	946	363	3502		127	151	422		122	
v/s Ratio Prot	0.01	0.26		c0.07	c0.51				0.01			
v/s Ratio Perm			0.09				c0.08	0.07	0.01		c0.06	
v/c Ratio	0.16	0.44	0.15	0.71	0.78		0.53	0.45	0.06		0.74	
Uniform Delay, d1	70.5	17.2	14.4	65.3	18.2		58.8	58.0	45.0		67.5	
Progression Factor	1.33	0.71	0.07	0.80	1.75		1.00	1.00	1.00		1.00	
Incremental Delay, d2	0.4	0.4	0.3	3.1	1.0		1.8	0.8	0.0		19.1	
Delay (s)	93.8	12.6	1.3	55.0	32.7		60.6	58.8	45.0		86.6	
Level of Service	F	B	A	E	C		E	E	D		F	
Approach Delay (s)		11.5			34.6			53.4			86.6	
Approach LOS		B			C			D			F	

Intersection Summary			
HCM 2000 Control Delay	29.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	80.4%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	120	1300	130	230	2440	190	320	50	50	140	40	140
Future Volume (vph)	120	1300	130	230	2440	190	320	50	50	140	40	140
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Util. Factor	1.00	0.91		1.00	0.91		0.97	1.00		1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.97		1.00	1.00	0.97
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		0.96	1.00	1.00
Frt	1.00	0.99		1.00	0.99		1.00	0.93		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1863	5279		1863	5281		3676	1790		1824	2000	1657
Flt Permitted	0.95	1.00		0.95	1.00		0.72	1.00		0.57	1.00	1.00
Satd. Flow (perm)	1863	5279		1863	5281		2777	1790		1102	2000	1657
Peak-hour factor, PHF	0.98	0.98	0.98	0.91	0.91	0.91	0.87	0.87	0.87	0.82	0.82	0.82
Growth Factor (vph)	100%	115%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Adj. Flow (vph)	122	1526	133	253	2681	209	368	57	57	171	49	171
RTOR Reduction (vph)	0	6	0	0	5	0	0	25	0	0	0	135
Lane Group Flow (vph)	122	1653	0	253	2885	0	368	89	0	171	49	36
Confl. Peds. (#/hr)	5		1	1		5	2		35	35		2
Confl. Bikes (#/hr)						2			3			10
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	Perm
Protected Phases	1	6		5	2			4			4	
Permitted Phases							4			4		4
Actuated Green, G (s)	15.1	94.7		12.0	91.6		29.3	29.3		29.3	29.3	29.3
Effective Green, g (s)	16.1	96.7		13.0	93.6		31.3	31.3		31.3	31.3	31.3
Actuated g/C Ratio	0.11	0.64		0.09	0.62		0.21	0.21		0.21	0.21	0.21
Clearance Time (s)	4.0	5.0		4.0	5.0		5.0	5.0		5.0	5.0	5.0
Vehicle Extension (s)	3.0	6.0		2.0	6.0		2.0	2.0		2.0	2.0	2.0
Lane Grp Cap (vph)	199	3403		161	3295		579	373		229	417	345
v/s Ratio Prot	c0.07	0.31		c0.14	c0.55			0.05			0.02	
v/s Ratio Perm							0.13			c0.16		0.02
v/c Ratio	0.61	0.49		1.57	0.88		0.64	0.24		0.75	0.12	0.10
Uniform Delay, d1	64.0	13.8		68.5	23.4		54.1	49.4		55.6	48.1	48.0
Progression Factor	1.40	0.26		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	5.2	0.5		284.9	3.6		1.7	0.1		11.0	0.0	0.0
Delay (s)	94.6	4.0		353.4	27.0		55.8	49.5		66.6	48.2	48.0
Level of Service	F	A		F	C		E	D		E	D	D
Approach Delay (s)		10.2			53.3			54.3			56.2	
Approach LOS		B			D			D			E	

Intersection Summary			
HCM 2000 Control Delay	40.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	90.6%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Intersection Delay, s/veh	7.4
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	10	40	10	10	40	20	10	10	40	10	10	10
Future Vol, veh/h	10	40	10	10	40	20	10	10	40	10	10	10
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	1	1	1	1	1	1	1	1	1	1	1	1
Mvmt Flow	11	44	11	11	44	22	11	11	44	11	11	11
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	7.5	7.4	7.2	7.3
HCM LOS	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	17%	17%	14%	33%
Vol Thru, %	17%	67%	57%	33%
Vol Right, %	67%	17%	29%	33%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	60	60	70	30
LT Vol	10	10	10	10
Through Vol	10	40	40	10
RT Vol	40	10	20	10
Lane Flow Rate	67	67	78	33
Geometry Grp	1	1	1	1
Degree of Util (X)	0.071	0.076	0.086	0.038
Departure Headway (Hd)	3.824	4.084	3.999	4.084
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	925	871	890	866
Service Time	1.897	2.138	2.053	2.161
HCM Lane V/C Ratio	0.072	0.077	0.088	0.038
HCM Control Delay	7.2	7.5	7.4	7.3
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.2	0.2	0.3	0.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	170	2870	40	40	2260	30	300	20	70	100	10	80
Future Volume (vph)	170	2870	40	40	2260	30	300	20	70	100	10	80
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	3.0
Lane Util. Factor	1.00	*1.00		1.00	*0.80		0.97	1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Frt	1.00	1.00		1.00	1.00		1.00	0.88			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.96	1.00
Satd. Flow (prot)	1863	5868		1863	4695		3686	1767			1913	1700
Flt Permitted	0.95	1.00		0.95	1.00		0.56	1.00			0.58	1.00
Satd. Flow (perm)	1863	5868		1863	4695		2166	1767			1163	1700
Peak-hour factor, PHF	0.95	0.95	0.95	0.89	0.89	0.89	0.83	0.83	0.83	0.88	0.88	0.88
Adj. Flow (vph)	179	3021	42	45	2539	34	361	24	84	114	11	91
RTOR Reduction (vph)	0	1	0	0	1	0	0	66	0	0	0	72
Lane Group Flow (vph)	179	3062	0	45	2572	0	361	42	0	0	125	19
Confl. Peds. (#/hr)	3		1	1		3						
Confl. Bikes (#/hr)						2						
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	Perm
Protected Phases	1	6		5	2			4			4	
Permitted Phases							4			4		4
Actuated Green, G (s)	11.0	91.3		6.9	87.2		27.8	27.8			27.8	27.8
Effective Green, g (s)	12.0	93.3		7.9	89.2		29.8	29.8			29.8	29.8
Actuated g/C Ratio	0.09	0.67		0.06	0.64		0.21	0.21			0.21	0.21
Clearance Time (s)	4.0	5.0		4.0	5.0		5.0	5.0			5.0	5.0
Vehicle Extension (s)	2.0	6.0		2.0	6.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	159	3910		105	2991		461	376			247	361
v/s Ratio Prot	c0.10	0.52		0.02	c0.55			0.02				
v/s Ratio Perm							c0.17				0.11	0.01
v/c Ratio	1.13	0.78		0.43	0.86		0.78	0.11			0.51	0.05
Uniform Delay, d1	64.0	16.3		63.9	20.4		52.0	44.4			48.6	43.9
Progression Factor	1.00	1.00		1.18	0.37		1.00	1.00			1.00	1.00
Incremental Delay, d2	109.1	1.6		0.6	1.9		8.5	0.1			1.6	0.1
Delay (s)	173.1	17.9		76.2	9.5		60.5	44.6			50.2	43.9
Level of Service	F	B		E	A		E	D			D	D
Approach Delay (s)		26.5			10.7			56.8			47.6	
Approach LOS		C			B			E			D	

Intersection Summary			
HCM 2000 Control Delay	23.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	82.5%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	30	2850	160	80	2000	60	300	10	290	30	10	30
Future Volume (vph)	30	2850	160	80	2000	60	300	10	290	30	10	30
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	3.0	3.0	4.0	3.0	3.0		3.0	3.0	3.0		3.0	
Lane Util. Factor	1.00	*1.00	1.00	0.97	0.91		0.95	0.95	1.00		1.00	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85		0.94	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.96	1.00		0.98	
Satd. Flow (prot)	1863	5882	1667	3614	5324		1805	1815	1693		1831	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.43	0.44	1.00		0.77	
Satd. Flow (perm)	1863	5882	1667	3614	5324		812	844	1693		1442	
Peak-hour factor, PHF	0.97	0.97	0.97	0.89	0.89	0.89	0.79	0.79	0.79	0.73	0.73	0.73
Adj. Flow (vph)	31	2938	165	90	2247	67	380	13	367	41	14	41
RTOR Reduction (vph)	0	0	59	0	2	0	0	0	244	0	19	0
Lane Group Flow (vph)	31	2938	106	90	2312	0	198	195	123	0	77	0
Confl. Peds. (#/hr)	4					4			4	4		
Confl. Bikes (#/hr)						2						1
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA	Perm	Prot	NA		Perm	NA	custom	Perm	NA	
Protected Phases	1	6		5	2			3	3		4	
Permitted Phases			6				3		4	4		
Actuated Green, G (s)	6.0	68.0	68.0	10.0	72.0		33.0	33.0	43.0		10.0	
Effective Green, g (s)	7.0	70.0	69.0	11.0	74.0		35.0	35.0	47.0		12.0	
Actuated g/C Ratio	0.05	0.50	0.49	0.08	0.53		0.25	0.25	0.34		0.09	
Clearance Time (s)	4.0	5.0	5.0	4.0	5.0		5.0	5.0	5.0		5.0	
Vehicle Extension (s)	1.0	6.0	6.0	1.0	6.0		1.0	1.0	1.0		1.0	
Lane Grp Cap (vph)	93	2941	821	283	2814		203	211	604		123	
v/s Ratio Prot	0.02	c0.50		c0.02	c0.43				0.05			
v/s Ratio Perm			0.06				c0.24	0.23	0.02		c0.05	
v/c Ratio	0.33	1.00	0.13	0.32	0.82		0.98	0.92	0.20		0.62	
Uniform Delay, d1	64.2	35.0	19.2	61.0	27.5		52.1	51.2	33.2		61.8	
Progression Factor	1.12	0.74	1.07	1.25	0.58		1.00	1.00	1.00		1.00	
Incremental Delay, d2	0.5	13.1	0.2	0.2	2.0		55.4	40.6	0.1		6.9	
Delay (s)	72.3	38.8	20.8	76.5	17.9		107.5	91.8	33.2		68.7	
Level of Service	E	D	C	E	B		F	F	C		E	
Approach Delay (s)		38.2			20.1			67.6			68.7	
Approach LOS		D			C			E			E	

Intersection Summary			
HCM 2000 Control Delay	35.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	89.4%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	120	2700	360	210	2000	210	220	60	70	190	90	130
Future Volume (vph)	120	2700	360	210	2000	210	220	60	70	190	90	130
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Util. Factor	1.00	*1.00		1.00	0.91		0.97	1.00		1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.97		1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		0.97	1.00	1.00
Frt	1.00	0.98		1.00	0.99		1.00	0.92		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1863	5761		1863	5259		3686	1786		1846	2000	1664
Flt Permitted	0.95	1.00		0.95	1.00		0.59	1.00		0.53	1.00	1.00
Satd. Flow (perm)	1863	5761		1863	5259		2277	1786		1031	2000	1664
Peak-hour factor, PHF	0.89	0.89	0.89	0.94	0.94	0.94	0.84	0.84	0.84	0.73	0.73	0.73
Adj. Flow (vph)	135	3034	404	223	2128	223	262	71	83	260	123	178
RTOR Reduction (vph)	0	14	0	0	9	0	0	30	0	0	0	134
Lane Group Flow (vph)	135	3424	0	223	2342	0	262	124	0	260	123	45
Confl. Peds. (#/hr)	5		2	2		5			29	29		
Confl. Bikes (#/hr)						2			3			10
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	Perm
Protected Phases	1	6		5	2			4			4	
Permitted Phases							4			4		4
Actuated Green, G (s)	15.0	82.0		11.0	78.0		33.0	33.0		33.0	33.0	33.0
Effective Green, g (s)	16.0	84.0		12.0	80.0		35.0	35.0		35.0	35.0	35.0
Actuated g/C Ratio	0.11	0.60		0.09	0.57		0.25	0.25		0.25	0.25	0.25
Clearance Time (s)	4.0	5.0		4.0	5.0		5.0	5.0		5.0	5.0	5.0
Vehicle Extension (s)	3.0	6.0		2.0	6.0		2.0	2.0		2.0	2.0	2.0
Lane Grp Cap (vph)	212	3456		159	3005		569	446		257	500	416
v/s Ratio Prot	0.07	c0.59		c0.12	0.45			0.07			0.06	
v/s Ratio Perm							0.12			c0.25		0.03
v/c Ratio	0.64	0.99		1.40	0.78		0.46	0.28		1.01	0.25	0.11
Uniform Delay, d1	59.2	27.6		64.0	23.2		44.5	42.3		52.5	42.0	40.5
Progression Factor	0.78	1.40		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	2.9	8.4		214.4	2.1		0.2	0.1		59.2	0.1	0.0
Delay (s)	48.9	46.9		278.4	25.3		44.7	42.4		111.7	42.0	40.5
Level of Service	D	D		F	C		D	D		F	D	D
Approach Delay (s)		47.0			47.2			43.9			73.8	
Approach LOS		D			D			D			E	

Intersection Summary			
HCM 2000 Control Delay	49.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	110.8%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Intersection	
Intersection Delay, s/veh	7.8
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Traffic Vol, veh/h	10	90	10	10	60	10	20	10	30	20	10	20
Future Vol, veh/h	10	90	10	10	60	10	20	10	30	20	10	20
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	1	1	1	1	1	1	1	1	1	1	1	1
Mvmt Flow	11	100	11	11	67	11	22	11	33	22	11	22
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	7.9	7.8	7.6	7.6
HCM LOS	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	33%	9%	12%	40%
Vol Thru, %	17%	82%	75%	20%
Vol Right, %	50%	9%	12%	40%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	60	110	80	50
LT Vol	20	10	10	20
Through Vol	10	90	60	10
RT Vol	30	10	10	20
Lane Flow Rate	67	122	89	56
Geometry Grp	1	1	1	1
Degree of Util (X)	0.078	0.141	0.103	0.066
Departure Headway (Hd)	4.212	4.16	4.173	4.297
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	855	848	844	838
Service Time	2.214	2.252	2.272	2.299
HCM Lane V/C Ratio	0.078	0.144	0.105	0.067
HCM Control Delay	7.6	7.9	7.8	7.6
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.3	0.5	0.3	0.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	96	1355	50	50	2662	50	150	10	50	180	10	194
Future Volume (vph)	96	1355	50	50	2662	50	150	10	50	180	10	194
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	3.0
Lane Util. Factor	1.00	0.91		1.00	0.91		0.97	1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Frt	1.00	0.99		1.00	1.00		1.00	0.88			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.95	1.00
Satd. Flow (prot)	1863	5317		1863	5335		3686	1752			1910	1700
Flt Permitted	0.95	1.00		0.95	1.00		0.37	1.00			0.66	1.00
Satd. Flow (perm)	1863	5317		1863	5335		1421	1752			1319	1700
Peak-hour factor, PHF	0.97	0.97	0.97	0.95	0.95	0.95	0.94	0.94	0.94	0.90	0.90	0.90
Adj. Flow (vph)	99	1397	52	53	2802	53	160	11	53	200	11	216
RTOR Reduction (vph)	0	2	0	0	1	0	0	42	0	0	0	121
Lane Group Flow (vph)	99	1447	0	53	2854	0	160	22	0	0	211	95
Confl. Peds. (#/hr)	2		7	7		2						
Confl. Bikes (#/hr)						2						
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	Perm
Protected Phases	1	6		5	2			4			4	
Permitted Phases							4			4		4
Actuated Green, G (s)	12.4	99.9		7.2	94.7		28.9	28.9			28.9	28.9
Effective Green, g (s)	13.4	101.9		8.2	96.7		30.9	30.9			30.9	30.9
Actuated g/C Ratio	0.09	0.68		0.05	0.64		0.21	0.21			0.21	0.21
Clearance Time (s)	4.0	5.0		4.0	5.0		5.0	5.0			5.0	5.0
Vehicle Extension (s)	2.0	6.0		2.0	6.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	166	3612		101	3439		292	360			271	350
v/s Ratio Prot	c0.05	0.27		0.03	c0.53			0.01				
v/s Ratio Perm							0.11				c0.16	0.06
v/c Ratio	0.60	0.40		0.52	0.83		0.55	0.06			0.78	0.27
Uniform Delay, d1	65.7	10.6		69.0	20.4		53.3	47.9			56.3	50.1
Progression Factor	1.00	1.00		1.15	0.66		1.00	1.00			1.00	1.00
Incremental Delay, d2	3.8	0.3		1.5	1.7		2.1	0.1			13.2	0.4
Delay (s)	69.5	10.9		81.2	15.0		55.4	48.0			69.5	50.5
Level of Service	E	B		F	B		E	D			E	D
Approach Delay (s)		14.7			16.2			53.3			59.9	
Approach LOS		B			B			D			E	

Intersection Summary			
HCM 2000 Control Delay	21.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	81.6%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	1340	230	250	2610	42	110	10	90	41	10	42
Future Volume (vph)	15	1340	230	250	2610	42	110	10	90	41	10	42
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0		3.0	
Lane Util. Factor	1.00	0.91	1.00	0.97	0.91		0.95	0.95	1.00		1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00		1.00	1.00	0.99		0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85		0.94	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.96	1.00		0.98	
Satd. Flow (prot)	1863	5353	1627	3614	5339		1805	1824	1686		1816	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.44	0.53	1.00		0.82	
Satd. Flow (perm)	1863	5353	1627	3614	5339		847	1003	1686		1529	
Peak-hour factor, PHF	0.96	0.96	0.96	0.97	0.97	0.97	0.89	0.89	0.89	0.82	0.82	0.82
Adj. Flow (vph)	16	1396	240	258	2691	43	124	11	101	50	12	51
RTOR Reduction (vph)	0	0	97	0	1	0	0	0	78	0	19	0
Lane Group Flow (vph)	16	1396	143	258	2733	0	67	68	23	0	94	0
Confl. Peds. (#/hr)			6	6					9	9		
Confl. Bikes (#/hr)						2						1
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA	Perm	Prot	NA		Perm	NA	custom	Perm	NA	
Protected Phases	1	6		5	2			3	3		4	
Permitted Phases			6				3		4	4		
Actuated Green, G (s)	4.0	86.3	86.3	14.1	96.4		20.6	20.6	30.6		10.0	
Effective Green, g (s)	5.0	88.3	88.3	15.1	98.4		22.6	22.6	34.6		12.0	
Actuated g/C Ratio	0.03	0.59	0.59	0.10	0.66		0.15	0.15	0.23		0.08	
Clearance Time (s)	4.0	5.0	5.0	4.0	5.0		5.0	5.0	5.0		5.0	
Vehicle Extension (s)	1.0	6.0	6.0	1.0	6.0		1.0	1.0	1.0		1.0	
Lane Grp Cap (vph)	62	3151	957	363	3502		127	151	422		122	
v/s Ratio Prot	0.01	0.26		c0.07	c0.51				0.01			
v/s Ratio Perm			0.09				c0.08	0.07	0.01		c0.06	
v/c Ratio	0.26	0.44	0.15	0.71	0.78		0.53	0.45	0.06		0.77	
Uniform Delay, d1	70.7	17.2	13.9	65.3	18.2		58.8	58.0	45.0		67.6	
Progression Factor	1.31	0.71	0.05	0.80	1.75		1.00	1.00	1.00		1.00	
Incremental Delay, d2	0.7	0.4	0.3	3.0	1.0		1.8	0.8	0.0		22.5	
Delay (s)	93.3	12.5	1.0	55.3	32.8		60.6	58.8	45.0		90.1	
Level of Service	F	B	A	E	C		E	E	D		F	
Approach Delay (s)		11.6			34.8			53.4			90.1	
Approach LOS		B			C			D			F	

