

Transportation Impact Analysis

The Residence at 558 Main

Watsonville, CA

April 2020

Transportation Impact Analysis

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Watsonville, CA

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Section 1

Executive Summary

EXECUTIVE SUMMARY

Pacific Coast Development is proposing to develop The Residence at 558 Main, a four-story, mixed use building at 558 Main Street in downtown Watsonville, CA (project). The project includes ground floor retail of approximately 2,220 square feet and three upper levels of 50 total residential dwelling units. Access to the project is provided on Main Street and via an alley driveway to Brennan Street at the rear of the site. The project site previously was occupied by a bank with drive-through service.

The results of this study indicate that the proposed Residence at 558 Main development can be constructed while maintaining acceptable traffic operations at the study intersections and improving safety at the site access on Brennan Street, assuming provision of the recommended improvement measures at the alley driveway.

FINDINGS

Year 2020 Existing Conditions

- All of the study intersections operate at acceptable levels of service during the weekday a.m. and p.m. peak hours.
- A review of historical crash data revealed two (2) pedestrian fatalities within a three-year period. The City's Downtown Complete Streets Plan includes improvements that will enhance the circulation network and improve safety for people walking in downtown. Therefore, the crash patterns or trends in the site vicinity do not require mitigation associated with this project.

Proposed Project

The proposed development is estimated to generate 20 net new trips (6 inbound, 14 outbound) are projected to occur during the weekday a.m. peak hour and 39 net new trips (24 inbound, 15 outbound) are projected to occur during the weekday p.m. peak hour. These levels of trip generation are lower than the previous use on the site: a bank with drive through tellers (48 a.m. peak hour trips and 102 p.m. peak hour trips), which was operational through April 2019. Therefore, the proposed project is expected to generate 28 fewer trips during the a.m. peak hour and 63 fewer trips during the p.m. peak hour than the previous use generated.

Existing Plus Project Conditions

All of the study intersections, except for the intersection of E 5th Street and Brennan Street, are forecast to operate with acceptable levels of service during the weekday a.m. and p.m. peak hours.

- The project adds seven (7) trips during the p.m. peak hour to the eastbound approach at the E 5th Street/Brennan Street intersection, which is less than 3% of existing traffic volumes for this approach when the site is vacant and is within the typical daily fluctuation of traffic.
- The eastbound left-turn movement operations at the E 5th Street/Brennan Street intersection are projected to change from level of service E to F during the weekday p.m. peak hour with the addition of project traffic.
- The 95th percentile queue at the E 5th Street/Brennan Street intersection eastbound approach during the p.m. peak hour is projected to be seven (7) vehicles or approximately 175 feet, which would be accommodated within the length of the road segment.

Site Access and Circulation Evaluation

- The existing alley driveway at the rear of the site providing access to Brennan Street has sightline constraints due to the existing building on the north side of the driveway.
- Drivers entering and existing the site at Brennan Street will continue to experience the existing sightline constraints after the project is constructed.

RECOMMENDATIONS

The following activities are recommended to ensure adequate safety and operation at the internal intersections and roadways:

- Install lane striping within the alley and signs at the driveway to increase drivers' awareness of appropriate vehicle position within the cross section of the driveway and alley.
- Install a convex mirror on the south side of the driveway providing visibility around the corner of the existing building for drivers exiting the site and drivers entering from southbound Brennan Street.

Additional details of the study methodology, findings, and recommendations are provided within this report.

Section 2

Introduction

INTRODUCTION

PROJECT DESCRIPTION

The proposed project is a four-story, multi-use building at 558 Main Street Watsonville, CA. Figure 1 presents the location of the proposed project. The ground floor would be a sit-down restaurant of approximately 2,220 square feet. The three upper levels would have 50 residential dwelling units located, composed of 15 studios, 29 one-bedroom units, and 6 two-bedroom units. The covered ground floor parking provides 3 accessible stalls, 35 standard parking stalls, 8 long-term bike stalls. The gated rear parking lot is uncovered and includes 17 standard parking stalls and 8 long-term bike stalls. There is a shared alley and driveway providing access from the parking lot to Brennan Street. The project site is bounded by Main Street to the west, Brennan Street to the east, and existing commercial buildings to the north and south.

The site previously had a 5,000-square foot bank with drive-through service, which was accessed from curb cuts on Main Street and an alley connection from the rear parking lot to Brannan Street. The bank was demolished in April of 2019.

Figure 2 presents the preliminary site plan for the project. As shown, people walking and walking to/from transit stops have direct access to the building's main entrance from the sidewalk on Main Street and are expected to access the site primarily from Main Street. The nearest transit stop is located near the intersection of Main Street and W 5th Street. People driving and biking access the parking lot and bike storage through the alley connected with Brennan Street. People walking to and from Brennan Street share the alley with bicycles and vehicles. A sidewalk is not provided between the parking lot and Brennan Street, which was the case on this site with the prior use as well.

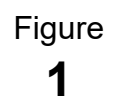
SCOPE OF THE REPORT

Kittelson & Associates, Inc. (Kittelson) prepared this memorandum for Pacific Coast Development (project Sponsor) to summarize the transportation analysis of the proposed residence and commercial building at 558 Main Street Watsonville, CA. The location was previously a 5,000-square foot bank with drive-through service, which was accessed from curb cuts on Main Street and a minor driveway connecting the rear parking lot with Brennan Street. The bank was demolished in April of 2019. The proposed development is a four-story mixed-use building with ground floor retail and 50 residential units on the upper floors.

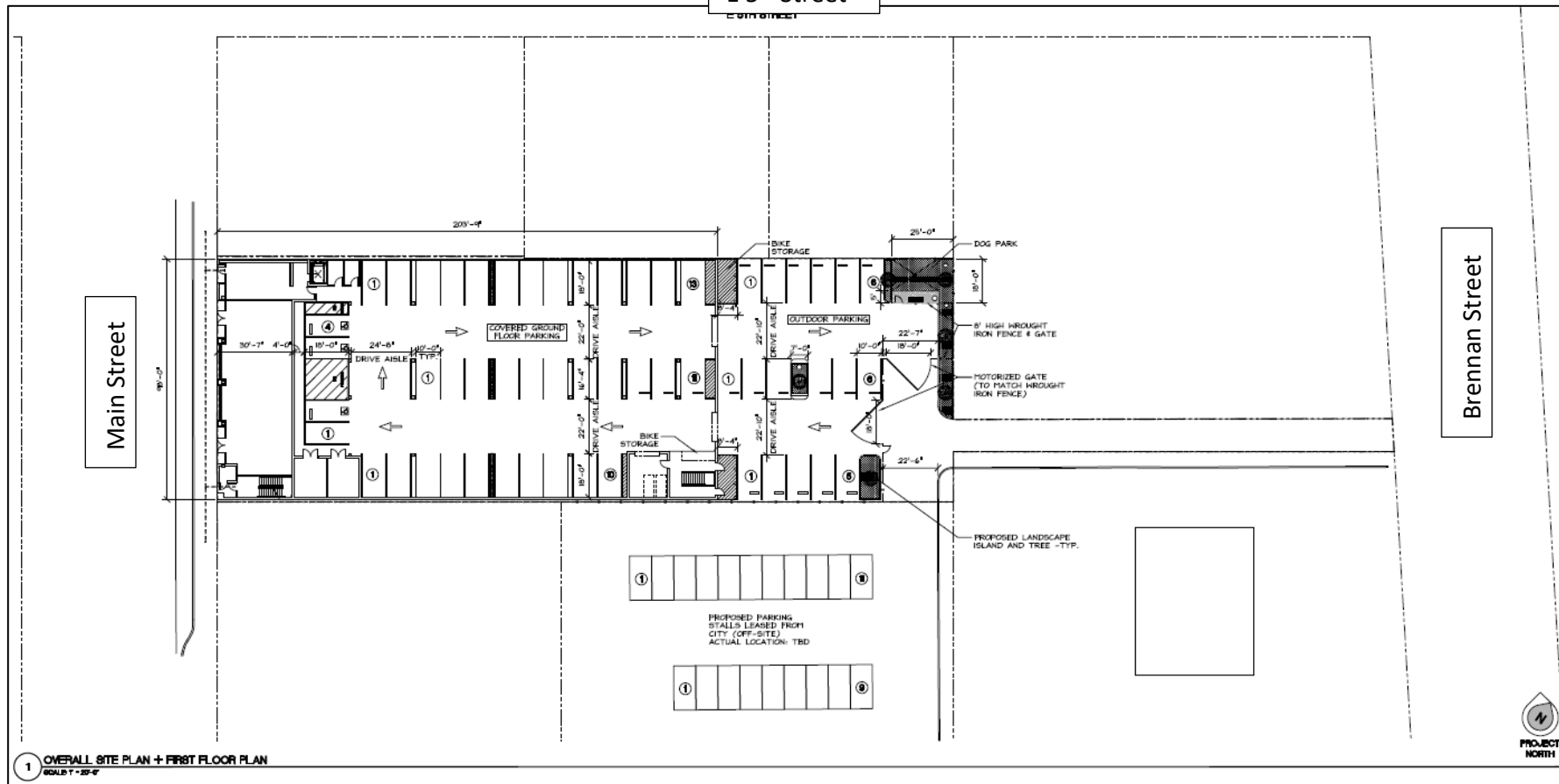
This traffic impact study addresses the following topics:

- Existing conditions near the project site for people walking, biking, driving, and taking transit.
- Vehicle trip generation of the project and distribution of those trips to the local roadway network in the vicinity of the project.

- Evaluate the effects of project trips on the study intersections during morning and evening peak hours.
- Review of site access and site circulation for people walking, biking, driving, and taking transit.
- Review crash history data in the vicinity of the project.
- Recommend improvements to the local transportation network to minimize the impact of project-related traffic and safety issues.



E 5th Street



Source: Pacific Coast Development, 10/31/2019.

Section 3 Existing Conditions

EXISTING CONDITIONS

The existing conditions analysis identifies the site conditions and current operational and geometric characteristics of the roadways within the study area. Later in this report, these conditions are compared with conditions that would result from construction of the proposed project.

Kittelson & Associates, Inc. (Kittelson) staff visited and inventoried the project site and surrounding study area on March 1, 2020. At that time, Kittelson collected information regarding site conditions, adjacent land uses, and transportation facilities in the study area. Kittelson had intersection turning movement count data collected for the four study intersections on March 5, 2020.

SITE CONDITIONS AND ADJACENT LAND USES

The project site is in downtown Watsonville and currently is vacant. The land uses in the vicinity of the site are retail businesses along Main Street and retail, office, and single-family residential uses along Brennan Street.

This section discusses the existing conditions of the transportation and circulation network near the proposed project for people walking, biking, driving and taking transit. Figure 3 shows the location of the study intersections and the peak hour volumes. A systemic peak hour was identified for a.m. and p.m. based on the volumes at all four intersection. The a.m. peak hour is 7:30-8:30 a.m., and the p.m. peak hour is 5:05-6:05 p.m. Since the previous bank building at 558 Main Street was demolished in April 2019, bank-generated trips were not included as part of the existing condition.

Existing Traffic Conditions

Analysis Methodologies and Level-of-Service Standards

Level of service (LOS) is a qualitative measure of the effect of a number of factors, including speed, travel time, traffic interruptions, freedom to maneuver, driving comfort and convenience. Levels of service are designated A through F from best to worst, which cover the entire range of traffic operations that might occur.

All intersection level-of-service evaluations used the peak 15-minute flow rate during the weekday a.m. and p.m. peak hours. Using the peak 15-minute flow rate ensures that this analysis is based on a reasonable worst-case scenario. For this reason, the analysis reflects conditions that are only likely to occur for 15 minutes out of each average peak hour. During all other periods, the transportation system likely will operate under conditions better than the conditions described in this memo.

Intersection LOS

LOS describes the operating conditions experienced by motorists. LOS is a qualitative measure of the effect of a number of factors, including speed and travel time, traffic interruptions, freedom to maneuver,

driving comfort, and convenience. LOS A through LOS F covers the entire range of traffic operations that might occur. Motorists using a facility that operates at LOS A experience very little delay, while those using a facility that operates at LOS F will experience long delays. These conditions are generally described in Table 1.

Table 1 General Level of Service Definitions

LOS	Description
A	Free Flow or Insignificant Delays: Vehicles are completely unimpeded in their ability to maneuver within the traffic stream. Control delay at signalized intersections is minimal.
B	Stable Operation or Minimal Delays: The ability to maneuver within the traffic stream is only slightly restricted, and control delay at signalized intersections are not significant.
C	Stable Operation or Acceptable Delays: The ability to maneuver and change lanes is somewhat restricted, and average travel speeds may be about 50 percent of the free flow speed.
D	Approaching Unstable or Tolerable Delays: Small increases in flow may cause substantial increases in delay and decreases in travel speed.
E	Unstable Operation or Significant Delays: Significant delays may occur, and average travel speeds may be 33 percent or less of the free flow speed.
F	Forced Flow or Excessive Delays: Congestion, high delays, and extensive queuing occur at critical signalized intersections with urban street flow at extremely low speeds.

Source: *Highway Capacity Manual*, Transportation Research Board, Washington D.C., 2016

Intersection analysis was conducted using the operational methodology outlined in the *Highway Capacity Manual* (HCM) 6th Edition (Transportation Research Board, Washington, D.C., 2016), as operationalized by Vistro version 2020 software tool. For signalized intersection, the HCM 6th Edition procedure calculates a weighted average control delay in seconds per vehicle at an intersection and assigns a level of service designation based on the delay. Table 2 presents the relationship of average delay to level of service for signalized intersections and two-way stop control (TWSC) intersections.

For two-way stop control (TWSC) intersections—in this case, the T-intersection of E 5th Street at Brennan Street with one-way stop control—the LOS criteria apply to each lane on a given approach and to each approach on the minor street, LOS is not calculated for major-street approaches or for the intersection as a whole. This is because major street through vehicles are assumed to experience no delay. The average control delay at the intersection level will also be provided in this section as additional information. In addition to average delay, a volume over capacity (V/C) ratio greater than 1.0 also indicates a LOS F for a minor street movement.

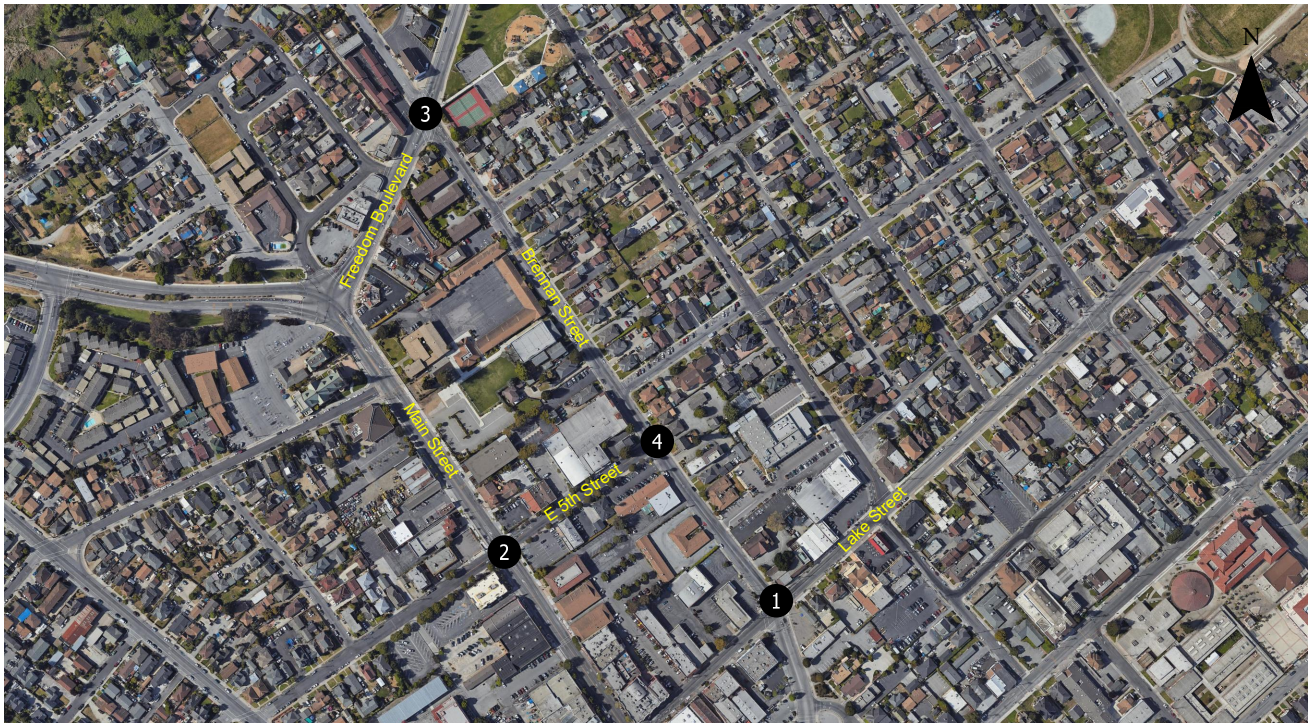
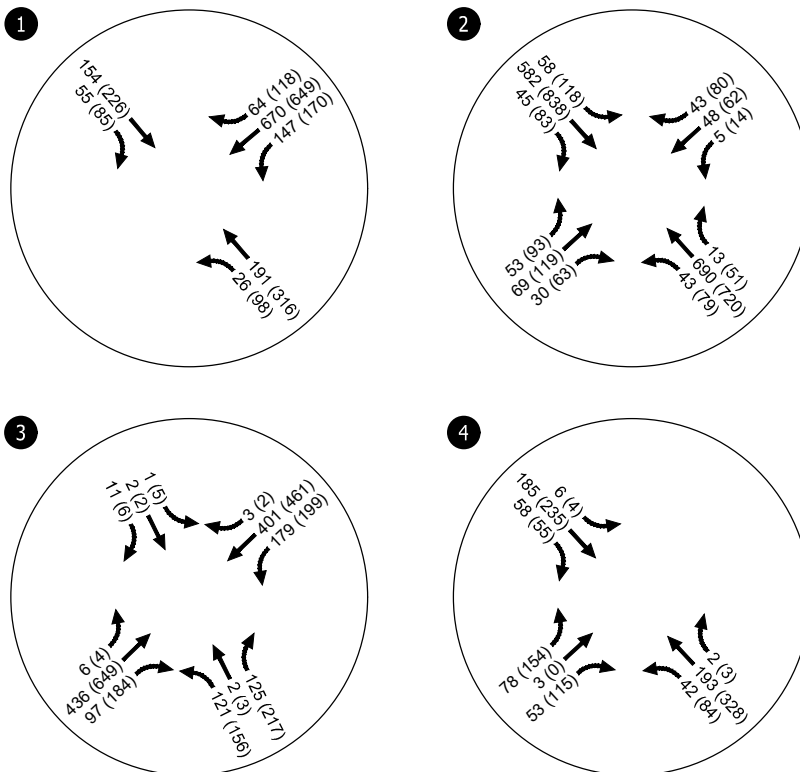


Image Source: Google Earth, 2020.



- Study Intersections

AM (PM) - Traffic Volume

Existing Peak Hour Volumes
Watsonville, California

Figure
3

Table 2 Intersection Level of Service Definitions by Average Delay

Signalized Intersection	LOS	TWSC Intersection ¹
Average Delay Per Vehicle (seconds)		Average Delay Per Vehicle (seconds)
≤10.0	A	≤10.0
>10.0 and ≤20.0	B	>10.0 and ≤15.0
>20.0 and ≤35.0	C	>15.0 and ≤25.0
>35.0 and ≤55.0	D	>25.0 and ≤35.0
>55.0 and ≤80.0	E	>35.0 and ≤50.0
>80.0	F	>50.0 or V/C>1.0

Source: *Highway Capacity Manual*, Transportation Research Board, Washington D.C., 2016

¹ The LOS criteria apply to each lane on a given approach and to each approach on the minor street.

