# APPENDIX C-1 TRAFFIC ANALYSIS



April 4, 2018

Mr. Will Burns, AICP David J. Powers & Associates, Inc. 1611 Telegraph Avenue, Ste. 1002 Oakland, CA 94612

# **Kawana Springs Community Park Circulation Analysis**

Dear Mr. Burns;

As requested, W-Trans has prepared a traffic analysis for the proposed Kawana Springs Community Park project in southeast Santa Rosa. The purpose of the analysis is to address the potential circulation-related effects of the park on surrounding neighborhoods and streets. The study was completed in support of the project's CEQA review and is consistent with standard traffic engineering techniques.

# **Project Description**

The proposed project would develop a city park on a currently-undeveloped 19.2-acre site within a residential area in Santa Rosa. Of the 19.2 acres, approximately 5.5 acres would be used as active park space, with the remainder comprised of passive spaces including oak riparian woodland areas, Colgan Creek, storm water detention areas, and seasonal wetland areas. The park would be bound on the north by Kawana Springs Road and on the south by Kawana Terrace. Meda Avenue splits the park space, with active spaces in the western portion to be used for a community garden and walking trails, and active components in the eastern section including picnic areas, a children's play area, a dog park, a bocce ball court, sand volleyball court, pump track, and other recreational spaces in addition to walking paths. The park's primary off-street parking lot would be accessed via Kawana Terrace, just east of the Meda Avenue intersection. A small off-street parking lot would also be provided at the community garden on Kawana Springs Road.

#### **Study Area and Periods**

The study area consists of Kawana Springs Road, Kawana Terrace, and Meda Avenue, all of which front the proposed park site in the southeast quadrant of the City of Santa Rosa. Intersection Level of Service (LOS) was analyzed for the intersection of Petaluma Hill Road/Kawana Springs Road, which is the major intersection nearest the proposed project site and therefore most likely to have a traffic impact associated with drivers traveling to and from the park. Operating conditions during the weekday p.m. peak period and Saturday midday peak period were evaluated to capture the highest potential impacts for the proposed project. The weekday p.m. peak hour occurs between 4:00 and 6:00 p.m. and typically reflects the highest level of commute-related congestion. In the project area, the Saturday midday peak period occurs between 1:00 and 3:00 p.m.

# **Circulation Setting**

#### **Vehicular Circulation**

Kawana Springs Road is an east-west road that serves as a connector between residential areas to the east near the project site and commercial uses to the west and provides the area's primary connection to the surrounding arterial street network. Kawana Terrace is a local street that parallels Kawana Springs Road, providing access to several local neighborhood streets as well as the Taylor Mountain Regional Park parking lot. In the study area, Meda Avenue is a local residential north-south street. The speed limit on all three streets is 25 mph.

The study intersection at Petaluma Hill Road/Kawana Springs Road is signalized and has protected-permitted left-turn phasing on all four approaches, plus right-turn overlap signal phasing on the southbound and eastbound approaches. Marked crosswalks with pedestrian signals exist on the north, east, and west intersection legs.

#### **Pedestrian Facilities**

Pedestrian facilities include sidewalks, crosswalks, pedestrian signal phases, curb ramps, curb extensions, and various streetscape amenities such as lighting, benches, etc. In general, a network of sidewalks, crosswalks, and curb ramps provide access for pedestrians near the proposed project site; however, sidewalk gaps can be found along some of the roadways connecting to the project site.

- Kawana Springs Road Intermittent sidewalk coverage is provided on Kawana Springs Road with gaps on the south side of the street between Petaluma Hill Road and Meda Avenue, and on the north side of the street from Brookwood Avenue to Taylor Mountain Place. Curb ramps are provided at each of the side street approaches and crosswalks at the intersection with Meda Avenue. Pedestrian-scale street lighting exists along the street.
- Kawana Terrace Continuous sidewalk coverage exists on the north side of the street between Kawana Springs Road and Meda Avenue. To the east of Meda Avenue, Kawana Terrace transitions to a more rural character without curbs, sidewalks, or street lighting.
- Meda Avenue Continuous sidewalks are provided on both sides of Meda Avenue between Kawana Terrace and Tokay Street. There are existing curb ramps at each corner and crosswalks at the intersection with Kawana Springs Road. Lighting is provided by pedestrian-scale street lights.

#### **Bicycle Facilities**

The Highway Design Manual, Caltrans, 2017, classifies bikeways into four categories:

- Class I Multi-Use Path a completely separated right-of-way for the exclusive use of bicycles and pedestrians with cross flows of motorized traffic minimized.
- Class II Bike Lane a striped and signed lane for one-way bike travel on a street or highway.
- Class III Bike Route signing only for shared use with motor vehicles within the same travel lane on a street or highway.

In the project area, Class II bike lanes exist on Kawana Springs Road, Petaluma Hill Road, and Brookwood Avenue. Otherwise, within the study area, bicyclists ride in the roadway on local streets. Table 1 summarizes the existing and planned bicycle facilities in the project vicinity, as contained in the *City of Santa Rosa Bicycle and Pedestrian Master Plan*, 2010.

Table 1– Bicycle Facility Summa	ary			
Status Facility	Class	Length (miles)	Begin Point	End Point
Existing				
Colgan Creek Trail	I	0.6	Colgan Ave	Petaluma Hill Rd
Petaluma Hill Rd	II	0.9	Barham Ave-Pressley St	Kawana Springs Rd
Kawana Springs Rd (WB)	II	0.50	Santa Rosa Ave	Petaluma Hill Rd
Kawana Springs Rd	II	0.50	Petaluma Hill Rd	Brookwood Ave
Planned				
Kawana Springs Rd	II	0.33	Brookwood Ave	Farmers Ln
Colgan Creek Trail	I	0.64	Meda Ave	Kawana Creek

Source: City of Santa Rosa Bicycle and Pedestrian Master Plan, City of Santa Rosa, 2010

#### **Transit Facilities**

Sonoma County Transit (SCT) and Santa Rosa CityBus provide fixed-route bus service in Santa Rosa and near the project. Santa Rosa CityBus Local Route 5 provides service to the downtown Mall, facilitating transfers to other routes and destinations throughout the City. Route 5 stops at the intersection of Petaluma Hill Road/Kawana Springs Road just west of the project site. The route operates Monday through Friday with approximately half-hour headways between 6:15 a.m. and 8:15 p.m. Saturday service operates with approximately one-hour headways between 6:30 a.m. and 7:30 p.m. Sunday service operates approximately one-hour headways from 10:30 a.m. and 4:30 p.m.

SCT Route 46 also stops at the intersection of Kawana Springs Road/Petaluma Hill Road and provides service to the downtown transit center, Sonoma State University, and the Cotati SMART depot. Route 46 only operates during commute hours with about 50-minute headways in the northbound direction and 30-minute headways in the southbound direction.

### **Collision History**

The collision histories for the three streets in the study area were reviewed to determine any trends or patterns that may indicate a safety issue. Where count information was available, the collision rate was calculated based on records available from the California Highway Patrol as published in their Statewide Integrated Traffic Records System (SWITRS) reports. The most current five-year period available is January 1, 2013 through December 31, 2017. Where the collision rate was calculated, it was compared to the statewide average for similar facilities, as indicated in 2013 Collision Data on California State Highways, California Department of Transportation (Caltrans).

On Kawana Springs Road between Petaluma Hill Road and the eastern boundary of the proposed project, there were ten reported collisions in five years, resulting in a collision rate of 0.51 collisions per million vehicle miles (c/mvm), which is less than that statewide average of 2.21 c/mvm for similar facilities. Of the ten collisions, three occurred along the frontage of the proposed project, all of which were single-vehicle collisions. Two of the collisions occurred at night and had "driving under the influence" as the primary collision factor. The other had a primary collision factor of "unsafe speed" at the intersection with Meda Avenue, which at the time of the collision did not have all-way stop-controls in place.

On the full length of Kawana Terrace there were two reported collisions, though none were along the proposed project's frontage. The two collisions were associated with unsafe starting and stopping at the intersection with Zircon Place.

Meda Avenue between Tokay Avenue and Kawana Terrace had only one reported collision within the most recent five years of data; it occurred near the intersection with Tokay Avenue and was therefore not along the project frontage.

Based on the collision records reviewed for the three segments, there is no indication of potential existing safety concerns that could be exacerbated by the addition of project-related traffic.