Intersection Summary			
HCM 2000 Control Delay	29.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	80.4%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	120	1301	130	230	2453	190	320	50	50	146	40	140
Future Volume (vph)	120	1301	130	230	2453	190	320	50	50	146	40	140
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Util. Factor	1.00	0.91		1.00	0.91		0.97	1.00		1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.97		1.00	1.00	0.97
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		0.96	1.00	1.00
Frt	1.00	0.99		1.00	0.99		1.00	0.93		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1863	5279		1863	5282		3676	1790		1824	2000	1657
Flt Permitted	0.95	1.00		0.95	1.00		0.72	1.00		0.57	1.00	1.00
Satd. Flow (perm)	1863	5279		1863	5282		2778	1790		1104	2000	1657
Peak-hour factor, PHF	0.98	0.98	0.98	0.91	0.91	0.91	0.87	0.87	0.87	0.82	0.82	0.82
Growth Factor (vph)	100%	115%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Adj. Flow (vph)	122	1527	133	253	2696	209	368	57	57	178	49	171
RTOR Reduction (vph)	0	6	0	0	5	0	0	25	0	0	0	135
Lane Group Flow (vph)	122	1654	0	253	2900	0	368	89	0	178	49	36
Confl. Peds. (#/hr)	5		1	1		5	2		35	35		2
Confl. Bikes (#/hr)						2			3			10
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	Perm
Protected Phases	1	6		5	2			4			4	
Permitted Phases							4			4		4
Actuated Green, G (s)	15.1	94.4		12.1	91.4		29.5	29.5		29.5	29.5	29.5
Effective Green, g (s)	16.1	96.4		13.1	93.4		31.5	31.5		31.5	31.5	31.5
Actuated g/C Ratio	0.11	0.64		0.09	0.62		0.21	0.21		0.21	0.21	0.21
Clearance Time (s)	4.0	5.0		4.0	5.0		5.0	5.0		5.0	5.0	5.0
Vehicle Extension (s)	3.0	6.0		2.0	6.0		2.0	2.0		2.0	2.0	2.0
Lane Grp Cap (vph)	199	3392		162	3288		583	375		231	420	347
v/s Ratio Prot	c0.07	0.31		c0.14	c0.55			0.05			0.02	
v/s Ratio Perm							0.13			c0.16		0.02
v/c Ratio	0.61	0.49		1.56	0.88		0.63	0.24		0.77	0.12	0.10
Uniform Delay, d1	64.0	13.9		68.5	23.7		54.0	49.3		55.8	48.0	47.8
Progression Factor	1.40	0.26		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	5.2	0.5		280.6	3.8		1.6	0.1		13.4	0.0	0.0
Delay (s)	94.8	4.1		349.1	27.5		55.6	49.4		69.3	48.0	47.9
Level of Service	F	A		F	C		E	D		E	D	D
Approach Delay (s)		10.3			53.3			54.1			57.5	
Approach LOS		B			D			D			E	

Intersection Summary			
HCM 2000 Control Delay	40.5	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	90.8%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Intersection Delay, s/veh	7.6
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	36	40	10	10	40	31	10	17	40	16	13	24
Future Vol, veh/h	36	40	10	10	40	31	10	17	40	16	13	24
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	1	1	1	1	1	1	1	1	1	1	1	1
Mvmt Flow	40	44	11	11	44	34	11	19	44	18	14	27
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	7.9	7.6	7.4	7.5
HCM LOS	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	15%	42%	12%	30%
Vol Thru, %	25%	47%	49%	25%
Vol Right, %	60%	12%	38%	45%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	67	86	81	53
LT Vol	10	36	10	16
Through Vol	17	40	40	13
RT Vol	40	10	31	24
Lane Flow Rate	74	96	90	59
Geometry Grp	1	1	1	1
Degree of Util (X)	0.084	0.112	0.1	0.069
Departure Headway (Hd)	4.058	4.231	4.016	4.189
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	888	835	877	860
Service Time	2.06	2.317	2.109	2.191
HCM Lane V/C Ratio	0.083	0.115	0.103	0.069
HCM Control Delay	7.4	7.9	7.6	7.5
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.3	0.4	0.3	0.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	188	2873	40	40	2265	30	300	20	70	100	10	108
Future Volume (vph)	188	2873	40	40	2265	30	300	20	70	100	10	108
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	3.0
Lane Util. Factor	1.00	*1.00		1.00	*0.80		0.97	1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Frt	1.00	1.00		1.00	1.00		1.00	0.88			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.96	1.00
Satd. Flow (prot)	1863	5868		1863	4695		3686	1767			1913	1700
Flt Permitted	0.95	1.00		0.95	1.00		0.56	1.00			0.58	1.00
Satd. Flow (perm)	1863	5868		1863	4695		2170	1767			1166	1700
Peak-hour factor, PHF	0.95	0.95	0.95	0.89	0.89	0.89	0.83	0.83	0.83	0.88	0.88	0.88
Adj. Flow (vph)	198	3024	42	45	2545	34	361	24	84	114	11	123
RTOR Reduction (vph)	0	1	0	0	1	0	0	66	0	0	0	97
Lane Group Flow (vph)	198	3065	0	45	2578	0	361	42	0	0	125	26
Confl. Peds. (#/hr)	3		1	1		3						
Confl. Bikes (#/hr)						2						
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	Perm
Protected Phases	1	6		5	2			4			4	
Permitted Phases							4			4		4
Actuated Green, G (s)	11.0	91.1		6.9	87.0		28.0	28.0			28.0	28.0
Effective Green, g (s)	12.0	93.1		7.9	89.0		30.0	30.0			30.0	30.0
Actuated g/C Ratio	0.09	0.66		0.06	0.64		0.21	0.21			0.21	0.21
Clearance Time (s)	4.0	5.0		4.0	5.0		5.0	5.0			5.0	5.0
Vehicle Extension (s)	2.0	6.0		2.0	6.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	159	3902		105	2984		465	378			249	364
v/s Ratio Prot	c0.11	0.52		0.02	c0.55			0.02				
v/s Ratio Perm							c0.17				0.11	0.02
v/c Ratio	1.25	0.79		0.43	0.86		0.78	0.11			0.50	0.07
Uniform Delay, d1	64.0	16.4		63.9	20.6		51.8	44.3			48.4	43.9
Progression Factor	1.00	1.00		1.19	0.38		1.00	1.00			1.00	1.00
Incremental Delay, d2	152.1	1.7		0.6	2.0		7.9	0.1			1.6	0.1
Delay (s)	216.1	18.1		76.5	9.8		59.8	44.4			50.0	44.0
Level of Service	F	B		E	A		E	D			D	D
Approach Delay (s)		30.1			10.9			56.2			47.0	
Approach LOS		C			B			E			D	

Intersection Summary			
HCM 2000 Control Delay	25.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	82.5%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	33	2850	160	80	2000	61	300	10	290	32	10	35
Future Volume (vph)	33	2850	160	80	2000	61	300	10	290	32	10	35
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0		3.0	
Lane Util. Factor	1.00	*1.00	1.00	0.97	0.91		0.95	0.95	1.00		1.00	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85		0.94	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.96	1.00		0.98	
Satd. Flow (prot)	1863	5882	1667	3614	5323		1805	1815	1693		1824	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.42	0.43	1.00		0.77	
Satd. Flow (perm)	1863	5882	1667	3614	5323		811	844	1693		1440	
Peak-hour factor, PHF	0.97	0.97	0.97	0.89	0.89	0.89	0.79	0.79	0.79	0.73	0.73	0.73
Adj. Flow (vph)	34	2938	165	90	2247	69	380	13	367	44	14	48
RTOR Reduction (vph)	0	0	59	0	2	0	0	0	244	0	21	0
Lane Group Flow (vph)	34	2938	107	90	2314	0	198	195	123	0	85	0
Confl. Peds. (#/hr)	4					4			4	4		
Confl. Bikes (#/hr)						2						1
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA	Perm	Prot	NA		Perm	NA	custom	Perm	NA	
Protected Phases	1	6		5	2			3	3		4	
Permitted Phases			6				3		4	4		
Actuated Green, G (s)	6.0	68.0	68.0	10.0	72.0		33.0	33.0	43.0		10.0	
Effective Green, g (s)	7.0	70.0	70.0	11.0	74.0		35.0	35.0	47.0		12.0	
Actuated g/C Ratio	0.05	0.50	0.50	0.08	0.53		0.25	0.25	0.34		0.09	
Clearance Time (s)	4.0	5.0	5.0	4.0	5.0		5.0	5.0	5.0		5.0	
Vehicle Extension (s)	1.0	6.0	6.0	1.0	6.0		1.0	1.0	1.0		1.0	
Lane Grp Cap (vph)	93	2941	833	283	2813		202	211	604		123	
v/s Ratio Prot	c0.02	c0.50		0.02	c0.43				0.05			
v/s Ratio Perm			0.06				c0.24	0.23	0.02		c0.06	
v/c Ratio	0.37	1.00	0.13	0.32	0.82		0.98	0.92	0.20		0.69	
Uniform Delay, d1	64.4	35.0	18.7	61.0	27.5		52.2	51.2	33.2		62.2	
Progression Factor	1.12	0.73	1.05	1.25	0.58		1.00	1.00	1.00		1.00	
Incremental Delay, d2	0.6	13.0	0.2	0.2	2.0		57.3	40.6	0.1		12.6	
Delay (s)	72.5	38.7	19.7	76.5	17.8		109.4	91.8	33.2		74.8	
Level of Service	E	D	B	E	B		F	F	C		E	
Approach Delay (s)		38.1			20.0			68.1			74.8	
Approach LOS		D			C			E			E	

Intersection Summary			
HCM 2000 Control Delay	35.5	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	89.4%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	120	2702	360	210	2009	210	220	60	70	201	90	130
Future Volume (vph)	120	2702	360	210	2009	210	220	60	70	201	90	130
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Util. Factor	1.00	*1.00		1.00	0.91		0.97	1.00		1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.97		1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		0.97	1.00	1.00
Frt	1.00	0.98		1.00	0.99		1.00	0.92		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1863	5761		1863	5260		3686	1786		1846	2000	1664
Flt Permitted	0.95	1.00		0.95	1.00		0.59	1.00		0.53	1.00	1.00
Satd. Flow (perm)	1863	5761		1863	5260		2277	1786		1031	2000	1664
Peak-hour factor, PHF	0.89	0.89	0.89	0.94	0.94	0.94	0.84	0.84	0.84	0.73	0.73	0.73
Adj. Flow (vph)	135	3036	404	223	2137	223	262	71	83	275	123	178
RTOR Reduction (vph)	0	14	0	0	9	0	0	30	0	0	0	134
Lane Group Flow (vph)	135	3426	0	223	2351	0	262	124	0	275	123	45
Confl. Peds. (#/hr)	5		2	2		5			29	29		
Confl. Bikes (#/hr)						2			3			10
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	Perm
Protected Phases	1	6		5	2			4			4	
Permitted Phases							4			4		4
Actuated Green, G (s)	15.0	82.0		11.0	78.0		33.0	33.0		33.0	33.0	33.0
Effective Green, g (s)	16.0	84.0		12.0	80.0		35.0	35.0		35.0	35.0	35.0
Actuated g/C Ratio	0.11	0.60		0.09	0.57		0.25	0.25		0.25	0.25	0.25
Clearance Time (s)	4.0	5.0		4.0	5.0		5.0	5.0		5.0	5.0	5.0
Vehicle Extension (s)	3.0	6.0		2.0	6.0		2.0	2.0		2.0	2.0	2.0
Lane Grp Cap (vph)	212	3456		159	3005		569	446		257	500	416
v/s Ratio Prot	0.07	c0.59		c0.12	0.45			0.07			0.06	
v/s Ratio Perm							0.12			c0.27		0.03
v/c Ratio	0.64	0.99		1.40	0.78		0.46	0.28		1.07	0.25	0.11
Uniform Delay, d1	59.2	27.6		64.0	23.3		44.5	42.3		52.5	42.0	40.5
Progression Factor	0.78	1.40		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	2.8	8.5		214.4	2.1		0.2	0.1		75.9	0.1	0.0
Delay (s)	48.9	47.0		278.4	25.4		44.7	42.4		128.4	42.0	40.5
Level of Service	D	D		F	C		D	D		F	D	D
Approach Delay (s)		47.1			47.2			43.9			82.8	
Approach LOS		D			D			D			F	

Intersection Summary			
HCM 2000 Control Delay	49.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.05		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	111.4%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Intersection	
Intersection Delay, s/veh	8.1
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	28	90	10	10	60	18	20	14	30	31	17	48
Future Vol, veh/h	28	90	10	10	60	18	20	14	30	31	17	48
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	1	1	1	1	1	1	1	1	1	1	1	1
Mvmt Flow	31	100	11	11	67	20	22	16	33	34	19	53
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	8.4	8	7.8	8
HCM LOS	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	31%	22%	11%	32%
Vol Thru, %	22%	70%	68%	18%
Vol Right, %	47%	8%	20%	50%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	64	128	88	96
LT Vol	20	28	10	31
Through Vol	14	90	60	17
RT Vol	30	10	18	48
Lane Flow Rate	71	142	98	107
Geometry Grp	1	1	1	1
Degree of Util (X)	0.086	0.175	0.119	0.128
Departure Headway (Hd)	4.362	4.418	4.372	4.306
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	822	814	821	834
Service Time	2.384	2.437	2.392	2.326
HCM Lane V/C Ratio	0.086	0.174	0.119	0.128
HCM Control Delay	7.8	8.4	8	8
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.3	0.6	0.4	0.4

Worksheet 2A -- General Information and Input Data for Urban and Suburban Arterial Intersections			
General Information		**Location Information**	
Analyst	EC	Roadway	
Agency or Company	Fehr & Peers	Intersection	Marchbanks Drive / Ygnacio Valley Road
Date Performed	05/28/20	Jurisdiction	Walnut Creek, CA
		Analysis Year	2020

Input Data		**Base Conditions**	**Site Conditions**
Intersection type (3ST, 3SG, 4ST, 4SG)		--	4SG
AADT $_{major}$ (veh/day)	$AADT_{MAX}$ = 67,700 (veh/day)	--	51,210
AADT $_{minor}$ (veh/day)	$AADT_{MAX}$ = 33,400 (veh/day)	--	4,700
Intersection lighting (present/not present)		Not Present	Present
Calibration factor, C_i		1.00	1.00
Data for unsignalized intersections only:		--	--
Number of major-road approaches with left-turn lanes (0,1,2)		0	1
Number of major-road approaches with right-turn lanes (0,1,2)		0	0
Data for signalized intersections only:		--	--
Number of approaches with left-turn lanes (0,1,2,3,4) [for 3SG, use maximum value of 3]		0	3
Number of approaches with right-turn lanes (0,1,2,3,4) [for 3SG, use maximum value of 3]		0	1
Number of approaches with left-turn signal phasing [for 3SG, use maximum value of 3]		--	4
Type of left-turn signal phasing for Leg #1		Permissive	Protected
Type of left-turn signal phasing for Leg #2		--	Protected
Type of left-turn signal phasing for Leg #3		--	Permissive
Type of left-turn signal phasing for Leg #4 (if applicable)		--	Permissive
Number of approaches with right-turn-on-red prohibited [for 3SG, use maximum value of 3]		0	0
Intersection red light cameras (present/not present)		Not Present	Not Present
Sum of all pedestrian crossing volumes (PedVol) -- Signalized intersections only			240
Maximum number of lanes crossed by a pedestrian (n_{lanesx})		--	7
Number of bus stops within 300 m (1,000 ft) of the intersection		0	3
Schools within 300 m (1,000 ft) of the intersection (present/not present)		Not Present	Not Present
Number of alcohol sales establishments within 300 m (1,000 ft) of the intersection		0	0

Worksheet 2B -- Crash Modification Factors for Urban and Suburban Arterial Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
CMF for Left-Turn Lanes	CMF for Left-Turn Signal Phasing	CMF for Right-Turn Lanes	CMF for Right Turn on Red	CMF for Lighting	CMF for Red Light Cameras	Combined CMF
CMF 1i	*CMF 2i*	*CMF 3i*	*CMF 4i*	*CMF 5i*	*CMF 6i*	*CMF* $_{COMB}$
from Table 12-24	from Table 12-25	from Table 12-26	from Equation 12-35	from Equation 12-36	from Equation 12-37	(1)*(2)*(3)*(4)*(5)*(6)
0.73	0.88	0.96	1.00	0.91	1.00	0.56

Worksheet 2C -- Multiple-Vehicle Collisions by Severity Level for Urban and Suburban Arterial Intersections								
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	**SPF Coefficients**	**Overdispersion Parameter, k**	**Initial N_{bimv}**	**Proportion of Total Crashes**	**Adjusted N_{bimv}**	**Combined CMFs**	**Calibration Factor, C_i**	**Predicted N_{bimv}**

	a	b	c							
	from Table 12-10			from Table 12-10	from Equation 12-21		$(4)_{TOTAL}*(5)$	(7) from Worksheet 2B		(6)*(7)*(8)
Total	-10.99	1.07	0.23	0.39	12.903	1.000	12.903	0.56	1.00	7.276
Fatal and Injury (FI)	-13.14	1.18	0.22	0.33	4.553	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.365	4.708	0.56	1.00	2.655
Property Damage Only (PDO)	-11.02	1.02	0.24	0.44	7.924	$(5)_{TOTAL}-(5)_{FI}$ 0.635	8.195	0.56	1.00	4.621

