



Memorandum

Date: January 24, 2024

Project: Penngrove Intersection Improvements
C23602 (SOX796)

To: Carmen Rodriguez
County of Sonoma

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Subject: Intersection Control Evaluation for Old Redwood Highway North/Ely Road

In support of improving capacity and operation at the intersection of Old Redwood Highway North/Ely Road, current and projected future operation under various control and lane configuration alternatives has been evaluated. The purpose of this memorandum is to set forth the background data collected, assumptions applied, analysis performed, and findings to help County of Sonoma (County) staff make informed decisions regarding planned intersection layout and control improvements.

Setting

Old Redwood Highway North/Ely Road is a four-legged intersection with stop controls on the Ely Road approaches. There are single through lanes on all four approaches plus left-turn lanes on both Old Redwood Highway approaches (Plate 1).



Collision History

The collision history for the study area was reviewed to determine any trends or patterns that may indicate a safety issue. Collision rates were calculated based on records available from the California Highway Patrol as published in their Statewide Integrated Traffic Records System (SWITRS) reports. The most current five-year period available is January 1, 2018, through December 31, 2022. The calculated collision rate for the study intersection was compared to the average collision rate for similar facilities statewide, as indicated in *2021 Collision Data on California State Highways*, California Department of Transportation (Caltrans). These average rates statewide are for intersections in the same environment (urban, suburban, or rural), with the same number of approaches (three or four), and the same controls (all-way stop, two-way stop, or traffic signal).

Between January 2018 and December 2022, 16 collisions were documented at the study intersection. This equates to a collision rate of 0.45 crashes per million vehicles entering the intersection (c/mve). The statewide average collision rate for four-legged stop-controlled intersections in a suburban setting is 0.36 c/mve and therefore the study intersection has a collision rate that is slightly higher than the statewide average. Copies of the collision data and collision rate calculations are attached.

Of the 16 collisions that occurred during the study period, eight were broadside, three were collisions with an object, three were rear-end, one was an overturn, and one was a head-on collision. All eight broadside collisions were due to right-of-way violations. Further, the injury rate at the intersection was 62.5 percent, which is much

higher than the Statewide average of 42.6 percent, indicating a potential safety concern. Through a change in intersection control such as signalization or conversion to a roundabout, 12 of the 16 collisions (75 percent) would become less probable. Further, changes in intersection control would likely reduce speeds through the intersection. This in turn would reduce collision severity and injury rate.

Operation Under Existing Controls

Traffic counts obtained at the study intersection during the morning and evening peak periods were used to evaluate current operation. Future volumes in the horizon year of 2040 were also projected using information obtained from the Sonoma County Transportation Authority’s (SCTA) travel demand model and application of the Furness method, which is an iterative process that employs existing turn movement data, existing link volumes and future link volumes to project likely turning future movement volumes at intersections.

With the existing two-way stop controls, the intersection is currently operating acceptably at LOS C overall during the a.m. and p.m. peak hours, though it is noted that the westbound Ely Road approach is operating at LOS F. Under the projected future volumes operation would be expected to deteriorate with delays increasing and operation becoming LOS F. These results are summarized in Table 1.

Table 1 – Peak Hour Intersection Levels of Service Under Existing Controls

Study Intersection <i>Approach</i>	Existing Volumes				Future Volumes			
	AM Peak		PM Peak		AM Peak		PM Peak	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1. Old Redwood Hwy N/Ely Rd	23.1	C	21.9	C	84.3	F	>120	F
<i>Eastbound (Ely Rd) Approach</i>	<i>29.4</i>	<i>D</i>	<i>27.8</i>	<i>D</i>	<i>74.0</i>	<i>F</i>	<i>>120</i>	<i>F</i>
<i>Westbound (Ely Rd) Approach</i>	<i>>120</i>	<i>F</i>	<i>>120</i>	<i>F</i>	<i>>120</i>	<i>F</i>	<i>>120</i>	<i>F</i>

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service; Results for minor approaches to two-way stop-controlled intersections are indicated in *italics*

Signal Warrants

The potential need for a traffic signal was evaluated using criteria published in the *California Manual on Uniform Traffic Control Devices (CA-MUTCD)*. Based on the data gathered, Warrants 2, 3, and 7 were assessed and a spreadsheet indicating the analysis is attached.

Warrant 2 is met when an engineering study finds that, for each of any four hours of an average day, the plotted points representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the higher-volume minor street approach (one direction only) all fall above the applicable curve in Figure 4C-1 for the existing combination of approach lanes. On the minor street, the higher volume shall not be required to be on the same approach during each of these four hours.

Volumes during all four hours of the morning and evening peak periods (7:00 a.m. to 9:00 a.m. and 4:00 p.m. to 6:00 p.m.) satisfy the requirements to meet Warrant 2.

Warrant 3 is often the first warrant to be met. Under the Peak Hour Warrant the need for a traffic control signal shall be considered if an engineering study finds that the criteria in either of the following two categories are met:

- A. If all three of the following conditions exist for the same one hour (any four consecutive 15-minute periods) of an average day:

1. The total stopped time delay experienced by the traffic on one minor-street approach (one direction only) controlled by a STOP sign equals or exceeds: four vehicle-hours for a one-lane approach; or five vehicle-hours for a two-lane approach; and
 2. The volume on the same minor-street approach (one direction only) equals or exceeds 100 vehicles per hour for one moving lane of traffic or 150 vehicles per hour for two moving lanes; and
 3. The total entering volume serviced during the hour equals or exceeds 650 vehicles per hour for intersections with three approaches or 800 vehicles per hour for intersections with four or more approaches.
- B. The plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the higher-volume minor-street approach (one direction only) for one hour (any four consecutive 15-minute periods) of an average day falls above the applicable curve in Figure 4C-3 for the existing combination of approach lanes.

Warrant 3 is based on vehicle delay and volumes occurring during the peak hour at an intersection. The existing volumes at the study intersection exceed the threshold established in the warrant for both the a.m. and p.m. peak hours. Based on the operational analysis detailed above, the delay exceeds eleven vehicle hours on the westbound Ely Road approach, exceeding the minimum delay threshold established in the warrant.

Warrant 7 addresses the collision history of a location. The need for a traffic control signal shall be considered if an engineering study finds that all of the following criteria are met:

- A. Adequate trial of alternatives with satisfactory observance and enforcement has failed to reduce the crash frequency; and
- B. Five or more reported crashes, of types susceptible to correction by a traffic control signal, have occurred within a 12-month period, each crash involving personal injury or property damage apparently exceeding the applicable requirements for a reportable crash; and
- C. For each of any eight hours of an average day, the vehicles per hour (vph) given in both of the 80 percent columns of Condition A in Table 4C-1 (see Section 4C.02), or the vph in both of the 80 percent columns of Condition B in Table 4C-1 exists on the major-street and the higher-volume minor-street approach, respectively, to the intersection, or the volume of pedestrian traffic is not less than 80 percent of the requirements specified in the Pedestrian Volume warrant. These major-street and minor-street volumes shall be for the same eight hours. On the minor street, the higher volume shall not be required to be on the same approach during each of the eight hours.

Warrant 7 depends both on collision history and traffic volumes over an eight-hour period. Over the past five years, there was one instance where the number of collisions of types susceptible to correction by a traffic signal (e.g., broadside, head-on) in a 12-month period met the threshold required by the warrant. Between October 4, 2019, and September 20, 2020, there were six reported collisions. Of those, four were broadside, one was hit object, and one was rear-end. The four broadside and one hit object collisions are considered susceptible to correction by a traffic signal, meeting the minimum requirement of five. It is noted that only four hours of volume data was collected for this study, though the four hours meet the threshold described in the warrant. Due to lack of data, this warrant is inconclusive, but it appears that it would be met if additional count data were obtained.

Finding – Based on analysis of Warrants 2, 3 and 7, a signal is warranted at Old Redwood Highway North/Ely Road.

Alternatives Analysis

Options considered for improving operation at the study intersection included a traffic signal, without or with additional lanes, and a modern roundabout, with or without right-turn slip lanes. The alternatives evaluated were as follows.

- Signalized with Existing Lane Configuration (Plate 2)
- Signalized with Added Right-Turn Lanes on Ely Road (Plate 3)
- Signalized with Added Through Lanes on Old Redwood Highway (Plate 4). This would extend the five-lane cross-section on Old Redwood Highway from Redwood Way past Ely Road.
- Roundabout (Plate 5)
- Roundabout with Added Right-Turn Slip Lanes on Old Redwood Highway and westbound Ely Road (Plate 6)

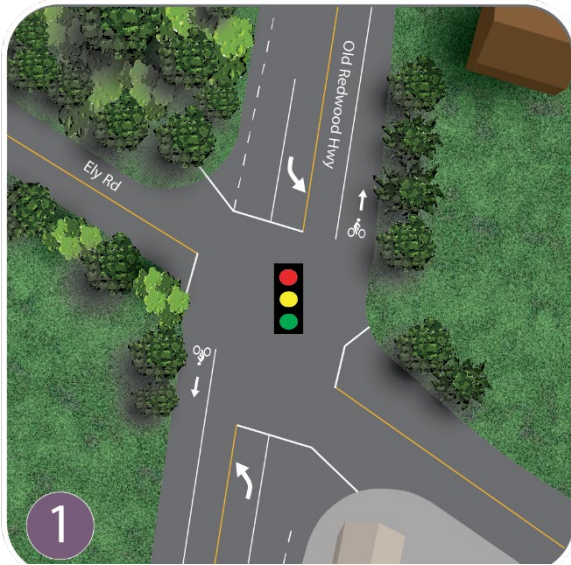


Plate 2 Signalized with Existing Lanes

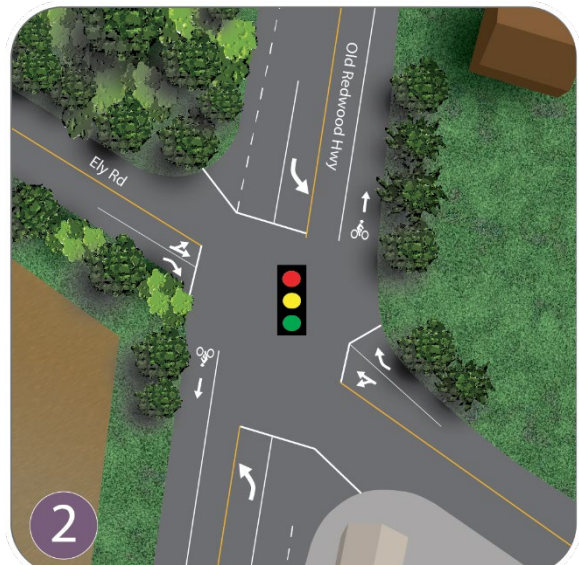


Plate 3 Signalized with Added Lanes on Ely Rd

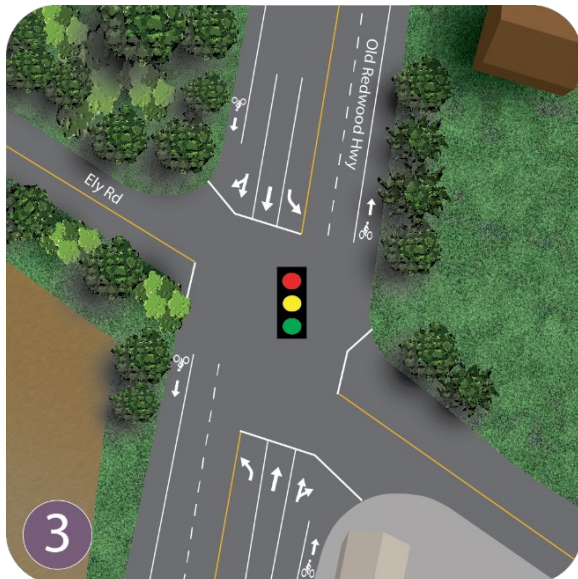


Plate 4 Signalized with Added Lanes on Old Redwood Hwy



Plate 5 Roundabout

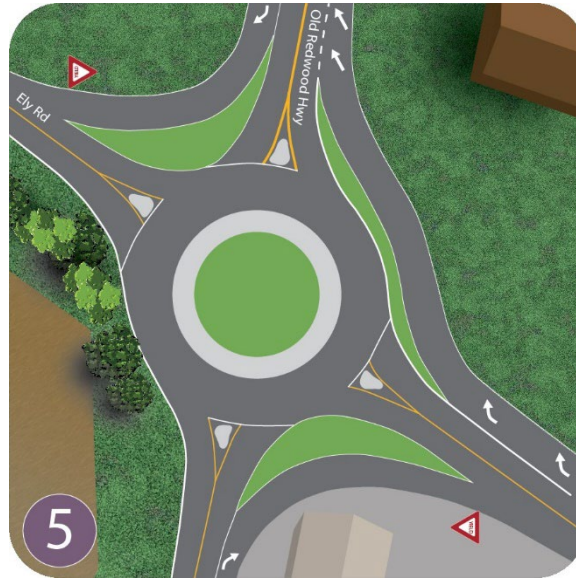


Plate 6 Roundabout with Right-turn Slip Lanes

The alternative including additional through lanes on Old Redwood Highway has been identified in the County's General Plan, which states a policy of acquiring joint funding between the Cities of Santa Rosa, Rohnert Park, Cotati, and Petaluma to widen Old Redwood Highway to four lanes in the Penngrove area (Policy CT-7w).