# **Intersection Level of Service Methodologies**

Level of Service (LOS) is used to rank traffic operation on various types of facilities based on traffic volumes and roadway capacity using a series of letter designations ranging from A to F. Generally, Level of Service A represents free flow conditions and Level of Service F represents forced flow or breakdown conditions. A unit of measure that indicates a level of delay generally accompanies the LOS designation.

The study intersection was analyzed using the signalized methodology published in the *Highway Capacity Manual* (HCM), Transportation Research Board, 2010. This methodology is based on factors including traffic volumes, green time for each movement, phasing, whether or not the signal is coordinated, truck traffic, and pedestrian

activity. The signal timing parameters for the intersection were obtained from the City of Santa Rosa. Average stopped delay per vehicle in seconds is used as the basis for evaluation in this LOS methodology.

The ranges of delay associated with the various levels of service are indicated in Table 2.

Table 2	- Signalized Intersection Level of Service Criteria
LOS A	Delay of 0 to 10 seconds. Most vehicles arrive during the green phase, so do not stop at all.
LOS B	Delay of 10 to 20 seconds. More vehicles stop than with LOS A, but many drivers still do not have to stop.
LOS C	Delay of 20 to 35 seconds. The number of vehicles stopping is significant, although many still pass through without stopping.
LOS D	Delay of 35 to 55 seconds. The influence of congestion is noticeable, and most vehicles have to stop.
LOS E	Delay of 55 to 80 seconds. Most, if not all, vehicles must stop and drivers consider the delay excessive.
LOS F	Delay of more than 80 seconds. Vehicles may wait through more than one cycle to clear the intersection.

Reference: Highway Capacity Manual, Transportation Research Board, 2010

# **Traffic Operations**

The City of Santa Rosa's adopted Level of Service (LOS) Standard is contained in Santa Rosa General Plan 2035. Standard TD-1 states that the City will try to maintain a Level of Service (LOS) D or better along all major corridors. Exceptions to meeting this standard are allowed where attainment would result in significant environmental degradation; where topography or environmental impacts make the improvement impossible; or where attainment would ensure loss of an area's unique character.

While a corridor level of service is applied by the City in its analysis of the entire City as part of the environmental documentation supporting the General Plan, this type of analysis only provides relevant data when performed on a much longer segment than the one included as the study area for the project. Therefore, although the City's standard does not specify criteria for intersections, for the purposes of this study, as is standard practice for such studies, a minimum operation of LOS D for operation of the signalized intersection was applied.

#### **Trip Generation**

The Institute of Transportation Engineers (ITE) publication *Trip Generation Manual*, 10<sup>th</sup> Edition, 2017, is typically used as a source of trip generation rates for traffic impact analyses. Because *Trip Generation* contains limited data for parks and recreational uses, trip generation rates developed by SANDAG (San Diego Area Council of Governments) were instead applied. SANDAG has rates specific to developed "City Parks" with active uses including sports facilities and is well-suited to estimate the potential trip generation of Kawana Springs Park. The trip generation rates were applied only to the 5.5-acres of active park space, as the passive park acreage (comprised primarily of oak woodland, creekside and riparian areas, detention basins, and seasonal wetland areas) would be expected to generate essentially no park user activity or vehicle trips.

The standard rate for a City Park published by Institute of Transportation Engineers (ITE) in *Trip Generation Manual*, 10<sup>th</sup> Edition, 2017 was also reviewed but not considered for this project since the rates resulted in a lower trip generation than was achieved using the SANDAG rates.

Because the SANDAG reference does not include trip generation rates for the weekend peak hour, rates from the City Park land use in the *Trip Generation Manual* were used to determine a factor to translate weekday p.m. peak hour rates to a weekend peak hour rate. In reviewing the limited data in *Trip Generation*, it was determined that the weekend midday peak hour rate is approximately three-and-a-half times higher than the weekday p.m. peak hour rate. This factor was applied to SANDAG's p.m. peak rate to determine a weekend rate for the analysis.

Based on the applied assumptions and trip generation rates, the proposed project is expected to generate an average of 275 daily trips, including 25 during the p.m. peak hour and 87 during the weekend midday peak hour. The trip generation estimates for the proposed project are summarized in Table 3.

Table 3– Trip Gene	ration Summ	ary									
Land Use	Units	Da	aily	ı	PM Peak	Hour		Week	end Mic	lday F	<sup>2</sup> eak
		Rate	Trips	Rate	Trips	ln	Out	Rate	Trips	ln	Out
City Park	5.5 ac	50	275	4.50	25	12	13	15.75	87	44	43

Note: ac=acres of active park space

# **Trip Distribution**

The pattern used to allocate new project trips to the street network was based on prevailing circulation patterns, along with consideration of existing counts at the study intersection. While most of the park's users are likely to be from surrounding neighborhoods, 75 percent of auto trips were conservatively assumed to pass through the study intersection at Petaluma Hill Road/Kawana Springs Road. The remaining 25 percent of auto trips were assumed to be oriented to local neighborhoods within an approximately half-mile radius of the proposed park site. The applied distribution assumptions and resulting trips are shown in Table 4.

Table 4– Trip Distribution Assumptions				
Route	Percent	Daily Trips	PM Peak Trips	Saturday Midday Peak Trips
To/From Petaluma Hill Rd North of Kawana Springs Rd	37%	102	9	33
To/From Petaluma Hill Rd South of Kawana Springs Rd	19%	52	5	16
To/From Kawana Springs Rd West of Petaluma Hill Rd	19%	52	5	16
To/From Neighborhood	25%	69	6	22
TOTAL	100%	275	25	87

#### **Existing and Existing plus Project Conditions**

The Existing Conditions scenario provides an evaluation of current operation based on existing traffic volumes during the p.m. and weekend peak periods. The Existing plus Project scenario adds traffic associated with the proposed Kawana Springs Park project to the existing volumes.

The intersection of Petaluma Hill Road/Kawana Springs Road currently operates acceptably at LOS C during the weekday p.m. peak hour, and LOS B during the weekend midday peak hour. Upon the addition of project-related traffic to the existing volumes, the intersection is expected to continue operating acceptably at the same service levels as without the project. These results are summarized in Table 5.

Table 5 – Existing and Existing plus Project	ct Peak H	our Int	ersection	Levels of	Service			
Study Intersection	E	xisting	Condition	าร	Ex	cisting <sub> </sub>	olus Proje	ect
	PM P	eak	Weeker	nd Peak	PM P	eak	Weeker	nd Peak
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1. Petaluma Hill Rd/Kawana Springs Rd	24.7	C	15.6	В	24.9	C	16.1	В

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service

**Finding** – The study intersection is expected to continue operating acceptably at the same levels of service upon the addition of project-generated traffic to existing volumes.

### **Future and Future plus Project Conditions**

Segment volumes for the horizon year of 2040 were obtained from the SCTA travel demand model and translated to turning movement volumes at the study intersection using the "Furness" method for the p.m. peak hour. The Furness method is an iterative process that employs existing turn movement data, existing link volumes and future link volumes to project likely turning future movement volumes at intersections. The SCTA model does not include weekend projections. Based on the model's projected weekday growth on nearby segments, a growth factor of 1.28 (which translates to a growth rate of slightly greater than one percent per year) was applied to the existing weekend volumes to estimate weekend midday peak hour volumes in 2040.

Under future conditions without the project, the intersection is expected to continue operating acceptably at LOS C or better. Upon the addition of project-generated traffic to future volumes, operation is projected to remain unchanged and at acceptable levels. The Future and Future plus Project operating conditions are summarized in Table 6.

Table 6– Future and Future plus Project	Peak Hou	ır Level	s of Servi	ce				
Study Intersection	F	uture C	onditions	5	F	uture p	us Projec	t
	PM F	Peak	Weeker	nd Peak	PM P	eak	Weeken	d Peak
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1.Petaluma Hill Rd/Kawana Springs Rd	29.3	C	18.4	В	29.6	С	19.0	В

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service

**Finding** – The study intersection is projected to continue operating acceptably under Future conditions both without and with the addition of project-generated traffic.

#### **Non-Auto Modes**

#### **Pedestrian Facilities**

Given that the proposed project is located within a residential community, it is reasonable to assume that many users will want to walk or bicycle to reach the park.

