PARK AVENUE BRIDGE REPLACEMENT TRAFFIC ANALYSIS

Prepared for

CITY OF NEWPORT BEACH

Prepared by

14725 ALTON PARKWAY, IRVINE, CALIFORNIA 92618-2027
CONTACT: BOB MATSON 949.855.5736 bobmatson@rbf.com

May 15, 2014

JN 130307

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EXECUTIVE SUMMARY

This study analyzes two traffic analysis scenarios associated with construction of the Park Avenue Bridge replacement project in the City of Newport Beach. The proposed project consists of replacing the existing Park Avenue Bridge over Grand Canal on the east side of Balboa Island. During the reconstruction stages of the project, the following temporary traffic conditions are considered:

- Alternative 1 – provide alternating two-way traffic on a one-lane bridge controlled by temporary traffic signals at the Park Avenue location during the Park Avenue Bridge reconstruction stages; or

- Alternative 2 – provide two-way traffic on a temporary two-lane bridge at the Balboa Avenue location during the Park Avenue Bridge reconstruction stages with no traffic connection at the Park Avenue location.

Traffic conditions will return to existing conditions upon completion of the proposed Park Avenue Bridge replacement.

Alternative 1 reconstruction conditions are forecast to cause two of the study intersections to operate at a deficient LOS (LOS E or worse) according to City of Newport Beach performance criteria.

The approximate 16 on-street parking spaces along Park Avenue between Marine Avenue and Abalone Avenue would be temporarily displaced under Alternative 1 reconstruction conditions.

Access at the alleyways located between Marine Avenue and Abalone Avenue would also have to be temporarily restricted to prevent vehicles from exiting the alleyways onto Park Avenue and conflicting with the alternating two-way travel under Alternative 1 reconstruction conditions. Alleyway restrictions would be most disruptive to delivery and trash hauling trucks servicing the commercial businesses fronting Marine Avenue.

The study intersections are forecast to continue to operate at an acceptable LOS (LOS D or better) according to City of Newport Beach performance criteria for Alternative 2 reconstruction conditions.

Approximately 11 on-street parking spaces would be temporarily displaced on the north side of Balboa Avenue between Marine Avenue and Abalone Avenue to allow two-way traffic for Alternative 2 reconstruction conditions.

Queue lengths at the northbound and southbound approaches of the Marine Avenue/Balboa intersection are expected to increase during the a.m. and p.m. peak hours by no more than one vehicle (25 feet) for Alternative 2 reconstruction conditions.

INTRODUCTION

This study analyzes two traffic analysis scenarios associated with construction of the Park Avenue Bridge replacement project in the City of Newport Beach. The proposed project consists of replacing the existing Park Avenue Bridge over Grand Canal on the east side of Balboa Island. During the reconstruction stages of the project, the following temporary traffic conditions are considered:

- Alternative 1 – provide alternating two-way traffic on a one-lane bridge controlled by temporary traffic signals at the Park Avenue location during the Park Avenue Bridge reconstruction stages; or

- Alternative 2 – provide two-way traffic on a temporary two-lane bridge at the Balboa Avenue location during the Park Avenue Bridge reconstruction stages with no traffic connection at the Park Avenue location.

Traffic conditions will return to existing conditions upon completion of the proposed Park Avenue Bridge replacement.

Exhibit 1 shows the regional project location. Exhibit 2 shows the project site location.

Study Area

The study area consists of the following four unsignalized intersections:

1. Marine Avenue/Balboa Avenue;
2. Marine Avenue/Park Avenue;
3. Abalone Avenue/Balboa Avenue; and
4. Abalone Avenue/Park Avenue.

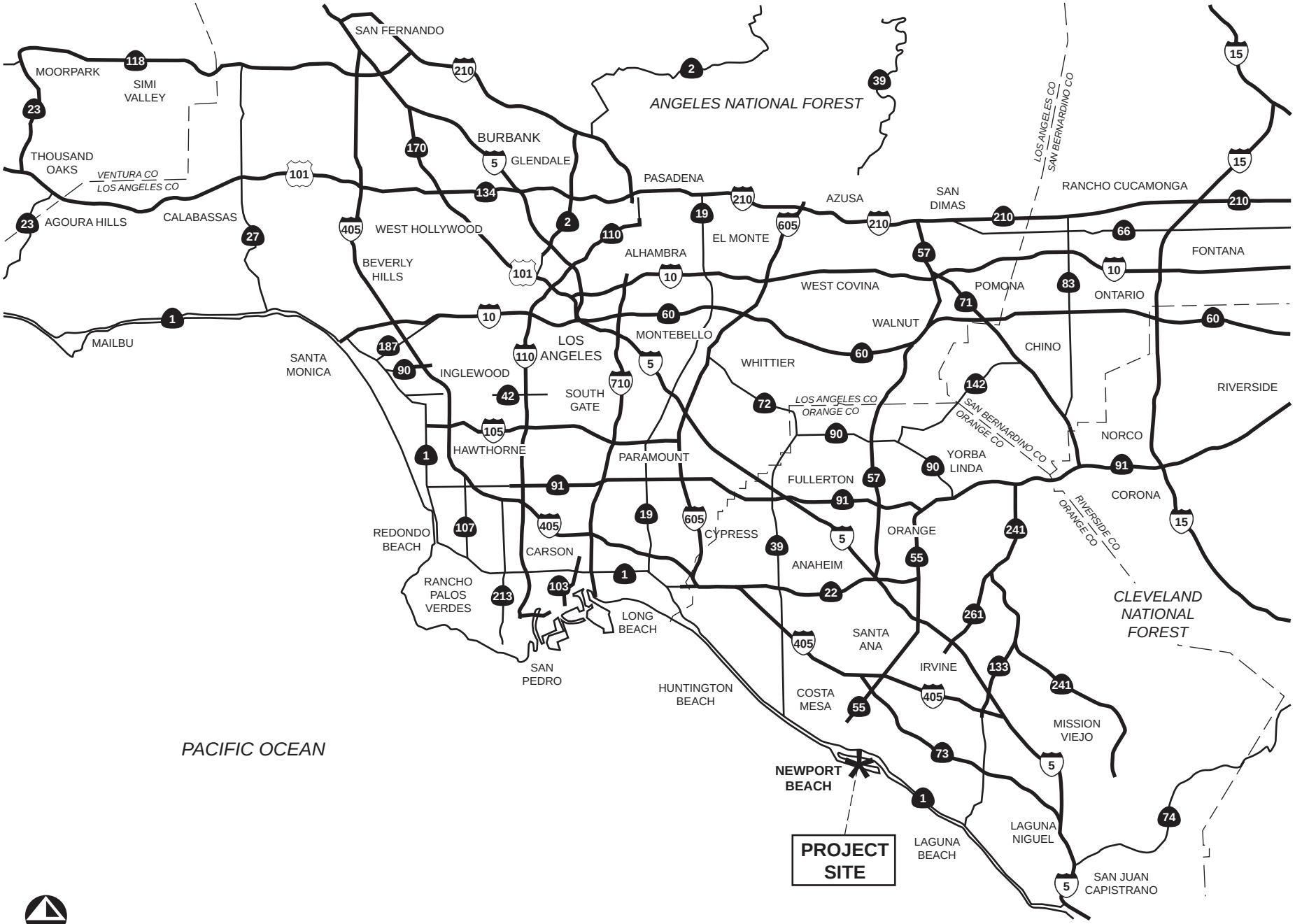
Exhibit 2 shows the location of the study intersections, which are analyzed for the following study scenarios:

- Existing Conditions;
- Alternative 1 Reconstruction Conditions; and
- Alternative 2 Reconstruction Conditions.

Analysis Methodology

Level of service (LOS) is commonly used as a qualitative description of intersection operation and is based on the capacity of the intersection and the volume of traffic using the intersection. The *Intersection Capacity Utilization (ICU)* analysis method is typically utilized by the City of Newport Beach to determine the operating LOS of signalized intersections; however, the *ICU* analysis methodology is not applicable to unsignalized intersections. Therefore, the *Highway Capacity Manual (HCM)* analysis methodology has been utilized to determine the operating LOS of the study intersections for this study.

The analysis of proposed temporary signalized intersections associated with Alternative 1 conditions has also been prepared utilizing the *HCM* analysis methodology so the particular



Not to Scale

Regional Project Location

Exhibit 1

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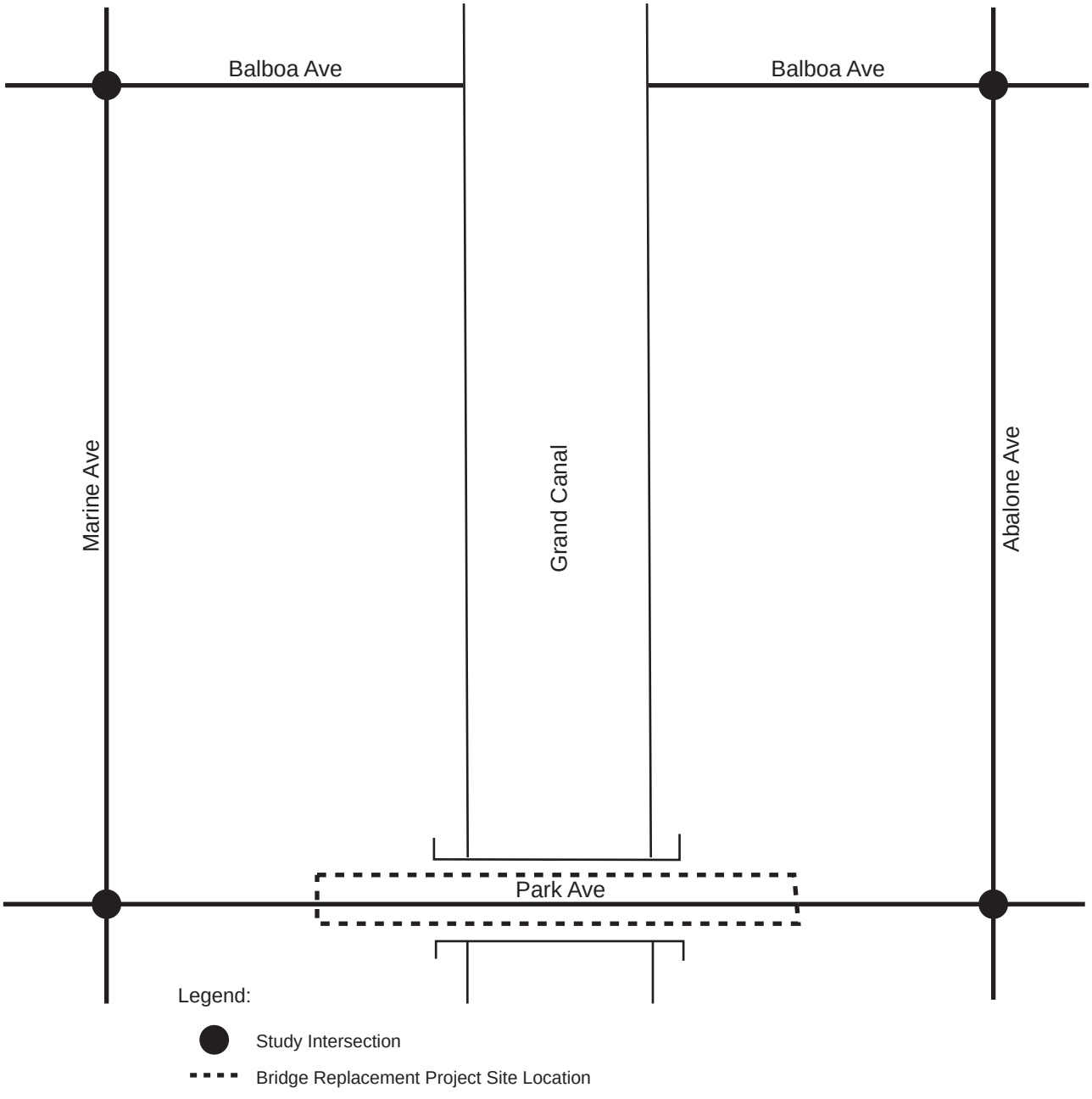

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Project Site & Study Intersection Locations

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Exhibit 2

signal operations can be modeled more accurately. Unlike the *HCM* analysis methodology, the *ICU* analysis methodology does not account for various factors that would affect the study intersection LOS such as traffic signal timing (extended all-red clearance intervals in particular), phasing, cycle length, and distance between intersections.

The *2000 HCM* analysis methodology describes the operation of an intersection using a range of LOS from LOS A (free-flow conditions) to LOS F (severely congested conditions), based on the corresponding ranges of stopped delay experienced per vehicle for signalized and unsignalized intersections shown in Table 1.

Table 1
LOS & Delay Ranges

LOS	Delay (seconds/vehicle)	
	Signalized Intersections	**Unsignalized Intersections**
A	≤ 10.0	≤ 10.0
B	> 10.0 to ≤ 20.0	> 10.0 to ≤ 15.0
C	> 20.0 to ≤ 35.0	> 15.0 to ≤ 25.0
D	> 35.0 to ≤ 55.0	> 25.0 to ≤ 35.0
E	> 55.0 to ≤ 80.0	> 35.0 to ≤ 50.0
F	> 80.0	> 50.0

Source: *2000 Highway Capacity Manual*

The City of Newport Beach target for peak hour intersection operation as stated in the Circulation Element of the General Plan is LOS D or better except at the following locations where LOS E or better is considered acceptable:

- Intersections in the John Wayne Airport Area shared with the City of Irvine;
- Dover Drive/West Coast Highway (SR-1);
- Goldenrod Avenue/East Coast Highway (SR-1); and
- Marguerite Avenue/East Coast Highway (SR-1).

The City of Newport Beach has no thresholds of significance for unsignalized intersections. Therefore, this analysis documents the delay/LOS, displaced parking, and vehicle queuing for existing conditions and the two alternative reconstruction conditions.

EXISTING CONDITIONS

Roadway Description

The characteristics of the roadway system in the vicinity of the project site are described below:

Marine Avenue is a two-lane undivided roadway trending in a north-south direction. There is no posted speed limit on Marine Avenue within the project vicinity; on-street parking is permitted.

Abalone Avenue is a one-way southbound undivided roadway. There is no posted speed limit on Abalone Avenue within the project vicinity; on-street parking is permitted.

Balboa Avenue is a two-lane undivided roadway trending in an east-west direction. Balboa Avenue is bisected by the Grand Canal water channel which runs north-south. There is no posted speed limit on Balboa Avenue within the project vicinity; on-street parking is permitted.

Park Avenue is a two-lane roadway with intermittent raised medians trending in an east-west direction. The Park Avenue Bridge spans the Grand Canal water channel. There is no posted speed limit on Park Avenue within the project vicinity; on-street parking is generally permitted with the exception of on the Park Avenue Bridge.

Existing Conditions Peak Hour Traffic Volumes

To determine existing operation of the study intersections, a.m. peak period and p.m. peak period traffic movement counts were collected in April 2014 during typical weekday conditions. The a.m. peak period intersection counts were collected from 7:00 a.m. to 9:00 a.m.; the p.m. peak period intersection counts were collected from 4:00 p.m. to 6:00 p.m. The traffic volumes used in this analysis were taken from the highest hour within the two-hour peak period counted. Additionally, daily traffic volumes for the roadway circulation system were also collected in April 2014. Detailed traffic count data sheets are contained in Appendix A.

Exhibit 3 shows existing conditions peak hour and daily volumes for the study area. Exhibit 4 shows existing study area geometry.

Existing Conditions Peak Hour Level of Service

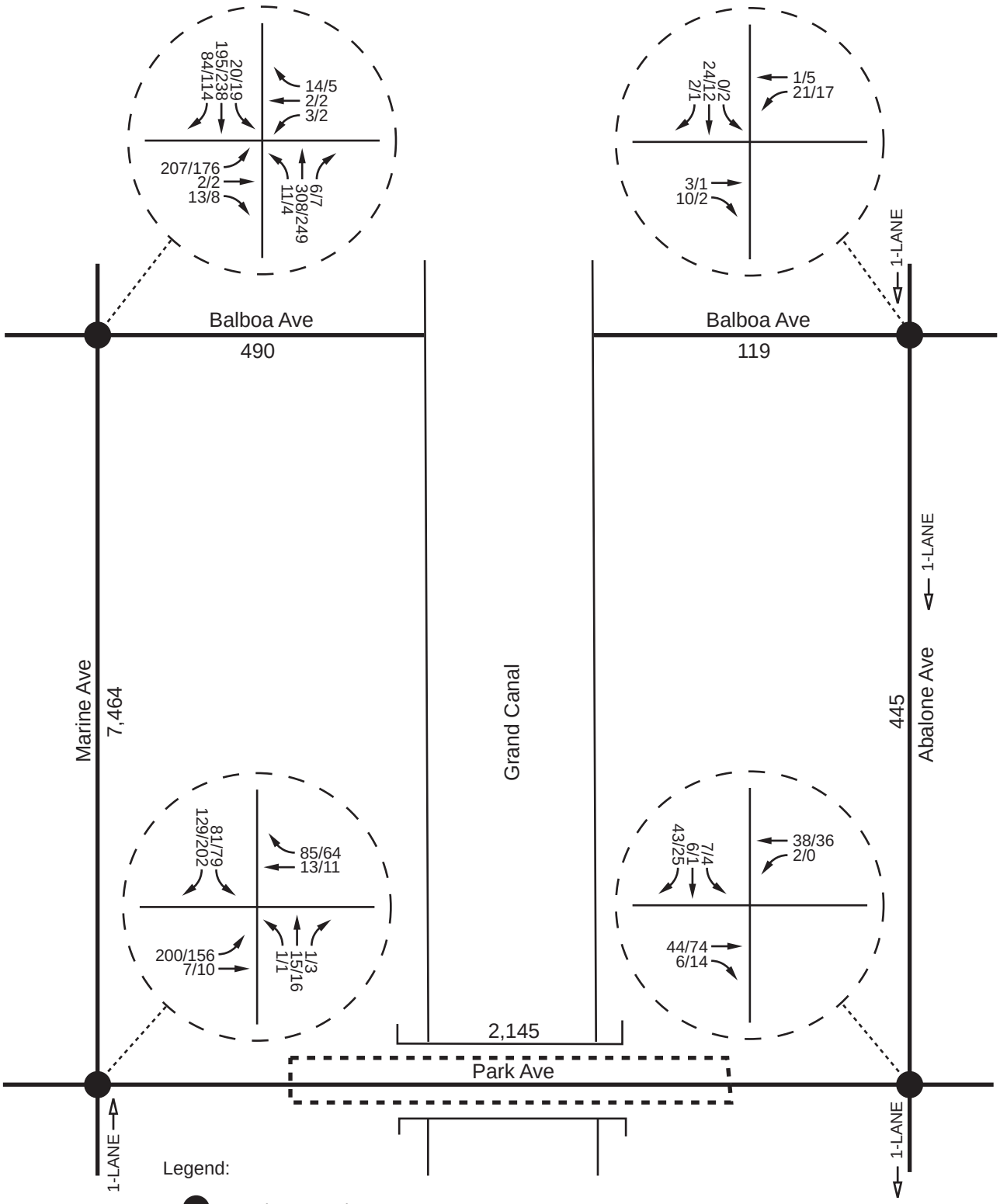
Table 2 summarizes existing conditions a.m. and p.m. peak hour LOS of the study intersections; detailed LOS analysis sheets are contained in Appendix B.

Table 2
Existing Conditions AM/PM Peak Hour Intersection LOS

Study Intersection	Existing Conditions	
	Delay – LOS	
	AM Peak Hour	PM Peak Hour
Marine Ave/Balboa Ave	12.3 - B	11.7 - B
Marine Ave/Park Ave	9.0 - A	9.4 - A
Abalone Ave/Balboa Ave	9.7 - A	9.3 - A
Abalone Ave/Park Ave	7.2 - A	7.2 - A

Note: delay shown in seconds.

As shown in Table 2, the study intersections are currently operating at an acceptable LOS (LOS D or better) according to City of Newport Beach performance criteria.



Existing Conditions Peak Hour & Daily Volumes

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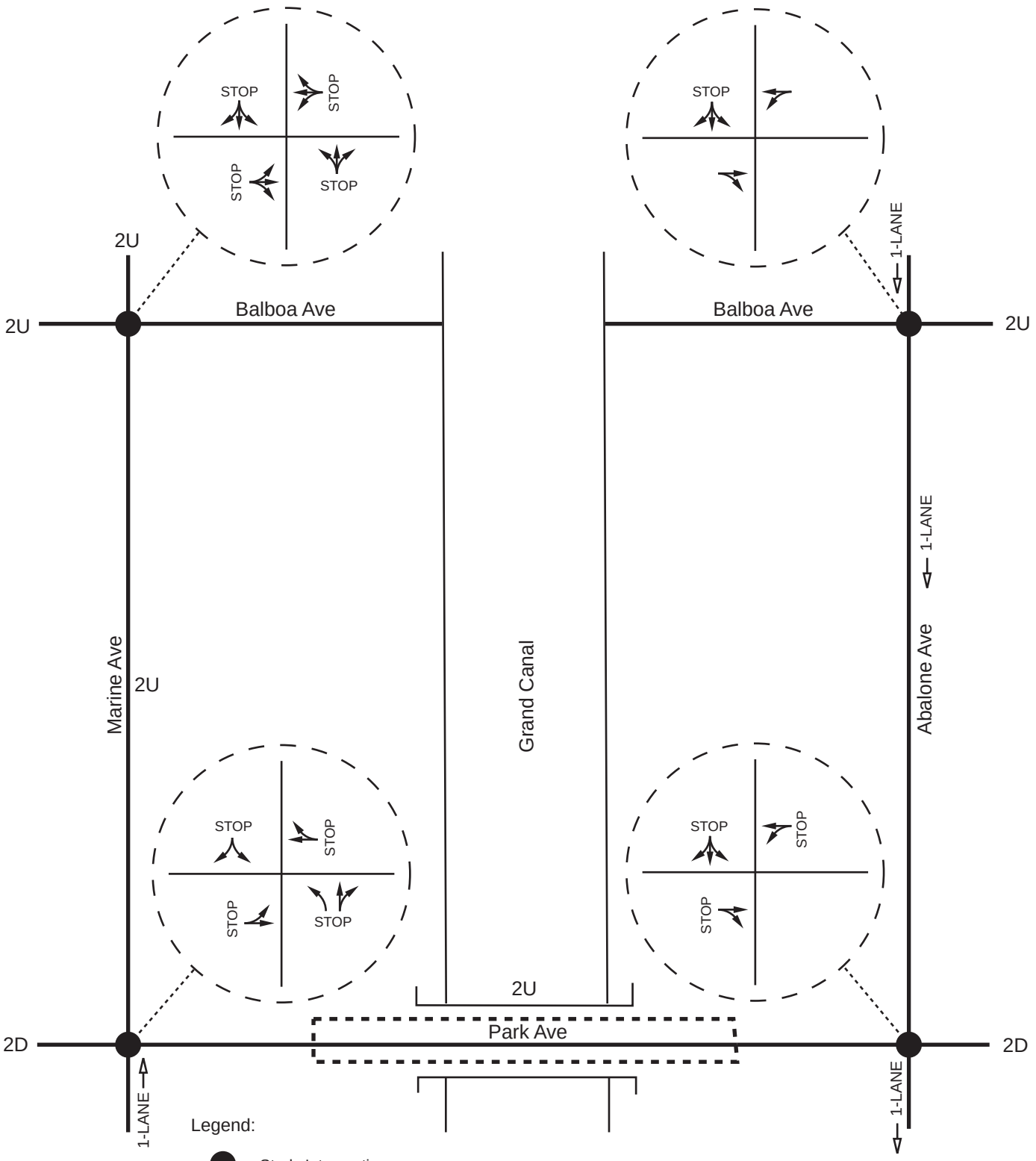
Exhibit 3



Existing Study Intersection Geometry & Control

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Exhibit 4

PROPOSED PROJECT

The proposed project consists of replacing the existing Park Avenue Bridge over Grand Canal on the east side of Balboa Island. During the reconstruction stages of the project, the following temporary traffic conditions are considered:

- Alternative 1 – provide alternating two-way traffic on a one-lane bridge controlled by temporary traffic signals at the Park Avenue location during the Park Avenue Bridge reconstruction stages; or

- Alternative 2 – provide two-way traffic on a temporary two-lane bridge at the Balboa Avenue location during the Park Avenue Bridge reconstruction stages with no traffic connection at the Park Avenue location.