The roundabout alternative including slip lanes was evaluated with additional slip lanes only on three of the four legs. The eastbound Ely Road leg has much less traffic than the rest; this is expected to continue in the future condition as well. Given the low volume, the addition of a slip lane from that approach had negligible effects on vehicle operations, and therefore was not included in the alternative.

Operation with Alternative Controls

The adequacy of each of the alternatives considered to achieve acceptable operation (LOS D or better) was evaluated. For alternatives involving signalization, optimized timing provided by the Synchro software package was used. In some cases, this resulted in long (greater than 120 seconds) cycle lengths due to the projected volume of vehicles continuing through the intersection in the northbound and southbound directions.

As shown in Table 2, each alternative would improve operations when compared to the existing condition. While acceptable operation can be achieved in the short-term through signalization alone, the future condition would reach unacceptable LOS E during the p.m. peak hour. Therefore, to maintain acceptable operation, right-turn lanes on the Ely Road approaches or additional through lanes in both directions on Old Redwood Highway would be required. Both options would result in acceptable service levels, though adding lanes on Old Redwood Highway would provide acceptable LOS B operation under both short-term and future volumes and would represent the lowest delay of all alternatives evaluated. When compared to the other alternatives, converting the intersection to a roundabout would result in the most delay overall under both short-term and future volumes. Additional slip lanes reduce the delay for the roundabout during the p.m. peak hour in both short-term and future conditions, though they do not have as large of an effect on the a.m. peak hour. Summaries of the individual operational analyses are attached.

Table 2 – Peak Hour Intersection Levels of Service at Old Redwood Highway/Ely Road

Control Alternative	Existing Volumes				Future Volumes			
	AM Peak		PM Peak		AM Peak		PM Peak	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
Signalized with Existing Lanes	18.2	B	29.8	C	24.8	C	62.5*	E
Signalized, Added Lanes on Ely Rd	10.3	B	19.4	B	15.2	B	52.6	D
Signalized, Added Lanes on Old Redwood Highway	9.1	A	12.1	B	10.1	B	14.6	B
Roundabout	14.0	B	22.6	C	46.9	E	72.2	F
Roundabout, Added Slip Lanes	13.4	B	12.6	B	45.9	E	35.4	E

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service; **Bold** text = deficient operation; * = modeled with cycle length in excess of 120 seconds

While the two roundabout alternatives were evaluated, operationally they do not meet acceptable standards set by Sonoma County of achieving LOS D or better. Further, the volumes entering the intersection are greater than what is recommended for a single-lane roundabout in *NCHRP Research Report 1043: Guide for Roundabouts*. While a multi-lane roundabout could provide acceptable operation, it was not evaluated due to the novelty of multi-lane roundabouts in the area.

Crash Reduction

The safety benefits of each alternative were evaluated using Crash Modification Factors (CMFs) published by the Federal Highway Administration (FHWA). CMFs represent the crash reduction (or inflation) that could be expected due to implementation of a specific countermeasure based on studies that have occurred on similar roadways within the United States. CMFs can also provide information regarding specific crash types. A common example is implementation of a signal where rear-end crashes would be expected to increase though collisions overall would be expected to decrease.

Applying CMFs to the observed crash frequency obtained can provide an estimated number of crashes after implementation of a countermeasure. CMFs can also be converted to Crash Reduction Factors (CRFs) and presented in that form. CRFs represent a percent reduction (or inflation) expected from a specific countermeasure and are generally more comprehensible and easier to directly compare.

As summarized in Table 3, the countermeasures applied to the five alternatives include installation of a traffic signal, installation of a right-turn lane, or conversion of a stop-controlled intersection to a modern roundabout. It is noted that there is no high-quality published CMF for a countermeasure focused on addition of through lanes at an intersection, nor the addition of slip lanes at a roundabout. Based on these countermeasures, the three alternatives involving signalization would generally perform similarly in terms of collision reduction, with each expected to reduce collisions overall by 23 or 24 percent. As is typical of signalization, these three alternatives would likely result in an increase in the number of rear-end crashes of about 38 percent, but a decrease in broadside crashes of about 67 percent. The roundabout alternative would be expected to have the greatest beneficial effect on crashes, with an expected reduction of 72 percent. With added slip lanes, the roundabout alternative would still have expected benefits to crash reduction when compared to signalization, however the added conflict points would likely make it less beneficial than the roundabout alternative without the slip lanes. Note that the FHWA does not have high quality data published regarding the safety impacts of the addition of slip lanes at roundabouts, and therefore the CMF applied for that alternative is an estimation based on engineering judgement.

Table 3 – Expected Crash Reduction for Each Alternative

Control Alternative	All Crashes		Rear-End Crashes		Broadside Crashes	
	CMF	CRF	CMF	CRF	CMF	CRF
Signalized with Existing Lanes	0.77	23%	1.38	-38%	0.33	67%
Signalized, Added Lanes on Ely Rd	0.76	24%	1.38	-38%	0.33	67%
Signalized, Added Lanes on Old Redwood Highway	0.77	23%	1.38	-38%	0.33	67%
Roundabout	0.28	72%	-	-	-	-
Roundabout, Added Slip Lanes	0.42	58%	-	-	-	-

Life Cycle Costs

Costs associated with each alternative were evaluated based on the anticipated construction, planning, design, environmental clearance, right-of-way acquisition, and operating/maintenance costs, supplemented by costs associated with operational delay and collisions at the intersection. These costs were applied through 2040, the future year used for operations the analysis. To compare costs on an equivalent scale, all costs accrued during the study period were converted to present value costs, or 2024 dollars. For the purposes of evaluating each component of the planning and construction costs, environmental clearance was estimated as two percent of the total construction cost, planning and design as 25 percent, and construction management as 13 percent. Table 4 provides a summary of the planning and construction costs per alternative. A spreadsheet containing a further breakdown of the anticipated construction cost per alternative is attached.

Table 4 – Expected Planning and Construction Costs

Cost Category	Control Alternative				
	Signalized with Existing Lanes	Signalized with Added Lanes on Ely Rd	Signalized with Added Lanes on Old Redwood Hwy	Roundabout	Roundabout with Added Slip Lanes
Construction ¹	\$1,194,300	\$1,340,920	\$3,567,320	\$1,003,293	\$1,672,148
Environmental Clearance (2%)	\$23,886	\$26,818	\$71,346	\$20,066	33,443
Planning (5%)	\$59,715	\$67,046	\$178,366	\$50,165	\$83,607
Design (20%)	\$238,860	\$268,184	\$713,464	\$200,659	\$334,430
Right-of-Way Acquisition ¹	\$3,000	\$9,000	\$3,000	\$86,400	\$178,500
Construction Easements (1%)	\$11,943	\$13,409	\$35,673	\$10,033	\$16,721
Construction Management (12%)	\$143,316	\$160,910	\$428,078	\$120,395	\$200,658
Present Value	\$1,519,410	\$1,886,288	\$4,997,248	\$1,491,010	\$2,519,507

Notes: ¹ Refer to attached cost estimate spreadsheet for a breakdown of construction and Right-of-Way costs

Table 5 provides the anticipated operations and maintenance costs associated with each alternative, based on cost information provided by the County for existing facilities. These costs are applied in the cost model at recurring intervals, as noted in the table, with a four percent increase in cost per year. For the No Build alternative, these costs would begin immediately. For all other alternatives, a two-year delay in operation and maintenance is expected to account for the time needed for construction activities.

Table 5 – Expected Operation and Maintenance Costs

Cost Category (Dollars per year unless noted otherwise)	Control Alternative					
	No Build	Signalized with Existing Lanes	Signalized with Added Lanes on Ely Rd	Signalized with Added Lanes on Old Redwood Hwy	Roundabout	Roundabout with Added Slip Lanes
Inspection (\$/2 yr)	\$1,000	\$1,000	\$1,000	\$1,500	\$1,000	\$1,000
Repaving (\$/5 yr)	\$100,000	\$100,000	\$100,000	\$300,000	\$100,000	\$120,000
Signing & Striping	\$1,200	\$1,200	\$1,200	\$2,500	\$1,200	\$1,300
Signal Mtce	-	\$3,000	\$3,000	\$3,000	-	-
Electrical Mtce	-	\$1,000	\$1,000	\$3,000	\$2,000	\$2,200
Vegetation Mtce	\$1,000	\$1,000	\$1,000	\$2,000	\$1,000	\$1,000
Present Value	\$340,952	\$357,422	\$357,422	\$972,945	\$335,014	\$394,824

Notes: yr = year; Mtce = Maintenance

Costs attributable to collisions and operational delay were calculated for each alternative using data provided by Caltrans in the *California Life-Cycle Benefit/Cost Analysis Model*. This model applies a cost of \$13 million to fatal collisions, \$173,000 to collisions resulting in injury, and \$10,400 to collisions resulting in property damage only. For delay, a cost of \$16.45 is assumed per person-hour, and \$37.55 is assumed per truck-hour.

Table 6 summarizes the total present value of costs for all alternatives, including costs attributable to collisions and delay. All potential alternatives would provide cost benefits in the long-term since they all have a cheaper present value than maintaining existing conditions. The present value of the roundabout alternative is much less than the other options, which is attributable primarily to the expected collision reduction associated with that option. Conversely, the No Build alternative is much more costly than the other alternatives due to costs from high operational delay.