As part of the project, walking trails would be installed throughout the site. Where there are currently no sidewalks along the south side of Kawana Springs Road the proposed project includes walking paths. The two sections of the park, divided by Meda Avenue, would be connected by crosswalks at the all-way stop-controlled Meda Avenue/Kawana Springs Avenue intersection. The crosswalks at the Meda Avenue intersection would also serve pedestrians crossing Kawana Springs Avenue.

The park would also include pedestrian connections to the existing sidewalk network on Meda Avenue south of Kawana Springs Road, and to the Meda Avenue/Kawana Terrace intersection. There are no proposed sidewalks or walking paths proposed along Kawana Terrace other than the connection to the intersection with Meda Avenue. Interior pathways link the park's proposed parking lot on Kawana Terrace to the park's facilities. Since the only other destination to the east on Kawana Terrace is the Taylor Mountain Regional Park parking lot, pedestrian facilities along the project's Kawana Terrace frontage are not recommended as they would potentially encourage Taylor Mountain visitors to park their vehicle at the Kawana Springs parking lot, as opposed to using the Taylor Mountain paid parking lot. Pedestrian connectivity between Kawana Springs Park and Taylor Mountain Regional Park would still be accommodated by a developed pathway along Kawana Springs Road and pedestrian bridge over Colgan Creek near the Taylor Mountain Regional Park entrance.

Finding – Pedestrian facilities serving the project site are adequate.

#### **Bicycle Facilities**

Existing bicycle facilities, including bike lanes on streets together with shared use of minor streets, provide adequate access to the park for bicyclists. Bike lanes on Kawana Springs Road east of Brookwood Avenue are included in the City's Bike Plan, so it is recommended that the City install the bike lanes along the site's frontage as part of the park project.

**Finding** – Bicycle facilities serving the project site are generally adequate, though would benefit from completion of a planned bike lane on Kawana Springs Road.

**Recommendation** – The proposed project should include the installation of planned bike lanes on the segment of Kawana Springs Road fronting the project site between Brookwood Avenue and Rudesill Lane.

#### **Transit**

Existing transit routes are adequate to accommodate project-generated transit trips. Existing bus stops are within acceptable walking distance of the site, and accessible via continuous sidewalks.

Finding – Transit facilities serving the project site are adequate.

#### **Conclusions and Recommendations**

- The proposed project is expected to generate an average of 275 weekday trips, of which 25 would occur
  during the p.m. peak hour. Approximately 87 trips are anticipated to be generated during the Saturday
  midday peak hour.
- Under the existing and future scenarios, without and with the proposed project, the intersection of Kawana Springs Road/Petaluma Hill Road is expected to operate acceptably at LOS C or better.
- Transit facilities serving the site are adequate.
- The proposed bicycle and pedestrian facilities serving the site are generally adequate, though would benefit from an extension of the bike lane network.
- Construction of the proposed park should include the installation of bike lanes on the segment of Kawana Springs Road fronting the project site between Brookwood Avenue and Rudesill Lane.

Thank you for giving W-Trans the opportunity to provide these services. Please call if you have any questions.

Sincerely,

Briana Byrne, EIT Assistant Engineer

Zack Matley, AICP Associate Principal

ZM/bkb/SRO392.L1

Enclosure: Level of Service Calculations

HCM 2010 Signalized Intersection Summary 1: Petaluma Hill Rd & Kawana Springs Rd

Part	Movement -ane Configurations	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
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1 2 3 4 5 6 7 105 36.9 88 48 12.5 350 5.2 3.0 3.9 3.0 4.3 3.0 3.9 3.0 12.0 31.1 12.0 31 12.0 31.1 12.0 7.6 9.9 5.7 19.2 9.4 11.6 2.5 0.1 1.3 0.1 1.6 0.1 1.2 0.0	Approach LUS		ی			ی			ی			ی	
105 369 88 48 155 350 52 105 369 88 125 350 52 120 31.1 120 31.1 120 31.1 120 76 99 57 192 94 116 25 0.1 1.3 0.1 1.6 0.1 1.2 0.0	limer	1	2	3	4	2	9	7	8				
105 369 88 438 125 350 52 30 39 30 43 30 39 30 120 31.1 120 31.1 120 31.1 120 0.1 1.3 0.1 1.6 0.1 1.2 0.0 24.7 C	Assigned Phs	_	2	3	4	2	9	7	00				
30 39 30 43 30 39 30 120 120 31.1 120 31.1 120 31.1 120 31.1 120 31.1 120 31.1 120 31.1 120 31.1 120 31.1 12 30 1.1	Phs Duration (G+Y+Rc), s	10.5	36.9	89 99	43.8	12.5	32.0	5.2	47.4				
120 31.1 12.0 31 12.0 31.1 12.0 17.6 9.9 5.7 19.2 9.4 11.6 2.5 0.0 1 1.3 0.1 1.5 0.1 1.2 0.0 24.7 C		3.0	3.9	3.0	* 4.3	3.0	3.9	3.0	4.3				
7.0 7.7 1.3 0.1 1.6 0.1 1.2 0.0 0.1 1.3 0.1 1.6 0.1 1.2 0.0 C.2 0.1 0.1 0.1 0.1 0.0 0.0 0.1 0.1 0.1 0.1	Max Green Setting (Gmax), s	0.71	3.1.	0.71	10.01	0.21	31.1	0.21	30.7				
24.7 C C C C C C C C C C C C C C C C C C C	Max C Clear Time (g_C+II), s Groop Ext Time (n_c)_s	0.7	4.4	0.7	1 6	4.4	0. 5	2.3	2.02				
	olegii Lat Illile (p_c), s	5	<u>:</u>	5	<u>-</u>	- -	7	9.0	0.7				
	ntersection summary												
	HCM 2010 Ctrl Delay			24.7									
Notes	HCM 2010 LOS			ပ									
	Votes												
* UPM 2010 committational consists requires causal cleareness times for the whose creecing the harrior	LCM 2010 computational opair	20.00	iroc odi	Closton	timor f	or tho ph	010 0000	cina tho	harrior				