Exhibit 5 shows the conceptual traffic conditions for the Alternative 1 reconstruction stage. As shown on Exhibit 5, the Marine Avenue/Park Avenue and Abalone Avenue/Park Avenue intersections would be temporarily signalized and coordinated to control the alternating two-way traffic on a one-lane bridge at the Park Avenue location during the reconstruction project. The traffic signal controls must be installed at the Marine Avenue/Park Avenue and Abalone Avenue/Park Avenue intersections to facilitate lane tapering into the one-lane bridge configuration.

Exhibit 6 shows the conceptual temporary bridge at the Balboa Avenue location for the Alternative 2 reconstruction stage. Under Alternative 2 reconstruction conditions, trips currently traversing the Park Avenue Bridge would be redistributed to the temporary Balboa Avenue connection since there would be no traffic connection at the Park Avenue location during the reconstruction stages. Approximately 11 on-street parking spaces would be temporarily displaced on the north side of Balboa Avenue between Marine Avenue and Abalone Avenue to allow two-way traffic.

Traffic conditions will return to existing conditions upon completion of the Park Avenue Bridge replacement.

ALTERNATIVE 1 RECONSTRUCTION CONDITIONS

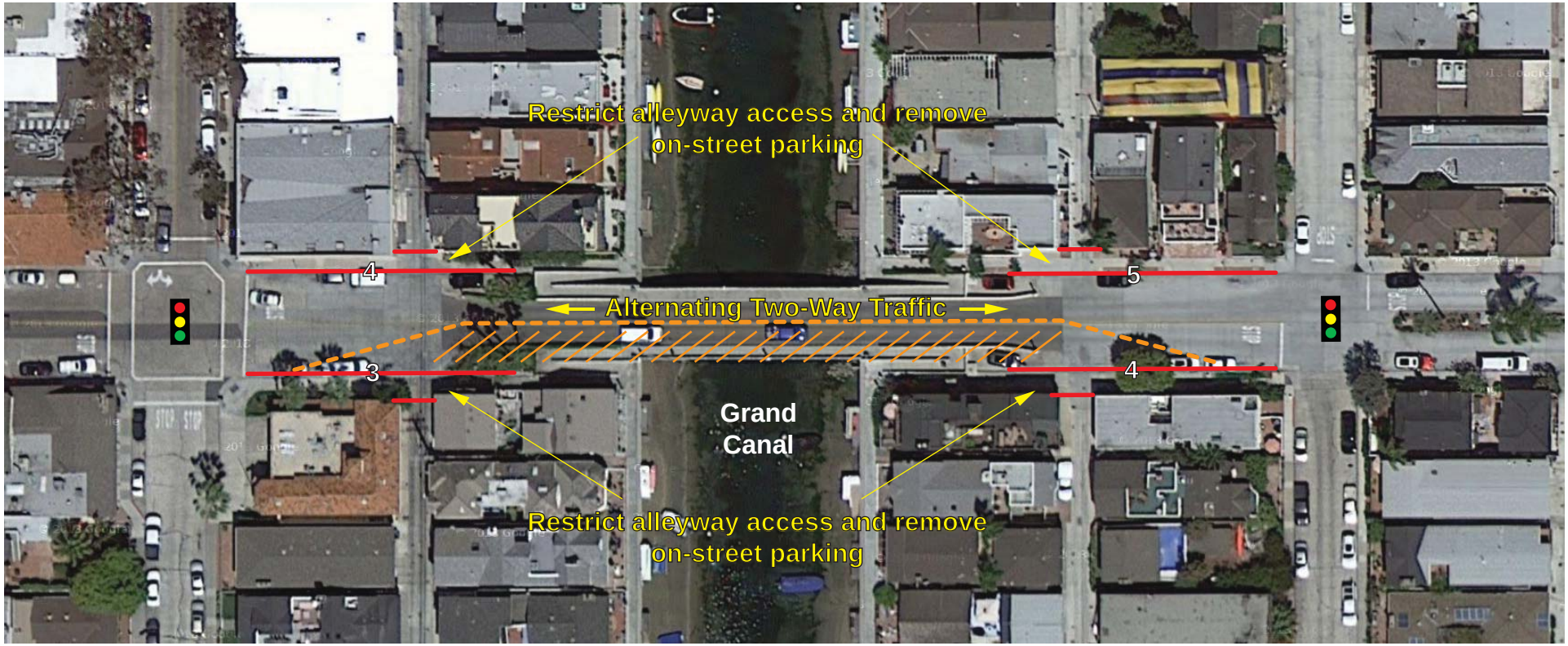
Under Alternative 1 reconstruction conditions, temporary traffic signals at the Marine Avenue/Park Avenue intersection and the Abalone Avenue/Park Avenue intersection would be coordinated to allow only one direction of travel at a time between the intersections.

Alternative 1 Reconstruction Conditions Peak Hour Traffic Volumes

Alternative 1 reconstruction conditions traffic volumes at the study intersections would remain the same as existing conditions.

Alternative 1 Reconstruction Conditions Peak Hour Level of Service

Table 3 summarizes Alternative 1 reconstruction conditions a.m. peak hour and p.m. peak hour LOS of the study intersections; detailed LOS analysis sheets are contained in Appendix B.



Legend:

- Temporary Signal Control
- Conceptual Lane Tapering
- # Approximate Number of Existing On-street Parking Spaces
- Construction Area

Not to Scale

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Conceptual Alternative 1 Southside Reconstruction Conditions

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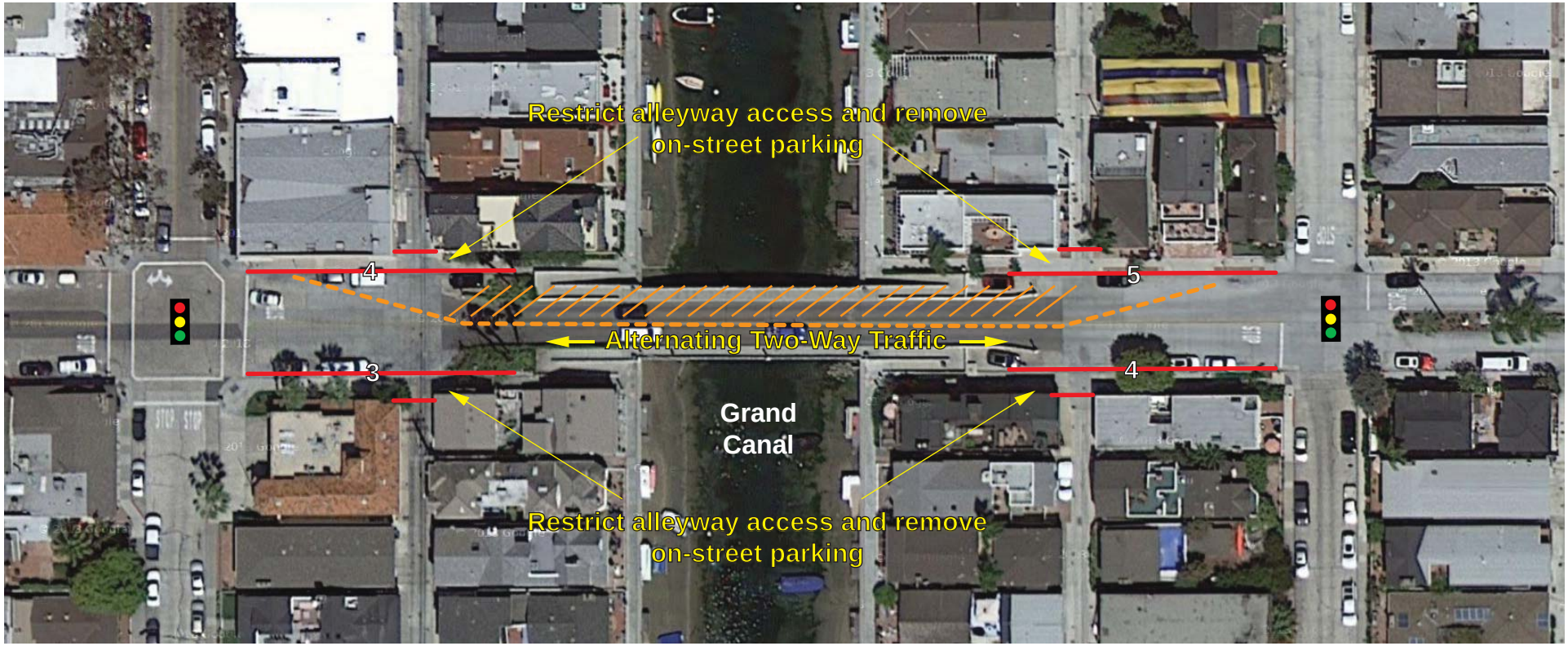
Exhibit 5a



Legend:

- Temporary Signal Control
- Conceptual Lane Tapering
- # Approximate Number of Existing On-street Parking Spaces
- Construction Area

Not to Scale

RBF A Baker Company

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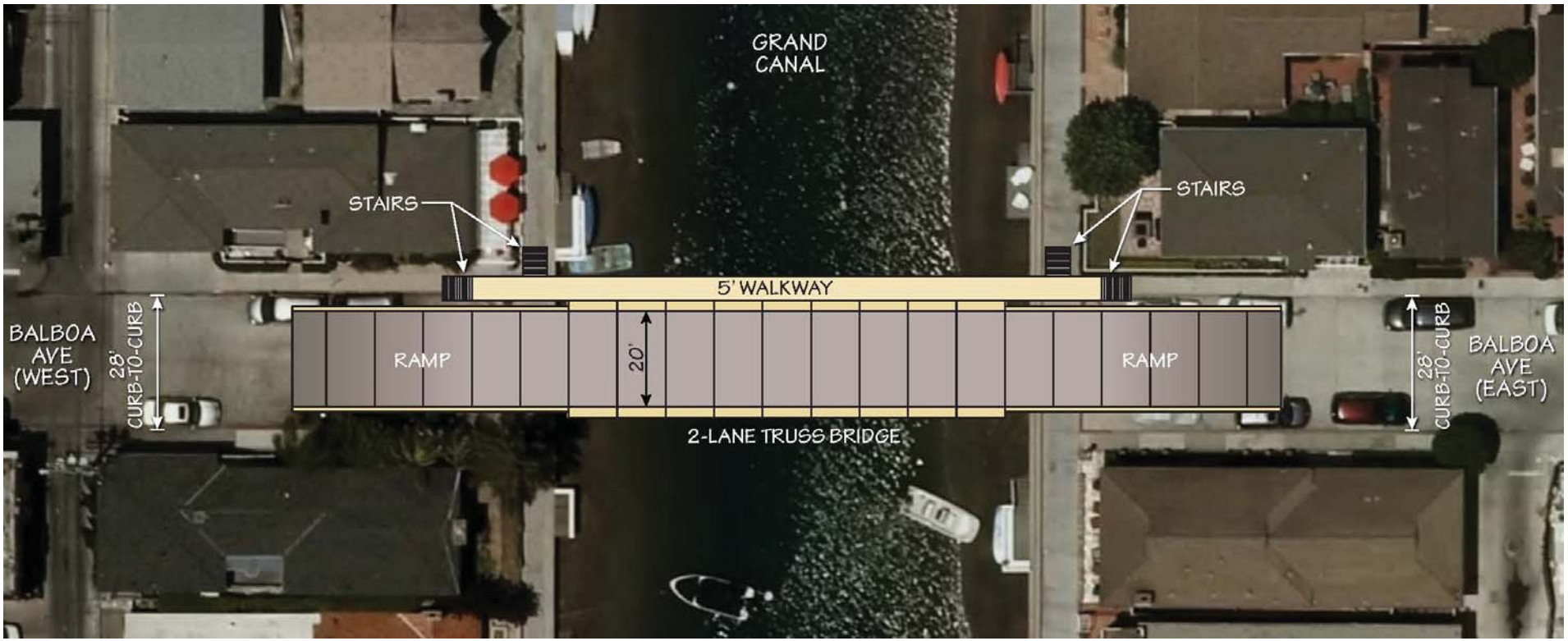
Conceptual Alternative 1 Northside Reconstruction Conditions

Exhibit 5b



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Conceptual Alternative 2 Reconstruction Conditions

Exhibit 6

Table 3
Alternative 1 Reconstruction Conditions AM & PM Peak Hour LOS

Study Intersection	Existing Conditions		Alternative 1 Reconstruction Conditions		Change in Delay	
	Delay – LOS		Delay – LOS		AM Peak Hour	PM Peak Hour
	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour		
Marine Ave/Balboa Ave	12.3 - B	11.7 - B	12.3 - B	11.7 - B	+0.0	+0.0
Marine Ave/Park Ave	9.0 - A	9.4 - A	**399.9 - F**	**305.6 - F**	+390.0	+295.6
Abalone Ave/Balboa Ave	9.7 - A	9.3 - A	9.7 - A	9.3 - A	+0.0	+0.0
Abalone Ave/Park Ave	7.2 - A	7.2 - A	**109.1 - F**	54.4 - D	+101.8	+46.8

Notes: delay shown in seconds; deficient intersection operation shown in bold.

As shown in Table 3, Alternative 1 reconstruction conditions are forecast to cause two of the study intersections to operate at a deficient LOS (LOS E or worse) according to City of Newport Beach performance criteria:

- Marine Avenue/Park Avenue (both a.m. peak hour and p.m. peak hour); and
- Abalone Avenue/Park Avenue (a.m. peak hour only).

Alternative 1 Reconstruction Conditions Parking and Other Considerations

As shown on Exhibit 5, Alternative 1 reconstruction conditions would require temporary displacement of existing on-street parking spaces along Park Avenue between Marine Avenue and Abalone Avenue. Allowing the existing on-street parking along Park Avenue between Marine Avenue and Abalone Avenue to remain on the non-construction side of Park Avenue would effectively allow by-pass of the traffic signals controlling one direction of travel at time. Therefore, the approximate 16 on-street parking spaces along Park Avenue between Marine Avenue and Abalone Avenue would be temporarily displaced under Alternative 1 reconstruction conditions.

For similar reasons, access at the alleyways located between Marine Avenue and Abalone Avenue would also have to be temporarily restricted to prevent vehicles from exiting the alleyways onto Park Avenue and conflicting with the alternating two-way travel under Alternative 1 reconstruction conditions. Alleyway restrictions would be most disruptive to delivery and trash hauling trucks servicing the commercial businesses fronting Marine Avenue.

ALTERNATIVE 2 RECONSTRUCTION CONDITIONS

Under Alternative 2 reconstruction conditions, trips currently traversing the Park Avenue Bridge would be redistributed to the temporary Balboa Avenue connection since there would be no traffic connection at the Park Avenue location during the reconstruction stage.

Alternative 2 Reconstruction Conditions Peak Hour Traffic Volumes

Exhibit 7 shows the Alternative 2 reconstruction conditions peak hour and daily volumes for the study area.

Alternative 2 Reconstruction Conditions Peak Hour Level of Service

Table 4 summarizes Alternative 2 reconstruction conditions a.m. peak hour and p.m. peak hour LOS of the study intersections; detailed LOS analysis sheets are contained in Appendix B.

Table 4
Alternative 2 Reconstruction Conditions AM & PM Peak Hour LOS

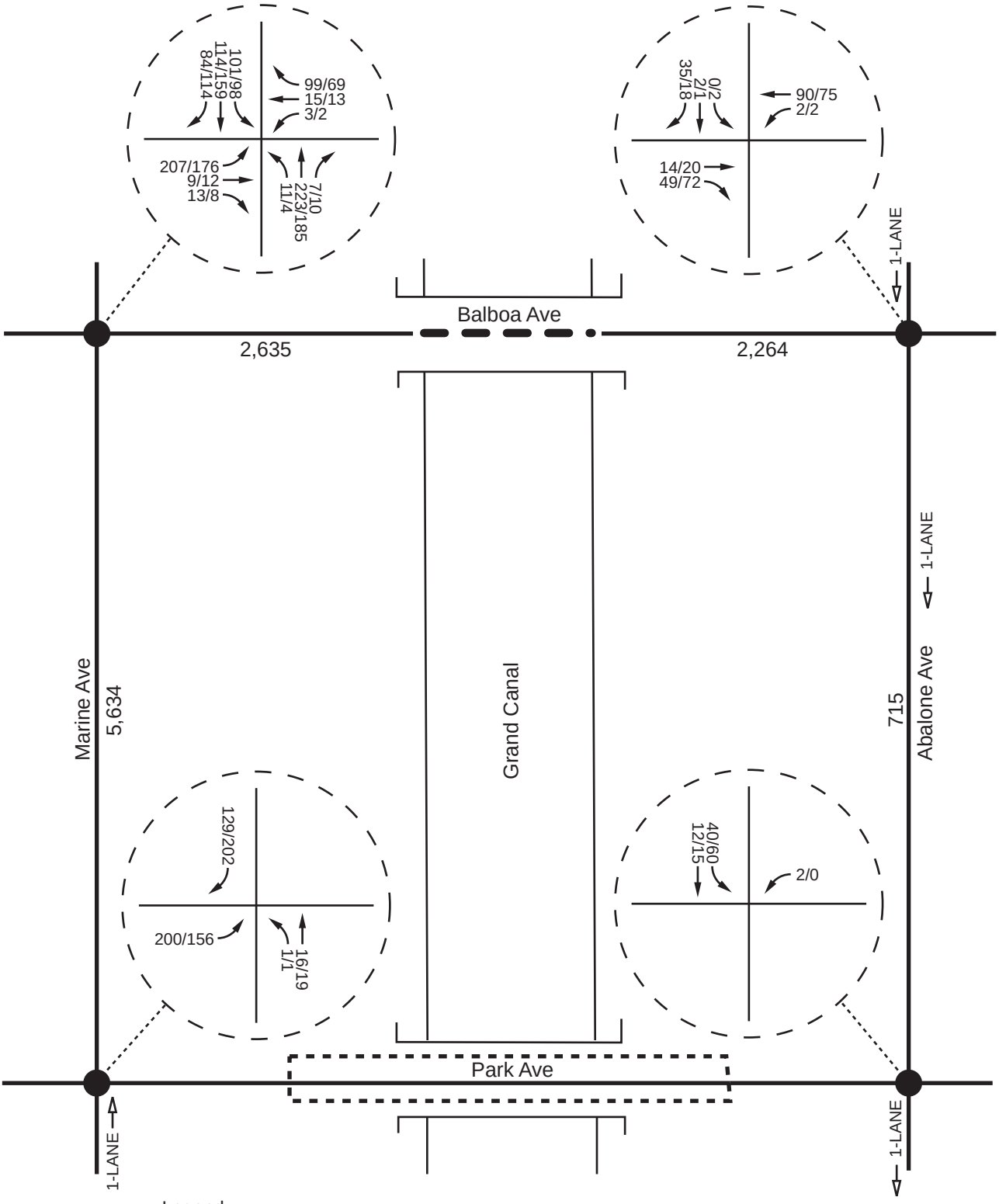
Study Intersection	Existing Conditions		Alternative 2 Reconstruction Conditions		Change in Delay	
	Delay – LOS		Delay – LOS		AM Peak Hour	PM Peak Hour
	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour		
Marine Ave/Balboa Ave	12.3 - B	11.7 - B	12.2 - B	12.0 - B	-0.1	+0.3
Marine Ave/Park Ave	9.0 - A	9.4 - A	8.4 - A	8.4 - A	-0.6	-1.0
Abalone Ave/Balboa Ave	9.7 - A	9.3 - A	9.3 - A	8.9 - A	-0.4	-0.4
Abalone Ave/Park Ave	7.2 - A	7.2 - A	7.4 - A	7.5 - A	+0.2	+0.3

Note: delay shown in seconds.

As shown in Table 4, the study intersections are forecast to continue to operate at an acceptable LOS (LOS D or better) according to City of Newport Beach performance criteria for Alternative 2 reconstruction conditions.

Alternative 2 Reconstruction Conditions Parking and Other Considerations

As shown on Exhibit 6, existing curb-to-curb width on Balboa Avenue between Marine Avenue and Abalone Avenue is approximately 28 feet; approximately twelve feet of travel way is provided with on-street parking allowed on both sides of Balboa Avenue. Therefore, approximately 11 on-street parking spaces would be temporarily displaced on the north side of Balboa Avenue between Marine Avenue and Abalone Avenue to allow two-way traffic for Alternative 2 reconstruction conditions.



Legend:

- Study Intersection
- Bridge Replacement Project Site Location
- One-Way
- STOP Stop-Controlled Approach
- XX/YY AM/PM Peak Hour Intersection Volumes
- X,XXX Daily Roadway Segment Volumes
- Proposed Temporary Bridge

Not to Scale

Alternative 2 Reconstruction
Conditions Peak Hour & Daily Volumes

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Exhibit 7

A queuing analysis has been conducted at the Marine Avenue/Balboa Avenue intersection since this study intersection is a key access point to Balboa Island and the intersection volumes are forecast to increase under Alternative 2 reconstruction conditions. Table 5 summarizes the results of the queue analysis of the northbound and southbound approaches at the Marine Avenue/Balboa Avenue intersection comparing existing and Alternative 2 reconstruction conditions; detailed queue analysis sheets are contained in Appendix C.

Table 5
Marine Avenue/Balboa Avenue Queue Lengths for Alternative 2 Reconstruction Conditions

Study Intersection	95th Percentile Queue Length				Change in Queue Length	
	Existing Conditions		Alternative 2 Reconstruction Conditions			
	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
Northbound Approach	40 feet	28 feet	45 feet	33 feet	+5 feet	+5 feet
Southbound Approach	53 feet	70 feet	63 feet	80 feet	+10 feet	+10 feet

Note: queue length is based on 25 feet of spacing per queued vehicle.

As shown in Table 5, queue lengths at the northbound and southbound approaches of the Marine Avenue/Balboa intersection are expected to increase during the a.m. and p.m. peak hours by no more than one vehicle (25 feet) for Alternative 2 reconstruction conditions.

CONCLUSIONS

Alternative 1 reconstruction conditions are forecast to cause two of the study intersections to operate at a deficient LOS (LOS E or worse) according to City of Newport Beach performance criteria.

The approximate 16 on-street parking spaces along Park Avenue between Marine Avenue and Abalone Avenue would be temporarily displaced under Alternative 1 reconstruction conditions.

Access at the alleyways located between Marine Avenue and Abalone Avenue would also have to be temporarily restricted to prevent vehicles from exiting the alleyways onto Park Avenue and conflicting with the alternating two-way travel under Alternative 1 reconstruction conditions. Alleyway restrictions would be most disruptive to delivery and trash hauling trucks servicing the commercial businesses fronting Marine Avenue.

The study intersections are forecast to continue to operate at an acceptable LOS (LOS D or better) according to City of Newport Beach performance criteria for Alternative 2 reconstruction conditions.

Approximately 11 on-street parking spaces would be temporarily displaced on the north side of Balboa Avenue between Marine Avenue and Abalone Avenue to allow two-way traffic for Alternative 2 reconstruction conditions.

Queue lengths at the northbound and southbound approaches of the Marine Avenue/Balboa intersection are expected to increase during the a.m. and p.m. peak hours by no more than one vehicle (25 feet) for Alternative 2 reconstruction conditions.

Table 6 shows a summary comparing Alternative 1 and Alternative 2 analysis.

