

# TETAP

## **County of Marin** **Miller Creek Road Operations and Safety Study**

*Final Report*

Prepared for:

**County of Marin, Caltrans and  
Metropolitan Transportation Commission (MTC)**

Prepared by:



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This document represents the Final version of the study report and addresses comments received on the Draft version received from MTC and the County of Marin. Caltrans responded to the Draft version with no comments on the Draft Report.

## 1.1 Project Summary

Over the past several years, commuters have utilized the US-101 Southbound Ramps at Miller Creek Road to bypass the slow morning commute conditions on southbound US-101. The County of Marin, Caltrans, and the California Highway Patrol have made several attempts to change commuter habits with engineering controls and enforcement but with only partial success. Thus, the community has continued to express concern related to the bypass commute traffic and the County would like to reduce congestion on Miller Creek Road by exploring alternative intersection treatments on this primary collector serving residential neighborhoods, a local shopping center and commercial businesses.

In response, the County of Marin in conjunction with the California Highway Patrol, Caltrans, Marinwood Community Services District, and Marinwood Fire Department applied for and received a TETAP grant from the Metropolitan Transportation Commission (MTC) to provide alternatives and feasibility analysis for recommendations to improve intersection mobility, understanding and safety for existing and future traffic conditions on Miller Creek Road at the following two intersections. **Figure 1** illustrates the project area and the two study intersections.

- § Two-way stop-controlled intersection at US-101 Southbound Ramps/Miller Creek Road
- § Four-way stop-controlled intersection at Marinwood Drive/Miller Creek Road

Figure 1 – Study Area

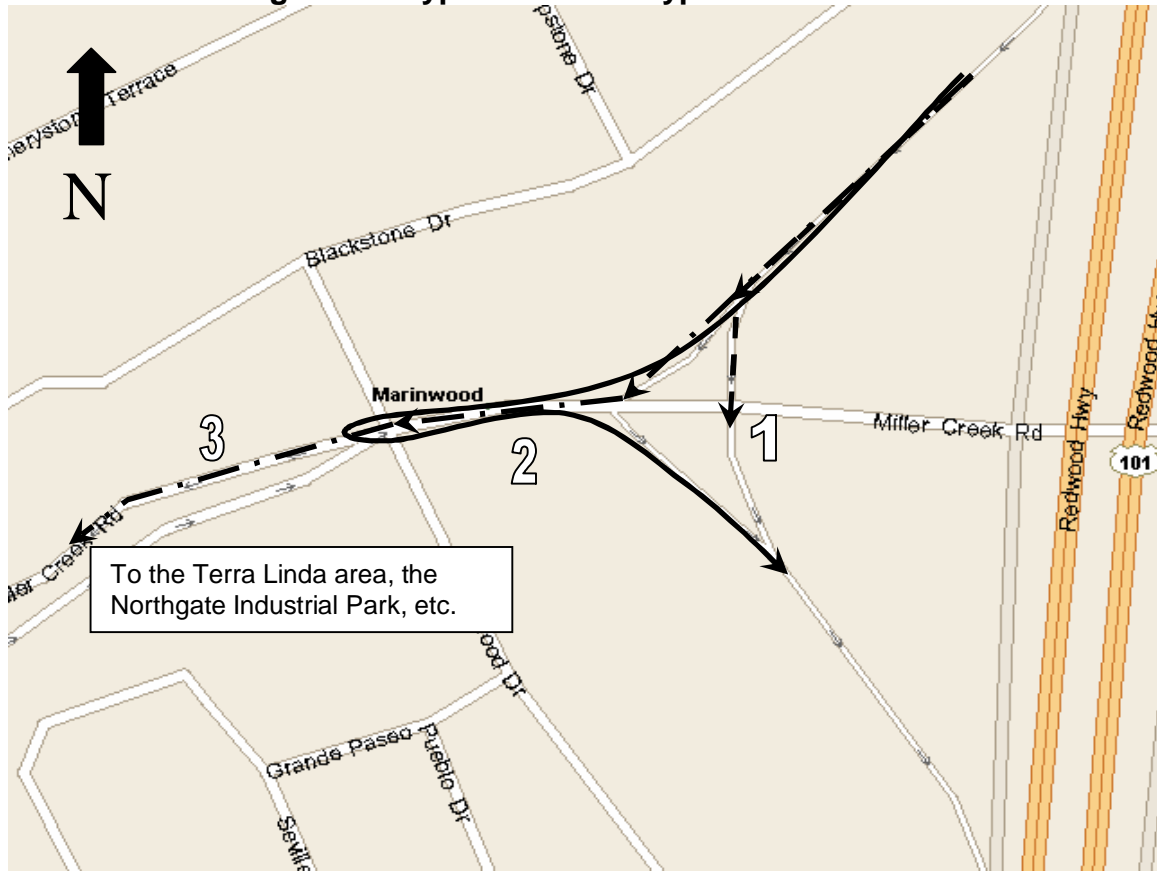


The two major goals of this project are: 1) discourage bypass traffic from US-101 from using Miller Creek Road; 2) recommend alternative for US-101 Southbound Ramps and Marinwood Avenue intersections with Miller Creek Road that manage existing and future traffic demand in the area. These goals are in response to current vehicular traffic attempting to bypass the US-101 southbound congestion in at least the three different manners described below and illustrated in **Figure 2**. Multiple alternatives have been evaluated on practicality, system mobility, operation and maintenance, accident reduction, ability to maintain the semi-rural character and improve pedestrian & bicycle safety consistent with the project goals.

1. Vehicles use the US-101 Southbound Ramps/Miller Creek Road to proceed straight through the intersection and use the on-ramp to return to the freeway, thereby utilizing the ramp as a bypass of the US-101 congestion.
2. During periods when many vehicles attempt to use the bypass method above and create a long queue of traffic on the off-ramp, some motorists use the southbound free right and make a U-turn at the intersection of Marinwood Avenue/Miller Creek Road to return to the freeway.
3. Some motorists bypass a larger portion of US-101 by using the off-ramp to proceed on Miller Creek Road to connect to Las Gallinas Avenue and then continue to Lucas Valley Road to access destinations such as the Terra Linda area, the Northgate Industrial Park, or other destinations in the vicinity. Some

motorists may also use this route to again access US-101.

Figure 2 – Typical US-101 Bypass Maneuvers



## 2.1 Introduction

Data collection and reduction was the initial stage of analysis and consisted of the following:

- § Meeting with the County of Marin
- § Field Review
- § Collect Traffic Volumes
- § Collision History

## 2.2 Meeting with the County

Kimley-Horn and Associates, Inc. (Kimley-Horn) met with the County, Caltrans, and MTC to review and finalize the scope of services and project schedule, and discuss project goals. In addition, issues associated with the existing traffic operations and conditions in the area were reviewed with the County. Data received from the County included the following:

- § Collision data
- § Existing traffic volumes
- § Previous traffic studies

The primary participants and contacts in the preparation of this study are listed below:

- § Kimley-Horn and Associates, Inc. (Brian Sowers and Michael Mowery)
- § Metropolitan Transportation Commission (Christina Atienza)
- § County of Marin (Jason Nutt and Jack Baker)
- § Caltrans (Phillipe Van)

## 2.3 Field Review

A field review was conducted on Thursday, May 19, 2005 during the morning peak period to analyze existing traffic conditions along the corridor. The following summarizes the primary observations made during that field review.

### US-101 Southbound Ramps/Miller Creek Road

The intersection of US-101 Southbound Ramps/Miller Creek Road is stop-controlled on the southbound approach with a free right turn, as shown in **Figure 3**. During the morning peak period there are heavy traffic volumes southbound on US-101. As a result, vehicles use the southbound off/on-ramp as an auxiliary lane to by-pass the slow traffic on the highway. The morning intersection turning movement count shows a relatively high volume of traffic using the southbound off-ramp to proceed either immediately southbound through the intersection to the on-ramp or use the “free” right turn to travel westbound on Miller Creek Road.

### Marinwood Avenue/ Miller Creek Road

As seen in **Figure 3**, the Marinwood Avenue/Miller Creek Road intersection is a four-way stop-controlled intersection, with on-street parking on Marinwood Avenue adjacent to the intersection as well as on Miller Creek Road near the intersection. Golden Gate Transit bus stops are located on Miller Creek Road west of the intersection for both directions of travel. Miller Creek Road is designated as a Bike Route along the north side of the roadway and connects to a bike path that parallels US-101 on the west side behind the sound wall. A gas station is located on the southwest corner of the intersection and there is residential housing on the north side of the intersection. There is a traffic median island on Miller Creek Road and aerial power line poles are located on both sides of the intersection. The posted speed limit is 25 mph on both Marinwood Avenue and Miller Creek Road.

The heaviest turning movements during the morning peak period at the intersection of Marinwood Avenue/Miller Creek Road are the southbound left, westbound through, and westbound U-turn movements. During the field visit, a 10-minute manual turning movement count was performed between 7:28 AM and 7:38 AM and found that 24 of the 37 vehicles which used the westbound left turn bay at the Marinwood Avenue/Miller Creek Road intersection made a U-turn at the intersection to return to the freeway. Closer to 8:00 AM there were a larger number of vehicles making a westbound right onto Marinwood Avenue to drop off students at Mary Silveira private Elementary School on Blackstone Drive inside the residential neighborhood.

## **2.4 Traffic Counts**

Turning movement counts were provided by the County of Marin for the two study intersections and were conducted in March 2001 for the Oakview Master Plan Final EIR prepared by Nichols Berman Environmental Planning, dated June 2002. These counts were requested to be used by the County in the analysis of this study to be consistent with other current engineering studies in the project area. It is anticipated that peak hour traffic volumes in the study area may vary following time completion of the US-101 “Gap Closure” project, which is expected in late 2008. It is recommended that the County continue to monitor traffic volumes in the study area to determine the continued need for implementation of alternatives detailed in this report.



**FIGURE 3 - EXISTING CONDITIONS**  
 MILLER CREEK ROAD FROM US-101 SOUTHBOUND RAMPs TO MARINWOOD DRIVE

### 3.1 Introduction

A collision review, signal warrant, and traffic operations analysis were conducted to evaluate the effectiveness of the multiple alternatives at the study intersections. Kimley-Horn used *Synchro*, *Highway Capacity Software*, and *aaSIDRA* software to conduct the evaluation of the signalized, unsignalized, and roundabout intersection alternatives, respectively.

### 3.2 Collision Review

Historical collision data was received from Marin County for Miller Creek Road from the US-101 Southbound Ramps to Marinwood Avenue. Records were available between 2001 and 2005. Data was summarized and is shown in **Table 1**.

**Table 1 – Collision Summary**

Type of Collision	# of Collisions
Broadside	2
Rear-End	1

Two collisions were reported at the intersection of US-101 Southbound Ramps/Miller Creek Road. One was a collision from a southbound vehicle on the freeway off-ramp colliding broadside with a vehicle traveling westbound on Miller Creek Road. The second was from another southbound vehicle colliding broadside with a vehicle traveling eastbound on Miller Creek Road. These accidents may suggest a need to provide a protected movement for vehicles exiting the southbound off-ramp from the current free flow of traffic eastbound and westbound on Miller Creek Road.

In addition, a rear-end accident occurred on Miller Creek Road due to excessive speeding in the eastbound direction listed as at an unavailable location. Field observations did not show a deficiency in sight distance for vehicles traveling in the eastbound direction toward the Marinwood Avenue/Miller Creek Road intersection.

The installation of a traffic signal at both study intersections is evaluated as part of this study, although unlikely warranted based solely on the collision history at each intersection. Information from Caltrans reports that the statewide average intersection collision rate is approximately 1.07 collisions per million entering vehicles. The relatively low number of collisions at the two study intersections results in an accident rate significantly below that of the statewide average rate, further acknowledging collisions as a relatively small issue to be considered in the study area.