Existing Intersection LOS Results

Table 3 summarizes the existing LOS for the study intersections for a.m. and p.m. peak hours. The eastbound approach at the T-intersection at E 5th Street and Brennan Street is stop controlled and the eastbound left-turn (EBL) is the worst movement for both a.m. and p.m. peak hours. During the p.m. peak hour, the EBL movement runs at the LOS E and the expected 95th percentile queue length for this approach is 7 vehicles. The three signalized intersections operate at LOS D or better. Appendix I includes the full intersection analysis reports exported from Vistro.

Table 3 Intersection LOS under Existing Traffic Conditions

#	Intersection	Control	Standard	Weekday a.m. Peak Hour		Weekday p.m. Peak Hour	
				Delay (s/veh)	LOS	Delay (s/veh)	LOS
1	W Lake Avenue and Brennan Street/Union Street	Signal	C	14.0	B	17.1	B
2	W 5th Street and Main Street	Signal	D	26.8	C	52.0	D
3	Freedom Boulevard and Brennan Street	Signal	D	16.3	B	20.3	C
4	E 5th Street and Brennan Street	Side-Street Stop Control	E	16.2 ¹	C	46.3 ¹	E

¹ The worst movement is eastbound left-turn. The average intersection delay is 3.7 seconds for a.m. and 12.6 seconds for p.m. peak hours.

Source: Kittelson & Associates, Inc., 2020

Vehicle Facilities

This section discusses the key roadway and study intersections for people driving to and from the project site. Major regional corridors connecting the City of Watsonville with other cities are:

Highway 1 is the primary north-south corridor for vehicular transportation. The traffic has steadily increased over the years as people travel into the greater Bay Area for employment related activities.

Highway 152 is the primary east-west corridor through the City, connecting to the community of Gilroy and Highway 101 to the east.

Highway 129 (East Riverside Drive) is another east-west corridor connecting Highway 101 in the east and Highway 1 in the west.

In the immediate vicinity of the project site, the road network consists of:

Main Street, Highway 152 in the City, is a four-lane north-south arterial with on-street parallel parking on both sides of the street when there is enough right of way. However, on-street parking is not permitted at the project site frontage given the limited right of way as a left-turn bay is added at the intersection with E 5th Street, north of the project Site. The speed limit is 25 mph.

Brennan Street is a north-south, two-lane local street with on-street parallel parking on both sides of the street. The speed limit is 25 mph. Single-family homes exist along Brennan Street.

E Lake Avenue is a two-lane one-way local street heading west between west of Lincoln Street to east of Rodriguez Street. On-street parallel parking is allowed on both sides of the street. The speed limit is 25 mph.

Freedom Boulevard is a two-lane local street. It provides limited on-street parking between Main Street and Brennan Street. East of Brennan Street, on-street parking is only allowed on the northwest side of the roadway. The speed limit is 25 mph.

Pedestrian Facilities

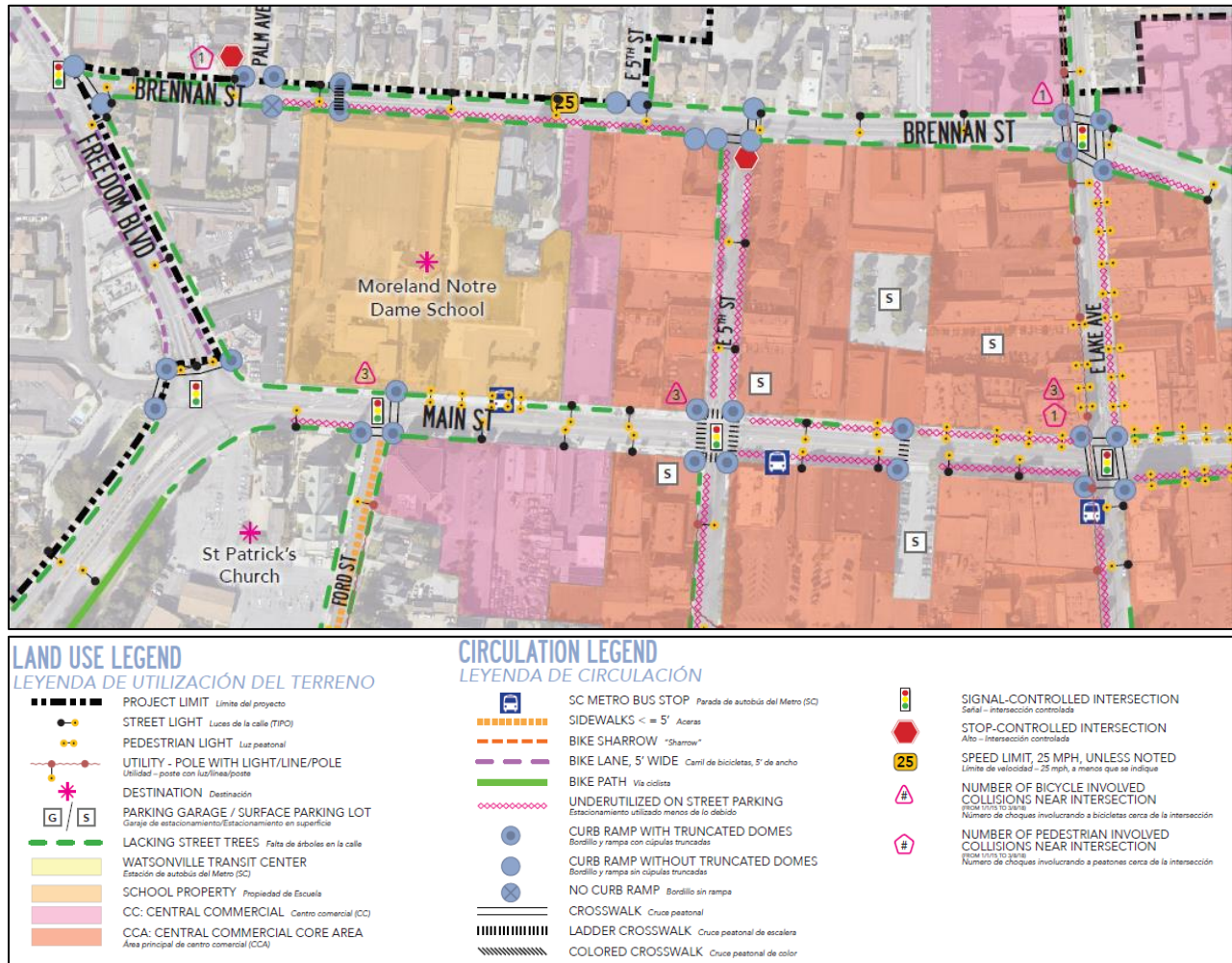
Figure 4 shows the existing pedestrian conditions along Main Street and Brennan Street and the crosswalks and curb ramps at the intersections in the vicinity of the project site.

Pedestrians can access the project site via the sidewalk along the east side of Main Street. An 8-foot-wide sidewalk is currently present at this location. The sidewalk is continuous to the north and south of the project site. The intersection of Main Street and E 5th Street north of the project site and the intersection of Main Street and E Lake Avenue south of the project site have pedestrian crosswalks, pedestrian signal heads and push buttons. There is one mid-block pedestrian crossing with rectangular rapid flash beacons (RRFB) on Main Street approximately 100 feet south of the project site. In addition, Main Street provides pedestrian lighting in front of Moreland Notre Dame School and the commercial buildings south of the project site. The curb ramps at intersections on Main Street have truncated domes.

Brennan Street has sidewalks on both sides of the street of approximately 6 feet at the project site. Pedestrians can access the site via the sidewalk along the west side of Brennan Street. The stop-controlled at the T-intersection of Brennan Street and E 5th Street has pedestrian crosswalks on the west

let on E 5th Street and south leg on Brennan Street. The signalized intersection of Brennan Street and Lake Avenue has ladder crosswalks on all four legs and pedestrian signal heads and pushbuttons. The curb ramps at intersections on Main Street lack truncated domes.

Figure 4 Existing Conditions for Pedestrian and Bicycle Facility



Source: Downtown Watsonville Complete Streets Plan, Figure 8 – Existing Conditions Plan, 2019.

Bicycle Facilities

Bicycle facilities are defined by the following four classes in Chapter 1000 of California Department of Transportation's (Caltrans) *Highway Design Manual* and *Design Information Bulletin 89*:

Class I – Provides a completely separated facility designed for the exclusive use of bicyclists and pedestrians with crossing points minimized.

Class II – Provides a restricted right-of-way designated lane for the exclusive or semi-exclusive use of bicycles with through travel by motor vehicles or pedestrians prohibited, but with vehicle parking and cross-flows by pedestrians and motorists permitted.

Class III – Provides a right-of-way designated by signs or permanent markings and shared with pedestrians and motorists.

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

Based on the 2016 Santa Cruz County Bikeways Map, Main Street adjacent to the project site is identified as an alternative bike route, which is defined as a route that is favorable to bicyclists that is not striped and not necessarily signed. No signs or markings for bicyclists exist on Main Street or Brennan Street. Class III bicycle routes are present on Main Street and Brennan Street adjacent to the project site. Figure 4 illustrates the existing bicycle facilities in the vicinity of the project Site.

The observed numbers of bicyclists are minor at the study intersections. The great number of bicyclists traveling through a study intersection during a peak hour is three bicyclists on Main Street at E 5th Street and five on Brennan Street at E Lake Avenue.

Transit Facilities

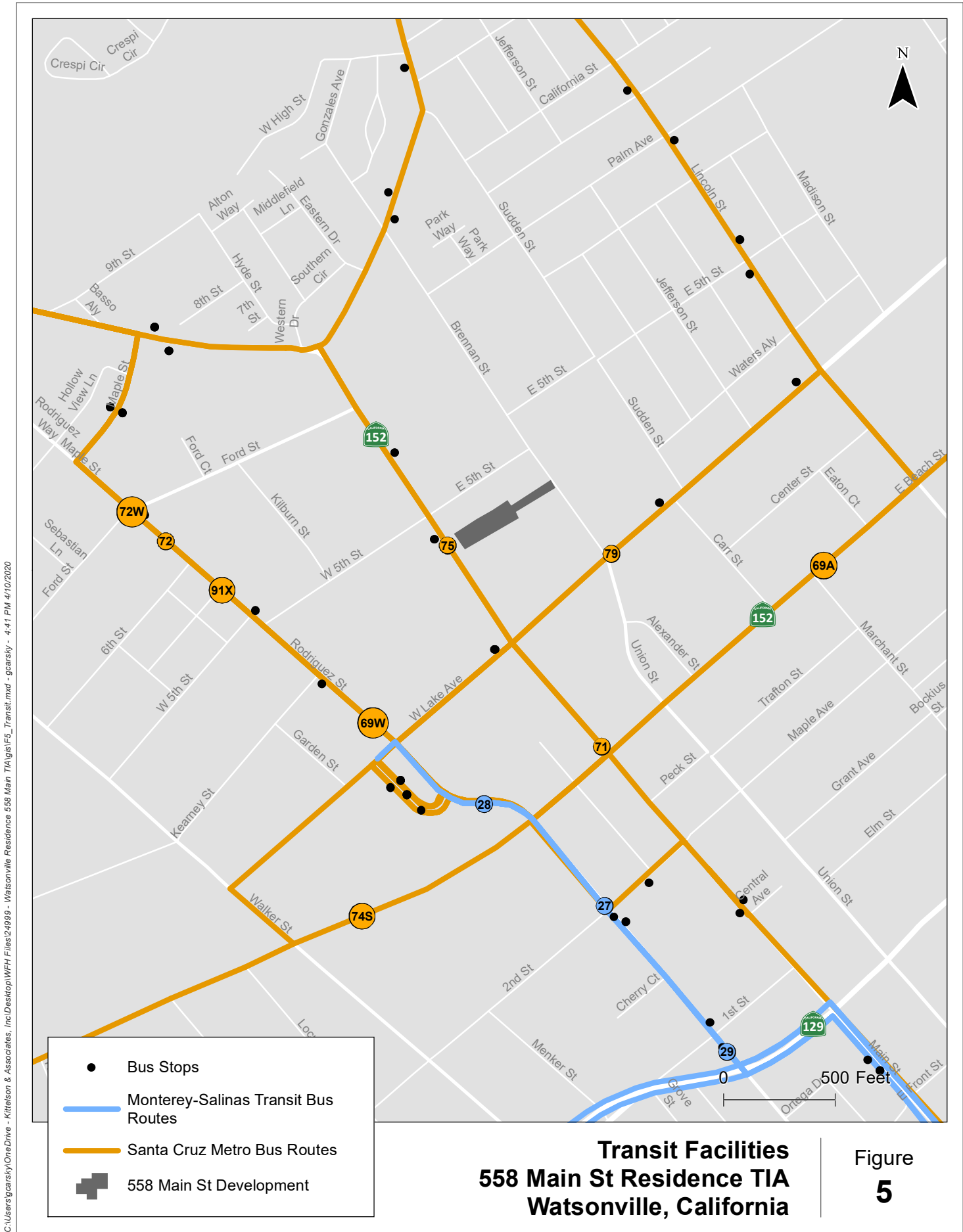
The transit system in the study area includes bus services provided by Santa Cruz Metro and Monterey-Salinas Transit. Transit stops near the project site are located on Main Street southbound south of W 5th Street (Routes 71, 75, and 79), on Main Street northbound south of Ford Street (Routes 71 and 75). Both stops serve for bus services provided by Santa Cruz Metro. The stops are marked by a sign post and each has a bench for people waiting for a bus.

A bus transit center is located next to the intersection of Rodriguez Street and W Lake Avenue, about 0.3 mile from the project Site. This transit center offers access to Santa Cruz Metro (Routes 69, 71, 72, 74, 75, 79, and 91) and Monterey-Salinas Transit bus lines (Routes 27, 28 and 29). Table 4 presents the details of the routes running near the project site. Figure 5 illustrates the transit routes and stops in the vicinity of the project site.

Table 4 Bus Routes near the project Site

Route	Route Description	Service Frequency on Weekday
Santa Cruz Metro		
69A/ 69W	Capitola Road / Cabrillo / Watsonville	Approx. every 30 minutes between 6:20 a.m. and 5:50 p.m., Approx. every hour between 5:50 p.m. and 9:50 p.m.
71	Santa Cruz to Watsonville	Approx. every 30 minutes between 5:30 a.m. and 8:40 p.m., Additional two runs at 9:40 p.m. and 11:15 p.m.
72	Hospital /Pinto Lake	Approx. every hour between 6:45 a.m. and 5:45 p.m.
74S	PVHS / Watsonville Hospital	Two runs per day, one at 7:00 a.m. and the other at 3:05 p.m.
75	Green Valley	Approx. every hour between 5:15 a.m. and 6:15 p.m.
79	East Lake / Crestview	Approx. every hour between 7:25 a.m. and 5:25 p.m.
91X	Commuter Express Santa Cruz to Watsonville	Approx. every 40 minutes between 6:00 a.m. and 4:30 p.m.
Monterey-Salinas Transit		
27	Watsonville - Marina	Approx. two hours between 5:50 a.m. and 5:50 p.m.
28	Watsonville – Salinas	Approx. two hours between 6:45 a.m. and 6:45 p.m.
29	Watsonville via Prunedale	Approx. two hours between 7:34 a.m. and 5:34 p.m.

Source: website <http://www.scmtd.com/media/bkg/20203/publications/headways.pdf>, headway information for departures at Watsonville Transit Center, accessed April 6, 2020.



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Crash Analysis

The crash analysis involves three years of crash data (2017 to 2019) for the study area, accessed from the California Statewide Integrated Traffic Record System (SWITRS). These crashes are geolocated and presented of Figure 6. The figure presents crashes on Main Street and Brennan Street between Freedom Boulevard and W Beach Street. During the three years evaluated, 101 crashes were reported in the study area. Table 5 summarizes the number of crashes by severity for each year. The fatal crash in 2017 involved a pedestrian fatality at the intersection of Main Street and Lake Avenue in the dark with streetlights working. The primary collision factor was pedestrian violation. The fatal crash in 2018 involved a pedestrian at the intersection of Main Street and Beach Street during daylight. The primary collision factor was a driver failing to yield to pedestrian right of way. Table 6 lists the crashes by mode.

visualizes the geographical locations of all the crashes, especially those involved pedestrians and bicycles. The two fatal crashes were marked in red.

Table 5 Crash Severity by Year (2017 - 2019)

Crash Severity	2017	2018	2019	3 - Year Total
Fatal	1	1	0	2
Minor Injury	2	3	0	5
Complain of Injury	7	8	10	25
PDO	22	23	24	69
Total	32	35	34	101

Source: SWITRS, Kittelson & Associates, 2020

Table 6 Number of Crashes by Mode (2017 – 2019)

Mode	Number Crashes	% Crashes
Motor Vehicle Only	84	83%
Pedestrian Involved	15	15%
Bicyclist Involved	2	2%
Total	101	100 %

Source: Kittelson & Associates, 2020



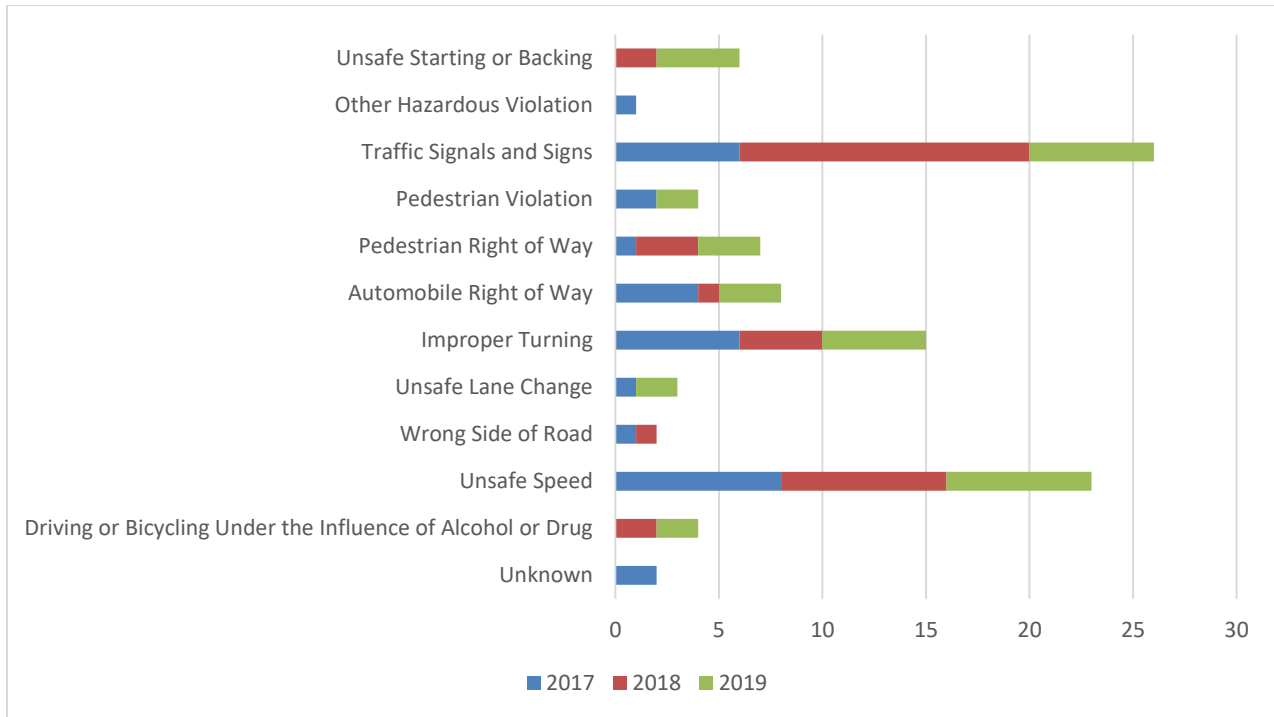
Crashes by Severity and Mode (2017 - 2019)
558 Main St Development
Watsonville, California

Figure
6

Figure 7 illustrates the primary collision factors for the 101 reported crashes in the vicinity of the project sites from 2017 to 2019. The top three factors are:

- Motorist fails to comply with a traffic signal or sign
- Unsafe speed
- Improper turning

Figure 7 Primary Collision Factors in the Vicinity of the project Site (2017 – 2019)



Sources: SWITRS, Kittelson & Associates, Inc., 2020

“Automobile Right of Way” is a crash resulting from one motorist failing to yield to a motorist with the right of way.