Table 6
Summary of Alternative 1 and Alternative 2 Analysis

Conditions	Causes Intersection Deficiencies?	Causes Alley Restrictions?	Number of Parking Spaces Temporarily Displaced
Alternative 1 Reconstruction	Yes	Yes	16
Alternative 2 Reconstruction	No	No	11

APPENDIX A
Existing Count Data

Intersection Turning Movement Counts

Intersection Turning Movement

Prepared by:

National Data & Surveying Services

Project ID: 14-1095-001 **Day:** Tuesday

City: Newport Beach **Date:** 4/22/2014

AM

NS/EW Streets:	Marine Ave			Marine Ave			Balboa Ave			Balboa Ave			
	NORTHBOUND			SOUTHBOUND			EASTBOUND			WESTBOUND			
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
LANES:	0	1	0	0	1	0	0	1	0	0	1	0	
7:00 AM	0	48	0	7	41	14	18	0	1	0	0	2	131
7:15 AM	0	63	0	5	43	9	41	1	1	1	0	2	166
7:30 AM	2	62	0	9	41	17	47	1	1	1	0	1	182
7:45 AM	3	77	1	3	44	17	65	0	1	0	0	4	215
8:00 AM	1	74	3	5	46	21	45	0	8	0	0	3	206
8:15 AM	3	80	3	7	45	24	58	1	1	1	1	6	230
8:30 AM	3	75	0	5	50	22	52	0	1	2	1	2	213
8:45 AM	4	79	0	3	54	17	52	1	3	0	0	3	216
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
TOTAL VOLUMES :	16	558	7	44	364	141	378	4	17	5	2	23	1559
APPROACH %'s :	2.75%	96.04%	1.20%	8.01%	66.30%	25.68%	94.74%	1.00%	4.26%	16.67%	6.67%	76.67%	
PEAK HR START TIME :	800 AM												TOTAL
PEAK HR VOL :	11	308	6	20	195	84	207	2	13	3	2	14	865
PEAK HR FACTOR :		0.945			0.971			0.925			0.594		0.940

CONTROL : 4-Way Stop

Intersection Turning Movement

Prepared by:

National Data & Surveying Services

Project ID: 14-1095-001 **Day:** Tuesday

City: Newport Beach **Date:** 4/22/2014

PM

NS/EW Streets:	Marine Ave			Marine Ave			Balboa Ave			Balboa Ave			
	NORTHBOUND			SOUTHBOUND			EASTBOUND			WESTBOUND			
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
LANES:	0	1	0	0	1	0	0	1	0	0	1	0	
4:00 PM	1	70	1	4	50	24	57	0	3	1	0	1	212
4:15 PM	1	64	3	5	70	32	39	1	2	0	1	0	218
4:30 PM	2	55	2	5	51	34	34	1	2	0	1	0	187
4:45 PM	0	60	1	5	67	24	46	0	1	1	0	4	209
5:00 PM	1	62	0	1	69	24	37	0	2	0	1	1	198
5:15 PM	0	62	0	3	68	20	36	0	1	0	1	2	193
5:30 PM	2	50	1	5	69	15	33	0	2	1	1	3	182
5:45 PM	2	67	0	3	70	31	36	0	0	0	1	2	212
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
TOTAL VOLUMES :	9	490	8	31	514	204	318	2	13	3	6	13	1611
APPROACH %'s :	1.78%	96.65%	1.58%	4.14%	68.62%	27.24%	95.50%	0.60%	3.90%	13.64%	27.27%	59.09%	
PEAK HR START TIME :	400 PM												TOTAL
PEAK HR VOL :	4	249	7	19	238	114	176	2	8	2	2	5	826
PEAK HR FACTOR :		0.903			0.867			0.775			0.450		0.947

CONTROL : 4-Way Stop

ITM Peak Hour Summary

Prepared by:

National Data & Surveying Services

Marine Ave and Balboa Ave , Newport Beach

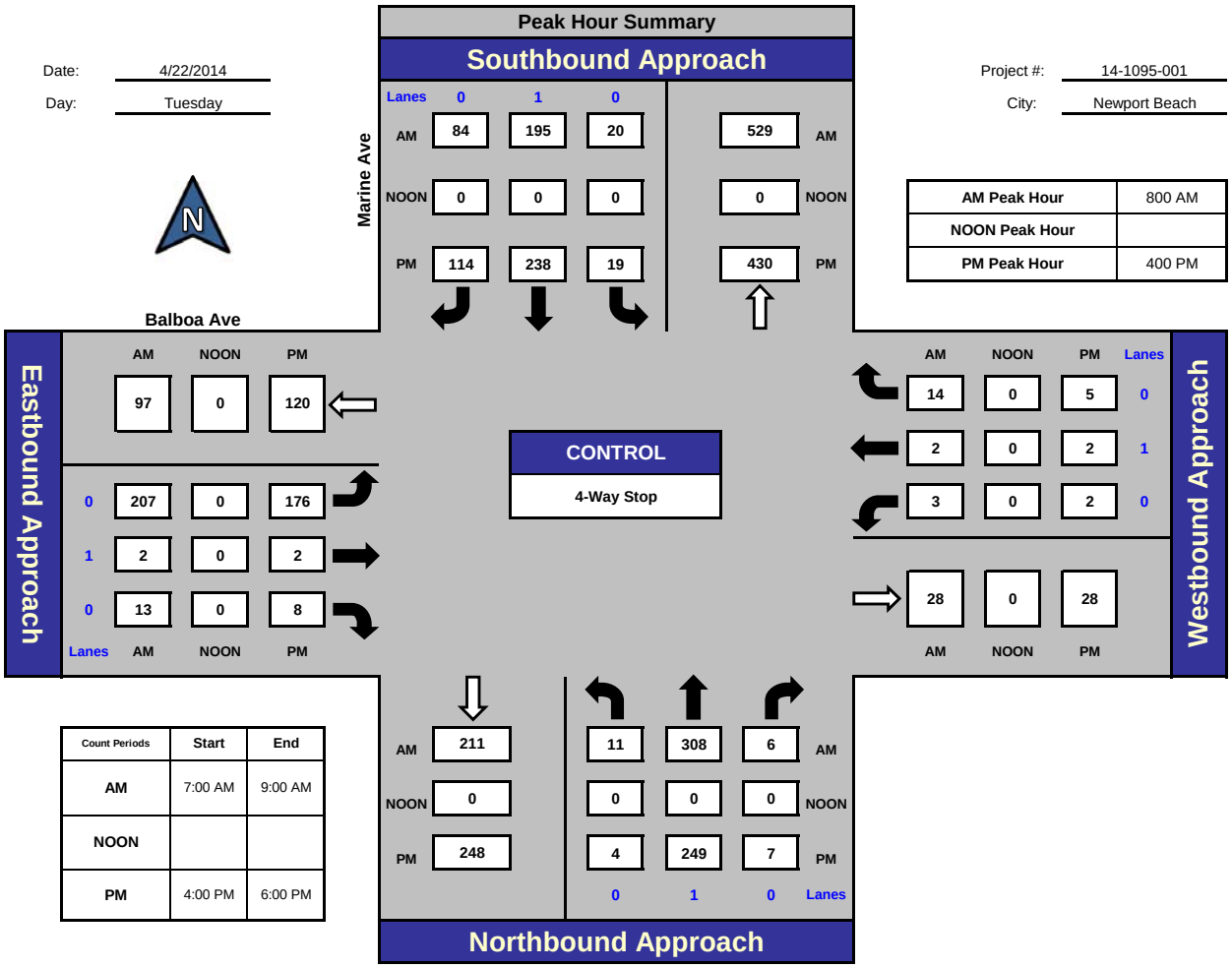
Date: 4/22/2014

Day: Tuesday

Project #: 14-1095-001

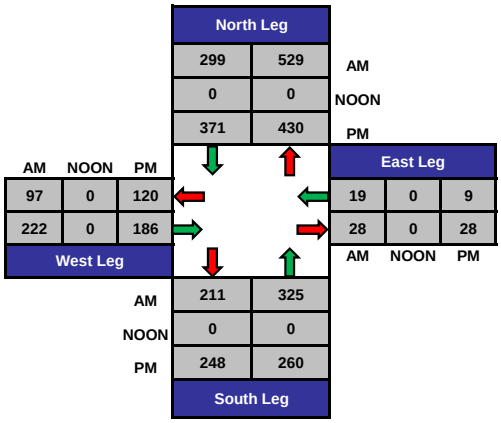
City: Newport Beach

AM Peak Hour	800 AM
NOON Peak Hour	
PM Peak Hour	400 PM

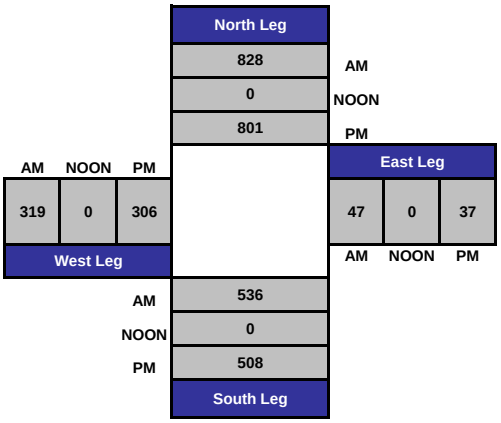


Count Periods	Start	End
AM	7:00 AM	9:00 AM
NOON		
PM	4:00 PM	6:00 PM

Total Ins & Outs



Total Volume Per Leg



Intersection Turning Movement

Prepared by:

National Data & Surveying Services

Project ID: 14-1095-002 **Day:** Tuesday

City: Newport Beach **Date:** 4/22/2014

AM

NS/EW Streets:	Marine Ave			Marine Ave			Park Ave			Park Ave			
	NORTHBOUND			SOUTHBOUND			EASTBOUND			WESTBOUND			
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
LANES:	0	1	0	0.5	0	0.5	0	1	0	0	1	0	
7:00 AM	0	3	0	15	0	28	31	2	0	0	1	10	90
7:15 AM	0	9	0	16	0	27	37	2	0	0	0	18	109
7:30 AM	0	5	0	18	0	23	37	2	0	0	4	16	105
7:45 AM	0	5	1	11	0	35	51	5	0	0	2	18	128
8:00 AM	0	4	0	23	0	31	49	2	0	0	2	17	128
8:15 AM	1	6	1	21	0	23	52	3	0	0	6	24	137
8:30 AM	0	2	0	17	0	39	50	2	0	0	3	22	135
8:45 AM	0	3	0	20	0	36	49	0	0	0	2	22	132
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
TOTAL VOLUMES :	1	37	2	141	0	242	356	18	0	0	20	147	964
APPROACH %'s :	2.50%	92.50%	5.00%	36.81%	0.00%	63.19%	95.19%	4.81%	0.00%	0.00%	11.98%	88.02%	
PEAK HR START TIME :	800 AM												TOTAL
PEAK HR VOL :	1	15	1	81	0	129	200	7	0	0	13	85	532
PEAK HR FACTOR :		0.531			0.938			0.941			0.817		0.971

CONTROL : 4-Way Stop

Intersection Turning Movement

Prepared by:

National Data & Surveying Services

Project ID: 14-1095-002 **Day:** Tuesday

City: Newport Beach **Date:** 4/22/2014

PM

NS/EW Streets:	Marine Ave			Marine Ave			Park Ave			Park Ave			
	NORTHBOUND			SOUTHBOUND			EASTBOUND			WESTBOUND			
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
LANES:	0	1	0	0.5	0	0.5	0	1	0	0	1	0	
4:00 PM	0	4	1	24	0	31	38	4	0	0	4	22	128
4:15 PM	1	6	1	30	0	37	44	1	0	0	6	14	140
4:30 PM	1	2	0	26	0	33	36	2	0	0	3	15	118
4:45 PM	0	3	0	27	0	41	37	5	0	0	2	17	132
5:00 PM	0	4	1	20	0	50	37	2	0	0	3	15	132
5:15 PM	0	5	2	11	0	57	38	1	0	0	1	15	130
5:30 PM	1	4	0	23	0	48	38	2	0	0	2	14	132
5:45 PM	0	3	0	25	0	47	43	5	0	0	5	20	148
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
TOTAL VOLUMES :	3	31	5	186	0	344	311	22	0	0	26	132	1060
APPROACH %'s :	7.69%	79.49%	12.82%	35.09%	0.00%	64.91%	93.39%	6.61%	0.00%	0.00%	16.46%	83.54%	
PEAK HR START TIME :	500 PM												TOTAL
PEAK HR VOL :	1	16	3	79	0	202	156	10	0	0	11	64	542
PEAK HR FACTOR :		0.714			0.976			0.865			0.750		0.916

CONTROL : 4-Way Stop

ITM Peak Hour Summary

Prepared by:

National Data & Surveying Services

Marine Ave and Park Ave , Newport Beach

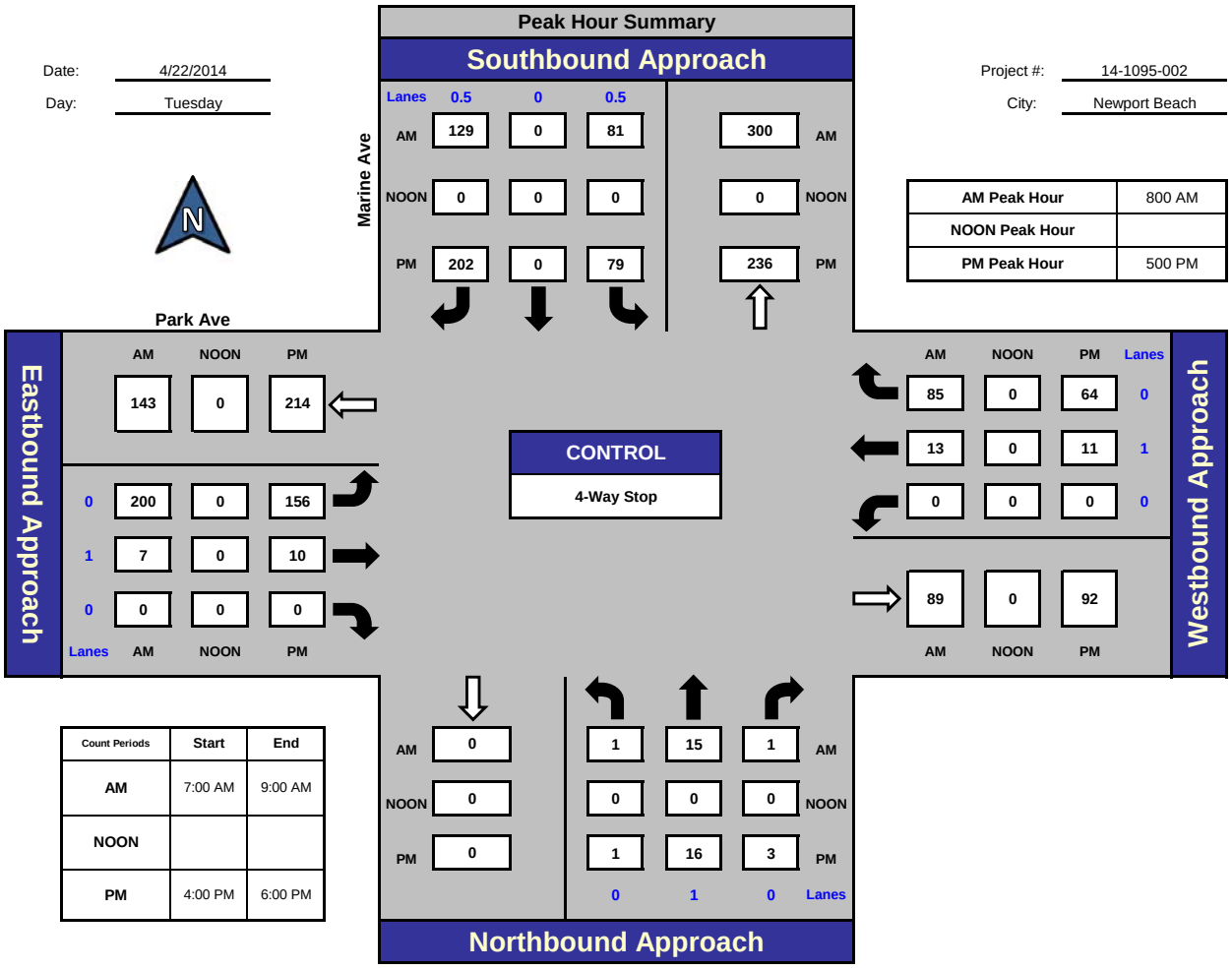
Date: 4/22/2014

Day: Tuesday

Project #: 14-1095-002

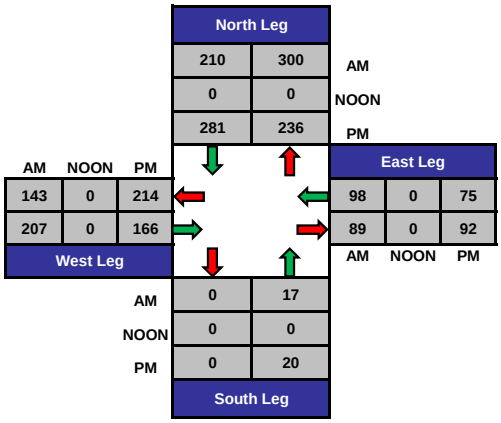
City: Newport Beach

AM Peak Hour	800 AM
NOON Peak Hour	
PM Peak Hour	500 PM

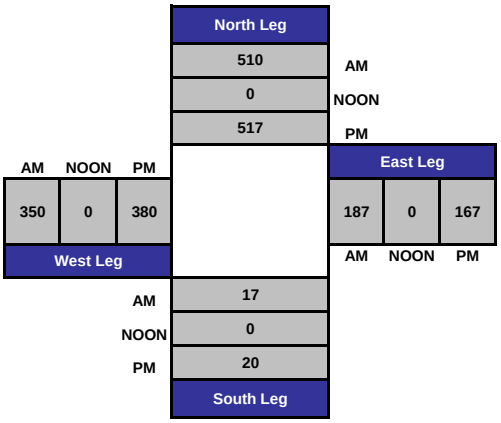


Count Periods	Start	End
AM	7:00 AM	9:00 AM
NOON		
PM	4:00 PM	6:00 PM

Total Ins & Outs



Total Volume Per Leg



Intersection Turning Movement

Prepared by:

National Data & Surveying Services

Project ID: 14-1095-003 **Day:** Tuesday

City: Newport Beach **Date:** 4/22/2014

AM

NS/EW Streets:	Abalone Ave			Abalone Ave			Balboa Ave			Balboa Ave			
	NORTHBOUND			SOUTHBOUND			EASTBOUND			WESTBOUND			
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
LANES:	0	0	0	0	1	0	0	1	0	0	1	0	
7:00 AM	0	0	0	0	1	0	0	0	1	1	0	0	3
7:15 AM	0	0	0	0	2	0	0	0	1	7	0	0	10
7:30 AM	0	0	0	0	5	0	0	0	0	4	0	0	9
7:45 AM	0	0	0	0	3	0	0	0	1	4	0	0	8
8:00 AM	0	0	0	0	3	0	0	0	2	5	0	0	10
8:15 AM	0	0	0	0	9	0	0	2	4	8	1	0	24
8:30 AM	0	0	0	0	5	0	0	0	2	5	0	0	12
8:45 AM	0	0	0	0	7	2	0	1	2	3	0	0	15
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
TOTAL VOLUMES :	0	0	0	0	35	2	0	3	13	37	1	0	91
APPROACH %'s :	#DIV/0!	#DIV/0!	#DIV/0!	0.00%	94.59%	5.41%	0.00%	18.75%	81.25%	97.37%	2.63%	0.00%	
PEAK HR START TIME :	800 AM												TOTAL
PEAK HR VOL :	0	0	0	0	24	2	0	3	10	21	1	0	61
PEAK HR FACTOR :		0.000			0.722			0.542			0.611		0.635

CONTROL : 1-Way Stop (SB)

Intersection Turning Movement

Prepared by:

National Data & Surveying Services

Project ID: 14-1095-003 **Day:** Tuesday

City: Newport Beach **Date:** 4/22/2014

PM

NS/EW Streets:	Abalone Ave			Abalone Ave			Balboa Ave			Balboa Ave			
	NORTHBOUND			SOUTHBOUND			EASTBOUND			WESTBOUND			
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
LANES:	0	0	0	0	1	0	0	1	0	0	1	0	
4:00 PM	0	0	0	0	4	0	0	0	1	5	2	0	12
4:15 PM	0	0	0	1	1	0	0	0	0	3	1	0	6
4:30 PM	0	0	0	1	3	1	0	1	0	5	0	0	11
4:45 PM	0	0	0	0	4	0	0	0	1	4	2	0	11
5:00 PM	0	0	0	0	2	0	0	0	0	4	1	0	7
5:15 PM	0	0	0	0	3	0	0	0	2	3	0	0	8
5:30 PM	0	0	0	0	2	0	0	0	2	4	1	0	9
5:45 PM	0	0	0	0	4	0	0	0	1	3	3	0	11
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
TOTAL VOLUMES :	0	0	0	2	23	1	0	1	7	31	10	0	75
APPROACH %'s :	#DIV/0!	#DIV/0!	#DIV/0!	7.69%	88.46%	3.85%	0.00%	12.50%	87.50%	75.61%	24.39%	0.00%	
PEAK HR START TIME :	400 PM												TOTAL
PEAK HR VOL :	0	0	0	2	12	1	0	1	2	17	5	0	40
PEAK HR FACTOR :		0.000			0.750			0.750			0.786		0.833

CONTROL : 1-Way Stop (SB)

ITM Peak Hour Summary

Prepared by:

National Data & Surveying Services

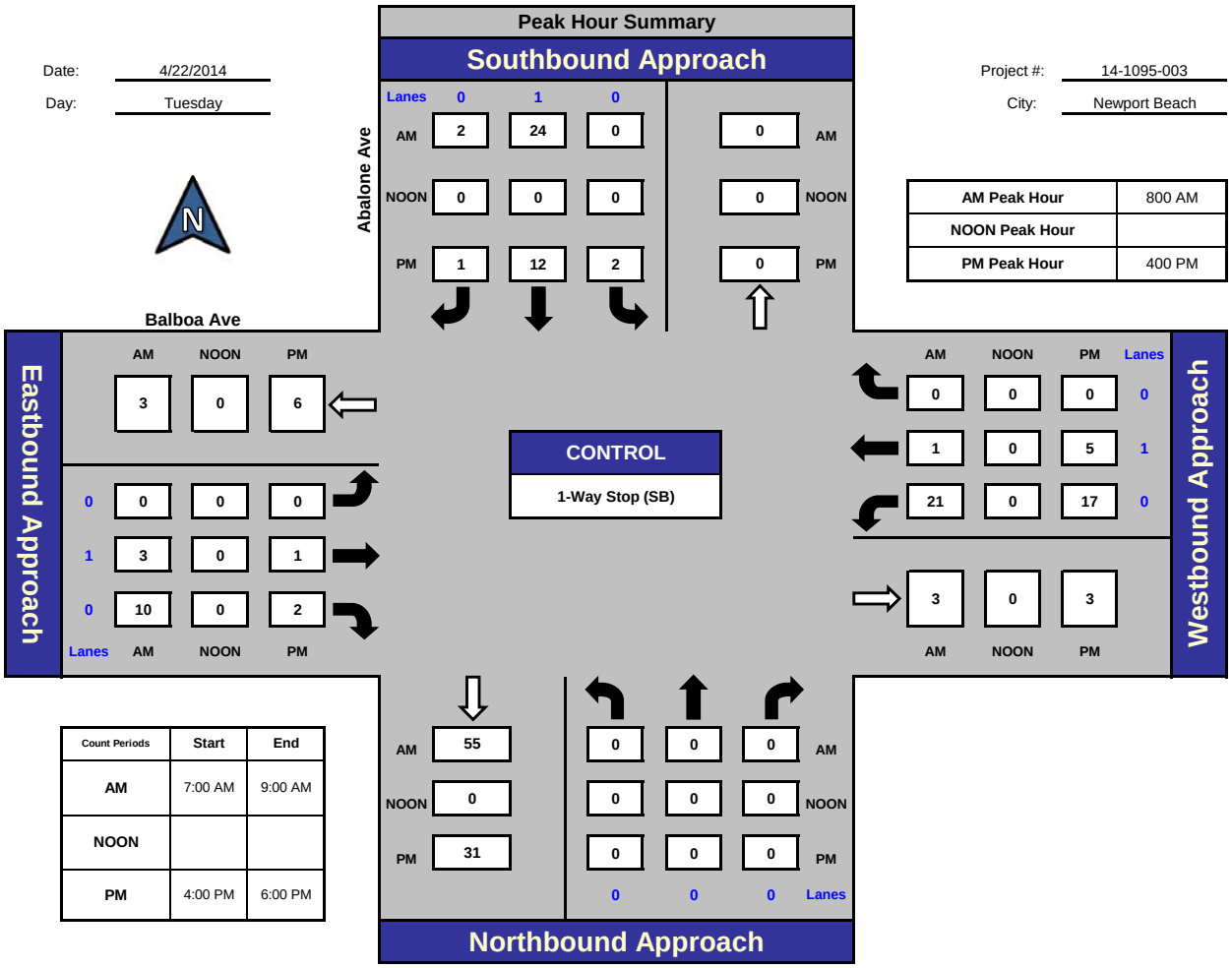
Abalone Ave and Balboa Ave , Newport Beach