### 3.3 Warrant Analysis

A warrant analysis was completed for the intersections of the US-101 Southbound Ramps/Miller Creek Road and Marinwood Avenue/Miller Creek Road. Warrant 3, the Peak Hour warrant from the *Manual on Uniform Traffic Control Devices 2003* is satisfied at both intersections. The peak hour warrant is only one of the multiple traffic signal warrants identified in the MUTCD and other warrants are typically required to be met for a municipal agency to install of a traffic signal at an intersection. Information was unavailable in this study to evaluate any other signal warrant outside of Warrant 3. A summary of the warrant analysis results is included in the Appendix.

### 3.4 Operations Analysis

As discussed previously, during the morning peak period there are many vehicles trying to get ahead of the congested US-101 southbound traffic by using the auxiliary lane off the freeway onto Miller Creek Road and then proceeding straight back onto the freeway or making a U-turn at the Miller Creek Road/Marinwood Avenue intersection to return to the freeway. This study evaluated a matrix of alternatives at the two study intersections to provide a recommendation that would both achieve the project goals as well as limit the potential impacts those recommendations may have on other roadway users and outside of the very specific condition existing only during the AM peak period. The matrix of alternatives at each intersection and how those alternatives may work between the intersections is discussed below.

It should be noted that other alternatives were considered but not evaluated since they would result in probable negative impacts beyond the goal of improving the AM peak period traffic conditions. For example, an all-way stop at the US-101 Southbound Ramps/Miller Creek Road intersection was not evaluated because the increased freeway traffic in the neighborhood only occurs during the AM peak period, not throughout the day, and this alternative would negatively impact traffic throughout the day and lack the flexibility necessary to respond to the specific traffic conditions in the study area. In addition, the prohibition of the southbound through movement at the US-101 Southbound Ramps was not evaluated because it would likely result in additional traffic entering the neighborhood and making the westbound U-turn at Marinwood Avenue as opposed to remaining on the freeway or continuing to exclusively use the off-ramp/on-ramp as a bypass option.

US-101 Southbound Ramps/Miller Creek Road***Alternative 1 – Do nothing alternative***

For informational purposes the results of the analysis of the existing conditions are held herein but not studied further since a signal warrant is met at the US-101 Southbound Ramps/Miller Creek Road intersection. Therefore, Alternative 1 is not preferred.

***Alternative 2 – Existing condition with the elimination of SB free right turn***

Alternative 2, realigning the southbound free right turn to the intersection and adjacent to the other southbound movements at the unsignalized intersection of US-101 Southbound Ramps and Miller Creek Road results in a limited improvement to intersection operation and safety from the existing condition. The alternative was evaluated because the elimination of the dedicated southbound right lane will slightly increase the amount of time necessary to make a westbound U-turn at Marinwood Avenue; however, Alternative 2 is not preferred because of limited improvement to traffic operations in the study area compared to other alternatives evaluated.

***Alternative 3 – Signalized with the elimination of SB free right turn &******Alternative 4 – Signalized with the elimination of SB free right turn and no right turn on red***

Alternative 3, installing a traffic signal at the US-101 Southbound Ramps and realigning the southbound free right turn to the intersection and adjacent to the other southbound movements improves the operation and safety at the intersection. Alternative 4 is very similar to Alternative 3, but also prohibits southbound right turns on red at the signalized intersection. Therefore, Alternative 3 and Alternative 4 would both operate well but Alternative 4 is selected as the preferred alternative because of the right turn prohibition.

Alternative 4 was selected from the four alternatives evaluated at the US-101 Southbound Ramps/Miller Creek Road intersection because it provides the balanced result of creating a disincentive in increased delay to bypass traffic entering the neighborhood without unfairly penalizing vehicular traffic with a destination in the neighborhood. In addition, if a signal is installed at Alternative 3 and operated to create a disincentive in metering bypass traffic returning to US-101 by proceeding southbound through the intersection and a right turn on red prohibition isn't implemented, there may result in an increase in bypass traffic in the neighborhood. Specifically, if US-101 traffic still chooses to use this ramp location to bypass congestion and the delay to the southbound through movement is purposefully increased, more vehicles will likely choose to use the right turn and enter the neighborhood unless the control of that movement is also enhanced.



Marinwood Avenue/Miller Creek Road

***Alternative A – All-way stop controlled (existing condition)***

For informational purposes the results of the analysis of the existing conditions are held herein but not studied further since a signal warrant is met at the Marinwood Avenue/Miller Creek Road intersection. Therefore, Alternative A is not preferred.

***Alternative B – All-way stop controlled with no WB U-turn***

Previously, the County prohibited westbound U-turns at the Marinwood Avenue/Miller Creek Road intersection and found that the commuters developed alternatives to the movement by making either a left turn or a right turn onto Marinwood Avenue followed by an immediate U-turn and return to the freeway. Instead of reducing or eliminating the problem, these new travel patterns were viewed as unsafe and complicating to the movement of traffic in the area. Therefore, Alternative B is expected to exhibit similar results to those experienced previously and is not preferred.

***Alternative C – Signalized with EB protected left turn phase***

Since a signal is warranted at the Marinwood Avenue/Miller Creek Road intersection, Alternative C, installing a traffic signal and an exclusive eastbound left turn at the intersection was analyzed. Signalizing the intersection would improve the overall level-of-service (LOS) and signal timing could be developed to discourage westbound U-turn traffic by increasing the amount of time necessary to make the movement. In addition, signalization of the intersection would improve intersection safety for both vehicles and pedestrians. Therefore, Alternative C is selected as one of the two preferred alternatives.

***Alternative D – Signalized with EB left and no WB U-turn***

Alternative D is very similar to Alternative C, adding a westbound U-turn prohibition to the traffic control at the Marinwood Avenue/Miller Creek intersection. Alternative D does not provide any additional benefit from Alternative C, and rather creates the negative impact of disallowing the westbound U-turns outside of the AM peak period when mistaken motorists may want to make the movement or in the future should a driveway ever be located slightly east of the southeast corner of the intersection. Therefore, Alternative D is not preferred.

***Alternative E – Roundabout***

Alternative E, installing a roundabout was analyzed as a potential solution at the Marinwood Avenue/Miller Creek Road intersection. A one lane roundabout with single lane ingress and egress on each approach would improve the flow and operation of traffic through the intersection. Therefore, Alternative E is selected as one of the two preferred alternatives.

Alternative C and E were selected from the five alternatives evaluated at the Marinwood Avenue/Miller Creek Road intersection because they provide the balanced results of creating a disincentive in increased delay to bypass traffic entering the neighborhood without unfairly penalizing vehicular traffic with a destination in the neighborhood. If a signal is installed as evaluated in Alternative C, the delay for vehicles using the westbound U-turn may be increased through signal timing operations exclusively during the AM peak period and operated in a more typical fashion throughout other periods of the day and not negatively impacting the residences and businesses south of the intersection. Alternative E was selected to also increase the delay to westbound U-turn traffic while also providing an enhanced operation over the existing four-way stop-controlled intersection. In addition, the residents of the community and the County of Marin have previously exhibited an interest in the operations and aesthetics of a roundabout at this intersection.

Based on the delay, level of service, and qualitative evaluation of the matrix of alternatives evaluated and summarized in **Table 2**, two alternatives were chosen, as described below. Both alternatives include a prohibition of right turns on red at the US-101 Southbound Ramps and the improvements at the Marinwood Avenue intersection that will improve traffic operation and safety in the study area, as well as reduce US-101 bypass traffic in the neighborhood.

**Table 2 – LOS & Delay Comparison Summary**

	1		2		3		4									
	101 SB Ramps		Marinwood		101 SB Ramps		Marinwood									
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay								
A	F	386.7	F	211.3	F	257.4	F	211.3	B	18.6	F	211.3	C	22.6	F	211.3
B	F	340.4	F	253.4	F	220.3	F	253.4	B	14.8	F	253.4	C	22.5	F	253.4
C	F	382.1	B	13.1	F	255.8	B	13.6	B	13.1	B	13.6	B	18.4	B	13.6
D	F	323.0	B	13.9	F	213.1	B	13.9	B	13.8	B	13.9	C	20.3	B	13.9
E	F	386.7	A	7.0	F	257.4	A	7.0	B	13.1	A	7.0	B	18.4	A	7.0

Marinwood		US 101 Ramps	
A	Existing	1	Existing
B	Existing w/o WB U-turn	2	Existing w/o SB free right
C	Signal	3	Signal w/ SB left & w/o SB free right
D	Signal w/o WB U-turn	4	Signal w/ SB left & w/o SB free right AND No RTOR
E	Roundabout		

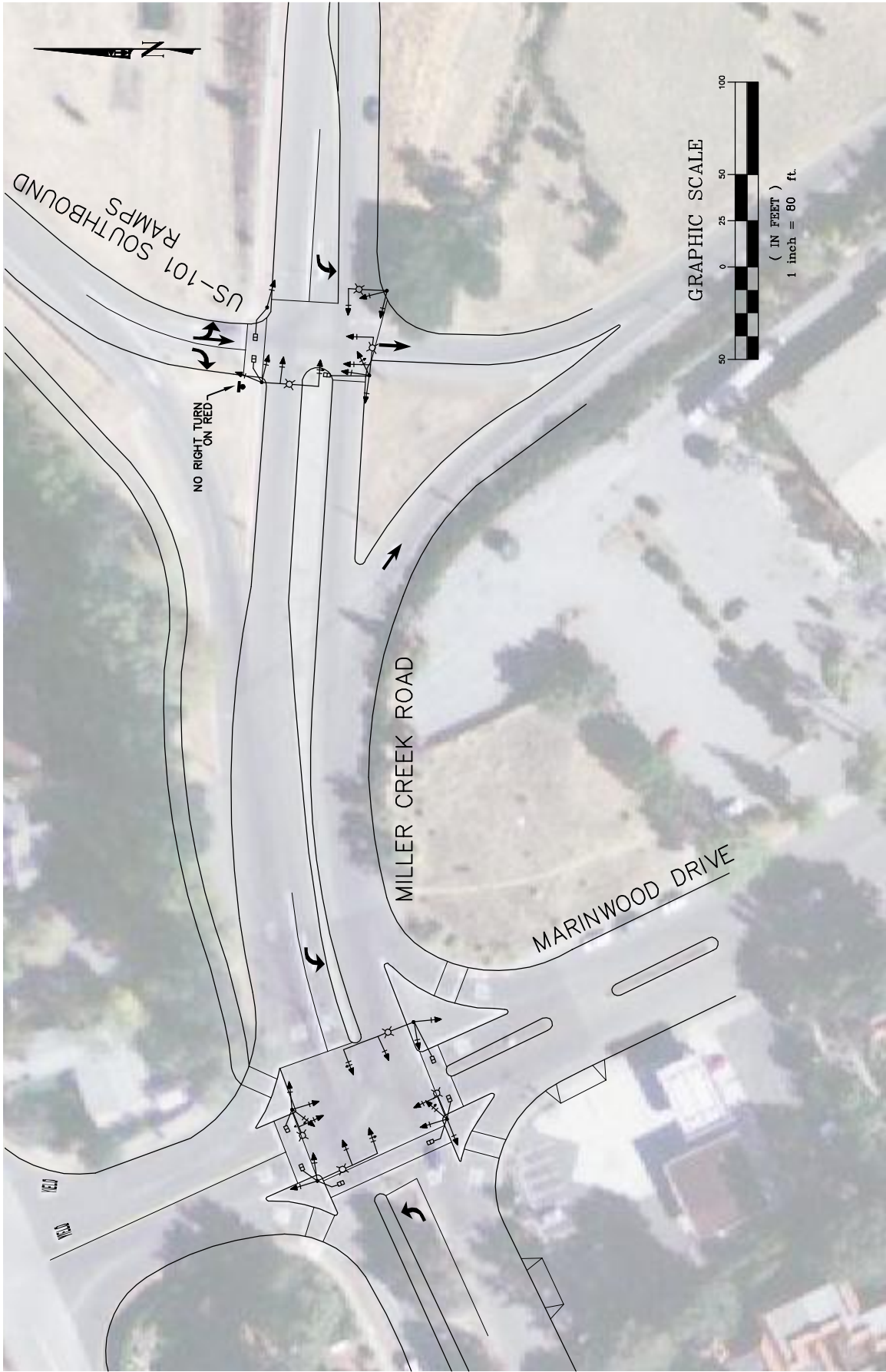
§ **Preferred Alternative C & #4** – Install a traffic signal at the Marinwood Avenue/Miller Creek Road intersection (Alternative C). Install a traffic signal the US-101 Southbound Ramps/Miller Creek Road intersection and realign the southbound free right turn to the intersection and adjacent to the other southbound movements while disallow right turns on red (Alternative 4).