“Pedestrian Right of Way” is a crash in which a motorist failed to yield to a pedestrian with the right of way.

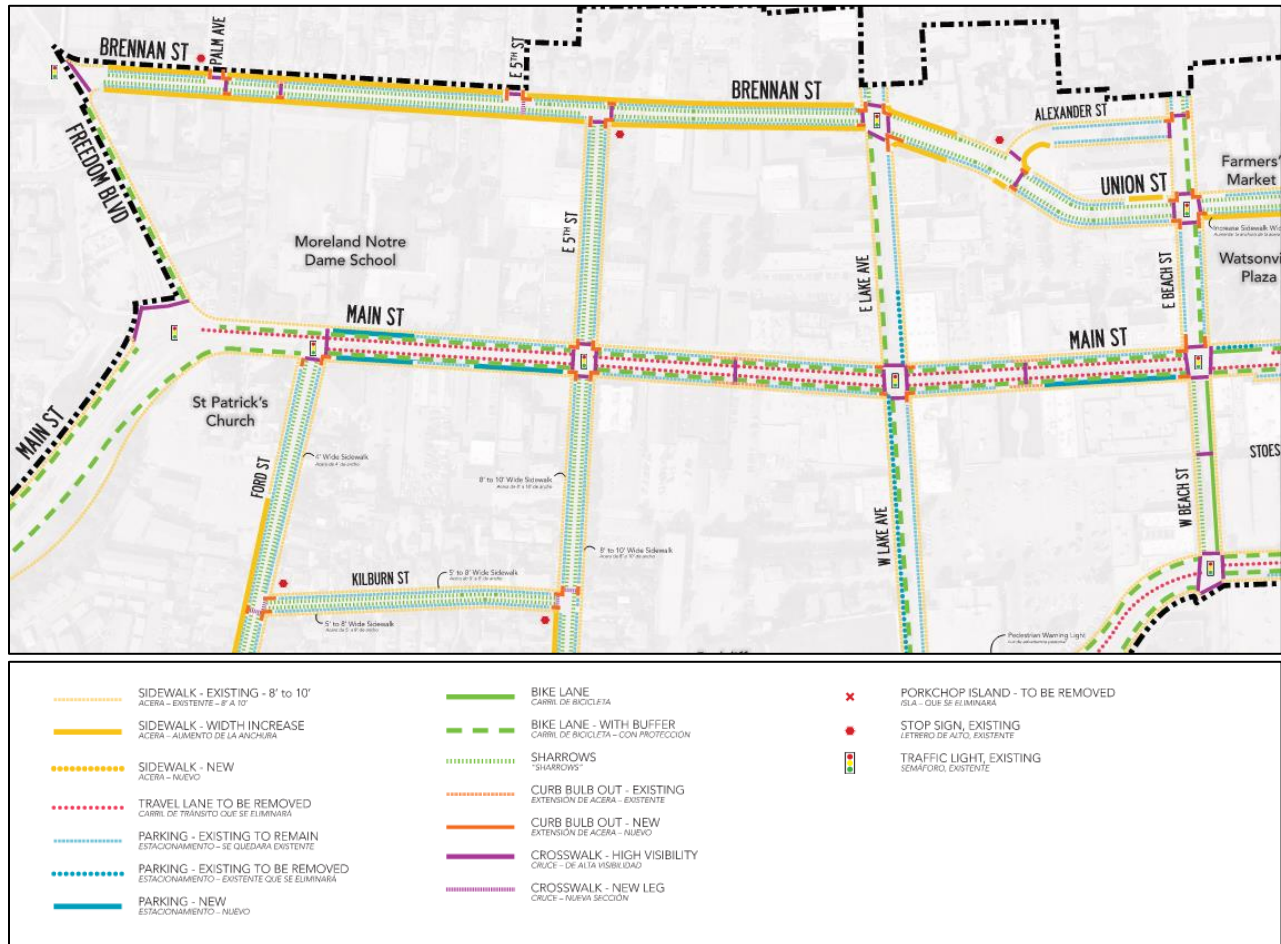
“Pedestrian Violation” is a crash in which a pedestrian violated a driver’s right of way.

“Traffic Signals and Signs: is a crash resulting from a motorist’s failure to comply with a traffic control device (traffic signal, yield sign, or stop sign).

Complete Street Plan

The City of Watsonville published the Downtown Watsonville Complete Streets Plan in 2019. The Plan outlines a vision for a revitalized Downtown that focuses on increased connectivity and safety for bicyclists, pedestrians, and transit users including the vicinity of the project site. The concepts provided in the plan would help slow down travel speeds on Main Street and improve safety in the vicinity of the project site for all travel modes. Figure 8 presents planned improvements to the circulation network, including constructing curb extensions and high-visibility crosswalks at the E 5th Street/Brennan Street intersection. Figure 9 presents planned amenities in downtown, including additional street lighting along Brennan Street, E 5th Street, and Main Street near the project site and bike parking on Brennan Street on the block north of E 5th Street.

Figure 8 Planned Improvements, Downtown Complete Streets Plan



Source: Downtown Watsonville Complete Streets Plan, Figure 34 – Circulation Plan, 2019.

Figure 9 Planned Amenities, Downtown Complete Streets Plan



Source: Downtown Watsonville Complete Streets Plan, Figure 34 – Circulation Plan, 2019.

Section 4

Transportation Impact Analysis

TRANSPORTATION IMPACT ANALYSIS

The transportation impact analysis identifies how the study area's transportation system will operate when the project is built. The effects of traffic that would be generated by the project during the typical weekday a.m. and p.m. peak hours were examined as follows:

- Site-generated trips were estimated for the proposed residential and retail uses.
- Distribution of trips were developed based on the current travel pattern.
- Existing (2020) with project conditions consist of existing traffic volumes and distribution of new trips associated with the site-generated trips.
- Site access and circulation for the project site were analyzed using the preliminary site plan.

STANDARD INTERSECTION OPERATIONS THRESHOLDS

Caltrans Facilities

Caltrans provided the following Level of Service (LOS) standards for Caltrans Facilities in the Guide for the Preparation of Traffic Impact Studies (TIS) published in 2002. Caltrans is currently updating the TIS guidelines to comply with Senate Bill 743 to establish methods for evaluating vehicle miles traveled and no longer focusing on LOS. However, this study uses Caltrans' historic threshold for operations analysis.

Caltrans endeavors to maintain a target LOS at the transition between LOS C and LOS D on State highway facilities, however, Caltrans acknowledges that this may not always be feasible and recommends that the lead agency consult with Caltrans to determine the appropriate target LOS. If an existing State highway facility is operating at less than the appropriate target LOS, the existing MOE should be maintained.

Signalized Intersections

The City of Watsonville General Plan provides the following Level of Service (LOS) standards for signalized intersections¹:

Level of Service D provides an acceptable level of operation for urban areas and is generally used for planning purposes. Watsonville/Vista requires street improvements when traffic volumes exceed LOS D on roadway segments and at signalized intersections except for those accepted to operate at less than a LOS D in the 2004–2030 Major Streets Master Plan as updated in 2005.

¹ Chapter 6 , Watsonville VISTA 2030 General Plan, <https://www.cityofwatsonville.org/DocumentCenter/Index/157>.

Unsignalized Intersections

The General Plan provides the following direction for unsignalized intersections:

This level of service standard is not applicable at unsignalized intersections where peak hour operations may exceed LOS D, but a traffic signal is not warranted. Unsignalized intersections that operate worse than LOS D should be evaluated for feasible improvements to improve operations.

Since the worst scenario existing condition at the TWSC intersection at E 5th Street and Brennan Street is LOS E, the with-project condition at this intersection shall maintain LOS E or better.

TRIP GENERATION

Trip generation estimates were developed for the project based on trip rates provided in the Institute of Transportation Engineers' (ITE) *Trip Generation*, 10th Edition (2017). Table 7 summarizes the trip generation rates and in/out percentages used to develop the project trip generation. Table 8 shows the generated project vehicle trips for the project.

Table 7 ITE Vehicle Trip Generation Rates

Land Use	ITE Code	Unit	Weekday a.m. Peak Hour			Weekday p.m. Peak Hour		
			Rate	In %	Out %	Rate	In %	Out %
Multifamily Housing (Mid-Rise)	221	Dwelling Unites	0.36	26%	74%	0.44	61%	39%
Quality Restaurant	931	TSF ¹	0.73	55% ²	45% ²	7.80	67%	33%

Source: ITE *Trip Generation Manual*, 10th Edition, 2017

¹ Thousand Square Feet.

² In/Out % for high turn-over sit-down restaurant (ITE Code 932) are used for quality restaurant because the percentages were not available for ITE 931 in weekday a.m. peak hour.

Table 8 Project Vehicle Trip Estimates

Land Use	Size	Units	Weekday a.m. Peak Hour			Weekday p.m. Peak Hour		
			In	Out	Total	In	Out	Total
Multifamily Housing (Mid-Rise)	50	Dwelling Units ¹	5	13	18	13	9	22
Quality Restaurant	2.22	TSF ²	1	1	2	11	6	17
Total			6	14	20	24	15	39

Source: Kittelson & Associates, Inc., 2020

¹ The 50 units include 15 studios, 29 one-bedrooms, and 6 two-bedrooms.

² Thousand Square Feet.

For comparative purposes, Table 9 presents the trip generation for the prior use of this site—a bank with drive through teller service. As shown, the prior bank use would have generated approximately 48 trips in the a.m. peak hour and 102 trips in the p.m. peak hour. During both times of day, the prior use generated far more trips than the proposed project is expected to generate.

Table 9 Comparison of Trip Estimates for Prior Use and Project

Land Use	Size	Units	Weekday a.m. Peak Hour			Weekday p.m. Peak Hour		
			In	Out	Total	In	Out	Total
Drive-in Bank	5	TSF ¹	28	20	48	51	51	102
Project ²			6	14	20	24	15	39
Difference in Trips with Project			-22	-6	-28	-27	-36	-63

Source: ITE Trip Generation Manual, 10th Edition, 2017. Trip generation rates for ITE code 912 Drive-in Bank are used.

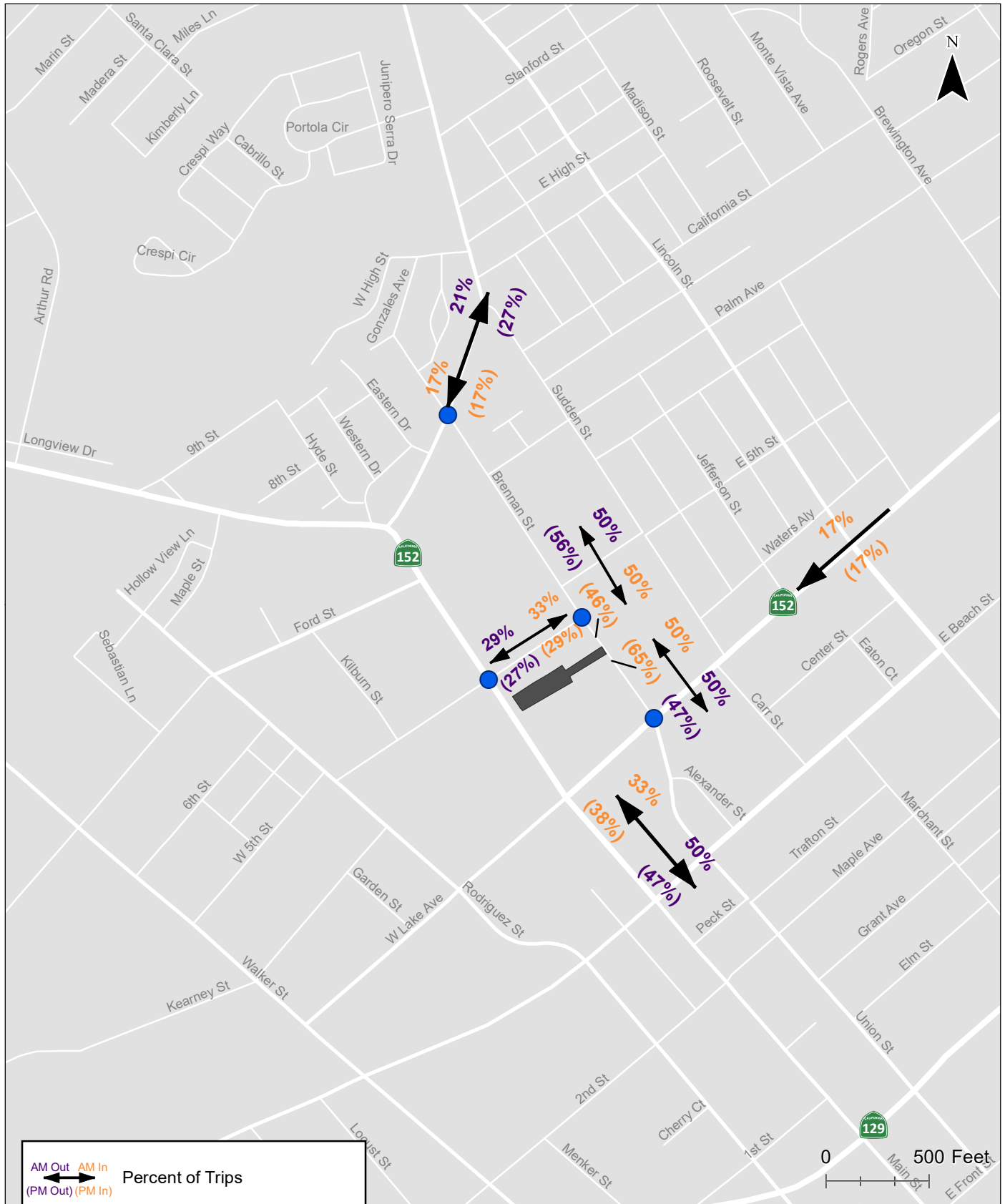
¹ Thousand Square Feet.

² Project trips calculated in Table 8.

TRIP DISTRIBUTION

The distribution of project trips was developed based on existing travel patterns and traffic count data. For a conservative approach, all the vehicle traffic was assumed to originate and end from the rear of the site on Brannan Street. This includes the limited amount of traffic generated by the restaurant. Figure 10 presents the general distribution of trips. Figure 11 shows the turning movement volumes for project only trips at the four study intersections and Figure 12 shows the turning movement volumes for project plus existing trips at the four study intersections.

C:\Users\carsky\OneDrive - Kittelson & Associates, Inc\Desktop\WFH Files\24999 - Watsonville Residence 558 Main St\TIA\fig18_TripDistribution.mxd - garsky - 4:43 PM 4/10/2020



**Trip Distribution Percentages
558 Main St Residence TIA
Watsonville, California**

**Figure
10**

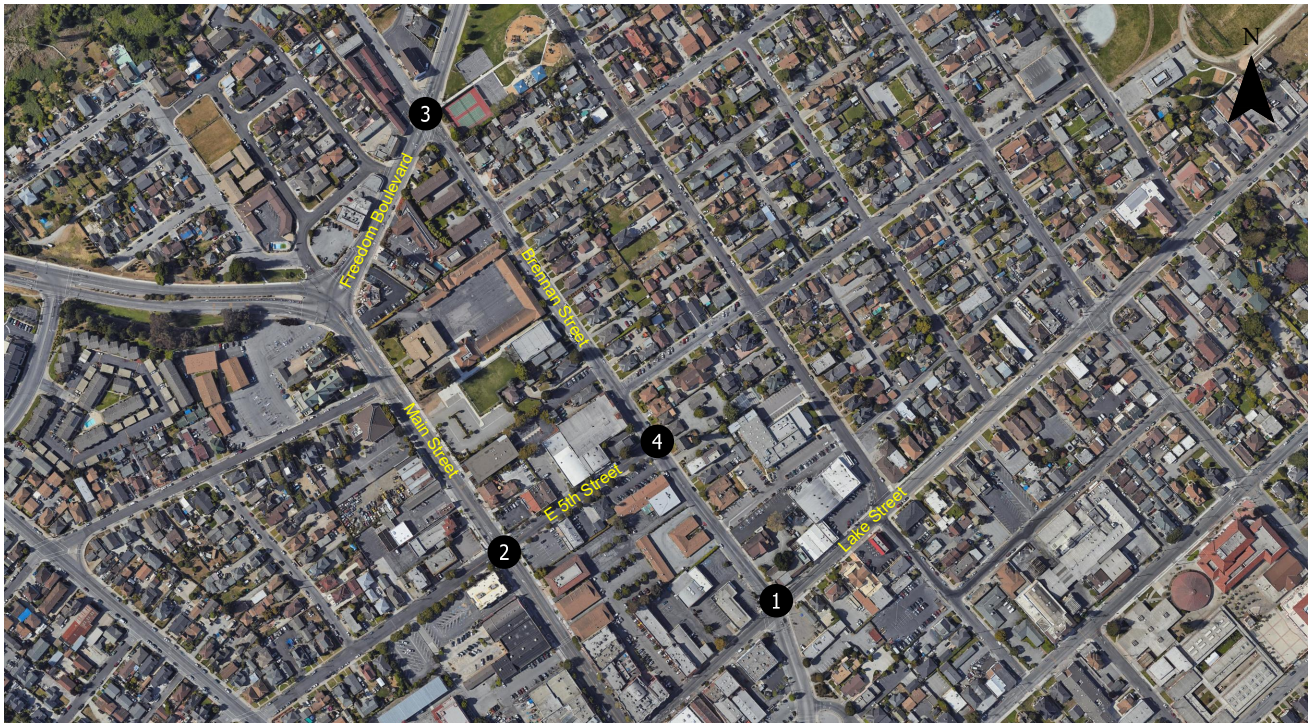
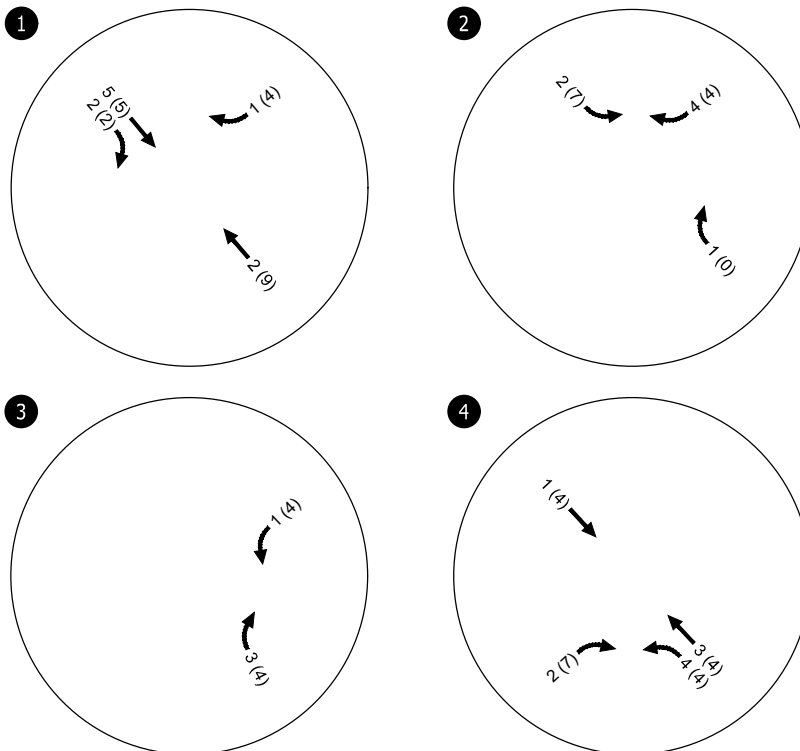


Image Source: Google Earth, 2020.



