

Appendix K

Transportation Study

**N. Iris Lane (102 Multi-Family Units)
Southwest corner of N. Iris Ln at Robin Hill Ln (PHG20-0032)
Escondido, California**

September 1, 2022

Vehicle Miles Traveled and Local Mobility Analysis

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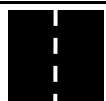
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Executive Summary

This report includes a Vehicle Miles Traveled (VMT) analysis and Local Mobility Analysis (LMA). The VMT analysis determines if there is a potential California Environmental Quality Act (CEQA) transportation VMT impact, while the LMA determines if there are any traffic effects on the surrounding roadways based on City of Escondido General Plan requirements.

The project is a multi-family complex with 102 dwelling units. A zone change and annexation is proposed on a subject property of approximately 7.7 gross acres on the southwest corner of N. Iris Lane at Robin Hill Lane, from the County of San Diego into the City of Escondido. The proposed zoning is PD-R-18 resulting in a density of 13.2 DU/acre (102 units/ 7.7 acres), which is a reduction from the current County of San Diego zoning of 24 DU/acre. The existing site includes 4 single family dwelling units that will be removed. The project applicant is processing the following:

- 1) Zone Change to Urban III with a pre-zone designation of R3
- 2) General Plan Amendment

The **VMT analysis** is required to satisfy the CEQA guidelines that utilize VMT as the measure of mobility effectiveness for determining transportation impacts. The California Governor's Office of Planning and Research (OPR) Technical Advisory developed guidance on implementing Senate Bill 743 (SB 743) that shifts the transportation impact measure of effectiveness from Level of Service (LOS) to VMT.

The project VMT per Capita by Census Tract was obtained from the SANDAG ABM2+ Base Year 2016 screening map. The project is located within census tract 201.05 that has an existing VMT per capita of 18.4 that is at 97.3% of the regional mean of 18.9 VMT per capita. Therefore, the project being located in census tract 201.05 is expected to have similar VMT characteristics of the census tract, resulting in a VMT transportation impact because it is higher than 85% of the regional mean. The project VMT impact is mitigated to below a level of significance through implementation of the California Air Pollution Control Officers Associates (CAPCOA) T-1 VMT reduction measure and payment of \$67,500 to the City of Escondido for pedestrian improvements at five (5) intersections. These mitigation measures are calculated to reduce the project VMT to lower than 85% of the regional mean.

In addition to the above VMT mitigation measures, the project applicant proposes to implement Transportation Demand Management (TDM) strategies to further reduce single occupant vehicle use through promoting alternative modes of transportation. The following TDM plan will provide the means to disseminate information to residents to learn about and use alternative forms of transportation other than single occupancy vehicles. The following TDM elements (to be implemented by the developer at the time of product sales) will be provided during the sales phase and can be incorporated into the project conditions of approval: 1) Provide information about SANDAG's iCommute program (www.icommutesd.com) to encourage carpooling, and 2) Provide information about maps, routes, and schedules for public transit. The applicant will also construct sidewalks along the project frontage on N. Iris Ln (this will complete a missing sidewalk link in the community without taking a VMT credit) and along the project frontage on Robin Hill Ln.



This **LMA analysis** determines if there are any traffic effects caused by the project traffic that would trigger roadway and other multi-modal improvements. The LMA is based on the City of Escondido *Transportation Impact Analysis Guidelines*, April 21, 2021 and includes the analysis of pedestrian, bicycle, transit, and vehicular facilities.

Pedestrian facilities within the ¼-mile walking distance from the project site were evaluated. As part of the project, the applicant will install sidewalks along the project frontage on N. Iris Ln (approximately 850 ft) and along Robin Hill Ln (approximately 440 feet). The sidewalk to be constructed on the westside of N. Iris Ln along the project frontage will complete a missing section, thus improving pedestrian network connectivity for the neighborhood. No other off-site sidewalk improvements are proposed within a ¼-mile walking distance of the project entrance.

Bicycle facilities within a 1-mile bicycling distance from the project site were evaluated. There are existing bike lanes/markings within a 1-mile bicycling distance of the project site on Centre City Pkwy, Country Club Lane, Rincon Ave, El Norte Pkwy near the intersection of S. Iris Ln, and N. Broadway south of Rincon Ave. Within a 1-mile bicycling distance of the project site, N. Broadway north of Rincon Ave, and N. Iris Lane currently do not have bike lanes/markings as proposed in the City's Bicycle Master Plan. As part of the project, the applicant will install Class III bike marking along the project's frontage on N. Iris Ln.

Transit facilities within a ¼-mile walking distance from the project site were evaluated. There are no transit stops within ¼-mile walking distance; however, there are two transit stops just over a ¼-mile walking distance (approximately 1,500 feet away). These bus stops are on N. Broadway near Village Rd. The southbound bus stop has a bus stop sign, a bench, and a trash receptacle. The northbound bus stop has a bus stop sign, a bench with shelter, and a trash receptacle. Both bus stops are in good condition, thus no improvements are proposed.

Vehicular facilities included the analysis of four (4) intersections, and two (2) roadway segments under Existing, Existing plus Project, Existing + Cumulative, Existing + Cumulative + Project, Year 2035, and Year 2035 + Project Conditions. The 102 units are calculated to generate 816 Average Daily Trips (ADT) with 65 AM peak hour trips (13 inbound and 52 outbound) and 81 PM peak hour trips (57 inbound and 24 outbound). For each study scenario, the findings included:

- 1) Under existing conditions, the study intersections and segments were calculated to operate at LOS D or better except for N. Iris Ln from Robin Hill Ln to Centre City Pkwy (LOS E). Also, there is an existing long westbound left turn queue from N. Iris Ln to Centre City Pkwy.
- 2) Under existing plus project conditions, the study intersections and segments were calculated to operate at LOS D or better except for N. Iris Ln from Robin Hill Ln to Centre City Pkwy (LOS E). There is a calculated project traffic effect along the segment of N. Iris Ln from Robin Hill Ln to Centre City Pkwy. Additionally, the project will add traffic to the existing westbound left turn queue from N. Iris Ln to Centre City Pkwy. Project improvements are described below.



- 3) Under near term conditions, the study intersections and segments were calculated to operate at LOS D or better except for N. Iris Ln from Robin Hill Ln to Centre City Pkwy (LOS E). Also, there is a long westbound left turn queue from N. Iris Ln to Centre City Pkwy.
- 4) Under near term plus project conditions, the study intersections and segments were calculated to operate at LOS D or better except for N. Iris Ln from Robin Hill Ln to Centre City Pkwy (LOS E). There is a calculated project traffic effect along the segment of N. Iris Ln from Robin Hill Ln to Centre City Pkwy. Additionally, the project will add traffic to the near-term westbound left turn queue from N. Iris Ln to Centre City Pkwy. Project improvements are described below.
- 5) Under long term year 2035 conditions, the study intersections and segments were calculated to operate at LOS D or better except for N. Iris Ln from Robin Hill Ln to Centre City Pkwy (LOS E). Also, there is a long westbound left turn queue from N. Iris Ln to Centre City Pkwy.
- 6) Under long term year 2035 conditions, the study intersections and segments were calculated to operate at LOS D or better except for N. Iris Ln from Robin Hill Ln to Centre City Pkwy (LOS E). There is a calculated project traffic effect along the segment of N. Iris Ln from Robin Hill Ln to Centre City Pkwy. Also, the project will add traffic to the westbound left turn queue from N. Iris Ln to Centre City Pkwy. Project improvements are described below.

Based on the City of Escondido traffic significance criteria, the project is calculated to have a project effect on the segment of N. Iris Ln from Robin Hill Ln to Centre City Pkwy and will add traffic to an existing excessive westbound left turn queue from N. Iris Ln to Centre City Pkwy. This segment is operating at LOS E without project traffic; therefore, the proposed improvement is widening N. Iris along the project frontage as part of the project construction and contributing a fair share payment of **\$6,975** toward widening the section of N. Iris Ln located northeast of Centre City Pkwy. The intersection of Centre City Pkwy at N. Iris Ln has an existing westbound to southbound left turn volume of 386 vehicles during the AM peak hour. This high left turn volume contributes to a lengthy left turn queue. Since this is an existing deficiency, the applicant will contribute an additional fair share payment of **\$10,075** toward a city improvement of rephasing the operations to a split phase on Iris Lane and restriping the westbound approach from a left and through right configuration to a left and left-through-right configuration.



1.0 Introduction

The project is a multi-family complex with 102 dwelling units. A zone change and annexation is proposed on a subject property of approximately 7.7 gross acres on the southwest corner of N. Iris Lane at Robin Hill Lane from the County of San Diego into the City of Escondido. The proposed zoning is PD-R-18 resulting in a density of 13.2 DU/acre (102 units/ 7.7 acres) , which is a reduction from the current County of San Diego zoning of 24 DU/acre. The site is occupied by four (4) single family homes that will be removed. The location of the project is shown in **Figure 1**. The project site boundary is shown in **Figure 2** with a site plan shown in **Figure 3**. The project applicant is processing the following permits:

- 1) Zone Change to Urban III with a pre-zone designation of R3
- 2) General Plan Amendment

The purpose of this study is to comply with the California Environmental Quality Act (CEQA) requirements by providing a Vehicle Miles Traveled (VMT) analysis and to fulfill the City of Escondido non-CEQA discretionary/entitlements project requirements through preparing a Local Mobility Analysis (LMA). The LMA includes traffic, pedestrian, bicycle, and transit analyses. This report includes the following chapters:

- 1.0 Introduction
- 2.0 VMT Significance Criteria and LMA Project Effect Criteria
- 3.0 Vehicle Miles Traveled Analysis
- 4.0 Traffic Analysis
- 5.0 Pedestrian Analysis
- 6.0 Bicycle Analysis
- 7.0 Transit Analysis
- 8.0 Conclusions
- 9.0 References



Figure 1: Project Location

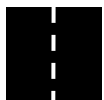
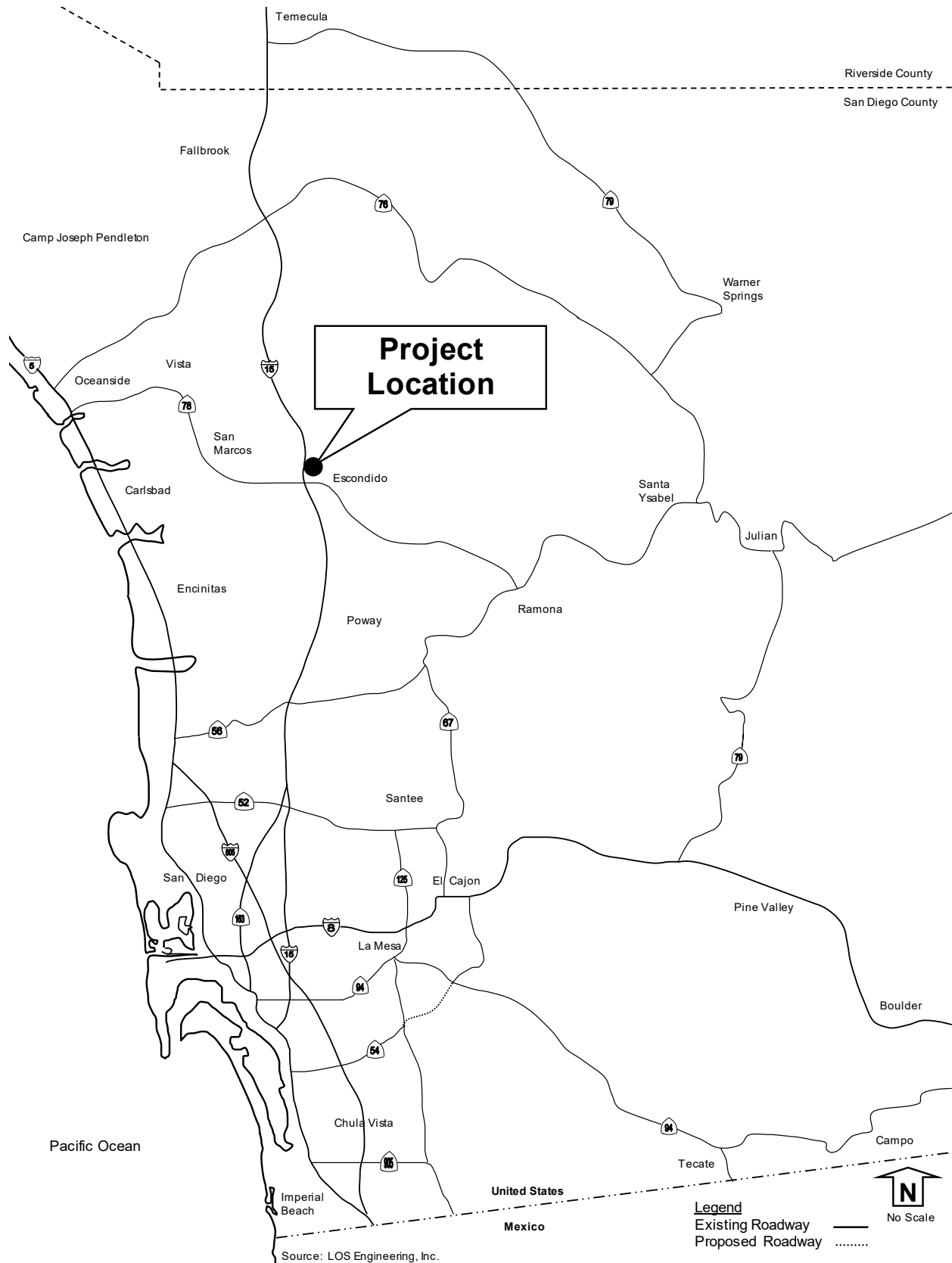


Figure 2: Project Boundary



Source: USGS



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Traffic and Transportation

N. Iris Ln 102 Multi-Family Homes (PHG20-0032) VMT-LMA

September 1, 2022

Figure 3: Site Plan



2.0 VMT Significance and LMA Project Effect Criteria

The City of Escondido *Transportation Impact Analysis Guidelines* (“City Guidelines”) dated April 21, 2021 provide a comprehensive manual for the CEQA VMT significance criteria and for the discretionary/entitlements non-CEQA Local Mobility Analysis traffic effect criteria (excerpts in **Appendix A**).

2.1 Vehicle Miles Traveled Significance Criteria

The City Guidelines document significance thresholds for transportation VMT impacts based on the project type. For residential projects, the metric is VMT/capita. As shown in **Table 1**, the significance threshold for a transportation VMT impact is based on 15% below the regional average of VMT/Capita.

TABLE 1: CITY OF ESCONDIDO PROJECT THRESHOLDS FOR VMT TRANSPORTATION IMPACTS

Project Type	Metric	Significance Thresholds
Residential	VMT/Capita	15% below regional average

Source: The City of Escondido *Transportation Impact Analysis Guidelines* (April 21, 2021).

2.2 Local Mobility Analysis Study Area and Effect Criteria

The City Guidelines document the following modes and study criteria requirements for analysis based on the how far away from the project site individual modes of travel extend or project traffic will travel.

2.2.1 Traffic Study Area

The number of study segments and intersections is based on a threshold level of project trips as shown in **Table 2**.

TABLE 2: ADT THRESHOLDS FOR ROADWAY SEGMENTS TO BE INCLUDED IN THE LMA

Street Classification	Lanes	Cross Section (ft)	LMA Trigger Points (ADT generation)
Prime Arterial	(8 lanes)	116/136 (NP)	900
	(6 lanes)	106/126 (NP)	800
Major Road	(6 lanes)	90/110 (NP)	700
	(4 lanes)	82/102 (NP)	500
Collector	(4 lanes)	64/84 (NP)	500
	(4 lanes)	(WP)	250
Local Collector and other	(2 lanes)	42/66 (NP)	200
	(2 lanes)	(WP)	200

Source: City of Escondido *Transportation Impact Analysis Guidelines* April 2021



The number of study intersection by project trips is shown in **Table 3**.

TABLE 3: ADT THRESHOLDS FOR INTERSECTIONS TO BE INCLUDED IN THE LMA

Intersection Classification	LMA Trigger Points (AM or PM peak hour trips added to any leg)
Prime Arterial	50
Major Road	40
Collector	30
Local Collector	20

Source: City of Escondido *Transportation Impact Analysis Guidelines* April 2021

The study scenarios are required based on the City Guideline criteria:

- 1) Existing Conditions
- 2) Existing + Project Conditions
- 3) Near-Term Conditions (includes near term planned and approved projects)
- 4) Near-Term + Project Conditions
- 5) Long Term (future year) Conditions (if the project is not consistent with the General Plan)
- 6) Long Term (future year) + Project Conditions (if the project is not consistent with the GP)

A completed Scoping Agreement defining the study area based on the above criteria is included in **Appendix B**.

2.2.2 Traffic Effect Criteria

If a proposed project's traffic causes the values shown in the **Table 4** to be exceeded, the effects of the project are determined to justify improvements.

TABLE 4: CITY OF ESCONDIDO LEVEL OF SERVICE THRESHOLDS

Level of Service with Project	Allowable Change Due to Project		
	Roadway Segments		Intersections
	V/C	Speed (mph)	Delay (sec.)
D, E, or F	0.02	1	2

Notes: The Downtown Specific Plan identifies select roadway segments where LOS E is acceptable if adjacent intersection operations are LOS D or better. Transportation Improvement should be considered for any segment or intersection operating at LOS F. V/C: Volume to capacity ratio. The roadway capacity is the LOS E threshold.



2.3 Pedestrian Study Criteria

Documentation of existing and planned pedestrian facilities and any substandard or missing facilities (e.g., missing sidewalk, curb ramps, major obstructions) within a ¼-mile walking distance measured from each pedestrian access point as required on page 28 of the City Guidelines.

2.4 Bicycle Study Criteria

Documentation of existing and planned bicycle facilities and any substandard or missing facilities (e.g., bike lane gaps, obstructions) within a 1-mile bicycling distance measured from the centroid point of the parcel's linear frontage or from the center of the intersection formed by each project driveway as required on page 28 of the City Guidelines.

2.5 Transit Study Criteria

Documentation of transit amenities and connectivity to transit, especially for projects where the entire project site within a ½-mile walkshed from the centroid point of the parcel's linear frontage or to a major transit stop or a high-quality transit corridor. The analysis should identify the closest transit routes and stops to the project within ¼-mile walking distance and documentation of amenities at existing transit stops (e.g., shelters, maps, benches) as required on page 28 of the City Guidelines.



3.0 Vehicle Miles Traveled Analysis

A VMT analysis is required to satisfy the CEQA guidelines that utilize VMT as the measure of effectiveness for determining transportation impacts. The California Governor's Office of Planning and Research (OPR) Technical Advisory developed guidance on implementing Senate Bill 743 (SB 743) that shifts the transportation impact measure of effectiveness from Level of Service (LOS) to VMT.

The City of Escondido *VMT Exchange Program Documentation – Public Review Draft* (“City VMT Exchange Program”) dated August 5, 2022 provides a comprehensive manual for implementation of a VMT Exchange program to provide mitigation options for projects with transportation VMT impacts. Excerpts from the Draft VMT Exchange Program are included in **Appendix C**. The process for using the exchange program includes the following steps.

- 1) Perform Transportation VMT Analysis
- 2) Apply On-Site Mitigation Measures
- 3) Calculate amount of VMT needed to reduce the impact
- 4) Choose VMT Exchange Projects/Programs

3.1 Transportation VMT Analysis

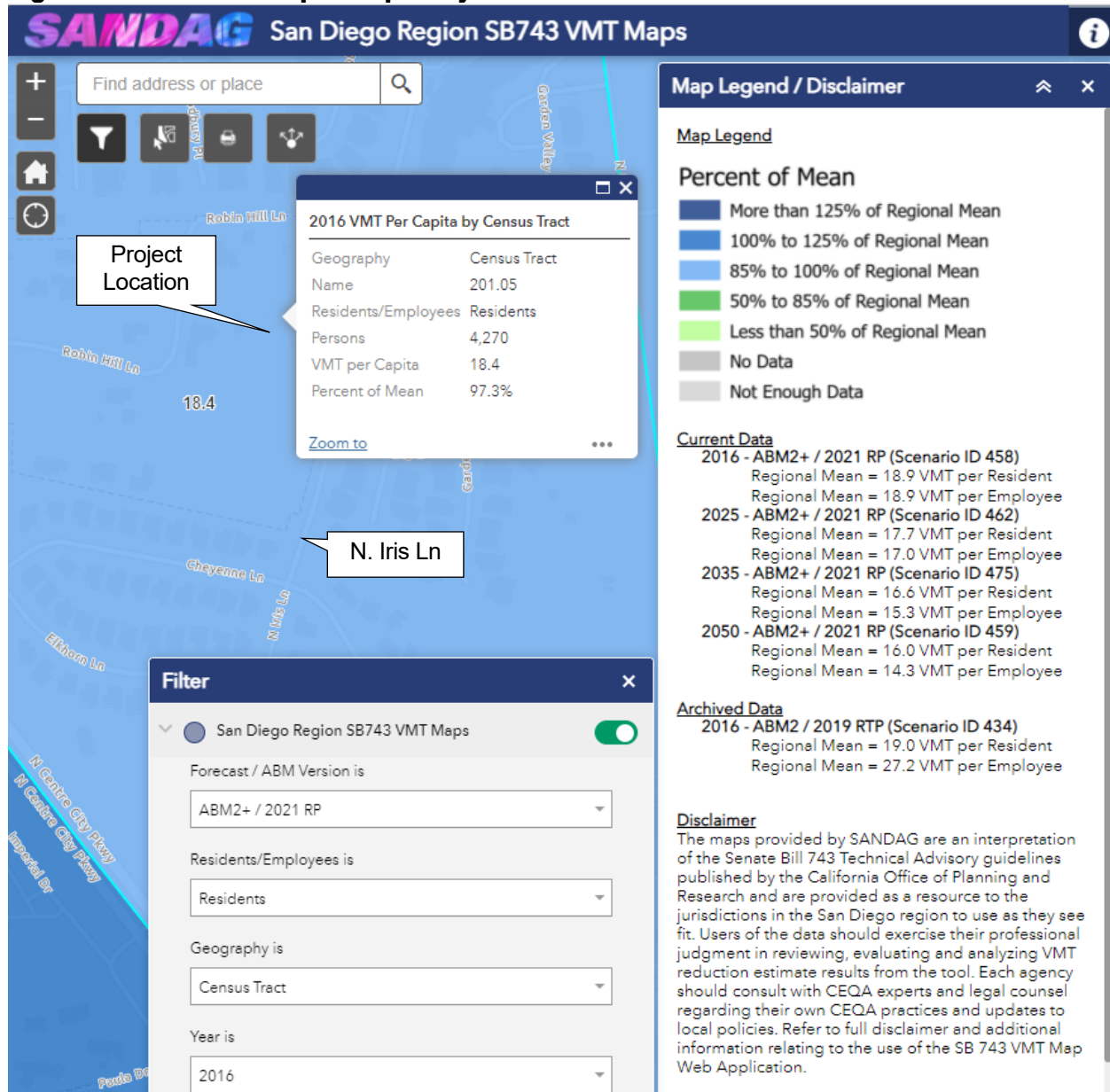
The project VMT per Capita by Census Tract was obtained from the SANDAG ABM2+ Base Year 2016 screening map. The project is located within census tract 201.05 that has an existing VMT per capita of 18.4 that is at 97.3% of the regional mean of 18.9 VMT per capita. The City Guidelines state on page 20:

“The project’s VMT/Capita will be considered the same as the VMT/capita of the census tract it is located in.”

Therefore, the project being located in census tract 201.05 is expected to have similar VMT characteristics of the census tract resulting in a VMT transportation impact because it is higher than 85% of the regional mean. The VMT per Capita by Census Tract is shown in **Figure 4**.



Figure 4: SANDAG VMT per Capita by Census Tract



3.2 On-Site Mitigation Measures

The City Guidelines recommend use of VMT reduction methodologies by the California Air Pollution Control Officers Association (CAPCOA). The CAPCOA *Quantifying Greenhouse Gas Mitigation Measures A Resource for Local Government to Assess Emission Reductions from Greenhouse Gas Mitigation Measures*, December 2021 (“GHG Handbook”) was reviewed for applicability for on-site mitigation measures. The following CAPCOA on-site VMT reduction measure was applied (GHG Handbook excerpts included in **Appendix C**):

- 1) **T-1: Increase Residential Density.** Designing the Project with increased densities, where allowed by the General Plan and/or Zoning Ordinance reduces GHG emissions associated with traffic in several ways. Density is usually measured in terms of persons, jobs, or dwellings per unit area. Increased densities affect the distance people travel and provide greater options for the mode of travel they choose. This strategy also provides a foundation for implementation of many other strategies which would benefit from increased densities. For example, transit ridership increases with density, which justifies enhanced transit service.

VMT reduction measure T-1 is calculated based on the number of housing units per acre. The project with 102 housing units divided by the project site of approximately 7.7 acres equals 13.2 dwelling units per acre. T-1 requirements state that this measure is most accurately quantified when applied to larger developments and/or developments where the density is somewhat similar to the surrounding neighborhood. T-1 also defines key variables for residential density to use acres of developed land, not including streets, school sites, parks, and other undevelopable land. The SANDAG MGRA density with streets and other undevelopable land removed results in a surrounding residential density of 10.6 dwelling units per acre (**Appendix C**). The project at 13.2 du/ac is similar to the surrounding neighborhood density of 10.6 du/ac. The CAPCOA T-1 VMT reduction formula and calculation is shown in **Table 5**.

TABLE 5: CAPCOA VMT REDUCTION MEASURES

VMT Mitigation Measure	Scale of Application	VMT % Reduction Range	Formula and Calculation	Project VMT % Reduction
T-1. Increase Residential Density	Project/Site	0% to 30.0%	$\% \text{ VMT Reduction} = ((B-C)/C) \times -0.22$ Where: B= project density = 13.2 du/ac C = surrounding density = 10.6 du/ac CAPCOA elasticity constant = -0.22. Calculation: $((13.2-10.6)/10.6) \times -0.22 = -0.054$	-5.4%

Source: CAPCOA December 2021

The project VMT per Capita after application of CAPCOA T-1 is $97.3\% - 5.4\% = 91.9\%$. The project continues to have a VMT impact and will require additional VMT reduction measures as mitigation.



3.3 Amount of VMT Needed to Reduce Impact

The transportation VMT impact can be mitigated to below a level of significance if the VMT is reduced to 85% or less of the Regional Mean VMT/Capita. As shown in **Table 6**, at least 426 VMT is required to reduce the impact.

TABLE 6: VMT REDUCTION REQUIRED TO REDUCE IMPACT

Project Number of Dwelling Units	SANDAG Avg		Project VMT/ Capita	Project VMT	Mean VMT/ Capita	Percent of Mean
	Household Size	Persons				
	Person/Unit					
<u>SANDAG Screenline Map VMT Percent of Mean and Project VMT</u>						
102	3.2	326.4	18.40	6,006	18.9	97.3%
<u>CAPCOA T-1 Increase Residential Density VMT % Reduction:</u>						-5.4%
102	3.2	326.4	17.37	5,669	18.9	91.9%
<u>85th Percentile Project VMT</u>						
102	3.2	326.4	16.07	5,244	18.9	85.0%
Required VMT Reduction after CAPCOA On-Site Mitigation =				426		

SANDAG Average Household Size per dwelling unit from Mode Choice Report (Appendix C).

3.4 VMT Exchange Projects/Programs

The City of Escondido has pedestrian VMT reduction measures that are based on CAPCOA's T-18 Pedestrian Network Improvements (**Appendix C**). Providing sidewalks and an enhanced pedestrian network encourages people to walk instead of driving. The City's VMT Exchange Projects include:

- Bus Stop Shelters
- High-Visibility Crosswalks (HVC)
- Pedestrian Hybrid Beacons
- Pedestrian Signals
- Mid-Block Crossing Walks
- Pedestrian Refuge Islands
- Speed Tables
- Bulb-Outs (curb extensions)
- Curb Ramps (on all corners of an intersection)
- Roundabouts
- Mini-Circles
- Pedestrian-Only Connections and Districts
- Planter Strips with Street Trees (minimum 1 mile)

City staff established a reduction of up to 60 VMT per improvement per intersection based on an estimated number of new walking trips resulting from improved pedestrian experience using GHG



Handbook VMT reduction measures as a starting point. The city methodology for the VMT reductions are based on the following (City VMT Exchange Program, Appendix A page 7):

Pedestrian Network Improvements

2. Improve existing pedestrian infrastructure

The GHG Handbook does not provide a quantitative approach for determining the VMT reduction associated with pedestrian improvements or traffic calming. However, the GHG Handbook does document that (GHG Handbook, page 133):

Expanded Mitigation Options

When improving sidewalks, a best practice is to ensure they are contiguous and link externally with existing and planned pedestrian facilities. Barriers to pedestrian access and interconnectivity, such as walls, landscaping buffers, slopes, and unprotected crossings should be minimized. Other best practice features could include high-visibility crosswalks, pedestrian hybrid beacons, and other pedestrian signals, mid-block crossing walks, pedestrian refuge islands, speed tables, bulb-outs (curb extensions), curb ramps, signage, pavement markings, pedestrian-only connections and districts, landscaping, and other improvements to pedestrian safety (see Measure T-35, *Provide Traffic Calming Measures*).

Additionally, GHG Handbook Measure T-35 Provide Traffic Calming also describes improving the bicycle and pedestrian experience by reducing travel speeds, encouraging walking and biking. The measure is described as follows (GHG Handbook, page 53):

T-35. Provide Traffic Calming Measures

This measure requires projects to include pedestrian/bicycle safety and traffic calming measures above jurisdictional requirements. Roadways should also be designed to reduce motor vehicle speeds and encourage pedestrian and bicycle trips with traffic calming features. Traffic calming features may include marked crosswalks, count-down signal timers, curb extensions, speed tables, raised crosswalks, raised intersections, median islands, tight corner radii, roundabouts or mini-circles, on-street parking, planter strips with street trees, chicanes/chokers, and others. Providing traffic calming measures encourages people to walk or bike instead of using a vehicle. This mode shift will result in a decrease in vehicle miles traveled. In 2017, 3,904 people were killed and 277,160 injured by vehicle collisions in California; traffic calming can reduce injuries and death, which improves health (State of California et al., 2018). Traffic calming also promotes active transportation, which improves physical health.

As noted in the GHG Handbook, the improvements are intended to improve pedestrian experience and safety to encourage more people to choose walking instead of driving for nearby destinations. The previous version of the CAPCOA GHG Handbook did provide some limited research about the amount of VMT reduction associated with pedestrian improvements and traffic calming features. However, since the research was limited and not geographically diverse, the update GHG Handbook does not offer specific VMT quantification of these measures.

An engineering/planning judgement estimate was made assuming the number of new walking trips that would result daily from these types of improvements. The improvements are estimated to convert up to 25 short vehicle trips to walking trips per day. The average walking trip length is

0.6 miles one-way (based on the GHG Handbook) or 1.2 miles round-trip. Therefore, 25 additional walking trips reduces VMT by 1.2 miles *25 walking trips = 30 VMT per one pedestrian improvement.

In addition, planning/engineering judgement was used to establish what constitutes “one pedestrian improvement.” For improvements at intersections, (such as enhancing the crosswalks, adding raised crosswalks, or installing median refuse islands) features that improve access for a walking desire line across two intersection legs is considered an improvement. This is logical because if you are walking and need to access the opposite corner of the intersection you would need to cross two legs of the intersection to continue to your desired destination. Therefore, to be inclusive of all walking desire lines the improvements should upgrade the pedestrian conditions on least two intersection legs to be considered one pedestrian improvement.

For mid-block locations, a single crossing provides access to all pedestrian desire lines; therefore, upgrading the mid-block location results in the same VMT reduction benefit as upgrading two legs of an intersection.

Curb ramp installation also encourages pedestrian activity for people who use mobility devices, have limited mobility, and for people who are pushing strollers, wagons, etc. Most intersections in Escondido have curb ramps; however, some intersections have incomplete (not all corners have them) or completely missing ramps. To offer flexibility and achieve the benefit of having curb ramps installed, the 30 VMT reduction per improvement was divided by four (4) to reflect a typical four-corner intersection ($30/4=7.5$, rounded to the nearest whole number = 8). Also note that directional curb ramps are preferred in Escondido, which results in two curb ramps per intersection corner. The 8 VMT reduced is “per corner” not “per ramp.”

Based on the aforementioned city methodology, the proposed VMT reduction measures and city provided cost estimates are included in **Table 7**.

TABLE 7: CITY VMT REDUCTION MEASURES

Intersection	Improvement	City Cost Estimate	VMT Reduction
1) Centre City Pkwy at Iris Ln	Four High-Visibility Crosswalks (HVC) Countdown pedestrian heads 1 intersection upgrade	\$16,000	60 VMT 60 VMT
2) El Norte at S. Iris Ln	Four High-Visibility Crosswalks (HVC) Countdown pedestrian heads 1 intersection upgrade	\$14,000	60 VMT 60 VMT
3) Broadway at Vista Ave	Four High-Visibility Crosswalks (HVC) Countdown pedestrian heads 1 intersection upgrade	\$26,000	60 VMT 60 VMT
4) El Norte at Mountain View	Countdown pedestrian heads 1 intersection upgrade	\$4,000	60 VMT
5) Country Club at Broadway	Three High-Visibility Crosswalks (HVC)	\$7,500	45 VMT
Totals		\$67,500	465 VMT

Source: City of Escondido draft VMT Exchange Program. Cost estimates provided by City staff.



The project transportation VMT impact is mitigated to below a level of significance with the VMT reduction added to the CAPCOA T-1 reduction resulting in a final VMT at 84.4%, which is less than the 85th percentile regional mean as shown in **Table 8**.

TABLE 8: PROJECT VMT MITIGATION RESULTS

Project Number of Dwelling Units	SANDAG Avg Household Size Person/Unit	Persons	Project VMT/ Capita	Project VMT	Mean VMT/ Capita	Percent of Mean
<u>SANDAG Screenline Map VMT Percent of Mean and Project VMT</u>						
102	3.2	326.4	18.40	6,006	18.9	97.3%
<u>CAPCOA T-1 Increase Residential Density VMT % Reduction:</u>						
102	3.2	326.4	17.37	5,669	18.9	91.9%
<u>85th Percentile Project VMT</u>						
102	3.2	326.4	16.07	5,244	18.9	85.0%
<i>Required VMT Reduction after CAPCOA On-Site Mitigation =</i>				<i>426</i>		
<u>City VMT Exchange Program Reduction Measures</u>				<u>Reduction</u>		
Centre City Pkwy/Iris Ln (HVC & count down ped timers)				-120		
El Norte/S. Iris Ln (HVC & count down ped timers)				-120		
Broadway/Vista Ave (HVC & count down ped timers)				-120		
El Norte/Mountain View (count down ped timers)				-60		
Country Club at Broadway (HVC)				-45		
VMT Reduction				-465		
Mitigation reduces VMT by at least 426?				Yes		
Project Final VMT after CAPCOA T-1 mitigation (5,669-465) =				5,204	84.4%	

Dec 2021 CAPCOA, City 2022 VMT Reduction Options. Persons/Unit from SANDAG. HVC: High Visibility Crosswalks

3.5 Other VMT Reduction Measures

In addition to the proposed VMT measures, the project applicant proposes to implement Transportation Demand Management (TDM) strategies to further reduce single occupant vehicle use through promoting alternative modes of transportation. The following TDM plan will provide the means to disseminate information to residents to learn about and use alternative forms of transportation other than single occupancy vehicles. The following TDM elements (to be implemented by the developer at the time of product sales) will be provided during the sales phase and can be incorporated into the project conditions of approval.

- 1) Provide information about SANDAG's iCommute program (www.icommutesd.com) to encourage carpooling.
- 2) Provide information about maps, routes, and schedules for public transit.

The applicant will also construct sidewalks along the project frontage on N. Iris Ln (this will complete a missing sidewalk link in the community without taking a VMT credit) and along the project frontage on Robin Hill Ln.



3.6 VMT Mitigation Summary

The project VMT impact is mitigated to below a level of significance at through implementation of the CAPCOA T-1 VMT reduction measure and payment of **\$67,500** to the City of Escondido for pedestrian improvements at five (5) intersections. These mitigation measures are calculated to reduce the project VMT to lower than 85% of the regional mean.

In addition to the above VMT mitigation measures, the project applicant proposes to implement Transportation Demand Management (TDM) strategies to further reduce single occupant vehicle use through promoting alternative modes of transportation. The following TDM plan will provide the means to disseminate information to residents to learn about and use alternative forms of transportation other than single occupancy vehicles. The following TDM elements (to be implemented by the developer at the time of product sales) will be provided during the sales phase and can be incorporated into the project conditions of approval: 1) Provide information about SANDAG's iCommute program (www.icommutesd.com) to encourage carpooling, and 2) Provide information about maps, routes, and schedules for public transit. The applicant will also construct sidewalks along the project frontage on N. Iris Ln (this will complete a missing sidewalk link in the community without taking a VMT credit) and along the project frontage on Robin Hill Ln.



4.0 Traffic Analysis

The traffic analysis study is based on the criteria outline in Section 2.1 and included the following intersections:

- 1) N. Iris Ln/Village Rd (un-signalized)
- 2) N. Iris Ln/Robin Hill Ln (un-signalized)
- 3) N. Iris Ln/Iris Glen Private Driveway (un-signalized)
- 4) Centre City Pkwy/Iris Lane (signalized)

And the following street segments:

- 1) N. Iris Ln from Village Rd to Robin Hill Ln
- 2) N. Iris Ln from Robin Hill Ln to Centre City Pkwy

4.1 Analysis Methodology

The traffic analyses prepared for this study were based on the *Highway Capacity Manual* (HCM) operations analysis using Level of Service (LOS) evaluation criteria. The operating conditions of the study intersections were measured using the HCM LOS designations, which ranges from A through F. LOS A represents the best operating condition and LOS F denotes the worst operating condition. The LOS criteria for each roadway component are described below.

4.1.1 Intersections

The study intersections were analyzed based on the **operational analysis** outlined in the 6th Edition HCM. This process defines LOS in terms of **average control delay** per vehicle, which is measured in seconds. LOS at the intersections was calculated using the computer software program Synchro 10 (Trafficware Corporation). The 6th Edition HCM LOS for the range of delay by seconds for intersections is shown in **Table 9**.

TABLE 9: INTERSECTION LEVEL OF SERVICE DEFINITIONS (6TH EDITION HCM)

Level of Service	Un-Signalized Control Delay for TWSC, AWSC, and Roundabout (sec/veh where $v/c \leq 1$)	Signalized Control Delay (sec/veh where $v/c \leq 1$)
A	0-10	≤ 10
B	> 10-15	> 10-20
C	> 15-25	> 20-35
D	> 25-35	> 35-55
E	> 35-50	> 55-80
F	> 50	> 80

Source: 6th Edition HCM. TWSC: Two Way Stop Control. AWSC: All Way Stop Control. For unsignalized intersections, the control delay is the worst movement delay in seconds/vehicle.



4.1.2 Street Segments

The street segments were analyzed based on the functional classification of the roadway using the City of Escondido Street Segment Average Daily Vehicle Trip Thresholds table. The roadway segment capacity and LOS standards used to analyze street segments are summarized in **Table 10**.

TABLE 10: STREET SEGMENT DAILY CAPACITY AND LOS (CITY OF ESCONDIDO)

Circulation Element Road Classification	Cross Sections (ft)	LOS A	LOS B	LOS C	LOS D	LOS E
Prime Arterial – 8 Lanes	116/136 (NP)	23,800	37,800	51,800	62,300	70,000
Prime Arterial – 6 Lanes	106/126 (NP)	20,400	32,400	44,400	53,400	60,000
Major Road – 6 Lanes	90/110 (NP)	17,000	27,000	37,000	44,500	50,000
Major Road – 4 Lanes	82/102 (NP)	12,600	20,000	27,400	32,900	37,000
Collector – 4 Lanes	64/84 (NP)	11,600	18,500	25,300	30,400	34,200
Collector – 4 Lanes	(WP)	6,800	10,800	14,800	17,800	20,000
Local Collector – 2 Lanes	42/66 (NP)	5,100	8,100	11,100	13,400	15,000
Local Collector – 2 Lanes	(WP)	3,400	5,400	7,400	8,900	10,000

Source: City of Escondido *Transportation Impact Analysis Guidelines* April 21, 2021. NP: No Parking. WP: With Parking.

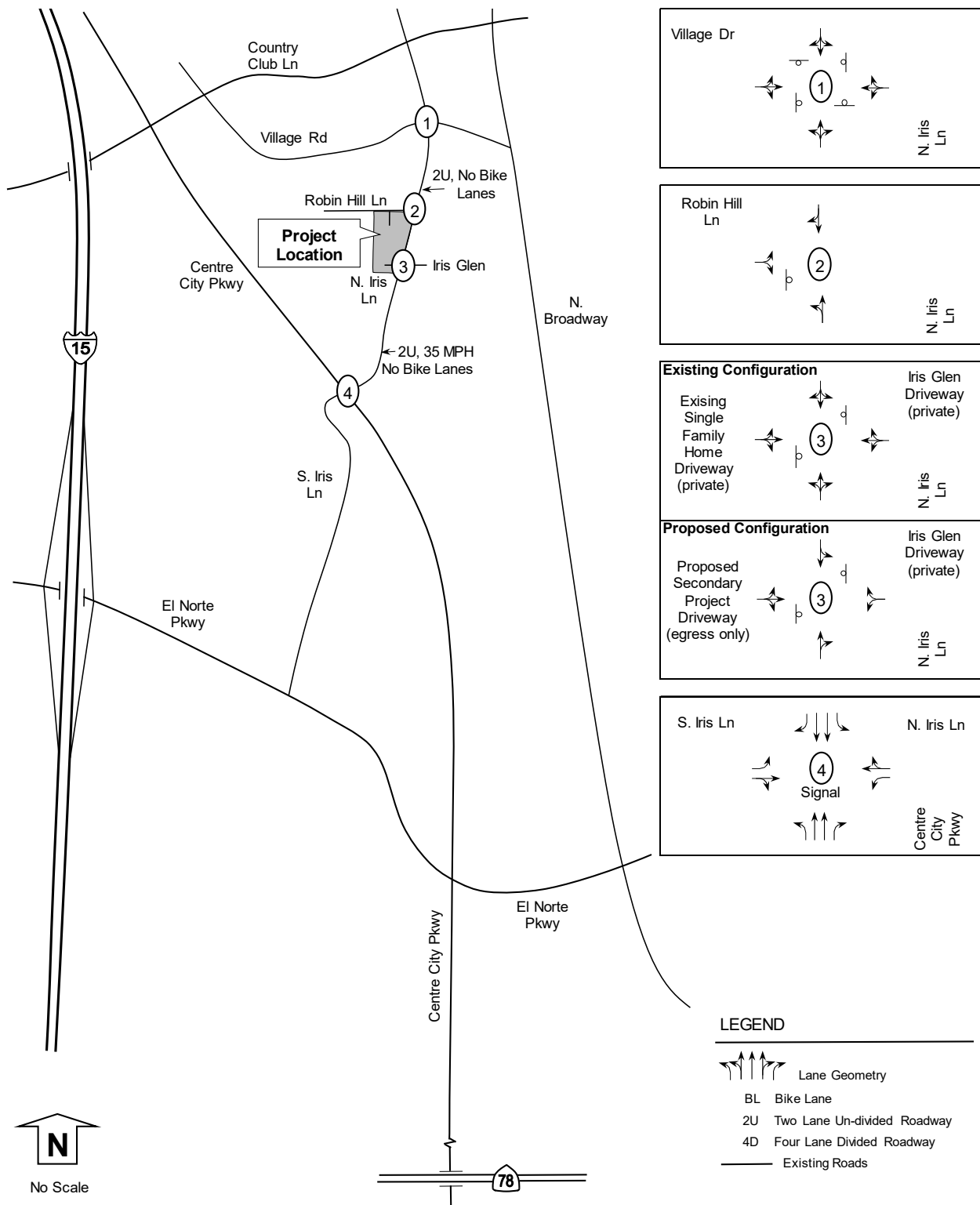
4.2 Existing Traffic Conditions

In the vicinity of the project, the following roadway was analyzed as part of this study with roadway conditions are shown in **Figure 5**.

N. Iris Lane from Village Rd to Centre City Pkwy is classified as a *Local Collector* in the City of Escondido 2012 General Plan (excerpt included in **Appendix D**). This segment of roadway is constructed as a 2-lane un-divided roadway. This segment is posted at 35 MPH with no bike lanes. For the purposes of this analysis, the segment of N. Iris Lane from Robin Hill Lane to Centre City Parkway was analyzed with a capacity of 10,000 ADT at LOS E due to two sections that are not constructed to the ultimate classification width even though the number of travel lanes match the classification. The sections currently not built to the final cross section is from Centre City Parkway to south of Elkhorn Lane (580 feet (both sides)), and from just north of Cheyenne Lane to Robin Hill Lane (880 feet (west side)).



Figure 5: Existing Roadway Conditions



4.3 Existing Traffic Volumes and LOS Analysis

Intersection counts from 7-9 AM and 4-6 PM were collected at the following locations with count dates noted in parentheses:

- 1) N. Iris Ln/Village Rd (10/7/2020)
- 2) N. Iris Ln/Robin Hill Ln (10/7/2020)
- 3) N. Iris Ln/Iris Glen minor leg movements for Meadowbrook Village (8/31/2021)
- 4) Centre City Pkwy/Iris Lane (5/3/2018 & 10/7/2020)

The following street segments were also counted over a 24-hour period:

- 1) N. Iris Ln from Village Rd to Robin Hill Ln (10/7/2020)
- 2) N. Iris Ln from Robin Hill Ln to Centre City Pkwy (5/3/2018 & 10/7/2020)

Due to the Covid Pandemic, historical year 2018 and current year 2020 counts were reviewed to determine which volumes should be used to represent existing conditions. All year 2020 counts collected above were lower than year 2018 counts as follows. ADTs were 35.7% lower. The intersection of Centre City Pkwy/Iris Ln was 92% lower in the AM and 16% lower in the PM. Therefore, the higher year 2018 counts were used to represent existing conditions for the following locations:

- 1) Intersection of Centre City Pkwy/Iris Lane (2018 data used), and
- 2) Segment of N. Iris Ln from Robin Hill Ln to Centre City Pkwy (2018 data used).

For the locations that did not have historical year 2018 counts available, a growth factor was applied to year 2020 counts to represent existing conditions. The growth factor was calculated by taking the reduction between year 2020 and year 2018 counts on the segment of N. Iris Ln between Robin Hill Ln and Centre City Pkwy. This segment had a 35.7% reduction in traffic volume. Therefore, a growth factor of 35.7% was applied to the following locations to represent existing conditions:

- 1) Intersection of N. Iris Ln/Village Rd (2020 data factored up by 35.7%),
- 2) Intersection of N. Iris Ln/Robin Hill Ln (2020 data factored up by 35.7%), and
- 3) Segment of N. Iris Ln from Village Rd to Robin Hill (2020 data factored up by 35.7%).

The turn moves entering and exiting Meadowbrook Village at N. Iris Ln/Iris Glen (minor leg movements) were counted on 8/31/21. These 8/31/21 turn moves were compared against the forecast turn moves in the Meadowbrook Village TIA to which the higher volumes from the TIA were used for existing conditions.

The historical data, calculated growth factors, and applied volumes are included in **Appendix E**. The existing weekday daily and peak hour volumes are shown in **Figure 6**.

The LOS calculated for the intersections and roadway segments are included in **Tables 11 and 12**. Intersection LOS worksheets are included in **Appendix F**.



Figure 6: Existing Volumes

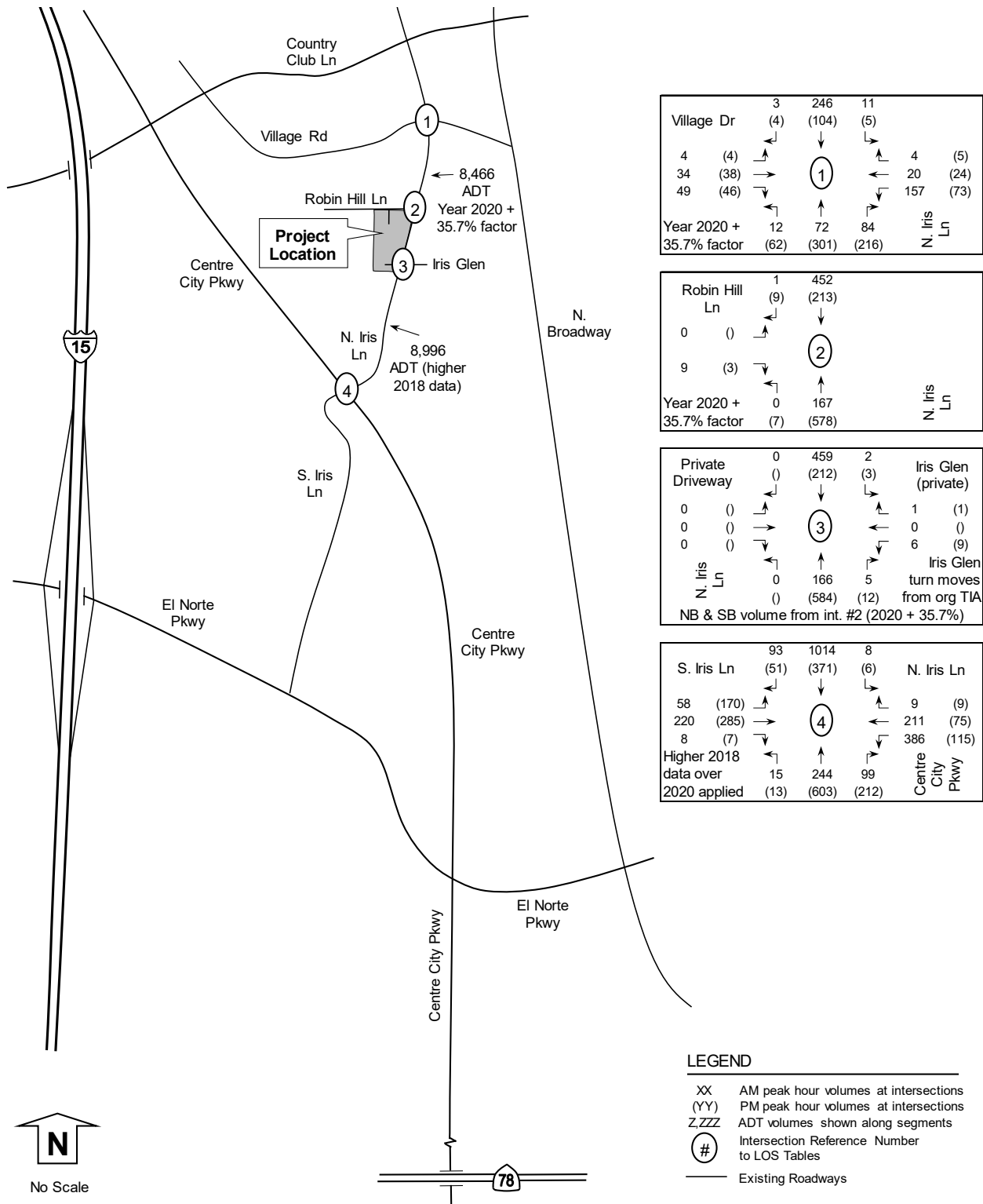


TABLE 11: EXISTING INTERSECTION LEVEL OF SERVICE

Intersection and (Analysis) ¹	Movement	Study Period	Existing	
			Delay ²	LOS ³
1) N. Iris Ln at Village Rd (U)	All	AM	10.3	B
	All	PM	17.6	C
2) N. Iris Ln at Robin Hill Ln (U)	EB	AM	11.5	B
	EB	PM	9.6	A
3) N. Iris Ln at Iris Glen (U)	EB	AM	0.0	A
	WB	AM	14.3	B
	EB	PM	0.0	A
	WB	PM	18.4	C
4) Centre City Pkwy at Iris Ln (S)	All	AM	36.2	D
	All	PM	22.8	C

Notes: 1) Intersection Analysis - (S) Signalized, (U) Unsignalized. 2) Delay - HCM Average Control Delay in seconds. 3) LOS: Level of Service.

TABLE 12: EXISTING SEGMENT VOLUMES AND LEVEL OF SERVICE

Segment	General Plan Classification	LOS E Capacity	Existing			
			Daily Volume	V/C	LOS	
<u>N. Iris Lane</u>						
Village Rd to Robin Hill Ln	2-Ln Local Coll.	15,000	8,466	0.564	C	
Robin Hill Ln to Centre City Pkwy	2-Ln Local Coll.	10,000	8,996	0.900	E	

Notes: Coll. = Collector. Daily volume is a 24 hour volume. V/C: Volume to Capacity Ratio. LOS: Level of Service.

Under existing conditions, the study intersections and segments were calculated to operate at LOS D or better except for N. Iris Ln from Robin Hill Ln to Centre City Pkwy (LOS E). Also, there is an existing long westbound left turn queue from N. Iris Ln to Centre City Pkwy.

4.4 Project Traffic Generation

The project traffic generation was calculated using SANDAG trip rates from the *Brief Guide of Vehicular Traffic Generation Rates for the San Diego Region*, April 2002, for the condominium/multi-family development classification. A trip credit was not applied for the existing four (4) single family homes to be conservative. The 102 units are calculated to generate 816 Average Daily Trips (ADT) with 65 AM peak hour trips (13 in and 52 out) and 81 PM peak hour trips (57 in and 24 out) as shown in **Table 13**.

TABLE 13: PROJECT TRAFFIC GENERATION

Proposed Land Use	Rate	Size & Units	ADT	%	Split	AM			%	Split	PM		
						IN	OUT				IN	OUT	
Residential - Multi Family	8 /DU	102 DU	816	8%	0.2 0.8	13	52	10%	0.7	0.3	57	24	

Source: SANDAG *Brief Guide of Vehicular Traffic Generation Rates for the San Diego Region*, April 2002.



4.5 Project Construction Traffic Generation

Construction traffic includes demolition (removal of existing structures), site preparation (export of basted materials for offsite crushing), grading (soil import), paving, building construction, and architectural coating. Additionally, deliveries of concrete and materials will occur over different phases of activity.

Construction work does not start until 7 AM; however, workers arrive before 7 AM for pre-work task meetings or coordination. Since workers arrive before 7 AM, they will not be any construction worker traffic added to the 7-9 AM peak hour analysis. These workers will typically leave around 3:30 PM; however, a few workers (estimated at 10) may stay late due to unforeseeable circumstances (not anticipated to occur on a regular basis). To account for the unforeseeable circumstances, 10 construction workers are shown in the outbound construction PM peak hour. Work is anticipated to occur Monday through Friday with some potential Saturday work if required.

The highest number of construction workers occurs during the building construction phase. During this phase, there are 112 forecasted workers, and the vendor truck trips are forecasted at approximately 26 per day over an 8-hour period (about 3-4 trucks per hour inbound or 3-4 trucks per hour outbound, which is about 8 inbound and 8 outbound with a Passenger Car Equivalent [PCE] factor of 2 applied). The number of workers and vendor truck trips are from the California Emissions Estimator Model (CalEEMod) provided by LDN Consulting, Inc. As shown in **Table 14**, the highest number of construction workers results in a construction traffic generation of 328 ADT, 16 AM peak hour trips, and 26 PM peak hour trips, which is less than what was analyzed for the project (816 ADT, 65 AM and 81 PM); therefore, the project traffic generation analysis provides a conservative analysis over the temporary construction traffic.

TABLE 14: PROJECT CONSTRUCTION TRAFFIC GENERATION (HIGHEST PHASE)

Highest Concentration Construction Trip Generation	Construction Workers by Phase	Deliveries/ Trucks by Phase	ADT	AM Peak Hour		PM Peak Hour	
				1hr btw 7-9 IN	1hr btw 7-9 OUT	1hr btw 4-6 IN	1hr btw 4-6 OUT
Building Construction Workers	up to 112	na	224	0	0	0	10
Building Construction Deliveries(with PCE)	na	up to 26	104	8	8	8	8
		Totals:	328	8	8	8	18

Source: CalEEMod forecasted workers from LDN Consulting, Inc. Worker egress of 10 PM peak hour trips is not anticipated to occur on a daily basis, rather it would only occur when there are unforeseeable circumstance where a few workers may remain later than normal to complete the work. PCE: Passenger Car Equivalent factor of 2.0.

The demolition, site preparation, and grading phases have fewer construction workers than during the building phase; however, there is a forecasted maximum of approximately 100 trucks per day that are required for either exporting or importing material. Over a typical 8-hour day, there would be about 13 trucks per hour entering and exiting the project site. Using a Passenger Car Equivalent (PCE) factor of 2.0 to convert one truck to two equivalent passenger cars, the AM peak hour is forecasted to have 13 inbound plus 13 outbound trucks, or 26 trucks in an hour. Multiplied by 2.0, the AM construction peak hour would have 26 inbound and 26 outbound, or 52 PCE vehicles, which is less than what was analyzed for the project with 65 AM vehicles; therefore, the project traffic generation analysis provides a conservative analysis over the temporary construction traffic.



4.6 Project Access

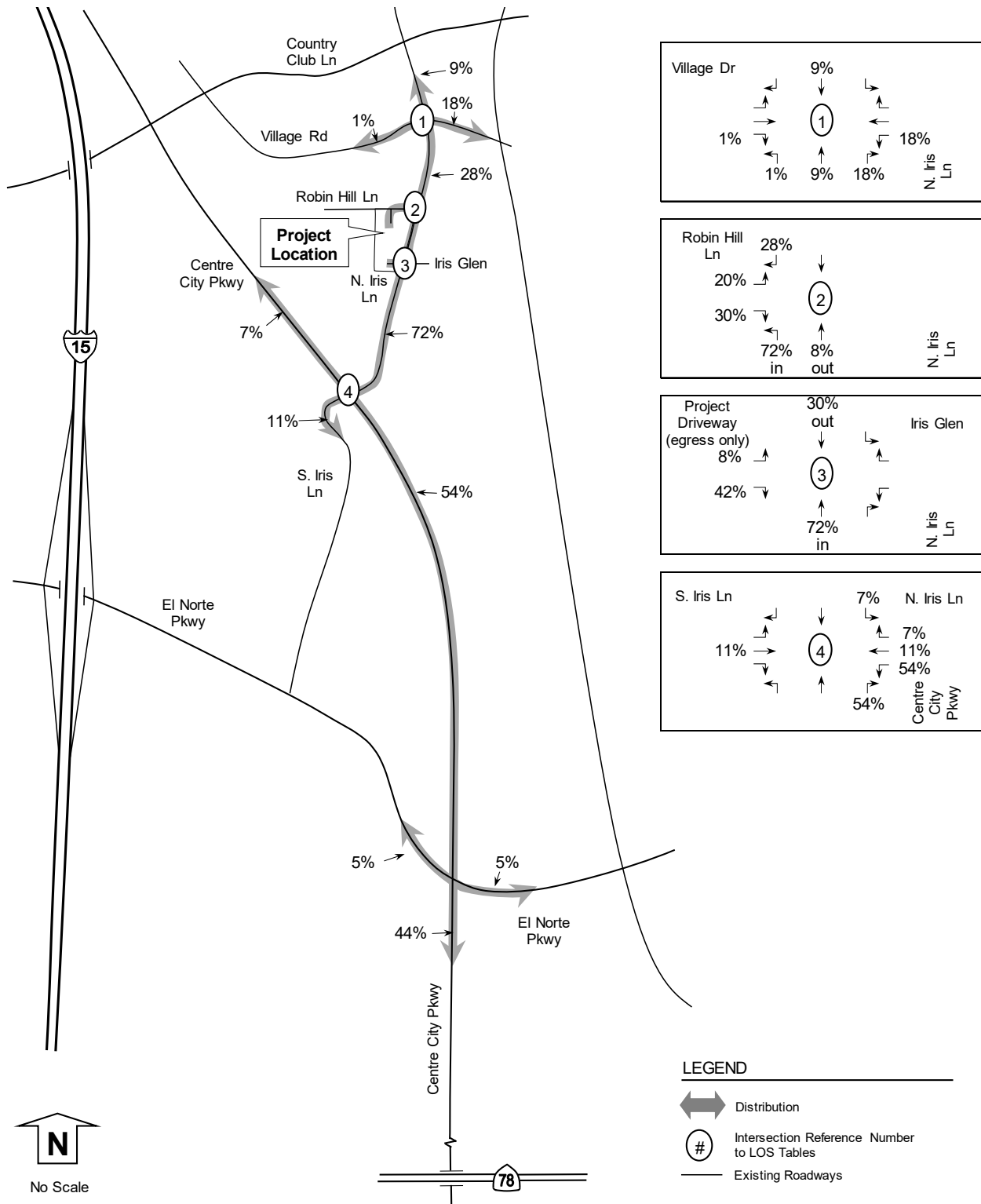
Robin Hill has a full access gated driveway with a secondary egress only gated driveway on N. Iris.