Alternative C & #4 improvements are shown in concept in **Figure 3** and the estimated probable cost for implementation of the above improvements at each intersection is approximately \$200,000 to \$250,000 or \$400,000 to \$500,000 total (including planning, design, and construction).

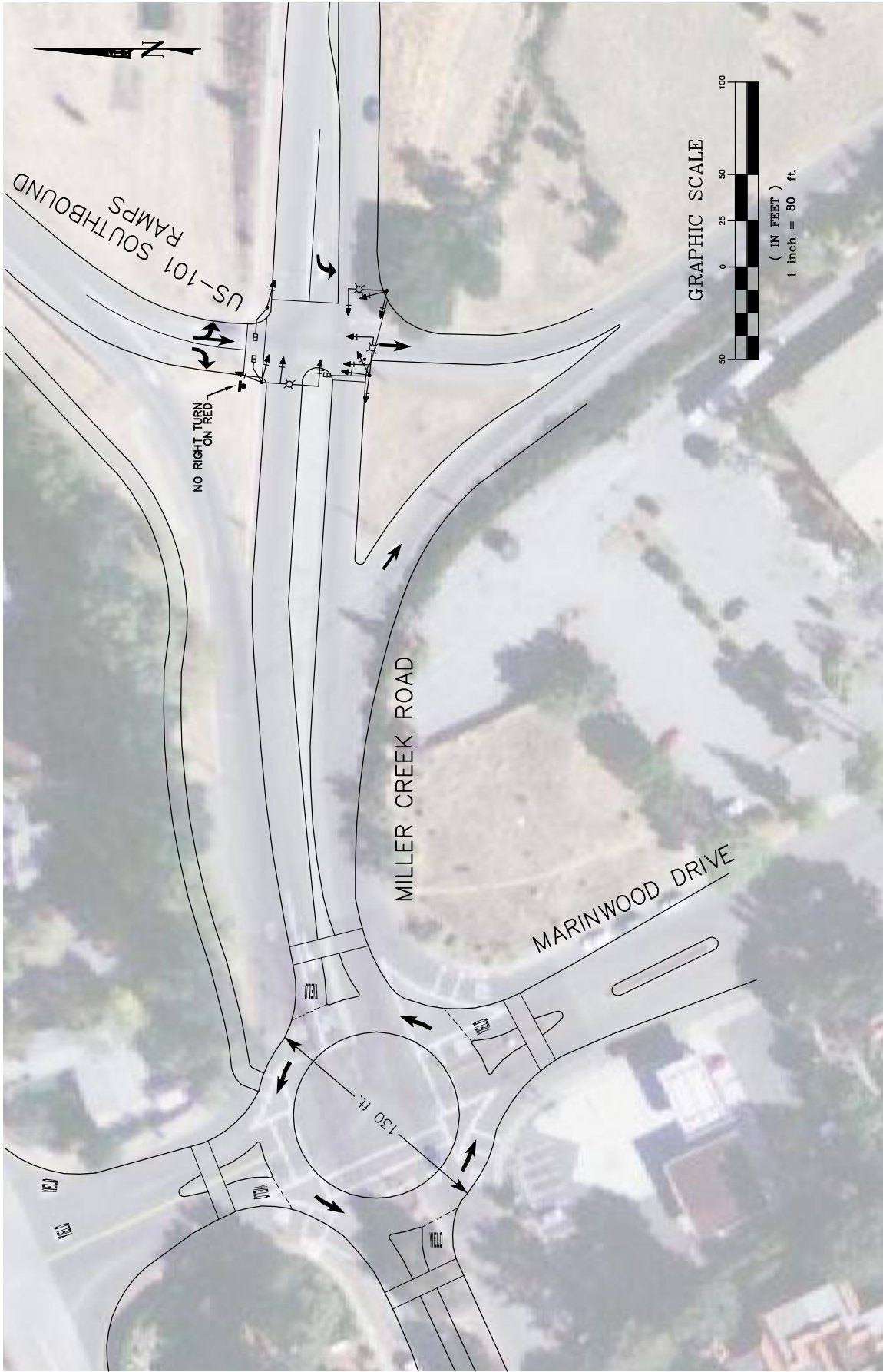


- § **Preferred Alternative E & #4** – Install a roundabout at the Marinwood Avenue/Miller Creek Road intersection (Alternative E). Install a traffic signal at the US-101 Southbound Ramps/Miller Creek Road intersection and realign the southbound free right turn to the intersection and adjacent to the other southbound movements while disallow right turns on red (Alternative 4).

Alternative E & #4 improvements are shown in concept in **Figure 4**. The estimated probable cost for implementation of the improvements at the intersection of Marinwood Avenue/Miller Creek Road is approximately \$340,000 to \$390,000 (including planning, design, and construction). The estimated probable cost for implementation of the above improvements at the intersection of US-101 Southbound Ramps/Miller Creek Road is approximately \$200,000 to \$250,000 (including planning, design, and construction).



**FIGURE 4 - ALTERNATIVE C & #4 CONCEPT PLAN**  
 MILLER CREEK ROAD FROM US-101 SOUTHBOUND RAMPs TO MARINWOOD DRIVE



**FIGURE 5 - ALTERNATIVE E & #4 CONCEPT PLAN**  
 MILLER CREEK ROAD FROM US-101 SOUTHBOUND RAMPS TO MARINWOOD DRIVE

# **APPENDIX**

# **ALTERNATIVE A**

# ALL-WAY STOP CONTROL ANALYSIS

General Information		Site Information	
Analyst Agency/Co. Date Performed Analysis Time Period	<i>Kimley-Horn and Associates</i>  <i>AM Peak</i>	Intersection Jurisdiction Analysis Year	<i>Miller Creek Rd &amp; Marinwood Rd</i>  <i>Alternative A1</i>

Project ID <i>TETAP - Marin County (2005)</i>	
East/West Street: <i>Miller Creek Road</i>	North/South Street: <i>Marinwood Road</i>

Volume Adjustments and Site Characteristics								
Approach	Eastbound				Westbound			
Movement	L	T	R	L	T	R	L	R
Volume	13	181	37	281	781	192		
%Thrus Left Lane	100			0				
Approach	Northbound				Southbound			
Movement	L	T	R	L	T	R	L	R
Volume	50	7	97	147	22	21		
%Thrus Left Lane	100			100				
	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	<i>LT</i>	<i>R</i>	<i>L</i>	<i>TR</i>	<i>LT</i>	<i>R</i>	<i>LT</i>	<i>R</i>
PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Flow Rate	210	40	305	1056	61	105	182	22
% Heavy Vehicles								
No. Lanes	2		2		2		2	
Geometry Group	5		5		5		5	
Duration, T	0.25							

Saturation Headway Adjustment Worksheet								
Prop. Left-Turns	0.1	0.0	1.0	0.0	0.9	0.0	0.9	0.0
Prop. Right-Turns	0.0	1.0	0.0	0.2	0.0	1.0	0.0	1.0
Prop. Heavy Vehicle								
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	7.15	7.15	7.15	7.15	7.15	7.15	7.15	7.15

Departure Headway and Service Time								
hd, initial value	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
x, initial	0.19	0.04	0.27	0.94	0.05	0.09	0.16	0.02
hd, final value	7.15	7.15	7.15	7.15	7.15	7.15	7.15	7.15
x, final value	0.42	0.07	0.57	1.80	0.14	0.20	0.41	0.04
Move-up time, m	2.3		2.3		2.3		2.3	
Service Time	4.8	4.1	4.8	4.1	4.8	4.1	4.8	4.1

Capacity and Level of Service								
	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity	460	290	527	1056	311	355	432	272
Delay	14.86	9.61	18.23	382.94	12.17	11.52	16.10	9.89
LOS	B	A	C	F	B	B	C	A
Approach: Delay	14.02		301.21		11.76		15.43	
LOS	B		F		B		C	
Intersection Delay	211.28							
Intersection LOS	F							

## TWO-WAY STOP CONTROL SUMMARY

General Information				Site Information			
Analyst	Kimley-Horn and Associates			Intersection	Miller Creek Rd & 101 SB Ramps		
Agency/Co.				Jurisdiction			
Date Performed	08/03/2005			Analysis Year	Alternative A1		
Analysis Time Period	AM Peak						
Project Description TETAP - Marin County (2005)							
East/West Street: Miller Creek Road				North/South Street: US 101 SB Ramps			
Intersection Orientation: East-West				Study Period (hrs): 0.25			

Vehicle Volumes and Adjustments						
Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	0	200	244	13	202	0
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Hourly Flow Rate (veh/h)	0	217	265	14	219	0
Proportion of heavy vehicles, P <sub>HV</sub>	2	--	--	2	--	--
Median type	Undivided					
RT Channelized?			0			0
Lanes	0	1	1	1	1	0
Configuration		T	R	L	T	
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	0	0	0	20	550	0
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Hourly Flow Rate (veh/h)	0	0	0	21	597	0
Proportion of heavy vehicles, P <sub>HV</sub>	2	2	2	2	2	2
Percent grade (%)	0			0		
Flared approach		N			N	
Storage		0			0	
RT Channelized?			0			0
Lanes	0	0	0	0	1	0
Configuration				LT		

Control Delay, Queue Length, Level of Service								
Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		L				LT		
Volume, v (vph)		14				618		
Capacity, c <sub>m</sub> (vph)		1081				348		
v/c ratio		0.01				1.78		
Queue length (95%)		0.04				39.60		
Control Delay (s/veh)		8.4				386.7		
LOS		A				F		
Approach delay (s/veh)	--	--				386.7		
Approach LOS	--	--				F		

# ALL-WAY STOP CONTROL ANALYSIS

General Information		Site Information	
Analyst <i>Kimley-Horn and Associates</i>		Intersection <i>Miller Creek Rd &amp; Marinwood Rd</i>	
Agency/Co.		Jurisdiction	
Date Performed <i>08/03/2005</i>		Analysis Year	<i>Alternative A2</i>
Analysis Time Period <i>AM Peak</i>			

Project ID <i>TETAP - Marin County (2005)</i>	
East/West Street: <i>Miller Creek Road</i>	North/South Street: <i>Marinwood Road</i>

Volume Adjustments and Site Characteristics								
Approach	Eastbound				Westbound			
Movement	L	T	R	L	T	R	L	R
Volume	13	181	37	281	781	192		
%Thrus Left Lane	100			0				
Approach	Northbound				Southbound			
Movement	L	T	R	L	T	R	L	R
Volume	50	7	97	147	22	21		
%Thrus Left Lane	100			100				
	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	<i>LT</i>	<i>R</i>	<i>L</i>	<i>TR</i>	<i>LT</i>	<i>R</i>	<i>LT</i>	<i>R</i>
PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Flow Rate	210	40	305	1056	61	105	182	22
% Heavy Vehicles								
No. Lanes	2		2		2		2	
Geometry Group	5		5		5		5	
Duration, T	0.25							

Saturation Headway Adjustment Worksheet								
Prop. Left-Turns	0.1	0.0	1.0	0.0	0.9	0.0	0.9	0.0
Prop. Right-Turns	0.0	1.0	0.0	0.2	0.0	1.0	0.0	1.0
Prop. Heavy Vehicle								
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	7.15	7.15	7.15	7.15	7.15	7.15	7.15	7.15

Departure Headway and Service Time								
hd, initial value	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
x, initial	0.19	0.04	0.27	0.94	0.05	0.09	0.16	0.02
hd, final value	7.15	7.15	7.15	7.15	7.15	7.15	7.15	7.15
x, final value	0.42	0.07	0.57	1.80	0.14	0.20	0.41	0.04
Move-up time, m	2.3		2.3		2.3		2.3	
Service Time	4.8	4.1	4.8	4.1	4.8	4.1	4.8	4.1

