

Memorandum

26 July 2021

To	Netra Khatri, City Engineer, City of Arcata		
Copy to	David Loya, Community Development Director City of Arcata		
From	Kamesh Vedula PE/TE and Josh Wolf PE	Tel	707-443-8326
Subject	Alternatives Considerations for the Old Arcata Road/Jacoby Creek intersection	Project no.	11159130

1. Introduction

The Old Arcata Road Improvement Project (project) would provide roadway improvements to Old Arcata Road through the community of Bayside, between the Buttermilk Road Roundabout and Jacoby Creek Road. The project is being led by the City of Arcata and would improve safety for non-motorized and motorized users, increase the use of active modes of transportation, and rehabilitate deteriorated roadway pavement. Additional benefits include enhanced heightened driver awareness of the community and filling an existing gap for non-motorized travel between the Jacoby Creek School and Jacoby Creek Road. This technical memorandum specifically focuses on the intersection improvements at Old Arcata Road and Jacoby Creek Road.

2. Alternatives Previously Considered

Analysis of the following alternatives was included in the environmental documentation:

- Channelization and Striping Improvements
- Roundabouts - Due to its unique geometric configurations, the proposed roundabout at the intersection of Old Arcata Road and Jacoby Creek Road has the potential to reduce high-severity collisions in the future at this location.

3. Additional Alternatives

Based on the feedback from the agencies, a discussion of the following intersection improvements alternatives is provided below:

3.1 Multi Way Stop Control

Multi Way Stop Control (MWSC) – Under this MWSC alternative, all the approaches to the intersection would be stop controlled. The intersection falls within both the City of Arcata and the County of Humboldt jurisdiction. While the City of Arcata does have policies/guidelines for TWSC stop control installation, the County does not. In the instance where an agency does not have policies/guidelines for MWSC installation, the guidelines provided by the California Manual of Uniform Traffic Control Devices (CA MUTCD) are typically utilized. An engineering study needs to be conducted based on the guidelines provided under

Section 2B.07 Multiway Stop Applications of the CA MUTCD to determine if the installation of MWSC is justified. While there are many guidelines, this memorandum reviewed the minimum volumes and crash history criteria due to the availability of volume data.

A. Minimum volumes:

1. The vehicular volume entering the intersection from the major street approaches (total of both approaches) averages at least 300 vehicles per hour for any 8 hours of an average day, and
2. The combined vehicular, pedestrian, and bicycle volume entering the intersection from the minor street approaches (total of both approaches) averages at least 200 units per hour for the same 8 hours, with an average delay to minor-street vehicular traffic of at least 30 seconds per vehicle during the highest hour, but
3. If the 85th-percentile approach speed of the major-street exceeds 40 mph, the minimum vehicular volume warrants are 70 percent of the values provided in Item 1 and 2.

Volumes on Jacoby Creek Road: A review of available data on Jacoby Creek Road from February 2013 indicates that the approach volumes on Jacoby Creek Road do not exceed more than 200 vehicles per hour during the day. Per the Eureka-Arcata Route 101 Corridor Improvement Project EIR, the Level Of Service (LOS) is noted to be LOS B, which corresponds to a delays of about 15 seconds. *As such, the minimum volume warrant is not satisfied.* Appendix A includes the volumes.

B. Five or more reported crashes in a 12-month period that are susceptible to correction by a multi-way stop installation. Such crashes include right-turn and left-turn collision as well as right-angle collisions.

Two-year crash data for the periods of 2018 and 2019 was reviewed. One crash in the vicinity of the intersection was reported during the two-year period. The crash occurred 107 feet north of the intersection on Old Arcata Road. There was a Visible Injury and the crash type was noted as rear end and the causal factor was determined to be unsafe speed and the crash occurred when the road was wet. *As such, the crash warrants are not satisfied.* Appendix A includes the crash data.