Worksheet 2D -- Multiple-Vehicle Collisions by Collision Type for Urban and Suburban Arterial Intersections

(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	**Proportion of Collision Type$_{(FI)}$**	**Predicted $N_{bimv\ (FI)}$ (crashes/year)**	**Proportion of Collision Type $_{(PDO)}$**	**Predicted $N_{bimv\ (PDO)}$ (crashes/year)**	**Predicted $N_{bimv\ (TOTAL)}$ (crashes/year)**
	from Table 12-11	$(9)_{FI}$ from Worksheet 2C	from Table 12-11	$(9)_{PDO}$ from Worksheet 2C	$(9)_{PDO}$ from Worksheet 2C
Total	1.000	2.655	1.000	4.621	7.276
		$(2)*(3)_{FI}$		$(4)*(5)_{PDO}$	(3)+(5)
Rear-end collision	0.450	1.195	0.483	2.232	3.427
Head-on collision	0.049	0.130	0.030	0.139	0.269
Angle collision	0.347	0.921	0.244	1.128	2.049
Sideswipe	0.099	0.263	0.032	0.148	0.411
Other multiple-vehicle collision	0.055	0.146	0.211	0.975	1.121

Worksheet 2E -- Single-Vehicle Collisions by Severity Level for Urban and Suburban Arterial Intersections

(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	**SPF Coefficients**			**Overdispersion Parameter, k**	**Initial N_{bisv}**	**Proportion of Total Crashes**	**Adjusted N_{bimv}**	**Combined CMFs**	**Calibration Factor, C_i**	**Predicted N_{bisv}**
	from Table 12-12			from Table 12-12	from Eqn. 12-24; (FI) from Eqn. 12-24 or 12-27		$(4)_{TOTAL}*(5)$	(7) from Worksheet 2B		(6)*(7)*(8)
	a	b	c							
Total	-10.21	0.68	0.27	0.36	0.575	1.000	0.575	0.56	1.00	0.324
Fatal and Injury (FI)	-9.25	0.43	0.29	0.09	0.118	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.203	0.117	0.56	1.00	0.066
Property Damage Only (PDO)	-11.34	0.78	0.25	0.44	0.464	$(5)_{TOTAL}-(5)_{FI}$ 0.797	0.458	0.56	1.00	0.258

Worksheet 2F -- Single-Vehicle Collisions by Collision Type for Urban and Suburban Arterial Intersections

(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	**Proportion of Collision Type$_{(FI)}$**	**Predicted $N_{bisv\ (FI)}$ (crashes/year)**	**Proportion of Collision Type $_{(PDO)}$**	**Predicted $N_{bisv\ (PDO)}$ (crashes/year)**	**Predicted $N_{bisv\ (TOTAL)}$ (crashes/year)**
	from Table 12-13	$(9)_{FI}$ from Worksheet 2E	from Table 12-13	$(9)_{PDO}$ from Worksheet 2E	$(9)_{PDO}$ from Worksheet 2E
Total	1.000	0.066	1.000	0.258	0.324

		$(2)*(3)_{FI}$		$(4)*(5)_{PDO}$	(3)+(5)
Collision with parked vehicle	0.001	0.000	0.001	0.000	0.000
Collision with animal	0.002	0.000	0.002	0.001	0.001
Collision with fixed object	0.744	0.049	0.870	0.225	0.274
Collision with other object	0.072	0.005	0.070	0.018	0.023
Other single-vehicle collision	0.040	0.003	0.023	0.006	0.009
Single-vehicle noncollision	0.141	0.009	0.034	0.009	0.018

Worksheet 2G -- Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Stop-Controlled Intersections

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**Predicted N_{bimv}**	**Predicted N_{bisv}**	**Predicted N_{bi}**	f_{pedi}	**Calibration factor, C_i**	**Predicted N_{pedi}**
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-16		(4)*(5)*(6)
Total	--	--	--	--	1.00	--
Fatal and injury (FI)	--	--	--	--	1.00	--

Worksheet 2H -- Crash Modification Factors for Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Signalized Intersections

(1)	(2)	(3)	(4)
CMF for Bus Stops	CMF for Schools	CMF for Alcohol Sales Establishments	Combined CMF
CMF_{1p}	CMF_{2p}	CMF_{3p}	
from Table 12-28	from Table 12-29	from Table 12-30	(1)*(2)*(3)
4.15	1.00	1.00	4.15

Worksheet 2I -- Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Signalized Intersections

(1)	(2)					(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**SPF Coefficients**					**Overdispersion Parameter, k**	$N_{pedbase}$	**Combined CMF**	**Calibration factor, C_i**	**Predicted N_{pedi}**
	from Table 12-14						from Equation 12-29	(4) from Worksheet 2H		(4)*(5)*(6)
	a	b	c	d	e					
Total	-9.53	0.40	0.26	0.45	0.04	0.24	0.048	4.15	1.00	0.200
Fatal and Injury (FI)	--	--	--	--	--	--	--	--	1.00	0.200

Worksheet 2J -- Vehicle-Bicycle Collisions for Urban and Suburban Arterial Intersections

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**Predicted N_{bimv}**	**Predicted N_{bisv}**	**Predicted N_{bi}**	f_{bikei}	**Calibration factor, C_i**	**Predicted N_{bikei}**
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-17		(4)*(5)*(6)
Total	7.276	0.324	7.601	0.015	1.00	0.114
Fatal and injury (FI)	--	--	--	--	1.00	0.114

Worksheet 2K -- Crash Severity Distribution for Urban and Suburban Arterial Intersections			
(1)	(2)	(3)	(4)
Collision type	**Fatal and injury (FI)**	**Property damage only (PDO)**	**Total**
	(3) from Worksheet 2D and 2F; (7) from 2G or 2I and 2J	(5) from Worksheet 2D and 2F	(6) from Worksheet 2D and 2F; (7) from 2G or 2I and 2J
MULTIPLE-VEHICLE			
Rear-end collisions (from Worksheet 2D)	1.195	2.232	3.427
Head-on collisions (from Worksheet 2D)	0.130	0.139	0.269
Angle collisions (from Worksheet 2D)	0.921	1.128	2.049
Sideswipe (from Worksheet 2D)	0.263	0.148	0.411
Other multiple-vehicle collision (from Worksheet 2D)	0.146	0.975	1.121
Subtotal	2.655	4.621	7.276
SINGLE-VEHICLE			
Collision with parked vehicle (from Worksheet 2F)	0.000	0.000	0.000
Collision with animal (from Worksheet 2F)	0.000	0.001	0.001
Collision with fixed object (from Worksheet 2F)	0.049	0.225	0.274
Collision with other object (from Worksheet 2F)	0.005	0.018	0.023
Other single-vehicle collision (from Worksheet 2F)	0.003	0.006	0.009
Single-vehicle noncollision (from Worksheet 2F)	0.009	0.009	0.018
Collision with pedestrian (from Worksheet 2G or 2I)	0.200	0.000	0.200
Collision with bicycle (from Worksheet 2J)	0.114	0.000	0.114
Subtotal	0.380	0.258	0.638
Total	3.035	4.880	7.915

Worksheet 2L -- Summary Results for Urban and Suburban Arterial Intersections	
(1)	(2)
Crash severity level	**Predicted average crash frequency, $N_{predicted\ int}$ (crashes/year)**
	(Total) from Worksheet 2K
Total	7.9
Fatal and injury (FI)	3.0
Property damage only (PDO)	4.9

Worksheet 2A -- General Information and Input Data for Urban and Suburban Arterial Intersections			
General Information		**Location Information**	
Analyst	EC	Roadway	
Agency or Company	Fehr & Peers	Intersection	Kinross Drive / Ygnacio Valley Road
Date Performed	05/28/20	Jurisdiction	Walnut Creek, CA
		Analysis Year	2020

Input Data		**Base Conditions**	**Site Conditions**
Intersection type (3ST, 3SG, 4ST, 4SG)		--	4SG
AADT $_{major}$ (veh/day)	$AADT_{MAX}$ = 67,700 (veh/day)	--	48,580
AADT $_{minor}$ (veh/day)	$AADT_{MAX}$ = 33,400 (veh/day)	--	6,020
Intersection lighting (present/not present)		Not Present	Present
Calibration factor, C_i		1.00	1.00
Data for unsignalized intersections only:		--	--
Number of major-road approaches with left-turn lanes (0,1,2)		0	0
Number of major-road approaches with right-turn lanes (0,1,2)		0	0
Data for signalized intersections only:		--	--
Number of approaches with left-turn lanes (0,1,2,3,4) [for 3SG, use maximum value of 3]		0	3
Number of approaches with right-turn lanes (0,1,2,3,4) [for 3SG, use maximum value of 3]		0	2
Number of approaches with left-turn signal phasing [for 3SG, use maximum value of 3]		--	4
Type of left-turn signal phasing for Leg #1		Permissive	Protected
Type of left-turn signal phasing for Leg #2		--	Protected
Type of left-turn signal phasing for Leg #3		--	Protected
Type of left-turn signal phasing for Leg #4 (if applicable)		--	Protected
Number of approaches with right-turn-on-red prohibited [for 3SG, use maximum value of 3]		0	0
Intersection red light cameras (present/not present)		Not Present	Not Present
Sum of all pedestrian crossing volumes (PedVol) -- Signalized intersections only			240
Maximum number of lanes crossed by a pedestrian (n_{lanesx})		--	8
Number of bus stops within 300 m (1,000 ft) of the intersection		0	1
Schools within 300 m (1,000 ft) of the intersection (present/not present)		Not Present	Not Present
Number of alcohol sales establishments within 300 m (1,000 ft) of the intersection		0	0

Worksheet 2B -- Crash Modification Factors for Urban and Suburban Arterial Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
CMF for Left-Turn Lanes	CMF for Left-Turn Signal Phasing	CMF for Right-Turn Lanes	CMF for Right Turn on Red	CMF for Lighting	CMF for Red Light Cameras	Combined CMF
CMF 1i	*CMF 2i*	*CMF 3i*	*CMF 4i*	*CMF 5i*	*CMF 6i*	*CMF $_{COMB}$*
from Table 12-24	from Table 12-25	from Table 12-26	from Equation 12-35	from Equation 12-36	from Equation 12-37	(1)*(2)*(3)*(4)*(5)*(6)
0.73	0.78	0.92	1.00	0.91	1.00	0.48

Worksheet 2C -- Multiple-Vehicle Collisions by Severity Level for Urban and Suburban Arterial Intersections										
(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	**SPF Coefficients**			**Overdispersion Parameter, k**	**Initial N_{bimv}**	**Proportion of Total Crashes**	**Adjusted N_{bimv}**	**Combined CMFs**	**Calibration Factor, C_i**	**Predicted N_{bimv}**
	from Table 12-10			from Table 12-10	from Equation 12-21		$(4)_{TOTAL}$*(5)	(7) from Worksheet 2B		(6)*(7)*(8)
	a	b	c							
Total	-10.99	1.07	0.23	0.39	12.910	1.000	12.910	0.48	1.00	6.176
Fatal and Injury (FI)	-13.14	1.18	0.22	0.33	4.518	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.362	4.671	0.48	1.00	2.234
Property Damage Only (PDO)	-11.02	1.02	0.24	0.44	7.968	$(5)_{TOTAL}-(5)_{FI}$ 0.638	8.239	0.48	1.00	3.941

Worksheet 2D -- Multiple-Vehicle Collisions by Collision Type for Urban and Suburban Arterial Intersections					
(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	**Proportion of Collision $Type_{(FI)}$**	**Predicted $N_{bimv\ (FI)}$ (crashes/year)**	**Proportion of Collision Type $_{(PDO)}$**	**Predicted $N_{bimv\ (PDO)}$ (crashes/year)**	**Predicted $N_{bimv\ (TOTAL)}$ (crashes/year)**
	from Table 12-11	$(9)_{FI}$ from Worksheet 2C	from Table 12-11	$(9)_{PDO}$ from Worksheet 2C	$(9)_{PDO}$ from Worksheet 2C
Total	1.000	2.234	1.000	3.941	6.176
		$(2)*(3)_{FI}$		$(4)*(5)_{PDO}$	(3)+(5)
Rear-end collision	0.450	1.005	0.483	1.904	2.909
Head-on collision	0.049	0.109	0.030	0.118	0.228
Angle collision	0.347	0.775	0.244	0.962	1.737
Sideswipe	0.099	0.221	0.032	0.126	0.347
Other multiple-vehicle collision	0.055	0.123	0.211	0.832	0.954

Worksheet 2E -- Single-Vehicle Collisions by Severity Level for Urban and Suburban Arterial Intersections										
(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	**SPF Coefficients**			**Overdispersion Parameter, k**	**Initial N_{bisv}**	**Proportion of Total Crashes**	**Adjusted N_{bimv}**	**Combined CMFs**	**Calibration Factor, C_i**	**Predicted N_{bisv}**
	from Table 12-12			from Table 12-12	from Eqn. 12-24; (FI) from Eqn. 12-24 or 12-27		$(4)_{TOTAL}$*(5)	(7) from Worksheet 2B		(6)*(7)*(8)
	a	b	c							
Total	-10.21	0.68	0.27	0.36	0.593	1.000	0.593	0.48	1.00	0.284
Fatal and Injury (FI)	-9.25	0.43	0.29	0.09	0.124	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.208	0.123	0.48	1.00	0.059
Property Damage Only (PDO)	-11.34	0.78	0.25	0.44	0.474	$(5)_{TOTAL}-(5)_{FI}$ 0.792	0.470	0.48	1.00	0.225

Worksheet 2F -- Single-Vehicle Collisions by Collision Type for Urban and Suburban Arterial Intersections					
(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	**Proportion of Collision Type$_{(FI)}$**	**Predicted $N_{bisv\ (FI)}$ (crashes/year)**	**Proportion of Collision Type $_{(PDO)}$**	**Predicted $N_{bisv\ (PDO)}$ (crashes/year)**	**Predicted $N_{bisv\ (TOTAL)}$ (crashes/year)**
	from Table 12-13	$(9)_{FI}$ from Worksheet 2E	from Table 12-13	$(9)_{PDO}$ from Worksheet 2E	$(9)_{PDO}$ from Worksheet 2E
Total	1.000	0.059	1.000	0.225	0.284
		$(2)*(3)_{FI}$		$(4)*(5)_{PDO}$	(3)+(5)
Collision with parked vehicle	0.001	0.000	0.001	0.000	0.000
Collision with animal	0.002	0.000	0.002	0.000	0.001
Collision with fixed object	0.744	0.044	0.870	0.196	0.239
Collision with other object	0.072	0.004	0.070	0.016	0.020
Other single-vehicle collision	0.040	0.002	0.023	0.005	0.008
Single-vehicle noncollision	0.141	0.008	0.034	0.008	0.016

Worksheet 2G -- Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Stop-Controlled Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**Predicted N_{bimv}**	**Predicted N_{bisv}**	**Predicted N_{bi}**	**f_{pedi}**	**Calibration factor, C_i**	**Predicted N_{pedi}**
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-16		(4)*(5)*(6)
Total	--	--	--	--	1.00	--
Fatal and injury (FI)	--	--	--	--	1.00	--

Worksheet 2H -- Crash Modification Factors for Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Signalized Intersections			
(1)	(2)	(3)	(4)
CMF for Bus Stops	CMF for Schools	CMF for Alcohol Sales Establishments	Combined CMF
CMF_{1p}	CMF_{2p}	CMF_{3p}	
from Table 12-28	from Table 12-29	from Table 12-30	(1)*(2)*(3)
2.78	1.00	1.00	2.78

Worksheet 2I -- Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Signalized Intersections										
(1)	(2)					(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**SPF Coefficients**					**Overdispersion Parameter, k**	**$N_{pedbase}$**	**Combined CMF**	**Calibration factor, C_i**	**Predicted N_{pedi}**
	from Table 12-14						from Equation 12-29	(4) from Worksheet 2H		(4)*(5)*(6)
	a	b	c	d	e					
Total	-9.53	0.40	0.26	0.45	0.04	0.24	0.054	2.78	1.00	0.149
Fatal and Injury (FI)	--	--	--	--	--	--	--	--	1.00	0.149

Worksheet 2J -- Vehicle-Bicycle Collisions for Urban and Suburban Arterial Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Predicted N_{bimv}	Predicted N_{bisv}	Predicted N_{bi}	f_{bikei}	Calibration factor, C_i	Predicted N_{bikei}
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-17		(4)*(5)*(6)
Total	6.176	0.284	6.459	0.015	1.00	0.097
Fatal and injury (FI)	--	--	--	--	1.00	0.097

Worksheet 2K -- Crash Severity Distribution for Urban and Suburban Arterial Intersections			
(1)	(2)	(3)	(4)
Collision type	**Fatal and injury (FI)**	**Property damage only (PDO)**	**Total**
	(3) from Worksheet 2D and 2F; (7) from 2G or 2I and 2J	(5) from Worksheet 2D and 2F	(6) from Worksheet 2D and 2F; (7) from 2G or 2I and 2J
MULTIPLE-VEHICLE			
Rear-end collisions (from Worksheet 2D)	1.005	1.904	2.909
Head-on collisions (from Worksheet 2D)	0.109	0.118	0.228
Angle collisions (from Worksheet 2D)	0.775	0.962	1.737
Sideswipe (from Worksheet 2D)	0.221	0.126	0.347
Other multiple-vehicle collision (from Worksheet 2D)	0.123	0.832	0.954
Subtotal	2.234	3.941	6.176
SINGLE-VEHICLE			
Collision with parked vehicle (from Worksheet 2F)	0.000	0.000	0.000
Collision with animal (from Worksheet 2F)	0.000	0.000	0.001
Collision with fixed object (from Worksheet 2F)	0.044	0.196	0.239
Collision with other object (from Worksheet 2F)	0.004	0.016	0.020
Other single-vehicle collision (from Worksheet 2F)	0.002	0.005	0.008
Single-vehicle noncollision (from Worksheet 2F)	0.008	0.008	0.016
Collision with pedestrian (from Worksheet 2G or 2I)	0.149	0.000	0.149
Collision with bicycle (from Worksheet 2J)	0.097	0.000	0.097
Subtotal	0.305	0.225	0.530
Total	2.540	4.166	6.706

Worksheet 2L -- Summary Results for Urban and Suburban Arterial Intersections	
(1)	(2)
Crash severity level	**Predicted average crash frequency, $N_{predicted\ int}$ (crashes/year)**
	(Total) from Worksheet 2K
Total	6.7
Fatal and injury (FI)	2.5
Property damage only (PDO)	4.2

