Memorandum

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To: Lisa Ketcham, Vice Chair
Midcoast Community Council

From: Michael J. Wallwork, Roundabout Expert

Date: 5/17/2016

Re: Thoughts on the possibility of a roundabout at the intersection of Highway 1 and Cypress Avenue

Following your request for my thoughts on the possibility of a roundabout at the above intersection, an initial analysis was undertaken to test the feasibility of a roundabout using SIDRA, Standard Model and using the proposed traffic volumes from the 2014 Hexagon Report (Cumulative + Project at AM/PM peak hours).

Of the various software packages available for analysis, SIDRA is the most widely used. SIDRA is a most complex analysis program that requires many inputs related to vehicles, pedestrians, trucks, roundabout parameters, size, lane widths, circulating widths, entry radii, lane widths etc. It is in use by approximately 8,300 licensees, in over 1900 organizations in 86 countries. for upwards of 35 years. It has been adopted by the Departments of Transportation, Cities and Counties, including Caltrans.

It is far more complex than other programs that use simpler analytical methods such as, HCM that was released in 2010. Recent research has found that the saturation values used in that program are quite low and new values are coming that are about 23 percent higher. These analyses can be further refined based the final roundabout geometry, local conditions and local driver experience now and in the future. Such refinements may or may not be significant. Other capacity analysis programs tend to be based on HCM 2010, which leads to lower capacity levels.

The results suggest that a roundabout is expected to operate around level-of-service A or B in both peaks for vehicles although the roundabout is operating close to its upper range. Typically, roundabouts have higher capacity than the same signalized intersection because of no lost time, the all-red and yellow periods at signals, and the ability of drivers to enter a roundabout whenever a gap is available, a sharp contrast to signalized intersections.

Summary sheets of my initial analyses are shown in Appendix A. A round layout was also prepared to show the approximate size and shape of a possible roundabout.

Other information

Other issues that should be considered when evaluating a roundabout are as follows:

1. Installation of curb and gutter and drainage are added so pedestrian crossings can be added as part of the signalization. The construction cost for a roundabout may be similar to the road improvements and traffic signal cost.
2. Maintenance cost. A roundabout typically only needs minimal maintenance of the landscaping. Alternatively, cost to a community to a signalized intersection is around $10,000 a year for signal maintenance and replacement.
3. Crash costs. Roundabouts have significantly fewer and less severe crashes than a signalized intersection, a considerable saving to the community.
4. Replacement cost of a roundabout is usually measured in hundreds of years compared to 30 or so years for a signal.
5. Other benefits of a roundabout are safer pedestrian crossings with almost no delay for pedestrians when crossing the roundabout, lower speeds, a quieter environment, and attractive intersection and a gateway to a community, etc., things that are often neglected when comparing the two types of traffic control.

Of great importance and rarely mentioned by most traffic engineers is that roundabouts provide pedestrians with the least delay. Pedestrians only have to check that there are no vehicles that could conflict with them before crossing. In comparison, signals make pedestrians wait until permission is granted after vehicle demand has been met.

Roundabouts are promoted by FHWA as a safety countermeasure that signals are not. Also, a number of Departments of Transportation, FL, NY, and others have a roundabout first policy, meaning that roundabouts are always the first choice when traffic control at an intersection is to be changed or installed.

