Endo Engineering *Traffic Engineering Air Quality Studies Noise Assessments*

January 6, 2012

Mr. Chevis Hosea
KSL Land Corporation
2100 Costa Del Mar Road
Carlsbad, CA 92009

Subject: Focused Traffic Impact Memo Update of Traffic Signal Warrant Study for Three Intersections On Madison Street Adjacent to PGA West

Dear Mr. Hosea;

The need for signalization is typically recognized through periodic traffic counts made to determine if traffic volumes are approaching the applicable traffic signal warrant thresholds identified in the *California Manual on Uniform Traffic Control Devices* (CA MUTCD) *for Streets and Highways* (Revised January 21, 2010). As the development of the PGA West Specific Plan in the City of La Quinta neared completion in the fall of 2009, KSL Land Corporation (the master developer) commissioned traffic counts at the access points. Based on those traffic counts, a preliminary traffic signal warrant evaluation was prepared (Endo Engineering; January 14, 2010) to determine whether or not the installation of traffic signals would be justified at three PGA West access intersections along Madison Street following completion of the development. Figure 1 illustrates the three intersections evaluated and the study area, which extends along Madison Street, from Avenue 54 to Avenue 58, in the City of La Quinta, California.

This focused traffic impact memo updates and supplements the previous preliminary screening of three unsignalized intersections along Madison Street adjacent to the PGA West community. The more detailed analysis summarized below evaluates new traffic counts made in late October and early November of 2011. The objective was to make a definitive determination of the appropriate future intersection control type for each intersection and provide the rationale for the recommended traffic control treatment. Near-term conditions are addressed by evaluating traffic volumes upon completion of the PGA West Specific Plan. Long-term conditions are also evaluated, based on projected traffic volumes upon buildout of the *City of La Quinta General Plan*. The Andalusia Specific Plan and the Travertine Specific Plan are two large projects in the early stages of development that are anticipated to contribute significant amounts of traffic to Madison Street over the next 20 years.

In addition to evaluating applicable traffic signal warrants, the operational and safety performance of the three intersections is documented with and without traffic control signals to clarify the advantages and disadvantages of alternative traffic control types. The City of La Quinta asked that this study provide: (1) the updated traffic count data; (2) evaluate both the operational and safety performance of three traffic control/median opening treatment alternatives; (3) address the potential impacts of non-uniform traffic signal spacing on progressive traffic flow; and (4) include the additional technical information necessary to fully address concerns raised at a recent public hearing.

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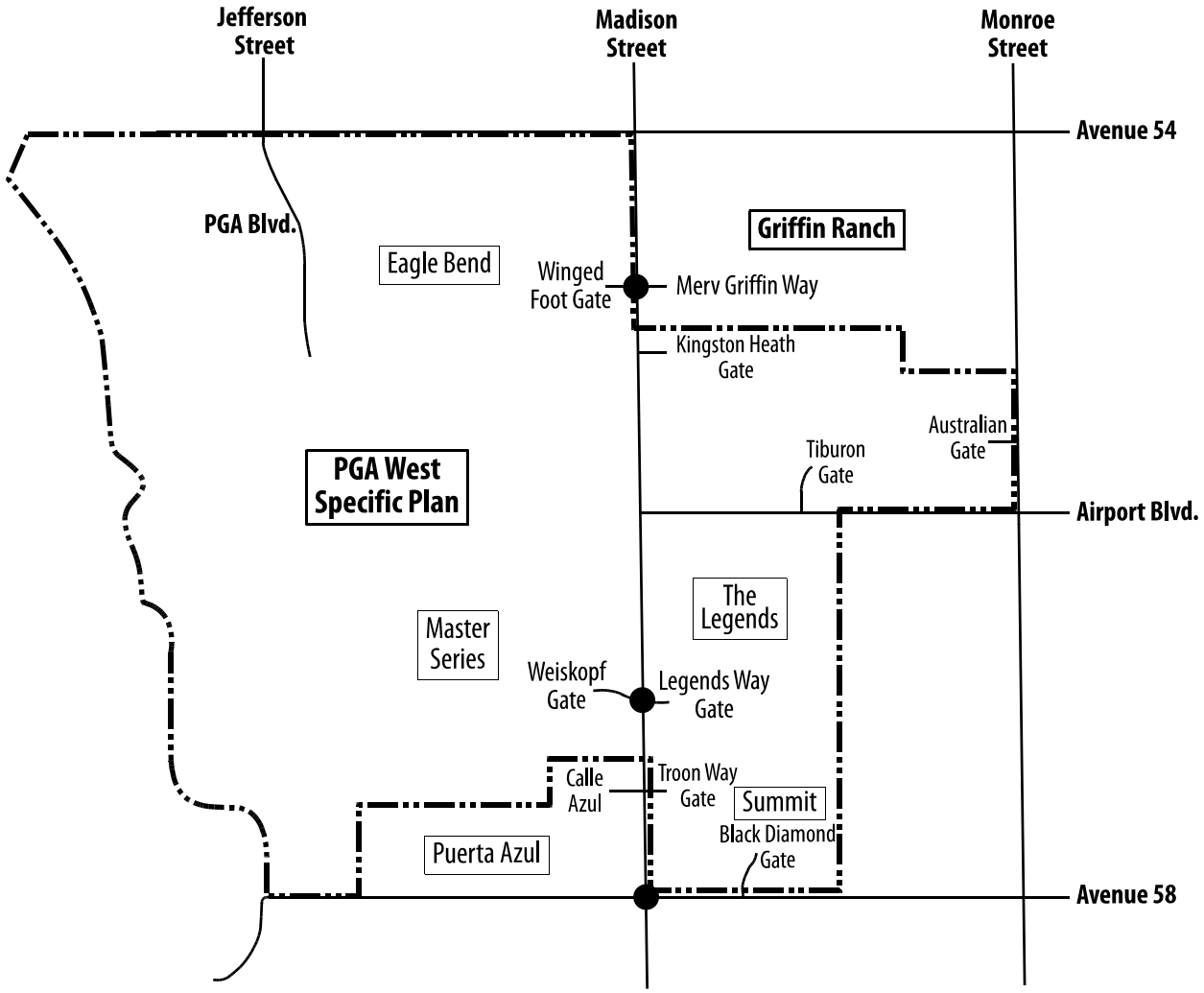
Figure 1
Three Intersections Evaluated Along Madison Street



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Scale: 1" = 2,545'

The eight warrants established by the State of California identify the minimum conditions under which unsignalized intersections may be considered potentially viable candidates for signalization. Further investigation of the intersection should be initiated if one or more of the warrants are met to determine if signalization is justified based on an established traffic need. A traffic control signal should not be installed unless the minimum threshold criteria are met or exceeded for one or more of the warrants described in the CA MUTCD.

Since the installation of traffic signals typically increases the accident rate and the total vehicular delay, a traffic signal should not be installed, even though the traffic volume thresholds for signalization are reached, unless there is evidence of the need for right-of-way assignment beyond that which could be provided by a STOP sign. Where traffic signals are not warranted, but increases in future traffic will cause an unsignalized intersection to fail to meet the applicable minimum intersection performance standard in the City of La Quinta, less restrictive forms of mitigation should be identified to address the operational deficiency. Traffic signals should be installed only when one or more signal warrants is met, lesser measures have failed to remedy the deficiency, and no other solution or form of control would be effective in assuring traffic safety and efficiency. Traffic signals should be installed only where the net effect expected to occur would be an improvement in the overall safety and/or operations at an intersection.

The peak hour delay at each intersection was determined for conditions with three traffic control and median opening treatment alternatives to ensure that these intersections will continue to meet the City of La Quinta minimum unsignalized intersection performance standard upon completion of the PGA West Specific Plan as well as upon buildout of the General Plan. Specific mitigation strategies were identified to minimize the potential for future operational or safety deficiencies at these intersections and insure that the residents of PGA West, the surrounding community, and all future road users at these intersections will continue to enjoy the benefits of safe and efficient access in the future without adversely affecting the mobility function of Madison Street.

Summary of Findings

1. The traffic volumes included in the January 14, 2010 analysis addressing intersection controls at three intersections on Madison Street were counted in late October and early November, 2011. Based upon the new traffic counts, the findings and recommendations for these three intersections remain unchanged from the January 14, 2010 report.

2. All three of the unsignalized intersections evaluated along Madison Street are currently providing acceptable levels of service and control delay in the peak hours of the peak season. No operational or safety deficiencies were identified at any of these intersections.

3. The existing all-way stop control at the intersection of Madison Street with Avenue 58 and two-way stop control (at the other low-volume PGA West Specific Plan access connections) are appropriate for existing and near-term traffic conditions upon completion of the PGA West Specific Plan.

4. In the future, traffic volumes exiting the PGA West community through the gates onto Madison Street are not expected to increase substantially; however, traffic volumes on Madison Street are expected to grow by a factor of five upon buildout of the General Plan, which may not occur for 20 years or more.

5. When traffic volumes on Madison Street reach 15,000 to 20,000 vehicles per day, vehicles exiting the PGA West access connections and either crossing or turning left

onto Madison Street, will experience lengthy delays. At that point, the unsignalized intersections at Winged Foot/Merv Griffin Way and at Weiskopf/Legends Way will no longer meet the City of La Quinta minimum intersection performance standard.

6. The PGA West access intersections evaluated on Madison Street are not projected to meet or exceed the minimum traffic signal warrant thresholds upon General Plan buildout, but will require mitigation to meet the City of La Quinta minimum intersection performance standard.

7. The City of La Quinta minimum intersection performance standard can be met at the unsignalized intersections of Madison Street with Winged Foot/Merv Griffin Way and with Weiskopf/Legends Way by modifying the existing full-turn median openings to prevent minor-street left-turn and through movements across Madison Street. The minor-street left-turn and through movements can be redirected to an adjacent median opening on Madison Street with a right-turn onto Madison Street, followed by a U-turn.

8. Upon buildout of the *City of La Quinta General Plan,* the traffic volumes at the intersection of Madison Street and Avenue 58 are projected to exceed rural traffic signal volume warrants and signalization will be required to meet the City of La Quinta minimum intersection performance standard. The Andalusia Specific Plan and the Travertine Specific Plan are two large projects in the early stages of development that are expected to contribute significant amounts of traffic to Madison Street over the next 20 years. Although the master developer of PGA West will contribute to the cost of a traffic signal at this location, PGA West traffic represents approximately three percent of the traffic volumes projected for this intersection upon buildout of the *City of La Quinta General Plan*.

Methodology

Manual AM and PM peak hour turning movement traffic counts as well as 24-hour machine traffic counts were made, as specified in the most recent revision of the City of La Quinta Engineering Bulletin #06-13. The traffic counts were made in late October and early November, 2011. Per Engineering Bulletin #06-13, a seasonal expansion factor of 1.10 was used to increase the October count data to reflect peak season traffic volumes. A seasonal expansion factor of 1.05 was applied to the Winged Foot November peak hour count data to reflect peak season traffic volumes.

A heavy vehicle mix of 5 percent was assumed for the peak hour intersection delay analysis. A saturation flow rate of 1,850 vehicles per hour per lane was assumed for the signalized intersection analysis, as specified in Engineering Bulletin #06-13.

Minimum Intersection Performance Standard

The City of La Quinta peak hour intersection performance standards for unsignalized and signalized intersections specified in Engineering Bulletin #06-13 were utilized to determine when future impacts required mitigation. Signalized intersections are required to operate at LOS "D" or better, based on the overall intersection delay using the operational methodology in the *Highway Capacity Manual*. Unsignalized intersections with all-way stop control (AWSC) are required to operate at LOS "D" or better. The minor street approaches at unsignalized intersections with two-way stop control (TWSC) are required to operate at LOS "E" or better using the operational methodology in the *Highway Capacity Manual*.

Traffic Signal Warrant Analysis

The traffic signal guidance in Engineering Bulletin #06-13 was followed in performing the traffic signal warrant analysis. All of the relevant traffic signal warrants identified in Chapter 4C of the January 21, 2010 *California Manual of Uniform Traffic Control Devices for Streets and Highways* (CA MUTCD) were checked. These warrants define the minimum conditions under which installing traffic control signals might be justified in California.

Existing Conditions

The PGA West community is located both east and west of Madison Street, between Avenue 54 and Avenue 58. Direct full-turn access to Madison Street is currently provided for the PGA West community via several gated low-speed unsignalized access connections. As shown in Figure 1, tunnels are located beneath Madison Street at Kingston Heath and at Weiskopf/Legends Way. These tunnels permit residents using golf carts to access the golf courses and related facilities and amenities on both sides of Madison Street without crossing Madison Street at-grade in golf carts or private automobiles.

Existing Roadway Conditions

Madison Street is currently one of the primary north/south through routes extending south of Avenue 54. Within the study area, Madison Street is a fully improved four-lane divided Primary arterial with a raised landscaped median and a posted speed limit of 50 miles per hour. Along Primary arterials, traffic signals should not be located less than 1,300 feet from an adjacent traffic signal. The only traffic signal currently located along Madison Street in the study area is at Airport Boulevard, as shown in Figure 2.

The northern most intersection evaluated on Madison Street is located at Winged Foot/Merv Griffin Way. This intersection provides full-turn access to and from Madison Street for the Eagle Bend area of the PGA West development (located west of Madison Street). Merv Griffin Way is located on the east side of Madison Street, opposite the Winged Foot gate. Merv Griffin Way provides direct full-turn access to Madison Street for the Griffin Ranch Specific Plan development, which is partially constructed.

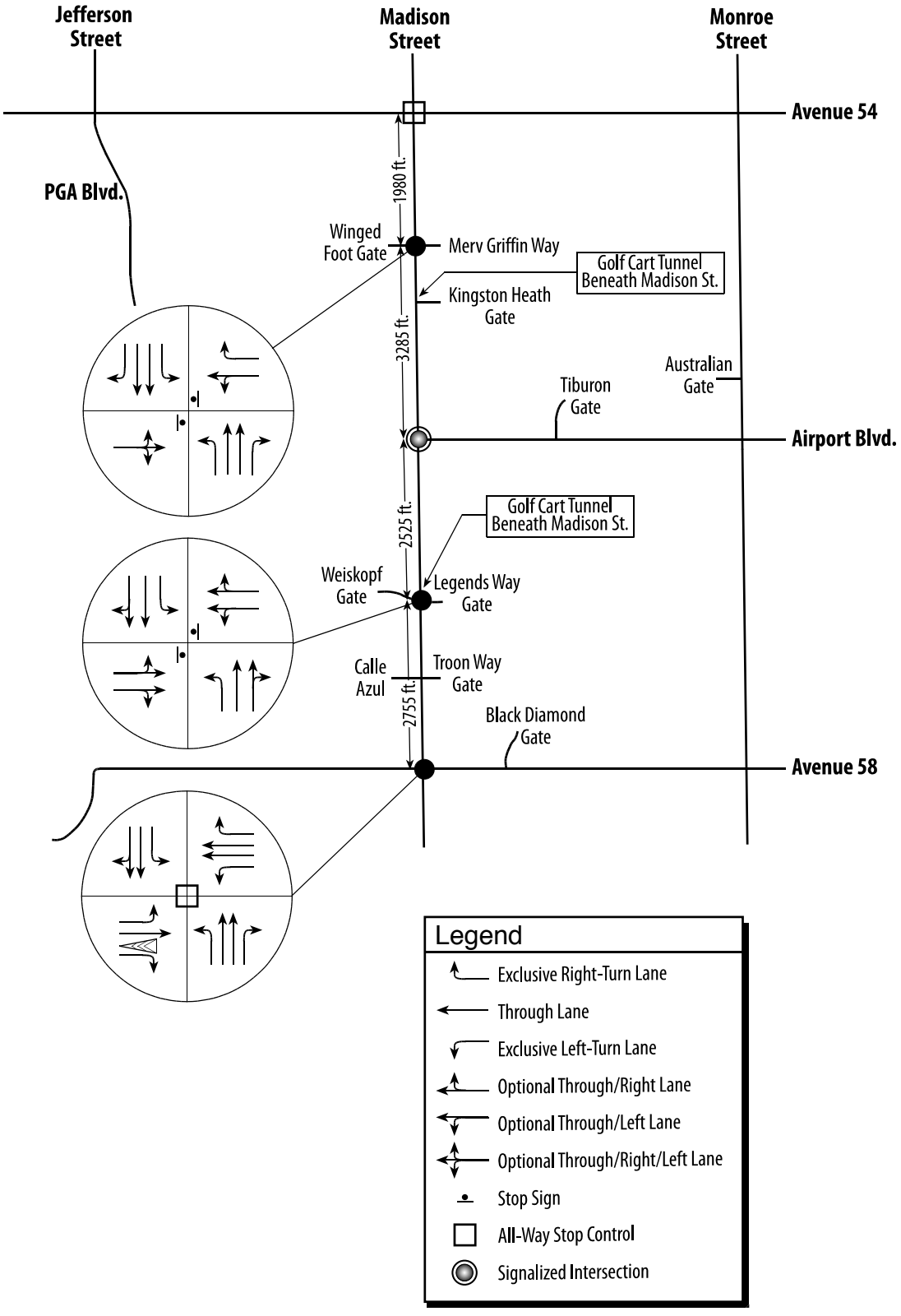
As shown in Figure 2, the gated access at Winged Foot has a single-lane approach to the intersection of Madison Street. The intersection is controlled by stop signs facing the minor streets which is referred to as two-way stop control (TWSC). The street carrying the lower traffic volumes is referred to as the minor street.

The PGA West access intersection on Madison Street at the Weiskopf/Legends Way gate was also evaluated. This low-speed private access connection is located near the middle of the one-mile segment of Madison Street extending between Airport Boulevard and Avenue 58. As shown in Figure 2, Weiskopf/Legends Way access intersection on Madison Street has two-lane minor-street approaches with stop signs facing the minor streets.

The intersection of Madison Street with Avenue 58 is all-way stop controlled and currently provides more than two lanes on all intersection approaches. Avenue 58 provides access to the Coral Mountain Specific Plan, the Quarry Specific Plan, and the Lake Cahuilla Recreation Area. The Isle of Travertine Specific Plan will eventually be developed and generate traffic on both Avenue 58 and Madison Street at this intersection. The Andalusia development could also increase future traffic volumes at this intersection.

Figure 2

Existing Roadway Conditions
and Traffic Controls



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Scale: 1" = 2,545'

Future traffic signals are planned along Madison Street at Avenue 54 and at Avenue 58, when signal warrants are satisfied and the operational performance of these intersections fall below the City of La Quinta minimum intersection performance standards outlined in Engineering Bulletin #06-013. With the resulting long and uniform one-mile signal spacing, the segment of Madison Street within the study area will be a good candidate for coordinated traffic signals with a 100-second cycle length to facilitate the efficient and progressive movement to platoons of northbound and southbound vehicles at controlled speeds.

Existing Traffic Volumes

New peak hour and 24-hour traffic count data was collected at the three intersections along Madison Street within the last three weeks. That count data is provided as Attachment A. Appropriate peak season expansion factors were applied to the count data to more closely reflect peak season traffic volumes. The resulting peak hour turning movement volumes at the three intersections of interest along Madison Street are shown in Figure 3.

A 24-hour machine traffic count made on Madison Street, south of Airport Boulevard, on November 5, 2009 identified a two-way traffic volume of 6,598 vehicles per day. The CVAG *2009 Traffic Census Report* included a 24-hour traffic count of 6,212 vehicles per day for Madison Street, south of Airport Boulevard. The current (2011) CVAG traffic count for Madison Street at this locations is 6,113 vehicles per day. The traffic volume on Madison Street within the study area appears to have remained relatively constant for the last six years. The daily traffic volume on Madison Street, south of Avenue 54 has also remained relatively constant for the last five years at 9,400 vehicles per day.

Existing Levels of Service

Levels of Service (LOS) are used to describe the effect of various factors such as speed, traffic volume, geometric features, traffic interruptions, delays, and freedom to maneuver on driver satisfaction. Operating conditions ranging from the most favorable at LOS A (little or no delay) to the least favorable at LOS F (unacceptable traffic delay) are used to describe driving conditions in a qualitative manner.

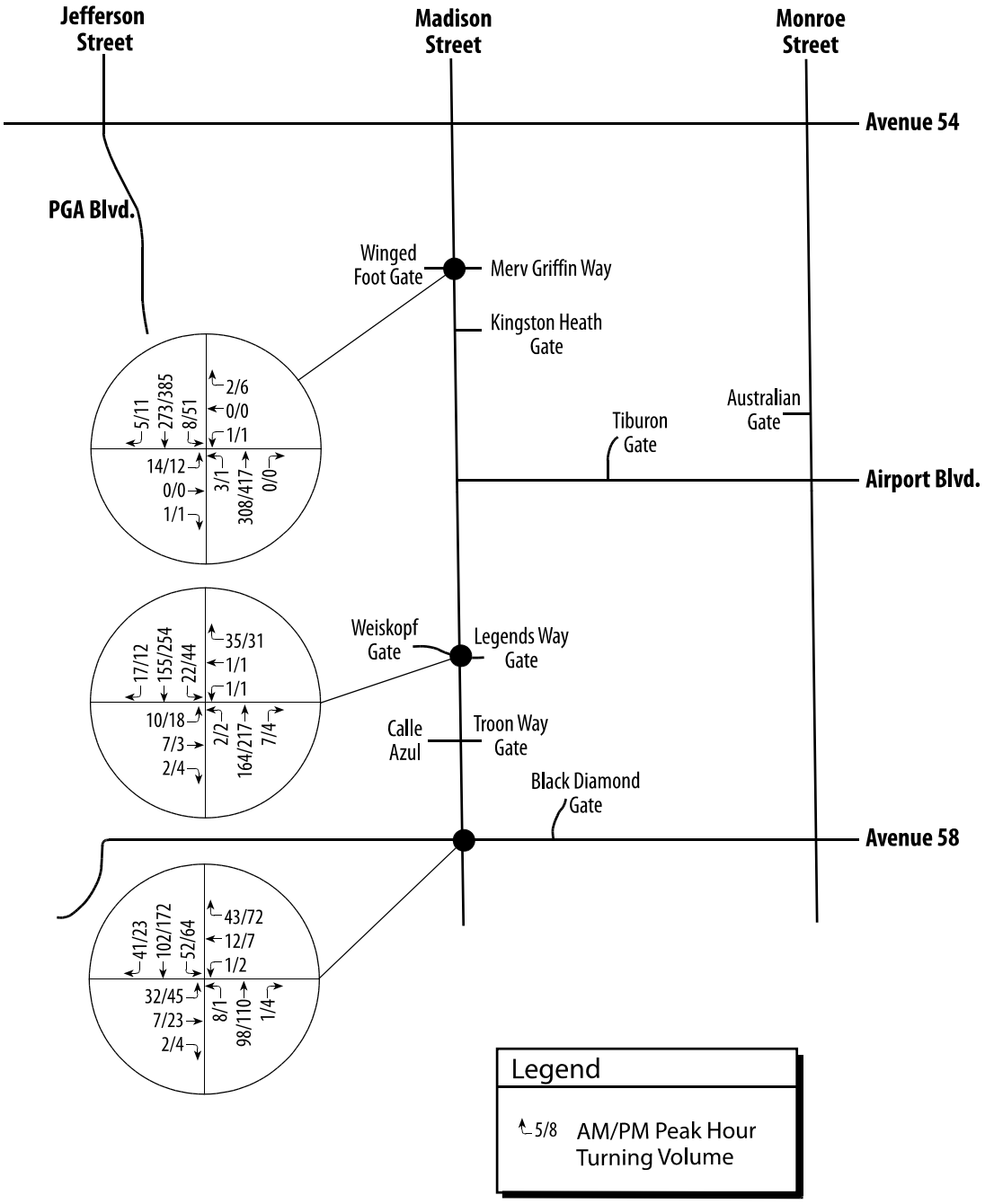
Within the City of La Quinta the minor-street approaches at intersections with TWSC are required to provide LOS E at a minimum during the peak hour in the peak season. LOS E reflects conditions with very long traffic delays of 35 to 50 seconds per vehicle on the minor-street approach.

Based on the existing intersection approach lanes and traffic controls shown in Figure 2, and the peak hour traffic volumes shown in Figure 3, all three of the intersections evaluated along Madison Street are currently providing acceptable levels of service in the peak hours of the peak season without traffic control signals. The unsignalized Highway Capacity Software worksheets for these intersections are provided in Attachment B with additional details regarding levels of service at unsignalized intersections.

The intersection of Madison Street with Avenue 58 is operating at LOS A in the peak hour with all-way stop control. Minor-street traffic exiting the Eagle Bend and Master Series areas of the PGA West Specific Plan via the Winged Foot gate and the Weiskopf/Legends Way gates at Madison Street are currently experiencing levels of control delay considered short to average in length. This level of peak hour delay is consistent with LOS B or LOS C operation. Motorists making eastbound left-turn movements from the Winged Foot and Weiskopf gates onto Madison Street, are currently experiencing average control delays of 10 and 20 seconds per vehicle during the AM and PM peak hours, respectively.

Figure 3

Existing Peak Hour Traffic Volumes
(Year 2011 Peak Season)



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Scale: 1" = 2,545'

The existing traffic control at each of these intersections is the appropriate intersection control type in that it is the least restrictive form of traffic control that will achieve acceptable levels of service during the peak hours. No operational or safety deficiencies were identified at any of the intersections evaluated.

Traffic Signal Warrant Analysis

A detailed description of traffic signal warrants is included in Attachment C. Rural traffic signal warrants were checked for each of the three intersections of interest along Madison Street, based on the 50 mph posted speed limit on this roadway. None of the applicable traffic signal volume warrants established in the *California MUTCD* were determined to be currently satisfied at any of the three intersections evaluated along Madison Street.

Three exhibits are provided in Attachment C which illustrate the hourly variation in traffic volumes counted exiting through each of the three PGA West gates onto Madison Street. Each exhibit shows the highest hourly volume counted and the minimum hourly traffic volume that would have to exit through each gate onto Madison Street to warrant further consideration of the access intersection on Madison Street as a potentially viable candidate for future signalization. Even if the volume of PGA West traffic were to increase sufficiently in the future to reach the minimum volume warrant threshold shown, it would indicate that further study would be required of other less-restrictive alternatives to evaluate the effects of each alternative on traffic operations and safety before a determination could be made regarding the appropriate intersection control type.

These exhibits provide useful information in that they clearly show the hours of the day when the highest volumes of exiting traffic pass from the PGA West development through the gates onto Madison Street and the magnitude of those volumes. They also illustrate the extent to which the PGA West traffic volumes would have to increase in the future before serious consideration would be given to traffic signals as a viable traffic control option along Madison Street. These exhibits were not included within the body of the report because they reflect traffic count data that was not adjusted to reflect peak season conditions. More importantly, no reductions were made to the exiting traffic volumes shown to remove vehicles turning right onto Madison Street, which may be ignored if they enter the major street without undue delay (per the guidance in the CA MUTCD). Although the portion of the exiting traffic that turned right on Madison Street was known for the peak hours, it was not known for the other hours shown in these exhibits.

This is particularly evident with respect to the exhibit showing the volumes exiting from the Legends Way gate. Although these volumes look larger than the Weiskopf exiting volumes, Figure 3 shows that nearly all of these vehicles turn right onto Madison Street during the peak hours with little delay from a separate right-turn lane. As a result, the westbound volumes at this location should be discounted and the Weiskopf gate (eastbound) exiting volumes should be compared to the traffic signal warrant.

The City of La Quinta staff reviewed collision data for the latest three years for three roadways including: (1) Madison Street, from Avenue 54 to Avenue 58; (2) Airport Boulevard, from Madison Street to Monroe Street; and (3) Avenue 58, from Madison Street to Monroe Street. There was no pattern of broadside collisions identified for the various gate locations that are the subject of this study.[1]

[1] Lalani, Nazir. City of La Quinta, Electronic Mail dated October 13, 2011.

Based upon the lack of any history of five or more reported collisions of types that would be susceptible to correction by a traffic control signal within a 12-month period, the Crash Experience signal warrant conditions were not satisfied. The recent crash history indicates that no safety deficiencies exist at these unsignalized intersections with the full-turn conventional median openings on Madison Street.

Future Conditions

Future Traffic Projections

Future traffic volumes were projected for both near-term and long-term planning horizons. The near-term conditions reflect existing peak season traffic plus the future traffic that will be generated by the remaining undeveloped area within the PGA West Specific Plan. The long-term traffic projections reflect conditions with the PGA West Specific Plan completed and buildout of the *City of La Quinta General Plan*.

Updated near-term traffic projections for the three intersections evaluated are provided in Figure 4. Figure 5 provides the updated traffic projections upon buildout of the *City of La Quinta General Plan*. Revisions to the previous traffic projections were required to reflect the updated traffic count data.

Evaluation of Traffic Signal Warrants

The installation of a traffic signal should either: (1) improve traffic operations without being detrimental to traffic safety; (2) improve safety performance without being detrimental to traffic operations; or (3) improve both safety and traffic operations.[2] Traffic signal warrants were checked for the three intersections of interest, based on the near-term traffic projections shown in Figure 4.

The near-term traffic volumes on Avenue 58 approaching Madison Street represent 56 percent of the minimum threshold criteria in the morning peak hour and 81 percent of the minimum threshold criteria in the evening peak hour, as shown in Figure 6. Therefore, upon completion of the PGA West development, the intersection of Madison Street and Avenue 58 will not warrant signalization. However, upon buildout of the General Plan, the projected volumes will exceed the peak hour volume warrants by a substantial margin. The event that will most likely trigger the need for signals at this intersection is the development of the Andalusia or Isle of Travertine sites.

As shown in Table 1, each of the three volume-based traffic signal warrants identify minimum threshold criteria for minor streets with either one-lane or two-lane approaches. The volumes exiting PGA West from the Winged Foot and Weiskopf gates are substantially lower than the minimum volumes required to justify signalization. All three of these low-volume access connections have current and future traffic volumes which represent between 17 and 54 percent of the minimum vehicular volume thresholds associated with Traffic Signal Warrants 1, 2, and 3, as shown in Figure 7. Therefore, not only are the peak hour volumes substantially lower than necessary to justify signalization, but the 8-hour volumes will never be sufficient to warrant signalization. Consequently, no change in the full-turn median openings or the existing traffic control is required in the near-term.

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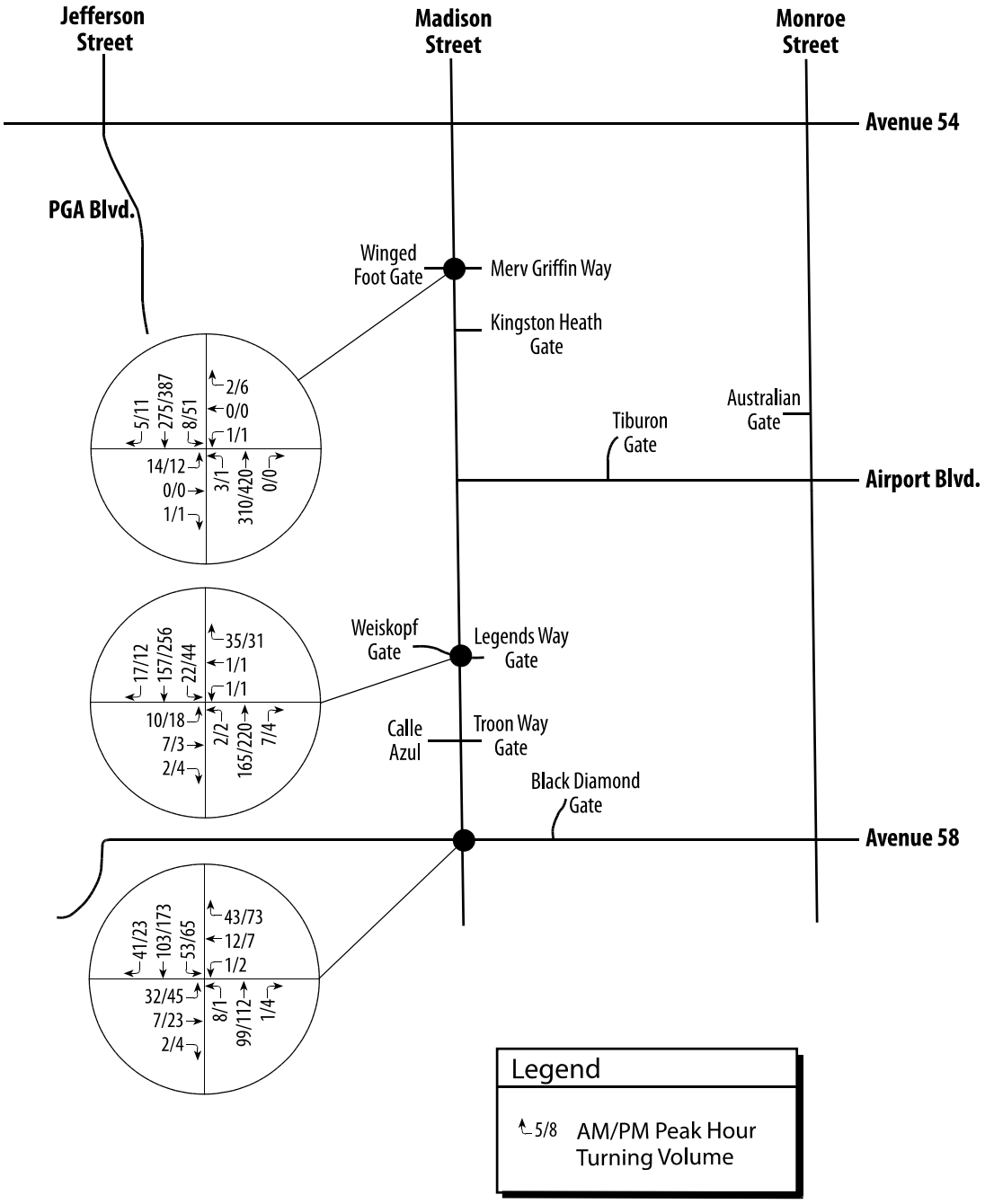
[2] Kell, James H., Iris J. Fullerton. *Manual of Traffic Signal Design*. Institute of Transportation Engineers. Prentice-Hall, Inc., Englewood Cliffs, New Jersey 07632. 1982.