Worksheet 2A -- General Information and Input Data for Urban and Suburban Arterial Intersections			
General Information		**Location Information**	
Analyst	EC	Roadway	
Agency or Company	Fehr & Peers	Intersection	San Carlos Drive / Ygnacio Valley Road
Date Performed	05/28/20	Jurisdiction	Walnut Creek, CA
		Analysis Year	2020

Input Data		**Base Conditions**	**Site Conditions**
Intersection type (3ST, 3SG, 4ST, 4SG)		--	4SG
AADT $_{major}$ (veh/day)	$AADT_{MAX}$ = 67,700 (veh/day)	--	51,490
AADT $_{minor}$ (veh/day)	$AADT_{MAX}$ = 33,400 (veh/day)	--	7,010
Intersection lighting (present/not present)		Not Present	Present
Calibration factor, C_i		1.00	1.00
Data for unsignalized intersections only:		--	--
Number of major-road approaches with left-turn lanes (0,1,2)		0	0
Number of major-road approaches with right-turn lanes (0,1,2)		0	0
Data for signalized intersections only:		--	--
Number of approaches with left-turn lanes (0,1,2,3,4) [for 3SG, use maximum value of 3]		0	3
Number of approaches with right-turn lanes (0,1,2,3,4) [for 3SG, use maximum value of 3]		0	1
Number of approaches with left-turn signal phasing [for 3SG, use maximum value of 3]		--	4
Type of left-turn signal phasing for Leg #1		Permissive	Protected
Type of left-turn signal phasing for Leg #2		--	Protected
Type of left-turn signal phasing for Leg #3		--	Protected
Type of left-turn signal phasing for Leg #4 (if applicable)		--	Protected
Number of approaches with right-turn-on-red prohibited [for 3SG, use maximum value of 3]		0	0
Intersection red light cameras (present/not present)		Not Present	Not Present
Sum of all pedestrian crossing volumes (PedVol) -- Signalized intersections only			240
Maximum number of lanes crossed by a pedestrian (n_{lanesx})		--	7
Number of bus stops within 300 m (1,000 ft) of the intersection		0	1
Schools within 300 m (1,000 ft) of the intersection (present/not present)		Not Present	Not Present
Number of alcohol sales establishments within 300 m (1,000 ft) of the intersection		0	1

Worksheet 2B -- Crash Modification Factors for Urban and Suburban Arterial Intersections

(1)	(2)	(3)	(4)	(5)	(6)	(7)
CMF for Left-Turn Lanes	CMF for Left-Turn Signal Phasing	CMF for Right-Turn Lanes	CMF for Right Turn on Red	CMF for Lighting	CMF for Red Light Cameras	Combined CMF
CMF 1i	*CMF 2i*	*CMF 3i*	*CMF 4i*	*CMF 5i*	*CMF 6i*	*CMF_{COMB}*
from Table 12-24	from Table 12-25	from Table 12-26	from Equation 12-35	from Equation 12-36	from Equation 12-37	(1)*(2)*(3)*(4)*(5)*(6)
0.73	0.78	0.96	1.00	0.91	1.00	0.50

Worksheet 2C -- Multiple-Vehicle Collisions by Severity Level for Urban and Suburban Arterial Intersections

(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	**SPF Coefficients**			**Overdispersion Parameter, k**	**Initial N_{bimv}**	**Proportion of Total Crashes**	**Adjusted N_{bimv}**	**Combined CMFs**	**Calibration Factor, C_i**	**Predicted N_{bimv}**
	from Table 12-10			from Table 12-10	from Equation 12-21		$(4)_{TOTAL}$*(5)	(7) from Worksheet 2B		(6)*(7)*(8)
	a	b	c							
Total	-10.99	1.07	0.23	0.39	14.229	1.000	14.229	0.50	1.00	7.090
Fatal and Injury (FI)	-13.14	1.18	0.22	0.33	5.003	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.363	5.169	0.50	1.00	2.576
Property Damage Only (PDO)	-11.02	1.02	0.24	0.44	8.770	$(5)_{TOTAL}-(5)_{FI}$ 0.637	9.060	0.50	1.00	4.514

Worksheet 2D -- Multiple-Vehicle Collisions by Collision Type for Urban and Suburban Arterial Intersections

(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	**Proportion of Collision Type$_{(FI)}$**	**Predicted N $_{bimv\ (FI)}$ (crashes/year)**	**Proportion of Collision Type $_{(PDO)}$**	**Predicted N $_{bimv\ (PDO)}$ (crashes/year)**	**Predicted N $_{bimv\ (TOTAL)}$ (crashes/year)**
	from Table 12-11	$(9)_{FI}$ from Worksheet 2C	from Table 12-11	$(9)_{PDO}$ from Worksheet 2C	$(9)_{PDO}$ from Worksheet 2C
Total	1.000	2.576	1.000	4.514	7.090
		$(2)*(3)_{FI}$		$(4)*(5)_{PDO}$	(3)+(5)
Rear-end collision	0.450	1.159	0.483	2.180	3.339
Head-on collision	0.049	0.126	0.030	0.135	0.262
Angle collision	0.347	0.894	0.244	1.102	1.995
Sideswipe	0.099	0.255	0.032	0.144	0.399
Other multiple-vehicle collision	0.055	0.142	0.211	0.953	1.094

Worksheet 2E -- Single-Vehicle Collisions by Severity Level for Urban and Suburban Arterial Intersections

(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	**SPF Coefficients**			**Overdispersion Parameter, k**	**Initial N_{bisv}**	**Proportion of Total Crashes**	**Adjusted N_{bimv}**	**Combined CMFs**	**Calibration Factor, C_i**	**Predicted N_{bisv}**
	from Table 12-12			from Table 12-12	from Eqn. 12-24; (FI) from Eqn. 12-24 or 12-27		$(4)_{TOTAL}$*(5)	(7) from Worksheet 2B		(6)*(7)*(8)
	a	b	c							
Total	-10.21	0.68	0.27	0.36	0.643	1.000	0.643	0.50	1.00	0.320
Fatal and Injury (FI)	-9.25	0.43	0.29	0.09	0.133	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.205	0.132	0.50	1.00	0.066
Property Damage Only (PDO)	-11.34	0.78	0.25	0.44	0.515	$(5)_{TOTAL}-(5)_{FI}$ 0.795	0.511	0.50	1.00	0.255

Worksheet 2F -- Single-Vehicle Collisions by Collision Type for Urban and Suburban Arterial Intersections					
(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	**Proportion of Collision Type(FI)**	**Predicted N $_{bisv\ (FI)}$ (crashes/year)**	**Proportion of Collision Type (PDO)**	**Predicted N $_{bisv\ (PDO)}$ (crashes/year)**	**Predicted N $_{bisv\ (TOTAL)}$ (crashes/year)**
	from Table 12-13	$(9)_{FI}$ from Worksheet 2E	from Table 12-13	$(9)_{PDO}$ from Worksheet 2E	$(9)_{PDO}$ from Worksheet 2E
Total	1.000	0.066	1.000	0.255	0.320
		$(2)*(3)_{FI}$		$(4)*(5)_{PDO}$	(3)+(5)
Collision with parked vehicle	0.001	0.000	0.001	0.000	0.000
Collision with animal	0.002	0.000	0.002	0.001	0.001
Collision with fixed object	0.744	0.049	0.870	0.221	0.270
Collision with other object	0.072	0.005	0.070	0.018	0.023
Other single-vehicle collision	0.040	0.003	0.023	0.006	0.008
Single-vehicle noncollision	0.141	0.009	0.034	0.009	0.018

Worksheet 2G -- Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Stop-Controlled Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**Predicted N_{bimv}**	**Predicted N_{bisv}**	**Predicted N_{bi}**	**f_{pedi}**	**Calibration factor, C_i**	**Predicted N_{pedi}**
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-16		(4)*(5)*(6)
Total	--	--	--	--	1.00	--
Fatal and injury (FI)	--	--	--	--	1.00	--

Worksheet 2H -- Crash Modification Factors for Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Signalized Intersections			
(1)	(2)	(3)	(4)
CMF for Bus Stops	CMF for Schools	CMF for Alcohol Sales Establishments	Combined CMF
CMF_{1p}	CMF_{2p}	CMF_{3p}	
from Table 12-28	from Table 12-29	from Table 12-30	(1)*(2)*(3)
2.78	1.00	1.12	3.11

Worksheet 2I -- Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Signalized Intersections										
(1)	(2)					(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**SPF Coefficients**					**Overdispersion Parameter, k**	**$N_{pedbase}$**	**Combined CMF**	**Calibration factor, C_i**	**Predicted N_{pedi}**
	from Table 12-14						from Equation 12-29	(4) from Worksheet 2H		(4)*(5)*(6)
	a	b	c	d	e					
Total	-9.53	0.40	0.26	0.45	0.04	0.24	0.054	3.11	1.00	0.169
Fatal and Injury (FI)	--	--	--	--	--	--	--	--	1.00	0.169

Worksheet 2J -- Vehicle-Bicycle Collisions for Urban and Suburban Arterial Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	Predicted N_{bimv}	Predicted N_{bisv}	Predicted N_{bi}	f_{bikei}	Calibration factor, C_i	Predicted N_{bikei}
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-17		(4)*(5)*(6)
Total	7.090	0.320	7.410	0.015	1.00	0.111
Fatal and injury (FI)	--	--	--	--	1.00	0.111

Worksheet 2K -- Crash Severity Distribution for Urban and Suburban Arterial Intersections			
(1)	(2)	(3)	(4)
Collision type	Fatal and injury (FI)	Property damage only (PDO)	Total
	(3) from Worksheet 2D and 2F; (7) from 2G or 2I and 2J	(5) from Worksheet 2D and 2F	(6) from Worksheet 2D and 2F; (7) from 2G or 2I and 2J
MULTIPLE-VEHICLE			
Rear-end collisions (from Worksheet 2D)	1.159	2.180	3.339
Head-on collisions (from Worksheet 2D)	0.126	0.135	0.262
Angle collisions (from Worksheet 2D)	0.894	1.102	1.995
Sideswipe (from Worksheet 2D)	0.255	0.144	0.399
Other multiple-vehicle collision (from Worksheet 2D)	0.142	0.953	1.094
Subtotal	2.576	4.514	7.090
SINGLE-VEHICLE			
Collision with parked vehicle (from Worksheet 2F)	0.000	0.000	0.000
Collision with animal (from Worksheet 2F)	0.000	0.001	0.001
Collision with fixed object (from Worksheet 2F)	0.049	0.221	0.270
Collision with other object (from Worksheet 2F)	0.005	0.018	0.023
Other single-vehicle collision (from Worksheet 2F)	0.003	0.006	0.008
Single-vehicle noncollision (from Worksheet 2F)	0.009	0.009	0.018
Collision with pedestrian (from Worksheet 2G or 2I)	0.169	0.000	0.169
Collision with bicycle (from Worksheet 2J)	0.111	0.000	0.111
Subtotal	0.346	0.255	0.601
Total	2.922	4.769	7.691

Worksheet 2L -- Summary Results for Urban and Suburban Arterial Intersections	
(1)	(2)
Crash severity level	Predicted average crash frequency, $N_{predicted\ int}$ (crashes/year)
	(Total) from Worksheet 2K
Total	7.7
Fatal and injury (FI)	2.9
Property damage only (PDO)	4.8

Worksheet 2A -- General Information and Input Data for Urban and Suburban Arterial Intersections			
General Information		**Location Information**	
Analyst	EC	Roadway	
Agency or Company	Fehr & Peers	Intersection	Kinross Drive / Marchbanks Drive
Date Performed	05/28/20	Jurisdiction	Walnut Creek, CA
		Analysis Year	2020

Input Data		Base Conditions	Site Conditions
Intersection type (3ST, 3SG, 4ST, 4SG)		--	4ST
AADT $_{major}$ (veh/day)	$AADT_{MAX}$ = 46,800 (veh/day)	--	1,900
AADT $_{minor}$ (veh/day)	$AADT_{MAX}$ = 5,900 (veh/day)	--	1,100
Intersection lighting (present/not present)		Not Present	Not Present
Calibration factor, C_i		1.00	1.00
Data for unsignalized intersections only:		--	--
Number of major-road approaches with left-turn lanes (0,1,2)		0	0
Number of major-road approaches with right-turn lanes (0,1,2)		0	0
Data for signalized intersections only:		--	--
Number of approaches with left-turn lanes (0,1,2,3,4) [for 3SG, use maximum value of 3]		0	4
Number of approaches with right-turn lanes (0,1,2,3,4) [for 3SG, use maximum value of 3]		0	1
Number of approaches with left-turn signal phasing [for 3SG, use maximum value of 3]		--	4
Type of left-turn signal phasing for Leg #1		Permissive	Protected
Type of left-turn signal phasing for Leg #2		--	Protected
Type of left-turn signal phasing for Leg #3		--	Protected
Type of left-turn signal phasing for Leg #4 (if applicable)		--	Protected
Number of approaches with right-turn-on-red prohibited [for 3SG, use maximum value of 3]		0	0
Intersection red light cameras (present/not present)		Not Present	Not Present
Sum of all pedestrian crossing volumes (PedVol) -- Signalized intersections only			1,500
Maximum number of lanes crossed by a pedestrian (n_{lanesx})		--	7
Number of bus stops within 300 m (1,000 ft) of the intersection		0	1
Schools within 300 m (1,000 ft) of the intersection (present/not present)		Not Present	Not Present
Number of alcohol sales establishments within 300 m (1,000 ft) of the intersection		0	0

Worksheet 2B -- Crash Modification Factors for Urban and Suburban Arterial Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
CMF for Left-Turn Lanes	CMF for Left-Turn Signal Phasing	CMF for Right-Turn Lanes	CMF for Right Turn on Red	CMF for Lighting	CMF for Red Light Cameras	Combined CMF
CMF 1i	*CMF 2i*	*CMF 3i*	*CMF 4i*	*CMF 5i*	*CMF 6i*	*CMF_{COMB}*
from Table 12-24	from Table 12-25	from Table 12-26	from Equation 12-35	from Equation 12-36	from Equation 12-37	(1)*(2)*(3)*(4)*(5)*(6)
1.00	1.00	1.00	1.00	1.00	1.00	1.00

Worksheet 2C -- Multiple-Vehicle Collisions by Severity Level for Urban and Suburban Arterial Intersections										
(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	**SPF Coefficients**			**Overdispersion Parameter, k**	**Initial N_{bimv}**	**Proportion of Total Crashes**	**Adjusted N_{bimv}**	**Combined CMFs**	**Calibration Factor, C_i**	**Predicted N_{bimv}**
	from Table 12-10			from Table 12-10	from Equation 12-21		$(4)_{TOTAL}$*(5)	(7) from Worksheet 2B		(6)*(7)*(8)
	a	b	c							
Total	-8.90	0.82	0.25	0.40	0.383	1.000	0.383	1.00	1.00	0.383
Fatal and Injury (FI)	-11.13	0.93	0.28	0.48	0.117	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.303	0.116	1.00	1.00	0.116
Property Damage Only (PDO)	-8.74	0.77	0.23	0.40	0.268	$(5)_{TOTAL}-(5)_{FI}$ 0.697	0.267	1.00	1.00	0.267

Worksheet 2D -- Multiple-Vehicle Collisions by Collision Type for Urban and Suburban Arterial Intersections					
(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	**Proportion of Collision Type$_{(FI)}$**	**Predicted $N_{bimv\ (FI)}$ (crashes/year)**	**Proportion of Collision Type $_{(PDO)}$**	**Predicted $N_{bimv\ (PDO)}$ (crashes/year)**	**Predicted $N_{bimv\ (TOTAL)}$ (crashes/year)**
	from Table 12-11	$(9)_{FI}$ from Worksheet 2C	from Table 12-11	$(9)_{PDO}$ from Worksheet 2C	$(9)_{PDO}$ from Worksheet 2C
Total	1.000	0.116	1.000	0.267	0.383
		$(2)*(3)_{FI}$		$(4)*(5)_{PDO}$	(3)+(5)
Rear-end collision	0.338	0.039	0.374	0.100	0.139
Head-on collision	0.041	0.005	0.030	0.008	0.013
Angle collision	0.440	0.051	0.335	0.090	0.141
Sideswipe	0.121	0.014	0.044	0.012	0.026
Other multiple-vehicle collision	0.060	0.007	0.217	0.058	0.065

Worksheet 2E -- Single-Vehicle Collisions by Severity Level for Urban and Suburban Arterial Intersections										
(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	**SPF Coefficients**			**Overdispersion Parameter, k**	**Initial N_{bisv}**	**Proportion of Total Crashes**	**Adjusted N_{bimv}**	**Combined CMFs**	**Calibration Factor, C_i**	**Predicted N_{bisv}**
	from Table 12-12			from Table 12-12	from Eqn. 12-24; (FI) from Eqn. 12-24 or 12-27		$(4)_{TOTAL}$*(5)	(7) from Worksheet 2B		(6)*(7)*(8)
	a	b	c							
Total	-5.33	0.33	0.12	0.65	0.136	1.000	0.136	1.00	1.00	0.136
Fatal and Injury (FI)	--	--	--	--	0.038	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.332	0.045	1.00	1.00	0.045
Property Damage Only (PDO)	-7.04	0.36	0.25	0.54	0.076	$(5)_{TOTAL}-(5)_{FI}$ 0.668	0.091	1.00	1.00	0.091

Worksheet 2F -- Single-Vehicle Collisions by Collision Type for Urban and Suburban Arterial Intersections					
(1)	(2)	(3)	(4)	(5)	(6)
Collision Type	**Proportion of Collision Type$_{(FI)}$**	**Predicted $N_{bisv\ (FI)}$ (crashes/year)**	**Proportion of Collision Type $_{(PDO)}$**	**Predicted $N_{bisv\ (PDO)}$ (crashes/year)**	**Predicted $N_{bisv\ (TOTAL)}$ (crashes/year)**
	from Table 12-13	$(9)_{FI}$ from Worksheet 2E	from Table 12-13	$(9)_{PDO}$ from Worksheet 2E	$(9)_{PDO}$ from Worksheet 2E
Total	1.000	0.045	1.000	0.091	0.136
		$(2)*(3)_{FI}$		$(4)*(5)_{PDO}$	(3)+(5)
Collision with parked vehicle	0.001	0.000	0.001	0.000	0.000
Collision with animal	0.001	0.000	0.026	0.002	0.002
Collision with fixed object	0.679	0.031	0.847	0.077	0.107
Collision with other object	0.089	0.004	0.070	0.006	0.010
Other single-vehicle collision	0.051	0.002	0.007	0.001	0.003
Single-vehicle noncollision	0.179	0.008	0.049	0.004	0.012