Capacity and Level of Service								
	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity	460	290	527	1056	311	355	432	272
Delay	14.86	9.61	18.23	382.94	12.17	11.52	16.10	9.89
LOS	B	A	C	F	B	B	C	A
Approach: Delay	14.02		301.21		11.76		15.43	
LOS	B		F		B		C	
Intersection Delay	211.28							
Intersection LOS	F							

## TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	Kimley-Horn and Associates	Intersection	Miller Creek Rd & 101 SB Ramps
Agency/Co.		Jurisdiction	
Date Performed	08/03/2005	Analysis Year	Alternative A2
Analysis Time Period	AM Peak		
Project Description TETAP - Marin County (2005)			
East/West Street: Miller Creek Road		North/South Street: US 101 SB Ramps	
Intersection Orientation: East-West		Study Period (hrs): 0.25	

Vehicle Volumes and Adjustments						
Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	0	200	244	13	202	0
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Hourly Flow Rate (veh/h)	0	217	265	14	219	0
Proportion of heavy vehicles, P <sub>HV</sub>	2	--	--	2	--	--
Median type	Undivided					
RT Channelized?			0			0
Lanes	0	1	1	1	1	0
Configuration		T	R	L	T	
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	0	0	0	20	550	1026
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Hourly Flow Rate (veh/h)	0	0	0	21	597	1115
Proportion of heavy vehicles, P <sub>HV</sub>	2	2	2	2	2	2
Percent grade (%)	0			0		
Flared approach		N			N	
Storage		0			0	
RT Channelized?			0			0
Lanes	0	0	0	0	1	1
Configuration				LT		R

Control Delay, Queue Length, Level of Service								
Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		L				LT		R
Volume, v (vph)		14				618		1115
Capacity, c <sub>m</sub> (vph)		1081				348		821
v/c ratio		0.01				1.78		1.36
Queue length (95%)		0.04				39.60		45.87
Control Delay (s/veh)		8.4				386.7		185.7
LOS		A				F		F
Approach delay (s/veh)	--	--				257.4		
Approach LOS	--	--				F		

# ALL-WAY STOP CONTROL ANALYSIS

General Information		Site Information	
Analyst <i>Kimley-Horn and Associates</i>		Intersection <i>Miller Creek Rd &amp; Marinwood Rd</i>	
Agency/Co.		Jurisdiction	
Date Performed <i>08/03/2005</i>		Analysis Year	<i>Alternative A3</i>
Analysis Time Period <i>AM Peak</i>			

Project ID <i>TETAP - Marin County (2005)</i>	
East/West Street: <i>Miller Creek Road</i>	North/South Street: <i>Marinwood Road</i>

Volume Adjustments and Site Characteristics								
Approach	Eastbound				Westbound			
Movement	L	T	R		L	T	R	
Volume	13	181	37		281	781	192	
%Thrus Left Lane	100				0			
Approach	Northbound				Southbound			
Movement	L	T	R		L	T	R	
Volume	50	7	97		147	22	21	
%Thrus Left Lane	100				100			
	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	<i>LT</i>	<i>R</i>	<i>L</i>	<i>TR</i>	<i>LT</i>	<i>R</i>	<i>LT</i>	<i>R</i>
PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Flow Rate	210	40	305	1056	61	105	182	22
% Heavy Vehicles								
No. Lanes	2		2		2		2	
Geometry Group	5		5		5		5	
Duration, T	0.25							

Saturation Headway Adjustment Worksheet								
Prop. Left-Turns	0.1	0.0	1.0	0.0	0.9	0.0	0.9	0.0
Prop. Right-Turns	0.0	1.0	0.0	0.2	0.0	1.0	0.0	1.0
Prop. Heavy Vehicle								
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	7.15	7.15	7.15	7.15	7.15	7.15	7.15	7.15

Departure Headway and Service Time								
hd, initial value	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
x, initial	0.19	0.04	0.27	0.94	0.05	0.09	0.16	0.02
hd, final value	7.15	7.15	7.15	7.15	7.15	7.15	7.15	7.15
x, final value	0.42	0.07	0.57	1.80	0.14	0.20	0.41	0.04
Move-up time, m	2.3		2.3		2.3		2.3	
Service Time	4.8	4.1	4.8	4.1	4.8	4.1	4.8	4.1

Capacity and Level of Service								
	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity	460	290	527	1056	311	355	432	272
Delay	14.86	9.61	18.23	382.94	12.17	11.52	16.10	9.89
LOS	B	A	C	F	B	B	C	A
Approach: Delay	14.02		301.21		11.76		15.43	
LOS	B		F		B		C	
Intersection Delay	211.28							
Intersection LOS	F							



# ALL-WAY STOP CONTROL ANALYSIS

General Information		Site Information	
Analyst Agency/Co. <i>Kimley-Horn and Associates</i>		Intersection Jurisdiction <i>Miller Creek Rd &amp; Marinwood Rd</i>	
Date Performed Analysis Time Period <i>08/03/2005 AM Peak</i>		Analysis Year <i>Alternative A4</i>	

Project ID *TETAP - Marin County (2005)*

East/West Street: *Miller Creek Road*

North/South Street: *Marinwood Road*

## Volume Adjustments and Site Characteristics

Approach	Eastbound			Westbound		
	L	T	R	L	T	R
Movement						
Volume	13	181	37	281	781	192
%Thrus Left Lane	100			0		

Approach	Northbound			Southbound		
	L	T	R	L	T	R
Movement						
Volume	50	7	97	147	22	21
%Thrus Left Lane	100			100		

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	<i>LT</i>	<i>R</i>	<i>L</i>	<i>TR</i>	<i>LT</i>	<i>R</i>	<i>LT</i>	<i>R</i>
PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Flow Rate	210	40	305	1056	61	105	182	22
% Heavy Vehicles								
No. Lanes	2		2		2		2	
Geometry Group	5		5		5		5	
Duration, T	0.25							

## Saturation Headway Adjustment Worksheet

Prop. Left-Turns	0.1	0.0	1.0	0.0	0.9	0.0	0.9	0.0
Prop. Right-Turns	0.0	1.0	0.0	0.2	0.0	1.0	0.0	1.0
Prop. Heavy Vehicle								
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	7.15	7.15	7.15	7.15	7.15	7.15	7.15	7.15

## Departure Headway and Service Time

hd, initial value	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
x, initial	0.19	0.04	0.27	0.94	0.05	0.09	0.16	0.02
hd, final value	7.15	7.15	7.15	7.15	7.15	7.15	7.15	7.15
x, final value	0.42	0.07	0.57	1.80	0.14	0.20	0.41	0.04
Move-up time, m	2.3		2.3		2.3		2.3	
Service Time	4.8	4.1	4.8	4.1	4.8	4.1	4.8	4.1

## Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity	460	290	527	1056	311	355	432	272
Delay	14.86	9.61	18.23	382.94	12.17	11.52	16.10	9.89
LOS	B	A	C	F	B	B	C	A
Approach: Delay	14.02		301.21		11.76		15.43	
LOS	B		F		B		C	
Intersection Delay	211.28							
Intersection LOS	F							

TETAP - Marin County (2005)  
 2: Miller Creek Rd & 101 SB Ramps

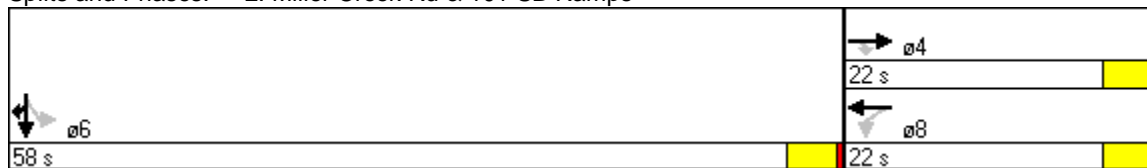
Alt A4  
 AM Peak

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Satd. Flow (prot)	0	1961	1667	1863	1961	0	0	0	0	0	1957	1667
Flt Permitted				0.467							0.998	
Satd. Flow (perm)	0	1961	1667	916	1961	0	0	0	0	0	1957	1667
Satd. Flow (RTOR)			265									
Volume (vph)	0	200	244	13	202	0	0	0	0	20	550	1026
Lane Group Flow (vph)	0	217	265	14	220	0	0	0	0	0	620	1115
Turn Type			Perm	Perm						Perm		Prot
Protected Phases		4			8						6	6
Permitted Phases			4	8						6		
Total Split (s)	0.0	22.0	22.0	22.0	22.0	0.0	0.0	0.0	0.0	58.0	58.0	58.0
Act Effct Green (s)		18.0	18.0	18.0	18.0						54.0	54.0
Actuated g/C Ratio		0.23	0.23	0.23	0.23						0.68	0.68
v/c Ratio		0.49	0.46	0.07	0.50						0.47	0.99
Uniform Delay, d1		27.0	0.0	24.4	27.0						6.2	12.8
Delay		27.6	3.9	24.9	27.6						6.4	34.1
LOS		C	A	C	C						A	C
Approach Delay		14.6			27.5						24.2	
Approach LOS		B			C						C	
Queue Length 50th (ft)		95	0	6	96						126	469
Queue Length 95th (ft)		161	58	21	163						191	#816
Internal Link Dist (ft)		347			115			105			84	
50th Up Block Time (%)											16%	28%
95th Up Block Time (%)					28%						22%	32%
Turn Bay Length (ft)				100								
50th Bay Block Time %					5%							
95th Bay Block Time %					35%							
Queuing Penalty (veh)					3							

Intersection Summary

Cycle Length: 80  
 Actuated Cycle Length: 80  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.99  
 Intersection Signal Delay: 22.6  
 Intersection LOS: C  
 Intersection Capacity Utilization 83.2%  
 ICU Level of Service D  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.

Splits and Phases: 2: Miller Creek Rd & 101 SB Ramps



# **ALTERNATIVE B**

# ALL-WAY STOP CONTROL ANALYSIS

General Information		Site Information	
Analyst <i>Kimley-Horn and Associates</i>		Intersection <i>Miller Creek Rd &amp; Marinwood Rd</i>	
Agency/Co.		Jurisdiction	
Date Performed <i>08/03/2005</i>		Analysis Year	<i>Alternative B1</i>
Analysis Time Period <i>AM Peak</i>			

Project ID <i>TETAP - Marin County (2005)</i>	
East/West Street: <i>Miller Creek Road</i>	North/South Street: <i>Marinwood Road</i>

Volume Adjustments and Site Characteristics								
Approach	Eastbound				Westbound			
Movement	L	T	R	L	T	R	L	R
Volume	13	181	37	140	831	192		
%Thrus Left Lane	100			0				
Approach	Northbound				Southbound			
Movement	L	T	R	L	T	R	L	R
Volume	50	7	97	147	22	21		
%Thrus Left Lane	100			100				
	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	<i>LT</i>	<i>R</i>	<i>L</i>	<i>TR</i>	<i>LT</i>	<i>R</i>	<i>LT</i>	<i>R</i>
PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Flow Rate	210	40	152	1111	61	105	182	22
% Heavy Vehicles								
No. Lanes	2		2		2		2	
Geometry Group	5		5		5		5	
Duration, T	0.25							

Saturation Headway Adjustment Worksheet								
Prop. Left-Turns	0.1	0.0	1.0	0.0	0.9	0.0	0.9	0.0
Prop. Right-Turns	0.0	1.0	0.0	0.2	0.0	1.0	0.0	1.0
Prop. Heavy Vehicle								
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	6.95	6.95	6.95	6.95	6.95	6.95	6.95	6.95

Departure Headway and Service Time								
hd, initial value	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
x, initial	0.19	0.04	0.14	0.99	0.05	0.09	0.16	0.02
hd, final value	6.95	6.95	6.95	6.95	6.95	6.95	6.95	6.95
x, final value	0.41	0.07	0.28	1.89	0.14	0.20	0.40	0.04
Move-up time, m	2.3		2.3		2.3		2.3	
Service Time	4.6	3.9	4.6	3.9	4.6	3.9	4.6	3.9