Figure 4

Near-Term Traffic Projections
With PGA West Completed



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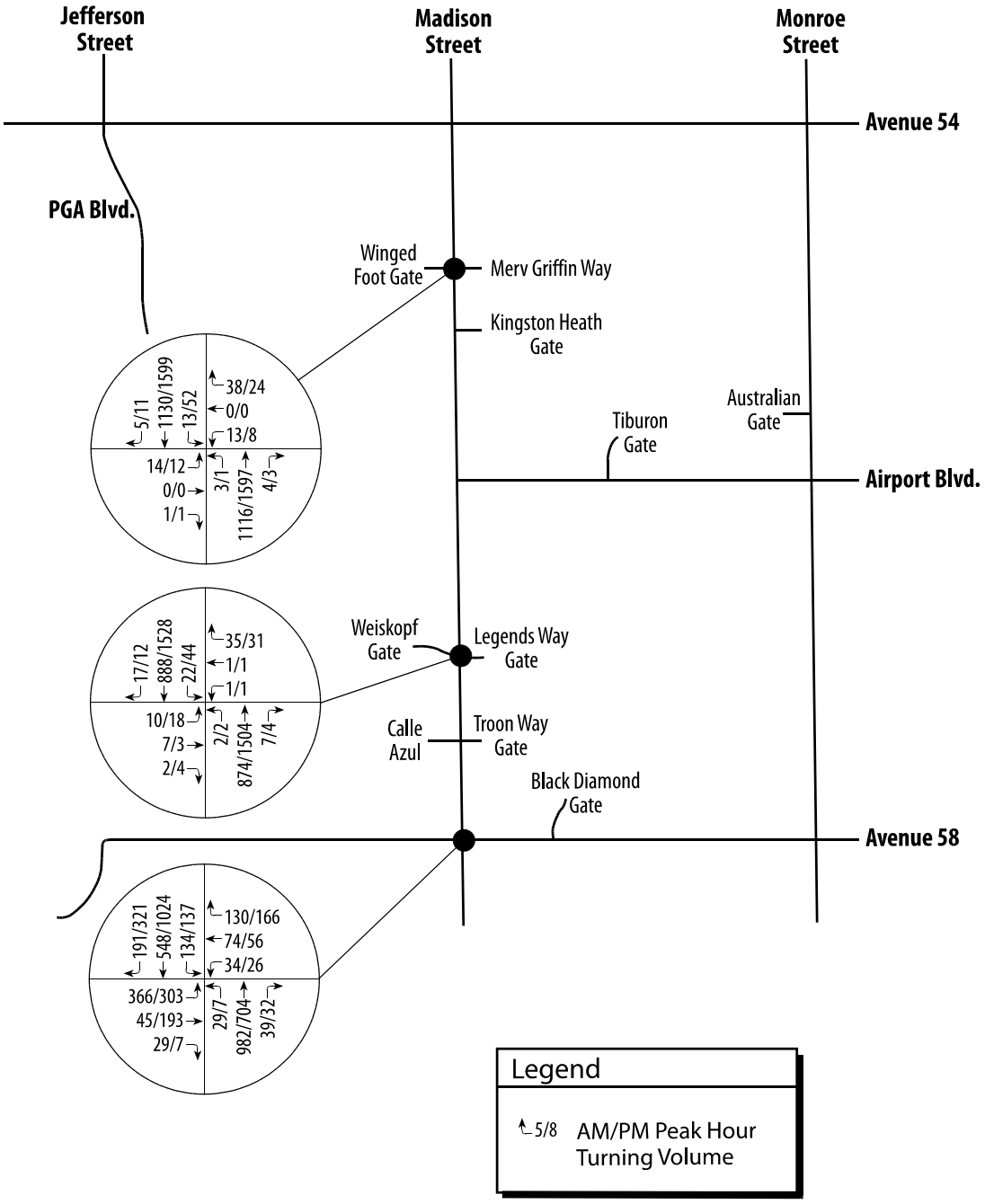
Scale: 1" = 2,545'

Figure 5

General Plan Buildout Traffic Projections
(With PGA West Completed)



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Scale: 1" = 2,545'

Figure 6
Portion of Peak Hour Signal Warrant Satisfied By
Peak Season Traffic Volume on Avenue 58 at Madison Street

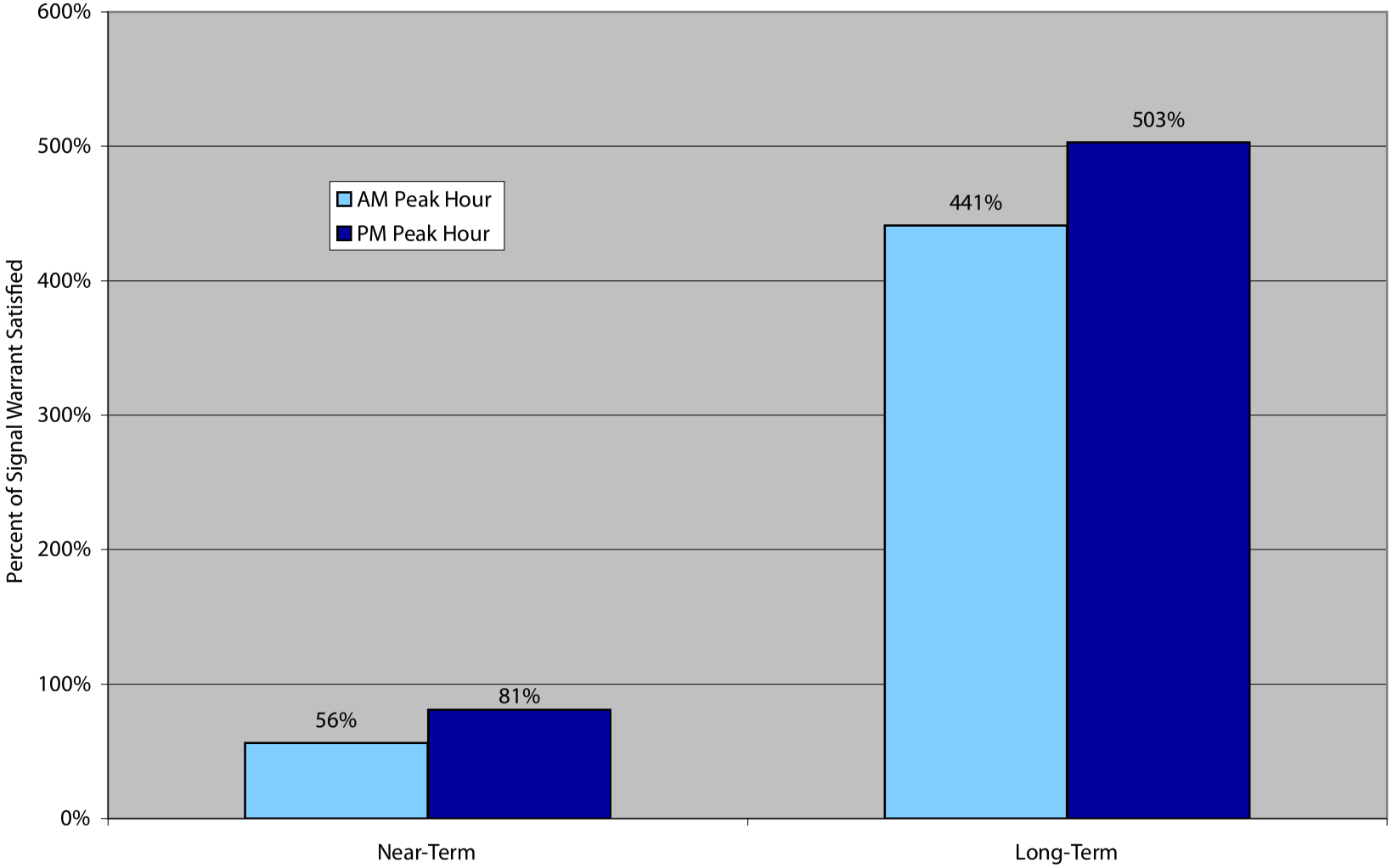
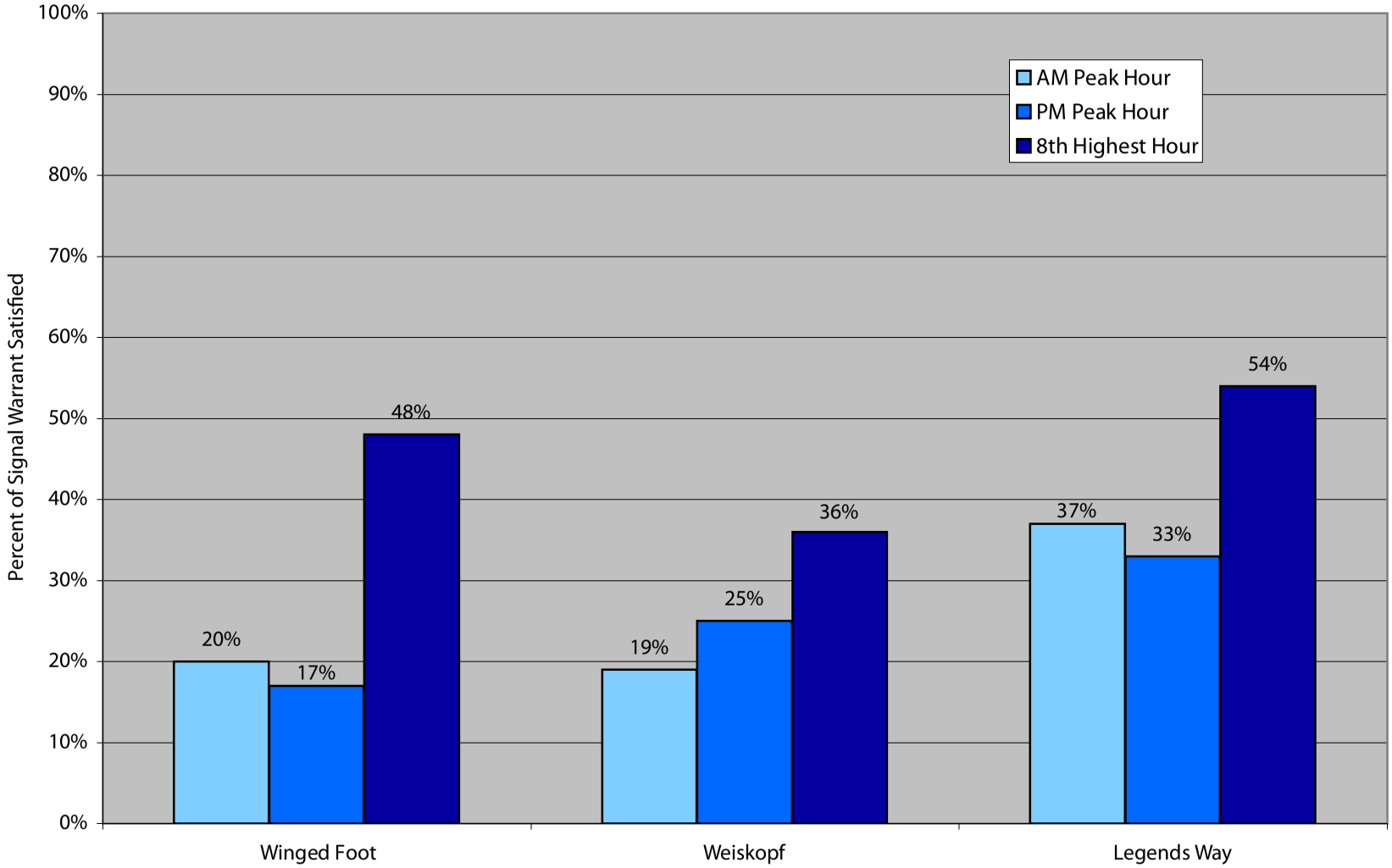


Table 1
Traffic Signal Volume Warrant Summary For The Minor Streets Intersecting Madison Street[a]
Adjacent To The PGA West Specific Plan

Minor Street Higher-Volume Approach Warrant Minimum Hourly Traffic Volume Required To Warrant Signalization		Winged Foot One-Lane Approach	Weiskopf/Legends Way Two-Lane Approach
Warrant 1	8th Highest Hourly Minimum Volume Required • 42 Vehicles For A Minor Street One-Lane Approach • 56 Vehicles For A Minor Street Two-Lane Approach	20 Vehicles/Hour Eastbound **Warrant Not Met**	20 Vehicles/Hour Eastbound[a] **Warrant Not Met**
Warrant 2	4th Highest Hourly Minimum Volume Required • 60 Vehicles For A Minor Street One-Lane Approach • 80 Vehicles For A Minor Street Two-Lane Approach	24 Vehicles/Hour Eastbound **Warrant Not Met**	28 Vehicles/Hour Eastbound[a] **Warrant Not Met**
Warrant 3	Peak Hour Minimum Volume Required • 75 Vehicles For A Minor Street One-Lane Approach • 100 Vehicles For A Minor Street Two-Lane Approach	43 Vehicles/Hour Eastbound **Warrant Not Met**	40 Vehicles/Hour Eastbound[a] **Warrant Not Met**

a. Since future traffic projections for Madison Street indicate that it will eventually satisfy the major street vehicular volume warrants, only the minor street warrants were evaluated based upon the 24-hour count data provided in Attachment A, with a 10 percent seasonal adjustment per EB #06-13.
b. The eastbound vehicles exiting the Weiskopf Gate were on the higher-volume approach because more than 90 percent of the vehicles exiting through the Legends Way Gate were making right turns onto Madison Street without disrupting through traffic on Madison Street.

Figure 7
Portion of Signal Warrant Satisfied by Peak Season Volume on
Minor-Street Approach at Madison Street



Traffic signal warrants have been established for special conditions that involve factors such as substantial numbers of pedestrians in a central business district, designated school crossings, coordinated signal systems, crash experience, roadway network considerations, and roadways near at-grade railroad crossings. However, the vast majority of traffic signals are installed based upon the three traffic volume warrants: (1) eight-hour vehicular volume, (2) four-hour vehicular volume, and (3) peak hour vehicular volume and delay. When asked if there is ever any justification for installing signals at an intersection where none of the numerical warrants are met, the FHWA issued the following statement :

> *"In the vast majority of cases, a signal should not be installed if the MUTCD signal warrants are not met. However, there can be very rare cases where the engineer's study finds no satisfaction of numerical warrants but finds other special conditions that cause him/her to conclude that a signal is the best solution (vs. other possible alternatives). An experienced and properly qualified traffic engineer has the ability to assess conditions and make this kind of a determination under the provisions of the MUTCD. Section 4C.01 says a signal should not be installed unless one or more of the warrants are satisfied. That's a "should not" rather than a "shall not", for the very reason discussed above. The decision and the engineering reasons for it should be clearly documented in the study. It is important to note that a politically dictated unwarranted signal installation (typically against the professional advice of the traffic engineer) is not what is contemplated by the MUTCD language."*[3]

Future Operational Impacts

Operational effects include primarily the peak hour delay incurred by future traffic on the approaches of the minor cross streets to Madison Street. The City of La Quinta has a TWSC intersection minimum performance standard of LOS "E" for the minor-street approach. Unacceptable levels of traffic delay have been established by the City of La Quinta as exceeding 50 seconds per vehicle on the minor-street approach.

No near-term operational or traffic safety deficiencies were identified at any of the three intersections evaluated, assuming no change in the existing traffic control or median openings along Madison Street. As shown in Table 2, all three of these intersections are projected to continue to operate efficiently in the peak hours of the peak season, following buildout of the PGA West Specific Plan (near-term condition).

Without mitigation, the control delay at all three unsignalized intersections will exceed the City of La Quinta minimum performance standards upon buildout of the General Plan. With the existing AWSC, the intersection of Madison Street with Avenue 58 will operate at LOS F in the peak hours. The projected growth in the traffic volume on Madison Street will eventually cause the level of service for the minor-street through and left-turn movements to drop to an unacceptable level with the existing intersection control and median opening configuration. Without mitigation, the minor-street approach delay will range from 54.2 to 825 vehicle-seconds in the peak hours upon buildout of the General Plan. This indicates LOS F conditions with excessive and unacceptable delays on the minor-street approaches.

[3] http://mutcd.fhwa.dot.gov/knowledge/faqs/faq_part4.htm

Table 2
Future Levels of Service
Upon Buildout of the PGA West Specific Plan

Intersection-Scenario	Traffic Control	Level of Service[a] AM Peak	PM Peak
Near-Term Condition			
Madison Street @			
- Winged Foot/Merv Griffin Way	TWSC	B	C
- Weiskopf/Legends Way	TWSC	B	B
- Avenue 58	AWSC	A	A
Long-Term Condition			
Madison Street @			
- Winged Foot/Merv Griffin Way	TWSC	F	F
- Weiskopf/Legends Way	TWSC	F	F
- Avenue 58	AWSC	F	F

a. LOS A occurs at control delays which are less than or equal to10 seconds per vehicle. LOS B occurs when control delays exceed 10 but are less than 15 seconds per vehicle. LOS C occurs when the control delay is greater than 15 but less than 25 seconds per vehicle. Minor-street control delay in excess of 50 seconds per vehicle during the peak hour is considered LOS F (unacceptable) operation.

Analysis of Alternatives

Even if one or more of the signal warrants has been satisfied, consideration should be given to providing alternatives to traffic signals because vehicular delay and the frequency of some types of collisions can be greater with signals than with STOP sign control. Of all the alternatives to traffic signal control identified in Section 4B.04 of the CA MUTCD, three were initially considered for the intersections of interest. These included the following.

- Restricting one or more turning movements if alternate routes are available.
- Installing all-way STOP sign control if the warrant is satisfied.
- Installing a roundabout intersection.

Range of Treatment Options

Roundabouts

The geometric and right-of-way requirements make a roundabout infeasible at this location. A roundabout with one circulating lane can only accommodate a circulating flow of up to 1,200 vehicles per hour. The future traffic projections for Madison Street upon buildout of the General Plan would exceed the capacity of a roundabout with one circulating lane. Therefore, a roundabout with two circulating lanes would be required to accommodate the future traffic demands projected for Madison Street. A roundabout with two circulating lanes would be a major project requiring right-of-way acquisition in an area which already developed. It could be problematic at gated entries to developments where the queue of vehicles awaiting entry through a gated access could extend into the roundabout. The provision of bicycle facilities at a roundabout could also be a challenge. The adjacent land is developed and insufficient right-of-way exists along Madison Street at these two

intersections to accommodate a roundabout with two circulating lanes. The recommended median modifications along Madison Street would not require additional right-of-way.

All-Way Stop Control (AWSC)

Residents often request the installation of STOP signs in their communities to slow traffic and/or make side street access easier and safer. However, STOP signs are a substantial inconvenience to all motorists entering an intersection and dramatically increase the overall control delay. When traffic flows on the major street are impeded, an increase in the frequency of rear-end accidents is likely to occur. Where used excessively, STOP signs have been found to lose their effectiveness. Too many STOP signs in an area can result in fewer motorists consistently obeying the STOP sign controls at critical intersections. The result tends to be an increase in accident frequency.

All-way stop control can reduce right-angle crashes and turning collisions at unsignalized intersections as well as reduce through and turning speeds. However, AWSC is suitable only at intersections with moderate and relatively balanced volumes on the intersection approaches. The traffic demand associated with the two minor cross streets being studied is much less than the traffic demand on Madison Street, and will remain low in the future. This imbalance makes AWSC at these intersections unlikely to be an appropriate traffic control option.

The CA MUTCD identifies several criteria for the installation of all-way stop control (AWSC). All-way stop-control warrants require the combined volume entering the intersection from both minor street approaches to average at least 140 vehicles per hour during eight hours on an average day. In the peak hour, the combined approach volume on the minor streets never exceeds 87 vehicles at the intersections along Madison Street being studied. Neither intersection is close to meeting the CA MUTCD warrants for all-way stop-control. With AWSC, a peak hour level of service failure will eventually occur at these intersections, when the future traffic volumes on Madison Street increase to levels above approximately 15,000 vehicles per day. Therefore, AWSC is not an appropriate traffic control device on Madison Street at either the Winged Foot or Weiskopf gate.

Traffic Signals

The CA MUTCD requires a traffic engineering study evaluating the warrants and related factors to determine if a traffic control signal is justified. Where justified, traffic control signals alternately assign the right of way along the major street to various road users (vehicular, pedestrian, bicyclists, golf cart movements). Traffic signals would interrupt heavy traffic flows at intervals to permit cross traffic to either turn left onto or cross Madison Street. That would make it easier for residents and service providers to move between the portion of the adjacent PGA West community on one side of Madison Street and the community and associated amenities on the opposite side.

If warranted, properly located, designed, installed, and maintained, traffic signals could improve the convenience of access for the adjacent residents, service providers, and others who visit the adjacent community less frequently. The interruption of the northbound and southbound traffic flow on Madison Street would reduce the potential for conflicts between some minor-street vehicle movements, thereby reducing the frequency of certain types of crashes (especially right-angle crashes). If properly spaced and coordinated, traffic signals may also provide an opportunity in the future to provide for the continuous movement of platoons of traffic at a definite speed along Madison Street.[4] This could increase the

[4] Pline, James L., Wolfgang S Homburger, Walter H. Kraft. *Traffic Engineering Handbook*. Sixth Edition. Institute of Transportation Engineers. Washington, DC 20005. 2010. pp. 403.

frequency and length of the gaps in the flow of through traffic on Madison Street within which motorists waiting on unsignalized minor cross streets can complete their turning movements.

Traffic signals can improve access, but can also have drawbacks that should be considered, such as:

- increased delay;
- increases in the frequency of crashes (especially rear-end crashes);
- increased congestion (when poorly spaced or improperly timed);
- increases in the use of parallel routes by motorists attempting to avoid the signals;
- reduced intersection capacity; and
- increased costs associated with the long-term operation and maintenance of the traffic signal equipment.

Signalization was examined as an alternative treatment option, even though signal warrants were not satisfied at two of the three intersections studied. This was done in an effort to more clearly convey the effect of traffic signals on traffic operations and safety at these intersections compared to the maintaining the existing conventional median opening or constructing a directional median opening. The evaluation of the operational effects associated with the signalized treatment option is not intended to imply an endorsement of installing traffic signals on Madison Street at either Winged Foot or the Weiskopf/Legends Way gates, since traffic signal warrants were not satisfied at these intersections.

Median Treatments

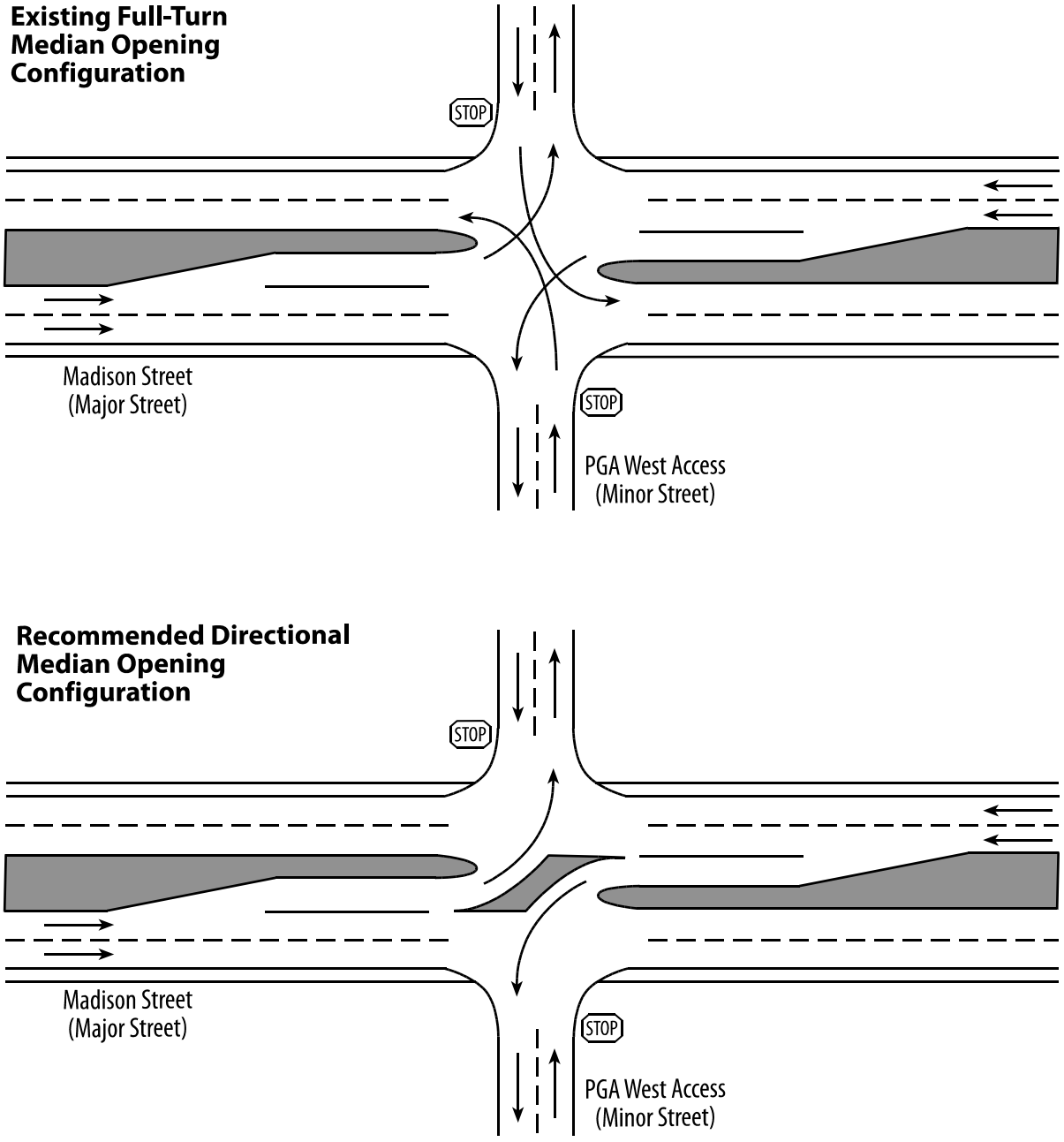
With the existing two-way stop control and full-turn median openings on Madison Street, the two unsignalized PGA West access intersections of interest will operate at acceptable levels of service and control delay only until growth in the area causes the daily traffic volumes on Madison Street to increase to approximately 15,000 to 20,000 vehicles per day (375 to 500 vehicles per hour per lane). At that point, there will be an insufficient number of simultaneous gaps in the northbound and southbound streams of traffic on Madison Street that are long enough to permit residents of the adjacent community to cross Madison Street or turn left onto Madison Street from the minor cross streets. Not only will the minor-street approaches operate at an unacceptable level of service (LOS F) with excessive delay during the peak hours by that time, but the frequency and severity of collisions would likely increase noticeably. This level of minor-street control delay would not meet the applicable City of La Quinta minimum intersection performance standards.

If no change is made to the existing full-turn median openings on Madison Street, opposite Winged Foot and the Weiskopf/Legends Way gates, both traffic operations and safety would be adversely affected before the daily traffic volumes on Madison Street reach one-half of the levels expected upon buildout of the General Plan. A directional median opening design for Madison Street was identified as a treatment option for evaluation.

Figure 8 illustrates both the existing full-turn median opening and a directional median opening design for the unsignalized PGA West access connections on Madison Street. The number of conflict points at each access intersection would decrease from 32 points to 12 with the proposed median treatment. A directional median like the one shown in Figure 8 would permit left-turn movements from Madison Street to enter the adjacent PGA West community, but eliminate the problematic minor-street left-turn and through movements at these four-leg intersections. The median modification shown would replace the minor-street through and left-turn movements with a right-turn followed by a U-turn at the adjacent downstream median opening or intersection.

Figure 8

Existing and Recommended Median Opening on Madison Street



Endo Engineering

Schematic

The time required for a motorist to make a right turn onto Madison Street followed by a U-turn at the next median break and return to the minor cross street intersection was quantified by Counts Unlimited, Inc. for the two unsignalized PGA West access intersections on Madison Street. A vehicle beginning a right turn from the Winged Foot approach onto southbound Madison Street required an elapsed time of 47 seconds to make the right turn, weave into the inner lane and enter the southbound left-turn lane in the median, then make a U-turn at the unsignalized Kingston Heath intersection and return to Winged Foot in the northbound through lanes on Madison Street. As expected, the longer indirect right-turn/U-turn maneuver required to travel from the Weiskopf gate to Calle Azul and back results in a longer indirect travel time when starting from the Weiskopf gate (57 seconds).

Minor-Street Approach Delay

Table 3 summarizes the effect of three alternative treatment options on the delay experienced by a vehicle turning left from the PGA West access onto Madison Street. The three scenarios evaluated include: (1) the existing configuration, as shown in Figure 8; (2) the unsignalized directional median opening configuration shown in Figure 8; and (3) the existing full-turn median opening configuration with traffic signals installed. In the near-term, the left-turn delay per vehicle is the lowest with the existing configuration at these intersections. In the long term, the increased traffic volume on Madison Street will dramatically increase the delay experienced by each vehicle turning left from the minor street. Since Winged Foot has only one eastbound approach lane, an increase in delay for any eastbound movement translates into an increase in average approach delay for all vehicles traveling eastbound in the peak hours at this location.

Figures 9 and 10 illustrate the effect of each alternative treatment at the Winged Foot gate and the Weiskopf gate. As shown therein, the existing control is clearly the best solution for minor-street vehicles turning left onto Madison Street today. However, the "do nothing" strategy represents the worst solution in the future at both of these intersections.

The future left-turn delay experienced by vehicles exiting the PGA West development with an unsignalized directional median opening would be slightly greater than the projected delay with a traffic signal, as shown in Figures 9 and 10. However, a traffic signal would also introduce control delay for northbound vehicles entering PGA West at both the Weiskopf and Winged Foot gates, which is not shown in Figures 9 and 10. Those vehicles making a left turn from Madison Street into the site would experience an average delay of approximately 43 seconds per vehicle. By comparison, an unsignalized directional median opening would result in 8 to 14 seconds of delay per vehicle turning left into the PGA West access gates from Madison Street, as shown in Attachment B.

Overall Intersection Delay

Table 4 provides a comparison of the overall intersection delay at each of the two PGA West access intersections on Madison Street with the same three treatment alternatives addressed in Table 3. Since a traffic signal will introduce delay for the high-volume through movements on Madison Street, the total intersection delay from all movements combined would be greatest with traffic control signals.

Figures 11 and 12 illustrate the effect of each alternative treatment on overall intersection delay at the Winged Foot gate and the Weiskopf gate, respectively. In the near-term, the lowest overall delay occurs with the existing median opening and TWSC. Upon buildout of the General Plan, however, the directional median with TWSC results in substantially less delay than the other alternatives. From a traffic operations perspective, the directional median opening with TWSC is the superior treatment alternative upon buildout of the General Plan.

Table 3
Weekday Peak Hour Left-Turn Delay Per Vehicle For
PGA West Traffic Exiting Onto Madison Street
By Alternative Traffic Control Treatment

Intersection-Scenario	Two-Way Stop Control Existing Median Opening (Seconds Per Vehicle)	Two-Way Stop Control Indirect Right/U-Turn (Seconds Per Vehicle)	Traffic Control Signal Full-Turn Median Opening (Seconds Per Vehicle)
NEAR-TERM CONDITION			
Winged Foot Gate			
- AM Peak Hour	13.2	47	44.8
- PM Peak Hour	18.4	47	44.5
Weiskopf Gate			
- AM Peak Hour	11.9	57	44.7
- PM Peak Hour	14.7	57	45.5
LONG-TERM CONDITION			
Winged Foot Gate			
- AM Peak Hour	95.6	50	44.6
- PM Peak Hour	634.9	54	44.4
Weiskopf Gate			
- AM Peak Hour	54.2	60	45.5
- PM Peak Hour	825.0	63	45.1

Note: The delay associated with the through and left-turn movements from the Legends Way Gate would be similar to that shown for the Weiskopf Gate, but includes the time required for the mechanical opening of the gate at Troon Way.