4.7 Project Trip Distribution and Assignment

The distribution was based on a SANDAG Series 14 Year 2035 Select Zone Assignment (SZA) traffic model run that incorporates local and regional trip attractions such as jobs, schools, and shopping. A small scale and large scale copy of the SZA are included in **Appendix G**. The project distribution is shown in **Figure 7** while the trip assignment is shown in **Figure 8**.



Figure 7: Project Distribution



[illegible]

4.8 Existing plus Project Conditions

This scenario accounts for the addition of project traffic onto existing conditions. The traffic volumes are shown in **Figure 9**. The LOS calculated for the study intersections and segments are included in **Tables 15 and 16**. Intersection LOS worksheets are included in **Appendix H**.

TABLE 15: EXISTING PLUS PROJECT INTERSECTION LEVEL OF SERVICE

Intersection and (Analysis) ¹	Movement	Study Period	Existing		Existing + Project			
			Delay ²	LOS ³	Delay ²	LOS ³	Delta ⁴	Effect? ⁵
1) N. Iris Ln at Village Rd (U)	All	AM	10.3	B	10.5	B	0.2	No
	All	PM	17.6	C	18.4	C	0.8	No
2) N. Iris Ln at Robin Hill Ln (U)	EB	AM	11.5	B	12.8	B	1.3	No
	EB	PM	9.6	A	12.6	B	3.0	No
3) N. Iris Ln at Iris Glen (U)	EB	AM	0.0	A	12.5	B	12.5	No
	WB	AM	14.3	B	15.3	C	1.0	No
	EB	PM	0.0	A	11.2	B	11.2	No
	WB	PM	18.4	C	19.9	C	1.5	No
4) Centre City Pkwy at Iris Ln (S)	All	AM	36.2	D	36.6	D	0.4	No
	All	PM	22.8	C	23.7	C	0.9	No

Notes: 1) Intersection Analysis - (S) Signalized, (U) Unsignalized. 2) Delay - HCM Average Control Delay in seconds. 3) LOS: Level of Service. 4) Delta is the increase in delay from project. 5) Project Effect if project traffic exceeds threshold.

TABLE 16: EXISTING PLUS PROJECT SEGMENT VOLUMES AND LEVEL OF SERVICE

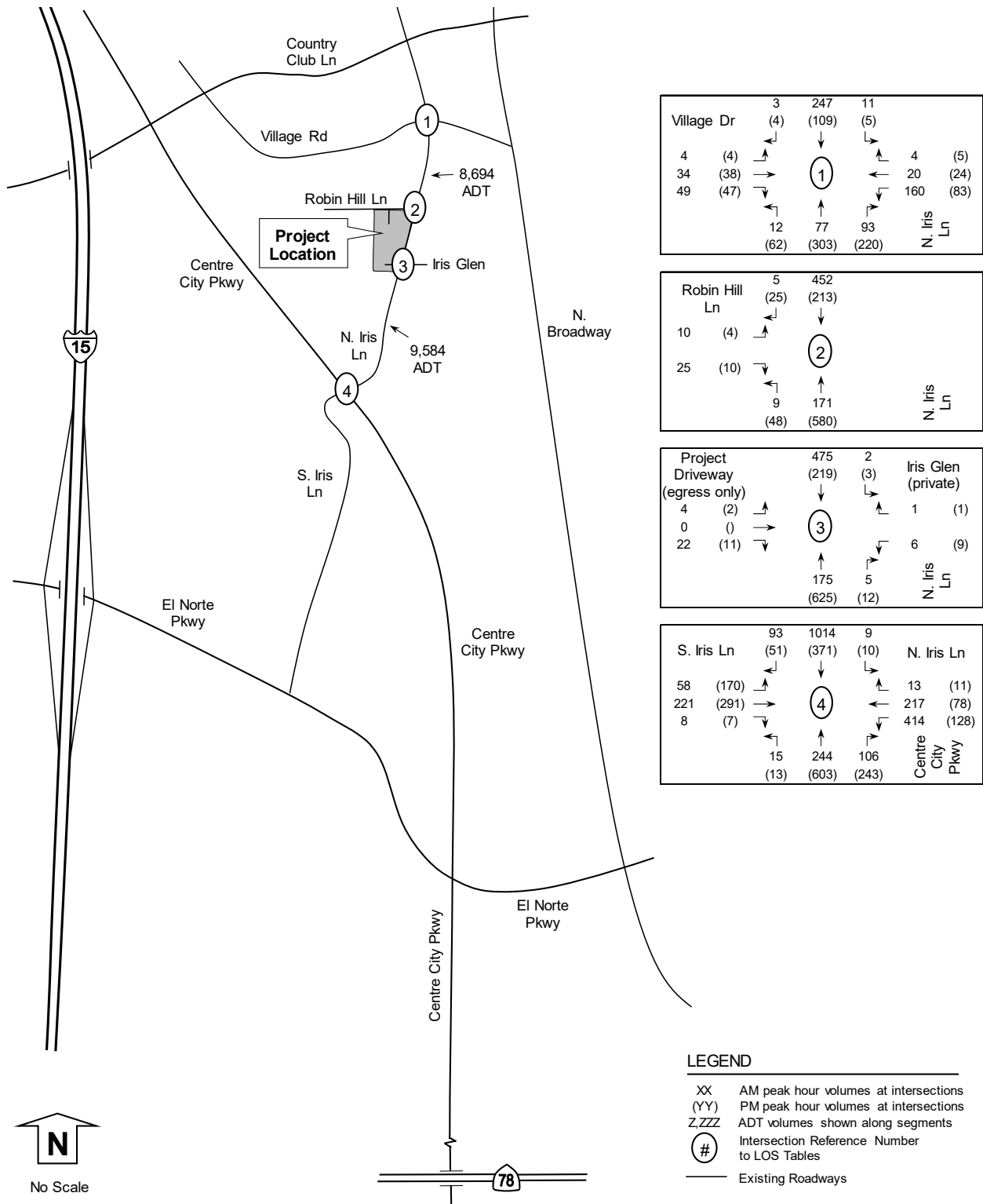
Segment	General Plan Classification	LOS E Capacity	Existing			Project	Existing + Project				
			Daily Volume	V/C	LOS	Daily Volume	Daily Volume	V/C	LOS	Change in V/C	Project Effect?
<u>N. Iris Lane</u>											
Village Rd to Robin Hill Ln	2-Ln Local Coll.	15,000	8,466	0.564	C	228	8,694	0.580	C	0.015	No
Robin Hill Ln to Centre City Pkwy	2-Ln Local Coll.	10,000	8,996	0.900	E	588	9,584	0.958	E	0.059	Yes

Notes: Coll. = Collector. Daily volume is a 24 hour volume. V/C: Volume to Capacity Ratio. LOS: Level of Service. Effect: Yes or No.

Under existing plus project conditions, the study intersections and segments were calculated to operate at LOS D or better except for N. Iris Ln from Robin Hill Ln to Centre City Pkwy (LOS E). There is a calculated project traffic effect along the segment of N. Iris Ln from Robin Hill Ln to Centre City Pkwy. Additionally, the project will add traffic to the existing westbound left turn queue from N. Iris Ln to Centre City Pkwy. Project improvements are described in Section 4.14.



Figure 9: Existing plus Project Volumes



4.9 Near Term Cumulative Projects

Based on a review of City of Escondido on-line cumulative projects the following cumulative projects were determined to add traffic to the study area. Individual cumulative project assignments are included in **Appendix I**. The following cumulative project (referenced by city map # included in Appendix I) were included in this analysis.

City Map #29: Escondido Country Club – The Villages. A mixed-use project with 392 single family homes, recreational amenities, and an urban farm generally located north of El Norte Parkway, west of I-15, along on both side of Country Club Lane.

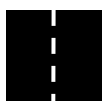
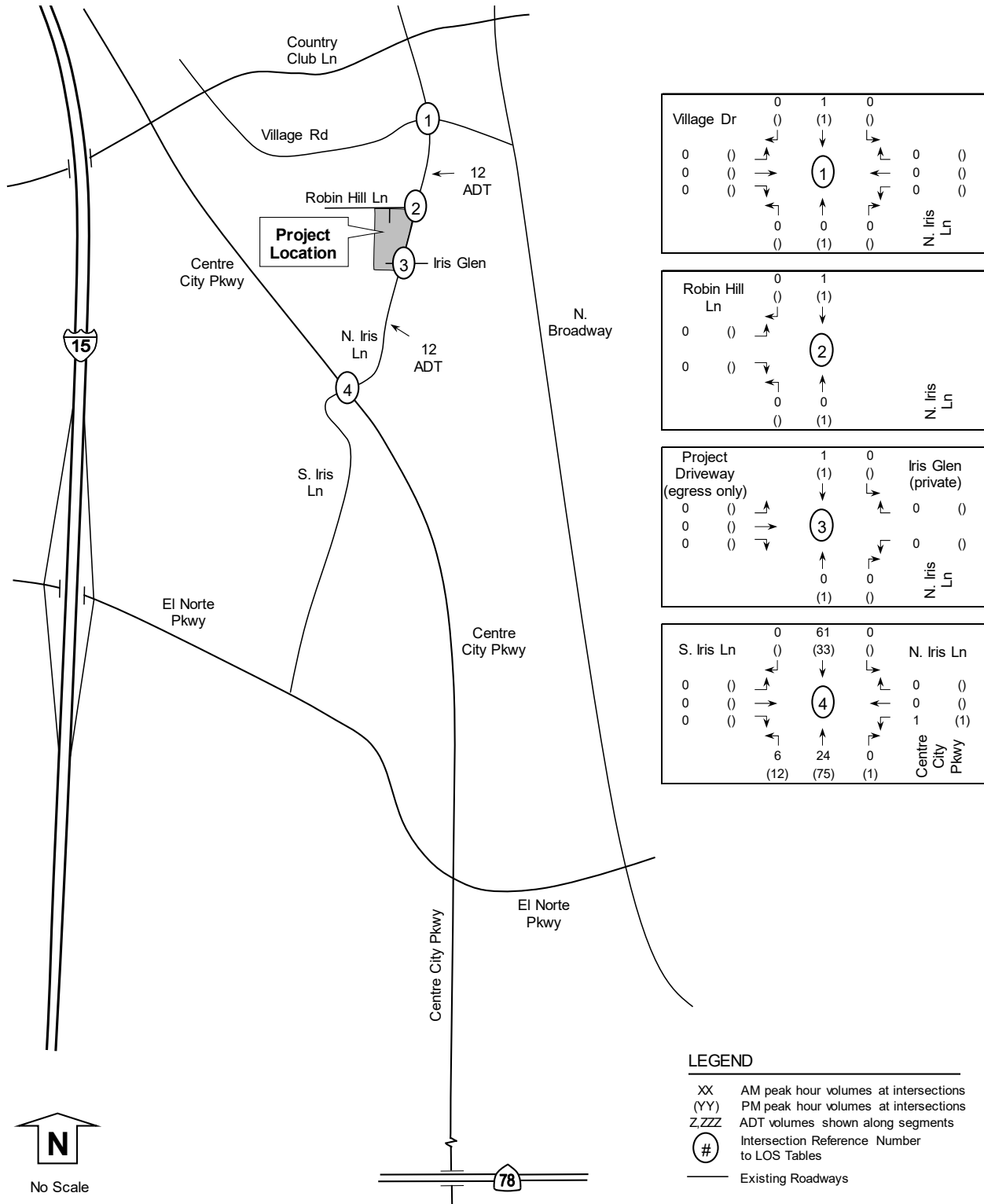
City Map #109 & 136: Nutmeg Residences (137 townhomes and 97 single family homes) generally located on the southwest corner of Centre City Pkwy at Nutmeg St.

City Map #130: Assisted Living Residences (96 bed residential care facility) generally located on the east side of Centre City Pkwy south of Iris Lane.

The cumulative project volumes are shown in **Figure 10**.



Figure 10: Near Term Cumulative Project Volumes



4.10 Near Term Conditions

Near Term (existing plus cumulative) describes the anticipated roadway operations with the completion of the cumulative projects. The near term volumes are shown in **Figure 11**. The LOS calculated for the study intersections and segments are included in **Tables 17 and 18**. Intersection LOS worksheets are included in **Appendix J**.

TABLE 17: NEAR TERM INTERSECTION LEVEL OF SERVICE

Intersection and (Analysis) ¹	Movement	Peak Hour	Existing		Near Term (E+C)	
			Delay ²	LOS ³	Delay ²	LOS ³
1) N. Iris Ln at Village Rd (U)	All	AM	10.3	B	10.3	B
	All	PM	17.6	C	17.7	C
2) N. Iris Ln at Robin Hill Ln (U)	EB	AM	11.5	B	11.5	B
	EB	PM	9.6	A	9.6	A
3) N. Iris Ln at Iris Glen (U)	EB	AM	0.0	A	0.0	A
	WB	AM	14.3	B	14.3	B
	EB	PM	0.0	A	0.0	A
	WB	PM	18.4	C	18.5	C
4) Centre City Pkwy at Iris Ln (S)	All	AM	36.2	D	36.9	D
	All	PM	22.8	C	22.9	C

Notes: 1) Intersection Analysis - (S) Signalized, (U) Unsignalized. 2) Delay - HCM Average Control Delay in seconds. 3) LOS: Level of Service.

TABLE 18: NEAR TERM SEGMENT VOLUMES AND LEVEL OF SERVICE

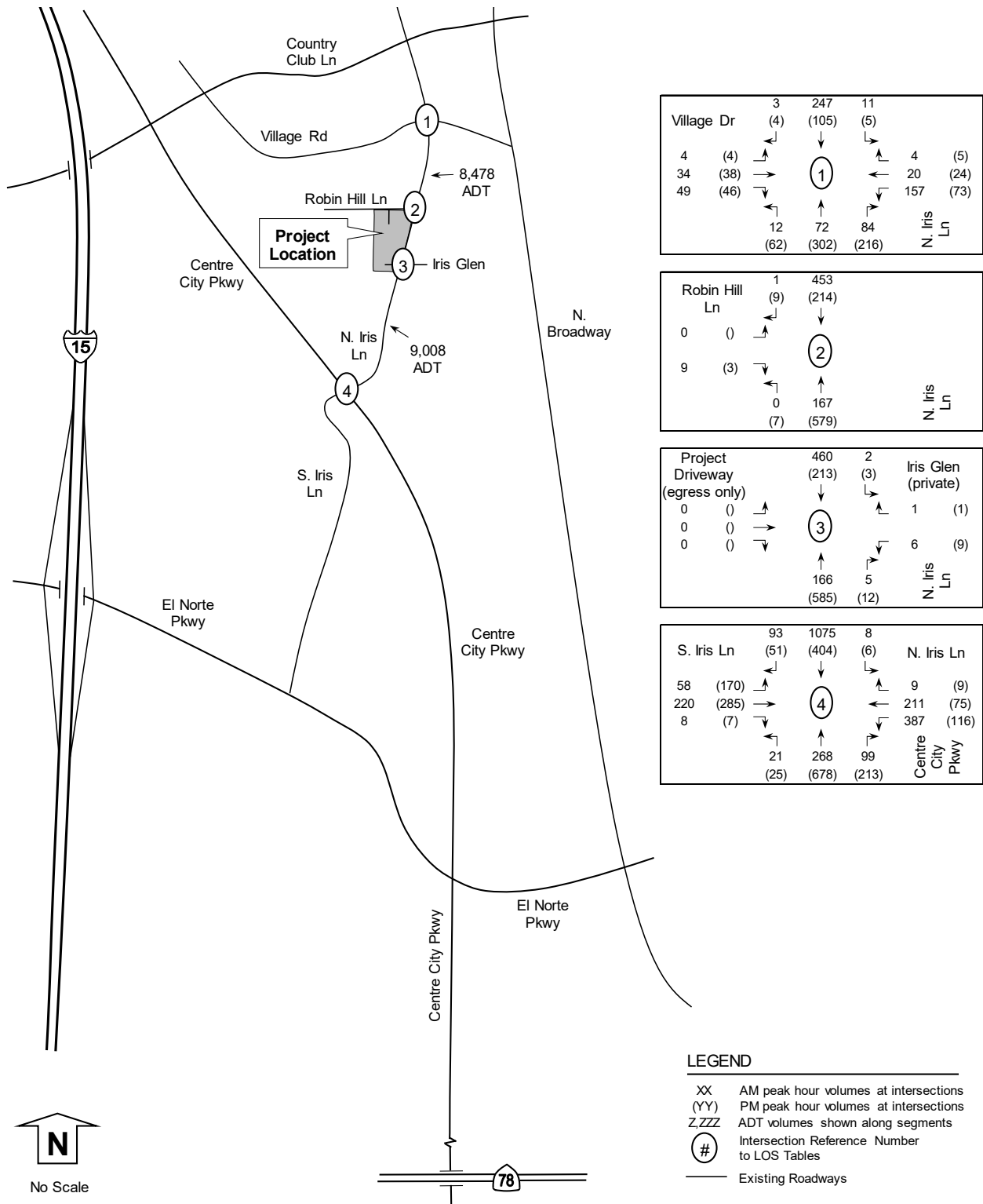
Segment	General Plan Classification	LOS E Capacity	Existing			Cumulative	Near Term (E+C)			
			Daily	V/C	LOS	Daily	Daily Volume	V/C	LOS	
			Volume			Volume				
<u>N. Iris Lane</u>										
Village Rd to Robin Hill Ln	2-Ln Local Coll.	15,000	8,466	0.564	C	12	8,478	0.565	C	
Robin Hill Ln to Centre City Pkwy	2-Ln Local Coll.	10,000	8,996	0.900	E	12	9,008	0.901	E	

Notes: Coll. = Collector. Daily volume is a 24 hour volume. V/C: Volume to Capacity Ratio. LOS: Level of Service.

Under near term conditions, the study intersections and segments were calculated to operate at LOS D or better except for N. Iris Ln from Robin Hill Ln to Centre City Pkwy (LOS E). Also, there is a long westbound left turn queue from N. Iris Ln to Centre City Pkwy.



Figure 11: Near Term Volumes



4.11 Near Term plus Project Conditions

The near term plus project condition describes the anticipated roadway operations with the addition of project traffic. Near term plus project traffic volumes are shown in **Figure 12**. The LOS calculated for the study intersections and segments are included in **Tables 19 and 20**. Intersection LOS worksheets are included in **Appendix K**.

TABLE 19: NEAR TERM PLUS PROJECT INTERSECTION LEVEL OF SERVICE

Intersection and (Analysis) ¹	Movement	Peak Hour	Near Term (E+C)		Near Term + Project			
			Delay ²	LOS ³	Delay ²	LOS ³	Delta ⁴	Effect? ⁵
1) N. Iris Ln at Village Rd (U)	All	AM	10.3	B	10.5	B	0.2	No
	All	PM	17.7	C	19.5	C	1.8	No
2) N. Iris Ln at Robin Hill Ln (U)	EB	AM	11.5	B	12.8	B	1.3	No
	EB	PM	9.6	A	12.6	B	3.0	No
3) N. Iris Ln at Iris Glen (U)	EB	AM	0.0	A	12.5	B	12.5	No
	WB	AM	14.3	B	15.3	C	1.0	No
	EB	PM	0.0	A	11.2	B	11.2	No
	WB	PM	18.5	C	19.9	C	1.4	No
4) Centre City Pkwy at Iris Ln (S)	All	AM	36.9	D	37.3	D	0.4	No
	All	PM	22.9	C	23.9	C	1.0	No

Notes: 1) Intersection Analysis - (S) Signalized, (U) Unsignalized. 2) Delay - HCM Average Control Delay in seconds. 3) LOS: Level of Service. 4) Delta is the increase in delay from project. 5) Effect if project traffic exceeds threshold.

TABLE 20: NEAR TERM PLUS PROJECT SEGMENT VOLUMES AND LEVEL OF SERVICE

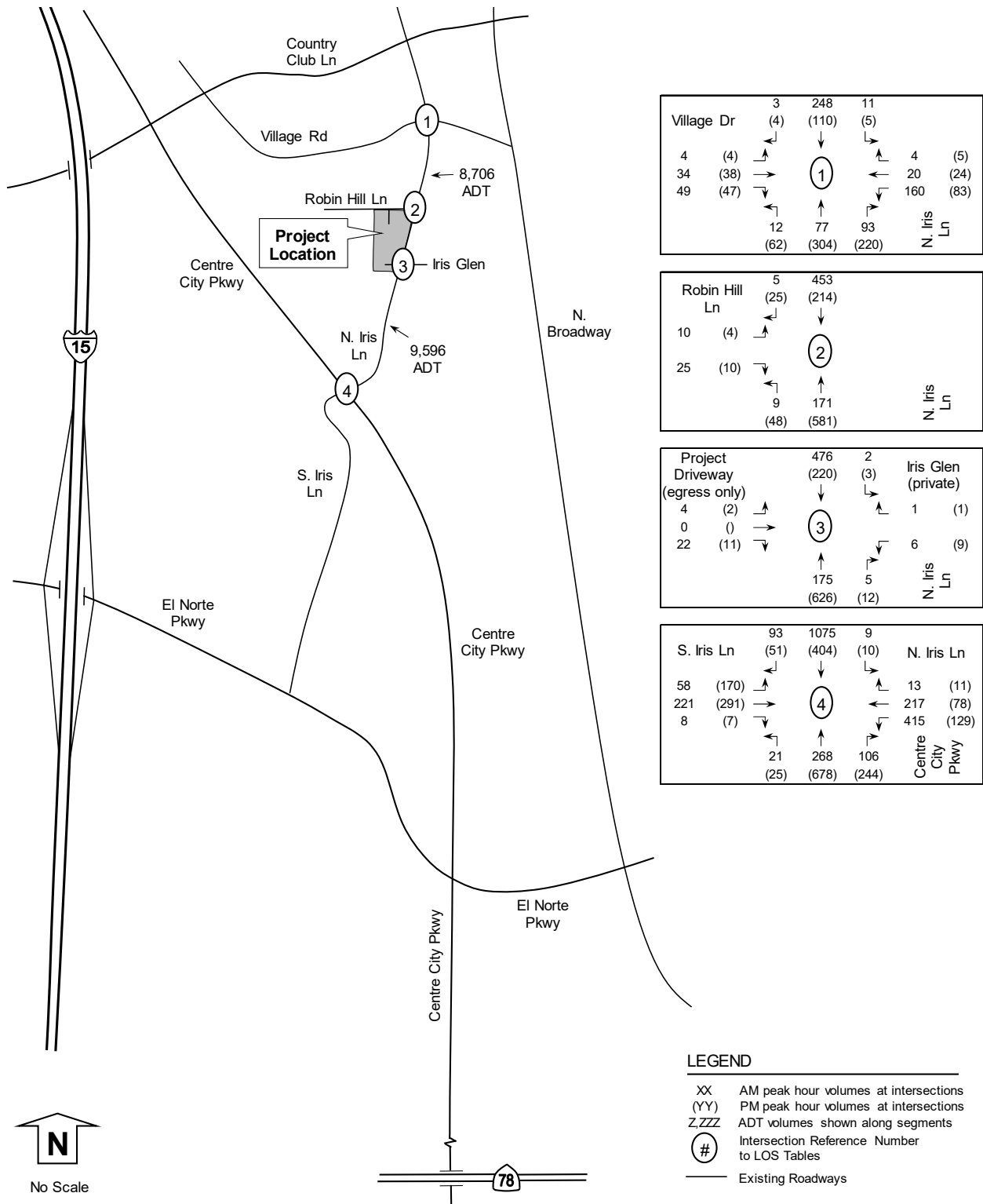
Segment	General Plan Classification	LOS E Capacity	Near Term			Project	Near Term + Project				
			Daily			Daily	Daily				
			Volume	V/C	LOS	Volume	Volume	V/C	LOS	Change in V/C	Effect?
<u>N. Iris Lane</u>											
Village Rd to Robin Hill Ln 2-Ln Local Coll.		15,000	8,478	0.565	C	228	8,706	0.580	C	0.015	No
Robin Hill Ln to Centre City Pkwy 2-Ln Local Coll.		10,000	9,008	0.901	E	588	9,596	0.960	E	0.059	Yes

Notes: Coll. = Collector. Daily volume is a 24 hour volume. V/C: Volume to Capacity Ratio. LOS: Level of Service. Effect: Yes or No.

Under near term plus project conditions, the study intersections and segments were calculated to operate at LOS D or better except for N. Iris Ln from Robin Hill Ln to Centre City Pkwy (LOS E). There is a calculated project traffic effect along the segment of N. Iris Ln from Robin Hill Ln to Centre City Pkwy. Additionally, the project will add traffic to the near-term westbound left turn queue from N. Iris Ln to Centre City Pkwy. Project improvements are described in Section 4.14.



Figure 12: Near Term plus Project Volumes



4.12 Long Term Year 2035 Conditions

The year 2035 is used for the long term conditions in order to match the City's General Plan long term scenario. Long term (year 2035) conditions were analyzed using volumes from the following sources:

- 1) *City of Escondido General Plan, May 2012*
- 2) SANDAG Series 14 Horizon Year Volumes

Additionally, growth factors (described below) were used to forecast volumes that were not included in the above sources. The intersection year 2035 volumes sources or factoring included:

- 1) N. Iris Ln/Village Rd (2.2% growth factor, described below)
- 2) N. Iris Ln/Robin Hill Ln (2.2% growth factor)
- 3) N. Iris Ln/Iris Glen (2.2% growth factor to north and south through movements, no growth on minor legs that serve Meadowbrook Village and the proposed N. Iris Project)
- 4) Centre City Pkwy/Iris Lane (27.9% growth factor described below for north and south through movements on Centre City Pkwy and 2.2% on remaining movements because there is significantly less forecasted growth based on SANDAG forecasts on the minor street movements)

The segment year 2035 volume sources for factoring included:

- 1) N. Iris Ln from Village Rd to Robin Hill Ln (SANDAG year 2050 volume)
- 2) N. Iris Ln from Robin Hill Ln to Centre City Pkwy (SANDAG year 2050 volume)

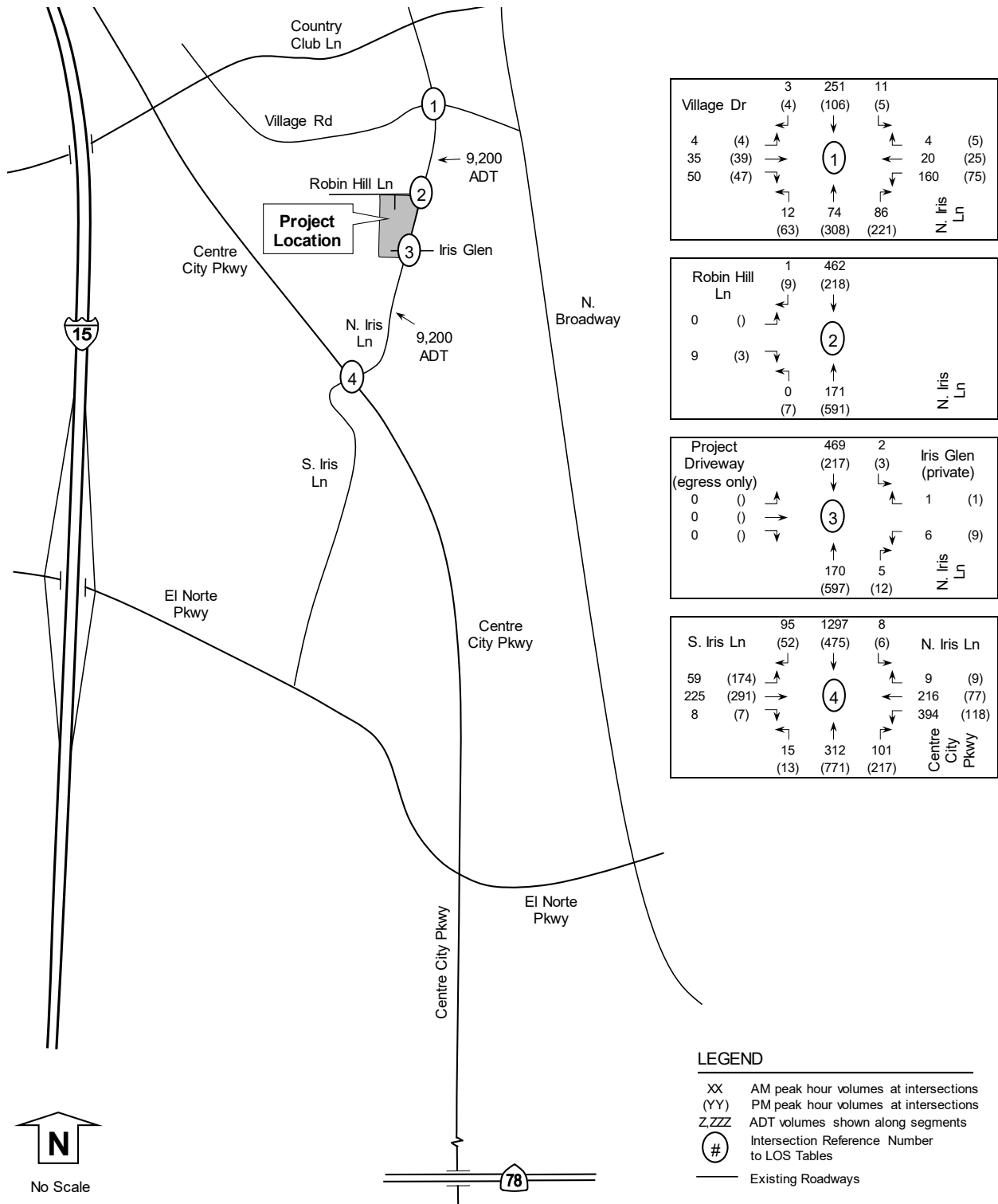
The 2.2% growth factor was calculated from the percent increase on N. Iris Ln between a year 2018 ADT of 8,996 and a year 2050 ADT of 9,200 from the SANDAG Series 14 model. The SANDAG year 2050 volume of 9,200 ADT was applied for N. Iris Ln because the City's General Plan Update had a year 2035 volume of 8,400 ADT, which was lower than the year 2018 volume of 8,996 ADT.

At Centre City Pkwy/Iris Lane, a 27.9% growth factor for northbound and southbound through movements was applied and a 2.2% growth factor on remaining movements was applied. The 2.2% represents the adjacent parcels served by Iris Lane and not the high through movements along Centre City Pkwy. Hence, the application of 2.2% to all intersection movements on N. Iris Ln at Village Rd and at Robin Hill Ln.

The long term volume sources and growth factors are included in **Appendix L**. Long term year 2035 volumes based on the aforementioned sources and growth factoring are shown in **Figure 13**.



Figure 13: Long Term Year 2035 Volumes



The LOS calculated for the study intersections and segments are included in **Tables 21 and 22**. Intersection LOS calculations are included in **Appendix M**.

TABLE 21: LONG TERM YEAR 2035 INTERSECTION LEVEL OF SERVICE

Intersection and (Analysis) ¹	Movement	Study Period	Year 2035	
			Delay ²	LOS ³
1) N. Iris Ln at Village Rd (U)	All	AM	10.5	B
	All	PM	18.7	C
2) N. Iris Ln at Robin Hill Ln (U)	EB	AM	11.6	B
	EB	PM	9.6	A
3) N. Iris Ln at Iris Glen (U)	EB	AM	0.0	A
	WB	AM	14.6	B
	EB	PM	0.0	A
	WB	PM	18.8	C
4) Centre City Pkwy at Iris Ln (S)	All	AM	42.5	D
	All	PM	23.5	C

Notes: 1) Intersection Analysis - (S) Signalized, (U) Unsignalized. 2) Delay - HCM Average Control Delay in seconds. 3) LOS: Level of Service.

TABLE 22: LONG TERM YEAR 2035 SEGMENT VOLUMES AND LEVEL OF SERVICE

Segment	General Plan Classification	LOS E Capacity	Year 2035		
			Daily Volume	V/C	LOS
<u>N. Iris Lane</u>					
Village Rd to Robin Hill Ln	2-Ln Local Coll.	15,000	9,200	0.613	C
Robin Hill Ln to Centre City Pkwy	2-Ln Local Coll.	10,000	9,200	0.920	E

Notes: Coll. = Collector. Daily volume is a 24 hour volume. V/C: Volume to Capacity Ratio. LOS: Level of Service.

Under Long Term Year 2035 conditions, the study intersections and segments were calculated to operate at LOS D or better except for N. Iris Ln from Robin Hill Ln to Centre City Pkwy (LOS E). Also, there is a long westbound left turn queue from N. Iris Ln to Centre City Pkwy.



4.13 Long Term Year 2035 plus Project Conditions

The Long Term Year 2035 with the project conditions were analyzed by adding the project traffic onto Year 2035 volumes. The Year 2035 volumes plus Project traffic are shown in **Figure 14**. The LOS calculated for the study intersections and segments are included in **Tables 23 and 24**. LOS calculations are included in **Appendix N**.

TABLE 23: LONG TERM YEAR 2035 PLUS PROJECT INTERSECTION LEVEL OF SERVICE

Intersection and (Analysis) ¹	Movement	Study Period	Year 2035		Year 2035 + Project			
			Delay ²	LOS ³	Delay ²	LOS ³	Delta ⁴	Effect? ⁵
1) N. Iris Ln at Village Rd (U)	All	AM	10.5	B	10.6	B	0.1	No
	All	PM	18.7	C	20.8	C	2.1	No
2) N. Iris Ln at Robin Hill Ln (U)	EB	AM	11.6	B	12.9	B	1.3	No
	EB	PM	9.6	A	12.7	B	3.1	No
3) N. Iris Ln at Iris Glen (U)	EB	AM	0.0	A	12.6	B	12.6	No
	WB	AM	14.6	B	15.6	C	1.0	No
	EB	PM	0.0	A	11.3	B	11.3	No
	WB	PM	18.8	C	20.4	C	1.6	No
4) Centre City Pkwy at Iris Ln (S)	All	AM	42.5	D	43.4	D	0.9	No
	All	PM	23.5	C	24.6	C	1.1	No

Notes: 1) Intersection Analysis - (S) Signalized, (U) Unsignalized. 2) Delay - HCM Average Control Delay in seconds. 3) LOS: Level of Service. 4) Delta is the increase in delay from project. 5) Project Effect if project traffic exceeds threshold.

TABLE 24: LONG TERM YEAR 2035 PLUS PROJECT SEGMENT VOLUMES AND LEVEL OF SERVICE

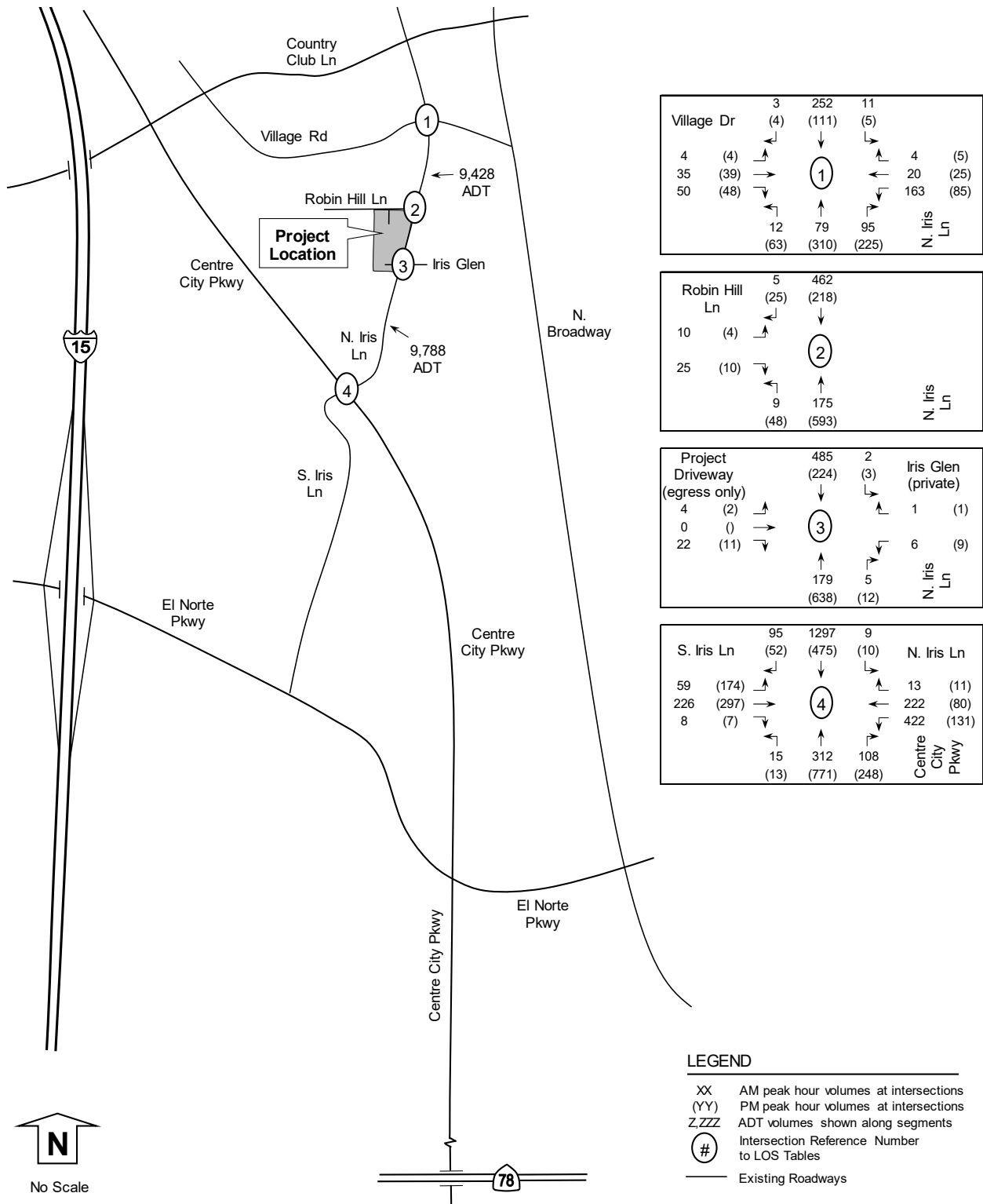
Segment	General Plan Classification	LOS E Capacity	Year 2035		Project		Year 2035 + Project				
			Daily		Daily		Daily		Change		
			Volume	V/C	LOS	Volume	Volume	V/C	LOS	In V/C	Effect?
<u>N. Iris Lane</u>											
Village Rd to Robin Hill Ln	2-Ln Local Coll.	15,000	9,200	0.613	C	228	9,428	0.629	C	0.015	No
Robin Hill Ln to Centre City Pkwy	2-Ln Local Coll.	10,000	9,200	0.920	E	588	9,788	0.979	E	0.059	Yes

Notes: Coll. = Collector. Daily volume is a 24 hour volume. V/C: Volume to Capacity Ratio. LOS: Level of Service. Effect? Yes or No.

Under Long Term Year 2035 plus project conditions, the study intersections and segments were calculated to operate at LOS D or better except for N. Iris Ln from Robin Hill Ln to Centre City Pkwy (LOS E). There is a calculated project traffic effect along the segment of N. Iris Ln from Robin Hill Ln to Centre City Pkwy. Also, the project will add traffic to the westbound left turn queue from N. Iris Ln to Centre City Pkwy. Project improvements are described in Section 4.14.



Figure 14: Long Term Year 2035 plus Project Volumes



4.14 Project Off-Site Improvements

Based on the City of Escondido traffic significance criteria, the project is calculated to have a project effect on the segment of N. Iris Ln from Robin Hill Ln to Centre City Pkwy and will add traffic to an existing excessive westbound left turn queue from N. Iris Ln to Centre City Pkwy.

4.14.1 Segment of N. Iris Ln from Robin Hill Ln to Centre City Pkwy

The project effect is calculated to occur under existing, near-term, and horizon year conditions. This segment is operating at LOS E without project traffic; therefore, the proposed improvement includes: 1) widening N. Iris Ln along the project frontage, and 2) a fair share toward the widening of N. Iris Ln for approximately 280 linear feet northeast of Centre City Pkwy. The fair share is calculated at 6.5% resulting in a fee requirement of **\$10,075 (Appendix O)**. As shown in **Table 25**, the project effect is eliminated with the increased capacity associated with the widening to the ultimate 2-lane classification.

TABLE 25: N. IRIS LN FROM ROBIN HILL LN TO CENTRE CITY PKWY OPERATIONS WITHOUT AND WITH IMPROVEMENT

	<i>Without Improvement (Current Conditions)</i>					<i>With Improvement to Ultimate Street Classification</i>				
	LOS E Capacity	Daily Volume	V/C	LOS	Project Effect?	LOS E Capacity	Daily Volume	V/C	LOS	Project Effect?
<u>Existing + Project</u>						<u>Existing + Project</u>				
<u>N. Iris Lane</u> Robin Hill Ln to Centre City Pkwy	10,000	9,584	0.958	E	Yes	15,000	9,584	0.639	C	No
<u>Near-Term + Project</u>						<u>Near-Term + Project</u>				
<u>N. Iris Lane</u> Robin Hill Ln to Centre City Pkwy	10,000	9,596	0.960	E	Yes	15,000	9,596	0.640	C	No
<u>Year 2035 + Project</u>						<u>Year 2035 + Project</u>				
<u>N. Iris Lane</u> Robin Hill Ln to Centre City Pkwy	10,000	9,788	0.979	E	Yes	15,000	9,788	0.653	C	No

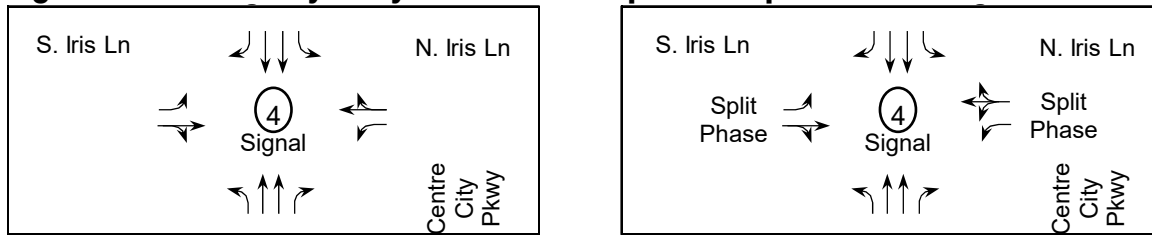
Notes: Daily volume is a 24 hour volume. V/C: Volume over Capacity. LOS: Level of Service.

4.14.2 Intersection of Centre City Pkwy/N. Iris Ln

The intersection of Centre City Pkwy at N. Iris Ln has an existing westbound to southbound left turn volume of 386 vehicles during the AM peak hour (from N. Iris Ln to Centre City Pkwy). This high left turn volume contributes to a long left turn queue. Since this is an existing deficiency, the applicant will contribute a fair share toward a city improvement of modifying the intersection operations to a split phase on Iris Lane and restriping the westbound approach (on N. Iris Ln) from a left and through right configuration to a left and left-through-right configuration as shown in **Figure 15**. This will permit a dual westbound left turn movement thereby increasing opportunities for left turns.



Figure 15: Centre City Pkwy at N. Iris Ln Proposed Improvement



A fair share is calculated at 3.1% resulting in a fee requirement of **\$6,975 (Appendix O)**. The intersection delay and LOS without and with the improvement of modifying the intersection operations to a split phase on Iris Lane and restriping the westbound approach is shown in **Table 26** with LOS worksheets included in **Appendix P**.

TABLE 26: CENTRE CITY PKWY AT IRIS LN LOS WITHOUT AND WITH IMPROVEMENT

Intersection & Scenario	Move-ment	Study Period	Without Improvement		With Improvement		
			Delay ¹	LOS ²	Delay ¹	LOS ²	Delta ³
<u>Existing + Project</u>							
4) Centre City Pkwy at Iris Ln (S)	All	AM	36.6	D	34.6	D	-2.0
	All	PM	23.7	C	19.8	B	-3.9
<u>Existing + Cumualtive + Project</u>							
4) Centre City Pkwy at Iris Ln (S)	All	AM	37.3	D	36.3	D	-1.0
	All	PM	23.9	C	20.4	C	-3.5
<u>Horizon Year + Project</u>							
4) Centre City Pkwy at Iris Ln (S)	All	AM	43.4	D	43.2	D	-0.2
	All	PM	24.6	C	21.2	C	-3.4

Notes: 1) Delay - HCM Average Control Delay in seconds. 2) LOS: Level of Service. 3) Delta is the change in delay from intersection phasing and striping improvement.



5.0 Pedestrian Analysis

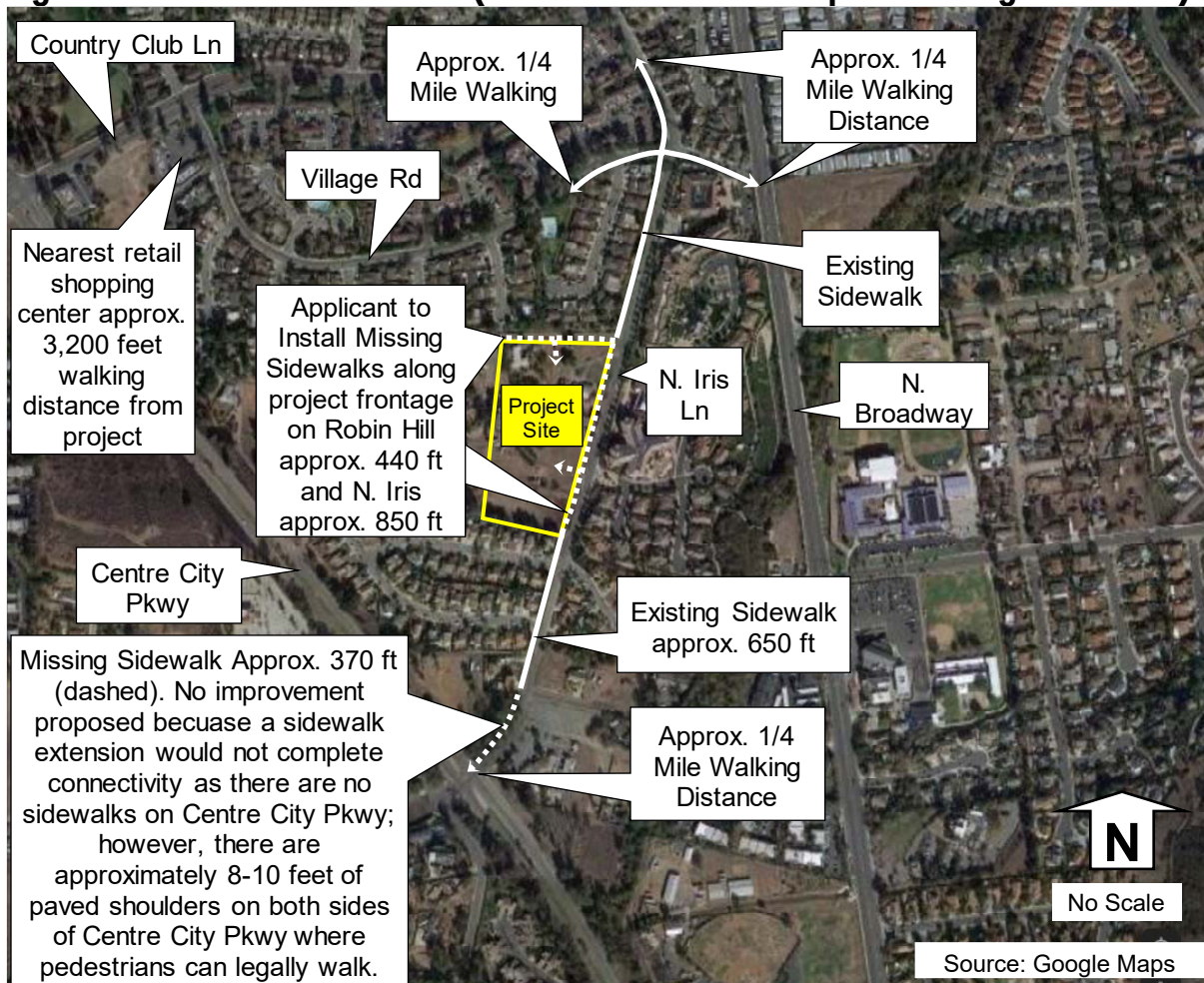
Existing and planned pedestrian facilities with any substandard or missing facilities (e.g., missing sidewalk, curb ramps, major obstructions) within a ¼-mile walking distance measured from the pedestrian access points were documented as required on page 28 of the City Guidelines.

There are no sidewalks on the west side of N. Iris Ln along the project frontage nor are there any sidewalks along Robin Hill Ln along the project frontage. There is an existing sidewalk on the west side of N. Iris Ln from the southern property boundary extending to the south approximately 650 feet (this section has intersection curb ramps). From this section of sidewalk, there is no sidewalk down to Centre City Parkway, a distance of approximately 370' on the west side of N Iris. On the east side, there is no sidewalks from south of Elkhorn to Centre City Parkway, a distance of approximately 600 feet. There is an existing sidewalk on the west side of N. Iris Ln from the northern property boundary extending to the north for more than ¼ mile. The westside sidewalk on N. Iris Ln north of Robin Hill has intersection curb ramps; however, there are three power poles within the sidewalk walking area along this segment.

As part of the project, the applicant will install sidewalks along the project frontage on Robin Hill Ln (approx. 440 ft) and on N. Iris Ln (approx. 850 ft). The sidewalk to be constructed on the westside of N. Iris Ln along the project frontage will complete a missing sidewalk section improving connectivity for the neighborhood. No other off-site sidewalk improvements are proposed. While there are missing sidewalks on N. Iris Ln within ¼ mile of the project site, the missing segment would not provide a connection to a completed sidewalk network because Centre City Parkway does not have sidewalks; however, there are approximately 8-10 feet of paved shoulders on both sides of Centre City Pkwy where pedestrians can legally walk. The pedestrian facilities are shown in **Figure 16**.



Figure 16: Pedestrian Facilities (1/4-mile distance from pedestrian gate access)



6.0 Bicycle Analysis

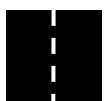
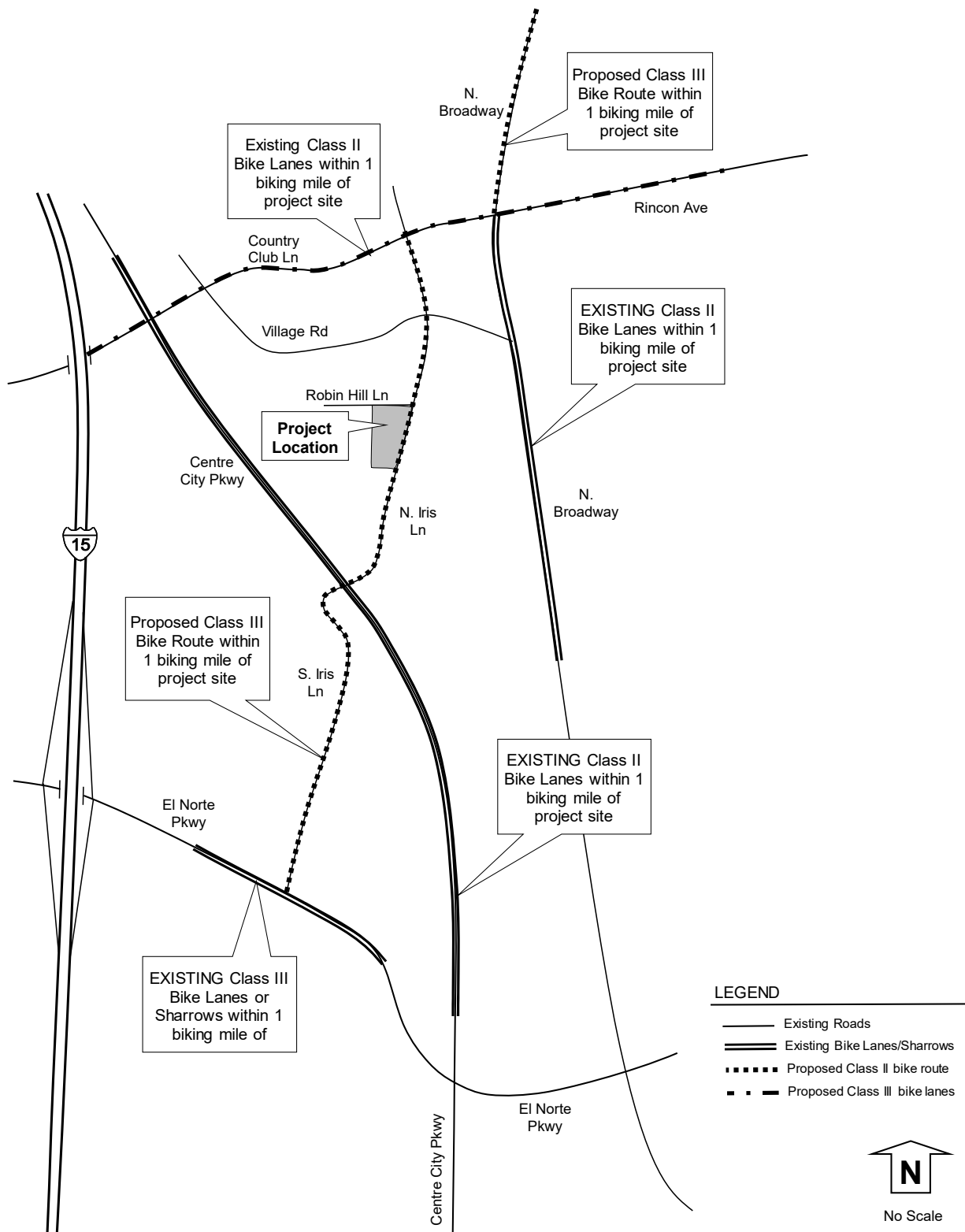
Existing and planned bicycle facilities with any substandard or missing facilities (e.g., bike lane gaps, obstructions) within a 1-mile bicycling distance measured from the centroid point of the parcel's linear frontage or from the center of the intersection formed by each project driveway was documented as required on page 28 of the City Guidelines. Excerpts from the City of Escondido *Bicycle Master Plan* are included in **Appendix Q**. **Figure 17** shows the existing and proposed within a 1-mile bicycling distance from the project site. The existing and proposed bike lanes/routes included:

- 1) Centre City Pkwy within a 1-mile bicycling distance of the site has existing Class II bike lanes.
- 2) Country Club Lane/Rincon Ave has existing Class II bike lanes within a 1-mile bicycling distance of the site.
- 3) El Norte Pkwy near the intersection of S. Iris Ln within a 1-mile bicycling distance of the project site has existing Class III bike lanes or bike sharrows.
- 4) N. Broadway south of Rincon Ave within a 1-mile bicycling distance of the project site has existing Class II bike lanes.
- 5) N. Broadway north of Rincon Ave within a 1-mile bicycling distance of the site has proposed Class III bike markings. There were no observed Class III bike markings along this segment.
- 6) N. Iris Lane within a 1-mile bicycling distance of the project site has proposed Class III bike markings. There were no observed Class III bike markings along this segment.

As part of the project, the applicant will install Class III bike marking along the project's frontage on N. Iris Ln



Figure 17: Existing and Proposed Bicycle Facilities (1-mile from project)



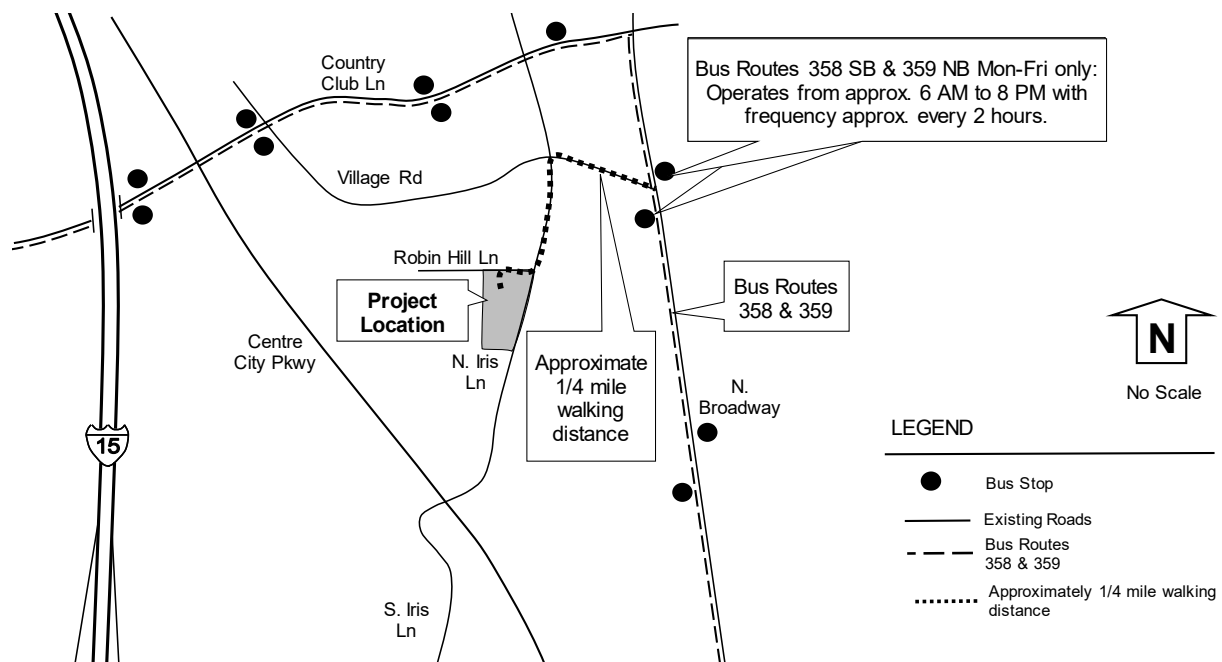
7.0 Transit Analysis

Existing transit amenities and potential connectivity to transit within a ¼-mile walkshed from the centroid point of the parcel was documented as required on page 28 of the City Guidelines.