While a detailed engineering study would need to be performed to understand the need for evaluation of the MWSC at the intersection, volume and crash history – key criteria for justification of MWSC – are not satisfied.

City of Arcata's Policy on implementing MWSC Intersections was reviewed and the findings are provided below. The criteria for the MWSC analysis recognizes that delays are superseded by the desire to reduce potential crashes. An intersection qualifies for this analysis, for both residential and non-residential neighborhood in the City of Arcata, if it does not exceed an average daily traffic volume of 5,000 vehicles. The City Engineer may recommend installation of MWSC signs if an intersection obtains a minimum of 20 points as determined below:

A. Volume conflicts (maximum 10 points)

- a. One point for every 100 conflicting movements per day in excess of the first 400 conflicting movements for a four-way intersection.

The criteria is not applicable as the intersection is a three-way intersection. No points possible for this criterion.

- b. One point for every 100 conflicting movements per day in excess of the first 300 conflicting movements for a three-way intersection.

According to traffic count data provided by the County of Humboldt, the volumes on Jacoby Creek Road exceed 100 vehicles per hour once. While it is not clear if the conflicting volume will be over 300 movements, for conservative analysis purpose, this intersection is expected to score one point for volume conflict points.

B. Recommendation of Transportation Safety Committee (TSC), Police Department, and Complaints (maximum 6 points)

The TSC has not recommended a MWSC at this intersection; therefore, the intersection does not score any points based on this criterion.

C. Crash Experience - Six points for each crash during any 12-month period within two years prior to investigation that might have been prevented by the vehicles complying with properly placed stop signs, as determined by City Engineer.

Two-year crash data for the periods of 2018 and 2019 was reviewed. One crash in the vicinity of the intersection was reported during the two-year period. The crash occurred 107 feet north of the intersection on Old Arcata Road. There was a Visible Injury and the crash type was noted as rear end and the causal factor was determined to be unsafe speed and the crash occurred when the road was wet. A rear end collision is typically not correctable due to a MWSC placement. It is unlikely that the City Engineer would award any points for this criterion.

D. School Warrant (maximum 6 points) - Points shall be assigned for the intersection being adjacent to or within two blocks from the school (kindergarten through high school). Multiple schools would generate additional points using the same point distribution, as shown below:

INTERSECTION	SCHOOL 1	SCHOOL 2	SCHOOL 3
Adjacent	3 points	3 points	3 points
One Block	2 points	2 points	2 points
Two Block	1 point	1 point	1 point

The nearest public school is located 0.3 miles from the intersection about 6 blocks away. There is a private school (Mistwood Education Center) located at the intersection. Based on the above criteria, the intersection could score up to 3 points.

E. Unusual Conditions (maximum 12 points) - Points may be assigned considering the severity of:

- a. High pedestrian and bicycle activity because of proximity to recreational facilities including school facilities, parks, senior centers, high-density housing, neighborhood library, transit stops, and other facilities that generate high pedestrian and bicycle activity;
- b. Intersections within a pedestrian corridor or zone as identified in the General Plan;
- c. Average speeds in excess of the speed limit;
- d. Visual signs of emergency maneuvers such as skid marks and crash debris;
- e. Unique geometric conditions exist;
- f. Petition from a citizen; or
- g. Reports of near misses.

There is a potential for up to 6 points to be awarded for the following conditions:

1. High pedestrian and bicycle activity because of the close proximity of the Bayside Post Office, Mistwood Education Center, and Bayside Community Center.
2. If average speeds are determined to be in excess of the speed limit.
3. Reports of near misses

Based on the information and criteria above, the intersection could score up to 10 points, which is below the required 20 points needed to warrant consideration of a MWSC.

3.2 Traffic Signal Control

Applicable traffic signal warrants provided in the publication *California Manual on Uniform Traffic Control Devices for Streets and Highways* (MUTCD, 2012 Edition), CHAPTER 4C. TRAFFIC CONTROL SIGNAL NEEDS STUDIES, Section 4C.02 through Section 4C.10 were reviewed for the study intersection. Specifically, the following warrants could be evaluated for the study intersection based on the collected accident, speed, and traffic volume data.