Figure 9
Peak Hour Delay Per Vehicle Turning Left Onto Madison Street
From PGA West At Winged Foot

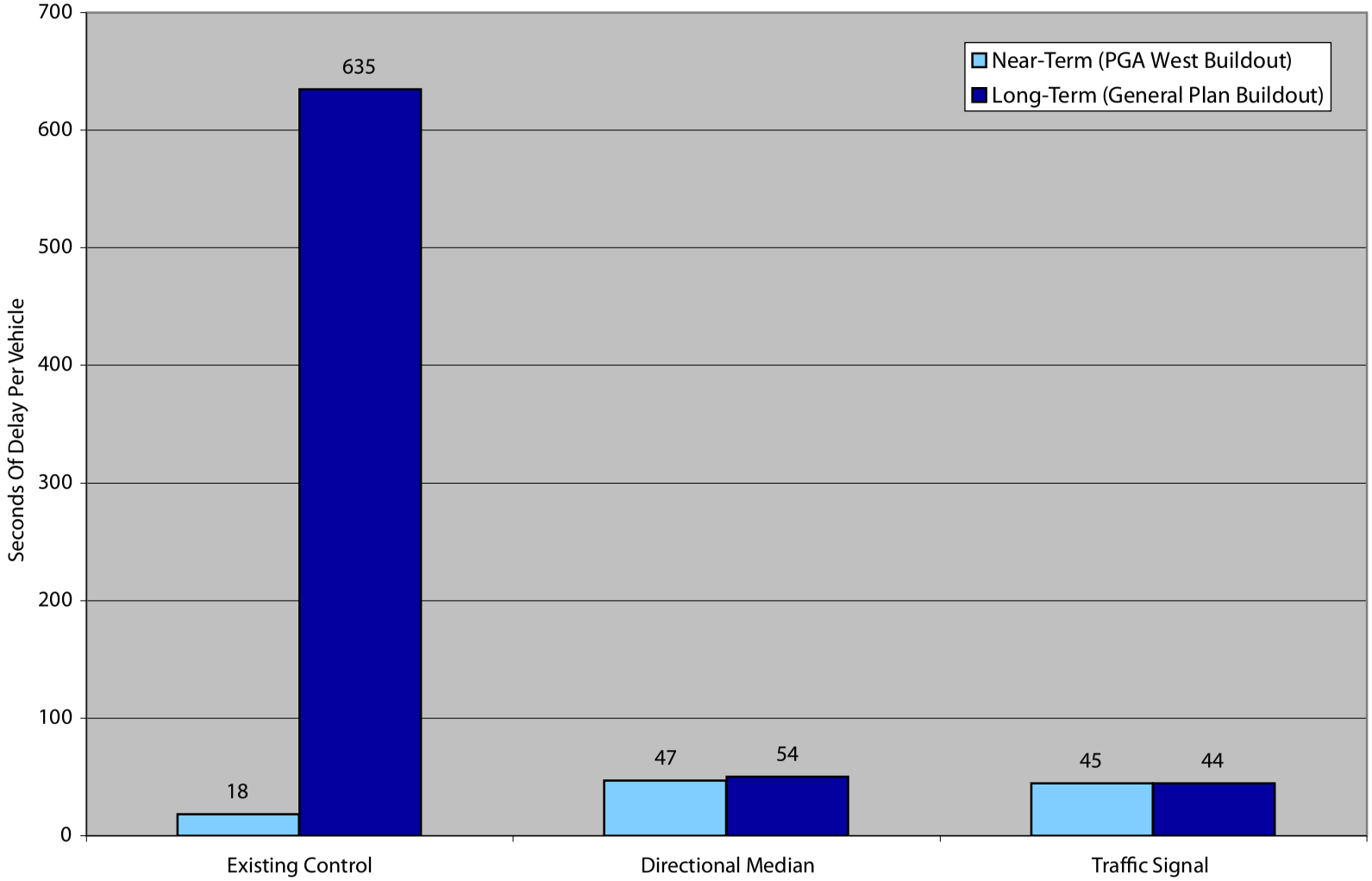


Figure 10
Peak Hour Delay Per Vehicle Turning Left Onto Madison Street
From PGA West At Weiskopf

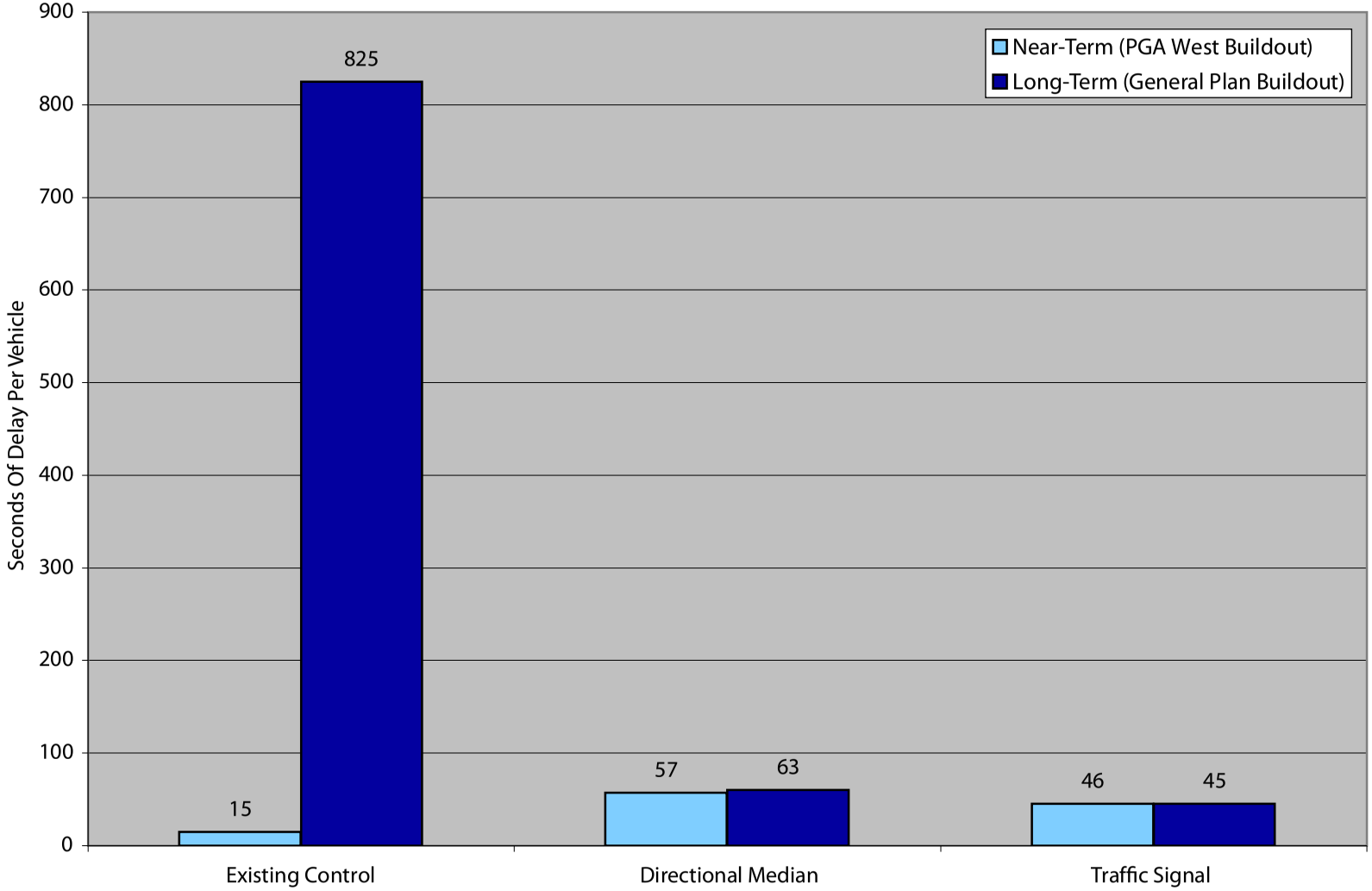


Table 4
Overall Intersection Delay in the Peak Hour
By Alternative Traffic Control Treatment[a]

Intersection-Scenario	Two-Way Stop Control Existing Median Opening[b] (Vehicle-Minutes)	Two-Way Stop Control Indirect Right/U-Turn[c] (Vehicle-Minutes)	Traffic Control Signal Full-Turn Median Opening[d] (Vehicle-Minutes)
NEAR-TERM CONDITION			
Winged Foot Gate			
- AM Peak Hour	5.3	15.2	56.6
- PM Peak Hour	12.6	20.0	105.2
Weiskopf Gate			
- AM Peak Hour	12.5	29.5	52.7
- PM Peak Hour	17.0	36.8	83.8
LONG-TERM CONDITION			
Winged Foot Gate			
- AM Peak Hour	54.2	28.6	227.3
- PM Peak Hour	222.1	36.2	430.3
Weiskopf Gate			
- AM Peak Hour	28.7	33.6	171.8
- PM Peak Hour	325.4	49.6	390.6

a. The values shown with underlining represent the alternative treatment with the lowest overall delay.
b. The delay with the existing median opening and TWSC was determined from the HCS worksheets included in the Appendix.
c. The intersection delay for this alternative includes the delay associated with the indirect travel to and from the median opening where the U-turn will occur as well as the delay associated with each U-turn.
d. The overall intersection delay with traffic control signals includes delay associated with vehicles making through movements on Madison Street.

Figure 11
Overall Peak Hour Delay At Madison Street/Winged Foot Intersection

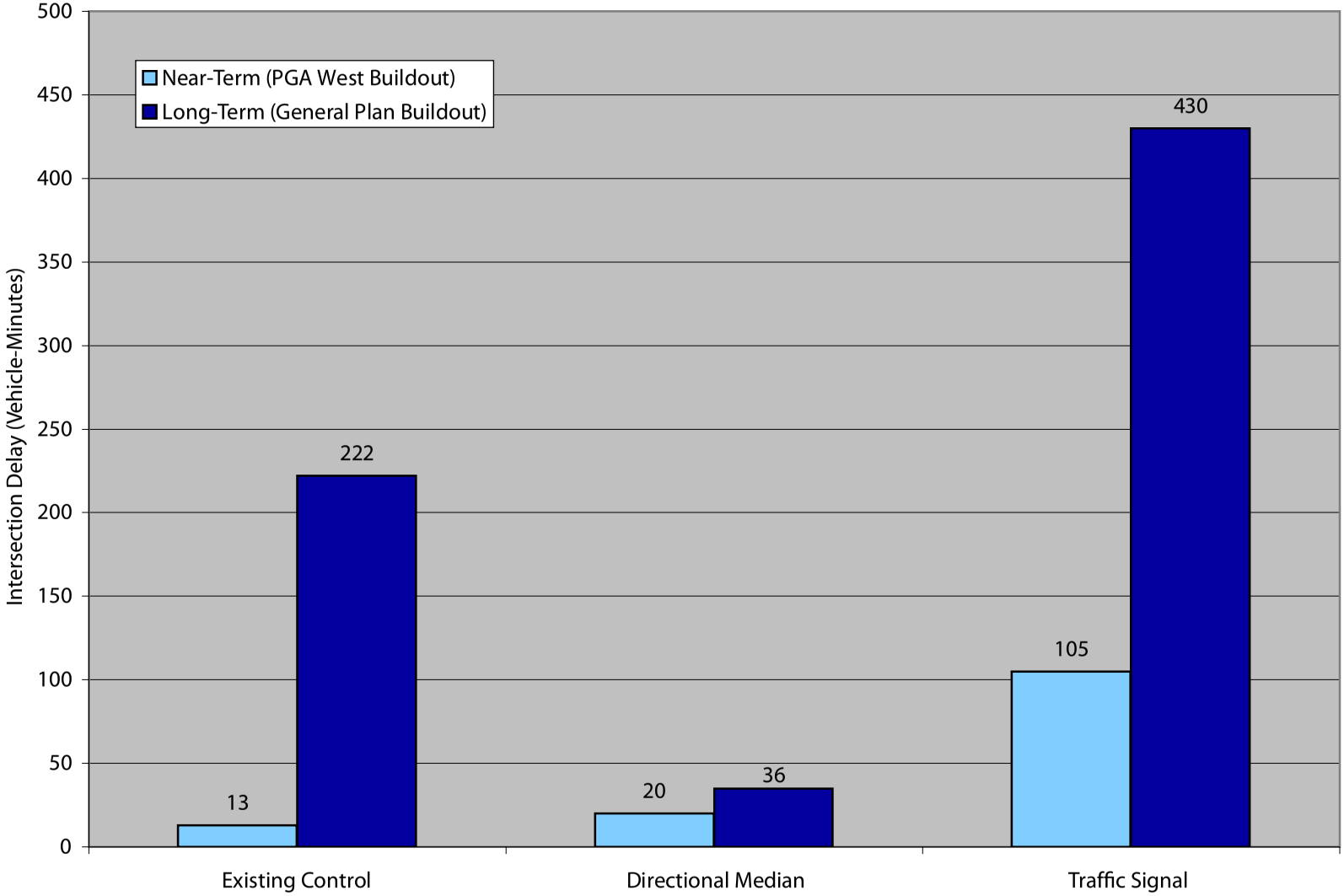
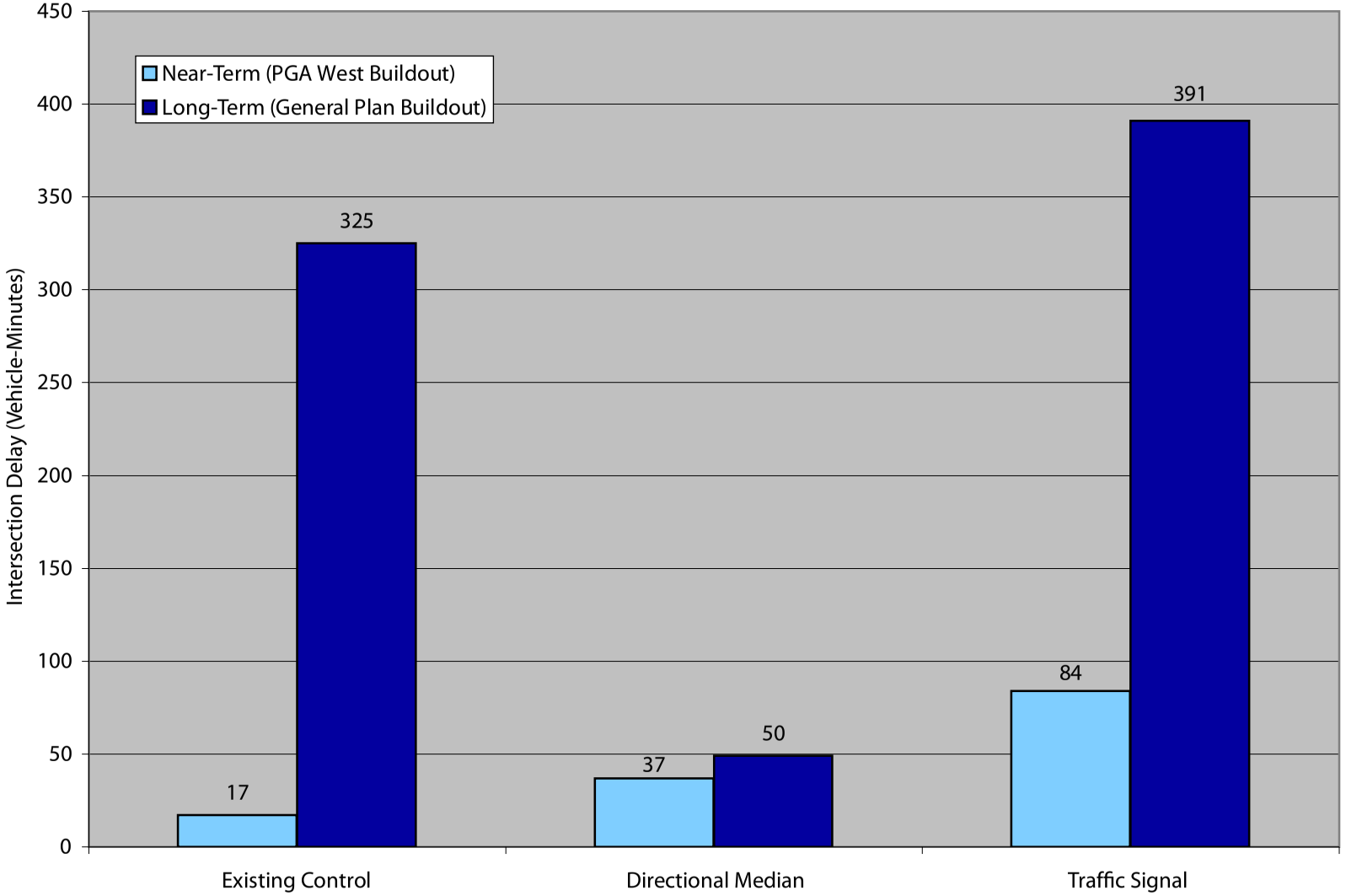


Figure 12
Overall Peak Hour Delay At The Madison Street/Weiskopf Intersection



Safety Performance

The safety of traffic exiting PGA West and crossing or turning left onto Madison Street was the prime consideration in recommending the median modifications on Madison Street. The relative safety of median openings on Madison Street is related to the number of potential traffic conflict points between vehicles (crossing vehicle paths, diverge points and merge points). As shown in Table 5, the number of vehicle-vehicle conflict points would be reduced substantially with the recommended median opening configuration. The existing median openings at the four intersections shown involve 87 conflict points at present. Following the proposed median modifications at two of these intersections, the number of conflict points drops to 47, which should result in improved safety along Madison Street.

Accidents related to left-turn and U-turn maneuvers at unsignalized median openings occur very infrequently. In urban arterial corridors, unsignalized median openings experienced an average of 0.41 U-turn plus left-turn accidents per median opening per year. The corresponding rate for rural arterial corridors was an average of 0.20 U-turn plus left-turn accidents per median opening per year. Based on these accident frequencies, there is no indication that U-turns at unsignalized median openings constitute a major safety concern.

Lower accident rates can be achieved by implementing various strategies. Limiting the number of conflict points will reduce accidents because drivers facing complex driving situations created by numerous conflicts make more mistakes and are more likely to have collisions. Separating the conflict areas allows drivers more perception and reaction time to address each potential set of conflicts before facing another. Simplifying the driving task contributes to improved traffic operations and fewer collisions.

The proposed improvements would replace the existing left-turn and through movements from the cross streets with a sequence of right-turn followed by U-turn movements. Numerous traffic studies have examined the traffic safety effects of similar modifications.

NCHRP Report 420: *Impacts of Access Management Techniques* indicates that eliminating direct left turns from driveways and replacing them with right-turn/U-turn maneuvers results in a 20 percent reduction in accident rate. The *Access Management Manual* (TRB, 2003) states that U-turns are generally safer than direct left-turns on multi-lane arterial roadways with a non-traversable median. The analysis of 250 sites in Florida in the year 2000 revealed that right-turn/U-turn maneuvers on six-lane arterials exhibited a 17.8 percent lower crash rate and 27.3 percent lower injury/fatality rate than direct left turns under high-volume conditions at a 95 percent confidence level.

NCHRP Report 524: *Safety of U-turns at Unsignalized Median Openings* quantifies accident rates for various intersection configurations. Four-legged intersections with conventional median openings such as those on Madison Street at Winged Foot/Merv Griffin Way and at Weiskopf/Legends Way, exhibit an accident rate of 3.34 accidents per million turning vehicles. Three-legged intersections with conventional median openings such as the median opening on Madison Street at Kingston Heath, exhibit an accident rate of 2.46 accidents per million turning vehicles. Four-legged intersections with directional median openings like Madison Street at Calle Azul and proposed for Madison Street at Winged Foot/Merv Griffin Way and at Weiskopf/Legends Way, exhibit a lower accident rate of 2.57 accidents per million turning vehicles.

The proposed intersection improvements will divert the left-turn traffic from intersection configurations with higher accident rates to intersection configurations with lower accident rates. All of these studies are generally consistent with expectation of a 20 percent reduction in accident rates with the proposed directional median opening when compared to the existing full-turn median opening.

Table 5
Relative Safety of Median Openings On Madison Street
Based Upon Number of Potential Traffic Conflict Points[a]

Scenario	Number of Potential Vehicular Conflict Points At Each Median Opening[b]				
	Winged Foot/ Merv Griffin Way	Kingston Heath	Weiskopf/ Legends Way	Calle Azul	Total
Existing Medians	32	11	32	12	87
Recommended Median Modification	12	11	12	12	47
Reduction With Median Modification	-20	No Change	-20	No Change	-40

a. Source: Potts, Ingrid B., Douglas W. Harwood, Darren J. Yorbic, and Karen R. Richard. *Safety of U-Turns at Unsignalized Median Openings,* NCHRP Report 524, National Coorperative Highway Research Program. Transportation Research Board, Washington, D.C., 2004.

b. The number of potential vehicle-vehicle conflict points shown includes crossing vehicle paths, diverge points, and merge points. It does not include potential pedestrian-vehicle conflict points or bicycle-vehicle conflict points at these intersections.

Several studies including NCHRP Report 420 have found that both the number of crashes and crash rates increase as the number of traffic signals increases. As shown in Table 6, the installation of traffic signals typically results in an increase in overall accident rates, a significant increase in rear-end accidents, and a decrease in angle collisions. Signalized intersections usually exhibit less severity per accident.

Table 6
Caltrans Crash Rates[a]
(Per Million Entering Vehicles)

Intersection Type	Rural	Suburban	Urban
Four-Way Intersection			
- Signalized	0.98	0.77	0.54
- Unsignalized	0.40	0.42	0.32
T-Intersection			
- Signalized	0.49	0.47	0.37
- Unsignalized	0.26	0.26	0.17

a. Accident data on California State Highway, Caltrans, 1989, pg. 27.

Access Impacts

Both the master developer and the City of La Quinta share the responsibility of providing safe and efficient access for the PGA West Specific Plan. The PGA West community currently has reasonable access to the public street system through ten gates on five surrounding master planned public arterial streets. Madison Street is a public Primary arterial street that bisects the PGA West development and provides access to the community via five private access connections. Until recently, all five of these access connections were permitted direct full-turn access via conventional full-turn median openings.

The full-turn median opening on Madison Street at Calle Azul was recently modified to redirect problematic minor-street turning movements to nearby median breaks. This change was warranted for the same reasons discussed above for the directional median opening. However, the Puerta Azul development lacks the alternative access options available to the PGA West development.

The directional median opening treatment would redirect the movements with excessive delay and poor levels of service to intersections with better operational and safety performance characteristics. However, the directional median opening modifications would require a relatively minor amount of indirect travel on the same route and would maintain reasonable access to Madison Street. It would not represent a complete denial of access to any public street. Historically, governmental actions that affect left-turn access through the installation of a raised median have not required compensation.[5]

[5] Transportation Research Board of the National Academies. *Access Management Manual*. Washington, DC. 2003. pp 272-273.

The indirect right-turn/U-turn maneuvers required by a directional median opening opposite the Weiskopf gate would increase travel distance for the redirected left-turning vehicles by 0.46 mile per trip. In the peak hours, the average travel time required to complete this maneuver on Madison Street would be 57 seconds in the near-term and 60 to 63 seconds in the long-term. In the near-term, these increases in travel time and distance would make the access-related movements less convenient. However, PGA West residents will continue to have access to Madison Street from the Winged Foot gate and the Weiskopf/Legends Way gates. The PGA West residents would also have alternative access routes available using the fully improved internal street system to access the surrounding arterial streets.

Although golf carts have been observed crossing Madison Street at grade between the Weiskopf and Legends Way gates in the past, no golf carts were observed during the recent peak hour counts. The directional median would prevent these crossings of Madison Street at grade; however, two tunnels exist that would allow golf carts to pass under Madison Street.

Findings and Recommendations

The existing traffic controls at all three intersections evaluated are appropriate for existing and near-term traffic conditions upon buildout of the PGA West Specific Plan. Projected future traffic demands on Madison Street identified in the *City of La Quinta General Plan* will require mitigation at all three intersections evaluated if these intersections are to continue to meet the applicable City of La Quinta minimum intersection performance standards set forth in Engineering Bulletin #06-13.

Recommended PGA West Access Modifications

Future traffic volumes at the intersection of Madison Street and Avenue 58 upon buildout of the *City of La Quinta General Plan* will satisfy the traffic signal volume warrants in the CA MUTCD and signalization will be required at this intersection to meet the City of La Quinta minimum intersection performance standard. Therefore, traffic signals should be installed at the intersection of Madison Street and Avenue 58 when traffic signal warrants are met. Although KSL Land Corporation may be asked to participate in the funding of a traffic signal at this location, PGA West traffic travels primarily to/from the north and will represent approximately three percent of the traffic volumes projected for this intersection upon buildout of the *City of La Quinta General Plan*.

The future traffic volumes upon buildout of the *City of La Quinta General Plan* at the two PGA West access intersections evaluated on Madison Street will not meet the minimum traffic signal warrant thresholds. To avoid excessive delay on primary through routes, traffic signals should not be installed at locations where warrants are not satisfied. The most effective traffic control device is the least restrictive while still accomplishing the intended purpose. Traffic signals should be considered in the future only if one or more of the California MUTCD traffic signal warrants is met and a traffic engineering study determines that a traffic control signal is the appropriate traffic control device after less restrictive measures have failed to remedy the deficiency.

The City of La Quinta minimum intersection performance standard can be met at the unsignalized intersections along Madison Street at Winged Foot/Merv Griffin Way and at Weiskopf/Legends Way by modifying the existing full-turn median opening to prevent left-turn and through movements across Madison Street. The minor street through and left-turn movements can be replaced with right-turns followed by U-turns at the next median break. Therefore, it is recommended that the existing traffic control type at these two intersections

remain unchanged and the existing full-turn median openings be modified to prohibit future problematic minor street left-turn and through movements.

Effects of Indirect U-turns on Travel Time and Distance Traveled

The safety and travel time effects of the right-turn/U-turn maneuver are a function of the traffic volumes on Madison Street and the separation between the minor cross streets and the U-turn channel where the left-turns will be redirected. Increasing the separation distances increases indirect travel times but also provides more maneuvering space for drivers and allows longer queue storage lanes in the raised median on Madison Street.

In practice, motorists become impatient when gaps on the major street exceed one or two minutes and are apt to avoid direct left-turn egress from the minor street when delays become excessive. When arterial traffic exceeds 375 to 500 vehicles per hour per lane on a four-lane facility, the delays associated with single-stage left-turn egress from a minor cross road exceed those associated with the indirect right-turn/U-turn maneuver.

Figure 13 shows the operation of the recommended treatment at the Winged Foot gate. As shown therein, the redirected eastbound left-turn movements from the Winged Foot gate will turn right onto Madison Street and make a U-turn at the Kingston Heath intersection, approximately 0.20 mile to the south. Based upon timed travel runs by Counts Unlimited, Inc., this maneuver requires an indirect travel time of 47 seconds to complete and a total distance of 0.40 mile. In the future, the operational analysis indicates that this U-turn maneuver will require an average of 50 to 54 seconds to complete during the peak hours because of the increase in future northbound volumes on Madison Street. The number of vehicles that would be redirected by the recommended median modification is shown on Figure 13.

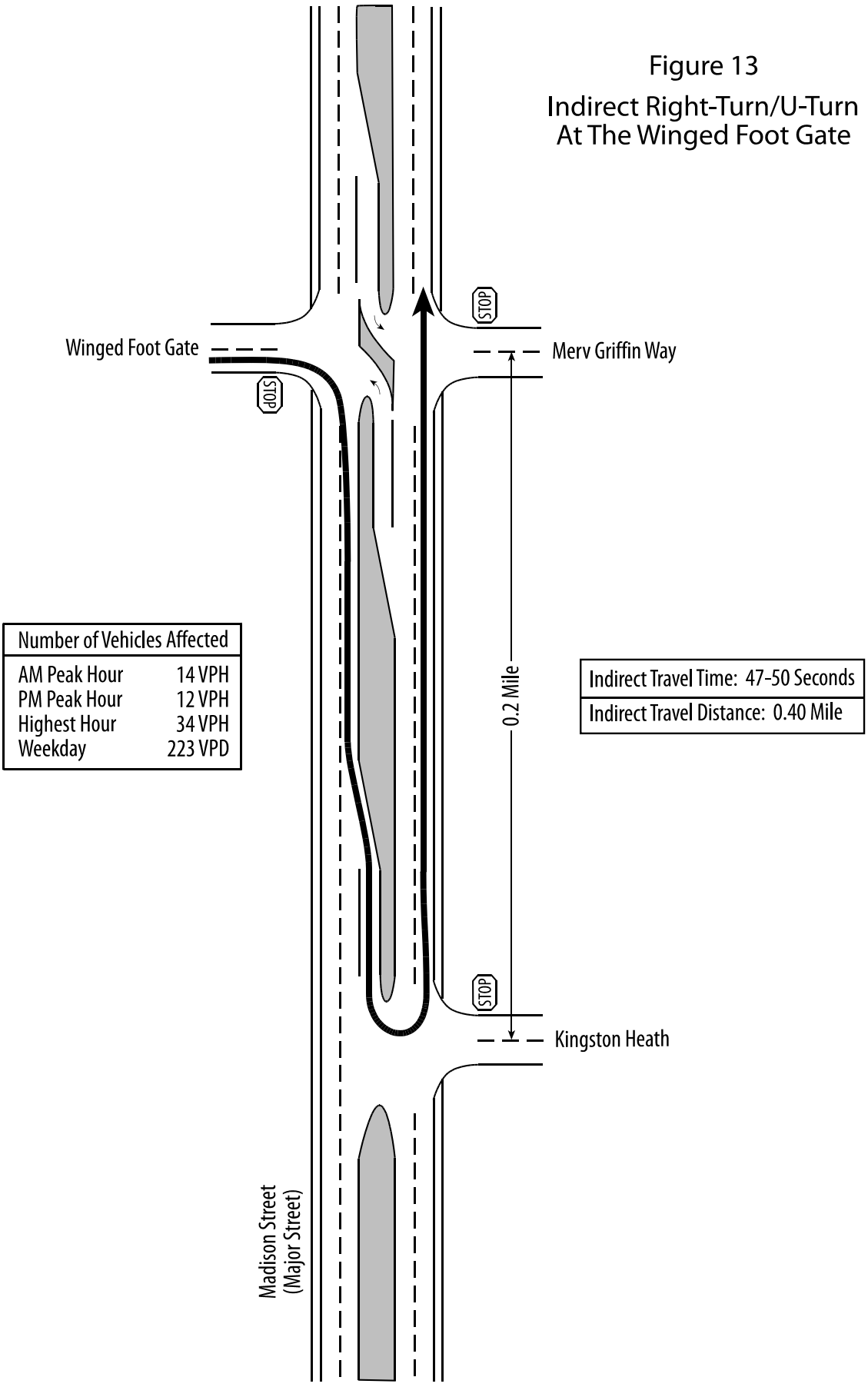
Figure 14 illustrates the operation of the recommended treatment at the Weiskopf gate. The redirected eastbound left-turn movements from the Winged Foot gate will turn right onto Madison Street and make a U-turn at Calle Azul, approximately 0.23 mile to the south. Based upon timed travel runs by Counts Unlimited, Inc., this maneuver requires an indirect travel time of 57 seconds to complete and a total distance of 0.46 mile. In the future, the operational analysis indicates that this U-turn maneuver will require an average of 60 to 63 seconds to complete during the peak hours, based on the increase in future northbound volumes on Madison Street. The number of vehicles that would be redirected by this recommended median modification is shown on Figure 14.

Figure 15 depicts the shortest of three possible paths available to westbound vehicles redirected from the Legends Way gate by the recommended median modifications. By turning south onto Troon Way before reaching the Legends Way gate, these vehicles can exit PGA West through the Troon Way gate. After turning right onto Madison Street, these vehicles can enter the northbound left-turn lane at Weiskopf and turn left into the Weiskopf gate or make a U-turn onto southbound Madison Street. The indirect travel time and distance is shown on Figure 15. The indirect travel time shown on Figure 15 includes 20 additional seconds for the opening of the Troon Way gate.

In addition to using the Troon Way Gate, the vehicles redirected from the Legends Way gate may use the Black Diamond Gate on Avenue 58 to obtain access to the south, or they may use the Legends Way gate and make a U-turn at Airport Boulevard. Figure 16 provides an overview that shows the distance between the intersections and the location of the redirected left-turn movements within the study area.

Figure 13

Indirect Right-Turn/U-Turn
At The Winged Foot Gate



Number of Vehicles Affected	
AM Peak Hour	14 VPH
PM Peak Hour	12 VPH
Highest Hour	34 VPH
Weekday	223 VPD

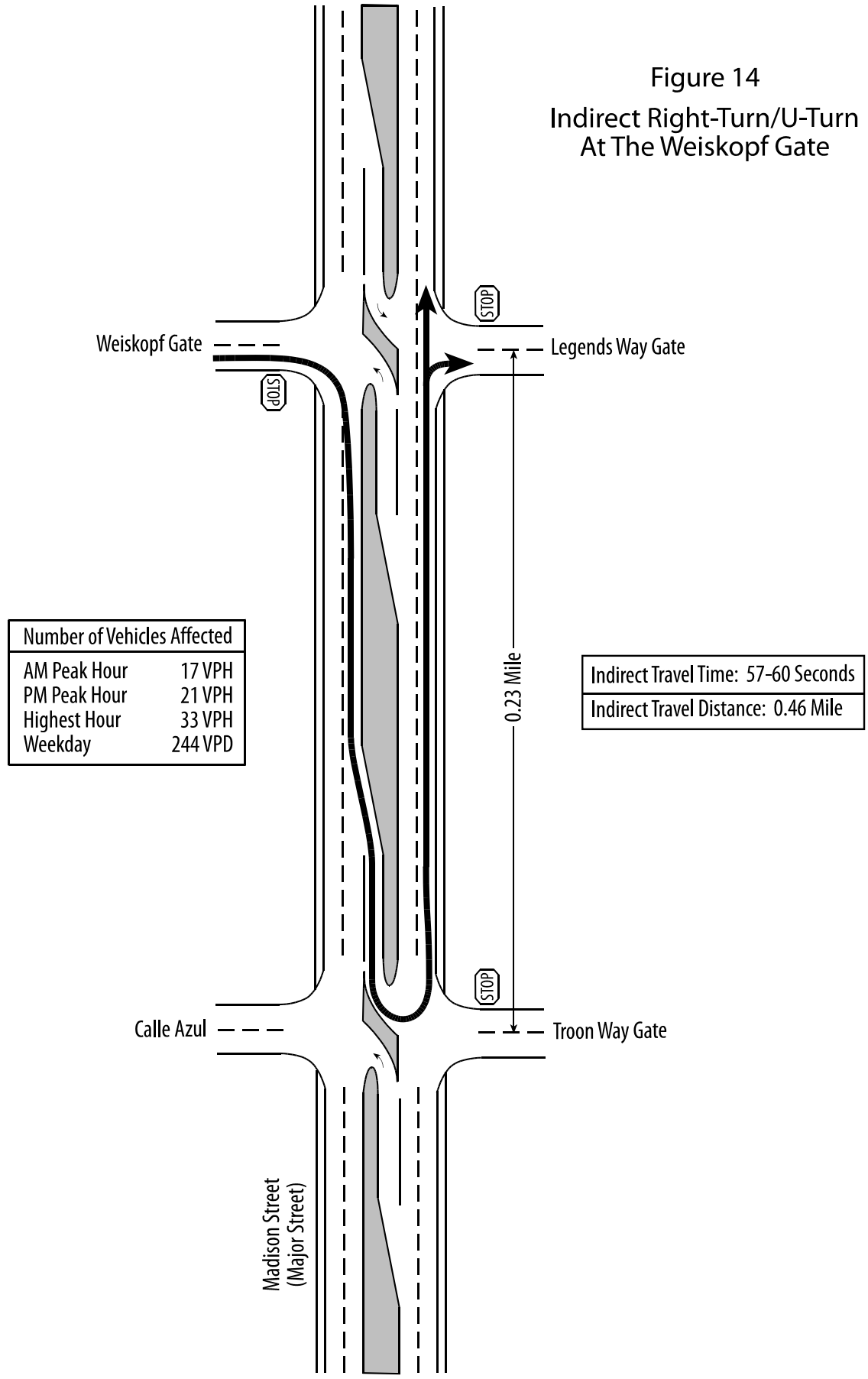
Indirect Travel Time: 47-50 Seconds
Indirect Travel Distance: 0.40 Mile

Endo Engineering

Schematic

Figure 14

Indirect Right-Turn/U-Turn
At The Weiskopf Gate



Number of Vehicles Affected	
AM Peak Hour	17 VPH
PM Peak Hour	21 VPH
Highest Hour	33 VPH
Weekday	244 VPD