North County Transit District (NCTD) provides bus service as Route 358 and 359 along N. Broadway with bus stops near N. Broadway at Village Rd as shown in **Figure 18**. No bus service is provided along the project frontage. A bus route map and bus frequency details are included in **Appendix R**. Bus Route 358 runs southbound on N. Broadway and Route 359 runs northbound on N. Broadway. These routes operate Monday through Friday from approximately 6 AM to 8 PM with a service frequency of approximately two hours. There is no weekend service on these two routes. The main destination/connection of these routes is the Escondido Transit Center that provides connections with Routes 305, 308, 350, 351/352, 353, 354, 355/357, 356, FLEX 371/372, 388, MTS 235, 280, SPRINTER, Greyhound, and RTA 217. Additional destinations include Escondido Civic Center, Kaiser Permanente, Regal Cinemas, Escondido Senior Center, Escondido High School, YMCA, Vons, and Stater Brothers.

There are no transit stops within ¼-mile walking distance; however, the two transit stops noted above are just over a ¼-mile walking distance (approximately 1,500 feet away). These bus stops are on N. Broadway near Village Rd. The southbound bus stop has a bus stop sign, a bench, and a trash receptacle. The northbound bus stop has a bus stop sign, a bench with shelter, and a trash receptacle. Both bus stops are in good condition, thus no improvements are proposed.

Figure 18: Existing Bus Stops and Routes



8.0 Conclusion

This report included a Vehicle Miles Traveled (VMT) analysis and Local Mobility Analysis (LMA). The VMT analysis determined if there is a potential California Environmental Quality Act (CEQA) transportation VMT impact, while the LMA determined if there are any traffic effects on the surrounding roadways based on City of Escondido General Plan requirements.

The project is a multi-family complex with 102 dwelling units. A zone change and annexation is proposed on a subject property of approximately 7.7 gross acres on the southwest corner of N. Iris Lane at Robin Hill Lane, from the County of San Diego into the City of Escondido. The proposed zoning is PD-R-18 resulting in a density 13.2 DU/acre (102 units/ 7.7 acres), which is a reduction from the current County of San Diego zoning of 24 DU/acre. The existing site includes 4 single family dwelling units that will be removed. The project applicant is processing the following:

- 1) Zone Change to Urban III with a pre-zone designation of R3
- 2) General Plan Amendment

The **VMT analysis** is required to satisfy the CEQA guidelines that utilize VMT as the measure of mobility effectiveness for determining transportation impacts. The California Governor's Office of Planning and Research (OPR) Technical Advisory developed guidance on implementing Senate Bill 743 (SB 743) that shifts the transportation impact measure of effectiveness from Level of Service (LOS) to VMT.

The project VMT per Capita by Census Tract was obtained from the SANDAG ABM2+ Base Year 2016 screening map. The project is located within census tract 201.05 that has an existing VMT per capita of 18.4 that is at 97.3% of the regional mean of 18.9 VMT per capita. Therefore, the project being located in census tract 201.05 is expected to have similar VMT characteristics of the census tract, resulting in a VMT transportation impact because it is higher than 85% of the regional mean. The project VMT impact is mitigated to below a level of significance through implementation of the California Air Pollution Control Officers Associates (CAPCOA) T-1 VMT reduction measure and payment of \$67,500 to the City of Escondido for pedestrian improvements at five (5) intersections. These mitigation measures are calculated to reduce the project VMT to lower than 85% of the regional mean.

In addition to the above VMT mitigation measures, the project applicant proposes to implement Transportation Demand Management (TDM) strategies to further reduce single occupant vehicle use through promoting alternative modes of transportation. The following TDM plan will provide the means to disseminate information to residents to learn about and use alternative forms of transportation other than single occupancy vehicles. The following TDM elements (to be implemented by the developer at the time of product sales) will be provided during the sales phase and can be incorporated into the project conditions of approval: 1) Provide information about SANDAG's iCommute program (www.icommutesd.com) to encourage carpooling, and 2) Provide information about maps, routes, and schedules for public transit. The applicant will also construct sidewalks along the project frontage on N. Iris Ln (this will complete a missing sidewalk link in the community without taking a VMT credit) and along the project frontage on Robin Hill Ln.



This **LMA analysis** determines if there are any traffic effects caused by the project traffic that would trigger roadway and other multi-modal improvements. The LMA is based on the City of Escondido *Transportation Impact Analysis Guidelines*, April 21, 2021 and includes the analysis of pedestrian, bicycle, transit, and vehicular facilities.

Pedestrian facilities within the ¼-mile walking distance from the project site were evaluated. As part of the project, the applicant will install sidewalks along the project frontage on N. Iris Ln (approximately 850 ft) and along Robin Hill Ln (approximately 440 feet). The sidewalk to be constructed on the westside of N. Iris Ln along the project frontage will complete a missing section, thus improving pedestrian network connectivity for the neighborhood. No other off-site sidewalk improvements are proposed within a ¼-mile walking distance of the project entrance.

Bicycle facilities within a 1-mile bicycling distance from the project site were evaluated. There are existing bike lanes/markings within a 1-mile bicycling distance of the project site on Centre City Pkwy, Country Club Lane, Rincon Ave, El Norte Pkwy near the intersection of S. Iris Ln, and N. Broadway south of Rincon Ave. Within a 1-mile bicycling distance of the project site, N. Broadway north of Rincon Ave, and N. Iris Lane currently do not have bike lanes/markings as proposed in the City's Bicycle Master Plan. As part of the project, the applicant will install Class III bike marking along the project's frontage on N. Iris Ln.

Transit facilities within a ¼-mile walking distance from the project site were evaluated. There are no transit stops within ¼-mile walking distance; however, there are two transit stops just over a ¼-mile walking distance (approximately 1,500 feet away). These bus stops are on N. Broadway near Village Rd. The southbound bus stop has a bus stop sign, a bench, and a trash receptacle. The northbound bus stop has a bus stop sign, a bench with shelter, and a trash receptacle. Both bus stops are in good condition, thus no improvements are proposed.

Vehicular facilities included the analysis of four (4) intersections, and two (2) roadway segments under Existing, Existing plus Project, Existing + Cumulative, Existing + Cumulative + Project, Year 2035, and Year 2035 + Project Conditions. The 102 units are calculated to generate 816 Average Daily Trips (ADT) with 65 AM peak hour trips (13 inbound and 52 outbound) and 81 PM peak hour trips (57 inbound and 24 outbound). For each study scenario, the findings included:

- 1) Under existing conditions, the study intersections and segments were calculated to operate at LOS D or better except for N. Iris Ln from Robin Hill Ln to Centre City Pkwy (LOS E). Also, there is an existing long westbound left turn queue from N. Iris Ln to Centre City Pkwy.
- 2) Under existing plus project conditions, the study intersections and segments were calculated to operate at LOS D or better except for N. Iris Ln from Robin Hill Ln to Centre City Pkwy (LOS E). There is a calculated project traffic effect along the segment of N. Iris Ln from Robin Hill Ln to Centre City Pkwy. Additionally, the project add traffic to the existing westbound left turn queue from N. Iris Ln to Centre City Pkwy. Project improvements are described below.

- 3) Under near term conditions, the study intersections and segments were calculated to operate at LOS D or better except for N. Iris Ln from Robin Hill Ln to Centre City Pkwy (LOS E). Also, there is a long westbound left turn queue from N. Iris Ln to Centre City Pkwy.
- 4) Under near term plus project conditions, the study intersections and segments were calculated to operate at LOS D or better except for N. Iris Ln from Robin Hill Ln to Centre City Pkwy (LOS E). There is a calculated project traffic effect along the segment of N. Iris Ln from Robin Hill Ln to Centre City Pkwy. Additionally, the project will add traffic to the near-term westbound left turn queue from N. Iris Ln to Centre City Pkwy. Project improvements are described below.
- 5) Under long term year 2035 conditions, the study intersections and segments were calculated to operate at LOS D or better except for N. Iris Ln from Robin Hill Ln to Centre City Pkwy (LOS E). Also, there is a long westbound left turn queue from N. Iris Ln to Centre City Pkwy.
- 6) Under long term year 2035 conditions, the study intersections and segments were calculated to operate at LOS D or better except for N. Iris Ln from Robin Hill Ln to Centre City Pkwy (LOS E). There is a calculated project traffic effect along the segment of N. Iris Ln from Robin Hill Ln to Centre City Pkwy. Also, the project will add traffic to the westbound left turn queue from N. Iris Ln to Centre City Pkwy. Project improvements are described below.

Based on the City of Escondido traffic significance criteria, the project is calculated to have a project effect on the segment of N. Iris Ln from Robin Hill Ln to Centre City Pkwy and will add traffic to an existing excessive westbound left turn queue from N. Iris Ln to Centre City Pkwy. This segment is operating at LOS E without project traffic; therefore, the proposed improvement is widening N. Iris along the project frontage as part of the project construction and contributing a fair share payment of **\$6,975** toward widening the section of N. Iris Ln located northeast of Centre City Pkwy. The intersection of Centre City Pkwy at N. Iris Ln has an existing westbound to southbound left turn volume of 386 vehicles during the AM peak hour. This high left turn volume contributes to a lengthy left turn queue. Since this is an existing deficiency, the applicant will contribute an additional fair share payment of **\$10,075** toward a city improvement of rephasing the operations to a split phase on Iris Lane and restriping the westbound approach from a left and through right configuration to a left and left-through-right configuration.



9.0 References

California Air Pollution Control Offices Association (CAPCOA) *Quantifying Greenhouse Gas Mitigation Measures A Resource for Local Government to Assess Emission Reductions from Greenhouse Gas Mitigation Measures*, December 2021

City of Escondido *General Plan*, May 2012.

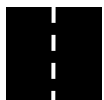
City of Escondido *Transportation Impact Analysis Guidelines*, April 21, 2021.

City of Escondido *VMT Exchange Program Documentation – Public Review Draft*, August 5, 2022.

Institute of Transportation Engineers, San Diego Section. *Guidelines for Transportation Impact Studies in the San Diego Region*. May 2019.

Trafficware Corporation, 2006. Synchro Version 10 computer software.

Transportation Research Board National Research Council Washington, D.C. *Highway Capacity Manual 2010*.



Appendix A

Excerpts from the City of Escondido Transportation Impact Analysis Guidelines



Transportation Impact Analysis Guidelines

Adopted by City Council
April 21, 2021

Prepared by: FEHR & PEERS

1. Introduction

1.1 Background

Under the California Environmental Quality Act ("CEQA"), all phases of a project must be considered when evaluating its impact on the environment: planning, acquisition, development, and operation. The determination of whether a project may have a significant effect on the environment calls for careful judgment on the part of the public agency ("Lead Agency") involved. Thresholds of significance, as defined in California Environmental Quality Act Guidelines ("CEQA Guidelines") section 15064.7(a), may assist lead agencies in determining whether a project may cause a significant impact. In the past, CEQA review of a project's transportation impacts focused primarily on metrics related to vehicle delay and Level of Service ("LOS"). These analysis requirements involved a quantitative analysis to determine whether a project may have a significant impact on the roadway network pursuant to CEQA.

CEQA Changes

On September 27, 2013, Governor Jerry Brown signed Senate Bill 743 ("SB 743") into law and started a process intended to fundamentally change transportation impact analysis as part of CEQA compliance. A key element of this law is the elimination of auto delay, LOS, and other similar measures of vehicular capacity or traffic congestion as a basis for determining significant impacts under CEQA. The change was to balance the needs of congestion management with statewide goals related to infill development, promotion of public health through active transportation, and the reduction of greenhouse gas emissions.

As a result, the Governor's Office of Planning and Research ("OPR") updated CEQA Guidelines to establish new criteria for determining the significance of transportation impacts. Based on feedback from the public, public agencies, and various organizations, OPR recommended that Vehicle Miles Traveled ("VMT") be the primary metric for evaluating transportation impacts under CEQA. VMT refers to the amount and distance of automobile travel attributable to a project. Pursuant to CEQA Guidelines section 15064, transportation projects that reduce, or have no impact on, vehicle miles traveled should be presumed to cause a less than significant transportation impact. Other relevant considerations may include the effects of the project on transit and non-motorized travel.

SB 743 does not prevent a city or county from continuing to analyze local mobility in terms of delay or LOS as part of other plans (e.g., general plans); studies; congestion management plans; or transportation improvement plans, but these metrics may no longer constitute the basis for CEQA transportation impacts as of July 1, 2020.

City General Plan Goals and Policies

The City of Escondido's ("City's") General Plan (Adopted 2012) forms the foundation upon which all land use decisions in the City are based. The General Plan includes goals and policies that guide the City's growth, and many of these policies relate to and support the intent of SB 743. The City has also adopted

specific greenhouse gas (“GHG”) reduction targets and has completed a climate action plan (“CAP”) that identifies policies and programs designed to meet those targets. Among other things, approaches for reducing GHGs in the transportation sector address vehicle efficiency and low-carbon fuels, as well as measures designed to reduce annual VMT. VMT-reduction measures include alternatives to passenger vehicle travel, land use policies that incentivize compact development, and incentives and disincentives aimed at changing individual behavior through transportation demand management (“TDM”) practices.

SB 743-Related General Plan Policies

The General Plan goals and policies that are most consistent with the intent of SB 743 are those regarding planned improvements, including districts that contain a mix of uses, an accessible and integrated multi-modal network, and improvements that enhance connectivity to major transit stations. For example, promoting integrated transportation and land use decisions that enhance smart growth development, requiring sidewalks along all classified streets designated on the Circulation Plan, requiring larger new developments to provide connections to existing and proposed bicycle routes, and encouraging employers to offer incentives to their employees to promote carpooling and other alternative modes are among the existing City of Escondido policies that align with SB 743.

The General Plan requires analysis of a project’s impacts to roadway level of service and implementation of measures necessary to reduce impacts to level of service below specified thresholds. A Local Mobility Analysis is required for General Plan conformance and to evaluate the effects of a proposed development project on traffic operations.

1.2 Purpose

The City of Escondido’s goal is to achieve a safe, efficient, accessible, and sustainable transportation system that meets the needs of all users. Transportation improvements and mitigation from proposed land development projects should be consistent with City-adopted plans and policies, as well as regional and state environmental and legislative requirements. The Transportation Impact Analysis Guidelines (“TIAG”) provides criteria on how projects should be evaluated for consistency related to the City’s transportation goals, policies, and plans, and through procedures established under CEQA. The TIAG establishes the contents and procedures for preparing a Transportation Impact Analysis in the City of Escondido.

The purpose of the TIAG (and a Transportation Impact Analysis) is to inform land use and development decisions by providing qualitative and quantitative criteria to assess the transportation system within the vicinity of a land development project. The TIAG aids in determining appropriate mitigation under CEQA, as well as site-specific improvements to the transportation system to accommodate project traffic.

Reasons to perform a Transportation Impact Analysis:

- Provide public agencies with a mechanism for managing transportation impacts of land development projects.

- Provide applicants with transportation-related site planning recommendations.
- Provide a method for analyzing the transportation effects of development projects.
- Establish a framework for transportation mitigation measures and project conditions for land development.
- Implement CEQA and General Plan policies.

1.3 Objectives

The following objectives are intended to provide consistency between local, regional, and state policies in forecasting, describing, and analyzing the effects of land development on transportation and circulation for all transportation modes and users:

- Provide clear direction to applicants and consultants to better meet expectations, increase the efficiency of the review process, and minimize delays.
- Provide scoping procedures and recommendations for early coordination during the planning/discretionary phases of a land development project.
- Provide guidance in determining when, what type, and how to prepare a Transportation Impact Analysis.
- Help achieve consistency, uniformity, and accuracy in the preparation of a Transportation Impact Analysis.
- Promote quality assurance in transportation studies by agreeing to the assumptions, data requirements, study scenarios, and analysis methodologies.
- Provide consistency and equity in the identification of measures to mitigate the transportation impacts generated by land development.
- Assist City staff in developing objective recommendations and project conditions of approval as part of the land development discretionary review process.
- Help to ensure that City transportation studies are in conformance with all applicable City, region and state regulations, including legislative requirements as part of CEQA.

1.4 CEQA vs. Non-CEQA Transportation Analysis

The City TIAG is a comprehensive manual for both CEQA VMT analysis and discretionary/entitlement non-CEQA Local Mobility Analysis ("LMA"). The TIAG provides guidance for the two elements of transportation analyses needed to comprehensively assess the potential effects from new development to the City's roadway and mobility system.

CEQA Transportation Analysis (VMT Analysis)

CEQA requires VMT analysis for compliance with state policies to evaluate a project's potential impacts related to VMT significance criteria. The VMT analysis will:

- Enable proposed development projects to comply with current CEQA requirements as a result of the implementation of SB 743.
- Outline the City's VMT significance thresholds, screening criteria, and methodology for conducting the transportation VMT analysis.
- Help determine if mitigation is required to offset a project's significant VMT impacts.
- Identify VMT reduction measures and strategies to mitigate potential impacts below a level of significance.
- Reduce the need to widen or build roads through effective use of the existing transportation network and maximizing the use of alternative modes of travel throughout the City.

Non-CEQA Transportation Analysis (Local Mobility Analysis)

An LMA is required by the City of Escondido to assess transportation effects and ensure orderly development, public safety, adequate infrastructure, and consistency with the General Plan. The LMA analysis will:

- Specify the City's screening criteria, study area, and methodologies to assess the potential need for off-site operation improvements to the project study area transportation network.
- Ensure that the local transportation facilities will have sufficient capacity to accommodate the project's demand on various modes of travel, and that improvements identified by the City are constructed when needed consistent with the City's adopted standards and policies.
- Ensure consistency with transportation planning documents (such as bicycle and pedestrian planning efforts).
- Establish measures of effectiveness to maintain vehicular LOS consistent with the City's General Plan Mobility and Infrastructure Element, as may be amended from time to time.
- Facilitate site project access and roadway frontage infrastructure improvements to serve the project vicinity.
- Identify project-level design features, standards, and/or conditions appropriate to, and as applied to facilitate General Plan consistency review and make determinations on new land use development projects. General Plan consistency findings, when required by State law or by the City's Municipal or Zoning Code, shall be based upon the implementation of the recommended design features, standards, and/or conditions and be the basis to make one or more findings to disapprove, approve, or conditionally approve a land use development project application.

1.5 Process Overview

The TIAG is intended for the use by City staff, project applicants, consultants, other agencies/jurisdictions, the general public, and decision makers to evaluate transportation effects of proposed land development and infrastructure projects going through the environmental or discretionary planning/entitlement processes within the jurisdiction of the City of Escondido.

The following summarizes the typical process for completing a Transportation Impact Analysis in the City of Escondido:

Step 1 – Complete Part 1 of the Scoping Agreement: The applicant will complete and submit a scoping agreement to City staff to determine if a Transportation Impact Analysis is required. If the project is screened out, a technical memorandum is required to document the decision, screening process, and justification for why an analysis is not required. If not screened out, the applicant must complete Part 2 of the Scoping Agreement and the project proceeds to Step 2.

Step 2 – Determine Study Requirements: The consultant will meet or coordinate with City staff regarding the scoping agreement items including the proposed project description, location, site plan, site access, estimated trip generation and trip distribution, study area, methodology requirements, and any other specific issues to be addressed in the Transportation Impact Analysis.

Step 3 – Conduct Transportation Impact Analysis and Submit Draft: The consultant will prepare the Transportation Impact Analysis consistent with the requirements established in Step 2 (and as outlined in the TIAG) and will submit a draft to the City. The City will provide written comments on the draft study. During this process, the consultant may request a meeting with City staff to clarify study requirements or comments received on the draft study.

Step 4 – Submit Final Transportation Impact Analysis: The consultant will address all City comments and produce a Final Transportation Impact Analysis to be approved by staff. Multiple iterations of study review may be necessary to adequately address all staff comments. It is critical that staff and the consultant coordinate closely during review process to ensure productive and efficient communications in achieving the mutual goal to finalize the Transportation Impact Analysis. A record identifying how each comment was addressed should also accompany the Final Transportation Impact Analysis. Depending on whether the Transportation Impact Analysis included a VMT analysis, the final mitigation recommendations or improvements will be in the CEQA Findings or the discretionary Conditions of Approval.

It should be noted that the City may update the TIAG on an as-needed basis to reflect the best state of practice methodologies and changes in CEQA requirements. As such, the City will continually review the TIAG for applicability and coordinate with other jurisdictions and professionals to ensure the most recent guidance and best practices are being applied for land development review and transportation analysis. Additional information regarding the applicability of the procedures outlined in this document for various project types are provided in **Chapter 2**.

The TIAG is not binding on any decision maker and should not be substituted for the use of independent professional judgment and evaluation of evidence in the record. The City also reserves the right to request further, project-specific information in its evaluation that may not be identified or described in this document.

City Review and Outside Agency Coordination

Transportation Studies will be reviewed by appropriate City of Escondido staff.

If a project will affect another agency or jurisdiction, such as the California Department of Transportation (“Caltrans”), San Diego Association of Governments (SANDAG), San Diego Metropolitan Transit System (MTS), North County Transit District (NCTD), or neighboring cities, coordination with that agency or jurisdiction may be required and will be identified during the scoping process. City of Escondido staff can provide guidance and contact information for other agencies or jurisdictions.

2. Transportation Impact Analysis Initiation

The applicant should first complete the Transportation Impact Scoping Agreement (form in Appendix A) and coordinate with City staff to determine the Transportation Impact Analysis requirements.

2.1 Types of Transportation Studies

CEQA and LMA requirements should be determined separately, as CEQA VMT analysis and/or LMA may apply to any type of transportation study. The following types of transportation studies (or a combination) may be required:

- **No Transportation Analysis Required:** If CEQA does not apply to a project (e.g., is screened out or the project is ministerial) and the project meets LMA screening criteria, a Transportation Impact Analysis is not required. A technical memorandum accompanied by the completed Part 1 of the Scoping Agreement is required to document justification for why an analysis is not required.
- **Detailed CEQA VMT Analysis and LMA Required:** Transportation studies that include both a CEQA VMT analysis and LMA are required for projects that are not screened out based on the City's screening criteria.
- **LMA Only Required:** Transportation studies only require an LMA when the project meets CEQA VMT screening criteria in **Section 3.3**. The findings of the VMT screening analysis must be documented in the Transportation Impact Analysis. A technical memorandum accompanied by the completed Part 1 of the Scoping Agreement is required to document justification for why transportation CEQA analysis is not required.

2.2 Determining Study Requirements

Scoping Agreement

The consultant will prepare a Scoping Agreement (Appendix A) before coordinating with the City to ensure all information needed to determine the study requirements are compiled, including the key items outlined below.

Project Location

- Project location and vicinity map
- Zoning and General Plan land use designation of the project site (to demonstrate consistency)

Detailed Project Description

- Land uses and intensities.
- Gross and developable acreage or building square footage or number of proposed residential units.
- Number of parking spaces: vehicle (including accessible spaces), bicycle (racks and secure storage), motorcycle, and electric vehicle (EV).

Site Plan

- Driveway locations and access type (e.g., full access, partial access, right in/out only).
- Pedestrian access, bicycle access, and on-site pedestrian circulation.
- Location/distance of nearest existing transit stop (measure as walking distance to project entrance/or middle of parcel).
- Location of any planned sidewalks or bikeways identified in the Bicycle Master Plan and other City planning documents within ¼ mile of the project location.

Trip Generation

The consultant should identify the number of new daily and peak hour driveway vehicle-trips added by the project as described in this section.

Trip generation rates are commonly expressed in trips per unit of development – for example, trips per housing unit or trips per thousand square feet – and are derived by averaging trip generation data collected from existing land uses.

For the City of Escondido, the following trip generation sources should be used:

- The current version of SANDAG's *(Not So) Brief Guide of Vehicle Traffic Generation Rates for the San Diego Region*. The SANDAG guide provides average trip generation rates for a wide variety of land use categories.
- If the proposed use is not included in SANDAG's *(Not So) Brief Guide of Vehicle Traffic Generation Rates for the San Diego Region*, City staff, at their sole discretion, may consider an applicable rate published by the Institute of Transportation Engineers ("ITE") in the most recent edition of the *ITE Trip Generation Manual*.
- Where uses are not included in either the SANDAG or ITE documents, trip generation should be derived from locally observed data that includes trip generation samples from at least three similar facilities at the City's discretion. The facilities selected as samples, and the timing and methods of data collection, must be approved by City staff prior to data collection.
- For existing facilities that are being expanded, trip generation should be determined by surveying the existing use to generate a project-specific trip generation rate. The survey of the existing use should be conducted using driveway counts or SANDAG/ITE published rates at the City's discretion.

- The most detailed project information should be used to determine a project's trip generation estimate. For example, if the project's building square footage and the project acreage are both known, the building square footage is more detailed; therefore, it should be used to estimate the trip generation.

Trip Reductions

Reasonable reductions to trip rates may also be considered, including the following (as shown on the trip generation process shown on **Figure 1**):

Internal Capture

For mixed-use development projects, it is appropriate to estimate the interaction between the project uses. For example, for a project that has retail, residential, and office uses, with compatible supporting land uses within a ¼ mile walking distance, trip reductions may be used. Most trip generation data is for stand-alone, single land uses and does not account for the interaction between land uses for a mixed-use development project.

Trip internalization for mixed-use developments (if applicable) should be calculated using state of the practice methodologies. The *ITE Trip Generation Handbook* provides a procedure for calculating internal trips for mixed-use projects. SANDAG's mixed-use trip generation or ("MXD") methodology may also be considered. The consultant may also propose a method for determining adjustments to trip generation for mixed-use projects, with approval from City staff.

Trip generation adjustments to account for internal capture should be applied to the raw trip generation calculated for each land use.

Alternative Modes

Most trip generation data is based on suburban locations with primarily auto trips. Transit, bicycling, and walking is not generally captured in the trip generation data. For projects that will have alternative modes, transit use, bicycling, and walking may be specifically acknowledged to reduce the trip generation (after the internal capture step) with proper justification and subject to the approval of City staff.

Accounting for alternative modes includes considerations for project proposed (or required) TDM measures. Consultant should propose the alternative modes reduction factor for the project to be reviewed and approved by City staff.

SANDAG trip reduction factors may also be considered for developments within ¼ mile walking distance to a local transit station.

Pass-By & Diverted Trips

Properly estimating the number of pass-by trips is important because even though pass-by trips do not add extra trips to the surrounding roadway system, such trips impact the traffic at the driveways and all the turning movements expected at these driveways. The percentage of pass-by and diverted link trips

should be estimated based on data provided by ITE or actual surveys of similar land uses. The pass-by reduction should not exceed 10% of the adjacent street volume.

Typically, pass-by trips will not be added to the study intersections (except for accounting for them at project driveways). Typically, diverted link trips are added to all study intersections along with the net new project trips, unless there is specific justification to demonstrate where the trips are diverting from.

Credit for Existing Uses

For redevelopment projects, it may be appropriate to apply a “trip credit” to account for vehicle trips being generated by an existing use that will be redeveloped. Traffic counts should be performed to determine the appropriate trip credit. The “trip credit” should be applied after internal capture and alternative modes are accounted for. The existing use should be operating at the time of data collection or be in operation within the last six months prior to submitting discretionary permits as demonstrated to the satisfaction of the City Engineer.

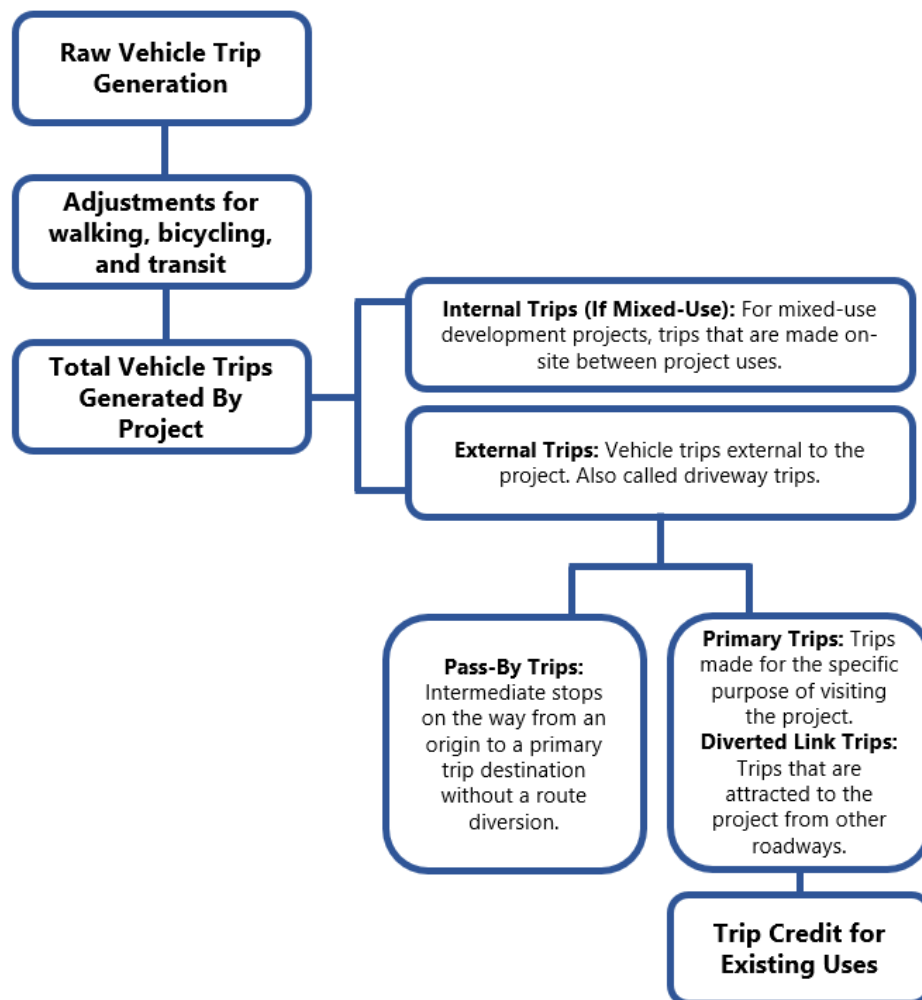
Truck Traffic

For projects that anticipate the generation of significant truck traffic (typically a project that estimates that truck traffic will account for 25% or more of the total project trip generation), all truck trips should be converted to passenger car equivalents (“PCE”) for the capacity analysis. Typically, the PCE factor that should be applied is 2.5 passenger cars for each truck trip.

Other Jurisdictions

Caltrans or adjacent jurisdictions may use different trip reduction rates. Early consultation with reviewing agencies is strongly recommended.

Figure 1: Trip Generation Calculation Process



Trip Distribution

The following describes the procedure for assigning project trips to the roadway network. Trip distribution can be determined from zip code data, census data, market research, travel demand models, existing travel patterns, or the locations of complementary land uses. Trip distribution assumptions should be consistent for developments of the same use in the same areas. Trip distribution for the City of Escondido can be estimated using two methods:

- Manual estimation using existing traffic volumes, location of complementary land uses, and engineering judgement. The trip distribution should be clearly communicated on a map that shows the percent of project traffic on each roadway in the vicinity of the project site. Manual estimation is generally appropriate for projects that generate fewer than 2,400 daily trips.

- Use the current version of the SANDAG Regional Travel Demand Model to perform a select zone analysis. The SANDAG Regional Travel Demand Model should generally be used to determine the trip distribution for projects that generate 2,400 or greater daily trips.

3. CEQA Requirements for Transportation VMT

3.1 Overview

SB 743 changes the focus of transportation impact analysis in CEQA from measuring impacts to drivers, to measuring the impact of driving. The change is being made by replacing LOS with VMT and providing streamlined review of land use and transportation projects that will help reduce future VMT growth. This shift in transportation impact focus is expected to better align transportation impact analysis and mitigation outcomes with the State's goals to reduce GHG emissions, encourage infill development, and improve public health through more active transportation.

In January 2019, the Natural Resources Agency finalized updates to the CEQA Guidelines including the incorporation of SB 743 modifications. The OPR published its latest Technical Advisory on Evaluating Transportation Impacts in CEQA to the California Natural Resources Agency in December 2018. This Technical Advisory provides recommendations on how to evaluate transportation impacts under SB 743. These changes include elimination of auto delay, LOS, and other similar measures of vehicular capacity or traffic congestion as a basis for determining significant CEQA transportation impacts. The OPR guidance recommends the use of VMT as the preferred CEQA transportation metric. To comply with the new legislation, the City of Escondido has identified VMT analysis methodology, establishment of VMT thresholds for CEQA transportation impacts, and identification of possible mitigation strategies. SB 743 includes the following two legislative intent statements:

1. Ensure that the environmental impacts of traffic, such as noise, air pollution, and safety concerns, continue to be properly addressed and mitigated through the California Environmental Quality Act.
2. More appropriately balance the needs of congestion management with statewide goals related to infill development, promotion of public health through active transportation, and reduction of GHG emissions.

VMT is a metric that accounts for the number of vehicle trips generated and the length or distance of those trips. VMT does not directly measure traffic operations but instead is a measure of network use or efficiency, especially if expressed as a function of population or employment (e.g., VMT/capita). VMT tends to increase as land use density decreases and travel becomes more reliant on the use of the automobile due to the long distances between origins and destinations. VMT can also serve as a proxy for impacts related to energy use, air pollution emissions, GHG emissions, safety, and roadway maintenance. The relationship between VMT and energy or emissions is based on fuel consumption. The traditional use of VMT in environmental impact analysis is to estimate mobile air pollution emissions, GHGs, and energy consumption.

3.2 Metrics and Methodology for Calculating VMT

In general, transportation VMT analysis for CEQA should be conducted using the SANDAG Regional Travel Demand Model. The model outputs can be used to produce VMT/capita, VMT/employee, and Total VMT.

There may be special circumstances under which other tools and techniques should be used to perform VMT analysis. There are some unique land uses that are not appropriately modeled using the SANDAG model, such as uses that have the majority of their activity on the weekends (the SANDAG Model produces weekday results). The applicant's consultant should coordinate with City staff if a VMT estimate tool other than the SANDAG Model is proposed for use.

Summary of Metrics by Project Type

The following summarizes the appropriate metric for various types of projects. Detailed definitions of the metrics follow.

- **Residential:** VMT/capita
- **General Employment:** VMT/employee
- **Industrial Employment:** VMT/employee
- **Regional Retail, Regional Recreational, or Regional Public Facilities:** Change in total VMT (using the boundary method)
- **Mixed-Use:** Each project component evaluated per the appropriate metric based on land use type (e.g., residential, employment, and retail)
- **Transportation Project:** Change in total VMT (using the boundary method)
- Unique circumstances may require alternate metrics

VMT per Capita

VMT/capita is established by summing up total daily VMT generated by residents of a geographic area and dividing by the population of that geographic area. Total daily VMT includes all trip tours made by residents: home-based and non-home-based trip tours (i.e., all VMT for a resident for the entire day regardless of trip purpose or origin/destination).

To analyze the VMT/capita for a proposed project, total daily VMT generated by project residents is divided by the project resident population.

SANDAG has a procedure to produce VMT/capita; however, the SANDAG procedure to produce this metric only includes VMT generated within the SANDAG region by residents of the SANDAG region. If a project is expected to produce consistent travel outside of the SANDAG region, the VMT outside of the regional should be included in the analysis. To account for VMT generated by residents of the SANDAG region traveling outside of the region, the SANDAG model data should be appended with the VMT that occurs by SANDAG region residents outside of the region. The steps necessary to include VMT from all trips that enter or exit the SANDAG region are explained in the Trip Length Adjustment in Appendix G.

VMT per Employee

VMT/employee is established by summing the total daily VMT generated by resident employees¹ of a geographic area and dividing by the number of employees of that geographic area. Total daily VMT includes all trip tours made by employees, not just work-related trips (i.e., all VMT for a resident for the entire day regardless of trip purpose or origin/destination). Employees whose work location is specified as home are not included in the calculations. To analyze the VMT/employee for a proposed project, the total daily VMT produced by the project's employees is divided by the total number of employees.

The procedure developed by SANDAG to calculate VMT/employee by TAZ only accounts for VMT generated within the SANDAG region by employees who are also residents of the SANDAG region. Employees that live outside of the region and travel into the SANDAG region for work are not accounted for because of the nature of the calculation.

Total VMT

Total VMT can be calculated by either of two methods – the Boundary Method or the Origin-Destination Method.

Boundary Method

Total daily VMT (Boundary Method) within a given area can be measured by multiplying the daily volume on every roadway segment by the length of every roadway segment within the area. This is called Boundary Method VMT. Examples of Total VMT (Boundary Method) are VMT within the SANDAG region, VMT within a defined planning area, or VMT within the market area to be served by the project.

This metric is used to analyze regional retail, service, recreational, regional public facilities, and transportation infrastructure projects.

Origin-Destination Method

Total daily VMT (Origin-Destination Method) within a given area can be calculated directly from model outputs by multiplying the origin-destination (O-D) trip matrix by the final assignment skims (O-D Method VMT). The total VMT value should be appended to include VMT from all trips that enter or exit the SANDAG region.

This metric is used to evaluate a regional project if that project is expected to draw trips from outside the region (e.g., an amusement park).

Other VMT Metrics

There may be circumstances where other types of VMT metrics may be appropriate, such as projects that draw people from outside of the SANDAG region. One of these is the VMT/service population metric. VMT/service population is established by dividing the total VMT with at least one trip end in a geographic

¹ Resident employees both live and work in the SANDAG region.

area by the population plus employment of that geographic area. The total VMT includes all internal VMT, internal-to-external, and external-to-internal VMT (i.e., all VMT regardless of geographic boundaries). Since this metric combines VMT for residents and employees and reflects how accessible all land uses are (e.g., geographies with higher density, more shopping, and more jobs will have lower VMT/service population) it can be useful to understand a variety of project types. To analyze the VMT/service population for a proposed project, the project's total VMT (using the origin-destination method) is divided by the project population plus employment. Use of an alternate metric, such as VMT/service population, should be used only when standard metrics are not applicable and after coordinating with City staff in advance.

Trip Length Adjustments

Trip length adjustments for trips leaving the SANDAG Model Area can be made by using the California Statewide Travel Demand Model (CSTDm). Information on adjusting trip lengths is provided in Appendix G.

3.3 VMT Analysis for Land Use Projects

Screening Criteria for CEQA VMT Analysis

The requirements to prepare a detailed transportation VMT analysis apply to all land development projects, except those that meet at least one of the screening criteria. A project that meets at least one of the screening criteria below would be presumed to have a less than significant VMT impact due to project characteristics and/or location.

Projects screened out shall still evaluate connectivity to existing sidewalks on adjacent key land uses (e.g., schools for residential projects, transit for employment uses) and propose improvements to address connectivity gaps in a manner proportionate to the project size and demand.

1. Small Residential and Employment Projects

Projects generating 200 or fewer net new daily vehicle trips may be presumed to have a less-than-significant impact absent substantial evidence to the contrary. Trips are based on the number of vehicle trips calculated using SANDAG's *(Not So) Brief Guide of Vehicular Traffic Generation Rates for the San Diego Region* or ITE trip generation rates with any alternative modes/location-based adjustments applied.

2. Projects Located in a Transit-Accessible Area

Projects located within a half-mile walking distance of an existing major transit stop or an existing stop along a high-quality transit corridor² may be presumed to have a less-than-significant impact absent substantial evidence to the contrary. Distance to transit should be determined along an ADA-accessible

² Major transit stop: a site containing an existing rail transit station, a ferry terminal served by either a bus or rail transit service, or the intersection of two or more major bus routes with a frequency of service interval of 15 minutes or less during the morning and afternoon peak commute periods. High quality transit corridor: a corridor with fixed route bus service with service intervals no longer than 15 minutes during peak commute periods.

path of travel, not “as the crow flies” measurements. Note that SPRINTER Light Rail stations are considered major transit stops. A map of existing major transit stops and existing stops along high-quality transit corridors is provided in **Appendix B**.

The presumption of a less-than-significant impact near these transit stops may **not** be appropriate if the project:

- Has a Floor Area Ratio of less than 0.75
- Includes more parking for use by residents, customers, or employees of the project than required by the City
- Is inconsistent with SANDAG’s most recent Sustainable Communities Strategy or the land use growth assumption accommodated by the Land Use Element portion of the General Plan
- Replaces affordable residential units with a smaller number of moderate- or high-income residential units
- Does not have basic walking and biking access to transit (e.g., sidewalks connecting to transit stops)

3. Projects in a VMT-Efficient Area

A VMT-efficient area is any area within the City with an average VMT/capita or VMT/employee below the thresholds as compared to the baseline regional average for the census tract it is located within, as provided on the SANDAG website.³

Residential projects located within a VMT-efficient area may be presumed to have a less-than-significant impact absent substantial evidence to the contrary. A VMT-efficient area for residential projects is any area with an average VMT/capita 15% below the baseline regional average for the census tract it is located within.

Employment projects located within a VMT-efficient area may be presumed to have a less-than-significant impact absent substantial evidence to the contrary. A VMT-efficient area for employment projects (excluding industrial employment projects) is any area with an average VMT/employee 15% below the baseline regional average for the census tract it is located within.

³ The VMT/Capita and VMT/Employee screening maps are created using information from the current version of the SANDAG model at the time a project notice of preparation (NOP) is produced. The current web address is: <https://sandag.maps.arcgis.com/apps/webappviewer/index.html?id=5b4af92bc0dd4b7babbce21a7423402a>. As SANDAG updates the model to reflect development and planning throughout the region, the screening maps will be updated and may change resulting in development that may have at one time been screened to no longer be screened and vice versa. As the model is updated, earlier versions of the model will also cease to be supported by SANDAG, meaning that model runs can no longer be completed with the previous versions of the model. If a project begins the transportation study process using one version of the model that becomes unsupported during the process, the project can utilize model outputs from the older model version, as long as no additional modeling work will be done. Projects cannot complete their transportation analysis using multiple model versions.

Industrial Employment projects located within a VMT-efficient area may be presumed to have a less-than-significant impact absent substantial evidence to the contrary. A VMT-efficient area for industrial employment projects is any area with an average VMT/employee at or below the baseline regional average for the census tract it is located within.

Mixed-Use projects located within a VMT-efficient area for each of its land uses may be presumed to have a less-than-significant impact absent substantial evidence to the contrary. Refer to the appropriate section for each land use included as a part of the mixed-use project to determine the definition of a VMT-efficient area for each land use.

4. Locally-Serving Retail Projects

Local serving retail projects less than 50,000 square feet that are expected to draw at least 75% of customers from the local area (based on a market study and/or qualitative information provided by the applicant) may be presumed to have a less than significant impact absent substantial evidence to the contrary. Local serving retail generally improves the convenience of shopping close to home and has the effect of reducing vehicle travel.

5. Locally-Serving Public Facilities

Public facilities that serve the surrounding community or public facilities that are passive use may be presumed to have a less-than-significant impact absent substantial evidence to the contrary. The following are considered locally serving facilities:

- Transit centers
- Public schools
- Libraries
- Post offices
- Park-and-ride lots
- Police and fire facilities
- Parks and trailheads
- Government offices
- Passive public uses, including communication and utility buildings, water sanitation, and waste management
- Other public uses as shown in **Appendix C** or determined by City staff

6. Redevelopment Projects with Lower Total VMT

A redevelopment project may be presumed to have a less-than-significant impact absent substantial evidence to the contrary if the proposed project's total project VMT is less than the existing land use's total VMT and the CEQA action includes closing the existing land use.

For projects that meet one of the screening criteria for CEQA VMT analysis, a detailed VMT analysis is not necessary. The Transportation Impact Analysis must include a technical memorandum to document the screening process and findings, including attaching screening maps, market studies, evaluation of sidewalk gaps and proposed improvements, or other relevant supporting data. Additionally, the Transportation Impact Analysis must include a conclusion that the transportation impact is presumed to be less than significant in accordance with criterion b, Section XVII of *Appendix G* to the CEQA Guidelines.

VMT Thresholds of Significance

Projects that do not meet the above screening criteria must include a detailed evaluation of the VMT produced by the project. The significant thresholds and specific VMT metrics used to measure VMT are described by land use type below.

- **Residential:** 15% below regional average VMT/capita
- **Employment:** 15% below regional average VMT/employee
- **Industrial Employment:** At or below regional average VMT/employee
- **Mixed-Use:** Each project component evaluated per the appropriate metric based on land use type (e.g., residential, employment, and retail)
- **Regional Retail, Regional Recreational, or Regional Public Facilities:** A net increase in total regional VMT using the boundary method

Appendix C provides a list of unique project types and which land use category is appropriate for VMT analysis purposes.

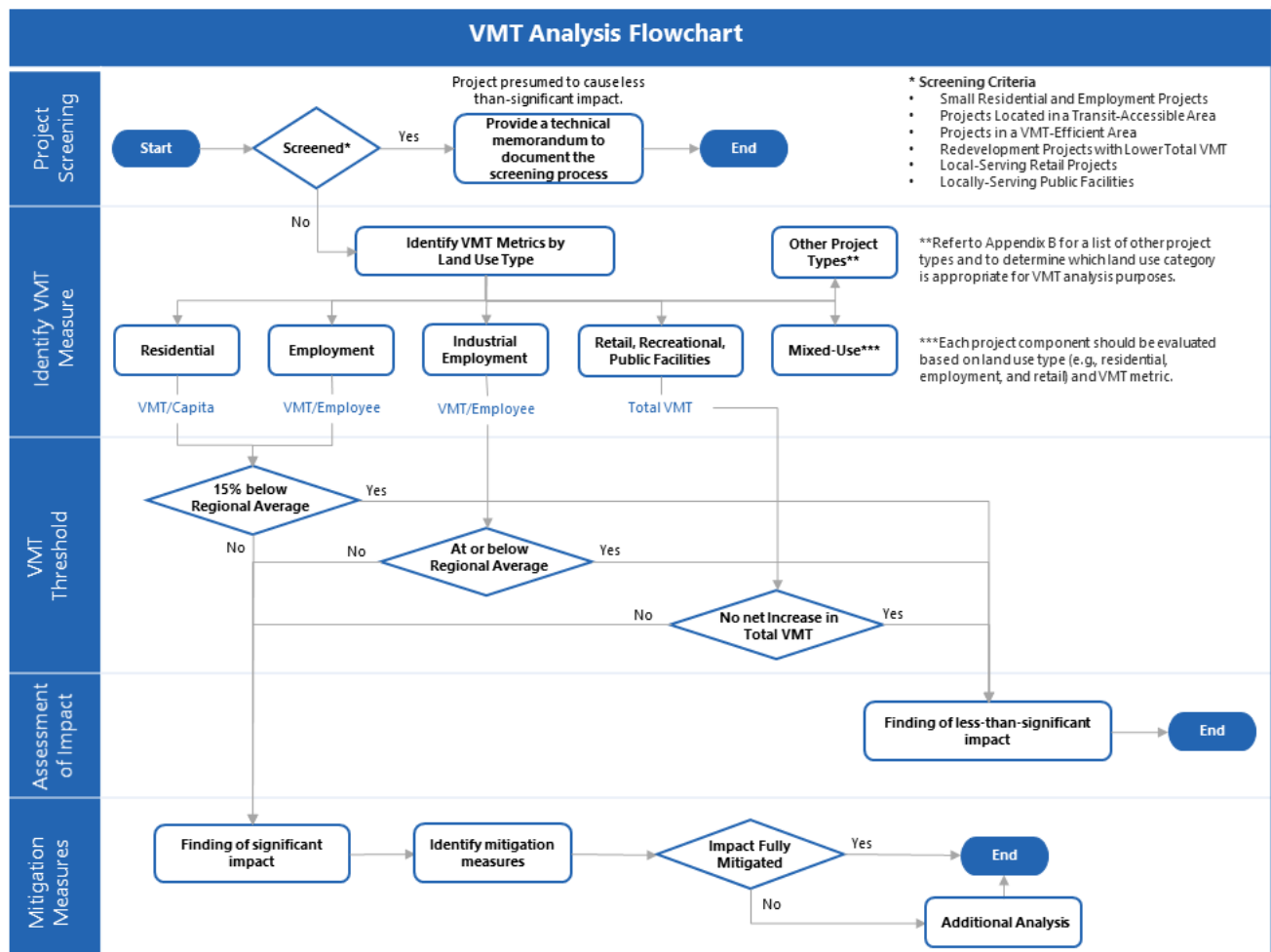
Specific Plans or General Plan Amendments: The land use plan should be compared to the region overall. Comparison to the region is appropriate because large land use plans can have an effect on regional VMT (akin to how a regional retail project affects regional VMT). The significance thresholds described above apply to specific plans or General Plan Amendments. In addition, plan buildout/cumulative analysis is needed.

Additional information regarding the significance thresholds presented here is provided in **Appendix D**.

VMT Analysis Procedures

For projects that are not screened and must provide a detailed evaluation of the VMT produced by the project, guidance is provided below on how to conduct transportation VMT analysis by project type. In addition, **Figure 2** displays the VMT analysis process.

Figure 2: VMT Analysis Process



Note that there may be unique circumstances that require use of tools/techniques other than the SANDAG Regional Travel Demand Model. Use of a tool other than the SANDAG Model should be discussed and documented with City staff in advance.

Residential Projects

For projects that generate fewer than 2,400 daily unadjusted driveway trips: Identify the location of the project on SANDAG's VMT/capita map. The project's VMT/capita will be considered the same as the VMT/capita of the census tract it is located in. Compare the project's VMT/capita to the threshold to determine if the impact is significant, or input the project into the SANDAG Regional Travel Demand Model to determine the project's VMT/capita.

For projects that generate 2,400 or greater daily unadjusted driveway trips: Input the project into the SANDAG Regional Travel Demand Model for SANDAG to provide the project's VMT/capita. To perform

the analysis, all project land uses should be inputted, and the VMT/capita should be determined using the same method/scripts that SANDAG utilizes to calculate the VMT/capita metric. Note that there may be some circumstances where use of the screening maps or other sketch modeling tools are appropriate for larger projects.

Employment Projects

For projects that generate fewer than 2,400 daily unadjusted driveway trips: Identify the location of the project on SANDAG's VMT/employee map. The project's VMT/Employee will be considered the same as the VMT/Employee of the census tract it is located in. Alternatively, the project's VMT can be determined by inputting the project into the SANDAG Regional Travel Demand Model in the manner previously described. Compare the project's VMT/Employee to the threshold to determine if the impact is significant.

For projects that generate 2,400 or greater daily unadjusted driveway trips: Input the project into the SANDAG Regional Travel Demand Model to determine the project's VMT/Employee. To perform the analysis, all project land uses should be inputted, and the VMT/Employee should be determined using the same method/scripts that SANDAG utilizes to develop the VMT/Employee metric. Note that there may be some circumstances where use of the screening maps or other sketch modeling tools are appropriate for larger projects.

Retail Projects

Calculate the change to area VMT using the SANDAG Travel Demand Model (or other appropriate sketch model as coordinated with City Staff). To calculate the change in area VMT, the regional retail component of the project should be inputted into the travel demand model (year that is used to determine the VMT thresholds). The "with project regional retail" area VMT produced by the model run is compared to the "no project" area VMT.

Mixed-Use Projects

Evaluate each individual project component per the appropriate metric based on land use type (e.g., residential, employment, and retail) as described above.

Other Projects

Input the project into the SANDAG Regional Travel Demand Model for SANDAG to provide the project's applicable VMT metric. To perform the analysis, all project land uses should be inputted, and the VMT metric that is appropriate based on the land use type should be determined using the methodology described in **Section 3.2**.

VMT Reductions

If the project includes transportation demand management (TDM) measures, the reduction in VMT due to each measure shall be calculated and can be applied to the project analysis. See **Section 3.5** for resources for determining the reduction in VMT due to TDM measures.

The VMT reductions associated with project TDM should be applied to the appropriate metrics based on the project land uses. If the project does not include any TDM, then no reduction is taken.

The resulting VMT values should be compared to the appropriate threshold (described previously under **VMT Thresholds of Significance**) to determine whether the project results in a significant CEQA transportation impact due to VMT.

3.4 VMT Analysis for Transportation Projects

Projects that result in an increase in additional motor vehicle capacity (such as constructing a new roadway or adding more vehicle travel lanes to an existing roadway) has the potential to increase vehicle travel, referred to as “induced vehicle travel.”

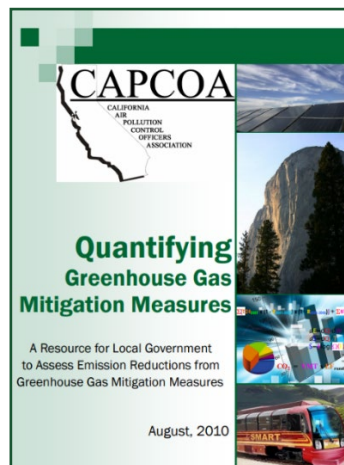
Appendix E contains a list of transportation projects that, absent substantial evidence to the contrary, do not require an induced travel/VMT analysis since they typically do not cause substantial or measurable increases in VMT.

For all other projects, a VMT analysis must be done. To calculate the change in area VMT (boundary method), the project should be inputted into the travel demand model. The “with project” area VMT produced by the model run is compared to the “no project” area VMT. A net increase in area VMT indicates that the project has a significant impact.

3.5 VMT Reduction and Mitigation Measures

To mitigate VMT impacts, the project applicant must reduce VMT, which can be done by either reducing the number of automobile trips generated by the project or by reducing the distance that people drive. The following strategies are available to achieve this:

1. Modify the project’s built environment characteristics to reduce VMT generated by the project.
2. Implement TDM measures to reduce VMT generated by the project.



CAPCOA Quantification Report, which includes quantification of VMT reducing measures.



SANDAG Mobility Management Guidebook, which includes recommendations of VMT-reducing measures.

Strategies that reduce single-occupant automobile trips or reduce travel distances are called TDM strategies. There are several resources for determining the reduction in VMT due to TDM measures, such as the California Air Pollution Control Officers Association (“CAPCOA”) *Quantifying Greenhouse Gas*

Mitigation Measures (2010) (Quantification Report) and the SANDAG *Mobility Management Guidebook/* VMT Reduction Calculator Tool.

- [CAPCOA Quantification Report](#)
- [SANDAG Mobility Management Guidebook/VMT Reduction Calculator Tool](#)

Both resources above include equations that address the diminishing value or decreased effectiveness of TDM measures when those measures are used in combination. The equation below should be used by applicants to accurately quantify the effectiveness of a proposed TDM program.

$$\text{Total VMT Reduction} = (1 - P_a) * (1 - P_b) * (1 - P_c) * \dots$$

where:

P_x = percent reduction of each VMT reduction strategy

Additionally, applicants should be aware of limits to overall program effectiveness (i.e., VMT reduction) that may be achieved from TDM strategies dependent on the project's land use context. Projects that are in urban areas have a higher limit of effectiveness (i.e., they can result in higher VMT reductions) than those in suburban areas. The formula defines the particular conditions that lead to different ways that the TDM measure may be applied or how a TDM measure might be applied in different circumstances. That is, to proposed effective and appropriate TDM measures is based on the project's size, location, and land uses for varying levels of implementation.

Special attention should be given to ensuring that measures are not double-counted through the transportation analysis process. For example, if a project identifies telecommuting as a reduction strategy, care should be taken to identify the level of telecommuting that has already been assumed as part of the travel demand model through coordination with SANDAG modeling staff or review of SANDAG model documentation available on SANDAG's website.

An example VMT reduction calculation is provided below showing quantified TDM measures for a sample mixed-use development project is provided in **Appendix H**. The City of Escondido is currently evaluating VMT Mitigation Strategies that could include, among other things, a VMT Exchange Program or VMT Mitigation Bank. Until such a program is adopted, applicants should reach out to City staff to identify candidate VMT mitigation projects within the City of Escondido that can be analyzed to mitigate VMT impacts. Pursuant to the City's Climate Action Plan, mitigation is required to be local.

3.6 Cumulative VMT Impacts

Since VMT is a composite metric that will continue to be generated over time, a key consideration for cumulative scenarios is whether the rate of VMT generation gets better or worse in the long term. If the rate is trending down over time consistent with expectations for air pollutant and GHGs, then the project level analysis may suffice. However, the trend direction must be supported with substantial evidence. A project would result in a significant project-generated VMT impact under cumulative conditions if the applicable cumulative project-generated VMT thresholds are exceeded.

Measuring the project's effect on VMT is necessary especially under cumulative conditions to fully explain the project's impact. A project effect on VMT under cumulative conditions would be considered significant if the cumulative link-level boundary VMT/capita or VMT/employee for the San Diego region increases under the "plus project" condition compared to the "no project" condition.

Please note that the cumulative "no project" condition shall reflect the adopted Regional Transportation Plan (RTP)/Sustainable Communities Strategy (SCS); as such, if a project is consistent with the regional RTP/SCS, then the cumulative impacts shall be considered less than significant.

4. Local Mobility Analysis

4.1 Overview

The authority for requiring non-CEQA transportation analysis and potentially requiring project improvement conditions to address identified deficiencies lies in the City's project review authority and General Plan policies to promote orderly development, promote public safety, and ensure land development site planning and needed infrastructure are adequate.

The LMA evaluates the effects of a proposed development project on traffic operations and safety for the roadway network in the proximate area of the project. The LMA will:

- Specify the City's screening criteria, study area, and methodologies to assess the potential need for off-site operation improvements to the project study area transportation network.
- Ensure that the local transportation facilities will have sufficient capacity to accommodate the project's demand on various modes of travel, and that improvements identified by the City are constructed when needed, consistent with the City's adopted standards and policies.
- Ensure consistency with transportation planning documents (such as bicycle and pedestrian planning efforts).
- Establish measures of effectiveness to maintain vehicular LOS consistent with the City's General Plan Mobility and Infrastructure Element, as may be amended from time to time.
- Facilitate site project access and roadway frontage infrastructure improvements to serve the project vicinity.

Detailed information on the analysis methodologies, standards, and thresholds are discussed in the following sections. As discussed previously and in **Section 2.3**, all projects will be required to coordinate with City staff prior to project initiation to ensure an efficient review process.

4.2 Requirements

The required study scenarios and scope will vary depending on the total number of daily trips the project is anticipated to generate. Both the analysis scenarios and the facilities that need to be analyzed are to be confirmed with City staff (see **Sections 1.5 and 2.2**) prior to conducting an LMA through the scoping process.

The LMA should use the current state-of-the-practice analysis methodologies to analyze traffic conditions. General requirements for analysis in the LMA are outlined below:

Vehicle

The City's General Plan (2012) establishes a goal of LOS C for all City streets; however, due to overall citywide traffic conditions, LOS D was considered acceptable. If the existing LOS is D or worse, preservation of the existing LOS must be maintained, or acceptable mitigation must be identified.