Date: 4/22/2014

Day: Tuesday

Project #: 14-1095-003

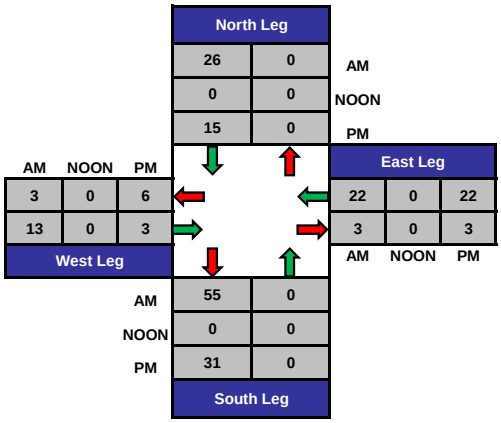
City: Newport Beach



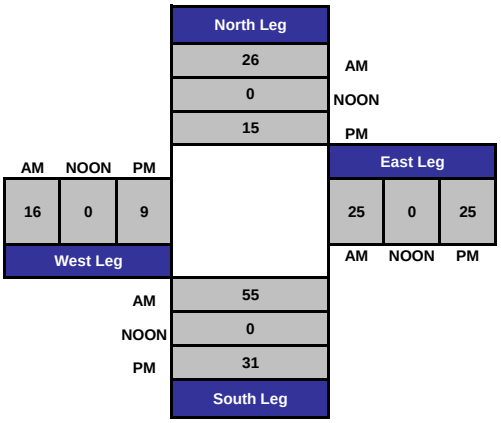
AM Peak Hour	800 AM
NOON Peak Hour	
PM Peak Hour	400 PM

Count Periods	Start	End
AM	7:00 AM	9:00 AM
NOON		
PM	4:00 PM	6:00 PM

Total Ins & Outs



Total Volume Per Leg



Intersection Turning Movement

Prepared by:

National Data & Surveying Services

Project ID: 14-1095-004 **Day:** Tuesday

City: Newport Beach **Date:** 4/22/2014

AM

NS/EW Streets:	Abalone Ave			Abalone Ave			Park Ave			Park Ave			
	NORTHBOUND			SOUTHBOUND			EASTBOUND			WESTBOUND			
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
LANES:	0	0	0	0	1	0	0	1	0	0	1	0	
7:00 AM	0	0	0	0	0	4	0	5	2	1	5	0	17
7:15 AM	0	0	0	1	0	8	0	10	0	1	11	0	31
7:30 AM	0	0	0	1	0	7	0	7	2	1	9	0	27
7:45 AM	0	0	0	1	0	10	0	8	1	0	3	0	23
8:00 AM	0	0	0	1	1	8	0	8	2	0	6	0	26
8:15 AM	0	0	0	5	2	13	1	13	1	0	13	0	48
8:30 AM	0	0	0	0	2	13	0	10	1	0	9	0	35
8:45 AM	0	0	0	1	1	9	1	11	2	2	10	0	37
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
TOTAL VOLUMES :	0	0	0	10	6	72	2	72	11	5	66	0	244
APPROACH %'s :	#DIV/0!	#DIV/0!	#DIV/0!	11.36%	6.82%	81.82%	2.35%	84.71%	12.94%	7.04%	92.96%	0.00%	
PEAK HR START TIME :	800 AM												TOTAL
PEAK HR VOL :	0	0	0	7	6	43	2	42	6	2	38	0	146
PEAK HR FACTOR :		0.000			0.700			0.833			0.769		0.760

CONTROL : 3-Way Stop (SB/EB/WB)

Intersection Turning Movement

Prepared by:

National Data & Surveying Services

Project ID: 14-1095-004 **Day:** Tuesday

City: Newport Beach **Date:** 4/22/2014

PM

NS/EW Streets:	Abalone Ave			Abalone Ave			Park Ave			Park Ave			
	NORTHBOUND			SOUTHBOUND			EASTBOUND			WESTBOUND			
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
LANES:	0	0	0	0	1	0	0	1	0	0	1	0	
4:00 PM	0	0	0	2	1	8	1	16	2	0	11	0	41
4:15 PM	0	0	0	0	0	2	1	17	5	0	11	0	36
4:30 PM	0	0	0	0	0	9	0	19	4	0	3	0	35
4:45 PM	0	0	0	2	0	6	1	19	3	0	11	0	42
5:00 PM	0	0	0	0	0	5	1	6	4	0	6	0	22
5:15 PM	0	0	0	0	0	8	0	6	1	1	7	0	23
5:30 PM	0	0	0	1	0	6	1	13	5	0	5	0	31
5:45 PM	0	0	0	1	0	9	0	15	4	0	10	0	39
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
TOTAL VOLUMES :	0	0	0	6	1	53	5	111	28	1	64	0	269
APPROACH %'s :	#DIV/0!	#DIV/0!	#DIV/0!	10.00%	1.67%	88.33%	3.47%	77.08%	19.44%	1.54%	98.46%	0.00%	
PEAK HR START TIME :	400 PM												TOTAL
PEAK HR VOL :	0	0	0	4	1	25	3	71	14	0	36	0	154
PEAK HR FACTOR :		0.000			0.682			0.957			0.818		0.917

CONTROL : 3-Way Stop (SB/EB/WB)

ITM Peak Hour Summary

Prepared by:

National Data & Surveying Services

Abalone Ave and Park Ave , Newport Beach

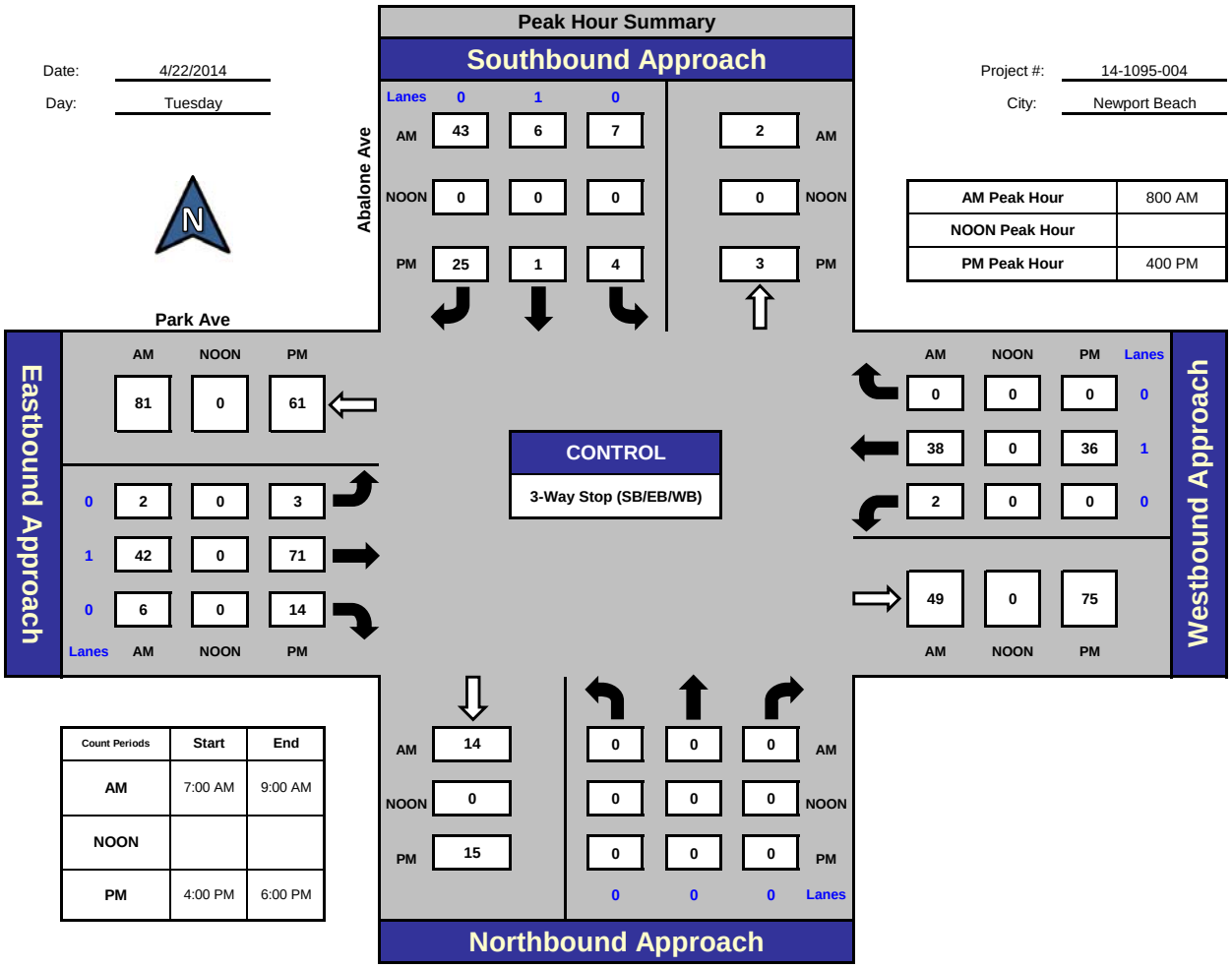
Date: 4/22/2014

Day: Tuesday

Project #: 14-1095-004

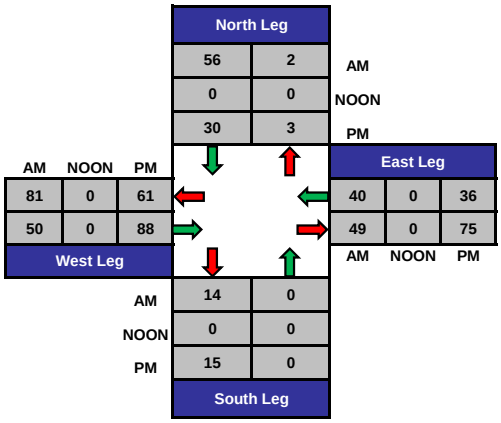
City: Newport Beach

AM Peak Hour	800 AM
NOON Peak Hour	
PM Peak Hour	400 PM

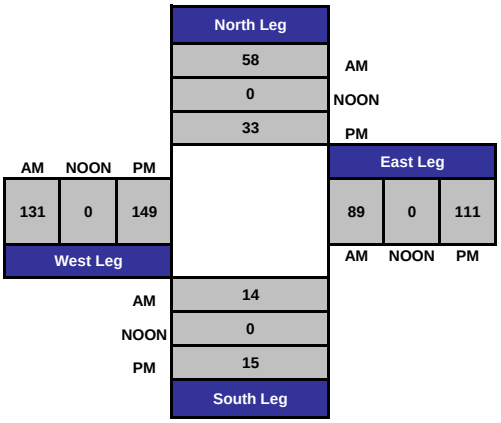


Count Periods	Start	End
AM	7:00 AM	9:00 AM
NOON		
PM	4:00 PM	6:00 PM

Total Ins & Outs



Total Volume Per Leg



Daily Traffic Counts

Prepared by NDS/ATD

VOLUME

Marine Ave btwn Balboa Ave & Park Ave

Day: Tuesday
Date: 4/22/2014

City: Newport Beach
Project #: CA14_1096_001

DAILY TOTALS	NB	SB	EB	WB	Total
	4,035	3,429	0	0	7,464

AM Period	NB		SB		EB	WB	TOTAL		PM Period	NB		SB		EB	WB	TOTAL	
00:00	6		2				8		12:00	73		70				143	
00:15	3		5				8		12:15	68		60				128	
00:30	0		5				5		12:30	74		67				141	
00:45	1	10	5	17			6	27	12:45	67	282	76	273			143	555
01:00	2		1				3		13:00	69		49				118	
01:15	1		0				1		13:15	63		59				122	
01:30	0		0				0		13:30	76		56				132	
01:45	0	3	0	1			0	4	13:45	70	278	58	222			128	500
02:00	1		0				1		14:00	78		59				137	
02:15	0		1				1		14:15	93		62				155	
02:30	0		0				0		14:30	68		54				122	
02:45	2	3	1	2			3	5	14:45	68	307	48	223			116	530
03:00	1		2				3		15:00	53		48				101	
03:15	1		0				1		15:15	95		58				153	
03:30	1		1				2		15:30	81		63				144	
03:45	2	5	0	3			2	8	15:45	88	317	55	224			143	541
04:00	1		1				2		16:00	72		54				126	
04:15	2		3				5		16:15	68		72				140	
04:30	2		1				3		16:30	59		53				112	
04:45	8	13	1	6			9	19	16:45	61	260	69	248			130	508
05:00	4		2				6		17:00	63		71				134	
05:15	11		6				17		17:15	62		69				131	
05:30	12		8				20		17:30	53		72				125	
05:45	21	48	10	26			31	74	17:45	69	247	70	282			139	529
06:00	16		13				29		18:00	84		61				145	
06:15	30		9				39		18:15	58		67				125	
06:30	36		26				62		18:30	46		63				109	
06:45	35	117	31	79			66	196	18:45	57	245	70	261			127	506
07:00	48		42				90		19:00	50		63				113	
07:15	63		45				108		19:15	42		41				83	
07:30	64		43				107		19:30	44		50				94	
07:45	81	256	45	175			126	431	19:45	39	175	51	205			90	380
08:00	78		54				132		20:00	41		47				88	
08:15	86		48				134		20:15	46		50				96	
08:30	78		53				131		20:30	24		36				60	
08:45	83	325	57	212			140	537	20:45	35	146	37	170			72	316
09:00	59		43				102		21:00	34		31				65	
09:15	61		40				101		21:15	28		29				57	
09:30	70		47				117		21:30	17		29				46	
09:45	69	259	45	175			114	434	21:45	22	101	23	112			45	213
10:00	63		47				110		22:00	22		20				42	
10:15	67		50				117		22:15	17		12				29	
10:30	71		56				127		22:30	9		19				28	
10:45	70	271	53	206			123	477	22:45	7	55	7	58			14	113
11:00	69		52				121		23:00	4		9				13	
11:15	76		54				130		23:15	5		4				9	
11:30	72		62				134		23:30	5		7				12	
11:45	79	296	57	225			136	521	23:45	2	16	4	24			6	40
TOTALS		1606		1127				**2733**	**TOTALS**		2429		2302				**4731**
SPLIT %		58.8%		41.2%				**36.6%**	**SPLIT %**		51.3%		48.7%				**63.4%**

DAILY TOTALS	NB	SB	EB	WB	Total
	4,035	3,429	0	0	7,464

AM Peak Hour	08:00	11:45					**11:45**		**PM Peak Hour**	15:15	17:00					**15:15**		
AM Pk Volume	325	254					**548**		**PM Pk Volume**	336	282					**566**		
Pk Hr Factor	0.945	0.907					**0.958**		**Pk Hr Factor**	0.884	0.979					**0.925**		
7 - 9 Volume	581	387	0	0			**968**		**4 - 6 Volume**	507	530	0	0			**1037**		
7 - 9 Peak Hour	08:00	08:00					**08:00**		**4 - 6 Peak Hour**	16:00	17:00					**17:00**		
7 - 9 Pk Volume	325	212	0	0			**537**		**4 - 6 Pk Volume**	260	282	0	0			**529**		
Pk Hr Factor	0.945	0.930	0.000	0.000			**0.959**		**Pk Hr Factor**	0.903	0.979	0.000	0.000			**0.951**		

Prepared by NDS/ATD

VOLUME

Park Ave btwn Marine Ave & Abalone Ave

Day: Tuesday
Date: 4/22/2014

City: Newport Beach
Project #: CA14_1096_002

DAILY TOTALS	NB	SB	EB	WB	Total
	0	0	1,056	1,089	2,145

AM Period	NB	SB	EB		WB		TOTAL		PM Period	NB	SB	EB		WB		TOTAL	
00:00			1		3		4		12:00			16		23		39	
00:15			2		1		3		12:15			15		15		30	
00:30			0		0		0		12:30			18		30		48	
00:45			3	6	1	5	4	11	12:45			18	67	22	90	40	157
01:00			0		0		0		13:00			20		14		34	
01:15			0		0		0		13:15			18		18		36	
01:30			0		0		0		13:30			22		28		50	
01:45			0		0		0		13:45			19	79	15	75	34	154
02:00			1		1		2		14:00			23		21		44	
02:15			0		0		0		14:15			17		18		35	
02:30			0		0		0		14:30			13		19		32	
02:45			1	2	0	1	1	3	14:45			17	70	19	77	36	147
03:00			1		2		3		15:00			17		13		30	
03:15			1		1		2		15:15			23		18		41	
03:30			1		1		2		15:30			31		22		53	
03:45			0	3	0	4	0	7	15:45			24	95	30	83	54	178
04:00			0		0		0		16:00			20		27		47	
04:15			0		0		0		16:15			26		17		43	
04:30			0		0		0		16:30			21		14		35	
04:45			0		3	3	3	3	16:45			25	92	21	79	46	171
05:00			0		0		0		17:00			13		13		26	
05:15			0		5		5		17:15			11		16		27	
05:30			0		1		1		17:30			19		14		33	
05:45			2	2	3	9	5	11	17:45			22	65	21	64	43	129
06:00			0		3		3		18:00			18		15		33	
06:15			2		5		7		18:15			22		17		39	
06:30			2		9		11		18:30			19		17		36	
06:45			9	13	9	26	18	39	18:45			19	78	9	58	28	136
07:00			10		10		20		19:00			16		6		22	
07:15			13		18		31		19:15			13		17		30	
07:30			10		19		29		19:30			8		6		14	
07:45			11	44	16	63	27	107	19:45			17	54	14	43	31	97
08:00			12		17		29		20:00			7		4		11	
08:15			18		28		46		20:15			13		7		20	
08:30			13		24		37		20:30			11		10		21	
08:45			18	61	24	93	42	154	20:45			11	42	7	28	18	70
09:00			18		20		38		21:00			10		11		21	
09:15			21		28		49		21:15			11		2		13	
09:30			22		23		45		21:30			8		2		10	
09:45			11	72	16	87	27	159	21:45			7	36	9	24	16	60
10:00			15		27		42		22:00			4		7		11	
10:15			20		13		33		22:15			6		2		8	
10:30			20		16		36		22:30			4		1		5	
10:45			15	70	19	75	34	145	22:45			1	15	2	12	3	27
11:00			14		12		26		23:00			1		1		2	
11:15			19		27		46		23:15			2		1		3	
11:30			25		21		46		23:30			3		2		5	
11:45			24	82	24	84	48	166	23:45			2	8	2	6	4	14
TOTALS				355		450		**805**	**TOTALS**				701		639		**1340**
SPLIT %				44.1%		55.9%		**37.5%**	**SPLIT %**				52.3%		47.7%		**62.5%**

DAILY TOTALS	NB	SB	EB	WB	Total
	0	0	1,056	1,089	2,145

AM Peak Hour			11:15	08:15	**11:15**	**PM Peak Hour**			15:30	15:15	**15:30**
AM Pk Volume			84	96	**179**	**PM Pk Volume**			101	97	**197**
Pk Hr Factor			0.840	0.857	**0.932**	**Pk Hr Factor**			0.815	0.808	**0.912**
7 - 9 Volume	0	0	105	156	**261**	**4 - 6 Volume**	0	0	157	143	**300**
7 - 9 Peak Hour			08:00	08:00	**08:00**	**4 - 6 Peak Hour**			16:00	16:00	**16:00**
7 - 9 Pk Volume	0	0	61	93	**154**	**4 - 6 Pk Volume**	0	0	92	79	**171**
Pk Hr Factor	0.000	0.000	0.847	0.830	**0.837**	**Pk Hr Factor**	0.000	0.000	0.885	0.731	**0.910**

Prepared by NDS/ATD

VOLUME

Abalone Ave btwn Balboa Ave & Park Ave

Day: Tuesday
Date: 4/22/2014

City: Newport Beach
Project #: CA14_1096_003

DAILY TOTALS	NB	SB	EB	WB	Total
	0	445	0	0	445

AM Period	NB	SB	EB	WB	TOTAL		PM Period	NB	SB	EB	WB	TOTAL	
00:00	0	0			0		12:00	0	8			8	
00:15	0	0			0		12:15	0	5			5	
00:30	0	0			0		12:30	0	7			7	
00:45	0	1	1		1	1	12:45	0	6	26		6	26
01:00	0	0			0		13:00	0	6			6	
01:15	0	0			0		13:15	0	2			2	
01:30	0	0			0		13:30	0	9			9	
01:45	0	0			0		13:45	0	4	21		4	21
02:00	0	0			0		14:00	0	10			10	
02:15	0	0			0		14:15	0	4			4	
02:30	0	0			0		14:30	0	7			7	
02:45	0	0			0		14:45	0	9	30		9	30
03:00	0	0			0		15:00	0	6			6	
03:15	0	1			1		15:15	0	4			4	
03:30	0	1			1		15:30	0	12			12	
03:45	0	0	2		0	2	15:45	0	12	34		12	34
04:00	0	0			0		16:00	0	10			10	
04:15	0	0			0		16:15	0	4			4	
04:30	0	0			0		16:30	0	8			8	
04:45	0	1	1		1	1	16:45	0	9	31		9	31
05:00	0	3			3		17:00	0	6			6	
05:15	0	1			1		17:15	0	8			8	
05:30	0	2			2		17:30	0	8			8	
05:45	0	1	7		1	7	17:45	0	8	30		8	30
06:00	0	1			1		18:00	0	0			0	
06:15	0	3			3		18:15	0	5			5	
06:30	0	5			5		18:30	0	6			6	
06:45	0	9	18		9	18	18:45	0	0	11		0	11
07:00	0	3			3		19:00	0	3			3	
07:15	0	10			10		19:15	0	2			2	
07:30	0	9			9		19:30	0	5			5	
07:45	0	8	30		8	30	19:45	0	0	10		0	10
08:00	0	10			10		20:00	0	0			0	
08:15	0	21			21		20:15	0	3			3	
08:30	0	12			12		20:30	0	5			5	
08:45	0	12	55		12	55	20:45	0	7	15		7	15
09:00	0	13			13		21:00	0	2			2	
09:15	0	14			14		21:15	0	1			1	
09:30	0	11			11		21:30	0	2			2	
09:45	0	11	49		11	49	21:45	0	3	8		3	8
10:00	0	6			6		22:00	0	1			1	
10:15	0	3			3		22:15	0	1			1	
10:30	0	6			6		22:30	0	0			0	
10:45	0	9	24		9	24	22:45	0	0	2		0	2
11:00	0	5			5		23:00	0	0			0	
11:15	0	10			10		23:15	0	1			1	
11:30	0	12			12		23:30	0	2			2	
11:45	0	8	35		8	35	23:45	0	2	5		2	5
TOTALS		222			**222**		**TOTALS**		223			**223**	
SPLIT %		100.0%			**49.9%**		**SPLIT %**		100.0%			**50.1%**	

DAILY TOTALS	NB	SB	EB	WB	Total
	0	445	0	0	445

AM Peak Hour		08:15			**08:15**		**PM Peak Hour**		15:15			**15:15**
AM Pk Volume		58			**58**		**PM Pk Volume**		38			**38**
Pk Hr Factor		0.690			**0.690**		**Pk Hr Factor**		0.792			**0.792**
7 - 9 Volume	0	85	0	0	**85**		**4 - 6 Volume**	0	61	0	0	**61**
7 - 9 Peak Hour		08:00			**08:00**		**4 - 6 Peak Hour**		16:00			**16:00**
7 - 9 Pk Volume	0	55	0	0	**55**		**4 - 6 Pk Volume**	0	31	0	0	**31**
Pk Hr Factor	0.000	0.655	0.000	0.000	**0.655**		**Pk Hr Factor**	0.000	0.775	0.000	0.000	**0.775**

Prepared by NDS/ATD

VOLUME

Balboa Ave btwn Abalone Ave & Grand Canal

Day: Tuesday
Date: 4/22/2014

City: Newport Beach
Project #: CA14_1096_004

DAILY TOTALS	NB	SB	EB	WB	Total
	0	0	85	34	119

AM Period	NB		SB		EB		WB		TOTAL	
00:00					0		0		0	
00:15					0		0		0	
00:30					1		0		1	
00:45					0	1	0		0	1
01:00					0		0		0	
01:15					0		0		0	
01:30					0		0		0	
01:45					0		0		0	
02:00					0		0		0	
02:15					0		0		0	
02:30					0		0		0	
02:45					1	1	0		1	1
03:00					0		0		0	
03:15					0		0		0	
03:30					0		0		0	
03:45					0		0		0	
04:00					0		0		0	
04:15					0		0		0	
04:30					0		0		0	
04:45					1	1	0		1	1
05:00					0		0		0	
05:15					0		0		0	
05:30					0		0		0	
05:45					0		0		0	
06:00					0		0		0	
06:15					0		0		0	
06:30					0		0		0	
06:45					0		0		0	
07:00					1		0		1	
07:15					1		0		1	
07:30					0		0		0	
07:45					1	3	0		1	3
08:00					2		0		2	
08:15					6		1		7	
08:30					2		0		2	
08:45					3	13	2	3	5	16
09:00					3		3		6	
09:15					3		0		3	
09:30					5		2		7	
09:45					1	12	0	5	1	17
10:00					1		0		1	
10:15					0		0		0	
10:30					0		0		0	
10:45					0	1	0		0	1
11:00					2		1		3	
11:15					2		0		2	
11:30					2		0		2	
11:45					0	6	1	2	1	8
TOTALS						38		10		**48**
SPLIT %						79.2%		20.8%		**40.3%**