Section 4C.02 Warrant 1, Eight-Hour Vehicular Volume:

Section 4C.03 Warrant 2, Four-Hour Vehicular Volume:

Section 4C.04 Warrant 3, Peak Hour:

Section 4C.05 Warrant 4, Pedestrian Volume:

- Section 4C.06 Warrant 5, School Crossing:
- Section 4C.07 Warrant 6, Coordinated Signal System:
- Section 4C.08 Warrant 7, Crash Experience:
- Section 4C.09 Warrant 8, Roadway Network:
- Section 4C.10 Warrant 9, Intersection near a Grade Crossing:

Based on the review of available data in relation to the above warrants, it appears that traffic signals are not likely justified at the study intersection.

4. Summary

Preliminary analysis suggests that the MWSC and Traffic Signal installation are not likely justified at the Old Arcata Road/Jacoby Creek Road intersection.

As such, the alternatives previously considered, channelization and striping Improvements and a roundabout, are more appropriate for this intersection. Specifically, the roundabout alternative would lower the approach speeds and likely to improve safety and operations compared to all alternatives considered in this memo.

5. Preparer Qualifications

Kamesh Vedula, PE/TE

Kamesh Vedula has over 21 years in the disciplines of transportation engineering, planning, and modeling. His project management experience includes Caltrans Project Study Report-Project Development Support (PSR-PDS), Project Approval/Environmental Documents (PA/ED), ICE studies, roundabout planning/design, advanced roundabout operations analyses/design, complete streets studies, corridor studies, traffic impact studies, and traffic safety studies.

Josh Wolf, PE

Josh Wolf is a senior engineer with over 17 years of experience designing and managing a wide range of transportation infrastructure projects including both motorized and non-motorized improvements on and off the state highway system. His project experience includes the design of public infrastructure projects that include roadway improvements, highway interchanges, intersection improvements, roundabouts, bicycle and pedestrian facilities, storm drainage improvements, and stormwater treatment facilities.

Daily Vehicle Volume Report

Location: Jacoby creek rd. # C4K230 pm. 0.09

Unit ID: 17550/26958

Study Date: Tuesday - February 05, 2013

Time	East Bound Volume	West Bound Volume	Total Volume
00:00 - 00:59	-	-	-
01:00 - 01:59	-	-	-
02:00 - 02:59	-	-	-
03:00 - 03:59	-	-	-
04:00 - 04:59	-	-	-
05:00 - 05:59	-	-	-
06:00 - 06:59	-	-	-
07:00 - 07:59	-	-	-
08:00 - 08:59	0	0	0
09:00 - 09:59	0	0	0
10:00 - 10:59	0	0	0
11:00 - 11:59	0	0	0
12:00 - 12:59	47	42	89
13:00 - 13:59	51	58	109
14:00 - 14:59	50	54	104
15:00 - 15:59	83	56	139
16:00 - 16:59	73	61	134
17:00 - 17:59	119	45	164
18:00 - 18:59	76	35	111
19:00 - 19:59	42	28	70
20:00 - 20:59	31	13	44
21:00 - 21:59	27	16	43
22:00 - 22:59	9	3	12
23:00 - 23:59	3	1	4
ADT	611	412	1023
AM Peak Time	00:00 - 00:59	00:00 - 00:59	00:00 - 00:59
AM Peak Volume	0	0	0
PM Peak Time	17:00 - 17:59	16:30 - 17:29	16:45 - 17:44
PM Peak Volume	119	62	169