Worksheet 2G -- Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Stop-Controlled Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**Predicted N_{bimv}**	**Predicted N_{bisv}**	**Predicted N_{bi}**	**f_{pedi}**	**Calibration factor, C_i**	**Predicted N_{pedi}**
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-16		(4)*(5)*(6)
Total	0.383	0.136	0.519	0.022	1.00	0.011
Fatal and injury (FI)	--	--	--	--	1.00	0.011

Worksheet 2H -- Crash Modification Factors for Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Signalized Intersections			
(1)	(2)	(3)	(4)
CMF for Bus Stops	CMF for Schools	CMF for Alcohol Sales Establishments	Combined CMF
CMF_{1p}	CMF_{2p}	CMF_{3p}	
from Table 12-28	from Table 12-29	from Table 12-30	(1)*(2)*(3)
--	--	--	--

Worksheet 2I -- Vehicle-Pedestrian Collisions for Urban and Suburban Arterial Signalized Intersections										
(1)	(2)					(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**SPF Coefficients**					**Overdispersion Parameter, k**	**$N_{pedbase}$**	**Combined CMF**	**Calibration factor, C_i**	**Predicted N_{pedi}**
	from Table 12-14						from Equation 12-29	(4) from Worksheet 2H		(4)*(5)*(6)
	a	b	c	d	e					
Total	--	--	--	--	--	--	--	--	1.00	--
Fatal and Injury (FI)	--	--	--	--	--	--	--	--	1.00	--

Worksheet 2J -- Vehicle-Bicycle Collisions for Urban and Suburban Arterial Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**Predicted N_{bimv}**	**Predicted N_{bisv}**	**Predicted N_{bi}**	**f_{bikei}**	**Calibration factor, C_i**	**Predicted N_{bikei}**
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-17		(4)*(5)*(6)
Total	0.383	0.136	0.519	0.018	1.00	0.009
Fatal and injury (FI)	--	--	--	--	1.00	0.009

Worksheet 2K -- Crash Severity Distribution for Urban and Suburban Arterial Intersections			
(1)	(2)	(3)	(4)
Collision type	**Fatal and injury (FI)**	**Property damage only (PDO)**	**Total**
	(3) from Worksheet 2D and 2F; (7) from 2G or 2I and 2J	(5) from Worksheet 2D and 2F	(6) from Worksheet 2D and 2F; (7) from 2G or 2I and 2J
MULTIPLE-VEHICLE			
Rear-end collisions (from Worksheet 2D)	0.039	0.100	0.139
Head-on collisions (from Worksheet 2D)	0.005	0.008	0.013
Angle collisions (from Worksheet 2D)	0.051	0.090	0.141
Sideswipe (from Worksheet 2D)	0.014	0.012	0.026
Other multiple-vehicle collision (from Worksheet 2D)	0.007	0.058	0.065
Subtotal	0.116	0.267	0.383
SINGLE-VEHICLE			
Collision with parked vehicle (from Worksheet 2F)	0.000	0.000	0.000
Collision with animal (from Worksheet 2F)	0.000	0.002	0.002
Collision with fixed object (from Worksheet 2F)	0.031	0.077	0.107
Collision with other object (from Worksheet 2F)	0.004	0.006	0.010
Other single-vehicle collision (from Worksheet 2F)	0.002	0.001	0.003
Single-vehicle noncollision (from Worksheet 2F)	0.008	0.004	0.012
Collision with pedestrian (from Worksheet 2G or 2I)	0.011	0.000	0.011
Collision with bicycle (from Worksheet 2J)	0.009	0.000	0.009
Subtotal	0.066	0.091	0.156
Total	0.182	0.358	0.540

Worksheet 2L -- Summary Results for Urban and Suburban Arterial Intersections	
(1)	(2)
Crash severity level	**Predicted average crash frequency, $N_{predicted\ int}$ (crashes/year)**
	(Total) from Worksheet 2K
Total	0.5
Fatal and injury (FI)	0.2
Property damage only (PDO)	0.4

FEHR & PEERS

TECHNICAL MEMORANDUM

Date: July 26, 2021

To: Troy Bourne, Spieker Senior Development
Dick Loewke, Loewke Planning Associates

From: Bill Burton, PE, Fehr & Peers

Subject: Spieker Walnut Creek – Draft Transportation Assessment – Responses to Comments

WC20-3699.00

This technical memorandum has been prepared to summarize our responses to comments provided by Hexagon Transportation Consultants on the *Draft Transportation Assessment* (December 17, 2020) prepared for the proposed Spieker Walnut Creek Continuing Care Retirement Facility. Our responses are numerically keyed to the comments provided in Hexagon's letter of June 28, 2021, which is attached to this memorandum as a reference.

1. Project size – The transportation assessment has been revised to reflect the project's current size of 454 units. None of the conclusions of the original study have changed.

2. Page 8 Typographic Error – This typographic issue has been corrected.

3. Page 9 Footnote Request – The requested footnote has been added.

4. VMT Analysis – The requested change to the Vehicle Miles Traveled (VMT) assessment has not been changed because it is not consistent with Contra Costa County Guidelines and the direction of Contra Costa County staff. Hexagon suggests that the analysis divide the housing and employment elements of the project and evaluate their VMT separately. As noted by the comment, the project contains both residential and employment uses and is considered a mixed-use project. Per County guidelines (*Contra Costa County Transportation Analysis* Guidelines, June 23, 2020, Conservation and Development

Department, Public Works Department) mixed-use projects should be evaluated using total VMT per service population. The guidelines do not suggest that mixed use projects be subdivided into their individual parts with their constituent elements evaluated separately. As part of the preparation of the Draft Transportation Assessment for the Spieker project, Fehr & Peers was directed by Contra Costa County staff to evaluate the project in this manner (total VMT per service population), consistent with the County's written guidelines. We agreed with this approach and direction when it was given.

The comment also suggests that if subdivided into its constituent parts the employment uses of the project may result in a significant impact related to VMT. This finding is related to the ambient VMT per employee of other employment uses in the area. This approach would likely overstate the project's employment related VMT effects. Most employees at continuing care retirement facilities have travel patterns analogous to retail employees rather than typical office-based employment. The jobs at these types of facilities are predominantly service type employment such as food service, janitorial, or similar. As such, they are frequently filled by younger staff and others with shorter trip lengths.

5. Page 14 Footnote Request – The requested footnote has been added.

6. Page 10 Intersection Labeling Request – The requested change to the labeling of an intersection has been made.

7. Page 16 MTSO Explanation – The requested language regarding volume development has been made.

8. Page 20 Footnote Request – The requested footnote has been added.

9. Page 20 Footnote Request – The requested footnote has been added.

10. Figure 3 Footnote Request – The requested footnote has been added.

11. Cumulative Growth Rates – Cumulative traffic volumes were developed using turning movement specific growth from the current version of the CCTA travel demand model. The comment specifically refers to the southbound left turn movement at intersection number

1 potentially being inconsistent with other movements. The amount of traffic exiting intersection number 1 in the eastbound direction (i.e., from the southbound left turn movement) is equivalent to the amount of eastbound traffic arriving at intersection number 2 (the intersection immediately downstream) during both the cumulative AM and PM peak hours.

12. Synchro LOS Calculations – The geometry at intersection number 1 has been updated to reflect the recent intersection restriping.

13. Collision Summary Analysis – The requested crash prediction evaluation reports have been added to the technical appendix.

Attachment: *Peer Review of Traffic Study for Proposed Spieker Retirement Facility in Contra Costa County, Hexagon Transportation Consultants, June 28, 2021*

RECEIVED on 7/7/2021 CDDP20-03018
By Contra Costa County
Department of Conservation and Development

June 28, 2021

Mr. Connor Tutino
David J. Powers & Associates, Inc.
1736 Franklin Street, Suite 300
Oakland, CA 94612

Re: Peer Review of Traffic Study for Proposed Spieker Retirement Facility in Contra Costa County

Dear Mr. Tutino:

Hexagon Transportation Consultants, Inc. has completed a peer review of the traffic study prepared for the proposed Spieker Continuing Care Retirement facility in Contra Costa County. The project proposes the construction of 460 units on a 30.4-acre site accessed exclusively from Kinross Drive west of Ygnacio Valley Road. The traffic study was prepared by Fehr & Peers and is dated December 17, 2020.

Hexagon has reviewed the traffic study and has the following comments.

1. The architectural plans show 458 units, and the traffic analysis is based on 475 units. This represents a conservative analysis as the traffic study analyzed a higher number of units than proposed.

2. Page 8. The statement "Identifying improvements to address operational deficiencies would not be required under the following circumstances" is incorrect. It should be "Identifying improvements to address operational deficiencies would be required under the following circumstances".

3. Page 9 (Table 1). Include in the footnote that the daily trip generation of 1,140 trips is based on the average ITE trip rate for 475 units.

4. Page 9 (VMT Analysis). The VMT analysis presented in the report may not accurately reflect the VMT for the project. The project was analyzed as a mixed-use project due to the relatively high number of employees, and VMT impacts were identified by calculating the VMT per service population for the project and comparing it with the countywide VMT per service population. The VMT for the project was calculated by multiplying the total number of daily trips from the project (estimated from ITE trip generation rates) and multiplying by the VMT per service population for the Traffic Analysis Zone (TAZ) that the project is located in. The VMT per service population was calculated based on the weighted average of the trip lengths for employees and the trip lengths for the residents in the TAZ that the project is located in. Since the trip making characteristics (trip purpose and length) for residents of the retirement community are significantly different from the trip making characteristics of regular households, Hexagon believes that combining the trip length for the residents and the employees would not accurately represent the project VMT. Hexagon recommends that the VMT analysis be conducted separately for the

residential and the employment components of the project. Using the CCTA travel demand model, the VMT per employee for the project TAZ (TAZ 20183) is 18 miles. The baseline Bay Area regional average VMT/employee is 15.6. Compared to the threshold of 13.26 VMT/employee (15% below the regional average), the VMT/employee for the project would be 35.75% higher and would result in a significant impact. The project should identify TDM measures that would encourage employees to choose an alternative mode of transportation. Given the project's proximity to the Walnut Creek BART station (approximately 2 miles) and adequate bicycle and pedestrian connectivity between the project site and the BART station, the project may be able to attain a 35.75% reduction in employee trips. The report states that free shuttle service would be provided to the residents of the retirement facility. The project should consider extending the shuttle service to employees and also provide free/subsidized transit tickets for employees. For the residential component of the project, based on the CCTA travel demand model, the average home based VMT per capita for the project TAZ is 13.7 and the average countywide home based VMT per capita is 17.3. Compared to the threshold of 14.7 VMT per capita (15% below the countywide average), the homebased VMT for the project would be 6.8% lower than the threshold. Because the number of trips and the trip length for the residents of the retirement community would be fewer and shorter compared to the trips made by regular households, the home based VMT per resident for the proposed project is expected to be even lower and the project would not have a significant impact for the residential component.

5. Page 14 (Table 5). Add in the footnote that the trip generation is based on average rates.

6. Page 10 (List of study intersections). Intersection #1 should be called out as Marchbanks Dr/Tampico and Ygnacio Valley Road, as there is another intersection Marchbanks Dr and Ygnacio Valley Road to the east.

7. Page 16, Multimodal Transportation Service Objectives (MTSO) – Please explain how the existing and cumulative traffic volumes for the two intersections were developed.

8. Page 20 (Table 11). Include in the footnote what "PDO" stands for.

9. Page 20 (Table 12). Include in the footnote what "DUI" stands for.

10. Existing Volumes (Page 11). The reports states that the existing turning movement counts were obtained from Streetlight data for the year 2019, the year before the pandemic; the data was compared to historical traffic counts from other studies conducted in the area, and the comparison showed consistency between the Streetlight data and the historical counts. Please include the historical count data to the appendix. Add a footnote to Figure 3 stating that the turning movement counts were based on Streetlight data for the year 2019.

11. Cumulative Volumes (Page 15). The report states that the cumulative volumes were developed based on growth factors from the CCTA travel demand model. It is not clear if an overall growth factor for the study area was applied to the existing turning movement counts or if separate growth factors were applied to individual turning movements for each intersection. For example, at intersection #1, the cumulative volume for the southbound left-turn movement shows approximately a 600% increase (from 24 vehicles under existing conditions to 180 vehicles under cumulative conditions and from 14 vehicles to 100 vehicles during the AM and PM peak hours, respectively). This growth seems to occur only to the west of intersection #4, as the cumulative volume at intersection #4 does not show any increase from existing conditions. Please confirm that this is indeed the case.

12. Synchro LOS Calculations. The intersection LOS calculations (Synchro outputs) for intersection #1 show that the southbound approach on Marchbanks Drive was evaluated with one left-turn lane, one through lane and one right-turn lane. However, the lane striping shows a shared left-through lane. Please revise the delay/LOS calculations at intersection #1.

13. Collision Summary Analysis (Page 17). Include the intersection crash prediction evaluation report in the appendix.

This concludes Hexagon's peer review of the Spieker Continuing Care Retirement Facility traffic study. Please let us know if you have any questions about our review.

Sincerely,
HEXAGON TRANSPORTATION CONSULTANTS, INC.

Trisha Dudala

Trisha Dudala

TECHNICAL MEMORANDUM

Date: October 1, 2021

To: Troy Bourne, Spieker Senior Development
Dick Loewke, Loewke Planning Associates

From: Bill Burton, PE, Fehr & Peers

Subject: Spieker Walnut Creek – Transportation Assessment – Responses to City of Walnut Creek Comments

WC20-3699.00

This technical memorandum has been prepared to summarize our responses to transportation comments provided by the City of Walnut Creek as part of the scoping of the EIR for the Spieker Walnut Creek Continuing Care Retirement Facility. The comments submitted by the city pertain to our revised Draft Transportation Assessment of July 21, 2021. Our responses to the city's comments are provided below.

Comment #16. *Provide a comparison of trip generation rates for LU 255 (which was used in the preliminary traffic analysis), as compared to a combination of Senior Living, Congregate Care, Assisted Living, and other land uses contained within the ITE 10th ed., as the project description does break down the project into more specific uses and employee shift information. The more conservative trip generation estimate should be applied to this project. Furthermore, confirm whether the breakdown for employees/residents that would have project characteristics for locations where data was collected for LU 255 trip generation match that used in the VMT calculations used for this project.*

Response to Comment #16 - The ITE *Trip Generation Manual, 10th Edition* describes Land Use Code 255 (Continuing Care Retirement Community) as follows: *"A continuing care retirement community is a land use that provides multiple elements of senior adult living. CCRCs combine aspects of independent living with increased care, as lifestyle needs change with time. Housing options may include various combinations of senior adult (detached), senior adult (attached), congregate care, assisted living, and skilled nursing care – aimed at allowing the residents to live in one community as their medical needs change. The communities may also contain special* *services such as medical, dining, recreational, and some limited supporting retail facilities. CCRCs are usually self-contained villages."* This description precisely fits what the project proposes and is the ITE land-use most appropriate for project evaluation. Disaggregating the component parts of the proposed project for individual treatment within the trip generation calculations would not be appropriate and has not been done as part of the project's transportation assessment.

The breakdown of employees and residents present at the locations used for data within Land Use Code 255 is not available. However, a review of the site's incorporated within the data shows an average size of 382 occupied units with a minimum of 242 occupied units and a maximum of 720 occupied units. This compares directly with the 454 units proposed as part of the Spieker Walnut Creek project, which is located within the middle of the range of the surveyed sites. In addition, each of the site's surveyed for the ITE data has the constituent parts proposed within the Spieker Walnut Creek facility. The source data and trip generation characteristics of LU 255 best fit the proposed project and most accurately describe the anticipated trips associated with the development. A disaggregation of the component parts of the project for individual trip generation treatment would lead to a less accurate characterization of project trip generation.

Comment # 17 - *Similar to the trip generation assumptions, please break down parking demand analysis by more specific land uses to better match the project description.*

Response to Comment #17 – The logic behind the use of Land Use Code 255 data for the calculation of project generated parking demand is the same as described above for project trip generation. The proposed project precisely fits the CCRC description, and that data set is the best predictor of project generated parking demand. A disaggregation of the component parts of the project for individual parking demand treatment would lead to a less accurate characterization of project parking demand. It should also be noted that the developer for this project, Spieker Senior Development, operates eight similar CCRCs within the State of California. The proposed amount of parking exceeds the per unit parking demand experienced at these facilities.

Comment #18a. LOS Analysis comments: *Generally: City staff has a preference not to apply a peak hour factor (PHF) for cumulative conditions, and to apply a consistent PHF across all intersection approaches (especially one where traffic volumes are heavy commute condition rather than very peaky conditions such as near a school).*

Response to Comment #18a – The project's LOS analysis retains the existing observed peak hour factors within the cumulative assessment. If a consistent peak hour factor reflecting heavy commute conditions (such as 1.0) were used within the cumulative assessment, the identified LOS and delays would be better than those currently reported within our transportation assessment. Under any reasonable set of PHF assumptions, the conclusions of the transportation analysis would not change.

Comment #18b. LOS Analysis Comments: *YVR/San Carlos: The NB and SB San Carlos approaches are split phase and should be analyzed accordingly.*

Response to Comment #18b. – Agree. The LOS and delays illustrated within our report reflect split phasing on the NB and SB San Carlos Drive approaches. Several incorrect synchro reports were attached within the technical appendix. The proper reports are attached to this memorandum.

Comment #18c. LOS Analysis Comments: *YVR/La Casa Via: The signal does not operate any special phasing on the NB approach, and should be analyzed accordingly.*

Response to Comment #18c. – Agree. The LOS and delays illustrated within our report reflect split phasing on the NB and SB approaches to the intersection (no special phasing is assumed). Several incorrect synchro reports were attached within the technical appendix. The proper reports are attached to this memorandum.

Comment #18d. LOS Analysis Comments: *YVR/Tampico: The overall LOS used in the previous analysis did not appear to be realistic. Confirm the model to be used as a basis for the analysis in the EIR, and whether it was provided by the City of Walnut Creek.*

Response to Comment #18d – The synchro model used as the basis for the analysis was previously provided by the City of Walnut Creek. Current signal phasing and timings were checked in the field. Traffic counts for existing conditions were developed using the Streetlight Data turning movement product due to the on-going Covid-19 pandemic (the Streetlight counts were cross-checked against historic manual turning movement counts from 2015 and 2016 and found to be accurate). Cumulative forecasts were developed using projections from the CCTA travel demand model.