- Study Intersections

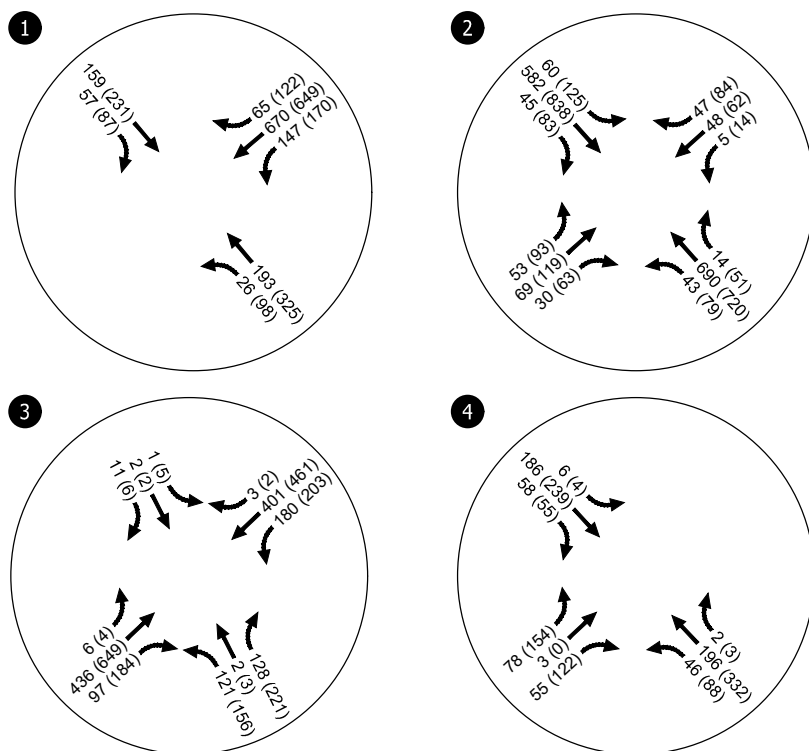
AM (PM) - Traffic Volume

Project Generated Peak Hour Volumes
Watsonville, California

Figure
11



Image Source: Google Earth, 2020.



- Study Intersections

AM (PM) - Traffic Volume

Existing + Project Peak Hour Volumes
Watsonville, California

Figure
12

EXISTING PLUS PROJECT CONDITIONS

Table 10 summarizes the LOS results for the study intersections for Existing Plus Project conditions. All signalized intersections are expected to operate at the same LOS as under Existing conditions, at LOS D or better. At the stop-controlled T-intersection of E 5th Street and Brennan Street, the eastbound left-turn (EBL) is the worst movement for both a.m. and p.m. peak hours. During the p.m. peak hour, the EBL movement is expected to operate at LOS F, compared to LOS E under Existing conditions shown in Table 3. This change in LOS corresponds to an increase in delay per vehicle of about five (5) seconds during the p.m. peak hour. The expected 95th percentile queue length for this approach is eight (8) vehicles, compared to seven (7) vehicles under Existing conditions. As shown in Figure 11, the project adds seven (7) vehicles to this approach during the p.m. peak hour, which is less than 3% of existing traffic on that approach and would be within typical daily fluctuation of traffic volumes. Moreover, the existing condition analysis did not include trips generated by the prior bank use, which may have contributed some traffic on E 5th Street. Appendix I includes the full intersection analysis reports exported from Vistro.

Table 10 Intersection LOS under Existing Plus Project Conditions

#	Intersection	Control	Standard	Weekday a.m. Peak Hour		Weekday p.m. Peak Hour	
				Delay (s/veh)	LOS	Delay (s/veh)	LOS
1	W Lake Avenue and Brennan Street/Union Street	Signal	C	14.1	B	17.2	B
2	W 5th Street and Main Street	Signal	D	26.8	C	52.0	D
3	Freedom Boulevard and Brennan Street	Signal	D	16.5	B	21.2	C
4	E 5th Street and Brennan Street	Side-Street Stop Control	E	16.5 ¹	C	51.2 ¹	F

¹ The worst movement is eastbound left-turn. Average intersection delay is 3.8 seconds for a.m. and 13.9 seconds for p.m. peak hours.

Bold and shaded indicates intersection would operate beyond the standard.

Source: Kittelson & Associates, Inc., 2020

SITE ACCESS AND CIRCULATION ANALYSIS

Kittelsohn conducted a qualitative assessment of site access and circulation for vehicles, pedestrians, bicyclists, and deliveries based on the preliminary site plan presented in Figure 2. The results of this review are summarized in this section.

VEHICLE ACCESS

Residential Use. People driving to the site and accessing the residential units would access the parking lot through the existing alley driveway from Brennan Street. The two-way alley driveway is approximately 20 feet in width and would serve both in-bound and out-bound traffic. The alley and driveway would be shared with pedestrians and bicyclists.

When two large vehicles (e.g., SUVs and pick-up trucks) enter/exit the site concurrently, the width of the driveway and alley may be insufficient for comfortable 2-way travel. At such times, drivers would need to take turns using the alley. This condition exists on the site today and would continue to exist with construction of the proposed project.

For drivers exiting the site, the sightline toward people approaching from the north on Brennan Street (pedestrians and drivers) is encumbered by an existing commercial building. This condition exists on the site today and would continue to exist with construction of the proposed project. Likewise, for drivers entering the site, the sightline toward the alley is encumbered by the existing building—a condition that would remain after construction of the project.

Vehicles volumes at the driveway resulting from the project are expected to be low (on average, one vehicle about every three minutes during the peak hours; volumes for the remainder of the day). Therefore, drivers would need to continue exercising caution to enter and exit the site at the alley driveway.

Commercial Use. No on-site parking is provided for the restaurant. Therefore, people driving to the site to visit the restaurant would use public parking available within downtown and walk to the site.

Recommendations

The following activities are recommended to ensure adequate safety and operation at the internal intersections and roadways:

- Install lane striping within the alley and signs at the driveway to increase drivers' awareness of appropriate vehicle position within the cross section of the driveway and alley.
- Install a convex mirror on the south side of the driveway providing visibility around the corner of the existing building for drivers exiting the site and drivers entering from southbound Brennan Street.

PEDESTRIAN AND BICYCLIST ACCESS

Residential Use. Residents of the building, both as pedestrians and bicyclists, have access through two paths:

- Via the two-way alley connected to Brennan Street
- From E Lake Avenue via the connected parking lots south of the project site

Visitors can access the building via the front of the entrance on Main Street.

Commercial Use. Customers of the restaurant located on the ground floor can access the building from the entrance located on Main Street. Bicyclists would use publicly available bike parking. No bike parking is provided for the restaurant use.

Transit users, both as pedestrians and bicyclists, can access the project site via sidewalks in the vicinity of the project site.

PASSENGER AND FREIGHT LOADING

The existing red-curb on Main Street in front of the project site does not allow parking or loading activities since two driveways serving the previous bank drive-through are narrowly spaced. With construction of the project, the two curb-cuts would be removed, and the curb at the project frontage would be non-colored to accommodate passenger and freight loading activities for the proposed project. This unrestricted section of curb would be approximately 100 feet long.

Residential Use. Passenger loading for the apartments would take place in the garage and/or the open parking area to the rear of the building. When people move into and out of the residential units, loading would occur in the garage and/or the parking lot at the rear of the building.

Commercial Use. Passenger loading activities for the restaurant are expected to take place at the curb on Main Street in front of the building. Delivery trucks for the restaurant also are expected to be loaded at the curb on Main Street.

Section 5

Conclusions and Recommendations

CONCLUSIONS AND RECOMMENDATIONS

The results of this study indicate that the proposed Residence at 558 Main development can be constructed while maintaining acceptable traffic operations at the study intersections and improving safety at the site access on Brennan Street, assuming provision of the recommended improvement measures at the alley driveway on Brennan Street.

FINDINGS

Year 2020 Existing Conditions

- All of the study intersections operate at acceptable levels of service during the weekday a.m. and p.m. peak hours.
- A review of historical crash data revealed two (2) pedestrian fatalities within a three-year period. The City's Downtown Complete Streets Plan includes improvements that will enhance the circulation network and improve safety for people walking in downtown. Therefore, the crash patterns or trends in the site vicinity do not require mitigation associated with this project.

Existing Plus Project Conditions

All of the study intersections, except for the intersection of E 5th Street and Brennan Street, are forecast to operate with acceptable levels of service during the weekday a.m. and p.m. peak hours.

- The project adds seven (7) trips during the p.m. peak hour to the eastbound approach at the E 5th Street/Brennan Street intersection, which is less than 3% of existing traffic volumes for this approach and is within the typical daily fluctuation of traffic.
- The eastbound left-turn movement operations at the E 5th Street/Brennan Street intersection are projected to change from level of service E to F during the weekday p.m. peak hour with the addition of project traffic.
- The 95th percentile queue at the E 5th Street/Brennan Street intersection eastbound approach during the p.m. peak hour is projected to be seven (7) vehicles or approximately 175 feet, which would be accommodated within the length of the road segment.
- The project would generate 20 weekday a.m. peak hour vehicle-trips, and 39 weekday p.m. peak hour vehicle-trips. The project would generate fewer trips than the prior bank use that was on this site until April 2019 (with 48 a.m. and 102 p.m. peak hour trips). Given the lower vehicle trips generated on the roadway, the project is not expected to contribute significantly to the operational and safety conditions prior to the project.

Site Access and Circulation Evaluation

- The existing alley driveway at the rear of the site providing access to Brennan Street has sightline constraints due to the existing building on the north side of the driveway.
- Drivers entering and exiting the site at Brennan Street will continue to experience the existing sightline constraints after the project is constructed.

RECOMMENDATIONS

The following activities are recommended to ensure adequate safety and operation at the internal intersections and roadways:

- Install lane striping within the alley and signs at the driveway to increase drivers' awareness of appropriate vehicle position within the cross section of the driveway and alley.
- Install a convex mirror on the south side of the driveway providing visibility around the corner of the existing building for drivers exiting the site and drivers entering from southbound Brennan Street.

Appendix 1

Intersection Analysis Sheets

Vistro File: C:\...\Existing_20200403.vistro
Report File: C:\...\lex_am.pdf

Scenario 1 Existing_AM
4/10/2020

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	Lake Ave/Brennan St-Union St	Signalized	HCM 6th Edition	NB Left	0.478	14.0	B
2	5th St and Main St	Signalized	HCM 6th Edition	EB Thru	1.225	26.8	C
3	Freedom Blvd and Brennan St	Signalized	HCM 6th Edition	NB Left	0.789	16.3	B
4	Brennan St and E 5th St	Two-way stop	HCM 6th Edition	EB Left	0.206	16.2	C

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 1: Lake Ave/Brennan St-Union St

Control Type:	Signalized	Delay (sec / veh):	14.0
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.478

Intersection Setup

Name	Union St			Brennan St			Lake Ave			Lake Ave		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	0	0	1	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	70.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No						No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Union St			Brennan St			Lake Ave			Lake Ave		
Base Volume Input [veh/h]	26	191	0	0	154	55	0	0	0	147	670	64
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	8.00	3.00	2.00	2.00	3.00	4.00	2.00	2.00	2.00	3.00	3.00	5.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	26	191	0	0	154	55	0	0	0	147	670	64
Peak Hour Factor	0.8800	0.8800	1.0000	1.0000	0.8800	0.8800	1.0000	1.0000	1.0000	0.8800	0.8800	0.8800
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	7	54	0	0	44	16	0	0	0	42	190	18
Total Analysis Volume [veh/h]	30	217	0	0	175	63	0	0	0	167	761	73
Presence of On-Street Parking	No		No	No		No				No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major street	5			7			5			6		
v_di, Inbound Pedestrian Volume crossing major street	5			6			5			7		
v_co, Outbound Pedestrian Volume crossing minor street	3			14			15			3		
v_ci, Inbound Pedestrian Volume crossing minor street	3			15			14			3		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			2		

Intersection Settings

Located in CBD	Yes
Signal Coordination Group	1 - Coordination Group
Cycle Length [s]	75
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	48.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis
Signal Group	0	8	0	0	4	0	0	0	0	0	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	-	-	-	-	-	-	-	-	-
Minimum Green [s]	0	7	0	0	7	0	0	0	0	0	7	0
Maximum Green [s]	0	27	0	0	27	0	0	0	0	0	30	0
Amber [s]	0.0	3.2	0.0	0.0	3.2	0.0	0.0	0.0	0.0	0.0	3.2	0.0
All red [s]	0.0	1.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0
Split [s]	0	39	0	0	39	0	0	0	0	0	34	0
Vehicle Extension [s]	0.0	2.5	0.0	0.0	2.5	0.0	0.0	0.0	0.0	0.0	2.5	0.0
Walk [s]	0	6	0	0	6	0	0	0	0	0	6	0
Pedestrian Clearance [s]	0	12	0	0	14	0	0	0	0	0	18	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No						No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	2.2	0.0	0.0	2.2	0.0	0.0	0.0	0.0	0.0	2.2	0.0
Minimum Recall		No			No						No	
Maximum Recall		No			No						No	
Pedestrian Recall		No			No						No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	R		C	C
C, Cycle Length [s]	75	75	75	75		75	75
L, Total Lost Time per Cycle [s]	4.20	4.20	4.20	4.20		4.20	4.20
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	0.00	0.00		0.00	0.00
l2, Clearance Lost Time [s]	2.20	2.20	2.20	2.20		2.20	2.20
g_i, Effective Green Time [s]	14	14	14	14		53	53
g / C, Green / Cycle	0.18	0.18	0.18	0.18		0.70	0.70
(v / s)_i Volume / Saturation Flow Rate	0.03	0.13	0.10	0.05		0.32	0.32
s, saturation flow rate [veh/h]	1011	1669	1669	1341		1643	1471
c, Capacity [veh/h]	156	308	308	247		1157	1035
d1, Uniform Delay [s]	34.20	28.68	27.87	26.12		4.84	4.86
k, delay calibration	0.08	0.08	0.08	0.08		0.50	0.50
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00		1.00	1.00
d2, Incremental Delay [s]	0.44	2.21	1.23	0.40		1.30	1.46
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00		0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00		1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00		1.00	1.00

Lane Group Results

X, volume / capacity	0.19	0.71	0.57	0.25		0.46	0.46
d, Delay for Lane Group [s/veh]	34.64	30.89	29.10	26.52		6.14	6.32
Lane Group LOS	C	C	C	C		A	A
Critical Lane Group	No	Yes	No	No		No	Yes
50th-Percentile Queue Length [veh/ln]	0.54	3.71	2.86	0.96		2.97	2.72
50th-Percentile Queue Length [ft/ln]	13.40	92.69	71.58	23.95		74.17	68.04
95th-Percentile Queue Length [veh/ln]	0.96	6.67	5.15	1.72		5.34	4.90
95th-Percentile Queue Length [ft/ln]	24.11	166.85	128.84	43.10		133.50	122.46

Movement, Approach, & Intersection Results

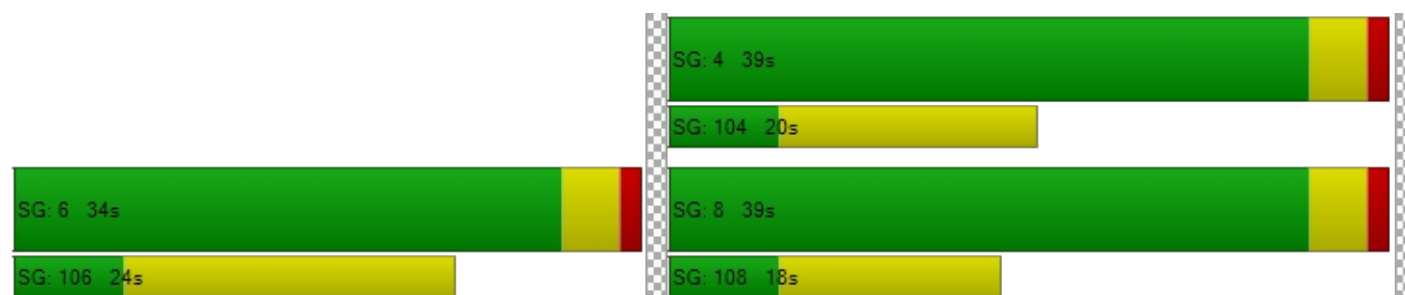
d_M, Delay for Movement [s/veh]	34.64	30.89	0.00	0.00	29.10	26.52	0.00	0.00	0.00	6.14	6.23	6.32
Movement LOS	C	C			C	C				A	A	A
d_A, Approach Delay [s/veh]	31.35			28.42			0.00			6.22		
Approach LOS	C			C			A			A		
d_I, Intersection Delay [s/veh]	13.95											
Intersection LOS	B											
Intersection V/C	0.478											

Other Modes

g_Walk,mi, Effective Walk Time [s]	10.0	10.0	10.0	10.0
M_corner, Corner Circulation Area [ft ² /ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft ² /ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	28.17	28.17	28.17	28.17
I_p,int, Pedestrian LOS Score for Intersection	2.123	2.103	2.165	2.194
Crosswalk LOS	B	B	B	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	928	928	0	795
d_b, Bicycle Delay [s]	10.77	10.77	37.50	13.63
I_b,int, Bicycle LOS Score for Intersection	1.967	1.952	4.132	2.385
Bicycle LOS	A	A	D	B

Sequence

Ring 1	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	6	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-







**Intersection Level Of Service Report
Intersection 2: 5th St and Main St**

Control Type: Signalized
 Analysis Method: HCM 6th Edition
 Analysis Period: 15 minutes

Delay (sec / veh): 26.8
 Level Of Service: C
 Volume to Capacity (v/c): 1.225

Intersection Setup

Name	Main St			Main St			5th St			5th St		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	0	0	1	0	0	1
Entry Pocket Length [ft]	75.00	100.00	100.00	55.00	100.00	100.00	100.00	100.00	50.00	100.00	100.00	75.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Main St			Main St			5th St			5th St		
Base Volume Input [veh/h]	43	690	13	58	582	45	53	69	30	5	48	43
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	5.00	8.00	3.00	3.00	2.00	2.00	4.00	3.00	0.00	2.00	0.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	43	690	13	58	582	45	53	69	30	5	48	43
Peak Hour Factor	0.8700	0.8700	0.8700	0.8700	0.8700	0.8700	0.8700	0.8700	0.8700	0.8700	0.8700	0.8700
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	12	198	4	17	167	13	15	20	9	1	14	12
Total Analysis Volume [veh/h]	49	793	15	67	669	52	61	79	34	6	55	49
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major street	7			12			6			12		
v_di, Inbound Pedestrian Volume crossing major street	6			12			7			12		
v_co, Outbound Pedestrian Volume crossing minor street	4			4			4			4		
v_ci, Inbound Pedestrian Volume crossing minor street	4			4			4			4		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	1			0			0			0		

Intersection Settings

Located in CBD	Yes
Signal Coordination Group	1 - Coordination Group
Cycle Length [s]	75
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	50.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	12.00

