CR 98 Bike and Safety Improvements, Phase II

Intersection Control Evaluation (ICE) Report

Yolo County

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Executive Summary

GHD has prepared this report for the County of Yolo utilizing the Intersection Evaluation Control (ICE) process currently implemented by the California Department of Transportation. The purpose of the report is to evaluate two potential design alternatives for the three study intersections of County Road 98 at W. Covell Boulevard, Russell Boulevard and Hutchison Drive/Primate Drive. The two potential design alternatives evaluated are:

1. **Traffic Signal Alternative** – Upgrade the study intersections from stop control to traffic signal control, and;
2. **Roundabout Alternative** – Construct a modern, single-lane, four-legged roundabout at the study intersections.

The existing intersection control was evaluated utilizing the traffic conditions anticipated to occur in the design year 2040 and found to operate at unacceptable levels of service during the AM and/or PM peak hours. Conceptual layouts for both a traffic signal alternative and a roundabout alternative where then developed at each of the three study locations. These layout alternatives were evaluated using a method that compares and contrast the costs involved with each alternative. Cost elements evaluated include design costs, right-of-way costs, construction costs, safety costs, fuel costs, delay costs and green-house gas costs to name a few. The Table below summarizes the life cycle costs for the roundabout alternative compared to the traffic signal alternative at each of the three study intersections.

Life-Cycle Costs Summary for Roundabout &Traffic Signal Alternatives

Life Cycle Costs (20 Year Design)	CR 98 & CR 31 (Covell Boulevard)		CR 98 & CR 32 (Russell Boulevard)		CR 98 &Hutchinson Drive/ Primate Drive	
	Roundabout	Signal	Roundabout	Signal	Roundabout	Signal
Collision Costs	$2,864,000	$11,828,000	$681,000	$8,976,000	$681,000	$8,800,000
Delay costs	$210,000	$530,000	$110,000	$360,000	$100,000	$330,000
Fuel and GHD Costs	$941,000	$1,369,000	$609,000	$775,000	$538,000	$654,000
Operation and Maintenance Costs	$70,000	$83,000	$70,000	$83,000	$79,000	$94,000
Project Costs	$3,208,000	$4,170,000	$3,723,000	$4,082,000	$2,784,000	$2,759,000
Total Life Cycle Costs	**$7,293,000**	**$17,980,000**	**$5,193,000**	**$14,276,000**	**$4,182,000**	**$12,637,000**

As presented within the table above, the roundabout alternative has a lower anticipated life cycle cost than the traffic signal alternative at each of the three study intersections. Based on the results of this analysis, it is recommended that the County of Yolo implement roundabouts as the preferred alternative at each of the three study intersections.

The Table presented on the following page summarizes the quantitative performance evaluation of the roundabout alternatives compared to the traffic signal alternatives.

Performance Summary for Roundabout & Traffic Signal Alternatives

Performance Measure	CR 98 & CR 31 (Covell Boulevard)		CR 98 & CR 32 (Russell Boulevard)		CR 98 &Hutchinson Drive/Primate Drive		Measurement
	Roundabout	Signal	Roundabout	Signal	Roundabout	Signal	
Safety							
Potential Vehicle Conflicts	8	32	8	32	8	32	Quantitative
	✓		✓		✓		
Pedestrian/Bicycle Safety	8	24	8	24	8	24	Quantitative
	✓		✓		✓		
Local Access							
Maintains local access and circulations	✓	✓	✓	✓	✓	✓	Qualitative
Truck Accommodations							
Serves design vehicle for all movements	✓		✓		✓		Qualitative
Costs							
Lowest Total Project Costs	✓		✓		✓		Quantitative
Cumulative Condition							
Intersection Delay (PM Peak Hour)	12.3	28.3	8.0	25.5	6.6	23.3	Quantitative
	✓		✓		✓		
Intersection LOS (PM Peak Hour)	B	C	A	C	A	C	Quantitative
	✓	✓	✓	✓	✓	✓	
Storage adequacy for 95th % Queue (PM Peak Hour)	✓	✓	✓	✓	✓	✓	Quantitative
Future Investment Needs							
Service Life Past the Design Year	✓		✓		✓		Qualitative
Total Performance Measures Met (Total Check Marks Awarded)	9	3	9	3	9	3	

Based on this quantitative analysis, the roundabout alternatives are projected to best meet the criteria for each of the three study intersections.

1. Introduction

This report has been prepared by GHD for the County of Yolo, to present the results of the conceptual alternatives analysis at the following three intersections along County Road 98 (CR 98), located within Yolo County, California:

- County Road 98 & County Road 31 (W. Covell Boulevard)
- County Road 98 & County Road 32 (Russell Boulevard)
- County Road 98 & Hutchison Drive/Primate Drive.

The analysis presented within report uses guidelines provided within the Caltrans Intersection Control Evaluation (ICE) process. The analysis is consistent with the most recent Caltrans Traffic Operations Policy Directive (TOPD 13-02) for intersection improvements on the state highway system. The term “project” as used in this report, refers to the potential improvements that are to be constructed at above noted three (3) intersections on CR 98.

1.1 Need and Purpose

Through the proposed improvements, the County aims to improve safety and mobility on this corridor for all modes of transportation. Specifically, these improvements aim to increase safety and reduce potential conflict points within the County Road 98 corridor. This report specifically looks at intersections of County Road 98 with County Road 31, County Road 32 and Hutchison Drive/Primate Drive.

2. Existing Conditions

The following section presents an overview of the existing roadway conditions and infrastructure present along County Road 98 and within the vicinity of the three study intersections noted above.

2.1 Existing Roadway Geometric Features

County Road 98 (CR 98) is a major two-lane county road/highway (minor rural arterial) that traverses in the north-south direction through Yolo County. County Road 98 is the primary route for emergency evacuations within Yolo County. Between Russell Boulevard and W. Covell Boulevard, County Road 98 is known as Pedrick Road, and between Russell Boulevard and Highway 113 it is known as the Lincoln Highway. Within Yolo County, County Road 98 serves primarily as a collector facility by linking commuter and truck traffic between the townships of Woodland and Davis. County Road 98 is typically used as a route to reach Interstate-80 (I-80) by truck traffic associated with industrial and agricultural facilities within Yolo County. The speed limit on County Road 98 within the study area is generally 55 mph.

W. Covell Boulevard (County Road 31) is a major two-lane county road/highway (minor rural arterial) that traverses in the east-west direction through Yolo County and the City of Davis. Within Yolo County, W. Covell Boulevard serves primarily as a collector facility by linking commuter and

truck traffic to and from Davis. The posted speed limit on County Road 31 within the study area is 55 mph.

Russell Boulevard (County Road 32) is a minor two-lane county road that traverses in the east-west direction through Yolo County and the City of Davis. Within Davis, Russell Boulevard services commuter and truck. There are no posted speed limits on County Road 32 west of County Road 98. The California vehicle code mandates that no person shall drive at speeds greater than 55 mph on two-lane, undivided highways.

Hutchison Drive is a minor two-lane county road that traverses in the east-west direction between County Road 98 and Old Davis Road. Hutchison Drive primarily serves directional commuter traffic between the Yolo County and the University California, Davis. The posted speed limit on Hutchison Drive within the study area is 45 mph. The posted speed limit on Primate Drive is 15 mph.

2.2 Existing Traffic Data

Weekday AM (7:00 - 8:00 am) and PM (4:00 - 5:00 pm) peak hour intersection turn movement counts were provided for the three study intersections by the County staff. These counts were performed on Wednesday, July 27-28, 2016 and no known special events were occurring in the area at that time. Counts were obtained in the absence of inclement weather. Figure 1 in Appendix D presents the Existing 2016 peak hour traffic volumes at the study intersections.

2.3 Multimodal Transportation

The following section presents a discussion on the multimodal transportation options provided along the study corridor.

2.3.1 Public Transportation

The Yolo County Transportation District operates the fixed route bus service Route 220 serving Vacaville/Winters/Davis. This route operates between the Memorial Union on the UC Davis campus and the Vacaville Transportation Center, thereby linking the City of Davis to the City of Winters and the City of Vacaville. Multiple bus routes service the surrounding areas; however there are no bus stops near any of the study intersections.

2.3.2 Bicycle Facilities

Existing bicycle facilities along the following roadway segments are as below:

- County Road 98 – Bikes share the road with motor vehicles along both easterly and westerly sides of the road.
- County Road 31 – Bikes have six-foot shoulder along both northerly and southerly sides of the road.
- Russell Boulevard – Bikes have nine-foot wide shared use path along the southerly side of the roadway for use by both pedestrians and bicyclists.
- Hutchison Drive - Bikes have six-foot shoulder along northerly and southerly sides of the road between County Road 98 and UC Davis West Village.

According to the County of Yolo Bicycle Transportation Plan: Bicycle Routes and Priorities (released March 2013), no new Class I, II or III bicycle facilities are proposed in the vicinity of the study intersections.

2.3.3 Pedestrian Facilities

Owing to the existing rural character associated with County Roads 98, 31 and 32, pedestrian activity within the vicinity of the study intersections is very low. Existing conditions indicate the absence of pedestrian facilities providing connectivity along the study roadways. A Class I shared-use path for use by both pedestrians and bicyclists exist along the southerly side of Russell Boulevard.

3. Design Alternatives

The analysis includes intersection traffic operations for both the Traffic Signal and Roundabout Alternatives. The alternatives are summarized below.

3.1 Traffic Signal Alternative

This alternative features the construction of new traffic signals at the existing study intersections. Additionally, modifications to existing intersection geometry and lane configurations are made to improve safety and traffic operations along the County Road 98 corridor. The following section presents the proposed improvements to lane geometry at each study intersection:

- **Intersection 1 - County Road 98 & County Road 31**
  - Left turn pocket with 200’ storage bay along eastbound CR 31
  - Left turn pocket with 150’ storage bay along westbound CR 31
  - Provide a left turn pocket 150’ storage bay along northbound CR 98
  - Provide a left turn pocket with 100’ storage bay along southbound CR 98
- **Intersection 2 - County Road 98 & Russell Boulevard**
  - Left turn pocket with 100’ storage bay along eastbound CR 32 (Russell Boulevard)
  - Left turn pocket with 125’ storage bay along westbound CR 32
  - Left turn pocket with 150’ storage bay along northbound CR 98
  - Left turn pocket with 100’ storage bay along southbound CR 98
- **Intersection 3 - County Road 98 & Hutchison Drive/Primate Drive**
  - Left turn pocket with 100’ storage bay along northbound CR 98.
  - Left turn pocket with 175’ storage bay along southbound CR 98.

Appendix B presents preliminary conceptual layouts for the proposed Traffic Signal Alternatives.

3.2 Roundabout Alternative

This alternative features the construction of a single lane modern roundabout. The preliminary conceptual layouts and design checks for the proposed Roundabout Alternative can be found in **Appendix C** in this report.

3.2.1 Roundabout Performance Checks

To assess the feasibility of the Roundabout Alternative, performance checks that are compliant with current Caltrans TOPD 13- 02 and HDM 405.10 (which mandates conformance with the National Cooperative Highway Research Program (NCHRP) Report 672 entitled "Roundabouts: An Informational Guide, 2nd edition") were conducted

The following design criteria were used to analyze the geometrics and safety performance of the proposed Roundabout Alternative:

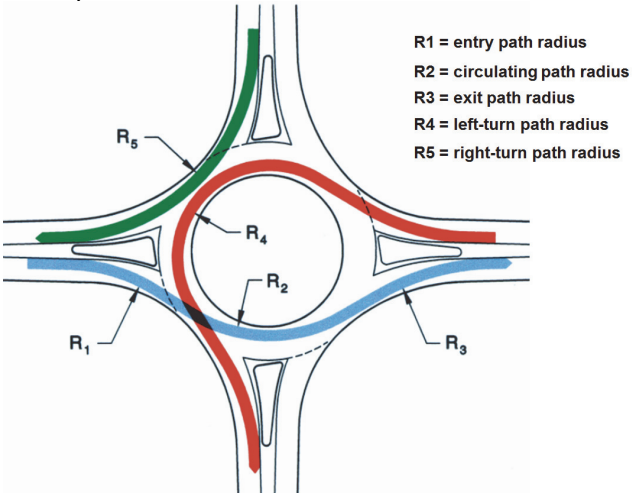
- Criteria and methodologies to be consistent with Caltrans DIB 80-01, Caltrans Highway Design Manual, and Report 672 of the National Cooperative Highway Research Program (NCHRP) titled Roundabouts: An Informational Guide (Second Edition). This document supersedes the original roundabout guide published by the FHWA in 2000.
- The “CA-Legal” design vehicle from the Caltrans Highway Design Manual, 6th Edition (updated July 2016) was accommodated on all movements. This vehicle shall be accommodated such that the tractor portion of the vehicle does not need to mount any truck aprons.
- The “Bus-45, motor coach” design vehicle from the Caltrans Highway Design Manual, 6th Edition (updated July 2016) was accommodated along eastbound/westbound direction along W. Covell Boulevard (only). This vehicle shall be accommodated such that it does not need to mount any truck aprons.
- Fast path entry speeds are targeted to be 25 mph or less.
- Minimum stopping sight distance for posted speed limits should be provided for vehicles approaching roundabout entrances and pedestrian crosswalks.
- View angles for all legs of the roundabout should be no more than 15 degrees.
- Entry angles for all legs of the roundabout should be between 20 and 40 degrees.

3.2.2 Fastest Path and Vehicle Speed Checks

The “Fastest Path” represents the path that the most aggressive drivers could take through the roundabout and assumes no other traffic to be within the intersection. NCHRP Report 672 also indicates that the differential speed between consecutive or conflicting projected fast path speeds should be less than 15 mph.

Fast path speeds are determined for five locations per approach. These include entry speeds (referred to as V1); through movement circulating speeds (V2); exiting speeds (V3); left turn movement circulating speeds (V4); and right turn speeds (V5). A diagram of the described locations is shown in Figure 3.

Figure 1 Fast Path Critical Speed Locations



Fast path speeds for each of the three Single Lane Roundabout Alternatives are shown in Table 1 to Table 3.

Table 1: CR 98 & CR 31 - Fastest Path Speeds (mph)

	NB CR 98 (N#)	SB CR 98 (S#)	EB CR 31 (E#)	WB CR 31 (W#)
Entering (V1)	25.1	25.0	25.2	25.2
Circulating (V2)	16.4	16.4	17.0	16.5
Exiting (V3)	30.1	30.1	30.5	30.2
Left Turn (V4)	15.1	15.1	15.1	15.1
Right Turn (V5)	17.6	17.9	16.1	18.6

Notes:

All values are in miles per hour

V3 exit speeds are derived from vehicle acceleration formulas in NCHRP 672

V3 is measured at exit crosswalk or 100 feet downstream of V2 if there is no crosswalk.

N/A = Fast path speed does not exist for this approach

2% cross-slope assumed for determining Fast path

Table 2: CR 98 & CR 32 - Fastest Path Speeds (mph)

	NB CR 98 (N#)	SB CR 98 (S#)	EB CR 32 (E#)	WB CR 32 (W#)
Entering (V1)	25.1	25.0	25.2	25.2
Circulating (V2)	16.4	16.4	17.0	16.5
Exiting (V3)	30.1	30.1	30.5	30.2
Left Turn (V4)	15.1	15.1	15.1	15.1
Right Turn (V5)	17.6	17.9	16.1	18.6

Notes:

All values are in miles per hour

V3 exit speeds are derived from vehicle acceleration formulas in NCHRP 672

V3 is measured at exit crosswalk or 100 feet downstream of V2 if there is no crosswalk.

N/A = Fast path speed does not exist for this approach

2% cross-slope assumed for determining Fast path

Table 3: CR 98 & Hutchison Drive/Primate Drive - Fastest Path Speeds (mph)

	NB CR 98 (N#)	SB CR 98 (S#)	EB Hutch (E#)	WB Hutch (W#)
Entering (V1)	24.2	24.4	17.4	25.6
Circulating (V2)	17.4	17.2	17.7	14.1
Exiting (V3)	30.7	30.6	30.8	28.9
Left Turn (V4)	15.1	15.1	15.1	15.1
Right Turn (V5)	18.0	23.4	17.9	17.5

Notes:
All values are in miles per hour
V3 exit speeds are derived from vehicle acceleration formulas in NCHRP 672
V3 is measured at exit crosswalk or 100 feet downstream of V2 if there is no crosswalk.
N/A = Fast path speed does not exist for this approach
2% cross-slope assumed for determining Fast path

The results of the fast path analysis at each of the three intersections are found to be acceptable as vehicle entry speeds and consecutive differential speeds are below the design requirements.

3.2.3 Sight Distance

Intersection sight distance differs at roundabouts versus other intersections. Drivers must be able to see potentially conflicting oncoming traffic from the left as they approach the roundabout entry.

NCHRP Report 672 provides methodologies to establish the required sight distance triangles for conflicting traffic, as well as pedestrians in crosswalks, for both entering and circulating vehicle movements. Sight distance lengths vary and are determined according to vehicle fast path speeds. Intersection sight distances will be calculated using a critical headway time (tc) of 5 seconds.

3.2.4 Angle of Visibility

The angle between consecutive entries must not be overly acute in order to allow drivers to comfortably turn their heads to the left to view oncoming traffic from the adjacent upstream entry and circulatory roadway. Guidance from the NCHRP Section 6.7.4 recommends a minimum 75 degree intersection angle (15 degree view angle).

Any of the above mentioned design checks not fully satisfied will be revisited during the detailed design phase.

4. Design Considerations for Build Alternatives

4.1 Guide Signing

Guide signing is critical for providing proper direction to drivers as they approach any type of intersection or diverging roadway. Signing for the signal alternative is generally simpler due to the fact that this alternative would mimic existing movements. The Roundabout Alternative may require additional guide signage at the approaches and exits to ensure drivers traverse the intersection in the correct lane to reach their destination.

4.2 Trucks, Emergency Equipment and Farm Equipment Accommodation

The design vehicles for the study intersections includes the California Legal Truck (which possesses a 60-ft turning radius). For the Roundabout Alternative, the truck turn templates are illustrated allowing truck aprons to be mounted only by the truck trailer and not the tractor. Exhibits showing the truck turning movements are presented in Appendix C.

The Traffic Signal and Roundabout Alternatives were compared based on the ability to adequately serve the required design vehicle for all movements. Both proposed Build Alternatives (at each of the three study intersections) were ensured to satisfy the performance criteria for accommodating trucks for all through, left and right turning movements.

Regarding emergency vehicles, the largest vehicle of West Plainfield Fire Station (Pumper Trucks with 22' wheelbase) was analyzed for turns assuming that a passenger vehicle has stalled or stopped inside the circulating portion of the roadway. The emergency vehicle is also able to negotiate the turns as shown in the Appendix B.

Due to the presence significant agricultural land in the project vicinity, several different types of farm implements and equipment combinations were analyzed as shown in Appendix B. A local known largest vehicle (Triplane Grader, 40' long x 16' wide) pulled with a John Deere Tractor (15.6' long) was also analyzed. This combination vehicle is able to negotiate the turns with minimum overhang over the curb returns. If additional types of farm equipment are known to be used in the area (information to be provided by Farmers/County); these will also be analyzed in the detailed design phase.

4.3 Pedestrian & Bicycle Accommodations

Preliminary concepts for both the proposed traffic signal and roundabout Build Alternatives (at each study intersection) were designed to accommodate cyclists and pedestrians in a manner consistent with adjacent land uses and County policies. Brief descriptions of the improvements are provided below.

4.3.1 Traffic Signal Alternative

Pedestrian crossings are provided on all 4-legs of each of the project intersections. The crossing is 10 feet in width and pedestrians will wait for the respective green phase prior to crossing the road. Bicycles are accommodated on the shoulder sections on CR 98 and other intersection roads and will cross the road similar to the pedestrians.

4.3.2 Roundabout Alternative

Pedestrian crossings are provided on all 4-legs of each of the project intersections. The crossing is 10 feet in width and is typically set back a minimum of 20 feet from the roundabouts' circulating roadway. Where the crosswalk intersects the splitter island, a 6 foot long minimum paved pathway is provided between the travel lanes for refuge when waiting to cross. Shared-use pathways, 10 feet in width and located in the northwest and northeast quadrants, are setback 2-5 feet from the circulatory roadway with landscape strips to increase accessibility and discourage pedestrians from crossing into traveled way.

Bicycles are accommodated with Class II bike lanes on CR 98. Cyclists may choose to take either the travel lane and travel through the roundabouts as a vehicle or the separated bike ramp/shared use path and travel around the roundabout as a pedestrian.

In general, both alternatives provide an acceptable level of accommodation; however, the Roundabout Alternative provides higher safety benefits, as the potential for vehicle/pedestrian interactions are reduced by separating pedestrians from motorists on the traveled way.

5. Non-Conforming Features

Non-conforming geometric design features are identified and compared between the Traffic Signal and Roundabout Alternatives. Due to the preliminary planning stage of this ICE document, the identified features and the resulting study alternative should not be considered as complete and comprehensive. Some design parameters and/or elements may change during detailed engineering design phase.

5.1 Traffic Signal Alternative

The design of the Traffic Signal Alternative concepts were accomplished consistent with Caltrans Highway Design Manual (HDM) 6th Edition. No non-conforming features for the signal concept are currently found except that the U-turn movements are not feasible at any of the intersections. To add U-turn movements would require widening of the existing intersection by additional twelve feet (12').

5.2 Roundabout Alternative

The preliminary concepts for Roundabout Alternatives were accomplished consistent Caltrans Highway Design Manual (HDM) 6th Edition, Caltrans Design Bulletin 80-01, and the NCHRP Report 672. The Roundabout Alternatives (at each of the three study intersections) appear to meet the design requirements contained therein. Additionally, the Roundabout Alternatives are able to provide U-turning movements at all three study intersections.

6. Safety Analysis

6.1 Analysis of Collision Data

Collision data for the study intersection was obtained from the Statewide Integrated Traffic Records System (SWITRS) for a three-year period (2015 through 2017). Note that accidents within 500' on each approach leg were considered to be part of the intersection data. A summary of the collisions at the intersection by type and severity is shown in Table 4.

Table 4: Historical Collision Data by Type and Severity

Intx #	Intersection	Collision Severity					Total
		PDO [1]	Fatality	Severe Injury	Injury (Other Visible)	Complaint of Pain	
1	CR 98 & CR 31 (W. Covell Blvd)	8	0	0	1	1	10
2	CR 98 & CR 32 (Russell Blvd)	1	0	0	0	1	2
3	CR 98 & Hutchison Dr/Primate Dr	2	0	0	1	3	6
Total Number of Collisions on CR 98 Corridor from 2015-2017							18

Notes:

1. PDO = Property Damage Only

2. Collisions presented above are from a 3-year period spanning 2015-2017

3. Per the Caltrans Collision Cost Analysis guidelines, only PDO, Fatality and Injury collisions were considered in the evaluation of historical collision data.

As shown in Table 4, there were 18 collisions along the three project intersections on CR 98 corridor between the years 2015-2017. The following presents a brief synopsis of the collision patterns at each intersection.

6.1.1 Intersection 1 – County Road 98 & County Road 31 (W. Covell Boulevard)

The highest occurrence of collisions was noted at the intersection of CR 98 & CR 31 (W. Covell Boulevard), where a total of 10 collisions were recorded. However, 80% of the collisions at this intersection led to Property Damage Only (PDO), while a single collision resulted in a non-severe injury. The primary collision factor for these collisions included driving at excessive speeds and performing improper turning maneuvers. The predominant collision types at this intersection included broadsides and rear ends. None of these collisions had cyclist/pedestrian involvement.

6.1.2 Intersection 2 – County Road 98 & County Road 32 (Russell Boulevard)

Within the 3-year period, this intersection has experienced a total of two collisions. While one of these collisions resulted in PDO, the other collision was recorded as resulting in complaint of pain only. The primarily collision factor for the PDO collision was improper turning, which resulted in the vehicle being overturned. However, the collision recorded as “complaint of pain” was caused by driving at unsafe speeds, which resulted in a rear end collision. None of these collisions had cyclist/pedestrian involvement.

6.1.3 Intersection 3 – County Road 98 & Hutchison Drive/Primate Drive

Between the years 2015-2017, a total of six (6) collisions were recorded at this intersection; 2 PDO collisions, 1 non-severe injury collision and 3 “Complaint of Pain” collisions. The primarily collision factor for these collisions included driving at unsafe speeds, failing to follow traffic signs and automobile right-of-way rules. The predominant collision types at this intersection included rear end collisions (caused by speeding) and broadside collisions (caused by failing to follow automobile right-of-way rules and traffic signs).

6.2 Crash Reduction Factors and Conflict Points

Crash Reduction Factors (CRF) provide the estimated percentage crash reduction that may be expected following the implementation of an intersection/roadway improvement at a given location. A higher CRFs provides greater potential for *reducing* the number of collisions.