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Appendix A

MOVEMENT SUMMARY

Site: Cypress at CA 1 FIgure 14 volumes AM

New Site
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
Northbound: CA 1											
3	L2	23	2.0	0.622	1.0	LOS A	6.1	155.6	0.54	0.32	35.4
8	T1	733	2.0	0.622	1.0	LOS A	6.1	155.6	0.54	0.32	35.5
18	R2	9	2.0	0.622	1.0	LOS A	6.1	155.6	0.54	0.32	34.6
Approach		764	2.0	0.622	1.0	LOS A	6.1	155.6	0.54	0.32	35.4
Westbound: Cypress											
1	L2	16	2.0	0.052	4.9	LOS A	0.3	8.0	0.76	0.60	33.3
6	T1	10	2.0	0.052	4.9	LOS A	0.3	8.0	0.76	0.60	33.4
16	R2	8	2.0	0.052	4.9	LOS A	0.3	8.0	0.76	0.60	32.6
Approach		34	2.0	0.052	4.9	LOS A	0.3	8.0	0.76	0.60	33.1
Southbound: CA 1											
7	L2	8	2.0	0.824	0.9	LOS A	14.0	355.7	0.56	0.24	35.4
4	T1	1012	2.0	0.824	0.9	LOS A	14.0	355.7	0.56	0.24	35.5
14	R2	73	2.0	0.824	0.9	LOS A	14.0	355.7	0.56	0.24	34.6
Approach		1092	2.0	0.824	0.9	LOS A	14.0	355.7	0.56	0.24	35.4
Eastbound: Cypress											
5	L2	110	2.0	0.290	8.3	LOS A	2.0	51.9	0.92	0.89	31.2
2	T1	4	2.0	0.290	8.3	LOS A	2.0	51.9	0.92	0.89	31.3
12	R2	33	2.0	0.290	8.3	LOS A	2.0	51.9	0.92	0.89	30.6
Approach		147	2.0	0.290	8.3	LOS A	2.0	51.9	0.92	0.89	31.1
All Vehicles		2037	2.0	0.824	1.5	LOS A	14.0	355.7	0.58	0.33	35.0