Table 6 – Present Value of Expected Costs

Cost Category	Control Alternative					
	No Build	Signalized with Existing Lanes	Signalized & Added Lanes on Ely Rd	Signalized & Added Lanes on ORH	Roundabout	Roundabout with Added Slip Lanes
Planning & Construction	-	\$1,675,020	\$1,886,288	\$4,997,248	\$1,491,010	\$2,519,507
Operations & Maintenance	\$340,952	\$357,422	\$357,422	\$972,945	\$335,014	\$394,824
Collisions	\$5,395,955	\$4,154,885	\$4,100,925	\$4,154,885	\$1,510,867	\$2,266,301
Delay	\$15,228,105	\$3,462,862	\$393,084	\$435,235	\$559,202	\$462,044
Total Present Value	\$20,965,011	\$9,650,189	\$6,737,720	\$10,560,313	\$3,896,093	\$5,642,676

Benefit/Cost Ratio

Benefit/Cost ratios (BCR) are used in transportation economics to compare alternatives on as similar a scale as possible, with the present value of benefits being directly compared to the present value of costs for a particular

alternative. Net present values, or the difference between the present value of the alternative and the No Build, are used in BCR calculations. BCR values greater than one indicate that the benefits of a potential alternative outweigh the costs associated with that alternative. Conversely, BCR values less than one suggest that an alternative is not economically beneficial. Given that benefits and costs are calculated relative to the No Build alternative, the BCR of doing nothing is always equal to one. In this case, the No Build alternative has much higher costs associated with per person delay resulting from the unacceptable operation at the intersection if no changes are made. This leads to BCR values much greater than one for all alternatives. Net Present values of benefits and costs, as well as calculated BCR values, are summarized in Table 7.

Table 7 – Benefits and Costs						
	Control Alternative					
	No Build	Signalized with Existing Lanes	Signalized with Added Lanes on Ely Rd	Signalized with Added Lanes on Old Redwood Hwy	Roundabout	Roundabout with Added Slip Lanes
NPV of Benefits	-	\$13,006,312	\$16,130,049	\$16,033,939	\$18,553,990	\$17,895,714
NPV of Costs	-	\$1,691,490	\$1,902,758	\$5,629,241	\$1,485,072	\$2,573,379
Present Value of Net Benefits	-	\$11,314,822	\$14,227,291	\$10,404,699	\$17,068,918	\$15,322,335
Benefit/Cost Ratio	1.00	7.69	8.48	2.85	12.49	6.95

Notes: NPV = Net Present Value

Conclusions

Old Redwood Highway North/Ely Road, while currently operating acceptably, is expected to operate at an unacceptable LOS F in the future. It also has a collision rate higher than the statewide average. Five potential solutions to address deficient operation and safety concerns were analyzed and compared to a No Build alternative: converting the intersection to a signalized intersection with the existing lane configuration, converting it to signalized control with added right-turn lanes on the Ely Road approaches, converting it to signalized control and extending the five-lane cross section on Old Redwood Highway past Ely Road, converting it to a modern roundabout, or converting it to a modern roundabout with right-turn slip lanes on the Old Redwood Highway approaches and the westbound Ely Road approach. Only two of the options (signalization with added lanes either on Ely Road or Old Redwood Highway) would improve future operation to an acceptable level. All five options would be expected to reduce the number of collisions at the intersection. Although the roundabout alternative has the highest BCR, it would not provide acceptable operation in the future condition. Of the options that do provide acceptable operation, signalization with added lanes on Ely Road has the most economic benefit. It is noted that all five options would be much more economically beneficial than the No Build alternative.

DJW/ngb/SOX796.M2

Attachments: Collision Rate Calculations, Signal Warrant Analysis, Operational Analyses, Construction Cost Spreadsheet

Intersection Collision Rate Worksheet

Penngrove Intersection Improvements

Intersection # 1: Old Redwood Highway North & Ely Road

Date of Count: Thursday, September 28, 2023

Number of Collisions: 16

Number of Injuries: 10

Number of Fatalities: 0

Average Daily Traffic (ADT): 19500

Start Date: January 1, 2018

End Date: December 31, 2022

Number of Years: 5

Intersection Type: Four-Legged

Control Type: Stop & Yield Controls

Area: Suburban

$$\text{Collision Rate} = \frac{\text{Number of Collisions} \times 1 \text{ Million}}{\text{ADT} \times \text{Days per Year} \times \text{Number of Years}}$$

$$\text{Collision Rate} = \frac{16}{19,500} \times \frac{1,000,000}{365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	0.45 c/mve	0.0%	62.5%
Statewide Average*	0.36 c/mve	1.5%	42.6%

Notes

ADT = average daily total vehicles entering intersection

c/mve = collisions per million vehicles entering intersection

* 2020 Collision Data on California State Highways, Caltrans

Warrant 2: Four-Hour Vehicular Volume

Old Redwood Hwy & Ely Rd
Sonoma County

Project Name: SOX796

Intersection: 1

Scenario: Existing

Date of Count: 9/28/2023

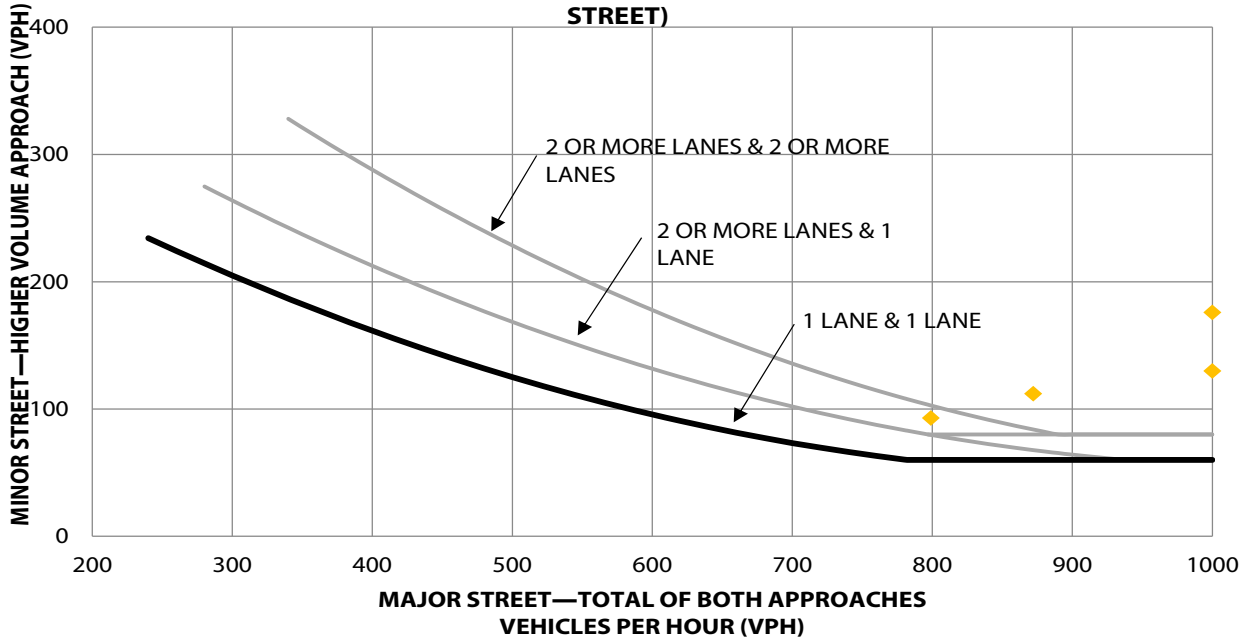
	<u>Major Street</u>	<u>Minor Street</u>
Street Name:	Old Redwood Hwy	Ely Rd
Direction:	N-S	E-W
Number of Lanes:	1	1
Approach Speed:	45	45

Community with population < 10,000? No

WARRANT MET? Yes

Hour	Both Approaches	Highest Approach
	<u>Major Street</u>	<u>Minor Street</u>
1	1564	176
2	1155	130
3	872	112
4	799	93

Warrant 2, Four-Hour Volumes (70% Factor)
(COMMUNITY LESS THAN 10,000 POPULATION, OR ABOVE 40 MPH ON MAJOR STREET)



Warrant 3: Peak-Hour Volumes and Delay

Old Redwood Hwy & Ely Rd
Sonoma County

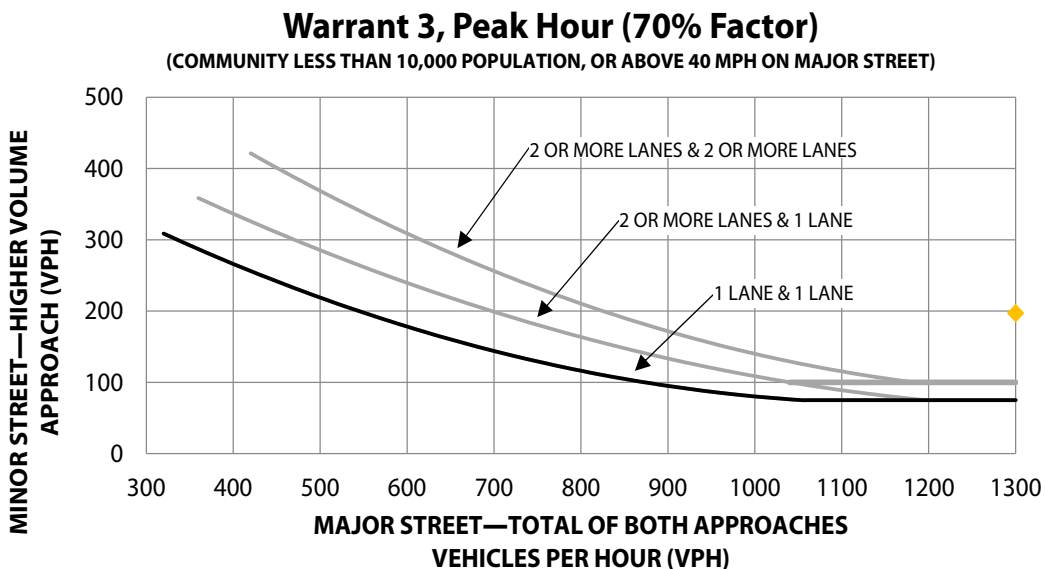
Project Name: SOX796

Intersection: 1

	<u>Major Street</u>	<u>Minor Street</u>
Street Name	Old Redwood Hwy	Ely Rd
Direction	N-S	E-W
Number of Lanes	1	1
Approach Speed	45	45

Population less than 10,000? No
Date of Count: Thursday, September 28, 2023
Scenario: Existing

Warrant 3 Met?: Met when either Condition A or B is met	Yes
Condition A: Met when conditions A1, A2, and A3 are met	Met
<i>Condition A1</i> The total delay experienced by traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one lane approach, or five vehicle-hours for a two-lane approach Minor Approach Delay: 11.27 vehicle-hours	Met
<i>Condition A2</i> The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic of 150 vph for two moving lanes Minor Approach Volume: 197 vph	Met
<i>Condition A3</i> The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaches Total Entering Volume: 1953 vph	Met
Condition B The plotted point falls above the curve	Met



HCM 6th TWSC
3: Old Redwood Hwy & Ely Rd

11/14/2023

Intersection												
Int Delay, s/veh	23.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔		↔		↔		↔		↔		↔	
Traffic Vol, veh/h	2	4	31	45	3	128	17	436	80	218	813	0
Future Vol, veh/h	2	4	31	45	3	128	17	436	80	218	813	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	110	-	-	110	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	2	4	31	45	3	128	17	436	80	218	813	0

Major/Minor	Minor2	Minor1	Major1	Major2
Conflicting Flow All	1825	1799	813	1777
Stage 1	1249	1249	-	510
Stage 2	576	550	-	1267
Critical Hdwy	7.12	6.52	6.22	7.12
Critical Hdwy Stg 1	6.12	5.52	-	6.12
Critical Hdwy Stg 2	6.12	5.52	-	6.12
Follow-up Hdwy	3.518	4.018	3.318	3.518
Pot Cap-1 Maneuver	59	80	378	64
Stage 1	212	245	-	546
Stage 2	503	516	-	207
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	37	62	378	46
Mov Cap-2 Maneuver	37	62	-	46
Stage 1	208	194	-	535
Stage 2	383	505	-	147