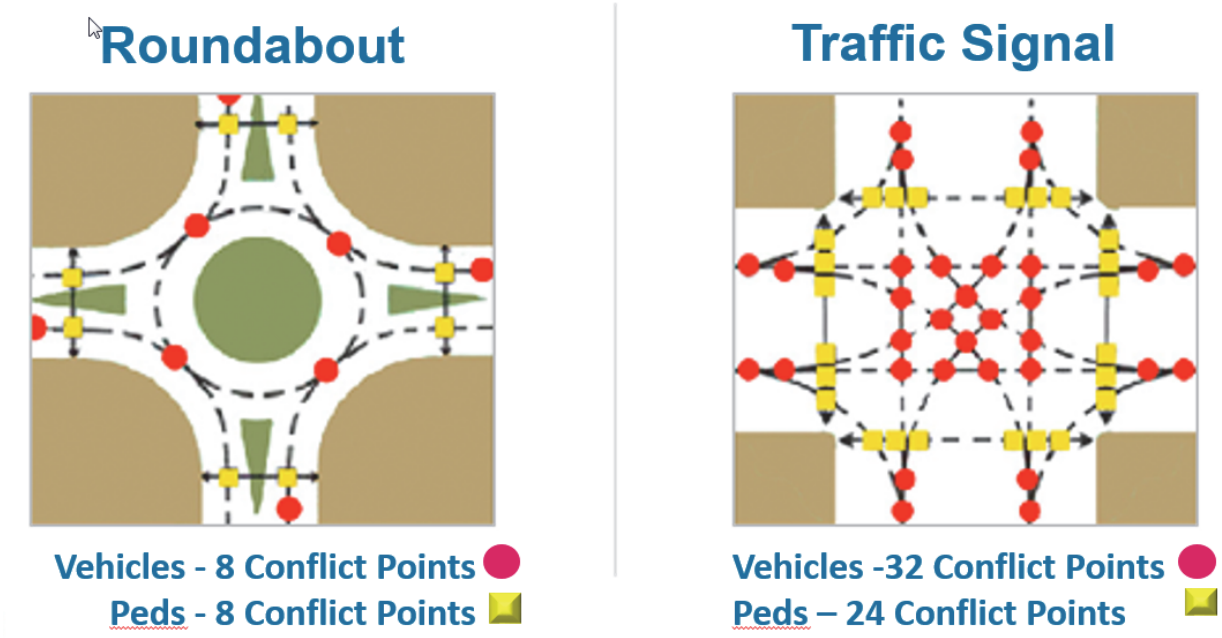
Typically, Crash Reduction Factors for intersection improvements are referred from the FHWA Report No. FHWA-SA-08-011, *Desktop Reference for Crash Reduction Factors*. CRFs provided by

the FHWA are estimations based on nationwide collision data. However, to maintain the locality of the data, this ICE analysis used CRFs developed by Caltrans. Unlike the CRFs developed by the FHWA, Caltrans uses only statewide historical collision data to estimate CRFs. However this data was also checked with FHWA and Washington DOT and found to be consistent with their predicted crash numbers.

6.2.1 Number of Conflicting Points

The number of conflicting points within an intersection directly correlates to the risk of an incident, especially at intersections. Conflicting points are locations at which a roadway user can cross, merge, and diverge with another roadway user. A diagram of conflict locations at typical intersections are provided in Figure 6.2.1.

Figure 6.2.1 Typical Conflict Points at Intersections



The above illustrates the advantages that the Roundabout Alternative provides by significantly reducing the number of conflict points and further justifies the higher CRF values as the exposure to risk is significantly reduced.

6.2.2 Reduced Speed Potential and Crash Severity Potential

Typically, the roundabout design forces the driver to reduce the speed in the intersection to 25-30 mph. However, drivers can travel an intersection with signal control at higher speeds due to no geometric constraints. Due to reduced travel speeds through the intersection and fewer conflict points, the Roundabout Alternative is likely to eliminate most severe crash types (i.e. head-on, broadside).

7. Opening and Design Year Volumes

7.1 Existing Conditions (Year 2016)

As stated in Section 2.2 of this report, intersection turning movement counts were provided by County for the weekday AM and PM peak hours of the Existing Conditions.

7.2 Opening Year Conditions (Year 2020)

The following section presents the basis for simulating Opening Year (2020) Conditions.

7.2.1 Opening Year 2020 Traffic Volumes

The forecast turning movements for the Opening Year 2020 Conditions were calculated by applying the estimated growth rate given by the County (between Year 2016 and Year 2040 Conditions) to Year 2016 Counts.

7.3 Design Year Conditions (Year 2040)

The following section presents the basis for simulating Design Year (2040) Condition.

7.3.1 Design Year 2040 Traffic Volumes

Forecast turning movement volumes for Design Year 2040 Conditions were provided by County for the weekday AM and PM peak hour traffic volumes. Figure 2 in Appendix D presents the Design Year forecast volumes.

8. Traffic Operations

An initial evaluation of the existing intersection controls and lane geometrics at the three study intersections was performed for both the Existing Year 2016 and Design Year 2040 Conditions. This analysis showed unacceptable levels of service for Design Year 2040. Tables 5 & 6 present the summary of the findings:

Table 5: Summary of Existing Year 2016 Intersection Operations

#	Intersection	Control Type[1,2]	Target LOS	AM Peak Hour		PM Peak Hour	
				Delay	LOS	Delay	LOS
1	CR 98 & W. Covell Blvd	AWSC	C	10.2	B	13.1	B
2	CR 98 & Russell Blvd	AWSC	C	9.0	A	9.8	A
3	CR 98 & Primate Dr/ Hutchinson Dr	TWSC	C	13.7	B	13.7	B

Notes:
1. AWSC = All Way Stop Control; TWSC = Two Way Stop Control; RNDBT = Roundabout
2. LOS = Delay based on worst minor street approach for TWSC intersections, average of all approaches for AWSC

Table 6: Summary of Design Year 2040 Intersection Operations

#	Intersection	Control Type[1,2]	Target LOS	AM Peak Hour		PM Peak Hour	
				Delay	LOS	Delay	LOS
1	CR 98 & W. Covell Blvd	AWSC	C	36.4	E	127.4	F
2	CR 98 & Russell Blvd	AWSC	C	15.7	C	37.0	E
3	CR 98 & Primate Dr/ Hutchinson Dr	TWSC	C	39.6	E	51.9	F

Notes:

1. AWSC = All Way Stop Control; TWSC = Two Way Stop Control; RNDBT = Roundabout

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

A summary of these peak hour traffic operations are also provided in Appendix D.

For the purpose of conducting an intersection comparison for the proposed Design Alternatives, the traffic operations for the Traffic Signal and Roundabout Alternatives were analyzed for AM and PM peak hours of both the Opening Year 2020 and Design Year 2040 Conditions.

8.1 Analysis Methodology

The Signal Alternative was analyzed using Synchro/SimTraffic analysis software and the roundabout was analyzed using SIDRA Intersection 7.0 analysis software. Analysis procedures from the Highway Capacity Manual (HCM), 2010 were used for Signals to determine the Level of Service (LOS), Volume/Capacity (V/C) ratio and delay. SimTraffic was utilized to determine the queuing characteristics of the proposed Traffic Signal Alternatives.

As accepted by Caltrans, SIDRA analysis methodology was used for roundabouts to determine the LOS, V/C, delay and 95th percentile queues.

8.2 Traffic Operations Analysis

Traffic operations have been quantified through the determination of Level of Service (LOS). LOS is a qualitative measure of traffic measuring conditions, whereby a letter grade “A” through “F” is assigned to an intersection or roadway segment representing progressively worsening traffic conditions. LOS was calculated for different intersection control types using the methods documented in the Highway Capacity Manual 2010 (HCM 2010). LOS definitions for different types of intersection controls are outlined in Table 4 “Level of Service Thresholds” in Appendix D.

Yolo County's Year 2030 Countywide General Plan Circulation Element contains the following policy pertaining to LOS standards in the County:

Policy CI-3.1 *Maintain Level of Service (LOS) C or better for roadways and intersections in the unincorporated county. In no case shall land use be approved that would either result in worse than LOS C conditions, or require additional improvements to maintain the required level of service, except as specified below. The intent of this policy is to consider level of service as a limit on the planned capacity of the County's roadways.*

Q. County Road 31 (County Road 95 to County Road 98) - LOS D is acceptable. (DEIR MM CI-2).

S. County Road 98 (County Road 29 to County Road 27) - LOS D is acceptable. (DEIR MM CI-2).

For the purposes of comparing the traffic operations for stop controlled intersections, signals and roundabouts, LOS C is used as the target.

8.2.1 Analysis Criteria

The following criteria are incorporated in the analysis in order to most accurately reflect intersection operating conditions.

- Peak Hour Factor (PHF): 0.88 for AM and PM peak hours for Existing, Opening and Design Years
- Truck Percentages: 10%, based on existing peak hour counts.
- Environmental Factor: 1.02 for Existing and Design Year

8.3 Traffic Signal Alternative Analysis

This section provides a summary of the intersection operations associated with the Traffic Signal Alternative for peak hour time periods.

Appendix A provides the Synchro and SimTraffic outputs for the Traffic Signal Alternative analysis.

8.3.1 Opening Year (2020) Conditions

8.3.1.1 Intersection Operations

Appendix Table D1 presents the Opening Year AM and PM peak hour operations for the Traffic Signal Alternative. As presented within Appendix Table D1, the Traffic Signal Alternative would provide acceptable peak hour operations.

8.3.1.2 Queueing Operations

Appendix Table D2 presents the Opening Year AM and PM peak hour queueing operations for the Traffic Signal Alternative at the three study intersections. As presented within Appendix Table D2, the Traffic Signal would provide acceptable peak hour queueing operations.

8.3.2 Design Year (2040) Conditions

8.3.2.1 Intersection Operations

Table 7 presents the Design Year 2040 AM and PM peak hour operations for the Traffic Signal Alternative.

Table 7: Traffic Signal – Design Year Peak Hour Intersection Operations

#	Intersection	Control Type[1,2]	Target LOS	AM Peak Hour		PM Peak Hour	
				Delay	LOS	Delay	LOS
1	CR 98 & W. Covell Blvd	Signal	C	22.3	C	28.3	C
2	CR 98 & Russell Blvd	Signal	C	22.0	C	25.5	C
3	CR 98 & Primate Dr/ Hutchinson Dr	Signal	C	26.1	C	23.3	C

Notes:

1. AWSC = All Way Stop Control; TWSC = Two Way Stop Control; RNDBT = Roundabout

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

As presented within Table 7, the Traffic Signal Alternative is projected to provide acceptable peak hour operations, by operating at the threshold LOS C.

8.3.2.2 Queueing Operations

Appendix Table D3 presents the Design Year 2040 AM and PM peak hour queueing operations for the Traffic Signal Alternative. As presented within Appendix Table D3, project intersections are projected to provide acceptable 95th percentile queues.

8.4 Roundabout Alternative Analysis

This section provides a summary of the intersection operations associated with the Roundabout Alternative for peak hour time periods.

Appendix A provides the SIDRA Intersection Lane Summaries for the Roundabout Alternative analysis.

8.4.1 Opening Year (2020) Conditions

8.4.1.1 Intersection Operations

Appendix Table D4 presents the Opening Year AM and PM peak hour operations for the Roundabout Alternative. As presented within Appendix Table D4, the Roundabout Alternative is projected to provide acceptable peak hour operations.

8.4.1.2 Queueing Operations

Appendix Table D5 presents the Opening Year AM and PM peak hour operations for the Roundabout Alternative. As presented within Appendix Table D5 shows that Roundabout Alternative is projected to provide minimal 95th percentile queues during the weekday peak hours.

8.4.2 Design Year (2040) Conditions

8.4.2.1 Intersection Operations

Table 8 presents the Design Year 2040 AM and PM peak hour operations for the Roundabout Alternative.

Table 8: Roundabout – Design Year Peak Hour Intersection Operations

#	Intersection	Control Type[1,2]	Target LOS	AM Peak Hour		PM Peak Hour	
				Delay	LOS	Delay	LOS
1	CR 98 & W. Covell Blvd	RNDBT	C	8.8	A	12.3	B
2	CR 98 & Russell Blvd	RNDBT	C	6.4	A	8.0	A
3	CR 98 & Primate Dr/ Hutchinson Dr	RNDBT	C	6.9	A	6.6	A

Notes:

1. AWSC = All Way Stop Control; TWSC = Two Way Stop Control; RNDBT = Roundabout

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

As shown in Table 8, the Roundabout Alternative is projected to provide acceptable peak hour operations.

8.4.2.2 Queueing Operations

Appendix Table D6 presents the Design Year 2040 Conditions AM and PM peak hour operations for the Roundabout Alternative. As presented within Appendix Table D6, the Roundabout Alternative is projected to provide minimal 95th percentile queue lengths during the weekday peak hours. Noticeably, the queue lengths formed at the Roundabout (for the Design Year 2040 Conditions) are shorter than those formed at Signal Alternative.

9. Intersection Comparison

The following section presents brief summaries of the parameters used in assessing the life cycle costs for each of the proposed build alternatives at each study intersection. Results obtained from the life cycle cost analyses are summarized in Table 9-11. Detailed analysis are provided within **Appendix C**.

9.1 Collison Costs

Costs associated with collisions anticipated for each proposed intersection improvement was quantified using the Caltrans Intersection Control Evaluation Collision Cost Analysis spreadsheet. The Economic Analysis Branch of the Transportation Planning Department of Caltrans provides the costs associated with collision types in Life-Cycle Benefit-Cost Analysis Economic Parameter 2016 (http://www.dot.ca.gov/hq/tpp/offices/eab/benefit_cost/LCBCA-economic_parameters.html). These costs (in 2016 Current Dollar Value) are as follows:

- Fatal Accident $10,800,000
- Injury Accident: $148,800
- Property Damage (PDO) Accidents: $10,200
- Average Cost per Accident: $185,600

Other unit costs below are from Vehicle Operation Cost Parameters 2016 published by Caltrans.

The Caltrans ICE spreadsheet tool considers the higher numbers of the Base number of collisions versus anticipated number of Future Collison's.

Base Number of collisions uses a Base Rate Factor multiplied by Average Daily Traffic for 20 years while Anticipated Collisions uses Existing Accident data projected to Future Vehicle Miles Traveled with the application of a CRF (explained under Section 6.2).

The higher number of the Base and Anticipated Future collisions is then applied with unit rates to achieve the total collision costs.

9.2 Delay Costs

To calculate the delay costs for the alternatives, the value of travel time was quantified for each proposed build alternative. The delay costs were computed using the delay for the AM and PM peak hour periods of both the Alternatives. In assessing the delay costs, the weighted-average for costing the value of time for automobiles and trucks was used.

An average delay cost of $18.95/person hours was used.

9.3 Fuel Costs

To calculate the fuel cost for the alternatives, the vehicle operating costs were quantified. The fuel costs (vehicle operating costs) were computed using the delay for the AM and PM peak hour periods for both the Alternatives.

An Average fuel price (for Regular Unleaded automobile fuel) of $3.18 is used.

9.4 Environmental Costs

To calculate the environmental cost, the greenhouse gas emissions costs were quantified for the project.

The health cost of Carbon Monoxide (CO) in a rural California is $75/ton while that of Nitrogen Oxide (NOx) is $13,900/ton.

9.5 Construction Cost

Based on the concept-level preliminary project cost estimates (see **Appendices B** and **C**), the total estimated project construction costs (including design, environmental, right-of-way, construction and construction management costs) for each alternative are presented in Tables 9-11 which follow.

9.6 Other Costs

Another important component of the cost associated with both alternatives will be related to its operation & maintenance costs.

9.6.1 Operation & Maintenance Cost

The maintenance and operation cost for a traffic signal includes providing power service to the signal and street lighting ($600/yr), signal retiming ($1,500/3 yrs), and signal maintenance for power outages/new detector loops/etc ($5000/yr).

The roundabout alternative would incur much lower operation and maintenance costs limited to the cost to power street lighting, which is estimated at $250 annually.

9.6.2 Landscape Maintenance Cost

The landscape maintenance cost is directly proportional to the area covered by the landscape for this project and other areas to be maintained within the entire County. Roundabouts typically have a central island covered by landscaping, in addition to median areas not typical for a signal.

An estimated cost of about $5000/yr is used for the Roundabout while $0/yr was used for Signal alternative.

9.7 Service Life

The roundabout and signal alternatives proposed for the ultimate design year are projected to provide acceptable levels of service for the Design Year 2040; however, the roundabout alternative is projected to operate with lower delays and shorter queues for the Design Year than the Traffic Signal Alternative. It can be concluded that the Roundabout Alternative will provide increased benefit with regards to service life when compared to the Signal Alternative.

9.8 Summary of Intersection Comparison

Table 9-11 summarize the performance for the two Build Alternatives proposed at each of the three study intersections.

Table 9: Summary of Findings – County Road 98 & County Road 31

Life Cycle Costs	Roundabout Alternative	Traffic Signal Alternative
Collision and Mobility Costs		
Collision Costs of predicted crashes	$2,864,000	$11,828,000
Delay Costs	$210,000	$530,000
Fuel and GHG Costs	$941,000	$1,369,000
Project Costs including design, construction and maintenance		
Operations and Maintenance Costs	$70,000	$83,000
Project Costs	$3,208,000	$4,170,000
Total Life Cycle Costs	**$7,293,000**	**$17,980,000**

Table 10: Summary of Findings – County Road 98 & County Road 32

Life Cycle Costs	Roundabout Alternative	Traffic Signal Alternative
Collision and Mobility Costs		
Collision Costs of predicted crashes	$681,000	$8,976,000
Delay Costs	$110,000	$360,000
Fuel and GHG Costs	$609,000	$775,000
Project Costs including design, construction and maintenance		
Operations and Maintenance Costs	$70,000	$83,000
Project Costs	$3,723,000	$4,082,000
Total Life Cycle Costs	**$5,193,000**	**$14,276,000**

Table 11: Summary of Findings – County Road 98 & Hutchison Drive/Primate Drive

Life Cycle Costs	Roundabout Alternative	Traffic Signal Alternative
Collision and Mobility Costs		
Collision Costs of predicted crashes	$681,000	$8,800,000
Delay Costs	$100,000	$330,000
Fuel and GHG Costs	$538,000	$654,000
Project Costs including design, construction and maintenance		
Operations and Maintenance Costs	$79,000	$94,000
Project Costs	$2,784,000	$2,759,000
Total Life Cycle Costs	**$4,182,000**	**$12,637,000**

10. Recommendations

As shown in Tables 9-11, the Roundabout Alternative at each of the three study intersections is projected to incur lower total costs compared to the Traffic Signal Alternative. The most significant component contributing to the lower cost is the anticipated reduction in the number and severity of future collision costs.

Based on these results and the analysis presented herein, it is recommended that the County of Yolo implement the Roundabout as the Build Alternative at the following three (3) study intersections:

1. County Road 98 & County Road 31 (W. Covell Boulevard)
2. County Road 98 & County Road 32 (Russell Boulevard)
3. County Road 98 & Hutchison Drive/Primate Drive

Appendices

Appendix A

Traffic Signal Alternative Exhibits and Cost Estimates

Preliminary Signal Geometric Layout

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CR 98 PHASE II IMPROVEMENTS (CR 31 COVELL) Fig No. 1

Yolo, California

November 8, 2018
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Preliminary Opinion of Costs

CR 98 Phase II Improvements - Signal Alternative
CR 98/CR 31
Yolo County

10/2/2018
11145129/2266

Construction Costs:

No.	*Item Description*	*Units*	*Quantity*	*Unit Cost*	*Total*
1	Traffic Control	LS	1	$100,000.00	$100,000.00
2	Remove Tree	EA	24	$1,050.00	$25,200.00
3	Roadway Excavation	CY	5,980	$35.00	$209,300.00
4	Ditch Excavation	CY	3,430	$35.00	$120,050.00
5	Class 3 ASB (Pulverize Exist Pvmt and Compact)	SY	24,790	$3.00	$74,370.00
6	Class 2 Aggregate Base	CY	9,490	$50.00	$474,500.00
7	Hot Mix Asphalt (Type A)	TON	8,470	$90.00	$762,300.00
8	Minor Concrete (Curb - Truck Apron)	LF	0	$40.00	$0.00
9	Minor Concrete (Median Curb)	LF	0	$40.00	$0.00
10	Minor Concrete (Curb and Gutter)	LF	0	$33.00	$0.00
11	Storm Drain System	LS	1	$10,000.00	$10,000.00
12	Traffic Stripe/Marking	LS	1	$10,000.00	$10,000.00
13	Signs	EA	20	$415.00	$8,300.00
14	Lighting & Electrical	LS	0	$100,000.00	$0.00
15	Planting and Irrigation	SQFT	0	$5.00	$0.00
16	Traffic Signal	LS	1	$282,000.00	$282,000.00
17	Minor/ Supplemental Items	%	8%	$2,076,020.00	$166,082.00
18	Mobilization (10%)	LS	1	$224,300.00	$224,300.00
	Subtotal (Construction Costs)				$ 2,466,402.00
	Construction Contingency			25%	$ 616,601.00
	Total Construction Costs				**$ 3,083,003.00**
Right of Way (Capital) and Utility Relocation Costs:					
1	Right Of Way	LS	1	$ 174,000.00	$ 174,000.00
2	Utility Relocation	ALLOW		$ 200,000.00	$ -
	Total Right of Way (Capital) and Utility Relocation Costs				**$ 174,000.00**
	Total Project Capital Cost				**$ 3,257,003.00**
Project Support Costs					
1	Environmental Clearance (CEQA/NEPA)		Capital Costs	10%	$ 246,700.00
2	PS&E		Capital Costs	Contract	$ 186,100.00
3	Right of Way Engineering & Acquisition		LS	10%	$ 17,400.00
4	Construction Support and Management		Con. Costs	15%	$ 462,500.00
	Total Project Support Costs				**$ 912,700.00**
	Total Estimated Project Costs				**$ 4,169,703.00**
	Total Estimated Project Costs (Rounded)				**$ 4,170,000.00**

Assumptions
1. Shoulder has same structural section as that of travelled way.
2. Median islands to be landscaped/bouldered along with Central Island

Preliminary Signal Geometric Layout

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CR 98 PHASE II IMPROVEMENTS (CR 32 RUSSELL)

Fig No. 1

Yolo, California

November 8, 2018
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Preliminary Opinion of Costs

CR 98 Phase II Improvements - Signal Alternative
CR 98/CR 32
Yolo County

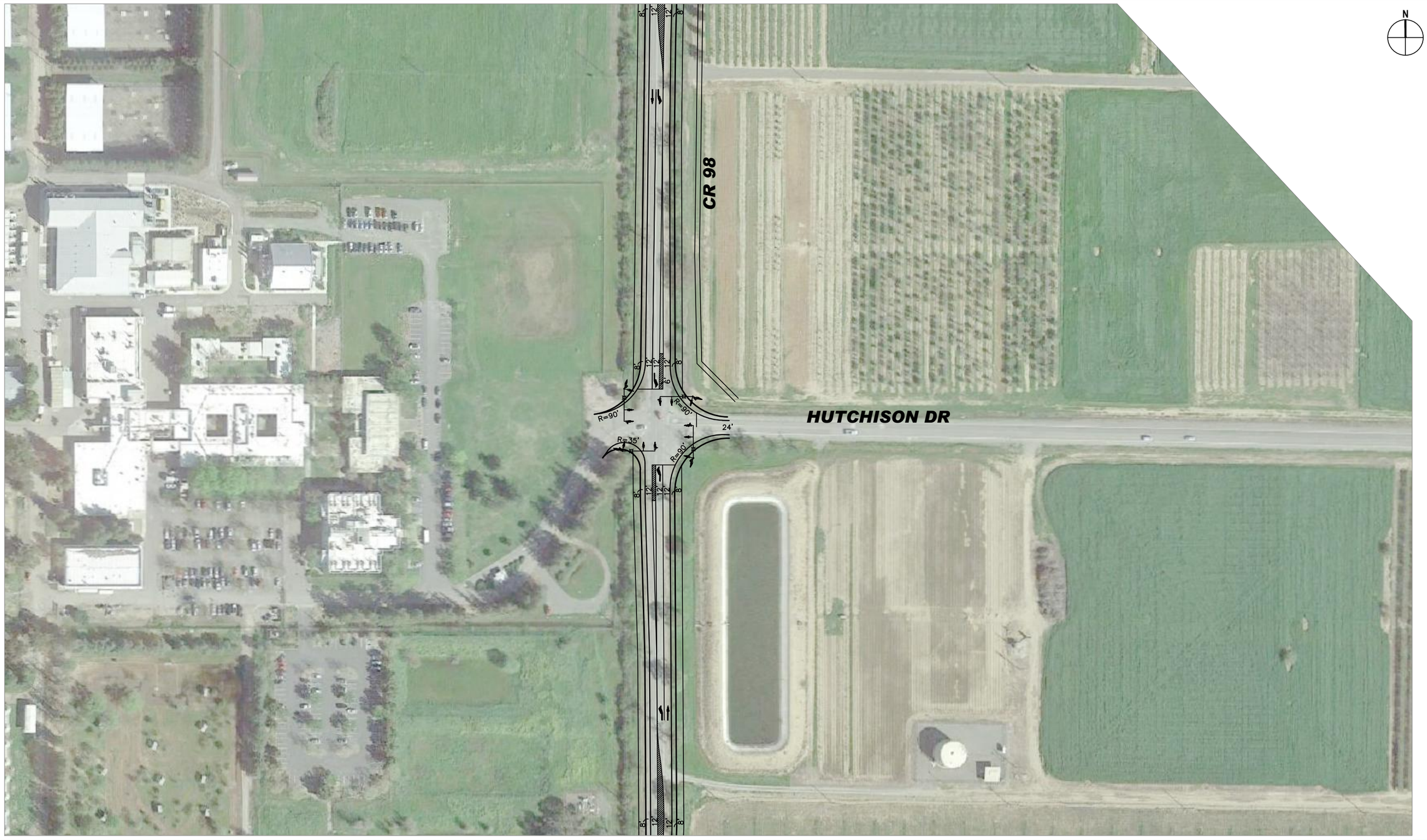
10/2/2018
11145129/2266

Construction Costs:

No.	*Item Description*	*Units*	*Quantity*	*Unit Cost*	*Total*
1	Traffic Control	LS	1	$100,000.00	$100,000.00
2	Remove Tree	EA	160	$1,050.00	$168,000.00
3	Roadway Excavation	CY	5,250	$35.00	$183,750.00
4	Ditch Excavation	CY	2,100	$35.00	$73,500.00
5	Class 3 ASB (Pulverize Exist Pvmt and Compact)	SY	21,630	$3.00	$64,890.00
6	Class 2 Aggregate Base	CY	8,430	$50.00	$421,500.00
7	Hot Mix Asphalt (Type A)	TON	7,680	$90.00	$691,200.00
8	Minor Concrete (Curb - Truck Apron)	LF	0	$40.00	$0.00
9	Minor Concrete (Median Curb)	LF	0	$40.00	$0.00
10	Minor Concrete (Curb and Gutter)	LF	0	$33.00	$0.00
11	Storm Drain System	LS	1	$10,000.00	$10,000.00
12	Traffic Stripe/Marking	LS	1	$10,000.00	$10,000.00
13	Signs	EA	20	$415.00	$8,300.00
14	Lighting & Electrical	LS	0	$100,000.00	$0.00
15	Planting and Irrigation	SQFT	0	$5.00	$0.00
16	Traffic Signal	LS	1	$282,000.00	$282,000.00
17	Minor/ Supplemental Items	%	8%	$2,013,140.00	$161,052.00
18	Mobilization (10%)	LS	1	$217,500.00	$217,500.00
	Subtotal (Construction Costs)				$ 2,391,692.00
	Construction Contingency			25%	$ 597,923.00
	Total Construction Costs				**$ 2,989,615.00**
Right of Way (Capital) and Utility Relocation Costs:					
1	Right Of Way	LS	1	$ 203,000.00	$ 203,000.00
2	Utility Relocation	ALLOW		$ 200,000.00	$ -
	Total Right of Way (Capital) and Utility Relocation Costs				**$ 203,000.00**
	Total Project Capital Cost				**$ 3,192,615.00**
Project Support Costs					
1	Environmental Clearance (CEQA/NEPA)		Capital Costs	10%	$ 239,200.00
2	PS&E		Capital Costs	Contract	$ 180,500.00
3	Right of Way Engineering & Acquisition		LS	10%	$ 20,300.00
4	Construction Support and Management		Con. Costs	15%	$ 448,500.00
	Total Project Support Costs				**$ 888,500.00**
	Total Estimated Project Costs				**$ 4,081,115.00**
	Total Estimated Project Costs (Rounded)				**$ 4,082,000.00**

Assumptions
1. Shoulder has same structural section as that of travelled way.
2. Median islands to be landscaped/bouldered along with Central Island

Preliminary Signal Geometric Layout



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CR 98 PHASE II IMPROVEMENTS (HUTCHISON)

Fig No. 1

Yolo, California

November 8, 2018
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Preliminary Opinion of Costs

CR 98 Phase II Improvements - Signal Alternative
CR 98/Hutchinson
Yolo County

10/2/2018
11145129/2266

Construction Costs:

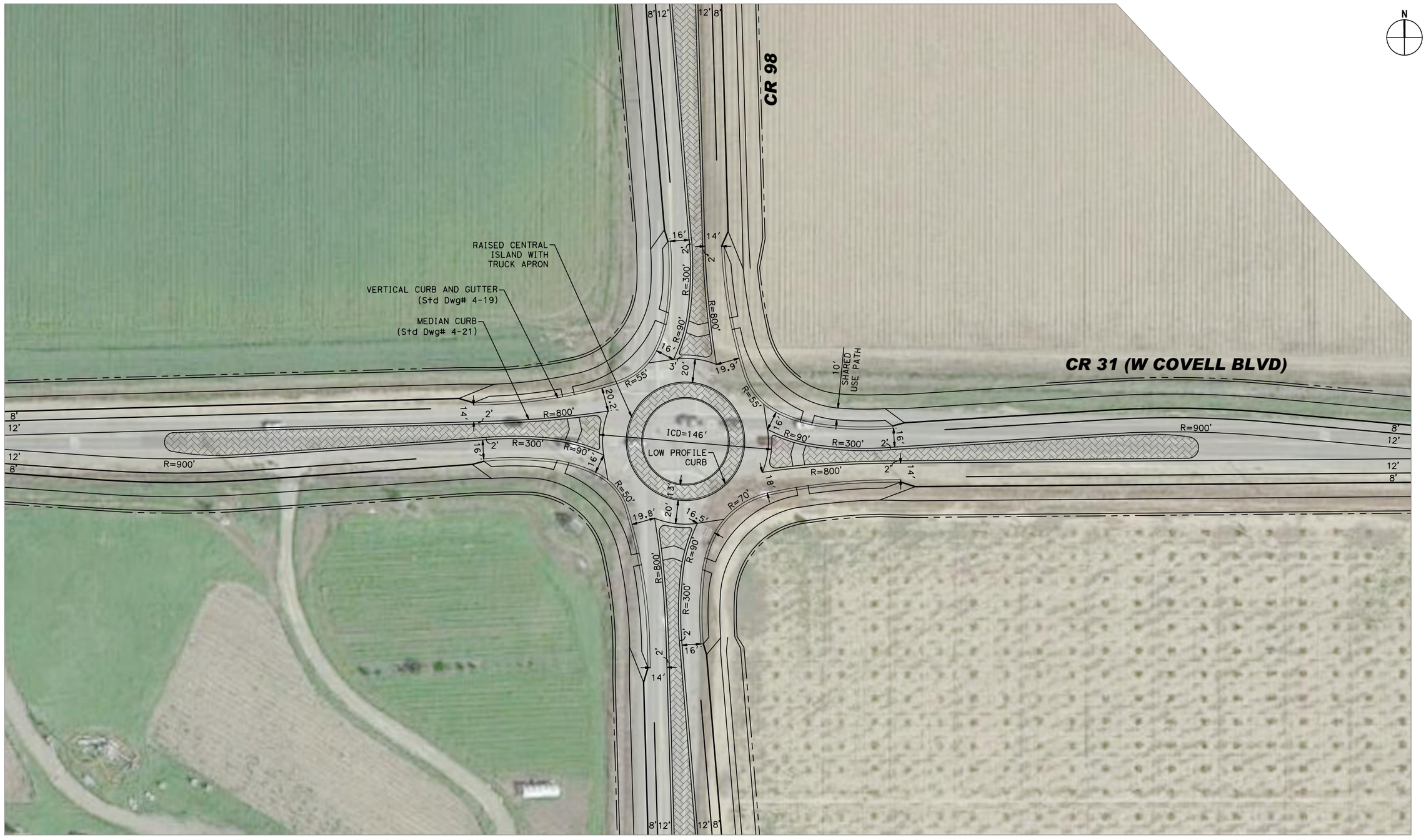
No.	Item Description	Units	Quantity	Unit Cost	Total
1	Traffic Control	LS	1	$100,000.00	$100,000.00
2	Remove Tree	EA	74	$1,050.00	$77,700.00
3	Roadway Excavation	CY	2,320	$35.00	$81,200.00
4	Ditch Excavation	CY	1,670	$35.00	$58,450.00
5	Class 3 ASB (Pulverize Exist Pvmt and Compact)	SY	13,270	$3.00	$39,810.00
6	Class 2 Aggregate Base	CY	5,270	$50.00	$263,500.00
7	Hot Mix Asphalt (Type A)	TON	4,900	$90.00	$441,000.00
8	Minor Concrete (Curb - Truck Apron)	LF	0	$40.00	$0.00
9	Minor Concrete (Median Curb)	LF	0	$40.00	$0.00
10	Minor Concrete (Curb and Gutter)	LF	0	$33.00	$0.00
11	Storm Drain System	LS	1	$10,000.00	$10,000.00
12	Traffic Stripe/Marking	LS	1	$10,000.00	$10,000.00
13	Signs	EA	20	$415.00	$8,300.00
14	Lighting & Electrical	LS	0	$100,000.00	$0.00
15	Planting and Irrigation	SQFT	0	$5.00	$0.00
16	Traffic Signal	LS	1	$ 282,000.00	$282,000.00
17	Minor/ Supplemental Items	%	8%	$1,371,960.00	$109,757.00
18	Mobilization (10%)	LS	1	$148,200.00	$148,200.00
	Subtotal (Construction Costs)				$ 1,629,917.00
	Construction Contingency			25%	$ 407,480.00
	Total Construction Costs				**$ 2,037,397.00**
Right of Way (Capital) and Utility Relocation Costs:					
1	Right Of Way	LS	1	$ 118,000.00	$ 118,000.00
2	Utility Relocation	ALLOW		$ 200,000.00	$ -
	Total Right of Way (Capital) and Utility Relocation Costs				**$ 118,000.00**
	Total Project Capital Cost				**$ 2,155,397.00**
Project Support Costs					
1	Environmental Clearance (CEQA/NEPA)		Capital Costs	10%	$ 163,000.00
2	PS&E		Capital Costs	Contract	$ 123,000.00
3	Right of Way Engineering & Acquisition		LS	10%	$ 11,800.00
4	Construction Support and Management		Con. Costs	15%	$ 305,700.00
	Total Project Support Costs				**$ 603,500.00**
	Total Estimated Project Costs				**$ 2,758,897.00**
	Total Estimated Project Costs (Rounded)				**$ 2,759,000.00**

Assumptions
1. Shoulder has same structural section as that of travelled way.
2. Median islands to be landscaped/bouldered along with Central Island

Appendix B

Roundabout Alternative Exhibits and Cost Estimates

Preliminary Roundabout Geometric Layout



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CR 98 PHASE II IMPROVEMENTS (CR 31) Fig No. 1

Yolo, California

November 8, 2018
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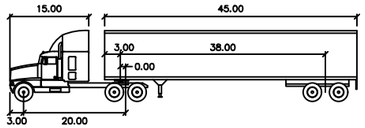
CA LEGAL THROUGH TURNS

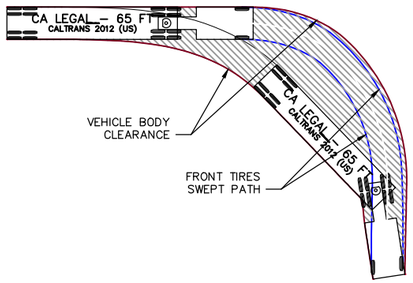
VEHICLE PROFILE



CA LEGAL – 65 FT feet

Tractor Width	: 8.50	Lock to Lock Time	: 6.0
Trailer Width	: 8.50	Steering Angle	: 26.3
Tractor Track	: 8.50	Articulating Angle	: 70.0
Trailer Track	: 8.50		

LEGEND



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CR 98 PHASE II IMPROVEMENTS (CR 31)

Fig No. 1

Yolo, California

November 8, 2018
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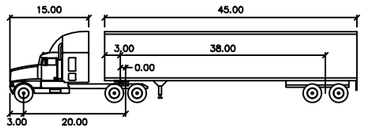
CA LEGAL RIGHT TURNS

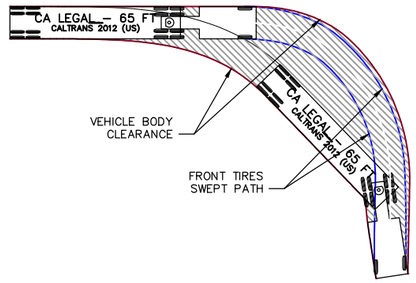
VEHICLE PROFILE



CA LEGAL – 65 FT feet

Tractor Width	: 8.50	Lock to Lock Time	: 6.0
Trailer Width	: 8.50	Steering Angle	: 26.3
Tractor Track	: 8.50	Articulating Angle	: 70.0
Trailer Track	: 8.50		

LEGEND



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CR 98 PHASE II IMPROVEMENTS (CR 31)

Fig No. 1

Yolo, California

November 8, 2018
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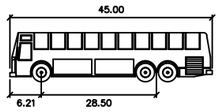
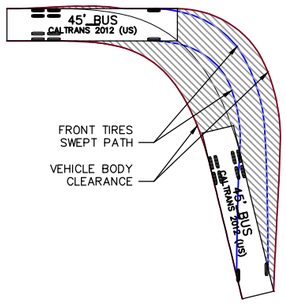
BUS-45 THROUGH TURNS

VEHICLE PROFILE



45' BUS	feet
Width	: 8.50
Track	: 8.50
Lock to Lock Time	: 6.0
Steering Angle	: 44.3

LEGEND



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CR 98 PHASE II IMPROVEMENTS (CR 31)

Fig No. 1

Yolo, California

November 8, 2018
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Preliminary Opinion of Costs

CR 98 Phase II Improvements - Roundabout Alternative
CR 98/CR 31
Yolo County

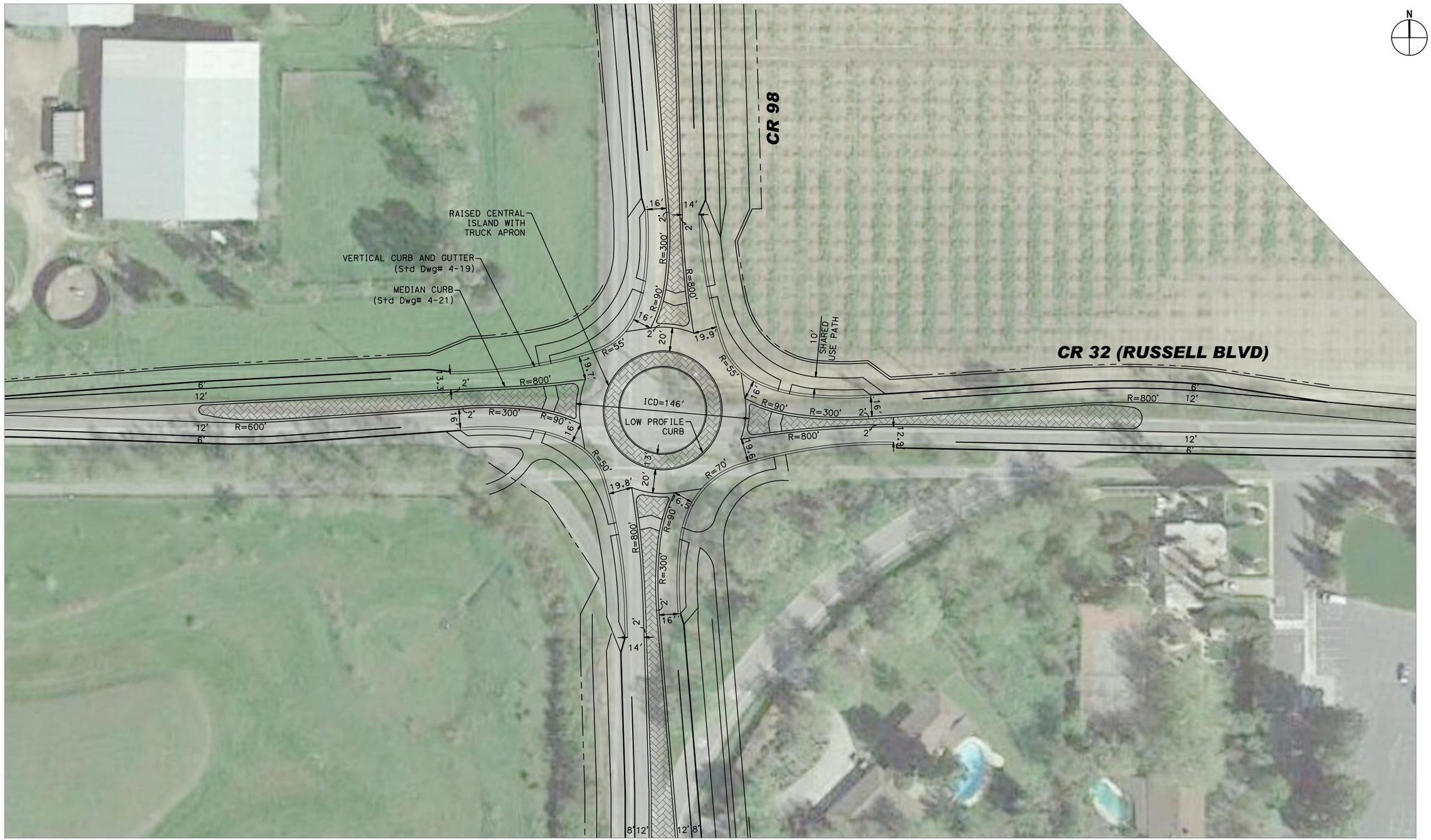
10/2/2018
11145129/2266

Construction Costs:

No.	Item Description	Units	Quantity	Unit Cost	Total
1	Traffic Control	LS	1	$100,000.00	$100,000.00
2	Remove Tree	EA	7	$1,050.00	$7,350.00
3	Roadway Excavation	CY	4,300	$35.00	$150,500.00
4	Ditch Excavation	CY	2,320	$35.00	$81,200.00
5	Class 3 ASB (Pulverize Exist Pvmt and Compact)	SY	14,610	$3.00	$43,830.00
6	Class 2 Aggregate Base	CY	5,910	$50.00	$295,500.00
7	Hot Mix Asphalt (Type A)	TON	5,260	$90.00	$473,400.00
8	Minor Concrete (Curb - Truck Apron)	LF	550	$40.00	$22,000.00
9	Minor Concrete (Median Curb)	LF	3,060	$40.00	$122,400.00
10	Minor Concrete (Curb and Gutter)	LF	1,060	$33.00	$34,980.00
11	Storm Drain System	LS	1	$10,000.00	$10,000.00
12	Traffic Stripe/Marking	LS	1	$10,000.00	$10,000.00
13	Signs	EA	40	$415.00	$16,600.00
14	Lighting & Electrical	LS	1	$100,000.00	$100,000.00
15	Planting and Irrigation (Median & Central Island)	SQFT	24,400	$5.00	$122,000.00
16	Traffic Signal	LS	0	$282,000.00	$0.00
17	Minor/ Supplemental Items	%	8%	$1,589,760.00	$127,181.00
18	Mobilization (10%)	LS	1	$171,700.00	$171,700.00
	Subtotal (Construction Costs)				$ 1,888,641.00
	Construction Contingency			25%	$ 472,161.00
	Total Construction Costs				**$ 2,360,802.00**
Right of Way (Capital) and Utility Relocation Costs:					
1	Right Of Way	LS	1	$ 129,000.00	$ 129,000.00
2	Utility Relocation	ALLOW		$ 200,000.00	$ -
	Total Right of Way (Capital) and Utility Relocation Costs				**$ 129,000.00**
	Total Project Capital Cost				**$ 2,489,802.00**
Project Support Costs					
1	Environmental Clearance (CEQA/NEPA)		Capital Costs	10%	$ 188,900.00
2	PS&E		Capital Costs	Contract	$ 162,100.00
3	Right of Way Engineering & Acquisition		LS	10%	$ 12,900.00
4	Construction Support and Management		Con. Costs	15%	$ 354,200.00
	Total Project Support Costs				**$ 718,100.00**
	Total Estimated Project Costs				**$ 3,207,902.00**
	Total Estimated Project Costs (Rounded)				**$ 3,208,000.00**

Assumptions
1. Shoulder has same structural section as that of travelled way.
2. Median islands to be landscaped/bouldered along with Central Island

Preliminary Roundabout Geometric Layout



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CR 98 PHASE II IMPROVEMENTS (CR 32)

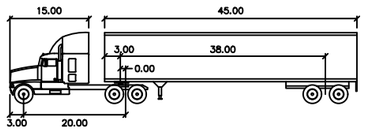
Fig No. 1

Yolo, California

November 8, 2018
2266EX017.dwg

CA LEGAL THROUGH TURNS

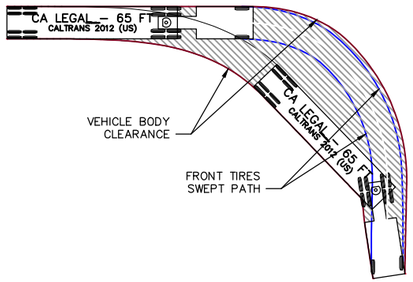
VEHICLE PROFILE



CA LEGAL – 65 FT feet

Tractor Width	: 8.50	Lock to Lock Time	: 6.0
Trailer Width	: 8.50	Steering Angle	: 26.3
Tractor Track	: 8.50	Articulating Angle	: 70.0
Trailer Track	: 8.50		

LEGEND



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CR 98 PHASE II IMPROVEMENTS (CR 32)

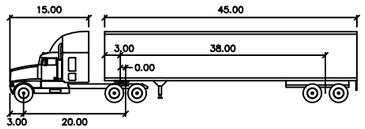
Fig No. 1

Yolo, California

November 8, 2018
2266RA002.dwg

CA LEGAL RIGHT TURNS

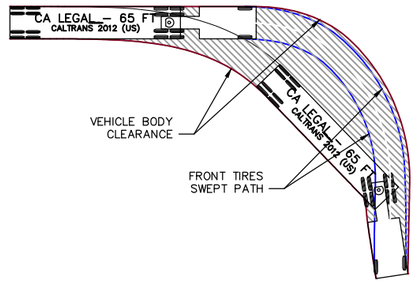
VEHICLE PROFILE

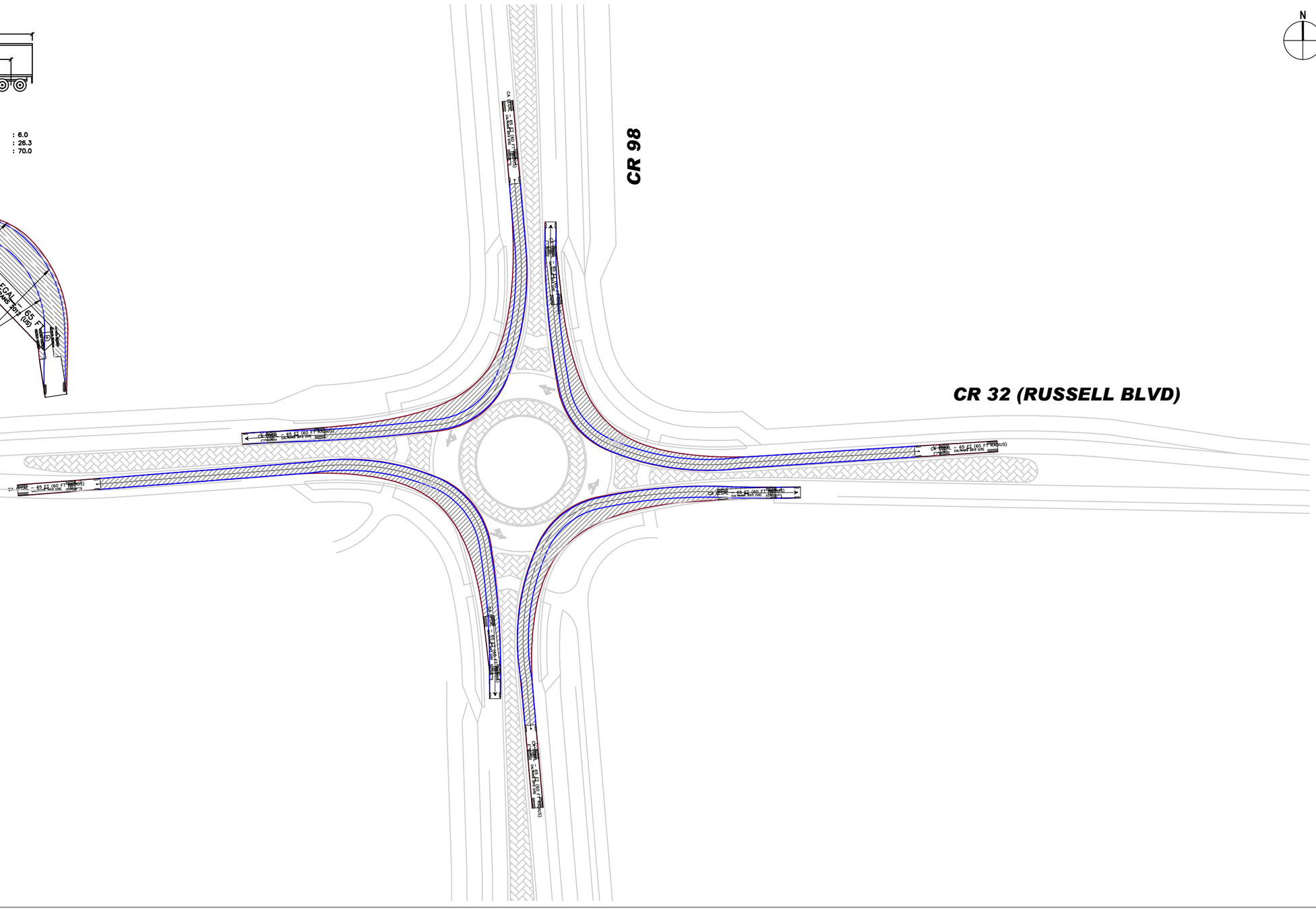


CA LEGAL – 65 FT feet

Tractor Width	: 8.50	Lock to Lock Time	: 6.0
Trailer Width	: 8.50	Steering Angle	: 26.3
Tractor Track	: 8.50	Articulating Angle	: 70.0
Trailer Track	: 8.50		