HCM 2010 Signalized Intersection Summary 1: Petaluma Hill Rd & Kawana Springs Rd

03/05/2018

03/05/2018

Movement Lane Configurations Traffic Volume (vehin) Number Loure Volume (vehin) Number Initial O (Db), veh Ped-Bike Adji(A_pbT) Parking Bus, Adj Adj Stal Flow, vehinh Rég Stal Flow, vehinh Peak Hour Factor Adj No. of Lanes Peak Hour Factor Percent Heavy Veh, % Percent Heavy Veh, % Adj No. of Lanes Peak Hour Factor Adj No. of Lanes Peak Hour Factor Percent Heavy Veh, % Anno On Green Ord No. vehinh Anno Anno Anno Anno Anno Anno Anno Anno	<b>EBT</b> 142 142 2 0	EBR 53	WBL 94	WBT ♣	WBR	NBL	NBT	NBR	SBL	SBT	SBR
nigurations olume (verlyh) olume (verlyh) olume (verlyh) c(bb), veh s Adj(A_pbT) Bus, Adj rlow, verlyhin of Lanes ur Factor Heavy Veh, % Heavy Veh, % n Green n Geren		53	64	151	à	-	44		-		,
olume (veh/h) olume (veh/h) olume (veh/h) olume (veh/h) (2b), veh Bus, Adj low, veh/h/n if Lanes ur Factor Heavy Veh, % Heavy Veh, % n Green n Green		53	94	151	, ,					<b>←</b>	_
olume (veh/h)  (Cb), veh s Adj(A_pbT)  Bus, Adj  Bus, Adj  Tanes  In Factor  The avery Veh, %  Heavy Veh, %  The avery Veh, %					97	98	330	19	28	377	173
(Ob), veh Adi(A_pt) Bus, Adj Bus, Adj Iow, vehrhin Iow, vehrlin Tane, vehr Hate, vehr Haroy Veh, % Heavy Veh, % I Green I Green Vehrhin Agreen Vehrhin Agreen Vehrhin Agreen Vehrhin Vehrhin Agreen Vehringen Vehrhin Feren Vehrhi		53	94	151	26	98	330	19	28	377	173
		12	<del>-</del>	9	16	3	00	18	7	4	14
		0	0	0	0	0	0	0	0	15	0
, , ,		1.00	1.00	5	0.97	0.99	5	0.98	1.00	5	0.06
	1863	1863	1863	1863	1900	1863	1863	1900	1863	1863	1863
,		29	94	151	23	98	330	09	28	377	06
<b>%</b>		<b>—</b>	-	<del>-</del>	0	<del></del>	2	0	<u></u>	-	_
<b>~</b>	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
		2	2	2	2	2	2	2	2	2	2
		445	479	254	39	408	1059	190	503	270	663
	0.20	0.20	0.09	0.16	0.16	60:0	0.34	0.34	0.04	0.29	0.29
		1581	1774	1572	239	1774	2987	536	1774	1863	1520
	142	29	94	0	174	98	194	196	28	377	90
.veh/h/ln 1		1581	1774	0	1811	1774	1770	1754	1774	1863	1520
Q Serve(g_s), s 3.5	2.8	9.0	1.8	0.0	3.8	1.3	3.5	3.6	0.5	7.7	1.6
r(g_c), s		9.0	1.8	0.0	3.8	1.3	3.5	3.6	0.5	7.7	1.6
		1.00	1.00		0.13	1.00		0.31	1.00		1.00
p(c), veh/h		445	479	0	292	408	627	622	203	220	663
_	_	0.07	0.20	0.00	09.0	0.21	0.31	0.32	90.0	99.0	0.14
£		926	824	0	982	99/	1899	1882	920	2017	1844
0		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh 13.1	16.2	12.2	13.7	0.0	18.0	9.8	10.4	10.4	6.7	14.1	7.7
	0.7	0.1	0.1	0.0	1.9	0.1	0.1	0.1	0.0	0.5	0.0
Initial Q Delay(d3),s/veh 0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.4	0.0
eh/ln	1.6	0.3	0.9	0.0	2.2	0.7	1.7	-0.2	0.7	7.0	0.7
LnGrp Delay(d),s/veh 13.4	16.9	12.3	13.8	0.0	19.9	6.6	10.5	10.5	6.7	24.0	7.7
LnGrp LOS B	В	В	В		В	A	В	В	A	ပ	A
Approach Vol, veh/h	326			268			476			495	
Approach Delay, sheh	14.7			17.8			10.4			20.2	
Approach LOS	a			B			В			ပ	
Timer 1	2	3	4	2	9	7	8				
Assigned Phs 1	2	3	4	2	9	7	∞				
		8.9	16.5	8.4	10.9	4.7	18.7				
Change Period (Y+Rc), s 3.0	3.9	3.0	* 4.3	3.0	3.9	3.0	4.3				
		12.0	* 46	17.0	16.1	12.0	45.7				
Max Q Clear Time (g_c+I1), s 3.8		3.3	6.7	5.5	5.8	2.5	9.9				
Green Ext Time (p_c), s 0.1		0.1	1.7	0.2	9.0	0.0	1.6				
Intersection Summary											
HCM 2010 Ctrl Delay		15.6									
HCM 2010 LOS		В									
Notes											

Kawana Springs Community Park 5:00 pm 10/17/2016 Weekend Existing Conditions W-Trans

HCM 2010 Signalized Intersection Summary 1: Petaluma Hill Rd & Kawana Springs Rd

Movement Lane Configurations	EBI	EBT	EBR	WBL	WBT	WBR	NBL *	NBT	NBR	SBL	SBT	SBR
Lane Configurations	r	•	*	4	~		*	*		*		١
	-	-	_	-	<u>\$</u>		-	<u>↑</u>		-	۰	_
Traffic Volume (veh/h)	200	199	117	150	201	33	115	673	194	20	412	265
Future Volume (veh/h)	200	199	117	120	201	33	115	673	194	20	412	265
Number	2	2	12	<del>-</del>	9	16	3	∞	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	12	0
Ped-Bike Adj(A_pbT)	0.99		1.00	1.00		0.97	1.00		0.98	1.00		0.98
Parking Bus, Adj	1.00	1.00	1:00	1:00	1.00	1.00	1:00	1.00	1.00	1.00	1.00	1:00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1900	1863	1863	1900	1863	1863	1863
Adj Flow Kate, venvn	700	66 '	40	120	701	ξ, (	2 ₹	6/3	2/2	70	412	138
Adj No. of Lanes	- ;	- ;	- ;	- ;	- ;	0 ;	- ;	7	0 ;	- ;	- ;	
Peak Hour Factor	90.	00.1	00.1	00.1	00.1	90.1	00.1	00.	1.00 0	1:00 0	00.L	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	7
Cap, veh/h	480	614	611	484	493	71	336	1181	307	274	735	761
Arrive On Green	60:0	0.33	0.33	0.08	0.31	0.31	90:0	0.43	0.43	0.03	0.39	0.39
Sat Flow, veh/h	1//4	1863	15/8	1//4	1586	57.7	1//4	7/68	6[/	1//4	1863	154/
Grp Volume(v), veh/h	200	199	64	150	0	230	115	430	418	20	412	138
Grp Sat Flow(s), veryryin	1//4	1803	8/61	4//	0 0	1812	1//4	0/2	2 / 18	1//4	1803	1547
O Serve(g_s), s	7.4	0.0	0.7	2.7	0.0	10.0	7.7	18.4	18.4	0.7	7.71	0.0
Cycle U Clear(g_c), s	4.7	8.0	7.00	2.7	0:0	10.0	3.7	18.4	18.4	0.7	71.7	5.0
Prop In Lane	00.1	7 7 7	0.1	00.1	c	0.13	00.1	111	777	0.10	707	1.00
Lane Grip Cap(c), venin	480	0 14	- 6	484	0 0	204	330	730	733	4/7	730	010
Avail Cap(c a) web/h	7.72 7.75	614	611	562	00.00	1,7	475	755	723	70.0	735	741
Avail Cap(L_a), veriiii HCM Diatoon Patio	1 00	5 5	5 5	202	9 6	50.0	100	100	100	100	100	100
How Filter(I)	8.6	9.0	8.0	00.1	8.0	8.6	8.0	9.0	00.1	100	100	1 00
Uniform Delay (d) s/veh	200	25.2	19.6	707	000	27.7	180	717	21.7	18.2	24.5	14.3
Incr Delay (d2), s/veh	0.2	1.4	0.3	0.1	0.0	2.2	0.2	3.1	3.2	0.0	3.1	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.4	0.0
%ile BackOfQ(50%),veh/ln	3.6	4.4	1.2	2.7	0.0	5.3	1.8	9.6	9.4	0.3	12.0	2.2
LnGrp Delay(d),s/veh	20.3	26.6	19.9	50.9	0.0	29.4	18.2	24.8	24.9	18.2	32.0	14.8
LnGrp LOS	ပ	ပ	В	ပ		ပ	В	ပ	ပ	В	ပ	В
Approach Vol, veh/h		463			380			696			220	
Approach Delay, s/veh		22.9			26.0			24.1			27.3	
Approach LOS		ပ			ပ			ပ			ပ	
Timer	<del>-</del>	2	က	4	2	9	7	∞				
Assigned Phs	1	2	3	4	2	9	7	8				
Phs Duration (G+Y+Rc), s	10.6	36.9	89 99	43.8	12.5	32.0	9.6	47.0				
Change Period (Y+Rc), s	3.0	3.9	3.0	* 4.3	3.0	3.9	3.0	4.3				
Max Green Setting (Gmax), s	12.0	31.1	12.0	33	12.0	31.1	12.0	30.7				
Max Q Clear Time (g_c+11), s	7.7	10.0	2.7	19.2	9.4	12.0	2.7	20.4				
Green Ext Time (p_c), s	0.1	1.3	0.1	1.6	0.1	1.2	0.0	2.8				
Intersection Summary												
HCM 2010 Ctrl Delay			24.9									
HCM 2010 LOS			S									
Notes												
				ľ				ŀ				
ac cacitoti acco of or Mall *			4 4 4 4 4	4 4 4 4 4 4 4 4	40000	0000	Out Dais	norrior				