PM Period	NB		SB		EB		WB		TOTAL	
12:00					1		0		1	
12:15					1		2		3	
12:30					1		2		3	
12:45					1	4	2	6	3	10
13:00					0		0		0	
13:15					0		0		0	
13:30					1		1		2	
13:45					2	3	1	2	3	5
14:00					4		1		5	
14:15					0		0		0	
14:30					1		0		1	
14:45					2	7	0	1	2	8
15:00					1		1		2	
15:15					1		0		1	
15:30					2		0		2	
15:45					3	7	0	1	3	8
16:00					1		2		3	
16:15					0		1		1	
16:30					1		1		2	
16:45					1	3	2	6	3	9
17:00					0		1		1	
17:15					2		0		2	
17:30					2		1		3	
17:45					1	5	3	5	4	10
18:00					3		0		3	
18:15					0		1		1	
18:30					2		0		2	
18:45					2	7	0	1	2	8
19:00					1		0		1	
19:15					1		0		1	
19:30					0		0		0	
19:45					0	2	0		0	2
20:00					0		0		0	
20:15					0		0		0	
20:30					1		0		1	
20:45					1	2	0		1	2
21:00					1		0		1	
21:15					0		0		0	
21:30					3		0		3	
21:45					0	4	0		0	4
22:00					0		1		1	
22:15					1		0		1	
22:30					0		0		0	
22:45					0	1	0	1	0	2
23:00					0		0		0	
23:15					1		1		2	
23:30					1		0		1	
23:45					0	2	0	1	0	3
TOTALS						47		24		**71**
SPLIT %						66.2%		33.8%		**59.7%**

DAILY TOTALS	NB	SB	EB	WB	Total
	0	0	85	34	119

AM Peak Hour			08:15	08:45	**08:45**
AM Pk Volume			14	7	**21**
Pk Hr Factor			0.583	0.583	**0.750**
7 - 9 Volume	0	0	16	3	**19**
7 - 9 Peak Hour			08:00	08:00	**08:00**
7 - 9 Pk Volume	0	0	13	3	**16**
Pk Hr Factor	0.000	0.000	0.542	0.375	**0.571**

PM Peak Hour			17:15	12:00	**17:15**
PM Pk Volume			8	6	**12**
Pk Hr Factor			0.667	0.750	**0.750**
4 - 6 Volume	0	0	8	11	**19**
4 - 6 Peak Hour			16:45	16:00	**17:00**
4 - 6 Pk Volume	0	0	5	6	**10**
Pk Hr Factor	0.000	0.000	0.625	0.750	**0.625**

Prepared by NDS/ATD

VOLUME

Balboa Ave E/o Marine Way

Day: Tuesday
Date: 4/22/2014

City: Newport Beach
Project #: CA14_1096_005

DAILY TOTALS	NB	SB	EB	WB	Total
	0	0	268	222	490

AM Period	NB	SB	EB		WB		TOTAL		PM Period	NB	SB	EB		WB		TOTAL	
00:00			0		0		0		12:00			1		6		7	
00:15			0		0		0		12:15			2		2		4	
00:30			0		0		0		12:30			7		0		7	
00:45			0		0		0		12:45			6	16	7	15	13	31
01:00			0		0		0		13:00			9		3		12	
01:15			0		0		0		13:15			2		4		6	
01:30			0		0		0		13:30			6		6		12	
01:45			0		0		0		13:45			5	22	2	15	7	37
02:00			0		0		0		14:00			7		8		15	
02:15			0		0		0		14:15			7		4		11	
02:30			0		0		0		14:30			2		2		4	
02:45			0		0		0		14:45			5	21	1	15	6	36
03:00			0		0		0		15:00			4		6		10	
03:15			0		0		0		15:15			5		5		10	
03:30			0		0		0		15:30			7		10		17	
03:45			0		0		0		15:45			4	20	5	26	9	46
04:00			0		0		0		16:00			4		2		6	
04:15			0		0		0		16:15			8		1		9	
04:30			0		0		0		16:30			7		1		8	
04:45			0		0		0		16:45			6	25	5	9	11	34
05:00			0		1		1		17:00			0		2		2	
05:15			0		0		0		17:15			3		3		6	
05:30			0		1		1		17:30			5		5		10	
05:45			0		1	3	1	3	17:45			3	11	3	13	6	24
06:00			2		2		4		18:00			1		2		3	
06:15			1		2		3		18:15			5		4		9	
06:30			4		1		5		18:30			1		4		5	
06:45			3	10	2	7	5	17	18:45			5	12	2	12	7	24
07:00			2		2		4		19:00			2		1		3	
07:15			4		3		7		19:15			3		3		6	
07:30			5		2		7		19:30			4		2		6	
07:45			3	14	4	11	7	25	19:45			2	11	2	8	4	19
08:00			7		3		10		20:00			4		3		7	
08:15			9		8		17		20:15			1		1		2	
08:30			3		5		8		20:30			1		0		1	
08:45			3	22	3	19	6	41	20:45			4	10	2	6	6	16
09:00			9		8		17		21:00			1		1		2	
09:15			5		5		10		21:15			2		1		3	
09:30			2		3		5		21:30			2		0		2	
09:45			5	21	6	22	11	43	21:45			2	7	0	2	2	9
10:00			4		2		6		22:00			0		1		1	
10:15			7		8		15		22:15			1		1		2	
10:30			2		3		5		22:30			0		0		0	
10:45			3	16	1	14	4	30	22:45			0	1	0	2	0	3
11:00			8		7		15		23:00			1		0		1	
11:15			7		6		13		23:15			0		0		0	
11:30			5		7		12		23:30			0		0		0	
11:45			8	28	3	23	11	51	23:45			0	1	0		0	1
TOTALS				111		99		**210**	**TOTALS**				157		123		**280**
SPLIT %				52.9%		47.1%		**42.9%**	**SPLIT %**				56.1%		43.9%		**57.1%**

DAILY TOTALS	NB	SB	EB	WB	Total
	0	0	268	222	490

AM Peak Hour			11:00	08:15	**11:00**	**PM Peak Hour**			13:30	15:00	**15:00**
AM Pk Volume			28	24	**51**	**PM Pk Volume**			25	26	**46**
Pk Hr Factor			0.875	0.750	**0.850**	**Pk Hr Factor**			0.893	0.650	**0.676**
7 - 9 Volume	0	0	36	30	**66**	**4 - 6 Volume**	0	0	36	22	**58**
7 - 9 Peak Hour			07:30	07:45	**07:45**	**4 - 6 Peak Hour**			16:00	16:45	**16:00**
7 - 9 Pk Volume	0	0	24	20	**42**	**4 - 6 Pk Volume**	0	0	25	15	**34**
Pk Hr Factor	0.000	0.000	0.667	0.625	**0.618**	**Pk Hr Factor**	0.000	0.000	0.781	0.750	**0.773**

APPENDIX B
LOS Analysis Sheets

Existing Conditions

HCS+: Unsignalized Intersections Release 5.21

Phone: Fax:
E-Mail:

ALL-WAY STOP CONTROL(AWSC) ANALYSIS

Analyst: GJG
Agency/Co.: RBF Consulting
Date Performed: 5/2/2014
Analysis Time Period: AM Peak Hour
Intersection: Marine Ave/Balboa Ave
Jurisdiction: Newport Beach
Units: U. S. Customary
Analysis Year: Existing (2014)
Project ID: PARK AVE BRIDGE REPLACEMENT
East/West Street: Balboa Ave
North/South Street: Marine Ave

Worksheet 2 - Volume Adjustments and Site Characteristics

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	207	2	13	3	2	14	11	308	6	20	195	84
% Thrus Left Lane												

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	LTR		LTR		LTR		LTR	
PHF	0.94		0.94		0.94		0.94	
Flow Rate	235		19		344		317	
% Heavy Veh	0		0		0		0	
No. Lanes	1		1		1		1	
Opposing-Lanes	1		1		1		1	
Conflicting-lanes	1		1		1		1	
Geometry group	1		1		1		1	
Duration, T 0.25 hrs.								

Worksheet 3 - Saturation Headway Adjustment Worksheet

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow Rates:								
Total in Lane	235		19		344		317	
Left-Turn	220		3		11		21	
Right-Turn	13		14		6		89	
Prop. Left-Turns	0.9		0.2		0.0		0.1	
Prop. Right-Turns	0.1		0.7		0.0		0.3	
Prop. Heavy Vehicle	0.0		0.0		0.0		0.0	
Geometry Group	1		1		1		1	
Adjustments Exhibit 17-33:								
hLT-adj	0.2		0.2		0.2		0.2	
hRT-adj	-0.6		-0.6		-0.6		-0.6	
hHV-adj	1.7		1.7		1.7		1.7	
hadj, computed	0.2		-0.4		-0.0		-0.2	

Worksheet 4 - Departure Headway and Service Time

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow rate	235		19		344		317	
hd, initial value	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
x, initial	0.21		0.02		0.31		0.28	
hd, final value	5.76		5.69		5.13		5.02	
x, final value	0.38		0.03		0.49		0.44	
Move-up time, m	2.0		2.0		2.0		2.0	
Service Time	3.8		3.7		3.1		3.0	

Worksheet 5 - Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow Rate	235		19		344		317	
Service Time	3.8		3.7		3.1		3.0	
Utilization, x	0.38		0.03		0.49		0.44	
Dep. headway, hd	5.76		5.69		5.13		5.02	
Capacity	485		269		594		567	
Delay	12.20		8.87		12.95		11.94	
LOS	B		A		B		B	
Approach:								
Delay	12.20		8.87		12.95		11.94	
LOS	B		A		B		B	
Intersection Delay 12.32			Intersection LOS B					

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ALL-WAY STOP CONTROL(AWSC) ANALYSIS

Analyst:	GJG
Agency/Co.:	RBF Consulting
Date Performed:	5/2/2014
Analysis Time Period:	PM Peak Hour
Intersection:	Marine Ave/Balboa Ave
Jurisdiction:	Newport Beach
Units: U. S. Customary	
Analysis Year:	Existing (2014)
Project ID:	PARK AVE BRIDGE REPLACEMENT
East/West Street:	Balboa Ave
North/South Street:	Marine Ave

Worksheet 2 - Volume Adjustments and Site Characteristics

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	176	2	8	2	2	5	4	249	7	19	238	114
% Thrus Left Lane												

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	LTR		LTR		LTR		LTR	
PHF	0.95		0.95		0.95		0.95	
Flow Rate	195		9		273		390	
% Heavy Veh	0		0		0		0	
No. Lanes	1		1		1		1	
Opposing-Lanes	1		1		1		1	
Conflicting-lanes	1		1		1		1	
Geometry group	1		1		1		1	
Duration, T 0.25 hrs.								

Worksheet 3 - Saturation Headway Adjustment Worksheet

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow Rates:								
Total in Lane	195		9		273		390	
Left-Turn	185		2		4		20	
Right-Turn	8		5		7		120	
Prop. Left-Turns	0.9		0.2		0.0		0.1	
Prop. Right-Turns	0.0		0.6		0.0		0.3	
Prop. Heavy Vehicle	0.0		0.0		0.0		0.0	
Geometry Group	1		1		1		1	
Adjustments Exhibit 17-33:								
hLT-adj	0.2		0.2		0.2		0.2	
hRT-adj	-0.6		-0.6		-0.6		-0.6	
hHV-adj	1.7		1.7		1.7		1.7	
hadj, computed	0.2		-0.3		-0.0		-0.2	

Worksheet 4 - Departure Headway and Service Time

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow rate	195		9		273		390	
hd, initial value	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
x, initial	0.17		0.01		0.24		0.35	
hd, final value	5.68		5.64		5.00		4.71	
x, final value	0.31		0.01		0.38		0.51	
Move-up time, m	2.0		2.0		2.0		2.0	
Service Time	3.7		3.6		3.0		2.7	

Worksheet 5 - Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow Rate	195		9		273		390	
Service Time	3.7		3.6		3.0		2.7	
Utilization, x	0.31		0.01		0.38		0.51	
Dep. headway, hd	5.68		5.64		5.00		4.71	
Capacity	445		259		523		640	
Delay	11.19		8.72		11.03		12.53	
LOS	B		A		B		B	
Approach:								
Delay	11.19		8.72		11.03		12.53	
LOS	B		A		B		B	
Intersection Delay 11.72			Intersection LOS B					

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Phone: Fax:
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ALL-WAY STOP CONTROL(AWSC) ANALYSIS

Analyst: GJG
Agency/Co.: RBF Consulting
Date Performed: 5/2/2014
Analysis Time Period: AM Peak Hour
Intersection: Marine Ave/Park Ave
Jurisdiction: Newport Beach
Units: U. S. Customary
Analysis Year: Existing (2014)
Project ID: PARK AVE BRIDGE REPLACEMENT
East/West Street: Park Ave
North/South Street: Marine Ave

Worksheet 2 - Volume Adjustments and Site Characteristics

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	200	7	0	0	13	85	1	15	1	81	0	129
% Thrus Left Lane												

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	LT		TR		L	TR	LTR	
PHF	0.97		0.97		0.97	0.97	0.97	
Flow Rate	213		100		1	16	215	
% Heavy Veh	0		0		0	0	0	
No. Lanes	1		1		2		1	
Opposing-Lanes	1		1		1		2	
Conflicting-lanes	2		2		1		1	
Geometry group	2		2		5		4a	
Duration, T	0.25	hrs.						

Worksheet 3 - Saturation Headway Adjustment Worksheet

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow Rates:								
Total in Lane	213		100		1	16	215	
Left-Turn	206		0		1	0	83	
Right-Turn	0		87		0	1	132	
Prop. Left-Turns	1.0		0.0		1.0	0.0	0.4	
Prop. Right-Turns	0.0		0.9		0.0	0.1	0.6	
Prop. Heavy Vehicle	0.0		0.0		0.0	0.0	0.0	
Geometry Group	2		2		5		4a	
Adjustments Exhibit 17-33:								
hLT-adj	0.2		0.2		0.5		0.2	
hRT-adj	-0.6		-0.6		-0.7		-0.6	
hHV-adj	1.7		1.7		1.7		1.7	
hadj, computed	0.2		-0.5		0.5	-0.0	-0.3	

Worksheet 4 - Departure Headway and Service Time

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow rate	213		100		1	16	215	
hd, initial value	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
x, initial	0.19		0.09		0.00	0.01	0.19	
hd, final value	4.75		4.20		5.98	5.43	4.49	
x, final value	0.28		0.12		0.00	0.02	0.27	
Move-up time, m	2.0		2.0		2.3		2.0	
Service Time	2.8		2.2		3.7	3.1	2.5	

Worksheet 5 - Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow Rate	213		100		1	16	215	
Service Time	2.8		2.2		3.7	3.1	2.5	
Utilization, x	0.28		0.12		0.00	0.02	0.27	
Dep. headway, hd	4.75		4.20		5.98	5.43	4.49	
Capacity	463		350		251	266	465	
Delay	9.60		7.75		8.69	8.27	9.13	
LOS	A		A		A	A	A	
Approach:								
Delay	9.60		7.75		8.29		9.13	
LOS	A		A		A		A	
Intersection Delay	9.04		Intersection LOS A					

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Phone: Fax:
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ALL-WAY STOP CONTROL(AWSC) ANALYSIS

Analyst: GJG
Agency/Co.: RBF Consulting
Date Performed: 5/2/2014
Analysis Time Period: PM Peak Hour
Intersection: Marine Ave/Park Ave
Jurisdiction: Newport Beach
Units: U. S. Customary
Analysis Year: Existing (2014)
Project ID: PARK AVE BRIDGE REPLACEMENT
East/West Street: Park Ave
North/South Street: Marine Ave

Worksheet 2 - Volume Adjustments and Site Characteristics

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	156	10	0	0	11	64	1	16	3	79	0	202
% Thrus Left Lane												

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	LT		TR		L	TR	LTR	
PHF	0.92		0.92		0.92	0.92	0.92	
Flow Rate	179		80		1	20	304	
% Heavy Veh	0		0		0	0	0	
No. Lanes	1		1		2		1	
Opposing-Lanes	1		1		1		2	
Conflicting-lanes	2		2		1		1	
Geometry group	2		2		5		4a	
Duration, T 0.25 hrs.								

Worksheet 3 - Saturation Headway Adjustment Worksheet

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow Rates:								
Total in Lane	179		80		1	20	304	
Left-Turn	169		0		1	0	85	
Right-Turn	0		69		0	3	219	
Prop. Left-Turns	0.9		0.0		1.0	0.0	0.3	
Prop. Right-Turns	0.0		0.9		0.0	0.2	0.7	
Prop. Heavy Vehicle	0.0		0.0		0.0	0.0	0.0	
Geometry Group	2		2		5		4a	
Adjustments Exhibit 17-33:								
hLT-adj	0.2		0.2		0.5		0.2	
hRT-adj	-0.6		-0.6		-0.7		-0.6	
hHV-adj	1.7		1.7		1.7		1.7	
hadj, computed	0.2		-0.5		0.5	-0.1	-0.4	

Worksheet 4 - Departure Headway and Service Time

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow rate	179		80		1	20	304	
hd, initial value	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
x, initial	0.16		0.07		0.00	0.02	0.27	
hd, final value	4.92		4.36		5.94	5.33	4.31	
x, final value	0.24		0.10		0.00	0.03	0.36	
Move-up time, m	2.0		2.0		2.3		2.0	
Service Time	2.9		2.4		3.6	3.0	2.3	

Worksheet 5 - Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow Rate	179		80		1	20	304	
Service Time	2.9		2.4		3.6	3.0	2.3	
Utilization, x	0.24		0.10		0.00	0.03	0.36	
Dep. headway, hd	4.92		4.36		5.94	5.33	4.31	
Capacity	429		330		251	270	554	
Delay	9.51		7.83		8.65	8.19	9.75	
LOS	A		A		A	A	A	
Approach:								
Delay	9.51		7.83		8.21		9.75	
LOS	A		A		A		A	
Intersection Delay 9.36			Intersection LOS A					

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TWO-WAY STOP CONTROL SUMMARY

Analyst: GJG
Agency/Co.: RBF Consulting
Date Performed: 5/5/2014
Analysis Time Period: AM Peak Hour
Intersection: Abalone Ave/Balboa Ave
Jurisdiction: Newport Beach
Units: U. S. Customary
Analysis Year: Existing (2014)
Project ID: PARK AVE BRIDGE REPLACEMENT
East/West Street: Balboa Ave
North/South Street: Abalone Ave
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		3	10	21	1	
Peak-Hour Factor, PHF		0.64	0.64	0.64	0.64	
Hourly Flow Rate, HFR		4	15	32	1	
Percent Heavy Vehicles		--	--	0	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR	LT		
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				0	24	2
Peak Hour Factor, PHF				0.64	0.64	0.64
Hourly Flow Rate, HFR				0	37	3
Percent Heavy Vehicles				0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/		No	/
Lanes				0	1	0
Configuration					LTR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT					LTR	
v (vph)		32					40	
C(m) (vph)		1611					811	
v/c		0.02					0.05	
95% queue length		0.06					0.16	
Control Delay		7.3					9.7	
LOS		A					A	
Approach Delay							9.7	
Approach LOS							A	

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E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: GJG
Agency/Co.: RBF Consulting
Date Performed: 5/5/2014
Analysis Time Period: AM Peak Hour
Intersection: Abalone Ave/Balboa Ave
Jurisdiction: Newport Beach
Units: U. S. Customary
Analysis Year: Existing (2014)
Project ID: PARK AVE BRIDGE REPLACEMENT
East/West Street: Balboa Ave
North/South Street: Abalone Ave
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		3	10	21	1	
Peak-Hour Factor, PHF		0.64	0.64	0.64	0.64	
Peak-15 Minute Volume		1	4	8	0	
Hourly Flow Rate, HFR		4	15	32	1	
Percent Heavy Vehicles		--	--	0	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR	LT		
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				0	24	2
Peak Hour Factor, PHF				0.64	0.64	0.64
Peak-15 Minute Volume				0	9	1
Hourly Flow Rate, HFR				0	37	3
Percent Heavy Vehicles				0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/		No	/
RT Channelized?						
Lanes				0	1	0
Configuration					LTR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		1
Shared ln volume, major rt vehicles:		0
Sat flow rate, major th vehicles:		1700
Sat flow rate, major rt vehicles:		1700
Number of major street through lanes:		1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1				7.1	6.5	6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0				0	0	0
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Grade/100			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00				0.70	0.00	0.00
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage		4.1				6.4	6.5	6.2
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)		2.20				3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		0				0	0	0
t(f)		2.2				3.5	4.0	3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 V(l,prot)
V prog				
Total Saturation Flow Rate, s (vph)				
Arrival Type				
Effective Green, g (sec)				
Cycle Length, C (sec)				
Rp (from Exhibit 16-11)				
Proportion vehicles arriving on green P				
g(q1)				
g(q2)				
g(q)				

Computation 2-Proportion of TWSC Intersection Time blocked

	Movement 2 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5

Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x		19				77	84	1
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s						1500		1500
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.			9			12		
Conflicting Flows						1		
Potential Capacity						1090		
Pedestrian Impedance Factor			1.00			1.00		
Movement Capacity						1090		
Probability of Queue free St.			1.00			1.00		

Step 2: LT from Major St.			4			1		
Conflicting Flows			19					
Potential Capacity			1611					
Pedestrian Impedance Factor			1.00			1.00		
Movement Capacity			1611					
Probability of Queue free St.			0.98			1.00		
Maj L-Shared Prob Q free St.			0.98					

Step 3: TH from Minor St.			8			11		
Conflicting Flows						84		
Potential Capacity						810		
Pedestrian Impedance Factor			1.00			1.00		
Cap. Adj. factor due to Impeding mvmnt			0.98			0.98		
Movement Capacity						794		
Probability of Queue free St.			1.00			0.95		

Step 4: LT from Minor St.			7			10		
Conflicting Flows						77		
Potential Capacity						931		
Pedestrian Impedance Factor			1.00			1.00		
Maj. L, Min T Impedance factor			0.93					
Maj. L, Min T Adj. Imp Factor.			0.95					
Cap. Adj. factor due to Impeding mvmnt			0.95			0.98		
Movement Capacity						913		

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.			8			11		
Part 1 - First Stage								
Conflicting Flows								
Potential Capacity								
Pedestrian Impedance Factor								
Cap. Adj. factor due to Impeding mvmnt								
Movement Capacity								
Probability of Queue free St.								
Part 2 - Second Stage								
Conflicting Flows								
Potential Capacity								
Pedestrian Impedance Factor								
Cap. Adj. factor due to Impeding mvmnt								
Movement Capacity								
Part 3 - Single Stage								
Conflicting Flows						84		
Potential Capacity						810		
Pedestrian Impedance Factor					1.00		1.00	
Cap. Adj. factor due to Impeding mvmnt					0.98		0.98	
Movement Capacity						794		
Result for 2 stage process:								
a								
y								
C t						794		
Probability of Queue free St.					1.00		0.95	

Step 4: LT from Minor St.			7			10		
Part 1 - First Stage								
Conflicting Flows								
Potential Capacity								
Pedestrian Impedance Factor								
Cap. Adj. factor due to Impeding mvmnt								
Movement Capacity								
Part 2 - Second Stage								
Conflicting Flows								
Potential Capacity								
Pedestrian Impedance Factor								
Cap. Adj. factor due to Impeding mvmnt								
Movement Capacity								
Part 3 - Single Stage								
Conflicting Flows						77		
Potential Capacity						931		
Pedestrian Impedance Factor					1.00		1.00	
Maj. L, Min T Impedance factor					0.93			
Maj. L, Min T Adj. Imp Factor.					0.95			
Cap. Adj. factor due to Impeding mvmnt					0.95		0.98	
Movement Capacity						913		
Results for Two-stage process:								
a								
y								
C t						913		

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)				0	37	3
Movement Capacity (vph)				913	794	1090
Shared Lane Capacity (vph)					811	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep				913	794	1090
Volume				0	37	3
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh					811	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT					LTR	
v (vph)		32					40	
C(m) (vph)		1611					811	
v/c		0.02					0.05	
95% queue length		0.06					0.16	
Control Delay		7.3					9.7	
LOS		A					A	
Approach Delay							9.7	
Approach LOS							A	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.98
v(il), Volume for stream 2 or 5		1
v(i2), Volume for stream 3 or 6		0
s(il), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		0.98
d(M,LT), Delay for stream 1 or 4		7.3
N, Number of major street through lanes		1
d(rank,1) Delay for stream 2 or 5		0.1