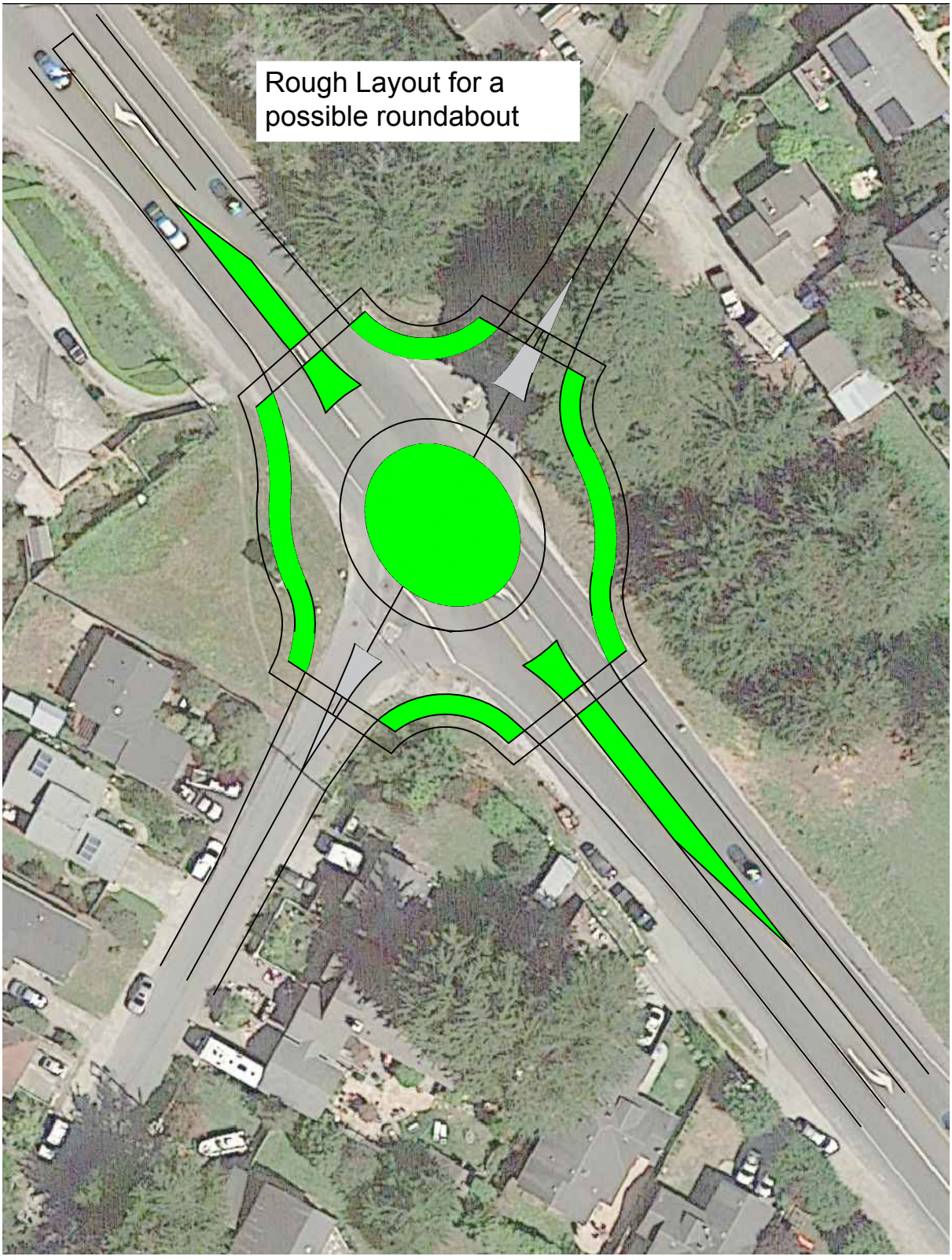
MOVEMENT SUMMARY

Site: Cypress at CA 1 FIgure 14 volumes - PM

New Site
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
Northbound: CA 1											
3	L2	55	2.0	0.883	6.3	LOS A	18.1	458.8	1.00	0.83	33.7
8	T1	946	2.0	0.883	6.3	LOS A	18.1	458.8	1.00	0.83	33.7
18	R2	11	2.0	0.883	6.3	LOS A	18.1	458.8	1.00	0.83	32.9
Approach		1012	2.0	0.883	6.3	LOS A	18.1	458.8	1.00	0.83	33.7
Westbound: Cypress											
1	L2	5	2.0	0.058	10.5	LOS B	0.4	10.8	0.98	0.82	31.2
6	T1	7	2.0	0.058	10.5	LOS B	0.4	10.8	0.98	0.82	31.3
16	R2	8	2.0	0.058	10.5	LOS B	0.4	10.8	0.98	0.82	30.5
Approach		20	2.0	0.058	10.5	LOS B	0.4	10.8	0.98	0.82	31.0
Southbound: CA 1											
7	L2	13	2.0	0.807	1.0	LOS A	13.4	340.2	0.66	0.32	35.1
4	T1	921	2.0	0.807	1.0	LOS A	13.4	340.2	0.66	0.32	35.2
14	R2	110	2.0	0.807	1.0	LOS A	13.4	340.2	0.66	0.32	34.3
Approach		1043	2.0	0.807	1.0	LOS A	13.4	340.2	0.66	0.32	35.1
Eastbound: Cypress											
5	L2	170	2.0	0.444	8.5	LOS A	3.5	89.7	0.95	0.98	31.2
2	T1	17	2.0	0.444	8.5	LOS A	3.5	89.7	0.95	0.98	31.3
12	R2	57	2.0	0.444	8.5	LOS A	3.5	89.7	0.95	0.98	30.6
Approach		243	2.0	0.444	8.5	LOS A	3.5	89.7	0.95	0.98	31.1
All Vehicles		2318	2.0	0.883	4.2	LOS A	18.1	458.8	0.84	0.62	34.0


Rough Layout for a
possible roundabout

Appendix B

2014 Hexagon Report for Big Wave North Parcel Alternative
HCM 2010 Roundabout
Highway 1 & Cypress
Cumulative Conditions with Project AM/PM peak hours
Synchro 8 Report