LEGEND





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CR 98 PHASE II IMPROVEMENTS (CR 32)

Fig No. 1

Yolo, California

November 8, 2018
2266RA002.dwg

Preliminary Opinion of Costs

CR 98 Phase II Improvements - Roundabout Alternative
CR 98/CR 32
Yolo County

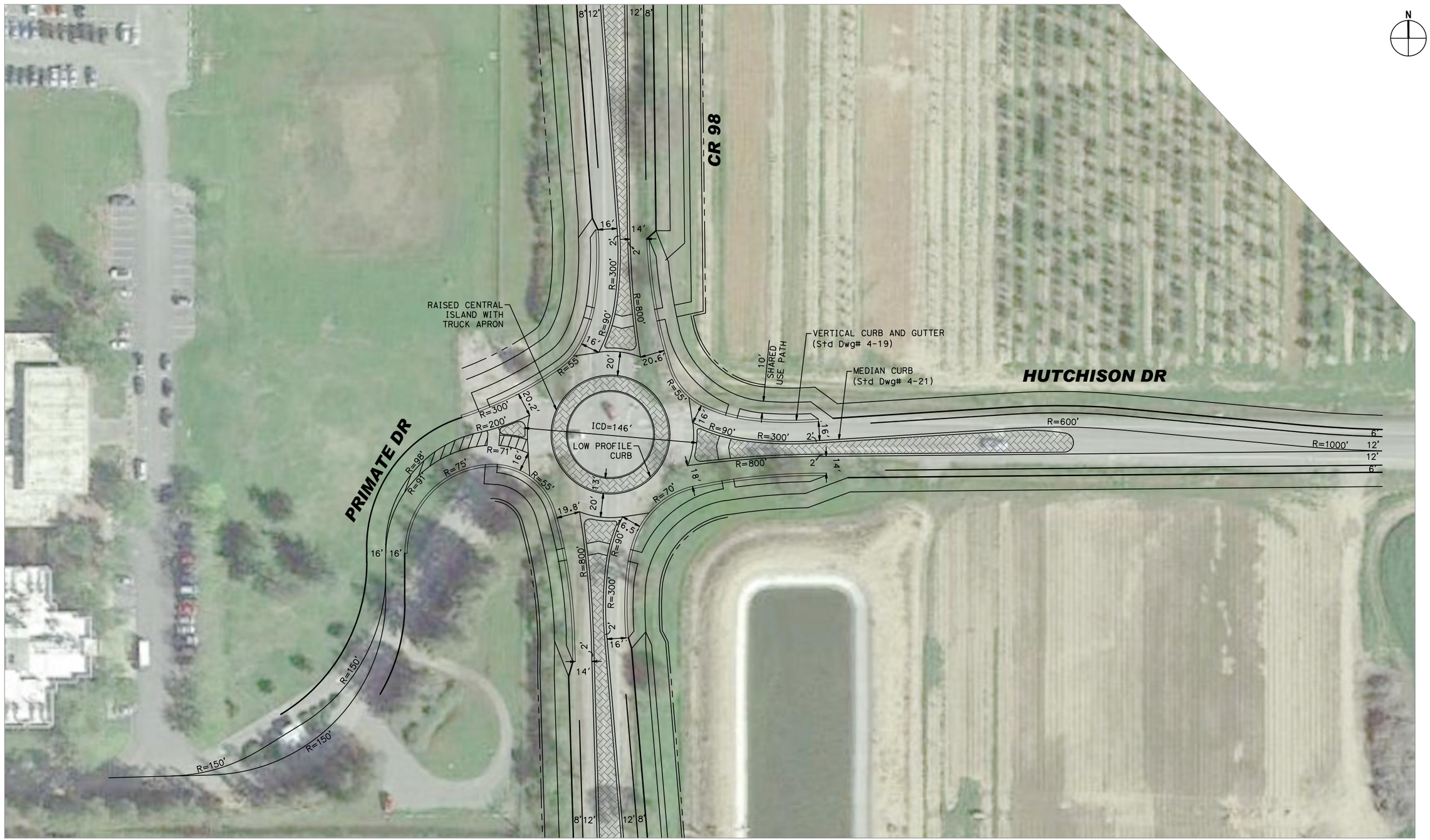
10/2/2018
11145129/2266

Construction Costs:

No.	Item Description	Units	Quantity	Unit Cost	Total
1	Traffic Control	LS	1	$100,000.00	$100,000.00
2	Remove Tree	EA	125	$1,050.00	$131,250.00
3	Roadway Excavation	CY	4,760	$35.00	$166,600.00
4	Ditch Excavation	CY	2,000	$35.00	$70,000.00
5	Class 3 ASB (Pulverize Exist Pvmt and Compact)	SY	16,530	$3.00	$49,590.00
6	Class 2 Aggregate Base	CY	6,750	$50.00	$337,500.00
7	Hot Mix Asphalt (Type A)	TON	6,140	$90.00	$552,600.00
8	Minor Concrete (Curb - Truck Apron)	LF	550	$40.00	$22,000.00
9	Minor Concrete (Median Curb)	LF	2,750	$40.00	$110,000.00
10	Minor Concrete (Curb and Gutter)	LF	1,080	$33.00	$35,640.00
11	Storm Drain System	LS	1	$10,000.00	$10,000.00
12	Traffic Stripe/Marking	LS	1	$10,000.00	$10,000.00
13	Signs	EA	40	$415.00	$16,600.00
14	Lighting & Electrical	LS	1	$100,000.00	$100,000.00
15	Planting and Irrigation (Median & Central Island)	SQFT	21,670	$5.00	$108,350.00
16	Traffic Signal	LS	0	$282,000.00	$0.00
17	Minor/ Supplemental Items	%	8%	$1,820,130.00	$145,620.00
18	Mobilization (10%)	LS	1	$196,600.00	$196,600.00
	Subtotal (Construction Costs)				$ 2,162,350.00
	Construction Contingency			25%	$ 540,588.00
	Total Construction Costs				**$ 2,702,938.00**
Right of Way (Capital) and Utility Relocation Costs:					
1	Right Of Way	LS	1	$ 193,000.00	$ 193,000.00
2	Utility Relocation	ALLOW		$ 200,000.00	$ -
	Total Right of Way (Capital) and Utility Relocation Costs				**$ 193,000.00**
	Total Project Capital Cost				**$ 2,895,938.00**
Project Support Costs					
1	Environmental Clearance (CEQA/NEPA)		Capital Costs	10%	$ 216,300.00
2	PS&E		Capital Costs	Contract	$ 185,500.00
3	Right of Way Engineering & Acquisition		LS	10%	$ 19,300.00
4	Construction Support and Management		Con. Costs	15%	$ 405,500.00
	Total Project Support Costs				**$ 826,600.00**
	Total Estimated Project Costs				**$ 3,722,538.00**
	Total Estimated Project Costs (Rounded)				**$ 3,723,000.00**

Assumptions
1. Shoulder has same structural section as that of travelled way.
2. Median islands to be landscaped/bouldered along with Central Island

Preliminary Roundabout Geometric Layout



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CR 98 PHASE II IMPROVEMENTS (HUTCHISON)

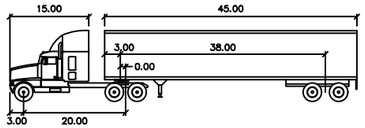
Fig No. 1

Yolo, California

November 8, 2018
2266EX017.dwg

CA LEGAL THROUGH TURNS

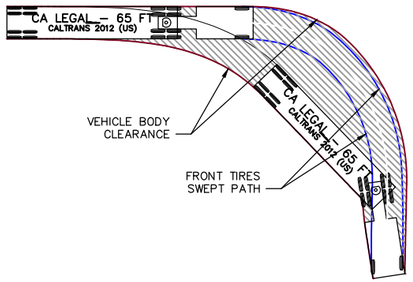
VEHICLE PROFILE



CA LEGAL – 65 FT feet

Tractor Width	: 8.50	Lock to Lock Time	: 6.0
Trailer Width	: 8.50	Steering Angle	: 26.3
Tractor Track	: 8.50	Articulating Angle	: 70.0
Trailer Track	: 8.50		

LEGEND



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CR 98 PHASE II IMPROVEMENTS (HUTCHISON)

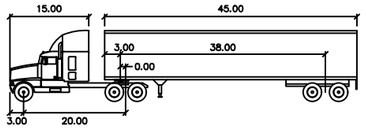
Fig No. 1

Yolo, California

November 8, 2018
2266RA002.dwg

CA LEGAL RIGHT TURNS

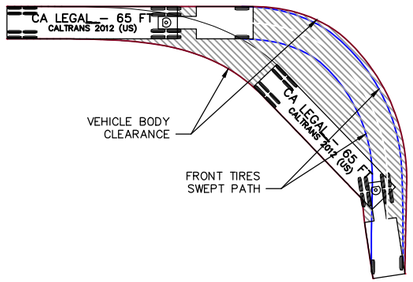
VEHICLE PROFILE



CA LEGAL – 65 FT feet

Tractor Width	: 8.50	Lock to Lock Time	: 6.0
Trailer Width	: 8.50	Steering Angle	: 26.3
Tractor Track	: 8.50	Articulating Angle	: 70.0
Trailer Track	: 8.50		

LEGEND



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CR 98 PHASE II IMPROVEMENTS (HUTCHISON)

Fig No. 1

Yolo, California

November 8, 2018
2266RA002.dwg

Preliminary Opinion of Costs

CR 98 Phase II Improvements - Roundabout Alternative
CR 98/Hutchinson
Yolo County

10/2/2018
11145129/2266

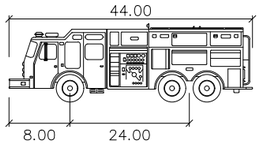
Construction Costs:

No.	Item Description	Units	Quantity	Unit Cost	Total
1	Traffic Control	LS	1	$100,000.00	$100,000.00
2	Remove Tree	EA	45	$1,050.00	$47,250.00
3	Roadway Excavation	CY	2,820	$35.00	$98,700.00
4	Ditch Excavation	CY	1,720	$35.00	$60,200.00
5	Class 3 ASB (Pulverize Exist Pvmt and Compact)	SY	12,320	$3.00	$36,960.00
6	Class 2 Aggregate Base	CY	5,140	$50.00	$257,000.00
7	Hot Mix Asphalt (Type A)	TON	4,700	$90.00	$423,000.00
8	Minor Concrete (Curb - Truck Apron)	LF	550	$40.00	$22,000.00
9	Minor Concrete (Median Curb)	LF	2,250	$40.00	$90,000.00
10	Minor Concrete (Curb and Gutter)	LF	1,060	$33.00	$34,980.00
11	Storm Drain System	LS	1	$10,000.00	$10,000.00
12	Traffic Stripe/Marking	LS	1	$10,000.00	$10,000.00
13	Signs	EA	40	$415.00	$16,600.00
14	Lighting & Electrical	LS	1	$100,000.00	$100,000.00
15	Planting and Irrigation (Median & Central Island)	SQFT	17,390	$5.00	$86,950.00
16	Traffic Signal	LS	0	$ 282,000.00	$0.00
17	Minor/ Supplemental Items	%	8%	$1,393,640.00	$111,500.00
18	Mobilization (10%)	LS	1	$150,600.00	$150,600.00
	Subtotal (Construction Costs)				$ 1,655,740.00
	Construction Contingency			25%	$ 413,935.00
	Total Construction Costs				**$ 2,069,675.00**
Right of Way (Capital) and Utility Relocation Costs:					
1	Right Of Way	LS	1	$ 87,000.00	$ 87,000.00
2	Utility Relocation	ALLOW		$ 200,000.00	$ -
	Total Right of Way (Capital) and Utility Relocation Costs				**$ 87,000.00**
	Total Project Capital Cost				**$ 2,156,675.00**
Project Support Costs					
1	Environmental Clearance (CEQA/NEPA)		Capital Costs	10%	$ 165,600.00
2	PS&E		Capital Costs	Contract	$ 142,100.00
3	Right of Way Engineering & Acquisition		LS	10%	$ 8,700.00
4	Construction Support and Management		Con. Costs	15%	$ 310,500.00
	Total Project Support Costs				**$ 626,900.00**
	Total Estimated Project Costs				**$ 2,783,575.00**
	Total Estimated Project Costs (Rounded)				**$ 2,784,000.00**

Assumptions
1. Shoulder has same structural section as that of travelled way.
2. Median islands to be landscaped/bouldered along with Central Island

FIRE TRUCK TURNS

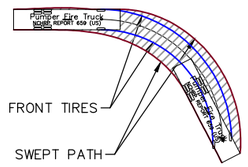
VEHICLE PROFILE



Pumper Fire Truck

	feet
Width	: 8.50
Track	: 8.50
Lock to Lock Time	: 6.0
Steering Angle	: 37.8

DESIGN VEHICLE TURN



RIGHT TURN

LEFT AND U–TURN

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CR 98 PHASE II IMPROVEMENTS Fig No. 1

Yolo, California

November 9, 2018
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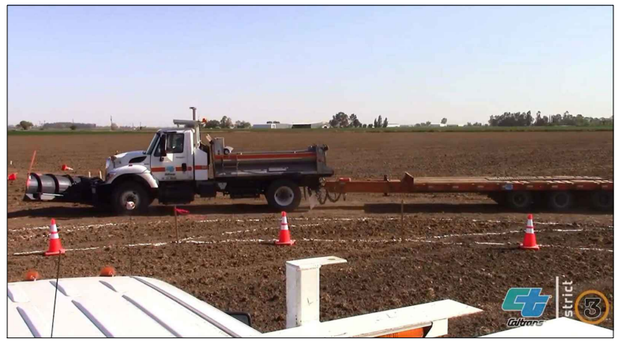
FARM EQUIPMENT TURNS



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CR 98 PHASE II IMPROVEMENTS

Fig No. 1

Yolo, California

November 9, 2018
2266RA002.dwg

Appendix C

Life Cycle Cost Analysis Worksheet

CR 98 & CR 31 Intersection

Summary of Life Cycle Cost Analyses

Total Life Cycle Costs (2020 - 2040)	Roundabout Alternative		Traffic Signal Alternative	
Safety	**Total Predicted Crashes**	**Safety Cost**	**Total Predicted Crashes**	**Safety Cost**
	Total Costs of Predicted Crashes	**$ 2,864,000**	Total Costs of Predicted Crashes	**$ 11,827,200**
Delay	**Total Intersection Delay (person-hrs)**	**Delay Cost**	**Total Intersection Delay (person-hrs)**	**Delay Cost**
Total Person (in Vehicle) Delay	16,420	**$ 210,000**	41,952	**$ 530,000**
Fuel and GHG Cost	**Fuel and Green House Gas Cost**		**Fuel and Green House Gas Cost**	
		$ 940,262		**$ 1,368,378**
Operation and Maintenance	**Operation and Maintenance**	**O&M Cost**	**Operation and Maintenance**	**O&M Cost**
Annual Cost of Signal Retiming		$ -	Signal Retiming	$ 6,795
Annual Cost of Power	Intersection Illumination	$ 3,398	Power for Signal & Intersection Illumination	$ 8,154
Annual Cost of Maintenance	Landscaping Maintenance	$ 66,593	Signal Maintenance (power outage, detection, etc.)	$ 67,952
	Total Annual Operation and Maintenance Costs	**$ 69,990**	Total Annual Operation and Maintenance Costs	**$ 82,901**
Total Initial Capital Costs	**Design & Construction**	**Capital Cost**	**Design & Construction**	**Capital Cost**
		$ 3,208,000		**$ 4,170,000**
Total Life Cycle Costs		**$ 7,292,252**		**$ 17,978,479**

***Delay cost is based upon an average of the AM and PM peak hours.**

Roundabout Alternative to Signal Alternative

Life Cycle Costs	Roundabout Alternative		Traffic Signal Alternative
Collision and Mobility Costs			
Collision Costs of predicted crashes	$2,864,000		$11,828,000
Delay Costs	$210,000		$530,000
Fuel and GHG Costs	$941,000		$1,369,000
Project Costs including design, construction and maintenance			
Operations and Maintenance Costs	$70,000		$83,000
Project Costs	$3,208,000		$4,170,000
Total Life Cycle Costs	**$7,293,000**		**$17,980,000**

Intersection Control Evaluation
Collision Cost Analysis and B/C

-- Fill in tan boxes along with 'Area' --

County	Rte	Postmile	Location Description
YOLO	CR 98	-	CR 98 & CR 31

Area: (•) Rural ( ) Suburban ( ) Urban

Intersection Types:
F - Four-Legged
M - Multi-Legged
S - Offsett -Tee
Y - "Y" Wye

Existing Condition	# of Years for Analysis	Rate Group
All Way Stop, Type F, M or S	20	I3

Year 2020 ADT (x1000)		Future ADT (x1000)			
Mainline	Cross St	Mainline	Cross St	Average ADT	VCF
4.6	7.3	8.3	11.5	15.9	1.33

Est. Capital Cost (x1000) for Desired Improvement

Desired Improvement	Const	R/W	Total
Yield Control (Roundabout 1-Lane)	$ 3,079	$ 129	$ 3,208
Yield Control (Roundabout 2-Lane)			$ -
Traffic Signal, Type F, M or S	$ 3,996	$ 174	$ 4,170
All Way Stop, Type F, M or S		.	$ -

Existing Collision Data

Number of Years	3	Total Collisions	9
Injury	1	PDO	8
Fatal	0	Fat + Inj	1

	Collision Cost (x1000)					B/C
	Existing Condition		Desired Improvement		Projected Savings	
1	All Way Stop, Type F, M or S	$11,784	Yield Control (Roundabout 1-Lane)	$2,864	$8,920	2.78
2	All Way Stop, Type F, M or S	$11,784	Traffic Signal, Type F, M or S	$11,827	($43)	-0.01

NOTE: Only average collision costs are used for calculation purposes.

INTERSECTION SUMMARY

Site: 101 [1 - RNDBT - CR 98/ Covell Blvd - Yr 2020 AM]

New Site
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Travel Speed (Average)	29.0	mph	29.0	mph
Travel Distance (Total)	203.7	veh-mi/h	244.5	pers-mi/h
Travel Time (Total)	7.0	veh-h/h	8.4	pers-h/h
Demand Flows (Total)	740	veh/h	888	pers/h
Percent Heavy Vehicles (Demand)	13.9	%		
Degree of Saturation	0.284			
Practical Spare Capacity	199.4	%		
Effective Intersection Capacity	2606	veh/h		
Control Delay (Total)	1.13	veh-h/h	1.35	pers-h/h
Control Delay (Average)	5.5	sec	5.5	sec
Control Delay (Worst Lane)	6.2	sec		
Control Delay (Worst Movement)	8.6	sec	8.6	sec
Geometric Delay (Average)	0.0	sec		
Stop-Line Delay (Average)	5.5	sec		
Idling Time (Average)	3.0	sec		
Intersection Level of Service (LOS)	LOS A			
95% Back of Queue - Vehicles (Worst Lane)	1.7	veh		
95% Back of Queue - Distance (Worst Lane)	48.6	ft		
Queue Storage Ratio (Worst Lane)	0.03			
Total Effective Stops	204	veh/h	244	pers/h
Effective Stop Rate	0.28	per veh	0.28	per pers
Proportion Queued	0.43		0.43	
Performance Index	15.9		15.9	
Cost (Total)	180.72	$/h	180.72	$/h
Fuel Consumption (Total)	21.5	gal/h		
Carbon Dioxide (Total)	195.3	kg/h		
Hydrocarbons (Total)	0.019	kg/h		
Carbon Monoxide (Total)	0.250	kg/h		
NOx (Total)	0.660	kg/h		

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	355,091	veh/y	426,109	pers/y
Delay	540	veh-h/y	648	pers-h/y
Effective Stops	97,686	veh/y	117,223	pers/y
Travel Distance	97,790	veh-mi/y	117,349	pers-mi/y
Travel Time	3,375	veh-h/y	4,051	pers-h/y
Cost	86,744	$/y	86,744	$/y
Fuel Consumption	10,302	gal/y		
Carbon Dioxide	93,763	kg/y		
Hydrocarbons	9	kg/y		
Carbon Monoxide	120	kg/y		
NOx	317	kg/y		

INTERSECTION SUMMARY

Site: 101 [1 - RNDBT - CR 98/ Covell Blvd - Yr 2020 PM]

New Site
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Travel Speed (Average)	28.5	mph	28.5	mph
Travel Distance (Total)	285.8	veh-mi/h	342.9	pers-mi/h
Travel Time (Total)	10.0	veh-h/h	12.0	pers-h/h
Demand Flows (Total)	1036	veh/h	1244	pers/h
Percent Heavy Vehicles (Demand)	10.0	%		
Degree of Saturation	0.321			
Practical Spare Capacity	165.2	%		
Effective Intersection Capacity	3233	veh/h		
Control Delay (Total)	1.80	veh-h/h	2.16	pers-h/h
Control Delay (Average)	6.3	sec	6.3	sec
Control Delay (Worst Lane)	6.7	sec		
Control Delay (Worst Movement)	6.7	sec	6.7	sec
Geometric Delay (Average)	0.0	sec		
Stop-Line Delay (Average)	6.3	sec		
Idling Time (Average)	3.4	sec		
Intersection Level of Service (LOS)	LOS A			
95% Back of Queue - Vehicles (Worst Lane)	2.1	veh		
95% Back of Queue - Distance (Worst Lane)	56.6	ft		
Queue Storage Ratio (Worst Lane)	0.03			
Total Effective Stops	369	veh/h	442	pers/h
Effective Stop Rate	0.36	per veh	0.36	per pers
Proportion Queued	0.50		0.50	
Performance Index	24.2		24.2	
Cost (Total)	247.00	$/h	247.00	$/h
Fuel Consumption (Total)	28.1	gal/h		
Carbon Dioxide (Total)	253.8	kg/h		
Hydrocarbons (Total)	0.026	kg/h		
Carbon Monoxide (Total)	0.343	kg/h		
NOx (Total)	0.684	kg/h		

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	497,455	veh/y	596,945	pers/y
Delay	864	veh-h/y	1,036	pers-h/y
Effective Stops	176,919	veh/y	212,303	pers/y
Travel Distance	137,166	veh-mi/y	164,599	pers-mi/y
Travel Time	4,813	veh-h/y	5,775	pers-h/y
Cost	118,562	$/y	118,562	$/y
Fuel Consumption	13,468	gal/y		
Carbon Dioxide	121,843	kg/y		
Hydrocarbons	13	kg/y		
Carbon Monoxide	165	kg/y		
NOx	328	kg/y		

INTERSECTION SUMMARY

Site: 101 [1 - RNDBT - CR 98/ Covell Blvd - Yr 2040 AM]

