

PROJECT AND
RANCHERIA ANALYSIS



Memorandum

To: City of Redding
Attn: Kent Manual

Date: January 26, 2018
Project: River Crossing Marketplace Specific Plan (Costco Wholesale Development)

From: Russ Wenham, P.E., T.E.
Kamesh Vedula, P.E., T.E.

Re: Proposed Project and “Plus Rancheria” Impacts Comparison
Job No.: 11145014

CC: Zachary Stinger, E.I.T.
File No.: C2226MEM019.DOCX

Introduction

Omni-Means, a GHD Company, has prepared this Memorandum to accompany the River Crossing Marketplace Specific Plan Traffic Impact Analysis Report (TIAR). This memorandum presents a quantitative analysis by comparing the:

- Cumulative Plus Project conditions - From the TIAR, and
- Cumulative Plus Project with Rancheria conditions - From the December 1, 2017 “Impacts from proposed Redding Rancheria” memorandum, Omni-Means.

This technical memorandum presents:

- Year 2040 Plus Project conditions
- Year 2040 Plus Project with Rancheria conditions

Comparison of Conditions

The following sections compare the operations of the Year 2040 Plus Project conditions with the Year 2040 Plus Project with Rancheria conditions.

Intersection Operations

Table 1A presents a comparison of the intersection operations for the Year 2040 Plus Project and Year 2040 Plus Project with Rancheria conditions during the AM peak hour.

**TABLE 1A
AM PEAK HOUR INTERSECTION OPERATIONS COMPARISON**

#	Intersection	Control Type ^{1,2}	Target LOS	Year 2040 Plus Project			Year 2040 Plus Project with Rancheria		
				Delay	LOS	Warrant Met? ³	Delay	LOS	Warrant Met? ³
1	S. Bonnyview Rd/ Cedars Rd & SR 273	Signal	D	39.9	D	-	41.5	D	-
2	S. Bonnyview Rd/ Eastside Rd	Signal	D	39.1	D	-	42.2	D	-
3	S. Bonnyview Rd/ E. Bonnyview Rd	Signal	D	40.9	D	-	50.4	D	-
4	S. Bonnyview Rd/ Indianwood Dr	Signal	D	7.0	A	-	7.1	A	-
5	S. Bonnyview Rd/ Bechelli Ln	Signal	D	58.6	E	-	65.1	E	-
6A	S. Bonnyview Rd/ Texaco Dwy	TWSC	D	20.5	C	-	23.2	C	-
6B	S. Bonnyview Rd/ S. Bonnyview Dwy	TWSC	D	32.2	D	-	52.6	F	No
7	S. Bonnyview Rd/ I-5 SB Ramps	Signal	D	83.5	F	-	83.8	F	-
8	S. Bonnyview Rd/ I-5 NB Ramps	Signal	D	59.2	E	-	70.6	E	-
9	S. Bonnyview Rd/ Churn Creek Rd	Signal	D	36.7	D	-	42.4	D	-
10	Churn Creek Rd/ Alose Ln	TWSC	D	14.5	B	-	14.8	B	-
11	Churn Creek Rd/ Hartmeyer Ln	TWSC	E	61.6	F	No	67.2	F	No
12	Churn Creek Rd/ Huntington Dr	TWSC	D	45.8	E	No	48.8	E	No
13	Churn Creek Rd/ Victor Ave	TWSC	D	84.5	F	Yes	98.0	F	Yes
14	Churn Creek Rd/ Rancho Rd	TWSC	C	45.7	E	Yes	51.0	F	Yes
15	Rancho Rd/ Alta Mesa Dr	TWSC	C	18.1	C	-	18.7	C	-
16	Rancho Rd/ Shasta View Dr	TWSC	C	143.6	F	No	164.1	F	No
17	Rancho Rd/ Airport Rd	Signal	C	41.0	D	-	42.6	D	-
18	Blue Shield Dwy/ Middle Dwy	Signal	C	19.7	B	-	19.7	B	-
19	Bechelli Ln/ Chinook Dr	TWSC	C	14.0	B	-	14.2	B	-
20	Bechelli Ln/ Rivercrest Pkwy	TWSC	C	16.3	C	-	16.6	C	-
21	Bechelli Ln/ Loma Vista Dr	TWSC	C	116.9	F	Yes	160.2	F	Yes
22	Bechelli Ln/ Hartnell Ave	Signal	C	34.7	C	-	34.9	C	-
23	Churn Creek Rd/ Public ROW to Chevron	Signal	C	18.3	B	-	18.3	B	-
24	Churn Creek Rd/ Arizona Ln	TWSC	C	14.1	B	-	14.1	B	-
25	Churn Creek Rd/ Loma Vista Dr	Signal	C	21.6	C	-	21.8	C	-
26	Churn Creek Rd/Shirley Ln & Enterprise HS Dwy	Signal	C	34.6	C	-	34.7	C	-
27	Churn Creek Rd/ Hartnell Ave	Signal	C	59.7	E	-	60.0	E	-
28	Bechelli Ln/ Northern Dwy	TWSC	C	20.2	C	-	21.0	C	-
29	Bechelli Ln/ Southern Dwy	TWSC	C	13.4	B	-	13.5	B	-