Morning and evening peak hour conditions were observed at the intersection on Thursday September 30, 2021. Observed conditions during the morning peak hour closely matched the

LOS and delays reported in our technical memorandum. Conditions during the evening peak hour showed quite a bit of fluctuation throughout the period of observation. In general, delays on the NB, SB and WB approaches were very low. Eastbound delays and queues varied substantially from 4 to 6 PM, largely due to downstream conditions at the San Carlos Drive/Ygnacio Valley Road intersection and not due to any constraint present at the Marchbank/Tampico intersection. The project adds a small amount of traffic to the intersection and would not have a material impact on its operation regardless of the baseline level of service.

Comment #19. *Analyze the need for pedestrian connections at the Seven Hills Ranch Rd/Homestead Ave intersection in light of the VMT resulting from the proposed project.*

Response to Comment #19 – The proposed project would have a less than significant impact related to VMT and mitigation measures to reduce project generated VMT are not required. The proposed project does not substantially increase hazards (e.g. sharp curves or dangerous intersections) or incompatible uses (e.g. farm equipment). As no project significant adverse impacts related to transportation were identified at this off-site intersection, no mitigation measures were proposed. Formal pedestrian facilities such as crosswalks or sidewalks are not currently provided at the Seven Hills Ranch Road/Homestead Avenue intersection.

Comment #20. *Analyze the need for a direct pedestrian connection from the project site to Heather Farm Park in light of the VMT resulting from the proposed project.*

Response to Comment #20 – The proposed project would have a less than significant impact related to VMT and mitigation measures to reduce project generated VMT are not required. The proposed project does not substantially increase hazards (e.g. sharp curves or dangerous intersections) or incompatible uses (e.g. farm equipment). As no project significant adverse impacts related to transportation were identified on this off-site roadway, no mitigation measures were proposed. Formal pedestrian facilities such as crosswalks or sidewalks are not currently provided on the section of North San Carlos Drive between the project site and Heather Farm Park.

Comment #21. *Analyze the need for secure indoor bicycle parking for the project's employees and residents (in addition to the proposed locker and shower facilities for employees), and convenient outdoor bicycle parking for visitors, in light of the VMT resulting from the project and the site's proximity to the Contra Costa Canal and the Iron Horse Trails.*

Response to Comment #21 – The need for bicycle parking was reviewed in detail as part of our transportation assessment. As national statistics on parking demand at Continuing Care Retirement Communities are not available, counts were performed at six similar California facilities. Those observations found the following:

- Stoneridge Creek (565 Independent Living Units, Pleasanton, CA) = 20 parked bicycles
- University Village (367 Independent Living Units, Thousand Oaks, CA) = 4 parked bicycles
- Glen at Scripps Ranch (400 Independent Living Units, San Diego, CA) = 5 parked bicycles
- La Costa Glen (646 Independent Living Units, Carlsbad, CA) = 16 parked bicycles
- Reata Glen (480 Independent Living Units, San Juan Capistrano, CA) = 12 parked bicycles
- Morningside (324 Independent Living Units, Fullerton, CA) = 0 parked bicycles

The average peak use of bicycle parking facilities at similar facilities in California was observed to be 1 parked bicycle per 49 independent living units. At the facility displaying the greatest use of bicycle parking (Pleasanton) the usage was 1 parked bicycle per 28 residential units. As the project proposes 1 bicycle parking space per 13.5 independent living units, it is expected that adequate bicycle parking is proposed as part of the project.

The project proposes nine racks (for 18 bicycles) in the garage under the Independent Living Building, three racks (for six bicycles) at the Health Care Center's back entrance and one rack (for two bicycles) at the rear of the Maintenance Building. A total of 13 bicycle racks with a combined capacity for 26 bicycles are proposed. Should employees, visitors, or residents feel uncomfortable parking their bicycle in one of the outdoor bicycle racks they will be allowed to store their bike indoors.

Comment #22. *Analyze the need for pedestrian and bicycle connections between the Iron Horse Trail and the Seven Hills Ranch Road EVA, and between the Contra Costa Canal Trail and the N San Carlos Drive EVA, to serve employees and visitors, in addition to the senior residents (who may use tricycles or other similar vehicles, as well as bicycles), in light of the VMT resulting from the project.*

Response to Comment #22 - The proposed project would have a less than significant impact related to VMT and mitigation measures to reduce project generated VMT are not required.

The proposed project does not substantially increase hazards (e.g. sharp curves or dangerous intersections) or incompatible uses (e.g. farm equipment). As no project significant adverse impacts related to transportation were identified on this off-site roadway, no mitigation measures were proposed. Formal pedestrian or bicycle facilities such as crosswalks, sidewalks or bike lanes are not currently provided on the section of North San Carlos Drive between the project site and Heather Farm Park or on Seven Hills Ranch Road. Bicycles and pedestrians are not prohibited from using either facility.

Attachments: Synchro outputs for Ygnacio Valley Road/San Carlos Drive and Ygnacio Valley Road/La Casa Via intersections

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	2	1109	214	245	2569	14	108	2	77	33	1	39
Future Volume (veh/h)	2	1109	214	245	2569	14	108	2	77	33	1	39
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.97	1.00		0.97	1.00		0.95
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	1969	1969	1969	1969	1969	1969	2000	2000	2000	2000	2000	2000
Adj Flow Rate, veh/h	2	1155	134	253	2648	14	122	0	8	40	1	14
Peak Hour Factor	0.96	0.96	0.96	0.97	0.97	0.97	0.89	0.89	0.89	0.82	0.82	0.82
Percent Heavy Veh, %	2	2	2	2	2	2	0	0	0	0	0	0
Cap, veh/h	25	3417	1044	338	3947	21	357	0	154	110	3	39
Arrive On Green	0.01	0.64	0.63	0.09	0.72	0.71	0.09	0.00	0.09	0.08	0.08	0.08
Sat Flow, veh/h	1875	5375	1664	3638	5517	29	3810	0	1646	1325	33	464
Grp Volume(v), veh/h	2	1155	134	253	1719	943	122	0	8	55	0	0
Grp Sat Flow(s),veh/h/ln	1875	1792	1664	1819	1792	1963	1905	0	1646	1822	0	0
Q Serve(g_s), s	0.1	12.7	4.1	8.6	33.3	33.5	3.8	0.0	0.6	3.6	0.0	0.0
Cycle Q Clear(g_c), s	0.1	12.7	4.1	8.6	33.3	33.5	3.8	0.0	0.6	3.6	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.01	1.00		1.00	0.73		0.25
Lane Grp Cap(c), veh/h	25	3417	1044	338	2563	1404	357	0	154	152	0	0
V/C Ratio(X)	0.08	0.34	0.13	0.75	0.67	0.67	0.34	0.00	0.05	0.36	0.00	0.00
Avail Cap(c_a), veh/h	192	3417	1044	573	2563	1404	360	0	156	172	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.96	0.96	0.96	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	61.9	10.7	9.6	56.1	9.9	9.9	53.9	0.0	52.4	55.2	0.0	0.0
Incr Delay (d2), s/veh	0.5	0.3	0.2	1.2	1.4	2.6	0.2	0.0	0.1	0.5	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	4.7	1.5	4.0	11.6	13.2	1.9	0.0	0.2	1.7	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	62.4	11.0	9.8	57.4	11.3	12.5	54.1	0.0	52.5	55.7	0.0	0.0
LnGrp LOS	E	B	A	E	B	B	D	A	D	E	A	A
Approach Vol, veh/h		1291			2915			130			55	
Approach Delay, s/veh		11.0			15.7			54.0			55.7	
Approach LOS		B			B			D			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	4.7	93.9		14.9	14.8	83.7		13.6
Change Period (Y+Rc), s	4.0	5.0		5.0	4.0	5.0		5.0
Max Green Setting (Gmax), s	12.0	76.0		10.0	19.0	69.0		10.0
Max Q Clear Time (g_c+I1), s	2.1	35.5		5.8	10.6	14.7		5.6
Green Ext Time (p_c), s	0.0	40.5		0.1	0.2	42.2		0.0

Intersection Summary			
HCM 6th Ctrl Delay			15.9
HCM 6th LOS			B

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	111	1169	125	222	2425	182	291	42	49	134	35	75
Future Volume (veh/h)	111	1169	125	222	2425	182	291	42	49	134	35	75
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.97	1.00		0.92	1.00		0.90
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	1969	1969	1969	1969	1969	1969	2000	2000	2000	2000	2000	2000
Adj Flow Rate, veh/h	113	1372	122	244	2665	196	334	48	32	103	127	15
Peak Hour Factor	0.98	0.98	0.98	0.91	0.91	0.91	0.87	0.87	0.87	0.82	0.82	0.82
Percent Heavy Veh, %	2	2	2	2	2	2	0	0	0	0	0	0
Cap, veh/h	126	2086	185	275	2525	181	573	167	111	273	286	219
Arrive On Green	0.07	0.42	0.41	0.15	0.49	0.49	0.16	0.16	0.16	0.14	0.14	0.14
Sat Flow, veh/h	1875	5022	447	1875	5108	366	3695	1077	718	1905	2000	1530
Grp Volume(v), veh/h	113	979	515	244	1849	1012	334	0	80	103	127	15
Grp Sat Flow(s),veh/h/ln	1875	1792	1885	1875	1792	1891	1848	0	1795	1905	2000	1530
Q Serve(g_s), s	10.6	39.1	39.2	22.7	88.0	88.0	14.9	0.0	7.0	8.7	10.3	1.5
Cycle Q Clear(g_c), s	10.6	39.1	39.2	22.7	88.0	88.0	14.9	0.0	7.0	8.7	10.3	1.5
Prop In Lane	1.00		0.24	1.00		0.19	1.00		0.40	1.00		1.00
Lane Grp Cap(c), veh/h	126	1488	783	275	1771	935	573	0	278	273	286	219
V/C Ratio(X)	0.89	0.66	0.66	0.89	1.04	1.08	0.58	0.00	0.29	0.38	0.44	0.07
Avail Cap(c_a), veh/h	126	1488	783	369	1771	935	685	0	333	353	371	284
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	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	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	82.4	41.9	42.0	74.5	45.0	45.1	69.8	0.0	66.5	69.1	69.8	66.0
Incr Delay (d2), s/veh	49.2	2.3	4.3	15.2	33.7	54.5	0.4	0.0	0.2	0.3	0.4	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	6.9	17.7	19.1	12.1	46.2	54.2	7.2	0.0	3.3	4.3	5.4	0.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	131.6	44.1	46.3	89.7	78.7	99.6	70.2	0.0	66.7	69.4	70.2	66.0
LnGrp LOS	F	D	D	F	F	F	E	A	E	E	E	E
Approach Vol, veh/h		1607			3105			414			245	
Approach Delay, s/veh		51.0			86.4			69.5			69.6	
Approach LOS		D			F			E			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	15.0	91.0		30.6	29.1	76.9		28.5
Change Period (Y+Rc), s	4.0	5.0		5.0	4.0	5.0		5.0
Max Green Setting (Gmax), s	11.0	86.0		31.0	34.0	63.0		31.0
Max Q Clear Time (g_c+I1), s	12.6	90.0		16.9	24.7	41.2		12.3
Green Ext Time (p_c), s	0.0	0.0		1.0	0.3	20.6		0.5

Intersection Summary	
HCM 6th Ctrl Delay	73.7
HCM 6th LOS	E

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	23	2691	99	80	1941	24	276	2	288	12	1	23
Future Volume (veh/h)	23	2691	99	80	1941	24	276	2	288	12	1	23
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.98	1.00		0.99	1.00		0.97
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	1969	1969	1969	1969	1969	1969	2000	2000	2000	2000	2000	2000
Adj Flow Rate, veh/h	24	2774	62	90	2181	26	351	0	37	16	1	3
Peak Hour Factor	0.97	0.97	0.97	0.89	0.89	0.89	0.79	0.79	0.79	0.73	0.73	0.73
Percent Heavy Veh, %	2	2	2	2	2	2	0	0	0	0	0	0
Cap, veh/h	103	3797	1056	342	3733	44	391	0	172	86	5	16
Arrive On Green	0.05	0.64	0.63	0.09	0.68	0.67	0.10	0.00	0.10	0.06	0.06	0.05
Sat Flow, veh/h	1875	5906	1665	3638	5473	65	3810	0	1675	1492	93	280
Grp Volume(v), veh/h	24	2774	62	90	1427	780	351	0	37	20	0	0
Grp Sat Flow(s),veh/h/ln	1875	1969	1665	1819	1792	1955	1905	0	1675	1865	0	0
Q Serve(g_s), s	1.4	37.0	1.7	2.7	24.6	24.7	10.7	0.0	2.4	1.2	0.0	0.0
Cycle Q Clear(g_c), s	1.4	37.0	1.7	2.7	24.6	24.7	10.7	0.0	2.4	1.2	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.03	1.00		1.00	0.80		0.15
Lane Grp Cap(c), veh/h	103	3797	1056	342	2444	1334	391	0	172	108	0	0
V/C Ratio(X)	0.23	0.73	0.06	0.26	0.58	0.58	0.90	0.00	0.22	0.19	0.00	0.00
Avail Cap(c_a), veh/h	176	3797	1056	933	2444	1334	391	0	172	191	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.68	0.68	0.68	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	52.9	14.1	8.1	49.2	9.8	9.8	51.9	0.0	48.2	52.6	0.0	0.0
Incr Delay (d2), s/veh	0.3	0.9	0.1	0.2	1.0	1.9	22.3	0.0	0.2	0.3	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	0.7	14.7	0.6	1.2	8.6	9.8	6.3	0.0	1.0	0.6	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	53.2	14.9	8.2	49.4	10.9	11.7	74.2	0.0	48.4	52.9	0.0	0.0
LnGrp LOS	D	B	A	D	B	B	E	A	D	D	A	A
Approach Vol, veh/h		2860			2297			388			20	
Approach Delay, s/veh		15.1			12.7			71.7			52.9	
Approach LOS		B			B			E			D	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	9.4	82.8		15.0	14.0	78.2		9.8				
Change Period (Y+Rc), s	4.0	5.0		5.0	4.0	5.0		5.0				
Max Green Setting (Gmax), s	10.0	68.0		10.0	29.0	49.0		10.0				
Max Q Clear Time (g_c+I1), s	3.4	26.7		12.7	4.7	39.0		3.2				
Green Ext Time (p_c), s	0.0	40.9		0.0	0.1	10.0		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			18.2									
HCM 6th LOS			B									

Notes

User approved volume balancing among the lands for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	116	2694	261	184	1691	203	215	55	62	186	60	123
Future Volume (veh/h)	116	2694	261	184	1691	203	215	55	62	186	60	123
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.97	1.00		0.92	1.00		0.92
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	1969	1969	1969	1969	1969	1969	2000	2000	2000	2000	2000	2000
Adj Flow Rate, veh/h	130	3027	286	196	1799	209	256	65	50	168	203	65
Peak Hour Factor	0.89	0.89	0.89	0.94	0.94	0.94	0.84	0.84	0.84	0.73	0.73	0.73
Percent Heavy Veh, %	2	2	2	2	2	2	0	0	0	0	0	0
Cap, veh/h	160	3035	277	126	2685	310	519	142	109	296	311	242
Arrive On Green	0.09	0.57	0.56	0.07	0.55	0.55	0.14	0.14	0.14	0.16	0.16	0.16
Sat Flow, veh/h	1875	5330	487	1875	4871	562	3695	1008	776	1905	2000	1560
Grp Volume(v), veh/h	130	2209	1104	196	1320	688	256	0	115	168	203	65
Grp Sat Flow(s),veh/h/ln	1875	1969	1879	1875	1792	1850	1848	0	1784	1905	2000	1560
Q Serve(g_s), s	12.1	97.9	101.4	12.0	46.6	47.3	11.4	0.0	10.5	14.5	17.0	6.5
Cycle Q Clear(g_c), s	12.1	97.9	101.4	12.0	46.6	47.3	11.4	0.0	10.5	14.5	17.0	6.5
Prop In Lane	1.00		0.26	1.00		0.30	1.00		0.43	1.00		1.00
Lane Grp Cap(c), veh/h	160	2242	1070	126	1975	1020	519	0	250	296	311	242
V/C Ratio(X)	0.81	0.99	1.03	1.55	0.67	0.67	0.49	0.00	0.46	0.57	0.65	0.27
Avail Cap(c_a), veh/h	200	2242	1070	126	1975	1020	727	0	351	375	393	307
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	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	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	80.0	37.6	38.5	83.0	28.4	28.7	70.7	0.0	70.3	69.6	70.7	66.3
Incr Delay (d2), s/veh	17.9	15.8	36.2	282.9	1.8	3.6	0.3	0.0	0.5	0.6	1.2	0.2
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	6.6	50.1	55.4	15.7	20.2	21.7	5.5	0.0	4.9	7.3	8.9	2.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	97.8	53.3	74.6	365.9	30.2	32.2	70.9	0.0	70.8	70.3	71.9	66.5
LnGrp LOS	F	D	F	F	C	C	E	A	E	E	E	E
Approach Vol, veh/h		3443			2204			371			436	
Approach Delay, s/veh		61.9			60.7			70.9			70.4	
Approach LOS		E			E			E			E	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	18.2	101.1		28.0	15.0	104.4		30.7				
Change Period (Y+Rc), s	4.0	5.0		5.0	4.0	5.0		5.0				
Max Green Setting (Gmax), s	18.0	75.0		33.0	11.0	82.0		33.0				
Max Q Clear Time (g_c+I1), s	14.1	49.3		13.4	14.0	103.4		19.0				
Green Ext Time (p_c), s	0.1	25.3		1.0	0.0	0.0		0.9				