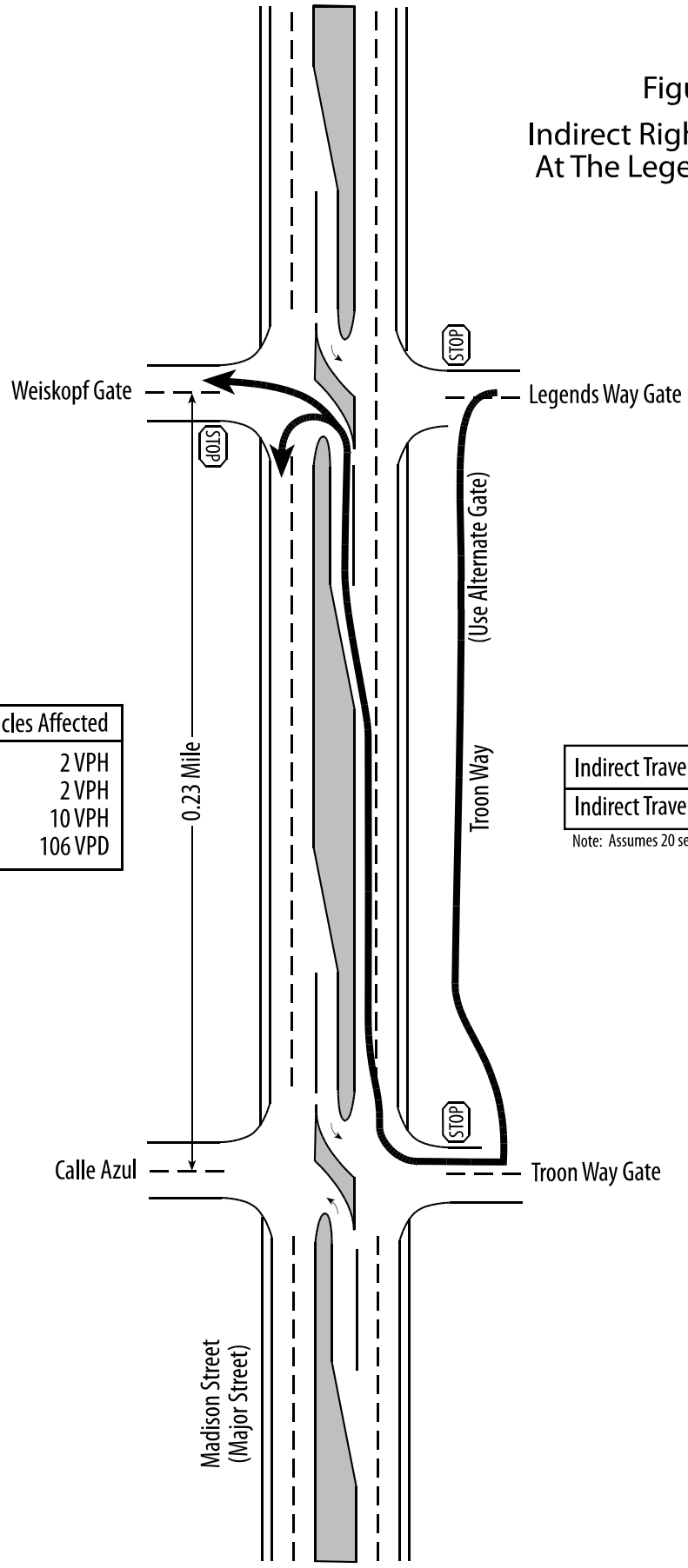
Indirect Travel Time: 57-60 Seconds
Indirect Travel Distance: 0.46 Mile

Endo Engineering

Schematic

Figure 15

Indirect Right-Turn/U-Turn
At The Legends Way Gate



Number of Vehicles Affected	
AM Peak Hour	2 VPH
PM Peak Hour	2 VPH
Highest Hour	10 VPH
Weekday	106 VPD

Indirect Travel Time: 82-86 Seconds
Indirect Travel Distance: 0.47 Mile

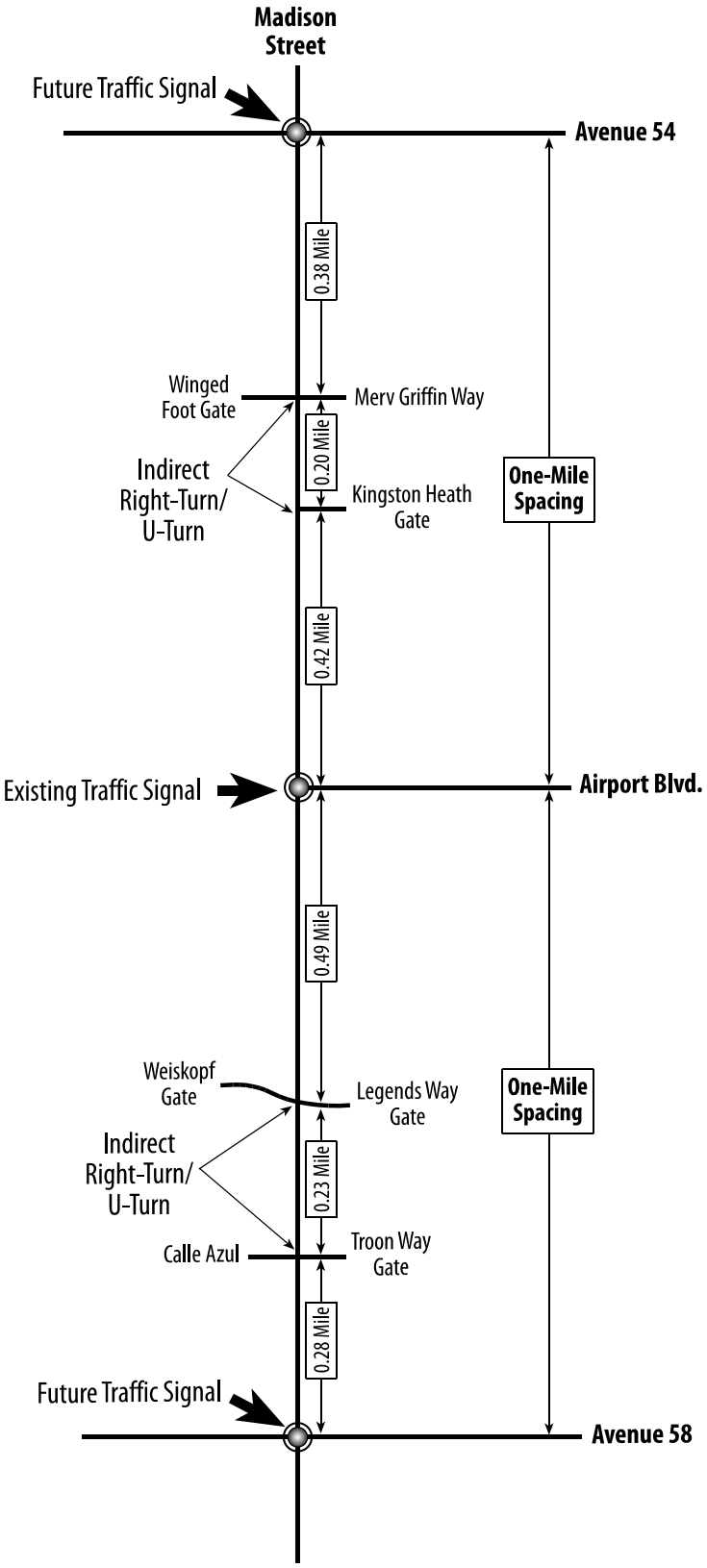
Note: Assumes 20 seconds to activate Troon Way Gate

Endo Engineering

Schematic

Figure 16

Intersection Spacing and Location of U-Turns



Endo Engineering

Schematic

Advantages of the Modifications Recommended

1. **Meets the City of La Quinta Intersection Performance Standard.** - The treatment recommended would ensure that both intersections continue to meet the City of La Quinta peak hour intersection performance standards in the future.

2. **Incorporates the Appropriate Intersection Traffic Control Type**. - TWSC with a directional median is the appropriate traffic control based upon consideration of all relevant factors, since future traffic volumes on the minor streets approaching these two intersections will never be sufficient to satisfy the applicable traffic signal volume warrants.

3. **Improves Traffic Safety** - The treatment recommended would improve the safety of both PGA West access connections on Madison Street when compared to signalized intersections and conventional full-turn median openings by reducing the number of conflict points, separating conflict areas, using the raised median to manage left-turn movements, and reducing interference with through traffic resulting from left turns out of PGA West.

4. **Reduces the Control Delay on Minor Street Approaches** – With the future long-term increases in traffic volumes on Madison Street, the recommended treatment would reduce the delay experienced by exiting PGA West traffic when crossing or turning left onto Madison Street.

5. **Reduces Overall Intersection Delay** - The treatment recommended would result in only a fraction of the overall vehicular intersection delay during the peak hours when compared to retaining the full-turn median openings and TWSC or signalizing the intersections at the Winged Foot/Merv Griffin Way access connection and at the Weiskopf/Legends Way access connection.

6. **Promotes Long Uniform Signal Spacing on Madison Street** - The recommended treatment would enhance the ability to locate signals to favor through movements and coordinate signals on Madison Street, between Avenue 54 and Avenue 58 by minimizing unwarranted traffic signals and allowing long and uniform signal spacing that would facilitate traffic progression.

7. **Consistent With Standard Engineering Practices** - The treatment recommended is the only treatment that would be consistent with all of the applicable criteria established in the CA MUTCD for identifying the appropriate intersection traffic control type as well as the accepted engineering procedures documented in other standard references employed nationwide by traffic engineers to determine the appropriate intersection traffic control type including:

    - the *Traffic Engineering Handbook (ITE;2010)*,
    - the *Manual of Transportation Engineering Studies* (ITE;2010)
    - the *Manual on Uniform Traffic Control Devices for Streets and Highways* (FHWA; 2009)
    - the *Manual of Traffic Signal Design* (ITE; 1982); and
    - the *Highway Capacity Manual* (Transportation Research Board; 2000).

Other Factors Considered

Warrant 7 (Crash Experience)

If five or more reported crashes of types susceptible to correction by a traffic signal occurred within a 12-month period in the future, and each crash involves personal injury or property damage apparently exceeding the applicable requirements for a reportable crash, the minor-street volumes for each of any eight hours of an average day would still be insufficient to satisfy Warrant 7 (Crash Experience). In addition, the intersection will require minimum minor-street approach volumes that are 80 percent of the 8-hour traffic signal volume warrant to satisfy Warrant 7. Based upon the available count data, neither PGA West access intersections on Madison Street will ever meet the minimum 8-hour volume requirement to satisfy Warrant 7 since the volume exiting the Winged Foot gate is 48 percent of the minimum threshold and the volume exiting the Weiskopf gate is 35 percent of the minimum threshold. Less restrictive measures (a directional median opening with TWSC) would be appropriate to remedy future safety deficiencies without the installation of traffic control signals.

Emergency Access/Response Time

The safety of motorists and residents must be assured. Therefore, appropriate access to and through the local street network must be provided for emergency vehicles.

The emergency response time is the time from the initial call to arrival at the scene of the emergency. The directional median opening modifications on Madison Street at Winged Foot/Merv Griffin Way and at the Weiskopf/Legends Way access connections would not alter the design of the ingress points available along Madison Street, and should not affect the emergency response time associated with the PGA West community.

Although it is also important to minimize the travel time to the hospital, patients are usually stabilized by emergency medical technicians before being transported to the hospital. Ambulances are expected to be able to negotiate U-turns from the median on Madison Street in a single continuous movement at the Kingston Heath intersection and at Calle Azul. However, emergency vehicles traveling with lights and sirens active have the right to violate highway laws in an emergency and drive on either side of Madison Street.

Two fire stations (#39 and #70) currently provide fire protection and emergency medical services in the vicinity and emergency response times are currently five minutes or less. A new fire station is planned near the intersection of Monroe Street and Avenue 60 that would use Madison Street for access in emergency situations.

Traffic Calming and Speed Control

Arterial streets built to high design standards can safely handle traffic moving at high speeds, but this can pose a problem when a high-speed roadway passes through a residential community. In residential areas a high premium is placed on traffic safety. Roadways located in residential communities are considered spaces that residents on bicycles, pedestrian using sidewalks, and golfers traveling in golf carts share with automobiles.

Traffic calming techniques are often used within residential communities to discourage through-traffic volumes and reduce travel speed on two-lane residential streets. However, Madison Street is a Primary arterial that is designed to promote mobility and handle regional traffic flows between future development to the south and the City. Madison Street

is being planned to maximize the flow of traffic through the judicious placement and coordination of traffic signals. Traffic signals should not be installed where warrants are not met in an effort to impede the flow of through traffic.

Signal Coordination/Progression

Fewer signals at uniform spacing improve traffic flow, reduce delay, and respond more efficiently to a variety of traffic conditions. Uniform spacing based on the optimal location permits more traffic can pass through a series of signals during the green phase (without stopping). The time during which the progression is maintained is reduced as signals are placed away from the optimal location. When signals are located midway between the optimal location and an existing signal, the through bandwidth is cut in half.

In the study area, the locations of intersecting arterial streets at one-mile intervals provides a unique opportunity to obtain long uniform signal spacing at one-mile intervals. The desirable efficiency of progression differs by roadway classification and should be considered when establishing appropriate signal spacing. Progression efficiency directly affects delay at signalized intersections. A high level of progression efficiency is desirable on high-speed arterials projected to carry a substantial volume of traffic making long trips. Lower levels of efficiency are acceptable on lower classification roadways serving shorter trips at lower speeds. One-half mile signal spacing could reduce vehicle-hours of delay by over 60 percent and vehicle hours of travel by over 50 percent, compared with signals at one-quarter mile intervals with full median openings between signals.[6]

> *"Any intersection or driveway that requires a traffic signal should be located carefully to maintain the flow of traffic by signal progression. Progression systems work best when signal spacing is uniform. Current practice for arterials calls for one-half-mile spacing in urban areas and 1-mile spacing in suburban and rural areas. This spacing produces the best balance between access service to the local network and arterial capacity and speed, but it also requires an adjacent network of local streets and collectors. As signal spacing drops below one-half mile, progression speeds are significantly reduced and travel delay increases, which affect capacity and mobility performance."*[7]

Legal Issues in Access Management

> *"Public agencies may regulate access even if the regulation denies direct roadway access as requested, as long as the property as a whole has reasonable access to the general system of streets….Most states do not compensate for value reduction unless the change in value is substantial or the change leaves the property with no reasonable access."*

> *"The most frequent legal issue involving access modification is when an agency plans to install a nontraversable median and restrict left turns. While there can be exceptions, there is no property right to a left turn. Property rights do not extend off the property to control the design, operation and safety of the public roadway. A decision not to install a restrictive median or to leave an opening in the median is a decision for traffic engineers and elected officials, not a jury."*[8]

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[6] Colorado Department of Transportation. *Final Report of the Colorado Access Control Demonstration Project*. Denver, Colorado. June, 1985.

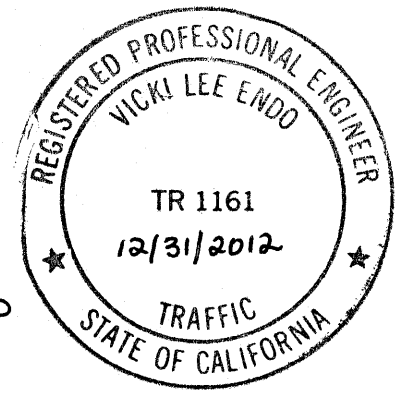
[7] Pline, James L., Wolfgang S Homburger, Walter H. Kraft. *Traffic Engineering Handbook*. Sixth Edition. Institute of Transportation Engineers. Washington, DC 20005. 2010. pp. 461.

[8] Pline, James L., Wolfgang S Homburger, Walter H. Kraft. *Traffic Engineering Handbook*. Sixth Edition. Institute of Transportation Engineers. Washington, DC 20005. 2010. pp. 459.

We trust that this supplemental information adequately meets your needs as well as those of the City of La Quinta in determining the appropriate intersection control type for three intersections on Madison Street, between Avenue 54 and Avenue 58. If questions or comments arise, please do not hesitate to contact our offices by telephone at (949) 362-0020 or via electronic mail at endoengr@cox.net.

Sincerely,
ENDO ENGINEERING

Gregory Endo
Principal



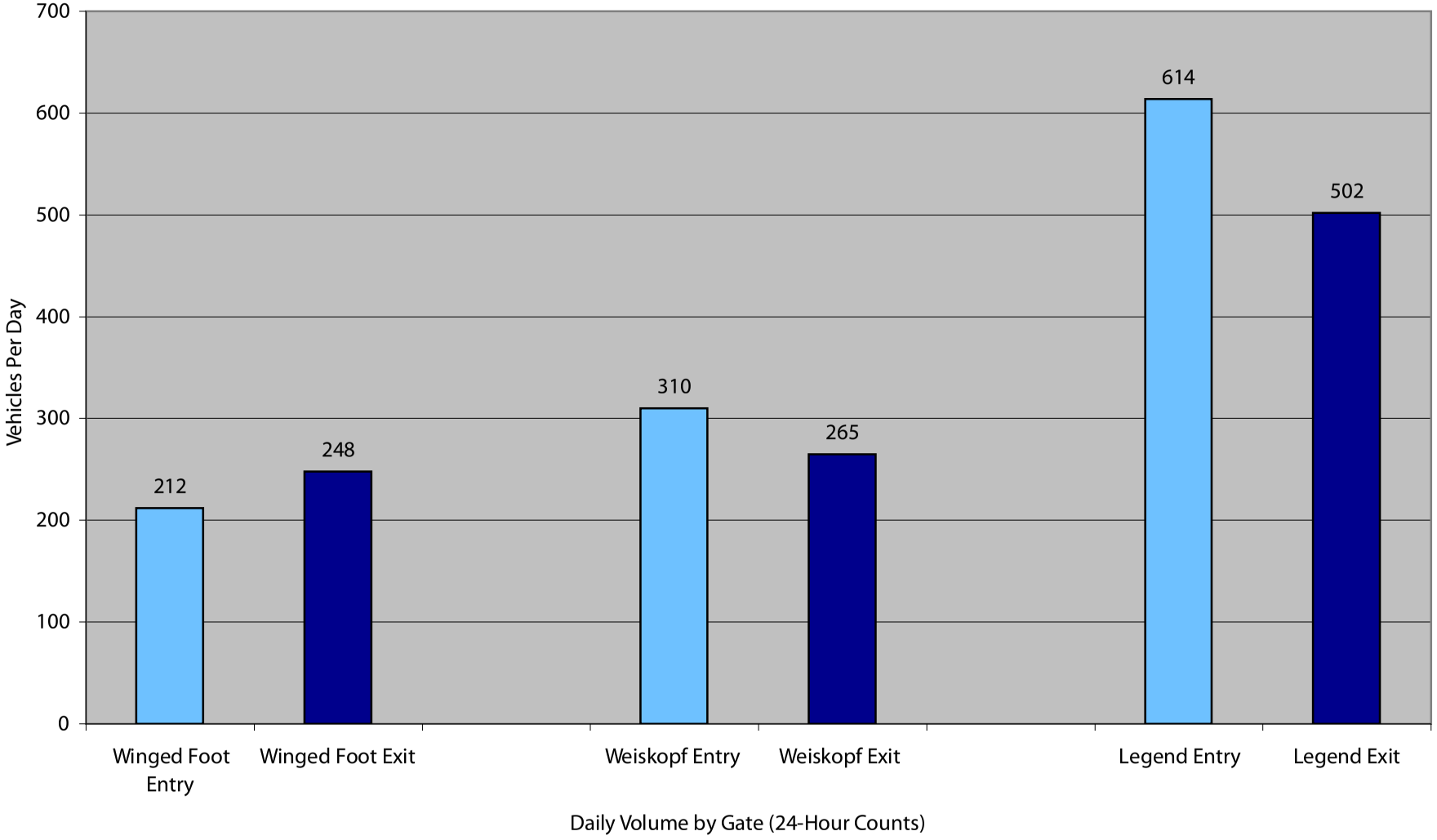
Vicki Lee Endo
Registered Professional Traffic Engineer
TR-1161

Attachment A – Traffic Count Data
Attachment B – HCS Worksheets
Attachment C – Traffic Control Signal Warrants

Attachment A

Figure A-1 Daily Gate Usage Counts
2011 Traffic Count Data
Indirect Travel Time Data

Figure A-1
Daily Gate Usage On October 25, 2011



Counts Unlimited, Inc
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Corona, CA 92878
(951) 268-6268

City of La Quinta
Winged Foot Gate
W/ Madison Street
24 Hour Directional Volume Count

LQAWFWMA
Site Code: 009-11246
Date Start: 25-Oct-11
Date End: 25-Oct-11

Start Time	25-Oct-11 Tue	Eastbound Morning	Eastbound Afternoon	Hour Totals Morning	Hour Totals Afternoon	Westbound Morning	Westbound Afternoon	Hour Totals Morning	Hour Totals Afternoon	Combined Totals Morning	Combined Totals Afternoon
12:00		0	4			0	4				
12:15		0	3			0	3				
12:30		2	3			0	4				
12:45		0	8	2	18	0	3	0	14	2	32
01:00		0	3			0	2				
01:15		1	4			0	0				
01:30		0	2			0	4				
01:45		0	1	1	10	0	5	0	11	1	21
02:00		0	3			0	5				
02:15		0	4			0	10				
02:30		0	8			0	7				
02:45		0	7	0	22	0	2	0	24	0	46
03:00		0	6			0	4				
03:15		0	2			0	3				
03:30		0	3			0	7				
03:45		0	**17**	0	28	0	**14**	0	28	0	56
04:00		0	**9**			0	**6**				
04:15		1	**3**			1	**3**				
04:30		0	**10**			0	**9**				
04:45		0	3	1	25	0	9	1	27	2	52
05:00		0	2			0	3				
05:15		0	7			0	5				
05:30		2	3			1	3				
05:45		1	8	3	20	0	5	1	16	4	36
06:00		1	4			1	3				
06:15		0	2			0	4				
06:30		2	3			0	0				
06:45		1	0	4	9	2	0	3	7	7	16
07:00		3	0			0	6				
07:15		1	1			2	3				
07:30		6	3			3	1				
07:45		2	1	12	5	3	2	8	12	20	17
08:00		4	1			1	1				
08:15		3	0			2	1				
08:30		7	0			2	3				
08:45		7	0	21	1	2	3	7	8	28	9
09:00		3	2			3	3				
09:15		4	0			2	1				
09:30		**5**	0			3	1				
09:45		**11**	0	23	2	4	1	12	6	35	8
10:00		**3**	1			3	0				
10:15		**5**	0			1	1				
10:30		3	0			3	0				
10:45		7	1	18	2	3	0	10	1	28	3
11:00		5	0			**1**	0				
11:15		6	0			**4**	0				
11:30		3	0			**4**	1				
11:45		6	1	20	1	**6**	0	15	1	35	2
Total		105	143	105	143	57	155	57	155	162	298
Combined Total		248		248		212		212		460	
AM Peak		09:30				11:00					
Vol.		24				15					
P.H.F.		0.545				0.625					
PM Peak			03:45				03:45				
Vol.			39				32				
P.H.F.			0.574				0.571				
Percentage		42.3%	57.7%			26.9%	73.1%				
ADT/AADT		ADT 460		AADT 460							

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City of La Quinta
Wiskopf Gate
W/ Madison Street
24 Hour Directional Volume Count

LQAWEWMA
Site Code: 009-11246
Date Start: 25-Oct-11
Date End: 25-Oct-11

Start Time	25-Oct-11 Tue	Eastbound Morning	Eastbound Afternoon	Hour Totals Morning	Hour Totals Afternoon	Westbound Morning	Westbound Afternoon	Hour Totals Morning	Hour Totals Afternoon	Combined Totals Morning	Combined Totals Afternoon
12:00		0	8			0	6				
12:15		0	7			0	6				
12:30		0	7			0	5				
12:45		0	3	0	25	0	9	0	26	0	51
01:00		0	4			0	4				
01:15		0	3			0	2				
01:30		0	6			0	1				
01:45		0	5	0	18	0	11	0	18	0	36
02:00		1	3			0	5				
02:15		0	4			0	12				
02:30		0	8			0	5				
02:45		0	1	1	16	0	10	0	32	1	48
03:00		0	4			0	6				
03:15		0	**4**			0	4				
03:30		0	**7**			0	**3**				
03:45		0	**20**	0	35	0	**22**	0	35	0	70
04:00		0	**5**			0	**5**				
04:15		1	2			1	**12**				
04:30		0	9			0	2				
04:45		0	3	1	19	0	2	1	21	2	40
05:00		0	3			0	5				
05:15		1	4			0	6				
05:30		0	1			0	1				
05:45		1	2	2	10	0	2	0	14	2	24
06:00		2	4			0	2				
06:15		0	2			0	1				
06:30		0	1			0	7				
06:45		0	2	2	9	5	2	5	12	7	21
07:00		4	0			6	1				
07:15		4	3			6	4				
07:30		4	1			4	2				
07:45		10	0	22	4	**17**	3	33	10	55	14
08:00		6	0			**5**	0				
08:15		6	1			**7**	4				
08:30		7	2			**7**	2				
08:45		7	1	26	4	4	1	23	7	49	11
09:00		2	0			4	1				
09:15		0	2			4	1				
09:30		9	2			6	2				
09:45		2	2	13	6	6	0	20	4	33	10
10:00		4	0			9	1				
10:15		5	0			3	0				
10:30		4	0			4	0				
10:45		5	0	18	0	5	0	21	1	39	1
11:00		**9**	0			4	2				
11:15		**4**	1			5	0				
11:30		**11**	0			9	1				
11:45		**9**	0	33	1	6	0	24	3	57	4
Total		118	147	118	147	127	183	127	183	245	330
Combined Total		265		265		310		310		575	
AM Peak		11:00				07:45					
Vol.		33				36					
P.H.F.		0.750				0.529					
PM Peak			03:15				03:30				
Vol.			36				42				
P.H.F.			0.450				0.477				
Percentage		44.5%	55.5%			41.0%	59.0%				
ADT/AADT		ADT 575		AADT 575							

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City of La Quinta
Legends Gate
E/ Madison Street
24 Hour Directional Volume Count

LQATREMA
Site Code: 009-11246
Date Start: 25-Oct-11
Date End: 25-Oct-11

Start Time	25-Oct-11 Tue	Eastbound Morning	Eastbound Afternoon	Hour Totals Morning	Hour Totals Afternoon	Westbound Morning	Westbound Afternoon	Hour Totals Morning	Hour Totals Afternoon	Combined Totals Morning	Combined Totals Afternoon
12:00		1	**11**			0	12				
12:15		0	**15**			0	12				
12:30		0	**22**			0	14				
12:45		0	**18**	1	66	0	10	0	48	1	114
01:00		0	8			0	8				
01:15		1	14			0	17				
01:30		0	12			0	8				
01:45		0	12	1	46	0	**14**	0	47	1	93
02:00		1	10			1	**6**				
02:15		0	10			0	**11**				
02:30		0	6			0	**19**				
02:45		0	13	1	39	0	13	1	49	2	88
03:00		1	14			0	7				
03:15		0	13			0	6				
03:30		0	12			2	7				
03:45		0	21	1	60	0	10	2	30	3	90
04:00		1	12			0	6				
04:15		1	6			0	9				
04:30		0	12			1	7				
04:45		0	7	2	37	1	8	2	30	4	67
05:00		1	6			0	5				
05:15		0	11			1	8				
05:30		0	12			0	5				
05:45		0	4	1	33	3	5	4	23	5	56
06:00		2	10			3	5				
06:15		0	10			1	5				
06:30		2	4			2	9				
06:45		12	6	16	30	2	3	8	22	24	52
07:00		11	2			6	4				
07:15		12	8			7	4				
07:30		4	4			9	3				
07:45		20	6	47	20	13	0	35	11	82	31
08:00		7	4			8	2				
08:15		8	3			8	2				
08:30		13	8			12	1				
08:45		8	3	36	18	11	0	39	5	75	23
09:00		7	3			9	1				
09:15		9	9			7	0				
09:30		**13**	3			12	5				
09:45		**18**	2	47	17	15	1	43	7	90	24
10:00		**12**	2			11	1				
10:15		**11**	2			9	1				
10:30		7	0			13	1				
10:45		14	1	44	5	6	0	39	3	83	8
11:00		10	0			**19**	1				
11:15		7	0			**5**	0				
11:30		16	1			**12**	1				
11:45		10	2	43	3	**15**	1	51	3	94	6
Total		240	374	240	374	224	278	224	278	464	652
Combined Total		614		614		502		502		1116	
AM Peak		09:30				11:00					
Vol.		54				51					
P.H.F.		0.750				0.671					
PM Peak			12:00				01:45				
Vol.			66				50				
P.H.F.			0.750				0.658				
Percentage		39.1%	60.9%			44.6%	55.4%				
ADT/AADT		ADT 1,116		AADT 1,116							

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City of La Quinta
N/S: Madison Street
E/W: Winged Foot/Merv Griffin Way
Weather: Sunny

File Name : LQAMAWFAM2
Site Code : 11246001
Start Date : 11/2/2011
Page No : 1

Groups Printed- Total Volume

	Madison Street Southbound				Merv Griffin Way Westbound				Madison Street Northbound				Winged Foot Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
06:00 AM	0	44	0	44	0	0	0	0	0	19	0	19	0	0	0	0	63
06:15 AM	0	26	0	26	0	0	1	1	0	24	0	24	1	0	0	1	52
06:30 AM	2	18	0	20	1	0	0	1	0	41	1	42	2	0	0	2	65
06:45 AM	3	38	0	41	0	0	0	0	0	53	0	53	0	0	0	0	94
Total	5	126	0	131	1	0	1	2	0	137	1	138	3	0	0	3	274
07:00 AM	3	72	0	75	0	0	1	1	1	41	0	42	2	0	0	2	120
07:15 AM	1	51	0	52	0	0	1	1	0	49	2	51	3	0	2	5	109
07:30 AM	2	66	0	68	0	0	2	2	0	72	0	72	4	0	0	4	146
07:45 AM	0	70	2	72	1	0	0	1	0	71	0	71	3	0	1	4	148
Total	6	259	2	267	1	0	4	5	1	233	2	236	12	0	3	15	523
08:00 AM	1	64	1	66	0	0	0	0	2	72	0	74	3	0	0	3	143
08:15 AM	5	60	2	67	0	0	0	0	1	78	0	79	3	0	0	3	149
Grand Total	17	509	5	531	2	0	5	7	4	520	3	527	21	0	3	24	1089
Apprch %	3.2	95.9	0.9		28.6	0	71.4		0.8	98.7	0.6		87.5	0	12.5		
Total %	1.6	46.7	0.5	48.8	0.2	0	0.5	0.6	0.4	47.8	0.3	48.4	1.9	0	0.3	2.2	

	Madison Street Southbound				Merv Griffin Way Westbound				Madison Street Northbound				Winged Foot Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 08:15 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:30 AM																	
07:30 AM	2	66	0	68	0	0	**2**	**2**	0	72	0	72	**4**	0	0	**4**	146
07:45 AM	0	**70**	**2**	**72**	**1**	0	0	1	0	71	0	71	3	0	**1**	4	148
08:00 AM	1	64	1	66	0	0	0	0	**2**	72	0	74	3	0	0	3	143
08:15 AM	**5**	60	2	67	0	0	0	0	1	**78**	0	**79**	3	0	0	3	**149**
Total Volume	8	260	5	273	1	0	2	3	3	293	0	296	13	0	1	14	586
% App. Total	2.9	95.2	1.8		33.3	0	66.7		1	99	0		92.9	0	7.1		
PHF	.400	.929	.625	.948	.250	.000	.250	.375	.375	.939	.000	.937	.813	.000	.250	.875	.983

Counts Unlimited Inc.
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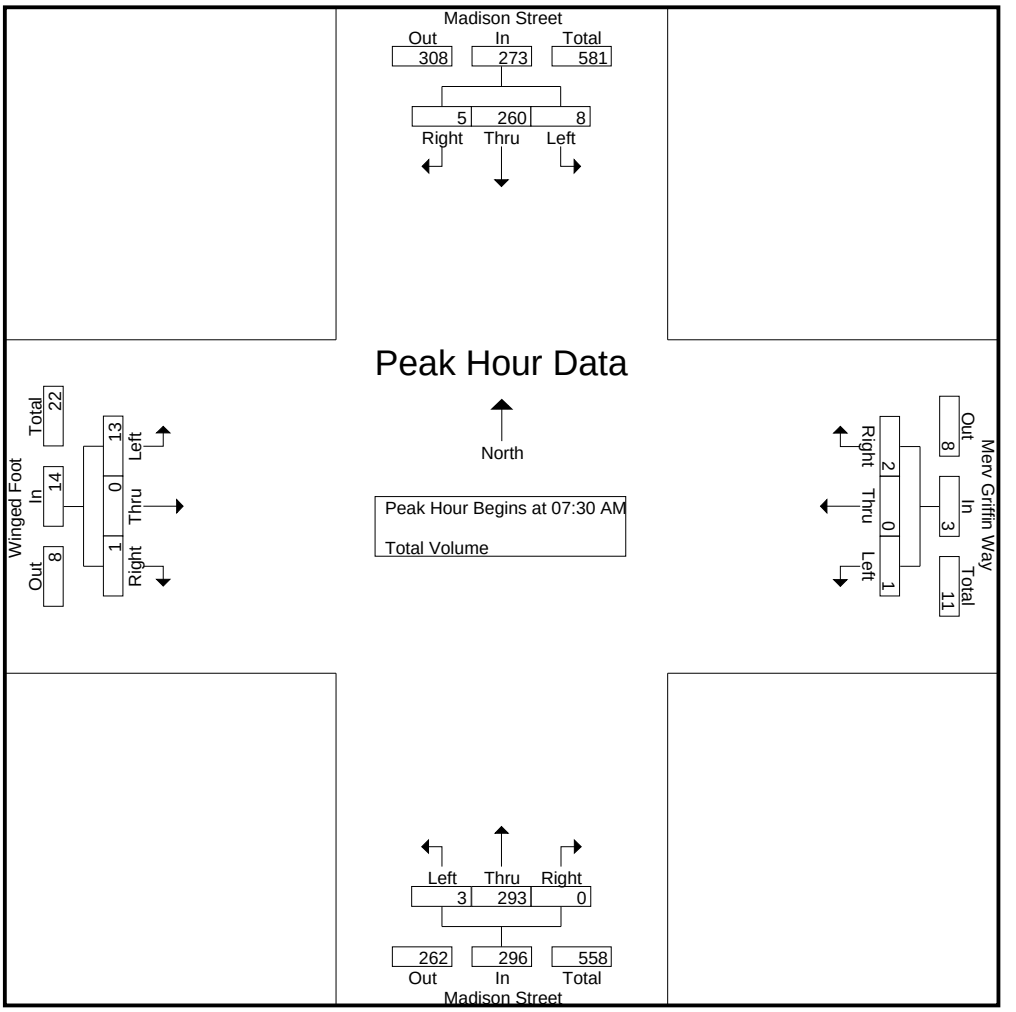
City of La Quinta
N/S: Madison Street
E/W: Winged Foot/Merv Griffin Way
Weather: Sunny

File Name : LQAMAWFAM2
Site Code : 11246001
Start Date : 11/2/2011
Page No : 2



Peak Hour Analysis From 06:00 AM to 08:15 AM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