New Site
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Travel Speed (Average)	26.4	mph	26.4	mph
Travel Distance (Total)	341.7	veh-mi/h	410.0	pers-mi/h
Travel Time (Total)	12.9	veh-h/h	15.5	pers-h/h
Demand Flows (Total)	1241	veh/h	1489	pers/h
Percent Heavy Vehicles (Demand)	13.8	%		
Degree of Saturation	0.518			
Practical Spare Capacity	64.2	%		
Effective Intersection Capacity	2397	veh/h		
Control Delay (Total)	3.04	veh-h/h	3.64	pers-h/h
Control Delay (Average)	8.8	sec	8.8	sec
Control Delay (Worst Lane)	10.7	sec		
Control Delay (Worst Movement)	13.7	sec	13.7	sec
Geometric Delay (Average)	0.0	sec		
Stop-Line Delay (Average)	8.8	sec		
Idling Time (Average)	5.1	sec		
Intersection Level of Service (LOS)	LOS A			
95% Back of Queue - Vehicles (Worst Lane)	4.0	veh		
95% Back of Queue - Distance (Worst Lane)	113.1	ft		
Queue Storage Ratio (Worst Lane)	0.07			
Total Effective Stops	649	veh/h	779	pers/h
Effective Stop Rate	0.52	per veh	0.52	per pers
Proportion Queued	0.65		0.65	
Performance Index	36.2		36.2	
Cost (Total)	325.90	$/h	325.90	$/h
Fuel Consumption (Total)	37.4	gal/h		
Carbon Dioxide (Total)	340.2	kg/h		
Hydrocarbons (Total)	0.034	kg/h		
Carbon Monoxide (Total)	0.433	kg/h		
NOx (Total)	1.155	kg/h		

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	595,636	veh/y	714,764	pers/y
Delay	1,457	veh-h/y	1,749	pers-h/y
Effective Stops	311,507	veh/y	373,809	pers/y
Travel Distance	164,000	veh-mi/y	196,800	pers-mi/y
Travel Time	6,210	veh-h/y	7,452	pers-h/y
Cost	156,433	$/y	156,433	$/y
Fuel Consumption	17,946	gal/y		
Carbon Dioxide	163,279	kg/y		
Hydrocarbons	16	kg/y		
Carbon Monoxide	208	kg/y		
NOx	554	kg/y		

INTERSECTION SUMMARY

Site: 101 [1 - RNDBT - CR 98/ Covell Blvd - Yr 2040 PM]

New Site
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Travel Speed (Average)	24.3	mph	24.3	mph
Travel Distance (Total)	476.6	veh-mi/h	572.0	pers-mi/h
Travel Time (Total)	19.6	veh-h/h	23.6	pers-h/h
Demand Flows (Total)	1730	veh/h	2075	pers/h
Percent Heavy Vehicles (Demand)	10.0	%		
Degree of Saturation	0.602			
Practical Spare Capacity	41.2	%		
Effective Intersection Capacity	2873	veh/h		
Control Delay (Total)	5.93	veh-h/h	7.12	pers-h/h
Control Delay (Average)	12.3	sec	12.3	sec
Control Delay (Worst Lane)	16.2	sec		
Control Delay (Worst Movement)	16.2	sec	16.2	sec
Geometric Delay (Average)	0.0	sec		
Stop-Line Delay (Average)	12.3	sec		
Idling Time (Average)	6.6	sec		
Intersection Level of Service (LOS)	LOS B			
95% Back of Queue - Vehicles (Worst Lane)	6.4	veh		
95% Back of Queue - Distance (Worst Lane)	173.6	ft		
Queue Storage Ratio (Worst Lane)	0.11			
Total Effective Stops	1309	veh/h	1571	pers/h
Effective Stop Rate	0.76	per veh	0.76	per pers
Proportion Queued	0.80		0.80	
Performance Index	70.3		70.3	
Cost (Total)	469.07	$/h	469.07	$/h
Fuel Consumption (Total)	50.0	gal/h		
Carbon Dioxide (Total)	452.6	kg/h		
Hydrocarbons (Total)	0.047	kg/h		
Carbon Monoxide (Total)	0.598	kg/h		
NOx (Total)	1.250	kg/h		

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	830,182	veh/y	996,218	pers/y
Delay	2,847	veh-h/y	3,416	pers-h/y
Effective Stops	628,489	veh/y	754,187	pers/y
Travel Distance	228,784	veh-mi/y	274,540	pers-mi/y
Travel Time	9,430	veh-h/y	11,316	pers-h/y
Cost	225,153	$/y	225,153	$/y
Fuel Consumption	24,019	gal/y		
Carbon Dioxide	217,228	kg/y		
Hydrocarbons	23	kg/y		
Carbon Monoxide	287	kg/y		
NOx	600	kg/y		

INTERSECTION SUMMARY

Site: 101 [1 - SIGNAL - CR 98 & W Covell Blvd - Year 2020 AM]

New Site
Signals - Pretimed Isolated Cycle Time = 92 seconds (Optimum Cycle Time - Minimum Delay)

Intersection Performance - Hourly Values						
Performance Measure	**Vehicles**		**Pedestrians**		**Persons**	
Travel Speed (Average)	29.0	mph	1.4	mph	23.6	mph
Travel Distance (Total)	315.0	veh-mi/h	4.5	ped-mi/h	382.5	pers-mi/h
Travel Time (Total)	10.9	veh-h/h	3.2	ped-h/h	16.2	pers-h/h
Demand Flows (Total)	740	veh/h	217	ped/h	1105	pers/h
Percent Heavy Vehicles (Demand)	10.0	%				
Degree of Saturation	0.334		0.035			
Practical Spare Capacity	169.1	%				
Effective Intersection Capacity	2212	veh/h				
Control Delay (Total)	4.44	veh-h/h	1.63	ped-h/h	6.95	pers-h/h
Control Delay (Average)	21.6	sec	26.9	sec	22.6	sec
Control Delay (Worst Lane)	41.4	sec				
Control Delay (Worst Movement)	41.4	sec	34.9	sec	41.4	sec
Geometric Delay (Average)	0.0	sec				
Stop-Line Delay (Average)	21.6	sec				
Idling Time (Average)	17.8	sec				
Intersection Level of Service (LOS)	LOS C		LOS C			
95% Back of Queue - Vehicles (Worst Lane)	7.5	veh				
95% Back of Queue - Distance (Worst Lane)	203.2	ft				
Queue Storage Ratio (Worst Lane)	0.11					
Total Effective Stops	463	veh/h	165	ped/h	720	pers/h
Effective Stop Rate	0.63	per veh	0.76	per ped	0.65	per pers
Proportion Queued	0.77		0.76		0.77	
Performance Index	65.4		4.1		69.5	
Cost (Total)	238.35	$/h	32.82	$/h	271.17	$/h
Fuel Consumption (Total)	25.8	gal/h				
Carbon Dioxide (Total)	233.9	kg/h				
Hydrocarbons (Total)	0.023	kg/h				
Carbon Monoxide (Total)	0.336	kg/h				
NOx (Total)	0.782	kg/h				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Intersection Performance - Annual Values						
Performance Measure	**Vehicles**		**Pedestrians**		**Persons**	
Demand Flows (Total)	355,091	veh/y	104,348	ped/y	530,457	pers/y
Delay	2,130	veh-h/y	780	ped-h/y	3,336	pers-h/y
Effective Stops	222,240	veh/y	79,007	ped/y	345,695	pers/y
Travel Distance	151,212	veh-mi/y	2,154	ped-mi/y	183,608	pers-mi/y
Travel Time	5,218	veh-h/y	1,515	ped-h/y	7,777	pers-h/y
Cost	114,408	$/y	15,754	$/y	130,161	$/y
Fuel Consumption	12,394	gal/y				
Carbon Dioxide	112,280	kg/y				
Hydrocarbons	11	kg/y				
Carbon Monoxide	161	kg/y				
NOx	375	kg/y				

INTERSECTION SUMMARY

Site: 101 [1 - SIGNAL - CR 98 & W Covell Blvd - Year 2020 PM]

New Site
Signals - Pretimed Isolated Cycle Time = 50 seconds (Practical Cycle Time)

Intersection Performance - Hourly Values						
Performance Measure	**Vehicles**		**Pedestrians**		**Persons**	
Travel Speed (Average)	30.9	mph	1.8	mph	27.1	mph
Travel Distance (Total)	441.3	veh-mi/h	4.5	ped-mi/h	534.1	pers-mi/h
Travel Time (Total)	14.3	veh-h/h	2.5	ped-h/h	19.7	pers-h/h
Demand Flows (Total)	1036	veh/h	217	ped/h	1461	pers/h
Percent Heavy Vehicles (Demand)	10.0	%				
Degree of Saturation	0.649		0.025			
Practical Spare Capacity	38.8	%				
Effective Intersection Capacity	1598	veh/h				
Control Delay (Total)	5.32	veh-h/h	1.02	ped-h/h	7.41	pers-h/h
Control Delay (Average)	18.5	sec	16.8	sec	18.3	sec
Control Delay (Worst Lane)	21.3	sec				
Control Delay (Worst Movement)	21.3	sec	16.8	sec	21.3	sec
Geometric Delay (Average)	0.0	sec				
Stop-Line Delay (Average)	18.5	sec				
Idling Time (Average)	13.3	sec				
Intersection Level of Service (LOS)	LOS B		LOS B			
95% Back of Queue - Vehicles (Worst Lane)	7.0	veh				
95% Back of Queue - Distance (Worst Lane)	187.8	ft				
Queue Storage Ratio (Worst Lane)	0.10					
Total Effective Stops	827	veh/h	179	ped/h	1171	pers/h
Effective Stop Rate	0.80	per veh	0.82	per ped	0.80	per pers
Proportion Queued	0.95		0.82		0.93	
Performance Index	72.7		3.5		76.2	
Cost (Total)	351.01	$/h	26.50	$/h	377.51	$/h
Fuel Consumption (Total)	39.6	gal/h				
Carbon Dioxide (Total)	358.8	kg/h				
Hydrocarbons (Total)	0.035	kg/h				
Carbon Monoxide (Total)	0.491	kg/h				
NOx (Total)	1.251	kg/h				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Intersection Performance - Annual Values						
Performance Measure	**Vehicles**		**Pedestrians**		**Persons**	
Demand Flows (Total)	497,455	veh/y	104,348	ped/y	701,293	pers/y
Delay	2,556	veh-h/y	488	ped-h/y	3,555	pers-h/y
Effective Stops	396,949	veh/y	85,759	ped/y	562,099	pers/y
Travel Distance	211,839	veh-mi/y	2,154	ped-mi/y	256,361	pers-mi/y
Travel Time	6,866	veh-h/y	1,223	ped-h/y	9,463	pers-h/y
Cost	168,486	$/y	12,720	$/y	181,206	$/y
Fuel Consumption	19,022	gal/y				
Carbon Dioxide	172,238	kg/y				
Hydrocarbons	17	kg/y				
Carbon Monoxide	236	kg/y				
NOx	600	kg/y				

INTERSECTION SUMMARY

Site: 101 [1 - SIGNAL - CR 98 & W Covell Blvd - Year 2040 AM]

New Site
Signals - Pretimed Isolated Cycle Time = 92 seconds (Optimum Cycle Time - Minimum Delay)

Intersection Performance - Hourly Values						
Performance Measure	**Vehicles**		**Pedestrians**		**Persons**	
Travel Speed (Average)	27.1	mph	1.4	mph	24.1	mph
Travel Distance (Total)	528.4	veh-mi/h	4.5	ped-mi/h	638.6	pers-mi/h
Travel Time (Total)	19.5	veh-h/h	3.1	ped-h/h	26.5	pers-h/h
Demand Flows (Total)	1241	veh/h	217	ped/h	1706	pers/h
Percent Heavy Vehicles (Demand)	10.0	%				
Degree of Saturation	0.593		0.028			
Practical Spare Capacity	51.7	%				
Effective Intersection Capacity	2092	veh/h				
Control Delay (Total)	8.69	veh-h/h	1.59	ped-h/h	12.01	pers-h/h
Control Delay (Average)	25.2	sec	26.3	sec	25.3	sec
Control Delay (Worst Lane)	49.3	sec				
Control Delay (Worst Movement)	49.3	sec	32.3	sec	49.3	sec
Geometric Delay (Average)	0.0	sec				
Stop-Line Delay (Average)	25.2	sec				
Idling Time (Average)	20.9	sec				
Intersection Level of Service (LOS)	LOS C		LOS C			
95% Back of Queue - Vehicles (Worst Lane)	14.2	veh				
95% Back of Queue - Distance (Worst Lane)	384.3	ft				
Queue Storage Ratio (Worst Lane)	0.21					
Total Effective Stops	881	veh/h	163	ped/h	1220	pers/h
Effective Stop Rate	0.71	per veh	0.75	per ped	0.72	per pers
Proportion Queued	0.84		0.75		0.83	
Performance Index	124.5		4.0		128.5	
Cost (Total)	430.25	$/h	32.43	$/h	462.67	$/h
Fuel Consumption (Total)	45.3	gal/h				
Carbon Dioxide (Total)	410.6	kg/h				
Hydrocarbons (Total)	0.041	kg/h				
Carbon Monoxide (Total)	0.579	kg/h				
NOx (Total)	1.383	kg/h				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Intersection Performance - Annual Values						
Performance Measure	**Vehicles**		**Pedestrians**		**Persons**	
Demand Flows (Total)	595,636	veh/y	104,348	ped/y	819,111	pers/y
Delay	4,171	veh-h/y	762	ped-h/y	5,767	pers-h/y
Effective Stops	422,795	veh/y	78,438	ped/y	585,793	pers/y
Travel Distance	253,647	veh-mi/y	2,154	ped-mi/y	306,531	pers-mi/y
Travel Time	9,357	veh-h/y	1,497	ped-h/y	12,725	pers-h/y
Cost	206,519	$/y	15,564	$/y	222,084	$/y
Fuel Consumption	21,763	gal/y				
Carbon Dioxide	197,105	kg/y				
Hydrocarbons	20	kg/y				
Carbon Monoxide	278	kg/y				
NOx	664	kg/y				

INTERSECTION SUMMARY

Site: 101 [1 - SIGNAL - CR 98 & W Covell Blvd - Year 2040 PM]

New Site
Signals - Pretimed Isolated Cycle Time = 92 seconds (Practical Cycle Time)

Intersection Performance - Hourly Values						
Performance Measure	**Vehicles**		**Pedestrians**		**Persons**	
Travel Speed (Average)	20.6	mph	1.4	mph	19.3	mph
Travel Distance (Total)	736.5	veh-mi/h	4.5	ped-mi/h	888.3	pers-mi/h
Travel Time (Total)	35.7	veh-h/h	3.1	ped-h/h	46.0	pers-h/h
Demand Flows (Total)	1730	veh/h	217	ped/h	2293	pers/h
Percent Heavy Vehicles (Demand)	10.0	%				
Degree of Saturation	0.894		0.023			
Practical Spare Capacity	0.7	%				
Effective Intersection Capacity	1935	veh/h				
Control Delay (Total)	20.68	veh-h/h	1.62	ped-h/h	26.43	pers-h/h
Control Delay (Average)	43.0	sec	26.8	sec	41.5	sec
Control Delay (Worst Lane)	78.2	sec				
Control Delay (Worst Movement)	78.2	sec	29.8	sec	78.2	sec
Geometric Delay (Average)	0.0	sec				
Stop-Line Delay (Average)	43.0	sec				
Idling Time (Average)	36.1	sec				
Intersection Level of Service (LOS)	LOS D		LOS C			
95% Back of Queue - Vehicles (Worst Lane)	24.2	veh				
95% Back of Queue - Distance (Worst Lane)	653.8	ft				
Queue Storage Ratio (Worst Lane)	0.36					
Total Effective Stops	1609	veh/h	166	ped/h	2097	pers/h
Effective Stop Rate	0.93	per veh	0.76	per ped	0.91	per pers
Proportion Queued	0.96		0.76		0.94	
Performance Index	233.7		4.1		237.8	
Cost (Total)	762.59	$/h	32.74	$/h	795.33	$/h
Fuel Consumption (Total)	71.5	gal/h				
Carbon Dioxide (Total)	646.8	kg/h				
Hydrocarbons (Total)	0.066	kg/h				
Carbon Monoxide (Total)	0.869	kg/h				
NOx (Total)	2.203	kg/h				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Intersection Performance - Annual Values						
Performance Measure	**Vehicles**		**Pedestrians**		**Persons**	
Demand Flows (Total)	830,182	veh/y	104,348	ped/y	1,100,566	pers/y
Delay	9,927	veh-h/y	776	ped-h/y	12,688	pers-h/y
Effective Stops	772,476	veh/y	79,575	ped/y	1,006,546	pers/y
Travel Distance	353,533	veh-mi/y	2,154	ped-mi/y	426,394	pers-mi/y
Travel Time	17,135	veh-h/y	1,511	ped-h/y	22,073	pers-h/y
Cost	366,043	$/y	15,714	$/y	381,757	$/y
Fuel Consumption	34,300	gal/y				
Carbon Dioxide	310,441	kg/y				
Hydrocarbons	32	kg/y				
Carbon Monoxide	417	kg/y				
NOx	1,057	kg/y				

CR 98 & CR 32 Intersection

Summary of Life Cycle Cost Analyses

Total Life Cycle Costs (2020 - 2040)	Roundabout Alternative		Traffic Signal Alternative	
Safety	**Total Predicted Crashes**	**Safety Cost**	**Total Predicted Crashes**	**Safety Cost**
	Total Costs of Predicted Crashes	**$ 680,200**	Total Costs of Predicted Crashes	**$ 8,976,000**
Delay	**Total Intersection Delay (person-hrs)**	**Delay Cost**	**Total Intersection Delay (person-hrs)**	**Delay Cost**
Total Person (in Vehicle) Delay	8,407	**$ 110,000**	28,341	**$ 360,000**
Fuel and GHG Cost	**Fuel and Green House Gas Cost**		**Fuel and Green House Gas Cost**	
		$ 608,163		**$ 774,221**
Operation and Maintenance	**Operation and Maintenance**	**O&M Cost**	**Operation and Maintenance**	**O&M Cost**
Annual Cost of Signal Retiming		$ -	Signal Retiming	$ 6,795
Annual Cost of Power	Intersection Illumination	$ 3,398	Power for Signal	$ 8,154
Annual Cost of Maintenance	Landscaping Maintenance	$ 66,593	Signal Maintenance Costs (power outage, detection, etc.)	$ 67,952
	Total Annual Operation and Maintenance Costs	**$ 69,990**	Total Annual Operation and Maintenance Costs	**$ 82,901**
Initial Capital Costs	**Design & Construction**	**Capital Cost**	**Design & Construction**	**Capital Cost**
		$ 3,723,000		**$ 4,082,000**
Total Life Cycle Costs		**$5,191,354**		**$ 14,275,122**

***Delay cost is based upon an average of the AM and PM peak hours.**

Roundabout Alternative to Signal Alternative

Life Cycle Costs	Roundabout Alternative		Traffic Signal Alternative
Collision and Mobility Costs			
Collision Costs of predicted crashes	$681,000		$8,976,000
Delay Costs	$110,000		$360,000
Fuel and GHG Costs	$609,000		$775,000
Project Costs including design, construction and maintenance			
Operations and Maintenance Costs	$70,000		$83,000
Project Costs	$3,723,000		$4,082,000
Total Life Cycle Costs	**$5,193,000**		**$14,276,000**

Intersection Control Evaluation
Collision Cost Analysis and B/C

-- Fill in tan boxes along with 'Area' --

County	Rte	Postmile	Location Description
YOLO	CR 98	-	CR 98 & CR 32

Area
- (●) Rural
- ( ) Suburban
- ( ) Urban

Intersection Types:
F - Four-Legged
M - Multi-Legged
S - Offsett -Tee
Y - "Y" Wye

Existing Condition	# of Years for Analysis	Rate Group
All Way Stop, Type F, M or S	20	I3

Year 2020 ADT (x1000)		Future ADT (x1000)			
Mainline	Cross St	Mainline	Cross St	Average ADT	VCF
5.4	3.2	9.6	5.7	12.0	1.39

Est. Capital Cost (x1000) for Desired Improvement

Desired Improvement	Const	R/W	Total
Yield Control (Roundabout 1-Lane)	$ 3,530	$ 193	$ 3,723
Yield Control (Roundabout 2-Lane)			$ -
Traffic Signal, Type F, M or S	$ 3,879	$ 203	$ 4,082
All Way Stop, Type F, M or S		.	$ -

Existing Collision Data

Number of Years	3	Total Collisions	1
Injury	0	PDO	1
Fatal	0	Fat + Inj	0

	Collision Cost (x1000)					B/C
	Existing Condition		Desired Improvement		Projected Savings	
1	All Way Stop, Type F, M or S	$1,326	Yield Control (Roundabout 1-Lane)	$680	$646	0.17
2	All Way Stop, Type F, M or S	$1,326	Traffic Signal, Type F, M or S	$8,976	($7,650)	-1.87

NOTE: Only average collision costs are used for calculation purposes.

INTERSECTION SUMMARY

Site: 101 [2 - RNDBT - CR 98 & Russell Blvd - Yr 2020 AM]

New Site
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Travel Speed (Average)	30.7	mph	30.7	mph
Travel Distance (Total)	193.8	veh-mi/h	232.6	pers-mi/h
Travel Time (Total)	6.3	veh-h/h	7.6	pers-h/h
Demand Flows (Total)	608	veh/h	730	pers/h
Percent Heavy Vehicles (Demand)	10.5	%		
Degree of Saturation	0.162			
Practical Spare Capacity	424.3	%		
Effective Intersection Capacity	3750	veh/h		
Control Delay (Total)	0.75	veh-h/h	0.89	pers-h/h
Control Delay (Average)	4.4	sec	4.4	sec
Control Delay (Worst Lane)	4.8	sec		
Control Delay (Worst Movement)	4.8	sec	4.8	sec
Geometric Delay (Average)	0.0	sec		
Stop-Line Delay (Average)	4.4	sec		
Idling Time (Average)	2.6	sec		
Intersection Level of Service (LOS)	LOS A			
95% Back of Queue - Vehicles (Worst Lane)	0.9	veh		
95% Back of Queue - Distance (Worst Lane)	24.9	ft		
Queue Storage Ratio (Worst Lane)	0.02			
Total Effective Stops	111	veh/h	133	pers/h
Effective Stop Rate	0.18	per veh	0.18	per pers
Proportion Queued	0.33		0.33	
Performance Index	12.2		12.2	
Cost (Total)	137.60	$/h	137.60	$/h
Fuel Consumption (Total)	15.8	gal/h		
Carbon Dioxide (Total)	143.0	kg/h		
Hydrocarbons (Total)	0.014	kg/h		
Carbon Monoxide (Total)	0.188	kg/h		
NOx (Total)	0.421	kg/h		

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	291,818	veh/y	350,182	pers/y
Delay	358	veh-h/y	429	pers-h/y
Effective Stops	53,103	veh/y	63,724	pers/y
Travel Distance	93,027	veh-mi/y	111,632	pers-mi/y
Travel Time	3,031	veh-h/y	3,638	pers-h/y
Cost	66,047	$/y	66,047	$/y
Fuel Consumption	7,573	gal/y		
Carbon Dioxide	68,643	kg/y		
Hydrocarbons	7	kg/y		
Carbon Monoxide	90	kg/y		
NOx	202	kg/y		

INTERSECTION SUMMARY

Site: 101 [2 - RNDBT - CR 98 & Russell Blvd - Yr 2020 PM]

New Site
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Travel Speed (Average)	29.6	mph	29.6	mph
Travel Distance (Total)	220.6	veh-mi/h	264.8	pers-mi/h
Travel Time (Total)	7.4	veh-h/h	8.9	pers-h/h
Demand Flows (Total)	684	veh/h	821	pers/h
Percent Heavy Vehicles (Demand)	10.0	%		
Degree of Saturation	0.274			
Practical Spare Capacity	209.7	%		
Effective Intersection Capacity	2493	veh/h		
Control Delay (Total)	0.93	veh-h/h	1.12	pers-h/h
Control Delay (Average)	4.9	sec	4.9	sec
Control Delay (Worst Lane)	5.4	sec		
Control Delay (Worst Movement)	5.4	sec	5.4	sec
Geometric Delay (Average)	0.0	sec		
Stop-Line Delay (Average)	4.9	sec		
Idling Time (Average)	3.0	sec		
Intersection Level of Service (LOS)	LOS A			
95% Back of Queue - Vehicles (Worst Lane)	1.7	veh		
95% Back of Queue - Distance (Worst Lane)	45.8	ft		
Queue Storage Ratio (Worst Lane)	0.02			
Total Effective Stops	141	veh/h	169	pers/h
Effective Stop Rate	0.21	per veh	0.21	per pers
Proportion Queued	0.36		0.36	
Performance Index	14.5		14.5	
Cost (Total)	156.53	$/h	156.53	$/h
Fuel Consumption (Total)	17.5	gal/h		
Carbon Dioxide (Total)	158.7	kg/h		
Hydrocarbons (Total)	0.016	kg/h		
Carbon Monoxide (Total)	0.207	kg/h		
NOx (Total)	0.456	kg/h		

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	328,364	veh/y	394,036	pers/y
Delay	448	veh-h/y	538	pers-h/y
Effective Stops	67,627	veh/y	81,152	pers/y
Travel Distance	105,910	veh-mi/y	127,092	pers-mi/y
Travel Time	3,575	veh-h/y	4,290	pers-h/y
Cost	75,134	$/y	75,134	$/y
Fuel Consumption	8,411	gal/y		
Carbon Dioxide	76,183	kg/y		
Hydrocarbons	7	kg/y		
Carbon Monoxide	99	kg/y		
NOx	219	kg/y		