HCS+: Unsignalized Intersections Release 5.21

TWO-WAY STOP CONTROL SUMMARY

Analyst: GJG
Agency/Co.: RBF Consulting
Date Performed: 5/5/2014
Analysis Time Period: PM Peak Hour
Intersection: Abalone Ave/Balboa Ave
Jurisdiction: Newport Beach
Units: U. S. Customary
Analysis Year: Existing (2014)
Project ID: PARK AVE BRIDGE REPLACEMENT
East/West Street: Balboa Ave
North/South Street: Abalone Ave
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		1	2	17	5	
Peak-Hour Factor, PHF		0.83	0.83	0.83	0.83	
Hourly Flow Rate, HFR		1	2	20	6	
Percent Heavy Vehicles		--	--	0	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR	LT		
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				2	12	1
Peak Hour Factor, PHF				0.83	0.83	0.83
Hourly Flow Rate, HFR				2	14	1
Percent Heavy Vehicles				0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/		No	/
Lanes				0	1	0
Configuration					LTR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT					LTR	
v (vph)		20					17	
C(m) (vph)		1632					860	
v/c		0.01					0.02	
95% queue length		0.04					0.06	
Control Delay		7.2					9.3	
LOS		A					A	
Approach Delay							9.3	
Approach LOS							A	

HCS+: Unsignalized Intersections Release 5.21

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: GJG
Agency/Co.: RBF Consulting
Date Performed: 5/5/2014
Analysis Time Period: PM Peak Hour
Intersection: Abalone Ave/Balboa Ave
Jurisdiction: Newport Beach
Units: U. S. Customary
Analysis Year: Existing (2014)
Project ID: PARK AVE BRIDGE REPLACEMENT
East/West Street: Balboa Ave
North/South Street: Abalone Ave
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		1	2	17	5	
Peak-Hour Factor, PHF		0.83	0.83	0.83	0.83	
Peak-15 Minute Volume		0	1	5	2	
Hourly Flow Rate, HFR		1	2	20	6	
Percent Heavy Vehicles		--	--	0	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR	LT		
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				2	12	1
Peak Hour Factor, PHF				0.83	0.83	0.83
Peak-15 Minute Volume				1	4	0
Hourly Flow Rate, HFR				2	14	1
Percent Heavy Vehicles				0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/		No	/
RT Channelized?						
Lanes				0	1	0
Configuration					LTR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		6
Shared ln volume, major rt vehicles:		0
Sat flow rate, major th vehicles:		1700
Sat flow rate, major rt vehicles:		1700
Number of major street through lanes:		1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1				7.1	6.5	6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0				0	0	0
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Grade/100			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00				0.70	0.00	0.00
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage		4.1				6.4	6.5	6.2
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)		2.20				3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		0				0	0	0
t(f)		2.2				3.5	4.0	3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 V(l,prot)
V prog				
Total Saturation Flow Rate, s (vph)				
Arrival Type				
Effective Green, g (sec)				
Cycle Length, C (sec)				
Rp (from Exhibit 16-11)				
Proportion vehicles arriving on green P				
g(q1)				
g(q2)				
g(q)				

Computation 2-Proportion of TWSC Intersection Time blocked

	Movement 2 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x		3				48	49	6
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s						1500		1500
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.					9		12	
Conflicting Flows							6	
Potential Capacity							1083	
Pedestrian Impedance Factor					1.00		1.00	
Movement Capacity							1083	
Probability of Queue free St.					1.00		1.00	
Step 2: LT from Major St.					4		1	
Conflicting Flows					3			
Potential Capacity					1632			
Pedestrian Impedance Factor					1.00		1.00	
Movement Capacity					1632			
Probability of Queue free St.					0.99		1.00	
Maj L-Shared Prob Q free St.					0.99			
Step 3: TH from Minor St.					8		11	
Conflicting Flows							49	
Potential Capacity							846	
Pedestrian Impedance Factor					1.00		1.00	
Cap. Adj. factor due to Impeding mvmnt					0.99		0.99	
Movement Capacity							836	
Probability of Queue free St.					1.00		0.98	
Step 4: LT from Minor St.					7		10	
Conflicting Flows							48	
Potential Capacity							967	
Pedestrian Impedance Factor					1.00		1.00	
Maj. L, Min T Impedance factor					0.97			
Maj. L, Min T Adj. Imp Factor.					0.98			
Cap. Adj. factor due to Impeding mvmnt					0.98		0.99	
Movement Capacity							955	

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.					8		11	
Part 1 - First Stage								
Conflicting Flows								
Potential Capacity								
Pedestrian Impedance Factor								
Cap. Adj. factor due to Impeding mvmnt								
Movement Capacity								
Probability of Queue free St.								
Part 2 - Second Stage								
Conflicting Flows								
Potential Capacity								
Pedestrian Impedance Factor								
Cap. Adj. factor due to Impeding mvmnt								
Movement Capacity								
Part 3 - Single Stage								
Conflicting Flows							49	
Potential Capacity							846	
Pedestrian Impedance Factor						1.00	1.00	
Cap. Adj. factor due to Impeding mvmnt						0.99	0.99	
Movement Capacity							836	
Result for 2 stage process:								
a								
y								
C t							836	
Probability of Queue free St.						1.00	0.98	
Step 4: LT from Minor St.					7		10	
Part 1 - First Stage								
Conflicting Flows								
Potential Capacity								
Pedestrian Impedance Factor								
Cap. Adj. factor due to Impeding mvmnt								
Movement Capacity								
Part 2 - Second Stage								
Conflicting Flows								
Potential Capacity								
Pedestrian Impedance Factor								
Cap. Adj. factor due to Impeding mvmnt								
Movement Capacity								
Part 3 - Single Stage								
Conflicting Flows							48	
Potential Capacity							967	
Pedestrian Impedance Factor						1.00	1.00	
Maj. L, Min T Impedance factor						0.97		
Maj. L, Min T Adj. Imp Factor.						0.98		
Cap. Adj. factor due to Impeding mvmnt						0.98	0.99	
Movement Capacity							955	
Results for Two-stage process:								
a								
y								
C t							955	

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)				2	14	1
Movement Capacity (vph)				955	836	1083
Shared Lane Capacity (vph)					860	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep				955	836	1083
Volume				2	14	1
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh					860	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT					LTR	
v (vph)		20					17	
C(m) (vph)		1632					860	
v/c		0.01					0.02	
95% queue length		0.04					0.06	
Control Delay		7.2					9.3	
LOS		A					A	
Approach Delay							9.3	
Approach LOS							A	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.99
v(il), Volume for stream 2 or 5		6
v(i2), Volume for stream 3 or 6		0
s(il), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		0.99
d(M,LT), Delay for stream 1 or 4		7.2
N, Number of major street through lanes		1
d(rank,1) Delay for stream 2 or 5		0.1

HCS+: Unsignalized Intersections Release 5.21

Phone: Fax:
E-Mail:

ALL-WAY STOP CONTROL(AWSC) ANALYSIS

Analyst: GJG
Agency/Co.: RBF Consulting
Date Performed: 5/2/2014
Analysis Time Period: AM Peak Hour
Intersection: Abalone Ave/Park Ave
Jurisdiction: Newport Beach
Units: U. S. Customary
Analysis Year: Existing (2014)
Project ID: PARK AVE BRIDGE REPLACEMENT
East/West Street: Park Ave
North/South Street: Abalone Ave

Worksheet 2 - Volume Adjustments and Site Characteristics

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	0	44	6	2	38	0	0	0	0	7	6	43
% Thrus Left Lane												

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	TR		LT				LTR	
PHF	0.76		0.76				0.76	
Flow Rate	64		52				72	
% Heavy Veh	0		0				0	
No. Lanes	1		1				1	
Opposing-Lanes	1		1				0	
Conflicting-lanes	1		1				1	
Geometry group	1		1				1	
Duration, T 0.25 hrs.								

Worksheet 3 - Saturation Headway Adjustment Worksheet

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow Rates:								
Total in Lane	64		52				72	
Left-Turn	0		2				9	
Right-Turn	7		0				56	
Prop. Left-Turns	0.0		0.0				0.1	
Prop. Right-Turns	0.1		0.0				0.8	
Prop. Heavy Vehicle	0.0		0.0				0.0	
Geometry Group	1		1				1	
Adjustments Exhibit 17-33:								
hLT-adj	0.2		0.2				0.2	
hRT-adj	-0.6		-0.6				-0.6	
hHV-adj	1.7		1.7				1.7	
hadj, computed	-0.1		0.0				-0.4	

Worksheet 4 - Departure Headway and Service Time

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow rate	64		52				72	
hd, initial value	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
x, initial	0.06		0.05				0.06	
hd, final value	4.03		4.11				3.71	
x, final value	0.07		0.06				0.07	
Move-up time, m	2.0		2.0				2.0	
Service Time	2.0		2.1				1.7	

Worksheet 5 - Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow Rate	64		52				72	
Service Time	2.0		2.1				1.7	
Utilization, x	0.07		0.06				0.07	
Dep. headway, hd	4.03		4.11				3.71	
Capacity	314		302				322	
Delay	7.34		7.37				7.00	
LOS	A		A				A	
Approach:								
Delay	7.34		7.37				7.00	
LOS	A		A				A	
Intersection Delay 7.22			Intersection LOS A					

HCS+: Unsignalized Intersections Release 5.21

Phone: Fax:
E-Mail:

ALL-WAY STOP CONTROL(AWSC) ANALYSIS

Analyst: GJG
Agency/Co.: RBF Consulting
Date Performed: 5/2/2014
Analysis Time Period: PM Peak Hour
Intersection: Abalone Ave/Park Ave
Jurisdiction: Newport Beach
Units: U. S. Customary
Analysis Year: Existing (2014)
Project ID: PARK AVE BRIDGE REPLACEMENT
East/West Street: Park Ave
North/South Street: Abalone Ave

Worksheet 2 - Volume Adjustments and Site Characteristics

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	0	74	14	0	36	0	0	0	0	4	1	25
% Thrus Left Lane												

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	TR		LT				LTR	
PHF	0.92		0.92				0.92	
Flow Rate	95		39				32	
% Heavy Veh	0		0				0	
No. Lanes	1		1				1	
Opposing-Lanes	1		1				0	
Conflicting-lanes	1		1				1	
Geometry group	1		1				1	
Duration, T 0.25 hrs.								

Worksheet 3 - Saturation Headway Adjustment Worksheet

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow Rates:								
Total in Lane	95		39				32	
Left-Turn	0		0				4	
Right-Turn	15		0				27	
Prop. Left-Turns	0.0		0.0				0.1	
Prop. Right-Turns	0.2		0.0				0.8	
Prop. Heavy Vehicle	0.0		0.0				0.0	
Geometry Group	1		1				1	
Adjustments Exhibit 17-33:								
hLT-adj	0.2		0.2				0.2	
hRT-adj	-0.6		-0.6				-0.6	
hHV-adj	1.7		1.7				1.7	
hadj, computed	-0.1		0.0				-0.5	

Worksheet 4 - Departure Headway and Service Time

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow rate	95		39				32	
hd, initial value	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
x, initial	0.08		0.03				0.03	
hd, final value	3.91		4.05				3.70	
x, final value	0.10		0.04				0.03	
Move-up time, m	2.0		2.0				2.0	
Service Time	1.9		2.1				1.7	

Worksheet 5 - Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow Rate	95		39				32	
Service Time	1.9		2.1				1.7	
Utilization, x	0.10		0.04				0.03	
Dep. headway, hd	3.91		4.05				3.70	
Capacity	345		289				282	
Delay	7.36		7.24				6.82	
LOS	A		A				A	
Approach:								
Delay	7.36		7.24				6.82	
LOS	A		A				A	
Intersection Delay 7.22			Intersection LOS A					

Alternative 1 Reconstruction Conditions

HCS+: Unsignalized Intersections Release 5.21

Phone: Fax:
E-Mail:

ALL-WAY STOP CONTROL(AWSC) ANALYSIS

Analyst: GJG
Agency/Co.: RBF Consulting
Date Performed: 5/6/2014
Analysis Time Period: AM Peak Hour
Intersection: Marine Ave/Balboa Ave
Jurisdiction: Newport Beach
Units: U. S. Customary
Analysis Year: Alternative 1 Conditions
Project ID: PARK AVE BRIDGE REPLACEMENT
East/West Street: Balboa Ave
North/South Street: Marine Ave

Worksheet 2 - Volume Adjustments and Site Characteristics

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	207	2	13	3	2	14	11	308	6	20	195	84
% Thrus Left Lane												

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	LTR		LTR		LTR		LTR	
PHF	0.94		0.94		0.94		0.94	
Flow Rate	235		19		344		317	
% Heavy Veh	0		0		0		0	
No. Lanes	1		1		1		1	
Opposing-Lanes	1		1		1		1	
Conflicting-lanes	1		1		1		1	
Geometry group	1		1		1		1	
Duration, T 0.25 hrs.								

Worksheet 3 - Saturation Headway Adjustment Worksheet

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow Rates:								
Total in Lane	235		19		344		317	
Left-Turn	220		3		11		21	
Right-Turn	13		14		6		89	
Prop. Left-Turns	0.9		0.2		0.0		0.1	
Prop. Right-Turns	0.1		0.7		0.0		0.3	
Prop. Heavy Vehicle	0.0		0.0		0.0		0.0	
Geometry Group	1		1		1		1	
Adjustments Exhibit 17-33:								
hLT-adj	0.2		0.2		0.2		0.2	
hRT-adj	-0.6		-0.6		-0.6		-0.6	
hHV-adj	1.7		1.7		1.7		1.7	
hadj, computed	0.2		-0.4		-0.0		-0.2	

Worksheet 4 - Departure Headway and Service Time

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow rate	235		19		344		317	
hd, initial value	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
x, initial	0.21		0.02		0.31		0.28	
hd, final value	5.76		5.69		5.13		5.02	
x, final value	0.38		0.03		0.49		0.44	
Move-up time, m	2.0		2.0		2.0		2.0	
Service Time	3.8		3.7		3.1		3.0	

Worksheet 5 - Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow Rate	235		19		344		317	
Service Time	3.8		3.7		3.1		3.0	
Utilization, x	0.38		0.03		0.49		0.44	
Dep. headway, hd	5.76		5.69		5.13		5.02	
Capacity	485		269		594		567	
Delay	12.20		8.87		12.95		11.94	
LOS	B		A		B		B	
Approach:								
Delay	12.20		8.87		12.95		11.94	
LOS	B		A		B		B	
Intersection Delay 12.32			Intersection LOS B					

HCS+: Unsignalized Intersections Release 5.21

Phone: Fax:
E-Mail:

ALL-WAY STOP CONTROL(AWSC) ANALYSIS

Analyst: GJG
Agency/Co.: RBF Consulting
Date Performed: 5/6/2014
Analysis Time Period: PM Peak Hour
Intersection: Marine Ave/Balboa Ave
Jurisdiction: Newport Beach
Units: U. S. Customary
Analysis Year: Alternative 1 Conditions
Project ID: PARK AVE BRIDGE REPLACEMENT
East/West Street: Balboa Ave
North/South Street: Marine Ave

Worksheet 2 - Volume Adjustments and Site Characteristics

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	176	2	8	2	2	5	4	249	7	19	238	114
% Thrus Left Lane												

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	LTR		LTR		LTR		LTR	
PHF	0.95		0.95		0.95		0.95	
Flow Rate	195		9		273		390	
% Heavy Veh	0		0		0		0	
No. Lanes	1		1		1		1	
Opposing-Lanes	1		1		1		1	
Conflicting-lanes	1		1		1		1	
Geometry group	1		1		1		1	
Duration, T 0.25 hrs.								

Worksheet 3 - Saturation Headway Adjustment Worksheet

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow Rates:								
Total in Lane	195		9		273		390	
Left-Turn	185		2		4		20	
Right-Turn	8		5		7		120	
Prop. Left-Turns	0.9		0.2		0.0		0.1	
Prop. Right-Turns	0.0		0.6		0.0		0.3	
Prop. Heavy Vehicle	0.0		0.0		0.0		0.0	
Geometry Group	1		1		1		1	
Adjustments Exhibit 17-33:								
hLT-adj	0.2		0.2		0.2		0.2	
hRT-adj	-0.6		-0.6		-0.6		-0.6	
hHV-adj	1.7		1.7		1.7		1.7	
hadj, computed	0.2		-0.3		-0.0		-0.2	

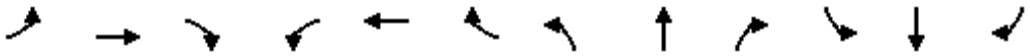
Worksheet 4 - Departure Headway and Service Time

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow rate	195		9		273		390	
hd, initial value	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
x, initial	0.17		0.01		0.24		0.35	
hd, final value	5.68		5.64		5.00		4.71	
x, final value	0.31		0.01		0.38		0.51	
Move-up time, m	2.0		2.0		2.0		2.0	
Service Time	3.7		3.6		3.0		2.7	

Worksheet 5 - Capacity and Level of Service

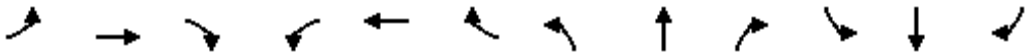
	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow Rate	195		9		273		390	
Service Time	3.7		3.6		3.0		2.7	
Utilization, x	0.31		0.01		0.38		0.51	
Dep. headway, hd	5.68		5.64		5.00		4.71	
Capacity	445		259		523		640	
Delay	11.19		8.72		11.03		12.53	
LOS	B		A		B		B	
Approach:								
Delay	11.19		8.72		11.03		12.53	
LOS	B		A		B		B	

Intersection Delay 11.72 Intersection LOS B



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	200	7	0	0	13	85	1	15	1	81	0	129
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		32.5	32.5			32.5	
Lane Util. Factor		1.00			1.00		1.00	1.00			1.00	
Frt		1.00			0.88		1.00	0.99			0.92	
Flt Protected		0.95			1.00		0.95	1.00			0.98	
Satd. Flow (prot)		1812			1677		1805	1882			1710	
Flt Permitted		0.56			1.00		0.62	1.00			0.87	
Satd. Flow (perm)		1068			1677		1183	1882			1510	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	206	7	0	0	13	88	1	15	1	84	0	133
RTOR Reduction (vph)	0	0	0	0	54	0	0	0	0	0	182	0
Lane Group Flow (vph)	0	213	0	0	47	0	1	16	0	0	35	0
Turn Type	Perm	NA			NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			2	
Permitted Phases	4						2			2		
Actuated Green, G (s)		7.0			40.5		17.0	17.0			17.0	
Effective Green, g (s)		7.0			40.5		17.0	17.0			17.0	
Actuated g/C Ratio		0.07			0.39		0.16	0.16			0.16	
Clearance Time (s)		4.0			4.0		32.5	32.5			32.5	
Vehicle Extension (s)		4.0			6.0		4.0	4.0			4.0	
Lane Grp Cap (vph)		71			646		191	304			244	
v/s Ratio Prot					c0.03			0.01				
v/s Ratio Perm		c0.20					0.00				c0.02	
v/c Ratio		3.00			0.07		0.01	0.05			0.14	
Uniform Delay, d1		49.0			20.4		36.9	37.2			37.8	
Progression Factor		1.00			0.06		1.00	1.00			1.00	
Incremental Delay, d2		936.5			0.0		0.0	0.3			1.2	
Delay (s)		985.5			1.2		37.0	37.5			39.0	
Level of Service		F			A		D	D			D	
Approach Delay (s)		985.5			1.2			37.5			39.0	
Approach LOS		F			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	399.9	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	73.0
Intersection Capacity Utilization	76.4%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	156	10	0	0	11	64	1	16	3	79	0	202
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		32.5	32.5			32.5	
Lane Util. Factor		1.00			1.00		1.00	1.00			1.00	
Frt		1.00			0.88		1.00	0.98			0.90	
Flt Protected		0.96			1.00		0.95	1.00			0.99	
Satd. Flow (prot)		1815			1681		1805	1857			1692	
Flt Permitted		0.21			1.00		0.57	1.00			0.90	
Satd. Flow (perm)		390			1681		1090	1857			1540	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	170	11	0	0	12	70	1	17	3	86	0	220
RTOR Reduction (vph)	0	0	0	0	46	0	0	0	0	0	265	0
Lane Group Flow (vph)	0	181	0	0	36	0	1	20	0	0	41	0
Turn Type	Perm	NA			NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			2	
Permitted Phases	4						2			2		
Actuated Green, G (s)		18.9			40.2		15.4	15.4			15.4	
Effective Green, g (s)		18.9			40.2		15.4	15.4			15.4	
Actuated g/C Ratio		0.16			0.35		0.13	0.13			0.13	
Clearance Time (s)		4.0			4.0		32.5	32.5			32.5	
Vehicle Extension (s)		4.0			6.0		4.0	4.0			4.0	
Lane Grp Cap (vph)		64			587		145	248			206	
v/s Ratio Prot					c0.02			0.01				
v/s Ratio Perm		c0.46					0.00				c0.03	
v/c Ratio		2.83			0.06		0.01	0.08			0.20	
Uniform Delay, d1		48.0			24.9		43.2	43.6			44.3	
Progression Factor		1.00			0.03		1.00	1.00			1.00	
Incremental Delay, d2		864.1			0.1		0.1	0.6			2.2	
Delay (s)		912.1			0.8		43.3	44.2			46.5	
Level of Service		F			A		D	D			D	
Approach Delay (s)		912.1			0.8			44.2			46.5	
Approach LOS		F			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	305.6	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.40		
Actuated Cycle Length (s)	115.0	Sum of lost time (s)	73.0
Intersection Capacity Utilization	78.5%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCS+: Unsignalized Intersections Release 5.21

TWO-WAY STOP CONTROL SUMMARY

Analyst:	GJG
Agency/Co.:	RBF Consulting
Date Performed:	5/6/2014
Analysis Time Period:	AM Peak Hour
Intersection:	Abalone Ave/Balboa Ave
Jurisdiction:	Newport Beach
Units: U. S. Customary	
Analysis Year:	Alternative 1 Conditions
Project ID: PARK AVE BRIDGE REPLACEMENT	
East/West Street:	Balboa Ave
North/South Street:	Abalone Ave
Intersection Orientation: EW	Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		3	10	21	1	
Peak-Hour Factor, PHF		0.64	0.64	0.64	0.64	
Hourly Flow Rate, HFR		4	15	32	1	
Percent Heavy Vehicles		--	--	0	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR		LT	
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				0	24	2
Peak Hour Factor, PHF				0.64	0.64	0.64
Hourly Flow Rate, HFR				0	37	3
Percent Heavy Vehicles				0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/		No	/
Lanes				0	1	0
Configuration					LTR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT					LTR	
v (vph)		32					40	
C(m) (vph)		1611					811	
v/c		0.02					0.05	
95% queue length		0.06					0.16	
Control Delay		7.3					9.7	
LOS		A					A	
Approach Delay							9.7	
Approach LOS							A	

HCS+: Unsignalized Intersections Release 5.21

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst:	GJG
Agency/Co.:	RBF Consulting
Date Performed:	5/6/2014
Analysis Time Period:	AM Peak Hour
Intersection:	Abalone Ave/Balboa Ave
Jurisdiction:	Newport Beach
Units: U. S. Customary	
Analysis Year:	Alternative 1 Conditions
Project ID: PARK AVE BRIDGE REPLACEMENT	
East/West Street:	Balboa Ave
North/South Street:	Abalone Ave
Intersection Orientation: EW	Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		3	10	21	1	
Peak-Hour Factor, PHF		0.64	0.64	0.64	0.64	
Peak-15 Minute Volume		1	4	8	0	
Hourly Flow Rate, HFR		4	15	32	1	
Percent Heavy Vehicles		--	--	0	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR		LT	
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				0	24	2
Peak Hour Factor, PHF				0.64	0.64	0.64
Peak-15 Minute Volume				0	9	1
Hourly Flow Rate, HFR				0	37	3
Percent Heavy Vehicles				0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/		No	/
RT Channelized?						
Lanes				0	1	0
Configuration					LTR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		1
Shared ln volume, major rt vehicles:		0
Sat flow rate, major th vehicles:		1700
Sat flow rate, major rt vehicles:		1700
Number of major street through lanes:		1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1				7.1	6.5	6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0				0	0	0
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Grade/100			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00				0.70	0.00	0.00
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage		4.1				6.4	6.5	6.2
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)		2.20				3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		0				0	0	0
t(f)		2.2				3.5	4.0	3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 V(l,prot)
V prog				
Total Saturation Flow Rate, s (vph)				
Arrival Type				
Effective Green, g (sec)				
Cycle Length, C (sec)				
Rp (from Exhibit 16-11)				
Proportion vehicles arriving on green P				
g(q1)				
g(q2)				
g(q)				