	07:30 AM				07:00 AM				07:30 AM				07:15 AM			
+0 mins.	2	66	0	68	0	0	1	1	0	72	0	72	3	0	**2**	**5**
+15 mins.	0	**70**	**2**	**72**	0	0	1	1	0	71	0	71	**4**	0	0	4
+30 mins.	1	64	1	66	0	0	**2**	**2**	**2**	72	0	74	3	0	1	4
+45 mins.	**5**	60	2	67	**1**	0	0	1	1	**78**	0	**79**	3	0	0	3
Total Volume	8	260	5	273	1	0	4	5	3	293	0	296	13	0	3	16
% App. Total	2.9	95.2	1.8		20	0	80		1	99	0		81.2	0	18.8	
PHF	.400	.929	.625	.948	.250	.000	.500	.625	.375	.939	.000	.937	.813	.000	.375	.800

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City of La Quinta
N/S: Madison Street
E/W: Winged Foot/Merv Griffin Way
Weather: Sunny

File Name : LQAMAWFPM2
Site Code : 11246001
Start Date : 11/2/2011
Page No : 1

Groups Printed- Total Volume

	Madison Street Southbound				Merv Griffin Way Westbound				Madison Street Northbound				Winged Foot Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
02:30 PM	6	95	2	103	0	0	2	2	2	77	0	79	4	0	3	7	191
02:45 PM	6	82	4	92	0	0	0	0	0	64	0	64	6	0	1	7	163
Total	12	177	6	195	0	0	2	2	2	141	0	143	10	0	4	14	354
03:00 PM	2	85	5	92	0	0	4	4	1	95	0	96	3	0	0	3	195
03:15 PM	21	89	2	112	1	0	1	2	0	84	0	84	3	0	0	3	201
03:30 PM	15	99	2	116	0	0	1	1	0	118	0	118	2	0	1	3	238
03:45 PM	11	94	1	106	0	0	0	0	0	100	0	100	3	0	0	3	209
Total	49	367	10	426	1	0	6	7	1	397	0	398	11	0	1	12	843
04:00 PM	1	88	3	92	0	0	0	0	1	60	1	62	4	0	1	5	159
04:15 PM	2	86	2	90	0	0	0	0	0	109	0	109	0	0	0	0	199
04:30 PM	1	73	4	78	0	0	0	0	1	87	0	88	4	0	0	4	170
04:45 PM	2	75	2	79	0	0	0	0	0	56	0	56	4	0	0	4	139
Total	6	322	11	339	0	0	0	0	2	312	1	315	12	0	1	13	667
05:00 PM	8	68	7	83	0	0	1	1	0	77	0	77	0	0	3	3	164
05:15 PM	2	70	3	75	0	0	0	0	1	65	0	66	4	0	1	5	146
Grand Total	77	1004	37	1118	1	0	9	10	6	992	1	999	37	0	10	47	2174
Apprch %	6.9	89.8	3.3		10	0	90		0.6	99.3	0.1		78.7	0	21.3		
Total %	3.5	46.2	1.7	51.4	0	0	0.4	0.5	0.3	45.6	0	46	1.7	0	0.5	2.2	

	Madison Street Southbound				Merv Griffin Way Westbound				Madison Street Northbound				Winged Foot Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 03:00 PM																	
03:00 PM	2	85	**5**	92	0	0	**4**	**4**	**1**	95	0	96	**3**	0	0	**3**	195
03:15 PM	**21**	89	2	112	**1**	0	1	2	0	84	0	84	3	0	0	3	201
03:30 PM	15	**99**	2	**116**	0	0	1	1	0	**118**	0	**118**	2	0	**1**	3	**238**
03:45 PM	11	94	1	106	0	0	0	0	0	100	0	100	3	0	0	3	209
Total Volume	49	367	10	426	1	0	6	7	1	397	0	398	11	0	1	12	843
% App. Total	11.5	86.2	2.3		14.3	0	85.7		0.3	99.7	0		91.7	0	8.3		
PHF	.583	.927	.500	.918	.250	.000	.375	.438	.250	.841	.000	.843	.917	.000	.250	1.000	.886

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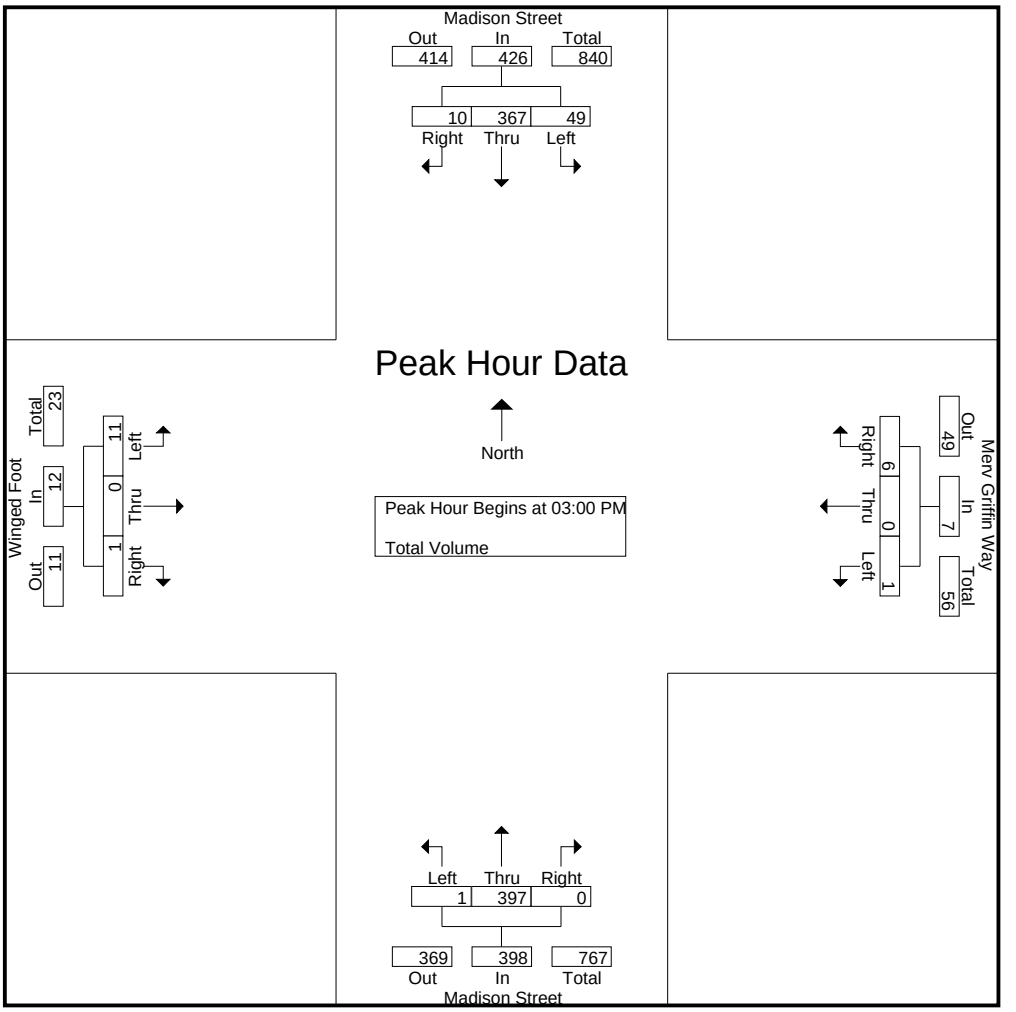
City of La Quinta
N/S: Madison Street
E/W: Winged Foot/Merv Griffin Way
Weather: Sunny

File Name : LQAMAWFPM2
Site Code : 11246001
Start Date : 11/2/2011
Page No : 2



Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

	03:00 PM				02:30 PM				03:00 PM				02:30 PM			
+0 mins.	2	85	**5**	92	0	0	2	2	**1**	95	0	96	4	0	**3**	**7**
+15 mins.	**21**	89	2	112	0	0	0	0	0	84	0	84	**6**	0	1	7
+30 mins.	15	**99**	2	**116**	0	0	**4**	**4**	0	**118**	0	**118**	3	0	0	3
+45 mins.	11	94	1	106	**1**	0	1	2	0	100	0	100	3	0	0	3
Total Volume	49	367	10	426	1	0	7	8	1	397	0	398	16	0	4	20
% App. Total	11.5	86.2	2.3		12.5	0	87.5		0.3	99.7	0		80	0	20	
PHF	.583	.927	.500	.918	.250	.000	.438	.500	.250	.841	.000	.843	.667	.000	.333	.714

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City of La Quinta
N/S: Madison Street
E/W: Wesikopf
Weather: Sunny

File Name : LQAMAWEAM
Site Code : 11246001
Start Date : 10/12/2011
Page No : 1

Groups Printed- Total Volume

	Madison Street Southbound				Weiskopf Westbound				Madison Street Northbound				Weiskopf Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
06:00 AM	0	8	0	8	0	0	0	0	0	25	1	26	0	0	0	0	34
06:15 AM	0	13	0	13	0	0	0	0	0	20	1	21	0	0	0	0	34
06:30 AM	2	32	0	34	0	0	3	3	0	37	0	37	1	1	1	3	77
06:45 AM	14	50	0	64	0	2	1	3	0	24	1	25	0	1	0	1	93
Total	16	103	0	119	0	2	4	6	0	106	3	109	1	2	1	4	238
07:00 AM	4	23	4	31	0	0	3	3	1	32	5	38	1	0	1	2	74
07:15 AM	2	38	1	41	3	2	3	8	1	29	0	30	1	0	1	2	81
07:30 AM	5	44	4	53	1	1	6	8	0	42	3	45	1	1	2	4	110
07:45 AM	5	42	3	50	0	0	4	4	0	37	2	39	1	0	0	1	94
Total	16	147	12	175	4	3	16	23	2	140	10	152	4	1	4	9	359
08:00 AM	3	29	4	36	0	0	9	9	1	35	1	37	5	1	0	6	88
08:15 AM	7	26	4	37	0	0	13	13	1	35	0	36	2	4	0	6	92
Grand Total	42	305	20	367	4	5	42	51	4	316	14	334	12	8	5	25	777
Apprch %	11.4	83.1	5.4		7.8	9.8	82.4		1.2	94.6	4.2		48	32	20		
Total %	5.4	39.3	2.6	47.2	0.5	0.6	5.4	6.6	0.5	40.7	1.8	43	1.5	1	0.6	3.2	

	Madison Street Southbound				Weiskopf Westbound				Madison Street Northbound				Weiskopf Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 08:15 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:30 AM																	
07:30 AM	5	**44**	**4**	**53**	**1**	**1**	6	8	0	**42**	**3**	**45**	1	1	**2**	4	**110**
07:45 AM	5	42	3	50	0	0	4	4	0	37	2	39	1	0	0	1	94
08:00 AM	3	29	4	36	0	0	9	9	**1**	35	1	37	**5**	1	0	**6**	88
08:15 AM	**7**	26	4	37	0	0	**13**	**13**	1	35	0	36	2	**4**	0	6	92
Total Volume	20	141	15	176	1	1	32	34	2	149	6	157	9	6	2	17	384
% App. Total	11.4	80.1	8.5		2.9	2.9	94.1		1.3	94.9	3.8		52.9	35.3	11.8		
PHF	.714	.801	.938	.830	.250	.250	.615	.654	.500	.887	.500	.872	.450	.375	.250	.708	.873

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City of La Quinta
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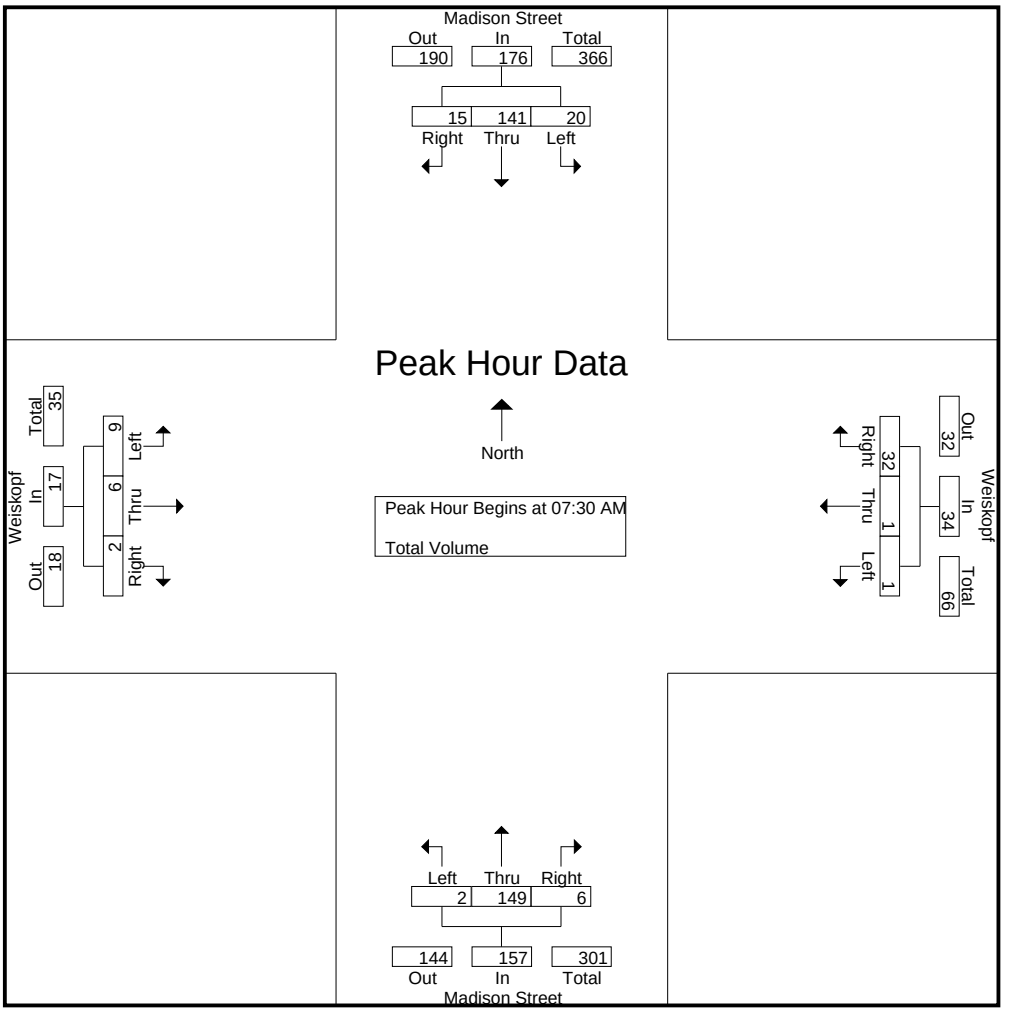
E/W: Wesikopf
Weather: Sunny

File Name : LQAMAWEAM
Site Code : 11246001
Start Date : 10/12/2011
Page No : 2



Peak Hour Analysis From 06:00 AM to 08:15 AM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

	06:45 AM				07:30 AM				07:30 AM				07:30 AM			
+0 mins.	**14**	**50**	0	**64**	**1**	**1**	6	8	0	**42**	**3**	**45**	1	1	**2**	4
+15 mins.	4	23	**4**	31	0	0	4	4	0	37	2	39	1	0	0	1
+30 mins.	2	38	1	41	0	0	9	9	**1**	35	1	37	**5**	1	0	**6**
+45 mins.	5	44	4	53	0	0	**13**	**13**	1	35	0	36	2	**4**	0	6
Total Volume	25	155	9	189	1	1	32	34	2	149	6	157	9	6	2	17
% App. Total	13.2	82	4.8		2.9	2.9	94.1		1.3	94.9	3.8		52.9	35.3	11.8	
PHF	.446	.775	.563	.738	.250	.250	.615	.654	.500	.887	.500	.872	.450	.375	.250	.708

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City of La Quinta
N/S: Madison Street
E/W: Wesikopf
Weather: Sunny

File Name : LQAMAWEPM
Site Code : 11246001
Start Date : 10/12/2011
Page No : 1

Groups Printed- Total Volume

	Madison Street Southbound				Weiskopf Westbound				Madison Street Northbound				Weiskopf Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
02:30 PM	10	44	3	57	1	2	7	10	3	58	0	61	0	0	0	0	128
02:45 PM	10	54	3	67	0	0	6	6	1	37	0	38	3	2	1	6	117
Total	20	98	6	124	1	2	13	16	4	95	0	99	3	2	1	6	245
03:00 PM	7	61	4	72	1	1	8	10	1	45	1	47	6	0	0	6	135
03:15 PM	13	63	1	77	0	0	12	12	0	37	3	40	1	0	2	3	132
03:30 PM	10	53	3	66	0	0	2	2	0	78	0	78	6	1	1	8	154
03:45 PM	11	52	2	65	0	1	4	5	0	37	0	37	0	0	0	0	107
Total	41	229	10	280	1	2	26	29	1	197	4	202	13	1	3	17	528
04:00 PM	9	47	3	59	2	0	5	7	0	48	0	48	4	0	1	5	119
04:15 PM	5	50	1	56	1	0	5	6	1	25	0	26	3	1	0	4	92
04:30 PM	3	54	1	58	1	1	5	7	0	36	0	36	2	1	1	4	105
04:45 PM	3	46	0	49	0	1	4	5	1	40	0	41	3	1	0	4	99
Total	20	197	5	222	4	2	19	25	2	149	0	151	12	3	2	17	415
05:00 PM	7	39	0	46	1	1	3	5	1	57	4	62	2	2	0	4	117
05:15 PM	9	35	2	46	2	1	6	9	1	45	0	46	3	0	1	4	105
Grand Total	97	598	23	718	9	8	67	84	9	543	8	560	33	8	7	48	1410
Apprch %	13.5	83.3	3.2		10.7	9.5	79.8		1.6	97	1.4		68.8	16.7	14.6		
Total %	6.9	42.4	1.6	50.9	0.6	0.6	4.8	6	0.6	38.5	0.6	39.7	2.3	0.6	0.5	3.4	

	Madison Street Southbound				Weiskopf Westbound				Madison Street Northbound				Weiskopf Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 02:45 PM																	
02:45 PM	10	54	3	67	0	0	6	6	**1**	37	0	38	3	**2**	1	6	117
03:00 PM	7	61	**4**	72	**1**	**1**	8	10	1	45	1	47	**6**	0	0	6	135
03:15 PM	**13**	**63**	1	**77**	0	0	**12**	**12**	0	37	**3**	40	1	0	**2**	3	132
03:30 PM	10	53	3	66	0	0	2	2	0	**78**	0	**78**	6	1	1	**8**	**154**
Total Volume	40	231	11	282	1	1	28	30	2	197	4	203	16	3	4	23	538
% App. Total	14.2	81.9	3.9		3.3	3.3	93.3		1	97	2		69.6	13	17.4		
PHF	.769	.917	.688	.916	.250	.250	.583	.625	.500	.631	.333	.651	.667	.375	.500	.719	.873

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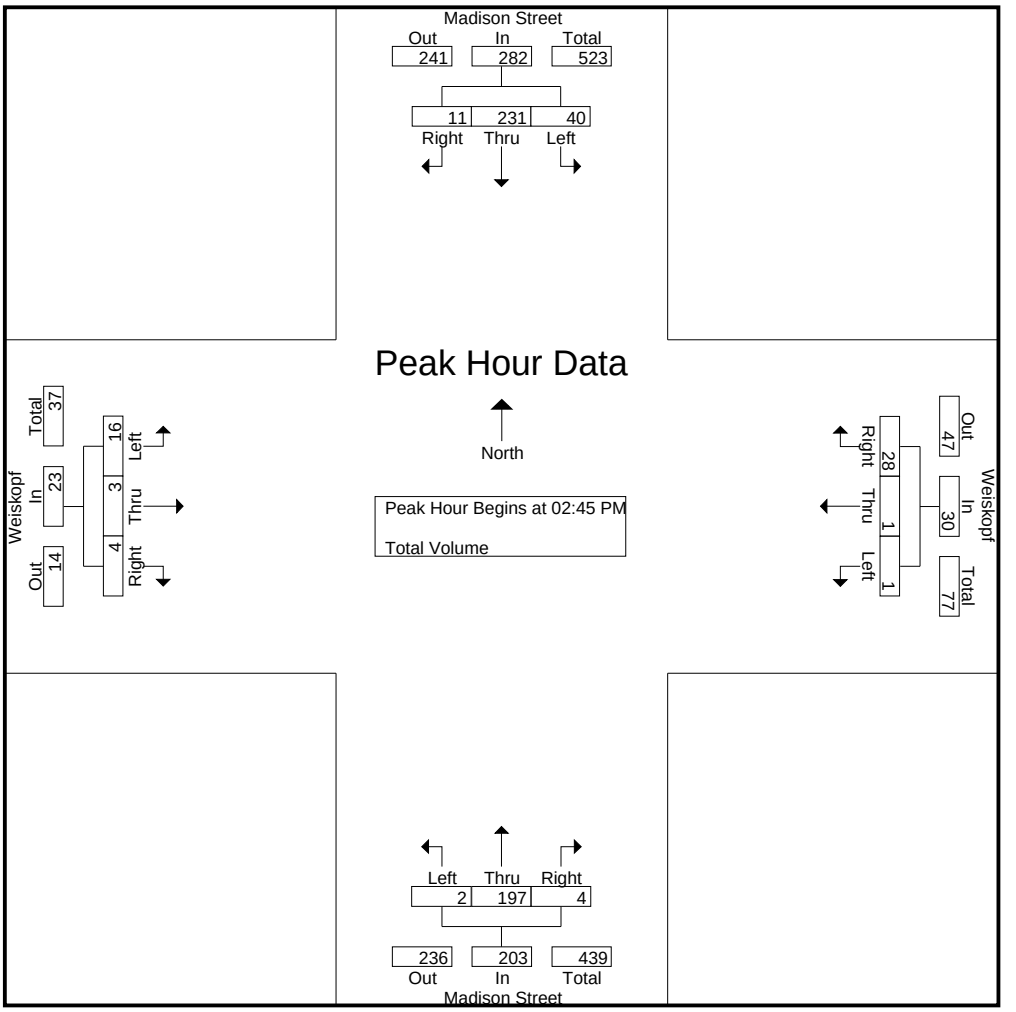
City of La Quinta
N/S: Madison Street
E/W: Wesikopf
Weather: Sunny

File Name : LQAMAWEPM
Site Code : 11246001
Start Date : 10/12/2011
Page No : 2



Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

	02:45 PM				02:30 PM				02:45 PM				02:45 PM			
+0 mins.	10	54	3	67	**1**	**2**	7	10	**1**	37	0	38	3	**2**	1	6
+15 mins.	7	61	**4**	72	0	0	6	6	1	45	1	47	**6**	0	0	6
+30 mins.	**13**	**63**	1	**77**	1	1	8	10	0	37	**3**	40	1	0	**2**	3
+45 mins.	10	53	3	66	0	0	**12**	**12**	0	**78**	0	**78**	6	1	1	**8**
Total Volume	40	231	11	282	2	3	33	38	2	197	4	203	16	3	4	23
% App. Total	14.2	81.9	3.9		5.3	7.9	86.8		1	97	2		69.6	13	17.4	
PHF	.769	.917	.688	.916	.500	.375	.688	.792	.500	.631	.333	.651	.667	.375	.500	.719

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City of La Quinta
N/S: Madison Street
E/W: Avenue 58
Weather: Sunny

File Name : LQAMA58AM
Site Code : 11246001
Start Date : 10/12/2011
Page No : 1

Groups Printed- Total Volume

	Madison Street Southbound				Avenue 58 Westbound				Madison Street Northbound				Avenue 58 Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
06:00 AM	4	5	5	14	0	4	6	10	0	7	0	7	0	0	0	0	31
06:15 AM	5	7	7	19	1	7	7	15	0	9	0	9	3	1	0	4	47
06:30 AM	6	3	5	14	0	5	11	16	0	9	0	9	2	0	0	2	41
06:45 AM	9	13	10	32	0	9	5	14	2	18	0	20	4	0	0	4	70
Total	24	28	27	79	1	25	29	55	2	43	0	45	9	1	0	10	189
07:00 AM	19	20	13	52	0	7	9	16	0	8	0	8	4	2	0	6	82
07:15 AM	8	18	6	32	0	6	10	16	2	16	0	18	8	0	0	8	74
07:30 AM	18	12	9	39	0	1	9	10	0	34	1	35	7	0	0	7	91
07:45 AM	10	32	8	50	1	2	11	14	1	14	0	15	3	1	2	6	85
Total	55	82	36	173	1	16	39	56	3	72	1	76	22	3	2	27	332
08:00 AM	11	31	14	56	0	2	9	11	4	25	0	29	11	5	0	16	112
08:15 AM	5	12	5	22	0	5	6	11	1	29	2	32	2	1	1	4	69
Grand Total	95	153	82	330	2	48	83	133	10	169	3	182	44	10	3	57	702
Apprch %	28.8	46.4	24.8		1.5	36.1	62.4		5.5	92.9	1.6		77.2	17.5	5.3		
Total %	13.5	21.8	11.7	47	0.3	6.8	11.8	18.9	1.4	24.1	0.4	25.9	6.3	1.4	0.4	8.1	

	Madison Street Southbound				Avenue 58 Westbound				Madison Street Northbound				Avenue 58 Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 08:15 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:15 AM																	
07:15 AM	8	18	6	32	0	**6**	10	**16**	2	16	0	18	8	0	0	8	74
07:30 AM	**18**	12	9	39	0	1	9	10	0	**34**	**1**	**35**	7	0	0	7	91
07:45 AM	10	**32**	8	50	**1**	2	**11**	14	1	14	0	15	3	1	**2**	6	85
08:00 AM	11	31	**14**	**56**	0	2	9	11	**4**	25	0	29	**11**	**5**	0	**16**	**112**
Total Volume	47	93	37	177	1	11	39	51	7	89	1	97	29	6	2	37	362
% App. Total	26.6	52.5	20.9		2	21.6	76.5		7.2	91.8	1		78.4	16.2	5.4		
PHF	.653	.727	.661	.790	.250	.458	.886	.797	.438	.654	.250	.693	.659	.300	.250	.578	.808

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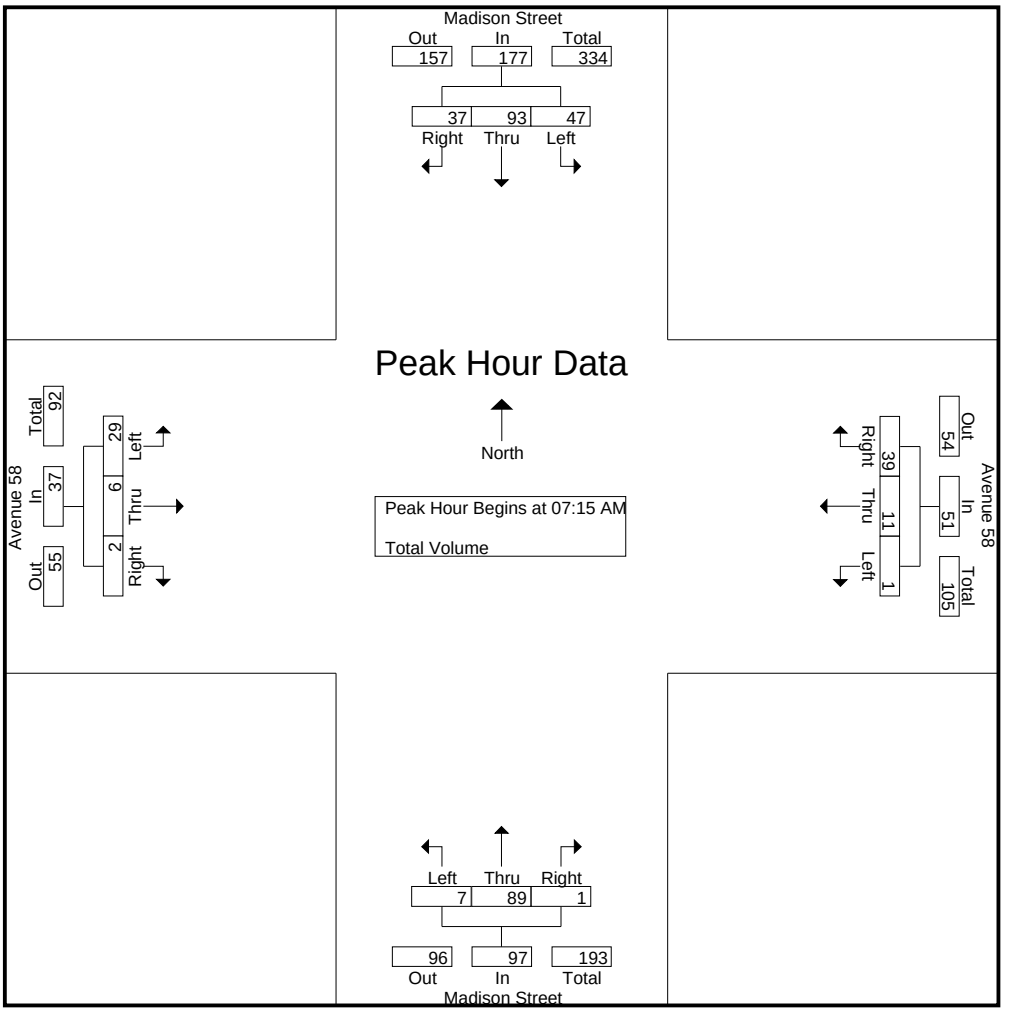
City of La Quinta
N/S: Madison Street
E/W: Avenue 58
Weather: Sunny

File Name : LQAMA58AM
Site Code : 11246001
Start Date : 10/12/2011
Page No : 2



Peak Hour Analysis From 06:00 AM to 08:15 AM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

	07:15 AM				06:30 AM				07:30 AM				07:15 AM			
+0 mins.	8	18	6	32	0	5	**11**	**16**	0	**34**	1	**35**	8	0	0	8
+15 mins.	**18**	12	9	39	0	**9**	5	14	1	14	0	15	7	0	0	7
+30 mins.	10	**32**	8	50	0	7	9	16	**4**	25	0	29	3	1	**2**	6
+45 mins.	11	31	**14**	**56**	0	6	10	16	1	29	**2**	32	**11**	**5**	0	**16**
Total Volume	47	93	37	177	0	27	35	62	6	102	3	111	29	6	2	37
% App. Total	26.6	52.5	20.9		0	43.5	56.5		5.4	91.9	2.7		78.4	16.2	5.4	
PHF	.653	.727	.661	.790	.000	.750	.795	.969	.375	.750	.375	.793	.659	.300	.250	.578

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City of La Quinta
N/S: Madison Street
E/W: Avenue 58
Weather: Sunny

File Name : LQAMA58PM
Site Code : 11246001
Start Date : 10/12/2011
Page No : 1

Groups Printed- Total Volume

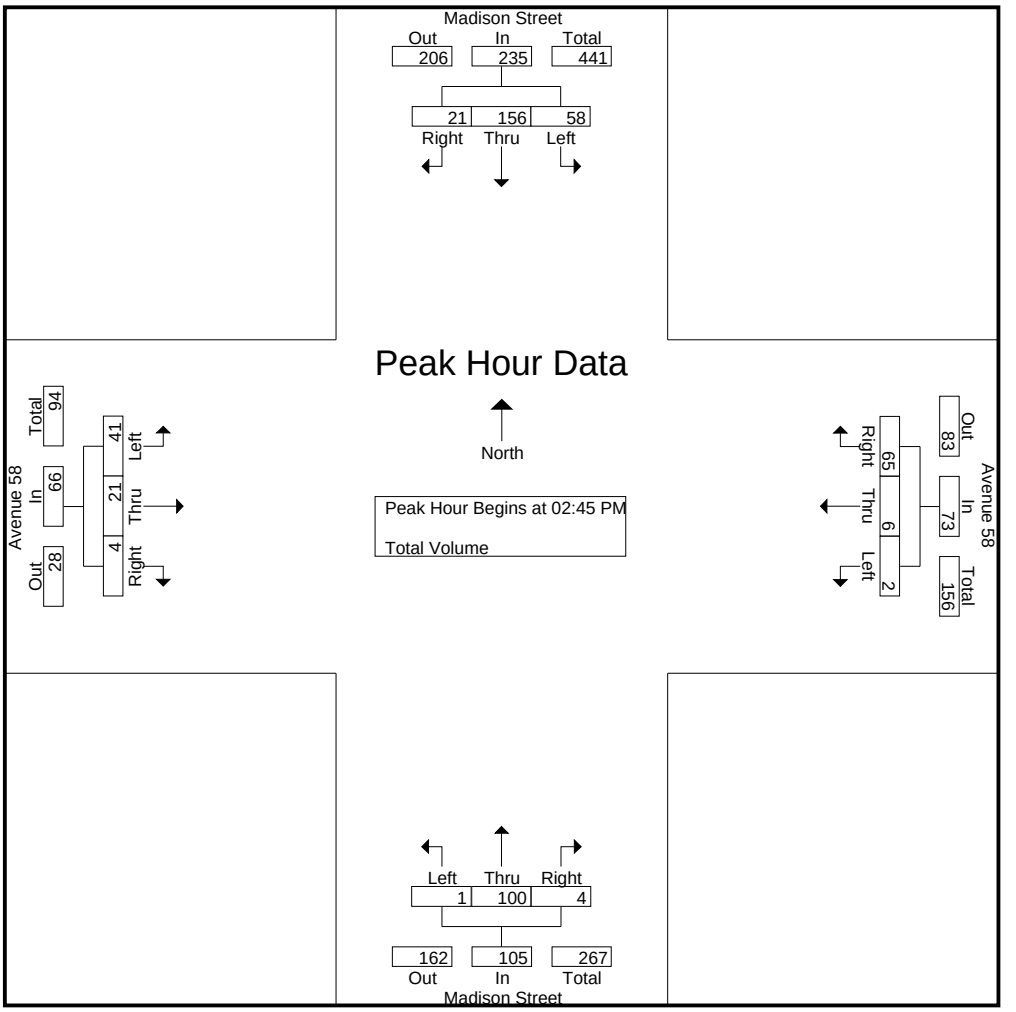
	Madison Street Southbound				Avenue 58 Westbound				Madison Street Northbound				Avenue 58 Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
02:30 PM	11	41	6	58	0	2	13	15	0	21	0	21	13	2	0	15	109
02:45 PM	16	41	7	64	1	2	12	15	0	15	0	15	8	4	2	14	108
Total	27	82	13	122	1	4	25	30	0	36	0	36	21	6	2	29	217
03:00 PM	14	42	6	62	1	1	10	12	1	31	0	32	8	3	0	11	117
03:15 PM	13	38	7	58	0	2	13	15	0	21	2	23	10	4	1	15	111
03:30 PM	15	35	1	51	0	1	30	31	0	33	2	35	15	10	1	26	143
03:45 PM	6	35	3	44	0	0	17	17	1	26	0	27	1	3	1	5	93
Total	48	150	17	215	1	4	70	75	2	111	4	117	34	20	3	57	464
04:00 PM	5	32	4	41	1	5	14	20	1	19	0	20	4	3	0	7	88
04:15 PM	10	32	7	49	1	3	11	15	0	21	1	22	6	0	0	6	92
04:30 PM	13	24	2	39	0	1	13	14	0	19	0	19	5	0	0	5	77
04:45 PM	9	25	3	37	1	0	12	13	0	23	0	23	4	1	1	6	79
Total	37	113	16	166	3	9	50	62	1	82	1	84	19	4	1	24	336
05:00 PM	4	33	6	43	0	2	11	13	0	22	0	22	5	1	3	9	87
05:15 PM	2	24	4	30	0	1	10	11	0	18	0	18	3	0	0	3	62
Grand Total	118	402	56	576	5	20	166	191	3	269	5	277	82	31	9	122	1166
Apprch %	20.5	69.8	9.7		2.6	10.5	86.9		1.1	97.1	1.8		67.2	25.4	7.4		
Total %	10.1	34.5	4.8	49.4	0.4	1.7	14.2	16.4	0.3	23.1	0.4	23.8	7	2.7	0.8	10.5	