Currently the approved level of service standards for different street segments based on their classifications and average daily vehicle trips (ADT) within the City of Escondido are provided in **Table 1**.

Table 1: City of Escondido Level of Service Standards:
Street Segments Average Daily Vehicle Trip Thresholds

Street Classification	Lanes	Cross Sections	Level of Service				
			A	B	C	D	E
Prime Arterial	(8 lanes)	116/136 (NP)	23,800	37,800	51,800	62,300	70,000
	(6 lanes)	106/126 (NP)	20,400	32,400	44,400	53,400	60,000
Major Road	(6 lanes)	90/110 (NP)	17,000	27,000	37,000	44,500	50,000
	(4 lanes)	82/102 (NP)	12,600	20,000	27,400	32,900	37,000
Collector	(4 lanes)	64/84 (NP)	11,600	18,500	25,300	30,400	34,200
	(4 lanes)	(WP)	6,800	10,800	14,800	17,800	20,000
Local Collector	(2 lanes)	42/66 (NP)	5,100	8,100	11,100	13,400	15,000
		(WP)	3,400	5,400	7,400	8,900	10,000

Source: City of Escondido former Traffic Impact Analysis Guidelines.

Notes:

NP: No Parking, WP: With Parking

The following V/C Ratios were utilized for determining Existing and Future Level of Service (rounded to the nearest hundredth).

Level of Service	(V/C Ratio)
A - Less than or Equal to	0.00 to 0.34
B - Less than or Equal to	0.35 to 0.54
C - Less than or Equal to	0.55 to 0.74
D - Less than or Equal to	0.75 to 0.89
E - Less than or Equal to	0.90 to 1.00

Trip generation should be determined following the guidelines outlined in **Section 2.2**. Based on the adopted 2013 General Plan with a goal of LOS C, an LMA must be prepared for any project that generates and adds more than 2% of the ADT to any street segments operating at LOS C or worse within the preliminary study area identified by the City staff. Based on this threshold, **Table 2** contains the trigger-points for a required LMA within the City of Escondido for each street classification.

Table 2: ADT Thresholds for Roadway Segments to Trigger Local Mobility Analysis for New Development

Street Classification	Lanes	Cross Sections (ft.)	LMA Trigger-Points (ADT generation)
Prime Arterial	(8 lanes)	116/136 (NP)	900
	(6 lanes)	106/126 (NP)	800
Major Road	(6 lanes)	90/110 (NP)	700
	(4 lanes)	82/102 (NP)	500
Collector	(4 lanes)	64/84 (NP)	500
	(4 lanes)	(WP)	250
Local Collector and other	(2 lanes)	42/66 (NP)	200
	(2 lanes)	(WP)	200

Source: City of Escondido former Traffic Impact Analysis Guidelines.

Notes:

2% of ADT for LOS C has been used as a guide to calculate the trigger point values

NP: No Parking, WP: With Parking

An LMA should be undertaken for any type of development that generates daily trips more than the above-mentioned trigger points. Certain types of projects that generate fewer than 500 ADTs may be considered by the City staff for an LMA waiver only where the affected segments and intersections operate at LOS C or better. On the contrary, City staff may require an LMA for any kind of development if the possible traffic effect of the project is believed to be considerable. At a minimum, the study area should include at least all site access points and major intersections (signalized and un-signalized) adjacent to the site in the study area. **Table 3** provides the peak hour trip thresholds for determining if an intersection should be included in the LMA. The thresholds represent the sum of all trips (inbound and outbound) added to any leg of the intersection.

Table 3: ADT Thresholds for Intersections to be included in the LMA

Intersection Classification	LMA Trigger Points (AM or PM peak hour trips added to any leg)
Prime Arterial	50
Major Road	40
Collector	30
Local Collector	20

Source: City of Escondido former Traffic Impact Analysis Guidelines.

Notes:

Study area can be expanded by City Engineer

At isolated intersections that are not heavily congested, deterministic methods that apply HCM equations for each intersection in isolation can be used. The current version of the Highway Capacity Manual reflects current state-of-the-practice methodology. There are several software packages that use deterministic methods such as Synchro, Vistro (previously Traffix), and Highway Capacity Software. The HCM methodology assigns a LOS grade to an intersection based on estimated delay.

For intersections that are closely spaced, have a unique geometry, or are part of a congested corridor, micro-simulation analysis should be performed. Micro-simulation can more accurately evaluate intersections with unique characteristics or in congested systems because the method accounts for how intersections within a system interact with one another. For example, if a vehicle queue extends from an intersection and blocks a different intersection, micro-simulation will account for that condition, whereas deterministic methods will not. Micro-simulation should also be considered when determining required turn lane storage if the analyst believes deterministic methods are not producing reasonable maximum or 95th percentile queue lengths. There are several micro-simulation software packages such as SimTraffic (which is a module of Synchro) and Vissim.

Signalized intersections, all-way-stop intersections, and roundabouts should have the entire intersection average vehicle delay reported. Minor side-street stop intersections should have the worst-case movement average vehicle delay reported.

It is recommended that the methodology and software proposed for use is coordinated with City staff. City staff may also request the consultant provide micro-simulation electronic files for review.

Active Transportation

Pedestrian: The pedestrian analysis should document existing and planned pedestrian facilities and any substandard or missing facilities (e.g., missing sidewalk, curb ramps, major obstructions) within a ¼-mile walking distance measured from each pedestrian access point (e.g., driveways, on-site sidewalk connections to the street). Planned facilities should be determined based on relevant planning documents (e.g., General Plan, other City planning documents).

Bicycle: The bicycle analysis should document existing and planned bicycle facilities and any substandard or missing facilities (e.g., bike lane gaps, obstructions) within a one-mile bicycling distance measured from the centroid point of the parcel's linear frontage or from the center of the intersection formed by each project driveway. Planned facilities should be determined based on relevant planning documents (e.g., General Plan, Bicycle Master Plan).

Transit: The transit analysis should focus on transit amenities and connectivity to transit, especially for projects where the entire project site within a half-mile walkshed from the centroid point of the parcel's linear frontage to a major transit stop or a high-quality transit corridor ⁴. The analysis should identify the closest transit routes and stops to the project within ¼-mile walking distance and documentation of amenities at existing transit stops (e.g., shelters, maps, benches). Evaluation of transit amenities should be completed considering the requirements in the latest North County Transit District (NCTD) Bus Stop Development Handbook and improved where demand of the project warrants such improvement. A sample of the amenity requirements is provided in **Appendix F**. Project applicants should always

⁴ Major transit stop: a site containing an existing rail transit station, a ferry terminal served by either a bus or rail transit service, or the intersection of two or more major bus routes with a frequency of service interval of 15 minutes or less during the morning and afternoon peak commute periods. High quality transit corridor: a corridor with fixed route bus service with service intervals no longer than 15 minutes during peak commute periods.

coordinate with City and NCTD staff to determine appropriate transit amenities and applicable guidelines. The analysis should include discussion on the quality of the nearby transit facilities, including frequency of service, connections to hubs, etc.

Site Access and Circulation

The LMA should address the following site-specific topics, where applicable:

- Appropriate access management standards for median openings and spacing between major driveway connections
- Potential sight distance problems
- Potential pedestrian or bicycle conflicts
- Relationship of internal circulation facilities to public streets
- Sufficiency of driveway length at major entrances
- On-site circulation as it impacts the public roadway system or access to public transportation and bicycle/pedestrian network
- Potential for shared access among developments, including alternate access roads.

Data Collection and Study Periods

- Traffic counts should be collected for each of the study locations and should be no more than two years old unless older counts are demonstrated to be still valid for Existing Conditions. Counts older than four years old must be updated. Coordination with City staff is required to determine appropriate use of any historic data.
- The LMA should provide tables and map figures of the traffic count data. Technical Appendices should include original traffic count data sheets.
- Traffic counts should typically be conducted during a.m. and p.m. peak periods on weekdays (Tuesdays, Wednesdays, or Thursdays), unless approved by City staff. For typical commute hours, the peak hours will fall between 7 and 9 a.m. and between 4 and 6 p.m.
- Other peak hours, off-peak, or special event peak periods, may also be required depending on the project location and type of use. Projects involving or located near schools may need to evaluate traffic during the associated school hours of operation (e.g., morning drop-off and afternoon dismissal times). If the study necessitates a weekend analysis, Saturday from 11 a.m. to 1 p.m. will be the analyzed peak period. The need for analysis during non-typical commute times should be established with City staff during the scoping process.
- Traffic data should not be collected on weeks that include a holiday and non-school session time periods, unless approved by City staff.

Other Data Collection Considerations

Other considerations in data collection documentation and analysis should incorporate all applicable components that relate to the transportation network, which may include:

- Speed limits and average/85th percentile vehicle speed
- Parking characteristics (on-street parking presence and type, bus stops)
- Signing (static, dynamic, or variable) and pavement markings
- School zone
- Signal phasing and timing plans
- Intersection control type
- Right turn and left turn treatments
- Railroad crossing location
- Ramp metering
- Pedestrian counts
- Bicycle counts
- Transit stops (type, frequency/schedule, dwell time, trip length, bus blockage)
- Roadway classification (functional class, rural/urban designation, access class, area type)
- Cross section elements (number, width and purpose of lanes, shoulder type and width, median type and width, pavement type and rating condition, cross slope, sidewalk, bicycle lane)
- Geometry (horizontal and vertical alignment, storage lengths, intersection/interchange configurations, auxiliary lanes)
- Pedestrian and bicycle accommodation
- Transit (location, position, proportions with shelters and benches)
- Roadside (clear zone width, lateral clearance, driveway counts)

Study Scenarios

The following scenarios should be evaluated for the LMA:

- Existing Conditions
- Existing Plus Project Conditions
- Near Term Conditions (includes near term planned and approved projects)
- Near Term Plus Project Conditions
- Long Term (future year) Conditions (if the project is not consistent with the GP)
- Long Term (future year) Plus Project Conditions (if the project is not consistent with the GP)
- Special Scenarios (e.g., a phased project analysis)

Trip generation and distribution should be determined following the guidelines outlined in **Section 2.2**.

4.3 Identifying Transportation Improvements

In general, a project should consider feasible improvements to accommodate the addition of the proposed project's vehicular, pedestrian, and bicycle traffic, and both the transit access and increased demand for transit services and facilities.

The following sections provide guidance for identifying when a transportation improvement is necessary by facility type:

Vehicle

The following thresholds shall be used to identify if a project is responsible to make transportation operational improvements. If at any time the project causes the values in **Table 4** below to be exceeded on a roadway segment or at an intersection that is operating at a LOS D or worse, the project shall identify improvements to achieve the desired LOS/delay. Below are the proposed thresholds for determining when improvements are needed to a roadway segment or an intersection. The Downtown Specific Plan identifies select roadway segment locations where LOS E is considered acceptable if adjacent intersection operations are LOS D or better. Coordination with City staff for projects within the Downtown Specific Plan is required.

Table 4: Level of Service Thresholds

Level of Service with Project	Allowable Change due to Project		
	Roadway Segments	Intersections	
	V/C	Speed Reduction (mph)	Delay (sec/veh)
D, E, or F	0.02	1	2

Notes:

The Downtown Specific Plan identifies select roadway segments where LOS E is acceptable if adjacent intersection operations are LOS D or better.

Transportation improvements should be considered for any segment or intersection operating on LOS F.

V/C: Volume-to-capacity ratio. The roadway capacity is the LOS E threshold as defined in Table 1.

Where existing segments or intersections operate at LOS F, projects should consider measures to reduce any impact or make improvements to a failing facility.

Active Transportation

Pedestrian: The project should construct sidewalks to close sidewalk gaps adjacent to the project site.

The project should remove sidewalk obstructions that limit the pedestrian accessible route to less than four feet in width adjacent to the project site.

The project should construct curb ramps and meet ADA accessibility standards for any intersections adjacent to the project site.

Consideration should be made for traffic calming and pedestrian-related signal timing changes (e.g., leading pedestrian interval signal timing, pedestrian signal head upgrades, installation of accessible signal features) to accommodate an increase in pedestrian demand on roadways and intersections adjacent to the project site.

Bicycle: The project should construct (or preserve space for) any planned bicycle facility pursuant to the City's Bicycle Master Plan, other planning documents, and City design standards.

The project may consider upgrading adjacent bicycle facilities by adding upgraded treatments (e.g., adding buffers or protected bike lanes, where appropriate) to accommodate an increase in bicycle demand.

The project should construct any planned bicycle facilities adjacent to the project frontage to be consistent with the City's Mobility and Infrastructure Element, the Bicycle Master Plan, and other applicable City documents, and through coordination with the City. (This might not be appropriate for short segments.)

Appendix H: VMT Mitigation Sample Calculation

VMT Mitigation Sample Calculation

As shown, each VMT reduction strategy is calculated individually then combined in the equation to determine the overall VMT reduction. The sum of all strategies results in a total of 11.6%; however, the overall VMT reduction is calculated using the multiplicative formula to account for the fact that some strategies are redundant or duplicative in nature.

Land Use Strategies

- **Land Use/Diversity: 5.0%** **$P_a = 5.0\%$**

Travel & Commute Services for Residents

- **Neighborhood/Site Enhancements: 3.0%** **$P_b = 3.0\%$**
 - Pedestrian/Bicyclist Trails Network: 2.0%
 - Electric Bike-Share Program: 0.6%
 - Car-share Program: 0.4%
 - Category % VMT Reduction = $1 - (1 - 2.0\%) * (1 - 0.6\%) * (1 - 0.4\%) = 3.0\%$
- **Transit System Improvements Strategies: 1.2%** **$P_c = 1.2\%$**
 - Network Expansion (through Local Shuttle Service): 0.9%
 - Service Frequency/Speed Increase (through Local Shuttle Service): 0.3%
 - Category % VMT Reduction = $1 - (1 - 0.9\%) * (1 - 0.3\%) = 1.2\%$
- **Commute Trip Reduction (CTR) for residents (home based work): 2.0%** **$P_d = 2.0\%$**
 - Ridesharing Support Features for Residents: 0.6%
 - Transit Fare Subsidy for Residents: 0.9%
 - TDM Program Marketing for Residents: 0.5%
 - Category % VMT Reduction = $1 - (1 - 0.6\%) * (1 - 0.9\%) * (1 - 0.5\%) = 2.0\%$

Commute Services for Employees

- **Commute Trip Reduction (CTR) for employees: 0.4%** **$P_e = 0.4\%$**
 - Transit Fare Subsidy for Employees: 0.3%
 - TDM Program Marketing for Employees: 0.1%
 - Category % VMT Reduction = $1 - (1 - 0.3\%) * (1 - 0.1\%) = 0.4\%$

$$\text{Total VMT Reduction} = (1 - P_a) * (1 - P_b) * (1 - P_c) * (1 - P_d) * (1 - P_e)$$

P_x = percent reduction of each VMT reduction strategy

$$\text{Total VMT Reduction} = (1 - 5.0\%) * (1 - 3.0\%) * (1 - 1.2\%) * (1 - 2.0\%) * (1 - 0.4\%) = \underline{11}$$

Appendix B

Scoping Agreement

PART 1

General Project Information and Description

Project Information

Project Name: N. Iris Lane 102 Multi-Family Units

Project Location: Southwest corner of N. Iris Ln at Robin Hill Ln

Project Description

Land Uses and Intensities: Residential 102 Multi-Family Units on 7.7 acres (13.3 du/acre)

Gross and Developable Acreage: Gross 7.7 acres, Net 7.0 acres

Building Square Footage or Number of Dwelling Units: 102

Vehicle Parking Spaces: 2 in each garage and 26 outside guest spaces

Bicycle Parking Spaces: within each garage space available to store bikes

Motorcycle Spaces: 0

Electric Vehicle Spaces: 3 (part of 26 outside spaces)

Project Applicant:

Name: Hallmark Development Corp. Attn: Ms. Mariana McGrain

Address: 740 Lomas Santa Fe Dr, STE 204 Solana Beach, CA 92075

Telephone and Email: 858-481-3310 x107 mmcgrain@hallmarkcommunities.com

Consultant

Firm: LOS Engineering, Inc.

Project Manager: Justin Rasas, P.E.

Address: 11622 El Camino Real STE 100 San Diego CA 92130

Telephone and Email: 619-890-1253 justin@losengineering.com

Project Trip Generation

Source: SANDAG

Pass-by Trips: 0

Total Daily Trips*: 816

Diverted Trips: 0

Internal Capture Rate: 0

Trip Credit: 0

Alternative Modes: None

Net New Daily Trips: 816

*If truck traffic accounts for 25% or more of project trips, then a Passenger Car Equivalent (PCE) factor of 2.5 should be applied to all truck trips.

General Plan Consistency

Is this project consistent with the General Plan? ☐ Yes ☐ No

Site Plan

Attach 11x17 copies of the project location/vicinity map and site plan containing the following:

- Driveway locations and access type
- Pedestrian access, bicycle access, and on-site pedestrian circulation
- Location and distance to nearest existing transit stop (measure as walking distance to project entrance or middle of parcel)
- Location of planned or proposed pedestrian or bicycle improvements within ¼ mile of the project identified in the General Plan Mobility and Infrastructure Element or the Bicycle Master Plan

CEQA Transportation Analysis Screening

Project Type Screening Criteria for CEQA Vehicle Miles Travelled (VMT) Analysis

		Screened Out	Not Screened Out
		Yes	No
1)	Select the Land Uses that apply to your project		
2)	Answer the questions for each Land Use that applies to your project (if "Yes" in any land use category below then that land use (or a portion of the land use) is screened from CEQA VMT Analysis; If a project is screened out, a technical memorandum is still required to document the screening process)		
☐	1. Small Residential and Employment Projects:		
	a. Does the project result in 200 daily trips or less?	☐	☒
☐	2. Project is Located in a Transit-Accessible Area:		
	a. Is the project located within a half-mile walking distance of an existing major transit stop or an existing stop along a high-quality transit corridor?	☐	☒
	b. Additional project features:		
	i. Does the project have a Floor Area Ratio ≥ 0.75 ?	☐	☐
	ii. Does project include the least amount of parking required for residents, customers, or employees (i.e. not more than required)?	☐	☐
	iii. Is the project consistent with SANDAG's most recent Sustainable Communities Strategy or the City of Escondido General Plan?	☐	☐
	iv. Does the project replace affordable residential units with a greater number of moderate- or high-income residential units?	☐	☐
	v. Does the project have basic walking and biking access to transit (e.g., sidewalks connecting to transit stops)?	☐	☐
☐	3. Project is in a VMT-Efficient Area:		
	a. Is the project in a VMT/Capita or VMT/Employee Efficient Area per SANDAG screening maps?	☐	☒
☐	4. Locally-Serving Retail Project:		
	a. Is the project less than 50,000 square feet and expected to draw at least 75% of customers from the local area?	☐	☒
☐	5. Locally Serving Public Facility:		
	a. Is the project a locally serving public facility?	☐	☒
☐	6. Redevelopment Project:		
	a. Does the project result in a net decrease in total Project VMT than the existing use?	☐	☒

Non-CEQA Local Mobility Analysis

Local Mobility Analysis (LMA) Requirement

		Yes	No
1) Select the Street Classifications for each street in the study area			
2) Answer the questions for each Street Classification that applies to your project			
☐	1. Prime Arterial:		
a.	Does the project add 900 ADT or more to any segment classified as 8-lane Prime Arterial?	☐	☒
b.	Does the project add 800 ADT or more to any segment classified as 6-lane Prime Arterial?	☐	☒
☐	2. Major Road:		
a.	Does the project add 700 ADT or more to any segment classified as 6-lane Major Road?	☐	☒
b.	Does the project add 500 ADT or more to any segment classified as 4-lane Major Road?	☐	☒
☐	3. Collector:		
a.	Does the project add 500 ADT or more to any segment classified as 4-lane Collector without parking?	☐	☒
b.	Does the project add 250 ADT or more to any segment classified as 4-lane Collector with parking?	☐	☒
☒	4. Local Collector and other:		
a.	Does the project add 200 ADT or more to any segment classified as 2-lane Local Collector or any other classifications?	☒	☐

Certain types of projects which generate less than 500 ADT may be considered by the City staff for an LMA waiver only where the affected segments and intersections operate at LOS C or better. Please briefly explain why your project might be eligible for an LMA waiver.

PART 2

Trip Distribution and Trip Assignment

☒ Select Zone (Model Series <u>14</u>)	Projects that generate greater than 2,400 daily trips
☐ Manual Estimation	Projects that generate less than 2,400 daily trips
Provide an exhibit detailing the project's trip distribution and trip assignment.	
Provide a table with the project's daily trip assignment for each street segment in the study area.	

Study Intersections and Roadway Segments (NOTE: Subject to change based of staff review)

1. N. Iris Ln at Village Rd	6.
2. N. Iris Ln at Robin Hill Rd	7.
3. N. Iris Ln at Centre City Pkwy	8.
4.	9.
5.	10.

Attach a separate page if the number of study locations exceeds 10.

Other Jurisdictions

Is this project located within one mile of another Local Jurisdiction? ☐ Yes ☐ No

If yes, name of Jurisdiction:

Specific Issues to be addressed within the Study

(in addition to requirements described in the Guidelines – to be filled out by City Staff)

1.
2.
3.
4.
5.

Recommended by:

Justin Rasas, P.E.

6/30/21

Consultant's Representative

Date

Scoping Agreement Submitted on

Date

Scoping Agreement Re-submitted on

Date

Approved Scoping Agreement:

City of Escondido

Transportation Specialist

Date

Appendix C

VMT Support Materials and Calculations



City of Escondido VMT Exchange Program Documentation – Public Review Draft

Prepared for:
City of Escondido

August 5, 2022

FEHR  PEERS

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Program Overview

Introduction

The following VMT Exchange Program Documentation provides the City of Escondido (City) with the technical basis for implementation of a VMT Exchange program to provide programmatic mitigation options to projects with transportation VMT impacts. The VMT Exchange program provides a list of community-based transportation projects and programs that can be selected to be full or partial mitigation for a transportation VMT impact pursuant to the California Environmental Quality Act (CEQA). The program has co-benefits in that it supports the City's future transportation needs and assists the City in reaching its Climate Action Plan (CAP) goals.

The Program offers a variety of VMT reducing projects and programs, such as constructing bicycle and pedestrian facilities, improving transit stops, funding a City run circulator shuttle, and funding commute trip reducing programs for City staff and residents/employees within Escondido. The program will be implemented over time and the projects available for programmatic mitigation will be expanded as city resources and/or new options become available. This initial program offers applicants the ability to construct City bicycle, pedestrian, and transit supportive infrastructure in exchange for VMT reduction that can be applied to their project. In the future, additional programmatic mitigation options such as a circulator shuttle and commute trip reduction programs may become available.

The VMT Exchange Program projects and programs are not already part of funded programs; therefore, meet the concept of additionality¹ – these projects/programs are in addition to what would have been implemented through other planning and capital improvement programs.

The VMT Exchange Program is a voluntary program that is designed to offer discretionary projects a programmatic option for reducing transportation VMT impacts either to less than significant or by providing mitigation to the extent feasible. A discretionary project with a significant transportation VMT impact may also choose to mitigate the impact using site specific mitigation measures outside of the VMT Exchange Program or a combination of site-specific measures plus use of the VMT Exchange Program.

The project/program list provided in the document is a live table that will be updated periodically to reflect the addition of VMT reducing projects and/or to reflect current research on the project/program's effectiveness at reducing VMT.

¹ Additionality is the requirement that the VMT reductions/exchange program projects would not have occurred absent inclusion in the exchange program. Additional information is provided in the UC Berkely publication, "Implementing SB 743, An Analysis of Vehicle Miles Traveled Banking and Exchange Frameworks," August 2018.

Background

SB 743 was made into law in 2013 fundamentally changing transportation impact analysis required for CEQA compliance. According to the new law, vehicle miles of travel (VMT) replaced auto level of service (LOS) and other similar measures of vehicular capacity or traffic congestion for determining significant impacts.

Transportation Demand Management (TDM) strategies have traditionally been utilized to change travel behavior as a way of reducing VMT. TDMs are generally most effective in urban areas where a project site is accessible through multiple travel modes (i.e., walking, bicycling, transit, and personal micro-mobility vehicles) offering similar travel times and convenience. On the other hand, TDM strategies are less effective in low-density suburban and rural areas where travel modes are more reliant upon personal automobiles. In these types of areas, a program-based approach to mitigation is typically more effective than applying strategies to a project site only. Following is a review of three common program-based approaches²:

- **Transportation Impact Fee Program** – is a traditional impact fee program in compliance with the Mitigation Fee Act³. The nexus for the fee program would be a VMT reduction goal consistent with the CEQA threshold established by a lead agency for SB 743 purposes. The City of Los Angeles is the first city in California to complete a nexus study for this type of program. The main difference from a fee program based on a metric such as vehicle level of service (LOS) is that the VMT reduction nexus results in a capital improvement program (CIP) consisting largely of transit, bicycle, and pedestrian projects. These types of fee programs are time-consuming to develop, monitor, and maintain but are recognized as an acceptable form of CEQA mitigation if they can demonstrate that the CIP projects will be fully funded and implemented.
- **VMT Mitigation Exchange** – relies on a developer agreeing to implement a predetermined VMT reducing project or proposing a new one. The project may be located in the vicinity of the project or elsewhere in the community, and possibly outside the community. The Exchange needs to have a facilitating entity that can match the VMT generator (the development project) with a VMT reducing project or action. The facilitating entity could be the lead agency or another entity that can provide the match and ensure through substantial evidence that the VMT reduction is valid. This option provides the most flexibility for mitigation project selection and is also the least complex to set up. Implementation is completed on a project-by-project basis, similar to typical mitigation measures.
- **VMT Mitigation Bank** – attempts to create a monetary value for VMT reduction such that a developer could purchase VMT reduction credits. The money exchanged for credits could be

² For more detail on each program, see VMT Mitigation Through Banks and Exchanges Understanding New Mitigation Approaches, Fehr & Peers, January 2020 (Draft)

³ The Mitigation Fee Act: (Gov. Code, §66000) establishes requirements for local entities when imposing development fees.
https://leginfo.ca.gov/faces/codes_displayText.xhtml?lawCode=GOV&division=1.&title=7.&part=&chapter=5.&article=

applied to local, regional, or state-level VMT reduction projects or actions. Like all VMT mitigation, substantial evidence would be necessary that the projects covered by the Bank would achieve expected VMT reductions and some form of monitoring may be required. This is more complicated than a simple exchange and requires more time and effort to set up and implement. The verification of how much VMT reduction is associated with each dollar or credit and tracking mitigation completion are more difficult parts of the program. The option that best fits the needs of Escondido currently is an exchange program. The City will serve as the facilitating entity and will be responsible for administering the program and verifying that the agreed upon exchange projects are completed.

Project Identification

Selected projects in this program reflect the most recent development patterns in the area as well as the policy direction set in the City's General Plan and other planning documents. All selected projects are estimated to result in a reduction in the number of vehicle trips in their area of influence or target population.

Following is a list of planning documents reviewed that assisted in developing the initial VMT exchange program project/program list:

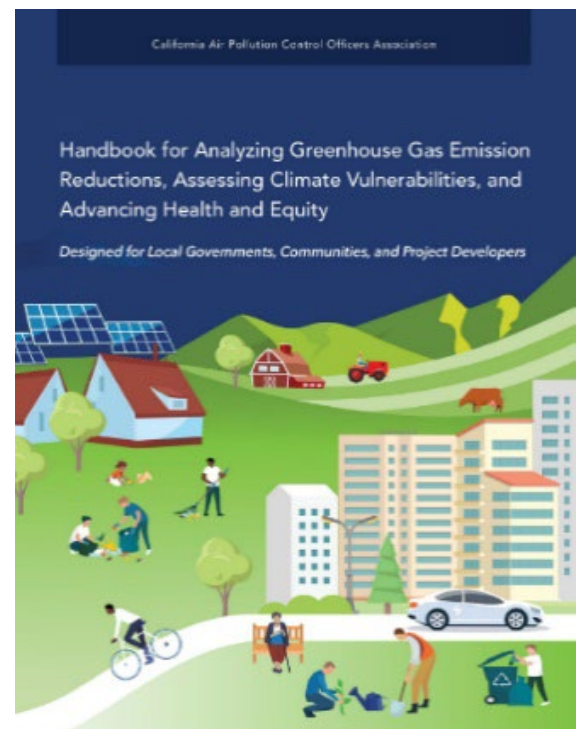
- General Plan (2012)
- Climate Action Plan (2021)
- Bicycle Master Plan (2012)
- Capital Improvement Program (2021-2022)
- Downtown Specific Plan (2013)
- Village Specific Plan (2017)
- East Valley Specific Plan – Draft (2021)
- Escondido Creek Trail Master Plan (2012)
- El Caballo Park Master Plan (2014)
- Grape Day Park Master Plan – Draft (2015)
- North County Transit District Project List (2021)
- Caltrans North County Project List (2021)

Nexus Methodology

The purpose of the nexus analysis is to:

- Provide justification for creating the VMT exchange program.
- Establish the relationship between the VMT exchange program individual projects/programs and the VMT reductions associated.

The VMT Exchange Program is a voluntary program that provides programmatic mitigation options to discretionary development projects that have a significant transportation VMT impact. The individual exchange projects/programs listed in this VMT Exchange Program reduce existing citywide VMT, offsetting a significant environmental impact due to the increase in VMT caused by a particular development project. Therefore, there is a direct benefit to the development project applicant utilizing the program to reduce the development project's significant transportation VMT impact. In addition, the program offers opportunities to reduce VMT through



encouragement of active transportation, transit use and other VMT reducing strategies near population centers, where they can serve the largest community benefit. Encouraging active transportation is also one of the legislative intents of SB 743.

The program establishes quantifiable benefits associated with VMT reduction strategies. There are several resources for determining the reduction in VMT associated with the individual projects/programs in this VMT Exchange Program. For this VMT Exchange Program, the VMT reduction for each individual project/program is calculated based on the California Air Pollution Control Officers (CAPCOA) 2021 *Handbook for Analyzing Greenhouse Gas Emission Reduction, Assessing Climate Vulnerabilities, and Advancing Health and Equity (GHG Handbook)*. The GHG Handbook provides the most current collection of research and documentation on TDM effectiveness at reducing VMT. In addition, the program references research compiled for the first version of the CAPCOA GHG Handbook (*Quantifying Greenhouse Gas Mitigation Measures*, 2010).

This study is designed to provide the necessary technical analysis to support the estimated VMT reductions. Technical information provided should be maintained and reviewed periodically to ensure that it reflects current planning documents, new potential projects/programs, updated TDM research, and updates to the SANDAG Regional Travel Model. Selected output from the SANDAG Regional Travel Demand Model (Activity Based Model 2+, Base Year, Regional Plan Version) was used in the TDM effectiveness calculations.

During the periodic review process, City staff will administratively incorporate minor amendments to the exchange project list such as adding new bicycle, pedestrian, or transit exchange projects. Adding new programs (such as those described for future updates including a citywide commute trip reduction program or circulator shuttle service) are considered major amendments that would require City Council approval.

Funds collected for projects/programs identified in this VMT Exchange Program cannot be used for maintenance of existing facilities.. All project/programs listed in this exchange program are additional to the roadway network; they do not exist today and are not contained in a funded improvement program. Note that upgrading an existing facility beyond standard requirements is an eligible project of this VMT Exchange Program.

VMT Exchange Program: Individual Projects/Programs

This section provides a description of the VMT reducing project and program types included in this VMT Exchange Program. The projects are separated into two categories: Early Action and Future. Initially, only bicycle, pedestrian, and transit supportive infrastructure/capital projects will be available as part of this exchange program. Once the program is established and additional City staff resources are available, other types of VMT reduction programs (circulator shuttle, commute trip reduction programs, etc.) may be offered. A sample of these future projects/programs are discussed in the “Future Exchange Program Options” section of this document.

The process for a developer to choose a project or program from the list is as follows:

1. Communicate with Development Services Staff that the development project has a significant transportation VMT impact, as indicated in the completed Scoping Agreement, and that the applicant would like to utilize the Exchange Program for full or partial mitigation of the impact.
2. Development Services Staff will discuss options with the applicant. The available VMT reducing projects from the Exchange will be reviewed and identified based on the following priorities:
 - a. The exchange project is near the development project (within a ½ mile travel distance from the development project) and connects the project or existing community to an existing bicycle or transit corridor.
 - b. If an exchange project is not available that meets priority (a), identify an exchange project that facilitates bicycle or pedestrian access to a key destination (park, school, community center, shopping) within ½ mile travel distance from the development project.
 - c. If an exchange project is not available that meets priorities (a) and (b), then expand the geography to citywide, first identifying an exchange project that connects existing communities to an existing bicycle or transit corridor and then expanding to an exchange project that facilitates bicycle or pedestrian access to a key destination (park, school, community center, shopping).

Early Action Exchange Program Projects

Table 1 provides the list of individual projects/programs, associated VMT reduction, and approximate construction costs for the early action exchange projects. **Appendix A** provides detailed calculation worksheets for each reduction strategy.

Pedestrian Network Projects

1. Increase Sidewalk Coverage

The objective of this measure is to increase access to surrounding land uses by providing new sidewalks, pedestrian bridges, and multi-use paths. A list of specific sidewalk project opportunities located near school areas and high activity pedestrian areas are identified and included in the Exchange Program.

Developers may select locations other than ones identified in this document; however, selected locations must be reviewed by the City Staff before applying VMT reductions to ensure that they are comparable to locations identified in this document and would result in increased pedestrian activity and meet the priority conditions stated above.

Note: While not a part of the VMT Exchange Program, development projects may take VMT reduction credit for construction of sidewalk along the project frontage (exterior edges of the project) if the new sidewalk fills a gap in the pedestrian network such that pedestrian connectivity is created. Sidewalks that are wholly contained within a development project (and therefore only serve the development project) are not eligible for VMT credit as part of the exchange program.

2. Improve Existing Pedestrian Infrastructure

The objective of this measure is to improve the existing pedestrian network through the implementation of measures that improve walking safety and quality that encourage people to walk instead of drive.

Such measures include installation of High-Visibility Crosswalks (HVC), pedestrian hybrid beacons, pedestrian signals, mid-block crosswalks, pedestrian refuge islands, speed tables, bulb-outs (curb extensions), curb ramps (at all corners of an intersection), roundabouts and mini-circles, pedestrian-only connections and districts, and planter strips with street trees (minimum 1 mile). Applicants must also demonstrate that the implementation of select measures will benefit a location that has existing pedestrian activity in consultation with City staff per the priority conditions stated above.

Applicants may propose pedestrian improvements other than the measures provided above, however, the applicant will need to demonstrate how the improvement encourages walking and may need to provide a VMT reduction study to justify the VMT reduction applied, if different from Table 1.

Bicycle Network Improvements

3. Increase Bike Facility Coverage

The objective of this measure is to increase access to surrounding land uses by increasing the number bicycle facilities or quality of existing bicycle facilities. Applicants may select a location from the bicycle network gaps/opportunities identified in the 2012 Bicycle Master Plan or any other planning document (General Plan, Specific Plan, ...) if the selected location is not already funded by a different source. The City may require the applicant to provide evidence on how the construction of the proposed bicycle facility will connect existing bicycle facilities or land use origins/destinations per the priorities established above such that the project would be anticipated to increase bicycling and thereby resulting in reducing VMT.

Note: While not a part of the VMT Exchange Program, development projects may take VMT reduction credit for construction of bike lanes along the project frontage (exterior edges of the project) if the new bike lanes fill a gap in the bicycle network such that bicycle connectivity is created. Bicycle facilities that are wholly contained within a development project (and therefore only serve the development project) are not eligible for VMT credit as part of the exchange program.

Transit Supportive Improvements

4. Upgrade Bus Stops

The objective of this measure is to improve the quality of bus service by providing bus shelter improvements such as lighting, transit route information, bicycle racks/lockers, benches, shelters or other improvements that help enhance the bus service user's comfort and experience. VMT reduction for such improvements should meet North County Transit District's (NCTD's) standards for providing a bus shelter (NCTD Bus Stop Development Handbook, March 2018⁴) or receive approval from NCTD. The selected bus shelter locations shall be identified through consultation with City and NCTD Staff and/or selected from the locations included on NCTD's priority list (to the extent that the list is available).

	Required Amenities	Recommended Amenities	Optional Amenities
Shelter Stops	• Bus stop sign • ADA accessible pad • Bench • Shelter • Connection to adjacent sidewalks/pathways • Trash receptacle	• Lighting • Bicycle racks/lockers • Transit route information • Screening from sun / elements (landscaping) • Transit system information	• Digital messaging signs

⁴ <https://lfportal.nctd.org/weblink/0/edoc/118390/2018%20Bus%20Stop%20Development%20Handbook.pdf>

Table 1: VMT Exchange Program Early Action Project List

#	Project	Unit	Daily VMT Reduction	Cost ^a
<i>Pedestrian Network Improvements</i>				
<i>1. Increase Sidewalk Coverage</i>				
1.1	Rose Elementary: E. Lincoln Avenue between N. Rose Street and Thomas Way (North side)	850 feet	49 VMT	\$170,000
1.2	Rose Elementary: N. Rose Street between E. Lincoln Avenue and E. El Norte Parkway (East side)	1750 feet	101 VMT	\$349,000
1.3	Rincon Middle School: Conway Drive between Rincon Avenue and Lehner Avenue (Both side)	3800 feet	219 VMT	\$756,000
1.4	Rincon Middle School: N. Ash Street between Spur Court to the City Limits (Both sides)	2250 feet	130 VMT	\$448,000
1.5	Felicita Elementary: S. Redwood Street between 13th Avenue and 15th Avenue (West side)	700 feet	41 VMT	\$140,000
1.6	Felicita Elementary: S. Redwood Street between 15th and W. Felicita Avenue (Both sides)	1150 feet	66 VMT	\$229,000
1.7	Felicita Elementary: 15th Avenue between Tulip Street and Centre City Parkway (Both sides)	2250 feet	130 VMT	\$448,000
1.8	Felicita Elementary: 13th Avenue between S. Redwood Street and South Quince Street (South sides)	400 feet	23 VMT	\$80,000
1.9	Hidden Valley Middle School: S. Citrus Avenue between La Ramada Lane and Patterson Road (East side)	950 feet	55 VMT	\$189,000
1.10	Farr Elementary: Farr Avenue between North Ash St and North Fig Str (North side)	1100 feet	64 VMT	\$219,000
1.11	Conway Elementary School: Sheridan Avenue between N. Ash Street and Fallsview Place (North sides)	950 feet	55 VMT	\$189,000
1.12	Escondido High School: Sheridan Avenue between Taft Street and N. Elm Street (Both sides)	2100 feet	121 VMT	\$418,000
1.13	Calvin Christian School: Vista Avenue between N. Ash Street and Bello Hills Lane (South side)	920 feet	53 VMT	\$183,000
1.14	N. Ash Street between Rincon Avenue and Madison Avenue	Various	303 VMT per 1 mile of new sidewalk	\$1,050,000 per 1 mile
1.15	Stanley Avenue between N. Broadway Street and Conway Street	Various	303 VMT per 1 mile of new sidewalk	\$1,050,000 per 1 mile
1.16	Other locations ^b	Various	303 VMT per 1 mile of new sidewalk	\$1,050,000 per 1 mile

Table 1: VMT Exchange Program Early Action Project List

#	Project	Unit	Daily VMT Reduction	Cost ^a
2. Improve Existing Pedestrian Infrastructure				
2.1	Intersection High-Visibility Crosswalks (HVC)	2 legs striped as HVC	30 VMT	\$5,000-\$10,000
		4 legs striped as HVC	60 VMT	
		3 legs striped as HVC for T-intersection	45 VMT	
2.2	Intersection Pedestrian Refuge Islands	2 Islands	30 VMT	\$20,000-\$60,000
		4 islands	60 VMT	
		3 islands for T-Intersection	45 VMT	
2.3	Intersection Raised Crosswalk (If HVC are also installed, VMT reduction is NOT doubled)*	2 raised crosswalks	30 VMT	\$20,000-\$60,000
		4 raised crosswalks	60 VMT	
		3 raised crosswalks for T-Intersection	45 VMT	
2.4	Intersection Pedestrian Signal Upgrades (countdown pedestrian heads plus accessible pedestrian signals (APS))	1 Intersection Upgrade (whole intersection)	60 VMT per intersection	Varies

Table 1: VMT Exchange Program Early Action Project List

#	Project	Unit	Daily VMT Reduction	Cost ^a
2.5	Install Intersection Curb Ramps (Directional Ramps Preferred).	1 Corner	8 VMT per corner improved	\$10,000
2.6	Install Curb-Extensions (bulb-outs).	1 Intersection Approach	8 VMT per intersection approach	Varies based on location and drainage considerations
2.7	Upgrade Existing or Install New Mid-Block Crossing with HVC and Rapid Rectangular Flashing Beacons (RRFBs)/Pedestrian Hybrid Beacon (PHB) (or other pedestrian activated crossing signals) as determined appropriate by the City's Crosswalk Policy	1 HVC Mid-Block Crossing with RRFB or PHB	30 VMT per mid-block crossing with RRFB or PHB	\$30,000-\$50,000
2.8	Mid-Block Crossing Pedestrian Refuge Island and other improvements as determined appropriate by the City's Crosswalk Policy.	1 Island	30 VMT per unit	\$10,000-20,000
2.9	Mid-Block Crossing Raised Crosswalk and other improvements as determined appropriate by the City's Crosswalk Policy	1 Raised Crosswalk	30 VMT per unit	\$10,000-20,000

Table 1: VMT Exchange Program Early Action Project List

#	Project	Unit	Daily VMT Reduction	Cost ^a
2.10	Traffic calming (traffic circles, speed tables, other speed reduction features) as identified in the City's Traffic Management Toolbox ⁵	Each device	30 VMT per each device (max 60 VMT per block)	Varies
2.11	Other pedestrian improvements may be identified through consultation with City staff.	1 measure	30 VMT per measure as reviewed/ approved by City Staff	Varies by measure
Bicycle Network Improvements				
3. Increase Bike Facility Coverage				
3.1	New Class I or Class IV Bikeway	1 mile (bi-directional)	107 VMT	Varies
3.2	New Class II Bike Lane	1 mile (bi-directional)	71 VMT	Varies
3.3	Upgrade Bicycle facility from (Class II to Class I or IV; Class III to Class I, II, or IV)	1 mile (bi-directional)	36 VMT	Varies
Transit Supportive Improvements				
4. Upgrade Bus Stops				
4.1	Upgrade an Existing Bench Stop to Shelter Stop if all NCTD criteria are met). Upgrade must include all required amenities for shelter stops per the NCTD Bus Stop Development Book.	1 upgrade	50 VMT	\$10,000-25,000 per shelter

- a. Cost associated to each improvement is estimates based on historical data and previous projects that Fehr and Peers has conducted around the San Diego Region.
- b. Selected location must be reviewed by City staff to ensure that VMT benefits are comparable to similar locations identified by the City.

⁵ <https://www.escondido.org/Data/Sites/1/media/Engineering/TrafficManagementToolbox.pdf>

Future Exchange Program Options

The following provides a summary of additional TDM-type programs/projects that the City could consider integrating into the exchange program based on demand for exchange projects and as time/resources are available. Including these items into the exchange program will require additional evaluation to determine the implementation logistics and to develop the mechanism for the City to collect funding and allocate for these purposes.

Table 2 summarizes possible programs/projects to include in the exchange program with initial estimates of VMT reduction and cost of these options.

Trip Reduction Marketing

1. Implement Trip Reduction Marketing (Future)

The objective of this measure is to fund programs that aim to reduce VMT and GHG emissions through education and marketing of trip reduction strategies. Following is a selection of example programs that could apply to the City of Escondido:

- Marketing programs (e.g. Escondido Transport Options campaign) focusing on educating and informing commuters on the benefits of alternative travel options (carpooling, transit, walking, biking, ...).
- Programs that provide information on commuting resources through digital/online platforms (e.g. Install strategically located kiosks with information on commute alternatives or/and use wayfinding applications or newsletters to share commute information).
- Periodic regional events that promote and encourage commute alternatives to driving alone, such as Bike to Work Month, Dump the Pump, Rideshare Week, Walk and Bike to School Day, and other similar events.

Applicants would provide general funding to the City for the administration and management of trip reduction marketing to City residents and employees.

2. Fund City Employee Trip Reduction Program (Future)

The City could administer and manage a trip reduction program specifically designed to reduce driving by city staff. Applicants would provide general funding to the City for the program. The program could include ride-share matching, free-ride-home programs, commute trip planning services, commute "gamification"⁶/incentives for not driving, etc. Public Transit/Shuttle Improvement

⁶ Gamification is the application of typical elements of game playing (e.g. point scoring, competition with others, rules of play) to other areas of activity, typically as a technique to encourage participation.

3. Downtown Escondido On-Demand Shuttle (Future)

The objective of this measure is to provide funding for the upfront capital investment and continued operation of a Downtown Escondido on-demand shuttle. The service could provide zero-emission electric vehicles for on-demand free rides around the downtown area. Beyond an initial capital investment, the program requires continuous funding per month to stay operational.

Table 2: VMT Exchange Program Future Programs

#	Project	Unit	Daily VMT Reduction	Estimated Cost
<i>Trip Reduction Marketing</i>				
<i>1. Implement Trip Reduction Marketing</i>				
1.1	Fund marketing programs (e.g. Escondido Transport Options campaign) that focuses on educating and informing commuters on alternative travel options (carpooling, transit, walking, biking, ...).	Employee (1-year program – funding for 30 years ⁷)	Varies	\$3,450 per VMT ^a \$115 per VMT per year
1.2	Fund programs that provide information on commuting resources through digital/online platforms (e.g. Install strategically located kiosks with information on commute alternatives or/and use way finding applications or newsletters to share commute information).	Employee (1-year program – funding for 30 years)	Varies	\$3,450 per VMT ^a \$115 per VMT per year
1.3	Fund annual regional events that promote and encourage commute alternatives to driving alone such as Bike to Work Month, Dump the Pump, Rideshare Week, Walk and Bike to School Day, and other similar events.	Employee (1-year program – funding for 30 years)	Varies	\$3,450 per VMT ^a \$115 per VMT per year
<i>2. Fund City Employee Trip Reduction Program</i>				
2.1	Fund programs that incentivize City employees to commute using alternative modes of transportation.	Employee (1-year program – funding for 30 years)	Varies	\$3,450 per VMT ^a \$115 per VMT per year
<i>Shuttle Improvement</i>				
<i>3. Downtown Escondido On-Demand Shuttle</i>				
3.1	Fund a program that increase access within downtown are during peak commute hours through implementation of intra-city shuttles that run within the downtown area ^c	minimum 2 shuttles for 1 month – funding for 1 year	Varies (Each shuttle reduces 26 daily VMT)	\$4,900 per shuttle per month ^b (\$4,524 per VMT)

⁷ 30 years was used as a timeframe because it is a common planning horizon and commonly used in CEQA mitigation and monitoring programs for monitoring mitigation measures.

Table 2: VMT Exchange Program Future Programs

#	Project	Unit	Daily VMT Reduction	Estimated Cost
a.	City of Escondido has approximately 700 staff and employees. Assuming one support staff to run the program (\$75,000 salary + benefits) and average of \$50 per employee marketing material, the city would require funding of approximately \$110,000 to operate the program each year, which results in (700 x 1.37 VMT reduction per employee) 959 daily VMT reduction. Average cost to reduce 1 daily VMT is calculated at \$115 for 1 year. For a 30-year program, the cost is \$3,450 (\$115*30 years).			
b.	According to a 2019 article on the San Diego Union-Tribune ([update]), City of San Diego operates a 22 all-electric vehicle service (FRED) that moves people around the San Diego downtown area for free, the service was reported to move an average of 17,500 passengers per month (27 passengers served per day per shuttle). The average cost of operation is also reported at \$6 per passenger or \$4,900 per month per shuttle (27 passengers*\$6/day*30days). According to SANDAG Regional Model, trips that occur within Escondido downtown area have an average length of approximately 0.5 mile per trip. Assuming that trips occur by single-occupant vehicles, 26 VMT translates to 52 individual passengers that could be served by minimum 2 shuttles. This results in a cost of \$4,900 per month reducing 13 daily VMT per shuttle = \$377/month to reduce 1 daily VMT. If the program requires funding the shuttle for 1 year, the cost is \$4,524 per VMT (\$377*12 months per year).			

Using the Exchange Program

This section provides instructions to applicants on utilizing the VMT Exchange program, defined variables necessary to perform the calculations, and provides a sample calculation.

Process for Using the Exchange Program



Standard Household Size and Number of Employees

The following standard values will be applicable to all projects utilizing the VMT Exchange Program. The values will be reviewed and updated periodically.

Standard Household Size

The average household size in Escondido as reported in the City's 2021-2029 Housing Element (March 2021) is 3.21 persons per household (US Census Bureau American Community Survey 2014-2018). For purposes of the VMT Exchange Program, the average number of bedrooms per household is two (2). Therefore, the average number of people per bedroom is 1.6. The following persons per household should be applied to perform the VMT reduction needed calculation in Step 3:

- Studio: 1.0 persons per unit
- Single/Multi-Family Residences: 1.6 persons per bedroom or 3.2 persons per unit – whichever results in a lower population.

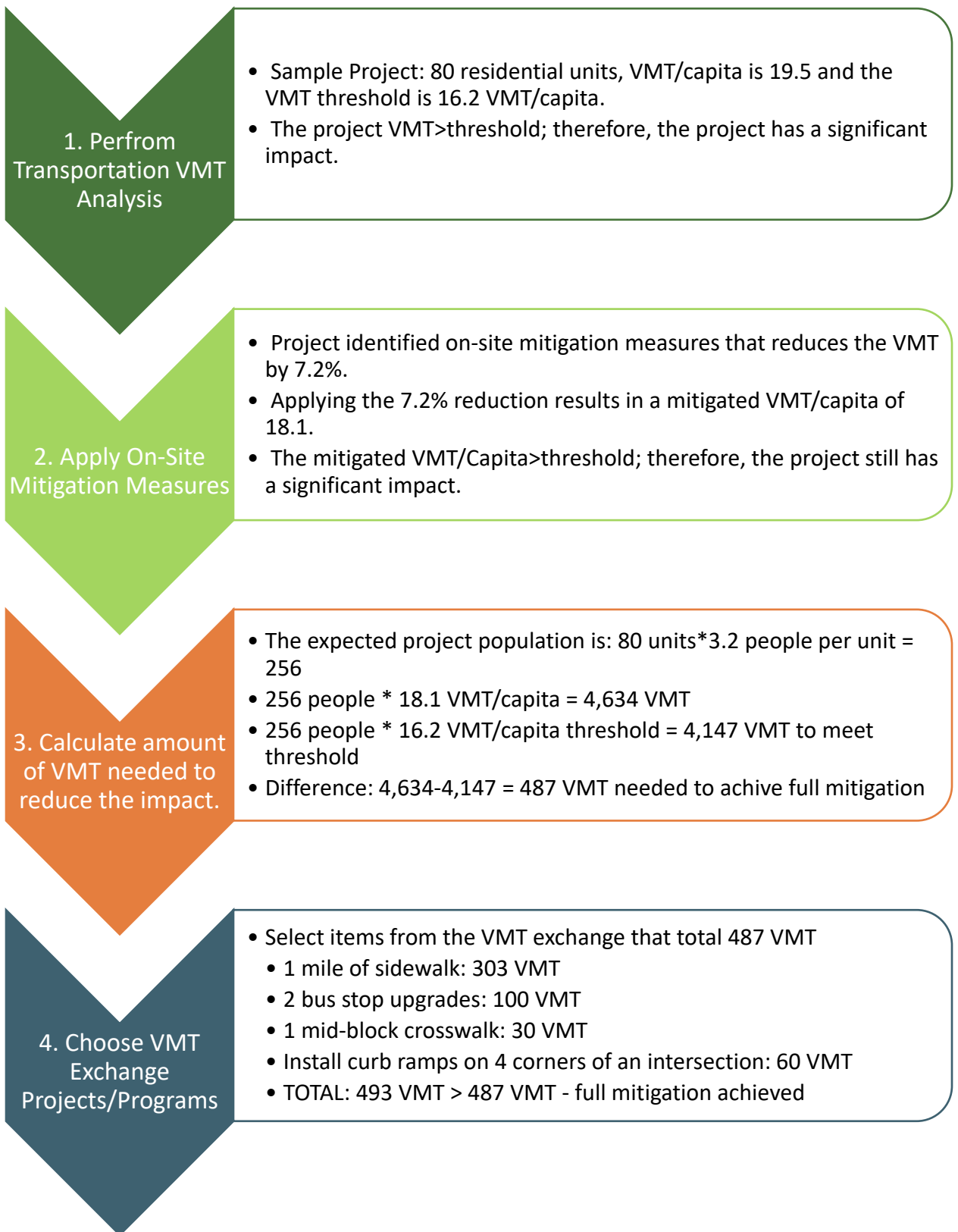
Standard Number of Employees by Employment Use

SANDAG uses a standard number of employees per square foot of employment use, provided by use. For purposes of calculating expected number of employees for purposes of applying the VMT Exchange Program, the SANDAG data will be used. A sample of commonly used employment types is provided below (see Attachment B for a comprehensive list of employment uses):

- Hotel (Low-Rise): 1,850 square feet per employee
- Light Industrial: 1,200 square feet per employee
- Low Rise Office (less than or equal to 100,000SF): 200 square feet per employee

Sample Calculation

The following provides a sample calculation for using the VMT Exchange Program



Appendix A

VMT Reduction Calculations

Early Action Exchange Program Projects

Pedestrian Network Improvements

1. Increase sidewalk coverage

Source:

- *Handbook for Analyzing Greenhouse Gas Emission Reduction, Assessing Climate Vulnerabilities, and Advancing Health and Equity (GHG Handbook), 2021, Measure T-18*

$$A = \left(\frac{C}{B} - 1 \right) \times D = \left(\frac{15.5 \text{ mile}}{14.5 \text{ mile}} - 1 \right) \times -0.05 \approx -0.34\%$$

Parameter	Quantity
A Percent reduction of VMT (Max allowed = 6.4%)	
B Average sidewalk length in 0.6-mile radius in the City of Escondido ¹	14.5 mile
C Average sidewalk length in 0.6-mile radius in the City of Escondido + 1-mile new sidewalk	15.5 mile
D The elasticity of VMT with respect to the ratio of sidewalks-to-streets	-0.05
1. The City of Escondido maintains approximately 300 miles of streets. Assuming roughly 80% of the streets have sidewalks on both sides, total sidewalks are estimated at 300 X 2-side X 80% = 480 miles of sidewalks. The City of Escondido has a land area of 37.34 square miles of land. It is estimated that Escondido has an approximate density of (480 miles of sidewalk / 37.34 square miles of land =) 12.85 miles of sidewalk per square mile of land. The GHG handbook recommends a study area of a 0.6-mile radius (1.13 square miles) to calculate VMT reduction achieved from increasing sidewalk coverage. A study area is estimated to have an average of (1.13 square miles x 12.85 miles of sidewalks / square mile of land =) 14.5 miles of sidewalk.	

Walking is typically an alternative for short trips and may not replace trips that are longer than 1 mile. The reduction is applied only on the VMT generated from all trips that start and end in the City of Escondido and the trip length is shorter than 1 mile. The average VMT reduction per mile of new sidewalks is calculated as below:

Total VMT in Escondido from Trips that are < 1 mile (per SANDAG ABM2+ Model 2016 Base Year) = 89,090

$$\text{Average VMT reduction} = A \times \text{Total VMT} = 0.34\% \times 89,090 \text{ VMT} = \frac{303 \text{ VMT reduced}}{1 \text{ mile of new sidewalk}}$$

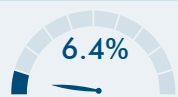
The purpose of this calculation is to create the average amount of VMT reduced by adding one mile of sidewalk within Escondido. This calculation uses Escondido specific assumptions about sidewalk density, sidewalk coverage, and VMT within Escondido (for only trips that are less than 1 mile long). The total VMT from trips that start and end in Escondido that are less than 1 mile long is sourced from the SANDAG AMB 2+ Regional Travel Demand Model for the 2016 base year. In addition, only VMT associated with trips that are shorter than 1 mile are included because adding sidewalks will primarily affect shorter trips. In other words, converting a car trip to a walking trip will only be possible for short car trips.

The GHG Handbook, Measure T-18 information is provided on the following pages for reference.

T-18. Provide Pedestrian Network Improvement



GHG Mitigation Potential



Up to 6.4% of GHG emissions from vehicle travel in the plan/community

Co-Benefits (icon key on pg. 34)



Climate Resilience

Improving pedestrian networks increases accessibility of outdoor spaces, which can provide health benefits and thus improve community resilience. This can also improve connectivity between residents and resources that may be needed in an extreme weather event.

Health and Equity Considerations

Ensure that the improvements also include accessibility features to allow for people of all abilities to use the network safely and conveniently. Ensure that sidewalks connect to nearby community assets, such as schools, retail, and healthcare.

Measure Description

This measure will increase the sidewalk coverage to improve pedestrian access. Providing sidewalks and an enhanced pedestrian network encourages people to walk instead of drive. This mode shift results in a reduction in VMT and GHG emissions.

Subsector

Neighborhood Design

Locational Context

Urban, suburban, rural

Scale of Application

Plan/Community

Implementation Requirements

The GHG reduction of this measure is based on the VMT reduction associated with expansion of sidewalk coverage expansion, which includes not only building of new sidewalks but also improving degraded or substandard sidewalk (e.g., damaged from street tree roots). However, pedestrian network enhancements with non-quantifiable GHG reductions are encouraged to be implemented, as discussed under *Expanded Mitigation Options*.

Cost Considerations

Depending on the improvement, capital and infrastructure costs may be high. However, improvements to the pedestrian network will increase pedestrian activity, which can increase businesses patronage and provide a local economic benefit. The local municipality may achieve cost savings through a reduction of cars on the road leading to lower infrastructure and roadway maintenance costs.

Expanded Mitigation Options

When improving sidewalks, a best practice is to ensure they are contiguous and link externally with existing and planned pedestrian facilities. Barriers to pedestrian access and interconnectivity, such as walls, landscaping buffers, slopes, and unprotected crossings should be minimized. Other best practice features could include high-visibility crosswalks, pedestrian hybrid beacons, and other pedestrian signals, mid-block crossing walks, pedestrian refuge islands, speed tables, bulb-outs (curb extensions), curb ramps, signage, pavement markings, pedestrian-only connections and districts, landscaping, and other improvements to pedestrian safety (see Measure T-35, *Provide Traffic Calming Measures*).