Intersection Summary			
HCM 6th Ctrl Delay			62.5
HCM 6th LOS			E

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	7	1109	214	245	2569	16	108	2	77	34	1	41
Future Volume (veh/h)	7	1109	214	245	2569	16	108	2	77	34	1	41
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.97	1.00		0.97	1.00		0.95
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	1969	1969	1969	1969	1969	1969	2000	2000	2000	2000	2000	2000
Adj Flow Rate, veh/h	7	1155	134	253	2648	16	122	0	8	41	1	16
Peak Hour Factor	0.96	0.96	0.96	0.97	0.97	0.97	0.89	0.89	0.89	0.82	0.82	0.82
Percent Heavy Veh, %	2	2	2	2	2	2	0	0	0	0	0	0
Cap, veh/h	47	3410	1043	338	3872	23	357	0	154	108	3	42
Arrive On Green	0.03	0.63	0.63	0.09	0.70	0.69	0.09	0.00	0.09	0.08	0.08	0.08
Sat Flow, veh/h	1875	5375	1664	3638	5512	33	3810	0	1646	1284	31	501
Grp Volume(v), veh/h	7	1155	134	253	1720	944	122	0	8	58	0	0
Grp Sat Flow(s),veh/h/ln	1875	1792	1664	1819	1792	1962	1905	0	1646	1816	0	0
Q Serve(g_s), s	0.5	12.7	4.2	8.6	34.9	35.1	3.8	0.0	0.6	3.8	0.0	0.0
Cycle Q Clear(g_c), s	0.5	12.7	4.2	8.6	34.9	35.1	3.8	0.0	0.6	3.8	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.02	1.00		1.00	0.71		0.28
Lane Grp Cap(c), veh/h	47	3410	1043	338	2517	1378	357	0	154	153	0	0
V/C Ratio(X)	0.15	0.34	0.13	0.75	0.68	0.69	0.34	0.00	0.05	0.38	0.00	0.00
Avail Cap(c_a), veh/h	192	3410	1043	573	2517	1378	360	0	156	172	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.96	0.96	0.96	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	60.6	10.8	9.6	56.1	10.8	10.8	53.9	0.0	52.4	55.1	0.0	0.0
Incr Delay (d2), s/veh	0.5	0.3	0.2	1.2	1.5	2.8	0.2	0.0	0.1	0.6	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	4.8	1.5	4.0	12.4	14.1	1.9	0.0	0.2	1.8	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	61.1	11.1	9.9	57.4	12.3	13.6	54.1	0.0	52.5	55.7	0.0	0.0
LnGrp LOS	E	B	A	E	B	B	D	A	D	E	A	A
Approach Vol, veh/h		1296			2917			130			58	
Approach Delay, s/veh		11.2			16.7			54.0			55.7	
Approach LOS		B			B			D			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	6.2	92.2		14.9	14.8	83.6		13.7
Change Period (Y+Rc), s	4.0	5.0		5.0	4.0	5.0		5.0
Max Green Setting (Gmax), s	12.0	76.0		10.0	19.0	69.0		10.0
Max Q Clear Time (g_c+I1), s	2.5	37.1		5.8	10.6	14.7		5.8
Green Ext Time (p_c), s	0.0	38.9		0.1	0.2	42.2		0.0

Intersection Summary	
HCM 6th Ctrl Delay	16.7
HCM 6th LOS	B

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	111	1170	125	222	2438	182	291	42	49	140	35	75
Future Volume (veh/h)	111	1170	125	222	2438	182	291	42	49	140	35	75
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.97	1.00		0.92	1.00		0.90
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	1969	1969	1969	1969	1969	1969	2000	2000	2000	2000	2000	2000
Adj Flow Rate, veh/h	113	1373	122	244	2679	196	334	48	32	107	133	15
Peak Hour Factor	0.98	0.98	0.98	0.91	0.91	0.91	0.87	0.87	0.87	0.82	0.82	0.82
Percent Heavy Veh, %	2	2	2	2	2	2	0	0	0	0	0	0
Cap, veh/h	126	2086	185	275	2527	180	573	167	111	275	289	221
Arrive On Green	0.07	0.42	0.41	0.15	0.49	0.49	0.16	0.16	0.16	0.14	0.14	0.14
Sat Flow, veh/h	1875	5022	446	1875	5111	364	3695	1077	718	1905	2000	1531
Grp Volume(v), veh/h	113	980	515	244	1857	1018	334	0	80	107	133	15
Grp Sat Flow(s),veh/h/ln	1875	1792	1885	1875	1792	1892	1848	0	1795	1905	2000	1531
Q Serve(g_s), s	10.6	39.2	39.2	22.7	88.0	88.0	14.9	0.0	7.0	9.1	10.8	1.5
Cycle Q Clear(g_c), s	10.6	39.2	39.2	22.7	88.0	88.0	14.9	0.0	7.0	9.1	10.8	1.5
Prop In Lane	1.00		0.24	1.00		0.19	1.00		0.40	1.00		1.00
Lane Grp Cap(c), veh/h	126	1488	783	275	1771	935	573	0	278	275	289	221
V/C Ratio(X)	0.89	0.66	0.66	0.89	1.05	1.09	0.58	0.00	0.29	0.39	0.46	0.07
Avail Cap(c_a), veh/h	126	1488	783	369	1771	935	685	0	333	353	371	284
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	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	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	82.4	41.9	42.0	74.5	45.0	45.1	69.8	0.0	66.5	69.0	69.8	65.8
Incr Delay (d2), s/veh	49.2	2.3	4.3	15.2	35.3	56.5	0.4	0.0	0.2	0.3	0.4	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	6.9	17.7	19.1	12.1	46.6	54.8	7.2	0.0	3.3	4.5	5.7	0.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	131.6	44.2	46.3	89.7	80.3	101.6	70.2	0.0	66.7	69.4	70.2	65.8
LnGrp LOS	F	D	D	F	F	F	E	A	E	E	E	E
Approach Vol, veh/h		1608			3119			414			255	
Approach Delay, s/veh		51.0			88.0			69.5			69.6	
Approach LOS		D			F			E			E	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	15.0	91.0		30.6	29.1	76.9		28.7				
Change Period (Y+Rc), s	4.0	5.0		5.0	4.0	5.0		5.0				
Max Green Setting (Gmax), s	11.0	86.0		31.0	34.0	63.0		31.0				
Max Q Clear Time (g_c+I1), s	12.6	90.0		16.9	24.7	41.2		12.8				
Green Ext Time (p_c), s	0.0	0.0		1.0	0.3	20.5		0.5				
Intersection Summary												
HCM 6th Ctrl Delay			74.7									
HCM 6th LOS			E									

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	26	2691	99	80	1941	25	276	2	288	14	1	28
Future Volume (veh/h)	26	2691	99	80	1941	25	276	2	288	14	1	28
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.98	1.00		0.99	1.00		0.97
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	1969	1969	1969	1969	1969	1969	2000	2000	2000	2000	2000	2000
Adj Flow Rate, veh/h	27	2774	62	90	2181	27	351	0	37	19	1	2
Peak Hour Factor	0.97	0.97	0.97	0.89	0.89	0.89	0.79	0.79	0.79	0.73	0.73	0.73
Percent Heavy Veh, %	2	2	2	2	2	2	0	0	0	0	0	0
Cap, veh/h	110	3781	1052	342	3696	46	391	0	172	99	5	10
Arrive On Green	0.06	0.64	0.63	0.09	0.68	0.67	0.10	0.00	0.10	0.06	0.06	0.05
Sat Flow, veh/h	1875	5906	1665	3638	5470	68	3810	0	1675	1625	86	171
Grp Volume(v), veh/h	27	2774	62	90	1428	780	351	0	37	22	0	0
Grp Sat Flow(s),veh/h/ln	1875	1969	1665	1819	1792	1955	1905	0	1675	1882	0	0
Q Serve(g_s), s	1.6	37.3	1.7	2.7	25.1	25.2	10.7	0.0	2.4	1.3	0.0	0.0
Cycle Q Clear(g_c), s	1.6	37.3	1.7	2.7	25.1	25.2	10.7	0.0	2.4	1.3	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.03	1.00		1.00	0.86		0.09
Lane Grp Cap(c), veh/h	110	3781	1052	342	2421	1321	391	0	172	114	0	0
V/C Ratio(X)	0.25	0.73	0.06	0.26	0.59	0.59	0.90	0.00	0.22	0.19	0.00	0.00
Avail Cap(c_a), veh/h	176	3781	1052	933	2421	1321	391	0	172	193	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.68	0.68	0.68	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	52.6	14.3	8.2	49.2	10.2	10.3	51.9	0.0	48.2	52.3	0.0	0.0
Incr Delay (d2), s/veh	0.3	0.9	0.1	0.2	1.1	1.9	22.3	0.0	0.2	0.3	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	0.8	14.9	0.6	1.2	8.9	10.1	6.3	0.0	1.0	0.6	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	52.9	15.2	8.3	49.4	11.3	12.2	74.2	0.0	48.4	52.6	0.0	0.0
LnGrp LOS	D	B	A	D	B	B	E	A	D	D	A	A
Approach Vol, veh/h		2863			2298			388			22	
Approach Delay, s/veh		15.4			13.1			71.7			52.6	
Approach LOS		B			B			E			D	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	9.8	82.1		15.0	14.0	77.9		10.1
Change Period (Y+Rc), s	4.0	5.0		5.0	4.0	5.0		5.0
Max Green Setting (Gmax), s	10.0	68.0		10.0	29.0	49.0		10.0
Max Q Clear Time (g_c+I1), s	3.6	27.2		12.7	4.7	39.3		3.3
Green Ext Time (p_c), s	0.0	40.3		0.0	0.1	9.7		0.0

Intersection Summary	
HCM 6th Ctrl Delay	18.5
HCM 6th LOS	B

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	116	2696	261	184	1700	203	215	55	62	197	60	123
Future Volume (veh/h)	116	2696	261	184	1700	203	215	55	62	197	60	123
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.97	1.00		0.92	1.00		0.92
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	1969	1969	1969	1969	1969	1969	2000	2000	2000	2000	2000	2000
Adj Flow Rate, veh/h	130	3029	286	196	1809	209	256	65	50	176	214	69
Peak Hour Factor	0.89	0.89	0.89	0.94	0.94	0.94	0.84	0.84	0.84	0.73	0.73	0.73
Percent Heavy Veh, %	2	2	2	2	2	2	0	0	0	0	0	0
Cap, veh/h	160	3020	276	126	2674	307	519	142	109	301	316	247
Arrive On Green	0.09	0.57	0.56	0.07	0.55	0.54	0.14	0.14	0.14	0.16	0.16	0.16
Sat Flow, veh/h	1875	5330	486	1875	4874	560	3695	1008	776	1905	2000	1562
Grp Volume(v), veh/h	130	2210	1105	196	1327	691	256	0	115	176	214	69
Grp Sat Flow(s),veh/h/ln	1875	1969	1879	1875	1792	1851	1848	0	1784	1905	2000	1562
Q Serve(g_s), s	12.1	98.7	100.9	12.0	47.2	48.0	11.4	0.0	10.5	15.3	18.0	6.9
Cycle Q Clear(g_c), s	12.1	98.7	100.9	12.0	47.2	48.0	11.4	0.0	10.5	15.3	18.0	6.9
Prop In Lane	1.00		0.26	1.00		0.30	1.00		0.43	1.00		1.00
Lane Grp Cap(c), veh/h	160	2231	1065	126	1965	1015	519	0	250	301	316	247
V/C Ratio(X)	0.81	0.99	1.04	1.55	0.68	0.68	0.49	0.00	0.46	0.58	0.68	0.28
Avail Cap(c_a), veh/h	200	2231	1065	126	1965	1015	727	0	351	375	393	307
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	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	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	80.0	38.1	38.7	83.0	28.8	29.1	70.7	0.0	70.3	69.5	70.6	66.0
Incr Delay (d2), s/veh	17.9	16.9	37.9	282.9	1.9	3.7	0.3	0.0	0.5	0.7	1.9	0.2
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	6.6	50.8	55.7	15.7	20.5	22.1	5.5	0.0	4.9	7.6	9.5	2.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	97.8	55.0	76.6	365.9	30.7	32.8	70.9	0.0	70.8	70.2	72.5	66.2
LnGrp LOS	F	D	F	F	C	C	E	A	E	E	E	E
Approach Vol, veh/h		3445			2214			371			459	
Approach Delay, s/veh		63.5			61.0			70.9			70.7	
Approach LOS		E			E			E			E	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	18.2	100.6		28.0	15.0	103.9		31.1				
Change Period (Y+Rc), s	4.0	5.0		5.0	4.0	5.0		5.0				
Max Green Setting (Gmax), s	18.0	75.0		33.0	11.0	82.0		33.0				
Max Q Clear Time (g_c+I1), s	14.1	50.0		13.4	14.0	102.9		20.0				
Green Ext Time (p_c), s	0.1	24.7		1.0	0.0	0.0		0.9				
Intersection Summary												
HCM 6th Ctrl Delay			63.6									
HCM 6th LOS			E									

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	1340	230	250	2610	40	110	10	90	40	10	40
Future Volume (veh/h)	10	1340	230	250	2610	40	110	10	90	40	10	40
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.97	1.00		0.97	1.00		0.95
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	1969	1969	1969	1969	1969	1969	2000	2000	2000	2000	2000	2000
Adj Flow Rate, veh/h	10	1381	142	258	2691	40	120	0	9	41	10	18
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	2	2	2	2	2	2	0	0	0	0	0	0
Cap, veh/h	59	3386	1035	343	3780	56	357	0	154	95	23	42
Arrive On Green	0.03	0.63	0.62	0.09	0.69	0.69	0.09	0.00	0.09	0.09	0.09	0.08
Sat Flow, veh/h	1875	5375	1664	3638	5454	81	3810	0	1646	1088	265	478
Grp Volume(v), veh/h	10	1381	142	258	1764	967	120	0	9	69	0	0
Grp Sat Flow(s),veh/h/ln	1875	1792	1664	1819	1792	1952	1905	0	1646	1831	0	0
Q Serve(g_s), s	0.7	16.3	4.5	8.8	37.8	38.3	3.7	0.0	0.6	4.5	0.0	0.0
Cycle Q Clear(g_c), s	0.7	16.3	4.5	8.8	37.8	38.3	3.7	0.0	0.6	4.5	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.04	1.00		1.00	0.59		0.26
Lane Grp Cap(c), veh/h	59	3386	1035	343	2483	1353	357	0	154	160	0	0
V/C Ratio(X)	0.17	0.41	0.14	0.75	0.71	0.72	0.34	0.00	0.06	0.43	0.00	0.00
Avail Cap(c_a), veh/h	192	3386	1035	573	2483	1353	360	0	156	173	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.93	0.93	0.93	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	59.9	11.7	9.9	56.1	11.8	11.9	53.9	0.0	52.4	55.1	0.0	0.0
Incr Delay (d2), s/veh	0.5	0.3	0.3	1.3	1.8	3.3	0.2	0.0	0.1	0.7	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	0.3	6.1	1.6	4.0	13.6	15.6	1.8	0.0	0.3	2.2	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	60.4	12.0	10.2	57.3	13.5	15.1	54.1	0.0	52.5	55.7	0.0	0.0
LnGrp LOS	E	B	B	E	B	B	D	A	D	E	A	A
Approach Vol, veh/h		1533			2989			129			69	
Approach Delay, s/veh		12.2			17.8			54.0			55.7	
Approach LOS		B			B			D			E	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	7.0	91.0		14.9	15.0	83.0		14.1				
Change Period (Y+Rc), s	4.0	5.0		5.0	4.0	5.0		5.0				
Max Green Setting (Gmax), s	12.0	76.0		10.0	19.0	69.0		10.0				
Max Q Clear Time (g_c+I1), s	2.7	40.3		5.7	10.8	18.3		6.5				
Green Ext Time (p_c), s	0.0	35.6		0.1	0.2	44.5		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			17.5									
HCM 6th LOS			B									

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	120	1300	130	230	2440	190	320	50	50	140	40	140
Future Volume (veh/h)	120	1300	130	230	2440	190	320	50	50	140	40	140
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.97	1.00		0.92	1.00		0.90
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	1969	1969	1969	1969	1969	1969	2000	2000	2000	2000	2000	2000
Adj Flow Rate, veh/h	122	1526	129	235	2490	190	327	51	31	92	112	22
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	2	2	2	0	0	0	0	0	0
Cap, veh/h	151	2456	208	129	2418	181	551	167	102	258	271	206
Arrive On Green	0.08	0.49	0.48	0.07	0.47	0.47	0.15	0.15	0.15	0.14	0.14	0.14
Sat Flow, veh/h	1875	5046	426	1875	5091	381	3695	1121	681	1905	2000	1522
Grp Volume(v), veh/h	122	1083	572	235	1737	943	327	0	82	92	112	22
Grp Sat Flow(s),veh/h/ln	1875	1792	1889	1875	1792	1888	1848	0	1803	1905	2000	1522
Q Serve(g_s), s	12.1	42.0	42.1	13.0	89.8	89.8	15.6	0.0	7.7	8.3	9.7	2.4
Cycle Q Clear(g_c), s	12.1	42.0	42.1	13.0	89.8	89.8	15.6	0.0	7.7	8.3	9.7	2.4
Prop In Lane	1.00		0.23	1.00		0.20	1.00		0.38	1.00		1.00
Lane Grp Cap(c), veh/h	151	1744	920	129	1702	897	551	0	269	258	271	206
V/C Ratio(X)	0.81	0.62	0.62	1.82	1.02	1.05	0.59	0.00	0.31	0.36	0.41	0.11
Avail Cap(c_a), veh/h	198	1744	920	129	1702	897	704	0	343	363	381	290
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	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	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	85.4	35.7	35.8	88.0	49.6	49.7	75.1	0.0	71.7	74.2	74.8	71.6
Incr Delay (d2), s/veh	16.6	1.7	3.2	398.7	27.2	44.4	0.4	0.0	0.2	0.3	0.4	0.1
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	6.6	18.7	20.2	20.6	45.7	52.5	7.6	0.0	3.6	4.2	5.1	1.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	102.0	37.4	38.9	486.7	76.9	94.1	75.5	0.0	71.9	74.5	75.2	71.7
LnGrp LOS	F	D	D	F	F	F	E	A	E	E	E	E
Approach Vol, veh/h		1777			2915			409			226	
Approach Delay, s/veh		42.3			115.5			74.7			74.6	
Approach LOS		D			F			E			E	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	18.2	92.8		31.2	16.0	95.0		28.6				
Change Period (Y+Rc), s	4.0	5.0		5.0	4.0	5.0		5.0				
Max Green Setting (Gmax), s	19.0	83.0		34.0	12.0	90.0		34.0				
Max Q Clear Time (g_c+I1), s	14.1	91.8		17.6	15.0	44.1		11.7				
Green Ext Time (p_c), s	0.1	0.0		1.1	0.0	42.9		0.5				