	Madison Street Southbound				Avenue 58 Westbound				Madison Street Northbound				Avenue 58 Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 02:45 PM																	
02:45 PM	**16**	41	**7**	**64**	**1**	**2**	12	15	0	15	0	15	8	4	**2**	14	108
03:00 PM	14	**42**	6	62	1	1	10	12	**1**	31	0	32	8	3	0	11	117
03:15 PM	13	38	7	58	0	2	13	15	0	21	**2**	23	10	4	1	15	111
03:30 PM	15	35	1	51	0	1	**30**	**31**	0	**33**	2	**35**	**15**	**10**	1	**26**	**143**
Total Volume	58	156	21	235	2	6	65	73	1	100	4	105	41	21	4	66	479
% App. Total	24.7	66.4	8.9		2.7	8.2	89		1	95.2	3.8		62.1	31.8	6.1		
PHF	.906	.929	.750	.918	.500	.750	.542	.589	.250	.758	.500	.750	.683	.525	.500	.635	.837

Counts Unlimited Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268

City of La Quinta
N/S: Madison Street
E/W: Avenue 58
Weather: Sunny

File Name : LQAMA58PM
Site Code : 11246001
Start Date : 10/12/2011
Page No : 2



Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

	02:30 PM				03:15 PM				03:00 PM				02:45 PM			
+0 mins.	11	41	6	58	0	2	13	15	**1**	31	0	32	8	4	**2**	14
+15 mins.	**16**	41	**7**	**64**	0	1	**30**	**31**	0	21	**2**	23	8	3	0	11
+30 mins.	14	**42**	6	62	0	0	17	17	0	**33**	2	**35**	10	4	1	15
+45 mins.	13	38	7	58	**1**	**5**	14	20	1	26	0	27	**15**	**10**	1	**26**
Total Volume	54	162	26	242	1	8	74	83	2	111	4	117	41	21	4	66
% App. Total	22.3	66.9	10.7		1.2	9.6	89.2		1.7	94.9	3.4		62.1	31.8	6.1	
PHF	.844	.964	.929	.945	.250	.400	.617	.669	.500	.841	.500	.836	.683	.525	.500	.635

Location: La Quinta
PGA West

Date: 10/12/11
Day: Wedensday

Transit Time Survey

Route #1
Weiskopf at Madison **TO** Calle Azul at Madison **TO** Weiskopf at Madison

	Exiting Weiskopf making an EB right turn onto Madison Street travelling Southbound	Making a SB U-turn at Madison Street and Calle Azul heading Northbound	Passing intersection of Madison Street and Weiskopf travelling Northbound	**TOTAL ELAPSED TIME**
Run 1	0:00	0:30	0:57	0 Minutes, 57 Seconds
Run 2	0:00	0:31	0:59	0 Minutes, 59 Seconds
Run 3	0:00	0:28	0:55	0 Minutes, 55 Seconds

Route #2
Winged Foot at Madison **TO** Kingston Heath at Madison **TO** Winged Foot at Madison

	Exiting Winged Foot making an EB right turn onto Madison Street travelling Southbound	Making a SB U-turn at Madison Street and Kingston Heath heading Northbound	Passing intersection of Madison Street and Kingston Heath travelling Northbound	**TOTAL ELAPSED TIME**
Run 1	0:00	0:23	0:47	0 Minutes, 47 Seconds
Run 2	0:00	0:23	0:45	0 Minutes, 45 Seconds
Run 3	0:00	0:24	0:49	0 Minutes, 49 Seconds

Counts Unlimited
P.O. Box 1178
Corona, CA 92878
(951) 268-6268

Attachment B
Highway Capacity Manual 2000 Intersection Methodology And HCS Worksheets

Unsignalized Intersection Methodology

Some of the key intersections in the study area are unsignalized and controlled by stop signs on one or more of the approaches. Unsignalized intersections are typically categorized as either two-way stop-controlled (TWSC) or all-way stop-controlled (AWSC) intersections. At TWSC intersections, the approaches controlled by the stop sign are referred to as the minor street approaches. Minor street approaches can be either public streets or private driveways. The intersection approaches that are not controlled by stop signs are called the major street approaches.

To evaluate the ability of these intersections to serve traffic demands during peak hours, the capacity is determined for each minor approach movement and the left-turn movements from the major street onto the minor street, and then compared to the demand for each movement. In this manner, the probable control delay and level of service can be estimated during the peak hour from Table B-1.

Table B-1
HCM 2000 Unsignalized Intersection
Level of Service Criteria[a]

Level of Service[b]	Average Control Delay (Seconds/Vehicle)
A	≤ 10.0
B	>10.0 and ≤15.0
C	>15.0 and ≤25.0
D	>25.0 and ≤35.0
E	>35.0 and ≤50.0
F	> 50.0

a. Source: *Highway Capacity Manual,* Special Report 209", Transportation Research Board, 2000; pg. 17-2 and 17-32.
b. Note that a level of service is not defined for the overall TWSC intersection, but rather for individual movements and intersection approaches.

The methodology utilized to determine the maximum capacity of the minor approach movements and the left turn onto the minor street (in passenger car equivalents per hour or PCPH) accounts for approach grade and speed, heavy vehicle mix, lane configuration, and type of traffic control. It allows the maximum potential capacity to be determined from the conflicting volumes and the critical gap associated with each type of vehicle maneuver. Once the capacity of each of the critical movements is calculated, the anticipated delay and the level of service for each of the intersection movements and each minor approach can be evaluated.

Typically, the movement with the longest average control delay or worst level or service defines the overall intersection evaluation; however, this may be tempered by engineering judgment, when conditions warrant it. Although the level of service is primarily related to the average control delay, which is given in terms of seconds of delay per vehicle by minor movement and intersection approach, other performance measures for TWSC and AWSC intersections include: delay to major street through vehicles, queue length, and volume-to-capacity ratio.

For example, left turns from the minor leg may experience delay consistent with LOS F operation, while the major street through movements experience little or no delay and LOS A. Since the major street through movements represent the majority of the traffic demand at the intersection, the overall intersection LOS would most likely be LOS A or LOS B. If the delay for the traffic on the minor leg is reduced by installing a traffic signal, the overall intersection delay will increase, as large numbers of vehicles on the major through moves are delayed by the new signal. The increase in total delay may lower the overall intersection LOS. For this reason, excessive delays on the minor legs of two-way stop intersections are only mitigated with a traffic signal when the minor street can no longer effectively provide access, as evidenced by traffic signal warrants being met. This eliminates situations where a large number of motorists are delayed for the benefit of only a few cars.

A two-way left-turn lane (TWLTL) or a raised or striped median allows a minor stream vehicle to cross one major traffic stream at a time. It results in two-stage gap acceptance, provided that sufficient storage space is available in the median or TWLTL to store vehicles. It reduces the critical gap (the minimum gap that would be acceptable to a driver on the minor approach) in the stream of traffic on the major street and increases the capacity of the minor approach.

The grade of the approach directly affects the capacity of each minor movement. Compared to a level approach, downgrades increase capacity and upgrades decrease the approach capacity.

A flared approach on the minor street increases the capacity of the minor street approach. It allows more vehicles to be served simultaneously. Increasing the length of the flared pavement improves access to the additional lane. Even with a flared approach, vehicles seeking to use the flared lane may be delayed by queued vehicles blocking access to the additional lane. Therefore, flaring does not increase the capacity of the approach to the extent that an additional lane would.

The presence of traffic signals upstream from the intersection on the major street will produce platoons and affect the capacity of the minor street approaches if the signal is located within 0.25 mile of the intersection. Four flow regimes can result: no platoons, platoons from the left only, platoons from the right only and platoons from both directions.

Signalized Intersection Methodology

The *Highway Capacity Manual* (HCM 2000) signalized intersection capacity and level of service methodology addresses the capacity and level of service of intersection approach land groups as well as the level of service of the intersection as a whole. The analysis is undertaken in terms of the ratio of demand flow rate to capacity (V/C ratio) for individual movements during a peak 15-minute interval and the composite V/C ratio for the sum of critical movements or lane groups within the intersection. The level of service is determined based upon average control delay per vehicle, as shown in Table B-2 below.

Table B-2
2000 HCM Signalized Intersection LOS Criteria

Level of Service	Traffic Flow Characteristics	Avg. Control Delay (Seconds/Vehicle)
A	Extremely favorable progression with very low control delay. Most vehicles arrive during the green phase. Many do not stop.	≤ 10
B	Good progression, short cycle lengths or both. More vehicles stop than with LOS A, causing higher levels of average delay.	> 10 and ≤ 20
C	Satisfactory operation with fair progression, longer cycle lengths, or both. Individual cycle failures may begin to appear. Cycle failure occurs when a given green phase does not serve queued vehicles and overflow occurs. A significant number of vehicles stop but many pass through without stopping.	> 20 and ≤ 35
D	Tolerable delay, where congestion becomes more noticeable and many vehicles stop. Individual cycle failures are noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high V/C ratios.	> 35 and ≤ 55
E	Unstable flow with poor progression, frequent cycle failures, long cycle lengths and high V/C ratios. Individual cycle failures are frequent occurrences. This is considered the limit of acceptable delay by many agencies.	> 55 and ≤ 80
F	Oversaturation with arrival flow rates exceeding the capacity of intersection lane groups and many individual cycle failures. Poor progression and long cycle lengths as well as high V/C ratios and high delay values occur at LOS F. Considered unacceptable to most drivers.	> 80

Source: *Highway Capacity Manual,* Special Report 209, Transportation Research Board, Fourth Edition, 2000; pp. 10-16.

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*Greg*	Intersection	*Madison St @ Winged Foot Gt*
Agency/Co.	*Endo Engineering*	Jurisdiction	*La Quinta*
Date Performed	*11/4/11*	Analysis Year	*Existing+Project*
Analysis Time Period	*AM Peak Hour*		

Project Description *PGA West*

East/West Street: *Winged Foot Gate* | North/South Street: *Madison Street*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*3*	*310*	*0*	*8*	*275*	*5*
Peak-Hour Factor, PHF	*0.89*	*0.89*	*0.89*	*0.89*	*0.89*	*0.89*
Hourly Flow Rate, HFR (veh/h)	*3*	*348*	*0*	*8*	*308*	*5*
Percent Heavy Vehicles	*5*	--	--	*5*	--	--
Median Type	*Raised curb*					
RT Channelized			*0*			*0*
Lanes	*1*	*2*	*1*	*1*	*2*	*1*
Configuration	*L*	*T*	*R*	*L*	*T*	*R*
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*14*	*0*	*1*	*1*	*0*	*2*
Peak-Hour Factor, PHF	*0.89*	*0.89*	*0.89*	*0.89*	*0.89*	*0.89*
Hourly Flow Rate, HFR (veh/h)	*15*	*0*	*1*	*1*	*0*	*2*
Percent Heavy Vehicles	*5*	*5*	*5*	*5*	*5*	*5*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*1*
Configuration		*LTR*		*LT*		*R*

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*	*L*	*LT*		*R*		*LTR*	
v (veh/h)	*3*	*8*	*1*		*2*		*16*	
C (m) (veh/h)	*1223*	*1186*	*427*		*858*		*454*	
v/c	*0.00*	*0.01*	*0.00*		*0.00*		*0.04*	
95% queue length	*0.01*	*0.02*	*0.01*		*0.01*		*0.11*	
Control Delay (s/veh)	*8.0*	*8.1*	*13.5*		*9.2*		*13.2*	
LOS	*A*	*A*	*B*		*A*		*B*	
Approach Delay (s/veh)	--	--	*10.6*			*13.2*		
Approach LOS	--	--	*B*			*B*		

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*Greg*	Intersection	*Madison St @ Winged Foot Gt*
Agency/Co.	*Endo Engineering*	Jurisdiction	*La Quinta*
Date Performed	*11/4/11*	Analysis Year	*Existing+Project*
Analysis Time Period	*PM Peak Hour*		

Project Description *PGA West*

East/West Street: *Winged Foot Gate* | North/South Street: *Madison Street*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*1*	*420*	*0*	*51*	*387*	*11*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR (veh/h)	*1*	*466*	*0*	*56*	*430*	*12*
Percent Heavy Vehicles	*5*	--	--	*5*	--	--
Median Type	*Raised curb*					
RT Channelized			*0*			*0*
Lanes	*1*	*2*	*1*	*1*	*2*	*1*
Configuration	*L*	*T*	*R*	*L*	*T*	*R*
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*12*	*0*	*1*	*1*	*0*	*6*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR (veh/h)	*13*	*0*	*1*	*1*	*0*	*6*
Percent Heavy Vehicles	*5*	*5*	*5*	*5*	*5*	*5*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*1*
Configuration		*LTR*		*LT*		*R*

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*	*L*	*LT*		*R*		*LTR*	
v (veh/h)	*1*	*56*	*1*		*6*		*14*	
C (m) (veh/h)	*1093*	*1071*	*262*		*795*		*283*	
v/c	*0.00*	*0.05*	*0.00*		*0.01*		*0.05*	
95% queue length	*0.00*	*0.17*	*0.01*		*0.02*		*0.16*	
Control Delay (s/veh)	*8.3*	*8.5*	*18.8*		*9.6*		*18.4*	
LOS	*A*	*A*	*C*		*A*		*C*	
Approach Delay (s/veh)	--	--	*10.9*			*18.4*		
Approach LOS	--	--	*B*			*C*		

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TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*Greg*
Agency/Co.	*Endo Engineering*
Date Performed	*11/4/11*
Analysis Time Period	*AM Peak Hour*

Site Information

Intersection	*Madison St @ Winged Foot Gt*
Jurisdiction	*La Quinta*
Analysis Year	*GPBO+Project*

Project Description *PGA West*

East/West Street: *Winged Foot Gate* | North/South Street: *Madison Street*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*3*	*1116*	*4*	*13*	*1130*	*5*
Peak-Hour Factor, PHF	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*3*	*1116*	*4*	*13*	*1130*	*5*
Percent Heavy Vehicles	*5*	--	--	*5*	--	--
Median Type	*Raised curb*					
RT Channelized			*0*			*0*
Lanes	*1*	*2*	*1*	*1*	*2*	*1*
Configuration	*L*	*T*	*R*	*L*	*T*	*R*
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*14*	*0*	*1*	*13*	*0*	*38*
Peak-Hour Factor, PHF	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*14*	*0*	*1*	*13*	*0*	*38*
Percent Heavy Vehicles	*5*	*5*	*5*	*5*	*5*	*5*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*1*
Configuration		*LTR*		*LT*		*R*

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*	*L*	*LT*		*R*		*LTR*	
v (veh/h)	*3*	*13*	*13*		*38*		*15*	
C (m) (veh/h)	*594*	*602*	*55*		*519*		*54*	
v/c	*0.01*	*0.02*	*0.24*		*0.07*		*0.28*	
95% queue length	*0.02*	*0.07*	*0.81*		*0.24*		*0.96*	
Control Delay (s/veh)	*11.1*	*11.1*	*89.6*		*12.5*		*95.6*	
LOS	*B*	*B*	*F*		*B*		*F*	
Approach Delay (s/veh)	--	--	*32.2*			*95.6*		
Approach LOS	--	--	*D*			*F*		

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TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*Greg*
Agency/Co.	*Endo Engineering*
Date Performed	*11/4/11*
Analysis Time Period	*PM Peak Hour*

Site Information

Intersection	*Madison St @ Winged Foot Gt*
Jurisdiction	*La Quinta*
Analysis Year	*GPBO+Project*

Project Description *PGA West*

East/West Street: *Winged Foot Gate* | North/South Street: *Madison Street*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*1*	*1597*	*3*	*52*	*1599*	*11*
Peak-Hour Factor, PHF	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*1*	*1597*	*3*	*52*	*1599*	*11*
Percent Heavy Vehicles	*5*	--	--	*5*	--	--
Median Type	*Raised curb*					
RT Channelized			*0*			*0*
Lanes	*1*	*2*	*1*	*1*	*2*	*1*
Configuration	*L*	*T*	*R*	*L*	*T*	*R*
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*12*	*0*	*1*	*8*	*0*	*24*
Peak-Hour Factor, PHF	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*12*	*0*	*1*	*8*	*0*	*24*
Percent Heavy Vehicles	*5*	*5*	*5*	*5*	*5*	*5*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*1*
Configuration		*LTR*		*LT*		*R*

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*	*L*	*LT*		*R*		*LTR*	
v (veh/h)	*1*	*52*	*8*		*24*		*13*	
C (m) (veh/h)	*388*	*391*	*13*		*377*		*13*	
v/c	*0.00*	*0.13*	*0.62*		*0.06*		*1.00*	
95% queue length	*0.01*	*0.46*	*1.45*		*0.20*		*2.21*	
Control Delay (s/veh)	*14.3*	*15.6*	*485.5*		*15.2*		*634.9*	
LOS	*B*	*C*	*F*		*C*		*F*	
Approach Delay (s/veh)	--	--	*132.8*			*634.9*		
Approach LOS	--	--	*F*			*F*		

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SHORT REPORT

General Information		Site Information	
Analyst	*Greg*	Intersection	*Madison St. @ Winged Foot Gate*
Agency or Co.	*Endo Engineering*	Area Type	*All other areas*
Date Performed	*11/4/2011*	Jurisdiction	*La Quinta*
Time Period	*Morning Peak Hour*	Analysis Year	*Existing+Project*

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes	*0*	*1*	*0*	*0*	*1*	*1*	*1*	*2*	*1*	*1*	*2*	*1*
Lane Group		*LTR*			*LT*	*R*	*L*	*T*	*R*	*L*	*T*	*R*
Volume (vph)	*14*	*0*	*1*	*1*	*0*	*2*	*3*	*310*	*0*	*8*	*275*	*5*
% Heavy Vehicles	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*
PHF	*0.89*	*0.89*	*0.89*	*0.89*	*0.89*	*0.89*	*0.89*	*0.89*	*0.89*	*0.89*	*0.89*	*0.89*
Pretimed/Actuated (P/A)	*A*	*A*	*A*	*A*	*A*	*A*	*A*	*A*	*A*	*A*	*A*	*A*
Startup Lost Time		*2.0*			*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*
Extension of Effective Green		*2.0*			*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*
Arrival Type		*3*			*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*
Unit Extension		*3.0*			*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*
Ped/Bike/RTOR Volume	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Lane Width		*12.0*			*12.0*	*12.0*	*12.0*	*12.0*	*12.0*	*12.0*	*12.0*	*12.0*
Parking/Grade/Parking	*N*	*0*	*N*	*N*	*0*	*N*	*N*	*0*	*N*	*N*	*0*	*N*
Parking/Hour												
Bus Stops/Hour		*0*			*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Minimum Pedestrian Time		*3.2*			*3.2*			*3.2*			*3.2*	

Phasing	EW Perm	02	03	04	Excl. Left	Thru & RT	07	08
Timing	G = *7.0*	G = *0.0*	G =	G =	G = *7.0*	G = *74.0*	G = *0.0*	G = *0.0*
	Y = *4*	Y = *0*	Y =	Y =	Y = *4*	Y = *4*	Y = *0*	Y = *0*

Duration of Analysis (hrs) = *0.25* | Cycle Length C = *100.0*

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Adjusted Flow Rate		*17*			*1*	*2*	*3*	*348*	*0*	*9*	*309*	*6*
Lane Group Capacity		*92*			*100*	*1498*	*117*	*2483*	*1273*	*117*	*2483*	*1273*
v/c Ratio		*0.18*			*0.01*	*0.00*	*0.03*	*0.14*	*0.00*	*0.08*	*0.12*	*0.00*
Green Ratio		*0.07*			*0.07*	*1.00*	*0.07*	*0.74*	*0.85*	*0.07*	*0.74*	*0.85*
Uniform Delay d_1		*43.8*			*43.3*	*0.0*	*43.3*	*3.8*	*1.1*	*43.5*	*3.7*	*1.1*
Delay Factor k		*0.11*			*0.11*	*0.11*	*0.11*	*0.11*	*0.11*	*0.11*	*0.11*	*0.11*
Incremental Delay d_2		*1.0*			*0.0*	*0.0*	*0.1*	*0.0*	*0.0*	*0.3*	*0.0*	*0.0*
PF Factor		*1.000*			*1.000*	*0.950*	*1.000*	*1.000*	*1.000*	*1.000*	*1.000*	*1.000*
Control Delay		*44.8*			*43.3*	*0.0*	*43.4*	*3.8*	*1.1*	*43.8*	*3.7*	*1.1*
Lane Group LOS		*D*			*D*	*A*	*D*	*A*	*A*	*D*	*A*	*A*
Approach Delay		*44.8*			*14.4*			*4.1*			*4.8*	
Approach LOS		*D*			*B*			*A*			*A*	
Intersection Delay		*5.5*			Intersection LOS						*A*	

SHORT REPORT

General Information		Site Information	
Analyst	*Greg*	Intersection	*Madison St. @ Winged Foot Gate*
Agency or Co.	*Endo Engineering*	Area Type	*All other areas*
Date Performed	*11/4/2011*	Jurisdiction	*La Quinta*
Time Period	*Evening Peak Hour*	Analysis Year	*Existing+Project*

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes	*0*	*1*	*0*	*0*	*1*	*1*	*1*	*2*	*1*	*1*	*2*	*1*
Lane Group		*LTR*			*LT*	*R*	*L*	*T*	*R*	*L*	*T*	*R*
Volume (vph)	*12*	*0*	*1*	*1*	*0*	*6*	*1*	*420*	*0*	*51*	*387*	*11*
% Heavy Vehicles	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*
PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Pretimed/Actuated (P/A)	*A*	*A*	*A*	*A*	*A*	*A*	*A*	*A*	*A*	*A*	*A*	*A*
Startup Lost Time		*2.0*			*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*
Extension of Effective Green		*2.0*			*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*
Arrival Type		*3*			*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*
Unit Extension		*3.0*			*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*
Ped/Bike/RTOR Volume	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Lane Width		*12.0*			*12.0*	*12.0*	*12.0*	*12.0*	*12.0*	*12.0*	*12.0*	*12.0*
Parking/Grade/Parking	*N*	*0*	*N*	*N*	*0*	*N*	*N*	*0*	*N*	*N*	*0*	*N*
Parking/Hour												
Bus Stops/Hour		*0*			*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Minimum Pedestrian Time		*3.2*			*3.2*			*3.2*			*3.2*	

Phasing	EW Perm	02	03	04	Excl. Left	Thru & RT	07	08
Timing	G = *7.0*	G = *0.0*	G =	G =	G = *7.0*	G = *74.0*	G = *0.0*	G = *0.0*
	Y = *4*	Y = *0*	Y =	Y =	Y = *4*	Y = *4*	Y = *0*	Y = *0*

Duration of Analysis (hrs) = *0.25* | Cycle Length C = *100.0*

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Adjusted Flow Rate		*14*			*1*	*7*	*1*	*467*	*0*	*57*	*430*	*12*
Lane Group Capacity		*93*			*100*	*1498*	*117*	*2483*	*1273*	*117*	*2483*	*1273*
v/c Ratio		*0.15*			*0.01*	*0.00*	*0.01*	*0.19*	*0.00*	*0.49*	*0.17*	*0.01*
Green Ratio		*0.07*			*0.07*	*1.00*	*0.07*	*0.74*	*0.85*	*0.07*	*0.74*	*0.85*
Uniform Delay d_1		*43.7*			*43.3*	*0.0*	*43.3*	*3.9*	*1.1*	*44.8*	*3.9*	*1.1*
Delay Factor k		*0.11*			*0.11*	*0.11*	*0.11*	*0.11*	*0.11*	*0.11*	*0.11*	*0.11*
Incremental Delay d_2		*0.8*			*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*3.2*	*0.0*	*0.0*
PF Factor		*1.000*			*1.000*	*0.950*	*1.000*	*1.000*	*1.000*	*1.000*	*1.000*	*1.000*
Control Delay		*44.5*			*43.3*	*0.0*	*43.3*	*4.0*	*1.1*	*47.9*	*3.9*	*1.1*
Lane Group LOS		*D*			*D*	*A*	*D*	*A*	*A*	*D*	*A*	*A*
Approach Delay		*44.5*			*5.4*			*4.0*			*8.9*	
Approach LOS		*D*			*A*			*A*			*A*	
Intersection Delay		*7.1*			Intersection LOS						*A*	

SHORT REPORT

General Information		Site Information	
Analyst	*Greg*	Intersection	*Madison St. @ Winged Foot Gate*
Agency or Co.	*Endo Engineering*	Area Type	*All other areas*
Date Performed	*11/4/2011*	Jurisdiction	*La Quinta*
Time Period	*Morning Peak Hour*	Analysis Year	*GPBO W/Project*

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes	*0*	*1*	*0*	*0*	*1*	*1*	*1*	*2*	*1*	*1*	*2*	*1*
Lane Group		*LTR*			*LT*	*R*	*L*	*T*	*R*	*L*	*T*	*R*
Volume (vph)	*14*	*0*	*1*	*13*	*0*	*38*	*3*	*1116*	*4*	*13*	*1130*	*5*
% Heavy Vehicles	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*
PHF	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Pretimed/Actuated (P/A)	*A*	*A*	*A*	*A*	*A*	*A*	*A*	*A*	*A*	*A*	*A*	*A*
Startup Lost Time		*2.0*			*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*
Extension of Effective Green		*2.0*			*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*
Arrival Type		*3*			*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*
Unit Extension		*3.0*			*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*
Ped/Bike/RTOR Volume	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Lane Width		*12.0*			*12.0*	*12.0*	*12.0*	*12.0*	*12.0*	*12.0*	*12.0*	*12.0*
Parking/Grade/Parking	*N*	*0*	*N*	*N*	*0*	*N*	*N*	*0*	*N*	*N*	*0*	*N*
Parking/Hour												
Bus Stops/Hour		*0*			*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Minimum Pedestrian Time		*3.2*			*3.2*			*3.2*			*3.2*	

Phasing	EW Perm	02	03	04	Excl. Left	Thru & RT	07	08
Timing	G = *7.0*	G = *0.0*	G =	G =	G = *7.0*	G = *74.0*	G = *0.0*	G = *0.0*
	Y = *4*	Y = *0*	Y =	Y =	Y = *4*	Y = *4*	Y = *0*	Y = *0*

Duration of Analysis (hrs) = *0.25* | Cycle Length C = *100.0*

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Adjusted Flow Rate		*15*			*13*	*38*	*3*	*1116*	*4*	*13*	*1130*	*5*
Lane Group Capacity		*92*			*91*	*1498*	*117*	*2483*	*1273*	*117*	*2483*	*1273*
v/c Ratio		*0.16*			*0.14*	*0.03*	*0.03*	*0.45*	*0.00*	*0.11*	*0.46*	*0.00*
Green Ratio		*0.07*			*0.07*	*1.00*	*0.07*	*0.74*	*0.85*	*0.07*	*0.74*	*0.85*
Uniform Delay d_1		*43.7*			*43.7*	*0.0*	*43.3*	*5.1*	*1.1*	*43.6*	*5.1*	*1.1*
Delay Factor k		*0.11*			*0.11*	*0.11*	*0.11*	*0.11*	*0.11*	*0.11*	*0.11*	*0.11*
Incremental Delay d_2		*0.8*			*0.7*	*0.0*	*0.1*	*0.1*	*0.0*	*0.4*	*0.1*	*0.0*
PF Factor		*1.000*			*1.000*	*0.950*	*1.000*	*1.000*	*1.000*	*1.000*	*1.000*	*1.000*
Control Delay		*44.6*			*44.4*	*0.0*	*43.4*	*5.2*	*1.1*	*44.0*	*5.2*	*1.1*
Lane Group LOS		*D*			*D*	*A*	*D*	*A*	*A*	*D*	*A*	*A*
Approach Delay		*44.6*			*11.3*			*5.3*			*5.7*	
Approach LOS		*D*			*B*			*A*			*A*	
Intersection Delay		*5.8*			Intersection LOS						*A*	

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SHORT REPORT

General Information		Site Information	
Analyst	*Greg*	Intersection	*Madison St. @ Winged Foot Gate*
Agency or Co.	*Endo Engineering*	Area Type	*All other areas*
Date Performed	*11/4/2011*	Jurisdiction	*La Quinta*
Time Period	*Evening Peak Hour*	Analysis Year	*GPBO W/ Project*

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes	*0*	*1*	*0*	*0*	*1*	*1*	*1*	*2*	*1*	*1*	*2*	*1*
Lane Group		*LTR*			*LT*	*R*	*L*	*T*	*R*	*L*	*T*	*R*
Volume (vph)	*12*	*0*	*1*	*8*	*0*	*24*	*1*	*1597*	*3*	*52*	*1599*	*11*
% Heavy Vehicles	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*
PHF	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Pretimed/Actuated (P/A)	*A*	*A*	*A*	*A*	*A*	*A*	*A*	*A*	*A*	*A*	*A*	*A*
Startup Lost Time		*2.0*			*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*
Extension of Effective Green		*2.0*			*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*
Arrival Type		*3*			*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*
Unit Extension		*3.0*			*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*
Ped/Bike/RTOR Volume	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Lane Width		*12.0*			*12.0*	*12.0*	*12.0*	*12.0*	*12.0*	*12.0*	*12.0*	*12.0*
Parking/Grade/Parking	*N*	*0*	*N*	*N*	*0*	*N*	*N*	*0*	*N*	*N*	*0*	*N*
Parking/Hour												
Bus Stops/Hour		*0*			*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Minimum Pedestrian Time		*3.2*			*3.2*			*3.2*			*3.2*	

Phasing	EW Perm	02	03	04	Excl. Left	Thru & RT	07	08
Timing	G = *7.0*	G = *0.0*	G =	G =	G = *7.0*	G = *74.0*	G = *0.0*	G = *0.0*
	Y = *4*	Y = *0*	Y =	Y =	Y = *4*	Y = *4*	Y = *0*	Y = *0*
Duration of Analysis (hrs) = *0.25*						Cycle Length C = *100.0*		

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Adjusted Flow Rate		*13*			*8*	*24*	*1*	*1597*	*3*	*52*	*1599*	*11*
Lane Group Capacity		*93*			*94*	*1498*	*117*	*2483*	*1273*	*117*	*2483*	*1273*
v/c Ratio		*0.14*			*0.09*	*0.02*	*0.01*	*0.64*	*0.00*	*0.44*	*0.64*	*0.01*
Green Ratio		*0.07*			*0.07*	*1.00*	*0.07*	*0.74*	*0.85*	*0.07*	*0.74*	*0.85*
Uniform Delay d_1		*43.7*			*43.5*	*0.0*	*43.3*	*6.4*	*1.1*	*44.6*	*6.5*	*1.1*
Delay Factor k		*0.11*			*0.11*	*0.11*	*0.11*	*0.22*	*0.11*	*0.11*	*0.22*	*0.11*
Incremental Delay d_2		*0.7*			*0.4*	*0.0*	*0.0*	*0.6*	*0.0*	*2.7*	*0.6*	*0.0*
PF Factor		*1.000*			*1.000*	*0.950*	*1.000*	*1.000*	*1.000*	*1.000*	*1.000*	*1.000*
Control Delay		*44.4*			*43.9*	*0.0*	*43.3*	*7.0*	*1.1*	*47.3*	*7.0*	*1.1*
Lane Group LOS		*D*			*D*	*A*	*D*	*A*	*A*	*D*	*A*	*A*
Approach Delay		*44.4*			*11.0*			*7.0*			*8.3*	
Approach LOS		*D*			*B*			*A*			*A*	
Intersection Delay		*7.8*			Intersection LOS						*A*	

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*Greg*	Intersection	*Madison St @ Winged Foot Gt*
Agency/Co.	*Endo Engineering*	Jurisdiction	*La Quinta*
Date Performed	*11/4/11*	Analysis Year	*Existing+Project*
Analysis Time Period	*AM Peak Hour*		

Project Description *PGA West*

East/West Street: *Winged Foot Gate* | North/South Street: *Madison Street*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*3*	*324*	*0*	*8*	*276*	*5*
Peak-Hour Factor, PHF	*0.89*	*0.89*	*0.89*	*0.89*	*0.89*	*0.89*
Hourly Flow Rate, HFR (veh/h)	*3*	*364*	*0*	*8*	*310*	*5*
Percent Heavy Vehicles	*5*	--	--	*5*	--	--
Median Type	*Raised curb*					
RT Channelized			*0*			*0*
Lanes	*1*	*2*	*1*	*1*	*2*	*1*
Configuration	*L*	*T*	*R*	*L*	*T*	*R*
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)			*15*			*3*
Peak-Hour Factor, PHF	*0.89*	*0.89*	*0.89*	*0.89*	*0.89*	*0.89*
Hourly Flow Rate, HFR (veh/h)	*0*	*0*	*16*	*0*	*0*	*3*
Percent Heavy Vehicles	*5*	*5*	*5*	*5*	*5*	*5*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*1*	*0*	*0*	*1*
Configuration			*R*			*R*

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*	*L*			*R*			*R*
v (veh/h)	*3*	*8*			*3*			*16*
C (m) (veh/h)	*1221*	*1170*			*850*			*880*
v/c	*0.00*	*0.01*			*0.00*			*0.02*
95% queue length	*0.01*	*0.02*			*0.01*			*0.06*
Control Delay (s/veh)	*8.0*	*8.1*			*9.3*			*9.2*
LOS	*A*	*A*			*A*			*A*
Approach Delay (s/veh)	--	--	*9.3*			*9.2*		
Approach LOS	--	--	*A*			*A*		