GHG Reduction Formula

$$A = \left(\frac{C}{B} - 1 \right) \times D$$

GHG Calculation Variables

ID	Variable	Value	Unit	Source
Output				
A	Percent reduction in GHG emissions from household vehicle travel in plan/community	0–6.4	%	calculated
User Inputs				
B	Existing sidewalk length in study area	[]	miles	user input
C	Sidewalk length in study area with measure	[]	miles	user input
Constants, Assumptions, and Available Defaults				
D	Elasticity of household VMT with respect to the ratio of sidewalks-to-streets	-0.05	unitless	Frank et al. 2011

Further explanation of key variables:

- (B and C) – Sidewalk length should be measured on both sides of the street. For example, if one 0.5-mile-long street has full sidewalk coverage, the sidewalk length would be 1.0 mile. If there is only sidewalk on one side of the street, the sidewalk length would be 0.5 mile. The recommended study area is 0.6 mile around the pedestrian network improvement. This represents a 6- to 10-minute walking time.
- (D) – A study found that a 0.05 percent decrease in household vehicle travel occurs for every 1 percent increase in the sidewalk-to-street ratio (Frank et al. 2011; Handy et al. 2014).

GHG Calculation Caps or Maximums

Measure Maximum

($A_{\max}$) The percent reduction in GHG emissions (A) is capped at 3.4 percent, which is based on the following assumptions:

- 35.2 percent of vehicle trips are short trips (2 mile or less, average of 1.29 miles) and thus could easily shift to walking (FHWA 2019).
- 64.8 percent of vehicle trips are longer trips that are unlikely to shift to walking (2 miles or more, average of 10.93 miles) (FHWA 2019).
- So $A_{\max} = \frac{35.2\% \times 1.29 \text{ miles}}{64.8\% \times 10.93 \text{ miles}} = 6.4\%$



Subsector Maximum

($\sum A_{\text{max T-18 through T-22-C}} \leq 10\%$) This measure is in the Neighborhood Design subsector. This subcategory includes Measures T-18 through T-22-C. The VMT reduction from the combined implementation of all measures within this subsector is capped at 10 percent.

Example GHG Reduction Quantification

The user reduces household VMT by improving the pedestrian network in the study area. In this example, the existing sidewalk length (B) is 9 miles, and the sidewalk length with the measure (C) would be 10 miles. With these conditions, the user would reduce GHG emissions from household VMT within the study area by 0.6 percent.

$$A = \left(\frac{10 \text{ miles}}{9 \text{ miles}} - 1 \right) \times -0.05 = -0.6\%$$

Quantified Co-Benefits



Improved Local Air Quality

The percent reduction in GHG emissions (A) would be the same as the percent reduction in NO_x, CO, NO₂, SO₂, and PM. Reductions in ROG emissions can be calculated by multiplying the percent reduction in GHG emissions (A) by an adjustment factor of 87 percent. See *Adjusting VMT Reductions to Emission Reductions* above for further discussion.



Energy and Fuel Savings

The percent reduction in vehicle fuel consumption would be the same as the percent reduction in GHG emissions (A).



VMT Reductions

The percent reduction in household VMT would be the same as the percent reduction in GHG emissions (A).



Improved Public Health

Users are directed to the Integrated Transport and Health Impact Model (ITHIM) (CARB et al. 2020). The ITHIM can quantify the annual change in health outcomes associated with active transportation, including deaths, years of life lost, years of living with disability, and incidence of community and individual disease.

Sources

- California Air Resources Board (CARB), California Department of Public Health (CDPH), and Nicholas Linesch Legacy Fund. 2020. Integrated Transport and Health Impact Model. Available: <https://skylab.cdph.ca.gov/HealthyMobilityOptionTool-ITHIM/#Home>. Accessed: September 17, 2021.
- Federal Highway Administration (FHWA). 2019. 2017 National Household Travel Survey Popular Vehicle Trip Statistics. Available: <https://nhts.ornl.gov/vehicle-trips>. Accessed: January 2021.



- Frank, L., M. Greenwald, S. Kavage, and A. Devlin. 2011. *An Assessment of Urban Form and Pedestrian and Transit Improvements as an Integrated GHG Reduction Strategy*. WSDOT Research Report WA-RD 765.1, Washington State Department of Transportation. April. Available: www.wsdot.wa.gov/research/reports/fullreports/765.1.pdf. Accessed: January 2021.
- Handy, S., S. Glan-Claudia, and M. Boarnet. 2014. *Impacts of Pedestrian Strategies on Passenger Vehicle Use and Greenhouse Gas Emissions: Policy Brief*. September. Available: https://ww2.arb.ca.gov/sites/default/files/2020-06/Impacts_of_Pedestrian_Strategies_on_Passenger_Vehicle_Use_and_Greenhouse_Gas_Emissions_Policy_Brief.pdf. Accessed: January 2021.

Pedestrian Network Improvements

2. Improve existing pedestrian infrastructure

The GHG Handbook does not provide a quantitative approach for determining the VMT reduction associated with pedestrian improvements or traffic calming. However, the GHG Handbook does document that (GHG Handbook, page 133):

Expanded Mitigation Options

When improving sidewalks, a best practice is to ensure they are contiguous and link externally with existing and planned pedestrian facilities. Barriers to pedestrian access and interconnectivity, such as walls, landscaping buffers, slopes, and unprotected crossings should be minimized. Other best practice features could include high-visibility crosswalks, pedestrian hybrid beacons, and other pedestrian signals, mid-block crossing walks, pedestrian refuge islands, speed tables, bulb-outs (curb extensions), curb ramps, signage, pavement markings, pedestrian-only connections and districts, landscaping, and other improvements to pedestrian safety (see Measure T-35, *Provide Traffic Calming Measures*).

Additionally, GHG Handbook Measure T-35 Provide Traffic Calming also describes improving the bicycle and pedestrian experience by reducing travel speeds, encouraging walking and biking. The measure is described as follows (GHG Handbook, page 53):

T-35. Provide Traffic Calming Measures

This measure requires projects to include pedestrian/bicycle safety and traffic calming measures above jurisdictional requirements. Roadways should also be designed to reduce motor vehicle speeds and encourage pedestrian and bicycle trips with traffic calming features. Traffic calming features may include marked crosswalks, count-down signal timers, curb extensions, speed tables, raised crosswalks, raised intersections, median islands, tight corner radii, roundabouts or mini-circles, on-street parking, planter strips with street trees, chicanes/chokers, and others. Providing traffic calming measures encourages people to walk or bike instead of using a vehicle. This mode shift will result in a decrease in vehicle miles traveled. In 2017, 3,904 people were killed and 277,160 injured by vehicle collisions in California; traffic calming can reduce injuries and death, which improves health (State of California et al., 2018). Traffic calming also promotes active transportation, which improves physical health.

As noted in the GHG Handbook, the improvements are intended to improve pedestrian experience and safety to encourage more people to choose walking instead of driving for nearby destinations. The previous version of the CAPCOA GHG Handbook did provide some limited research about the amount of VMT reduction associated with pedestrian improvements and traffic calming features. However, since the research was limited and not geographically diverse, the update GHG Handbook does not offer specific VMT quantification of these measures.

An engineering/planning judgement estimate was made assuming the number of new walking trips that would result daily from these types of improvements. The improvements are estimated to convert up to

25 short vehicle trips to walking trips per day. The average walking trip length is 0.6 miles one-way (based on the GHG Handbook) or 1.2 miles round-trip. Therefore, 25 additional walking trips reduces VMT by 1.2 miles * 25 walking trips = 30 VMT per one pedestrian improvement.

In addition, planning/engineering judgement was used to establish what constitutes "one pedestrian improvement." For improvements at intersections, (such as enhancing the crosswalks, adding raised crosswalks, or installing median refuse islands) features that improve access for a walking desire line across two intersection legs is considered an improvement. This is logical because if you are walking and need to access the opposite corner of the intersection you would need to cross two legs of the intersection to continue to your desired destination. Therefore, to be inclusive of all walking desire lines the improvements should upgrade the pedestrian conditions on least two intersection legs to be considered one pedestrian improvement.

For mid-block locations, a single crossing provides access to all pedestrian desire lines; therefore, upgrading the mid-block location results in the same VMT reduction benefit as upgrading two legs of an intersection.

Curb ramp installation also encourages pedestrian activity for people who use mobility devices, have limited mobility, and for people who are pushing strollers, wagons, etc. Most intersections in Escondido have curb ramps; however, some intersections have incomplete (not all corners have them) or completely missing ramps. To offer flexibility and achieve the benefit of having curb ramps installed, the 30 VMT reduction per improvement was divided by four (4) to reflect a typical four-corner intersection ($30/4=7.5$, rounded to the nearest whole number = 8). Also note that directional curb ramps are preferred in Escondido, which results in two curb ramps per intersection corner. The 8 VMT reduced is "per corner" not "per ramp."

Bicycle Network Improvements

3. Increase bike facility coverage

Source:

- *Handbook for Analyzing Greenhouse Gas Emission Reduction, Assessing Climate Vulnerabilities, and Advancing Health and Equity, 2021, Measure T-19-A*

$$A = -B \times \left(\frac{\frac{F}{I} \times (C + D) \times E_i \times G}{H} \right)$$

Parameter	Quantity
A Percent reduction of VMT (Max allowed = 0.8%)	
B Percent of plan/community VMT on parallel roadway	100%
C Active transportation adjustment factor (Assumptions: average ADT = 12k-24k, facility length = 1 mile)	0.0014
D Credit for key destinations near project (Assumptions: number of key destinations within 0.5 mile = 3)	0.0005
E ₁ Growth factor adjustment for facility type (New Class I or Class IV bikeway)	1.54
E ₂ Growth factor adjustment for facility type (New Class II bike lane)	1.00
E ₃ Growth factor adjustment for facility type (Convert Class II to IV)	0.54
F Annual days of use of new facility (San Diego)	323
G Existing regional average one-way bicycle trip length (mile – San Diego)	2.0
H Existing regional average one-way vehicle trip length (mile – San Diego)	19.1
I Days per year	365

VMT reduction per mile of bike facility is estimated in the following table per facility type. The reduction is applied only on the VMT generated from all trips that start and end in the City of Escondido and the trip length is shorter than 3 miles.

	Facility Type		
	E ₁	E ₂	E ₃
Percent reduction of VMT (A)	0.03%	0.02%	0.01%
VMT reduction per mile of bike facility (A X Total VMT)	107 VMT	71 VMT	36 VMT

Bicycling is typically an alternative for short trips and may not replace trips that are longer than 3 miles. The reduction is applied only on the VMT generated from all trips that start and end in the City of Escondido and the trip length is shorter than 3 miles. The average VMT reduction per mile of bicycle facility is calculated as below:

Total VMT in Escondido from Trips that are < 3 mile (per SANDAG ABM2+ Model 2016 Base Year) = 355,000 VMT

$$\text{Average VMT reduction} = A \times \text{Total VMT} = .03\% \times 355,000 \text{ VMT} = \frac{107 \text{ VMT reduced}}{1 \text{ mile of new class I or IV bikeway}}$$

$$\text{Average VMT reduction} = A \times \text{Total VMT} = .02\% \times 355,000 \text{ VMT} = \frac{71 \text{ VMT reduced}}{1 \text{ mile of new class II bikeway}}$$

$$\begin{aligned} \text{Average VMT reduction} &= A \times \text{Total VMT} = .01\% \times 355,000 \text{ VMT} \\ &= \frac{36 \text{ VMT}}{1 \text{ mile of converted class II to class I or IV bikeway}} \end{aligned}$$

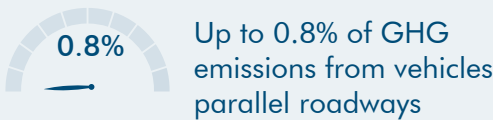
The purpose of this calculation is to create the average amount of VMT reduced by adding one mile of bikeway (or converting 1 mile of bike lanes to bike path or cycle track) within Escondido. This calculation uses Escondido specific assumptions about VMT within Escondido (for only trips that are less than 3 miles long). The total VMT from trips that start and end in Escondido that are less than 3 miles long is sourced from the SANDAG AMB 2+ Regional Travel Demand Model for the 2016 base year. Only VMT associated with trips that are shorter than 3 miles are included because adding bikeways will primarily affect shorter trips. In other words, converting a car trip to a bicycling trip will only be possible for short car trips.

The GHG Handbook, Measure T-19A information is provided on the following pages for reference.

T-19-A. Construct or Improve Bike Facility



GHG Mitigation Potential



Co-Benefits (icon key on pg. 34)



Climate Resilience

Constructing and improving bike facilities can incentivize more bicycle use and decrease vehicle use, which have health benefits and can thus improve community resilience. This can also improve connectivity between residents and resources that may be needed in an extreme weather event.

Health and Equity Considerations

Prioritize low-income and underserved areas and communities with lower rates of vehicle ownership or fewer transit options. Make sure that the bicycle facility connects to a larger existing bikeway network that accesses destinations visited by low-income or underserved communities.

Measure Description

This measure will construct or improve a single bicycle lane facility (only Class I, II, or IV) that connects to a larger existing bikeway network. Providing bicycle infrastructure helps to improve biking conditions within an area. This encourages a mode shift on the roadway parallel to the bicycle facility from vehicles to bicycles, displacing VMT and thus reducing GHG emissions. When constructing or improving a bicycle facility, a best practice is to consider local or state bike lane width standards. A variation of this measure is provided as T-19-B, *Construct or Improve Bike Boulevard*.

Subsector

Neighborhood Design

Locational Context

Urban, suburban

Scale of Application

Plan/Community. This measure reduces VMT on the roadway segment parallel to the bicycle facility (i.e., the corridor). An adjustment factor is included in the formula to scale the VMT reduction from the corridor level to the plan/community level.

Implementation Requirements

The bicycle lane facility must be either Class I, II, or IV. Class I bike paths are physically separated from motor vehicle traffic. Class IV bikeways are protected on-street bikeways, also called cycle tracks. Class II bike lanes are striped bicycle lanes that provide exclusive use to bicycles on a roadway.

Cost Considerations

Capital and infrastructure costs for new bike facilities may be high. The local municipality may achieve cost savings through a reduction of cars on the road leading to lower infrastructure and roadway maintenance costs.

Expanded Mitigation Options

Implement alongside Measures T-22-A, T-22-B, and/or T-22-C to ensure that micromobility users can ride safely along bicycle lane facilities and not have to ride along pedestrian infrastructure, which is a risk to pedestrian safety.





GHG Reduction Formula

$$A = -B \times \frac{F}{I} \times (C + D) \times E \times G$$

GHG Calculation Variables

ID	Variable	Value	Unit	Source
Output				
A	Percent reduction in GHG emissions from displaced vehicles on roadway parallel to bicycle facility	0–0.8	%	calculated
User Inputs				
B	Percent of plan/community VMT on parallel roadway	0–100	%	user input
C	Active transportation adjustment factor	Table T-19.1	unitless	CARB 2020
D	Credits for key destinations near project	Table T-19.2	unitless	CARB 2020
E	Growth factor adjustment for facility type	Table T-19.3	unitless	CARB 2020
Constants, Assumptions, and Available Defaults				
F	Annual days of use of new facility	Table T-19.4	days per year	NOAA 2017
G	Existing regional average one-way bicycle trip length	Table T-10.1	miles per trip	FHWA 2017
H	Existing regional average one-way vehicle trip length	Table T-10.1	miles per trip	FHWA 2017
I	Days per year	365	days per year	standard

Further explanation of key variables:

- (B) – The percent of total plan/community VMT within the roadway parallel to the bike facility should represent the expected total VMT generated by all land use in that area, including office, residences, retail, schools, and other uses. The most appropriate source for this data is from a local travel demand forecasting model. An alternate method uses VMT per worker or VMT per resident as calculated for SB 743 compliance and screening purposes multiplied by the population in the area.
- (C, D, and E) – The active transportation adjustment factor, key destination credit, and growth factor adjustment should be looked up by the user in Tables T-19.1 through T-19.3 in Appendix C. The active transport adjustment factor is based on the existing annual average daily traffic (AADT) of the facility, length of the proposed bike facility, and the city population. The key destination credit is based on the number of key destinations within 0.5-mile of the facility. The growth factor is based on the type of proposed bicycle facility.
- (F) – The annual days of use for the new facility should be looked up by users in Table T-19.4 based on the county in which the project is located. The days of use is based on the number of days per year where there is no rainfall (i.e., ≤ 0.1 inches) (NOAA 2017).



- (G and H) – Ideally, the user will calculate bicycle and vehicle trip lengths for the corridor at a scale no larger than the surrounding census tract. Potential data sources include the U.S. Census, California Household Travel Survey (preferred), or local survey efforts. If the user is not able to provide a project-specific value using one of these data sources, they have the option to input regional average one-way bicycle and vehicle trip lengths for one of the six most populated CBSAs in California provided in Table T-10.1 in Appendix C (FHWA 2017).

GHG Calculation Caps or Maximums

Measure Maximum

($A_{\max}$) For projects that use CBSA data from Table T-10.1 in Appendix C, the maximum percent reduction in GHG emissions (A) is 0.8 percent. This is based on a neighborhood project the size of a large corridor ($B = 100\%$) within the CBSA of Sacramento-Roseville-Arden-Arcade that uses the highest values for (C, D, and E) in Tables T-19.1 through T-19.3 and annual use days for Sacramento County (F) in Table T-19.4. This maximum scenario is presented in the below example quantification.

($C_{\max}$) The active transportation adjustment factor (C) was determined for roadways with AADT ranging from 1 to 30,000 (CARB 2020). Roadways with AADT greater than 30,000 are generally not appropriate for bicycle facilities. Care should be taken by the user in interpreting the results from this equation for a project roadway with AADT greater than 30,000.

Subsector Maximum

($\sum A_{\max T-18 \text{ through } T-22-C} \leq 10\%$) This measure is in the Neighborhood Design subsector. This subcategory includes Measures T-18 through T-22-C. The VMT reduction from the combined implementation of all measures within this subsector is capped at 10 percent.

Example GHG Reduction Quantification

The user reduces VMT by constructing a bicycle facility that displaces vehicle trips with bicycle trips. In this example, the following assumptions are made to obtain inputs from Tables T-19.1 through T-19.3 in Appendix C:

- Percent of plan/community VMT on parallel roadway (B) = 100%. The project would establish a bike corridor the whole length of a central commercial thoroughfare. It is assumed this main street makes up the entire neighborhood.
- Active transportation adjustment factor (C) = 0.0207. Existing AADT on the roadway parallel to the proposed bicycle facility is 10,000, the facility length is 2.5 miles, and the project site is in a university town with a population of 200,000.
- Key destination credit (D) = 0.003. There are 10 key destinations within 0.25 mile of the project site.
- Growth factor adjustment (E) = 1.54. The bike facility would be a new Class IV bikeway.



The project is within the Sacramento-Roseville-Arden-Arcade CBSA and the user does not have project-specific values for average bicycle and vehicle trip lengths. Accordingly, the inputs of 2.9 miles and 10.9 miles, respectively (G and H), from Table T-10.1 in Appendix C are assumed. The user would displace GHG emissions from project study area VMT by 0.8 percent.

$$A = -100\% \times \left(\frac{\frac{307 \text{ days}}{365 \text{ days}} \times (0.0207 + 0.003) \times 1.54 \times 2.9 \text{ miles}}{10.9 \text{ miles}} \right) = -0.8\%$$

Quantified Co-Benefits



Improved Local Air Quality

The percent reduction in GHG emissions (A) would be the same as the percent reduction in NO_x, CO, NO₂, SO₂, and PM. Reductions in ROG emissions can be calculated by multiplying the percent reduction in GHG emissions (A) by an adjustment factor of 87 percent. See *Adjusting VMT Reductions to Emission Reductions* above for further discussion.



Energy and Fuel Savings

The percent reduction in vehicle fuel consumption would be the same as the percent reduction in GHG emissions (A).



VMT Reductions

The percent reduction in VMT would be the same as the percent reduction in GHG emissions (A).



Improved Public Health

Users are directed to the ITHIM (CARB et al. 2020). The ITHIM can quantify the annual change in health outcomes associated with active transportation, including deaths, years of life lost, years of living with disability, and incidence of community and individual disease.

Sources

- California Air Resources Board (CARB). 2020. *Quantification Methodology for the Strategic Growth Council's Affordable Housing and Sustainable Communities Program*. September. Available: https://ww2.arb.ca.gov/sites/default/files/classic/cc/capandtrade/auctionproceeds/draft_sgc_ahsc_qm_091620.pdf. Accessed: January 2021.
- California Air Resources Board (CARB), California Department of Public Health (CDPH), and Nicholas Linesch Legacy Fund. 2020. *Integrated Transport and Health Impact Model*. Available: <https://skylab.cdph.ca.gov/HealthyMobilityOptionTool-ITHIM/#Home>. Accessed: September 17, 2021.
- Federal Highway Administration (FHWA). 2017. *National Household Travel Survey–2017 Table Designer*. Travel Day PT by TRPTRANS by HH_CBSA. Available: <https://nhts.ornl.gov/>. Accessed: January 2021.



- National Oceanic and Atmospheric Administration (NOAA). 2021. *Global Historical Climatology Network–Daily (GHCN-Daily), Version 3*. 2015-2019 Average of Days Per Year with Precipitation >0.1 Inches. Available: <https://www.ncdc.noaa.gov/access/search/data-search/daily-summaries?bbox=38.922,-120.071,38.338,-119.547&place=County:1276&dataTypes=PRCP&startDate=2015-01-01T00:00:00&endDate=2019-01-01T23:59:59>. Accessed: May 2021.

Transit Supportive Improvements

4. Upgrade Bus Stops

The GHG Handbook does not provide a quantitative approach for determining the VMT reduction associated with bus stop improvements. However, the GHG Handbook does include a qualitative measure documenting that improving bus stop locations enhances users' experience and can lead to increased ridership (GHG Handbook, page 55):

T-46. Improve Transit Access, Safety, and Comfort

This measure requires projects improve transit access and safety through sidewalk/crosswalk safety enhancements, bus shelter improvements, improved lighting, and other features. Work with the community to determine barriers to use, most desired improvements, and other access challenges.

A nominal reduction of 50 VMT per bus shelter upgrade is assumed to be achieved from this improvement. The average vehicle trip length in Escondido is 6.1 miles one-way (or 12.2 miles round trip), based on the base year (2016) ABM2+ SANDAG Model. A planning/engineering judgement assumption is applied assuming that upgrading a bus stop to provide a bus shelter (and required amenities) would encourage approximately 4-5 additional bus riders per day, it would result in a reduction of 49-61 VMT ($12.2 \times 4 = 49$ and $12.2 \times 5 = 61$). 50 VMT was selected as a conservative assumption.

FUTURE PROGRAMS

The following summarizes the estimated effectiveness of several programs that may be considered in the future for inclusion into the VMT Exchange program.

Trip Reduction Marketing

1. Implement trip reduction marketing

Source:

- *Handbook for Analyzing Greenhouse Gas Emission Reduction, Assessing Climate Vulnerabilities, and Advancing Health and Equity, 2021, Measure T-7*

$$A = B \times C \times D = 1 \times 0.04 \times 1 = -4\%$$

Parameter	Quantity
A Percent reduction in GHG emissions from project/site employee commute VMT (Max allowed = 4%)	-4%
B Percent of employees eligible for program ¹	100%
C Percent reduction in employee commute vehicle trips	-4%
D The adjustment from vehicle trips to VMT	1.0

1. Eligible employees are usually 100 percent. Employees who might not be able to participate include night-time employees or jobs that require employees to drive to work.

VMT reduction achieved from implementation of trip reduction marketing is calculated as below. The estimated reduction applies to all work-related trips that occur within the City of Escondido.

$$\begin{aligned} \text{VMT reduction} &= \frac{4\% \times \text{City of Escondido Total Work Related VMT}}{\text{Total number of employees in the City of Escondido}} = \frac{4\% \times 1,824,574 \text{ VMT}}{53,288} \\ &= 1.37 \text{ VMT/Employee} \end{aligned}$$

The City of Escondido Total Work Related VMT and number of employees is sourced from the SANDAG ABM 2+ Regional Travel Demand Model for the 2016 base year.

2. Fund City employees trip reduction program

VMT reduction calculated for this strategy is similar to measure 4 on a per-employee basis. The average fund associated with such a program is approximately \$5,000. The effectiveness is only applicable if a program is fully funded. Partially funded programs would require the City of Escondido to complete the funding for the program to become effective.

Public Transit/Shuttle Improvement

3. Downtown Escondido on-demand Shuttle

Source:

- *Handbook for Analyzing Greenhouse Gas Emission Reduction, Assessing Climate Vulnerabilities, and Advancing Health and Equity, 2021, Measure T-25*

$$A = -1 \times \frac{C - B}{B} \times D \times E \times F \times G = -1 \times 1 \times 2.4\% \times 0.7 \times 57.8\% \times 1 = 0.97\%$$

Parameter	Quantity	
A	Percent reduction in GHG emissions from plan/community VMT (Max allowed = 4.6%)	
B	Total transit service miles or service hours in plan/community before expansion ¹	
C	Total transit service miles or service hours in plan/community after expansion ¹	
D	Transit mode share in plan/community (San Diego)	2.4%
E	The elasticity of transit demand with respect to service miles or service hours	0.7
F	Statewide mode shift factor	57.8%
G	The adjustment from vehicle trips to VMT	1.0

1. Considering that no shuttle service is running to/from the downtown area, the expansion in shuttle service miles is assumed to be 100%.

VMT reduction achieved from implementation of providing funding for intra-city shuttle program is calculated as below. The estimated reduction applies to all trips that occur between all TAZs that fall inside Escondido downtown area.

$$\text{VMT reduction} = 0.97\% \times \text{VMT from trips start and end in downtown} = 0.97\% \times 2,696 = 26 \text{ VMT}$$

Appendix B

Standard Number of Square Feet Per Employee by Land Use (SANDAG)

SANDAG Land Use Codes, Definitions, and Square Feet Per Employee Conversions

[Land Use Codes and Definitions](#)

lu_code	land use	description	source
1501	Hotel (Low-Rise)	Hotels, motels, and other transient accommodations with three or less floors. Commonly found along freeways and prime commercial areas.	SANDAG
1502	Hotel (High-Rise)	Hotels and motels that have four or more floors. Primarily found in downtown areas and near tourist attractions.	SANDAG
1503	Resort	Resorts with hotel accommodations that usually contain recreation areas. Examples of resorts would be La Costa Health Spa, Lawrence Welk, and the Olympic Resort in Carlsbad near the airport.	SANDAG
2001	Heavy Industry	Shipbuilding, airframe, and aircraft manufacturing. Usually located close to transportation facilities and commercial areas. Parcels are typically large, 20-50 acres.	SANDAG
2101	Industrial Park	Office/industrial uses clustered into a center. The primary uses are industrial but may include high percentages of other uses in service or retail activities.	SANDAG
2103	Light Industry - General	All other industrial uses and manufacturing not included in the categories above. These are not located inside of parks but are usually along major streets or clustered in certain areas. Includes manufacturing uses such as lumber, furniture, paper, rubber, stone, clay, and glass; as well as light industrial uses as auto repair services and recycling centers. Mixed commercial and office uses (if not large enough to be identified separately) are also included. General industrial areas are comprised of 75 percent or more of industrial uses (manufacturing, warehousing, and wholesale trade).	SANDAG
2104	Warehousing	Usually large buildings located near freeways, industrial, or strip commercial areas.	SANDAG
2105	Public Storage	Public self-storage buildings are typically long, rectangular and closely spaced. Also includes RV and boat storage areas.	SANDAG
2201	Extractive Industry	Mining, sand and gravel extraction, salt evaporation.	SANDAG
2301	Scrap Yards/Auto Dismantling/Landfill	The landscape should show visible signs of the activity. Also include auto wrecking/dismantling and recycling centers.	SANDAG
6001	Office (High-Rise)	High rise buildings with more than four stories containing banking, offices for business and professional services (finance, insurance, real estate), some retail activities and restaurants.	SANDAG
6002	Office (Low-Rise)	Low rise buildings with less than five stories containing banking, offices for business and professional services (finance, insurance, real estate), some retail activities and restaurants.	SANDAG
6003	Government Office/Civic Center	Large government office buildings or centers (outside of military reservations) and civic centers, or city halls of local governments. Also includes the Chamber of Commerce buildings and DMV Offices.	SANDAG
6502	Hospital - General	Hospitals not included above.	SANDAG
6509	Other Health Care	Medical centers and buildings or offices, health care services, and other health care facilities. Smaller medical offices and facilities may be included within office, strip commercial, or other surrounding uses.	SANDAG

6802	Other University or College		SANDAG
6803	Junior College	Includes trade or vocational schools.	SANDAG
6804	Senior High School	9 - 12	SANDAG
6805	Junior High School or Middle School	6 - 8	SANDAG
6806	Elementary School	K - 7	SANDAG

Employment Density by Land Use Code (square feet per employee)

lu_code	description	Value_per_unit
1501	Hotel (Low-Rise)	1850
1502	Hotel (High-Rise)	1350
1503	Resort	550
2001	Heavy Industry	250
2101	Industrial Park	1050
2103	Light Industry - General	1200
2104	Warehousing	1550
2105	Public Storage	15000
2201	Extractive Industry	150
2301	Scrap Yards/Auto Dismantling/Landfill	800
6001	Office (High-Rise - greater than 100000 SF)	300
6002	Office (Low-Rise - less or equal to 100000 SF)	200
6003	Government Office/Civic Center	200
6007	Medical Office	400
6008	Medical Office (greater than 100000 SF)	200
6502	Hospital - General	450
6509	Other Health Care	500
6802	Other University or College	250
6803	Junior College	150

6804	Senior High School	650
6805	Junior High School or Middle School	700
6806	Elementary School	700

Handbook for Analyzing Greenhouse Gas Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity

*Designed for Local Governments, Communities,
and Project Developers*

Final Draft

December 2021



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Transportation

Fossil-fuel powered vehicles are the primary source of GHG emissions within the transportation sector. On-road vehicles traditionally use gasoline and diesel fuel and release emissions based on the amount of fuel combusted and the emission factor of the engine. Cleaner-fueled and electric powered vehicles can also generate GHG emissions, but often at far lower intensities.



Transportation emissions can be reduced by improving the emissions profile of the vehicle fleet or by reducing VMT. Most of the measures quantified in this Handbook aim to reduce VMT and encourage mode shifts from single-occupancy vehicles to shared (e.g., transit) or active modes of transportation (e.g., bicycle). This can be accomplished by coordinating trip reduction or incentive programs; optimizing the land use of the project study area; enhancing road, bike and pedestrian networks; implementing parking policies; or improving transit systems.

WHAT'S ELASTICITY?

Elasticity refers to how much one variable changes, relative to a change in another variable. For example, the elasticity of a VMT reduction measure would measure how much VMT is reduced in proportion to the increase in bicycle lanes.

Most of the emission reductions are determined by evaluating the *elasticity* of a measure relative to the amount of VMT that may be reduced by the measure. A few transportation measures are aimed at improving the emissions profile of the vehicle fleet. These measures promote alternative fuels and vehicle types. The emission reductions from these measures are based on the improved emission factors and on changes to the assumed vehicle fleet mix.

This section provides guidance for combining emission reductions from transportation measures

and adjusting VMT reductions to expected GHG savings. The measure factsheets and quantification methods for individual measures follow. Use the graphic on the following page to click on an individual measure to navigate directly to the measure's factsheet.

Selecting and Combining Transportation Measures

Depending on how VMT has been quantified for a project or program, users should exercise caution when selecting transportation measures to avoid double counting VMT benefits that may already be accounted for in the model used to produce the unmitigated or baseline VMT estimate. For example, regional travel demand models are generally sensitive to built environment and transit service variables (e.g., density, proximity to transit). VMT estimates developed for a project or program that use such models may, therefore, already account for VMT reductions associated with certain measures in this Handbook (e.g., T-1, *Increase Residential Density*).





Transportation

LAND USE

- ☐ T-1. Increase Residential Density
- ☐ T-2. Increase Job Density
- ☐ T-3. Provide Transit-Oriented Development
- ☐ T-4. Integrate Affordable and Below Market Rate Housing
- ☐ T-17. Improve Street Connectivity

TRIP REDUCTION PROGRAMS

- ☐ T-5. Implement Commute Trip Reduction Program (Voluntary)
- ☐ T-6. Implement Commute Trip Reduction Program (Mandatory Implementation and Monitoring)
- ☐ T-7. Implement Commute Trip Reduction Marketing
- ☐ T-8. Provide Ridesharing Program
- ☐ T-9. Implement Subsidized or Discounted Transit Program
- ☐ T-10. Provide End-of-Trip Bicycle Facilities
- ☐ T-11. Provide Employer-Sponsored Vanpool
- ☐ T-12. Price Workplace Parking
- ☐ T-13. Implement Employee Parking Cash-Out
- ☐ T-23. Provide Community-Based Travel Planning

PARKING OR ROAD PRICING/MANAGEMENT

- ☐ T-14. Provide Electric Vehicle Charging Infrastructure
- ☐ T-15. Limit Residential Parking Supply
- ☐ T-16. Unbundle Residential Parking Costs from Property Cost
- ☐ T-24. Implement Market Price Public Parking (On-Street)

NEIGHBORHOOD DESIGN

- ☐ T-18. Provide Pedestrian Network Improvement
- ☐ T-19-A. Construct or Improve Bike Facility
- ☐ T-19-B. Construct or Improve Bike Boulevard
- ☐ T-20. Expand Bikeway Network
- ☐ T-21-A. Implement Conventional Carshare Program
- ☐ T-21-B. Implement Electric Carshare Program
- ☐ T-22-A. Implement Pedal (Non-Electric) Bikeshare Program
- ☐ T-22-B. Implement Electric Bikeshare Program
- ☐ T-22-C. Implement Scootershare Program

TRANSIT

- ☐ T-25. Extend Transit Network Coverage or Hours
- ☐ T-26. Increase Transit Service Frequency
- ☐ T-27. Implement Transit-Supportive Roadway Treatments
- ☐ T-28. Provide Bus Rapid Transit
- ☐ T-29. Reduce Transit Fares

CLEAN VEHICLES AND FUELS

- ☐ T-30. Use Cleaner-Fuel Vehicles

Interactions between transportation measures are complex and sometimes counterintuitive, whereby combining measures can have a substantive impact on reported emission reductions. To safeguard the accuracy and reliability of the methods, while maintaining their ease of use, the following rules should be followed when combining reductions achieved by transportation measures.

Combining Measures Across Scales

The first level of organization for the transportation measures is the scale of application. There are 16 quantified measures at the Project/Site scale that can be combined with each other and 17 quantified measures at the Plan/Community scale that can be combined with each other.⁴ *The GHG reductions of transportation measures from different scales of application should never be combined.* While it may be possible that a user's project involves measures that affect vehicle trips or VMT at both scales, it is likely that combining the percent reduction from measures of different scales would not be valid. This rule does not apply to non-transportation measures that calculate the emissions reduction in terms of absolute emissions.

⁴ There is one additional quantified transportation measure: Measure T-30, *Use Cleaner-Fuel Vehicles*. All below discussion related to combining measures and determining maximums does not apply to this measure, which is part of the Clean Vehicles and Fuels subsector.



Combining Measures within a Subsector

The second level of organization for the transportation measures is the subsector. Transportation measures are separated into six subsectors: Land Use, Neighborhood Design, Trip Reduction Programs, Parking Management, Transit, Parking or Road Pricing/Management, and Clean Vehicles and Fuels.

Effectiveness levels for multiple measures within a subsector may be multiplied to determine a combined effectiveness level. Because the combination of measures and independence of measures are complicated, this Handbook recommends that measure reductions within a subsector be multiplied unless the user can provide substantial evidence indicating that emission reductions are independent of one another and that they should therefore be added. This will take the following form:

$$\text{Reduction}_{\text{subsector}} = 1 - [(1 - A) \times (1 - B) \times (1 - C)]$$

Where A, B, and C are the individual measure reduction percentages for the measures to be combined in each subsector.

Each measure has a maximum allowable reduction, discussed in the quantification methods for each measure. The user should calculate the reduction from each measure, compare it to the individual measure maximum, and use the lower value of the two in the equation above.

In addition, each subsector has a maximum allowable reduction. These were derived by combining the maximum allowable reduction of each individual non-mutually-exclusive measure within the subsector using the above formula (see table below for more details). The subsector maximum is intended to ensure that emissions are not double counted when measures within the subsector are combined. The subsector maximums are provided in the below table by scale of application.

Scale	Subsector	Quantified Measures ^a	Subsector Maximum ^{b, c, d, e, f}
P/S	Land Use	4	65%
	Neighborhood Design	—	—
	Trip Reduction Programs	9	45% commute VMT
	Parking or Road Pricing/Management	3	35%
	Transit	—	—
P/C	Land Use	1	30%
	Neighborhood Design	9	10%
	Trip Reduction Programs	1	2.3% commute VMT
	Parking or Road Pricing/Management	1	30%
	Transit	5	15%

P/S = project/site; P/C = plan/community; VMT = vehicle miles traveled.

^a Excludes Measure T-30, *Use Cleaner-Fuel Vehicles*, within the Clean Vehicles and Fuels subsector and all supporting or non-quantified measures from other subsectors.

^b — = no measure within the subsector at the specified scale.

^c Where a subsector consists of only one measure, the subsector maximum listed is the individual measure maximum.

^d Most maximums were conservatively rounded down to the nearest multiple of five or whole number.



^e Measure T-1 and Measure T-2 were assumed to be mutually exclusive for the purpose of deriving a project's single land use type maximum emissions reduction. More specifically, residential density (T-1) only applies to residential development, and job density only applies to commercial development (T-2). Similarly, Measure T-26 and Measure T-27 were assumed to be mutually exclusive with Measure T-28 for the purpose of deriving a plan/community's total transit-related emissions reduction. Measure T-28 accounts for the VMT reduction associated with increased transit frequency (T-26) and decreased transit travel time from transit supportive roadway treatments (T-27). It was assumed that bus rapid transit (BRT) (T-28) would cover all of the community's transit routes, and therefore no additional frequency or time improvements would be attainable (T-26 and T-27).

^f Measures within the Trip Reduction Programs primarily reduce VMT from *employee commute* trips, whereas all other measures reduce VMT from *all* trips associated with the relevant land use type.

The user should calculate the reduction from each subsector, compare it to the corresponding sector maximum, and use the lower value of the two.

Combining Measures Across Subsectors

There is limited research directly analyzing the combined VMT impact on a project/site or plan/community from implementation of all, or a majority, of the non-mutually-exclusive transportation sector measures provided in this Handbook. However, a University of California, Davis study compared household VMT across different place types in California and found that the difference in average VMT in single-family suburban neighborhoods and central city neighborhoods was approximately 70 percent.⁵ Central city neighborhoods are more likely to have implemented transportation strategies like those measures included in the Handbook, when compared to suburban neighborhoods. The Handbook therefore adopts 70 percent as a maximum for the combined VMT impact from the following four subsectors: Land Use, Neighborhood Design, Parking or Road Pricing/Management, and Transit.

$$\text{Reduction}_{\text{multi-subsector}} = 1 - [(1 - \text{Land}) \times (1 - \text{Design}) \times (1 - \text{Parking}) \times (1 - \text{Transit})] \leq 70\%$$

Note that this multi-subsector maximum purposefully excludes the Trip Reduction Program subsector. This is because measures in the Trip Reduction Program subsector are often implemented at the Project/Site scale based on the individual employer and are not as directly correlated with place type as the other subsectors. For example, all central city neighborhoods have a high residential and commercial density (i.e., Measure T-1 and Measure T-2 from the Land Use subsector), and most single-family suburban neighborhoods have low density. Conversely, not all employers in a central city neighborhood provide their employees with discounted transit passes (Measure T-9 from the Trip Reduction Program subsector), and the same is equally likely for the much smaller group of employers in a single-family suburban neighborhood.

Limitations of Maximums and Caps

The words *maximum* and *cap* are used interchangeably to describe either the highest percent reduction in GHG emissions or the highest expected value for a variable in the GHG reduction formula. Each subsector has a maximum allowable reduction and individual measures have a maximum allowable reduction, which is often based on one or more of the capped GHG reduction variables. In most instances, these values are a rule of thumb, or practical approximation, to limit the unrealistic influence of multiplicative measure variables. Where the

⁵ Salon, D. 2014. *Quantifying the Effect of Local Government Actions on VMT*. Institute of Transportation Studies, University of California, Davis. Prepared for the California Air Resources Board and the California Environmental Protection Agency. February. Available: <https://ww2.arb.ca.gov/sites/default/files/classic/research/apr/past/09-343.pdf>. Accessed: October 2021.

T-1. Increase Residential Density



GHG Mitigation Potential



Up to 30.0% of GHG emissions from project VMT in the study area

Co-Benefits (icon key on pg. 34)



Climate Resilience

Increased density can put people closer to resources they may need to access during an extreme weather event. Increased density can also shorten commutes, decreasing the amount of time people are on the road and exposed to hazards such as extreme heat or flooding.

Health and Equity Considerations

Neighborhoods should include different types of housing to support a variety of household sizes, age ranges, and incomes.

Measure Description

This measure accounts for the VMT reduction achieved by a project that is designed with a higher density of dwelling units (du) compared to the average residential density in the U.S. Increased densities affect the distance people travel and provide greater options for the mode of travel they choose. Increasing residential density results in shorter and fewer trips by single-occupancy vehicles and thus a reduction in GHG emissions. This measure is best quantified when applied to larger developments and developments where the density is somewhat similar to the surrounding area due to the underlying research being founded in data from the neighborhood level.

Subsector

Land Use

Locational Context

Urban, suburban

Scale of Application

Project/Site

Implementation Requirements

This measure is most accurately quantified when applied to larger developments and/or developments where the density is somewhat similar to the surrounding neighborhood.

Cost Considerations

Depending on the location, increasing residential density may increase housing and development costs. However, the costs of providing public services, such as health care, education, policing, and transit, are generally lower in more dense areas where things are closer together. Infrastructure that provides drinking water and electricity also operates more efficiently when the service and transmission area is reduced. Local governments may provide approval streamlining benefits or financial incentives for infill and high-density residential projects.

Expanded Mitigation Options

When paired with Measure T-2, *Increase Job Density*, the cumulative densification from these measures can result in a highly walkable and bikeable area, yielding increased co-benefits in VMT reductions, improved public health, and social equity.





GHG Reduction Formula

$$A = \frac{B - C}{C} \times D$$

GHG Calculation Variables

ID	Variable	Value	Unit	Source
Output				
A	Percent reduction in GHG emissions from project VMT in study area	0–30.0	%	calculated
User Inputs				
B	Residential density of project development	[]	du/acre	user input
Constants, Assumptions, and Available Defaults				
C	Residential density of typical development	9.1	du/acre	Ewing et al. 2007
D	Elasticity of VMT with respect to residential density	-0.22	unitless	Stevens 2016

Further explanation of key variables:

- (C) – The residential density of typical development is based on the blended average density of residential development in the U.S. forecasted for 2025. This estimate includes apartments, condominiums, and townhouses, as well as detached single-family housing on both small and large lots. An acre in this context is defined as an acre of developed land, not including streets, school sites, parks, and other undevelopable land. If reductions are being calculated from a specific baseline derived from a travel demand forecasting model, the residential density of the relevant transportation analysis zone should be used instead of the value for a typical development.
- (D) – A meta-regression analysis of five studies that controlled for self-selection found that a 0.22 percent decrease in VMT occurs for every 1 percent increase in residential density (Stevens 2016).

GHG Calculation Caps or Maximums

Measure Maximum

($A_{\max}$) The percent reduction in GHG emissions (A) is capped at 30 percent. The purpose for the 30 percent cap is to limit the influence of any single built environmental factor (such as density). Projects that implement multiple land use strategies (e.g., density, design, diversity) will show more of a reduction than relying on improvements from a single built environment factor.



Subsector Maximum

($\sum A_{\text{maxT-1 through T-4}} \leq 65\%$) This measure is in the Land Use subsector. This subcategory includes Measures T-1 through T-4. The VMT reduction from the combined implementation of all measures within this subsector is capped at 65 percent.

Example GHG Reduction Quantification

The user reduces VMT by increasing the residential density of the project study area. In this example, the project's residential density would be 15 du per acre (B), which would reduce GHG emissions from project VMT by 14.2 percent.

$$A = \frac{15 \frac{\text{du}}{\text{ac}} - 9.1 \frac{\text{du}}{\text{ac}}}{9.1 \frac{\text{du}}{\text{ac}}} \times -0.22 = -14.2\%$$

Quantified Co-Benefits



Improved Local Air Quality

The percent reduction in GHG emissions (A) would be the same as the percent reduction in NO_x, CO, NO₂, SO₂, and PM. Reductions in ROG emissions can be calculated by multiplying the percent reduction in GHG emissions (A) by an adjustment factor of 87 percent. See *Adjusting VMT Reductions to Emission Reductions* above for further discussion.



Energy and Fuel Savings

The percent reduction in vehicle fuel consumption would be the same as the percent reduction in GHG emissions (A).



VMT Reductions

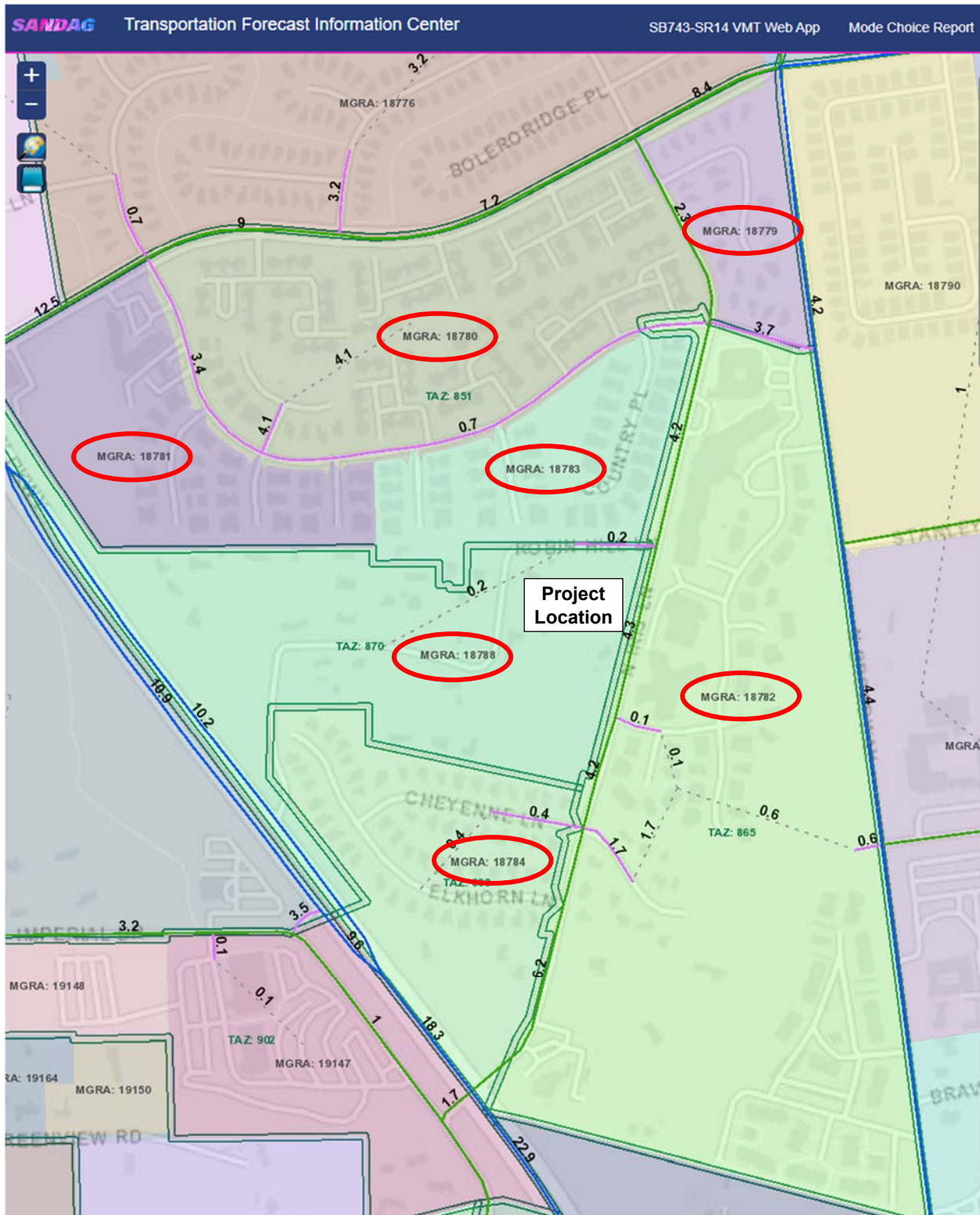
The percent reduction in VMT would be the same as the percent reduction in GHG emissions (A).

Sources

- Ewing, R., K. Bartholomew, S. Winkelman, J. Walters, and D. Chen. 2007. *Growing Cooler: The Evidence on Urban Development and Climate Change*. October. Available: https://www.nrdc.org/sites/default/files/cit_07092401a.pdf. Accessed: January 2021.
- Stevens, M. 2016. Does Compact Development Make People Drive Less? *Journal of the American Planning Association* 83:1(7–18), DOI: 10.1080/01944363.2016.1240044. November. Available: https://www.researchgate.net/publication/309890412_Does_Compact_Development_Make_People_Drive_Less. Accessed: January 2021.

CAPCOA Dec 2021 T-1 Surrounding Residential Density Calculations

Surrounding MGRAs: 18,779; 18,780; 18,781; 18,782; 18,783; 18,784; 18,788.



CAPCOA T-1 defines key variables for residential density to use acres of developed land, not including streets, school sites, parks, and other undevelopable land. The SANDAG MGRA land use documenting single family and multi-family number of units along with the area of land those units are built upon were used for this calculation. As shown below, this results in a surrounding residential density of 10.6 Dwelling Units per Acre.

SANDAG MGRA Data

data source _id	yr	mgra	lu	lu_name	emp_ total	emp_ _dist	acres	hs_sf	hs_ mf	hs_ mh	tot_ pop	hh_ pop
42	2016	18779	101	Single Family Residential	13	13	3.708	25	0	0	67	67
42	2016	18780	101	Single Family Residential	3	3	10.76	211	0	0	560	560
42	2016	18781	101	Single Family Residential	194	0	5.148	49	0	0	119	119
42	2016	18782	102	Multi-Family Residential	90	8	14.79	0	227	0	641	641
42	2016	18782	101	Single Family Residential	90	0	2.878	16	0	0	641	641
42	2016	18783	101	Single Family Residential	3	3	7.627	72	0	0	199	199
42	2016	18784	101	Single Family Residential	1	1	9.582	57	0	0	156	156
42	2016	18788	101	Single Family Residential	0	0	9.972	26	0	0	79	79
Total Acres (less streets, parks, and other undevelopable land): 64.47												
Total Dwelling Units (single family & multi-family):								456	227	=	683	Du
Residential Density =								10.6 Du/Acre				

CAPCOA T-1 requirements state that this measure is most accurately quantified when applied to larger developments and/or developments where the density is somewhat similar to the surrounding neighborhood. **The project at 13.2 du/ac is similar to the surrounding neighborhood density of 10.6 du/ac.**

Mode Choice Report

Report Generated	Scenario ID	Scenario Name	ABM Version
4/20/2022	458	2016	version_14_2_2

Jurisdiction
Escondido

Demographics

Metric	Amount
Population	148,763
Households	46,554
Employed Residents	61,947
Employees	53,707

3.20
Average Household Size

Study Area Trips: Escondido

Metric	Person Trips
Intra-zonal	11,512
Inter-zonal	425,107
Inter-Jurisdictional	431,300
Total	867,919

1.33%
Intra-Zonal Percentage

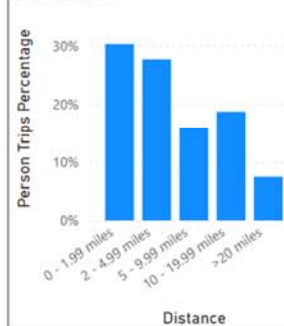
Average Trip Lengths

Metric	Miles
Resident Person Trip Length	7.1
Resident Vehicle Trip Length	8.2
All Model Person Trip Length	7.3
All Model Vehicle Trip Length	8.1
Resident Round-Trip Commuter Tour Length	29.8
Employee Round-Trip Commuter Tour Length	25.8

Vehicular Internal Capture Rate

Metric	Percentage
Study Area Internal Vehicle Capture Rate	42.1%

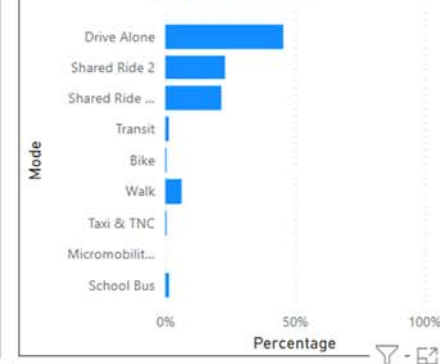
Resident Person Trip Length Distribution



Daily Mode Choice

Mode	Percentage	Person Trips
Drive Alone	45.5%	394,936
Shared Ride 2	23.0%	199,906
Shared Ride 3+	21.6%	187,565
Transit	1.3%	11,647
Bike	0.3%	2,706
Walk	6.3%	54,732
Taxi & TNC	0.5%	4,003
Micromobility & Microtransit	0.0%	0
School Bus	1.4%	12,424
Total	100.0%	867,919

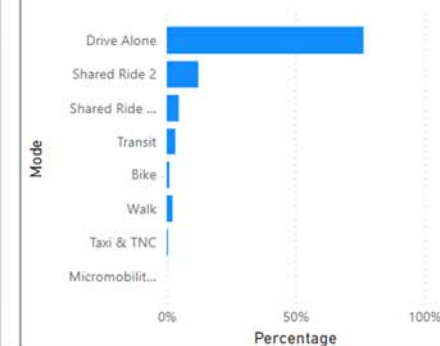
Daily Mode Choice



Peak Commute Mode Choice

Mode	Percentage	Person Trips
Drive Alone	76.4%	48,359
Shared Ride 2	12.2%	7,745
Shared Ride 3+	4.6%	2,926
Transit	3.3%	2,093
Bike	1.0%	629
Walk	2.2%	1,394
Taxi & TNC	0.2%	144
Micromobility & Microtransit	0.0%	0
Total	100.0%	63,290

Peak Commute Mode Choice



Appendix D

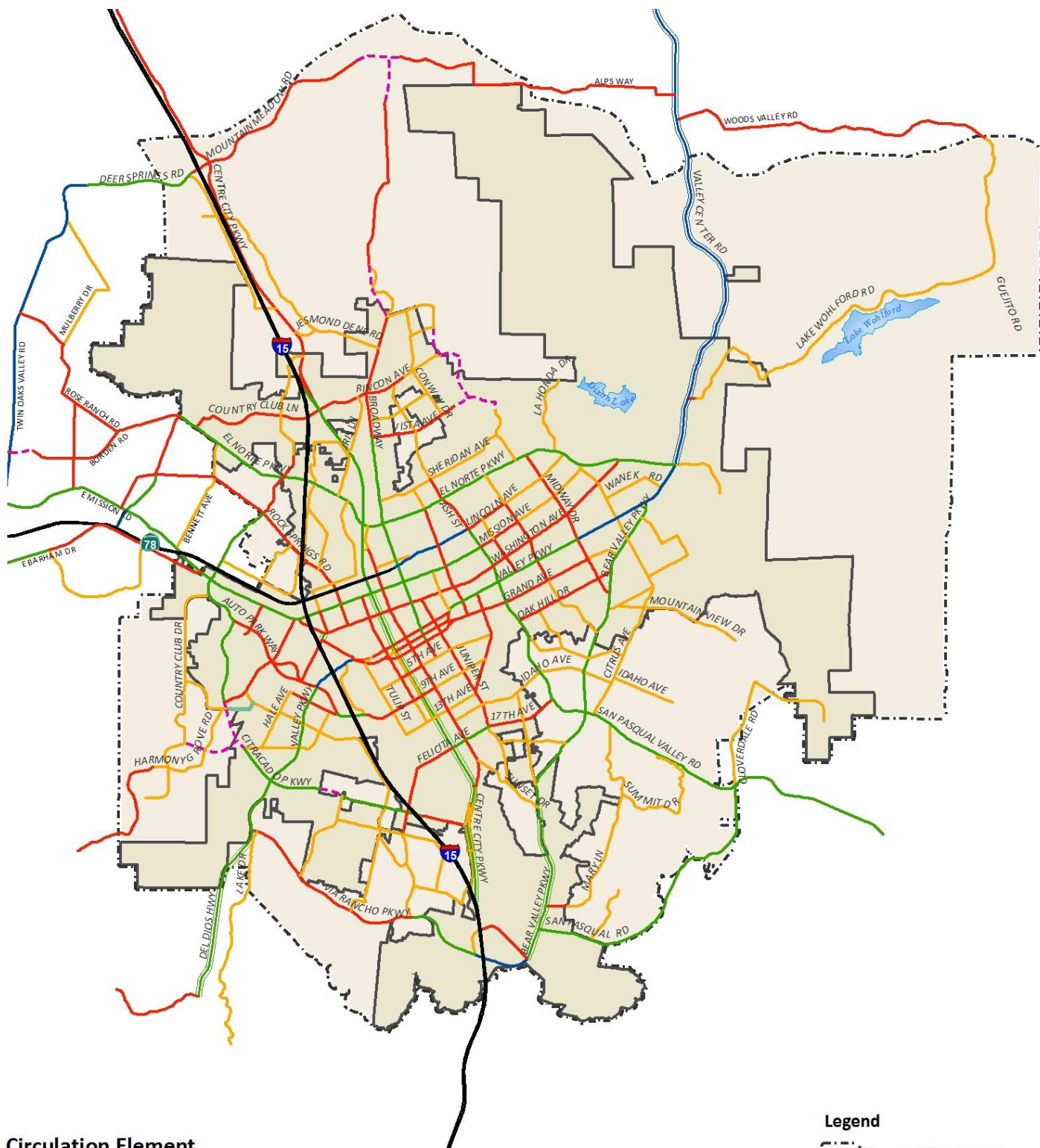
City of Escondido General Plan Excerpts

City of Escondido GENERAL PLAN

MAY 2012

Resolution 2012-52





Circulation Element

- | | |
|----------------------|------------------|
| Freeway | Major Road |
| Super Prime Arterial | Collector |
| Prime Arterial | Local Collector |
| Super Major Road | Future Alignment |

Legend

- General Plan Boundary
- City Limits
- Lakes



Escondido General Plan

Circulation Diagram

Figure III-6

Appendix E

Historical Count Data, Current Count Data, and Growth Factor Calculations

Growth Factor Calculations for Pandemic Traffic Volume Adjustments

Segment volumes trends were compared between 2018 and 2020 counts:

	2018	2020	Percent Change	Applied ADT
Iris Lane				
Village Rd to Robin Hill Ln	No Data	6,239	Not Applicable	8,466
Robin Hill Ln to Centre City Pkwy	8,996	6,628	-35.7%	8,996

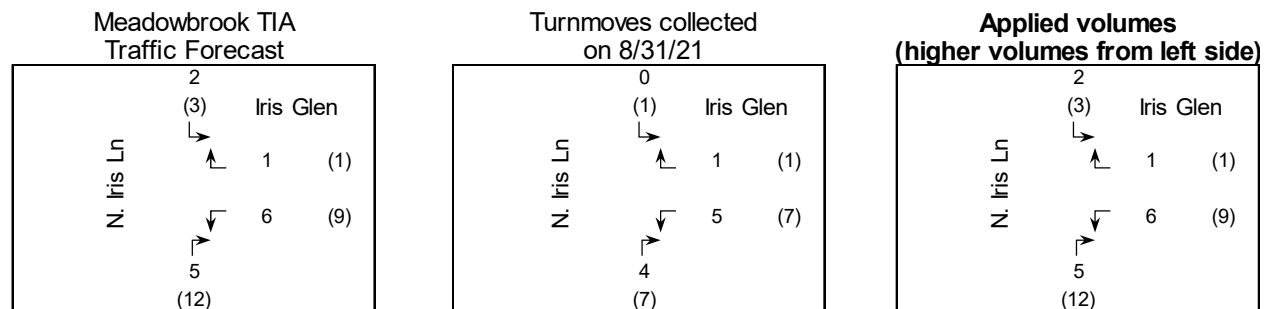
Because the intersections on Iris Lane at Robin Hill Ln and at Village Rd did not have historical counts, the above reduction of 35.7% along Iris Lane was the basis for a 35.7% growth factor for the two noted intersections and one segment on Iris Lane between Village Rd and Robin Hill Lane to estimate non-pandemic existing conditions.