Phasing & Timing

Control Type	Protect	Permis	Permis	Protect	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis
Signal Group	1	6	0	5	2	0	0	8	0	0	4	0
Auxiliary Signal Groups												
Lead / Lag	Lead	-	-	Lead	-	-	-	-	-	-	-	-
Minimum Green [s]	7	7	0	7	7	0	0	7	0	0	7	0
Maximum Green [s]	17	40	0	17	40	0	0	22	0	0	22	0
Amber [s]	3.2	3.6	0.0	3.2	3.6	0.0	0.0	3.2	0.0	0.0	3.2	0.0
All red [s]	0.5	1.0	0.0	0.5	1.0	0.0	0.0	1.0	0.0	0.0	1.0	0.0
Split [s]	19	29	0	19	29	0	0	27	0	0	27	0
Vehicle Extension [s]	2.0	3.0	0.0	2.0	3.0	0.0	0.0	2.5	0.0	0.0	2.5	0.0
Walk [s]	0	6	0	0	6	0	0	6	0	0	6	0
Pedestrian Clearance [s]	0	9	0	0	9	0	0	16	0	0	16	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	1.7	2.6	0.0	1.7	2.6	0.0	0.0	2.2	0.0	0.0	2.2	0.0
Minimum Recall	No	Yes		No	Yes			No			No	
Maximum Recall	No	No		No	No			No			No	
Pedestrian Recall	No	No		No	No			No			No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	L	C	C	C	R	C	R
C, Cycle Length [s]	75	75	75	75	75	75	75	75	75	75
L, Total Lost Time per Cycle [s]	3.70	4.60	4.60	3.70	4.60	4.60	4.20	4.20	4.20	4.20
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	2.00	0.00
l2, Clearance Lost Time [s]	1.70	2.60	2.60	1.70	2.60	2.60	2.20	2.20	2.20	2.20
g_i, Effective Green Time [s]	4	35	35	5	35	35	23	23	23	23
g / C, Green / Cycle	0.06	0.46	0.46	0.07	0.47	0.47	0.30	0.30	0.30	0.30
(v / s)_i Volume / Saturation Flow Rate	0.03	0.25	0.25	0.04	0.22	0.22	0.74	0.02	0.06	0.03
s, saturation flow rate [veh/h]	1603	1642	1630	1590	1669	1625	189	1401	941	1419
c, Capacity [veh/h]	96	757	752	112	787	767	126	423	337	428
d1, Uniform Delay [s]	34.20	14.45	14.46	33.84	13.39	13.40	27.83	18.72	19.63	18.91
k, delay calibration	0.04	0.50	0.50	0.04	0.50	0.50	0.50	0.08	0.08	0.08
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	1.57	2.70	2.73	1.92	1.96	2.02	112.96	0.06	0.19	0.09
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.51	0.54	0.54	0.60	0.46	0.46	1.11	0.08	0.18	0.11
d, Delay for Lane Group [s/veh]	35.77	17.15	17.19	35.76	15.35	15.42	140.79	18.78	19.82	19.00
Lane Group LOS	D	B	B	D	B	B	F	B	B	B
Critical Lane Group	No	No	Yes	Yes	No	No	Yes	No	No	No
50th-Percentile Queue Length [veh/ln]	0.89	5.07	5.04	1.21	4.23	4.14	6.22	0.41	0.75	0.60
50th-Percentile Queue Length [ft/ln]	22.15	126.70	126.07	30.32	105.79	103.59	155.45	10.31	18.86	15.01
95th-Percentile Queue Length [veh/ln]	1.60	8.76	8.73	2.18	7.60	7.46	10.87	0.74	1.36	1.08
95th-Percentile Queue Length [ft/ln]	39.88	219.00	218.14	54.57	190.12	186.45	271.74	18.56	33.94	27.02

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	35.77	17.17	17.19	35.76	15.38	15.42	140.79	140.79	18.78	19.82	19.82	19.00
Movement LOS	D	B	B	D	B	B	F	F	B	B	B	B
d_A, Approach Delay [s/veh]	18.24			17.12			116.95			19.45		
Approach LOS	B			B			F			B		
d_I, Intersection Delay [s/veh]	26.75											
Intersection LOS	C											
Intersection V/C	1.225											

Other Modes

g_Walk,mi, Effective Walk Time [s]	10.0	10.0	10.0	10.0
M_corner, Corner Circulation Area [ft ² /ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft ² /ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	28.17	28.17	28.17	28.17
I_p,int, Pedestrian LOS Score for Intersection	2.605	2.708	2.039	2.019
Crosswalk LOS	B	B	B	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	651	651	608	608
d_b, Bicycle Delay [s]	17.08	17.07	18.17	18.17
I_b,int, Bicycle LOS Score for Intersection	2.267	2.210	1.847	1.741
Bicycle LOS	B	B	A	A

Sequence





Ring 1	1	2	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 3: Freedom Blvd and Brennan St

Control Type:	Signalized	Delay (sec / veh):	16.3
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.789

Intersection Setup

Name	Freedom Blvd			Freedom Blvd			Brennan St			Brennan St		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	1	0	0	1	0	0	1	0	0
Entry Pocket Length [ft]	60.00	100.00	80.00	200.00	100.00	100.00	80.00	100.00	100.00	50.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Freedom Blvd			Freedom Blvd			Brennan St			Brennan St		
Base Volume Input [veh/h]	6	436	97	179	401	3	1	2	11	121	2	125
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	4.00	1.00	3.00	3.00	33.00	0.00	0.00	36.00	3.00	33.00	2.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	6	436	97	179	401	3	1	2	11	121	2	125
Peak Hour Factor	0.8300	0.8300	0.8300	0.8300	0.8300	0.8300	0.8300	0.8300	0.8300	0.8300	0.8300	0.8300
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	2	131	29	54	121	1	0	1	3	36	1	38
Total Analysis Volume [veh/h]	7	525	117	216	483	4	1	2	13	146	2	151
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major street	2			5			6			2		
v_di, Inbound Pedestrian Volume crossing major street	2			6			5			2		
v_co, Outbound Pedestrian Volume crossing minor street	2			5			2			4		
v_ci, Inbound Pedestrian Volume crossing minor street	2			4			2			5		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			1			0		

Intersection Settings

Located in CBD	Yes
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	12.00

Phasing & Timing

Control Type	Protect	Permis	Permis	Protect	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis
Signal Group	1	6	0	5	2	0	5	4	0	1	4	0
Auxiliary Signal Groups												
Lead / Lag	Lead	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	5	5	0	5	5	0	5	5	0	5	5	0
Maximum Green [s]	15	32	0	15	32	0	15	15	0	15	15	0
Amber [s]	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
All red [s]	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	6	0	0	6	0	0	5	0	0	5	0
Pedestrian Clearance [s]	0	12	0	0	10	0	0	10	0	0	10	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Minimum Recall	No	No		No	No			No			No	
Maximum Recall	No	No		No	No			No			No	
Pedestrian Recall	No	No		No	No			No			No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	R	L	C	L	C	L	C
C, Cycle Length [s]	50	50	50	50	50	50	50	50	50
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	2.00	0.00	2.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	0	18	18	8	26	11	11	11	11
g / C, Green / Cycle	0.01	0.37	0.37	0.17	0.52	0.22	0.22	0.22	0.22
(v / s)_i Volume / Saturation Flow Rate	0.00	0.32	0.08	0.14	0.29	0.00	0.01	0.12	0.14
s, saturation flow rate [veh/h]	1629	1656	1434	1590	1667	1117	1443	1239	1055
c, Capacity [veh/h]	15	607	525	268	876	203	323	363	236
d1, Uniform Delay [s]	24.51	14.62	10.87	19.90	7.92	22.36	15.13	19.11	17.51
k, delay calibration	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	20.06	3.88	0.21	5.69	0.55	0.01	0.06	0.72	2.96
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.46	0.87	0.22	0.81	0.56	0.00	0.05	0.40	0.65
d, Delay for Lane Group [s/veh]	44.58	18.50	11.08	25.59	8.47	22.37	15.19	19.83	20.47
Lane Group LOS	D	B	B	C	A	C	B	B	C
Critical Lane Group	No	Yes	No	Yes	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	0.16	5.16	0.78	2.57	2.66	0.01	0.12	1.47	1.59
50th-Percentile Queue Length [ft/ln]	4.02	128.88	19.42	64.23	66.43	0.27	3.09	36.86	39.82
95th-Percentile Queue Length [veh/ln]	0.29	8.88	1.40	4.62	4.78	0.02	0.22	2.65	2.87
95th-Percentile Queue Length [ft/ln]	7.23	221.97	34.95	115.61	119.58	0.48	5.57	66.34	71.68

Movement, Approach, & Intersection Results

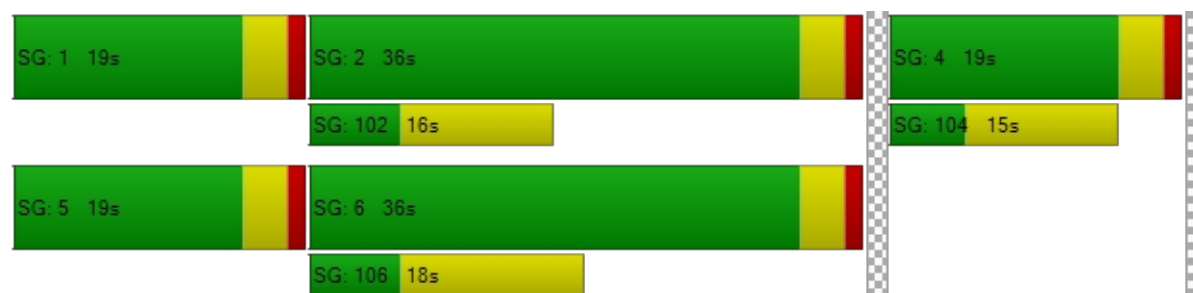
d_M, Delay for Movement [s/veh]	44.58	18.50	11.08	25.59	8.47	8.47	22.37	15.19	15.19	19.83	20.47	20.47
Movement LOS	D	B	B	C	A	A	C	B	B	B	C	C
d_A, Approach Delay [s/veh]	17.44			13.73			15.64			20.16		
Approach LOS	B			B			B			C		
d_I, Intersection Delay [s/veh]	16.35											
Intersection LOS	B											
Intersection V/C	0.789											

Other Modes

g_Walk,mi, Effective Walk Time [s]	9.0	9.0	10.0	10.0
M_corner, Corner Circulation Area [ft ² /ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft ² /ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	36.45	36.45	35.56	35.56
I_p,int, Pedestrian LOS Score for Intersection	2.655	2.392	1.950	2.147
Crosswalk LOS	B	B	A	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	711	711	333	333
d_b, Bicycle Delay [s]	18.69	18.69	31.27	31.25
I_b,int, Bicycle LOS Score for Intersection	2.630	2.720	1.586	2.053
Bicycle LOS	B	B	A	B

Sequence

Ring 1	1	2	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-






Intersection Level Of Service Report

Intersection 4: Brennan St and E 5th St

Control Type: Two-way stop
 Analysis Method: HCM 6th Edition
 Analysis Period: 15 minutes

Delay (sec / veh): 16.2
 Level Of Service: C
 Volume to Capacity (v/c): 0.206

Intersection Setup

Name	Brennan St		Brennan St		E 5th St	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	Brennan St		Brennan St		E 5th St	
Base Volume Input [veh/h]	42	193	185	58	78	53
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	4.00	3.00	0.00	4.00	4.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	42	193	185	58	78	53
Peak Hour Factor	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	12	54	52	16	22	15
Total Analysis Volume [veh/h]	47	217	208	65	88	60
Pedestrian Volume [ped/h]	1		25		17	

Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			No
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance			No
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.04	0.00	0.00	0.00	0.21	0.08
d_M, Delay for Movement [s/veh]	7.96	0.00	0.00	0.00	16.16	12.46
Movement LOS	A	A	A	A	C	B
95th-Percentile Queue Length [veh/ln]	0.12	0.12	0.00	0.00	1.17	1.17
95th-Percentile Queue Length [ft/ln]	2.90	2.90	0.00	0.00	29.13	29.13
d_A, Approach Delay [s/veh]	1.42		0.00		14.66	
Approach LOS	A		A		B	
d_I, Intersection Delay [s/veh]	3.71					
Intersection LOS	C					

Vistro File: C:\...\Existing_20200403.vistro
Report File: C:\...\lex_am.pdf

Scenario 1 Existing_AM
4/10/2020

Turning Movement Volume: Summary

ID	Intersection Name	Northbound		Southbound		Westbound			Total Volume
		Left	Thru	Thru	Right	Left	Thru	Right	
1	Lake Ave/Brennan St-Union St	26	191	154	55	147	670	64	1307

ID	Intersection Name	Northbound			Southbound			Eastbound			Westbound			Total Volume
		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
2	5th St and Main St	43	690	13	58	582	45	53	69	30	5	48	43	1679

ID	Intersection Name	Northbound			Southbound			Eastbound			Westbound			Total Volume
		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
3	Freedom Blvd and Brennan St	6	436	97	179	401	3	1	2	11	121	2	125	1384

ID	Intersection Name	Northbound		Southbound		Eastbound		Total Volume
		Left	Thru	Thru	Right	Left	Right	
4	Brennan St and E 5th St	42	193	185	58	78	53	609

Vistro File: C:\...\Existing_20200403.vistro
Report File: C:\...\lex_pm.pdf

Scenario 2 Existing_PM
4/10/2020

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	Lake Ave/Brennan St-Union St	Signalized	HCM 6th Edition	NB Left	0.557	17.1	B
2	5th St and Main St	Signalized	HCM 6th Edition	EB Thru	1.616	52.0	D
3	Freedom Blvd and Brennan St	Signalized	HCM 6th Edition	NB Left	0.883	20.3	C
4	Brennan St and E 5th St	Two-way stop	HCM 6th Edition	EB Left	0.618	46.3	E

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 1: Lake Ave/Brennan St-Union St

Control Type:	Signalized	Delay (sec / veh):	17.1
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.557

Intersection Setup

Name	Union St			Brennan St			Lake Ave			Lake Ave		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	0	0	1	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	70.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No						No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Union St			Brennan St			Lake Ave			Lake Ave		
Base Volume Input [veh/h]	98	316	0	0	226	85	0	0	0	170	649	118
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	1.00	2.00	2.00	1.00	0.00	2.00	2.00	2.00	0.00	2.00	0.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	98	316	0	0	226	85	0	0	0	170	649	118
Peak Hour Factor	0.9300	0.9300	1.0000	1.0000	0.9300	0.9300	1.0000	1.0000	1.0000	0.9300	0.9300	0.9300
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	26	85	0	0	61	23	0	0	0	46	174	32
Total Analysis Volume [veh/h]	105	340	0	0	243	91	0	0	0	183	698	127
Presence of On-Street Parking	No		No	No		No				No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major street	10			8			9			7		
v_di, Inbound Pedestrian Volume crossing major street	9			7			10			8		
v_co, Outbound Pedestrian Volume crossing minor street	6			12			13			6		
v_ci, Inbound Pedestrian Volume crossing minor street	6			13			12			6		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			3			0			4		

Intersection Settings

Located in CBD	Yes
Signal Coordination Group	1 - Coordination Group
Cycle Length [s]	75
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	48.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis
Signal Group	0	8	0	0	4	0	0	0	0	0	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	-	-	-	-	-	-	-	-	-
Minimum Green [s]	0	7	0	0	7	0	0	0	0	0	7	0
Maximum Green [s]	0	27	0	0	27	0	0	0	0	0	30	0
Amber [s]	0.0	3.2	0.0	0.0	3.2	0.0	0.0	0.0	0.0	0.0	3.2	0.0
All red [s]	0.0	1.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0
Split [s]	0	39	0	0	39	0	0	0	0	0	34	0
Vehicle Extension [s]	0.0	2.5	0.0	0.0	2.5	0.0	0.0	0.0	0.0	0.0	2.5	0.0
Walk [s]	0	6	0	0	6	0	0	0	0	0	6	0
Pedestrian Clearance [s]	0	12	0	0	14	0	0	0	0	0	18	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No						No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	2.2	0.0	0.0	2.2	0.0	0.0	0.0	0.0	0.0	2.2	0.0
Minimum Recall		No			No						No	
Maximum Recall		No			No						No	
Pedestrian Recall		No			No						No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	R		C	C
C, Cycle Length [s]	75	75	75	75		75	75
L, Total Lost Time per Cycle [s]	4.20	4.20	4.20	4.20		4.20	4.20
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	0.00	0.00		0.00	0.00
l2, Clearance Lost Time [s]	2.20	2.20	2.20	2.20		2.20	2.20
g_i, Effective Green Time [s]	21	21	21	21		46	46
g / C, Green / Cycle	0.28	0.28	0.28	0.28		0.61	0.61
(v / s)_i Volume / Saturation Flow Rate	0.10	0.20	0.14	0.07		0.32	0.33
s, saturation flow rate [veh/h]	1010	1696	1696	1395		1655	1447
c, Capacity [veh/h]	235	478	478	393		1003	877
d1, Uniform Delay [s]	31.11	24.19	22.58	20.64		8.59	8.64
k, delay calibration	0.08	0.08	0.08	0.08		0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00		1.00	1.00
d2, Incremental Delay [s]	0.99	1.47	0.62	0.22		2.03	2.37
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00		0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00		1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00		1.00	1.00

Lane Group Results

X, volume / capacity	0.45	0.71	0.51	0.23		0.53	0.54
d, Delay for Lane Group [s/veh]	32.09	25.66	23.20	20.86		10.63	11.01
Lane Group LOS	C	C	C	C		B	B
Critical Lane Group	No	Yes	No	No		No	Yes
50th-Percentile Queue Length [veh/ln]	1.83	5.34	3.51	1.20		4.76	4.31
50th-Percentile Queue Length [ft/ln]	45.82	133.43	87.81	29.95		119.05	107.64
95th-Percentile Queue Length [veh/ln]	3.30	9.13	6.32	2.16		8.34	7.71
95th-Percentile Queue Length [ft/ln]	82.48	228.15	158.06	53.91		208.52	192.72

Movement, Approach, & Intersection Results

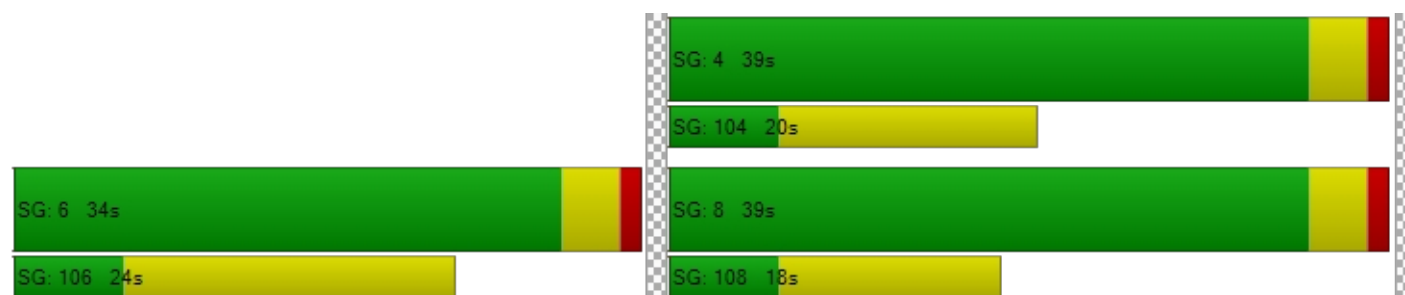
d_M, Delay for Movement [s/veh]	32.09	25.66	0.00	0.00	23.20	20.86	0.00	0.00	0.00	10.63	10.82	11.01
Movement LOS	C	C			C	C				B	B	B
d_A, Approach Delay [s/veh]	27.18			22.56			0.00			10.81		
Approach LOS	C			C			A			B		
d_I, Intersection Delay [s/veh]	17.08											
Intersection LOS	B											
Intersection V/C	0.557											

Other Modes

g_Walk,mi, Effective Walk Time [s]	10.0	10.0	10.0	10.0
M_corner, Corner Circulation Area [ft ² /ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft ² /ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	28.17	28.17	28.17	28.17
I_p,int, Pedestrian LOS Score for Intersection	2.214	2.192	2.291	2.197
Crosswalk LOS	B	B	B	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	928	928	0	795
d_b, Bicycle Delay [s]	10.77	10.79	37.50	13.65
I_b,int, Bicycle LOS Score for Intersection	2.294	2.111	4.132	2.391
Bicycle LOS	B	B	D	B

Sequence

Ring 1	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	6	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-







**Intersection Level Of Service Report
Intersection 2: 5th St and Main St**

Control Type: Signalized
 Analysis Method: HCM 6th Edition
 Analysis Period: 15 minutes