Approach	EB	WB	NB	SB
HCM Control Delay, s	29.4	214.8	0.3	2
HCM LOS	D	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	814	-	-	184	142	1050	-	-
HCM Lane V/C Ratio	0.021	-	-	0.201	1.239	0.208	-	-
HCM Control Delay (s)	9.5	-	-	29.4	214.8	9.3	-	-
HCM Lane LOS	A	-	-	D	F	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.7	10.5	0.8	-	-

HCM 6th TWSC
3: Old Redwood Hwy & Ely Rd

11/14/2023

Intersection												
Int Delay, s/veh	21.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔		↔		↔		↔		↔		↔	
Traffic Vol, veh/h	1	3	21	31	3	163	28	940	173	101	489	0
Future Vol, veh/h	1	3	21	31	3	163	28	940	173	101	489	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	110	-	-	110	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	3	21	31	3	163	28	940	173	101	489	0

Major/Minor	Minor2	Minor1	Major1	Major2
Conflicting Flow All	1857	1860	489	1786
Stage 1	691	691	-	1083
Stage 2	1166	1169	-	703
Critical Hdwy	7.12	6.52	6.22	7.12
Critical Hdwy Stg 1	6.12	5.52	-	6.12
Critical Hdwy Stg 2	6.12	5.52	-	6.12
Follow-up Hdwy	3.518	4.018	3.318	3.518
Pot Cap-1 Maneuver	56	73	579	63
Stage 1	435	446	-	263
Stage 2	236	267	-	428
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	20	60	579	50
Mov Cap-2 Maneuver	20	60	-	50
Stage 1	424	374	-	256
Stage 2	97	260	-	343

Approach	EB	WB	NB	SB
HCM Control Delay, s	27.8	206	0.2	2
HCM LOS	D	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1074	-	-	183	159	627	-	-
HCM Lane V/C Ratio	0.026	-	-	0.137	1.239	0.161	-	-
HCM Control Delay (s)	8.4	-	-	27.8	206	11.8	-	-
HCM Lane LOS	A	-	-	D	F	B	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.5	11.3	0.6	-	-

HCM 6th TWSC
3: Old Redwood Hwy & Ely Rd

11/07/2023

Intersection												
Int Delay, s/veh	84.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔		↔		↔		↔		↔		↔	
Traffic Vol, veh/h	2	4	31	45	3	128	17	603	80	224	1153	0
Future Vol, veh/h	2	4	31	45	3	128	17	603	80	224	1153	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	110	-	-	110	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	2	4	31	45	3	128	17	603	80	224	1153	0

Major/Minor	Minor2	Minor1	Major1	Major2										
Conflicting Flow All	2344	2318	1153	2296	2278	643	1153	0	0	683	0	0		
Stage 1	1601	1601	-	677	677	-	-	-	-	-	-	-	-	-
Stage 2	743	717	-	1619	1601	-	-	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-	-	-
Pot Cap-1 Maneuver	25	38	240	~ 27	40	473	606	-	-	910	-	-	-	-
Stage 1	133	165	-	443	452	-	-	-	-	-	-	-	-	-
Stage 2	407	434	-	130	165	-	-	-	-	-	-	-	-	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	13	28	240	~ 17	29	473	606	-	-	910	-	-	-	-
Mov Cap-2 Maneuver	13	28	-	~ 17	29	-	-	-	-	-	-	-	-	-
Stage 1	129	124	-	431	439	-	-	-	-	-	-	-	-	-
Stage 2	287	422	-	83	124	-	-	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	74	\$ 1067.3	0.3	1.7
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	606	-	-	87	58	910	-	-
HCM Lane V/C Ratio	0.028	-	-	0.425	3.034	0.246	-	-
HCM Control Delay (s)	11.1	-	-	78	1067.3	10.2	-	-
HCM Lane LOS	B	-	-	F	F	B	-	-
HCM 95th %tile Q(veh)	0.1	-	-	1.7	18.3	1	-	-

Notes
 ~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

HCM 6th TWSC
3: Old Redwood Hwy & Ely Rd

11/07/2023

Intersection												
Int Delay, s/veh	143.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔		↔		↔		↔		↔		↔	
Traffic Vol, veh/h	1	3	21	47	3	195	28	1242	187	105	786	0
Future Vol, veh/h	1	3	21	47	3	195	28	1242	187	105	786	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	110	-	-	110	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	3	21	47	3	195	28	1242	187	105	786	0

Major/Minor	Minor2	Minor1	Major1	Major2										
Conflicting Flow All	2487	2481	786	2400	2388	1336	786	0	0	1429	0	0		
Stage 1	996	996	-	1392	1392	-	-	-	-	-	-	-	-	-
Stage 2	1491	1485	-	1008	996	-	-	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-	-	-
Pot Cap-1 Maneuver	20	30	392	~ 23	34	~ 188	833	-	-	476	-	-	-	-
Stage 1	294	322	-	176	209	-	-	-	-	-	-	-	-	-
Stage 2	154	188	-	290	322	-	-	-	-	-	-	-	-	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	23	392	~ 16	26	~ 188	833	-	-	476	-	-	-	-
Mov Cap-2 Maneuver	-	23	-	~ 16	26	-	-	-	-	-	-	-	-	-
Stage 1	284	251	-	170	202	-	-	-	-	-	-	-	-	-
Stage 2	-	182	-	211	251	-	-	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s		\$ 1527.9	0.2	1.7
HCM LOS	-	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	833	-	-	60	476	-	-	-
HCM Lane V/C Ratio	0.034	-	-	4.083	0.221	-	-	-
HCM Control Delay (s)	9.5	-	-	\$ 1527.9	14.7	-	-	-
HCM Lane LOS	A	-	-	F	B	-	-	-
HCM 95th %tile Q(veh)	0.1	-	-	26.6	0.8	-	-	-

Notes
 ~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

HCM 6th Signalized Intersection Summary
3: Old Redwood Hwy & Ely Rd

11/14/2023

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔		↔	↔		↔	↔	
Traffic Volume (veh/h)	2	4	31	45	3	128	17	436	80	218	813	0
Future Volume (veh/h)	2	4	31	45	3	128	17	436	80	218	813	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No		No		No		No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1945	1870	1870
Adj Flow Rate, veh/h	2	4	31	45	3	128	17	436	80	218	813	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	51	33	191	98	18	158	35	844	155	264	1256	0
Arrive On Green	0.14	0.14	0.14	0.14	0.14	0.14	0.02	0.55	0.55	0.14	0.67	0.00
Sat Flow, veh/h	26	239	1370	296	130	1134	1781	1537	282	1853	1870	0
Grp Volume(v), veh/h	37	0	0	176	0	0	17	0	516	218	813	0
Grp Sat Flow(s),veh/h/ln	1636	0	0	1559	0	0	1781	0	1820	1853	1870	0
Q Serve(g_s), s	0.0	0.0	0.0	6.0	0.0	0.0	0.8	0.0	14.2	9.1	20.1	0.0
Cycle Q Clear(g_c), s	1.6	0.0	0.0	8.7	0.0	0.0	0.8	0.0	14.2	9.1	20.1	0.0
Prop In Lane	0.05		0.84	0.26		0.73	1.00		0.16	1.00		0.00
Lane Grp Cap(c), veh/h	275	0	0	274	0	0	35	0	999	264	1256	0
V/C Ratio(X)	0.13	0.00	0.00	0.64	0.00	0.00	0.48	0.00	0.52	0.83	0.65	0.00
Avail Cap(c_a), veh/h	413	0	0	406	0	0	112	0	999	405	1256	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	30.2	0.0	0.0	33.2	0.0	0.0	38.6	0.0	11.3	33.2	7.6	0.0
Incr Delay (d2), s/veh	0.2	0.0	0.0	2.5	0.0	0.0	10.0	0.0	1.9	8.2	2.6	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.6	0.0	0.0	3.4	0.0	0.0	0.4	0.0	5.6	4.6	7.2	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	30.4	0.0	0.0	35.7	0.0	0.0	48.7	0.0	13.2	41.4	10.2	0.0
LnGrp LOS	C	A	A	D	A	A	D	A	B	D	B	A
Approach Vol, veh/h		37			176			533			1031	
Approach Delay, s/veh		30.4			35.7			14.4			16.8	
Approach LOS		C			D			B			B	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	15.8	48.2		15.6	6.1	58.0		15.6				
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s	17.4	41.1		18.0	5.0	53.5		18.0				
Max Q Clear Time (g_c+1), s	11.1	16.2		3.6	2.8	22.1		10.7				
Green Ext Time (p_c), s	0.3	3.6		0.1	0.0	7.1		0.5				
Intersection Summary												
HCM 6th Ctrl Delay				18.2								
HCM 6th LOS				B								

HCM 6th Signalized Intersection Summary
3: Old Redwood Hwy & Ely Rd

11/14/2023

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔		↔	↔		↔	↔	
Traffic Volume (veh/h)	1	3	21	31	3	163	28	940	173	101	489	0
Future Volume (veh/h)	1	3	21	31	3	163	28	940	173	101	489	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No		No		No		No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1945	1870	1870
Adj Flow Rate, veh/h	1	3	21	31	3	163	28	940	173	101	489	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	41	36	201	68	16	191	49	988	182	129	1281	0
Arrive On Green	0.15	0.15	0.15	0.15	0.15	0.15	0.03	0.64	0.64	0.07	0.69	0.00
Sat Flow, veh/h	15	246	1372	165	107	1305	1781	1537	283	1853	1870	0
Grp Volume(v), veh/h	25	0	0	197	0	0	28	0	1113	101	489	0
Grp Sat Flow(s),veh/h/ln	1633	0	0	1578	0	0	1781	0	1819	1853	1870	0
Q Serve(g_s), s	0.0	0.0	0.0	7.1	0.0	0.0	1.5	0.0	53.8	5.1	10.7	0.0
Cycle Q Clear(g_c), s	1.3	0.0	0.0	11.6	0.0	0.0	1.5	0.0	53.8	5.1	10.7	0.0
Prop In Lane	0.04		0.84	0.16		0.83	1.00		0.16	1.00		0.00
Lane Grp Cap(c), veh/h	278	0	0	274	0	0	49	0	1170	129	1281	0
V/C Ratio(X)	0.09	0.00	0.00	0.72	0.00	0.00	0.57	0.00	0.95	0.78	0.38	0.00
Avail Cap(c_a), veh/h	347	0	0	341	0	0	110	0	1170	134	1281	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	35.4	0.0	0.0	39.7	0.0	0.0	45.9	0.0	15.7	43.8	6.4	0.0
Incr Delay (d2), s/veh	0.1	0.0	0.0	5.4	0.0	0.0	10.1	0.0	16.9	25.0	0.9	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	0.0	0.0	4.9	0.0	0.0	0.8	0.0	24.4	3.2	3.9	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	35.5	0.0	0.0	45.2	0.0	0.0	56.1	0.0	32.6	68.8	7.3	0.0
LnGrp LOS	D	A	A	D	A	A	E	A	C	E	A	A
Approach Vol, veh/h		25			197			1141			590	
Approach Delay, s/veh		35.5			45.2			33.2			17.8	
Approach LOS		D			D			C			B	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	11.1	66.0		18.5	7.1	70.0		18.5				
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s	6.9	61.5		18.1	5.9	62.5		18.1				
Max Q Clear Time (g_c+1), s	7.1	55.8		3.3	3.5	12.7		13.6				
Green Ext Time (p_c), s	0.0	4.0		0.1	0.0	3.6		0.4				
Intersection Summary												
HCM 6th Ctrl Delay								29.8				
HCM 6th LOS								C				