HCM 2010 Signalized Intersection Summary 1: Petaluma Hill Rd & Kawana Springs Rd

03/12/2018

03/12/2018

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	*	*	*	<u>-</u>	æ		~	<b>₽</b> ₽		<u>.</u>	*	*
Traffic Volume (veh/h)	188	150	53	102	159	42	98	330	75	44	377	173
Future Volume (veh/h)	188	150	53	102	159	42	98	330	75	44	377	173
Number	വ	7	12	<del>-</del> 0	9 0	16	m c	∞ α	9 0	<b>~</b> 0	4 (	14
Pod-Bike Adi(A phT)	000	0	100	100	>	0 0 0	000	>	000	0 0	7	0 0
Parking Bus. Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1900	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	88	150	29	102	159	39	98	330	89	44	377	06
Adj No. of Lanes	<del>-</del>	<del>-</del>	<del>-</del>	<del>-</del>	<del>-</del>	0	<del>-</del>	2	0	<del>-</del>	<u></u>	_
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	429	376	456	485	250	61	400	878	199	205	292	929
Arrive On Green	0.12	0.20	0.20	0.10	0.18	0.18	60.0	0.32	0.32	90:0	0.28	0.28
Sat Flow, veh/h	1774	1863	1581	1774	1436	352	1774	2919	593	1774	1863	1520
Grp Volume(v), veh/h	188	150	29	102	0	198	98	198	200	44	377	06
Grp Sat Flow(s),veh/h/ln	1774	1863	1581	1774	0	1788	1774	1770	1742	1774	1863	1520
Q Serve(g_s), s	3.6	3.0	9.0	1.9	0.0	4.5	1.4	3.8	3.9	0.7	7.9	1.6
Cycle Q Clear(g_c), s	3.6	3.0	9.0	1.9	0.0	4.5	1.4	3.8	3.9	0.7	7.9	1.6
Prop In Lane	1.00		1.00	1.00		0.20	1.00		0.34	1.00		1.00
Lane Grp Cap(c), veh/h	426	376	456	485	0	312	400	593	284	205	267	929
V/C Ratio(X)	0.41	0.40	90.0	0.21	0.00	0.63	0.22	0.33	0.34	0.09	0.67	0.14
Avail Cap(c_a), veh/h	943	006	902	813	0	629	747	1853	1824	877	1967	1800
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	13.3	16.4	12.3	13.6	0.0	18.2	10.4	11.4	11.4	6.7	14.5	8.0
Incr Delay (d2), s/veh	0.2	0.7	0.1	0.1	0.0	2.1	0.1	0.1	0.1	0:0	0.5	0.0
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.7	0.0
%ile BackOfQ(50%),veh/lin	1.9	1.7	0.3	1.0	0.0	2.6	0.7	1.9	1.9	0.4	7.1	0.7
LnGrp Delay(d),s/veh	13.5	17.1	12.3	13.7	0.0	20.3	10.5	11.5	11.5	9.7	24.7	8.0
LuGrp LUS	м	20 1	20	20	0	د	20	20 3	20	⋖	اد	۷
Approach Vol, veh/h		36/			300			484			511	
Approach Delay, swen		4. y			0.81			 			70.4 O	
Approach LUS		2			2			2			ر	
Timer	_	2	3	4	2	9	7	8				
Assigned Phs	-	2	3	4	2	9	7	∞				
Phs Duration (G+Y+Rc), s	7.3	12.8	6.9	16.7	8.4	11.6	5.5	18.1				
Change Period (Y+Rc), s	3.0	3.9	3.0	* 4.3	3.0	3.9	3.0	4.3				
Max Green Setting (Gmax), s	12.0	21.1	12.0	* 46	17.0	16.1	12.0	45.7				
Max Q Clear Time (g_c+I1), s	3.9	2.0	3.4	6.6	9.6	6.5	2.7	5.9				
Green Ext Time (p_c), s	0.1	0.7	0.1	1.7	0.2	0.7	0.0	1.6				
Intersection Summary												
HCM 2010 Ctrl Delay			16.1									
HCM 2010 LOS			В									
Notes												
INDICES												

Kawana Springs Community Park 5:00 pm 10/17/2016 Weekend Existing Conditions with Project W-Trans