Capacity and Level of Service								
	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity	460	290	402	1111	311	355	432	272
Delay	14.30	9.37	12.11	420.30	11.99	11.30	15.69	9.73
LOS	B	A	B	F	B	B	C	A
Approach: Delay	13.51		371.18		11.55		15.05	
LOS	B		F		B		C	
Intersection Delay	253.41							
Intersection LOS	F							

## TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	Kimley-Horn and Associates	Intersection	Miller Creek Rd & 101 SB Ramps
Agency/Co.		Jurisdiction	
Date Performed	08/03/2005	Analysis Year	Alternative B1
Analysis Time Period	AM Peak		
Project Description TETAP - Marin County (2005)			
East/West Street: Miller Creek Road		North/South Street: US 101 SB Ramps	
Intersection Orientation: East-West		Study Period (hrs): 0.25	

Vehicle Volumes and Adjustments						
Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	0	200	103	13	202	0
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Hourly Flow Rate (veh/h)	0	217	111	14	219	0
Proportion of heavy vehicles, P <sub>HV</sub>	2	--	--	2	--	--
Median type	Undivided					
RT Channelized?			0			0
Lanes	0	1	1	1	1	0
Configuration		T	R	L	T	
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	0	0	0	20	641	0
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Hourly Flow Rate (veh/h)	0	0	0	21	696	0
Proportion of heavy vehicles, P <sub>HV</sub>	2	2	2	2	2	2
Percent grade (%)	0			0		
Flared approach		N			N	
Storage		0			0	
RT Channelized?			0			0
Lanes	0	0	0	0	1	0
Configuration				LT		

Control Delay, Queue Length, Level of Service								
Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		L				LT		
Volume, v (vph)		14				717		
Capacity, c <sub>m</sub> (vph)		1232				426		
v/c ratio		0.01				1.68		
Queue length (95%)		0.03				42.68		
Control Delay (s/veh)		8.0				340.4		
LOS		A				F		
Approach delay (s/veh)	--	--				340.4		
Approach LOS	--	--				F		

# ALL-WAY STOP CONTROL ANALYSIS

General Information		Site Information	
Analyst <i>Kimley-Horn and Associates</i>		Intersection <i>Miller Creek Rd &amp; Marinwood Rd</i>	
Agency/Co.		Jurisdiction	
Date Performed <i>08/03/2005</i>		Analysis Year	<i>Alternative B2</i>
Analysis Time Period <i>AM Peak</i>			

Project ID *TETAP - Marin County (2005)*

East/West Street: *Miller Creek Road*

North/South Street: *Marinwood Road*

## Volume Adjustments and Site Characteristics

Approach	Eastbound			Westbound		
	L	T	R	L	T	R
Movement						
Volume	13	181	37	140	831	192
%Thrus Left Lane	100			0		

Approach	Northbound			Southbound		
	L	T	R	L	T	R
Movement						
Volume	50	7	97	147	22	21
%Thrus Left Lane	100			100		

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	<i>LT</i>	<i>R</i>	<i>L</i>	<i>TR</i>	<i>LT</i>	<i>R</i>	<i>LT</i>	<i>R</i>
PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Flow Rate	210	40	152	1111	61	105	182	22
% Heavy Vehicles								
No. Lanes	2		2		2		2	
Geometry Group	5		5		5		5	
Duration, T	0.25							

## Saturation Headway Adjustment Worksheet

Prop. Left-Turns	0.1	0.0	1.0	0.0	0.9	0.0	0.9	0.0
Prop. Right-Turns	0.0	1.0	0.0	0.2	0.0	1.0	0.0	1.0
Prop. Heavy Vehicle								
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	6.95	6.95	6.95	6.95	6.95	6.95	6.95	6.95

## Departure Headway and Service Time

hd, initial value	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
x, initial	0.19	0.04	0.14	0.99	0.05	0.09	0.16	0.02
hd, final value	6.95	6.95	6.95	6.95	6.95	6.95	6.95	6.95
x, final value	0.41	0.07	0.28	1.89	0.14	0.20	0.40	0.04
Move-up time, m	2.3		2.3		2.3		2.3	
Service Time	4.6	3.9	4.6	3.9	4.6	3.9	4.6	3.9

## Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity	460	290	402	1111	311	355	432	272
Delay	14.30	9.37	12.11	420.30	11.99	11.30	15.69	9.73
LOS	B	A	B	F	B	B	C	A
Approach: Delay	13.51		371.18		11.55		15.05	
LOS	B		F		B		C	
Intersection Delay	253.41							
Intersection LOS	F							

## TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst Agency/Co.	Kimley-Horn and Associates	Intersection	Miller Creek Rd & 101 SB Ramps
Date Performed	08/03/2005	Jurisdiction	
Analysis Time Period	AM Peak	Analysis Year	Alternative B2
Project Description TETAP - Marin County (2005)			
East/West Street: Miller Creek Road		North/South Street: US 101 SB Ramps	
Intersection Orientation: East-West		Study Period (hrs): 0.25	

Vehicle Volumes and Adjustments						
Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	0	200	103	13	202	0
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Hourly Flow Rate (veh/h)	0	217	111	14	219	0
Proportion of heavy vehicles, P <sub>HV</sub>	2	--	--	2	--	--
Median type	Undivided					
RT Channelized?			0			0
Lanes	0	1	1	1	1	0
Configuration		T	R	L	T	
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	0	0	0	20	641	935
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Hourly Flow Rate (veh/h)	0	0	0	21	696	1016
Proportion of heavy vehicles, P <sub>HV</sub>	2	2	2	2	2	2
Percent grade (%)	0			0		
Flared approach		N			N	
Storage		0			0	
RT Channelized?			0			0
Lanes	0	0	0	0	1	1
Configuration				LT		R

Control Delay, Queue Length, Level of Service								
Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		L				LT		R
Volume, v (vph)		14				717		1016
Capacity, c <sub>m</sub> (vph)		1232				426		821
v/c ratio		0.01				1.68		1.24
Queue length (95%)		0.03				42.68		35.20
Control Delay (s/veh)		8.0				340.4		135.6
LOS		A				F		F
Approach delay (s/veh)	--	--				220.3		
Approach LOS	--	--				F		

# ALL-WAY STOP CONTROL ANALYSIS

General Information		Site Information	
Analyst <i>Kimley-Horn and Associates</i>		Intersection <i>Miller Creek Rd &amp; Marinwood Rd</i>	
Agency/Co.		Jurisdiction	
Date Performed <i>08/03/2005</i>		Analysis Year	<i>Alternative B3</i>
Analysis Time Period <i>AM Peak</i>			

Project ID <i>TETAP - Marin County (2005)</i>	
East/West Street: <i>Miller Creek Road</i>	North/South Street: <i>Marinwood Road</i>

Volume Adjustments and Site Characteristics								
Approach	Eastbound				Westbound			
Movement	L	T	R	L	T	R	L	R
Volume	13	181	37	140	831	192		
%Thrus Left Lane	100			0				
Approach	Northbound				Southbound			
Movement	L	T	R	L	T	R	L	R
Volume	50	7	97	147	22	21		
%Thrus Left Lane	100			100				
	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	<i>LT</i>	<i>R</i>	<i>L</i>	<i>TR</i>	<i>LT</i>	<i>R</i>	<i>LT</i>	<i>R</i>
PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Flow Rate	210	40	152	1111	61	105	182	22
% Heavy Vehicles								
No. Lanes	2		2		2		2	
Geometry Group	5		5		5		5	
Duration, T	0.25							

Saturation Headway Adjustment Worksheet								
Prop. Left-Turns	0.1	0.0	1.0	0.0	0.9	0.0	0.9	0.0
Prop. Right-Turns	0.0	1.0	0.0	0.2	0.0	1.0	0.0	1.0
Prop. Heavy Vehicle								
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	6.95	6.95	6.95	6.95	6.95	6.95	6.95	6.95

Departure Headway and Service Time								
hd, initial value	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
x, initial	0.19	0.04	0.14	0.99	0.05	0.09	0.16	0.02
hd, final value	6.95	6.95	6.95	6.95	6.95	6.95	6.95	6.95
x, final value	0.41	0.07	0.28	1.89	0.14	0.20	0.40	0.04
Move-up time, m	2.3		2.3		2.3		2.3	
Service Time	4.6	3.9	4.6	3.9	4.6	3.9	4.6	3.9

Capacity and Level of Service								
	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity	460	290	402	1111	311	355	432	272
Delay	14.30	9.37	12.11	420.30	11.99	11.30	15.69	9.73
LOS	<i>B</i>	<i>A</i>	<i>B</i>	<i>F</i>	<i>B</i>	<i>B</i>	<i>C</i>	<i>A</i>
Approach: Delay	13.51		371.18		11.55		15.05	
LOS	<i>B</i>		<i>F</i>		<i>B</i>		<i>C</i>	
Intersection Delay	253.41							
Intersection LOS	<i>F</i>							

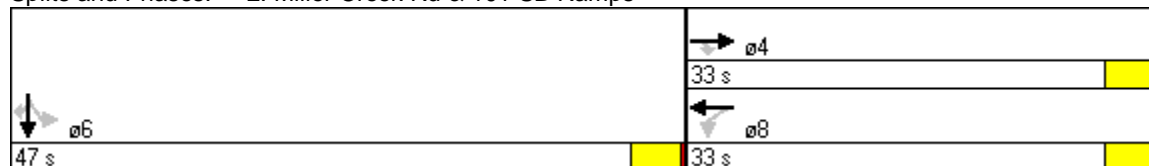


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑	↗	↖	↑						↕	↗
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Satd. Flow (prot)	0	1961	1667	1863	1961	0	0	0	0	0	1957	1667
Flt Permitted				0.558							0.998	
Satd. Flow (perm)	0	1961	1667	1094	1961	0	0	0	0	0	1957	1667
Satd. Flow (RTOR)			112									500
Volume (vph)	0	200	103	13	202	0	0	0	0	20	641	935
Lane Group Flow (vph)	0	217	112	14	220	0	0	0	0	0	719	1016
Turn Type			Perm	Perm						Perm		Perm
Protected Phases		4			8						6	
Permitted Phases			4	8						6		6
Total Split (s)	0.0	33.0	33.0	33.0	33.0	0.0	0.0	0.0	0.0	47.0	47.0	47.0
Act Effct Green (s)		29.5	29.5	29.5	29.5						37.0	37.0
Actuated g/C Ratio		0.40	0.40	0.40	0.40						0.50	0.50
v/c Ratio		0.28	0.15	0.03	0.28						0.74	0.94
Uniform Delay, d1		15.3	0.0	13.7	15.3						14.9	8.6
Delay		17.7	4.0	16.8	17.7						14.8	14.8
LOS		B	A	B	B						B	B
Approach Delay		13.1			17.7						14.8	
Approach LOS		B			B						B	
Queue Length 50th (ft)		76	0	4	78						245	232
Queue Length 95th (ft)		130	31	16	131						370	#579
Internal Link Dist (ft)		347			115			105			84	
50th Up Block Time (%)											33%	26%
95th Up Block Time (%)					14%						38%	40%
Turn Bay Length (ft)				100								
50th Bay Block Time %												
95th Bay Block Time %					21%							
Queuing Penalty (veh)					1							

**Intersection Summary**

Cycle Length: 80  
 Actuated Cycle Length: 74.5  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.94  
 Intersection Signal Delay: 14.8  
 Intersection LOS: B  
 Intersection Capacity Utilization 77.4%  
 ICU Level of Service C  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.