Notes:

1. TWSC = Two Way Stop Control
2. LOS = Delay based on worst minor street approach for TWSC intersections, average of all approaches for Signal
3. Warrant = Based on California MUTCD Warrant 3
4. **Bold** = Additional Impact for Year 2040 Plus Project with Rancheria
5. OVR = Delay exceeds 300 seconds

As presented in Table 1A, all Year 2040 Plus Project with Rancheria impacts are consistent with Year 2040 Plus Project impacts except the following intersection:

- Intersection 6B - S. Bonnyview Road & S. Bonnyview Driveway (Deteriorates from LOS D to LOS F)



Table 1B presents a comparison of the intersection operations for the Year 2040 Plus Project and Year 2040 Plus Project with Rancheria conditions during the PM peak hour.

**TABLE 1B
PM PEAK HOUR INTERSECTION OPERATIONS COMPARISON**

#	Intersection	Control Type ^{1,2}	Target LOS	Year 2040 Plus Project			Year 2040 Plus Project with Rancheria		
				Delay	LOS	Warrant Met? ³	Delay	LOS	Warrant Met? ³
1	S. Bonnyview Rd/ Cedars Rd & SR 273	Signal	D	39.3	D	-	40.5	D	-
2	S. Bonnyview Rd/ Eastside Rd	Signal	D	50.9	D	-	54.2	D	-
3	S. Bonnyview Rd/ E. Bonnyview Rd	Signal	D	45.7	D	-	53.4	D	-
4	S. Bonnyview Rd/ Indianwood Dr	Signal	D	10.2	B	-	10.3	B	-
5	S. Bonnyview Rd/ Bechelli Ln	Signal	D	76.3	E	-	152.3	F	-
6A	S. Bonnyview Rd/ Texaco Dwy	TWSC	D	35.8	E	No	49.8	E	No
6B	S. Bonnyview Rd/ S. Bonnyview Dwy	TWSC	D	28.8	D	-	51.4	F	No
7	S. Bonnyview Rd/ I-5 SB Ramps	Signal	D	114.7	F	-	114.9	F	-
8	S. Bonnyview Rd/ I-5 NB Ramps	Signal	D	40.9	D	-	77.8	E	-
9	S. Bonnyview Rd/ Churn Creek Rd	Signal	D	33.7	C	-	45.5	D	-
10	Churn Creek Rd/ Alrose Ln	TWSC	D	25.7	D	-	26.4	D	-
11	Churn Creek Rd/ Hartmeyer Ln	TWSC	E	107.3	F	Yes	125.1	F	Yes
12	Churn Creek Rd/ Huntington Dr	TWSC	D	37.1	E	No	39.5	E	No
13	Churn Creek Rd/ Victor Ave	TWSC	D	OVR	F	Yes	OVR	F	Yes
14	Churn Creek Rd/ Rancho Rd	TWSC	C	72.2	F	Yes	90.6	F	Yes
15	Rancho Rd/ Alta Mesa Dr	TWSC	C	15.1	C	-	15.6	C	-
16	Rancho Rd/ Shasta View Dr	TWSC	C	89.6	F	No	110.0	F	No
17	Rancho Rd/ Airport Rd	Signal	C	26.4	C	-	26.9	C	-
18	Blue Shield Dwy/ Middle Dwy	Signal	C	24.8	C	-	25.0	C	-
19	Bechelli Ln/ Chinook Dr	TWSC	C	16.2	C	-	16.6	C	-
20	Bechelli Ln/ Rivercrest Pkwy	TWSC	C	15.9	C	-	16.4	C	-
21	Bechelli Ln/ Loma Vista Dr	TWSC	C	OVR	F	Yes	OVR	F	Yes
22	Bechelli Ln/ Hartnell Ave	Signal	C	34.9	C	-	35.0	C	-
23	Churn Creek Rd/ Public ROW to Chevron	Signal	C	24.1	C	-	24.1	C	-
24	Churn Creek Rd/ Arizona Ln	TWSC	C	13.4	B	-	13.4	B	-
25	Churn Creek Rd/ Loma Vista Dr	Signal	C	17.5	B	-	17.7	B	-
26	Churn Creek Rd/Shirley Ln & Enterprise HS Dwy	Signal	C	14.5	B	-	14.5	B	-
27	Churn Creek Rd/ Hartnell Ave	Signal	C	60.4	E	-	60.8	E	-
28	Bechelli Ln/ Northern Dwy	TWSC	C	36.5	E	-	39.5	E	No
29	Bechelli Ln/ Southern Dwy	TWSC	C	11.8	B	-	11.9	B	-