Computation 2-Proportion of TWSC Intersection Time blocked

	Movement 2 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5

Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x		19				77	84	1
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s						1500		1500
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.			9			12		
Conflicting Flows						1		
Potential Capacity						1090		
Pedestrian Impedance Factor			1.00			1.00		
Movement Capacity						1090		
Probability of Queue free St.			1.00			1.00		

Step 2: LT from Major St.			4			1		
Conflicting Flows			19					
Potential Capacity			1611					
Pedestrian Impedance Factor			1.00			1.00		
Movement Capacity			1611					
Probability of Queue free St.			0.98			1.00		
Maj L-Shared Prob Q free St.			0.98					

Step 3: TH from Minor St.			8			11		
Conflicting Flows						84		
Potential Capacity						810		
Pedestrian Impedance Factor			1.00			1.00		
Cap. Adj. factor due to Impeding mvmnt			0.98			0.98		
Movement Capacity						794		
Probability of Queue free St.			1.00			0.95		

Step 4: LT from Minor St.			7			10		
Conflicting Flows						77		
Potential Capacity						931		
Pedestrian Impedance Factor			1.00			1.00		
Maj. L, Min T Impedance factor			0.93					
Maj. L, Min T Adj. Imp Factor.			0.95					
Cap. Adj. factor due to Impeding mvmnt			0.95			0.98		
Movement Capacity						913		

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.			8			11		
Part 1 - First Stage								
Conflicting Flows								
Potential Capacity								
Pedestrian Impedance Factor								
Cap. Adj. factor due to Impeding mvmnt								
Movement Capacity								
Probability of Queue free St.								
Part 2 - Second Stage								
Conflicting Flows								
Potential Capacity								
Pedestrian Impedance Factor								
Cap. Adj. factor due to Impeding mvmnt								
Movement Capacity								
Part 3 - Single Stage								
Conflicting Flows						84		
Potential Capacity						810		
Pedestrian Impedance Factor					1.00		1.00	
Cap. Adj. factor due to Impeding mvmnt					0.98		0.98	
Movement Capacity						794		
Result for 2 stage process:								
a								
y								
C t						794		
Probability of Queue free St.					1.00		0.95	

Step 4: LT from Minor St.			7			10		
Part 1 - First Stage								
Conflicting Flows								
Potential Capacity								
Pedestrian Impedance Factor								
Cap. Adj. factor due to Impeding mvmnt								
Movement Capacity								
Part 2 - Second Stage								
Conflicting Flows								
Potential Capacity								
Pedestrian Impedance Factor								
Cap. Adj. factor due to Impeding mvmnt								
Movement Capacity								
Part 3 - Single Stage								
Conflicting Flows						77		
Potential Capacity						931		
Pedestrian Impedance Factor					1.00		1.00	
Maj. L, Min T Impedance factor					0.93			
Maj. L, Min T Adj. Imp Factor.					0.95			
Cap. Adj. factor due to Impeding mvmnt					0.95		0.98	
Movement Capacity						913		
Results for Two-stage process:								
a								
y								
C t						913		

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)				0	37	3
Movement Capacity (vph)				913	794	1090
Shared Lane Capacity (vph)					811	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep				913	794	1090
Volume				0	37	3
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh					811	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT					LTR	
v (vph)		32					40	
C(m) (vph)		1611					811	
v/c		0.02					0.05	
95% queue length		0.06					0.16	
Control Delay		7.3					9.7	
LOS		A					A	
Approach Delay							9.7	
Approach LOS							A	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.98
v(il), Volume for stream 2 or 5		1
v(i2), Volume for stream 3 or 6		0
s(il), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		0.98
d(M,LT), Delay for stream 1 or 4		7.3
N, Number of major street through lanes		1
d(rank,1) Delay for stream 2 or 5		0.1

HCS+: Unsignalized Intersections Release 5.21

TWO-WAY STOP CONTROL SUMMARY

Analyst:	GJG
Agency/Co.:	RBF Consulting
Date Performed:	5/6/2014
Analysis Time Period:	PM Peak Hour
Intersection:	Abalone Ave/Balboa Ave
Jurisdiction:	Newport Beach
Units: U. S. Customary	
Analysis Year:	Alternative 1 Conditions
Project ID: PARK AVE BRIDGE REPLACEMENT	
East/West Street:	Balboa Ave
North/South Street:	Abalone Ave
Intersection Orientation: EW	Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	1	2		17	5	
Peak-Hour Factor, PHF	0.83	0.83		0.83	0.83	
Hourly Flow Rate, HFR	1	2		20	6	
Percent Heavy Vehicles	--	--		0	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	1	0		0	1	
Configuration		TR		LT		
Upstream Signal?	No				No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				2	12	1
Peak Hour Factor, PHF				0.83	0.83	0.83
Hourly Flow Rate, HFR				2	14	1
Percent Heavy Vehicles				0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/		No	/
Lanes				0	1	0
Configuration					LTR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT					LTR	
v (vph)		20					17	
C(m) (vph)		1632					860	
v/c		0.01					0.02	
95% queue length		0.04					0.06	
Control Delay		7.2					9.3	
LOS		A					A	
Approach Delay							9.3	
Approach LOS							A	

HCS+: Unsignalized Intersections Release 5.21

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst:	GJG
Agency/Co.:	RBF Consulting
Date Performed:	5/6/2014
Analysis Time Period:	PM Peak Hour
Intersection:	Abalone Ave/Balboa Ave
Jurisdiction:	Newport Beach
Units: U. S. Customary	
Analysis Year:	Alternative 1 Conditions
Project ID: PARK AVE BRIDGE REPLACEMENT	
East/West Street:	Balboa Ave
North/South Street:	Abalone Ave
Intersection Orientation: EW	Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	1	2		17	5	
Peak-Hour Factor, PHF	0.83	0.83		0.83	0.83	
Peak-15 Minute Volume	0	1		5	2	
Hourly Flow Rate, HFR	1	2		20	6	
Percent Heavy Vehicles	--	--		0	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	1	0		0	1	
Configuration		TR		LT		
Upstream Signal?	No				No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				2	12	1
Peak Hour Factor, PHF				0.83	0.83	0.83
Peak-15 Minute Volume				1	4	0
Hourly Flow Rate, HFR				2	14	1
Percent Heavy Vehicles				0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/		No	/
RT Channelized?						
Lanes				0	1	0
Configuration					LTR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		6
Shared ln volume, major rt vehicles:		0
Sat flow rate, major th vehicles:		1700
Sat flow rate, major rt vehicles:		1700
Number of major street through lanes:		1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1				7.1	6.5	6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0				0	0	0
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Grade/100			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00				0.70	0.00	0.00
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage		4.1				6.4	6.5	6.2
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)		2.20				3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		0				0	0	0
t(f)		2.2				3.5	4.0	3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 V(l,prot)
V prog				
Total Saturation Flow Rate, s (vph)				
Arrival Type				
Effective Green, g (sec)				
Cycle Length, C (sec)				
Rp (from Exhibit 16-11)				
Proportion vehicles arriving on green P				
g(q1)				
g(q2)				
g(q)				

Computation 2-Proportion of TWSC Intersection Time blocked

	Movement 2 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x		3				48	49	6
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s						1500		1500
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.					9		12	
Conflicting Flows							6	
Potential Capacity							1083	
Pedestrian Impedance Factor					1.00		1.00	
Movement Capacity							1083	
Probability of Queue free St.					1.00		1.00	
Step 2: LT from Major St.					4		1	
Conflicting Flows					3			
Potential Capacity					1632			
Pedestrian Impedance Factor					1.00		1.00	
Movement Capacity					1632			
Probability of Queue free St.					0.99		1.00	
Maj L-Shared Prob Q free St.					0.99			
Step 3: TH from Minor St.					8		11	
Conflicting Flows							49	
Potential Capacity							846	
Pedestrian Impedance Factor					1.00		1.00	
Cap. Adj. factor due to Impeding mvmnt					0.99		0.99	
Movement Capacity							836	
Probability of Queue free St.					1.00		0.98	
Step 4: LT from Minor St.					7		10	
Conflicting Flows							48	
Potential Capacity							967	
Pedestrian Impedance Factor					1.00		1.00	
Maj. L, Min T Impedance factor					0.97			
Maj. L, Min T Adj. Imp Factor.					0.98			
Cap. Adj. factor due to Impeding mvmnt					0.98		0.99	
Movement Capacity							955	

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.					8		11	
Part 1 - First Stage								
Conflicting Flows								
Potential Capacity								
Pedestrian Impedance Factor								
Cap. Adj. factor due to Impeding mvmnt								
Movement Capacity								
Probability of Queue free St.								
Part 2 - Second Stage								
Conflicting Flows								
Potential Capacity								
Pedestrian Impedance Factor								
Cap. Adj. factor due to Impeding mvmnt								
Movement Capacity								
Part 3 - Single Stage								
Conflicting Flows							49	
Potential Capacity							846	
Pedestrian Impedance Factor						1.00	1.00	
Cap. Adj. factor due to Impeding mvmnt						0.99	0.99	
Movement Capacity							836	
Result for 2 stage process:								
a								
y								
C t							836	
Probability of Queue free St.						1.00	0.98	
Step 4: LT from Minor St.					7		10	
Part 1 - First Stage								
Conflicting Flows								
Potential Capacity								
Pedestrian Impedance Factor								
Cap. Adj. factor due to Impeding mvmnt								
Movement Capacity								
Part 2 - Second Stage								
Conflicting Flows								
Potential Capacity								
Pedestrian Impedance Factor								
Cap. Adj. factor due to Impeding mvmnt								
Movement Capacity								
Part 3 - Single Stage								
Conflicting Flows							48	
Potential Capacity							967	
Pedestrian Impedance Factor						1.00	1.00	
Maj. L, Min T Impedance factor						0.97		
Maj. L, Min T Adj. Imp Factor.						0.98		
Cap. Adj. factor due to Impeding mvmnt						0.98	0.99	
Movement Capacity							955	
Results for Two-stage process:								
a								
y								
C t							955	

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)				2	14	1
Movement Capacity (vph)				955	836	1083
Shared Lane Capacity (vph)					860	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

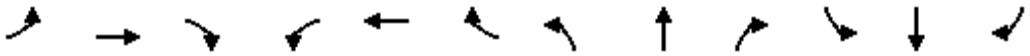
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep				955	836	1083
Volume				2	14	1
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh					860	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT					LTR	
v (vph)		20					17	
C(m) (vph)		1632					860	
v/c		0.01					0.02	
95% queue length		0.04					0.06	
Control Delay		7.2					9.3	
LOS		A					A	
Approach Delay							9.3	
Approach LOS							A	

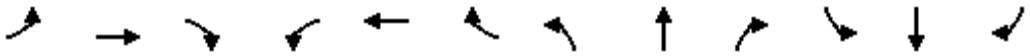
Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.99
v(il), Volume for stream 2 or 5		6
v(i2), Volume for stream 3 or 6		0
s(il), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		0.99
d(M,LT), Delay for stream 1 or 4		7.2
N, Number of major street through lanes		1
d(rank,1) Delay for stream 2 or 5		0.1



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	44	6	2	38	0	0	0	0	7	6	43
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			32.5						4.0	
Lane Util. Factor		1.00			1.00						1.00	
Frt		0.98			1.00						0.90	
Flt Protected		1.00			1.00						0.99	
Satd. Flow (prot)		1869			1895						1692	
Flt Permitted		1.00			0.97						0.99	
Satd. Flow (perm)		1869			1850						1692	
Peak-hour factor, PHF	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76
Adj. Flow (vph)	0	58	8	3	50	0	0	0	0	9	8	57
RTOR Reduction (vph)	0	4	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	62	0	0	53	0	0	0	0	0	74	0
Turn Type		NA		Perm	NA					Perm	NA	
Protected Phases		12			16						10	
Permitted Phases				16						10		
Actuated Green, G (s)		56.5			4.0						4.0	
Effective Green, g (s)		56.5			4.0						4.0	
Actuated g/C Ratio		0.54			0.04						0.04	
Clearance Time (s)		4.0			32.5						4.0	
Vehicle Extension (s)		6.0			4.0						4.0	
Lane Grp Cap (vph)		1005			70						64	
v/s Ratio Prot		c0.03										
v/s Ratio Perm					c0.03						0.04	
v/c Ratio		0.06			0.76						1.16	
Uniform Delay, d1		11.6			50.0						50.5	
Progression Factor		0.90			1.00						1.00	
Incremental Delay, d2		0.1			38.5						161.1	
Delay (s)		10.5			88.5						211.6	
Level of Service		B			F						F	
Approach Delay (s)		10.5			88.5			0.0			211.6	
Approach LOS		B			F			A			F	

Intersection Summary			
HCM 2000 Control Delay	109.1	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	0.35		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	73.0
Intersection Capacity Utilization	44.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	74	14	0	36	0	0	0	0	4	1	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			32.5						4.0	
Lane Util. Factor		1.00			1.00						1.00	
Frt		0.98			1.00						0.89	
Flt Protected		1.00			1.00						0.99	
Satd. Flow (prot)		1860			1900						1673	
Flt Permitted		1.00			1.00						0.99	
Satd. Flow (perm)		1860			1900						1673	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	80	15	0	39	0	0	0	0	4	1	27
RTOR Reduction (vph)	0	6	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	89	0	0	39	0	0	0	0	0	32	0
Turn Type		NA			NA					Perm	NA	
Protected Phases		12			16						10	
Permitted Phases				16						10		
Actuated Green, G (s)		66.8			5.3						2.4	
Effective Green, g (s)		66.8			5.3						2.4	
Actuated g/C Ratio		0.58			0.05						0.02	
Clearance Time (s)		4.0			32.5						4.0	
Vehicle Extension (s)		6.0			4.0						4.0	
Lane Grp Cap (vph)		1080			87						34	
v/s Ratio Prot		c0.05			c0.02							
v/s Ratio Perm											0.02	
v/c Ratio		0.08			0.45						0.94	
Uniform Delay, d1		10.6			53.4						56.2	
Progression Factor		0.77			1.00						1.00	
Incremental Delay, d2		0.1			4.9						130.7	
Delay (s)		8.2			58.4						186.9	
Level of Service		A			E						F	
Approach Delay (s)		8.2			58.4			0.0			186.9	
Approach LOS		A			E			A			F	

Intersection Summary			
HCM 2000 Control Delay	54.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.24		
Actuated Cycle Length (s)	115.0	Sum of lost time (s)	73.0
Intersection Capacity Utilization	44.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Alternative 2 Reconstruction Conditions

HCS+: Unsignalized Intersections Release 5.21

Phone: Fax:
E-Mail:

ALL-WAY STOP CONTROL(AWSC) ANALYSIS

Analyst: GJG
Agency/Co.: RBF Consulting
Date Performed: 5/5/2014
Analysis Time Period: AM Peak Hour
Intersection: Marine Ave/Balboa Ave
Jurisdiction: Newport Beach
Units: U. S. Customary
Analysis Year: Alternative 2 Conditions
Project ID: PARK AVE BRIDGE REPLACEMENT
East/West Street: Balboa Ave
North/South Street: Marine Ave

Worksheet 2 - Volume Adjustments and Site Characteristics

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	207	9	13	3	15	99	11	223	7	101	114	84
% Thrus Left Lane												

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	LTR		LTR		LTR		LTR	
PHF	0.94		0.94		0.94		0.94	
Flow Rate	242		123		255		317	
% Heavy Veh	0		0		0		0	
No. Lanes	1		1		1		1	
Opposing-Lanes	1		1		1		1	
Conflicting-lanes	1		1		1		1	
Geometry group	1		1		1		1	
Duration, T 0.25 hrs.								

Worksheet 3 - Saturation Headway Adjustment Worksheet

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow Rates:								
Total in Lane	242		123		255		317	
Left-Turn	220		3		11		107	
Right-Turn	13		105		7		89	
Prop. Left-Turns	0.9		0.0		0.0		0.3	
Prop. Right-Turns	0.1		0.9		0.0		0.3	
Prop. Heavy Vehicle	0.0		0.0		0.0		0.0	
Geometry Group	1		1		1		1	
Adjustments Exhibit 17-33:								
hLT-adj	0.2		0.2		0.2		0.2	
hRT-adj	-0.6		-0.6		-0.6		-0.6	
hHV-adj	1.7		1.7		1.7		1.7	
hadj, computed	0.1		-0.5		-0.0		-0.1	

Worksheet 4 - Departure Headway and Service Time

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow rate	242		123		255		317	
hd, initial value	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
x, initial	0.22		0.11		0.23		0.28	
hd, final value	5.85		5.47		5.51		5.33	
x, final value	0.39		0.19		0.39		0.47	
Move-up time, m	2.0		2.0		2.0		2.0	
Service Time	3.9		3.5		3.5		3.3	

Worksheet 5 - Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow Rate	242		123		255		317	
Service Time	3.9		3.5		3.5		3.3	
Utilization, x	0.39		0.19		0.39		0.47	
Dep. headway, hd	5.85		5.47		5.51		5.33	
Capacity	492		373		505		567	
Delay	12.60		9.73		11.99		12.94	
LOS	B		A		B		B	
Approach:								
Delay	12.60		9.73		11.99		12.94	
LOS	B		A		B		B	

Intersection Delay 12.17 Intersection LOS B

HCS+: Unsignalized Intersections Release 5.21

Phone: Fax:
E-Mail:

ALL-WAY STOP CONTROL(AWSC) ANALYSIS

Analyst: GJG
Agency/Co.: RBF Consulting
Date Performed: 5/5/2014
Analysis Time Period: PM Peak Hour
Intersection: Marine Ave/Balboa Ave
Jurisdiction: Newport Beach
Units: U. S. Customary
Analysis Year: Alternative 2 Conditions
Project ID: PARK AVE BRIDGE REPLACEMENT
East/West Street: Balboa Ave
North/South Street: Marine Ave

Worksheet 2 - Volume Adjustments and Site Characteristics

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	176	12	8	2	13	69	4	185	10	98	159	114
% Thrus Left Lane												

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	LTR		LTR		LTR		LTR	
PHF	0.95		0.95		0.95		0.95	
Flow Rate	205		87		208		390	
% Heavy Veh	0		0		0		0	
No. Lanes	1		1		1		1	
Opposing-Lanes	1		1		1		1	
Conflicting-lanes	1		1		1		1	
Geometry group	1		1		1		1	

Duration, T 0.25 hrs.

Worksheet 3 - Saturation Headway Adjustment Worksheet

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow Rates:								
Total in Lane	205		87		208		390	
Left-Turn	185		2		4		103	
Right-Turn	8		72		10		120	
Prop. Left-Turns	0.9		0.0		0.0		0.3	
Prop. Right-Turns	0.0		0.8		0.0		0.3	
Prop. Heavy Vehicle	0.0		0.0		0.0		0.0	
Geometry Group	1		1		1		1	
Adjustments Exhibit 17-33:								
hLT-adj	0.2		0.2		0.2		0.2	
hRT-adj	-0.6		-0.6		-0.6		-0.6	
hHV-adj	1.7		1.7		1.7		1.7	
hadj, computed	0.2		-0.5		-0.0		-0.1	

Worksheet 4 - Departure Headway and Service Time

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow rate	205		87		208		390	
hd, initial value	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
x, initial	0.18		0.08		0.18		0.35	
hd, final value	5.76		5.37		5.31		4.95	
x, final value	0.33		0.13		0.31		0.54	
Move-up time, m	2.0		2.0		2.0		2.0	
Service Time	3.8		3.4		3.3		3.0	

Worksheet 5 - Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow Rate	205		87		208		390	
Service Time	3.8		3.4		3.3		3.0	
Utilization, x	0.33		0.13		0.31		0.54	
Dep. headway, hd	5.76		5.37		5.31		4.95	
Capacity	455		337		458		640	
Delay	11.55		9.17		10.64		13.55	
LOS	B		A		B		B	
Approach:								
Delay	11.55		9.17		10.64		13.55	
LOS	B		A		B		B	

Intersection Delay 11.98 Intersection LOS B

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Phone: Fax:
E-Mail:

ALL-WAY STOP CONTROL(AWSC) ANALYSIS

Analyst: GJG
Agency/Co.: RBF Consulting
Date Performed: 5/5/2014
Analysis Time Period: AM Peak Hour
Intersection: Marine Ave/Park Ave
Jurisdiction: Newport Beach
Units: U. S. Customary
Analysis Year: Alternative 2 Conditions
Project ID: PARK AVE BRIDGE REPLACEMENT
East/West Street: Park Ave
North/South Street: Marine Ave

Worksheet 2 - Volume Adjustments and Site Characteristics

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	200	0	0	0	0	0	1	16	0	0	0	129
% Thrus Left Lane												

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	LT		TR		L	TR	LTR	
PHF	0.97		0.97		0.97	0.97	0.97	
Flow Rate	206		0		1	16	132	
% Heavy Veh	0		0		0	0	0	
No. Lanes	1		1		2		1	
Opposing-Lanes	1		1		1		2	
Conflicting-lanes	2		2		1		1	
Geometry group	2		2		5		4a	
Duration, T	0.25	hrs.						

Worksheet 3 - Saturation Headway Adjustment Worksheet

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow Rates:								
Total in Lane	206		0		1	16	132	
Left-Turn	206		0		1	0	0	
Right-Turn	0		0		0	0	132	
Prop. Left-Turns	1.0		0.0		1.0	0.0	0.0	
Prop. Right-Turns	0.0		0.0		0.0	0.0	1.0	
Prop. Heavy Vehicle	0.0		0.0		0.0	0.0	0.0	
Geometry Group	2		2		5		4a	
Adjustments Exhibit 17-33:								
hLT-adj	0.2		0.2		0.5		0.2	
hRT-adj	-0.6		-0.6		-0.7		-0.6	
hHV-adj	1.7		1.7		1.7		1.7	
hadj, computed	0.2		0.0		0.5	0.0	-0.6	

Worksheet 4 - Departure Headway and Service Time

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow rate	206		0		1	16	132	
hd, initial value	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
x, initial	0.18		0.00		0.00	0.01	0.12	
hd, final value	4.41		4.44		5.60	5.09	3.92	
x, final value	0.25		0.00		0.00	0.02	0.14	
Move-up time, m	2.0		2.0		2.3		2.0	
Service Time	2.4		2.4		3.3	2.8	1.9	

Worksheet 5 - Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow Rate	206		0		1	16	132	
Service Time	2.4		2.4		3.3	2.8	1.9	
Utilization, x	0.25		0.00		0.00	0.02	0.14	
Dep. headway, hd	4.41		4.44		5.60	5.09	3.92	
Capacity	456		0		251	266	382	
Delay	8.90		7.44		8.31	7.91	7.57	
LOS	A		A		A	A	A	
Approach:								
Delay	8.90		7.44		7.94		7.57	
LOS	A		A		A		A	
Intersection Delay	8.36		Intersection LOS A					

HCS+: Unsignalized Intersections Release 5.21

Phone: Fax:
E-Mail:

ALL-WAY STOP CONTROL(AWSC) ANALYSIS

Analyst: GJG
Agency/Co.: RBF Consulting
Date Performed: 5/5/2014
Analysis Time Period: PM Peak Hour
Intersection: Marine Ave/Park Ave
Jurisdiction: Newport Beach
Units: U. S. Customary
Analysis Year: Alternative 2 Conditions
Project ID: PARK AVE BRIDGE REPLACEMENT
East/West Street: Park Ave
North/South Street: Marine Ave

Worksheet 2 - Volume Adjustments and Site Characteristics

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	156	0	0	0	0	0	1	19	0	0	0	202
% Thrus Left Lane												

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	LT		TR		L	TR	LTR	
PHF	0.92		0.92		0.92	0.92	0.92	
Flow Rate	169		0		1	20	219	
% Heavy Veh	0		0		0	0	0	
No. Lanes	1		1		2		1	
Opposing-Lanes	1		1		1		2	
Conflicting-lanes	2		2		1		1	
Geometry group	2		2		5		4a	
Duration, T	0.25	hrs.						