INTERSECTION SUMMARY

Site: 101 [2 - RNDBT - CR 98 & Russell Blvd - Yr 2040 AM]

New Site
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Travel Speed (Average)	29.1	mph	29.1	mph
Travel Distance (Total)	347.4	veh-mi/h	416.9	pers-mi/h
Travel Time (Total)	11.9	veh-h/h	14.3	pers-h/h
Demand Flows (Total)	1090	veh/h	1308	pers/h
Percent Heavy Vehicles (Demand)	10.5	%		
Degree of Saturation	0.314			
Practical Spare Capacity	170.7	%		
Effective Intersection Capacity	3470	veh/h		
Control Delay (Total)	1.94	veh-h/h	2.33	pers-h/h
Control Delay (Average)	6.4	sec	6.4	sec
Control Delay (Worst Lane)	7.5	sec		
Control Delay (Worst Movement)	7.5	sec	7.5	sec
Geometric Delay (Average)	0.0	sec		
Stop-Line Delay (Average)	6.4	sec		
Idling Time (Average)	3.7	sec		
Intersection Level of Service (LOS)	LOS A			
95% Back of Queue - Vehicles (Worst Lane)	2.1	veh		
95% Back of Queue - Distance (Worst Lane)	56.9	ft		
Queue Storage Ratio (Worst Lane)	0.03			
Total Effective Stops	388	veh/h	466	pers/h
Effective Stop Rate	0.36	per veh	0.36	per pers
Proportion Queued	0.50		0.50	
Performance Index	27.2		27.2	
Cost (Total)	260.46	$/h	260.46	$/h
Fuel Consumption (Total)	29.2	gal/h		
Carbon Dioxide (Total)	264.5	kg/h		
Hydrocarbons (Total)	0.026	kg/h		
Carbon Monoxide (Total)	0.345	kg/h		
NOx (Total)	0.788	kg/h		

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	523,091	veh/y	627,709	pers/y
Delay	930	veh-h/y	1,116	pers-h/y
Effective Stops	186,232	veh/y	223,478	pers/y
Travel Distance	166,750	veh-mi/y	200,100	pers-mi/y
Travel Time	5,723	veh-h/y	6,868	pers-h/y
Cost	125,020	$/y	125,020	$/y
Fuel Consumption	14,008	gal/y		
Carbon Dioxide	126,942	kg/y		
Hydrocarbons	13	kg/y		
Carbon Monoxide	165	kg/y		
NOx	378	kg/y		

INTERSECTION SUMMARY

Site: 101 [2 - RNDBT - CR 98 & Russell Blvd - Yr 2040 PM]

New Site
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Travel Speed (Average)	27.5	mph	27.5	mph
Travel Distance (Total)	395.8	veh-mi/h	474.9	pers-mi/h
Travel Time (Total)	14.4	veh-h/h	17.3	pers-h/h
Demand Flows (Total)	1227	veh/h	1473	pers/h
Percent Heavy Vehicles (Demand)	10.0	%		
Degree of Saturation	0.532			
Practical Spare Capacity	59.8	%		
Effective Intersection Capacity	2307	veh/h		
Control Delay (Total)	2.73	veh-h/h	3.28	pers-h/h
Control Delay (Average)	8.0	sec	8.0	sec
Control Delay (Worst Lane)	9.3	sec		
Control Delay (Worst Movement)	9.3	sec	9.3	sec
Geometric Delay (Average)	0.0	sec		
Stop-Line Delay (Average)	8.0	sec		
Idling Time (Average)	4.9	sec		
Intersection Level of Service (LOS)	LOS A			
95% Back of Queue - Vehicles (Worst Lane)	4.4	veh		
95% Back of Queue - Distance (Worst Lane)	118.4	ft		
Queue Storage Ratio (Worst Lane)	0.06			
Total Effective Stops	521	veh/h	625	pers/h
Effective Stop Rate	0.42	per veh	0.42	per pers
Proportion Queued	0.58		0.58	
Performance Index	34.6		34.6	
Cost (Total)	302.98	$/h	302.98	$/h
Fuel Consumption (Total)	32.7	gal/h		
Carbon Dioxide (Total)	296.4	kg/h		
Hydrocarbons (Total)	0.029	kg/h		
Carbon Monoxide (Total)	0.382	kg/h		
NOx (Total)	0.862	kg/h		

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	589,091	veh/y	706,909	pers/y
Delay	1,310	veh-h/y	1,572	pers-h/y
Effective Stops	250,114	veh/y	300,137	pers/y
Travel Distance	189,963	veh-mi/y	227,955	pers-mi/y
Travel Time	6,919	veh-h/y	8,302	pers-h/y
Cost	145,431	$/y	145,431	$/y
Fuel Consumption	15,712	gal/y		
Carbon Dioxide	142,273	kg/y		
Hydrocarbons	14	kg/y		
Carbon Monoxide	184	kg/y		
NOx	414	kg/y		

INTERSECTION SUMMARY

Site: 101 [2 - SIGNAL - CR 98 & Russell Blvd - Year 2020 AM]

New Site
Signals - Pretimed Isolated Cycle Time = 100 seconds (Optimum Cycle Time - Minimum Delay)

Intersection Performance - Hourly Values						
Performance Measure	**Vehicles**		**Pedestrians**		**Persons**	
Travel Speed (Average)	25.5	mph	1.3	mph	19.5	mph
Travel Distance (Total)	220.3	veh-mi/h	4.5	ped-mi/h	268.8	pers-mi/h
Travel Time (Total)	8.6	veh-h/h	3.4	ped-h/h	13.8	pers-h/h
Demand Flows (Total)	608	veh/h	217	ped/h	947	pers/h
Percent Heavy Vehicles (Demand)	10.5	%				
Degree of Saturation	0.303		0.050			
Practical Spare Capacity	197.2	%				
Effective Intersection Capacity	2008	veh/h				
Control Delay (Total)	3.90	veh-h/h	1.92	ped-h/h	6.59	pers-h/h
Control Delay (Average)	23.1	sec	31.7	sec	25.1	sec
Control Delay (Worst Lane)	44.9	sec				
Control Delay (Worst Movement)	44.9	sec	41.5	sec	44.9	sec
Geometric Delay (Average)	0.0	sec				
Stop-Line Delay (Average)	23.1	sec				
Idling Time (Average)	19.4	sec				
Intersection Level of Service (LOS)	LOS C		LOS D			
95% Back of Queue - Vehicles (Worst Lane)	6.0	veh				
95% Back of Queue - Distance (Worst Lane)	165.1	ft				
Queue Storage Ratio (Worst Lane)	0.11					
Total Effective Stops	387	veh/h	173	ped/h	638	pers/h
Effective Stop Rate	0.64	per veh	0.79	per ped	0.67	per pers
Proportion Queued	0.79		0.79		0.79	
Performance Index	57.3		4.4		61.8	
Cost (Total)	193.54	$/h	35.86	$/h	229.40	$/h
Fuel Consumption (Total)	20.0	gal/h				
Carbon Dioxide (Total)	181.5	kg/h				
Hydrocarbons (Total)	0.018	kg/h				
Carbon Monoxide (Total)	0.251	kg/h				
NOx (Total)	0.605	kg/h				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Intersection Performance - Annual Values						
Performance Measure	**Vehicles**		**Pedestrians**		**Persons**	
Demand Flows (Total)	291,818	veh/y	104,348	ped/y	454,530	pers/y
Delay	1,871	veh-h/y	920	ped-h/y	3,165	pers-h/y
Effective Stops	185,972	veh/y	82,883	ped/y	306,050	pers/y
Travel Distance	105,741	veh-mi/y	2,154	ped-mi/y	129,043	pers-mi/y
Travel Time	4,145	veh-h/y	1,655	ped-h/y	6,629	pers-h/y
Cost	92,900	$/y	17,211	$/y	110,111	$/y
Fuel Consumption	9,615	gal/y				
Carbon Dioxide	87,116	kg/y				
Hydrocarbons	9	kg/y				
Carbon Monoxide	120	kg/y				
NOx	290	kg/y				

INTERSECTION SUMMARY

Site: 101 [2 - SIGNAL - CR 98 & Russell Blvd - Year 2020 PM]

New Site
Signals - Pretimed Isolated Cycle Time = 100 seconds (Optimum Cycle Time - Minimum Delay)

Intersection Performance - Hourly Values						
Performance Measure	**Vehicles**		**Pedestrians**		**Persons**	
Travel Speed (Average)	25.7	mph	1.3	mph	20.3	mph
Travel Distance (Total)	249.2	veh-mi/h	4.5	ped-mi/h	303.5	pers-mi/h
Travel Time (Total)	9.7	veh-h/h	3.3	ped-h/h	15.0	pers-h/h
Demand Flows (Total)	684	veh/h	217	ped/h	1038	pers/h
Percent Heavy Vehicles (Demand)	10.0	%				
Degree of Saturation	0.367		0.050			
Practical Spare Capacity	145.5	%				
Effective Intersection Capacity	1866	veh/h				
Control Delay (Total)	4.30	veh-h/h	1.80	ped-h/h	6.96	pers-h/h
Control Delay (Average)	22.6	sec	29.8	sec	24.1	sec
Control Delay (Worst Lane)	45.7	sec				
Control Delay (Worst Movement)	45.7	sec	41.5	sec	45.7	sec
Geometric Delay (Average)	0.0	sec				
Stop-Line Delay (Average)	22.6	sec				
Idling Time (Average)	19.0	sec				
Intersection Level of Service (LOS)	LOS C		LOS C			
95% Back of Queue - Vehicles (Worst Lane)	8.6	veh				
95% Back of Queue - Distance (Worst Lane)	232.8	ft				
Queue Storage Ratio (Worst Lane)	0.16					
Total Effective Stops	419	veh/h	165	ped/h	667	pers/h
Effective Stop Rate	0.61	per veh	0.76	per ped	0.64	per pers
Proportion Queued	0.76		0.76		0.76	
Performance Index	61.7		4.2		66.0	
Cost (Total)	211.70	$/h	34.62	$/h	246.31	$/h
Fuel Consumption (Total)	21.8	gal/h				
Carbon Dioxide (Total)	197.7	kg/h				
Hydrocarbons (Total)	0.020	kg/h				
Carbon Monoxide (Total)	0.279	kg/h				
NOx (Total)	0.634	kg/h				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Intersection Performance - Annual Values						
Performance Measure	**Vehicles**		**Pedestrians**		**Persons**	
Demand Flows (Total)	328,364	veh/y	104,348	ped/y	498,384	pers/y
Delay	2,064	veh-h/y	863	ped-h/y	3,340	pers-h/y
Effective Stops	200,965	veh/y	78,961	ped/y	320,119	pers/y
Travel Distance	119,618	veh-mi/y	2,154	ped-mi/y	145,695	pers-mi/y
Travel Time	4,658	veh-h/y	1,598	ped-h/y	7,187	pers-h/y
Cost	101,614	$/y	16,616	$/y	118,230	$/y
Fuel Consumption	10,478	gal/y				
Carbon Dioxide	94,892	kg/y				
Hydrocarbons	10	kg/y				
Carbon Monoxide	134	kg/y				
NOx	304	kg/y				

INTERSECTION SUMMARY

Site: 101 [2 - SIGNAL - CR 98 & Russell Blvd - Year 2040 AM]

New Site
Signals - Pretimed Isolated Cycle Time = 100 seconds (Optimum Cycle Time - Minimum Delay)

Intersection Performance - Hourly Values						
Performance Measure	**Vehicles**		**Pedestrians**		**Persons**	
Travel Speed (Average)	24.1	mph	1.3	mph	20.7	mph
Travel Distance (Total)	394.9	veh-mi/h	4.5	ped-mi/h	478.3	pers-mi/h
Travel Time (Total)	16.4	veh-h/h	3.4	ped-h/h	23.1	pers-h/h
Demand Flows (Total)	1090	veh/h	217	ped/h	1525	pers/h
Percent Heavy Vehicles (Demand)	10.5	%				
Degree of Saturation	0.553		0.050			
Practical Spare Capacity	62.7	%				
Effective Intersection Capacity	1971	veh/h				
Control Delay (Total)	7.89	veh-h/h	1.91	ped-h/h	11.38	pers-h/h
Control Delay (Average)	26.1	sec	31.6	sec	26.9	sec
Control Delay (Worst Lane)	45.7	sec				
Control Delay (Worst Movement)	45.7	sec	41.5	sec	45.7	sec
Geometric Delay (Average)	0.0	sec				
Stop-Line Delay (Average)	26.1	sec				
Idling Time (Average)	21.8	sec				
Intersection Level of Service (LOS)	LOS C		LOS D			
95% Back of Queue - Vehicles (Worst Lane)	12.7	veh				
95% Back of Queue - Distance (Worst Lane)	346.7	ft				
Queue Storage Ratio (Worst Lane)	0.24					
Total Effective Stops	788	veh/h	172	ped/h	1117	pers/h
Effective Stop Rate	0.72	per veh	0.79	per ped	0.73	per pers
Proportion Queued	0.86		0.79		0.85	
Performance Index	115.2		4.4		119.6	
Cost (Total)	368.58	$/h	35.75	$/h	404.33	$/h
Fuel Consumption (Total)	37.3	gal/h				
Carbon Dioxide (Total)	338.1	kg/h				
Hydrocarbons (Total)	0.034	kg/h				
Carbon Monoxide (Total)	0.461	kg/h				
NOx (Total)	1.133	kg/h				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Intersection Performance - Annual Values						
Performance Measure	**Vehicles**		**Pedestrians**		**Persons**	
Demand Flows (Total)	523,091	veh/y	104,348	ped/y	732,057	pers/y
Delay	3,787	veh-h/y	915	ped-h/y	5,460	pers-h/y
Effective Stops	378,142	veh/y	82,622	ped/y	536,392	pers/y
Travel Distance	189,538	veh-mi/y	2,154	ped-mi/y	229,600	pers-mi/y
Travel Time	7,861	veh-h/y	1,650	ped-h/y	11,084	pers-h/y
Cost	176,918	$/y	17,162	$/y	194,081	$/y
Fuel Consumption	17,914	gal/y				
Carbon Dioxide	162,280	kg/y				
Hydrocarbons	17	kg/y				
Carbon Monoxide	221	kg/y				
NOx	544	kg/y				

INTERSECTION SUMMARY

Site: 101 [2 - SIGNAL - CR 98 & Russell Blvd - Year 2040 PM]

New Site
Signals - Pretimed Isolated Cycle Time = 100 seconds (Optimum Cycle Time - Minimum Delay)

Intersection Performance - Hourly Values						
Performance Measure	**Vehicles**		**Pedestrians**		**Persons**	
Travel Speed (Average)	22.9	mph	1.4	mph	20.3	mph
Travel Distance (Total)	447.1	veh-mi/h	4.5	ped-mi/h	541.0	pers-mi/h
Travel Time (Total)	19.5	veh-h/h	3.3	ped-h/h	26.7	pers-h/h
Demand Flows (Total)	1227	veh/h	217	ped/h	1690	pers/h
Percent Heavy Vehicles (Demand)	10.0	%				
Degree of Saturation	0.737		0.050			
Practical Spare Capacity	22.1	%				
Effective Intersection Capacity	1666	veh/h				
Control Delay (Total)	9.81	veh-h/h	1.76	ped-h/h	13.53	pers-h/h
Control Delay (Average)	28.8	sec	29.2	sec	28.8	sec
Control Delay (Worst Lane)	70.0	sec				
Control Delay (Worst Movement)	70.0	sec	41.5	sec	70.0	sec
Geometric Delay (Average)	0.0	sec				
Stop-Line Delay (Average)	28.8	sec				
Idling Time (Average)	24.5	sec				
Intersection Level of Service (LOS)	LOS C		LOS C			
95% Back of Queue - Vehicles (Worst Lane)	20.3	veh				
95% Back of Queue - Distance (Worst Lane)	548.1	ft				
Queue Storage Ratio (Worst Lane)	0.37					
Total Effective Stops	868	veh/h	162	ped/h	1204	pers/h
Effective Stop Rate	0.71	per veh	0.75	per ped	0.71	per pers
Proportion Queued	0.83		0.75		0.81	
Performance Index	131.6		4.2		135.8	
Cost (Total)	419.47	$/h	34.24	$/h	453.72	$/h
Fuel Consumption (Total)	41.1	gal/h				
Carbon Dioxide (Total)	372.3	kg/h				
Hydrocarbons (Total)	0.039	kg/h				
Carbon Monoxide (Total)	0.517	kg/h				
NOx (Total)	1.195	kg/h				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Intersection Performance - Annual Values						
Performance Measure	**Vehicles**		**Pedestrians**		**Persons**	
Demand Flows (Total)	589,091	veh/y	104,348	ped/y	811,257	pers/y
Delay	4,708	veh-h/y	846	ped-h/y	6,496	pers-h/y
Effective Stops	416,671	veh/y	77,916	ped/y	577,921	pers/y
Travel Distance	214,593	veh-mi/y	2,154	ped-mi/y	259,666	pers-mi/y
Travel Time	9,360	veh-h/y	1,581	ped-h/y	12,813	pers-h/y
Cost	201,347	$/y	16,437	$/y	217,784	$/y
Fuel Consumption	19,740	gal/y				
Carbon Dioxide	178,710	kg/y				
Hydrocarbons	19	kg/y				
Carbon Monoxide	248	kg/y				
NOx	574	kg/y				

CR 98 and Hutchinson Intersection

Summary of Life Cycle Cost Analyses

Total Life Cycle Costs (2020 - 2040)	Roundabout Alternative		Traffic Signal Alternative	
Safety	**Total Predicted Crashes**	**Safety Cost**	**Total Predicted Crashes**	**Safety Cost**
	Total Costs of Predicted Crashes	**$680,200**	Total Costs of Predicted Crashes	**$8,800,000**
Delay	**Total Intersection Delay (person-hrs)**	**Delay Cost**	**Total Intersection Delay (person-hrs)**	**Delay Cost**
Total Person (in Vehicle) Delay	7,620	**$ 100,000**	26,928	**$ 330,000**
Fuel and GHG Cost	**Fuel and Green House Gas Cost**		**Fuel and Green House Gas Cost**	
		$ 537,143		**$ 653,175**
Operation and Maintenance	**Operation and Maintenance**	**O&M Cost**	**Operation and Maintenance**	**O&M Cost**
Annual Cost of Signal Retiming		$ -	Signal Retiming	$ 6,795
Annual Cost of Power	Intersection Illumination	$ 3,398	Power for Signal	$ 8,154
Annual Cost of Maintenance	Landscaping Maintenance	$ 66,593	Signal Maintenance Costs (power outage, detection, etc.)	$ 67,952
	Total Annual Operation and Maintenance Costs	**$ 69,990**	Total Annual Operation and Maintenance Costs	**$ 82,901**
Initial Capital Costs	**Design & Construction**	**Capital Cost**	**Design & Construction**	**Capital Cost**
		$ 2,784,000		**$ 2,759,000**
Total Life Cycle Costs		**$4,171,334**		**$12,625,076**

***Delay cost is based upon an average of the AM and PM peak hours.**

Roundabout Alternative to Signal Alternative

Life Cycle Costs	Roundabout Alternative		Traffic Signal Alternative
Collision and Mobility Costs			
Collision Costs of predicted crashes	$681,000		$8,800,000
Delay Costs	$100,000		$330,000
Fuel and GHG Costs	$538,000		$654,000
Project Costs including design, construction and maintenance			
Operations and Maintenance Costs	$79,000		$94,000
Project Costs	$2,784,000		$2,759,000
Total Life Cycle Costs	**$4,182,000**		**$12,637,000**

Intersection Control Evaluation
Collision Cost Analysis and B/C

-- Fill in tan boxes along with 'Area' --

County	Rte	Postmile	Location Description
YOLO	CR 98	-	CR 98 & Hutchison Dr/ Primate Dr

Area
- (•) Rural
- ( ) Suburban
- ( ) Urban

Intersection Types:
F - Four-Legged
M - Multi-Legged
S - Offsett -Tee
Y - "Y" Wye

Existing Condition	# of Years for Analysis	Rate Group
Stop Control (Minor Leg), Type F, M or S	20	I2

Year 2020 ADT (x1000)		Future ADT (x1000)			
Mainline	Cross St	Mainline	Cross St	Average ADT	VCF
6.1	2.3	10.9	4.2	11.8	1.40

Est. Capital Cost (x1000) for Desired Improvement

Desired Improvement	Const	R/W	Total
Yield Control (Roundabout 1-Lane)	$ 2,697	$ 87	$ 2,784
Yield Control (Roundabout 2-Lane)			$ -
Traffic Signal, Type F, M or S	$ 2,641	$ 118	$ 2,759
All Way Stop, Type F, M or S		.	$ -

Existing Collision Data

Number of Years	3	Total Collisions	3
Injury	1	PDO	2
Fatal	0	Fat + Inj	1

	Collision Cost (x1000)					B/C
	Existing Condition		Desired Improvement		Projected Savings	
1	Stop Control (Minor Leg), Type F, M or S	$9,901	Yield Control (Roundabout 1-Lane)	$680	$9,221	3.31
2	Stop Control (Minor Leg), Type F, M or S	$9,901	Traffic Signal, Type F, M or S	$8,800	$1,101	0.40

NOTE: Only average collision costs are used for calculation purposes.