Notes:

1. TWSC = Two Way Stop Control

2. LOS = Delay based on worst minor street approach for TWSC intersections, average of all approaches for Signal

3. Warrant = Based on California MUTCD Warrant 3

4. **Bold** = Additional Impact for Year 2040 Plus Project with Rancheria

5. OVR = Delay exceeds 300 seconds

As presented in Table 1B, all Year 2040 Plus Project with Rancheria impacts are consistent with Year 2040 Plus Project impacts except the following intersections:

- Intersection 6B - S. Bonnyview Road & S. Bonnyview Driveway (Deteriorates from LOS D to LOS F)
- Intersection 8 – S. Bonnyview Road & Interstate 5 Northbound Ramps (Deteriorates from LOS D to LOS E)



Roadway Segment Operations

Table 2A presents a comparison of the roadway segment operations for the Year 2040 Plus Project and the Year 2040 Plus Project with Rancheria conditions during the AM peak hour.

**TABLE 2A
AM PEAK HOUR ROADWAY OPERATIONS COMPARISON**

#	Roadway Segment	Capacity Configuration	Target LOS	Year 2040 Plus Project		Year 2040 Plus Project with Rancheria	
				ATS ² / Volume ³	LOS	ATS ² / Volume ³	LOS
1	S. Bonnyview Rd between SR 273 & Churn Creek Rd	Divided Arterial	D	14.2	E	14.8	E
2	Churn Creek Rd between S. Bonnyview Rd & Rancho Rd	Undivided Arterial	D	722	F	738	F
3	Rancho Rd between Churn Creek Rd & Airport Rd	Undivided Arterial	C	458	B	472	C
4	Bechelli Ln between S. Bonnyview Rd & Chinook Dr	Undivided Arterial	C	485	C	492	C
5	Bechelli Ln between Chinook Dr & 3rd St	Divided Arterial	C	558	B	566	C
6	Churn Creek Rd between S. Bonnyview Rd & Hartnell Ave	Divided Arterial	C	413	A	415	A
7	Churn Creek Rd between Rancho Rd & Knighton Rd	Collector	C	218	A	218	A

Notes:

1. Roadway Type as designated by Table 4.5 E of the City of Redding TIA Guidelines
2. ATS= Arterial Travel Speed. ATS is indicated only for the S. Bonnyview Road corridor between SR 273 & Churn Creek Rd.
3. Volume indicates Maximum Peak Hour Volume Per Lane.
4. **Bold** = Additional Impact for Year 2040 Plus Project with Rancheria

As presented in Table 2A, all Year 2040 Plus Project with Rancheria impacts are consistent with Year 2040 Plus Project impacts.

Table 2B presents a comparison of the roadway segment operations for the Year 2040 Plus Project and the Year 2040 Plus Project with Rancheria conditions during the PM peak hour.