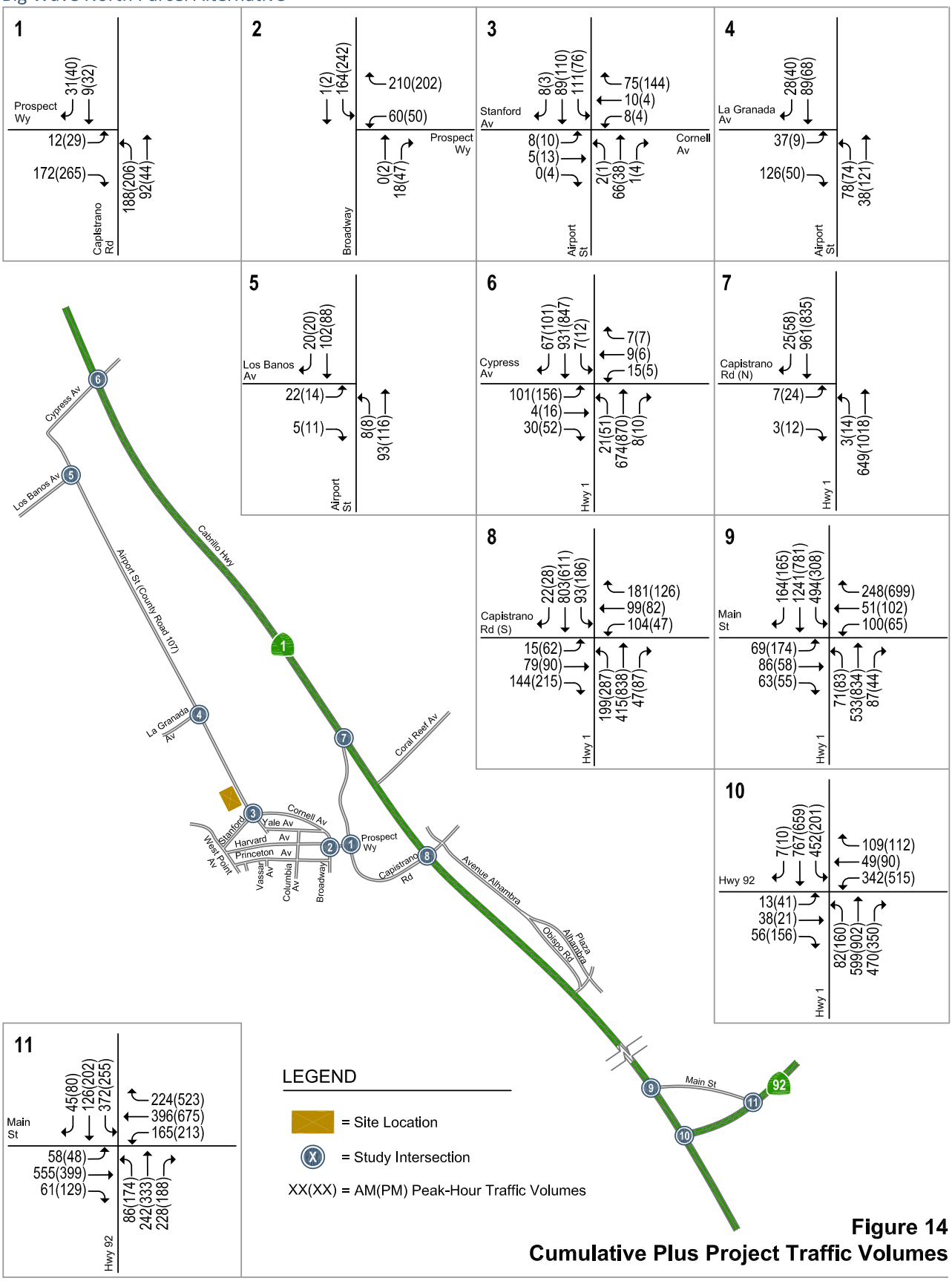


Figure 14
Cumulative Plus Project Traffic Volumes

Intersection	
Intersection Delay, s/veh	39.2
Intersection LOS	E

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	147	34	765	1093
Demand Flow Rate, veh/h	150	34	780	1114
Vehicles Circulating, veh/h	1056	883	124	49
Vehicles Exiting, veh/h	107	21	1082	868
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	16.9	8.7	19.3	57.0
Approach LOS	C	A	C	F

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	150	34	780	1114
Cap Entry Lane, veh/h	393	467	998	1076
Entry HV Adj Factor	0.979	0.994	0.981	0.981
Flow Entry, veh/h	147	34	765	1093
Cap Entry, veh/h	385	465	979	1055
V/C Ratio	0.382	0.073	0.781	1.035
Control Delay, s/veh	16.9	8.7	19.3	57.0
LOS	C	A	C	F
95th %tile Queue, veh	2	0	8	23

Intersection	
Intersection Delay, s/veh	63.3
Intersection LOS	F

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	244	20	1012	1044
Demand Flow Rate, veh/h	248	20	1032	1064
Vehicles Circulating, veh/h	957	1194	203	68
Vehicles Exiting, veh/h	175	41	1002	1146
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	22.0	11.5	87.9	50.0
Approach LOS	C	B	F	F

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	248	20	1032	1064
Cap Entry Lane, veh/h	434	342	922	1056
Entry HV Adj Factor	0.983	0.993	0.981	0.981
Flow Entry, veh/h	244	20	1012	1044
Cap Entry, veh/h	426	340	905	1035
V/C Ratio	0.571	0.058	1.119	1.008
Control Delay, s/veh	22.0	11.5	87.9	50.0
LOS	C	B	F	F
95th %tile Queue, veh	3	0	27	20