Worksheet 3 - Saturation Headway Adjustment Worksheet

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow Rates:								
Total in Lane	169		0		1	20	219	
Left-Turn	169		0		1	0	0	
Right-Turn	0		0		0	0	219	
Prop. Left-Turns	1.0		0.0		1.0	0.0	0.0	
Prop. Right-Turns	0.0		0.0		0.0	0.0	1.0	
Prop. Heavy Vehicle	0.0		0.0		0.0	0.0	0.0	
Geometry Group	2		2		5		4a	
Adjustments Exhibit 17-33:								
hLT-adj	0.2		0.2		0.5		0.2	
hRT-adj	-0.6		-0.6		-0.7		-0.6	
hHV-adj	1.7		1.7		1.7		1.7	
hadj, computed	0.2		0.0		0.5	0.0	-0.6	

Worksheet 4 - Departure Headway and Service Time

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow rate	169		0		1	20	219	
hd, initial value	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
x, initial	0.15		0.00		0.00	0.02	0.19	
hd, final value	4.59		4.60		5.58	5.08	3.85	
x, final value	0.22		0.00		0.00	0.03	0.23	
Move-up time, m	2.0		2.0		2.3		2.0	
Service Time	2.6		2.6		3.3	2.8	1.8	

Worksheet 5 - Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow Rate	169		0		1	20	219	
Service Time	2.6		2.6		3.3	2.8	1.8	
Utilization, x	0.22		0.00		0.00	0.03	0.23	
Dep. headway, hd	4.59		4.60		5.58	5.08	3.85	
Capacity	419		0		251	270	469	
Delay	8.85		7.60		8.29	7.93	8.02	
LOS	A		A		A	A	A	
Approach:								
Delay	8.85		7.60		7.95		8.02	
LOS	A		A		A		A	
Intersection Delay	8.36		Intersection LOS A					

HCS+: Unsignalized Intersections Release 5.21

TWO-WAY STOP CONTROL SUMMARY

Analyst:	GJG
Agency/Co.:	RBF Consulting
Date Performed:	5/5/2014
Analysis Time Period:	AM Peak Hour
Intersection:	Abalone Ave/Balboa Ave
Jurisdiction:	Newport Beach
Units: U. S. Customary	
Analysis Year:	Alternative 2 Conditions
Project ID: PARK AVE BRIDGE REPLACEMENT	
East/West Street:	Balboa Ave
North/South Street:	Abalone Ave
Intersection Orientation: EW	Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		14	49	2	90	
Peak-Hour Factor, PHF		0.64	0.64	0.64	0.64	
Hourly Flow Rate, HFR		21	76	3	140	
Percent Heavy Vehicles		--	--	0	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR		LT	
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				0	2	35
Peak Hour Factor, PHF				0.64	0.64	0.64
Hourly Flow Rate, HFR				0	3	54
Percent Heavy Vehicles				0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/		No	/
Lanes				0	1	0
Configuration					LTR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT					LTR	
v (vph)		3					57	
C(m) (vph)		1509					895	
v/c		0.00					0.06	
95% queue length		0.01					0.20	
Control Delay		7.4					9.3	
LOS		A					A	
Approach Delay							9.3	
Approach LOS							A	

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Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst:	GJG
Agency/Co.:	RBF Consulting
Date Performed:	5/5/2014
Analysis Time Period:	AM Peak Hour
Intersection:	Abalone Ave/Balboa Ave
Jurisdiction:	Newport Beach
Units: U. S. Customary	
Analysis Year:	Alternative 2 Conditions
Project ID: PARK AVE BRIDGE REPLACEMENT	
East/West Street:	Balboa Ave
North/South Street:	Abalone Ave
Intersection Orientation: EW	Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		14	49	2	90	
Peak-Hour Factor, PHF		0.64	0.64	0.64	0.64	
Peak-15 Minute Volume		5	19	1	35	
Hourly Flow Rate, HFR		21	76	3	140	
Percent Heavy Vehicles		--	--	0	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR		LT	
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				0	2	35
Peak Hour Factor, PHF				0.64	0.64	0.64
Peak-15 Minute Volume				0	1	14
Hourly Flow Rate, HFR				0	3	54
Percent Heavy Vehicles				0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/		No	/
RT Channelized?						
Lanes				0	1	0
Configuration					LTR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		140
Shared ln volume, major rt vehicles:		0
Sat flow rate, major th vehicles:		1700
Sat flow rate, major rt vehicles:		1700
Number of major street through lanes:		1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1				7.1	6.5	6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0				0	0	0
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Grade/100			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00				0.70	0.00	0.00
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage		4.1				6.4	6.5	6.2
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)		2.20				3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		0				0	0	0
t(f)		2.2				3.5	4.0	3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 V(l,prot)
V prog				
Total Saturation Flow Rate, s (vph)				
Arrival Type				
Effective Green, g (sec)				
Cycle Length, C (sec)				
Rp (from Exhibit 16-11)				
Proportion vehicles arriving on green P				
g(q1)				
g(q2)				
g(q)				

Computation 2-Proportion of TWSC Intersection Time blocked

	Movement 2 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x		97				205	243	140
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s						1500		1500
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.					9		12	
Conflicting Flows							140	
Potential Capacity							913	
Pedestrian Impedance Factor					1.00		1.00	
Movement Capacity							913	
Probability of Queue free St.					1.00		0.94	
Step 2: LT from Major St.					4		1	
Conflicting Flows					97			
Potential Capacity					1509			
Pedestrian Impedance Factor					1.00		1.00	
Movement Capacity					1509			
Probability of Queue free St.					1.00		1.00	
Maj L-Shared Prob Q free St.					1.00			
Step 3: TH from Minor St.					8		11	
Conflicting Flows							243	
Potential Capacity							662	
Pedestrian Impedance Factor					1.00		1.00	
Cap. Adj. factor due to Impeding mvmnt					1.00		1.00	
Movement Capacity							661	
Probability of Queue free St.					1.00		1.00	
Step 4: LT from Minor St.					7		10	
Conflicting Flows							205	
Potential Capacity							788	
Pedestrian Impedance Factor					1.00		1.00	
Maj. L, Min T Impedance factor					0.99			
Maj. L, Min T Adj. Imp Factor.					0.99			
Cap. Adj. factor due to Impeding mvmnt					0.94		1.00	
Movement Capacity							786	

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.					8		11	
Part 1 - First Stage								
Conflicting Flows								
Potential Capacity								
Pedestrian Impedance Factor								
Cap. Adj. factor due to Impeding mvmnt								
Movement Capacity								
Probability of Queue free St.								
Part 2 - Second Stage								
Conflicting Flows								
Potential Capacity								
Pedestrian Impedance Factor								
Cap. Adj. factor due to Impeding mvmnt								
Movement Capacity								
Part 3 - Single Stage								
Conflicting Flows							243	
Potential Capacity							662	
Pedestrian Impedance Factor						1.00	1.00	
Cap. Adj. factor due to Impeding mvmnt						1.00	1.00	
Movement Capacity							661	
Result for 2 stage process:								
a								
y								
C t							661	
Probability of Queue free St.						1.00	1.00	
Step 4: LT from Minor St.					7		10	
Part 1 - First Stage								
Conflicting Flows								
Potential Capacity								
Pedestrian Impedance Factor								
Cap. Adj. factor due to Impeding mvmnt								
Movement Capacity								
Part 2 - Second Stage								
Conflicting Flows								
Potential Capacity								
Pedestrian Impedance Factor								
Cap. Adj. factor due to Impeding mvmnt								
Movement Capacity								
Part 3 - Single Stage								
Conflicting Flows							205	
Potential Capacity							788	
Pedestrian Impedance Factor						1.00	1.00	
Maj. L, Min T Impedance factor						0.99		
Maj. L, Min T Adj. Imp Factor.						0.99		
Cap. Adj. factor due to Impeding mvmnt						0.94	1.00	
Movement Capacity							786	
Results for Two-stage process:								
a								
y								
C t							786	

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)				0	3	54
Movement Capacity (vph)				786	661	913
Shared Lane Capacity (vph)					895	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep				786	661	913
Volume				0	3	54
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh					895	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT					LTR	
v (vph)		3					57	
C(m) (vph)		1509					895	
v/c		0.00					0.06	
95% queue length		0.01					0.20	
Control Delay		7.4					9.3	
LOS		A					A	
Approach Delay							9.3	
Approach LOS							A	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
v(il), Volume for stream 2 or 5		140
v(i2), Volume for stream 3 or 6		0
s(il), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		1.00
d(M,LT), Delay for stream 1 or 4		7.4
N, Number of major street through lanes		1
d(rank,1) Delay for stream 2 or 5		0.0

HCS+: Unsignalized Intersections Release 5.21

TWO-WAY STOP CONTROL SUMMARY

Analyst: GJG
Agency/Co.: RBF Consulting
Date Performed: 5/5/2014
Analysis Time Period: PM Peak Hour
Intersection: Abalone Ave/Balboa Ave
Jurisdiction: Newport Beach
Units: U. S. Customary
Analysis Year: Alternative 2 Conditions
Project ID: PARK AVE BRIDGE REPLACEMENT
East/West Street: Balboa Ave
North/South Street: Abalone Ave
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		20	72	2	75	
Peak-Hour Factor, PHF		0.83	0.83	0.83	0.83	
Hourly Flow Rate, HFR		24	86	2	90	
Percent Heavy Vehicles		--	--	0	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR		LT	
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				2	1	18
Peak Hour Factor, PHF				0.83	0.83	0.83
Hourly Flow Rate, HFR				2	1	21
Percent Heavy Vehicles				0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/		No	/
Lanes				0	1	0
Configuration					LTR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT					LTR	
v (vph)		2					24	
C(m) (vph)		1493					944	
v/c		0.00					0.03	
95% queue length		0.00					0.08	
Control Delay		7.4					8.9	
LOS		A					A	
Approach Delay							8.9	
Approach LOS							A	

HCS+: Unsignalized Intersections Release 5.21

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: GJG
Agency/Co.: RBF Consulting
Date Performed: 5/5/2014
Analysis Time Period: PM Peak Hour
Intersection: Abalone Ave/Balboa Ave
Jurisdiction: Newport Beach
Units: U. S. Customary
Analysis Year: Alternative 2 Conditions
Project ID: PARK AVE BRIDGE REPLACEMENT
East/West Street: Balboa Ave
North/South Street: Abalone Ave
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		20	72	2	75	
Peak-Hour Factor, PHF		0.83	0.83	0.83	0.83	
Peak-15 Minute Volume		6	22	1	23	
Hourly Flow Rate, HFR		24	86	2	90	
Percent Heavy Vehicles		--	--	0	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR		LT	
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				2	1	18
Peak Hour Factor, PHF				0.83	0.83	0.83
Peak-15 Minute Volume				1	0	5
Hourly Flow Rate, HFR				2	1	21
Percent Heavy Vehicles				0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/		No	/
RT Channelized?						
Lanes				0	1	0
Configuration					LTR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		90
Shared ln volume, major rt vehicles:		0
Sat flow rate, major th vehicles:		1700
Sat flow rate, major rt vehicles:		1700
Number of major street through lanes:		1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1				7.1	6.5	6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0				0	0	0
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Grade/100			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00				0.70	0.00	0.00
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage		4.1				6.4	6.5	6.2
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)		2.20				3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		0				0	0	0
t(f)		2.2				3.5	4.0	3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 V(l,prot)
V prog				
Total Saturation Flow Rate, s (vph)				
Arrival Type				
Effective Green, g (sec)				
Cycle Length, C (sec)				
Rp (from Exhibit 16-11)				
Proportion vehicles arriving on green P				
g(q1)				
g(q2)				
g(q)				

Computation 2-Proportion of TWSC Intersection Time blocked

	Movement 2 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x		110				161	204	90
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s						1500		1500
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.					9		12	
Conflicting Flows							90	
Potential Capacity							973	
Pedestrian Impedance Factor					1.00		1.00	
Movement Capacity							973	
Probability of Queue free St.					1.00		0.98	
Step 2: LT from Major St.					4		1	
Conflicting Flows					110			
Potential Capacity					1493			
Pedestrian Impedance Factor					1.00		1.00	
Movement Capacity					1493			
Probability of Queue free St.					1.00		1.00	
Maj L-Shared Prob Q free St.					1.00			
Step 3: TH from Minor St.					8		11	
Conflicting Flows							204	
Potential Capacity							696	
Pedestrian Impedance Factor					1.00		1.00	
Cap. Adj. factor due to Impeding mvmnt					1.00		1.00	
Movement Capacity							695	
Probability of Queue free St.					1.00		1.00	
Step 4: LT from Minor St.					7		10	
Conflicting Flows							161	
Potential Capacity							835	
Pedestrian Impedance Factor					1.00		1.00	
Maj. L, Min T Impedance factor					1.00			
Maj. L, Min T Adj. Imp Factor.					1.00			
Cap. Adj. factor due to Impeding mvmnt					0.98		1.00	
Movement Capacity							834	

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.					8		11	
Part 1 - First Stage								
Conflicting Flows								
Potential Capacity								
Pedestrian Impedance Factor								
Cap. Adj. factor due to Impeding mvmnt								
Movement Capacity								
Probability of Queue free St.								
Part 2 - Second Stage								
Conflicting Flows								
Potential Capacity								
Pedestrian Impedance Factor								
Cap. Adj. factor due to Impeding mvmnt								
Movement Capacity								
Part 3 - Single Stage								
Conflicting Flows							204	
Potential Capacity							696	
Pedestrian Impedance Factor						1.00	1.00	
Cap. Adj. factor due to Impeding mvmnt						1.00	1.00	
Movement Capacity							695	
Result for 2 stage process:								
a								
y								
C t							695	
Probability of Queue free St.						1.00	1.00	
Step 4: LT from Minor St.					7		10	
Part 1 - First Stage								
Conflicting Flows								
Potential Capacity								
Pedestrian Impedance Factor								
Cap. Adj. factor due to Impeding mvmnt								
Movement Capacity								
Part 2 - Second Stage								
Conflicting Flows								
Potential Capacity								
Pedestrian Impedance Factor								
Cap. Adj. factor due to Impeding mvmnt								
Movement Capacity								
Part 3 - Single Stage								
Conflicting Flows							161	
Potential Capacity							835	
Pedestrian Impedance Factor						1.00	1.00	
Maj. L, Min T Impedance factor						1.00		
Maj. L, Min T Adj. Imp Factor.						1.00		
Cap. Adj. factor due to Impeding mvmnt						0.98	1.00	
Movement Capacity							834	
Results for Two-stage process:								
a								
y								
C t							834	

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)				2	1	21
Movement Capacity (vph)				834	695	973
Shared Lane Capacity (vph)					944	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep				834	695	973
Volume				2	1	21
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh					944	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT					LTR	
v (vph)		2					24	
C(m) (vph)		1493					944	
v/c		0.00					0.03	
95% queue length		0.00					0.08	
Control Delay		7.4					8.9	
LOS		A					A	
Approach Delay							8.9	
Approach LOS							A	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
v(il), Volume for stream 2 or 5		90
v(i2), Volume for stream 3 or 6		0
s(il), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		1.00
d(M,LT), Delay for stream 1 or 4		7.4
N, Number of major street through lanes		1
d(rank,1) Delay for stream 2 or 5		0.0

HCS+: Unsignalized Intersections Release 5.21

Phone: Fax:
E-Mail:

ALL-WAY STOP CONTROL(AWSC) ANALYSIS

Analyst: GJG
Agency/Co.: RBF Consulting
Date Performed: 5/5/2014
Analysis Time Period: AM Peak Hour
Intersection: Abalone Ave/Park Ave
Jurisdiction: Newport Beach
Units: U. S. Customary
Analysis Year: Alternative 2 Conditions
Project ID: PARK AVE BRIDGE REPLACEMENT
East/West Street: Park Ave
North/South Street: Abalone Ave

Worksheet 2 - Volume Adjustments and Site Characteristics

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	0	0	0	2	0	0	0	0	0	40	12	0
% Thrus Left Lane												

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	TR		LT				LTR	
PHF	0.76		0.76				0.76	
Flow Rate	0		2				67	
% Heavy Veh	0		0				0	
No. Lanes	1		1				1	
Opposing-Lanes	1		1				0	
Conflicting-lanes	1		1				1	
Geometry group	1		1				1	
Duration, T 0.25 hrs.								

Worksheet 3 - Saturation Headway Adjustment Worksheet

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow Rates:								
Total in Lane	0		2				67	
Left-Turn	0		2				52	
Right-Turn	0		0				0	
Prop. Left-Turns	0.0		1.0				0.8	
Prop. Right-Turns	0.0		0.0				0.0	
Prop. Heavy Vehicle	0.0		0.0				0.0	
Geometry Group	1		1				1	
Adjustments Exhibit 17-33:								
hLT-adj	0.2		0.2				0.2	
hRT-adj	-0.6		-0.6				-0.6	
hHV-adj	1.7		1.7				1.7	
hadj, computed	0.0		0.2				0.2	

Worksheet 4 - Departure Headway and Service Time

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow rate	0		2				67	
hd, initial value	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
x, initial	0.00		0.00				0.06	
hd, final value	4.05		4.25				4.06	
x, final value	0.00		0.00				0.08	
Move-up time, m	2.0		2.0				2.0	
Service Time	2.1		2.2				2.1	

Worksheet 5 - Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow Rate	0		2				67	
Service Time	2.1		2.2				2.1	
Utilization, x	0.00		0.00				0.08	
Dep. headway, hd	4.05		4.25				4.06	
Capacity	0		252				317	
Delay	7.05		7.26				7.39	
LOS	A		A				A	
Approach:								
Delay	7.05		7.26				7.39	
LOS	A		A				A	
Intersection Delay 7.39			Intersection LOS A					

HCS+: Unsignalized Intersections Release 5.21

Phone: Fax:
E-Mail:

ALL-WAY STOP CONTROL(AWSC) ANALYSIS

Analyst: GJG
Agency/Co.: RBF Consulting
Date Performed: 5/5/2014
Analysis Time Period: PM Peak Hour
Intersection: Abalone Ave/Park Ave
Jurisdiction: Newport Beach
Units: U. S. Customary
Analysis Year: Alternative 2 Conditions
Project ID: PARK AVE BRIDGE REPLACEMENT
East/West Street: Park Ave
North/South Street: Abalone Ave

Worksheet 2 - Volume Adjustments and Site Characteristics

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	0	0	0	0	0	0	0	0	0	60	15	0
% Thrus Left Lane												

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	TR		LT				LTR	
PHF	0.92		0.92				0.92	
Flow Rate	0		0				81	
% Heavy Veh	0		0				0	
No. Lanes	1		1				1	
Opposing-Lanes	1		1				0	
Conflicting-lanes	1		1				1	
Geometry group	1		1				1	
Duration, T 0.25 hrs.								

Worksheet 3 - Saturation Headway Adjustment Worksheet

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow Rates:								
Total in Lane	0		0				81	
Left-Turn	0		0				65	
Right-Turn	0		0				0	
Prop. Left-Turns	0.0		0.0				0.8	
Prop. Right-Turns	0.0		0.0				0.0	
Prop. Heavy Vehicle	0.0		0.0				0.0	
Geometry Group	1		1				1	
Adjustments Exhibit 17-33:								
hLT-adj	0.2		0.2				0.2	
hRT-adj	-0.6		-0.6				-0.6	
hHV-adj	1.7		1.7				1.7	
hadj, computed	0.0		0.0				0.2	

Worksheet 4 - Departure Headway and Service Time

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow rate	0		0				81	
hd, initial value	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
x, initial	0.00		0.00				0.07	
hd, final value	4.08		4.08				4.06	
x, final value	0.00		0.00				0.09	
Move-up time, m	2.0		2.0				2.0	
Service Time	2.1		2.1				2.1	

Worksheet 5 - Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow Rate	0		0				81	
Service Time	2.1		2.1				2.1	
Utilization, x	0.00		0.00				0.09	
Dep. headway, hd	4.08		4.08				4.06	
Capacity	0		0				331	
Delay	7.08		7.08				7.47	
LOS	A		A				A	
Approach:								
Delay	7.08		7.08				7.47	
LOS	A		A				A	
Intersection Delay 7.47			Intersection LOS A					

APPENDIX C
Queue Analysis Sheets

Intersection	
Intersection Delay, s/veh	11.2
Intersection LOS	B

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Vol, veh/h	0	207	2	13	0	3	2	14	0	11	223	6
Peak Hour Factor	0.92	0.94	0.94	0.94	0.92	0.94	0.94	0.94	0.92	0.94	0.94	0.94
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	0	220	2	14	0	3	2	15	0	12	237	6
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	1
HCM Control Delay	11.6	8.5	10.8
HCM LOS	B	A	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	5%	93%	16%	7%
Vol Thru, %	93%	1%	11%	65%
Vol Right, %	3%	6%	74%	28%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	240	222	19	299
LT Vol	223	2	2	195
Through Vol	6	13	14	84
RT Vol	11	207	3	20
Lane Flow Rate	255	236	20	318
Geometry Grp	1	1	1	1
Degree of Util (X)	0.353	0.361	0.03	0.421
Departure Headway (Hd)	5.08	5.506	5.361	4.86
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	712	657	671	744
Service Time	3.08	3.507	3.371	2.86
HCM Lane V/C Ratio	0.358	0.359	0.03	0.427
HCM Control Delay	10.8	11.6	8.5	11.3
HCM Lane LOS	B	B	A	B
HCM 95th-tile Q	1.6	1.6	0.1	2.1

Intersection	
Intersection Delay, s/veh	11.1
Intersection LOS	B

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Vol, veh/h	0	176	2	8	0	2	2	5	0	4	185	7
Peak Hour Factor	0.92	0.95	0.95	0.95	0.92	0.95	0.95	0.95	0.92	0.95	0.95	0.95
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	0	185	2	8	0	2	2	5	0	4	195	7
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	1
HCM Control Delay	10.8	8.5	9.9
HCM LOS	B	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	2%	95%	22%	5%
Vol Thru, %	94%	1%	22%	64%
Vol Right, %	4%	4%	56%	31%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	196	186	9	371
LT Vol	185	2	2	238
Through Vol	7	8	5	114
RT Vol	4	176	2	19
Lane Flow Rate	206	196	9	391
Geometry Grp	1	1	1	1
Degree of Util (X)	0.28	0.294	0.014	0.492
Departure Headway (Hd)	4.89	5.414	5.407	4.54
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	728	658	666	789
Service Time	2.961	3.502	3.407	2.597
HCM Lane V/C Ratio	0.283	0.298	0.014	0.496
HCM Control Delay	9.9	10.8	8.5	12
HCM Lane LOS	A	B	A	B
HCM 95th-tile Q	1.1	1.2	0	2.8

Intersection	
Intersection Delay, s/veh	12.2
Intersection LOS	B

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Vol, veh/h	0	207	9	13	0	3	15	99	0	11	223	7
Peak Hour Factor	0.92	0.94	0.94	0.94	0.92	0.94	0.94	0.94	0.92	0.94	0.94	0.94
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	0	220	10	14	0	3	16	105	0	12	237	7
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	1
HCM Control Delay	12.6	9.7	12
HCM LOS	B	A	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	5%	90%	3%	34%
Vol Thru, %	93%	4%	13%	38%
Vol Right, %	3%	6%	85%	28%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	241	229	117	299
LT Vol	223	9	15	114
Through Vol	7	13	99	84
RT Vol	11	207	3	101
Lane Flow Rate	256	244	124	318
Geometry Grp	1	1	1	1
Degree of Util (X)	0.389	0.393	0.187	0.467
Departure Headway (Hd)	5.462	5.803	5.414	5.281
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	656	619	658	681
Service Time	3.518	3.86	3.482	3.333
HCM Lane V/C Ratio	0.39	0.394	0.188	0.467
HCM Control Delay	12	12.6	9.7	12.9
HCM Lane LOS	B	B	A	B
HCM 95th-tile Q	1.8	1.9	0.7	2.5

Intersection	
Intersection Delay, s/veh	12
Intersection LOS	B

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Vol, veh/h	0	176	12	8	0	2	13	69	0	4	185	10
Peak Hour Factor	0.92	0.95	0.95	0.95	0.92	0.95	0.95	0.95	0.92	0.95	0.95	0.95
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	0	185	13	8	0	2	14	73	0	4	195	11
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	1
HCM Control Delay	11.6	9.2	10.7
HCM LOS	B	A	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	2%	90%	2%	26%
Vol Thru, %	93%	6%	15%	43%
Vol Right, %	5%	4%	82%	31%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	199	196	84	371
LT Vol	185	12	13	159
Through Vol	10	8	69	114
RT Vol	4	176	2	98
Lane Flow Rate	209	206	88	391
Geometry Grp	1	1	1	1
Degree of Util (X)	0.307	0.329	0.131	0.536
Departure Headway (Hd)	5.283	5.735	5.341	4.937
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	679	627	669	730
Service Time	3.321	3.774	3.388	2.969
HCM Lane V/C Ratio	0.308	0.329	0.132	0.536
HCM Control Delay	10.7	11.6	9.2	13.6
HCM Lane LOS	B	B	A	B
HCM 95th-tile Q	1.3	1.4	0.4	3.2