Daily Vehicle Volume Report

Location: Jacoby creek rd. # C4K230 pm. 0.09

Unit ID: 17550/26958

Study Date: Wednesday - February 06, 2013

Time	East Bound Volume	West Bound Volume	Total Volume
00:00 - 00:59	3	2	5
01:00 - 01:59	2	2	4
02:00 - 02:59	2	1	3
03:00 - 03:59	1	2	3
04:00 - 04:59	2	3	5
05:00 - 05:59	1	9	10
06:00 - 06:59	4	23	27
07:00 - 07:59	8	68	76
08:00 - 08:59	32	105	137
09:00 - 09:59	46	59	105
10:00 - 10:59	56	44	100
11:00 - 11:59	42	67	109
12:00 - 12:59	59	60	119
13:00 - 13:59	56	50	106
14:00 - 14:59	45	54	99
15:00 - 15:59	64	49	113
16:00 - 16:59	78	59	137
17:00 - 17:59	114	57	171
18:00 - 18:59	72	31	103
19:00 - 19:59	36	41	77
20:00 - 20:59	30	18	48
21:00 - 21:59	31	14	45
22:00 - 22:59	19	4	23
23:00 - 23:59	9	1	10
ADT	812	823	1635
AM Peak Time	10:00 - 10:59	07:30 - 08:29	07:45 - 08:44
AM Peak Volume	56	117	142
PM Peak Time	16:45 - 17:44	15:45 - 16:44	16:45 - 17:44
PM Peak Volume	118	61	172

Daily Vehicle Volume Report

Location: Jacoby creek rd. # C4K230 pm. 0.09

Unit ID: 17550/26958

Study Date: Thursday - February 07, 2013

Time	East Bound Volume	West Bound Volume	Total Volume
00:00 - 00:59	5	5	10
01:00 - 01:59	3	2	5
02:00 - 02:59	1	0	1
03:00 - 03:59	0	1	1
04:00 - 04:59	0	3	3
05:00 - 05:59	0	9	9
06:00 - 06:59	4	23	27
07:00 - 07:59	9	78	87
08:00 - 08:59	39	88	127
09:00 - 09:59	40	49	89
10:00 - 10:59	42	68	110
11:00 - 11:59	39	60	99
12:00 - 12:59	58	46	104
13:00 - 13:59	64	61	125
14:00 - 14:59	81	79	160
15:00 - 15:59	84	66	150
16:00 - 16:59	100	61	161
17:00 - 17:59	98	51	149
18:00 - 18:59	64	64	128
19:00 - 19:59	49	24	73
20:00 - 20:59	30	8	38
21:00 - 21:59	36	16	52
22:00 - 22:59	11	4	15
23:00 - 23:59	1	2	3
ADT	858	868	1726
AM Peak Time	08:15 - 09:14	07:45 - 08:44	07:45 - 08:44
AM Peak Volume	45	108	139
PM Peak Time	16:45 - 17:44	14:00 - 14:59	16:30 - 17:29
PM Peak Volume	112	79	168

Daily Vehicle Volume Report

Location: Jacoby creek rd. # C4K230 pm. 0.09

Unit ID: 17550/26958

Study Date: Friday - February 08, 2013

Time	East Bound Volume	West Bound Volume	Total Volume
00:00 - 00:59	1	0	1
01:00 - 01:59	2	0	2
02:00 - 02:59	1	1	2
03:00 - 03:59	1	1	2
04:00 - 04:59	0	3	3
05:00 - 05:59	2	7	9
06:00 - 06:59	5	17	22
07:00 - 07:59	12	61	73
08:00 - 08:59	38	97	135
09:00 - 09:59	53	46	99
10:00 - 10:59	46	71	117
11:00 - 11:59	60	83	143
12:00 - 12:59	52	59	111
13:00 - 13:59	63	59	122
14:00 - 14:59	69	70	139
15:00 - 15:59	66	56	122
16:00 - 16:59	82	55	137
17:00 - 17:59	96	58	154
18:00 - 18:59	45	26	71
19:00 - 19:59	33	28	61
20:00 - 20:59	28	16	44
21:00 - 21:59	30	12	42
22:00 - 22:59	22	12	34
23:00 - 23:59	13	8	21
ADT	820	846	1666
AM Peak Time	11:00 - 11:59	07:30 - 08:29	11:00 - 11:59
AM Peak Volume	60	97	143
PM Peak Time	17:00 - 17:59	14:00 - 14:59	17:00 - 17:59
PM Peak Volume	96	70	154