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TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*Greg*
Agency/Co.	*Endo Engineering*
Date Performed	*11/4/11*
Analysis Time Period	*PM Peak Hour*

Site Information

Intersection	*Madison St @ Winged Foot Gt*
Jurisdiction	*La Quinta*
Analysis Year	*Existing+Project*

Project Description *PGA West*

East/West Street: *Winged Foot Gate* | North/South Street: *Madison Street*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*1*	*432*	*0*	*51*	*388*	*11*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR (veh/h)	*1*	*480*	*0*	*56*	*431*	*12*
Percent Heavy Vehicles	*5*	--	--	*5*	--	--
Median Type	*Raised curb*					
RT Channelized			*0*			*0*
Lanes	*1*	*2*	*1*	*1*	*2*	*1*
Configuration	*L*	*T*	*R*	*L*	*T*	*R*
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)			*13*			*7*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR (veh/h)	*0*	*0*	*14*	*0*	*0*	*7*
Percent Heavy Vehicles	*5*	*5*	*5*	*5*	*5*	*5*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*1*	*0*	*0*	*1*
Configuration			*R*			*R*

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*	*L*			*R*			*R*
v (veh/h)	*1*	*56*			*7*			*14*
C (m) (veh/h)	*1092*	*1058*			*788*			*813*
v/c	*0.00*	*0.05*			*0.01*			*0.02*
95% queue length	*0.00*	*0.17*			*0.03*			*0.05*
Control Delay (s/veh)	*8.3*	*8.6*			*9.6*			*9.5*
LOS	*A*	*A*			*A*			*A*
Approach Delay (s/veh)	--	--	*9.6*			*9.5*		
Approach LOS	--	--	*A*			*A*		

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*Greg*	Intersection	*Madison St @ Winged Foot Gt*
Agency/Co.	*Endo Engineering*	Jurisdiction	*La Quinta*
Date Performed	*11/4/11*	Analysis Year	*GPBO+Project*
Analysis Time Period	*AM Peak Hour*		

Project Description *PGA West*

East/West Street: *Winged Foot Gate* | North/South Street: *Madison Street*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*3*	*1130*	*4*	*13*	*1143*	*5*
Peak-Hour Factor, PHF	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*3*	*1130*	*4*	*13*	*1143*	*5*
Percent Heavy Vehicles	*5*	--	--	*5*	--	--
Median Type	*Raised curb*					
RT Channelized			*0*			*0*
Lanes	*1*	*2*	*1*	*1*	*2*	*1*
Configuration	*L*	*T*	*R*	*L*	*T*	*R*
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)			*15*			*51*
Peak-Hour Factor, PHF	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*0*	*0*	*15*	*0*	*0*	*51*
Percent Heavy Vehicles	*5*	*5*	*5*	*5*	*5*	*5*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*1*	*0*	*0*	*1*
Configuration			*R*			*R*

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*	*L*			*R*			*R*
v (veh/h)	*3*	*13*			*51*			*15*
C (m) (veh/h)	*587*	*595*			*514*			*509*
v/c	*0.01*	*0.02*			*0.10*			*0.03*
95% queue length	*0.02*	*0.07*			*0.33*			*0.09*
Control Delay (s/veh)	*11.2*	*11.2*			*12.8*			*12.3*
LOS	*B*	*B*			*B*			*B*
Approach Delay (s/veh)	--	--	*12.8*			*12.3*		
Approach LOS	--	--	*B*			*B*		

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*Greg*	Intersection	*Madison St @ Winged Foot Gt*
Agency/Co.	*Endo Engineering*	Jurisdiction	*La Quinta*
Date Performed	*11/4/11*	Analysis Year	*GPBO+Project*
Analysis Time Period	*PM Peak Hour*		

Project Description *PGA West*

East/West Street: *Winged Foot Gate* | North/South Street: *Madison Street*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*1*	*1609*	*3*	*52*	*1607*	*11*
Peak-Hour Factor, PHF	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*1*	*1609*	*3*	*52*	*1607*	*11*
Percent Heavy Vehicles	*5*	--	--	*5*	--	--
Median Type	*Raised curb*					
RT Channelized			*0*			*0*
Lanes	*1*	*2*	*1*	*1*	*2*	*1*
Configuration	*L*	*T*	*R*	*L*	*T*	*R*
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)			*13*			*32*
Peak-Hour Factor, PHF	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*0*	*0*	*13*	*0*	*0*	*32*
Percent Heavy Vehicles	*5*	*5*	*5*	*5*	*5*	*5*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*1*	*0*	*0*	*1*
Configuration			*R*			*R*

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*	*L*			*R*			*R*
v (veh/h)	*1*	*52*			*32*			*13*
C (m) (veh/h)	*385*	*387*			*374*			*374*
v/c	*0.00*	*0.13*			*0.09*			*0.03*
95% queue length	*0.01*	*0.46*			*0.28*			*0.11*
Control Delay (s/veh)	*14.4*	*15.7*			*15.5*			*15.0*
LOS	*B*	*C*			*C*			*B*
Approach Delay (s/veh)	--	--	*15.5*			*15.0*		
Approach LOS	--	--	*C*			*B*		

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*Greg*	Intersection	*Madison St @ Weiskopf/Legends*
Agency/Co.	*Endo Engineering*	Jurisdiction	*La Quinta*
Date Performed	*1/9/2010*	Analysis Year	*Existing+Project*
Analysis Time Period	*AM Peak Hour*		

Project Description *PGA West*

East/West Street: *Weiskopf/Legends* | North/South Street: *Madison Street*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*2*	*165*	*7*	*22*	*157*	*17*
Peak-Hour Factor, PHF	*0.87*	*0.87*	*0.87*	*0.87*	*0.87*	*0.87*
Hourly Flow Rate, HFR (veh/h)	*2*	*189*	*8*	*25*	*180*	*19*
Percent Heavy Vehicles	*5*	--	--	*5*	--	--
Median Type	*Raised curb*					
RT Channelized			*0*			*0*
Lanes	*1*	*2*	*0*	*1*	*2*	*0*
Configuration	*L*	*T*	*TR*	*L*	*T*	*TR*
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*10*	*7*	*2*	*1*	*1*	*35*
Peak-Hour Factor, PHF	*0.87*	*0.87*	*0.87*	*0.87*	*0.87*	*0.87*
Hourly Flow Rate, HFR (veh/h)	*11*	*8*	*2*	*1*	*1*	*40*
Percent Heavy Vehicles	*5*	*5*	*5*	*5*	*5*	*5*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*2*	*0*	*0*	*2*	*0*
Configuration	*LT*		*TR*	*LT*		*TR*

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*	*L*	*LT*		*TR*	*LT*		*TR*
v (veh/h)	*2*	*25*	*1*		*40*	*15*		*6*
C (m) (veh/h)	*1349*	*1351*	*564*		*947*	*533*		*586*
v/c	*0.00*	*0.02*	*0.00*		*0.04*	*0.03*		*0.01*
95% queue length	*0.00*	*0.06*	*0.01*		*0.13*	*0.09*		*0.03*
Control Delay (s/veh)	*7.7*	*7.7*	*11.4*		*9.0*	*11.9*		*11.2*
LOS	*A*	*A*	*B*		*A*	*B*		*B*
Approach Delay (s/veh)	--	--	*9.0*			*11.7*		
Approach LOS	--	--	*A*			*B*		

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*Greg*	Intersection	*Madison St @ Weiskopf/Legends*
Agency/Co.	*Endo Engineering*	Jurisdiction	*La Quinta*
Date Performed	*1/9/2010*	Analysis Year	*Existing+Project*
Analysis Time Period	*PM Peak Hour*		

Project Description *PGA West*

East/West Street: *Weiskopf/Legends* | North/South Street: *Madison Street*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*2*	*220*	*4*	*44*	*256*	*12*
Peak-Hour Factor, PHF	*0.87*	*0.87*	*0.87*	*0.87*	*0.87*	*0.87*
Hourly Flow Rate, HFR (veh/h)	*2*	*252*	*4*	*50*	*294*	*13*
Percent Heavy Vehicles	*5*	--	--	*5*	--	--
Median Type	*Raised curb*					
RT Channelized			*0*			*0*
Lanes	*1*	*2*	*0*	*1*	*2*	*0*
Configuration	*L*	*T*	*TR*	*L*	*T*	*TR*
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*18*	*3*	*4*	*1*	*1*	*31*
Peak-Hour Factor, PHF	*0.87*	*0.87*	*0.87*	*0.87*	*0.87*	*0.87*
Hourly Flow Rate, HFR (veh/h)	*20*	*3*	*4*	*1*	*1*	*35*
Percent Heavy Vehicles	*5*	*5*	*5*	*5*	*5*	*5*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*2*	*0*	*0*	*2*	*0*
Configuration	*LT*		*TR*	*LT*		*TR*

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*	*L*	*LT*		*TR*	*LT*		*TR*
v (veh/h)	*2*	*50*	*1*		*35*	*21*		*5*
C (m) (veh/h)	*1229*	*1284*	*425*		*911*	*393*		*684*
v/c	*0.00*	*0.04*	*0.00*		*0.04*	*0.05*		*0.01*
95% queue length	*0.00*	*0.12*	*0.01*		*0.12*	*0.17*		*0.02*
Control Delay (s/veh)	*7.9*	*7.9*	*13.5*		*9.1*	*14.7*		*10.3*
LOS	*A*	*A*	*B*		*A*	*B*		*B*
Approach Delay (s/veh)	--	--	*9.2*			*13.8*		
Approach LOS	--	--	*A*			*B*		

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*Greg*	Intersection	*Madison St @ Weiskopf/Legends*
Agency/Co.	*Endo Engineering*	Jurisdiction	*La Quinta*
Date Performed	*1/9/2010*	Analysis Year	*GPBO+Project*
Analysis Time Period	*AM Peak Hour*		

Project Description *PGA West*

East/West Street: *Weiskopf/Legends* | North/South Street: *Madison Street*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*2*	*874*	*7*	*22*	*888*	*17*
Peak-Hour Factor, PHF	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*2*	*874*	*7*	*22*	*888*	*17*
Percent Heavy Vehicles	*5*	--	--	*5*	--	--
Median Type	*Raised curb*					
RT Channelized			*0*			*0*
Lanes	*1*	*2*	*0*	*1*	*2*	*0*
Configuration	*L*	*T*	*TR*	*L*	*T*	*TR*
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*10*	*7*	*2*	*1*	*1*	*35*
Peak-Hour Factor, PHF	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*10*	*7*	*2*	*1*	*1*	*35*
Percent Heavy Vehicles	*5*	*5*	*5*	*5*	*5*	*5*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*2*	*0*	*0*	*2*	*0*
Configuration	*LT*		*TR*	*LT*		*TR*

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*	*L*	*LT*		*TR*	*LT*		*TR*
v (veh/h)	*2*	*22*	*1*		*35*	*13*		*5*
C (m) (veh/h)	*729*	*744*	*92*		*606*	*86*		*111*
v/c	*0.00*	*0.03*	*0.01*		*0.06*	*0.15*		*0.05*
95% queue length	*0.01*	*0.09*	*0.03*		*0.18*	*0.51*		*0.14*
Control Delay (s/veh)	*10.0*	*10.0*	*44.6*		*11.3*	*54.2*		*39.0*
LOS	*A*	*A*	*E*		*B*	*F*		*E*
Approach Delay (s/veh)	--	--	*12.2*			*49.9*		
Approach LOS	--	--	*B*			*E*		

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TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*Greg*
Agency/Co.	*Endo Engineering*
Date Performed	*1/9/2010*
Analysis Time Period	*PM Peak Hour*

Site Information

Intersection	*Madison St @ Weiskopf/Legends*
Jurisdiction	*La Quinta*
Analysis Year	*GPBO+Project*

Project Description *PGA West*

East/West Street: *Weiskopf/Legends* | North/South Street: *Madison Street*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*2*	*1504*	*4*	*44*	*1528*	*12*
Peak-Hour Factor, PHF	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*2*	*1504*	*4*	*44*	*1528*	*12*
Percent Heavy Vehicles	*5*	--	--	*5*	--	--
Median Type	*Raised curb*					
RT Channelized			*0*			*0*
Lanes	*1*	*2*	*0*	*1*	*2*	*0*
Configuration	*L*	*T*	*TR*	*L*	*T*	*TR*
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*18*	*3*	*4*	*1*	*1*	*31*
Peak-Hour Factor, PHF	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*18*	*3*	*4*	*1*	*1*	*31*
Percent Heavy Vehicles	*5*	*5*	*5*	*5*	*5*	*5*	
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*2*	*0*	*0*	*2*	*0*
Configuration	*LT*		*TR*	*LT*		*TR*

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*	*L*	*LT*		*TR*	*LT*		*TR*
v (veh/h)	*2*	*44*	*1*		*31*	*19*		*5*
C (m) (veh/h)	*413*	*425*	*12*		*400*	*13*		*41*
v/c	*0.00*	*0.10*	*0.08*		*0.08*	*1.46*		*0.12*
95% queue length	*0.01*	*0.34*	*0.23*		*0.25*	*3.07*		*0.38*
Control Delay (s/veh)	*13.8*	*14.4*	*330.7*		*14.8*	*825.0*		*104.6*
LOS	*B*	*B*	*F*		*B*	*F*		*F*
Approach Delay (s/veh)	--	--	*24.6*			*674.9*		
Approach LOS	--	--	*C*			*F*		

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SHORT REPORT

General Information		Site Information	
Analyst	*Greg*	Intersection	*Madison St. @ Weiskopf Gate*
Agency or Co.	*Endo Engineering*	Area Type	*All other areas*
Date Performed	*11/4/2011*	Jurisdiction	*La Quinta*
Time Period	*Morning Peak Hour*	Analysis Year	*Existing+Project*

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes	*0*	*1*	*1*	*0*	*1*	*1*	*1*	*2*	*0*	*1*	*2*	*0*
Lane Group		*LT*	*R*		*LT*	*R*	*L*	*TR*		*L*	*TR*	
Volume (vph)	*10*	*7*	*2*	*1*	*1*	*35*	*2*	*165*	*7*	*22*	*157*	*17*
% Heavy Vehicles	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*
PHF	*0.87*	*0.87*	*0.87*	*0.87*	*0.87*	*0.87*	*0.87*	*0.87*	*0.87*	*0.87*	*0.87*	*0.87*
Pretimed/Actuated (P/A)	*A*	*A*	*A*	*A*	*A*	*A*	*A*	*A*	*A*	*A*	*A*	*A*
Startup Lost Time		*2.0*	*2.0*		*2.0*	*2.0*	*2.0*	*2.0*		*2.0*	*2.0*	
Extension of Effective Green		*2.0*	*2.0*		*2.0*	*2.0*	*2.0*	*2.0*		*2.0*	*2.0*	
Arrival Type		*3*	*3*		*3*	*3*	*3*	*3*		*3*	*3*	
Unit Extension		*3.0*	*3.0*		*3.0*	*3.0*	*3.0*	*3.0*		*3.0*	*3.0*	
Ped/Bike/RTOR Volume	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Lane Width		*12.0*	*12.0*		*12.0*	*12.0*	*12.0*	*12.0*		*12.0*	*12.0*	
Parking/Grade/Parking	*N*	*0*	*N*	*N*	*0*	*N*	*N*	*0*	*N*	*N*	*0*	*N*
Parking/Hour												
Bus Stops/Hour		*0*	*0*		*0*	*0*	*0*	*0*		*0*	*0*	
Minimum Pedestrian Time		*3.2*			*3.2*			*3.2*			*3.2*	

Phasing	EW Perm	02	03	04	Excl. Left	Thru & RT	07	08
Timing	G = *7.0*	G = *0.0*	G =	G =	G = *7.0*	G = *74.0*	G = *0.0*	G = *0.0*
	Y = *4*	Y = *0*	Y =	Y =	Y = *4*	Y = *4*	Y = *0*	Y = *0*

Duration of Analysis (hrs) = *0.25* | Cycle Length C = *100.0*

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Adjusted Flow Rate		*19*	*2*		*2*	*40*	*2*	*198*		*25*	*200*	
Lane Group Capacity		*104*	*1538*		*110*	*1498*	*117*	*2467*		*117*	*2445*	
v/c Ratio		*0.18*	*0.00*		*0.02*	*0.03*	*0.02*	*0.08*		*0.21*	*0.08*	
Green Ratio		*0.07*	*1.00*		*0.07*	*1.00*	*0.07*	*0.74*		*0.07*	*0.74*	
Uniform Delay d_1		*43.8*	*0.0*		*43.3*	*0.0*	*43.3*	*3.6*		*43.9*	*3.6*	
Delay Factor k		*0.11*	*0.11*		*0.11*	*0.11*	*0.11*	*0.11*		*0.11*	*0.11*	
Incremental Delay d_2		*0.8*	*0.0*		*0.1*	*0.0*	*0.1*	*0.0*		*0.9*	*0.0*	
PF Factor		*1.000*	*0.950*		*1.000*	*0.950*	*1.000*	*1.000*		*1.000*	*1.000*	
Control Delay		*44.7*	*0.0*		*43.4*	*0.0*	*43.4*	*3.6*		*44.8*	*3.6*	
Lane Group LOS		*D*	*A*		*D*	*A*	*D*	*A*		*D*	*A*	
Approach Delay		*40.4*			*2.1*			*4.0*			*8.2*	
Approach LOS		*D*			*A*			*A*			*A*	
Intersection Delay		*7.3*			Intersection LOS						*A*	

SHORT REPORT

General Information		Site Information	
Analyst	*Greg*	Intersection	*Madison St. @ Weiskopf Gate*
Agency or Co.	*Endo Engineering*	Area Type	*All other areas*
Date Performed	*11/4/2011*	Jurisdiction	*La Quinta*
Time Period	*Evening Peak Hour*	Analysis Year	*Existing+Project*

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes	*0*	*1*	*1*	*0*	*1*	*1*	*1*	*2*	*0*	*1*	*2*	*0*
Lane Group		*LT*	*R*		*LT*	*R*	*L*	*TR*		*L*	*TR*	
Volume (vph)	*18*	*3*	*4*	*1*	*1*	*31*	*2*	*220*	*4*	*44*	*256*	*12*
% Heavy Vehicles	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*
PHF	*0.87*	*0.87*	*0.87*	*0.87*	*0.87*	*0.87*	*0.87*	*0.87*	*0.87*	*0.87*	*0.87*	*0.87*
Pretimed/Actuated (P/A)	*A*	*A*	*A*	*A*	*A*	*A*	*A*	*A*	*A*	*A*	*A*	*A*
Startup Lost Time		*2.0*	*2.0*		*2.0*	*2.0*	*2.0*	*2.0*		*2.0*	*2.0*	
Extension of Effective Green		*2.0*	*2.0*		*2.0*	*2.0*	*2.0*	*2.0*		*2.0*	*2.0*	
Arrival Type		*3*	*3*		*3*	*3*	*3*	*3*		*3*	*3*	
Unit Extension		*3.0*	*3.0*		*3.0*	*3.0*	*3.0*	*3.0*		*3.0*	*3.0*	
Ped/Bike/RTOR Volume	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Lane Width		*12.0*	*12.0*		*12.0*	*12.0*	*12.0*	*12.0*		*12.0*	*12.0*	
Parking/Grade/Parking	*N*	*0*	*N*	*N*	*0*	*N*	*N*	*0*	*N*	*N*	*0*	*N*
Parking/Hour												
Bus Stops/Hour		*0*	*0*		*0*	*0*	*0*	*0*		*0*	*0*	
Minimum Pedestrian Time		*3.2*			*3.2*			*3.2*			*3.2*	

Phasing	EW Perm	02	03	04	Excl. Left	Thru & RT	07	08
Timing	G = *7.0*	G = *0.0*	G =	G =	G = *7.0*	G = *74.0*	G = *0.0*	G = *0.0*
	Y = *4*	Y = *0*	Y =	Y =	Y = *4*	Y = *4*	Y = *0*	Y = *0*
Duration of Analysis (hrs) = *0.25*						Cycle Length C = *100.0*		

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Adjusted Flow Rate		*24*	*5*		*2*	*36*	*2*	*258*		*51*	*308*	
Lane Group Capacity		*93*	*1538*		*110*	*1498*	*117*	*2475*		*117*	*2466*	
v/c Ratio		*0.26*	*0.00*		*0.02*	*0.02*	*0.02*	*0.10*		*0.44*	*0.12*	
Green Ratio		*0.07*	*1.00*		*0.07*	*1.00*	*0.07*	*0.74*		*0.07*	*0.74*	
Uniform Delay d_1		*44.0*	*0.0*		*43.3*	*0.0*	*43.3*	*3.7*		*44.6*	*3.7*	
Delay Factor k		*0.11*	*0.11*		*0.11*	*0.11*	*0.11*	*0.11*		*0.11*	*0.11*	
Incremental Delay d_2		*1.5*	*0.0*		*0.1*	*0.0*	*0.1*	*0.0*		*2.6*	*0.0*	
PF Factor		*1.000*	*0.950*		*1.000*	*0.950*	*1.000*	*1.000*		*1.000*	*1.000*	
Control Delay		*45.5*	*0.0*		*43.4*	*0.0*	*43.4*	*3.7*		*47.2*	*3.7*	
Lane Group LOS		*D*	*A*		*D*	*A*	*D*	*A*		*D*	*A*	
Approach Delay		*37.7*			*2.3*			*4.0*			*9.9*	
Approach LOS		*D*			*A*			*A*			*A*	
Intersection Delay		*8.4*			Intersection LOS						*A*	

SHORT REPORT

General Information		Site Information	
Analyst	*Greg*	Intersection	*Madison St. @ Weiskopf Gate*
Agency or Co.	*Endo Engineering*	Area Type	*All other areas*
Date Performed	*11/4/2011*	Jurisdiction	*La Quinta*
Time Period	*Morning Peak Hour*	Analysis Year	*GPBO W/Project*

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes	*0*	*1*	*1*	*0*	*1*	*1*	*1*	*2*	*0*	*1*	*2*	*0*
Lane Group		*LT*	*R*		*LT*	*R*	*L*	*TR*		*L*	*TR*	
Volume (vph)	*10*	*7*	*2*	*1*	*1*	*35*	*2*	*874*	*7*	*22*	*888*	*17*
% Heavy Vehicles	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*
PHF	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Pretimed/Actuated (P/A)	*A*	*A*	*A*	*A*	*A*	*A*	*A*	*A*	*A*	*A*	*A*	*A*
Startup Lost Time		*2.0*	*2.0*		*2.0*	*2.0*	*2.0*	*2.0*		*2.0*	*2.0*	
Extension of Effective Green		*2.0*	*2.0*		*2.0*	*2.0*	*2.0*	*2.0*		*2.0*	*2.0*	
Arrival Type		*3*	*3*		*3*	*3*	*3*	*3*		*3*	*3*	
Unit Extension		*3.0*	*3.0*		*3.0*	*3.0*	*3.0*	*3.0*		*3.0*	*3.0*	
Ped/Bike/RTOR Volume	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Lane Width		*12.0*	*12.0*		*12.0*	*12.0*	*12.0*	*12.0*		*12.0*	*12.0*	
Parking/Grade/Parking	*N*	*0*	*N*	*N*	*0*	*N*	*N*	*0*	*N*	*N*	*0*	*N*
Parking/Hour												
Bus Stops/Hour		*0*	*0*		*0*	*0*	*0*	*0*		*0*	*0*	
Minimum Pedestrian Time		*3.2*			*3.2*			*3.2*			*3.2*	

Phasing	EW Perm	02	03	04	Excl. Left	Thru & RT	07	08
Timing	G = *7.0*	G = *0.0*	G =	G =	G = *7.0*	G = *74.0*	G = *0.0*	G = *0.0*
	Y = *4*	Y = *0*	Y =	Y =	Y = *4*	Y = *4*	Y = *0*	Y = *0*
Duration of Analysis (hrs) = *0.25*						Cycle Length C = *100.0*		

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Adjusted Flow Rate		*17*	*2*		*2*	*35*	*2*	*881*		*22*	*905*	
Lane Group Capacity		*104*	*1538*		*110*	*1498*	*117*	*2480*		*117*	*2475*	
v/c Ratio		*0.16*	*0.00*		*0.02*	*0.02*	*0.02*	*0.36*		*0.19*	*0.37*	
Green Ratio		*0.07*	*1.00*		*0.07*	*1.00*	*0.07*	*0.74*		*0.07*	*0.74*	
Uniform Delay d_1		*43.7*	*0.0*		*43.3*	*0.0*	*43.3*	*4.6*		*43.8*	*4.6*	
Delay Factor k		*0.11*	*0.11*		*0.11*	*0.11*	*0.11*	*0.11*		*0.11*	*0.11*	
Incremental Delay d_2		*0.7*	*0.0*		*0.1*	*0.0*	*0.1*	*0.1*		*0.8*	*0.1*	
PF Factor		*1.000*	*0.950*		*1.000*	*0.950*	*1.000*	*1.000*		*1.000*	*1.000*	
Control Delay		*44.5*	*0.0*		*43.4*	*0.0*	*43.4*	*4.7*		*44.6*	*4.7*	
Lane Group LOS		*D*	*A*		*D*	*A*	*D*	*A*		*D*	*A*	
Approach Delay		*39.8*			*2.4*			*4.8*			*5.7*	
Approach LOS		*D*			*A*			*A*			*A*	
Intersection Delay		*5.5*			Intersection LOS						*A*	

SHORT REPORT

General Information		Site Information	
Analyst	*Greg*	Intersection	*Madison St. @ Weiskopf Gate*
Agency or Co.	*Endo Engineering*	Area Type	*All other areas*
Date Performed	*11/4/2011*	Jurisdiction	*La Quinta*
Time Period	*Evening Peak Hour*	Analysis Year	*GPBO W/Project*

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes	*0*	*1*	*1*	*0*	*1*	*1*	*1*	*2*	*0*	*1*	*2*	*0*
Lane Group		*LT*	*R*		*LT*	*R*	*L*	*TR*		*L*	*TR*	
Volume (vph)	*18*	*3*	*4*	*1*	*1*	*31*	*2*	*1504*	*4*	*44*	*1528*	*12*
% Heavy Vehicles	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*
PHF	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Pretimed/Actuated (P/A)	*A*	*A*	*A*	*A*	*A*	*A*	*A*	*A*	*A*	*A*	*A*	*A*
Startup Lost Time		*2.0*	*2.0*		*2.0*	*2.0*	*2.0*	*2.0*		*2.0*	*2.0*	
Extension of Effective Green		*2.0*	*2.0*		*2.0*	*2.0*	*2.0*	*2.0*		*2.0*	*2.0*	
Arrival Type		*3*	*3*		*3*	*3*	*3*	*3*		*3*	*3*	
Unit Extension		*3.0*	*3.0*		*3.0*	*3.0*	*3.0*	*3.0*		*3.0*	*3.0*	
Ped/Bike/RTOR Volume	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Lane Width		*12.0*	*12.0*		*12.0*	*12.0*	*12.0*	*12.0*		*12.0*	*12.0*	
Parking/Grade/Parking	*N*	*0*	*N*	*N*	*0*	*N*	*N*	*0*	*N*	*N*	*0*	*N*
Parking/Hour												
Bus Stops/Hour		*0*	*0*		*0*	*0*	*0*	*0*		*0*	*0*	
Minimum Pedestrian Time		*3.2*			*3.2*			*3.2*			*3.2*	

Phasing	EW Perm	02	03	04	Excl. Left	Thru & RT	07	08
Timing	G = *7.0*	G = *0.0*	G =	G =	G = *7.0*	G = *74.0*	G = *0.0*	G = *0.0*
	Y = *4*	Y = *0*	Y =	Y =	Y = *4*	Y = *4*	Y = *0*	Y = *0*
Duration of Analysis (hrs) = *0.25*						Cycle Length C = *100.0*		

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Adjusted Flow Rate		*21*	*4*		*2*	*31*	*2*	*1508*		*44*	*1540*	
Lane Group Capacity		*94*	*1538*		*110*	*1498*	*117*	*2481*		*117*	*2480*	
v/c Ratio		*0.22*	*0.00*		*0.02*	*0.02*	*0.02*	*0.61*		*0.38*	*0.62*	
Green Ratio		*0.07*	*1.00*		*0.07*	*1.00*	*0.07*	*0.74*		*0.07*	*0.74*	
Uniform Delay d_1		*43.9*	*0.0*		*43.3*	*0.0*	*43.3*	*6.1*		*44.4*	*6.3*	
Delay Factor k		*0.11*	*0.11*		*0.11*	*0.11*	*0.11*	*0.19*		*0.11*	*0.20*	
Incremental Delay d_2		*1.2*	*0.0*		*0.1*	*0.0*	*0.1*	*0.4*		*2.0*	*0.5*	
PF Factor		*1.000*	*0.950*		*1.000*	*0.950*	*1.000*	*1.000*		*1.000*	*1.000*	
Control Delay		*45.1*	*0.0*		*43.4*	*0.0*	*43.4*	*6.6*		*46.4*	*6.7*	
Lane Group LOS		*D*	*A*		*D*	*A*	*D*	*A*		*D*	*A*	
Approach Delay		*37.9*			*2.6*			*6.6*			*7.8*	
Approach LOS		*D*			*A*			*A*			*A*	
Intersection Delay		*7.4*			Intersection LOS						*A*	

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*Greg*	Intersection	*Madison St @ Weiskopf/Legends*
Agency/Co.	*Endo Engineering*	Jurisdiction	*La Quinta*
Date Performed	*1/9/2010*	Analysis Year	*Existing+Project*
Analysis Time Period	*AM Peak Hour*		

Project Description *PGA West*

East/West Street: *Weiskopf/Legends* | North/South Street: *Madison Street*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*4*	*175*	*7*	*22*	*157*	*17*
Peak-Hour Factor, PHF	*0.87*	*0.87*	*0.87*	*0.87*	*0.87*	*0.87*
Hourly Flow Rate, HFR (veh/h)	*4*	*201*	*8*	*25*	*180*	*19*
Percent Heavy Vehicles	*5*	--	--	*5*	--	--
Median Type	*Raised curb*					
RT Channelized			*0*			*0*
Lanes	*1*	*2*	*0*	*1*	*2*	*0*
Configuration	*L*	*T*	*TR*	*L*	*T*	*TR*
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)			*19*			*35*
Peak-Hour Factor, PHF	*0.87*	*0.87*	*0.87*	*0.87*	*0.87*	*0.87*
Hourly Flow Rate, HFR (veh/h)	*0*	*0*	*21*	*0*	*0*	*40*
Percent Heavy Vehicles	*5*	*5*	*5*	*5*	*5*	*5*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*1*	*0*	*0*	*1*
Configuration			*R*			*R*

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*	*L*			*R*			*R*
v (veh/h)	*4*	*25*			*40*			*21*
C (m) (veh/h)	*1349*	*1337*			*940*			*945*
v/c	*0.00*	*0.02*			*0.04*			*0.02*
95% queue length	*0.01*	*0.06*			*0.13*			*0.07*
Control Delay (s/veh)	*7.7*	*7.7*			*9.0*			*8.9*
LOS	*A*	*A*			*A*			*A*
Approach Delay (s/veh)	--	--	*9.0*			*8.9*		
Approach LOS	--	--	*A*			*A*		

HCS+™ Version 5.3 Generated: 11/5/2011 10:07 PM

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*Greg*	Intersection	*Madison St @ Weiskopf/Legends*
Agency/Co.	*Endo Engineering*	Jurisdiction	*La Quinta*
Date Performed	*1/9/2010*	Analysis Year	*Existing+Project*
Analysis Time Period	*PM Peak Hour*		

Project Description *PGA West*

East/West Street: *Weiskopf/Legends* | North/South Street: *Madison Street*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*4*	*238*	*7*	*44*	*256*	*12*
Peak-Hour Factor, PHF	*0.87*	*0.87*	*0.87*	*0.87*	*0.87*	*0.87*
Hourly Flow Rate, HFR (veh/h)	*4*	*273*	*8*	*50*	*294*	*13*
Percent Heavy Vehicles	*5*	--	--	*5*	--	--
Median Type	*Raised curb*					
RT Channelized			*0*			*0*
Lanes	*1*	*2*	*0*	*1*	*2*	*0*
Configuration	*L*	*T*	*TR*	*L*	*T*	*TR*
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)			*25*			*31*
Peak-Hour Factor, PHF	*0.87*	*0.87*	*0.87*	*0.87*	*0.87*	*0.87*
Hourly Flow Rate, HFR (veh/h)	*0*	*0*	*28*	*0*	*0*	*35*
Percent Heavy Vehicles	*5*	*5*	*5*	*5*	*5*	*5*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*1*	*0*	*0*	*1*
Configuration			*R*			*R*

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*	*L*			*R*			*R*
v (veh/h)	*4*	*50*			*35*			*28*
C (m) (veh/h)	*1229*	*1257*			*897*			*881*
v/c	*0.00*	*0.04*			*0.04*			*0.03*
95% queue length	*0.01*	*0.12*			*0.12*			*0.10*
Control Delay (s/veh)	*7.9*	*8.0*			*9.2*			*9.2*
LOS	*A*	*A*			*A*			*A*
Approach Delay (s/veh)	--	--	*9.2*			*9.2*		
Approach LOS	--	--	*A*			*A*		

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*Greg*	Intersection	*Madison St @ Weiskopf/Legends*
Agency/Co.	*Endo Engineering*	Jurisdiction	*La Quinta*
Date Performed	*1/9/2010*	Analysis Year	*GPBO+Project*
Analysis Time Period	*AM Peak Hour*		

Project Description *PGA West*

East/West Street: *Weiskopf/Legends* | North/South Street: *Madison Street*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*4*	*884*	*14*	*22*	*888*	*17*
Peak-Hour Factor, PHF	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*4*	*884*	*14*	*22*	*888*	*17*
Percent Heavy Vehicles	*5*	--	--	*5*	--	--
Median Type	*Raised curb*					
RT Channelized			*0*			*0*
Lanes	*1*	*2*	*0*	*1*	*2*	*0*
Configuration	*L*	*T*	*TR*	*L*	*T*	*TR*
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)			*19*			*35*
Peak-Hour Factor, PHF	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*0*	*0*	*19*	*0*	*0*	*35*
Percent Heavy Vehicles	*5*	*5*	*5*	*5*	*5*	*5*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*1*	*0*	*0*	*1*
Configuration			*R*			*R*