HCM 6th Signalized Intersection Summary
3: Old Redwood Hwy & Ely Rd

11/14/2023

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔		↔	↔		↔	↔	
Traffic Volume (veh/h)	2	4	31	45	3	128	17	603	80	224	1153	0
Future Volume (veh/h)	2	4	31	45	3	128	17	603	80	224	1153	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No		No		No		No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1945	1870	1870
Adj Flow Rate, veh/h	2	4	31	45	3	128	17	603	80	224	1153	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	51	33	191	98	18	158	35	884	117	268	1256	0
Arrive On Green	0.14	0.14	0.14	0.14	0.14	0.14	0.02	0.55	0.55	0.14	0.67	0.00
Sat Flow, veh/h	26	239	1370	296	130	1134	1781	1617	215	1853	1870	0
Grp Volume(v), veh/h	37	0	0	176	0	0	17	0	683	224	1153	0
Grp Sat Flow(s),veh/h/ln	1636	0	0	1559	0	0	1781	0	1832	1853	1870	0
Q Serve(g_s), s	0.0	0.0	0.0	6.0	0.0	0.0	0.8	0.0	21.5	9.4	42.1	0.0
Cycle Q Clear(g_c), s	1.6	0.0	0.0	8.7	0.0	0.0	0.8	0.0	21.5	9.4	42.1	0.0
Prop In Lane	0.05		0.84	0.26		0.73	1.00		0.12	1.00		0.00
Lane Grp Cap(c), veh/h	275	0	0	274	0	0	35	0	1001	268	1256	0
V/C Ratio(X)	0.13	0.00	0.00	0.64	0.00	0.00	0.48	0.00	0.68	0.84	0.92	0.00
Avail Cap(c_a), veh/h	413	0	0	406	0	0	112	0	1001	353	1256	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	30.2	0.0	0.0	33.2	0.0	0.0	38.6	0.0	13.1	33.2	11.2	0.0
Incr Delay (d2), s/veh	0.2	0.0	0.0	2.5	0.0	0.0	10.0	0.0	3.8	12.5	12.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.6	0.0	0.0	3.4	0.0	0.0	0.4	0.0	8.8	5.0	17.4	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	30.4	0.0	0.0	35.7	0.0	0.0	48.7	0.0	16.8	45.7	23.3	0.0
LnGrp LOS	C	A	A	D	A	A	D	A	B	D	C	A
Approach Vol, veh/h		37			176			700			1377	
Approach Delay, s/veh		30.4			35.7			17.6			26.9	
Approach LOS		C			D			B			C	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	16.0	48.1		15.6	6.1	58.0		15.6				
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s	15.2	43.3		18.0	5.0	53.5		18.0				
Max Q Clear Time (g_c+1), s	11.4	23.5		3.6	2.8	44.1		10.7				
Green Ext Time (p_c), s	0.2	4.8		0.1	0.0	6.2		0.5				
Intersection Summary												
HCM 6th Ctrl Delay				24.8								
HCM 6th LOS				C								

HCM 6th Signalized Intersection Summary
3: Old Redwood Hwy & Ely Rd

11/14/2023

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔		↔	↔		↔	↔	
Traffic Volume (veh/h)	1	3	21	47	3	195	28	1242	187	105	786	0
Future Volume (veh/h)	1	3	21	47	3	195	28	1242	187	105	786	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No		No		No		No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1945	1870	1870
Adj Flow Rate, veh/h	1	3	21	47	3	195	28	1242	187	105	786	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	27	31	174	59	9	153	41	1149	173	117	1428	0
Arrive On Green	0.12	0.12	0.12	0.12	0.12	0.12	0.02	0.72	0.72	0.06	0.76	0.00
Sat Flow, veh/h	16	252	1408	249	70	1242	1781	1588	239	1853	1870	0
Grp Volume(v), veh/h	25	0	0	245	0	0	28	0	1429	105	786	0
Grp Sat Flow(s),veh/h/ln	1677	0	0	1560	0	0	1781	0	1827	1853	1870	0
Q Serve(g_s), s	0.0	0.0	0.0	15.5	0.0	0.0	2.3	0.0	108.5	8.4	25.7	0.0
Cycle Q Clear(g_c), s	2.1	0.0	0.0	18.5	0.0	0.0	2.3	0.0	108.5	8.4	25.7	0.0
Prop In Lane	0.04		0.84	0.19		0.80	1.00		0.13	1.00		0.00
Lane Grp Cap(c), veh/h	232	0	0	221	0	0	41	0	1322	117	1428	0
V/C Ratio(X)	0.11	0.00	0.00	1.11	0.00	0.00	0.68	0.00	1.08	0.89	0.55	0.00
Avail Cap(c_a), veh/h	232	0	0	221	0	0	80	0	1322	117	1428	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	58.5	0.0	0.0	66.9	0.0	0.0	72.7	0.0	20.8	69.8	7.2	0.0
Incr Delay (d2), s/veh	0.2	0.0	0.0	92.7	0.0	0.0	18.3	0.0	49.8	52.0	1.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.9	0.0	0.0	14.3	0.0	0.0	1.3	0.0	59.6	5.7	10.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	58.7	0.0	0.0	159.5	0.0	0.0	91.0	0.0	70.6	121.7	8.8	0.0
LnGrp LOS	E	A	A	F	A	A	F	A	F	F	A	A
Approach Vol, veh/h		25			245			1457			891	
Approach Delay, s/veh		58.7			159.5			71.0			22.1	
Approach LOS		E			F			E			C	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	14.0	113.0		23.0	7.9	119.1		23.0				
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s	9.5	108.5		18.5	6.7	111.3		18.5				
Max Q Clear Time (g_c+1), s	10.4	110.5		4.1	4.3	27.7		20.5				
Green Ext Time (p_c), s	0.0	0.0		0.0	0.0	7.3		0.0				
Intersection Summary												
HCM 6th Ctrl Delay									62.5			
HCM 6th LOS									E			

HCM 6th Signalized Intersection Summary
3: Old Redwood Hwy & Ely Rd

11/14/2023

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↕		↕	↕	↕	↕	↕	↕	↕	↕
Traffic Volume (veh/h)	2	4	31	45	3	128	17	436	80	218	813	0
Future Volume (veh/h)	2	4	31	45	3	128	17	436	80	218	813	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No		No		No		No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1945	1870	1870
Adj Flow Rate, veh/h	2	4	31	45	3	128	17	436	80	218	813	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	96	145	196	223	12	269	445	1005	184	692	1309	0
Arrive On Green	0.10	0.10	0.10	0.10	0.10	0.10	0.02	0.65	0.65	0.07	0.70	0.00
Sat Flow, veh/h	320	1395	1585	1273	116	1585	1781	1537	282	1853	1870	0
Grp Volume(v), veh/h	6	0	31	48	0	128	17	0	516	218	813	0
Grp Sat Flow(s),veh/h/ln	1715	0	1585	1389	0	1585	1781	0	1820	1853	1870	0
Q Serve(g_s), s	0.0	0.0	1.3	2.3	0.0	5.6	0.2	0.0	10.5	2.7	17.6	0.0
Cycle Q Clear(g_c), s	0.2	0.0	1.3	2.5	0.0	5.6	0.2	0.0	10.5	2.7	17.6	0.0
Prop In Lane	0.33		1.00	0.94		1.00	1.00		0.16	1.00		0.00
Lane Grp Cap(c), veh/h	241	0	196	235	0	269	445	0	1190	692	1309	0
V/C Ratio(X)	0.02	0.00	0.16	0.20	0.00	0.48	0.04	0.00	0.43	0.32	0.62	0.00
Avail Cap(c_a), veh/h	453	0	405	419	0	478	526	0	1190	873	1309	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	30.8	0.0	30.0	31.8	0.0	28.7	5.4	0.0	6.4	4.2	6.1	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.4	0.4	0.0	1.3	0.0	0.0	1.2	0.3	2.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	0.5	0.8	0.0	2.1	0.1	0.0	3.6	0.7	5.8	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	30.8	0.0	30.3	32.3	0.0	30.0	5.5	0.0	7.5	4.5	8.3	0.0
LnGrp LOS	C	A	C	C	A	C	A	A	A	A	A	A
Approach Vol, veh/h		37			176			533			1031	
Approach Delay, s/veh		30.4			30.6			7.5			7.5	
Approach LOS		C			C			A			A	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	9.5	54.5		12.4	6.0	58.0		12.4				
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s	12.5	46.0		18.0	5.0	53.5		18.0				
Max Q Clear Time (g_c+1), s	4.7	12.5		3.3	2.2	19.6		7.6				
Green Ext Time (p_c), s	0.4	3.8		0.1	0.0	7.2		0.4				
Intersection Summary												
HCM 6th Ctrl Delay				10.3								
HCM 6th LOS				B								

HCM 6th Signalized Intersection Summary
3: Old Redwood Hwy & Ely Rd

11/14/2023

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↕		↕	↕	↕	↕	↕	↕	↕	↕
Traffic Volume (veh/h)	1	3	21	31	3	163	28	940	173	101	489	0
Future Volume (veh/h)	1	3	21	31	3	163	28	940	173	101	489	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No		No		No		No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1945	1870	1870
Adj Flow Rate, veh/h	1	3	21	31	3	163	28	940	173	101	489	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	77	182	235	228	19	271	672	1048	193	267	1318	0
Arrive On Green	0.12	0.12	0.12	0.12	0.12	0.12	0.03	0.68	0.68	0.05	0.70	0.00
Sat Flow, veh/h	234	1511	1585	1272	156	1585	1781	1537	283	1853	1870	0
Grp Volume(v), veh/h	4	0	21	34	0	163	28	0	1113	101	489	0
Grp Sat Flow(s),veh/h/ln	1745	0	1585	1427	0	1585	1781	0	1819	1853	1870	0
Q Serve(g_s), s	0.0	0.0	1.1	1.7	0.0	8.7	0.4	0.0	46.0	1.4	9.6	0.0
Cycle Q Clear(g_c), s	0.2	0.0	1.1	1.9	0.0	8.7	0.4	0.0	46.0	1.4	9.6	0.0
Prop In Lane	0.25		1.00	0.91		1.00	1.00		0.16	1.00		0.00
Lane Grp Cap(c), veh/h	259	0	235	247	0	271	672	0	1241	267	1318	0
V/C Ratio(X)	0.02	0.00	0.09	0.14	0.00	0.60	0.04	0.00	0.90	0.38	0.37	0.00
Avail Cap(c_a), veh/h	385	0	356	355	0	392	722	0	1241	289	1318	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	35.6	0.0	33.8	36.4	0.0	35.2	4.2	0.0	11.9	17.7	5.4	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.2	0.3	0.0	2.1	0.0	0.0	10.3	0.9	0.8	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	0.4	0.7	0.0	3.5	0.1	0.0	18.5	1.3	3.4	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	35.6	0.0	33.9	36.6	0.0	37.4	4.3	0.0	22.2	18.6	6.2	0.0
LnGrp LOS	D	A	C	D	A	D	A	A	C	B	A	A
Approach Vol, veh/h		25			197			1141			590	
Approach Delay, s/veh		34.2			37.2			21.8			8.3	
Approach LOS		C			D			C			A	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	9.1	67.2		15.6	7.1	69.3		15.6				
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s	5.7	62.7		18.1	5.1	63.3		18.1				
Max Q Clear Time (g_c+1), s	3.4	48.0		3.1	2.4	11.6		10.7				
Green Ext Time (p_c), s	0.0	8.3		0.0	0.0	3.6		0.4				
Intersection Summary												
HCM 6th Ctrl Delay						19.4						
HCM 6th LOS						B						