**TABLE 2B
PM PEAK HOUR ROADWAY OPERATIONS COMPARISON**

#	Roadway Segment	Capacity Configuration	Target LOS	Year 2040 Plus Project		Year 2040 Plus Project with Rancheria	
				ATS ² / Volume ³	LOS	ATS ² / Volume ³	LOS
1	S. Bonnyview Rd between SR 273 & Churn Creek Rd	Divided Arterial	D	16.3	E	12.5	F
2	Churn Creek Rd between S. Bonnyview Rd & Rancho Rd	Undivided Arterial	D	766	F	781	F
3	Rancho Rd between Churn Creek Rd & Airport Rd	Undivided Arterial	C	416	B	434	B
4	Bechelli Ln between S. Bonnyview Rd & Chinook Dr	Undivided Arterial	C	672	E	689	F
5	Bechelli Ln between Chinook Dr & 3rd St	Divided Arterial	C	760	E	781	E
6	Churn Creek Rd between S. Bonnyview Rd & Hartnell Ave	Divided Arterial	C	438	A	442	A
7	Churn Creek Rd between Rancho Rd & Knighton Rd	Collector	C	253	A	253	A

Notes:

1. Roadway Type as designated by Table 4.5 E of the City of Redding TIA Guidelines
2. ATS= Arterial Travel Speed. ATS is indicated only for the S. Bonnyview Road corridor between SR 273 & Churn Creek Rd.
3. Volume indicates Maximum Peak Hour Volume Per Lane.
4. **Bold** = Additional Impact for Year 2040 Plus Project with Rancheria

As presented in Table 2B, all Year 2040 Plus Project with Rancheria impacts are consistent with Year 2040 Plus Project impacts.

Freeway and Ramp Operations

Table 3A presents a comparison of the ramp merge, diverge, and freeway mainline operations for the Year 2040 Plus Project and Year 2040 Plus Project with Rancheria conditions during the AM peak hour.

**TABLE 3A
AM PEAK HOUR RAMP AND FREEWAY OPERATIONS COMPARISON**

#	Interchange Location	Target LOS	Segment Type	No. of Lanes	Year 2040 Plus Project			Year 2040 Plus Project with Rancheria		
					Volume	Density (pc/mi/ln)	LOS	Volume	Density (pc/mi/ln)	LOS
Interstate 5 (I-5)										
1	Cypress Ave Off Ramp NB	D	Diverge	1	970	28.0	C	979	28.4	D
2	S. Bonnyview Rd to Cypress Ave NB	D	Mainline	3	3,909	23.1	C	3,996	23.7	C
3	S. Bonnyview Rd On Ramp NB	D	Merge	1	1,081	26.1	C	1,168	26.8	C
4	S. Bonnyview Rd Off Ramp NB	D	Diverge	1	921	25.3	C	1,088	26.6	C
5	Knighton Rd to S. Bonnyview Rd NB	D	Mainline	3	3,749	22.2	C	3,916	23.2	C
6	Knighton Rd to S. Bonnyview Rd NB	D	Mainline	2	3,749	38.0	E	3,916	41.3	E
7	Knighton Rd On Ramp NB	D	Merge	1	267	36.2	E	277	37.7	E
8	Knighton Rd Off Ramp SB	D	Diverge	1	229	22.7	C	233	23.5	C
9	S. Bonnyview Rd to Knighton Rd SB	D	Mainline	2	2,244	19.9	B	2,317	20.5	B
10	S. Bonnyview Rd to Knighton Rd SB	D	Mainline	3	2,244	13.3	B	2,317	13.7	B
11	S. Bonnyview Rd On Ramp SB	D	Diverge	1	632	17.4	B	705	18.0	B
12	S. Bonnyview Rd Off Ramp SB	D	Mainline	1	1,014	19.8	B	1,212	21.5	B
13	Cypress Ave to S. Bonnyview Rd SB	D	Mainline	3	2,626	15.5	B	2,824	16.7	B
14	Cypress Ave On Ramp SB	D	Merge	1	434	17.4	B	449	18.4	B

Notes:

Capacity of Upstream/Downstream Freeway segment is 7,200 pc/h or 2,400 pc/hr/ln
Bold text indicates an additional impact for Year 2040 Plus Project with Rancheria

As presented in Table 3A, all 2040 Plus Project with Rancheria impacts are consistent with Year 2040 Plus Project impacts.