INTERSECTION SUMMARY

Site: 101 [3 - RNDBT - CR 98 & Hutchinson Dr - Yr 2020 AM]

New Site
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Travel Speed (Average)	25.8	mph	25.8	mph
Travel Distance (Total)	137.5	veh-mi/h	165.0	pers-mi/h
Travel Time (Total)	5.3	veh-h/h	6.4	pers-h/h
Demand Flows (Total)	557	veh/h	668	pers/h
Percent Heavy Vehicles (Demand)	10.5	%		
Degree of Saturation	0.243			
Practical Spare Capacity	249.8	%		
Effective Intersection Capacity	2292	veh/h		
Control Delay (Total)	0.71	veh-h/h	0.85	pers-h/h
Control Delay (Average)	4.6	sec	4.6	sec
Control Delay (Worst Lane)	4.8	sec		
Control Delay (Worst Movement)	4.8	sec	4.8	sec
Geometric Delay (Average)	0.0	sec		
Stop-Line Delay (Average)	4.6	sec		
Idling Time (Average)	3.2	sec		
Intersection Level of Service (LOS)	LOS A			
95% Back of Queue - Vehicles (Worst Lane)	1.5	veh		
95% Back of Queue - Distance (Worst Lane)	39.7	ft		
Queue Storage Ratio (Worst Lane)	0.03			
Total Effective Stops	71	veh/h	85	pers/h
Effective Stop Rate	0.13	per veh	0.13	per pers
Proportion Queued	0.27		0.27	
Performance Index	9.9		9.9	
Cost (Total)	113.72	$/h	113.72	$/h
Fuel Consumption (Total)	12.2	gal/h		
Carbon Dioxide (Total)	110.6	kg/h		
Hydrocarbons (Total)	0.011	kg/h		
Carbon Monoxide (Total)	0.137	kg/h		
NOx (Total)	0.307	kg/h		

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	267,273	veh/y	320,727	pers/y
Delay	340	veh-h/y	408	pers-h/y
Effective Stops	34,005	veh/y	40,806	pers/y
Travel Distance	66,006	veh-mi/y	79,207	pers-mi/y
Travel Time	2,558	veh-h/y	3,069	pers-h/y
Cost	54,586	$/y	54,586	$/y
Fuel Consumption	5,859	gal/y		
Carbon Dioxide	53,072	kg/y		
Hydrocarbons	5	kg/y		
Carbon Monoxide	66	kg/y		
NOx	147	kg/y		

INTERSECTION SUMMARY

Site: 101 [3 - RNDBT - CR 98 & Hutchinson Dr - Yr 2020 PM]

New Site
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Travel Speed (Average)	26.4	mph	26.4	mph
Travel Distance (Total)	158.2	veh-mi/h	189.9	pers-mi/h
Travel Time (Total)	6.0	veh-h/h	7.2	pers-h/h
Demand Flows (Total)	644	veh/h	773	pers/h
Percent Heavy Vehicles (Demand)	10.0	%		
Degree of Saturation	0.204			
Practical Spare Capacity	315.8	%		
Effective Intersection Capacity	3152	veh/h		
Control Delay (Total)	0.80	veh-h/h	0.95	pers-h/h
Control Delay (Average)	4.4	sec	4.4	sec
Control Delay (Worst Lane)	4.9	sec		
Control Delay (Worst Movement)	4.9	sec	4.9	sec
Geometric Delay (Average)	0.0	sec		
Stop-Line Delay (Average)	4.4	sec		
Idling Time (Average)	2.8	sec		
Intersection Level of Service (LOS)	LOS A			
95% Back of Queue - Vehicles (Worst Lane)	1.2	veh		
95% Back of Queue - Distance (Worst Lane)	31.2	ft		
Queue Storage Ratio (Worst Lane)	0.02			
Total Effective Stops	112	veh/h	134	pers/h
Effective Stop Rate	0.17	per veh	0.17	per pers
Proportion Queued	0.31		0.31	
Performance Index	12.6		12.6	
Cost (Total)	141.94	$/h	141.94	$/h
Fuel Consumption (Total)	15.6	gal/h		
Carbon Dioxide (Total)	141.5	kg/h		
Hydrocarbons (Total)	0.014	kg/h		
Carbon Monoxide (Total)	0.183	kg/h		
NOx (Total)	0.384	kg/h		

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	309,273	veh/y	371,127	pers/y
Delay	382	veh-h/y	458	pers-h/y
Effective Stops	53,597	veh/y	64,317	pers/y
Travel Distance	75,947	veh-mi/y	91,137	pers-mi/y
Travel Time	2,882	veh-h/y	3,459	pers-h/y
Cost	68,132	$/y	68,132	$/y
Fuel Consumption	7,509	gal/y		
Carbon Dioxide	67,931	kg/y		
Hydrocarbons	7	kg/y		
Carbon Monoxide	88	kg/y		
NOx	184	kg/y		

INTERSECTION SUMMARY

Site: 101 [3 - RNDBT - CR 98 & Hutchinson Dr - Yr 2040 AM]

New Site
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Travel Speed (Average)	24.2	mph	24.2	mph
Travel Distance (Total)	245.8	veh-mi/h	295.0	pers-mi/h
Travel Time (Total)	10.2	veh-h/h	12.2	pers-h/h
Demand Flows (Total)	995	veh/h	1195	pers/h
Percent Heavy Vehicles (Demand)	11.2	%		
Degree of Saturation	0.455			
Practical Spare Capacity	86.6	%		
Effective Intersection Capacity	2186	veh/h		
Control Delay (Total)	1.91	veh-h/h	2.29	pers-h/h
Control Delay (Average)	6.9	sec	6.9	sec
Control Delay (Worst Lane)	7.5	sec		
Control Delay (Worst Movement)	7.5	sec	7.5	sec
Geometric Delay (Average)	0.0	sec		
Stop-Line Delay (Average)	6.9	sec		
Idling Time (Average)	4.6	sec		
Intersection Level of Service (LOS)	LOS A			
95% Back of Queue - Vehicles (Worst Lane)	3.6	veh		
95% Back of Queue - Distance (Worst Lane)	96.3	ft		
Queue Storage Ratio (Worst Lane)	0.06			
Total Effective Stops	271	veh/h	325	pers/h
Effective Stop Rate	0.27	per veh	0.27	per pers
Proportion Queued	0.44		0.44	
Performance Index	22.9		22.9	
Cost (Total)	219.21	$/h	219.21	$/h
Fuel Consumption (Total)	23.1	gal/h		
Carbon Dioxide (Total)	209.0	kg/h		
Hydrocarbons (Total)	0.021	kg/h		
Carbon Monoxide (Total)	0.254	kg/h		
NOx (Total)	0.615	kg/h		

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	477,818	veh/y	573,382	pers/y
Delay	916	veh-h/y	1,100	pers-h/y
Effective Stops	129,970	veh/y	155,964	pers/y
Travel Distance	118,003	veh-mi/y	141,603	pers-mi/y
Travel Time	4,886	veh-h/y	5,863	pers-h/y
Cost	105,220	$/y	105,220	$/y
Fuel Consumption	11,067	gal/y		
Carbon Dioxide	100,334	kg/y		
Hydrocarbons	10	kg/y		
Carbon Monoxide	122	kg/y		
NOx	295	kg/y		

INTERSECTION SUMMARY

Site: 101 [3 - RNDBT - CR 98 & Hutchinson Dr - Yr 2040 PM]

New Site
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Travel Speed (Average)	24.8	mph	24.8	mph
Travel Distance (Total)	282.7	veh-mi/h	339.3	pers-mi/h
Travel Time (Total)	11.4	veh-h/h	13.7	pers-h/h
Demand Flows (Total)	1151	veh/h	1381	pers/h
Percent Heavy Vehicles (Demand)	10.0	%		
Degree of Saturation	0.402			
Practical Spare Capacity	111.7	%		
Effective Intersection Capacity	2866	veh/h		
Control Delay (Total)	2.11	veh-h/h	2.53	pers-h/h
Control Delay (Average)	6.6	sec	6.6	sec
Control Delay (Worst Lane)	7.6	sec		
Control Delay (Worst Movement)	7.6	sec	7.6	sec
Geometric Delay (Average)	0.0	sec		
Stop-Line Delay (Average)	6.6	sec		
Idling Time (Average)	4.1	sec		
Intersection Level of Service (LOS)	LOS A			
95% Back of Queue - Vehicles (Worst Lane)	2.8	veh		
95% Back of Queue - Distance (Worst Lane)	74.3	ft		
Queue Storage Ratio (Worst Lane)	0.05			
Total Effective Stops	390	veh/h	468	pers/h
Effective Stop Rate	0.34	per veh	0.34	per pers
Proportion Queued	0.48		0.48	
Performance Index	28.5		28.5	
Cost (Total)	268.54	$/h	268.54	$/h
Fuel Consumption (Total)	28.9	gal/h		
Carbon Dioxide (Total)	261.2	kg/h		
Hydrocarbons (Total)	0.027	kg/h		
Carbon Monoxide (Total)	0.334	kg/h		
NOx (Total)	0.718	kg/h		

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	552,545	veh/y	663,055	pers/y
Delay	1,011	veh-h/y	1,213	pers-h/y
Effective Stops	187,251	veh/y	224,701	pers/y
Travel Distance	135,703	veh-mi/y	162,844	pers-mi/y
Travel Time	5,476	veh-h/y	6,571	pers-h/y
Cost	128,900	$/y	128,900	$/y
Fuel Consumption	13,858	gal/y		
Carbon Dioxide	125,352	kg/y		
Hydrocarbons	13	kg/y		
Carbon Monoxide	160	kg/y		
NOx	345	kg/y		

INTERSECTION SUMMARY

Site: 101 [3 - SIGNAL - CR 98 & Primate Dr & Hutchison Dr - Year 2020 AM]

New Site
Signals - Pretimed Isolated Cycle Time = 98 seconds (Optimum Cycle Time - Minimum Delay)

Intersection Performance - Hourly Values						
Performance Measure	**Vehicles**		**Pedestrians**		**Persons**	
Travel Speed (Average)	21.3	mph	1.3	mph	15.6	mph
Travel Distance (Total)	150.6	veh-mi/h	4.2	ped-mi/h	185.0	pers-mi/h
Travel Time (Total)	7.1	veh-h/h	3.4	ped-h/h	11.9	pers-h/h
Demand Flows (Total)	557	veh/h	217	ped/h	886	pers/h
Percent Heavy Vehicles (Demand)	11.2	%				
Degree of Saturation	0.336		0.049			
Practical Spare Capacity	167.8	%				
Effective Intersection Capacity	1657	veh/h				
Control Delay (Total)	3.71	veh-h/h	1.94	ped-h/h	6.39	pers-h/h
Control Delay (Average)	24.0	sec	32.1	sec	26.0	sec
Control Delay (Worst Lane)	33.7	sec				
Control Delay (Worst Movement)	33.7	sec	40.5	sec	40.5	sec
Geometric Delay (Average)	0.0	sec				
Stop-Line Delay (Average)	24.0	sec				
Idling Time (Average)	20.6	sec				
Intersection Level of Service (LOS)	LOS C		LOS D			
95% Back of Queue - Vehicles (Worst Lane)	7.2	veh				
95% Back of Queue - Distance (Worst Lane)	194.0	ft				
Queue Storage Ratio (Worst Lane)	0.37					
Total Effective Stops	364	veh/h	175	ped/h	612	pers/h
Effective Stop Rate	0.65	per veh	0.80	per ped	0.69	per pers
Proportion Queued	0.80		0.80		0.80	
Performance Index	54.0		4.4		58.4	
Cost (Total)	152.50	$/h	35.19	$/h	187.69	$/h
Fuel Consumption (Total)	13.9	gal/h				
Carbon Dioxide (Total)	125.7	kg/h				
Hydrocarbons (Total)	0.013	kg/h				
Carbon Monoxide (Total)	0.166	kg/h				
NOx (Total)	0.448	kg/h				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Intersection Performance - Annual Values						
Performance Measure	**Vehicles**		**Pedestrians**		**Persons**	
Demand Flows (Total)	267,273	veh/y	104,348	ped/y	425,075	pers/y
Delay	1,781	veh-h/y	930	ped-h/y	3,067	pers-h/y
Effective Stops	174,899	veh/y	83,774	ped/y	293,653	pers/y
Travel Distance	72,289	veh-mi/y	2,036	ped-mi/y	88,782	pers-mi/y
Travel Time	3,392	veh-h/y	1,624	ped-h/y	5,694	pers-h/y
Cost	73,201	$/y	16,890	$/y	90,091	$/y
Fuel Consumption	6,656	gal/y				
Carbon Dioxide	60,352	kg/y				
Hydrocarbons	6	kg/y				
Carbon Monoxide	80	kg/y				
NOx	215	kg/y				

INTERSECTION SUMMARY

Site: 101 [3 - SIGNAL - CR 98 & Primate Dr & Hutchison Dr - Year 2020 PM]

New Site
Signals - Pretimed Isolated Cycle Time = 98 seconds (Optimum Cycle Time - Minimum Delay)

Intersection Performance - Hourly Values						
Performance Measure	**Vehicles**		**Pedestrians**		**Persons**	
Travel Speed (Average)	22.8	mph	1.3	mph	17.3	mph
Travel Distance (Total)	178.3	veh-mi/h	4.2	ped-mi/h	218.2	pers-mi/h
Travel Time (Total)	7.8	veh-h/h	3.3	ped-h/h	12.7	pers-h/h
Demand Flows (Total)	644	veh/h	217	ped/h	991	pers/h
Percent Heavy Vehicles (Demand)	10.0	%				
Degree of Saturation	0.359		0.049			
Practical Spare Capacity	151.0	%				
Effective Intersection Capacity	1797	veh/h				
Control Delay (Total)	4.05	veh-h/h	1.81	ped-h/h	6.66	pers-h/h
Control Delay (Average)	22.6	sec	29.9	sec	24.2	sec
Control Delay (Worst Lane)	44.6	sec				
Control Delay (Worst Movement)	44.6	sec	40.5	sec	44.6	sec
Geometric Delay (Average)	0.0	sec				
Stop-Line Delay (Average)	22.6	sec				
Idling Time (Average)	19.5	sec				
Intersection Level of Service (LOS)	LOS C		LOS C			
95% Back of Queue - Vehicles (Worst Lane)	8.2	veh				
95% Back of Queue - Distance (Worst Lane)	220.2	ft				
Queue Storage Ratio (Worst Lane)	0.57					
Total Effective Stops	409	veh/h	168	ped/h	659	pers/h
Effective Stop Rate	0.63	per veh	0.77	per ped	0.67	per pers
Proportion Queued	0.78		0.77		0.78	
Performance Index	69.9		4.2		74.1	
Cost (Total)	178.74	$/h	33.85	$/h	212.59	$/h
Fuel Consumption (Total)	18.1	gal/h				
Carbon Dioxide (Total)	163.8	kg/h				
Hydrocarbons (Total)	0.017	kg/h				
Carbon Monoxide (Total)	0.222	kg/h				
NOx (Total)	0.551	kg/h				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Intersection Performance - Annual Values						
Performance Measure	**Vehicles**		**Pedestrians**		**Persons**	
Demand Flows (Total)	309,273	veh/y	104,348	ped/y	475,475	pers/y
Delay	1,942	veh-h/y	868	ped-h/y	3,198	pers-h/y
Effective Stops	196,228	veh/y	80,840	ped/y	316,313	pers/y
Travel Distance	85,593	veh-mi/y	2,036	ped-mi/y	104,748	pers-mi/y
Travel Time	3,758	veh-h/y	1,562	ped-h/y	6,072	pers-h/y
Cost	85,793	$/y	16,249	$/y	102,042	$/y
Fuel Consumption	8,683	gal/y				
Carbon Dioxide	78,603	kg/y				
Hydrocarbons	8	kg/y				
Carbon Monoxide	106	kg/y				
NOx	265	kg/y				

INTERSECTION SUMMARY

Site: 101 [3 - SIGNAL - CR 98 & Primate Dr & Hutchison Dr - Year 2040 AM]

New Site
Signals - Pretimed Isolated Cycle Time = 102 seconds (Optimum Cycle Time - Minimum Delay)

Intersection Performance - Hourly Values						
Performance Measure	**Vehicles**		**Pedestrians**		**Persons**	
Travel Speed (Average)	16.6	mph	1.2	mph	14.2	mph
Travel Distance (Total)	269.2	veh-mi/h	4.2	ped-mi/h	327.2	pers-mi/h
Travel Time (Total)	16.2	veh-h/h	3.5	ped-h/h	23.0	pers-h/h
Demand Flows (Total)	995	veh/h	217	ped/h	1412	pers/h
Percent Heavy Vehicles (Demand)	11.2	%				
Degree of Saturation	0.838		0.051			
Practical Spare Capacity	7.4	%				
Effective Intersection Capacity	1188	veh/h				
Control Delay (Total)	10.25	veh-h/h	2.05	ped-h/h	14.36	pers-h/h
Control Delay (Average)	37.1	sec	34.0	sec	36.6	sec
Control Delay (Worst Lane)	56.0	sec				
Control Delay (Worst Movement)	56.0	sec	42.5	sec	56.0	sec
Geometric Delay (Average)	0.0	sec				
Stop-Line Delay (Average)	37.1	sec				
Idling Time (Average)	32.3	sec				
Intersection Level of Service (LOS)	LOS D		LOS D			
95% Back of Queue - Vehicles (Worst Lane)	18.5	veh				
95% Back of Queue - Distance (Worst Lane)	498.6	ft				
Queue Storage Ratio (Worst Lane)	0.78					
Total Effective Stops	792	veh/h	176	ped/h	1127	pers/h
Effective Stop Rate	0.80	per veh	0.81	per ped	0.80	per pers
Proportion Queued	0.88		0.81		0.87	
Performance Index	125.7		4.5		130.2	
Cost (Total)	339.16	$/h	36.38	$/h	375.55	$/h
Fuel Consumption (Total)	27.9	gal/h				
Carbon Dioxide (Total)	252.5	kg/h				
Hydrocarbons (Total)	0.027	kg/h				
Carbon Monoxide (Total)	0.321	kg/h				
NOx (Total)	0.898	kg/h				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Intersection Performance - Annual Values						
Performance Measure	**Vehicles**		**Pedestrians**		**Persons**	
Demand Flows (Total)	477,818	veh/y	104,348	ped/y	677,730	pers/y
Delay	4,921	veh-h/y	985	ped-h/y	6,890	pers-h/y
Effective Stops	380,314	veh/y	84,591	ped/y	540,967	pers/y
Travel Distance	129,195	veh-mi/y	2,036	ped-mi/y	157,070	pers-mi/y
Travel Time	7,798	veh-h/y	1,679	ped-h/y	11,037	pers-h/y
Cost	162,799	$/y	17,464	$/y	180,263	$/y
Fuel Consumption	13,375	gal/y				
Carbon Dioxide	121,201	kg/y				
Hydrocarbons	13	kg/y				
Carbon Monoxide	154	kg/y				
NOx	431	kg/y				

INTERSECTION SUMMARY

Site: 101 [3 - SIGNAL - CR 98 & Primate Dr & Hutchison Dr - Year 2040 PM]

New Site
Signals - Pretimed Isolated Cycle Time = 98 seconds (Optimum Cycle Time - Minimum Delay)

Intersection Performance - Hourly Values						
Performance Measure	**Vehicles**		**Pedestrians**		**Persons**	
Travel Speed (Average)	21.1	mph	1.3	mph	18.1	mph
Travel Distance (Total)	318.9	veh-mi/h	4.2	ped-mi/h	386.9	pers-mi/h
Travel Time (Total)	15.1	veh-h/h	3.3	ped-h/h	21.4	pers-h/h
Demand Flows (Total)	1151	veh/h	217	ped/h	1599	pers/h
Percent Heavy Vehicles (Demand)	10.0	%				
Degree of Saturation	0.636		0.049			
Practical Spare Capacity	41.4	%				
Effective Intersection Capacity	1809	veh/h				
Control Delay (Total)	8.33	veh-h/h	1.81	ped-h/h	11.80	pers-h/h
Control Delay (Average)	26.0	sec	29.9	sec	26.6	sec
Control Delay (Worst Lane)	52.7	sec				
Control Delay (Worst Movement)	52.7	sec	40.5	sec	52.7	sec
Geometric Delay (Average)	0.0	sec				
Stop-Line Delay (Average)	26.0	sec				
Idling Time (Average)	22.5	sec				
Intersection Level of Service (LOS)	LOS C		LOS C			
95% Back of Queue - Vehicles (Worst Lane)	17.6	veh				
95% Back of Queue - Distance (Worst Lane)	474.9	ft				
Queue Storage Ratio (Worst Lane)	1.16					
Total Effective Stops	843	veh/h	168	ped/h	1180	pers/h
Effective Stop Rate	0.73	per veh	0.77	per ped	0.74	per pers
Proportion Queued	0.86		0.77		0.85	
Performance Index	137.8		4.2		142.0	
Cost (Total)	346.46	$/h	33.85	$/h	380.31	$/h
Fuel Consumption (Total)	34.2	gal/h				
Carbon Dioxide (Total)	309.9	kg/h				
Hydrocarbons (Total)	0.031	kg/h				
Carbon Monoxide (Total)	0.411	kg/h				
NOx (Total)	1.055	kg/h				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Intersection Performance - Annual Values						
Performance Measure	**Vehicles**		**Pedestrians**		**Persons**	
Demand Flows (Total)	552,545	veh/y	104,348	ped/y	767,402	pers/y
Delay	3,997	veh-h/y	868	ped-h/y	5,665	pers-h/y
Effective Stops	404,605	veh/y	80,840	ped/y	566,366	pers/y
Travel Distance	153,050	veh-mi/y	2,036	ped-mi/y	185,695	pers-mi/y
Travel Time	7,241	veh-h/y	1,562	ped-h/y	10,251	pers-h/y
Cost	166,301	$/y	16,249	$/y	182,550	$/y
Fuel Consumption	16,439	gal/y				
Carbon Dioxide	148,765	kg/y				
Hydrocarbons	15	kg/y				
Carbon Monoxide	197	kg/y				
NOx	506	kg/y				

Appendix D

Traffic Operations Analysis Worksheets for Existing, Opening and Design Year Conditions

Appendix Table D1: Traffic Signal – Opening Year Peak Hour Intersection Operations

#	Intersection	Control Type[1,2]	Target LOS	AM Peak Hour		PM Peak Hour	
				Delay	LOS	Delay	LOS
1	CR 98 & W. Covell Blvd	Signal	C	16.9	B	19.5	B
2	CR 98 & Russell Blvd	Signal	C	17.0	B	16.3	B
3	CR 98 & Primate Dr/ Hutchinson Dr	Signal	C	11.9	B	16.7	B

Notes:

1. AWSC = All Way Stop Control; TWSC = Two Way Stop Control; RNDBT = Roundabout

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

Appendix Table D2: Traffic Signal – Opening Year Peak Hour Queueing Operations

Int. #	Signalized Intersection/Approach	Year 2020 95th Percentile Queue (ft)		Proposed Storage
		AM Peak Hour	PM Peak Hour	
1	***County Road 98 & County Road 31***			
	Eastbound Left	91	71	200
	Eastbound Thru/Right	109	121	
	Westbound Left	44	43	150
	Westbound Thru/Right	83	131	
	Northbound Left	65	36	150
	Northbound Thru/Right	64	107	
	Southbound Left	36	43	100
	Southbound Thru/Right	80	78	
2	***County Road 98 & County Road 32***			
	Eastbound Left	24	47	100
	Eastbound Thru/Right	82	62	
	Westbound Left	59	46	125
	Westbound Thru/Right	54	77	
	Northbound Left	28	54	150
	Northbound Thru/Right	77	103	
	Southbound Left	35	29	100
	Southbound Thru/Right	102	73	
3	***County Road 98 & Hutchison Drive***			
	Eastbound Left/Thru/Right	17	68	
	Westbound Left/Thru/Right	62	61	
	Northbound Left	25	12	100
	Northbound Thru/Right	72	105	
	Southbound Left	66	50	175
	Southbound Thru/Right	55	81	

Note:

1. ***Bold*** Text indicates queues that exceed available storage

Appendix Table D3: Traffic Signal – Design Year Peak Hour Queuing Operations

Int. #	Signalized Intersection/Approach	Year 2040 95th Percentile Queue (ft)		Proposed Storage
		AM Peak Hour	PM Peak Hour	
1	***County Road 98 & County Road 31***			
	Eastbound Left	191	188	200
	Eastbound Thru/Right	240	285	
	Westbound Left	75	129	150
	Westbound Thru/Right	148	288	
	Northbound Left	127	94	150
	Northbound Thru/Right	144	279	
	Southbound Left	82	80	100
	Southbound Thru/Right	162	196	
2	***County Road 98 & County Road 32***			
	Eastbound Left	48	75	100
	Eastbound Thru/Right	163	116	
	Westbound Left	102	91	125
	Westbound Thru/Right	79	158	
	Northbound Left	65	137	150
	Northbound Thru/Right	210	381	
	Southbound Left	71	59	100
	Southbound Thru/Right	193	156	
3	***County Road 98 & Hutchison Drive***			
	Eastbound Left/Thru/Right	40	141	
	Westbound Left/Thru/Right	49	152	
	Northbound Left	41	22	100
	Northbound Thru/Right	83	314	
	Southbound Left	165	98	175
	Southbound Thru/Right	66	169	

Note:

1. ***Bold*** Text indicates queues that exceed available storage

Appendix Table D4: Roundabout – Opening Year Peak Hour Intersection Operations

#	Intersection	Control Type[1,2]	Target LOS	AM Peak Hour		PM Peak Hour	
				Delay	LOS	Delay	LOS
1	CR 98 & W. Covell Blvd	RNDBT	C	5.5	A	6.3	A
2	CR 98 & Russell Blvd	RNDBT	C	4.4	A	4.9	A
3	CR 98 & Primate Dr/ Hutchinson Dr	RNDBT	C	4.6	A	4.4	A

lotes:

1. AWSC = All Way Stop Control; TWSC = Two Way Stop Control; RNDBT = Roundabout

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

Appendix Table D5: Roundabout – Opening Year Peak Hour Queueing Operations

Int. #	Roundabout Intersection/Approach	Year 2020 95th Percentile Queue (ft)	
		AM Peak Hour	PM Peak Hour
1	***County Road 98 & County Road 31***		
	Eastbound Left/Thru/Right	49	57
	Westbound Left/Thru/Right	23	46
	Northbound Left/Thru/Right	23	40
	Southbound Left/Thru/Right	20	26
2	***County Road 98 & County Road 32***		
	Eastbound Left/Thru/Right	20	11
	Westbound Left/Thru/Right	11	20
	Northbound Left/Thru/Right	25	46
	Southbound Left/Thru/Right	23	16
3	***County Road 98 & Hutchison Drive***		
	Eastbound Left/Thru/Right	1	10
	Westbound Left/Thru/Right	7	18
	Northbound Left/Thru/Right	23	31
	Southbound Left/Thru/Right	40	23

Notes :

Bold text indicates queues that exceed available storage

Appendix Table D6: Roundabout – Design Year Peak Hour Queueing Operations

Int. #	Roundabout Intersection/Approach	Year 2040 95th Percentile Queue (ft)	
		AM Peak Hour	PM Peak Hour
1	***County Road 98 & County Road 31***		
	Eastbound Left/Thru/Right	110	141
	Westbound Left/Thru/Right	46	122
	Northbound Left/Thru/Right	62	155
	Southbound Left/Thru/Right	49	74
2	***County Road 98 & County Road 32***		
	Eastbound Left/Thru/Right	51	24
	Westbound Left/Thru/Right	24	54
	Northbound Left/Thru/Right	57	118
	Southbound Left/Thru/Right	51	37
3	***County Road 98 & Hutchison Drive***		
	Eastbound Left/Thru/Right	3	24
	Westbound Left/Thru/Right	16	46
	Northbound Left/Thru/Right	51	74
	Southbound Left/Thru/Right	96	50

Notes :

Bold text indicates queues that exceed available storage

Intersection	
Intersection Delay, s/veh	10.2
Intersection LOS	B

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Lane Configurations												
Traffic Vol, veh/h	0	33	187	23	0	23	100	12	0	14	67	19
Future Vol, veh/h	0	33	187	23	0	23	100	12	0	14	67	19
Peak Hour Factor	0.92	0.88	0.88	0.88	0.92	0.88	0.88	0.88	0.92	0.88	0.88	0.88
Heavy Vehicles, %	2	10	10	10	2	10	10	10	2	10	10	10
Mvmt Flow	0	38	213	26	0	26	114	14	0	16	76	22
Number of Lanes	0	0	1	0	0	0	1	0	0	1	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	2
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	2	2	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	2	2	1
HCM Control Delay	10.9	9.6	9.6
HCM LOS	B	A	A