HCM 6th Signalized Intersection Summary
3: Old Redwood Hwy & Ely Rd

11/13/2023

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	2	4	31	45	3	128	17	603	80	224	1153	0
Future Volume (veh/h)	2	4	31	45	3	128	17	603	80	224	1153	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No		No		No		No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1945	1870	1870
Adj Flow Rate, veh/h	2	4	31	45	3	128	17	603	80	224	1153	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	96	145	196	223	12	268	236	1058	140	569	1309	0
Arrive On Green	0.10	0.10	0.10	0.10	0.10	0.10	0.02	0.65	0.65	0.07	0.70	0.00
Sat Flow, veh/h	320	1395	1585	1273	116	1585	1781	1617	215	1853	1870	0
Grp Volume(v), veh/h	6	0	31	48	0	128	17	0	683	224	1153	0
Grp Sat Flow(s),veh/h/ln	1715	0	1585	1389	0	1585	1781	0	1832	1853	1870	0
Q Serve(g_s), s	0.0	0.0	1.3	2.3	0.0	5.6	0.2	0.0	15.7	2.8	36.9	0.0
Cycle Q Clear(g_c), s	0.2	0.0	1.3	2.5	0.0	5.6	0.2	0.0	15.7	2.8	36.9	0.0
Prop In Lane	0.33		1.00	0.94		1.00	1.00		0.12	1.00		0.00
Lane Grp Cap(c), veh/h	241	0	196	235	0	268	236	0	1199	569	1309	0
V/C Ratio(X)	0.02	0.00	0.16	0.20	0.00	0.48	0.07	0.00	0.57	0.39	0.88	0.00
Avail Cap(c_a), veh/h	453	0	405	419	0	477	317	0	1199	661	1309	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	30.8	0.0	29.9	31.8	0.0	28.7	11.7	0.0	7.3	5.7	9.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.4	0.4	0.0	1.3	0.1	0.0	2.0	0.4	8.7	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	0.5	0.8	0.0	2.1	0.1	0.0	5.5	0.8	13.7	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	30.8	0.0	30.3	32.3	0.0	30.0	11.8	0.0	9.3	6.1	17.7	0.0
LnGrp LOS	C	A	C	C	A	C	B	A	A	A	B	A
Approach Vol, veh/h		37			176			700			1377	
Approach Delay, s/veh		30.4			30.6			9.3			15.8	
Approach LOS		C			C			A			B	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	9.5	54.5		12.4	6.0	58.0		12.4			19.2	
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5			4.5	
Max Green Setting (Gmax), s	8.8	49.7		18.0	5.0	53.5		18.0			18.0	
Max Q Clear Time (g_c+1), s	4.8	17.7		3.3	2.2	38.9		7.6			14.4	
Green Ext Time (p_c), s	0.2	5.5		0.1	0.0	8.6		0.4			0.3	
Intersection Summary												
HCM 6th Ctrl Delay				15.2								
HCM 6th LOS				B								

HCM 6th Signalized Intersection Summary
3: Old Redwood Hwy & Ely Rd

11/13/2023

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	3	21	47	3	195	28	1242	187	105	786	0
Future Volume (veh/h)	1	3	21	47	3	195	28	1242	187	105	786	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No		No		No		No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1945	1870	1870
Adj Flow Rate, veh/h	1	3	21	47	3	195	28	1242	187	105	786	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	78	201	247	245	14	270	453	1117	168	128	1342	0
Arrive On Green	0.14	0.14	0.14	0.14	0.14	0.14	0.02	0.70	0.70	0.03	0.72	0.00
Sat Flow, veh/h	262	1457	1585	1307	100	1585	1781	1588	239	1853	1870	0
Grp Volume(v), veh/h	4	0	21	50	0	195	28	0	1429	105	786	0
Grp Sat Flow(s),veh/h/ln	1719	0	1585	1406	0	1585	1781	0	1827	1853	1870	0
Q Serve(g_s), s	0.0	0.0	1.2	3.2	0.0	12.4	0.5	0.0	75.0	2.1	21.9	0.0
Cycle Q Clear(g_c), s	0.2	0.0	1.2	3.4	0.0	12.4	0.5	0.0	75.0	2.1	21.9	0.0
Prop In Lane	0.25		1.00	0.94		1.00	1.00		0.13	1.00		0.00
Lane Grp Cap(c), veh/h	279	0	247	259	0	270	453	0	1285	128	1342	0
V/C Ratio(X)	0.01	0.00	0.08	0.19	0.00	0.72	0.06	0.00	1.11	0.82	0.59	0.00
Avail Cap(c_a), veh/h	330	0	297	303	0	319	479	0	1285	128	1342	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	39.8	0.0	38.5	41.2	0.0	41.9	6.2	0.0	15.8	32.1	7.4	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.1	0.4	0.0	6.4	0.1	0.0	61.9	32.4	1.9	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	0.5	1.1	0.0	5.0	0.1	0.0	45.7	3.0	7.5	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	39.8	0.0	38.6	41.5	0.0	48.3	6.3	0.0	77.7	64.5	9.2	0.0
LnGrp LOS	D	A	D	D	A	D	A	A	F	E	A	A
Approach Vol, veh/h		25			245			1457			891	
Approach Delay, s/veh		38.8			46.9			76.4			15.7	
Approach LOS		D			D			E			B	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.0	79.5		19.2	6.5	81.0		19.2			19.2	
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5			4.5	
Max Green Setting (Gmax), s	3.5	75.0		18.0	3.5	75.0		18.0			18.0	
Max Q Clear Time (g_c+1), s	4.1	77.0		3.2	2.5	23.9		14.4			14.4	
Green Ext Time (p_c), s	0.0	0.0		0.0	0.0	6.4		0.3			0.3	
Intersection Summary												
HCM 6th Ctrl Delay									52.6			
HCM 6th LOS									D			

HCM 6th Signalized Intersection Summary
3: Old Redwood Hwy & Ely Rd

11/14/2023

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔		↔	↔		↔	↔	
Traffic Volume (veh/h)	2	4	31	45	3	128	17	436	80	218	813	0
Future Volume (veh/h)	2	4	31	45	3	128	17	436	80	218	813	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No		No		No		No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1945	1870	1870
Adj Flow Rate, veh/h	2	4	31	45	3	128	17	436	80	218	813	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	90	36	211	145	21	176	455	1322	241	670	1860	0
Arrive On Green	0.15	0.15	0.15	0.15	0.15	0.15	0.02	0.44	0.44	0.10	0.52	0.00
Sat Flow, veh/h	32	231	1363	288	137	1136	1781	3002	547	1853	3647	0
Grp Volume(v), veh/h	37	0	0	176	0	0	17	257	259	218	813	0
Grp Sat Flow(s),veh/h/ln	1627	0	0	1562	0	0	1781	1777	1772	1853	1777	0
Q Serve(g_s), s	0.0	0.0	0.0	2.9	0.0	0.0	0.2	4.2	4.3	2.6	6.4	0.0
Cycle Q Clear(g_c), s	0.9	0.0	0.0	4.8	0.0	0.0	0.2	4.2	4.3	2.6	6.4	0.0
Prop In Lane	0.05		0.84	0.26		0.73	1.00		0.31	1.00		0.00
Lane Grp Cap(c), veh/h	336	0	0	342	0	0	455	783	781	670	1860	0
V/C Ratio(X)	0.11	0.00	0.00	0.51	0.00	0.00	0.04	0.33	0.33	0.33	0.44	0.00
Avail Cap(c_a), veh/h	727	0	0	719	0	0	615	783	781	870	1860	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	16.4	0.0	0.0	18.0	0.0	0.0	6.6	8.2	8.2	5.1	6.6	0.0
Incr Delay (d2), s/veh	0.1	0.0	0.0	1.2	0.0	0.0	0.0	1.1	1.1	0.3	0.7	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.0	0.0	1.6	0.0	0.0	0.1	1.5	1.5	0.7	1.8	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	16.6	0.0	0.0	19.2	0.0	0.0	6.7	9.3	9.4	5.4	7.4	0.0
LnGrp LOS	B	A	A	B	A	A	A	A	A	A	A	A
Approach Vol, veh/h		37			176			533			1031	
Approach Delay, s/veh		16.6			19.2			9.3			6.9	
Approach LOS		B			B			A			A	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	9.2	24.3		11.5	5.5	28.0		11.5				
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s	9.5	19.0		18.0	5.0	23.5		18.0				
Max Q Clear Time (g_c+1), s	4.6	6.3		2.9	2.2	8.4		6.8				
Green Ext Time (p_c), s	0.3	2.5		0.1	0.0	5.1		0.7				
Intersection Summary												
HCM 6th Ctrl Delay				9.1								
HCM 6th LOS				A								

HCM 6th Signalized Intersection Summary
3: Old Redwood Hwy & Ely Rd

11/14/2023

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔		↔	↔		↔	↔	
Traffic Volume (veh/h)	1	3	21	31	3	163	28	940	173	101	489	0
Future Volume (veh/h)	1	3	21	31	3	163	28	940	173	101	489	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No		No		No		No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1945	1870	1870
Adj Flow Rate, veh/h	1	3	21	31	3	163	28	940	173	101	489	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	80	40	226	112	19	218	612	1437	264	417	1861	0
Arrive On Green	0.17	0.17	0.17	0.17	0.17	0.17	0.03	0.48	0.48	0.08	0.52	0.00
Sat Flow, veh/h	19	240	1360	156	116	1308	1781	2997	551	1853	3647	0
Grp Volume(v), veh/h	25	0	0	197	0	0	28	557	556	101	489	0
Grp Sat Flow(s),veh/h/ln	1619	0	0	1581	0	0	1781	1777	1771	1853	1777	0
Q Serve(g_s), s	0.0	0.0	0.0	2.8	0.0	0.0	0.4	11.6	11.6	1.2	3.7	0.0
Cycle Q Clear(g_c), s	0.6	0.0	0.0	5.7	0.0	0.0	0.4	11.6	11.6	1.2	3.7	0.0
Prop In Lane	0.04		0.84	0.16		0.83	1.00		0.31	1.00		0.00
Lane Grp Cap(c), veh/h	346	0	0	349	0	0	612	852	849	417	1861	0
V/C Ratio(X)	0.07	0.00	0.00	0.57	0.00	0.00	0.05	0.65	0.65	0.24	0.26	0.00
Avail Cap(c_a), veh/h	675	0	0	669	0	0	741	852	849	470	1861	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	17.2	0.0	0.0	19.2	0.0	0.0	5.9	9.6	9.6	6.8	6.4	0.0
Incr Delay (d2), s/veh	0.1	0.0	0.0	1.4	0.0	0.0	0.0	3.9	3.9	0.3	0.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.0	0.0	2.0	0.0	0.0	0.1	4.3	4.3	0.4	1.1	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	17.2	0.0	0.0	20.7	0.0	0.0	5.9	13.5	13.5	7.1	6.7	0.0
LnGrp LOS	B	A	A	C	A	A	A	B	B	A	A	A
Approach Vol, veh/h		25			197			1141			590	
Approach Delay, s/veh		17.2			20.7			13.3			6.8	
Approach LOS		B			C			B			A	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.2	27.8		12.6	6.1	29.9		12.6				
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s	5.1	23.3		18.1	5.1	23.3		18.1				
Max Q Clear Time (g_c+1), s	3.2	13.6		2.6	2.4	5.7		7.7				
Green Ext Time (p_c), s	0.0	5.0		0.1	0.0	3.0		0.8				
Intersection Summary												
HCM 6th Ctrl Delay								12.1				
HCM 6th LOS								B				