Daily Vehicle Volume Report

Location: Jacoby creek rd. # C4K230 pm. 0.09

Unit ID: 17550/26958

Study Date: Saturday - February 09, 2013

Time	East Bound Volume	West Bound Volume	Total Volume
00:00 - 00:59	2	1	3
01:00 - 01:59	8	1	9
02:00 - 02:59	6	1	7
03:00 - 03:59	3	2	5
04:00 - 04:59	1	1	2
05:00 - 05:59	0	1	1
06:00 - 06:59	2	5	7
07:00 - 07:59	8	16	24
08:00 - 08:59	19	29	48
09:00 - 09:59	37	50	87
10:00 - 10:59	50	69	119
11:00 - 11:59	44	63	107
12:00 - 12:59	56	69	125
13:00 - 13:59	61	66	127
14:00 - 14:59	70	58	128
15:00 - 15:59	77	54	131
16:00 - 16:59	73	50	123
17:00 - 17:59	72	48	120
18:00 - 18:59	53	47	100
19:00 - 19:59	24	39	63
20:00 - 20:59	31	46	77
21:00 - 21:59	26	30	56
22:00 - 22:59	19	8	27
23:00 - 23:59	23	5	28
ADT	765	759	1524
AM Peak Time	09:30 - 10:29	10:30 - 11:29	10:00 - 10:59
AM Peak Volume	55	70	119
PM Peak Time	15:45 - 16:44	12:00 - 12:59	13:30 - 14:29
PM Peak Volume	83	69	142

Daily Vehicle Volume Report

Location: Jacoby creek rd. # C4K230 pm. 0.09

Unit ID: 17550/26958

Study Date: Sunday - February 10, 2013

Time	East Bound Volume	West Bound Volume	Total Volume
00:00 - 00:59	5	3	8
01:00 - 01:59	12	2	14
02:00 - 02:59	2	4	6
03:00 - 03:59	7	3	10
04:00 - 04:59	3	4	7
05:00 - 05:59	0	3	3
06:00 - 06:59	3	6	9
07:00 - 07:59	6	13	19
08:00 - 08:59	15	20	35
09:00 - 09:59	25	41	66
10:00 - 10:59	78	46	124
11:00 - 11:59	39	68	107
12:00 - 12:59	52	91	143
13:00 - 13:59	67	58	125
14:00 - 14:59	56	56	112
15:00 - 15:59	59	58	117
16:00 - 16:59	54	55	109
17:00 - 17:59	59	40	99
18:00 - 18:59	37	27	64
19:00 - 19:59	27	20	47
20:00 - 20:59	29	12	41
21:00 - 21:59	14	10	24
22:00 - 22:59	6	8	14
23:00 - 23:59	6	2	8
ADT	661	650	1311
AM Peak Time	10:00 - 10:59	11:00 - 11:59	10:00 - 10:59
AM Peak Volume	78	68	124
PM Peak Time	13:00 - 13:59	12:00 - 12:59	12:00 - 12:59
PM Peak Volume	67	91	143