**Splits and Phases: 2: Miller Creek Rd & 101 SB Ramps**



# ALL-WAY STOP CONTROL ANALYSIS

General Information		Site Information	
Analyst Agency/Co. <i>Kimley-Horn and Associates</i>		Intersection Jurisdiction <i>Miller Creek Rd &amp; Marinwood Rd</i>	
Date Performed Analysis Time Period <i>08/03/2005 AM Peak</i>		Analysis Year <i>Alternative B4</i>	

Project ID <i>TETAP - Marin County (2005)</i>	
East/West Street: <i>Miller Creek Road</i>	North/South Street: <i>Marinwood Road</i>

Volume Adjustments and Site Characteristics								
Approach	Eastbound				Westbound			
Movement	L	T	R	L	T	R	L	R
Volume	13	181	37	140	831	192		
%Thrus Left Lane	100			0				
Approach	Northbound				Southbound			
Movement	L	T	R	L	T	R	L	R
Volume	50	7	97	147	22	21		
%Thrus Left Lane	100			100				
	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	<i>LT</i>	<i>R</i>	<i>L</i>	<i>TR</i>	<i>LT</i>	<i>R</i>	<i>LT</i>	<i>R</i>
PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Flow Rate	210	40	152	1111	61	105	182	22
% Heavy Vehicles								
No. Lanes	2		2		2		2	
Geometry Group	5		5		5		5	
Duration, T	0.25							

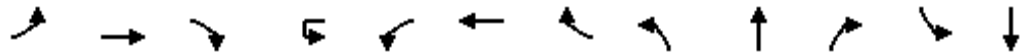
Saturation Headway Adjustment Worksheet								
Prop. Left-Turns	0.1	0.0	1.0	0.0	0.9	0.0	0.9	0.0
Prop. Right-Turns	0.0	1.0	0.0	0.2	0.0	1.0	0.0	1.0
Prop. Heavy Vehicle								
hLT-adj	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
hRT-adj	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7
hHV-adj	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
hadj, computed	6.95	6.95	6.95	6.95	6.95	6.95	6.95	6.95

Departure Headway and Service Time								
hd, initial value	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
x, initial	0.19	0.04	0.14	0.99	0.05	0.09	0.16	0.02
hd, final value	6.95	6.95	6.95	6.95	6.95	6.95	6.95	6.95
x, final value	0.41	0.07	0.28	1.89	0.14	0.20	0.40	0.04
Move-up time, m	2.3		2.3		2.3		2.3	
Service Time	4.6	3.9	4.6	3.9	4.6	3.9	4.6	3.9

Capacity and Level of Service								
	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity	460	290	402	1111	311	355	432	272
Delay	14.30	9.37	12.11	420.30	11.99	11.30	15.69	9.73
LOS	B	A	B	F	B	B	C	A
Approach: Delay	13.51		371.18		11.55		15.05	
LOS	B		F		B		C	
Intersection Delay	253.41							
Intersection LOS	F							



# **ALTERNATIVE C**

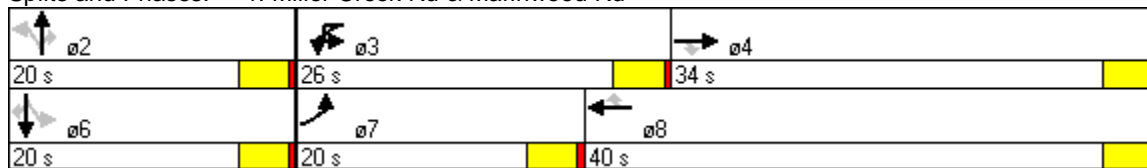


Lane Group	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Satd. Flow (prot)	1863	1961	1667	0	1863	1961	1667	0	1878	1667	0	1878
Flt Permitted	0.950				0.950				0.633			0.710
Satd. Flow (perm)	1863	1961	1667	0	1863	1961	1667	0	1241	1667	0	1392
Satd. Flow (RTOR)			40				209			105		
Volume (vph)	13	181	37	141	140	781	192	50	7	97	147	22
Lane Group Flow (vph)	14	197	40	0	305	849	209	0	62	105	0	184
Turn Type	Prot		Perm	Prot	Prot		Perm	Perm		Perm	Perm	
Protected Phases	7	4		3	3	8			2			6
Permitted Phases			4				8	2		2	6	
Total Split (s)	20.0	34.0	34.0	26.0	26.0	40.0	40.0	20.0	20.0	20.0	20.0	20.0
Act Effct Green (s)	6.2	13.6	13.6		17.2	30.3	30.3		11.8	11.8		11.8
Actuated g/C Ratio	0.10	0.25	0.25		0.33	0.58	0.58		0.23	0.23		0.23
v/c Ratio	0.07	0.40	0.09		0.50	0.75	0.20		0.22	0.23		0.59
Uniform Delay, d1	26.6	16.8	0.0		15.6	9.8	0.0		18.0	0.0		19.7
Delay	28.9	17.9	7.0		18.2	12.9	1.6		19.8	5.6		21.3
LOS	C	B	A		B	B	A		B	A		C
Approach Delay		16.8				12.3			10.9			20.0
Approach LOS		B				B			B			B
Queue Length 50th (ft)	4	49	0		86	151	0		16	0		52
Queue Length 95th (ft)	22	119	20		182	#537	29		54	36		136
Internal Link Dist (ft)		181				207			119			158
50th Up Block Time (%)						1%						
95th Up Block Time (%)						34%						
Turn Bay Length (ft)					100							
50th Bay Block Time %					1%	20%						
95th Bay Block Time %					36%	42%						
Queuing Penalty (veh)					152	241						

**Intersection Summary**

Cycle Length: 80  
 Actuated Cycle Length: 52.3  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.75  
 Intersection Signal Delay: 13.6  
 Intersection LOS: B  
 Intersection Capacity Utilization 72.0%  
 ICU Level of Service C  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.

**Splits and Phases: 1: Miller Creek Rd & Marinwood Rd**



Lane Group	SBR
Lane Configurations	
Total Lost Time (s)	4.0
Satd. Flow (prot)	1667
Flt Permitted	
Satd. Flow (perm)	1667
Satd. Flow (RTOR)	23
Volume (vph)	21
Lane Group Flow (vph)	23
Turn Type	Perm
Protected Phases	
Permitted Phases	6
Total Split (s)	20.0
Act Effct Green (s)	11.8
Actuated g/C Ratio	0.23
v/c Ratio	0.06
Uniform Delay, d1	0.0
Delay	9.8
LOS	A
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	0
Queue Length 95th (ft)	17
Internal Link Dist (ft)	
50th Up Block Time (%)	
95th Up Block Time (%)	
Turn Bay Length (ft)	
50th Bay Block Time %	
95th Bay Block Time %	
Queuing Penalty (veh)	
<b>Intersection Summary</b>	

## TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst Agency/Co.	Kimley-Horn and Associates	Intersection	Miller Creek Rd & 101 SB Ramps
Date Performed	08/03/2005	Jurisdiction	
Analysis Time Period	AM Peak	Analysis Year	Alternative C1
Project Description TETAP - Marin County (2005)			
East/West Street: Miller Creek Road		North/South Street: US 101 SB Ramps	
Intersection Orientation: East-West		Study Period (hrs): 0.25	

Vehicle Volumes and Adjustments						
Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	0	200	244	13	202	0
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Hourly Flow Rate (veh/h)	0	217	265	14	219	0
Proportion of heavy vehicles, P <sub>HV</sub>	2	--	--	2	--	--
Median type	Undivided					
RT Channelized?			0			0
Lanes	0	1	1	1	1	0
Configuration		T	R	L	T	
Upstream Signal		1			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	0	0	0	20	550	0
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Hourly Flow Rate (veh/h)	0	0	0	21	597	0
Proportion of heavy vehicles, P <sub>HV</sub>	2	2	2	2	2	2
Percent grade (%)	0			0		
Flared approach		N			N	
Storage		0			0	
RT Channelized?			0			0
Lanes	0	0	0	0	1	0
Configuration				LT		

Control Delay, Queue Length, Level of Service								
Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		L				LT		
Volume, v (vph)		14				618		
Capacity, c <sub>m</sub> (vph)		1071				350		
v/c ratio		0.01				1.77		
Queue length (95%)		0.04				39.38		
Control Delay (s/veh)		8.4				382.1		
LOS		A				F		
Approach delay (s/veh)	--	--				382.1		
Approach LOS	--	--				F		



Lane Group	SBR
Lane Configurations	
Total Lost Time (s)	4.0
Satd. Flow (prot)	1667
Flt Permitted	
Satd. Flow (perm)	1667
Satd. Flow (RTOR)	23
Volume (vph)	21
Lane Group Flow (vph)	23
Turn Type	Perm
Protected Phases	
Permitted Phases	6
Total Split (s)	20.0
Act Effct Green (s)	11.8
Actuated g/C Ratio	0.23
v/c Ratio	0.06
Uniform Delay, d1	0.0
Delay	9.8
LOS	A
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	0
Queue Length 95th (ft)	17
Internal Link Dist (ft)	
50th Up Block Time (%)	
95th Up Block Time (%)	
Turn Bay Length (ft)	
50th Bay Block Time %	
95th Bay Block Time %	
Queuing Penalty (veh)	
<b>Intersection Summary</b>	

## TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst Agency/Co.	Kimley-Horn and Associates	Intersection	Miller Creek Rd & 101 SB Ramps
Date Performed	08/03/2005	Jurisdiction	
Analysis Time Period	AM Peak	Analysis Year	Alternative C2
Project Description TETAP - Marin County (2005)			
East/West Street: Miller Creek Road		North/South Street: US 101 SB Ramps	
Intersection Orientation: East-West		Study Period (hrs): 0.25	

Vehicle Volumes and Adjustments						
Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	0	200	244	13	202	0
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Hourly Flow Rate (veh/h)	0	217	265	14	219	0
Proportion of heavy vehicles, P <sub>HV</sub>	2	--	--	2	--	--
Median type	Undivided					
RT Channelized?			0			0
Lanes	0	1	1	1	1	0
Configuration		T	R	L	T	
Upstream Signal		1			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	0	0	0	20	550	1026
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Hourly Flow Rate (veh/h)	0	0	0	21	597	1115
Proportion of heavy vehicles, P <sub>HV</sub>	2	2	2	2	2	2
Percent grade (%)	0			0		
Flared approach		N			N	
Storage		0			0	
RT Channelized?			0			0
Lanes	0	0	0	0	1	1
Configuration				LT		R

Control Delay, Queue Length, Level of Service								
Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		L				LT		R
Volume, v (vph)		14				618		1115
Capacity, c <sub>m</sub> (vph)		1071				350		821
v/c ratio		0.01				1.77		1.36
Queue length (95%)		0.04				39.38		45.87
Control Delay (s/veh)		8.4				382.1		185.7
LOS		A				F		F
Approach delay (s/veh)	--	--				255.8		
Approach LOS	--	--				F		



Lane Group	SBR
Lane Configurations	7
Total Lost Time (s)	4.0
Satd. Flow (prot)	1667
Flt Permitted	
Satd. Flow (perm)	1667
Satd. Flow (RTOR)	23
Volume (vph)	21
Lane Group Flow (vph)	23
Turn Type	Perm
Protected Phases	
Permitted Phases	6
Total Split (s)	20.0
Act Effct Green (s)	11.8
Actuated g/C Ratio	0.23
v/c Ratio	0.06
Uniform Delay, d1	0.0
Delay	9.8
LOS	A
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	0
Queue Length 95th (ft)	17
Internal Link Dist (ft)	
50th Up Block Time (%)	
95th Up Block Time (%)	
Turn Bay Length (ft)	
50th Bay Block Time %	
95th Bay Block Time %	
Queuing Penalty (veh)	
<b>Intersection Summary</b>	

TETAP - Marin County (2005)  
 2: Miller Creek Rd & 101 SB Ramps

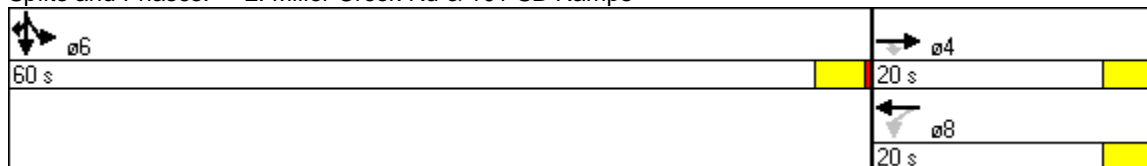
Alt C3  
 AM Peak

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Satd. Flow (prot)	0	1961	1667	1863	1961	0	0	0	0	0	1957	1667
Flt Permitted				0.437							0.998	
Satd. Flow (perm)	0	1961	1667	857	1961	0	0	0	0	0	1957	1667
Satd. Flow (RTOR)			265									260
Volume (vph)	0	200	244	13	202	0	0	0	0	20	550	1026
Lane Group Flow (vph)	0	217	265	14	220	0	0	0	0	0	620	1115
Turn Type			Perm	Perm						Split		Prot
Protected Phases		4			8					6	6	6
Permitted Phases			4	8								
Total Split (s)	0.0	20.0	20.0	20.0	20.0	0.0	0.0	0.0	0.0	60.0	60.0	60.0
Act Effct Green (s)		16.5	16.5	16.5	16.5						47.5	47.5
Actuated g/C Ratio		0.23	0.23	0.23	0.23						0.66	0.66
v/c Ratio		0.48	0.45	0.07	0.49						0.48	0.94
Uniform Delay, d1		24.0	0.0	21.7	24.0						6.1	8.2
Delay		27.9	4.3	26.7	27.9						5.9	13.3
LOS		C	A	C	C						A	B
Approach Delay		14.9			27.8						10.6	
Approach LOS		B			C						B	
Queue Length 50th (ft)		98	0	6	100						113	291
Queue Length 95th (ft)		167	60	21	169						172	#712
Internal Link Dist (ft)		347			115			105			84	
50th Up Block Time (%)											13%	22%
95th Up Block Time (%)											19%	28%
Turn Bay Length (ft)				100								200
50th Bay Block Time %					7%							12%
95th Bay Block Time %					37%						4%	26%
Queuing Penalty (veh)					3							117

Intersection Summary

Cycle Length: 80  
 Actuated Cycle Length: 72.2  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.94  
 Intersection Signal Delay: 13.1  
 Intersection LOS: B  
 Intersection Capacity Utilization 83.2%  
 ICU Level of Service D  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.