Delay (sec / veh): 52.0
 Level Of Service: D
 Volume to Capacity (v/c): 1.616

Intersection Setup

Name	Main St			Main St			5th St			5th St		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	0	0	1	0	0	1
Entry Pocket Length [ft]	75.00	100.00	100.00	55.00	100.00	100.00	100.00	100.00	50.00	100.00	100.00	75.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Main St			Main St			5th St			5th St		
Base Volume Input [veh/h]	79	720	51	118	838	83	93	119	63	14	62	80
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	1.00	1.00	4.00	0.00	2.00	0.00	0.00	1.00	2.00	0.00	0.00	2.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	79	720	51	118	838	83	93	119	63	14	62	80
Peak Hour Factor	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	21	194	14	32	225	22	25	32	17	4	17	22
Total Analysis Volume [veh/h]	85	774	55	127	901	89	100	128	68	15	67	86
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major street	30			10			29			9		
v_di, Inbound Pedestrian Volume crossing major street	29			9			30			10		
v_co, Outbound Pedestrian Volume crossing minor street	6			17			18			7		
v_ci, Inbound Pedestrian Volume crossing minor street	7			18			17			6		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	3			1			2			2		

Intersection Settings

Located in CBD	Yes
Signal Coordination Group	1 - Coordination Group
Cycle Length [s]	75
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	50.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	12.00

Phasing & Timing

Control Type	Protect	Permis	Permis	Protect	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis
Signal Group	1	6	0	5	2	0	0	8	0	0	4	0
Auxiliary Signal Groups												
Lead / Lag	Lead	-	-	Lead	-	-	-	-	-	-	-	-
Minimum Green [s]	7	7	0	7	7	0	0	7	0	0	7	0
Maximum Green [s]	17	40	0	17	40	0	0	22	0	0	22	0
Amber [s]	3.2	3.6	0.0	3.2	3.6	0.0	0.0	3.2	0.0	0.0	3.2	0.0
All red [s]	0.5	1.0	0.0	0.5	1.0	0.0	0.0	1.0	0.0	0.0	1.0	0.0
Split [s]	19	29	0	19	29	0	0	27	0	0	27	0
Vehicle Extension [s]	2.0	3.0	0.0	2.0	3.0	0.0	0.0	2.5	0.0	0.0	2.5	0.0
Walk [s]	0	6	0	0	6	0	0	6	0	0	6	0
Pedestrian Clearance [s]	0	9	0	0	9	0	0	16	0	0	16	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	1.7	2.6	0.0	1.7	2.6	0.0	0.0	2.2	0.0	0.0	2.2	0.0
Minimum Recall	No	Yes		No	Yes			No			No	
Maximum Recall	No	No		No	No			No			No	
Pedestrian Recall	No	No		No	No			No			No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	L	C	C	C	R	C	R
C, Cycle Length [s]	75	75	75	75	75	75	75	75	75	75
L, Total Lost Time per Cycle [s]	3.70	4.60	4.60	3.70	4.60	4.60	4.20	4.20	4.20	4.20
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	2.00	0.00
l2, Clearance Lost Time [s]	1.70	2.60	2.60	1.70	2.60	2.60	2.20	2.20	2.20	2.20
g_i, Effective Green Time [s]	6	33	33	7	34	34	23	23	23	23
g / C, Green / Cycle	0.08	0.43	0.43	0.10	0.45	0.45	0.30	0.30	0.30	0.30
(v / s)_i Volume / Saturation Flow Rate	0.05	0.25	0.25	0.08	0.30	0.30	1.00	0.05	0.13	0.06
s, saturation flow rate [veh/h]	1616	1696	1647	1629	1683	1610	227	1329	619	1385
c, Capacity [veh/h]	127	737	715	159	763	730	138	401	243	418
d1, Uniform Delay [s]	33.65	15.97	16.00	33.16	16.01	16.10	28.57	19.24	20.67	19.50
k, delay calibration	0.04	0.50	0.50	0.04	0.50	0.50	0.50	0.08	0.08	0.08
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	2.25	3.18	3.31	3.44	4.43	4.81	325.95	0.15	0.60	0.18
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.67	0.57	0.57	0.80	0.66	0.67	1.66	0.17	0.34	0.21
d, Delay for Lane Group [s/veh]	35.90	19.15	19.31	36.60	20.44	20.91	354.52	19.39	21.27	19.68
Lane Group LOS	D	B	B	D	C	C	F	B	C	B
Critical Lane Group	Yes	No	No	No	No	Yes	Yes	No	No	No
50th-Percentile Queue Length [veh/ln]	1.55	5.62	5.53	2.35	7.05	6.94	14.92	0.85	1.04	1.09
50th-Percentile Queue Length [ft/ln]	38.63	140.57	138.16	58.70	176.33	173.41	373.09	21.21	26.11	27.18
95th-Percentile Queue Length [veh/ln]	2.78	9.51	9.38	4.23	11.41	11.26	26.23	1.53	1.88	1.96
95th-Percentile Queue Length [ft/ln]	69.54	237.79	234.55	105.65	285.21	281.39	655.82	38.18	47.00	48.92

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	35.90	19.22	19.31	36.60	20.65	20.91	354.52	354.52	19.39	21.27	21.27	19.68
Movement LOS	D	B	B	D	C	C	F	F	B	C	C	B
d_A, Approach Delay [s/veh]	20.78			22.48			277.53			20.45		
Approach LOS	C			C			F			C		
d_I, Intersection Delay [s/veh]	51.98											
Intersection LOS	D											
Intersection V/C	1.616											

Other Modes

g_Walk,mi, Effective Walk Time [s]	10.0	10.0	10.0	10.0
M_corner, Corner Circulation Area [ft ² /ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft ² /ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	28.17	28.17	28.17	28.17
I_p,int, Pedestrian LOS Score for Intersection	2.682	2.838	2.106	2.087
Crosswalk LOS	B	C	B	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	651	651	608	608
d_b, Bicycle Delay [s]	17.09	17.08	18.18	18.18
I_b,int, Bicycle LOS Score for Intersection	2.314	2.481	2.048	1.837
Bicycle LOS	B	B	B	A

Sequence





Ring 1	1	2	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 3: Freedom Blvd and Brennan St

Control Type:	Signalized	Delay (sec / veh):	20.3
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.883

Intersection Setup

Name	Freedom Blvd			Freedom Blvd			Brennan St			Brennan St		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	1	0	0	1	0	0	1	0	0
Entry Pocket Length [ft]	60.00	100.00	80.00	200.00	100.00	100.00	80.00	100.00	100.00	50.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Freedom Blvd			Freedom Blvd			Brennan St			Brennan St		
Base Volume Input [veh/h]	4	649	184	199	461	2	5	2	6	156	3	217
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	1.00	1.00	1.00	2.00	0.00	0.00	0.00	0.00	1.00	0.00	1.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	4	649	184	199	461	2	5	2	6	156	3	217
Peak Hour Factor	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	171	48	52	121	1	1	1	2	41	1	57
Total Analysis Volume [veh/h]	4	683	194	209	485	2	5	2	6	164	3	228
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major street	4			3			4			5		
v_di, Inbound Pedestrian Volume crossing major street	5			4			3			4		
v_co, Outbound Pedestrian Volume crossing minor street	4			1			3			0		
v_ci, Inbound Pedestrian Volume crossing minor street	3			0			4			1		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			5			1		

Intersection Settings

Located in CBD	Yes
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	12.00

Phasing & Timing

Control Type	Protect	Permis	Permis	Protect	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis
Signal Group	1	6	0	5	2	0	5	4	0	1	4	0
Auxiliary Signal Groups												
Lead / Lag	Lead	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	5	5	0	5	5	0	5	5	0	5	5	0
Maximum Green [s]	15	50	0	15	50	0	15	10	0	15	10	0
Amber [s]	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
All red [s]	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	6	0	0	6	0	0	5	0	0	5	0
Pedestrian Clearance [s]	0	12	0	0	10	0	0	10	0	0	10	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Minimum Recall	No	No		No	No			No			No	
Maximum Recall	No	No		No	No			No			No	
Pedestrian Recall	No	No		No	No			No			No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	R	L	C	L	C	L	C
C, Cycle Length [s]	56	56	56	56	56	56	56	56	56
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	2.00	0.00	2.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	0	25	25	9	34	10	10	10	10
g / C, Green / Cycle	0.01	0.45	0.45	0.16	0.60	0.18	0.18	0.18	0.18
(v / s)_i Volume / Saturation Flow Rate	0.00	0.40	0.14	0.13	0.29	0.00	0.01	0.13	0.16
s, saturation flow rate [veh/h]	1629	1696	1428	1616	1682	1051	1451	1254	1421
c, Capacity [veh/h]	9	764	643	257	1016	128	258	300	252
d1, Uniform Delay [s]	27.92	14.25	9.84	22.87	6.22	28.16	19.15	24.10	22.75
k, delay calibration	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.20	0.31
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	31.30	3.98	0.26	6.11	0.35	0.12	0.05	2.81	28.05
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.45	0.89	0.30	0.81	0.48	0.04	0.03	0.55	0.92
d, Delay for Lane Group [s/veh]	59.22	18.23	10.10	28.98	6.57	28.28	19.20	26.91	50.79
Lane Group LOS	E	B	B	C	A	C	B	C	D
Critical Lane Group	No	Yes	No	Yes	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	0.13	7.37	1.33	2.90	2.37	0.07	0.08	2.23	4.71
50th-Percentile Queue Length [ft/ln]	3.21	184.31	33.17	72.46	59.24	1.71	2.09	55.79	117.83
95th-Percentile Queue Length [veh/ln]	0.23	11.83	2.39	5.22	4.27	0.12	0.15	4.02	8.27
95th-Percentile Queue Length [ft/ln]	5.78	295.63	59.70	130.43	106.64	3.08	3.76	100.43	206.84

Movement, Approach, & Intersection Results

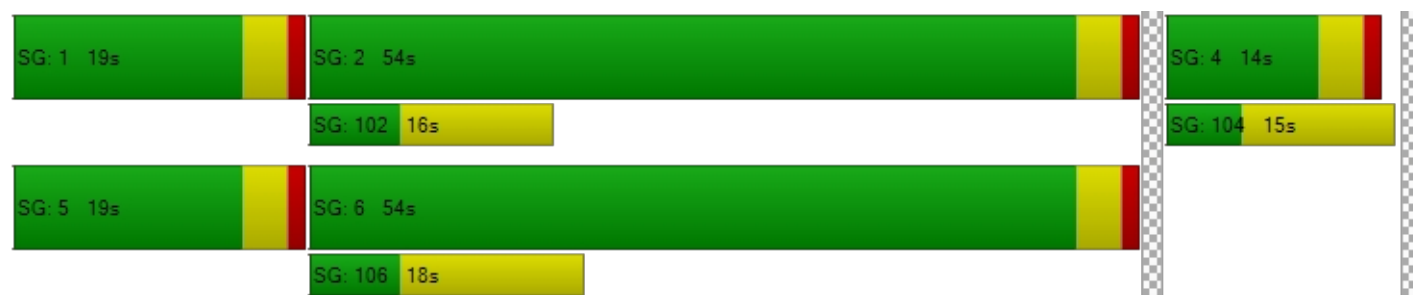
d_M, Delay for Movement [s/veh]	59.22	18.23	10.10	28.98	6.57	6.57	28.28	19.20	19.20	26.91	50.79	50.79
Movement LOS	E	B	B	C	A	A	C	B	B	C	D	D
d_A, Approach Delay [s/veh]	16.62			13.30			22.69			40.88		
Approach LOS	B			B			C			D		
d_I, Intersection Delay [s/veh]	20.32											
Intersection LOS	C											
Intersection V/C	0.883											

Other Modes

g_Walk,mi, Effective Walk Time [s]	9.0	9.0	10.0	10.0
M_corner, Corner Circulation Area [ft ² /ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft ² /ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	36.45	36.45	35.56	35.56
I_p,int, Pedestrian LOS Score for Intersection	2.740	2.473	1.948	2.201
Crosswalk LOS	B	B	A	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1111	1111	222	222
d_b, Bicycle Delay [s]	8.89	8.89	35.64	35.57
I_b,int, Bicycle LOS Score for Intersection	3.013	2.708	1.581	2.211
Bicycle LOS	C	B	A	B

Sequence

Ring 1	1	2	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-






Intersection Level Of Service Report

Intersection 4: Brennan St and E 5th St

Control Type: Two-way stop
 Analysis Method: HCM 6th Edition
 Analysis Period: 15 minutes

Delay (sec / veh): 46.3
 Level Of Service: E
 Volume to Capacity (v/c): 0.618

Intersection Setup

Name	Brennan St		Brennan St		E 5th St	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	Brennan St		Brennan St		E 5th St	
Base Volume Input [veh/h]	84	328	235	55	154	115
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	1.00	1.00	0.00	0.00	1.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	84	328	235	55	154	115
Peak Hour Factor	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	24	92	66	15	43	32
Total Analysis Volume [veh/h]	94	369	264	62	173	129
Pedestrian Volume [ped/h]	1		15		15	

Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			No
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance			No
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.08	0.00	0.00	0.00	0.62	0.18
d_M, Delay for Movement [s/veh]	8.22	0.00	0.00	0.00	46.31	38.45
Movement LOS	A	A	A	A	E	E
95th-Percentile Queue Length [veh/ln]	0.25	0.25	0.00	0.00	6.87	6.87
95th-Percentile Queue Length [ft/ln]	6.30	6.30	0.00	0.00	171.78	171.78
d_A, Approach Delay [s/veh]	1.67		0.00		42.96	
Approach LOS	A		A		E	
d_I, Intersection Delay [s/veh]	12.60					
Intersection LOS	E					

Vistro File: C:\...\Existing_20200403.vistro

Scenario 2 Existing_PM

Report File: C:\...\lex_pm.pdf

4/10/2020

Turning Movement Volume: Summary

ID	Intersection Name	Northbound		Southbound		Westbound			Total Volume
		Left	Thru	Thru	Right	Left	Thru	Right	
1	Lake Ave/Brennan St-Union St	98	316	226	85	170	649	118	1662

ID	Intersection Name	Northbound			Southbound			Eastbound			Westbound			Total Volume
		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
2	5th St and Main St	79	720	51	118	838	83	93	119	63	14	62	80	2320

ID	Intersection Name	Northbound			Southbound			Eastbound			Westbound			Total Volume
		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
3	Freedom Blvd and Brennan St	4	649	184	199	461	2	5	2	6	156	3	217	1888

ID	Intersection Name	Northbound		Southbound		Eastbound		Total Volume
		Left	Thru	Thru	Right	Left	Right	
4	Brennan St and E 5th St	84	328	235	55	154	115	971

Vistro File: C:\...\Existing_20200403.vistro
Report File: C:\...\ex+proj_am.pdf

Scenario 3 Existing+Proj_AM
4/10/2020

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	Lake Ave/Brennan St-Union St	Signalized	HCM 6th Edition	NB Left	0.479	14.1	B
2	5th St and Main St	Signalized	HCM 6th Edition	EB Thru	1.227	26.8	C
3	Freedom Blvd and Brennan St	Signalized	HCM 6th Edition	NB Left	0.791	16.5	B
4	Brennan St and E 5th St	Two-way stop	HCM 6th Edition	EB Left	0.211	16.5	C

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 1: Lake Ave/Brennan St-Union St

Control Type:	Signalized	Delay (sec / veh):	14.1
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.479

Intersection Setup

Name	Union St			Brennan St			Lake Ave			Lake Ave		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	0	0	1	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	70.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No						No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Union St			Brennan St			Lake Ave			Lake Ave		
Base Volume Input [veh/h]	26	193	0	0	159	57	0	0	0	147	670	65
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	8.00	3.00	2.00	2.00	3.00	4.00	2.00	2.00	2.00	3.00	3.00	5.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	26	193	0	0	159	57	0	0	0	147	670	65
Peak Hour Factor	0.8800	0.8800	1.0000	1.0000	0.8800	0.8800	1.0000	1.0000	1.0000	0.8800	0.8800	0.8800
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	7	55	0	0	45	16	0	0	0	42	190	18
Total Analysis Volume [veh/h]	30	219	0	0	181	65	0	0	0	167	761	74
Presence of On-Street Parking	No		No	No		No				No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major street	5			7			5			6		
v_di, Inbound Pedestrian Volume crossing major street	5			6			5			7		
v_co, Outbound Pedestrian Volume crossing minor street	3			14			15			3		
v_ci, Inbound Pedestrian Volume crossing minor street	3			15			14			3		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			2		

Intersection Settings

Located in CBD	Yes
Signal Coordination Group	1 - Coordination Group
Cycle Length [s]	75
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	48.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis
Signal Group	0	8	0	0	4	0	0	0	0	0	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	-	-	-	-	-	-	-	-	-
Minimum Green [s]	0	7	0	0	7	0	0	0	0	0	7	0
Maximum Green [s]	0	27	0	0	27	0	0	0	0	0	30	0
Amber [s]	0.0	3.2	0.0	0.0	3.2	0.0	0.0	0.0	0.0	0.0	3.2	0.0
All red [s]	0.0	1.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0
Split [s]	0	39	0	0	39	0	0	0	0	0	34	0
Vehicle Extension [s]	0.0	2.5	0.0	0.0	2.5	0.0	0.0	0.0	0.0	0.0	2.5	0.0
Walk [s]	0	6	0	0	6	0	0	0	0	0	6	0
Pedestrian Clearance [s]	0	12	0	0	14	0	0	0	0	0	18	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No						No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	2.2	0.0	0.0	2.2	0.0	0.0	0.0	0.0	0.0	2.2	0.0
Minimum Recall		No			No						No	
Maximum Recall		No			No						No	
Pedestrian Recall		No			No						No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	R		C	C
C, Cycle Length [s]	75	75	75	75		75	75
L, Total Lost Time per Cycle [s]	4.20	4.20	4.20	4.20		4.20	4.20
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	0.00	0.00		0.00	0.00
l2, Clearance Lost Time [s]	2.20	2.20	2.20	2.20		2.20	2.20
g_i, Effective Green Time [s]	14	14	14	14		53	53
g / C, Green / Cycle	0.19	0.19	0.19	0.19		0.70	0.70
(v / s)_i Volume / Saturation Flow Rate	0.03	0.13	0.11	0.05		0.32	0.32
s, saturation flow rate [veh/h]	1006	1669	1669	1342		1643	1470
c, Capacity [veh/h]	156	314	314	252		1151	1029
d1, Uniform Delay [s]	34.18	28.46	27.73	25.92		4.97	4.98
k, delay calibration	0.08	0.08	0.08	0.08		0.50	0.50
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00		1.00	1.00
d2, Incremental Delay [s]	0.44	2.09	1.25	0.40		1.32	1.49
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00		0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00		1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00		1.00	1.00

Lane Group Results

X, volume / capacity	0.19	0.70	0.58	0.26		0.46	0.46
d, Delay for Lane Group [s/veh]	34.62	30.55	28.98	26.32		6.29	6.47
Lane Group LOS	C	C	C	C		A	A
Critical Lane Group	No	Yes	No	No		No	Yes
50th-Percentile Queue Length [veh/ln]	0.54	3.72	2.96	0.98		3.03	2.78
50th-Percentile Queue Length [ft/ln]	13.39	93.00	73.94	24.60		75.85	69.55
95th-Percentile Queue Length [veh/ln]	0.96	6.70	5.32	1.77		5.46	5.01
95th-Percentile Queue Length [ft/ln]	24.11	167.39	133.09	44.29		136.53	125.19