HCM 6th Signalized Intersection Summary
3: Old Redwood Hwy & Ely Rd

11/13/2023

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔		↔	↔		↔	↔	
Traffic Volume (veh/h)	2	4	31	45	3	128	17	603	80	224	1153	0
Future Volume (veh/h)	2	4	31	45	3	128	17	603	80	224	1153	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No		No		No		No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1945	1870	1870
Adj Flow Rate, veh/h	2	4	31	45	3	128	17	603	80	224	1153	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	90	36	211	145	21	176	342	1388	184	596	1860	0
Arrive On Green	0.15	0.15	0.15	0.15	0.15	0.15	0.02	0.44	0.44	0.10	0.52	0.00
Sat Flow, veh/h	32	231	1363	288	137	1136	1781	3154	418	1853	3647	0
Grp Volume(v), veh/h	37	0	0	176	0	0	17	339	344	224	1153	0
Grp Sat Flow(s),veh/h/ln	1627	0	0	1562	0	0	1781	1777	1795	1853	1777	0
Q Serve(g_s), s	0.0	0.0	0.0	2.9	0.0	0.0	0.2	5.9	6.0	2.6	10.3	0.0
Cycle Q Clear(g_c), s	0.9	0.0	0.0	4.8	0.0	0.0	0.2	5.9	6.0	2.6	10.3	0.0
Prop In Lane	0.05		0.84	0.26		0.73	1.00		0.23	1.00		0.00
Lane Grp Cap(c), veh/h	336	0	0	342	0	0	342	782	790	596	1860	0
V/C Ratio(X)	0.11	0.00	0.00	0.51	0.00	0.00	0.05	0.43	0.44	0.38	0.62	0.00
Avail Cap(c_a), veh/h	727	0	0	719	0	0	502	782	790	819	1860	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	16.4	0.0	0.0	18.0	0.0	0.0	7.1	8.7	8.7	5.5	7.6	0.0
Incr Delay (d2), s/veh	0.1	0.0	0.0	1.2	0.0	0.0	0.1	1.8	1.7	0.4	1.6	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.0	0.0	1.6	0.0	0.0	0.1	2.1	2.1	0.7	3.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	16.6	0.0	0.0	19.2	0.0	0.0	7.1	10.5	10.5	5.9	9.1	0.0
LnGrp LOS	B	A	A	B	A	A	A	B	B	A	A	A
Approach Vol, veh/h		37			176			700			1377	
Approach Delay, s/veh		16.6			19.2			10.4			8.6	
Approach LOS		B			B			B			A	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	9.2	24.3		11.5	5.5	28.0		11.5				
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s	10.1	18.4		18.0	5.0	23.5		18.0				
Max Q Clear Time (g_c+1), s	4.6	8.0		2.9	2.2	12.3		6.8				
Green Ext Time (p_c), s	0.3	3.1		0.1	0.0	6.1		0.7				
Intersection Summary												
HCM 6th Ctrl Delay				10.1								
HCM 6th LOS				B								

HCM 6th Signalized Intersection Summary
3: Old Redwood Hwy & Ely Rd

11/13/2023

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔		↔	↔		↔	↔	
Traffic Volume (veh/h)	1	3	21	47	3	195	28	1242	187	105	786	0
Future Volume (veh/h)	1	3	21	47	3	195	28	1242	187	105	786	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No		No		No		No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1945	1870	1870
Adj Flow Rate, veh/h	1	3	21	47	3	195	28	1242	187	105	786	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	68	47	262	114	22	241	455	1618	242	295	1953	0
Arrive On Green	0.19	0.19	0.19	0.19	0.19	0.19	0.02	0.52	0.52	0.05	0.55	0.00
Sat Flow, veh/h	16	244	1361	205	116	1252	1781	3100	464	1853	3647	0
Grp Volume(v), veh/h	25	0	0	245	0	0	28	709	720	105	786	0
Grp Sat Flow(s),veh/h/ln	1620	0	0	1573	0	0	1781	1777	1787	1853	1777	0
Q Serve(g_s), s	0.0	0.0	0.0	5.1	0.0	0.0	0.4	18.2	18.5	1.5	7.3	0.0
Cycle Q Clear(g_c), s	0.7	0.0	0.0	8.5	0.0	0.0	0.4	18.2	18.5	1.5	7.3	0.0
Prop In Lane	0.04		0.84	0.19		0.80	1.00		0.26	1.00		0.00
Lane Grp Cap(c), veh/h	377	0	0	378	0	0	455	928	933	295	1953	0
V/C Ratio(X)	0.07	0.00	0.00	0.65	0.00	0.00	0.06	0.76	0.77	0.36	0.40	0.00
Avail Cap(c_a), veh/h	574	0	0	569	0	0	525	928	933	317	1953	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	19.0	0.0	0.0	22.0	0.0	0.0	6.3	10.9	11.0	9.7	7.5	0.0
Incr Delay (d2), s/veh	0.1	0.0	0.0	1.9	0.0	0.0	0.1	6.0	6.2	0.7	0.6	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.0	0.0	2.7	0.0	0.0	0.1	6.6	6.7	0.4	2.1	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	19.0	0.0	0.0	23.9	0.0	0.0	6.4	16.8	17.1	10.4	8.1	0.0
LnGrp LOS	B	A	A	C	A	A	A	B	B	B	A	A
Approach Vol, veh/h		25			245			1457			891	
Approach Delay, s/veh		19.0			23.9			16.8			8.3	
Approach LOS		B			C			B			A	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	7.3	34.4		15.5	5.8	36.0		15.5				
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s	3.5	29.9		18.1	3.5	29.9		18.1				
Max Q Clear Time (g_c+1), s	3.5	20.5		2.7	2.4	9.3		10.5				
Green Ext Time (p_c), s	0.0	5.9		0.0	0.0	5.1		0.7				
Intersection Summary												
HCM 6th Ctrl Delay								14.6				
HCM 6th LOS								B				

HCM 6th Roundabout
3: Old Redwood Hwy & Ely Rd

11/14/2023

Intersection				
Intersection Delay, s/veh	14.0			
Intersection LOS	B			
Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	37	176	533	1031
Demand Flow Rate, veh/h	38	180	544	1051
Vehicles Circulating, veh/h	1097	464	228	66
Vehicles Exiting, veh/h	20	308	907	578
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	9.4	6.5	9.1	18.0
Approach LOS	A	A	A	C
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
Follow-Up Headway, s	2.609	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976	4.976
Entry Flow, veh/h	38	180	544	1051
Cap Entry Lane, veh/h	451	860	1094	1290
Entry HV Adj Factor	0.972	0.977	0.980	0.981
Flow Entry, veh/h	37	176	533	1031
Cap Entry, veh/h	438	840	1072	1265
V/C Ratio	0.084	0.209	0.497	0.815
Control Delay, s/veh	9.4	6.5	9.1	18.0
LOS	A	A	A	C
95th %tile Queue, veh	0	1	3	10

HCM 6th Roundabout
3: Old Redwood Hwy & Ely Rd

11/14/2023

Intersection				
Intersection Delay, s/veh	22.6			
Intersection LOS	C			
Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	25	197	1141	590
Demand Flow Rate, veh/h	25	201	1164	602
Vehicles Circulating, veh/h	634	989	107	64
Vehicles Exiting, veh/h	32	282	552	1126
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	5.3	14.1	32.2	7.6
Approach LOS	A	B	D	A
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
Follow-Up Headway, s	2.609	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976	4.976
Entry Flow, veh/h	25	201	1164	602
Cap Entry Lane, veh/h	723	503	1237	1293
Entry HV Adj Factor	0.998	0.980	0.980	0.980
Flow Entry, veh/h	25	197	1141	590
Cap Entry, veh/h	721	493	1213	1267
V/C Ratio	0.035	0.399	0.941	0.466
Control Delay, s/veh	5.3	14.1	32.2	7.6
LOS	A	B	D	A
95th %tile Queue, veh	0	2	17	3

HCM 6th Roundabout
3: Old Redwood Hwy & Ely Rd

11/14/2023

Intersection				
Intersection Delay, s/veh	46.9			
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	37	176	700	1377
Demand Flow Rate, veh/h	38	180	714	1404
Vehicles Circulating, veh/h	1450	634	234	66
Vehicles Exiting, veh/h	20	314	1254	748
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	14.0	8.0	12.9	70.0
Approach LOS	B	A	B	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
Follow-Up Headway, s	2.609	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976	4.976
Entry Flow, veh/h	38	180	714	1404
Cap Entry Lane, veh/h	314	723	1087	1290
Entry HV Adj Factor	0.972	0.977	0.980	0.981
Flow Entry, veh/h	37	176	700	1377
Cap Entry, veh/h	306	706	1065	1265
V/C Ratio	0.121	0.249	0.657	1.088
Control Delay, s/veh	14.0	8.0	12.9	70.0
LOS	B	A	B	F
95th %tile Queue, veh	0	1	5	31

HCM 6th Roundabout
3: Old Redwood Hwy & Ely Rd

11/14/2023

Intersection				
Intersection Delay, s/veh	72.2			
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	25	245	1457	891
Demand Flow Rate, veh/h	25	250	1487	909
Vehicles Circulating, veh/h	957	1297	111	80
Vehicles Exiting, veh/h	32	301	871	1467
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	7.5	32.2	116.0	13.3
Approach LOS	A	D	F	B
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
Follow-Up Headway, s	2.609	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976	4.976
Entry Flow, veh/h	25	250	1487	909
Cap Entry Lane, veh/h	520	368	1232	1272
Entry HV Adj Factor	0.998	0.980	0.980	0.981
Flow Entry, veh/h	25	245	1457	891
Cap Entry, veh/h	519	360	1207	1247
V/C Ratio	0.048	0.680	1.207	0.715
Control Delay, s/veh	7.5	32.2	116.0	13.3
LOS	A	D	F	B
95th %tile Queue, veh	0	5	44	7

HCM 6th Roundabout
3: Old Redwood Hwy & Ely Rd

01/16/2024

Intersection							
Intersection Delay, s/veh	13.4						
Intersection LOS	B						
Approach	EB	WB	NB	SB			
Entry Lanes	1	1	1	1			
Conflicting Circle Lanes	1	1	1	1			
Adj Approach Flow, veh/h	37	176	533	1031			
Demand Flow Rate, veh/h	38	180	544	1051			
Vehicles Circulating, veh/h	1097	464	228	66			
Vehicles Exiting, veh/h	20	226	907	447			
Ped Vol Crossing Leg, #/h	0	0	0	0			
Ped Cap Adj	1.000	1.000	1.000	1.000			
Approach Delay, s/veh	9.4	5.4	7.3	18.0			
Approach LOS	A	A	A	C			
Lane	Left	Left	Bypass	Left	Bypass	Left	Bypass
Designated Moves	LTR	LT	R	LT	R	LT	R
Assumed Moves	LTR	LT	R	LT	R	LT	R
RT Channelized			Yield		Yield		Yield
Lane Util	1.000	1.000		1.000		1.000	
Follow-Up Headway, s	2.609	2.609		2.609		2.609	
Critical Headway, s	4.976	4.976	131	4.976	82	4.976	0
Entry Flow, veh/h	38	49	875	462	1096	1051	1352
Cap Entry Lane, veh/h	451	860	0.980	1094	0.980	1290	0.980
Entry HV Adj Factor	0.972	0.978	128	0.981	80	0.981	0
Flow Entry, veh/h	37	48	858	453	1074	1031	1325
Cap Entry, veh/h	438	841	0.149	1073	0.074	1265	0.000
V/C Ratio	0.084	0.057	5.7	0.422	4.0	0.815	2.7
Control Delay, s/veh	9.4	4.8	A	7.9	A	18.0	A
LOS	A	A	1	A	0	C	0
95th %tile Queue, veh	0	0		2		10	