Splits and Phases: 2: Miller Creek Rd & 101 SB Ramps





Lane Group	SBR
Lane Configurations	7
Total Lost Time (s)	4.0
Satd. Flow (prot)	1667
Flt Permitted	
Satd. Flow (perm)	1667
Satd. Flow (RTOR)	23
Volume (vph)	21
Lane Group Flow (vph)	23
Turn Type	Perm
Protected Phases	
Permitted Phases	6
Total Split (s)	20.0
Act Effct Green (s)	11.8
Actuated g/C Ratio	0.23
v/c Ratio	0.06
Uniform Delay, d1	0.0
Delay	9.8
LOS	A
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	0
Queue Length 95th (ft)	17
Internal Link Dist (ft)	
50th Up Block Time (%)	
95th Up Block Time (%)	
Turn Bay Length (ft)	
50th Bay Block Time %	
95th Bay Block Time %	
Queuing Penalty (veh)	
<b>Intersection Summary</b>	

TETAP - Marin County (2005)  
 2: Miller Creek Rd & 101 SB Ramps

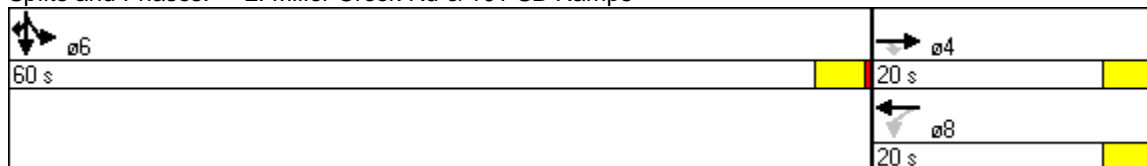
Alt C4  
 AM Peak

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑	↗	↖	↑						↕	↗
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Satd. Flow (prot)	0	1961	1667	1863	1961	0	0	0	0	0	1957	1667
Flt Permitted				0.437							0.998	
Satd. Flow (perm)	0	1961	1667	857	1961	0	0	0	0	0	1957	1667
Satd. Flow (RTOR)			265									
Volume (vph)	0	200	244	13	202	0	0	0	0	20	550	1026
Lane Group Flow (vph)	0	217	265	14	220	0	0	0	0	0	620	1115
Turn Type			Perm	Perm						Split		Prot
Protected Phases		4			8					6	6	6
Permitted Phases			4	8								
Total Split (s)	0.0	20.0	20.0	20.0	20.0	0.0	0.0	0.0	0.0	60.0	60.0	60.0
Act Effct Green (s)		16.1	16.1	16.1	16.1						53.9	53.9
Actuated g/C Ratio		0.21	0.21	0.21	0.21						0.69	0.69
v/c Ratio		0.54	0.48	0.08	0.55						0.46	0.97
Uniform Delay, d1		27.7	0.0	25.0	27.7						5.4	11.2
Delay		29.0	4.2	26.7	29.1						5.5	24.7
LOS		C	A	C	C						A	C
Approach Delay		15.4			29.0						17.9	
Approach LOS		B			C						B	
Queue Length 50th (ft)		98	0	6	100						113	422
Queue Length 95th (ft)		167	60	21	169						172	#794
Internal Link Dist (ft)		347			115			105			84	
50th Up Block Time (%)											13%	26%
95th Up Block Time (%)											19%	29%
Turn Bay Length (ft)				100								200
50th Bay Block Time %					7%							19%
95th Bay Block Time %					37%						4%	28%
Queuing Penalty (veh)					3							145

Intersection Summary

Cycle Length: 80  
 Actuated Cycle Length: 78  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.97  
 Intersection Signal Delay: 18.4  
 Intersection LOS: B  
 Intersection Capacity Utilization 83.2%  
 ICU Level of Service D  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.

Splits and Phases: 2: Miller Creek Rd & 101 SB Ramps



# **ALTERNATIVE D**

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Satd. Flow (prot)	1863	1961	1667	1863	1961	1667	0	1878	1667	0	1878	1667
Flt Permitted	0.950			0.950				0.633			0.710	
Satd. Flow (perm)	1863	1961	1667	1863	1961	1667	0	1241	1667	0	1392	1667
Satd. Flow (RTOR)			40			208			105			23
Volume (vph)	13	181	37	140	831	192	50	7	97	147	22	21
Lane Group Flow (vph)	14	197	40	152	903	209	0	62	105	0	184	23
Turn Type	Prot		Perm	Prot		Perm	Perm		Perm	Perm		Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases			4			8	2		2	6		6
Total Split (s)	20.0	40.0	40.0	20.0	40.0	40.0	20.0	20.0	20.0	20.0	20.0	20.0
Act Effct Green (s)	6.1	26.2	26.2	9.9	35.9	35.9		12.2	12.2		12.2	12.2
Actuated g/C Ratio	0.09	0.45	0.45	0.17	0.62	0.62		0.21	0.21		0.21	0.21
v/c Ratio	0.08	0.22	0.05	0.49	0.74	0.19		0.24	0.24		0.63	0.06
Uniform Delay, d1	29.6	9.6	0.0	24.8	9.7	0.0		20.7	0.0		22.7	0.0
Delay	29.2	13.0	5.1	23.0	14.5	1.5		20.4	5.5		22.2	9.6
LOS	C	B	A	C	B	A		C	A		C	A
Approach Delay		12.7			13.4			11.0			20.8	
Approach LOS		B			B			B			C	
Queue Length 50th (ft)	4	44	0	47	174	0		17	0		56	0
Queue Length 95th (ft)	22	100	17	108	#591	29		54	36		136	17
Internal Link Dist (ft)		181			207			119			158	
50th Up Block Time (%)					5%							
95th Up Block Time (%)					38%							
Turn Bay Length (ft)				100								
50th Bay Block Time %					22%							
95th Bay Block Time %				14%	44%							
Queuing Penalty (veh)				62	244							

**Intersection Summary**

Cycle Length: 80  
 Actuated Cycle Length: 58  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.74  
 Intersection Signal Delay: 13.9  
 Intersection LOS: B  
 Intersection Capacity Utilization 74.8%  
 ICU Level of Service C  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.

**Splits and Phases: 1: Miller Creek Rd & Marinwood Rd**

20 s	20 s	40 s	20 s	40 s	40 s	20 s	20 s	20 s	20 s	20 s	20 s

## TWO-WAY STOP CONTROL SUMMARY

General Information				Site Information			
Analyst	Kimley-Horn and Associates			Intersection	Miller Creek Rd & 101 SB Ramps		
Agency/Co.				Jurisdiction			
Date Performed	08/03/2005			Analysis Year	Alternative D1		
Analysis Time Period	AM Peak						
Project Description TETAP - Marin County (2005)							
East/West Street: Miller Creek Road				North/South Street: US 101 SB Ramps			
Intersection Orientation: East-West				Study Period (hrs): 0.25			

Vehicle Volumes and Adjustments						
Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	0	200	103	13	202	0
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Hourly Flow Rate (veh/h)	0	217	111	14	219	0
Proportion of heavy vehicles, P <sub>HV</sub>	2	--	--	2	--	--
Median type	Undivided					
RT Channelized?			0			0
Lanes	0	1	1	1	1	0
Configuration		T	R	L	T	
Upstream Signal		1			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	0	0	0	20	641	0
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Hourly Flow Rate (veh/h)	0	0	0	21	696	0
Proportion of heavy vehicles, P <sub>HV</sub>	2	2	2	2	2	2
Percent grade (%)	0			0		
Flared approach		N			N	
Storage		0			0	
RT Channelized?			0			0
Lanes	0	0	0	0	1	0
Configuration				LT		

Control Delay, Queue Length, Level of Service								
Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		L				LT		
Volume, v (vph)		14				717		
Capacity, c <sub>m</sub> (vph)		1235				436		
v/c ratio		0.01				1.64		
Queue length (95%)		0.03				41.59		
Control Delay (s/veh)		7.9				323.0		
LOS		A				F		
Approach delay (s/veh)	--	--				323.0		
Approach LOS	--	--				F		



## TWO-WAY STOP CONTROL SUMMARY

General Information				Site Information			
Analyst	Kimley-Horn and Associates			Intersection	Miller Creek Rd & 101 SB Ramps		
Agency/Co.				Jurisdiction			
Date Performed	08/03/2005			Analysis Year	Alternative D2		
Analysis Time Period	AM Peak						
Project Description TETAP - Marin County (2005)							
East/West Street: Miller Creek Road				North/South Street: US 101 SB Ramps			
Intersection Orientation: East-West				Study Period (hrs): 0.25			

Vehicle Volumes and Adjustments						
Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	0	200	103	13	202	0
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Hourly Flow Rate (veh/h)	0	217	111	14	219	0
Proportion of heavy vehicles, P <sub>HV</sub>	2	--	--	2	--	--
Median type	Undivided					
RT Channelized?			0			0
Lanes	0	1	1	1	1	0
Configuration		T	R	L	T	
Upstream Signal		1			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	0	0	0	20	641	935
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Hourly Flow Rate (veh/h)	0	0	0	21	696	1016
Proportion of heavy vehicles, P <sub>HV</sub>	2	2	2	2	2	2
Percent grade (%)	0			0		
Flared approach		N			N	
Storage		0			0	
RT Channelized?			0			0
Lanes	0	0	0	0	1	1
Configuration				LT		R

Control Delay, Queue Length, Level of Service								
Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		L				LT		R
Volume, v (vph)		14				717		1016
Capacity, c <sub>m</sub> (vph)		1235				436		821
v/c ratio		0.01				1.64		1.24
Queue length (95%)		0.03				41.59		35.20
Control Delay (s/veh)		7.9				323.0		135.6
LOS		A				F		F
Approach delay (s/veh)	--	--				213.1		
Approach LOS	--	--				F		