Intersection volume trends were compared between 2018 and 2020 counts:

Loc & Date	Total Vol	Pk Hr	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Centre City/Iris Ln														
5/3/2018	2,365	AM	15	244	99	8	1014	93	58	220	8	386	211	9
10/7/2020	1,234	AM	4	181	54	8	446	60	43	64	11	225	131	7
	-92%	AM												
5/3/2018	1,917	PM	(13)	(603)	(212)	(6)	(371)	(51)	(170)	(285)	(7)	(115)	(75)	(9)
10/7/2020	1,649	PM	(14)	(470)	(201)	(4)	(349)	(38)	(135)	(240)	(13)	(111)	(67)	(7)
	-16%	PM												

Due to the above reductions, the higher year 2018 volumes were used to represent non-pandemic existing conditions at Centre City Pkwy/Iris Ln.

The intersection of N. Iris Ln/Iris Glen serves the gated community of Meadowbrook Village. The higher turn moves between the original LLG traffic study and the 8/31/21 turn moves were applied as shown below (data included at the end of this appendix section).





PO Box 1178
Corona, CA 92880
951-268-6268

Location: Escondido
N/S: Centre City Parkway
E/W: Iris Lane

Date: 5/3/2018
Day: THURSDAY
Project # 143-18341

TURNING MOVEMENT COUNT

Count Period: 7:00 AM to 9:00 AM
Peak Hour: 7:15 AM to 8:15 AM

Vehicle Counts

	Centre City Parkway Northbound				Centre City Parkway Southbound				Iris Lane Eastbound				Iris Lane Westbound				TOTAL
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	NL	NT	NR	SL	
7:00 AM	3	47	17	4	215	21	14	39	5	82	36	2					485
7:15 AM	5	56	27	1	267	19	15	80	3	87	46	3					609
7:30 AM	4	60	32	3	270	20	26	64	1	97	43	4					624
7:45 AM	4	76	21	3	257	29	13	51	3	108	70	1					636
8:00 AM	2	52	19	1	220	25	4	25	1	94	52	1					496
8:15 AM	3	65	18	1	248	22	14	16	4	60	26	2					479
8:30 AM	2	71	13	0	191	15	7	13	2	55	18	0					387
8:45 AM	3	62	19	2	139	13	11	20	1	53	14	1					338
TOTAL VOLUMES:	26	489	166	15	1807	164	104	308	20	636	305	14					4054

AM Peak Hr Begins at: 7:15 AM

NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
15	244	99	8	1014	93	58	220	8	386	211	9	2365

PEAK HR FACTOR:	0.886	0.951	0.730	0.846	0.930
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Bicycle Counts

	Centre City Parkway Northbound				Centre City Parkway Southbound				Iris Lane Eastbound				Iris Lane Westbound				TOTAL
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	NL	NT	NR	SL	
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
7:30 AM	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
TOTAL VOLUMES:	0	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0	4

NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
0	0	0	0	2	0	0	0	0	1	0	0	3

Pedestrian Counts

	Centre City Parkway North Leg				Centre City Parkway South Leg				Iris Lane East Leg				Iris Lane West Leg				TOTAL
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	NL	NT	NR	SL	
7:00 AM	0				0			0					0				0
7:15 AM	0				0			0					0				0
7:30 AM	0				1			0					0				1
7:45 AM	0				0			0					0				0
8:00 AM	0				0			0					0				0
8:15 AM	0				0			0					0				0
8:30 AM	0				0			0					0				0
8:45 AM	0				0			0					0				0
TOTAL VOLUMES:	0				1			0					0				1

North Leg	South Leg	East Leg	West Leg	TOTAL
0	1	0	0	1



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951-268-6268

Location: Escondido
N/S: Centre City Parkway
E/W: Iris Lane

Date: 5/3/2018
Day: THURSDAY
Project # 143-18341

TURNING MOVEMENT COUNT

Count Period: 4:00 PM to 6:00 PM
Peak Hour: 4:45 PM to 5:45 PM

Vehicle Counts

	Centre City Parkway Northbound			Centre City Parkway Southbound			Iris Lane Eastbound			Iris Lane Westbound			TOTAL
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
4:00 PM	1	125	62	1	103	13	36	62	3	37	23	2	468
4:15 PM	2	118	48	3	90	15	39	47	2	35	18	3	420
4:30 PM	2	142	53	2	94	11	30	44	0	29	15	2	424
4:45 PM	7	143	51	1	88	12	35	77	3	26	14	3	460
5:00 PM	2	115	37	0	99	17	48	62	2	40	22	4	448
5:15 PM	2	186	55	4	105	12	43	71	1	28	14	1	522
5:30 PM	2	159	69	1	79	10	44	75	1	21	25	1	487
5:45 PM	1	126	46	1	87	11	35	62	9	34	23	1	436
TOTAL VOLUMES:	19	1114	421	13	745	101	310	500	21	250	154	17	3665

PM Peak Hr Begins at: 445 PM

	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
PEAK VOLUMES:	13	603	212	6	371	51	170	285	7	115	75	9	1917

PEAK HR FACTOR:	0.852	0.884	0.963	0.754	0.918
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Bicycle Counts

	Centre City Parkway Northbound				Centre City Parkway Southbound				Iris Lane Eastbound				Iris Lane Westbound				TOTAL
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR					
4:00 PM	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
4:15 PM	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL VOLUMES:	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2

	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
PEAK VOLUMES:	0	0	0	0	0	0	0	0	0	0	0	0	0

Pedestrian Counts

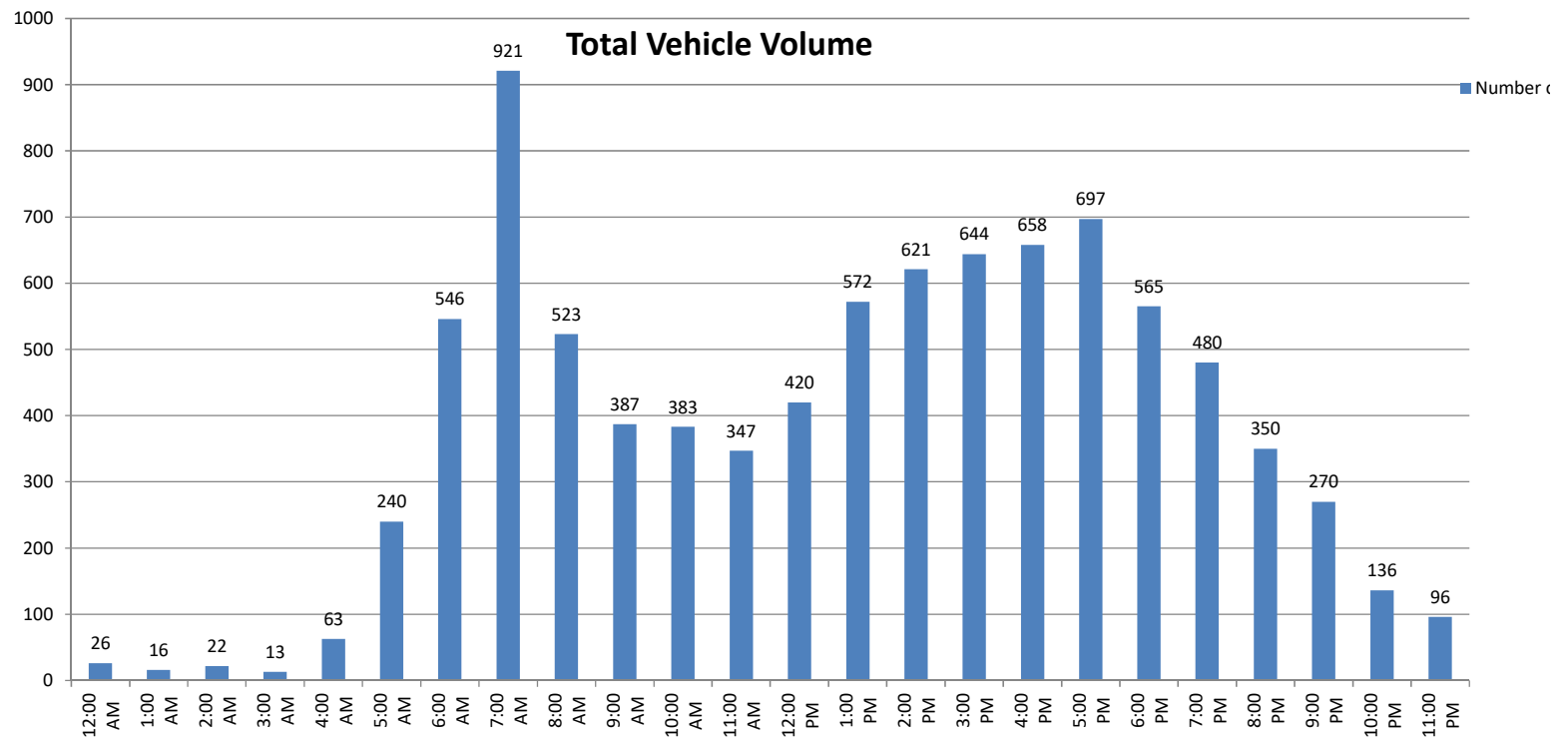
	Centre City Parkway North Leg		Centre City Parkway South Leg		Iris Lane East Leg		Iris Lane West Leg		TOTAL
	NL	NT	SL	ST	EL	ET	WL	WT	
4:00 PM	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	1	1	0	0	1	1	2
4:30 PM	0	0	0	0	0	0	0	0	1
4:45 PM	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	1	1	0	0	1
5:30 PM	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0
TOTAL VOLUMES:	0	0	1	1	1	1	2	2	4

	North Leg	South Leg	East Leg	West Leg	TOTAL
PEAK VOLUMES:	0	0	1	0	1



24 Hour Volume Plot
Iris Lane
NE/ Centre City Parkway
5/3/2018

Start Time	5/3/2018
12:00 AM	26
1:00 AM	16
2:00 AM	22
3:00 AM	13
4:00 AM	63
5:00 AM	240
6:00 AM	546
7:00 AM	921
8:00 AM	523
9:00 AM	387
10:00 AM	383
11:00 AM	347
12:00 PM	420
1:00 PM	572
2:00 PM	621
3:00 PM	644
4:00 PM	658
5:00 PM	697
6:00 PM	565
7:00 PM	480
8:00 PM	350
9:00 PM	270
10:00 PM	136
11:00 PM	96
Total	8996



Volumes represent the combined totals for both directions



PO Box 1178
Corona, CA 92880
951-268-6268

Location: Escondido
N/S: North Iris Lane
E/W: Village Road

Date: 10/7/20
Day: WEDNESDAY
Project # 143-20375

TURNING MOVEMENT COUNT

Count Period: 7:00 AM to 9:00 AM
Peak Hour: 7:15 AM to 8:15 AM

Vehicle Counts

	North Iris Lane Northbound				North Iris Lane Southbound				Village Road Eastbound				Village Road Westbound				TOTAL
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	WL	WT	WR	WR	
7:00 AM	0	8	13	4	30	0	0	3	13	22	3	0	22	3	0		96
7:15 AM	0	15	10	0	49	0	0	9	9	28	2	1	28	2	1		123
7:30 AM	1	10	14	1	47	0	0	5	12	27	4	0	27	4	0		121
7:45 AM	4	14	24	5	44	1	2	6	9	27	7	2	27	7	2		145
8:00 AM	4	14	14	2	41	1	1	5	6	34	2	0	34	2	0		124
8:15 AM	1	19	13	3	30	1	1	6	9	15	5	2	15	5	2		105
8:30 AM	2	16	17	1	31	1	0	6	9	15	2	1	15	2	1		101
8:45 AM	2	15	15	1	28	1	0	2	3	15	0	1	15	0	1		83
TOTAL VOLUMES:	14	111	120	17	300	5	4	42	70	183	25	7	183	25	7		898

AM Peak Hr Begins at: 7:15 AM

NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
9	53	62	8	181	2	3	25	36	116	15	3	513

PEAK VOLUMES:	9	53	62	8	181	2	3	25	36	116	15	3	513
PEAK HR FACTOR:	0.738	0.955	0.889	0.931	0.884								

Bicycle Counts

	North Iris Lane Northbound				North Iris Lane Southbound				Village Road Eastbound				Village Road Westbound				TOTAL
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	WL	WT	WR	WR	
7:00 AM	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0		1
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0
8:15 AM	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0		2
8:30 AM	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0		1
8:45 AM	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0		1
TOTAL VOLUMES:	0	2	1	0	0	0	0	0	0	0	2	0	0	2	0		5

NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
0	0	0	0	0	0	0	0	0	0	0	0	0

Pedestrian Counts

	North Iris Lane North Leg				North Iris Lane South Leg				Village Road East Leg				Village Road West Leg				TOTAL
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	WL	WT	WR	WR	
7:00 AM	0	0	0	0	4	0	0	0	0	0	1	0	0	1	0		5
7:15 AM	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0		2
7:30 AM	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0		2
7:45 AM	1	0	0	0	0	0	0	0	0	3	0	0	0	3	0		4
8:00 AM	0	0	0	0	0	0	0	0	0	2	0	0	0	2	0		2
8:15 AM	3	0	0	0	0	0	0	0	0	1	0	0	0	1	0		4
8:30 AM	0	0	0	0	0	0	0	0	0	2	0	0	0	2	0		2
8:45 AM	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0		1
TOTAL VOLUMES:	6	0	0	0	5	0	0	2	0	9	0	0	0	9	0		22

NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
3	0	0	0	0	1	0	0	0	0	0	0	0



PO Box 1178
Corona, CA 92880
951-268-6268

Location: Escondido
N/S: North Iris Lane
E/W: Village Road

Date: 10/7/20
Day: WEDNESDAY
Project # 143-20375

TURNING MOVEMENT COUNT

Count Period: 4:00 PM to 6:00 PM
Peak Hour: 4:45 PM to 5:45 PM

Vehicle Counts

	North Iris Lane Northbound				North Iris Lane Southbound				Village Road Eastbound				Village Road Westbound				TOTAL
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR					
4:00 PM	14	45	31	0	24	3	1	7	8	16	8	1					158
4:15 PM	10	39	41	1	21	1	2	4	6	21	7	0					153
4:30 PM	9	44	44	1	21	1	0	5	5	16	3	0					149
4:45 PM	11	45	33	1	17	2	2	6	5	16	3	1					142
5:00 PM	11	63	48	0	21	0	0	10	7	11	6	1					178
5:15 PM	11	52	42	1	22	1	1	4	8	14	5	0					161
5:30 PM	13	62	36	2	17	0	0	8	14	13	4	2					171
5:45 PM	9	35	28	0	18	0	0	6	5	17	5	0					123
TOTAL VOLUMES:	88	385	303	6	161	8	6	50	58	124	41	5					1235

PM Peak Hr Begins at: 445 PM

	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
PEAK VOLUMES:	46	222	159	4	77	3	3	28	34	54	18	4	652

PEAK HR FACTOR:	0.875	0.875	0.739	0.950	0.916
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Bicycle Counts

	North Iris Lane Northbound				North Iris Lane Southbound				Village Road Eastbound				Village Road Westbound				TOTAL
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR					
4:00 PM	0	0	0	0	0	0	0	1	0	0	0	0					1
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0					0
4:30 PM	0	0	1	0	0	0	0	0	0	0	0	0					1
4:45 PM	0	0	0	0	0	0	0	0	0	0	2	0					2
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0					0
5:15 PM	0	0	0	0	0	0	0	2	0	0	0	0					2
5:30 PM	0	1	0	0	0	0	0	0	0	0	0	0					1
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0					0
TOTAL VOLUMES:	0	1	1	0	0	0	0	3	0	0	2	0					7

	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
PEAK VOLUMES:	0	1	0	0	0	0	0	2	0	0	2	0	5

Pedestrian Counts

	North Iris Lane North Leg		North Iris Lane South Leg		Village Road East Leg		Village Road West Leg		TOTAL
	NL	NT	SL	ST	EL	ET	WL	WT	
4:00 PM	0			0		0		0	0
4:15 PM	1		1	1		0		1	3
4:30 PM	5		0			1		0	6
4:45 PM	0		1	1		1		0	2
5:00 PM	3		0			0		0	3
5:15 PM	3		0			0		4	7
5:30 PM	0		1	1		1		0	2
5:45 PM	0		0			0		1	1
TOTAL VOLUMES:	12		3	3		3		6	24

	North Leg	South Leg	East Leg	West Leg	TOTAL
PEAK VOLUMES:	6	2	2	4	14



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Location: Escondido
N/S: North Iris Lane
E/W: Robin Hill Lane

Date: 10/7/20
Day: WEDNESDAY
Project # 143-20375

TURNING MOVEMENT COUNT

Count Period: 7:00 AM to 9:00 AM
Peak Hour: 7:15 AM to 8:15 AM

Vehicle Counts

	North Iris Lane Northbound			North Iris Lane Southbound			Robin Hill Lane Eastbound			Robin Hill Lane Westbound			TOTAL
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
7:00 AM	1	18	0	0	63	0	2	0	1	0	0	0	85
7:15 AM	0	24	0	0	86	0	0	0	1	0	0	0	111
7:30 AM	0	25	0	0	86	1	0	0	4	0	0	0	116
7:45 AM	0	44	0	0	81	0	0	0	1	0	0	0	126
8:00 AM	0	30	0	0	80	0	0	0	1	0	0	0	111
8:15 AM	1	34	0	0	56	0	0	0	1	0	0	0	92
8:30 AM	0	34	0	0	56	0	0	0	0	0	0	0	90
8:45 AM	1	32	0	0	43	0	0	0	0	0	0	0	76
TOTAL VOLUMES:	3	241	0	0	551	1	2	0	9	0	0	0	807

AM Peak Hr Begins at: 7:15 AM

NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
0	123	0	0	333	1	0	0	7	0	0	0	464

PEAK HR FACTOR:	0.699	0.960	0.438	0.000	0.921
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Bicycle Counts

	North Iris Lane Northbound			North Iris Lane Southbound			Robin Hill Lane Eastbound			Robin Hill Lane Westbound			TOTAL
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	2	0	0	0	0	0	0	0	0	0	0	2
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	1	0	0	0	0	0	0	0	0	0	0	1
TOTAL VOLUMES:	0	3	0	0	0	0	0	0	0	0	0	0	3

NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
0	0	0	0	0	0	0	0	0	0	0	0	0

Pedestrian Counts

	North Iris Lane North Leg		North Iris Lane South Leg		Robin Hill Lane East Leg		Robin Hill Lane West Leg		TOTAL
	NL	NT	SL	ST	EL	ET	WL	WT	
7:00 AM	0	0	0	0	0	1	0	0	1
7:15 AM	0	0	0	0	0	1	0	0	1
7:30 AM	0	0	0	0	0	0	1	0	1
7:45 AM	0	0	0	0	0	0	1	0	1
8:00 AM	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	1	0	0	1
8:30 AM	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0
TOTAL VOLUMES:	0	0	0	0	3	3	2	2	5

North Leg	South Leg	East Leg	West Leg	TOTAL
0	0	1	2	3



PO Box 1178
Corona, CA 92880
951-268-6268

Location: Escondido
N/S: North Iris Lane
E/W: Robin Hill Lane

Date: 10/7/20
Day: WEDNESDAY
Project # 143-20375

TURNING MOVEMENT COUNT

Count Period: 4:00 PM to 6:00 PM
Peak Hour: 4:45 PM to 5:45 PM

Vehicle Counts

	North Iris Lane Northbound				North Iris Lane Southbound				Robin Hill Lane Eastbound				Robin Hill Lane Westbound				TOTAL
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	WL	WT	WR	WR	
4:00 PM	0	89	0	0	47	1	0	0	2	0	0	0	0	0	0	0	139
4:15 PM	1	87	0	0	46	0	3	0	1	0	0	0	0	0	0	0	138
4:30 PM	1	97	0	0	42	0	1	0	4	0	0	0	0	0	0	0	145
4:45 PM	4	90	0	0	36	2	0	0	0	0	0	0	0	0	0	0	132
5:00 PM	1	122	0	0	36	2	0	0	0	0	0	0	0	0	0	0	161
5:15 PM	0	110	0	0	43	2	0	0	1	0	0	0	0	0	0	0	156
5:30 PM	0	104	0	0	42	1	0	0	1	0	0	0	0	0	0	0	148
5:45 PM	1	73	0	0	38	1	0	0	0	0	0	0	0	0	0	0	113
TOTAL VOLUMES:	8	772	0	0	330	9	4	0	9	0	0	0	0	0	0	0	1132

PM Peak Hr Begins at: 445 PM

NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
5	426	0	0	157	7	0	0	2	0	0	0	597

PEAK HR FACTOR:	0.876	0.911	0.500	0.000	0.927
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Bicycle Counts

	North Iris Lane Northbound				North Iris Lane Southbound				Robin Hill Lane Eastbound				Robin Hill Lane Westbound				TOTAL
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	WL	WT	WR	WR	
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL VOLUMES:	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2

NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
0	1	0	0	0	0	0	0	0	0	0	0	1

Pedestrian Counts

	North Iris Lane North Leg		North Iris Lane South Leg		Robin Hill Lane East Leg		Robin Hill Lane West Leg		TOTAL
	NL	NT	SL	ST	EL	ET	WL	WT	
4:00 PM	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	1	0	0	1
4:45 PM	1	0	0	0	0	1	0	0	2
5:00 PM	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	4	0	0	4
5:45 PM	0	0	0	0	0	0	0	0	0
TOTAL VOLUMES:	1	0	0	0	0	6	0	0	7

North Leg	South Leg	East Leg	West Leg	TOTAL
1	0	5	0	6



PO Box 1178
Corona, CA 92880
951-268-6268

Location: Escondido
N/S: Centre City Parkway
E/W: North Iris Lane

Date: 10/7/20
Day: WEDNESDAY
Project # 143-20375

TURNING MOVEMENT COUNT

Count Period: 7:00 AM to 9:00 AM
Peak Hour: 7:15 AM to 8:15 AM

Vehicle Counts

	Centre City Parkway Northbound				Centre City Parkway Southbound				North Iris Lane Eastbound				North Iris Lane Westbound				TOTAL
	NL	NT	NR	SR	SL	ST	SR	EL	ET	ER	WL	WT	WR	WT	WR	WR	
7:00 AM	1	48	8	0	0	96	12	7	11	3	39	26	1				252
7:15 AM	2	37	10	4	113	17	8	13	2	2	52	35	2				295
7:30 AM	0	44	12	2	118	14	9	20	1	63	40	1					324
7:45 AM	2	47	22	0	104	13	14	18	3	3	50	29	2				304
8:00 AM	0	53	10	2	111	16	12	13	5	60	27	2					311
8:15 AM	4	44	20	2	98	15	11	19	2	42	21	1					279
8:30 AM	1	54	20	1	97	7	9	14	0	51	12	1					267
8:45 AM	3	45	13	0	95	10	12	19	1	35	10	1					244
TOTAL VOLUMES:	13	372	115	11	832	104	82	127	17	392	200	11					2276

AM Peak Hr Begins at: 7:15 AM

PEAK VOLUMES:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
	4	181	54	8	446	60	43	64	11	225	131	7	1234

PEAK HR FACTOR:	0.842	0.959	0.843	0.873	0.952
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Bicycle Counts

	Centre City Parkway Northbound				Centre City Parkway Southbound				North Iris Lane Eastbound				North Iris Lane Westbound				TOTAL
	NL	NT	NR	SR	SL	ST	SR	EL	ET	ER	WL	WT	WR	WT	WR	WR	
7:00 AM	0	0	0	0	0	1	0	0	0	0	0	0	0				1
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0				0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0				0
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0				0
8:00 AM	0	0	0	0	0	1	0	0	0	0	0	0	0				1
8:15 AM	0	1	2	0	0	0	0	0	0	0	0	0	0				3
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0				0
8:45 AM	0	0	0	0	1	0	0	0	0	0	0	0	0				1
TOTAL VOLUMES:	0	1	2	1	2	0	0	0	0	0	0	0	0				6

PEAK VOLUMES:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
	0	0	0	0	1	0	0	0	0	0	0	0	1

Pedestrian Counts

	Centre City Parkway North Leg		Centre City Parkway South Leg		North Iris Lane East Leg		North Iris Lane West Leg		TOTAL
	NL	NT	SL	ST	EL	ET	WL	WT	
7:00 AM	0	0	0	0	1	0	0	0	1
7:15 AM	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	1	0	0	0	0	0	1
TOTAL VOLUMES:	0	0	1	1	1	0	0	0	2

PEAK VOLUMES:	North Leg	South Leg	East Leg	West Leg	TOTAL
	0	0	0	0	0



PO Box 1178
Corona, CA 92880
951-268-6268

Location: Escondido
N/S: Centre City Parkway
E/W: North Iris Lane

Date: 10/7/20
Day: WEDNESDAY
Project # 143-20375

TURNING MOVEMENT COUNT

Count Period: 4:00 PM to 6:00 PM
Peak Hour: 4:30 PM to 5:30 PM

Vehicle Counts

	Centre City Parkway Northbound			Centre City Parkway Southbound			North Iris Lane Eastbound			North Iris Lane Westbound			TOTAL
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
4:00 PM	3	112	33	1	83	13	29	50	2	33	19	1	379
4:15 PM	3	114	58	0	96	10	28	45	2	29	22	5	412
4:30 PM	5	123	50	1	84	13	29	42	0	24	19	5	395
4:45 PM	1	103	51	2	81	11	40	52	3	29	14	1	388
5:00 PM	2	119	50	1	83	6	33	85	6	26	17	1	429
5:15 PM	6	125	50	0	101	8	33	61	4	32	17	0	437
5:30 PM	2	93	54	1	78	6	29	52	1	24	17	1	358
5:45 PM	6	79	34	1	72	9	33	49	4	23	17	1	328
TOTAL VOLUMES:	28	868	380	7	678	76	254	436	22	220	142	15	3126

PM Peak Hr Begins at: 430 PM

	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
PEAK VOLUMES:	14	470	201	4	349	38	135	240	13	111	67	7	1649

PEAK HR FACTOR:	0.946	0.897	0.782	0.944	0.943
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Bicycle Counts

	Centre City Parkway Northbound				Centre City Parkway Southbound				North Iris Lane Eastbound				North Iris Lane Westbound				TOTAL
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR					
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1
4:30 PM	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	2	2
4:45 PM	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	3	3
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL VOLUMES:	0	3	1	1	1	0	1	0	0	0	0	0	0	0	0	7	7

	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
PEAK VOLUMES:	0	1	1	0	1	0	0	0	0	0	0	0	3

Pedestrian Counts

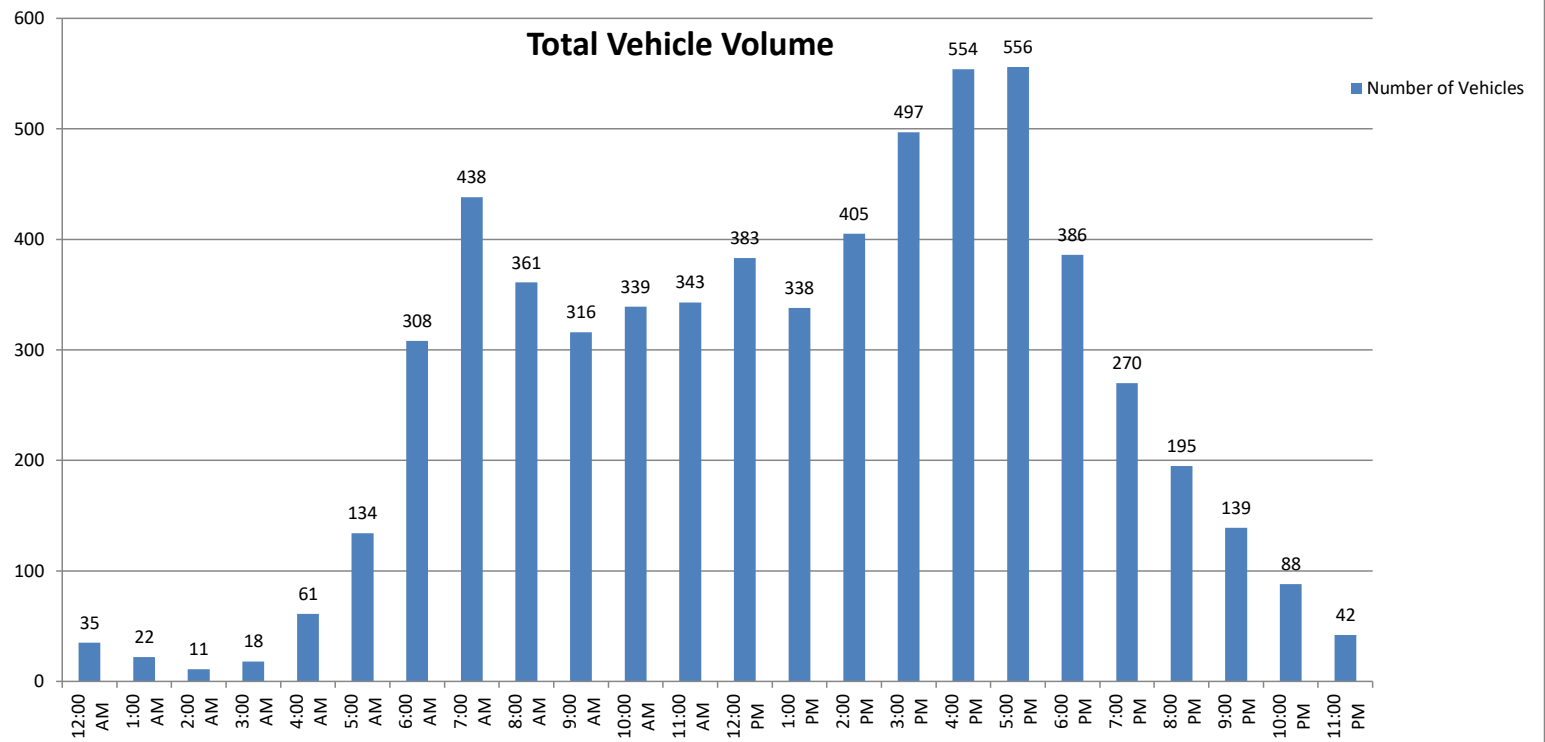
	Centre City Parkway North Leg		Centre City Parkway South Leg		North Iris Lane East Leg		North Iris Lane West Leg		TOTAL
	NL	NT	SL	ST	EL	ET	WL	WT	
4:00 PM	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	1	1	1
TOTAL VOLUMES:	0	0	0	0	0	0	1	1	1

	North Leg	South Leg	East Leg	West Leg	TOTAL
PEAK VOLUMES:	0	0	0	0	0



24 Hour Volume Plot
North Iris Lane
B/ Village Road - Robin Hill Lane
10/7/2020

Start Time	10/7/2020
12:00 AM	35
1:00 AM	22
2:00 AM	11
3:00 AM	18
4:00 AM	61
5:00 AM	134
6:00 AM	308
7:00 AM	438
8:00 AM	361
9:00 AM	316
10:00 AM	339
11:00 AM	343
12:00 PM	383
1:00 PM	338
2:00 PM	405
3:00 PM	497
4:00 PM	554
5:00 PM	556
6:00 PM	386
7:00 PM	270
8:00 PM	195
9:00 PM	139
10:00 PM	88
11:00 PM	42
Total	6239

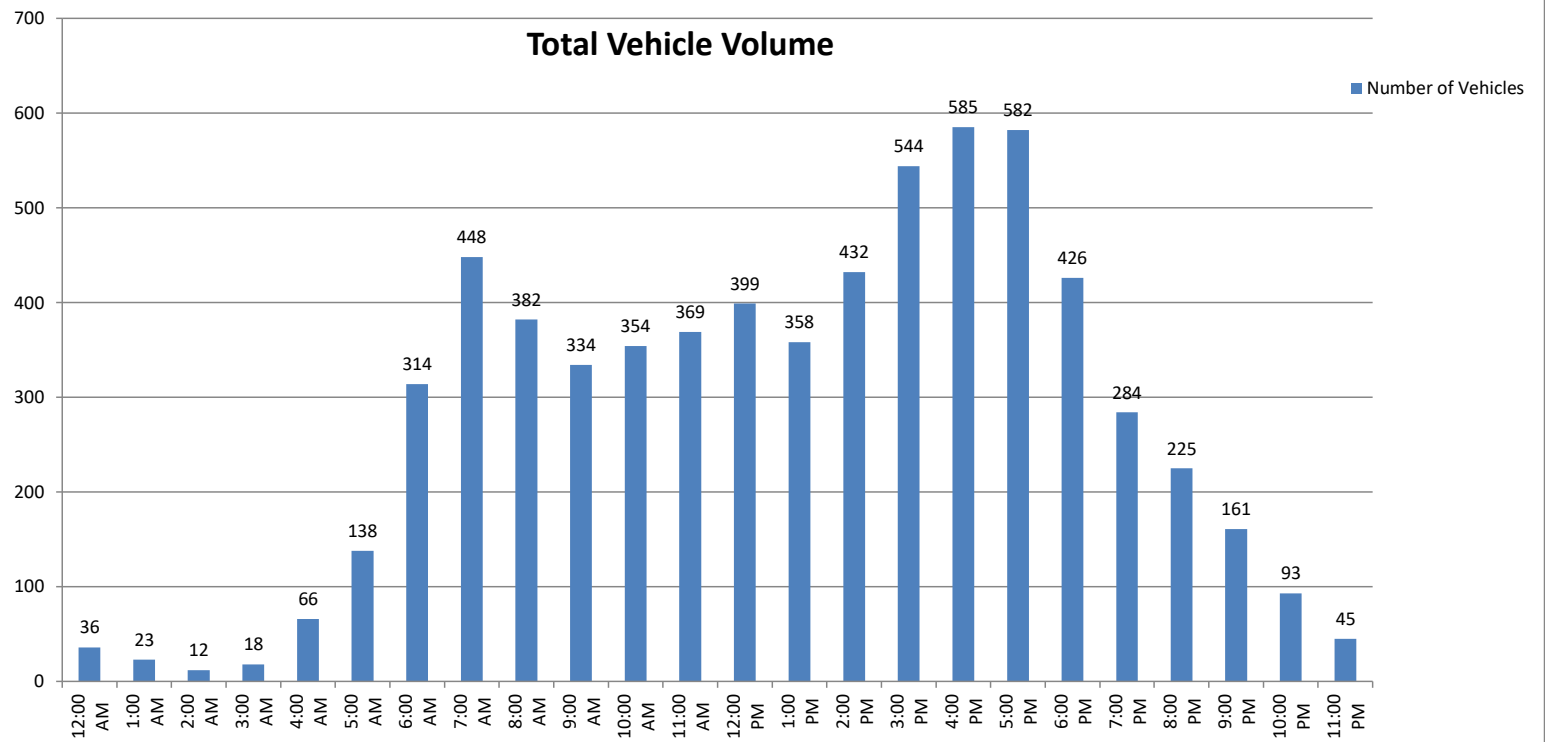


Volumes represent the combined totals for both directions



24 Hour Volume Plot
North Iris Lane
B/ Robin Hill Lane - Centre City Parkway
10/7/2020

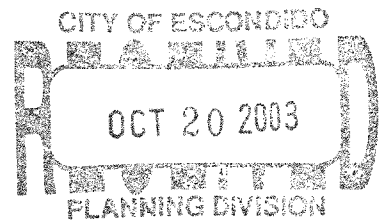
Start Time	10/7/2020
12:00 AM	36
1:00 AM	23
2:00 AM	12
3:00 AM	18
4:00 AM	66
5:00 AM	138
6:00 AM	314
7:00 AM	448
8:00 AM	382
9:00 AM	334
10:00 AM	354
11:00 AM	369
12:00 PM	399
1:00 PM	358
2:00 PM	432
3:00 PM	544
4:00 PM	585
5:00 PM	582
6:00 PM	426
7:00 PM	284
8:00 PM	225
9:00 PM	161
10:00 PM	93
11:00 PM	45
Total	6628



Volumes represent the combined totals for both directions

**TRAFFIC IMPACT ANALYSIS
GLENBROOK VILLAGE
ESCONDIDO, CALIFORNIA**
February 27, 2003
Revised: October 15, 2003

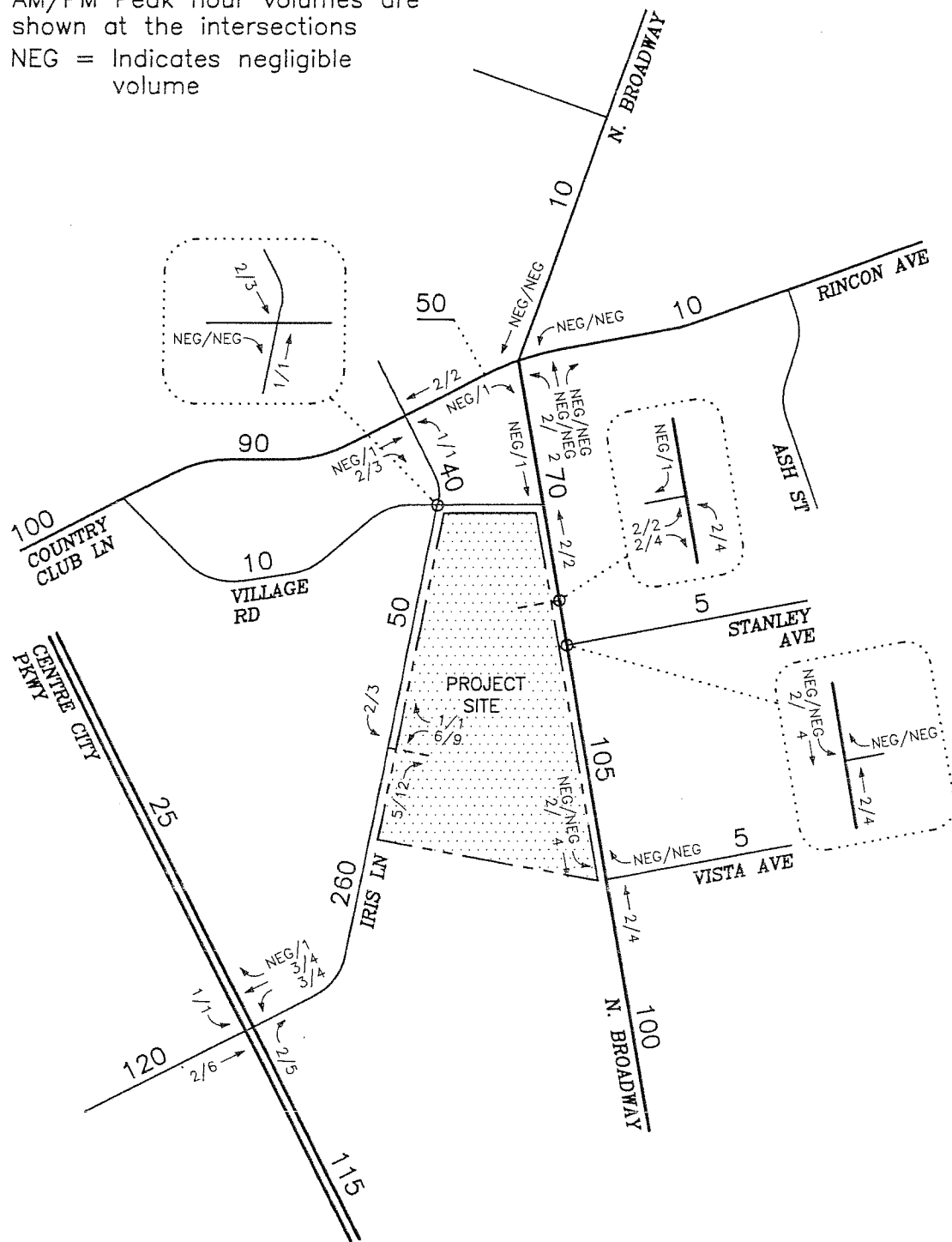
Prepared for:
Masson & Associates



E N G I N E E R S
Linscott, Law & Greenspan Engineers
1565 Hotel Circle South, Suite 310
San Diego, CA 92108
(619) 299-3090

JB/WBM/jn
3-02-1178

NOTE: - ADT's are shown midblock
- AM/PM Peak hour volumes are shown at the intersections
- NEG = Indicates negligible volume



REV. 10/14/03

FIG1178.DWG

NO SCALE

**LINSCOTT
LAW &
GREENSPAN**
N. 11th St. 102 W
ENGINEERS

SENIOR RESIDENTIAL COMPLEX PROJECT TRAFFIC VOLUMES
AM/PM PEAK HOURS & ADT's

14

Page 113 of 198
GLENBROOK VILLAGE



PO Box 1178
Corona, CA 92880
951-268-6268

Location: Escondido
N/S: N Iris Lane
E/W: Iris Glen

Date: 8/31/2021
Day: TUESDAY
Project # 143-21383

TURNING MOVEMENT COUNT

Count Period: 7:00 AM to 9:00 AM
Peak Hour: 7:30 AM to 8:30 AM

Vehicle Counts

	N Iris Lane Northbound			N Iris Lane Southbound			Iris Glen Eastbound			Iris Glen Westbound			TOTAL
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
7:00 AM			0	0						4	0	0	4
7:15 AM			0	0						2	0	0	2
7:30 AM			1	0						0	0	0	1
7:45 AM			3	0						1	0	0	4
8:00 AM			0	0						2	0	1	3
8:15 AM			0	0						2	0	0	2
8:30 AM			0	0						2	0	0	2
8:45 AM			0	0						0	0	0	0
TOTAL VOLUMES:			4	0						13	0	1	18

AM Peak Hr Begins at: 730 AM

NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
		4	0						5		1	10

PEAK HR FACTOR:

Bicycle Counts

	N Iris Lane Northbound			N Iris Lane Southbound			Iris Glen Eastbound			Iris Glen Westbound			TOTAL
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
7:00 AM													
7:15 AM													
7:30 AM													
7:45 AM													
8:00 AM													
8:15 AM													
8:30 AM													
8:45 AM													
TOTAL VOLUMES:													

NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL

Pedestrian Counts

	N Iris Lane North Leg		N Iris Lane South Leg		Iris Glen East Leg		Iris Glen West Leg		TOTAL
	NL	NT	SL	ST	EL	ET	WL	WT	
7:00 AM									0
7:15 AM									0
7:30 AM									0
7:45 AM									0
8:00 AM									0
8:15 AM									0
8:30 AM									0
8:45 AM									0
TOTAL VOLUMES:									0

NL	NT	SL	ST	EL	ET	WL	WT	TOTAL



PO Box 1178
Corona, CA 92880
951-268-6268

Location: Escondido
N/S: N Iris Lane
E/W: Iris Glen

Date: 8/31/2021
Day: TUESDAY
Project # 143-21383

TURNING MOVEMENT COUNT

Count Period: 4:00 PM to 6:00 PM
Peak Hour: 4:30 PM to 5:30 PM

Vehicle Counts

N Iris Lane Northbound			N Iris Lane Southbound			Iris Glen Eastbound			Iris Glen Westbound			TOTAL
NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
4:00 PM		1	1						0	0	0	2
4:15 PM		2	0						0	0	0	2
4:30 PM		3	0						1	0	1	5
4:45 PM		1	1						2	0	0	4
5:00 PM		2	0						2	0	0	4
5:15 PM		1	0						2	0	0	3
5:30 PM		2	1						1	0	0	4
5:45 PM		2	0						3	0	0	5
TOTAL VOLUMES:		14	3						11	0	1	29

PM Peak Hr Begins at: 430 PM

NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
PEAK VOLUMES:		7	1						7	0	1	16

PEAK HR FACTOR:

Bicycle Counts

N Iris Lane Northbound			N Iris Lane Southbound			Iris Glen Eastbound			Iris Glen Westbound			TOTAL
NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
4:00 PM												
4:15 PM												
4:30 PM												
4:45 PM												
5:00 PM												
5:15 PM												
5:30 PM												
5:45 PM												
TOTAL VOLUMES:												

NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
PEAK VOLUMES:												

Pedestrian Counts

N Iris Lane North Leg		N Iris Lane South Leg		Iris Glen East Leg		Iris Glen West Leg		TOTAL
NL	NT	SL	ST	EL	ET	ER	WL	
4:00 PM								
4:15 PM								
4:30 PM								
4:45 PM								
5:00 PM								
5:15 PM								
5:30 PM								
5:45 PM								
TOTAL VOLUMES:								

North Leg	South Leg	East Leg	West Leg	TOTAL
PEAK VOLUMES:				

Appendix F

Existing LOS Worksheets

Intersection	
Intersection Delay, s/veh	10.3
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	4	34	49	157	20	4	12	72	84	11	246	3
Future Vol, veh/h	4	34	49	157	20	4	12	72	84	11	246	3
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	37	53	171	22	4	13	78	91	12	267	3
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	8.9	10.6	9.4	11.1
HCM LOS	A	B	A	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	7%	5%	87%	4%
Vol Thru, %	43%	39%	11%	95%
Vol Right, %	50%	56%	2%	1%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	168	87	181	260
LT Vol	12	4	157	11
Through Vol	72	34	20	246
RT Vol	84	49	4	3
Lane Flow Rate	183	95	197	283
Geometry Grp	1	1	1	1
Degree of Util (X)	0.242	0.134	0.291	0.385
Departure Headway (Hd)	4.762	5.114	5.322	4.909
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	743	705	667	723
Service Time	2.858	3.114	3.421	2.997
HCM Lane V/C Ratio	0.246	0.135	0.295	0.391
HCM Control Delay	9.4	8.9	10.6	11.1
HCM Lane LOS	A	A	B	B
HCM 95th-tile Q	0.9	0.5	1.2	1.8

Intersection						
Int Delay, s/veh	0.2					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	9	0	167	452	1
Future Vol, veh/h	0	9	0	167	452	1
Conflicting Peds, #/hr	5	5	5	0	0	5
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	10	0	182	491	1
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	684	502	497	0	-	0
Stage 1	497	-	-	-	-	-
Stage 2	187	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	414	569	1067	-	-	-
Stage 1	611	-	-	-	-	-
Stage 2	845	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	411	564	1063	-	-	-
Mov Cap-2 Maneuver	411	-	-	-	-	-
Stage 1	609	-	-	-	-	-
Stage 2	842	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	11.5	0		0		
HCM LOS	B					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR	
Capacity (veh/h)	1063	-	564	-	-	
HCM Lane V/C Ratio	-	-	0.017	-	-	
HCM Control Delay (s)	0	-	11.5	-	-	
HCM Lane LOS	A	-	B	-	-	
HCM 95th %tile Q(veh)	0	-	0.1	-	-	

AM Existing

3: N. Iris Ln & Iris Glen

HCM 6th TWSC

Intersection															
Int Delay, s/veh		0.2													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR			
Lane Configurations															
Traffic Vol, veh/h	0	0	0	6	0	1	0	166	5	2	459	0			
Future Vol, veh/h	0	0	0	6	0	1	0	166	5	2	459	0			
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0			
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free			
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None			
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-			
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-			
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-			
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92			
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2			
Mvmt Flow	0	0	0	7	0	1	0	180	5	2	499	0			

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	686	688	499	686	686	686	183	499	0	0	185	0
Stage 1	503	503	-	183	183	-	-	-	-	-	-	-
Stage 2	183	185	-	503	503	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	4.12	-	-	4.12	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	2.218	-	-	2.218	-
Pot Cap-1 Maneuver	362	369	572	362	370	859	1065	1065	-	-	1390	-
Stage 1	551	541	-	819	748	-	-	-	-	-	-	-
Stage 2	819	747	-	551	541	-	-	-	-	-	-	-
Platoon blocked, %									-	-	-	-
Mov Cap-1 Maneuver	361	368	572	361	369	859	1065	1065	-	-	1390	-
Mov Cap-2 Maneuver	361	368	-	361	369	-	-	-	-	-	-	-
Stage 1	551	540	-	819	748	-	-	-	-	-	-	-
Stage 2	818	747	-	550	540	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	14.3	0	0
HCM LOS	A	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1065	-	-	-	394	1390	-	-
HCM Lane V/C Ratio	-	-	-	-	0.019	0.002	-	-
HCM Control Delay (s)	0	-	-	0	14.3	7.6	0	-
HCM Lane LOS	A	-	-	A	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	-	0.1	0	-	-

LOS Engineering, Inc.

AM Existing
4: Centre City Pkwy & Iris Ln

HCM 6th Signalized Intersection Summary

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	58	220	8	386	211	9	15	244	99	8	1014	93
Future Volume (veh/h)	58	220	8	386	211	9	15	244	99	8	1014	93
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	1.00		0.97	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No				No				No			
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	63	239	9	420	229	10	16	265	108	9	1102	101
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	502	849	32	494	843	37	23	1510	653	15	1493	646
Arrive On Green	0.47	0.47	0.47	0.47	0.47	0.47	0.01	0.42	0.42	0.01	0.42	0.42
Sat Flow, veh/h	1141	1789	67	1131	1777	78	1781	3554	1537	1781	3554	1537
Grp Volume(v), veh/h	63	0	248	420	0	239	16	265	108	9	1102	101
Grp Sat Flow(s),veh/h/ln	1141	0	1857	1131	0	1855	1781	1777	1537	1781	1777	1537
Q Serve(g_s), s	5.2	0.0	11.9	52.4	0.0	11.4	1.3	6.8	6.4	0.7	38.2	6.0
Cycle Q Clear(g_c), s	16.5	0.0	11.9	64.3	0.0	11.4	1.3	6.8	6.4	0.7	38.2	6.0
Prop In Lane	1.00		0.04	1.00		0.04	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	502	0	881	494	0	880	23	1510	653	15	1493	646
V/C Ratio(X)	0.13	0.00	0.28	0.85	0.00	0.27	0.69	0.18	0.17	0.60	0.74	0.16
Avail Cap(c_a), veh/h	627	0	1085	618	0	1083	55	1510	653	49	1493	646
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	28.2	0.0	23.3	42.8	0.0	23.2	71.9	26.2	26.0	72.3	35.7	26.3
Incr Delay (d2), s/veh	0.1	0.0	0.2	9.0	0.0	0.2	30.2	0.3	0.5	33.4	3.3	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.5	0.0	5.3	15.8	0.0	5.1	0.8	3.0	2.5	0.5	17.2	2.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	28.3	0.0	23.5	51.8	0.0	23.4	102.2	26.4	26.6	105.7	39.0	26.9
LnGrp LOS	C	A	C	D	A	C	F	C	C	F	D	C
Approach Vol, veh/h	311				659				389			
Approach Delay, s/veh	24.5				41.5				29.6			
Approach LOS	C				D				C			
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.7	66.7		74.0	6.4	66.0		74.0				
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s	4.0	62.0		85.5	4.5	61.5		85.5				
Max Q Clear Time (g_c+I1), s	2.7	8.8		18.5	3.3	40.2		66.3				
Green Ext Time (p_c), s	0.0	2.3		1.9	0.0	8.9		3.2				
Intersection Summary												
HCM 6th Ctrl Delay	36.2											
HCM 6th LOS	D											

Intersection	
Intersection Delay, s/veh	17.6
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	4	38	46	73	24	5	62	301	216	5	104	4
Future Vol, veh/h	4	38	46	73	24	5	62	301	216	5	104	4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	41	50	79	26	5	67	327	235	5	113	4
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	9.7	10.4	21.7	9.5
HCM LOS	A	B	C	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	11%	5%	72%	4%
Vol Thru, %	52%	43%	24%	92%
Vol Right, %	37%	52%	5%	4%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	579	88	102	113
LT Vol	62	4	73	5
Through Vol	301	38	24	104
RT Vol	216	46	5	4
Lane Flow Rate	629	96	111	123
Geometry Grp	1	1	1	1
Degree of Util (X)	0.78	0.15	0.186	0.182
Departure Headway (Hd)	4.464	5.658	6.036	5.33
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	799	636	598	676
Service Time	2.553	3.67	4.046	3.346
HCM Lane V/C Ratio	0.787	0.151	0.186	0.182
HCM Control Delay	21.7	9.7	10.4	9.5
HCM Lane LOS	C	A	B	A
HCM 95th-tile Q	7.8	0.5	0.7	0.7

Intersection						
Int Delay, s/veh	0.1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	3	7	578	213	9
Future Vol, veh/h	0	3	7	578	213	9
Conflicting Peds, #/hr	5	5	5	0	0	5
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	3	8	628	232	10
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	891	247	247	0	-	0
Stage 1	242	-	-	-	-	-
Stage 2	649	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	313	792	1319	-	-	-
Stage 1	798	-	-	-	-	-
Stage 2	520	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	308	785	1314	-	-	-
Mov Cap-2 Maneuver	308	-	-	-	-	-
Stage 1	788	-	-	-	-	-
Stage 2	518	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	9.6	0.1		0		
HCM LOS	A					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR	
Capacity (veh/h)	1314	-	785	-	-	
HCM Lane V/C Ratio	0.006	-	0.004	-	-	
HCM Control Delay (s)	7.8	0	9.6	-	-	
HCM Lane LOS	A	A	A	-	-	
HCM 95th %tile Q(veh)	0	-	0	-	-	

PM Existing

3: N. Iris Ln & Iris Glen

HCM 6th TWSC

Intersection																
Int Delay, s/veh 0.3																
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR				
Lane Configurations																
Traffic Vol, veh/h	0	0	0	9	0	1	0	584	12	3	212	0				
Future Vol, veh/h	0	0	0	9	0	1	0	584	12	3	212	0				
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0				
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free				
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None				
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-				
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-				
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-				
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92				
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2				
Mvmt Flow	0	0	0	10	0	1	0	635	13	3	230	0				
Major/Minor																
	Minor2			Minor1			Major1			Major2						
Conflicting Flow All	878	884	230	878	878	642	230	0	0	648	0	0				
Stage 1	236	236	-	642	642	-	-	-	-	-	-	-				
Stage 2	642	648	-	236	236	-	-	-	-	-	-	-				
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-				
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-				
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-				
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-				
Pot Cap-1 Maneuver	268	284	809	268	287	474	1338	-	-	938	-	-				
Stage 1	767	710	-	463	469	-	-	-	-	-	-	-				
Stage 2	463	466	-	767	710	-	-	-	-	-	-	-				
Platoon blocked, %																
Mov Cap-1 Maneuver	267	283	809	267	286	474	1338	-	-	938	-	-				
Mov Cap-2 Maneuver	267	283	-	267	286	-	-	-	-	-	-	-				
Stage 1	767	707	-	463	469	-	-	-	-	-	-	-				
Stage 2	462	466	-	764	707	-	-	-	-	-	-	-				
Approach																
	EB			WB			NB			SB						
HCM Control Delay, s	0			18.4			0									0.1
HCM LOS	A			C												
Minor Lane/Major Mvmt																
	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR								
Capacity (veh/h)	1338	-	-	-	279	938	-	-								
HCM Lane V/C Ratio	-	-	-	-	0.039	0.003	-	-								
HCM Control Delay (s)	0	-	-	0	18.4	8.9	0	-								
HCM Lane LOS	A	-	-	A	C	A	A	-								
HCM 95th %tile Q(veh)	0	-	-	-	0.1	0	-	-								

LOS Engineering, Inc.

PM Existing
4: Centre City Pkwy & Iris Ln

HCM 6th Signalized Intersection Summary

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	170	285	7	115	75	9	13	603	212	6	371	51
Future Volume (veh/h)	170	285	7	115	75	9	13	603	212	6	371	51
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	1.00		0.97	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	185	310	8	125	82	10	14	655	230	7	403	55
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	384	521	13	209	469	57	22	2109	915	12	2090	907
Arrive On Green	0.29	0.29	0.29	0.29	0.29	0.29	0.01	0.59	0.59	0.01	0.59	0.59
Sat Flow, veh/h	1300	1814	47	1062	1631	199	1781	3554	1542	1781	3554	1542
Grp Volume(v), veh/h	185	0	318	125	0	92	14	655	230	7	403	55
Grp Sat Flow(s),veh/h/ln	1300	0	1861	1062	0	1830	1781	1777	1542	1781	1777	1542
Q Serve(g_s), s	15.0	0.0	17.7	13.8	0.0	4.5	0.9	11.1	8.6	0.5	6.3	1.8
Cycle Q Clear(g_c), s	19.5	0.0	17.7	31.5	0.0	4.5	0.9	11.1	8.6	0.5	6.3	1.8
Prop In Lane	1.00		0.03	1.00		0.11	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	384	0	535	209	0	526	22	2109	915	12	2090	907
V/C Ratio(X)	0.48	0.00	0.59	0.60	0.00	0.17	0.63	0.31	0.25	0.57	0.19	0.06
Avail Cap(c_a), veh/h	782	0	1105	534	0	1086	170	2109	915	126	2090	907
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	39.5	0.0	36.9	50.4	0.0	32.2	59.2	12.2	11.7	59.6	11.5	10.6
Incr Delay (d2), s/veh	0.9	0.0	1.1	2.7	0.0	0.2	26.2	0.4	0.7	34.9	0.2	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.9	0.0	8.2	3.8	0.0	2.1	0.6	4.4	3.1	0.3	2.5	0.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	40.5	0.0	37.9	53.2	0.0	32.4	85.4	12.6	12.4	94.6	11.7	10.7
LnGrp LOS	D	A	D	D	A	C	F	B	B	F	B	B
Approach Vol, veh/h	503				217		899		465			
Approach Delay, s/veh	38.9				44.3		13.7		12.9			
Approach LOS	D				D		B		B			
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G + Y + Rc), s	5.3	76.0		39.1	6.0	75.3		39.1				
Change Period (Y + Rc), s	4.5	4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s	8.5	71.5		71.5	11.5	68.5		71.5				
Max Q Clear Time (g_c + I1), s	2.5	13.1		21.5	2.9	8.3		33.5				
Green Ext Time (p_c), s	0.0	6.4		2.7	0.0	3.2		1.1				
Intersection Summary												
HCM 6th Ctrl Delay			22.8									
HCM 6th LOS			C									

LOS Engineering, Inc.