HCM 6th Roundabout
3: Old Redwood Hwy & Ely Rd

01/16/2024

Intersection							
Intersection Delay, s/veh	12.6						
Intersection LOS	B						
Approach	EB	WB	NB	SB			
Entry Lanes	1	1	1	1			
Conflicting Circle Lanes	1	1	1	1			
Adj Approach Flow, veh/h	25	197	1141	590			
Demand Flow Rate, veh/h	25	201	1164	602			
Vehicles Circulating, veh/h	634	989	107	64			
Vehicles Exiting, veh/h	32	106	552	960			
Ped Vol Crossing Leg, #/h	0	0	0	0			
Ped Cap Adj	1.000	1.000	1.000	1.000			
Approach Delay, s/veh	5.3	11.4	15.5	7.6			
Approach LOS	A	B	C	A			
Lane	Left	Left	Bypass	Left	Bypass	Left	Bypass
Designated Moves	LTR	LT	R	LT	R	LT	R
Assumed Moves	LTR	LT	R	LT	R	LT	R
RT Channelized			Yield		Yield		Yield
Lane Util	1.000	1.000		1.000		1.000	
Follow-Up Headway, s	2.609	2.609		2.609		2.609	
Critical Headway, s	4.976	4.976	166	4.976	176	4.976	0
Entry Flow, veh/h	25	35	518	988	1238	602	1336
Cap Entry Lane, veh/h	723	503	0.980	1237	0.980	1293	0.980
Entry HV Adj Factor	0.998	0.970	163	0.980	173	0.980	0
Flow Entry, veh/h	25	34	508	968	1214	590	1309
Cap Entry, veh/h	721	488	0.321	1212	0.142	1267	0.000
V/C Ratio	0.035	0.070	12.0	0.799	4.2	0.466	2.7
Control Delay, s/veh	5.3	8.3	B	17.5	A	7.6	A
LOS	A	A	1	C	0	A	0
95th %tile Queue, veh	0	0		9		3	

HCM 6th Roundabout
3: Old Redwood Hwy & Ely Rd

01/16/2024

Intersection							
Intersection Delay, s/veh	45.9						
Intersection LOS	E						
Approach	EB	WB	NB		SB		
Entry Lanes	1	1	1	1	1	1	
Conflicting Circle Lanes	1	1	1	1	1	1	
Adj Approach Flow, veh/h	37	176	700		1377		
Demand Flow Rate, veh/h	38	180	714		1404		
Vehicles Circulating, veh/h	1450	634	234		66		
Vehicles Exiting, veh/h	20	232	1254		617		
Ped Vol Crossing Leg, #/h	0	0	0		0		
Ped Cap Adj	1.000	1.000	1.000		1.000		
Approach Delay, s/veh	14.0	6.6	10.1		70.0		
Approach LOS	B	A	B		F		
Lane	Left	Left	Bypass	Left	Bypass	Left	Bypass
Designated Moves	LTR	LT	R	LT	R	LT	R
Assumed Moves	LTR	LT	R	LT	R	LT	R
RT Channelized			Yield		Yield		Yield
Lane Util	1.000	1.000		1.000		1.000	
Follow-Up Headway, s	2.609	2.609		2.609		2.609	
Critical Headway, s	4.976	4.976	131	4.976	82	4.976	0
Entry Flow, veh/h	38	49	735	632	1089	1404	1352
Cap Entry Lane, veh/h	314	723	0.980	1087	0.980	1290	0.980
Entry HV Adj Factor	0.972	0.978	128	0.981	80	0.981	0
Flow Entry, veh/h	37	48	721	620	1068	1377	1325
Cap Entry, veh/h	306	707	0.178	1066	0.075	1265	0.000
V/C Ratio	0.121	0.068	7.0	0.581	4.0	1.088	2.7
Control Delay, s/veh	14.0	5.8	A	10.9	A	70.0	A
LOS	B	A	1	B	0	F	0
95th %tile Queue, veh	0	0		4		31	

HCM 6th Roundabout
3: Old Redwood Hwy & Ely Rd

01/16/2024

Intersection							
Intersection Delay, s/veh	35.4						
Intersection LOS	E						
Approach	EB	WB	NB		SB		
Entry Lanes	1	1	1	1	1	1	
Conflicting Circle Lanes	1	1	1	1	1	1	
Adj Approach Flow, veh/h	25	245	1457		891		
Demand Flow Rate, veh/h	25	250	1487		909		
Vehicles Circulating, veh/h	957	1297	111		80		
Vehicles Exiting, veh/h	32	110	871		1268		
Ped Vol Crossing Leg, #/h	0	0	0		0		
Ped Cap Adj	1.000	1.000	1.000		1.000		
Approach Delay, s/veh	7.5	20.5	52.0		13.3		
Approach LOS	A	C	F		B		
Lane	Left	Left	Bypass	Left	Bypass	Left	Bypass
Designated Moves	LTR	LT	R	LT	R	LT	R
Assumed Moves	LTR	LT	R	LT	R	LT	R
RT Channelized			Yield		Yield		Yield
Lane Util	1.000	1.000		1.000		1.000	
Follow-Up Headway, s	2.609	2.609		2.609		2.609	
Critical Headway, s	4.976	4.976	199	4.976	191	4.976	0
Entry Flow, veh/h	25	51	379	1296	1233	909	1336
Cap Entry Lane, veh/h	520	368	0.980	1232	0.980	1272	0.980
Entry HV Adj Factor	0.998	0.979	195	0.980	187	0.981	0
Flow Entry, veh/h	25	50	371	1270	1209	891	1309
Cap Entry, veh/h	519	360	0.525	1208	0.155	1247	0.000
V/C Ratio	0.048	0.139	22.6	1.052	4.3	0.715	2.7
Control Delay, s/veh	7.5	12.3	C	59.0	A	13.3	A
LOS	A	B	3	F	1	B	0
95th %tile Queue, veh	0	0		26		7	

Old Redwood Highway N/Ely Road Preliminary Construction Cost Summary

Item	Unit	Signal			Signal w/ Added Lanes on Ely			Signal w/ Added Lanes on ORH			Roundabout			Roundabout w/ Slip Lanes		
		Unit Cost	Quantity	Total Cost	Unit Cost	Quantity	Total Cost	Unit Cost	Quantity	Total Cost	Unit Cost	Quantity	Total Cost	Unit Cost	Quantity	Total Cost
R/W Acquisition	SF	\$ 30.00	100	\$ 3,000.00	\$ 30.00	300	\$ 9,000.00	\$ 30.00	100	\$ 3,000.00	\$ 30.00	2880	\$ 86,400.00	\$ 30.00	5950	\$ 178,500.00
Roadway Excavation	LS	\$ -	0	\$ -	\$ 4,000.00	1	\$ 4,000.00	\$ 80,000.00	1	\$ 80,000.00	\$ 86,000.00	1	\$ 86,000.00	\$ 129,000.00	1	\$ 129,000.00
Road Widening	SF	\$ 25.00	0	\$ -	\$ 25.00	2100	\$ 52,500.00	\$ 25.00	54000	\$ 1,350,000.00	\$ 25.00	5850	\$ 146,250.00	\$ 25.00	16245	\$ 406,125.00
Curb Installation	LF	\$ 75.00	0	\$ -	\$ 75.00	0	\$ -	\$ 75.00	1260	\$ 94,500.00	\$ 75.00	360	\$ 27,000.00	\$ 75.00	1400	\$ 105,000.00
Minor Concrete, Medians/Sidewalks	SF	\$ 20.00	0	\$ -	\$ 20.00	0	\$ -	\$ 20.00	0	\$ -	\$ 20.00	315	\$ 6,300.00	\$ 20.00	315	\$ 6,300.00
Landscaping	SF	\$ 10.00	0	\$ -	\$ 10.00	0	\$ -	\$ 10.00	0	\$ -	\$ 10.00	3860	\$ 38,600.00	\$ 10.00	8160	\$ 81,600.00
Truck Apron	SF	\$ 40.00	0	\$ -	\$ 40.00	0	\$ -	\$ 40.00	0	\$ -	\$ 40.00	3090	\$ 123,600.00	\$ 40.00	3090	\$ 123,600.00
Culvert Repair/Replacement	LF	\$ 300.00	55	\$ 16,500.00	\$ 300.00	55	\$ 16,500.00	\$ 300.00	55	\$ 16,500.00	\$ 300.00	55	\$ 16,500.00	\$ 300.00	55	\$ 16,500.00
Curb Removal	LF	\$ 15.00	0	\$ -	\$ 15.00	0	\$ -	\$ 15.00	1260	\$ 18,900.00	\$ 15.00	50	\$ 750.00	\$ 15.00	50	\$ 750.00
Tree Removal	EA	\$ 1,500.00	1	\$ 1,500.00	\$ 1,500.00	4	\$ 6,000.00	\$ 1,500.00	9	\$ 13,500.00	\$ 1,500.00	10	\$ 15,000.00	\$ 1,500.00	13	\$ 19,500.00
Fence Removal	LF	\$ 15.00	0	\$ -	\$ 15.00	0	\$ -	\$ 15.00	0	\$ -	\$ 15.00	375	\$ 5,625.00	\$ 15.00	500	\$ 7,500.00
Sign Removal	EA	\$ 200.00	0	\$ -	\$ 200.00	2	\$ 400.00	\$ 200.00	0	\$ -	\$ 200.00	6	\$ 1,200.00	\$ 200.00	6	\$ 1,200.00
Utility Pole Relocation	EA	\$ 10,000.00	0	\$ -	\$ 10,000.00	3	\$ 30,000.00	\$ 10,000.00	6	\$ 60,000.00	\$ 10,000.00	11	\$ 110,000.00	\$ 10,000.00	12	\$ 120,000.00
Utility Vault Relocation	EA	\$ 10,000.00	0	\$ -	\$ 10,000.00	1	\$ 10,000.00	\$ 10,000.00	0	\$ -	\$ 10,000.00	1	\$ 10,000.00	\$ 10,000.00	1	\$ 10,000.00
Fire Hydrant Relocation	EA	\$ 10,000.00	0	\$ -	\$ 10,000.00	1	\$ 10,000.00	\$ 10,000.00	1	\$ 10,000.00	\$ 10,000.00	0	\$ -	\$ 10,000.00	0	\$ -
Signalization	LS	\$ 550,000.00	1	\$ 550,000.00	\$ 550,000.00	1	\$ 550,000.00	\$ 600,000.00	1	\$ 600,000.00	\$ -	0	\$ -	\$ -	0	\$ -
Signal Interconnect	LS	\$ 190,000.00	1	\$ 190,000.00	\$ 190,000.00	1	\$ 190,000.00	\$ 190,000.00	1	\$ 190,000.00	\$ -	0	\$ -	\$ -	0	\$ -
Roadway Striping	LS	\$ 5,000.00	1	\$ 5,000.00	\$ 5,000.00	1	\$ 5,000.00	\$ 50,000.00	1	\$ 50,000.00	\$ 10,000.00	1	\$ 10,000.00	\$ 12,000.00	1	\$ 12,000.00
Signage	LS	\$ 5,000.00	1	\$ 5,000.00	\$ 5,000.00	1	\$ 5,000.00	\$ 10,000.00	1	\$ 10,000.00	\$ 5,000.00	1	\$ 5,000.00	\$ 6,000.00	1	\$ 6,000.00
Street Lighting	LS	\$ 150,000.00	1	\$ 150,000.00	\$ 150,000.00	1	\$ 150,000.00	\$ 250,000.00	1	\$ 250,000.00	\$ 150,000.00	1	\$ 150,000.00	\$ 200,000.00	1	\$ 200,000.00
Contingency:		30%														
TOTAL CONSTRUCTION COST PER ALTERNATIVE		\$		1,197,300.00	\$	1,349,920.00	\$	3,570,320.00	\$	1,089,693.00	\$	1,850,648.00				