HCM 2010 Signalized Intersection Summary 1: Petaluma Hill Rd & Kawana Springs Rd

The color of the	Movement -ane Configurations -raffic Volume (veh/h)	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
7         8         7         8         7	Lane Configurations		1		1			١	ŀ		ľ	ŀ	ľ
226         435         132         174         338         39         137         678         311         30         415           26         435         132         174         338         39         137         678         311         30         415           0         0         0         0         0         0         0         0         0         0         102         102         100	Fraffic Volume (veh/h)	<u>-</u>	<del>&lt;</del>	*-	-	<b>\$</b>		-	₹		F	<del>&lt;</del>	*
226         435         132         174         338         39         137         678         311         30         415           5         2         12         1         6         16         3         8         18         7         4           0         0         0         0         0         0         0         0         0         120           100         100         100         100         100         100         100         100         100         100           1863	Tallic volulle (volull)	226	435	132	174	338	39	137	879	311	30	415	365
5	uture Volume (veh/h)	226	435	132	174	338	39	137	829	311	30	415	365
0         0	Number	2	2	12	<del>-</del>	9	16	3	∞	18	7	4	14
0.099 1.00 1.00 1.00 1.00 1.00 1.00 1.00	nitial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	12	0
100	Ped-Bike Adj(A_pbT)	0.99		1.00	1.00		0.97	1.00		0.98	1.00		0.98
1863   1863   1863   1863   1960   1863	Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
226         435         79         144         338         35         137         648         292         30         415           1 10         1 0         1 0         1 0         1 0         1 0         1 0         1 0         1 0           2 2 2 3         2 2 3         2 2 2 2         1 1774         186         145         18	Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1900	1863	1863	1900	1863	1863	1863
10	Adj Flow Rate, veh/h	226	435	6/	174	338	32	137	8/9	292	30	415	238
100	Adj No. of Lanes	<del>-</del>	<del>,</del>	_	<del>-</del>	<del>-</del>	0	<del>-</del>	2	0	_	_	
2         3         3         10         0	Peak Hour Factor	1.00	1.00	1:00	1:00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
392 614 622 335 515 53 315 978 421 223 705 1774 1863 1578 1774 1863 1578 1774 1863 1774 1770 1655 1774 1863 1774 1770 1655 1774 1863 1776 1655 1774 1863 1776 1655 1774 1770 1655 1774 1863 1776 1655 1774 1863 1776 1655 1774 1770 1655 1774 1770 1655 1774 1863 1776 1778 1770 1655 1774 1770 1655 1774 1770 1655 1774 1770 1655 1774 1770 1700 1700 1700 1700 1700 1700	Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
1774   1863   1578   1774   1863   1774	Sap, veh/h	392	614	622	335	515	23	315	878	421	233	705	750
1774   1863   1578   1774   1655   177   1774   2394   1031   1774   1863   1578   1774   1863   1774   1770   1655   1774   1770   1655   1774   1774   1770   1655   1774   1774   1777   175   1774   1774   1777   17	Arrive On Green	0.10	0.33	0.33	0.09	0.31	0.31	90:0	0.41	0.41	0.03	0.38	0.38
1774         178         0         373         137         501         469         30         415           1774         1863         1774         0         1827         1774         170         1685         1774         178         1774         170         1685         1774         178         178         177         1827         174         170         1685         177         1685         177         1833         170         177         178         170         1685         177         178         177         178         177         178         177         178         177         178         177         178         178         177         178         178         178         179         178         178         178         178         178         178         178         178         178         178         178         178         178         178         179         178         179         178         179         178         179         178         179         178         179         179         179         179         179         179         179         179         179         179         179         179         179         179 <t< td=""><td>sat Flow, veh/h</td><td>1774</td><td>1863</td><td>1578</td><td>1774</td><td>1655</td><td>171</td><td>1774</td><td>2394</td><td>1031</td><td>1774</td><td>1863</td><td>1546</td></t<>	sat Flow, veh/h	1774	1863	1578	1774	1655	171	1774	2394	1031	1774	1863	1546
1/14   1/14	Srp Volume(v), veh/h	226	435	79	174	0	373	137	201	469	30	415	238
84 204 3.2 6.6 0.0 177 4.5 23.4 23.4 10 17.8 11.0 17.8 11.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.	orp sat Flow(s),venyrin	1//4	1803	8/61	1//4	0 0	1281	1//4	0//1	1000	1//4	1803	1240
100	2 Serve(g_s), s	4.0	20.4	3.2	0.0	0.0	1.7	4.5	23.4	23.4	0.7	17.8	4.4
1.00	ycle U Clear(g_c), s	4.0	70.4	3.2	0.0	0.0	1./1	4.5	73.4	23.4	0.0	2.0	4.4
0.88 0.71 0.22 396 0.00 0.66 0.43 7.50 0.00 0.50 0.10 0.10 0.10 0.10 0.10 0	rop in Lane	00.1	414	00.1	1.00	c	60.0	0.15	733	70.0	00.1	705	1.00
419   614   622   396   0   568   440   723   676   386   705     1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00     1.01   1.02   1.03   1.03   1.00   1.00   1.00   1.00   1.00     1.02   1.03   1.03   1.03   1.00   1.00   1.00   1.00   1.00     1.03   1.03   2.23   0.0   298   19.0   24.4   24.4   19.8   25.9     1.0   6.8   0.4   0.5   0.0   0.0   0.0   0.0   0.0   0.0     4.1   1.1   1.2   3   4   5   6   7   8     1.0   2.2   36.1   1.2   3   4   5   6   7   8     1.0   2.3   3.0   3.1   3.0   3.9   3.0   4.5     1.1   2.   3   4   5   6   7   8     2.   3.0   3.9   3.0   4.3   3.0   3.9   3.0     3.0   3.9   3.0   4.3   3.0   3.1   1.2   3.0     3.0   3.1   1.2   3   4   5   6   7   8     3.0   3.1   1.2   3   4   5   6   7   8     3.0   3.1   1.2   3.1   1.2   3.1   1.2   3.0     3.0   3.1   1.2   3.1   1.2   3.1   1.2   3.0     3.0   3.1   1.2   3.1   1.2   3.1   1.2   3.0     3.0   3.1   1.2   3.1   1.2   3.1   1.2   3.2     3.0   3.1   1.2   3.1   1.2   3.1   1.2   3.2     3.0   3.1   3.1   3.1   3.1   3.1   3.1     3.0   3.1   3.1   3.1   3.1   3.1   3.1     3.0   3.1   3.1   3.1   3.1   3.1     3.0   3.1   3.1   3.1   3.1   3.1     3.0   3.1   3.1   3.1   3.1   3.1     3.0   3.1   3.1   3.1   3.1   3.1     3.0   3.1   3.1   3.1   3.1   3.1     3.0   3.1   3.1   3.1   3.1   3.1     3.0   3.1   3.1   3.1   3.1   3.1     3.0   3.1   3.1   3.1   3.1   3.1     3.1   3.1   3.1   3.1   3.1   3.1     3.1   3.1   3.1   3.1   3.1   3.1     3.1   3.1   3.1   3.1   3.1   3.1   3.1     3.1   3.1   3.1   3.1   3.1   3.1   3.1     3.1   3.1   3.1   3.1   3.1   3.1   3.1     3.1   3.1   3.1   3.1   3.1   3.1   3.1     3.1   3.1   3.1   3.1   3.1   3.1   3.1   3.1     3.1   3.1   3.1   3.1   3.1   3.1   3.1   3.1   3.1     3.1   3.1   3.1   3.1   3.1   3.1   3.1   3.1   3.1   3.1   3.1     3.1	Alle Gip Cap(c), veiiiii	372 0 58	0 71	0.13	0.50	000	9000	0.43	0 69	0/0	0.13	0.50	037
1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00	Avail Cap(c, a), veh/h	419	614	623	396	0	20.0	440	723	676	386	705	750
1.00 1.00 1.00 1.00 0.00 1.00 1.00 1.00	HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
212     293     193     223     00     298     190     244     244     198     259       10     68     0.4     0.5     0.0     50     6.4     5.4     5.9     1.3     6.0     5.1       4.1     11.7     1.5     3.2     0.0     9.8     2.2     12.5     11.8     0.5     12.5       22.2     36.1     19.7     22.8     0.0     9.8     2.2     12.5     11.8     0.5     12.5       22.2     36.1     19.7     22.8     0.0     9.8     2.2     12.5     11.8     0.5     12.5       740     B     C     D     B     C     C     B     C       7     19.7     22.8     110.7     28.7     27.8       8     11.6     36.9     4.4     42.1     13.4     5.6     7     8       1     2     3     4     5     6     7     8     7     C     C     C       1     2     3     4.3     3.0     3.9     3.0     4.3     3.0     3.9     3.0     4.3       3     3.9     3.0     4.3     3.0     3.9     3.0     4.3     3.0 <td>Jpstream Filter(I)</td> <td>1.00</td> <td>1.00</td> <td>1.00</td> <td>1.00</td> <td>00:00</td> <td>1.00</td> <td>1.00</td> <td>1.00</td> <td>1.00</td> <td>1.00</td> <td>1.00</td> <td>1.00</td>	Jpstream Filter(I)	1.00	1.00	1.00	1.00	00:00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
10 68 04 05 00 58 04 54 58 01 36 00 00 00 00 00 00 00 00 00 00 00 00 00	Jniform Delay (d), s/veh	21.2	29.3	19.3	22.3	0.0	29.8	19.0	24.4	24.4	19.8	25.9	15.8
00 00 00 00 00 00 00 00 00 00 00 00 00	ncr Delay (d2), s/veh	1.0	9.9	0.4	0.5	0.0	2.8	0.4	5.4	2.8	0.1	3.6	Ξ.
4.1 11.7 1.5 3.2 0.0 9.8 2.2 12.5 11.8 0.5 12.5 12.5 2.2 36.1 19.7 22.8 0.0 35.7 19.3 29.8 30.2 19.8 34.6 C D B C C D B C C C D B C C C D S4.7 10.7 10.7 10.8 20.1 10.2 2.8 2.7 2.8 2.8 2.8 2.8 2.8 2.8 2.8 2.8 2.8 2.8	nitial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.1	0.0
222 361 197 228 0.0 357 193 298 302 198 346 C D B C D B C C B C C B 303 30.1 740 547 1107 6633 30.1 31.6 28.7 28.7 28.7 1 2 3 4 5 6 7 8 116 36.9 94 42.1 13.4 5.6 6.4 45.2 3 0 3.9 30 4.3 30 3.9 30 4.3 5 120 31.1 120 '31 120 31.1 120 30.7 5 8 6 224 6.5 19.8 10.4 19.7 3.0 25.4 C C C C C C C C C C C C C C C C C C C	%ile BackOfQ(50%),veh/ln	4.1	11.7	1.5	3.2	0.0	9.8	2.2	12.5	1.8	0.5	12.5	4.2
C D B C C B  340 547 1107 B  341 31.6 C C B  1 2 3 4 5 6 7 8  1 1 2 3 4 5 6 7 8  1 1 2 3 4 5 6 7 8  1 1 2 3 4 4 5 6 7 8  1 1 2 3 4 4 5 6 7 8  1 1 2 3 3 4 4 5 6 7 8  1 1 2 3 3 4 7 13.0 3.0 4.3  2 1 2 0 3.1 12.0 31.1 12.0 30.7  2 8 8 224 6.5 19.8 10.4 19.7 3.0 25.4  2 9 3 7 7 8 7 8  2 9 3 7 7 8 7 8  2 9 3 7 8 8 7 8 8 7 8  2 9 3 7 8 8 7 8 8 7 8 8  2 9 3 7 8 8 7 8 8 7 8 8  2 9 3 7 8 8 7 8 8 7 8 8  2 9 3 7 8 8 7 8 8 7 8 8 7 8 8  2 9 3 7 8 8 8 7 8 8 7 8 8 7 8 8 8 7 8 8 8 7 8 8 8 7 8 8 8 7 8 8 8 7 8 8 8 7 8 8 8 7 8 8 8 7 8 8 8 7 8 8 8 7 8 8 8 7 8 8 8 7 8 8 8 7 8 8 8 8 7 8 8 8 7 8 8 8 8 7 8 8 8 8 7 8 8 8 8 7 8 8 8 8 7 8	nGrp Delay(d),s/veh	22.2	36.1	19.7	22.8	0.0	35.7	19.3	29.8	30.2	19.8	34.6	16.9
740 547 1107 31.6 28.7 C C C C C C C C C C C C C C C C C C C	ngrp LOS	ی	۵	Я	ی		۵	Я	ی	U	м	S	m l
30.1	Approach Vol, veh/h		740			547			1107			683	
1 2 3 4 5 6 7 8 1 2 3 4 5 6 7 8 1 16 36.9 9.4 42.1 13.4 35.0 6.4 45.2 3.0 3.9 3.0 *4.3 3.0 3.9 3.0 4.3 5 12.0 31.1 12.0 *31 12.0 3.07 5 86 22.4 6.5 19.8 10.4 19.7 3.0 25.4 0.1 2.0 0.1 1.7 0.1 1.7 0.0 2.2 C	Approach Delay, siven		30.1			S. S.			7.87			8.12	
1 2 3 4 5 6 7 11.6 3 4 4 5 6 7 11.6 3.9 9.4 42.1 13.4 35.0 6.4 3.0 3.9 3.0 43.3 0 3.9 3.0 5 12.0 31.1 12.0 '31 12.0 31.1 12.0 5 86 224 6.5 19.8 10.4 19.7 3.0 0.1 2.0 0.1 1.7 0.1 1.7 0.0	Approach LUS		ر			ر			ر			ر	
11.6 36.9 94 42.1 13.4 35.0 64.4 35.0 8.4 35.0 8.4 35.0 8.4 3.0 3.9 3.0 3.9 3.0 3.0 3.9 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0	Timer	_	2	3	4	2	9	7	∞				
116 369 94 42.1 13.4 35.0 64 3.0 3.9 3.0 4.3 3.0 3.9 3.0 5 12.0 31.1 12.0 3.1 12.0 5 8.6 22.4 6.5 19.8 10.4 19.7 3.0 0.1 2.0 0.1 1.7 0.1 1.7 0.0 29.3 C	Assigned Phs	-	2	3	4	2	9	7	8				
30 39 30 43 30 39 30 8 30 8 30 8 30 8 30 8 30 8 30	Phs Duration (G+Y+Rc), s	11.6	36.9	9.4	42.1	13.4	32.0	6.4	45.2				
s 12.0 31.1 12.0 31 12.0 31.1 12.0 s 8.6 22.4 6.5 19.8 10.4 19.7 3.0 0.1 2.0 0.1 1.7 0.1 1.7 0.0 29.3 C	Change Period (Y+Rc), s	3.0	3.9	3.0	* 4.3	3.0	3.9	3.0	4.3				
s 6 224 65 198 104 19.7 3.0 s 20.3 c C	Aax Green Setting (Gmax), s	12.0	31.1	12.0	33	12.0	31.1	12.0	30.7				
s 0.1 2.0 0.1 1.7 0.1 1.7 0.0 29.3 C	Max Q Clear Time (g_c+I1), s	8.6	22.4	6.5	19.8	10.4	19.7	3.0	25.4				
Intersection Summary  CM 2010 Cirl Delay  C  C  Votes		0.1	2.0	0.1	1.7	0.1	1.7	0.0	2.2				
HCM 2010 Ctrl Delay 29.3 HCM 2010 LCS C Votes	ntersection Summary												
HCM 2010 LOS C	HCM 2010 Ctrl Delay			29.3									
Voles	HCM 2010 LOS			O									
	Votes												
	0000	The same		1		A to the second		after a Mary	1				