Appendix G

SANDAG Select Zone Assignment

SANDAG
SR14
version14_1_1
hwy_load 462

2035rc

Select Zone Run

TAZ 870

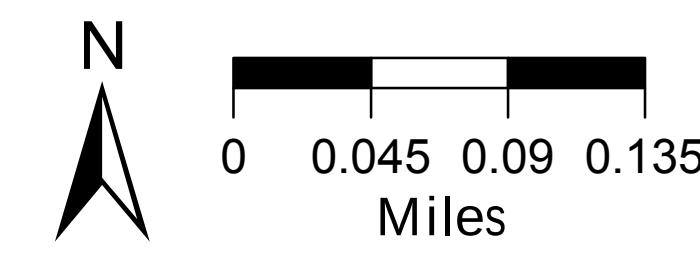
 Selected Zone(s)

Select Zone Vol and %

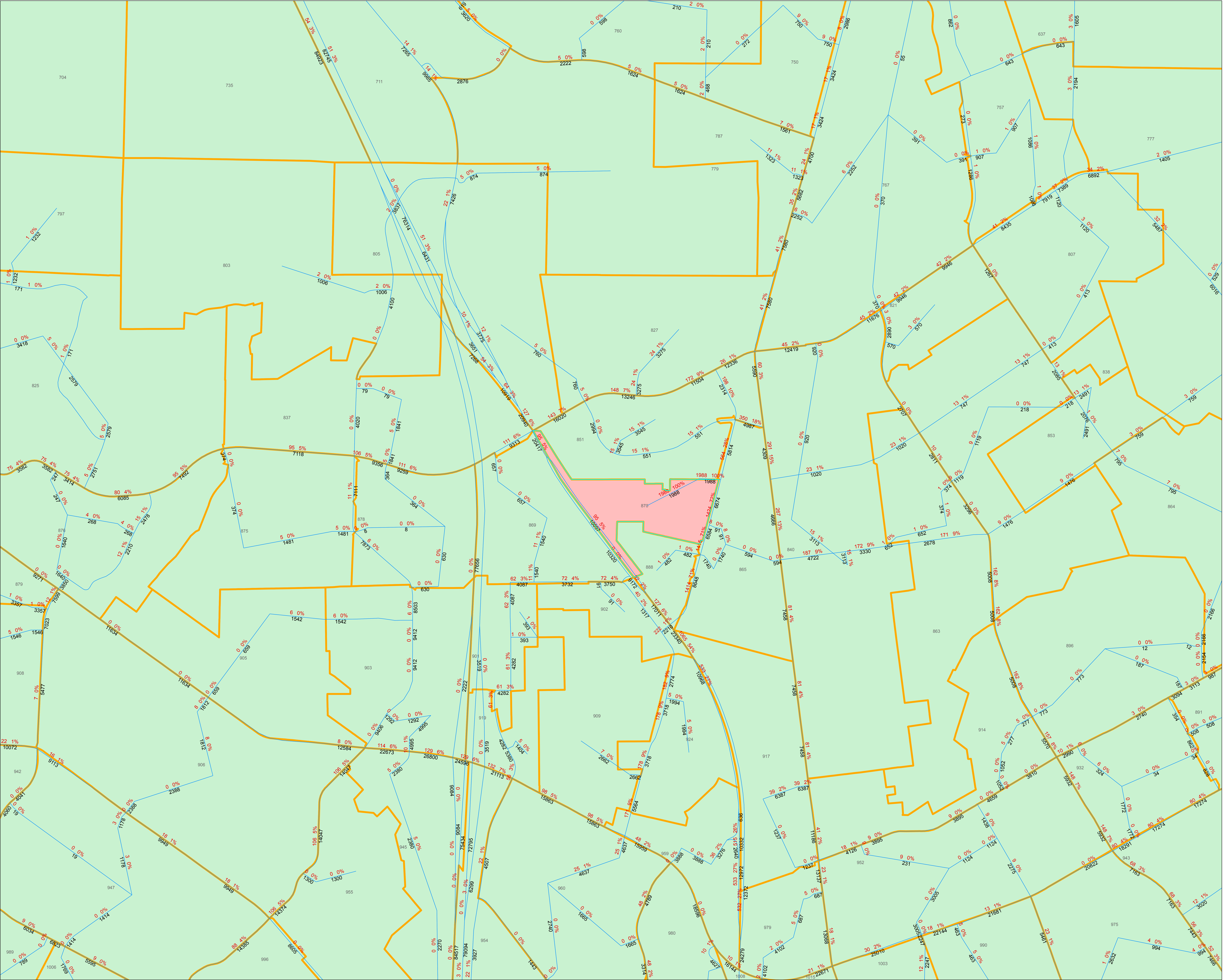
Model Estimated ADT

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Date: September 17, 2020



Appendix H

Existing plus Project LOS Worksheets

Intersection	
Intersection Delay, s/veh	10.5
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	4	34	49	160	20	4	12	77	93	11	247	3
Future Vol, veh/h	4	34	49	160	20	4	12	77	93	11	247	3
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	37	53	174	22	4	13	84	101	12	268	3
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	9	10.9	9.7	11.4
HCM LOS	A	B	A	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	7%	5%	87%	4%
Vol Thru, %	42%	39%	11%	95%
Vol Right, %	51%	56%	2%	1%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	182	87	184	261
LT Vol	12	4	160	11
Through Vol	77	34	20	247
RT Vol	93	49	4	3
Lane Flow Rate	198	95	200	284
Geometry Grp	1	1	1	1
Degree of Util (X)	0.268	0.136	0.304	0.398
Departure Headway (Hd)	4.886	5.17	5.466	5.049
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	738	693	658	718
Service Time	2.895	3.205	3.496	3.055
HCM Lane V/C Ratio	0.268	0.137	0.304	0.396
HCM Control Delay	9.7	9	10.9	11.4
HCM Lane LOS	A	A	B	B
HCM 95th-tile Q	1.1	0.5	1.3	1.9

Intersection						
Int Delay, s/veh	0.8					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	10	25	9	171	452	5
Future Vol, veh/h	10	25	9	171	452	5
Conflicting Peds, #/hr	5	5	5	0	0	5
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	27	10	186	491	5
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	710	504	501	0	-	0
Stage 1	499	-	-	-	-	-
Stage 2	211	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	400	568	1063	-	-	-
Stage 1	610	-	-	-	-	-
Stage 2	824	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	392	563	1059	-	-	-
Mov Cap-2 Maneuver	392	-	-	-	-	-
Stage 1	601	-	-	-	-	-
Stage 2	821	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	12.8	0.4		0		
HCM LOS	B					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR	
Capacity (veh/h)	1059	-	501	-	-	
HCM Lane V/C Ratio	0.009	-	0.076	-	-	
HCM Control Delay (s)	8.4	0	12.8	-	-	
HCM Lane LOS	A	A	B	-	-	
HCM 95th %tile Q(veh)	0	-	0.2	-	-	

Intersection												
Int Delay, s/veh	0.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	4	0	22	6	0	1	0	175	5	2	475	0
Future Vol, veh/h	4	0	22	6	0	1	0	175	5	2	475	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	0	24	7	0	1	0	190	5	2	516	0
Major/Minor	Minor2		Minor1			Major1			Major2			
Conflicting Flow All	713	715	516	725	713	193	-	0	0	195	0	0
Stage 1	520	520	-	193	193	-	-	-	-	-	-	-
Stage 2	193	195	-	532	520	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	-	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	-	-	-	2.218	-	-
Pot Cap-1 Maneuver	347	356	559	340	357	849	0	-	-	1378	-	0
Stage 1	539	532	-	809	741	-	0	-	-	-	-	0
Stage 2	809	739	-	531	532	-	0	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	346	355	559	325	356	849	-	-	-	1378	-	-
Mov Cap-2 Maneuver	346	355	-	325	356	-	-	-	-	-	-	-
Stage 1	539	531	-	809	741	-	-	-	-	-	-	-
Stage 2	808	739	-	507	531	-	-	-	-	-	-	-
Approach	EB		WB			NB			SB			
HCM Control Delay, s	12.5		15.3			0			0			
HCM LOS	B		C									
Minor Lane/Major Mvmt		NBT	NBR	EBLn1	WBLn1	SBL	SBT					
Capacity (veh/h)		-	-	511	356	1378	-					
HCM Lane V/C Ratio		-	-	0.055	0.021	0.002	-					
HCM Control Delay (s)		-	-	12.5	15.3	7.6	0					
HCM Lane LOS		-	-	B	C	A	A					
HCM 95th %tile Q(veh)		-	-	0.2	0.1	0	-					

AM Existing + Project
4: Centre City Pkwy & Iris Ln

HCM 6th Signalized Intersection Summary

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	58	221	8	414	217	13	15	244	106	9	1014	93
Future Volume (veh/h)	58	221	8	414	217	13	15	244	106	9	1014	93
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	1.00		0.97	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	63	240	9	450	236	14	16	265	115	10	1102	101
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	527	895	34	529	873	52	24	1403	607	16	1389	600
Arrive On Green	0.50	0.50	0.50	0.50	0.50	0.50	0.01	0.39	0.39	0.01	0.39	0.39
Sat Flow, veh/h	1129	1790	67	1130	1746	104	1781	3554	1536	1781	3554	1536
Grp Volume(v), veh/h	63	0	249	450	0	250	16	265	115	10	1102	101
Grp Sat Flow(s),veh/h/ln	1129	0	1857	1130	0	1850	1781	1777	1536	1781	1777	1536
Q Serve(g_s), s	4.8	0.0	10.9	53.8	0.0	11.0	1.3	6.9	6.9	0.8	38.5	6.0
Cycle Q Clear(g_c), s	15.8	0.0	10.9	64.7	0.0	11.0	1.3	6.9	6.9	0.8	38.5	6.0
Prop In Lane	1.00		0.04	1.00		0.06	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	527	0	928	529	0	925	24	1403	607	16	1389	600
V/C Ratio(X)	0.12	0.00	0.27	0.85	0.00	0.27	0.68	0.19	0.19	0.61	0.79	0.17
Avail Cap(c_a), veh/h	701	0	1214	703	0	1209	57	1403	607	51	1389	600
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	24.9	0.0	20.3	39.0	0.0	20.3	69.1	27.8	27.8	69.4	37.8	27.9
Incr Delay (d2), s/veh	0.1	0.0	0.2	7.6	0.0	0.2	29.2	0.3	0.7	31.5	4.7	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.3	0.0	4.8	15.8	0.0	4.9	0.8	3.0	2.7	0.5	17.6	2.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	25.0	0.0	20.5	46.6	0.0	20.5	98.3	28.1	28.5	101.0	42.6	28.5
LnGrp LOS	C	A	C	D	A	C	F	C	C	F	D	C
Approach Vol, veh/h		312			700			396			1213	
Approach Delay, s/veh		21.4			37.3			31.1			41.9	
Approach LOS		C			D			C			D	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.8	60.1		74.8	6.4	59.5		74.8				
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s	4.0	55.5		92.0	4.5	55.0		92.0				
Max Q Clear Time (g_c+I1), s	2.8	8.9		17.8	3.3	40.5		66.7				
Green Ext Time (p_c), s	0.0	2.3		1.9	0.0	7.2		3.7				
Intersection Summary												
HCM 6th Ctrl Delay			36.6									
HCM 6th LOS			D									

LOS Engineering, Inc.

Intersection	
Intersection Delay, s/veh	18.4
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	4	38	47	83	24	5	62	303	220	5	109	4
Future Vol, veh/h	4	38	47	83	24	5	62	303	220	5	109	4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	41	51	90	26	5	67	329	239	5	118	4
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	9.8	10.7	23	9.7
HCM LOS	A	B	C	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	11%	4%	74%	4%
Vol Thru, %	52%	43%	21%	92%
Vol Right, %	38%	53%	4%	3%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	585	89	112	118
LT Vol	62	4	83	5
Through Vol	303	38	24	109
RT Vol	220	47	5	4
Lane Flow Rate	636	97	122	128
Geometry Grp	1	1	1	1
Degree of Util (X)	0.796	0.154	0.206	0.192
Departure Headway (Hd)	4.508	5.729	6.095	5.397
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	788	629	592	667
Service Time	2.608	3.742	4.107	3.418
HCM Lane V/C Ratio	0.807	0.154	0.206	0.192
HCM Control Delay	23	9.8	10.7	9.7
HCM Lane LOS	C	A	B	A
HCM 95th-tile Q	8.3	0.5	0.8	0.7

Intersection						
Int Delay, s/veh	0.6					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	4	10	48	580	213	25
Future Vol, veh/h	4	10	48	580	213	25
Conflicting Peds, #/hr	5	5	5	0	0	5
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	4	11	52	630	232	27
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	990	256	264	0	-	0
Stage 1	251	-	-	-	-	-
Stage 2	739	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	273	783	1300	-	-	-
Stage 1	791	-	-	-	-	-
Stage 2	472	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	254	776	1295	-	-	-
Mov Cap-2 Maneuver	254	-	-	-	-	-
Stage 1	739	-	-	-	-	-
Stage 2	470	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	12.6	0.6		0		
HCM LOS	B					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR	
Capacity (veh/h)	1295	-	489	-	-	
HCM Lane V/C Ratio	0.04	-	0.031	-	-	
HCM Control Delay (s)	7.9	0	12.6	-	-	
HCM Lane LOS	A	A	B	-	-	
HCM 95th %tile Q(veh)	0.1	-	0.1	-	-	

Intersection												
Int Delay, s/veh	0.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	2	0	11	9	0	1	0	625	12	3	219	0
Future Vol, veh/h	2	0	11	9	0	1	0	625	12	3	219	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	2	0	12	10	0	1	0	679	13	3	238	0
Major/Minor	Minor2		Minor1			Major1			Major2			
Conflicting Flow All	930	936	238	936	930	686	-	0	0	692	0	0
Stage 1	244	244	-	686	686	-	-	-	-	-	-	-
Stage 2	686	692	-	250	244	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	-	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	-	-	-	2.218	-	-
Pot Cap-1 Maneuver	248	265	801	245	267	447	0	-	-	903	-	0
Stage 1	760	704	-	438	448	-	0	-	-	-	-	0
Stage 2	438	445	-	754	704	-	0	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	247	264	801	241	266	447	-	-	-	903	-	-
Mov Cap-2 Maneuver	247	264	-	241	266	-	-	-	-	-	-	-
Stage 1	760	701	-	438	448	-	-	-	-	-	-	-
Stage 2	437	445	-	740	701	-	-	-	-	-	-	-
Approach	EB		WB			NB			SB			
HCM Control Delay, s	11.2		19.9			0			0.1			
HCM LOS	B		C									
Minor Lane/Major Mvmt	NBT		NBR	EBLn1	WBLn1	SBL	SBT					
Capacity (veh/h)	-		-	596	253	903	-					
HCM Lane V/C Ratio	-		-	0.024	0.043	0.004	-					
HCM Control Delay (s)	-		-	11.2	19.9	9	0					
HCM Lane LOS	-		-	B	C	A	A					
HCM 95th %tile Q(veh)	-		-	0.1	0.1	0	-					

PM Existing + Project
4: Centre City Pkwy & Iris Ln

HCM 6th Signalized Intersection Summary

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	170	291	7	128	78	11	13	603	243	10	371	51
Future Volume (veh/h)	170	291	7	128	78	11	13	603	243	10	371	51
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	1.00		0.97	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	185	316	8	139	85	12	14	655	264	11	403	55
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	398	547	14	221	482	68	22	2058	893	18	2050	889
Arrive On Green	0.30	0.30	0.30	0.30	0.30	0.30	0.01	0.58	0.58	0.01	0.58	0.58
Sat Flow, veh/h	1295	1815	46	1056	1598	226	1781	3554	1542	1781	3554	1542
Grp Volume(v), veh/h	185	0	324	139	0	97	14	655	264	11	403	55
Grp Sat Flow(s),veh/h/ln	1295	0	1861	1056	0	1824	1781	1777	1542	1781	1777	1542
Q Serve(g_s), s	15.2	0.0	18.2	15.8	0.0	4.8	1.0	11.7	10.7	0.8	6.7	1.9
Cycle Q Clear(g_c), s	20.0	0.0	18.2	34.0	0.0	4.8	1.0	11.7	10.7	0.8	6.7	1.9
Prop In Lane	1.00		0.02	1.00		0.12	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	398	0	561	221	0	550	22	2058	893	18	2050	889
V/C Ratio(X)	0.47	0.00	0.58	0.63	0.00	0.18	0.64	0.32	0.30	0.61	0.20	0.06
Avail Cap(c_a), veh/h	757	0	1078	514	0	1056	166	2058	893	123	2050	889
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	39.2	0.0	36.5	50.9	0.0	31.8	60.7	13.4	13.2	60.9	12.5	11.5
Incr Delay (d2), s/veh	0.8	0.0	0.9	2.9	0.0	0.2	26.6	0.4	0.8	28.5	0.2	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.9	0.0	8.4	4.4	0.0	2.2	0.6	4.8	3.9	0.5	2.7	0.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	40.1	0.0	37.4	53.8	0.0	32.0	87.3	13.8	14.0	89.3	12.7	11.6
LnGrp LOS	D	A	D	D	A	C	F	B	B	F	B	B
Approach Vol, veh/h		509			236			933			469	
Approach Delay, s/veh		38.4			44.8			15.0			14.4	
Approach LOS		D			D			B			B	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G + Y + Rc), s	5.8	76.0		41.7	6.0	75.7		41.7				
Change Period (Y + Rc), s	4.5	4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s	8.5	71.5		71.5	11.5	68.5		71.5				
Max Q Clear Time (g_c + I1), s	2.8	13.7		22.0	3.0	8.7		36.0				
Green Ext Time (p_c), s	0.0	6.6		2.8	0.0	3.2		1.2				
Intersection Summary												
HCM 6th Ctrl Delay			23.7									
HCM 6th LOS			C									

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Appendix I

Cumulative Traffic Assignments

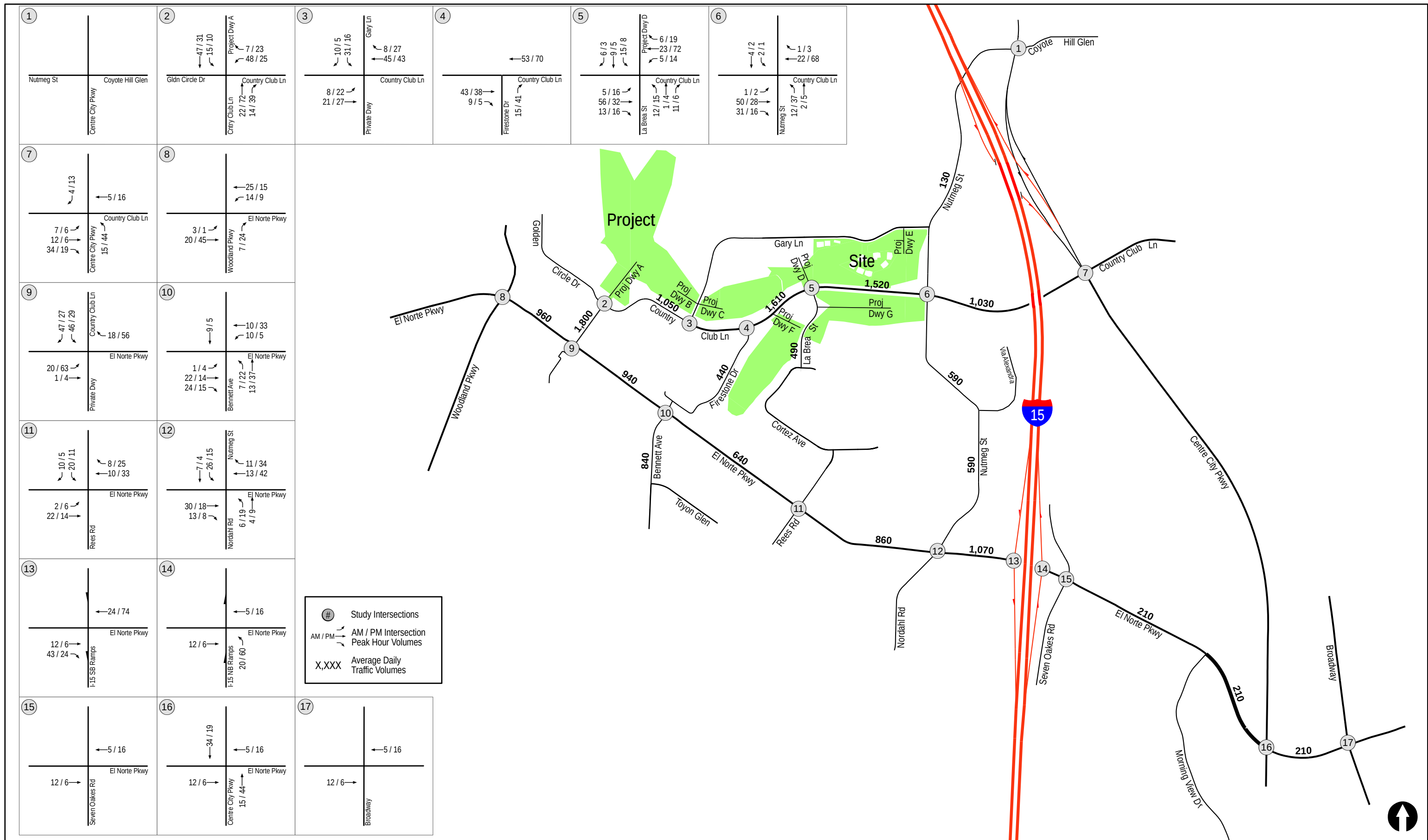
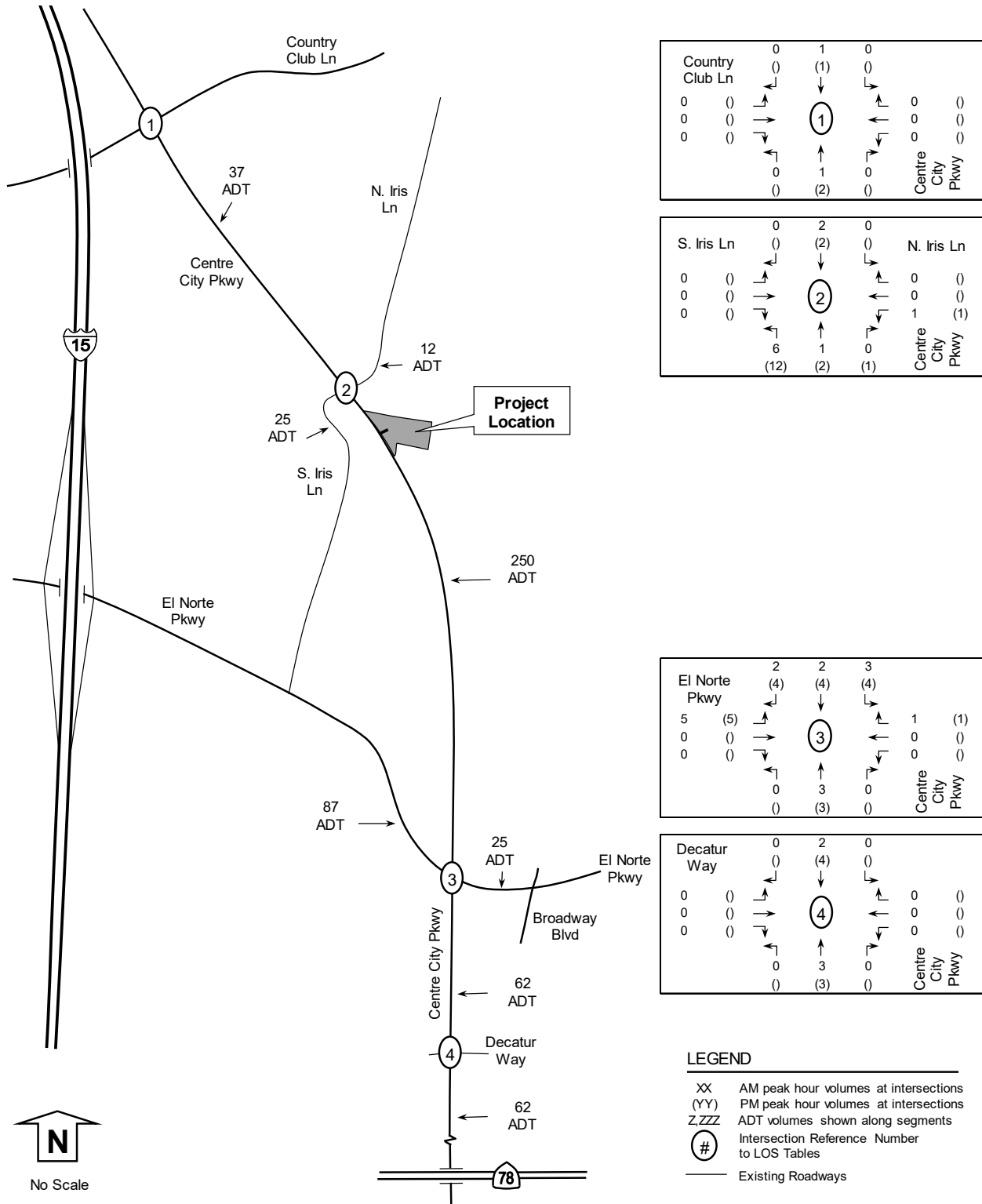
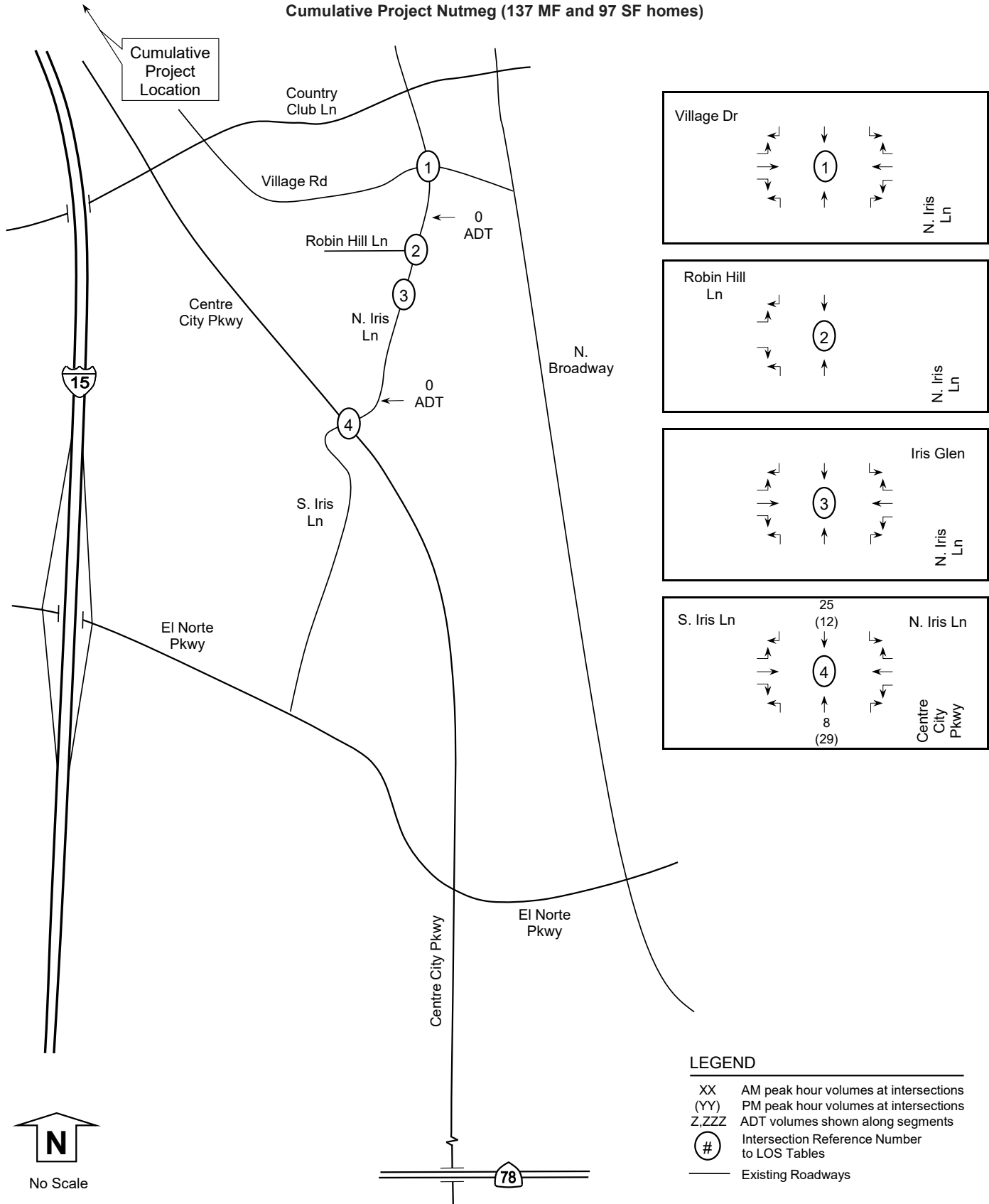


Figure 7-3
Total Project Traffic Volumes

Figure 6: Project Assignment



Cumulative Project Nutmeg (137 MF and 97 SF homes)



Appendix J

Near term LOS Worksheets

AM Existing + Cumulative
1: N. Iris Ln & Village Dr

HCM 6th AWSC

Intersection	
Intersection Delay, s/veh	10.3
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	4	34	49	157	20	4	12	72	84	11	247	3
Future Vol, veh/h	4	34	49	157	20	4	12	72	84	11	247	3
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	37	53	171	22	4	13	78	91	12	268	3
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	8.9	10.6	9.4	11.1
HCM LOS	A	B	A	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	7%	5%	87%	4%
Vol Thru, %	43%	39%	11%	95%
Vol Right, %	50%	56%	2%	1%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	168	87	181	261
LT Vol	12	4	157	11
Through Vol	72	34	20	247
RT Vol	84	49	4	3
Lane Flow Rate	183	95	197	284
Geometry Grp	1	1	1	1
Degree of Util (X)	0.242	0.134	0.291	0.387
Departure Headway (Hd)	4.764	5.118	5.325	4.909
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	743	705	667	723
Service Time	2.86	3.118	3.425	2.997
HCM Lane V/C Ratio	0.246	0.135	0.295	0.393
HCM Control Delay	9.4	8.9	10.6	11.1
HCM Lane LOS	A	A	B	B
HCM 95th-tile Q	0.9	0.5	1.2	1.8

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Intersection						
Int Delay, s/veh	0.2					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	9	0	167	453	1
Future Vol, veh/h	0	9	0	167	453	1
Conflicting Peds, #/hr	5	5	5	0	0	5
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	10	0	182	492	1
Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	685	503	498	0	-	0
Stage 1	498	-	-	-	-	-
Stage 2	187	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	414	569	1066	-	-	-
Stage 1	611	-	-	-	-	-
Stage 2	845	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	411	564	1062	-	-	-
Mov Cap-2 Maneuver	411	-	-	-	-	-
Stage 1	609	-	-	-	-	-
Stage 2	842	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	11.5	0		0		
HCM LOS	B					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR	
Capacity (veh/h)	1062	-	564	-	-	
HCM Lane V/C Ratio	-	-	0.017	-	-	
HCM Control Delay (s)	0	-	11.5	-	-	
HCM Lane LOS	A	-	B	-	-	
HCM 95th %tile Q(veh)	0	-	0.1	-	-	

Intersection												
Int Delay, s/veh	0.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	0	0	6	0	1	0	166	5	2	460	0
Future Vol, veh/h	0	0	0	6	0	1	0	166	5	2	460	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	7	0	1	0	180	5	2	500	0
Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	687	689	500	687	687	183	-	0	0	185	0	0
Stage 1	504	504	-	183	183	-	-	-	-	-	-	-
Stage 2	183	185	-	504	504	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	-	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	-	-	-	2.218	-	-
Pot Cap-1 Maneuver	361	369	571	361	370	859	0	-	-	1390	-	0
Stage 1	550	541	-	819	748	-	0	-	-	-	-	0
Stage 2	819	747	-	550	541	-	0	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	360	368	571	360	369	859	-	-	-	1390	-	-
Mov Cap-2 Maneuver	360	368	-	360	369	-	-	-	-	-	-	-
Stage 1	550	540	-	819	748	-	-	-	-	-	-	-
Stage 2	818	747	-	549	540	-	-	-	-	-	-	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0			14.3			0			0		
HCM LOS	A			B								
Minor Lane/Major Mvmt		NBT	NBR	EBLn1	WBLn1	SBL	SBT					
Capacity (veh/h)		-	-	-	393	1390	-					
HCM Lane V/C Ratio		-	-	-	0.019	0.002	-					
HCM Control Delay (s)		-	-	0	14.3	7.6	0					
HCM Lane LOS		-	-	A	B	A	A					
HCM 95th %tile Q(veh)		-	-	-	0.1	0	-					

AM Existing + Cumulative
4: Centre City Pkwy & Iris Ln

HCM 6th Signalized Intersection Summary

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	58	220	8	387	211	9	21	268	99	8	1075	93
Future Volume (veh/h)	58	220	8	387	211	9	21	268	99	8	1075	93
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	1.00		0.97	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	63	239	9	421	229	10	23	291	108	9	1168	101
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	505	852	32	498	847	37	30	1495	647	15	1466	634
Arrive On Green	0.48	0.48	0.48	0.48	0.48	0.48	0.02	0.42	0.42	0.01	0.41	0.41
Sat Flow, veh/h	1140	1789	67	1131	1777	78	1781	3554	1537	1781	3554	1537
Grp Volume(v), veh/h	63	0	248	421	0	239	23	291	108	9	1168	101
Grp Sat Flow(s),veh/h/ln	1140	0	1857	1131	0	1855	1781	1777	1537	1781	1777	1537
Q Serve(g_s), s	5.0	0.0	11.5	51.2	0.0	11.1	1.8	7.4	6.3	0.7	41.1	5.9
Cycle Q Clear(g_c), s	16.1	0.0	11.5	62.8	0.0	11.1	1.8	7.4	6.3	0.7	41.1	5.9
Prop In Lane	1.00		0.04	1.00		0.04	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	505	0	885	498	0	884	30	1495	647	15	1466	634
V/C Ratio(X)	0.12	0.00	0.28	0.85	0.00	0.27	0.77	0.19	0.17	0.60	0.80	0.16
Avail Cap(c_a), veh/h	664	0	1142	655	0	1141	56	1495	647	50	1466	634
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	27.4	0.0	22.6	41.6	0.0	22.5	70.0	26.1	25.8	70.7	36.8	26.4
Incr Delay (d2), s/veh	0.1	0.0	0.2	7.8	0.0	0.2	33.2	0.3	0.6	33.0	4.6	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.4	0.0	5.2	15.3	0.0	5.0	1.1	3.2	2.4	0.5	18.7	2.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	27.5	0.0	22.8	49.4	0.0	22.7	103.2	26.4	26.4	103.7	41.4	27.0
LnGrp LOS	C	A	C	D	A	C	F	C	C	F	D	C
Approach Vol, veh/h		311			660			422			1278	
Approach Delay, s/veh		23.7			39.7			30.6			40.7	
Approach LOS		C			D			C			D	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.7	64.7		72.6	6.9	63.5		72.6				
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s	4.0	59.5		88.0	4.5	59.0		88.0				
Max Q Clear Time (g_c+I1), s	2.7	9.4		18.1	3.8	43.1		64.8				
Green Ext Time (p_c), s	0.0	2.5		1.9	0.0	8.0		3.4				
Intersection Summary												
HCM 6th Ctrl Delay			36.9									
HCM 6th LOS			D									

LOS Engineering, Inc.

PM Existing + Cumulative
1: N. Iris Ln & Village Dr

HCM 6th AWSC

Intersection	
Intersection Delay, s/veh	17.7
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	4	38	46	73	24	5	62	302	216	5	105	4
Future Vol, veh/h	4	38	46	73	24	5	62	302	216	5	105	4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	41	50	79	26	5	67	328	235	5	114	4
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	9.7	10.4	21.8	9.6
HCM LOS	A	B	C	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	11%	5%	72%	4%
Vol Thru, %	52%	43%	24%	92%
Vol Right, %	37%	52%	5%	4%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	580	88	102	114
LT Vol	62	4	73	5
Through Vol	302	38	24	105
RT Vol	216	46	5	4
Lane Flow Rate	630	96	111	124
Geometry Grp	1	1	1	1
Degree of Util (X)	0.782	0.151	0.186	0.184
Departure Headway (Hd)	4.466	5.665	6.043	5.332
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	801	635	596	675
Service Time	2.557	3.677	4.055	3.35
HCM Lane V/C Ratio	0.787	0.151	0.186	0.184
HCM Control Delay	21.8	9.7	10.4	9.6
HCM Lane LOS	C	A	B	A
HCM 95th-tile Q	7.9	0.5	0.7	0.7

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Intersection						
Int Delay, s/veh	0.1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	3	7	579	214	9
Future Vol, veh/h	0	3	7	579	214	9
Conflicting Peds, #/hr	5	5	5	0	0	5
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	3	8	629	233	10
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	893	248	248	0	-	0
Stage 1	243	-	-	-	-	-
Stage 2	650	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	312	791	1318	-	-	-
Stage 1	797	-	-	-	-	-
Stage 2	520	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	307	784	1313	-	-	-
Mov Cap-2 Maneuver	307	-	-	-	-	-
Stage 1	787	-	-	-	-	-
Stage 2	518	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	9.6	0.1		0		
HCM LOS	A					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR	
Capacity (veh/h)	1313	-	784	-	-	
HCM Lane V/C Ratio	0.006	-	0.004	-	-	
HCM Control Delay (s)	7.8	0	9.6	-	-	
HCM Lane LOS	A	A	A	-	-	
HCM 95th %tile Q(veh)	0	-	0	-	-	

Intersection												
Int Delay, s/veh	0.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	0	0	9	0	1	0	585	12	3	213	0
Future Vol, veh/h	0	0	0	9	0	1	0	585	12	3	213	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	10	0	1	0	636	13	3	232	0
Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	881	887	232	881	881	643	-	0	0	649	0	0
Stage 1	238	238	-	643	643	-	-	-	-	-	-	-
Stage 2	643	649	-	238	238	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	-	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	-	-	-	2.218	-	-
Pot Cap-1 Maneuver	267	283	807	267	285	473	0	-	-	937	-	0
Stage 1	765	708	-	462	468	-	0	-	-	-	-	0
Stage 2	462	466	-	765	708	-	0	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	266	282	807	266	284	473	-	-	-	937	-	-
Mov Cap-2 Maneuver	266	282	-	266	284	-	-	-	-	-	-	-
Stage 1	765	705	-	462	468	-	-	-	-	-	-	-
Stage 2	461	466	-	762	705	-	-	-	-	-	-	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0			18.5			0			0.1		
HCM LOS	A			C								
Minor Lane/Major Mvmt		NBT	NBR	EBLn1	WBLn1	SBL	SBT					
Capacity (veh/h)		-	-	-	278	937	-					
HCM Lane V/C Ratio		-	-	-	0.039	0.003	-					
HCM Control Delay (s)		-	-	0	18.5	8.9	0					
HCM Lane LOS		-	-	A	C	A	A					
HCM 95th %tile Q(veh)		-	-	-	0.1	0	-					

PM Existing + Cumulative
4: Centre City Pkwy & Iris Ln

HCM 6th Signalized Intersection Summary

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	170	285	7	116	75	9	25	678	213	6	404	51
Future Volume (veh/h)	170	285	7	116	75	9	25	678	213	6	404	51
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	1.00		0.97	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	185	310	8	126	82	10	27	737	232	7	439	55
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	385	523	13	210	470	57	35	2107	914	12	2062	894
Arrive On Green	0.29	0.29	0.29	0.29	0.29	0.29	0.02	0.59	0.59	0.01	0.58	0.58
Sat Flow, veh/h	1300	1814	47	1062	1631	199	1781	3554	1542	1781	3554	1542
Grp Volume(v), veh/h	185	0	318	126	0	92	27	737	232	7	439	55
Grp Sat Flow(s),veh/h/ln	1300	0	1861	1062	0	1830	1781	1777	1542	1781	1777	1542
Q Serve(g_s), s	15.0	0.0	17.7	13.9	0.0	4.5	1.8	12.8	8.7	0.5	7.1	1.9
Cycle Q Clear(g_c), s	19.5	0.0	17.7	31.6	0.0	4.5	1.8	12.8	8.7	0.5	7.1	1.9
Prop In Lane	1.00		0.03	1.00		0.11	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	385	0	536	210	0	527	35	2107	914	12	2062	894
V/C Ratio(X)	0.48	0.00	0.59	0.60	0.00	0.17	0.77	0.35	0.25	0.57	0.21	0.06
Avail Cap(c_a), veh/h	782	0	1103	533	0	1085	170	2107	914	126	2062	894
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	39.5	0.0	36.8	50.4	0.0	32.2	58.8	12.6	11.8	59.7	12.1	11.0
Incr Delay (d2), s/veh	0.9	0.0	1.1	2.7	0.0	0.2	28.7	0.5	0.7	34.9	0.2	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.9	0.0	8.2	3.9	0.0	2.1	1.1	5.1	3.1	0.3	2.9	0.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	40.4	0.0	37.9	53.2	0.0	32.3	87.5	13.1	12.4	94.6	12.4	11.2
LnGrp LOS	D	A	D	D	A	C	F	B	B	F	B	B
Approach Vol, veh/h		503			218			996			501	
Approach Delay, s/veh		38.8			44.4			14.9			13.4	
Approach LOS		D			D			B			B	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.3	76.0		39.3	6.9	74.5		39.3				
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s	8.5	71.5		71.5	11.5	68.5		71.5				
Max Q Clear Time (g_c+I1), s	2.5	14.8		21.5	3.8	9.1		33.6				
Green Ext Time (p_c), s	0.0	7.3		2.7	0.0	3.5		1.1				
Intersection Summary												
HCM 6th Ctrl Delay			22.9									
HCM 6th LOS			C									

LOS Engineering, Inc.

Appendix K

Near Term plus Project LOS Worksheets

AM Existing + Cumulative + Project
1: N. Iris Ln & Village Dr

HCM 6th AWSC

Intersection	
Intersection Delay, s/veh	10.5
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	4	34	49	160	20	4	12	77	93	11	248	3
Future Vol, veh/h	4	34	49	160	20	4	12	77	93	11	248	3
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	37	53	174	22	4	13	84	101	12	270	3
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	9	10.9	9.7	11.4
HCM LOS	A	B	A	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	7%	5%	87%	4%
Vol Thru, %	42%	39%	11%	95%
Vol Right, %	51%	56%	2%	1%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	182	87	184	262
LT Vol	12	4	160	11
Through Vol	77	34	20	248
RT Vol	93	49	4	3
Lane Flow Rate	198	95	200	285
Geometry Grp	1	1	1	1
Degree of Util (X)	0.269	0.136	0.304	0.399
Departure Headway (Hd)	4.888	5.172	5.468	5.049
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	738	692	658	718
Service Time	2.896	3.209	3.499	3.056
HCM Lane V/C Ratio	0.268	0.137	0.304	0.397
HCM Control Delay	9.7	9	10.9	11.4
HCM Lane LOS	A	A	B	B
HCM 95th-tile Q	1.1	0.5	1.3	1.9

LOS Engineering, Inc.

AM Existing + Cumulative + Project
2: N. Iris Ln & Robin Hill Ln

HCM 6th TWSC

Intersection						
Int Delay, s/veh	0.8					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	10	25	9	171	453	5
Future Vol, veh/h	10	25	9	171	453	5
Conflicting Peds, #/hr	5	5	5	0	0	5
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	27	10	186	492	5
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	711	505	502	0	-	0
Stage 1	500	-	-	-	-	-
Stage 2	211	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	400	567	1062	-	-	-
Stage 1	609	-	-	-	-	-
Stage 2	824	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	392	562	1058	-	-	-
Mov Cap-2 Maneuver	392	-	-	-	-	-
Stage 1	600	-	-	-	-	-
Stage 2	821	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	12.8	0.4		0		
HCM LOS	B					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR	
Capacity (veh/h)	1058	-	500	-	-	
HCM Lane V/C Ratio	0.009	-	0.076	-	-	
HCM Control Delay (s)	8.4	0	12.8	-	-	
HCM Lane LOS	A	A	B	-	-	
HCM 95th %tile Q(veh)	0	-	0.2	-	-	

LOS Engineering, Inc.

AM Existing + Cumulative + Project
3: N. Iris Ln & Iris Glen

HCM 6th TWSC

Intersection												
Int Delay, s/veh	0.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	4	0	22	6	0	1	0	175	5	2	476	0
Future Vol, veh/h	4	0	22	6	0	1	0	175	5	2	476	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	0	24	7	0	1	0	190	5	2	517	0
Major/Minor	Minor2		Minor1			Major1			Major2			
Conflicting Flow All	714	716	517	726	714	193	-	0	0	195	0	0
Stage 1	521	521	-	193	193	-	-	-	-	-	-	-
Stage 2	193	195	-	533	521	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	-	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	-	-	-	2.218	-	-
Pot Cap-1 Maneuver	346	356	558	340	357	849	0	-	-	1378	-	0
Stage 1	539	532	-	809	741	-	0	-	-	-	-	0
Stage 2	809	739	-	531	532	-	0	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	345	355	558	325	356	849	-	-	-	1378	-	-
Mov Cap-2 Maneuver	345	355	-	325	356	-	-	-	-	-	-	-
Stage 1	539	531	-	809	741	-	-	-	-	-	-	-
Stage 2	808	739	-	507	531	-	-	-	-	-	-	-
Approach	EB		WB			NB			SB			
HCM Control Delay, s	12.5		15.3			0			0			
HCM LOS	B		C									
Minor Lane/Major Mvmt	NBT		NBR	EBLn1	WBLn1	SBL	SBT					
Capacity (veh/h)	-		-	510	356	1378	-					
HCM Lane V/C Ratio	-		-	0.055	0.021	0.002	-					
HCM Control Delay (s)	-		-	12.5	15.3	7.6	0					
HCM Lane LOS	-		-	B	C	A	A					
HCM 95th %tile Q(veh)	-		-	0.2	0.1	0	-					

LOS Engineering, Inc.

AM Existing + Cumulative + Project
4: Centre City Pkwy & Iris Ln

HCM 6th Signalized Intersection Summary

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	58	221	8	415	217	13	21	268	106	9	1075	93
Future Volume (veh/h)	58	221	8	415	217	13	21	268	106	9	1075	93
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	1.00		0.97	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	63	240	9	451	236	14	23	291	115	10	1168	101
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	533	899	34	534	877	52	31	1378	596	17	1350	583
Arrive On Green	0.50	0.50	0.50	0.50	0.50	0.50	0.02	0.39	0.39	0.01	0.38	0.38
Sat Flow, veh/h	1129	1790	67	1130	1746	104	1781	3554	1536	1781	3554	1535
Grp Volume(v), veh/h	63	0	249	451	0	250	23	291	115	10	1168	101
Grp Sat Flow(s),veh/h/ln	1129	0	1857	1130	0	1850	1781	1777	1536	1781	1777	1535
Q Serve(g_s), s	4.6	0.0	10.3	51.2	0.0	10.4	1.7	7.3	6.6	0.8	40.7	5.9
Cycle Q Clear(g_c), s	15.0	0.0	10.3	61.6	0.0	10.4	1.7	7.3	6.6	0.8	40.7	5.9
Prop In Lane	1.00		0.04	1.00		0.06	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	533	0	933	534	0	929	31	1378	596	17	1350	583
V/C Ratio(X)	0.12	0.00	0.27	0.84	0.00	0.27	0.75	0.21	0.19	0.61	0.86	0.17
Avail Cap(c_a), veh/h	773	0	1328	775	0	1323	60	1378	596	53	1350	583
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	23.5	0.0	19.2	36.9	0.0	19.2	65.7	27.4	27.2	66.2	38.4	27.6
Incr Delay (d2), s/veh	0.1	0.0	0.2	5.8	0.0	0.2	30.4	0.3	0.7	30.8	7.6	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.3	0.0	4.5	14.8	0.0	4.6	1.0	3.2	2.6	0.5	19.0	2.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	23.6	0.0	19.4	42.7	0.0	19.4	96.1	27.7	27.9	97.0	46.0	28.3
LnGrp LOS	C	A	B	D	A	B	F	C	C	F	D	C
Approach Vol, veh/h	312			701			429			1279		
Approach Delay, s/veh	20.2			34.4			31.4			45.0		
Approach LOS	C			C			C			D		
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.7	56.6		71.9	6.8	55.5		71.9				
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s	4.0	51.5		96.0	4.5	51.0		96.0				
Max Q Clear Time (g_c+I1), s	2.8	9.3		17.0	3.7	42.7		63.6				
Green Ext Time (p_c), s	0.0	2.5		1.9	0.0	5.1		3.8				
Intersection Summary												
HCM 6th Ctrl Delay				37.3								
HCM 6th LOS				D								

LOS Engineering, Inc.

PM Existing + Cumulative + Project
1: N. Iris Ln & Village Dr

HCM 6th AWSC

Intersection	
Intersection Delay, s/veh	19.5
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	4	38	47	83	24	5	62	304	220	5	110	4
Future Vol, veh/h	4	38	47	83	24	5	62	304	220	5	110	4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	41	51	90	26	5	67	330	239	5	120	4
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	9.8	10.7	24.6	9.7
HCM LOS	A	B	C	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	11%	4%	74%	4%
Vol Thru, %	52%	43%	21%	92%
Vol Right, %	38%	53%	4%	3%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	586	89	112	119
LT Vol	62	4	83	5
Through Vol	304	38	24	110
RT Vol	220	47	5	4
Lane Flow Rate	637	97	122	129
Geometry Grp	1	1	1	1
Degree of Util (X)	0.816	0.154	0.206	0.194
Departure Headway (Hd)	4.61	5.734	6.1	5.399
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	790	624	587	664
Service Time	2.61	3.785	4.148	3.439
HCM Lane V/C Ratio	0.806	0.155	0.208	0.194
HCM Control Delay	24.6	9.8	10.7	9.7
HCM Lane LOS	C	A	B	A
HCM 95th-tile Q	8.9	0.5	0.8	0.7

LOS Engineering, Inc.

PM Existing + Cumulative + Project
2: N. Iris Ln & Robin Hill Ln

HCM 6th TWSC

Intersection						
Int Delay, s/veh	0.6					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	4	10	48	581	214	25
Future Vol, veh/h	4	10	48	581	214	25
Conflicting Peds, #/hr	5	5	5	0	0	5
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	4	11	52	632	233	27
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	993	257	265	0	-	0
Stage 1	252	-	-	-	-	-
Stage 2	741	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	272	782	1299	-	-	-
Stage 1	790	-	-	-	-	-
Stage 2	471	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	253	775	1294	-	-	-
Mov Cap-2 Maneuver	253	-	-	-	-	-
Stage 1	738	-	-	-	-	-
Stage 2	469	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	12.6	0.6		0		
HCM LOS	B					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR	
Capacity (veh/h)	1294	-	488	-	-	
HCM Lane V/C Ratio	0.04	-	0.031	-	-	
HCM Control Delay (s)	7.9	0	12.6	-	-	
HCM Lane LOS	A	A	B	-	-	
HCM 95th %tile Q(veh)	0.1	-	0.1	-	-	

LOS Engineering, Inc.

PM Existing + Cumulative + Project
3: N. Iris Ln & Iris Glen

HCM 6th TWSC

Intersection												
Int Delay, s/veh	0.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	2	0	11	9	0	1	0	626	12	3	220	0
Future Vol, veh/h	2	0	11	9	0	1	0	626	12	3	220	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	2	0	12	10	0	1	0	680	13	3	239	0
Major/Minor	Minor2		Minor1			Major1			Major2			
Conflicting Flow All	932	938	239	938	932	687	-	0	0	693	0	0
Stage 1	245	245	-	687	687	-	-	-	-	-	-	-
Stage 2	687	693	-	251	245	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	-	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	-	-	-	2.218	-	-
Pot Cap-1 Maneuver	247	264	800	244	266	447	0	-	-	902	-	0
Stage 1	759	703	-	437	447	-	0	-	-	-	-	0
Stage 2	437	445	-	753	703	-	0	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	246	263	800	240	265	447	-	-	-	902	-	-
Mov Cap-2 Maneuver	246	263	-	240	265	-	-	-	-	-	-	-
Stage 1	759	700	-	437	447	-	-	-	-	-	-	-
Stage 2	436	445	-	739	700	-	-	-	-	-	-	-
Approach	EB		WB			NB			SB			
HCM Control Delay, s	11.2		19.9			0			0.1			
HCM LOS	B		C									
Minor Lane/Major Mvmt	NBT		NBR	EBLn1	WBLn1	SBL	SBT					
Capacity (veh/h)	-		-	594	252	902	-					
HCM Lane V/C Ratio	-		-	0.024	0.043	0.004	-					
HCM Control Delay (s)	-		-	11.2	19.9	9	0					
HCM Lane LOS	-		-	B	C	A	A					
HCM 95th %tile Q(veh)	-		-	0.1	0.1	0	-					

LOS Engineering, Inc.

PM Existing + Cumulative + Project
4: Centre City Pkwy & Iris Ln

HCM 6th Signalized Intersection Summary

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	170	291	7	129	78	11	25	678	244	10	404	51
Future Volume (veh/h)	170	291	7	129	78	11	25	678	244	10	404	51
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	1.00		0.97	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	185	316	8	140	85	12	27	737	265	11	439	55
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	399	549	14	222	483	68	35	2055	892	18	2022	877
Arrive On Green	0.30	0.30	0.30	0.30	0.30	0.30	0.02	0.58	0.58	0.01	0.57	0.57
Sat Flow, veh/h	1295	1815	46	1056	1598	226	1781	3554	1542	1781	3554	1541
Grp Volume(v), veh/h	185	0	324	140	0	97	27	737	265	11	439	55
Grp Sat Flow(s),veh/h/ln	1295	0	1861	1056	0	1824	1781	1777	1542	1781	1777	1541
Q Serve(g_s), s	15.2	0.0	18.2	16.0	0.0	4.8	1.9	13.6	10.8	0.8	7.5	2.0
Cycle Q Clear(g_c), s	20.0	0.0	18.2	34.2	0.0	4.8	1.9	13.6	10.8	0.8	7.5	2.0
Prop In Lane	1.00		0.02	1.00		0.12	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	399	0	562	222	0	551	35	2055	892	18	2022	877
V/C Ratio(X)	0.46	0.00	0.58	0.63	0.00	0.18	0.78	0.36	0.30	0.61	0.22	0.06
Avail Cap(c_a), veh/h	756	0	1076	514	0	1055	166	2055	892	122	2022	877
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	39.2	0.0	36.4	50.9	0.0	31.8	60.3	13.9	13.3	60.9	13.1	11.9
Incr Delay (d2), s/veh	0.8	0.0	0.9	2.9	0.0	0.2	29.7	0.5	0.9	28.5	0.2	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.9	0.0	8.4	4.4	0.0	2.2	1.1	5.5	3.9	0.5	3.1	0.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	40.0	0.0	37.4	53.8	0.0	31.9	90.1	14.4	14.1	89.4	13.3	12.0
LnGrp LOS	D	A	D	D	A	C	F	B	B	F	B	B
Approach Vol, veh/h		509			237			1029			505	
Approach Delay, s/veh		38.3			44.9			16.3			14.9	
Approach LOS		D			D			B			B	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G + Y + Rc), s	5.8	76.0		41.9	6.9	74.8		41.9				
Change Period (Y + Rc), s	4.5	4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s	8.5	71.5		71.5	11.5	68.5		71.5				
Max Q Clear Time (g_c + I1), s	2.8	15.6		22.0	3.9	9.5		36.2				
Green Ext Time (p_c), s	0.0	7.5		2.8	0.0	3.5		1.2				
Intersection Summary												
HCM 6th Ctrl Delay			23.9									
HCM 6th LOS			C									

LOS Engineering, Inc.

Appendix L

Long Term Year 2035 Volumes and Growth Factor Worksheets

Volume selection or adjustments to Year 2035 conditions

Segment volumes trends were compared between 2018 and horizon year volumes:

		Year 2018	Percent Change		Year 2035 City GP	Applied ADT
<u>Iris Lane</u>		Year 2050				
Village Rd to Robin Hill Ln		No Data	5,900	NA	8,400	9,200 (a)
Robin Hill Ln to Centre City Pkwy		8,996	9,200	2.2%	8,400	9,200 (a)

Source: (a) SANDAG Series 14 year 2050 volume.

Screen shots of the SANDAG Series 14 volumes by year are included on the next several pages.