Movement, Approach, & Intersection Results

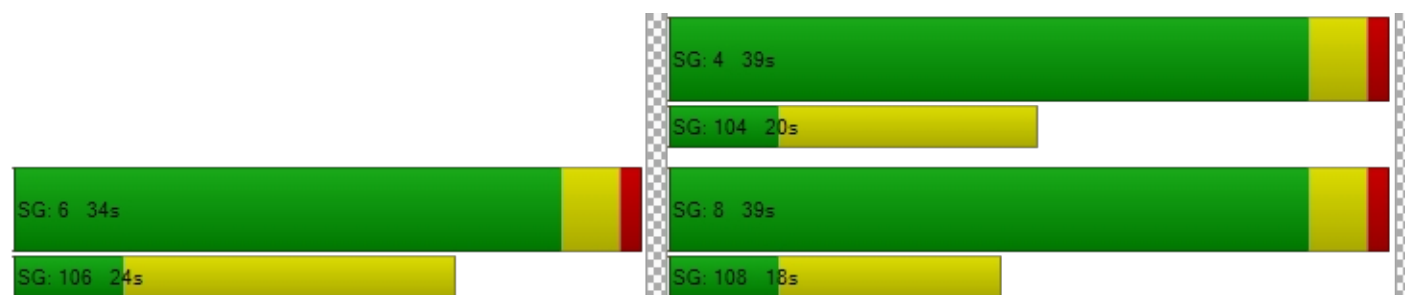
d_M, Delay for Movement [s/veh]	34.62	30.55	0.00	0.00	28.98	26.32	0.00	0.00	0.00	6.29	6.38	6.47
Movement LOS	C	C			C	C				A	A	A
d_A, Approach Delay [s/veh]	31.04			28.28			0.00			6.37		
Approach LOS	C			C			A			A		
d_I, Intersection Delay [s/veh]	14.08											
Intersection LOS	B											
Intersection V/C	0.479											

Other Modes

g_Walk,mi, Effective Walk Time [s]	10.0	10.0	10.0	10.0
M_corner, Corner Circulation Area [ft ² /ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft ² /ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	28.17	28.17	28.17	28.17
I_p,int, Pedestrian LOS Score for Intersection	2.125	2.107	2.166	2.195
Crosswalk LOS	B	B	B	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	928	928	0	795
d_b, Bicycle Delay [s]	10.77	10.77	37.50	13.63
I_b,int, Bicycle LOS Score for Intersection	1.970	1.966	4.132	2.386
Bicycle LOS	A	A	D	B

Sequence

Ring 1	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	6	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-







Intersection Level Of Service Report
Intersection 2: 5th St and Main St

Control Type: Signalized
 Analysis Method: HCM 6th Edition
 Analysis Period: 15 minutes

Delay (sec / veh): 26.8
 Level Of Service: C
 Volume to Capacity (v/c): 1.227

Intersection Setup

Name	Main St			Main St			5th St			5th St		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	0	0	1	0	0	1
Entry Pocket Length [ft]	75.00	100.00	100.00	55.00	100.00	100.00	100.00	100.00	50.00	100.00	100.00	75.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Main St			Main St			5th St			5th St		
Base Volume Input [veh/h]	43	690	14	60	582	45	53	69	30	5	48	47
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	5.00	8.00	3.00	3.00	2.00	2.00	4.00	3.00	0.00	2.00	0.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	43	690	14	60	582	45	53	69	30	5	48	47
Peak Hour Factor	0.8700	0.8700	0.8700	0.8700	0.8700	0.8700	0.8700	0.8700	0.8700	0.8700	0.8700	0.8700
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	12	198	4	17	167	13	15	20	9	1	14	14
Total Analysis Volume [veh/h]	49	793	16	69	669	52	61	79	34	6	55	54
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major street	7			12			6			12		
v_di, Inbound Pedestrian Volume crossing major street	6			12			7			12		
v_co, Outbound Pedestrian Volume crossing minor street	4			4			4			4		
v_ci, Inbound Pedestrian Volume crossing minor street	4			4			4			4		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	1			0			0			0		

Intersection Settings

Located in CBD	Yes
Signal Coordination Group	1 - Coordination Group
Cycle Length [s]	75
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	50.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	12.00

Phasing & Timing

Control Type	Protect	Permis	Permis	Protect	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis
Signal Group	1	6	0	5	2	0	0	8	0	0	4	0
Auxiliary Signal Groups												
Lead / Lag	Lead	-	-	Lead	-	-	-	-	-	-	-	-
Minimum Green [s]	7	7	0	7	7	0	0	7	0	0	7	0
Maximum Green [s]	17	40	0	17	40	0	0	22	0	0	22	0
Amber [s]	3.2	3.6	0.0	3.2	3.6	0.0	0.0	3.2	0.0	0.0	3.2	0.0
All red [s]	0.5	1.0	0.0	0.5	1.0	0.0	0.0	1.0	0.0	0.0	1.0	0.0
Split [s]	19	29	0	19	29	0	0	27	0	0	27	0
Vehicle Extension [s]	2.0	3.0	0.0	2.0	3.0	0.0	0.0	2.5	0.0	0.0	2.5	0.0
Walk [s]	0	6	0	0	6	0	0	6	0	0	6	0
Pedestrian Clearance [s]	0	9	0	0	9	0	0	16	0	0	16	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	1.7	2.6	0.0	1.7	2.6	0.0	0.0	2.2	0.0	0.0	2.2	0.0
Minimum Recall	No	Yes		No	Yes			No			No	
Maximum Recall	No	No		No	No			No			No	
Pedestrian Recall	No	No		No	No			No			No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	L	C	C	C	R	C	R
C, Cycle Length [s]	75	75	75	75	75	75	75	75	75	75
L, Total Lost Time per Cycle [s]	3.70	4.60	4.60	3.70	4.60	4.60	4.20	4.20	4.20	4.20
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	2.00	0.00
l2, Clearance Lost Time [s]	1.70	2.60	2.60	1.70	2.60	2.60	2.20	2.20	2.20	2.20
g_i, Effective Green Time [s]	4	34	34	5	35	35	23	23	23	23
g / C, Green / Cycle	0.06	0.46	0.46	0.07	0.47	0.47	0.30	0.30	0.30	0.30
(v / s)_i Volume / Saturation Flow Rate	0.03	0.25	0.25	0.04	0.22	0.22	0.74	0.02	0.06	0.04
s, saturation flow rate [veh/h]	1603	1642	1629	1590	1669	1625	189	1401	941	1419
c, Capacity [veh/h]	96	756	750	113	787	767	126	423	337	428
d1, Uniform Delay [s]	34.20	14.51	14.52	33.82	13.39	13.40	27.83	18.72	19.63	18.98
k, delay calibration	0.04	0.50	0.50	0.04	0.50	0.50	0.50	0.08	0.08	0.08
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	1.57	2.73	2.76	1.97	1.96	2.02	112.96	0.06	0.19	0.10
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.51	0.54	0.54	0.61	0.46	0.46	1.11	0.08	0.18	0.13
d, Delay for Lane Group [s/veh]	35.77	17.24	17.28	35.79	15.35	15.42	140.79	18.78	19.82	19.08
Lane Group LOS	D	B	B	D	B	B	F	B	B	B
Critical Lane Group	No	No	Yes	Yes	No	No	Yes	No	No	No
50th-Percentile Queue Length [veh/ln]	0.89	5.09	5.06	1.25	4.23	4.14	6.22	0.41	0.75	0.66
50th-Percentile Queue Length [ft/ln]	22.15	127.29	126.61	31.24	105.79	103.59	155.45	10.31	18.86	16.61
95th-Percentile Queue Length [veh/ln]	1.60	8.79	8.76	2.25	7.61	7.46	10.87	0.74	1.36	1.20
95th-Percentile Queue Length [ft/ln]	39.88	219.80	218.88	56.24	190.13	186.46	271.74	18.56	33.94	29.89

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	35.77	17.26	17.28	35.79	15.38	15.42	140.79	140.79	18.78	19.82	19.82	19.08
Movement LOS	D	B	B	D	B	B	F	F	B	B	B	B
d_A, Approach Delay [s/veh]	18.31			17.17			116.95			19.47		
Approach LOS	B			B			F			B		
d_I, Intersection Delay [s/veh]	26.78											
Intersection LOS	C											
Intersection V/C	1.227											

Other Modes

g_Walk,mi, Effective Walk Time [s]	10.0	10.0	10.0	10.0
M_corner, Corner Circulation Area [ft ² /ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft ² /ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	28.17	28.17	28.17	28.17
I_p,int, Pedestrian LOS Score for Intersection	2.605	2.709	2.039	2.022
Crosswalk LOS	B	B	B	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	651	651	608	608
d_b, Bicycle Delay [s]	17.08	17.07	18.17	18.17
I_b,int, Bicycle LOS Score for Intersection	2.267	2.211	1.847	1.749
Bicycle LOS	B	B	A	A

Sequence





Ring 1	1	2	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 3: Freedom Blvd and Brennan St

Control Type:	Signalized	Delay (sec / veh):	16.5
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.791

Intersection Setup

Name	Freedom Blvd			Freedom Blvd			Brennan St			Brennan St		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	1	0	0	1	0	0	1	0	0
Entry Pocket Length [ft]	60.00	100.00	80.00	200.00	100.00	100.00	80.00	100.00	100.00	50.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Freedom Blvd			Freedom Blvd			Brennan St			Brennan St		
Base Volume Input [veh/h]	6	436	97	180	401	3	1	2	11	121	2	128
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	4.00	1.00	3.00	3.00	33.00	0.00	0.00	36.00	3.00	33.00	2.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	6	436	97	180	401	3	1	2	11	121	2	128
Peak Hour Factor	0.8300	0.8300	0.8300	0.8300	0.8300	0.8300	0.8300	0.8300	0.8300	0.8300	0.8300	0.8300
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	2	131	29	54	121	1	0	1	3	36	1	39
Total Analysis Volume [veh/h]	7	525	117	217	483	4	1	2	13	146	2	154
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major street	2			5			6			2		
v_di, Inbound Pedestrian Volume crossing major street	2			6			5			2		
v_co, Outbound Pedestrian Volume crossing minor street	2			5			2			4		
v_ci, Inbound Pedestrian Volume crossing minor street	2			4			2			5		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			1			0		

Intersection Settings

Located in CBD	Yes
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	12.00

Phasing & Timing

Control Type	Protect	Permis	Permis	Protect	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis
Signal Group	1	6	0	5	2	0	5	4	0	1	4	0
Auxiliary Signal Groups												
Lead / Lag	Lead	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	5	5	0	5	5	0	5	5	0	5	5	0
Maximum Green [s]	15	32	0	15	32	0	15	15	0	15	15	0
Amber [s]	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
All red [s]	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	6	0	0	6	0	0	5	0	0	5	0
Pedestrian Clearance [s]	0	12	0	0	10	0	0	10	0	0	10	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Minimum Recall	No	No		No	No			No			No	
Maximum Recall	No	No		No	No			No			No	
Pedestrian Recall	No	No		No	No			No			No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	R	L	C	L	C	L	C
C, Cycle Length [s]	50	50	50	50	50	50	50	50	50
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	2.00	0.00	2.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	0	18	18	8	26	11	11	11	11
g / C, Green / Cycle	0.01	0.37	0.37	0.17	0.53	0.23	0.23	0.23	0.23
(v / s)_i Volume / Saturation Flow Rate	0.00	0.32	0.08	0.14	0.29	0.00	0.01	0.12	0.15
s, saturation flow rate [veh/h]	1629	1656	1434	1590	1667	1114	1443	1239	1055
c, Capacity [veh/h]	15	606	525	269	876	201	326	365	238
d1, Uniform Delay [s]	24.71	14.76	10.97	20.05	7.98	22.57	15.18	19.17	17.63
k, delay calibration	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	20.09	3.91	0.21	5.71	0.55	0.01	0.06	0.71	3.03
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.46	0.87	0.22	0.81	0.56	0.00	0.05	0.40	0.65
d, Delay for Lane Group [s/veh]	44.80	18.67	11.18	25.76	8.53	22.58	15.24	19.88	20.66
Lane Group LOS	D	B	B	C	A	C	B	B	C
Critical Lane Group	No	Yes	No	Yes	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	0.16	5.22	0.79	2.60	2.69	0.01	0.12	1.48	1.64
50th-Percentile Queue Length [ft/ln]	4.04	130.48	19.66	65.12	67.31	0.27	3.11	37.10	41.06
95th-Percentile Queue Length [veh/ln]	0.29	8.97	1.42	4.69	4.85	0.02	0.22	2.67	2.96
95th-Percentile Queue Length [ft/ln]	7.27	224.15	35.39	117.21	121.16	0.49	5.61	66.78	73.91

Movement, Approach, & Intersection Results

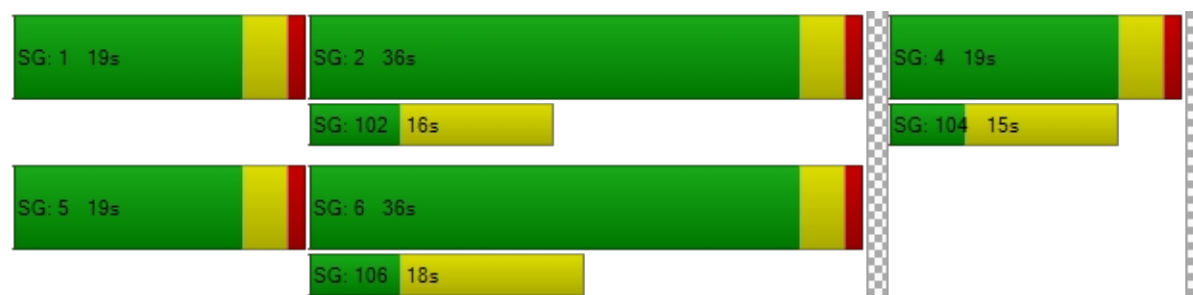
d_M, Delay for Movement [s/veh]	44.80	18.67	11.18	25.76	8.53	8.53	22.58	15.24	15.24	19.88	20.66	20.66
Movement LOS	D	B	B	C	A	A	C	B	B	B	C	C
d_A, Approach Delay [s/veh]	17.60			13.84			15.70			20.28		
Approach LOS	B			B			B			C		
d_I, Intersection Delay [s/veh]	16.48											
Intersection LOS	B											
Intersection V/C	0.791											

Other Modes

g_Walk,mi, Effective Walk Time [s]	9.0			9.0			10.0			10.0		
M_corner, Corner Circulation Area [ft ² /ped]	0.00			0.00			0.00			0.00		
M_CW, Crosswalk Circulation Area [ft ² /ped]	0.00			0.00			0.00			0.00		
d_p, Pedestrian Delay [s]	36.45			36.45			35.56			35.56		
I_p,int, Pedestrian LOS Score for Intersection	2.655			2.393			1.950			2.148		
Crosswalk LOS	B			B			A			B		
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000			2000			2000			2000		
c_b, Capacity of the bicycle lane [bicycles/h]	711			711			333			333		
d_b, Bicycle Delay [s]	18.69			18.69			31.27			31.25		
I_b,int, Bicycle LOS Score for Intersection	2.630			2.721			1.586			2.058		
Bicycle LOS	B			B			A			B		

Sequence

Ring 1	1	2	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-






Intersection Level Of Service Report

Intersection 4: Brennan St and E 5th St

Control Type: Two-way stop
 Analysis Method: HCM 6th Edition
 Analysis Period: 15 minutes

Delay (sec / veh): 16.5
 Level Of Service: C
 Volume to Capacity (v/c): 0.211

Intersection Setup

Name	Brennan St		Brennan St		E 5th St	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	Brennan St		Brennan St		E 5th St	
Base Volume Input [veh/h]	46	196	186	58	78	55
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	4.00	3.00	0.00	4.00	4.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	46	196	186	58	78	55
Peak Hour Factor	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	13	55	52	16	22	15
Total Analysis Volume [veh/h]	52	220	209	65	88	62
Pedestrian Volume [ped/h]	1		25		17	

Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			No
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance			No
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.04	0.00	0.00	0.00	0.21	0.08
d_M, Delay for Movement [s/veh]	7.98	0.00	0.00	0.00	16.50	12.60
Movement LOS	A	A	A	A	C	B
95th-Percentile Queue Length [veh/ln]	0.13	0.13	0.00	0.00	1.21	1.21
95th-Percentile Queue Length [ft/ln]	3.22	3.22	0.00	0.00	30.19	30.19
d_A, Approach Delay [s/veh]	1.52		0.00		14.89	
Approach LOS	A		A		B	
d_I, Intersection Delay [s/veh]	3.81					
Intersection LOS	C					

Vistro File: C:\...\Existing_20200403.vistro

Scenario 3 Existing+Proj_AM

Report File: C:\...\ex+proj_am.pdf

4/10/2020

Turning Movement Volume: Summary

ID	Intersection Name	Northbound		Southbound		Westbound			Total Volume
		Left	Thru	Thru	Right	Left	Thru	Right	
1	Lake Ave/Brennan St-Union St	26	193	159	57	147	670	65	1317

ID	Intersection Name	Northbound			Southbound			Eastbound			Westbound			Total Volume
		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
2	5th St and Main St	43	690	14	60	582	45	53	69	30	5	48	47	1686

ID	Intersection Name	Northbound			Southbound			Eastbound			Westbound			Total Volume
		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
3	Freedom Blvd and Brennan St	6	436	97	180	401	3	1	2	11	121	2	128	1388

ID	Intersection Name	Northbound		Southbound		Eastbound		Total Volume
		Left	Thru	Thru	Right	Left	Right	
4	Brennan St and E 5th St	46	196	186	58	78	55	619

Vistro File: C:\...\Existing_20200403.vistro
Report File: C:\...\lex+prj_pm.pdf

Scenario 4 Existing+Proj_PM
4/10/2020

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	Lake Ave/Brennan St-Union St	Signalized	HCM 6th Edition	NB Left	0.564	17.2	B
2	5th St and Main St	Signalized	HCM 6th Edition	EB Thru	1.616	52.0	D
3	Freedom Blvd and Brennan St	Signalized	HCM 6th Edition	NB Left	0.890	21.2	C
4	Brennan St and E 5th St	Two-way stop	HCM 6th Edition	EB Left	0.638	51.2	F

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 1: Lake Ave/Brennan St-Union St

Control Type:	Signalized	Delay (sec / veh):	17.2
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.564

Intersection Setup

Name	Union St			Brennan St			Lake Ave			Lake Ave		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	0	0	1	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	70.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No						No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Union St			Brennan St			Lake Ave			Lake Ave		
Base Volume Input [veh/h]	98	325	0	0	231	87	0	0	0	170	649	122
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	1.00	2.00	2.00	1.00	0.00	2.00	2.00	2.00	0.00	2.00	0.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	98	325	0	0	231	87	0	0	0	170	649	122
Peak Hour Factor	0.9300	0.9300	1.0000	1.0000	0.9300	0.9300	1.0000	1.0000	1.0000	0.9300	0.9300	0.9300
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	26	87	0	0	62	23	0	0	0	46	174	33
Total Analysis Volume [veh/h]	105	349	0	0	248	94	0	0	0	183	698	131
Presence of On-Street Parking	No		No	No		No				No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major street	10			8			9			7		
v_di, Inbound Pedestrian Volume crossing major street	9			7			10			8		
v_co, Outbound Pedestrian Volume crossing minor street	6			12			13			6		
v_ci, Inbound Pedestrian Volume crossing minor street	6			13			12			6		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			3			0			4		