# HCM 2010 Signalized Intersection Summary 1: Petaluma Hill Rd & Kawana Springs Rd

03/05/2018

03/05/2018

	١.	t	•					-				
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	-	+	ĸ.	*	42		-	4₽		-	*	R.
Traffic Volume (veh/h)	241	182	89	120	193	33	110	422	98	36	483	221
Future Volume (veh/h)	241	182	89	120	193	33	110	422	98	36	483	221
Number	2	2	12	<del>-</del> (	9	16	က	∞ α	9	7	4 (	14
Initial Q (Qb), ven	0 0	0	0 0	0 0	0	0 6	0 0	0	0 0	0 6	71	0 0
Ped-Bike Adj(A_pb1)	0.99	00	1.00	1.00	00	100	1.00	00	0.98	0.1	5	0.96
Parking Bus, Adj	1863	1863	1863	1863	1863	1900	1863	1863	1000	1863	1863	1863
Adj Flow Rate, veh/h	241	182	44	120	193	30	110	422	79	36	483	138
Adj No. of Lanes	<b>—</b>	<del>-</del>	<b>—</b>	-	<del>-</del>	0	<del>-</del>	2	0	<del>-</del>	_	<del></del>
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	443	415	490	449	273	42	348	1149	213	464	644	748
Arrive On Green	0.14	0.22	0.22	0.09	0.18	0.18	60:0	0.37	0.37	0.05	0.33	0.33
Sat Flow, veh/h	1774	1863	1581	1774	1567	244	1774	2969	551	1774	1863	1524
Grp Volume(v), veh/h	241	182	44	120	0	223	110	250	251	36	483	138
Grp Sat Flow(s),veh/h/ln	1774	1863	1581	1774	0	1811	1774	1770	1751	1774	1863	1524
O Serve(g_s), s	5.5	4.5	1.1	2.8	0.0	6.2	2.0	5.5	9.9	0.7	12.6	2.8
Cycle Q Clear(g_c), s	2.5	4.5	<del>-</del> -	2.8	0.0	6.2	2.0	2.5	9.6	0.7	12.6	2.8
Prop In Lane	1.00		1.00	1.00		0.13	1.00		0.31	1.00		1.00
Lane Grp Cap(c), veh/h	443	412	490	449	0	312	348	685	678	464	644	748
V/C Ratio(X)	0.54	0.44	0.09	0.27	0.00	0.71	0.32	0.37	0.37	0.08	0.75	0.18
Avail Cap(c_a), veh/h	292	734	766	693	0	545	902	1510	1495	769	1604	1535
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	00.1	00.1	0.00	0,7	0.00	00.1	1.00	1.00	1.00	1.00	00.1	00:1
Uniform Delay (d), siven	15.3	19.4	14.2	16.9	0.0	22.5	12.0	12.3	12.3	10.7	17.1	8.7
Incr Delay (dz), s/ven	0.4	0.7	0.1	0.1	0:0	2.9	0.7	6	00	0.0	0.7	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0	0.0
%ile BackOfQ(50%),veh/ln	2.9	2.5	0.5	7.5	0.0	3.6	1.0	5.8	7.8	0.3	10.2	1.2
LnGrp Delay(d),s/ven	12.7	70.1	14.3	0./1	0.0	25.4	7.77	12.4	12.5	8.01	27.8	8.7
LnGrp LOS	Я	ی	m	m		ی	Я	Я	В	м	ی	¥
Approach Vol, veh/h		467			343			611			657	
Approach Delay, sweh		17.3			22.5			12.4			22.7	
Approach LOS		a			ပ			n			ပ	
Timer	1	2	3	4	2	9	7	8				
Assigned Phs	-	2	3	4	2	9	7	∞				
Phs Duration (G+Y+Rc), s	8.0	15.9	7.8	21.8	10.5	13.4	5.5	24.1				
Change Period (Y+Rc), s	3.0	3.9	3.0	* 4.3	3.0	3.9	3.0	4.3				
Max Green Setting (Gmax), s	12.0	21.1	12.0	* 46	17.0	16.1	12.0	45.7				
Max Q Clear Time (g_c+I1), s	4.8	6.5	4.0	14.6	7.5	8.2	2.7	7.6				
Green Ext Time (p_c), s	0.1	6.0	0.1	2.3	0.2	0.7	0.0	2.1				
Intersection Summary												
HCM 2010 Ctrl Delay			18.4									
HCM 2010 LOS			В									

Kawana Springs Community Park 5:00 pm 10/17/2016 Weekend Future Conditions W-Trans