Table 3B presents a comparison of the ramp merge, diverge, and freeway mainline operations for the Year 2040 Plus Project and Year 2040 Plus Project with Rancheria conditions during the PM peak hour.

**TABLE 3B
PM PEAK HOUR RAMP AND FREEWAY OPERATIONS COMPARISON**

#	Interchange Location	Target LOS	Segment Type	No. of Lanes	Year 2040 Plus Project			Year 2040 Plus Project with Rancheria		
					Volume	Density (pc/mi/ln)	LOS	Volume	Density (pc/mi/ln)	LOS
Interstate 5 (I-5)										
1	Cypress Ave Off Ramp NB	D	Diverge	1	738	22.8	C	755	23.8	C
2	S. Bonnyview Rd to Cypress Ave NB	D	Mainline	3	3,061	18.1	B	3,232	19.1	C
3	S. Bonnyview Rd On Ramp NB	D	Merge	1	1,140	21.1	C	1,311	22.4	C
4	S. Bonnyview Rd Off Ramp NB	D	Diverge	1	756	18.8	B	970	20.6	C
5	Knighton Rd to S. Bonnyview Rd NB	D	Mainline	3	2,677	15.8	B	2,891	17.1	B
6	Knighton Rd to S. Bonnyview Rd NB	D	Mainline	2	2,677	23.8	C	2,891	26.0	D
7	Knighton Rd On Ramp NB	D	Merge	1	321	26.4	D	334	28.4	D
8	Knighton Rd Off Ramp SB	D	Diverge	1	381	39.0	E	390	40.4	E
9	S. Bonnyview Rd to Knighton Rd SB	D	Mainline	2	3,879	40.6	E	4,024	43.7	E
10	S. Bonnyview Rd to Knighton Rd SB	D	Mainline	3	3,879	23.0	C	4,024	23.9	C
11	S. Bonnyview Rd On Ramp SB	D	Diverge	1	1,050	26.5	C	1,195	27.7	C
12	S. Bonnyview Rd Off Ramp SB	D	Mainline	1	992	25.9	C	1,244	27.8	C
13	Cypress Ave to S. Bonnyview Rd SB	D	Mainline	3	3,821	22.6	C	4,073	24.2	C
14	Cypress Ave On Ramp SB	D	Merge	1	1,009	24.8	C	1,028	26.1	C

Notes:

Capacity of Upstream/Downstream Freeway segment is 7,200 pc/h or 2,400 pc/hr/ln
Bold text indicates an additional impact for Year 2040 Plus Project with Rancheria



As presented in Table 3B, all 2040 Plus Project with Rancheria impacts are consistent with Year 2040 Plus Project impacts

“With Rancheria” Additional Mitigation Measures

This section presents recommended mitigation measures for study intersections with impacts for Year 2040 Plus Project with Rancheria conditions. These mitigations are in addition to the mitigations recommended in the River Crossing Marketplace TIAR.

Intersections

The following improvements are proposed to provide acceptable operations at intersections where a project significant impact is identified for the Year 2040 Plus Project with Rancheria conditions determines whether a significant impact is identified.

Intersection 5 - S. Bonnyview Road & Bechelli Lane

The following mitigations, in addition to the mitigations recommended in the River Crossing Marketplace Specific Plan TIAR, are required for S. Bonnyview Road & Bechelli Lane for the Year 2040 Plus Project with Rancheria conditions.

- Provide Improvements recommended under Year 2040 Plus Project conditions, and
- Widen the eastbound approach to provide:
 - Two left-turn lanes of length 400 feet.
 - Three thru lanes of length 400 feet.
 - One right-turn pocket of length 350 feet.
- Widen the westbound approach to provide:
 - Two left-turn pockets of length 200 feet.

Roadway Segments

No additional roadway segment mitigations are required with the buildout of the Redding Rancheria.

Freeway Mainline and Ramp Segments

No additional freeway mainline and ramp segment mitigations are required with the buildout of the Redding Rancheria.