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*	*L*			*R*			*R*
v (veh/h)	*4*	*22*			*35*			*19*
C (m) (veh/h)	*729*	*733*			*599*			*597*
v/c	*0.01*	*0.03*			*0.06*			*0.03*
95% queue length	*0.02*	*0.09*			*0.19*			*0.10*
Control Delay (s/veh)	*10.0*	*10.1*			*11.4*			*11.2*
LOS	*A*	*B*			*B*			*B*
Approach Delay (s/veh)	--	--	*11.4*			*11.2*		
Approach LOS	--	--	*B*			*B*		

HCS+™ Version 5.3

Generated: 11/5/2011 11:09 PM

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*Greg*	Intersection	*Madison St @ Weiskopf/Legends*
Agency/Co.	*Endo Engineering*	Jurisdiction	*La Quinta*
Date Performed	*1/9/2010*	Analysis Year	*GPBO+Project*
Analysis Time Period	*PM Peak Hour*		

Project Description *PGA West*

East/West Street: *Weiskopf/Legends* | North/South Street: *Madison Street*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*4*	*1522*	*7*	*44*	*1528*	*12*
Peak-Hour Factor, PHF	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*4*	*1522*	*7*	*44*	*1528*	*12*
Percent Heavy Vehicles	*5*	--	--	*5*	--	--
Median Type	*Raised curb*					
RT Channelized			*0*			*0*
Lanes	*1*	*2*	*0*	*1*	*2*	*0*
Configuration	*L*	*T*	*TR*	*L*	*T*	*TR*
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)			*25*			*31*
Peak-Hour Factor, PHF	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*0*	*0*	*25*	*0*	*0*	*31*
Percent Heavy Vehicles	*5*	*5*	*5*	*5*	*5*	*5*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*1*	*0*	*0*	*1*
Configuration			*R*			*R*

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*	*L*			*R*			*R*
v (veh/h)	*4*	*44*			*31*			*25*
C (m) (veh/h)	*413*	*417*			*394*			*391*
v/c	*0.01*	*0.11*			*0.08*			*0.06*
95% queue length	*0.03*	*0.35*			*0.25*			*0.20*
Control Delay (s/veh)	*13.8*	*14.6*			*14.9*			*14.8*
LOS	*B*	*B*			*B*			*B*
Approach Delay (s/veh)	--	--	*14.9*			*14.8*		
Approach LOS	--	--	*B*			*B*		

ALL-WAY STOP CONTROL ANALYSIS

General Information

Analyst	*Greg*
Agency/Co.	*Endo Engineering*
Date Performed	*11/4/11*
Analysis Time Period	*AM Peak Hour*

Site Information

Intersection	*Madison Street @ Avenue 58*
Jurisdiction	*La Quinta*
Analysis Year	*Existing+Project*

Project ID *PGA West*

East/West Street: *Avenue 58* | North/South Street: *Madison Street*

Volume Adjustments and Site Characteristics

Approach	Eastbound			Westbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	*32*	*7*	*2*	*1*	*12*	*43*
%Thrus Left Lane						

Approach	Northbound			Southbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	*8*	*98*	*1*	*52*	*102*	*41*
%Thrus Left Lane	*45*			*40*		

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	*L*	*TR*	*LT*	*R*	*LT*	*TR*	*LT*	*TR*
PHF	*0.89*	*0.89*	*0.89*	*0.89*	*0.89*	*0.89*	*0.89*	*0.89*
Flow Rate (veh/h)	*35*	*9*	*14*	*48*	*57*	*61*	*102*	115
% Heavy Vehicles	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*
No. Lanes	*2*		*2*		*2*		*2*	
Geometry Group	*5*		*5*		*5*		*5*	
Duration, T	*0.25*							

Saturation Headway Adjustment Worksheet

Prop. Left-Turns	*1.0*	*0.0*	*0.1*	*0.0*	*0.1*	*0.0*	*0.6*	*0.0*
Prop. Right-Turns	*0.0*	*0.2*	*0.0*	*1.0*	*0.0*	*0.0*	*0.0*	*0.4*
Prop. Heavy Vehicle	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
hLT-adj	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*
hRT-adj	*-0.7*	*-0.7*	*-0.7*	*-0.7*	*-0.7*	*-0.7*	*-0.7*	*-0.7*
hHV-adj	*1.7*	*1.7*	*1.7*	*1.7*	*1.7*	*1.7*	*1.7*	*1.7*
hadj, computed	*0.6*	*-0.1*	*0.1*	*-0.6*	*0.2*	*0.1*	*0.4*	*-0.2*

Departure Headway and Service Time

hd, initial value (s)	*3.20*	*3.20*	*3.20*	*3.20*	*3.20*	*3.20*	*3.20*	*3.20*
x, initial	*0.03*	*0.01*	*0.01*	*0.04*	*0.05*	*0.05*	*0.09*	*0.10*
hd, final value (s)	*5.94*	*5.28*	*5.46*	*4.73*	*5.12*	*5.04*	*5.25*	*4.68*
x, final value	*0.06*	*0.01*	*0.02*	*0.06*	*0.08*	*0.09*	*0.15*	*0.15*
Move-up time, m (s)	*2.3*		*2.3*		*2.3*		*2.3*	
Service Time, t_s (s)	*3.6*	*3.0*	*3.2*	*2.4*	*2.8*	*2.7*	*2.9*	*2.4*

Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity (veh/h)	*285*	*259*	*264*	*298*	*307*	*311*	*352*	*365*
Delay (s/veh)	*9.00*	*8.05*	*8.28*	*7.75*	*8.27*	*8.21*	*8.86*	*8.21*
LOS	*A*	*A*	*A*	*A*	*A*	*A*	*A*	*A*
Approach: Delay (s/veh)	*8.81*		*7.87*		*8.24*		*8.52*	
LOS	*A*		*A*		*A*		*A*	
Intersection Delay (s/veh)	*8.38*							
Intersection LOS	*A*							

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ALL-WAY STOP CONTROL ANALYSIS

General Information

Analyst	*Greg*
Agency/Co.	*Endo Engineering*
Date Performed	*11/4/11*
Analysis Time Period	*PM Peak Hour*

Site Information

Intersection	*Madison Street @ Avenue 58*
Jurisdiction	*La Quinta*
Analysis Year	*Existing+Project*

Project ID *PGA West*

East/West Street: *Avenue 58* | North/South Street: *Madison Street*

Volume Adjustments and Site Characteristics

Approach	Eastbound			Westbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	45	23	4	2	7	72
%Thrus Left Lane						

Approach	Northbound			Southbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	1	112	4	65	173	23
%Thrus Left Lane	50			35		

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	L	TR	LT	R	LT	TR	LT	TR
PHF	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Flow Rate (veh/h)	53	31	10	85	67	70	148	161
% Heavy Vehicles	5	5	5	5	5	5	5	5
No. Lanes	2		2		2		2	
Geometry Group	5		5		5		5	
Duration, T	0.25							

Saturation Headway Adjustment Worksheet

Prop. Left-Turns	1.0	0.0	0.2	0.0	0.0	0.0	0.5	0.0
Prop. Right-Turns	0.0	0.1	0.0	1.0	0.0	0.1	0.0	0.2
Prop. Heavy Vehicle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
hLT-adj	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
hRT-adj	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7
hHV-adj	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
hadj, computed	0.6	-0.0	0.2	-0.6	0.1	0.0	0.3	-0.0

Departure Headway and Service Time

hd, initial value (s)	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
x, initial	0.05	0.03	0.01	0.08	0.06	0.06	0.13	0.14
hd, final value (s)	6.28	5.69	5.88	5.08	5.39	5.35	5.47	5.09
x, final value	0.09	0.05	0.02	0.12	0.10	0.10	0.22	0.23
Move-up time, m (s)	2.3		2.3		2.3		2.3	
Service Time, t_s (s)	4.0	3.4	3.6	2.8	3.1	3.0	3.2	2.8

Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity (veh/h)	303	281	260	335	317	320	398	411
Delay (s/veh)	9.62	8.68	8.68	8.47	8.69	8.67	9.75	9.29
LOS	A	A	A	A	A	A	A	A
Approach: Delay (s/veh)	9.27		8.49		8.68		9.51	
LOS	A		A		A		A	
Intersection Delay (s/veh)	9.14							
Intersection LOS	A							

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ALL-WAY STOP CONTROL ANALYSIS

General Information

Analyst	*Greg*
Agency/Co.	*Endo Engineering*
Date Performed	*11/4/11*
Analysis Time Period	*AM Peak Hour*

Site Information

Intersection	*Madison Street @ Avenue 58*
Jurisdiction	*La Quinta*
Analysis Year	*GPBO+Project*

Project ID *PGA West*

East/West Street: *Avenue 58* | North/South Street: *Madison Street*

Volume Adjustments and Site Characteristics

Approach	Eastbound			Westbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	*366*	*45*	*29*	*34*	*74*	*130*
%Thrus Left Lane						

Approach	Northbound			Southbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	*29*	*982*	*39*	*134*	*548*	*191*
%Thrus Left Lane	*50*			*55*		

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	*L*	*TR*	*LT*	*R*	*LT*	*TR*	*LT*	*TR*
PHF	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Flow Rate (veh/h)	*366*	*74*	*108*	*130*	*520*	*530*	*435*	438
% Heavy Vehicles	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*
No. Lanes	*2*		*2*		*2*		*2*	
Geometry Group	*5*		*5*		*5*		*5*	
Duration, T	*0.25*							

Saturation Headway Adjustment Worksheet

Prop. Left-Turns	*1.0*	*0.0*	*0.3*	*0.0*	*0.1*	*0.0*	*0.3*	*0.0*
Prop. Right-Turns	*0.0*	*0.4*	*0.0*	*1.0*	*0.0*	*0.1*	*0.0*	*0.4*
Prop. Heavy Vehicle	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
hLT-adj	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*
hRT-adj	*-0.7*	*-0.7*	*-0.7*	*-0.7*	*-0.7*	*-0.7*	*-0.7*	*-0.7*
hHV-adj	*1.7*	*1.7*	*1.7*	*1.7*	*1.7*	*1.7*	*1.7*	*1.7*
hadj, computed	*0.6*	*-0.2*	*0.2*	*-0.6*	*0.1*	*0.0*	*0.2*	*-0.2*

Departure Headway and Service Time

hd, initial value (s)	*3.20*	*3.20*	*3.20*	*3.20*	*3.20*	*3.20*	*3.20*	*3.20*
x, initial	*0.33*	*0.07*	*0.10*	*0.12*	*0.46*	*0.47*	*0.39*	*0.39*
hd, final value (s)	*9.97*	*9.19*	*10.10*	*9.24*	*8.81*	*8.73*	*8.94*	*8.48*
x, final value	*1.01*	*0.19*	*0.30*	*0.33*	*1.27*	*1.29*	*1.08*	*1.03*
Move-up time, m (s)	*2.3*		*2.3*		*2.3*		*2.3*	
Service Time, t_s (s)	*7.7*	*6.9*	*7.8*	*6.9*	*6.5*	*6.4*	*6.6*	*6.2*

Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity (veh/h)	*366*	*324*	*356*	*380*	*520*	*530*	*435*	*438*
Delay (s/veh)	*83.15*	*14.02*	*17.12*	*16.49*	*166.92*	*171.66*	*98.06*	*81.51*
LOS	*F*	*B*	*C*	*C*	*F*	*F*	*F*	*F*
Approach: Delay (s/veh)	*71.52*		*16.78*		*169.31*		*89.75*	
LOS	*F*		*C*		*F*		*F*	
Intersection Delay (s/veh)	*112.11*							
Intersection LOS	*F*							

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ALL-WAY STOP CONTROL ANALYSIS

General Information

Analyst	*Greg*
Agency/Co.	*Endo Engineering*
Date Performed	*11/4/11*
Analysis Time Period	*PM Peak Hour*

Site Information

Intersection	*Madison Street @ Avenue 58*
Jurisdiction	*La Quinta*
Analysis Year	*GPBO+Project*

Project ID *PGA West*

East/West Street: *Avenue 58* | North/South Street: *Madison Street*

Volume Adjustments and Site Characteristics

Approach	Eastbound			Westbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	*303*	*193*	*7*	*26*	*56*	*166*
%Thrus Left Lane						

Approach	Northbound			Southbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	*7*	*704*	*32*	*137*	*1024*	*321*
%Thrus Left Lane	*50*			*35*		

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	*L*	*TR*	*LT*	*R*	*LT*	*TR*	*LT*	*TR*
PHF	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Flow Rate (veh/h)	*303*	*200*	*82*	*166*	*359*	*384*	*495*	987
% Heavy Vehicles	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*
No. Lanes	*2*		*2*		*2*		*2*	
Geometry Group	*5*		*5*		*5*		*5*	
Duration, T	*0.25*							

Saturation Headway Adjustment Worksheet

Prop. Left-Turns	*1.0*	*0.0*	*0.3*	*0.0*	*0.0*	*0.0*	*0.3*	*0.0*
Prop. Right-Turns	*0.0*	*0.0*	*0.0*	*1.0*	*0.0*	*0.1*	*0.0*	*0.3*
Prop. Heavy Vehicle	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
hLT-adj	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*
hRT-adj	*-0.7*	*-0.7*	*-0.7*	*-0.7*	*-0.7*	*-0.7*	*-0.7*	*-0.7*
hHV-adj	*1.7*	*1.7*	*1.7*	*1.7*	*1.7*	*1.7*	*1.7*	*1.7*
hadj, computed	*0.6*	*0.1*	*0.2*	*-0.6*	*0.1*	*0.0*	*0.2*	*-0.1*

Departure Headway and Service Time

hd, initial value (s)	*3.20*	*3.20*	*3.20*	*3.20*	*3.20*	*3.20*	*3.20*	*3.20*
x, initial	*0.27*	*0.18*	*0.07*	*0.15*	*0.32*	*0.34*	*0.44*	*0.88*
hd, final value (s)	*9.85*	*9.33*	*10.25*	*9.39*	*8.91*	*8.85*	*8.96*	*8.59*
x, final value	*0.83*	*0.52*	*0.23*	*0.43*	*0.89*	*0.94*	*1.23*	*2.36*
Move-up time, m (s)	*2.3*		*2.3*		*2.3*		*2.3*	
Service Time, t_s (s)	*7.6*	*7.0*	*7.9*	*7.1*	*6.6*	*6.5*	*6.7*	*6.3*

Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity (veh/h)	*364*	*381*	*332*	*375*	*403*	*407*	*495*	*987*
Delay (s/veh)	*45.89*	*21.63*	*16.04*	*19.06*	*51.37*	*61.45*	*151.57*	*636.16*
LOS	*E*	*C*	*C*	*C*	*F*	*F*	*F*	*F*
Approach: Delay (s/veh)	*36.25*		*18.06*		*56.58*		*474.30*	
LOS	*E*		*C*		*F*		*F*	
Intersection Delay (s/veh)	*257.95*							
Intersection LOS	*F*							

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Attachment C
MUTCD Traffic Control Signal Warrants

Basis For Installation of Traffic Control Signals

The Federal Highway Administration (FHWA) publishes the *Manual on Uniform Traffic Control Devices* (MUTCD), which contains all national design, placement, operation, and maintenance standards for traffic control devices used to regulate, warn, or guide traffic. Traffic control devices provide visual information to road users and are placed by authority of a public agency having jurisdiction to help ensure the safe, orderly and efficient movement of all types of traffic.

To promote highway safety, efficiency, and uniformity so that traffic can move efficiently, the MUTCD documents national standards governing the design and use of traffic control devices on the streets and highways in the United States. All traffic control devices nationwide must conform to either the MUTCD or equivalent state and local manuals modified by state legislative action that contain more stringent requirements. Although the FHWA adopts the standards, the individual State and local highway agencies, not the FHWA, select, install, operate, and maintain traffic control devices on all roadways.

Although the FHWA has released the 2009 MUTCD, it is not effective in California until Caltrans and the California Traffic Control Devices Committee review it and incorporate the changes into the California MUTCD through formal efforts. California has until January 15, 2012 to accomplish this task. As of January 21, 2010, Caltrans has revised the *California Manual on Uniform Traffic Control Devices* (CA MUTCD) to prescribe uniform standards for traffic control devices in California and include the FHWA 2003 MUTCD Revisions 1 and 2.

Definition of Regulated Terms

The CA MUTCD (2010) establishes eight traffic signal control "**warrants**" and identifies other factors for consideration in the preparation of traffic control signal needs studies. These traffic signal warrants describe threshold conditions to engineers for use in evaluating the potential safety and operational benefits of traffic control devices and are based upon average or normal conditions.

The CA MUTCD identifies design, application, and placement "**standards**" which are uniformly applied throughout the State of California. These standards are statements of required, mandatory, or specifically prohibitive practice regarding a traffic control device and typically include the word "shall" but do not include the words "should" or "may". Standard statements are sometimes modified by "**options"** identified in the CA MUTCD. However, "standard" statements shall not be modified or compromised based on "**engineering judgment"** or **"engineering study"**.

The CA MUTCD (2010) provides informational "**support**" statements that do not convey any degree of mandate, recommendation, authorization, prohibition, or enforceable condition. The words "shall", "should", and "may" are not used in "support" statements.

The CA MUTCD (2010) also provides "**guidance**" for use in the proper application of the standards. A guidance statement includes recommended, but not mandatory, practice in

typical situations, with deviations allowed if "engineering judgment" or "engineering study" indicates the deviation to be appropriate. Guidance statements typically use the word "should" but do not use "shall" or "may." Guidance statements are sometimes modified by "**options**." Options are statements of practice that represent a permissive condition and carry no requirement or recommendation. Option statements may contain allowable modifications to a standard or guidance statement. The verb "may" is typically used in option statements.

Standards for Justifying Traffic Control Signals

Section 4C.01 of the CA MUTCD identifies as a standard within California that an engineering study of traffic conditions, pedestrian characteristics, and physical characteristics of the location shall be performed to determine whether the installation of a traffic control signal is justified at a particular location. The investigation of the need for a traffic control signal shall include an analysis of the applicable factors contained in eight traffic signal warrants as well as other factors related to existing operation and safety at the study location. The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

The eight warrants identified in the CA MUTCD for use as guidelines in justifying traffic control signals establish minimum thresholds below which a traffic signal should not be installed. These warrants include:

- Warrant 1, Eight-Hour Vehicular Volume
- Warrant 2, Four-Hour Vehicular Volume
- Warrant 3, Peak Hour Vehicular Volume
- Warrant 4, Pedestrian Vehicular Volume
- Warrant 5, School Crossing
- Warrant 6, Coordinated Signal System
- Warrant 7, Crash Experience
- Warrant 8, Roadway Network

Traffic signal warrants were established over a period of many years by experienced engineers based upon observations at intersections throughout the nation. These engineers determined that where these guidelines were met, traffic control signals were operating effectively and with good public compliance. At locations where these guidelines were not met, public compliance was reduced and that resulted in additional hazards. The MUTCD identified as a general principle in the development and implementation of traffic signal warrants that the most effective traffic control device is that which is the least restrictive while still accomplishing the intended purpose.[1]

A traffic signal that decreases accidents and improves the flow of traffic is an asset to any community. Therefore, traffic signals are typically installed as they are warranted, based on the guidelines in the traffic signal warrants and consideration of other related parameters. However, a comprehensive study of traffic and roadway conditions is required before the installation of traffic signals to determine if signalization is justified (i.e., the appropriate intersection control type). In conjunction with that study, engineers compare site-specific conditions at a particular location to the criteria identified in the warrants to define the relative need for a traffic signal to ensure roadway user safety and convenience.

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[1] Federal Highway Administration. *Manual on Uniform Traffic Control Devices. Washington, D.C.: FHWA, 2003.*

This protocol is followed because traffic signals do not always have a positive effect on roadway operations. The installation of traffic signals at locations where they are not justified can introduce a fixed source of delay into the system, resulting in excessive delay. Experience has also shown that although installing signals may result in a decrease in the number and severity of right-angle collisions, it may also result in an increase in the total number of collisions (especially rear-end collisions). There have been instances where the installation of traffic signals resulted in an increase in pedestrian accidents. Pedestrians who feel secure with a painted crosswalk and a red light between them and an approaching vehicle may not cross the roadway as defensively. Unfortunately, having a traffic signal assign a legal right to a pedestrian crossing the street at an intersection does not always prevent collisions involving a careless or distracted driver.

By alternately assigning the right-of-way to specific movements, traffic signals can substantially reduce the number and nature of intersection conflicts by separating them in time. However, signalization does not remove all conflicts from the realm of driver judgment. Where left-turn phasing is not justified, left-turn movements may still need to be made against an opposing vehicular flow, requiring drivers to evaluate and select gaps in opposing traffic through which to complete their turns. Vehicular-pedestrian and vehicular-bicycle conflicts may remain that require vigilance if accidents are to be avoided. Signalization has essentially no impact on head-on accidents, sideswipe accidents, or single-vehicle accidents involving fixed objects. Drivers may assume that a signal is broken and proceed against a red display if they experience an excessive wait when there is little or no demand occurring on the cross street.

In the final analysis, traffic signal warrants require the exercise of engineering judgment. If engineering studies indicate that signalization will not improve the overall safety or operational efficiency at a candidate location, traffic signals should not be installed. Traffic signals should be installed only where no other solution or form of control would be effective in assuring safety and efficiency at the intersection.

Guidance for Justifying Traffic Control Signals

Section 4C.01 of the CA MUTCD provides the following guidance with respect to justifying traffic control signals.

- A traffic control signal should not be installed unless one or more of the factors described in the eight warrants and Chapter 4 are met.
- A traffic control signal should not be installed unless an engineering study indicates that installing the traffic control signal will improve the overall safety and/or operation of the intersection.
- A traffic control signal should not be installed if it will seriously disrupt progressive traffic flow.

Advantages and Disadvantages of Traffic Control Signals

Section 4B.03 of the CA MUTCD provides the following **support** with respect to the advantages and disadvantages of traffic control signals.

When properly used, traffic control signals are valuable devices for the control of vehicular and pedestrian traffic. They assign the right-of-way to the various traffic movements and thereby profoundly influence traffic flow.

Traffic control signals that are properly designed, located, operated, and maintained will have one or more of the following advantages:

A. They provide for the orderly movement of traffic.
B. They increase the traffic-handling capacity of the intersection if:
   1. Proper physical layouts and control measures are used, and
   2. The signal operational parameters are reviewed and updated (if needed) on a regular basis (as engineering judgment determines that significant traffic flow and/or land use changes have occurred) to maximize the ability of the traffic control signal to satisfy current traffic demands.
C. They reduce the frequency and severity of certain types of crashes, especially right-angle collisions.
D. They are coordinated to provide for continuous or nearly continuous movement of traffic at a definite speed along a given route under favorable conditions.
E. They are used to interrupt heavy traffic at intervals to permit other traffic, vehicular or pedestrian, to cross.

Traffic control signals are often considered a panacea for all traffic problems at intersections. This belief has led to traffic control signals being installed at many locations where they are not needed, adversely affecting the safety and efficiency of vehicular, bicycle, and pedestrian traffic. Traffic control signals, even when justified by traffic and roadway conditions, can be ill-designed, ineffectively placed, improperly operated, or poorly maintained.

Improper or unjustified traffic control signals can result in one or more of the following disadvantages:

A. Excessive delay;
B. Excessive disobedience of the signal indications;
C. Increased use of less adequate routes as road users attempt to avoid the traffic control signals; and
D. Significant increases in the frequency of collisions (especially rear-end collisions).

Alternatives to Traffic Control Signals

Section 4B.04 of the CA MUTCD states the following as guidance with respect to alternatives to traffic control signals. Since vehicular delay and the frequency of some types of crashes are sometimes greater under traffic signal control than under STOP sign control, consideration should be given to providing alternatives to traffic control signals even if one or more of the signal warrants has been satisfied.

These alternatives may include, but are not limited to, the following:

A. Installing signs along the major street to warn road users approaching the intersection;
B. Relocating the stop line(s) and making other changes to improve the sight distance at the intersection;
C. Installing measures designed to reduce speeds on the approaches;
D. Installing a flashing beacon at the intersection to supplement STOP sign control;

E. Installing flashing beacons on warning signs in advance of a STOP sign controlled intersection on major-and/or minor-street approaches;

F. Adding one or more lanes on a minor-street approach to reduce the number of vehicles per lane on the approach;

G. Revising the geometrics at the intersection to channelize vehicular movements and reduce the time required for a vehicle to complete a movement, which could also assist pedestrians;

H. Installing roadway lighting if a disproportionate number of crashes occur at night;

I. Restricting one or more turning movements, perhaps on a time-of-day basis, if alternate routes are available;

J. If the warrant is satisfied, installing multiway STOP sign control;

K. Installing a roundabout intersection; and

L. Employing other alternatives, depending on conditions at the intersection.

Studies and Factors Required for Justifying Signals

The selection and use of traffic control signals should be based on an engineering study of roadway, traffic, and other conditions. A careful analysis of traffic operations, pedestrian and bicyclist needs, and other factors at a large number of signalized and unsignalized intersections, coupled with engineering judgment, has provided a series of signal warrants detailed in the FHWA MUTCD (2003 Edition)[2] that define the minimum conditions under which installing traffic control signals might be justified.

The Federal Highway Administration (FHWA) publishes the *Manual on Uniform Traffic Control Devices* (MUTCD), which contains all national design, application, and placement standards for traffic control devices. The purpose of these devices, which include signs, signals, and pavement markings, is to promote highway safety, efficiency, and uniformity so that traffic can move efficiently on the Nation's streets and highways. All traffic control devices nationwide must conform to the MUTCD. Although the FHWA adopts the standards, the individual State and local highway agencies, not the FHWA, select, install, operate, and maintain traffic control devices on all roadways (including the Interstate and the U.S. numbered systems) nationwide.

The FHWA has released the new *2009 MUTCD* but it is not effective in California until Caltrans and the California Traffic Control Devices Committee review it and incorporate the changes into the California MUTCD through formal efforts. California has until January 15, 2012 to accomplish this task. As of January 21, 2010, Caltrans has revised the *California Manual on Uniform Traffic Control Devices* (California MUTCD 2010) to include FHWA's 2003 MUTCD Revisions 1 and 2 and prescribe uniform standards for traffic control devices in California.

In order to justify the installation of a traffic control signal, a traffic control signal needs study is required that demonstrates delay, congestion, approach conditions, driver confusion, future land use, physical characteristics of the location, the factors contained in the traffic signal warrants, and/or other evidence of the need for right-of-way assignment beyond that which could be provided by a STOP sign. The FHWA MUTCD (2003 Edition) and the California MUTCD 2010 provide guidance and signal warrant sheets for use in developing traffic control signal needs studies.

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[2] Federal Highway Administration. *Manual on Uniform Traffic Control Devices. Washington, D.C.: FHWA, 2003.*

Figure C-1
Hourly Variation in Winged Foot Gate Exit Volume
(October 25, 2011)

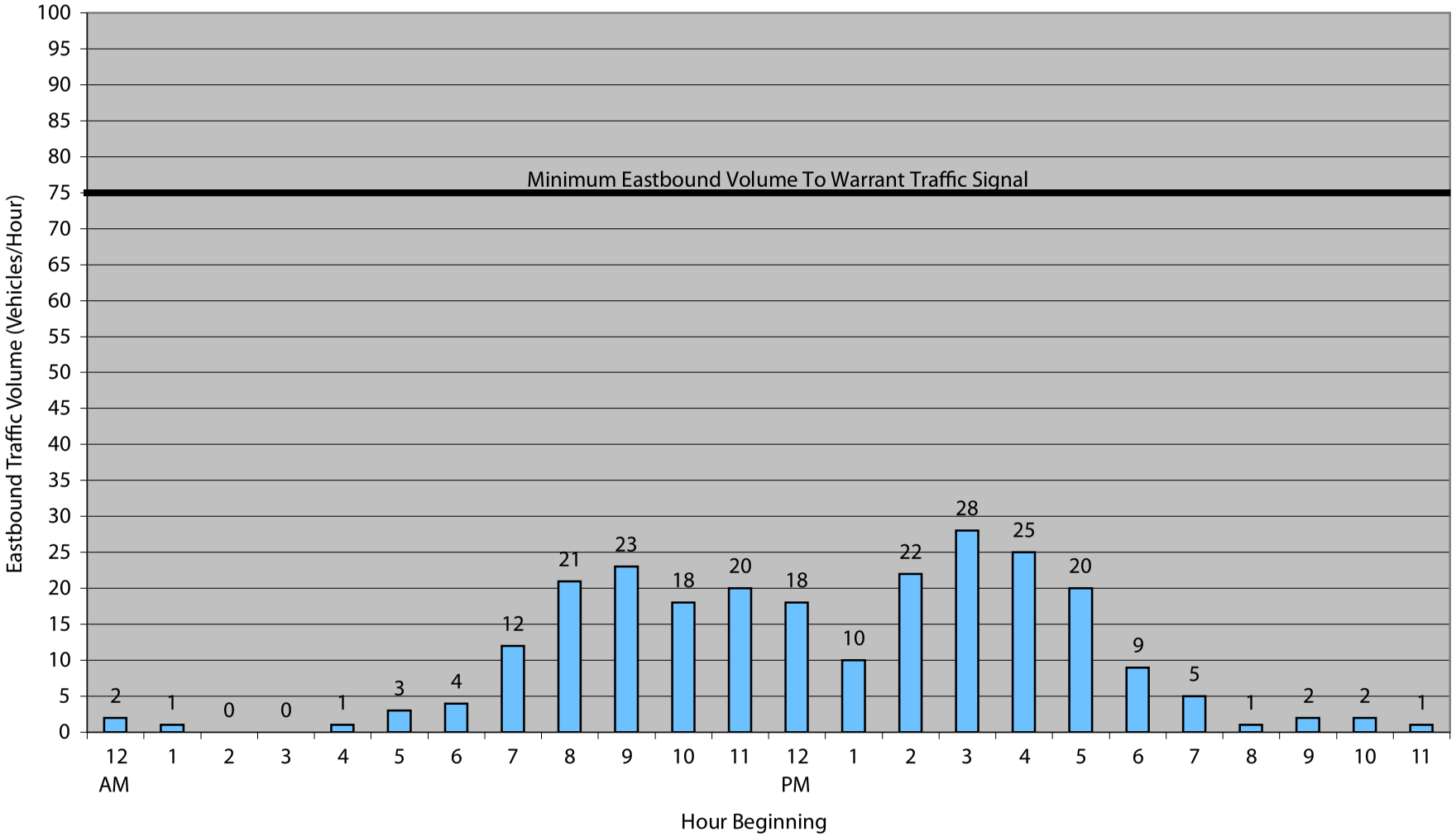

Figure C-2
Hourly Variation in Weiskopf Gate Exit Volume
(October 25, 2011)

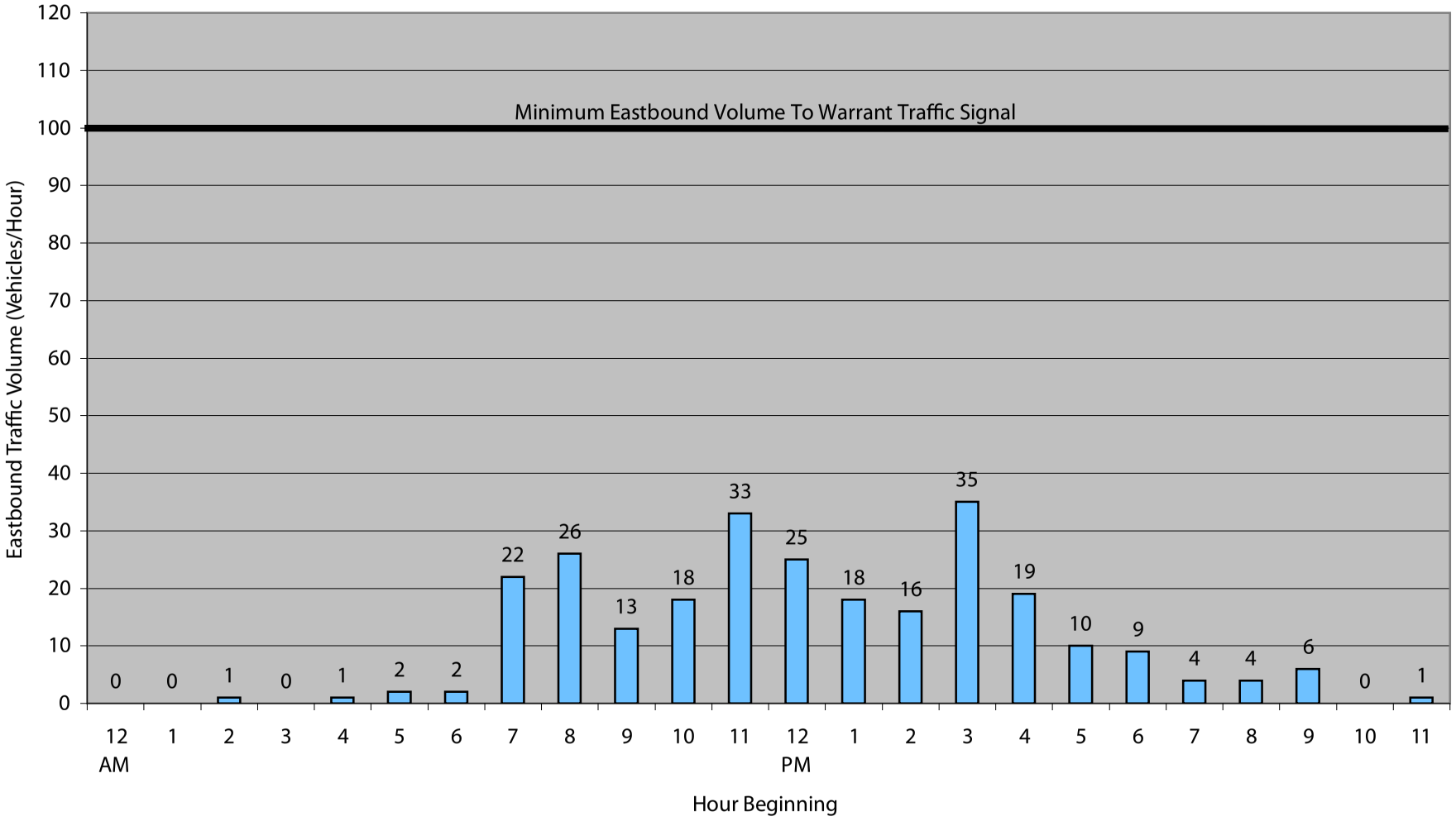

Figure C-3
Hourly Variation in Legends Way Gate Exit Volume
(October 25, 2011)