Intersection Settings

Located in CBD	Yes
Signal Coordination Group	1 - Coordination Group
Cycle Length [s]	75
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	48.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis
Signal Group	0	8	0	0	4	0	0	0	0	0	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	-	-	-	-	-	-	-	-	-
Minimum Green [s]	0	7	0	0	7	0	0	0	0	0	7	0
Maximum Green [s]	0	27	0	0	27	0	0	0	0	0	30	0
Amber [s]	0.0	3.2	0.0	0.0	3.2	0.0	0.0	0.0	0.0	0.0	3.2	0.0
All red [s]	0.0	1.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0
Split [s]	0	39	0	0	39	0	0	0	0	0	34	0
Vehicle Extension [s]	0.0	2.5	0.0	0.0	2.5	0.0	0.0	0.0	0.0	0.0	2.5	0.0
Walk [s]	0	6	0	0	6	0	0	0	0	0	6	0
Pedestrian Clearance [s]	0	12	0	0	14	0	0	0	0	0	18	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No						No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	2.2	0.0	0.0	2.2	0.0	0.0	0.0	0.0	0.0	2.2	0.0
Minimum Recall		No			No						No	
Maximum Recall		No			No						No	
Pedestrian Recall		No			No						No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	R		C	C
C, Cycle Length [s]	75	75	75	75		75	75
L, Total Lost Time per Cycle [s]	4.20	4.20	4.20	4.20		4.20	4.20
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	0.00	0.00		0.00	0.00
l2, Clearance Lost Time [s]	2.20	2.20	2.20	2.20		2.20	2.20
g_i, Effective Green Time [s]	21	21	21	21		45	45
g / C, Green / Cycle	0.28	0.28	0.28	0.28		0.60	0.60
(v / s)_i Volume / Saturation Flow Rate	0.10	0.21	0.15	0.07		0.32	0.33
s, saturation flow rate [veh/h]	1006	1696	1696	1395		1655	1444
c, Capacity [veh/h]	235	483	483	397		998	871
d1, Uniform Delay [s]	31.09	24.16	22.47	20.51		8.74	8.79
k, delay calibration	0.08	0.08	0.08	0.08		0.50	0.50
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00		1.00	1.00
d2, Incremental Delay [s]	0.99	1.54	0.63	0.23		2.08	2.44
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00		0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00		1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00		1.00	1.00

Lane Group Results

X, volume / capacity	0.45	0.72	0.51	0.24		0.54	0.54
d, Delay for Lane Group [s/veh]	32.07	25.70	23.10	20.74		10.82	11.23
Lane Group LOS	C	C	C	C		B	B
Critical Lane Group	No	Yes	No	No		No	Yes
50th-Percentile Queue Length [veh/ln]	1.83	5.49	3.58	1.23		4.85	4.38
50th-Percentile Queue Length [ft/ln]	45.81	137.31	89.47	30.85		121.28	109.57
95th-Percentile Queue Length [veh/ln]	3.30	9.34	6.44	2.22		8.46	7.82
95th-Percentile Queue Length [ft/ln]	82.46	233.40	161.05	55.53		211.59	195.40

Movement, Approach, & Intersection Results

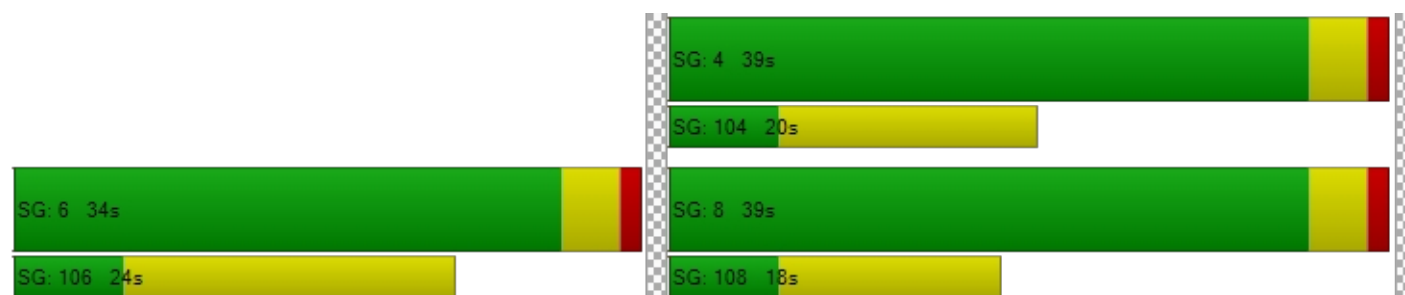
d_M, Delay for Movement [s/veh]	32.07	25.70	0.00	0.00	23.10	20.74	0.00	0.00	0.00	10.82	11.02	11.23
Movement LOS	C	C			C	C				B	B	B
d_A, Approach Delay [s/veh]	27.17			22.45			0.00			11.01		
Approach LOS	C			C			A			B		
d_I, Intersection Delay [s/veh]	17.23											
Intersection LOS	B											
Intersection V/C	0.564											

Other Modes

g_Walk,mi, Effective Walk Time [s]	10.0	10.0	10.0	10.0
M_corner, Corner Circulation Area [ft ² /ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft ² /ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	28.17	28.17	28.17	28.17
I_p,int, Pedestrian LOS Score for Intersection	2.219	2.199	2.293	2.199
Crosswalk LOS	B	B	B	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	928	928	0	795
d_b, Bicycle Delay [s]	10.77	10.79	37.50	13.65
I_b,int, Bicycle LOS Score for Intersection	2.309	2.124	4.132	2.395
Bicycle LOS	B	B	D	B

Sequence

Ring 1	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	6	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-







Intersection Level Of Service Report

Intersection 2: 5th St and Main St

Control Type: Signalized
 Analysis Method: HCM 6th Edition
 Analysis Period: 15 minutes

Delay (sec / veh): 52.0
 Level Of Service: D
 Volume to Capacity (v/c): 1.616

Intersection Setup

Name	Main St			Main St			5th St			5th St		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	0	0	1	0	0	1
Entry Pocket Length [ft]	75.00	100.00	100.00	55.00	100.00	100.00	100.00	100.00	50.00	100.00	100.00	75.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Main St			Main St			5th St			5th St		
Base Volume Input [veh/h]	79	720	51	125	838	83	93	119	63	14	62	84
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	1.00	1.00	4.00	0.00	2.00	0.00	0.00	1.00	2.00	0.00	0.00	2.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	79	720	51	125	838	83	93	119	63	14	62	84
Peak Hour Factor	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	21	194	14	34	225	22	25	32	17	4	17	23
Total Analysis Volume [veh/h]	85	774	55	134	901	89	100	128	68	15	67	90
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major street	30			10			29			9		
v_di, Inbound Pedestrian Volume crossing major street	29			9			30			10		
v_co, Outbound Pedestrian Volume crossing minor street	6			17			18			7		
v_ci, Inbound Pedestrian Volume crossing minor street	7			18			17			6		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	3			1			2			2		

Intersection Settings

Located in CBD	Yes
Signal Coordination Group	1 - Coordination Group
Cycle Length [s]	75
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	50.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	12.00

Phasing & Timing

Control Type	Protect	Permis	Permis	Protect	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis
Signal Group	1	6	0	5	2	0	0	8	0	0	4	0
Auxiliary Signal Groups												
Lead / Lag	Lead	-	-	Lead	-	-	-	-	-	-	-	-
Minimum Green [s]	7	7	0	7	7	0	0	7	0	0	7	0
Maximum Green [s]	17	40	0	17	40	0	0	22	0	0	22	0
Amber [s]	3.2	3.6	0.0	3.2	3.6	0.0	0.0	3.2	0.0	0.0	3.2	0.0
All red [s]	0.5	1.0	0.0	0.5	1.0	0.0	0.0	1.0	0.0	0.0	1.0	0.0
Split [s]	19	29	0	19	29	0	0	27	0	0	27	0
Vehicle Extension [s]	2.0	3.0	0.0	2.0	3.0	0.0	0.0	2.5	0.0	0.0	2.5	0.0
Walk [s]	0	6	0	0	6	0	0	6	0	0	6	0
Pedestrian Clearance [s]	0	9	0	0	9	0	0	16	0	0	16	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	1.7	2.6	0.0	1.7	2.6	0.0	0.0	2.2	0.0	0.0	2.2	0.0
Minimum Recall	No	Yes		No	Yes			No			No	
Maximum Recall	No	No		No	No			No			No	
Pedestrian Recall	No	No		No	No			No			No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	L	C	C	C	R	C	R
C, Cycle Length [s]	75	75	75	75	75	75	75	75	75	75
L, Total Lost Time per Cycle [s]	3.70	4.60	4.60	3.70	4.60	4.60	4.20	4.20	4.20	4.20
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	2.00	0.00
l2, Clearance Lost Time [s]	1.70	2.60	2.60	1.70	2.60	2.60	2.20	2.20	2.20	2.20
g_i, Effective Green Time [s]	6	32	32	8	34	34	23	23	23	23
g / C, Green / Cycle	0.08	0.43	0.43	0.10	0.45	0.45	0.30	0.30	0.30	0.30
(v / s)_i Volume / Saturation Flow Rate	0.05	0.25	0.25	0.08	0.30	0.30	1.00	0.05	0.13	0.06
s, saturation flow rate [veh/h]	1616	1696	1647	1629	1683	1610	227	1329	619	1385
c, Capacity [veh/h]	127	728	707	167	763	730	138	401	243	418
d1, Uniform Delay [s]	33.65	16.25	16.28	32.96	16.01	16.10	28.57	19.24	20.67	19.56
k, delay calibration	0.04	0.50	0.50	0.04	0.50	0.50	0.50	0.08	0.08	0.08
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	2.25	3.30	3.44	3.35	4.43	4.81	325.95	0.15	0.60	0.19
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.67	0.58	0.58	0.80	0.66	0.67	1.66	0.17	0.34	0.22
d, Delay for Lane Group [s/veh]	35.90	19.54	19.72	36.31	20.44	20.91	354.52	19.39	21.27	19.75
Lane Group LOS	D	B	B	D	C	C	F	B	C	B
Critical Lane Group	Yes	No	No	No	No	Yes	Yes	No	No	No
50th-Percentile Queue Length [veh/ln]	1.55	5.70	5.60	2.47	7.05	6.94	14.92	0.85	1.04	1.14
50th-Percentile Queue Length [ft/ln]	38.63	142.42	140.00	61.71	176.32	173.42	373.09	21.21	26.11	28.53
95th-Percentile Queue Length [veh/ln]	2.78	9.61	9.48	4.44	11.41	11.26	26.23	1.53	1.88	2.05
95th-Percentile Queue Length [ft/ln]	69.54	240.28	237.02	111.08	285.20	281.40	655.82	38.18	47.00	51.36

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	35.90	19.62	19.72	36.31	20.65	20.91	354.52	354.52	19.39	21.27	21.27	19.75
Movement LOS	D	B	B	D	C	C	F	F	B	C	C	B
d_A, Approach Delay [s/veh]	21.14			22.53			277.53			20.47		
Approach LOS	C			C			F			C		
d_I, Intersection Delay [s/veh]	52.01											
Intersection LOS	D											
Intersection V/C	1.616											

Other Modes

g_Walk,mi, Effective Walk Time [s]	10.0	10.0	10.0	10.0
M_corner, Corner Circulation Area [ft ² /ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft ² /ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	28.17	28.17	28.17	28.17
I_p,int, Pedestrian LOS Score for Intersection	2.682	2.840	2.106	2.090
Crosswalk LOS	B	C	B	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	651	651	608	608
d_b, Bicycle Delay [s]	17.09	17.08	18.18	18.18
I_b,int, Bicycle LOS Score for Intersection	2.314	2.487	2.048	1.843
Bicycle LOS	B	B	B	A

Sequence





Ring 1	1	2	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 3: Freedom Blvd and Brennan St

Control Type:	Signalized	Delay (sec / veh):	21.2
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.890

Intersection Setup

Name	Freedom Blvd			Freedom Blvd			Brennan St			Brennan St		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	1	0	0	1	0	0	1	0	0
Entry Pocket Length [ft]	60.00	100.00	80.00	200.00	100.00	100.00	80.00	100.00	100.00	50.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Freedom Blvd			Freedom Blvd			Brennan St			Brennan St		
Base Volume Input [veh/h]	4	649	184	203	461	2	5	2	6	156	3	221
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	1.00	1.00	1.00	2.00	0.00	0.00	0.00	0.00	1.00	0.00	1.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	4	649	184	203	461	2	5	2	6	156	3	221
Peak Hour Factor	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	171	48	53	121	1	1	1	2	41	1	58
Total Analysis Volume [veh/h]	4	683	194	214	485	2	5	2	6	164	3	233
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major street	4			3			4			5		
v_di, Inbound Pedestrian Volume crossing major street	5			4			3			4		
v_co, Outbound Pedestrian Volume crossing minor street	4			1			3			0		
v_ci, Inbound Pedestrian Volume crossing minor street	3			0			4			1		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			5			1		

Intersection Settings

Located in CBD	Yes
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	12.00

Phasing & Timing

Control Type	Protect	Permis	Permis	Protect	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis
Signal Group	1	6	0	5	2	0	5	4	0	1	4	0
Auxiliary Signal Groups												
Lead / Lag	Lead	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	5	5	0	5	5	0	5	5	0	5	5	0
Maximum Green [s]	15	50	0	15	50	0	15	10	0	15	10	0
Amber [s]	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
All red [s]	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	6	0	0	6	0	0	5	0	0	5	0
Pedestrian Clearance [s]	0	12	0	0	10	0	0	10	0	0	10	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Minimum Recall	No	No		No	No			No			No	
Maximum Recall	No	No		No	No			No			No	
Pedestrian Recall	No	No		No	No			No			No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	R	L	C	L	C	L	C
C, Cycle Length [s]	57	57	57	57	57	57	57	57	57
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	2.00	0.00	2.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	0	25	25	9	34	10	10	10	10
g / C, Green / Cycle	0.01	0.45	0.45	0.16	0.61	0.18	0.18	0.18	0.18
(v / s)_i Volume / Saturation Flow Rate	0.00	0.40	0.14	0.13	0.29	0.00	0.01	0.13	0.17
s, saturation flow rate [veh/h]	1629	1696	1428	1616	1682	1046	1451	1254	1420
c, Capacity [veh/h]	9	763	642	262	1020	127	256	298	250
d1, Uniform Delay [s]	28.13	14.37	9.92	22.94	6.18	28.37	19.36	24.34	23.08
k, delay calibration	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.20	0.33
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	31.33	4.01	0.26	6.10	0.35	0.13	0.05	2.93	33.90
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.45	0.90	0.30	0.82	0.48	0.04	0.03	0.55	0.94
d, Delay for Lane Group [s/veh]	59.45	18.38	10.18	29.04	6.52	28.49	19.40	27.26	56.98
Lane Group LOS	E	B	B	C	A	C	B	C	E
Critical Lane Group	No	Yes	No	Yes	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	0.13	7.46	1.34	2.99	2.37	0.07	0.08	2.26	5.21
50th-Percentile Queue Length [ft/ln]	3.22	186.41	33.56	74.65	59.23	1.73	2.11	56.55	130.23
95th-Percentile Queue Length [veh/ln]	0.23	11.93	2.42	5.37	4.26	0.12	0.15	4.07	8.95
95th-Percentile Queue Length [ft/ln]	5.80	298.37	60.40	134.37	106.62	3.11	3.80	101.78	223.81

Movement, Approach, & Intersection Results

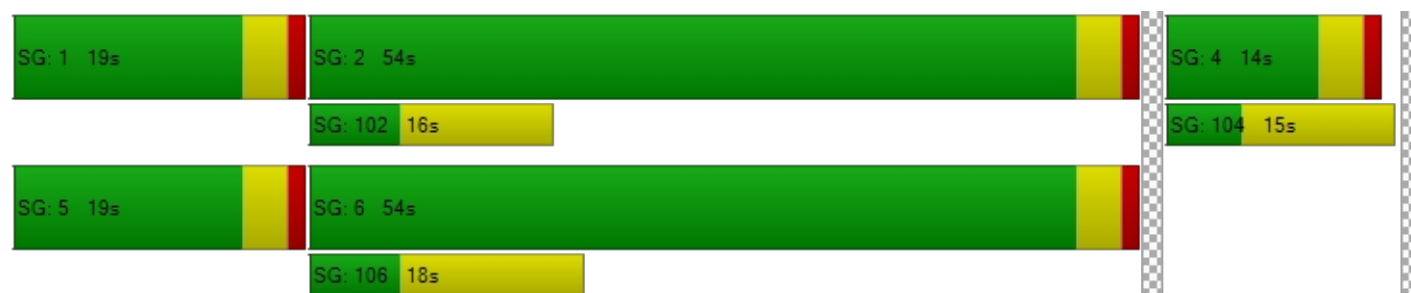
d_M, Delay for Movement [s/veh]	59.45	18.38	10.18	29.04	6.52	6.52	28.49	19.40	19.40	27.26	56.98	56.98
Movement LOS	E	B	B	C	A	A	C	B	B	C	E	E
d_A, Approach Delay [s/veh]	16.76			13.40			22.90			44.80		
Approach LOS	B			B			C			D		
d_I, Intersection Delay [s/veh]	21.24											
Intersection LOS	C											
Intersection V/C	0.890											

Other Modes

g_Walk,mi, Effective Walk Time [s]	9.0			9.0			10.0			10.0		
M_corner, Corner Circulation Area [ft ² /ped]	0.00			0.00			0.00			0.00		
M_CW, Crosswalk Circulation Area [ft ² /ped]	0.00			0.00			0.00			0.00		
d_p, Pedestrian Delay [s]	36.45			36.45			35.56			35.56		
I_p,int, Pedestrian LOS Score for Intersection	2.740			2.476			1.948			2.204		
Crosswalk LOS	B			B			A			B		
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000			2000			2000			2000		
c_b, Capacity of the bicycle lane [bicycles/h]	1111			1111			222			222		
d_b, Bicycle Delay [s]	8.89			8.89			35.64			35.57		
I_b,int, Bicycle LOS Score for Intersection	3.013			2.716			1.581			2.220		
Bicycle LOS	C			B			A			B		

Sequence

Ring 1	1	2	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-






Intersection Level Of Service Report

Intersection 4: Brennan St and E 5th St

Control Type: Two-way stop
 Analysis Method: HCM 6th Edition
 Analysis Period: 15 minutes

Delay (sec / veh): 51.2
 Level Of Service: F
 Volume to Capacity (v/c): 0.638

Intersection Setup

Name	Brennan St		Brennan St		E 5th St	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	Brennan St		Brennan St		E 5th St	
Base Volume Input [veh/h]	88	332	239	55	154	122
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	1.00	1.00	0.00	0.00	1.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	88	332	239	55	154	122
Peak Hour Factor	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	25	93	67	15	43	34
Total Analysis Volume [veh/h]	99	373	269	62	173	137
Pedestrian Volume [ped/h]	1		15		15	

Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			No
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance			No
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.08	0.00	0.00	0.00	0.64	0.19
d_M, Delay for Movement [s/veh]	8.25	0.00	0.00	0.00	51.15	42.90
Movement LOS	A	A	A	A	F	E
95th-Percentile Queue Length [veh/ln]	0.27	0.27	0.00	0.00	7.52	7.52
95th-Percentile Queue Length [ft/ln]	6.69	6.69	0.00	0.00	187.91	187.91
d_A, Approach Delay [s/veh]	1.73		0.00		47.51	
Approach LOS	A		A		E	
d_I, Intersection Delay [s/veh]	13.97					
Intersection LOS	F					

Vistro File: C:\...\Existing_20200403.vistro

Scenario 4 Existing+Proj_PM

Report File: C:\...\lex+prj_pm.pdf

4/10/2020

Turning Movement Volume: Summary

ID	Intersection Name	Northbound		Southbound		Westbound			Total Volume
		Left	Thru	Thru	Right	Left	Thru	Right	
1	Lake Ave/Brennan St-Union St	98	325	231	87	170	649	122	1682

ID	Intersection Name	Northbound			Southbound			Eastbound			Westbound			Total Volume
		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
2	5th St and Main St	79	720	51	125	838	83	93	119	63	14	62	84	2331

ID	Intersection Name	Northbound			Southbound			Eastbound			Westbound			Total Volume
		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
3	Freedom Blvd and Brennan St	4	649	184	203	461	2	5	2	6	156	3	221	1896

ID	Intersection Name	Northbound		Southbound		Eastbound		Total Volume
		Left	Thru	Thru	Right	Left	Right	
4	Brennan St and E 5th St	88	332	239	55	154	122	990