HCM 2010 Signalized Intersection Summary 1: Petaluma Hill Rd & Kawana Springs Rd

Lane Configurations 15 March Trailfu Volume (veh/h) 226 Future Veh/h) 226 Future Veh/h			EBK V	MBL MBL	MRI MRI	WBK	NBL	NBI ♣	NBK NBK	Jg F	- SBI	SBK
- 10		-	<b>*</b> _	×	2			<b>↑</b>		r	•	<b>*</b>
			132	176	340	44	137	8/9	313	34	415	365
		437 1	32	176	340	44	137	879	313	34	415	365
		2	12	_	9	16	m	∞	18	7	4	14
				0	0	0	0	0	0	0	12	0
Ì		<del>-</del>	1.00	1.00		0.97	1.00		0.98	1.00		0.98
				8.	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	_			1863	1863	1900	1863	1863	1900	1863	1863	1863
	437		79	176	340	40	137	678	294	34	415	238
				<del>,</del>	<del>-</del>	0	<del>-</del>	2	0	<del>-</del>	_	_
<del>-</del> -	1.00		1.00	1.00	1.00	1:00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, % 2				2	2	2	2	2	2	2	2	2
				334	207	09	315	696	420	235	704	750
Arrive On Green 0.10			0.33 (	0.09	0.31	0.31	90:0	0.41	0.41	0.04	0.38	0.38
Sat Flow, veh/h 1774	1863			1774	1631	192	1774	2388	1036	1774	1863	1546
Grp Volume(v), veh/h 226				176	0	380	137	203	470	34	415	238
veh/h/ln				17.74	0	1823	1774	1770	1654	1774	1863	1546
2 Serve(g_s), s 8.4	20.6		3.2	9.9	0.0	18.1	4.5	23.6	23.6		17.8	9.4
(g_c), s				9.9	0.0	18.1	4.5	23.6	23.6		17.8	9.4
				1.00		0.11	1.00		0.63	1.00		1.00
Lane Grp Cap(c), veh/h 386			Ì	334	0	267	315	718	677	235	704	750
				0.53	0.00	0.6/	0.43	0.70	0.70	0.14	0.59	0.32
ب				394	0	267	440	718	671	383	704	750
HCM Platoon Ratio 1.00			1.00	9.1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
				00.1	0.00	00.1	00.1	00.1	00.1	00.1	1.00	1.00
Jniform Delay (d), s/veh 21.4	29.4			22.4	0.0	30.0	19.0	24.7	24.7	19.8	25.9	15.8
				0.5	0.0	6.2	0.4	9.0	0.9		9.0	3
	•		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.1	0.0
envin				3.2	0.0	10.1	7.7	17.0	8. 5	0.0	12.5	4.2
.nGrp Delay(d),s/veh 22.4	36.3		8.61	8.77	0.0	36.2	19.4	30.3	30.6	6.61	34.6	16.9
ngip LOS		ا	В	ی		۵	m	ی	U	Я	ی	2
Approach Vol, veh/h	7	742			226			1109			789	
Approach Delay, siven	30	30.3			32.0			67			8.12	
Approach LUS		5			د			ی			د	
imer 1		2	3	4	2	9	7	8				
				4	2	9	7	∞				
	. ,			42.1	13.5	35.0	6.7	44.9				
				* 4.3	3.0	3.9	3.0	4.3				
				* 31	12.0	31.1	12.0	30.7				
Max Q Clear Time (g_c+I1), s 8.6	22.6		6.5	19.8	10.4	20.1	3.1	25.6				
Green Ext Time (p_c), s 0.1			1.	1.7	0.1	1.7	0.0	2.1				
ntersection Summary												
HCM 2010 Ctrl Delay		26	29.6									
HCM 2010 LOS			ပ									
o to N												
auto)												

HCM 2010 Signalized Intersection Summary 1: Petaluma Hill Rd & Kawana Springs Rd

03/12/2018

03/12/2018

Movement EBL  Lane Configurations Marrian Volume (veh/h) 241  Future Volume (veh/h) 241  Future Volume (veh/h) 241  Number 55  Initial O (20), veh 0  Ped-Bisk Adj(A, pb1) 0.99  Parking Bus, Adj 1.00  Perking Pus, veh/h 241  Adj No, of Lanes 1  Adj No, of Lanes 1  Adj No, of Lanes 1  Adj Flow Rale, veh/h 241  Adj No, of Lanes 1  Adj Procent Heavy Veh, % 242  Cap, veh/h 432  Annie On Green 1214		EBR 68 68 68 68 68 68 68 68 12 10 11.00 11.00 11.00 2 2 502 502 502 1581	WBL 128 128 128 100 1.00 1.00 1.00 1.00 1.00 1.00 1.00	201 201 201 0 0	WBR 49	110 110	NBT	NBR 94	SBL 52	SBT →	SBR 7
		68 68 68 12 0 1.00 1.00 1.00 1.00 2 2 502 0.23 0.23	128 128 128 100 1.00 1.00 1863 128 128 128 1774 1774	201 201 0 0	49	110	47 <b>5</b> 422 422	94	52	483	221
		68 68 68 112 0 1.00 1.00 1.00 2 502 502 502 502 1.581	128 128 100 1.00 1.00 1863 128 128 170 2 453 0.009	201 201 6	49	110	422	94	52	483	221
		68 12 0 1.00 1.00 1.863 44 1 1.00 2 2 502 502 502 1.581	128 0 0 1.00 1.00 1.00 1.00 2 2 453 0.09 1774	201	46	110	422	V	52		
		12 0 0 1.00 1883 44 44 1.00 2 502 0.23 1581 444	100 1.00 1.00 1.00 1.00 2 2 453 0.09 1774	0 0 100			777	74	70	483	221
		1.00 1.00 1.00 1.00 1.00 2 502 0.23 1.581	1.00 1.00 1.00 128 128 1.00 2 453 0.09 1774	100	16	<sub>د</sub>	∞ (	18	7	4	14
		1.00 1863 44 1.00 2 502 0.23 1.581 44	1.00 1863 128 1.00 2 453 0.09 1774	1 00	0 0	0 6	0	0	0 6	17	0 00
		1863 44 1.00 2 502 0.23 1581 44	1863 128 1.00 2 453 0.09 1774		1.00	1.00	1 00	100	8 6	1 00	1.00
		1.00 2 502 0.23 1.581 44	128 1.00 2 453 0.09 1774	1863	1900	1863	1863	1900	1863	1863	1863
		1.00 2 502 0.23 1581 44	1.00 2 453 0.09 1774	201	46	110	422	87	52	483	138
	, ,	1.00 2 502 0.23 1581 44	1.00 2 453 0.09 1774	<del>-</del>	0	_	2	0	_	<del>-</del>	_
,		2 502 0.23 1581 44	2 453 0.09 1774 128	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0,	, , ,	502 0.23 1581 44	453 0.09 1774 128	2	2	2	2	2	2	2	2
_	<u> </u>	0.23	0.09 1774 128	271	62	340	1081	221	462	640	742
		1581	1774	0.19	0.19	0.09	0.35	0.35	90.0	0.32	0.32
		44	128	1458	334	1774	2916	296	1774	1863	1524
		107		0	247	110	255	254	25	483	138
veh/h/ln 1		1381	1774	0	1792	1774	1770	1742	1774	1863	1524
Q Serve(g_s), s 5.6	4.8	1.	3.1	0.0	7.1	2.1	0.9	6.1	1.0	13.0	2.9
r(g_c), s		<del>-</del> ;	3.1	0.0	7.1	2.1	0.9	6.1	1:0	13.0	2.9
		1.00	1.00		0.19	1.00		0.34	1.00		1.00
p(c), veh/h		205	453	0	333	340	929	949	462	640	742
		0.09	0.28	0.00	0.74	0.32	0.39	0.39	0.11	0.75	0.19
ے		748	989	0 0	525	286	1472	1449	735	1563	1498
0		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
		1.00	1.00	0.00	00.1	1.00	00.1	1.00	1.00	00.1	00.1
e.	19.5	14.3	8.9	0.0	22.8	12.7	13.4	13.4	10.8	9./1	8.5
		0.1	0.1	0.0	3.3	0.7	O. 0	0.0	0.0	0.7	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.3	0.0
.eh/ln	Ì	0.5	1.6	0.0	4.1	- 6	3.0	3.0	0.5	10.4	1.2
LnGrp Delay(d),s/veh	20	14.4	16.9	0.0	26.1	12.9	13.5	13.5	10.9	28.6	9.6
LnGrp LOS B	ی	2	Я		اد	Я	Я	æ	Я	ی	¥
Approach Vol, veh/h	475			375			619			673	
Approach Delay, s/veh	17.5			23.0			13.4			23.1	
Approach LOS	n			ပ			a			<u>ن</u>	
Timer 1	2	3	4	5	9	7	8				
		3	4	2	9	7	∞				
	,	7.9	22.2	10.6	14.3	6.3	23.7				
		3.0	* 4.3	3.0	3.9	3.0	4.3				
		12.0	* 46	17.0	16.1	12.0	45.7				
Max Q Clear Time (g_c+I1), s 5.1	8.9	4.1	15.0	7.6	9.1	3.0	8.1				
Green Ext Time (p_c), s 0.1		0.1	2.3	0.2	0.7	0.0	2.1				
Intersection Summary											
HCM 2010 Ctrl Delay		19.0									
HCM 2010 LOS		В									
Noton											

Kawana Springs Community Park 5:00 pm 10/17/2016 Weekend Future Conditions with Project W-Trans