City of Escondido GENERAL PLAN

MAY 2012

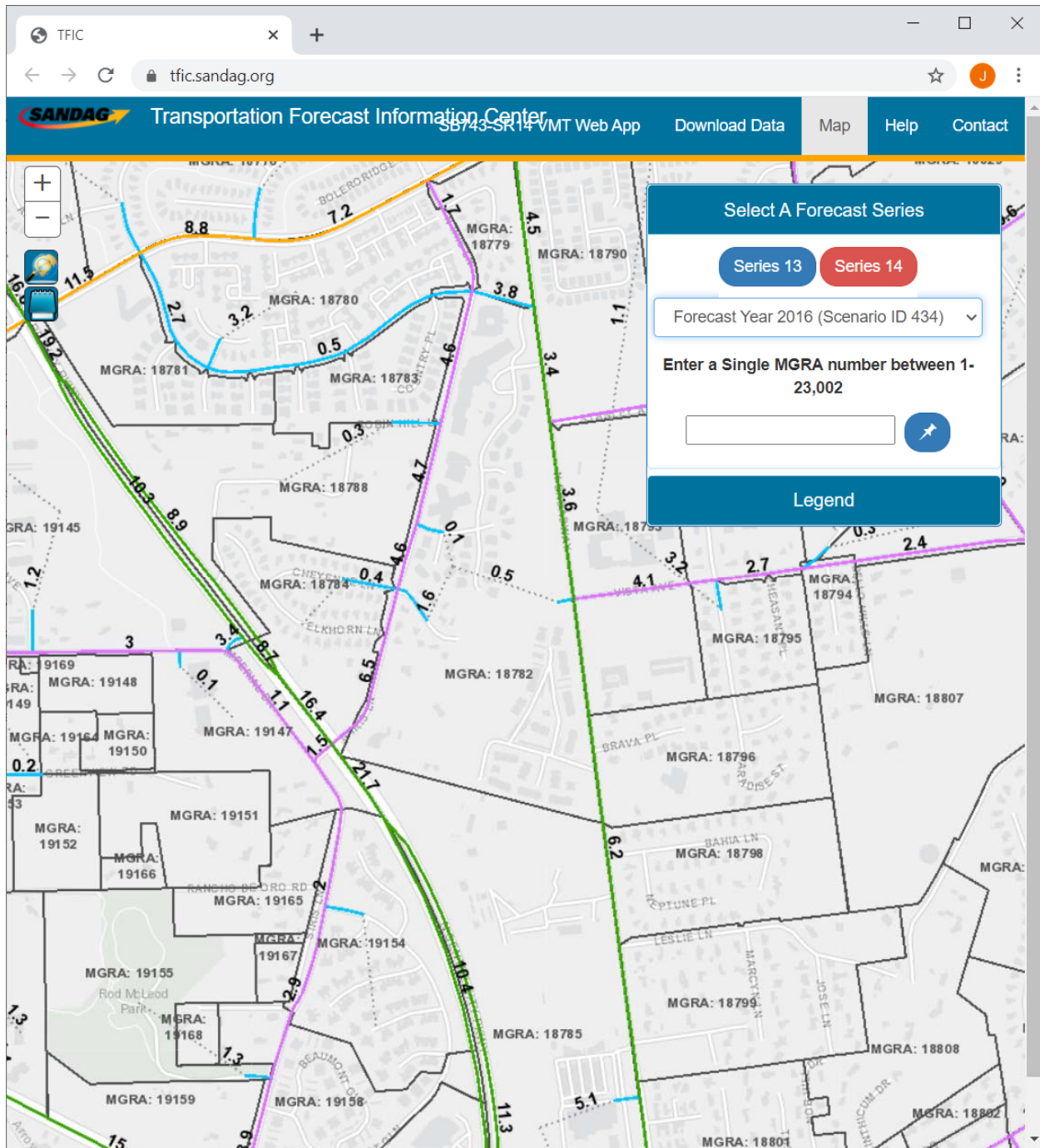
Resolution 2012-52



Table 4.16-2 continued

Street Segment	Roadway Direction	Existing Capacity ⁽¹⁾ (LOS E)	Existing Conditions (Year 2011)			Adopted City General Plan Classification (County Classification) ⁽⁵⁾	Adopted CEMIE Capacity (LOS E)	Proposed Classification	Proposed CEMIE Capacity (LOS E)	Proposed Project (Year 2035)		
			ADT ⁽²⁾	LOS ⁽³⁾	V/C ⁽⁴⁾					ADT ⁽²⁾	LOS ⁽³⁾	V/C ⁽⁴⁾
Escondido Boulevard												
El Norte Parkway to Lincoln Avenue	North/South	19,000	9,700	C	0.65	4-Ln Collector	34,200	4-Ln Collector	34,200	25,900	D	0.76
Fig Street												
El Norte Parkway to Lincoln Avenue	North/South	15,000	3,800	A	0.25	4-Ln Collector	34,200	4-Ln Collector	34,200	6,000	A	0.18
Jesmond Dene Road												
Centre City Parkway to Ivy Dell Lane ⁽¹¹⁾	North/South	15,000	2,100	A	0.14	2-Ln Local Collector	15,000	2-Ln Local Collector	15,000	10,900	C	0.73
Ivy Dell Lane to Broadway ⁽¹²⁾	North/South	15,000	2,900	A	0.19	4-Ln Collector	34,200	2-Ln Local Collector	15,000	8,400	C	0.56
Midway Drive												
El Norte Parkway to Lincoln Avenue	North/South	10,000	4,600	B	0.46	4-Ln Collector	34,200	4-Ln Collector	34,200	8,200	A	0.24
Morning View Road												
El Norte Parkway to Lincoln Avenue	North/South	15,000	8,200	B	0.55	2-Ln Local Collector	15,000	2-Ln Local Collector	15,000	9,200	C	0.61
North Iris Lane												
Country Club Road to Centre City Parkway	North/South	15,000	5,300	B	0.35	2-Ln Local Collector	15,000	2-Ln Local Collector	15,000	8,400	C	0.56
Rose Street												
El Norte Parkway to Lincoln Avenue	North/South	10,000	3,100	A	0.31	2-Ln Local Collector	15,000	2-Ln Local Collector	15,000	3,900	A	0.26
Seven Oaks Road												
El Norte Parkway to Borden Road	North/South	15,000	3,400	A	0.23	2-Ln Local Collector	15,000	2-Ln Local Collector	15,000	5,200	A	0.35
Borden Road to Rock Springs Road	North/South	15,000	2,100	A	0.14	2-Ln Local Collector	15,000	2-Ln Local Collector	15,000	2,700	A	0.18
Valley Center Road												
El Norte Parkway to Lake Wohlford Road	North/South	43,500	29,700	C	0.68	8-Ln Prime	70,000	8-Ln Prime	70,000	55,400	D	0.79
North of Lake Wohlford Road	North/South	37,000	21,300	C	0.58	8-Ln Prime (4-Ln Major Road)	70,000	8-Ln Prime	70,000	42,800	C	0.61
Vista Verde Way												
Vista Avenue to El Norte Parkway	North/South	10,000	2,400	A	0.24	2-Ln Local Collector	15,000	2-Ln Local Collector	15,000	10,900	C	0.73
Country Club Lane												
Centre City Parkway to Iris Lane	East/West	34,200	5,200	A	0.15	4-Ln Collector	34,200	4-Ln Collector	34,200	16,900	B	0.49
Iris Lane to Broadway	East/West	34,200	11,500	A	0.34	4-Ln Collector	34,200	4-Ln Collector	34,200	19,500	C	0.57
Broadway to Ash Street	East/West	34,200	6,700	A	0.20	4-Ln Collector	34,200	4-Ln Collector	34,200	12,900	B	0.38

SANDAG Series 14 Year 2016



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Series 13 Series 14

Forecast Year 2050 (Scenario ID 463)

Enter a Single MGRA number between 1-23,002

Legend

Appendix M

Long Term Year 2035 LOS Worksheets

Intersection	
Intersection Delay, s/veh	10.5
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	4	35	50	160	20	4	12	74	86	11	251	3
Future Vol, veh/h	4	35	50	160	20	4	12	74	86	11	251	3
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	38	54	174	22	4	13	80	93	12	273	3
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	9	10.9	9.6	11.4
HCM LOS	A	B	A	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	7%	4%	87%	4%
Vol Thru, %	43%	39%	11%	95%
Vol Right, %	50%	56%	2%	1%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	172	89	184	265
LT Vol	12	4	160	11
Through Vol	74	35	20	251
RT Vol	86	50	4	3
Lane Flow Rate	187	97	200	288
Geometry Grp	1	1	1	1
Degree of Util (X)	0.255	0.139	0.303	0.403
Departure Headway (Hd)	4.903	5.155	5.455	5.039
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	737	696	660	717
Service Time	2.912	3.189	3.485	3.045
HCM Lane V/C Ratio	0.254	0.139	0.303	0.402
HCM Control Delay	9.6	9	10.9	11.4
HCM Lane LOS	A	A	B	B
HCM 95th-tile Q	1	0.5	1.3	2

Intersection						
Int Delay, s/veh	0.2					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	9	0	171	462	1
Future Vol, veh/h	0	9	0	171	462	1
Conflicting Peds, #/hr	5	5	5	0	0	5
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	10	0	186	502	1
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	699	513	508	0	-	0
Stage 1	508	-	-	-	-	-
Stage 2	191	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	406	561	1057	-	-	-
Stage 1	604	-	-	-	-	-
Stage 2	841	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	403	556	1053	-	-	-
Mov Cap-2 Maneuver	403	-	-	-	-	-
Stage 1	602	-	-	-	-	-
Stage 2	838	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	11.6	0		0		
HCM LOS	B					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR	
Capacity (veh/h)	1053	-	556	-	-	
HCM Lane V/C Ratio	-	-	0.018	-	-	
HCM Control Delay (s)	0	-	11.6	-	-	
HCM Lane LOS	A	-	B	-	-	
HCM 95th %tile Q(veh)	0	-	0.1	-	-	

Intersection																
Int Delay, s/veh 0.2																
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR				
Lane Configurations																
Traffic Vol, veh/h	0	0	0	6	0	1	0	170	5	2	469	0				
Future Vol, veh/h	0	0	0	6	0	1	0	170	5	2	469	0				
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0				
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free				
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None				
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-				
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-				
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-				
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92				
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2				
Mvmt Flow	0	0	0	7	0	1	0	185	5	2	510	0				

Major/Minor	Minor2			Minor1			Major1			Major2						
Conflicting Flow All	702	704	510	702	702	188	510	0	0	190	0	0				
Stage 1	514	514	-	188	188	-	-	-	-	-	-	-				
Stage 2	188	190	-	514	514	-	-	-	-	-	-	-				
Critical Hdwy	712	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-				
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-				
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-				
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-				
Pot Cap-1 Maneuver	353	361	563	353	362	854	1055	-	-	1384	-	-				
Stage 1	543	535	-	814	745	-	-	-	-	-	-	-				
Stage 2	814	743	-	543	535	-	-	-	-	-	-	-				
Platoon blocked, %																
Mov Cap-1 Maneuver	352	360	563	352	361	854	1055	-	-	1384	-	-				
Mov Cap-2 Maneuver	352	360	-	352	361	-	-	-	-	-	-	-				
Stage 1	543	534	-	814	745	-	-	-	-	-	-	-				
Stage 2	813	743	-	542	534	-	-	-	-	-	-	-				

Approach	EB	WB	NB	SB				
HCM Control Delay, s	0	14.6	0	0				
HCM LOS	A	B						

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR				
Capacity (veh/h)	1055	-	-	-	384	1384	-	-				
HCM Lane V/C Ratio	-	-	-	-	0.02	0.002	-	-				
HCM Control Delay (s)	0	-	-	0	14.6	7.6	0	-				
HCM Lane LOS	A	-	-	A	B	A	A	-				
HCM 95th %tile Q(veh)	0	-	-	-	0.1	0	-	-				

LOS Engineering, Inc.

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	59	225	8	394	216	9	15	312	101	8	1297	95
Future Volume (veh/h)	59	225	8	394	216	9	15	312	101	8	1297	95
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	1.00		0.97	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	64	245	9	428	235	10	16	339	110	9	1410	103
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	498	841	31	490	836	36	24	1478	639	15	1461	632
Arrive On Green	0.47	0.47	0.47	0.47	0.47	0.47	0.01	0.42	0.42	0.01	0.41	0.41
Sat Flow, veh/h	1134	1791	66	1125	1779	76	1781	3554	1537	1781	3554	1537
Grp Volume(v), veh/h	64	0	254	428	0	245	16	339	110	9	1410	103
Grp Sat Flow(s),veh/h/ln	1134	0	1857	1125	0	1855	1781	1777	1537	1781	1777	1537
Q Serve(g_s), s	4.7	0.0	10.7	48.2	0.0	10.3	1.1	7.9	5.8	0.6	49.5	5.4
Cycle Q Clear(g_c), s	15.0	0.0	10.7	58.9	0.0	10.3	1.1	7.9	5.8	0.6	49.5	5.4
Prop In Lane	1.00		0.04	1.00		0.04	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	498	0	872	490	0	871	24	1478	639	15	1461	632
V/C Ratio(X)	0.13	0.00	0.29	0.87	0.00	0.28	0.66	0.23	0.17	0.59	0.97	0.16
Avail Cap(c_a), veh/h	498	0	872	490	0	871	56	1478	639	56	1461	632
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	25.3	0.0	20.8	38.9	0.0	20.7	62.7	24.1	23.5	63.1	36.7	23.7
Incr Delay (d2), s/veh	0.1	0.0	0.2	15.8	0.0	0.2	26.8	0.4	0.6	31.4	16.6	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.3	0.0	4.7	15.2	0.0	4.5	0.7	3.4	2.2	0.4	24.4	2.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	25.4	0.0	21.0	54.7	0.0	20.9	89.5	24.4	24.0	94.5	53.3	24.3
LnGrp LOS	C	A	C	D	A	C	F	C	C	F	D	C
Approach Vol, veh/h	318			673			465			1522		
Approach Delay, s/veh	21.9			42.4			26.6			51.6		
Approach LOS	C			D			C			D		
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.6	57.6		64.5	6.2	57.0		64.5				
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s	4.0	52.5		60.0	4.0	52.5		60.0				
Max Q Clear Time (g_c+I1), s	2.6	9.9		17.0	3.1	51.5		60.9				
Green Ext Time (p_c), s	0.0	2.8		1.9	0.0	0.8		0.0				
Intersection Summary												
HCM 6th Ctrl Delay	42.5											
HCM 6th LOS	D											

Intersection	
Intersection Delay, s/veh	18.7
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	4	39	47	75	25	5	63	308	221	5	106	4
Future Vol, veh/h	4	39	47	75	25	5	63	308	221	5	106	4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	42	51	82	27	5	68	335	240	5	115	4
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	9.8	10.6	23.3	9.6
HCM LOS	A	B	C	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	11%	4%	71%	4%
Vol Thru, %	52%	43%	24%	92%
Vol Right, %	37%	52%	5%	3%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	592	90	105	115
LT Vol	63	4	75	5
Through Vol	308	39	25	106
RT Vol	221	47	5	4
Lane Flow Rate	643	98	114	125
Geometry Grp	1	1	1	1
Degree of Util (X)	0.802	0.155	0.193	0.187
Departure Headway (Hd)	4.487	5.719	6.092	5.378
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	798	630	591	669
Service Time	2.581	3.731	4.104	3.396
HCM Lane V/C Ratio	0.806	0.156	0.193	0.187
HCM Control Delay	23.3	9.8	10.6	9.6
HCM Lane LOS	C	A	B	A
HCM 95th-tile Q	8.5	0.5	0.7	0.7

Intersection						
Int Delay, s/veh	0.1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	3	7	591	218	9
Future Vol, veh/h	0	3	7	591	218	9
Conflicting Peds, #/hr	5	5	5	0	0	5
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	3	8	642	237	10
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	910	252	252	0	-	0
Stage 1	247	-	-	-	-	-
Stage 2	663	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	305	787	1313	-	-	-
Stage 1	794	-	-	-	-	-
Stage 2	512	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	300	780	1308	-	-	-
Mov Cap-2 Maneuver	300	-	-	-	-	-
Stage 1	783	-	-	-	-	-
Stage 2	510	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	9.6	0.1		0		
HCM LOS	A					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR	
Capacity (veh/h)	1308	-	780	-	-	
HCM Lane V/C Ratio	0.006	-	0.004	-	-	
HCM Control Delay (s)	7.8	0	9.6	-	-	
HCM Lane LOS	A	A	A	-	-	
HCM 95th %tile Q(veh)	0	-	0	-	-	

Intersection												
Int Delay, s/veh	0.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	0	0	9	0	1	0	597	12	3	217	0
Future Vol, veh/h	0	0	0	9	0	1	0	597	12	3	217	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	10	0	1	0	649	13	3	236	0
Major/Minor	Minor2		Minor1			Major1			Major2			
Conflicting Flow All	898	904	236	898	898	656	-	0	0	662	0	0
Stage 1	242	242	-	656	656	-	-	-	-	-	-	-
Stage 2	656	662	-	242	242	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	-	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	-	-	-	2.218	-	-
Pot Cap-1 Maneuver	260	277	803	260	279	465	0	-	-	927	-	0
Stage 1	762	705	-	454	462	-	0	-	-	-	-	0
Stage 2	454	459	-	762	705	-	0	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	259	276	803	259	278	465	-	-	-	927	-	-
Mov Cap-2 Maneuver	259	276	-	259	278	-	-	-	-	-	-	-
Stage 1	762	702	-	454	462	-	-	-	-	-	-	-
Stage 2	453	459	-	759	702	-	-	-	-	-	-	-
Approach	EB		WB			NB			SB			
HCM Control Delay, s	0		18.8			0			0.1			
HCM LOS	A		C									
Minor Lane/Major Mvmt	NBT		NBR	EBLn1	WBLn1	SBL	SBT					
Capacity (veh/h)	-		-	-	271	927	-					
HCM Lane V/C Ratio	-		-	-	0.04	0.004	-					
HCM Control Delay (s)	-		-	0	18.8	8.9	0					
HCM Lane LOS	-		-	A	C	A	A					
HCM 95th %tile Q(veh)	-		-	-	0.1	0	-					

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	174	291	7	118	77	9	13	771	217	6	475	52
Future Volume (veh/h)	174	291	7	118	77	9	13	771	217	6	475	52
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	1.00		0.97	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	189	316	8	128	84	10	14	838	236	7	516	57
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	384	529	13	205	477	57	22	2125	922	12	2106	914
Arrive On Green	0.29	0.29	0.29	0.29	0.29	0.29	0.01	0.60	0.60	0.01	0.59	0.59
Sat Flow, veh/h	1298	1815	46	1056	1636	195	1781	3554	1542	1781	3554	1542
Grp Volume(v), veh/h	189	0	324	128	0	94	14	838	236	7	516	57
Grp Sat Flow(s),veh/h/ln	1298	0	1861	1056	0	1830	1781	1777	1542	1781	1777	1542
Q Serve(g_s), s	16.6	0.0	19.5	15.4	0.0	5.0	1.0	16.2	9.5	0.5	9.0	2.0
Cycle Q Clear(g_c), s	21.6	0.0	19.5	34.9	0.0	5.0	1.0	16.2	9.5	0.5	9.0	2.0
Prop In Lane	1.00		0.02	1.00		0.11	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	384	0	543	205	0	534	22	2125	922	12	2106	914
V/C Ratio(X)	0.49	0.00	0.60	0.62	0.00	0.18	0.64	0.39	0.26	0.57	0.24	0.06
Avail Cap(c_a), veh/h	677	0	963	444	0	947	130	2125	922	89	2106	914
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	42.6	0.0	39.6	54.6	0.0	34.5	64.1	13.8	12.4	64.6	12.7	11.2
Incr Delay (d2), s/veh	1.0	0.0	1.1	3.1	0.0	0.2	27.6	0.6	0.7	35.8	0.3	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.4	0.0	9.1	4.3	0.0	2.3	0.6	6.6	3.4	0.4	3.7	0.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	43.5	0.0	40.7	57.7	0.0	34.7	91.8	14.3	13.1	100.4	12.9	11.4
LnGrp LOS	D	A	D	E	A	C	F	B	B	F	B	B
Approach Vol, veh/h		513			222			1088			580	
Approach Delay, s/veh		41.7			47.9			15.1			13.8	
Approach LOS		D			D			B			B	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.4	82.5		42.5	6.1	81.8		42.5				
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s	6.5	78.0		67.5	9.5	75.0		67.5				
Max Q Clear Time (g_c+I1), s	2.5	18.2		23.6	3.0	11.0		36.9				
Green Ext Time (p_c), s	0.0	8.6		2.8	0.0	4.2		1.1				
Intersection Summary												
HCM 6th Ctrl Delay			23.5									
HCM 6th LOS			C									

Appendix N

Long Term Year 2035 plus Project LOS Worksheets

Intersection	
Intersection Delay, s/veh	10.6
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	4	35	50	163	20	4	12	79	95	11	252	3
Future Vol, veh/h	4	35	50	163	20	4	12	79	95	11	252	3
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	38	54	177	22	4	13	86	103	12	274	3
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	9.1	11	9.8	11.5
HCM LOS	A	B	A	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	6%	4%	87%	4%
Vol Thru, %	42%	39%	11%	95%
Vol Right, %	51%	56%	2%	1%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	186	89	187	266
LT Vol	12	4	163	11
Through Vol	79	35	20	252
RT Vol	95	50	4	3
Lane Flow Rate	202	97	203	289
Geometry Grp	1	1	1	1
Degree of Util (X)	0.276	0.14	0.311	0.408
Departure Headway (Hd)	4.919	5.21	5.501	5.078
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	734	687	654	711
Service Time	2.928	3.25	3.534	3.085
HCM Lane V/C Ratio	0.275	0.141	0.31	0.406
HCM Control Delay	9.8	9.1	11	11.5
HCM Lane LOS	A	A	B	B
HCM 95th-tile Q	1.1	0.5	1.3	2

Intersection						
Int Delay, s/veh	0.8					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	10	25	9	175	462	5
Future Vol, veh/h	10	25	9	175	462	5
Conflicting Peds, #/hr	5	5	5	0	0	5
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	27	10	190	502	5
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	725	515	512	0	-	0
Stage 1	510	-	-	-	-	-
Stage 2	215	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	392	560	1053	-	-	-
Stage 1	603	-	-	-	-	-
Stage 2	821	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	385	555	1049	-	-	-
Mov Cap-2 Maneuver	385	-	-	-	-	-
Stage 1	594	-	-	-	-	-
Stage 2	818	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	12.9	0.4		0		
HCM LOS	B					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR	
Capacity (veh/h)	1049	-	493	-	-	
HCM Lane V/C Ratio	0.009	-	0.077	-	-	
HCM Control Delay (s)	8.5	0	12.9	-	-	
HCM Lane LOS	A	A	B	-	-	
HCM 95th %tile Q(veh)	0	-	0.2	-	-	

Intersection																
Int Delay, s/veh		0.6														
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR				
Lane Configurations																
Traffic Vol, veh/h	4	0	22	6	0	1	0	179	5	2	485	0				
Future Vol, veh/h	4	0	22	6	0	1	0	179	5	2	485	0				
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0				
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free				
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None				
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-				
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-				
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-				
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92				
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2				
Mvmt Flow	4	0	24	7	0	1	0	195	5	2	527	0				

Major/Minor	Minor2			Minor1			Major1			Major2						
Conflicting Flow All	729	731	527	741	729	198	527	0	0	200	0	0				
Stage 1	531	531	-	198	198	-	-	-	-	-	-	-				
Stage 2	198	200	-	543	531	-	-	-	-	-	-	-				
Critical Hdwy	712	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-				
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-				
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-				
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-				
Pot Cap-1 Maneuver	338	349	551	332	350	843	1040	-	-	1372	-	-				
Stage 1	532	526	-	804	737	-	-	-	-	-	-	-				
Stage 2	804	736	-	524	526	-	-	-	-	-	-	-				
Platoon blocked, %								-	-	-	-	-				
Mov Cap-1 Maneuver	337	348	551	317	349	843	1040	-	-	1372	-	-				
Mov Cap-2 Maneuver	337	348	-	317	349	-	-	-	-	-	-	-				
Stage 1	532	525	-	804	737	-	-	-	-	-	-	-				
Stage 2	803	736	-	500	525	-	-	-	-	-	-	-				

Approach	EB	WB	NB	SB
HCM Control Delay, s	12.6	15.6	0	0
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1040	-	-	502	348	1372	-	-
HCM Lane V/C Ratio	-	-	-	0.056	0.022	0.002	-	-
HCM Control Delay (s)	0	-	-	12.6	15.6	7.6	0	-
HCM Lane LOS	A	-	-	B	C	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.2	0.1	0	-	-

LOS Engineering, Inc.

AM Year 2035 + Project
4: Centre City Pkwy & Iris Ln

HCM 6th Signalized Intersection Summary

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	59	226	8	422	222	13	15	312	108	9	1297	95
Future Volume (veh/h)	59	226	8	422	222	13	15	312	108	9	1297	95
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	1.00		0.97	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	64	246	9	459	241	14	16	339	117	10	1410	103
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	479	828	30	479	808	47	24	1503	650	17	1488	644
Arrive On Green	0.46	0.46	0.46	0.46	0.46	0.46	0.01	0.42	0.42	0.01	0.42	0.42
Sat Flow, veh/h	1124	1792	66	1124	1748	102	1781	3554	1537	1781	3554	1537
Grp Volume(v), veh/h	64	0	255	459	0	255	16	339	117	10	1410	103
Grp Sat Flow(s),veh/h/ln	1124	0	1857	1124	0	1850	1781	1777	1537	1781	1777	1537
Q Serve(g_s), s	4.8	0.0	10.9	48.1	0.0	11.0	1.1	7.8	6.1	0.7	48.8	5.3
Cycle Q Clear(g_c), s	15.8	0.0	10.9	59.0	0.0	11.0	1.1	7.8	6.1	0.7	48.8	5.3
Prop In Lane	1.00		0.04	1.00		0.05	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	479	0	858	479	0	854	24	1503	650	17	1488	644
V/C Ratio(X)	0.13	0.00	0.30	0.96	0.00	0.30	0.66	0.23	0.18	0.60	0.95	0.16
Avail Cap(c_a), veh/h	479	0	858	479	0	854	56	1503	650	56	1488	644
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	26.4	0.0	21.4	41.7	0.0	21.4	62.7	23.5	23.0	63.0	35.8	23.1
Incr Delay (d2), s/veh	0.1	0.0	0.2	30.5	0.0	0.2	26.8	0.3	0.6	30.0	13.8	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.3	0.0	4.8	19.0	0.0	4.8	0.7	3.4	2.3	0.5	23.6	2.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	26.5	0.0	21.6	72.2	0.0	21.6	89.5	23.8	23.6	93.1	49.5	23.7
LnGrp LOS	C	A	C	E	A	C	F	C	C	F	D	C
Approach Vol, veh/h		319			714			472			1523	
Approach Delay, s/veh		22.6			54.2			26.0			48.1	
Approach LOS		C			D			C			D	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.7	58.5		63.5	6.2	58.0		63.5				
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s	4.0	53.5		59.0	4.0	53.5		59.0				
Max Q Clear Time (g_c+I1), s	2.7	9.8		17.8	3.1	50.8		61.0				
Green Ext Time (p_c), s	0.0	2.9		1.9	0.0	2.1		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			43.4									
HCM 6th LOS			D									

LOS Engineering, Inc.

Intersection	
Intersection Delay, s/veh	20.8
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	4	39	48	85	25	5	63	310	225	5	111	4
Future Vol, veh/h	4	39	48	85	25	5	63	310	225	5	111	4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	42	52	92	27	5	68	337	245	5	121	4
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	9.9	10.9	26.6	9.8
HCM LOS	A	B	D	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	11%	4%	74%	4%
Vol Thru, %	52%	43%	22%	93%
Vol Right, %	38%	53%	4%	3%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	598	91	115	120
LT Vol	63	4	85	5
Through Vol	310	39	25	111
RT Vol	225	48	5	4
Lane Flow Rate	650	99	125	130
Geometry Grp	1	1	1	1
Degree of Util (X)	0.837	0.159	0.214	0.197
Departure Headway (Hd)	4.638	5.788	6.151	5.448
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	787	617	583	657
Service Time	2.638	3.842	4.201	3.491
HCM Lane V/C Ratio	0.826	0.16	0.214	0.198
HCM Control Delay	26.6	9.9	10.9	9.8
HCM Lane LOS	D	A	B	A
HCM 95th-tile Q	9.6	0.6	0.8	0.7

Intersection						
Int Delay, s/veh	0.6					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	4	10	48	593	218	25
Future Vol, veh/h	4	10	48	593	218	25
Conflicting Peds, #/hr	5	5	5	0	0	5
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	4	11	52	645	237	27
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	1010	261	269	0	-	0
Stage 1	256	-	-	-	-	-
Stage 2	754	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	266	778	1295	-	-	-
Stage 1	787	-	-	-	-	-
Stage 2	465	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	247	772	1290	-	-	-
Mov Cap-2 Maneuver	247	-	-	-	-	-
Stage 1	734	-	-	-	-	-
Stage 2	463	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	12.7	0.6		0		
HCM LOS	B					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR	
Capacity (veh/h)	1290	-	480	-	-	
HCM Lane V/C Ratio	0.04	-	0.032	-	-	
HCM Control Delay (s)	7.9	0	12.7	-	-	
HCM Lane LOS	A	A	B	-	-	
HCM 95th %tile Q(veh)	0.1	-	0.1	-	-	

Intersection												
Int Delay, s/veh	0.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	2	0	11	9	0	1	0	638	12	3	224	0
Future Vol, veh/h	2	0	11	9	0	1	0	638	12	3	224	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	2	0	12	10	0	1	0	693	13	3	243	0
Major/Minor	Minor2		Minor1			Major1			Major2			
Conflicting Flow All	949	955	243	955	949	700	-	0	0	706	0	0
Stage 1	249	249	-	700	700	-	-	-	-	-	-	-
Stage 2	700	706	-	255	249	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	-	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	-	-	-	2.218	-	-
Pot Cap-1 Maneuver	240	258	796	238	260	439	0	-	-	892	-	0
Stage 1	755	701	-	430	441	-	0	-	-	-	-	0
Stage 2	430	439	-	749	701	-	0	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	239	257	796	234	259	439	-	-	-	892	-	-
Mov Cap-2 Maneuver	239	257	-	234	259	-	-	-	-	-	-	-
Stage 1	755	698	-	430	441	-	-	-	-	-	-	-
Stage 2	429	439	-	735	698	-	-	-	-	-	-	-
Approach	EB		WB			NB			SB			
HCM Control Delay, s	11.3		20.4			0			0.1			
HCM LOS	B		C									
Minor Lane/Major Mvmt		NBT	NBR	EBLn1	WBLn1	SBL	SBT					
Capacity (veh/h)		-	-	586	245	892	-					
HCM Lane V/C Ratio		-	-	0.024	0.044	0.004	-					
HCM Control Delay (s)		-	-	11.3	20.4	9.1	0					
HCM Lane LOS		-	-	B	C	A	A					
HCM 95th %tile Q(veh)		-	-	0.1	0.1	0	-					

PM Year 2035 + Project
4: Centre City Pkwy & Iris Ln

HCM 6th Signalized Intersection Summary

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	174	297	7	131	80	11	13	771	248	10	475	52
Future Volume (veh/h)	174	297	7	131	80	11	13	771	248	10	475	52
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	1.00		0.97	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	189	323	8	142	87	12	14	838	270	11	516	57
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	398	556	14	217	491	68	22	2072	899	18	2064	895
Arrive On Green	0.31	0.31	0.31	0.31	0.31	0.31	0.01	0.58	0.58	0.01	0.58	0.58
Sat Flow, veh/h	1293	1816	45	1049	1604	221	1781	3554	1542	1781	3554	1542
Grp Volume(v), veh/h	189	0	331	142	0	99	14	838	270	11	516	57
Grp Sat Flow(s),veh/h/ln	1293	0	1861	1049	0	1825	1781	1777	1542	1781	1777	1542
Q Serve(g_s), s	16.8	0.0	20.1	17.7	0.0	5.3	1.0	17.2	11.8	0.8	9.5	2.2
Cycle Q Clear(g_c), s	22.1	0.0	20.1	37.8	0.0	5.3	1.0	17.2	11.8	0.8	9.5	2.2
Prop In Lane	1.00		0.02	1.00		0.12	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	398	0	570	217	0	559	22	2072	899	18	2064	895
V/C Ratio(X)	0.47	0.00	0.58	0.65	0.00	0.18	0.65	0.40	0.30	0.62	0.25	0.06
Avail Cap(c_a), veh/h	654	0	939	426	0	921	126	2072	899	87	2064	895
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	42.2	0.0	39.2	55.1	0.0	34.1	65.8	15.2	14.1	66.0	13.7	12.2
Incr Delay (d2), s/veh	0.9	0.0	0.9	3.3	0.0	0.1	28.1	0.6	0.9	29.7	0.3	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.5	0.0	9.4	4.9	0.0	2.4	0.6	7.1	4.3	0.5	3.9	0.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	43.1	0.0	40.1	58.4	0.0	34.2	93.9	15.8	15.0	95.7	14.0	12.3
LnGrp LOS	D	A	D	E	A	C	F	B	B	F	B	B
Approach Vol, veh/h		520			241			1122			584	
Approach Delay, s/veh		41.2			48.5			16.6			15.4	
Approach LOS		D			D			B			B	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.8	82.5		45.5	6.1	82.2		45.5				
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s	6.5	78.0		67.5	9.5	75.0		67.5				
Max Q Clear Time (g_c+I1), s	2.8	19.2		24.1	3.0	11.5		39.8				
Green Ext Time (p_c), s	0.0	8.8		2.9	0.0	4.2		1.2				
Intersection Summary												
HCM 6th Ctrl Delay			24.6									
HCM 6th LOS			C									

LOS Engineering, Inc.

Appendix O

Fair Share Calculations

Intersection: Center City Pkwy/N. Iris		Total Int. Vol	
	Project AM (Fig 8) =	47	
	Existing AM (Fig 6) =	2365	
	Fair Share (Project/Background) =	2.0%	
	Fair share against \$225,000	\$4,471	
	Project PM (Fig 8) =	59	
	Existing PM (Fig 6) =	1917	
	Fair Share (Project/Background) =	3.1%	
	Fair share against \$225,000	\$6,975	PM Controls
N. Iris Lane Segment Widening (280 LF)		Segment ADT	
	Project ADT (Fig 8) =	588	
	Existing ADT (Fig 6) =	8996	
	Fair Share (Project/Background) =	6.5%	
	Fair share against \$155,000	\$10,075	
TOTAL Intersection & Segment Fair Share		\$17,050	

Appendix P

Centre City Pkwy at Iris Ln LOS with Improvement Worksheets

AM Existing + Project
4: Centre City Pkwy & Iris Ln

E-W Split Phase and Restripe
HCM 6th Signalized Intersection Summary

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	58	221	8	414	217	13	15	244	106	9	1014	93
Future Volume (veh/h)	58	221	8	414	217	13	15	244	106	9	1014	93
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.98	1.00		0.97	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	63	240	9	350	376	14	16	265	115	10	1102	101
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	287	288	11	417	419	16	26	1351	584	18	1334	576
Arrive On Green	0.16	0.16	0.16	0.23	0.23	0.23	0.01	0.38	0.38	0.01	0.38	0.38
Sat Flow, veh/h	1781	1789	67	1781	1790	67	1781	3554	1535	1781	3554	1535
Grp Volume(v), veh/h	63	0	249	350	0	390	16	265	115	10	1102	101
Grp Sat Flow(s),veh/h/ln	1781	0	1856	1781	0	1857	1781	1777	1535	1781	1777	1535
Q Serve(g_s), s	2.6	0.0	10.9	15.7	0.0	17.1	0.7	4.2	4.2	0.5	23.6	3.7
Cycle Q Clear(g_c), s	2.6	0.0	10.9	15.7	0.0	17.1	0.7	4.2	4.2	0.5	23.6	3.7
Prop In Lane	1.00		0.04	1.00		0.04	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	287	0	299	417	0	435	26	1351	584	18	1334	576
V/C Ratio(X)	0.22	0.00	0.83	0.84	0.00	0.90	0.61	0.20	0.20	0.57	0.83	0.18
Avail Cap(c_a), veh/h	340	0	354	435	0	454	85	1351	584	85	1334	576
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	30.6	0.0	34.1	30.6	0.0	31.1	41.1	17.4	17.4	41.4	23.7	17.5
Incr Delay (d2), s/veh	0.4	0.0	13.6	13.2	0.0	19.7	20.3	0.3	0.8	25.5	6.0	0.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.1	0.0	5.9	8.0	0.0	9.8	0.5	1.7	1.6	0.3	10.4	1.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	31.0	0.0	47.7	43.8	0.0	50.9	61.3	17.7	18.2	66.8	29.7	18.2
LnGrp LOS	C	A	D	D	A	D	E	B	B	E	C	B
Approach Vol, veh/h		312			740			396			1213	
Approach Delay, s/veh		44.3			47.5			19.6			29.0	
Approach LOS		D			D			B			C	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.3	36.4		18.0	5.7	36.0		24.2				
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s	4.0	31.5		16.0	4.0	31.5		20.5				
Max Q Clear Time (g_c+I1), s	2.5	6.2		12.9	2.7	25.6		19.1				
Green Ext Time (p_c), s	0.0	2.1		0.5	0.0	3.7		0.6				

Intersection Summary

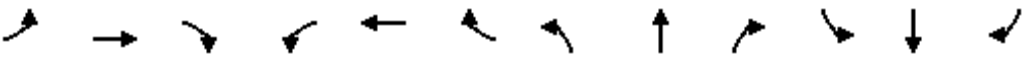
HCM 6th Ctrl Delay	34.6
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

PM Existing + Project
4: Centre City Pkwy & Iris Ln

E-W Split Phase and Restripe
HCM 6th Signalized Intersection Summary

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	170	291	7	128	78	11	13	603	243	10	371	51
Future Volume (veh/h)	170	291	7	128	78	11	13	603	243	10	371	51
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.97	1.00		0.97	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	185	316	8	118	114	12	14	655	264	11	403	55
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	403	411	10	213	199	21	25	1080	465	20	1070	461
Arrive On Green	0.23	0.23	0.23	0.12	0.12	0.12	0.01	0.30	0.30	0.01	0.30	0.30
Sat Flow, veh/h	1781	1815	46	1781	1657	174	1781	3554	1531	1781	3554	1531
Grp Volume(v), veh/h	185	0	324	118	0	126	14	655	264	11	403	55
Grp Sat Flow(s),veh/h/ln	1781	0	1861	1781	0	1832	1781	1777	1531	1781	1777	1531
Q Serve(g_s), s	4.8	0.0	8.7	3.3	0.0	3.5	0.4	8.4	7.7	0.3	4.8	1.4
Cycle Q Clear(g_c), s	4.8	0.0	8.7	3.3	0.0	3.5	0.4	8.4	7.7	0.3	4.8	1.4
Prop In Lane	1.00		0.02	1.00		0.10	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	403	0	421	213	0	219	25	1080	465	20	1070	461
V/C Ratio(X)	0.46	0.00	0.77	0.55	0.00	0.57	0.56	0.61	0.57	0.55	0.38	0.12
Avail Cap(c_a), veh/h	536	0	560	536	0	552	134	1080	465	134	1070	461
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	17.7	0.0	19.3	22.0	0.0	22.1	26.0	15.8	15.6	26.1	14.6	13.5
Incr Delay (d2), s/veh	0.8	0.0	4.6	2.2	0.0	2.4	18.1	2.5	5.0	21.2	1.0	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.9	0.0	3.9	1.4	0.0	1.5	0.3	3.3	3.0	0.2	1.8	0.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	18.6	0.0	23.9	24.3	0.0	24.5	44.1	18.3	20.5	47.3	15.7	14.0
LnGrp LOS	B	A	C	C	A	C	D	B	C	D	B	B
Approach Vol, veh/h		509			244			933			469	
Approach Delay, s/veh		22.0			24.4			19.3			16.2	
Approach LOS		C			C			B			B	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.1	20.6		16.5	5.2	20.5		10.9				
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s	4.0	16.0		16.0	4.0	16.0		16.0				
Max Q Clear Time (g_c+I1), s	2.3	10.4		10.7	2.4	6.8		5.5				
Green Ext Time (p_c), s	0.0	2.6		1.2	0.0	1.9		0.7				

Intersection Summary

HCM 6th Ctrl Delay	19.8
HCM 6th LOS	B

Notes

User approved volume balancing among the lanes for turning movement.

AM Existing + Cumulative + Project
4: Centre City Pkwy & Iris Ln

E-W Split Phasing and Restripe
HCM 6th Signalized Intersection Summary

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	58	221	8	415	217	13	21	268	106	9	1075	93
Future Volume (veh/h)	58	221	8	415	217	13	21	268	106	9	1075	93
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.98	1.00		0.97	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	63	240	9	350	377	14	23	291	115	10	1168	101
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	286	288	11	417	419	16	35	1359	587	18	1324	572
Arrive On Green	0.16	0.16	0.16	0.23	0.23	0.23	0.02	0.38	0.38	0.01	0.37	0.37
Sat Flow, veh/h	1781	1789	67	1781	1790	66	1781	3554	1536	1781	3554	1535
Grp Volume(v), veh/h	63	0	249	350	0	391	23	291	115	10	1168	101
Grp Sat Flow(s),veh/h/ln	1781	0	1856	1781	0	1857	1781	1777	1536	1781	1777	1535
Q Serve(g_s), s	2.6	0.0	11.0	15.8	0.0	17.3	1.1	4.7	4.2	0.5	26.0	3.7
Cycle Q Clear(g_c), s	2.6	0.0	11.0	15.8	0.0	17.3	1.1	4.7	4.2	0.5	26.0	3.7
Prop In Lane	1.00		0.04	1.00		0.04	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	286	0	298	417	0	434	35	1359	587	18	1324	572
V/C Ratio(X)	0.22	0.00	0.83	0.84	0.00	0.90	0.65	0.21	0.20	0.57	0.88	0.18
Avail Cap(c_a), veh/h	337	0	351	432	0	450	84	1359	587	84	1324	572
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	30.9	0.0	34.4	30.9	0.0	31.4	41.1	17.6	17.4	41.7	24.8	17.8
Incr Delay (d2), s/veh	0.4	0.0	13.9	13.4	0.0	20.4	18.7	0.4	0.7	25.5	8.7	0.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.1	0.0	6.0	8.1	0.0	9.9	0.7	1.9	1.6	0.3	11.9	1.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	31.2	0.0	48.3	44.3	0.0	51.8	59.8	17.9	18.2	67.2	33.5	18.5
LnGrp LOS	C	A	D	D	A	D	E	B	B	E	C	B
Approach Vol, veh/h	312			741			429			1279		
Approach Delay, s/veh	44.9			48.3			20.2			32.6		
Approach LOS	D			D			C			C		
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.3	36.8		18.1	6.2	36.0		24.3				
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s	4.0	31.5		16.0	4.0	31.5		20.5				
Max Q Clear Time (g_c+I1), s	2.5	6.7		13.0	3.1	28.0		19.3				
Green Ext Time (p_c), s	0.0	2.3		0.5	0.0	2.5		0.5				

Intersection Summary

HCM 6th Ctrl Delay	36.3
HCM 6th LOS	D

Notes

User approved volume balancing among the lanes for turning movement.

PM Existing + Cumulative + Project
4: Centre City Pkwy & Iris Ln

E-W Split Phase and Restripe
HCM 6th Signalized Intersection Summary

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	170	291	7	129	78	11	25	678	244	10	404	51
Future Volume (veh/h)	170	291	7	129	78	11	25	678	244	10	404	51
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.97	1.00		0.97	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	185	316	8	118	115	12	27	737	265	11	439	55
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	401	409	10	213	199	21	44	1102	475	20	1054	454
Arrive On Green	0.23	0.23	0.23	0.12	0.12	0.12	0.02	0.31	0.31	0.01	0.30	0.30
Sat Flow, veh/h	1781	1815	46	1781	1659	173	1781	3554	1531	1781	3554	1530
Grp Volume(v), veh/h	185	0	324	118	0	127	27	737	265	11	439	55
Grp Sat Flow(s),veh/h/ln	1781	0	1861	1781	0	1832	1781	1777	1531	1781	1777	1530
Q Serve(g_s), s	4.8	0.0	8.8	3.4	0.0	3.5	0.8	9.7	7.8	0.3	5.3	1.4
Cycle Q Clear(g_c), s	4.8	0.0	8.8	3.4	0.0	3.5	0.8	9.7	7.8	0.3	5.3	1.4
Prop In Lane	1.00		0.02	1.00		0.09	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	401	0	419	213	0	219	44	1102	475	20	1054	454
V/C Ratio(X)	0.46	0.00	0.77	0.55	0.00	0.58	0.61	0.67	0.56	0.55	0.42	0.12
Avail Cap(c_a), veh/h	528	0	552	528	0	544	132	1102	475	132	1054	454
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	18.1	0.0	19.6	22.4	0.0	22.4	26.0	16.2	15.5	26.5	15.2	13.8
Incr Delay (d2), s/veh	0.8	0.0	4.9	2.2	0.0	2.4	13.1	3.2	4.7	21.3	1.2	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.9	0.0	4.0	1.4	0.0	1.6	0.5	4.0	3.0	0.3	2.1	0.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	18.9	0.0	24.5	24.6	0.0	24.9	39.2	19.4	20.2	47.8	16.4	14.4
LnGrp LOS	B	A	C	C	A	C	D	B	C	D	B	B
Approach Vol, veh/h		509			245			1029			505	
Approach Delay, s/veh		22.5			24.7			20.1			16.9	
Approach LOS		C			C			C			B	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.1	21.2		16.6	5.8	20.5		11.0				
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s	4.0	16.0		16.0	4.0	16.0		16.0				
Max Q Clear Time (g_c+I1), s	2.3	11.7		10.8	2.8	7.3		5.5				
Green Ext Time (p_c), s	0.0	2.3		1.2	0.0	2.0		0.7				

Intersection Summary

HCM 6th Ctrl Delay	20.4
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

AM Year 2035 + Project
4: Centre City Pkwy & Iris Ln

E-W Split Phase and Restripe
HCM 6th Signalized Intersection Summary

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	59	226	8	422	222	13	15	312	108	9	1297	95
Future Volume (veh/h)	59	226	8	422	222	13	15	312	108	9	1297	95
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.98	1.00		0.97	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	64	246	9	357	384	14	16	339	117	10	1410	103
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	287	289	11	431	434	16	25	1526	660	17	1510	653
Arrive On Green	0.16	0.16	0.16	0.24	0.24	0.24	0.01	0.43	0.43	0.01	0.42	0.42
Sat Flow, veh/h	1781	1791	66	1781	1792	65	1781	3554	1538	1781	3554	1537
Grp Volume(v), veh/h	64	0	255	357	0	398	16	339	117	10	1410	103
Grp Sat Flow(s),veh/h/ln	1781	0	1856	1781	0	1857	1781	1777	1538	1781	1777	1537
Q Serve(g_s), s	3.6	0.0	15.2	21.7	0.0	23.6	1.0	6.9	5.4	0.6	43.2	4.7
Cycle Q Clear(g_c), s	3.6	0.0	15.2	21.7	0.0	23.6	1.0	6.9	5.4	0.6	43.2	4.7
Prop In Lane	1.00		0.04	1.00		0.04	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	287	0	299	431	0	450	25	1526	660	17	1510	653
V/C Ratio(X)	0.22	0.00	0.85	0.83	0.00	0.89	0.64	0.22	0.18	0.59	0.93	0.16
Avail Cap(c_a), veh/h	429	0	447	499	0	521	62	1526	660	62	1510	653
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	41.6	0.0	46.5	41.0	0.0	41.7	56.0	20.5	20.1	56.3	31.3	20.2
Incr Delay (d2), s/veh	0.4	0.0	9.8	9.8	0.0	15.1	24.6	0.3	0.6	28.5	12.0	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.6	0.0	7.8	10.6	0.0	12.6	0.6	2.9	2.0	0.4	20.5	1.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	42.0	0.0	56.4	50.8	0.0	56.8	80.6	20.9	20.7	84.8	43.3	20.7
LnGrp LOS	D	A	E	D	A	E	F	C	C	F	D	C
Approach Vol, veh/h		319			755			472			1523	
Approach Delay, s/veh		53.5			54.0			22.9			42.0	
Approach LOS		D			D			C			D	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.6	53.5		22.9	6.1	53.0		32.1				
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s	4.0	48.5		27.5	4.0	48.5		32.0				
Max Q Clear Time (g_c+I1), s	2.6	8.9		17.2	3.0	45.2		25.6				
Green Ext Time (p_c), s	0.0	2.8		1.2	0.0	2.6		2.0				
Intersection Summary												
HCM 6th Ctrl Delay			43.2									
HCM 6th LOS			D									
Notes												
User approved volume balancing among the lanes for turning movement.												

LOS Engineering, Inc.

PM Year 2035 + Project
4: Centre City Pkwy & Iris Ln

E-W Split Phase and Restripe
HCM 6th Signalized Intersection Summary

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	174	297	7	131	80	11	13	771	248	10	475	52
Future Volume (veh/h)	174	297	7	131	80	11	13	771	248	10	475	52
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.97	1.00		0.97	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	189	323	8	120	117	12	14	838	270	11	516	57
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	392	400	10	208	194	20	25	1252	540	20	1242	536
Arrive On Green	0.22	0.22	0.22	0.12	0.12	0.12	0.01	0.35	0.35	0.01	0.35	0.35
Sat Flow, veh/h	1781	1816	45	1781	1662	170	1781	3554	1534	1781	3554	1534
Grp Volume(v), veh/h	189	0	331	120	0	129	14	838	270	11	516	57
Grp Sat Flow(s),veh/h/ln	1781	0	1861	1781	0	1833	1781	1777	1534	1781	1777	1534
Q Serve(g_s), s	5.6	0.0	10.1	3.8	0.0	4.0	0.5	12.0	8.3	0.4	6.6	1.5
Cycle Q Clear(g_c), s	5.6	0.0	10.1	3.8	0.0	4.0	0.5	12.0	8.3	0.4	6.6	1.5
Prop In Lane	1.00		0.02	1.00		0.09	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	392	0	410	208	0	214	25	1252	540	20	1242	536
V/C Ratio(X)	0.48	0.00	0.81	0.58	0.00	0.60	0.57	0.67	0.50	0.55	0.42	0.11
Avail Cap(c_a), veh/h	474	0	496	474	0	488	119	1252	540	119	1242	536
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	20.4	0.0	22.2	25.1	0.0	25.2	29.4	16.5	15.3	29.5	14.9	13.2
Incr Delay (d2), s/veh	0.9	0.0	8.1	2.5	0.0	2.7	18.8	2.9	3.3	21.8	1.0	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.2	0.0	5.0	1.7	0.0	1.8	0.3	4.8	3.1	0.3	2.6	0.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	21.4	0.0	30.3	27.6	0.0	27.9	48.2	19.3	18.6	51.4	15.9	13.6
LnGrp LOS	C	A	C	C	A	C	D	B	B	D	B	B
Approach Vol, veh/h		520			249			1122			584	
Approach Delay, s/veh		27.1			27.8			19.5			16.3	
Approach LOS		C			C			B			B	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.2	25.7		17.7	5.3	25.5		11.5				
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s	4.0	21.0		16.0	4.0	21.0		16.0				
Max Q Clear Time (g_c+I1), s	2.4	14.0		12.1	2.5	8.6		6.0				
Green Ext Time (p_c), s	0.0	3.7		1.0	0.0	2.9		0.7				
Intersection Summary												
HCM 6th Ctrl Delay			21.2									
HCM 6th LOS			C									
Notes												
User approved volume balancing among the lanes for turning movement.												

Appendix Q

Excerpts from the City of Escondido *Bicycle Master Plan*

Bicycle Master Plan



City of Escondido

Case File No. PHG 12-0018

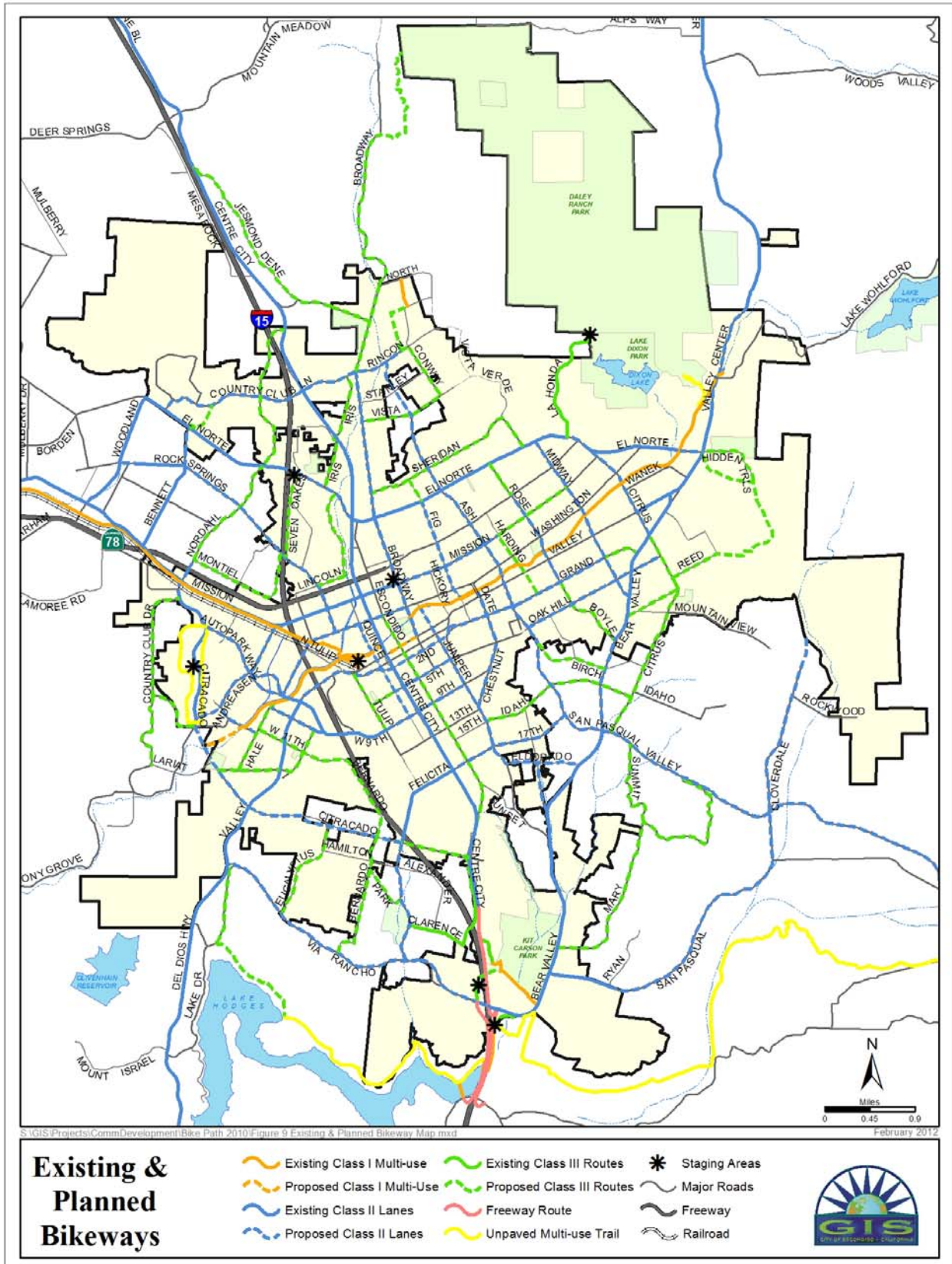
City Council
Sam Abed, Mayor
Marie Waldron, Deputy Mayor
Olga Diaz, Council Member
Ed Gallo, Council Member
Michael Morasco, Council Member

Staff Recognition
Jay Paul, Associate Planner-Project Manager
Jay Petrek-Principal Planner
Peggy Chapin – Contract Planner
Homi Namdari-Assistant City Engineer
Ali Shahzad-Associate Engineer, Traffic
Samuel Cottrell-Associate Engineer, Design
Daniel Hildebrand-GIS Manager
Jennifer Kay-GIS Technician

(Draft CC – October 2012)

Adopted by City Council Resolution No. 2012-162 on October _____ 2012

Figure ES 1 Existing and Proposed Bicycle Facilities



Appendix R

Transit Map and Schedules

358/359

N. Broadway, Country Club & El Norte Pkwy.

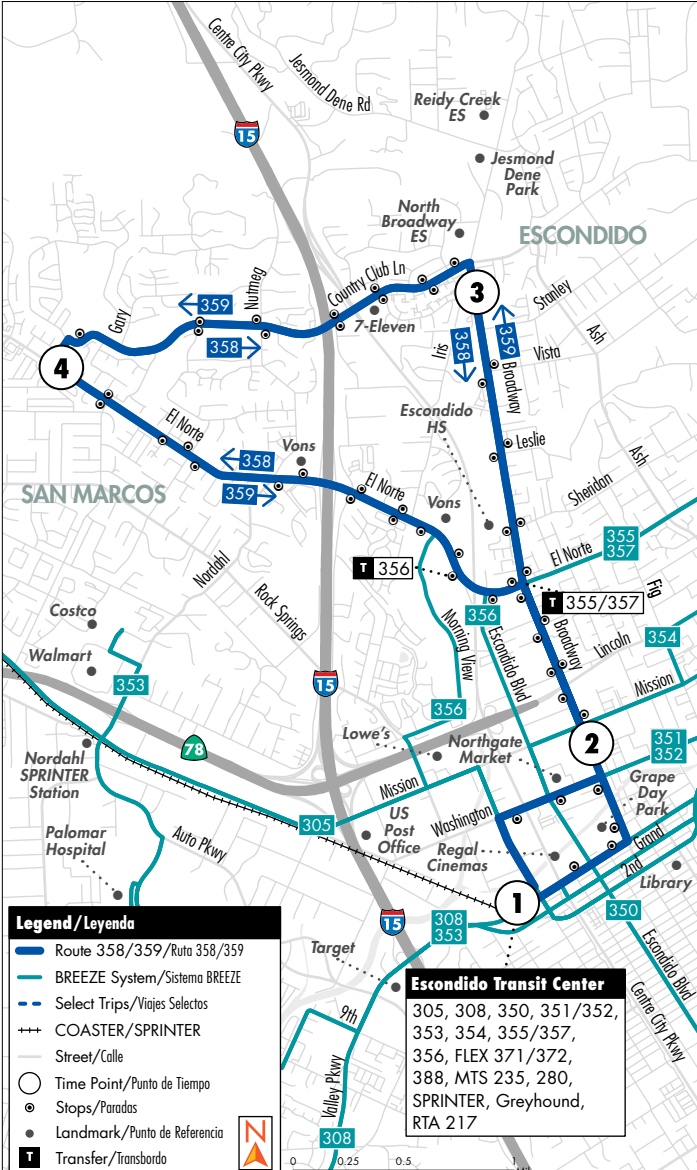
N. Broadway, Country Club y El Norte Pkwy.

M-F
L-V

Destinations/Dest.nos

- Escondido Civic Center
- Kaiser Permanente
- Regal Cinemas
- Escondido Senior Center

- Escondido High School
- YMCA
- Vons
- Stater Brothers



358/359

N. Broadway, Country Club & El Norte Pkwy.

N. Broadway, Country Club y El Norte Pkwy.

See pg. 6 for Holiday schedules/Ver pág. 236 para obtener los horarios de días festivos

 358 Monday - Friday El Norte Pkwy. then N. Broadway <i>358 Lunes a Viernes • El Norte Pkwy. luego N. Broadway</i>					
Escondido Transit Center	N. Broadway & Park Ave.	El Norte Pkwy. & Country Club Ln.	Country Club Ln. & N. Broadway	N. Broadway & Park Ave.	Escondido Transit Center
1	2	4	3	2	1
6:03	6:06	6:17	6:24	6:36	6:44a
8:03	8:07	8:22	8:29	8:41	8:50
10:03	10:07	10:21	10:28	10:40	10:49
12:02	12:06	12:21	12:28	12:40	12:49p
2:04	2:09	2:25	2:32	2:47	2:57
4:05	4:10	4:26	4:33	4:48	4:58
6:08	6:13	6:29	6:35	6:44	6:54
8:03	8:07	8:19	8:25	8:34	8:43

 359 Monday - Friday N. Broadway then El Norte Pkwy. <i>359 Lunes a Viernes • N. Broadway luego El Norte Pkwy.</i>					
Escondido Transit Center	N. Broadway & Park Ave.	Country Club Ln. & N. Broadway	El Norte Pkwy. & Country Club Ln.	N. Broadway & Park Ave.	Escondido Transit Center
1	2	3	4	2	1
5:09	5:11	5:17	5:24	5:36	5:45a
7:03	7:07	7:21	7:31	7:48	7:57
9:04	9:07	9:18	9:26	9:42	9:51
11:03	11:07	11:18	11:26	11:42	11:51
1:03	1:08	1:19	1:27	1:43	1:53p
3:02	3:07	3:18	3:26	3:42	3:52
5:04	5:09	5:20	5:28	5:44	5:54
7:08	7:12	7:22	7:28	7:41	7:49

Route 358/359 does not operate on Saturdays, Sundays, or holidays.

La Ruta 358/359 no opera los sábados, domingos o en días festivos.

N. Iris Ln 102 Multi-Family Project 108 and 108MA Appendix