Intersection Summary	
HCM 6th Ctrl Delay	86.2
HCM 6th LOS	F

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	30	2850	160	80	2000	60	300	10	290	30	10	30
Future Volume (veh/h)	30	2850	160	80	2000	60	300	10	290	30	10	30
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.98	1.00		0.99	1.00		0.97
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	1969	1969	1969	1969	1969	1969	2000	2000	2000	2000	2000	2000
Adj Flow Rate, veh/h	31	2938	110	82	2062	60	316	0	31	31	10	7
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	2	2	2	2	2	2	0	0	0	0	0	0
Cap, veh/h	118	3640	1012	342	3473	101	391	0	172	103	33	23
Arrive On Green	0.06	0.62	0.61	0.09	0.65	0.64	0.10	0.00	0.10	0.08	0.08	0.08
Sat Flow, veh/h	1875	5906	1665	3638	5364	156	3810	0	1675	1214	392	274
Grp Volume(v), veh/h	31	2938	110	82	1376	746	316	0	31	48	0	0
Grp Sat Flow(s),veh/h/ln	1875	1969	1665	1819	1792	1936	1905	0	1675	1880	0	0
Q Serve(g_s), s	1.8	44.4	3.2	2.4	25.7	25.9	9.5	0.0	2.0	2.8	0.0	0.0
Cycle Q Clear(g_c), s	1.8	44.4	3.2	2.4	25.7	25.9	9.5	0.0	2.0	2.8	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.08	1.00		1.00	0.65		0.15
Lane Grp Cap(c), veh/h	118	3640	1012	342	2320	1254	391	0	172	159	0	0
V/C Ratio(X)	0.26	0.81	0.11	0.24	0.59	0.60	0.81	0.00	0.18	0.30	0.00	0.00
Avail Cap(c_a), veh/h	176	3640	1012	933	2320	1254	391	0	172	193	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.61	0.61	0.61	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	52.2	17.1	9.6	49.1	11.8	11.9	51.4	0.0	48.0	50.4	0.0	0.0
Incr Delay (d2), s/veh	0.3	1.2	0.1	0.1	1.1	2.1	11.2	0.0	0.2	0.4	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	0.9	18.2	1.1	1.1	9.4	10.6	5.2	0.0	0.8	1.4	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	52.5	18.4	9.8	49.3	12.9	13.9	62.6	0.0	48.2	50.8	0.0	0.0
LnGrp LOS	D	B	A	D	B	B	E	A	D	D	A	A
Approach Vol, veh/h		3079			2204			347			48	
Approach Delay, s/veh		18.4			14.6			61.3			50.8	
Approach LOS		B			B			E			D	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	10.3	78.8		15.0	14.0	75.1		12.9				
Change Period (Y+Rc), s	4.0	5.0		5.0	4.0	5.0		5.0				
Max Green Setting (Gmax), s	10.0	68.0		10.0	29.0	49.0		10.0				
Max Q Clear Time (g_c+I1), s	3.8	27.9		11.5	4.4	46.4		4.8				
Green Ext Time (p_c), s	0.0	39.6		0.0	0.1	2.6		0.0				

Intersection Summary			
HCM 6th Ctrl Delay			19.8
HCM 6th LOS			B

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	120	2700	360	210	2000	210	220	60	70	190	90	130
Future Volume (veh/h)	120	2700	360	210	2000	210	220	60	70	190	90	130
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.97	1.00		0.93	1.00		0.92
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	1969	1969	1969	1969	1969	1969	2000	2000	2000	2000	2000	2000
Adj Flow Rate, veh/h	128	2872	383	223	2128	223	234	64	74	149	170	138
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	2	2	2	2	2	2	0	0	0	0	0	0
Cap, veh/h	158	2929	372	126	2731	282	536	117	135	285	299	233
Arrive On Green	0.08	0.57	0.56	0.07	0.55	0.55	0.14	0.14	0.14	0.15	0.15	0.15
Sat Flow, veh/h	1875	5133	652	1875	4935	509	3695	808	934	1905	2000	1555
Grp Volume(v), veh/h	128	2170	1085	223	1536	815	234	0	138	149	170	138
Grp Sat Flow(s),veh/h/ln	1875	1969	1848	1875	1792	1861	1848	0	1742	1905	2000	1555
Q Serve(g_s), s	11.9	93.8	101.6	12.0	59.7	62.0	10.3	0.0	13.1	12.8	14.1	14.7
Cycle Q Clear(g_c), s	11.9	93.8	101.6	12.0	59.7	62.0	10.3	0.0	13.1	12.8	14.1	14.7
Prop In Lane	1.00		0.35	1.00		0.27	1.00		0.54	1.00		1.00
Lane Grp Cap(c), veh/h	158	2247	1054	126	1983	1030	536	0	253	285	299	233
V/C Ratio(X)	0.81	0.97	1.03	1.76	0.77	0.79	0.44	0.00	0.55	0.52	0.57	0.59
Avail Cap(c_a), veh/h	200	2247	1054	126	1983	1030	727	0	343	375	393	306
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	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	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	80.1	36.6	38.4	83.0	31.1	31.7	69.5	0.0	70.7	69.8	70.3	70.6
Incr Delay (d2), s/veh	17.3	12.4	35.4	374.1	3.0	6.2	0.2	0.0	0.7	0.6	0.6	0.9
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	6.5	47.1	54.4	18.9	26.0	29.0	5.0	0.0	6.0	6.4	7.4	6.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	97.4	48.9	73.8	457.1	34.1	37.9	69.7	0.0	71.3	70.4	71.0	71.5
LnGrp LOS	F	D	F	F	C	D	E	A	E	E	E	E
Approach Vol, veh/h		3383			2574			372			457	
Approach Delay, s/veh		58.8			71.9			70.3			70.9	
Approach LOS		E			E			E			E	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	18.0	101.5		28.8	15.0	104.6		29.6				
Change Period (Y+Rc), s	4.0	5.0		5.0	4.0	5.0		5.0				
Max Green Setting (Gmax), s	18.0	75.0		33.0	11.0	82.0		33.0				
Max Q Clear Time (g_c+I1), s	13.9	64.0		15.1	14.0	103.6		16.7				
Green Ext Time (p_c), s	0.1	11.0		1.0	0.0	0.0		1.0				
Intersection Summary												
HCM 6th Ctrl Delay			65.2									
HCM 6th LOS			E									
Notes												

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	15	1340	230	250	2610	42	110	10	90	41	10	42
Future Volume (veh/h)	15	1340	230	250	2610	42	110	10	90	41	10	42
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.97	1.00		0.97	1.00		0.95
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	1969	1969	1969	1969	1969	1969	2000	2000	2000	2000	2000	2000
Adj Flow Rate, veh/h	15	1381	142	258	2691	42	120	0	9	42	10	19
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	2	2	2	2	2	2	0	0	0	0	0	0
Cap, veh/h	75	3383	1034	343	3725	58	357	0	154	95	23	43
Arrive On Green	0.04	0.63	0.62	0.09	0.68	0.68	0.09	0.00	0.09	0.09	0.09	0.08
Sat Flow, veh/h	1875	5375	1664	3638	5450	85	3810	0	1646	1082	258	489
Grp Volume(v), veh/h	15	1381	142	258	1765	968	120	0	9	71	0	0
Grp Sat Flow(s),veh/h/ln	1875	1792	1664	1819	1792	1951	1905	0	1646	1829	0	0
Q Serve(g_s), s	1.0	16.3	4.5	8.8	39.0	39.6	3.7	0.0	0.6	4.7	0.0	0.0
Cycle Q Clear(g_c), s	1.0	16.3	4.5	8.8	39.0	39.6	3.7	0.0	0.6	4.7	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.04	1.00		1.00	0.59		0.27
Lane Grp Cap(c), veh/h	75	3383	1034	343	2449	1334	357	0	154	161	0	0
V/C Ratio(X)	0.20	0.41	0.14	0.75	0.72	0.73	0.34	0.00	0.06	0.44	0.00	0.00
Avail Cap(c_a), veh/h	192	3383	1034	573	2449	1334	360	0	156	173	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.93	0.93	0.93	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	59.0	11.7	9.9	56.1	12.5	12.6	53.9	0.0	52.4	55.1	0.0	0.0
Incr Delay (d2), s/veh	0.4	0.3	0.3	1.3	1.9	3.5	0.2	0.0	0.1	0.7	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	0.5	6.1	1.6	4.0	14.2	16.3	1.8	0.0	0.3	2.2	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	59.4	12.1	10.2	57.3	14.4	16.1	54.1	0.0	52.5	55.8	0.0	0.0
LnGrp LOS	E	B	B	E	B	B	D	A	D	E	A	A
Approach Vol, veh/h		1538			2991			129			71	
Approach Delay, s/veh		12.4			18.7			54.0			55.8	
Approach LOS		B			B			D			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	8.1	89.8		14.9	15.0	82.9		14.2
Change Period (Y+Rc), s	4.0	5.0		5.0	4.0	5.0		5.0
Max Green Setting (Gmax), s	12.0	76.0		10.0	19.0	69.0		10.0
Max Q Clear Time (g_c+I1), s	3.0	41.6		5.7	10.8	18.3		6.7
Green Ext Time (p_c), s	0.0	34.4		0.1	0.2	44.5		0.0

Intersection Summary			
HCM 6th Ctrl Delay			18.1
HCM 6th LOS			B

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	120	1301	130	230	2453	190	320	50	50	146	40	140
Future Volume (veh/h)	120	1301	130	230	2453	190	320	50	50	146	40	140
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.97	1.00		0.92	1.00		0.90
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	1969	1969	1969	1969	1969	1969	2000	2000	2000	2000	2000	2000
Adj Flow Rate, veh/h	122	1527	129	235	2503	190	327	51	31	95	117	22
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	2	2	2	0	0	0	0	0	0
Cap, veh/h	151	2457	207	129	2419	180	551	167	102	260	273	208
Arrive On Green	0.08	0.49	0.48	0.07	0.47	0.47	0.15	0.15	0.15	0.14	0.14	0.14
Sat Flow, veh/h	1875	5047	426	1875	5093	379	3695	1121	681	1905	2000	1523
Grp Volume(v), veh/h	122	1084	572	235	1745	948	327	0	82	95	117	22
Grp Sat Flow(s),veh/h/ln	1875	1792	1889	1875	1792	1888	1848	0	1803	1905	2000	1523
Q Serve(g_s), s	12.1	42.1	42.2	13.0	89.8	89.8	15.6	0.0	7.7	8.6	10.1	2.4
Cycle Q Clear(g_c), s	12.1	42.1	42.2	13.0	89.8	89.8	15.6	0.0	7.7	8.6	10.1	2.4
Prop In Lane	1.00		0.23	1.00		0.20	1.00		0.38	1.00		1.00
Lane Grp Cap(c), veh/h	151	1744	920	129	1702	897	551	0	269	260	273	208
V/C Ratio(X)	0.81	0.62	0.62	1.82	1.03	1.06	0.59	0.00	0.31	0.37	0.43	0.11
Avail Cap(c_a), veh/h	198	1744	920	129	1702	897	704	0	343	363	381	290
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	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	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	85.4	35.7	35.8	88.0	49.6	49.7	75.1	0.0	71.7	74.2	74.8	71.5
Incr Delay (d2), s/veh	16.6	1.7	3.2	398.7	28.6	46.1	0.4	0.0	0.2	0.3	0.4	0.1
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	6.6	18.7	20.2	20.6	46.0	52.9	7.6	0.0	3.6	4.3	5.3	1.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	102.0	37.4	39.0	486.7	78.2	95.8	75.5	0.0	71.9	74.5	75.2	71.6
LnGrp LOS	F	D	D	F	F	F	E	A	E	E	E	E
Approach Vol, veh/h		1778			2928			409			234	
Approach Delay, s/veh		42.3			116.7			74.7			74.6	
Approach LOS		D			F			E			E	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	18.2	92.8		31.2	16.0	95.0		28.8				
Change Period (Y+Rc), s	4.0	5.0		5.0	4.0	5.0		5.0				
Max Green Setting (Gmax), s	19.0	83.0		34.0	12.0	90.0		34.0				
Max Q Clear Time (g_c+I1), s	14.1	91.8		17.6	15.0	44.2		12.1				
Green Ext Time (p_c), s	0.1	0.0		1.1	0.0	42.8		0.5				
Intersection Summary												
HCM 6th Ctrl Delay			86.9									
HCM 6th LOS			F									

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	33	2850	160	80	2000	61	300	10	290	32	10	35
Future Volume (veh/h)	33	2850	160	80	2000	61	300	10	290	32	10	35
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.98	1.00		0.99	1.00		0.97
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	1969	1969	1969	1969	1969	1969	2000	2000	2000	2000	2000	2000
Adj Flow Rate, veh/h	34	2938	110	82	2062	61	316	0	31	33	10	9
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	2	2	2	2	2	2	0	0	0	0	0	0
Cap, veh/h	123	3627	1008	342	3444	102	391	0	172	103	31	28
Arrive On Green	0.07	0.61	0.61	0.09	0.64	0.63	0.10	0.00	0.10	0.09	0.09	0.08
Sat Flow, veh/h	1875	5906	1665	3638	5361	158	3810	0	1675	1187	360	324
Grp Volume(v), veh/h	34	2938	110	82	1377	746	316	0	31	52	0	0
Grp Sat Flow(s),veh/h/ln	1875	1969	1665	1819	1792	1936	1905	0	1675	1871	0	0
Q Serve(g_s), s	2.0	44.7	3.3	2.4	26.1	26.3	9.5	0.0	2.0	3.1	0.0	0.0
Cycle Q Clear(g_c), s	2.0	44.7	3.3	2.4	26.1	26.3	9.5	0.0	2.0	3.1	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.08	1.00		1.00	0.63		0.17
Lane Grp Cap(c), veh/h	123	3627	1008	342	2302	1243	391	0	172	162	0	0
V/C Ratio(X)	0.28	0.81	0.11	0.24	0.60	0.60	0.81	0.00	0.18	0.32	0.00	0.00
Avail Cap(c_a), veh/h	176	3627	1008	933	2302	1243	391	0	172	192	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.58	0.58	0.58	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	52.0	17.3	9.7	49.1	12.2	12.2	51.4	0.0	48.0	50.3	0.0	0.0
Incr Delay (d2), s/veh	0.3	1.2	0.1	0.1	1.2	2.1	11.2	0.0	0.2	0.4	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	0.9	18.4	1.2	1.1	9.6	10.9	5.2	0.0	0.8	1.5	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	52.3	18.5	9.9	49.3	13.3	14.4	62.6	0.0	48.2	50.7	0.0	0.0
LnGrp LOS	D	B	A	D	B	B	E	A	D	D	A	A
Approach Vol, veh/h		3082			2205			347			52	
Approach Delay, s/veh		18.6			15.0			61.3			50.7	
Approach LOS		B			B			E			D	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	10.7	78.2		15.0	14.0	74.8		13.2				
Change Period (Y+Rc), s	4.0	5.0		5.0	4.0	5.0		5.0				
Max Green Setting (Gmax), s	10.0	68.0		10.0	29.0	49.0		10.0				
Max Q Clear Time (g_c+I1), s	4.0	28.3		11.5	4.4	46.7		5.1				
Green Ext Time (p_c), s	0.0	39.2		0.0	0.1	2.3		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			20.1									
HCM 6th LOS			C									

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	120	2702	360	210	2009	210	220	60	70	201	90	130
Future Volume (veh/h)	120	2702	360	210	2009	210	220	60	70	201	90	130
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.97	1.00		0.93	1.00		0.92
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	1969	1969	1969	1969	1969	1969	2000	2000	2000	2000	2000	2000
Adj Flow Rate, veh/h	128	2874	383	223	2137	223	234	64	74	155	179	138
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	2	2	2	2	2	2	0	0	0	0	0	0
Cap, veh/h	158	2927	372	126	2730	281	536	117	135	286	300	234
Arrive On Green	0.08	0.57	0.56	0.07	0.55	0.55	0.14	0.14	0.14	0.15	0.15	0.15
Sat Flow, veh/h	1875	5134	652	1875	4937	507	3695	808	934	1905	2000	1556
Grp Volume(v), veh/h	128	2171	1086	223	1542	818	234	0	138	155	179	138
Grp Sat Flow(s),veh/h/ln	1875	1969	1848	1875	1792	1862	1848	0	1742	1905	2000	1556
Q Serve(g_s), s	11.9	94.1	101.5	12.0	60.1	62.5	10.3	0.0	13.1	13.4	14.9	14.7
Cycle Q Clear(g_c), s	11.9	94.1	101.5	12.0	60.1	62.5	10.3	0.0	13.1	13.4	14.9	14.7
Prop In Lane	1.00		0.35	1.00		0.27	1.00		0.54	1.00		1.00
Lane Grp Cap(c), veh/h	158	2245	1054	126	1982	1029	536	0	253	286	300	234
V/C Ratio(X)	0.81	0.97	1.03	1.76	0.78	0.79	0.44	0.00	0.55	0.54	0.60	0.59
Avail Cap(c_a), veh/h	200	2245	1054	126	1982	1029	727	0	343	375	393	306
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	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	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	80.1	36.7	38.4	83.0	31.2	31.8	69.5	0.0	70.7	70.0	70.6	70.5
Incr Delay (d2), s/veh	17.3	12.6	35.8	374.1	3.1	6.3	0.2	0.0	0.7	0.6	0.7	0.9
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	6.5	47.4	54.5	18.9	26.2	29.3	5.0	0.0	6.0	6.7	7.8	6.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	97.4	49.3	74.3	457.1	34.3	38.2	69.7	0.0	71.3	70.6	71.3	71.4
LnGrp LOS	F	D	F	F	C	D	E	A	E	E	E	E
Approach Vol, veh/h		3385			2583			372			472	
Approach Delay, s/veh		59.1			72.0			70.3			71.1	
Approach LOS		E			E			E			E	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	18.0	101.4		28.8	15.0	104.5		29.7				
Change Period (Y+Rc), s	4.0	5.0		5.0	4.0	5.0		5.0				
Max Green Setting (Gmax), s	18.0	75.0		33.0	11.0	82.0		33.0				
Max Q Clear Time (g_c+I1), s	13.9	64.5		15.1	14.0	103.5		16.9				
Green Ext Time (p_c), s	0.1	10.5		1.0	0.0	0.0		1.1				
Intersection Summary												
HCM 6th Ctrl Delay			65.5									
HCM 6th LOS			E									
Notes												

User approved volume balancing among the lanes for turning movement.

HEXAGON TRANSPORTATION CONSULTANTS, INC.

July 30, 2021

Mr. Connor Tutino
David J. Powers & Associates, Inc.
1736 Franklin Street, Suite 300
Oakland, CA 94612

Re: Peer Review of Transportation Assessment Study for Proposed Spieker Retirement Facility in Contra Costa County

Dear Mr. Tutino:

Hexagon Transportation Consultants, Inc. has completed the peer review of the revised draft transportation assessment report dated July 21, 2021, prepared for the proposed Spieker Continuing Care Retirement facility in Contra Costa County. All comments in our letter dated June 28, 2021 on the draft transportation assessment report prepared by Fehr & Peers (dated December 17, 2020) have been addressed adequately. Hexagon has no further questions on the transportation assessment study.

This concludes Hexagon's peer review of the Spieker Continuing Care Retirement Facility traffic study. Please let us know if you have any questions about our review.

Sincerely,
HEXAGON TRANSPORTATION CONSULTANTS, INC.

Trisha Dudala

Trisha Dudala

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