# **ALTERNATIVE E**



# Movement Summary

Miller Creek Road & Marinwood Roundabout  
Roundabout

## Vehicle Movements

Mov No	Turn	Dem Flow (veh/h)	Cap (veh/h)	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (ft)	Eff. Stop Rate	Aver Speed (mi/h)	Oper Cost (\$/h)
NB Marinwood Avenue										
32	L	53	900	0.181	6.0	LOS A	32	1.15	16.6	15
32	T	7	900	0.181	6.0	LOS A	32	1.15	16.6	15
32	R	102	900	0.181	6.0	LOS A	32	1.15	16.6	15
Approach		163	900	0.181	6.0	LOS A	32	1.15	16.6	15
WB Miller Creek Road										
19	L	296	404	0.733	7.9	LOS A	256	1.10	16.1	42
22	T	822	1399	0.732	4.5	LOS A	256	0.79	33.3	236
22	R	202	1399	0.732	4.5	LOS A	256	0.79	33.3	236
Approach		1320	1804	0.732	5.3	LOS A	256	0.86	30.6	278
SB Marinwood Avenue										
42	L	155	417	0.484	23.1	LOS C	102	2.25	9.6	41
42	T	23	417	0.484	23.1	LOS C	102	2.25	9.6	41
42	R	22	417	0.484	23.1	LOS C	102	2.25	9.6	41
Approach		202	417	0.484	23.1	LOS C	102	2.25	9.6	41
EB Miller Creek Road										
12	L	14	933	0.262	3.5	LOS A	48	0.94	18.1	18
12	T	191	933	0.262	3.5	LOS A	48	0.94	18.1	18
12	R	39	933	0.262	3.5	LOS A	48	0.94	18.1	18
Approach		244	933	0.262	3.5	LOS A	48	0.94	18.1	18
All Vehicles		1929	4054	0.733	7.0	LOS A	256	1.04	26.7	352

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## TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst Agency/Co.	Kimley-Horn and Associates	Intersection	Miller Creek Rd & 101 SB Ramps
Date Performed	08/03/2005	Jurisdiction	
Analysis Time Period	AM Peak	Analysis Year	Alternative E1
Project Description TETAP - Marin County (2005)			
East/West Street: Miller Creek Road		North/South Street: US 101 SB Ramps	
Intersection Orientation: East-West		Study Period (hrs): 0.25	

Vehicle Volumes and Adjustments						
Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	0	200	244	13	202	0
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Hourly Flow Rate (veh/h)	0	217	265	14	219	0
Proportion of heavy vehicles, P <sub>HV</sub>	2	--	--	2	--	--
Median type	Undivided					
RT Channelized?			0			0
Lanes	0	1	1	1	1	0
Configuration		T	R	L	T	
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	0	0	0	20	550	0
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Hourly Flow Rate (veh/h)	0	0	0	21	597	0
Proportion of heavy vehicles, P <sub>HV</sub>	2	2	2	2	2	2
Percent grade (%)	0			0		
Flared approach		N			N	
Storage		0			0	
RT Channelized?			0			0
Lanes	0	0	0	0	1	0
Configuration				LT		

Control Delay, Queue Length, Level of Service								
Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		L				LT		
Volume, v (vph)		14				618		
Capacity, c <sub>m</sub> (vph)		1081				348		
v/c ratio		0.01				1.78		
Queue length (95%)		0.04				39.60		
Control Delay (s/veh)		8.4				386.7		
LOS		A				F		
Approach delay (s/veh)	--	--				386.7		
Approach LOS	--	--				F		

## TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	Kimley-Horn and Associates	Intersection	Miller Creek Rd & 101 SB Ramps
Agency/Co.		Jurisdiction	
Date Performed	08/03/2005	Analysis Year	Alternative E2
Analysis Time Period	AM Peak		
Project Description TETAP - Marin County (2005)			
East/West Street: Miller Creek Road		North/South Street: US 101 SB Ramps	
Intersection Orientation: East-West		Study Period (hrs): 0.25	

Vehicle Volumes and Adjustments						
Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	0	200	244	13	202	0
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Hourly Flow Rate (veh/h)	0	217	265	14	219	0
Proportion of heavy vehicles, P <sub>HV</sub>	2	--	--	2	--	--
Median type	Undivided					
RT Channelized?			0			0
Lanes	0	1	1	1	1	0
Configuration		T	R	L	T	
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	0	0	0	20	550	1026
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Hourly Flow Rate (veh/h)	0	0	0	21	597	1115
Proportion of heavy vehicles, P <sub>HV</sub>	2	2	2	2	2	2
Percent grade (%)	0			0		
Flared approach		N			N	
Storage		0			0	
RT Channelized?			0			0
Lanes	0	0	0	0	1	1
Configuration				LT		R

Control Delay, Queue Length, Level of Service								
Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		L				LT		R
Volume, v (vph)		14				618		1115
Capacity, c <sub>m</sub> (vph)		1081				348		821
v/c ratio		0.01				1.78		1.36
Queue length (95%)		0.04				39.60		45.87
Control Delay (s/veh)		8.4				386.7		185.7
LOS		A				F		F
Approach delay (s/veh)	--	--				257.4		
Approach LOS	--	--				F		

TETAP - Marin County (2005)  
 2: Miller Creek Rd & 101 SB Ramps

Alt E3  
 AM Peak

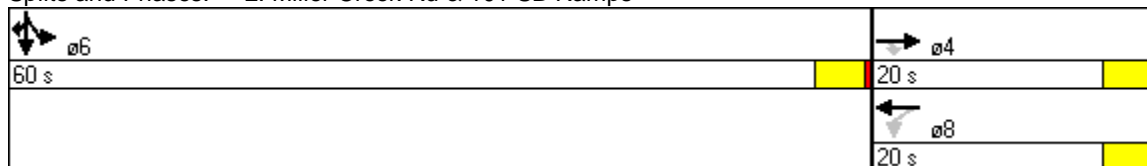


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑	↗	↖	↑						↕	↗
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Satd. Flow (prot)	0	1961	1667	1863	1961	0	0	0	0	0	1957	1667
Flt Permitted				0.437							0.998	
Satd. Flow (perm)	0	1961	1667	857	1961	0	0	0	0	0	1957	1667
Satd. Flow (RTOR)			265									260
Volume (vph)	0	200	244	13	202	0	0	0	0	20	550	1026
Lane Group Flow (vph)	0	217	265	14	220	0	0	0	0	0	620	1115
Turn Type			Perm	Perm						Split		Prot
Protected Phases		4			8					6	6	6
Permitted Phases			4	8								
Total Split (s)	0.0	20.0	20.0	20.0	20.0	0.0	0.0	0.0	0.0	60.0	60.0	60.0
Act Effct Green (s)		16.5	16.5	16.5	16.5						47.5	47.5
Actuated g/C Ratio		0.23	0.23	0.23	0.23						0.66	0.66
v/c Ratio		0.48	0.45	0.07	0.49						0.48	0.94
Uniform Delay, d1		24.0	0.0	21.7	24.0						6.1	8.2
Delay		27.9	4.3	26.7	27.9						5.9	13.3
LOS		C	A	C	C						A	B
Approach Delay		14.9			27.8						10.6	
Approach LOS		B			C						B	
Queue Length 50th (ft)		98	0	6	100						113	291
Queue Length 95th (ft)		167	60	21	169						172	#712
Internal Link Dist (ft)		347			115			105			84	
50th Up Block Time (%)											13%	22%
95th Up Block Time (%)											19%	28%
Turn Bay Length (ft)				100								200
50th Bay Block Time %					7%							12%
95th Bay Block Time %					37%						4%	26%
Queuing Penalty (veh)					3							117

Intersection Summary

Cycle Length: 80  
 Actuated Cycle Length: 72.2  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.94  
 Intersection Signal Delay: 13.1  
 Intersection LOS: B  
 Intersection Capacity Utilization 83.2%  
 ICU Level of Service D  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.

Splits and Phases: 2: Miller Creek Rd & 101 SB Ramps





# **WARRANT ANALYSIS**

## TRAFFIC SIGNAL VOLUME WARRANT ANALYSIS

INTERSECTION NAME: US-101 Southbound Ramps / Miller Creek Road

COUNT DATE: Existing

MAJOR STREET: Miller Creek Road

# OF APPROACH LANE 1

MINOR STREET: US-101 Southbound Ramps

# OF APPROACH LANE 1

ISOLATED COMMUNITY WITH POPULATION LESS THAN 10,000 (Y OR N): N

85TH PERCENTILE SPEED GREATER THAN 40 MPH ON MAJOR STREET (Y OR N): N

	MAJOR ST BOTH APPROACHES	MINOR ST HIGHEST APPROACH	Warrant 1 - Condition A			Warrant 1 - Condition B			WARRANT 2	WARRANT 3
			MAJOR STREET	MINOR STREET	BOTH MET	MAJOR STREET	MINOR STREET	BOTH MET		
THRESHOLD VALUES →			500	150		750	75			
06:00 AM TO 07:00 AM										
07:00 AM TO 08:00 AM										
08:00 AM TO 09:00 AM	659	1596	Y	Y	Y		Y	Y	Y	
09:00 AM TO 10:00 AM										
10:00 AM TO 11:00 AM										
11:00 AM TO 12:00 PM										
12:00 PM TO 01:00 PM										
01:00 PM TO 02:00 PM										
02:00 PM TO 03:00 PM										
03:00 PM TO 04:00 PM										
04:00 PM TO 05:00 PM										
05:00 PM TO 06:00 PM										
06:00 PM TO 07:00 PM										
07:00 PM TO 08:00 PM										
08:00 PM TO 09:00 PM										
09:00 PM TO 10:00 PM										
	659	1,596	<b>1</b>			<b>0</b>			<b>1</b>	<b>1</b>
			<b>8 HOURS NEEDED NOT SATISFIED</b>			<b>8 HOURS NEEDED NOT SATISFIED</b>			<b>4 HRS NEEDED NOT SATISFIED</b>	<b>1 HR NEEDED SATISFIED</b>

WARRANT 1 - Condition A -- Minimum Vehicular Volume Warrant (8 hours)

WARRANT 1 - Condition B -- Interruption of Continuous Traffic Warrant (8 hours)

WARRANT 2 -- Four Hour Volume Warrant - Figure 4C-1

WARRANT 3 -- Peak Hour Volume Warrant - Figure 4C-3

Conditions: Based on 2000 MUTCD

## TRAFFIC SIGNAL VOLUME WARRANT ANALYSIS

INTERSECTION NAME: Marinwood Avenue / Miller Creek Road

COUNT DATE: Existing

MAJOR STREET: Miller Creek Road

# OF APPROACH LANE 1

MINOR STREET: Marinwood Avenue

# OF APPROACH LANE 1

ISOLATED COMMUNITY WITH POPULATION LESS THAN 10,000 (Y OR N): N

85TH PERCENTILE SPEED GREATER THAN 40 MPH ON MAJOR STREET (Y OR N): N

	MAJOR ST BOTH APPROACHES	MINOR ST HIGHEST APPROACH	Warrant 1 - Condition A			Warrant 1 - Condition B			WARRANT 2	WARRANT 3
			MAJOR STREET	MINOR STREET	BOTH MET	MAJOR STREET	MINOR STREET	BOTH MET		
THRESHOLD VALUES <span style="font-size: 2em;">→</span>			500	150		750	75			
06:00 AM TO 07:00 AM										
07:00 AM TO 08:00 AM										
08:00 AM TO 09:00 AM	1,485	190	Y	Y	Y	Y	Y	Y	Y	
09:00 AM TO 10:00 AM										
10:00 AM TO 11:00 AM										
11:00 AM TO 12:00 PM										
12:00 PM TO 01:00 PM										
01:00 PM TO 02:00 PM										
02:00 PM TO 03:00 PM										
03:00 PM TO 04:00 PM										
04:00 PM TO 05:00 PM										
05:00 PM TO 06:00 PM										
06:00 PM TO 07:00 PM										
07:00 PM TO 08:00 PM										
08:00 PM TO 09:00 PM										
09:00 PM TO 10:00 PM										
	1,485	190	<b>1</b>			<b>1</b>			<b>1</b>	<b>1</b>
			<b>8 HOURS NEEDED NOT SATISFIED</b>			<b>8 HOURS NEEDED NOT SATISFIED</b>			<b>4 HRS NEEDED NOT SATISFIED</b>	<b>1 HR NEEDED SATISFIED</b>

WARRANT 1 - Condition A -- Minimum Vehicular Volume Warrant (8 hours)

WARRANT 1 - Condition B -- Interruption of Continuous Traffic Warrant (8 hours)

WARRANT 2 -- Four Hour Volume Warrant - Figure 4C-1

WARRANT 3 -- Peak Hour Volume Warrant - Figure 4C-3

Conditions: Based on 2000 MUTCD