Daily Vehicle Volume Report

Location: Jacoby creek rd. # C4K230 pm. 0.09

Unit ID: 17550/26958

Study Date: Monday - February 11, 2013

Time	East Bound Volume	West Bound Volume	Total Volume
00:00 - 00:59	1	1	2
01:00 - 01:59	3	1	4
02:00 - 02:59	2	0	2
03:00 - 03:59	1	0	1
04:00 - 04:59	0	5	5
05:00 - 05:59	1	8	9
06:00 - 06:59	2	17	19
07:00 - 07:59	9	64	73
08:00 - 08:59	30	92	122
09:00 - 09:59	5	8	13
10:00 - 10:59	-	-	-
11:00 - 11:59	-	-	-
12:00 - 12:59	-	-	-
13:00 - 13:59	-	-	-
14:00 - 14:59	-	-	-
15:00 - 15:59	-	-	-
16:00 - 16:59	-	-	-
17:00 - 17:59	-	-	-
18:00 - 18:59	-	-	-
19:00 - 19:59	-	-	-
20:00 - 20:59	-	-	-
21:00 - 21:59	-	-	-
22:00 - 22:59	-	-	-
23:00 - 23:59	-	-	-
ADT	54	196	250
AM Peak Time	08:15 - 09:14	07:30 - 08:29	07:45 - 08:44
AM Peak Volume	32	113	135
PM Peak Time	00:00 - 00:59	00:00 - 00:59	00:00 - 00:59
PM Peak Volume	0	0	0

CASE_ID	ACCIDENT_YEAR	PROC_DATE	JURIS	COLLISION_DATE	COLLISION_TIME
8769254	2018	20190126	1201	20181201	1100

OFFICER_ID	REPORTING_DISTRICT	DAY_OF_WEEK	CHP_SHIFT	POPULATION
565	407	6	5	3

CNTY_CITY_LOC	SPECIAL_COND	BEAT_TYPE	CHP_BEAT_TYPE	CITY_DIVISION_LAPD
1201	0	0	0	

CHP_BEAT_CLASS	BEAT_NUMBER	PRIMARY_RD
0	00S	OLD ARCATA RD

SECONDARY_RD	DISTANCE	DIRECTION	INTERSECTION	WEATHER_1
JACOBY CREEK RD	107 N	N	B	Cloudy

WEATHER_2	STATE_HWY_IND	CALTRANS COUNTY	CALTRANS DISTRICT
-	N		

STATE_ROUTE	ROUTE_SUFFIX	POSTMILE_PREFIX	POSTMILE	LOCATION_TYPE

RAMP_INTERSECTION	SIDE_OF_HWY	TOW_AWAY	COLLISION_SEVERITY	
	N		3	Visible injury

NUMBER_KILLED	NUMBER_INJURED	PARTY_COUNT	PRIMARY_COLL_FACTOR
0	2	2 A	Vehicle code violation

PCF_CODE_OF_VIOL	PCF_VIOL_CATEGORY	PCF_VIOLATION	PCF_VIOL_SUBSECTION
-	03 Unsafe Speed		22350

HIT_AND_RUN	TYPE_OF_COLLISION	MVIW	PED_ACTION	ROAD_SURFACE
N	C	C	A	B
	Rear end			Wet

ROAD_COND_1	ROAD_COND_2	LIGHTING	CONTROL_DEVICE	CHP_ROAD_TYPE
H	-	A	D	0
None		Day	None	

PEDESTRIAN_ACCIDENT BICYCLE_ACCIDENT MOTORCYCLE_ACCIDENT

TRUCK_ACCIDENT	NOT_PRIVATE_PROPERTY	ALCOHOL_INVOLVED
	Y	

STWD_VEHTYPE_AT_FAULT	CHP_VEHTYPE_AT_FAULT	COUNT_SEVERE_INJ
A	01	0

COUNT_VISIBLE_INJ	COUNT_COMPLAINT_PAIN	COUNT_PED_KILLED
2	0	0

COUNT_PED_INJURED	COUNT_BICYCLIST_KILLED	COUNT_BICYCLIST_INJURED
0	0	0

COUNT_MC_KILLED	COUNT_MC_INJURED	PRIMARY_RAMP	SECONDARY_RAMP
0	0 -	-	