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1	SBLn2
Vol Left, %	100%	0%	14%	17%	100%	0%
Vol Thru, %	0%	78%	77%	74%	0%	82%
Vol Right, %	0%	22%	9%	9%	0%	18%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	14	86	243	135	16	96
LT Vol	14	0	33	23	16	0
Through Vol	0	67	187	100	0	79
RT Vol	0	19	23	12	0	17
Lane Flow Rate	16	98	276	153	18	109
Geometry Grp	7	7	2	2	7	7
Degree of Util (X)	0.028	0.156	0.376	0.216	0.032	0.174
Departure Headway (Hd)	6.401	5.738	4.905	5.071	6.382	5.75
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	554	619	729	701	556	617
Service Time	4.199	3.535	2.971	3.149	4.177	3.545
HCM Lane V/C Ratio	0.029	0.158	0.379	0.218	0.032	0.177
HCM Control Delay	9.4	9.6	10.9	9.6	9.4	9.8
HCM Lane LOS	A	A	B	A	A	A
HCM 95th-tile Q	0.1	0.5	1.8	0.8	0.1	0.6

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Movement	SBU	SBL	SBT	SBR
Lane Configurations				
Traffic Vol, veh/h	0	16	79	17
Future Vol, veh/h	0	16	79	17
Peak Hour Factor	0.92	0.88	0.88	0.88
Heavy Vehicles, %	2	10	10	10
Mvmt Flow	0	18	90	19
Number of Lanes	0	1	1	0

Approach	SB
Opposing Approach	NB
Opposing Lanes	2
Conflicting Approach Left	WB
Conflicting Lanes Left	1
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	9.7
HCM LOS	A

Intersection	
Intersection Delay, s/veh	9
Intersection LOS	A

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Lane Configurations												
Traffic Vol, veh/h	0	9	49	58	0	39	23	4	0	10	112	30
Future Vol, veh/h	0	9	49	58	0	39	23	4	0	10	112	30
Peak Hour Factor	0.92	0.88	0.88	0.88	0.92	0.88	0.88	0.88	0.92	0.88	0.88	0.88
Heavy Vehicles, %	2	10	10	10	2	10	10	10	2	10	10	10
Mvmt Flow	0	10	56	66	0	44	26	5	0	11	127	34
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	1
HCM Control Delay	8.7	8.8	9.1
HCM LOS	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	7%	8%	59%	6%
Vol Thru, %	74%	42%	35%	91%
Vol Right, %	20%	50%	6%	4%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	152	116	66	142
LT Vol	10	9	39	8
Through Vol	112	49	23	129
RT Vol	30	58	4	5
Lane Flow Rate	173	132	75	161
Geometry Grp	1	1	1	1
Degree of Util (X)	0.224	0.172	0.107	0.216
Departure Headway (Hd)	4.669	4.686	5.12	4.823
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	767	763	698	742
Service Time	2.709	2.728	3.167	2.864
HCM Lane V/C Ratio	0.226	0.173	0.107	0.217
HCM Control Delay	9.1	8.7	8.8	9.2
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.9	0.6	0.4	0.8

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Movement	SBU	SBL	SBT	SBR
Lane Configurations				
Traffic Vol, veh/h	0	8	129	5
Future Vol, veh/h	0	8	129	5
Peak Hour Factor	0.92	0.88	0.88	0.88
Heavy Vehicles, %	2	13	10	10
Mvmt Flow	0	9	147	6
Number of Lanes	0	0	1	0

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

Intersection	
Int Delay, s/veh	3.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	3	2	2	3	33	11	7	103	22	86	143	21
Future Vol, veh/h	3	2	2	3	33	11	7	103	22	86	143	21
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	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	10	10	10	10	10	10	10	12	10	10	10	10
Mvmt Flow	3	2	2	3	38	13	8	117	25	98	163	24

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	540	528	174	517	527	130	186	0	0	142	0	0
Stage 1	370	370	-	145	145	-	-	-	-	-	-	-
Stage 2	170	158	-	372	382	-	-	-	-	-	-	-
Critical Hdwy	7.2	6.6	6.3	7.2	6.6	6.3	4.2	-	-	4.2	-	-
Critical Hdwy Stg 1	6.2	5.6	-	6.2	5.6	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.2	5.6	-	6.2	5.6	-	-	-	-	-	-	-
Follow-up Hdwy	3.59	4.09	3.39	3.59	4.09	3.39	2.29	-	-	2.29	-	-
Pot Cap-1 Maneuver	440	445	849	456	445	899	1342	-	-	1393	-	-
Stage 1	634	606	-	839	762	-	-	-	-	-	-	-
Stage 2	813	752	-	632	599	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	378	407	849	424	407	899	1342	-	-	1393	-	-
Mov Cap-2 Maneuver	378	407	-	424	407	-	-	-	-	-	-	-
Stage 1	630	558	-	834	757	-	-	-	-	-	-	-
Stage 2	757	747	-	578	552	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	13	13.7	0.4	2.7
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1342	-	-	460	468	1393	-	-
HCM Lane V/C Ratio	0.006	-	-	0.017	0.114	0.07	-	-
HCM Control Delay (s)	7.7	0	-	13	13.7	7.8	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.4	0.2	-	-

Intersection	
Intersection Delay, s/veh	13.1
Intersection LOS	B

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Lane Configurations												
Traffic Vol, veh/h	0	63	222	10	0	17	189	19	0	11	121	43
Future Vol, veh/h	0	63	222	10	0	17	189	19	0	11	121	43
Peak Hour Factor	0.92	0.88	0.88	0.88	0.92	0.88	0.88	0.88	0.92	0.88	0.88	0.88
Heavy Vehicles, %	2	10	10	10	2	10	10	10	2	10	10	10
Mvmt Flow	0	72	252	11	0	19	215	22	0	13	138	49
Number of Lanes	0	0	1	0	0	0	1	0	0	1	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	2
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	2	2	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	2	2	1
HCM Control Delay	14.8	12.7	12.3
HCM LOS	B	B	B

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1	SBLn2
Vol Left, %	100%	0%	21%	8%	100%	0%
Vol Thru, %	0%	74%	75%	84%	0%	71%
Vol Right, %	0%	26%	3%	8%	0%	29%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	11	164	295	225	14	114
LT Vol	11	0	63	17	14	0
Through Vol	0	121	222	189	0	81
RT Vol	0	43	10	19	0	33
Lane Flow Rate	12	186	335	256	16	130
Geometry Grp	7	7	2	2	7	7
Degree of Util (X)	0.025	0.334	0.525	0.406	0.032	0.235
Departure Headway (Hd)	7.149	6.451	5.637	5.717	7.259	6.541
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	499	555	637	626	491	547
Service Time	4.914	4.216	3.693	3.778	5.031	4.312
HCM Lane V/C Ratio	0.024	0.335	0.526	0.409	0.033	0.238
HCM Control Delay	10.1	12.4	14.8	12.7	10.3	11.3
HCM Lane LOS	B	B	B	B	B	B
HCM 95th-tile Q	0.1	1.5	3.1	2	0.1	0.9

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Movement	SBU	SBL	SBT	SBR
Lane Configurations				
Traffic Vol, veh/h	0	14	81	33
Future Vol, veh/h	0	14	81	33
Peak Hour Factor	0.92	0.88	0.88	0.88
Heavy Vehicles, %	2	10	10	10
Mvmt Flow	0	16	92	38
Number of Lanes	0	1	1	0

Approach	SB
Opposing Approach	NB
Opposing Lanes	2
Conflicting Approach Left	WB
Conflicting Lanes Left	1
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	11.2
HCM LOS	B

Intersection	
Intersection Delay, s/veh	9.8
Intersection LOS	A

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Lane Configurations												
Traffic Vol, veh/h	0	20	40	9	0	32	63	11	0	32	164	71
Future Vol, veh/h	0	20	40	9	0	32	63	11	0	32	164	71
Peak Hour Factor	0.92	0.88	0.88	0.88	0.92	0.88	0.88	0.88	0.92	0.88	0.88	0.88
Heavy Vehicles, %	2	10	10	10	2	10	10	10	2	10	10	10
Mvmt Flow	0	23	45	10	0	36	72	13	0	36	186	81
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	1
HCM Control Delay	8.9	9.3	10.5
HCM LOS	A	A	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	12%	29%	30%	12%
Vol Thru, %	61%	58%	59%	79%
Vol Right, %	27%	13%	10%	9%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	267	69	106	95
LT Vol	32	20	32	11
Through Vol	164	40	63	75
RT Vol	71	9	11	9
Lane Flow Rate	303	78	120	108
Geometry Grp	1	1	1	1
Degree of Util (X)	0.386	0.113	0.172	0.147
Departure Headway (Hd)	4.582	5.188	5.145	4.906
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	783	687	694	728
Service Time	2.623	3.249	3.202	2.959
HCM Lane V/C Ratio	0.387	0.114	0.173	0.148
HCM Control Delay	10.5	8.9	9.3	8.8
HCM Lane LOS	B	A	A	A
HCM 95th-tile Q	1.8	0.4	0.6	0.5

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Movement	SBU	SBL	SBT	SBR
Lane Configurations				
Traffic Vol, veh/h	0	11	75	9
Future Vol, veh/h	0	11	75	9
Peak Hour Factor	0.92	0.88	0.88	0.88
Heavy Vehicles, %	2	10	10	10
Mvmt Flow	0	13	85	10
Number of Lanes	0	0	1	0

Approach	SB
Opposing Approach	NB
Opposing Lanes	1
Conflicting Approach Left	WB
Conflicting Lanes Left	1
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	8.8
HCM LOS	A

Intersection	
Int Delay, s/veh	4.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	24	33	6	21	2	73	2	181	6	32	119	5
Future Vol, veh/h	24	33	6	21	2	73	2	181	6	32	119	5
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	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	10	10	10	10	10	10	10	10	10	10	10	10
Mvmt Flow	27	38	7	24	2	83	2	206	7	36	135	6

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	467	428	138	447	428	209	141	0	0	213	0	0
Stage 1	211	211	-	214	214	-	-	-	-	-	-	-
Stage 2	256	217	-	233	214	-	-	-	-	-	-	-
Critical Hdwy	7.2	6.6	6.3	7.2	6.6	6.3	4.2	-	-	4.2	-	-
Critical Hdwy Stg 1	6.2	5.6	-	6.2	5.6	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.2	5.6	-	6.2	5.6	-	-	-	-	-	-	-
Follow-up Hdwy	3.59	4.09	3.39	3.59	4.09	3.39	2.29	-	-	2.29	-	-
Pot Cap-1 Maneuver	493	507	889	508	507	812	1394	-	-	1311	-	-
Stage 1	773	713	-	770	711	-	-	-	-	-	-	-
Stage 2	731	709	-	752	711	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	430	491	889	463	491	812	1394	-	-	1311	-	-
Mov Cap-2 Maneuver	430	491	-	463	491	-	-	-	-	-	-	-
Stage 1	771	692	-	768	710	-	-	-	-	-	-	-
Stage 2	653	708	-	685	690	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	13.7	11.2	0.1	1.6
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1394	-	-	485	689	1311	-	-
HCM Lane V/C Ratio	0.002	-	-	0.148	0.158	0.028	-	-
HCM Control Delay (s)	7.6	0	-	13.7	11.2	7.8	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.5	0.6	0.1	-	-

Intersection	
Intersection Delay, s/veh	36.4
Intersection LOS	E

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Lane Configurations												
Traffic Vol, veh/h	0	56	320	39	0	39	171	21	0	28	135	38
Future Vol, veh/h	0	56	320	39	0	39	171	21	0	28	135	38
Peak Hour Factor	0.92	0.88	0.88	0.88	0.92	0.88	0.88	0.88	0.92	0.88	0.88	0.88
Heavy Vehicles, %	2	54	10	10	2	10	10	10	2	71	10	10
Mvmt Flow	0	64	364	44	0	44	194	24	0	32	153	43
Number of Lanes	0	0	1	0	0	0	1	0	0	1	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	2
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	2	2	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	2	2	1
HCM Control Delay	66.1	19.1	16.8
HCM LOS	F	C	C

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1	SBLn2
Vol Left, %	100%	0%	13%	17%	100%	0%
Vol Thru, %	0%	78%	77%	74%	0%	82%
Vol Right, %	0%	22%	9%	9%	0%	18%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	28	173	415	231	35	210
LT Vol	28	0	56	39	35	0
Through Vol	0	135	320	171	0	173
RT Vol	0	38	39	21	0	37
Lane Flow Rate	32	197	472	262	40	239
Geometry Grp	7	7	2	2	7	7
Degree of Util (X)	0.088	0.445	0.989	0.543	0.096	0.532
Departure Headway (Hd)	9.901	8.145	7.55	7.447	8.678	8.032
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	362	442	486	483	412	449
Service Time	7.664	5.907	5.55	5.507	6.437	5.79
HCM Lane V/C Ratio	0.088	0.446	0.971	0.542	0.097	0.532
HCM Control Delay	13.6	17.3	66.1	19.1	12.4	19.6
HCM Lane LOS	B	C	F	C	B	C
HCM 95th-tile Q	0.3	2.2	13	3.2	0.3	3.1

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Movement	SBU	SBL	SBT	SBR
Lane Configurations				
Traffic Vol, veh/h	0	35	173	37
Future Vol, veh/h	0	35	173	37
Peak Hour Factor	0.92	0.88	0.88	0.88
Heavy Vehicles, %	2	10	10	10
Mvmt Flow	0	40	197	42
Number of Lanes	0	1	1	0

Approach	SB
Opposing Approach	NB
Opposing Lanes	2
Conflicting Approach Left	WB
Conflicting Lanes Left	1
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	18.6
HCM LOS	C

Intersection	
Intersection Delay, s/veh	15.7
Intersection LOS	C

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Lane Configurations												
Traffic Vol, veh/h	0	18	99	117	0	79	46	8	0	20	226	60
Future Vol, veh/h	0	18	99	117	0	79	46	8	0	20	226	60
Peak Hour Factor	0.92	0.88	0.88	0.88	0.92	0.88	0.88	0.88	0.92	0.88	0.88	0.88
Heavy Vehicles, %	2	10	10	10	2	10	10	10	2	10	12	10
Mvmt Flow	0	20	113	133	0	90	52	9	0	23	257	68
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	1
HCM Control Delay	14.5	12.7	17.1
HCM LOS	B	B	C

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	7%	8%	59%	6%
Vol Thru, %	74%	42%	35%	91%
Vol Right, %	20%	50%	6%	3%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	306	234	133	286
LT Vol	20	18	79	16
Through Vol	226	99	46	260
RT Vol	60	117	8	10
Lane Flow Rate	348	266	151	325
Geometry Grp	1	1	1	1
Degree of Util (X)	0.58	0.459	0.288	0.554
Departure Headway (Hd)	6.007	6.208	6.856	6.137
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	602	580	523	588
Service Time	4.052	4.255	4.911	4.182
HCM Lane V/C Ratio	0.578	0.459	0.289	0.553
HCM Control Delay	17.1	14.5	12.7	16.6
HCM Lane LOS	C	B	B	C
HCM 95th-tile Q	3.7	2.4	1.2	3.4

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Movement	SBU	SBL	SBT	SBR
Lane Configurations				
Traffic Vol, veh/h	0	16	260	10
Future Vol, veh/h	0	16	260	10
Peak Hour Factor	0.92	0.88	0.88	0.88
Heavy Vehicles, %	2	10	10	13
Mvmt Flow	0	18	295	11
Number of Lanes	0	0	1	0

Approach	SB
Opposing Approach	NB
Opposing Lanes	1
Conflicting Approach Left	WB
Conflicting Lanes Left	1
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	16.6
HCM LOS	C

Intersection	
Int Delay, s/veh	6.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	6	4	4	6	66	22	14	207	44	173	288	42
Future Vol, veh/h	6	4	4	6	66	22	14	207	44	173	288	42
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	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	10	10	10	10	10	10	10	15	10	10	10	10
Mvmt Flow	7	5	5	7	75	25	16	235	50	197	327	48

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1086	1061	351	1041	1060	260	375	0	0	285	0	0
Stage 1	744	744	-	292	292	-	-	-	-	-	-	-
Stage 2	342	317	-	749	768	-	-	-	-	-	-	-
Critical Hdwy	7.2	6.6	6.3	7.2	6.6	6.3	4.2	-	-	4.2	-	-
Critical Hdwy Stg 1	6.2	5.6	-	6.2	5.6	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.2	5.6	-	6.2	5.6	-	-	-	-	-	-	-
Follow-up Hdwy	3.59	4.09	3.39	3.59	4.09	3.39	2.29	-	-	2.29	-	-
Pot Cap-1 Maneuver	187	217	675	201	217	760	1141	-	-	1233	-	-
Stage 1	394	410	-	699	657	-	-	-	-	-	-	-
Stage 2	657	640	-	392	400	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	100	170	675	163	170	760	1141	-	-	1233	-	-
Mov Cap-2 Maneuver	100	170	-	163	170	-	-	-	-	-	-	-
Stage 1	387	327	-	687	646	-	-	-	-	-	-	-
Stage 2	552	629	-	306	319	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	30.5	39.6	0.4	2.9
HCM LOS	D	E		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1141	-	-	157	207	1233	-	-
HCM Lane V/C Ratio	0.014	-	-	0.101	0.516	0.159	-	-
HCM Control Delay (s)	8.2	0	-	30.5	39.6	8.5	0	-
HCM Lane LOS	A	A	-	D	E	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.3	2.6	0.6	-	-

Intersection	
Intersection Delay, s/veh	127.4
Intersection LOS	F

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Lane Configurations												
Traffic Vol, veh/h	0	108	380	17	0	29	323	32	0	22	244	87
Future Vol, veh/h	0	108	380	17	0	29	323	32	0	22	244	87
Peak Hour Factor	0.92	0.88	0.88	0.88	0.92	0.88	0.88	0.88	0.92	0.88	0.88	0.88
Heavy Vehicles, %	2	10	10	10	2	10	10	10	2	10	10	10
Mvmt Flow	0	123	432	19	0	33	367	36	0	25	277	99
Number of Lanes	0	0	1	0	0	0	1	0	0	1	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	2
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	2	2	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	2	2	1
HCM Control Delay	235.7	105.4	68
HCM LOS	F	F	F

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1	SBLn2
Vol Left, %	100%	0%	21%	8%	100%	0%
Vol Thru, %	0%	74%	75%	84%	0%	71%
Vol Right, %	0%	26%	3%	8%	0%	29%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	22	331	505	384	31	249
LT Vol	22	0	108	29	31	0
Through Vol	0	244	380	323	0	177
RT Vol	0	87	17	32	0	72
Lane Flow Rate	25	376	574	436	35	283
Geometry Grp	7	7	2	2	7	7
Degree of Util (X)	0.068	0.958	1.435	1.084	0.1	0.749
Departure Headway (Hd)	11.182	10.457	9.494	10.254	11.685	10.938
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	322	350	390	358	309	334
Service Time	8.882	8.157	7.494	8.254	9.385	8.638
HCM Lane V/C Ratio	0.078	1.074	1.472	1.218	0.113	0.847
HCM Control Delay	14.7	71.5	235.7	105.4	15.7	40.1
HCM Lane LOS	B	F	F	F	C	E
HCM 95th-tile Q	0.2	10.3	27.9	13.9	0.3	5.8

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Movement	SBU	SBL	SBT	SBR
Lane Configurations				
Traffic Vol, veh/h	0	31	177	72
Future Vol, veh/h	0	31	177	72
Peak Hour Factor	0.92	0.88	0.88	0.88
Heavy Vehicles, %	2	10	10	10
Mvmt Flow	0	35	201	82
Number of Lanes	0	1	1	0

Approach	SB
Opposing Approach	NB
Opposing Lanes	2
Conflicting Approach Left	WB
Conflicting Lanes Left	1
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	37.4
HCM LOS	E

Intersection	
Intersection Delay, s/veh	37
Intersection LOS	E

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Lane Configurations												
Traffic Vol, veh/h	0	40	81	18	0	64	127	22	0	64	330	143
Future Vol, veh/h	0	40	81	18	0	64	127	22	0	64	330	143
Peak Hour Factor	0.92	0.88	0.88	0.88	0.92	0.88	0.88	0.88	0.92	0.88	0.88	0.88
Heavy Vehicles, %	2	10	10	10	2	10	10	10	2	10	10	10
Mvmt Flow	0	45	92	20	0	73	144	25	0	73	375	163
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	1
HCM Control Delay	13.8	16.4	59.3
HCM LOS	B	C	F

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	12%	29%	30%	12%
Vol Thru, %	61%	58%	60%	79%
Vol Right, %	27%	13%	10%	9%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	537	139	213	191
LT Vol	64	40	64	22
Through Vol	330	81	127	151
RT Vol	143	18	22	18
Lane Flow Rate	610	158	242	217
Geometry Grp	1	1	1	1
Degree of Util (X)	0.995	0.321	0.474	0.406
Departure Headway (Hd)	5.872	7.309	7.055	6.736
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	616	490	508	532
Service Time	3.926	5.389	5.128	4.812
HCM Lane V/C Ratio	0.99	0.322	0.476	0.408
HCM Control Delay	59.3	13.8	16.4	14.4
HCM Lane LOS	F	B	C	B
HCM 95th-tile Q	14.9	1.4	2.5	2

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Movement	SBU	SBL	SBT	SBR
Lane Configurations				
Traffic Vol, veh/h	0	22	151	18
Future Vol, veh/h	0	22	151	18
Peak Hour Factor	0.92	0.88	0.88	0.88
Heavy Vehicles, %	2	10	10	10
Mvmt Flow	0	25	172	20
Number of Lanes	0	0	1	0

Approach	SB
Opposing Approach	NB
Opposing Lanes	1
Conflicting Approach Left	WB
Conflicting Lanes Left	1
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	14.4
HCM LOS	B

Intersection	
Int Delay, s/veh	11.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	48	66	12	42	4	147	4	384	12	64	240	10
Future Vol, veh/h	48	66	12	42	4	147	4	384	12	64	240	10
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	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	10	10	10	10	10	10	10	12	10	10	10	10
Mvmt Flow	55	75	14	48	5	167	5	436	14	73	273	11

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	962	883	278	920	882	443	284	0	0	450	0	0
Stage 1	424	424	-	452	452	-	-	-	-	-	-	-
Stage 2	538	459	-	468	430	-	-	-	-	-	-	-
Critical Hdwy	7.2	6.6	6.3	7.2	6.6	6.3	4.2	-	-	4.2	-	-
Critical Hdwy Stg 1	6.2	5.6	-	6.2	5.6	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.2	5.6	-	6.2	5.6	-	-	-	-	-	-	-
Follow-up Hdwy	3.59	4.09	3.39	3.59	4.09	3.39	2.29	-	-	2.29	-	-
Pot Cap-1 Maneuver	228	276	742	243	277	598	1234	-	-	1069	-	-
Stage 1	592	574	-	572	557	-	-	-	-	-	-	-
Stage 2	513	553	-	560	570	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	151	252	742	172	253	598	1234	-	-	1069	-	-
Mov Cap-2 Maneuver	151	252	-	172	253	-	-	-	-	-	-	-
Stage 1	589	528	-	569	554	-	-	-	-	-	-	-
Stage 2	365	550	-	433	524	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	51.9	26.4	0.1	1.8
HCM LOS	F	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1234	-	-	211	382	1069	-	-
HCM Lane V/C Ratio	0.004	-	-	0.679	0.574	0.068	-	-
HCM Control Delay (s)	7.9	0	-	51.9	26.4	8.6	0	-
HCM Lane LOS	A	A	-	F	D	A	A	-
HCM 95th %tile Q(veh)	0	-	-	4.2	3.5	0.2	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	36	204	25	25	109	13	16	75	21	18	90	19
Future Volume (veh/h)	36	204	25	25	109	13	16	75	21	18	90	19
Number	5	2	12	1	6	16	3	8	18	7	4	14
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
Adj Sat Flow, veh/h/ln	1234	1727	1900	1727	1727	1900	1111	1727	1900	1727	1727	1900
Adj Flow Rate, veh/h	41	232	28	28	124	15	18	85	24	20	102	22
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	1	1	0
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	54	10	10	10	10	10	71	10	10	10	10	10
Cap, veh/h	55	344	42	200	457	55	24	165	47	41	179	39
Arrive On Green	0.05	0.23	0.23	0.12	0.30	0.30	0.02	0.13	0.13	0.03	0.13	0.13
Sat Flow, veh/h	1175	1513	183	1645	1512	183	1058	1297	366	1645	1378	297
Grp Volume(v), veh/h	41	0	260	28	0	139	18	0	109	20	0	124
Grp Sat Flow(s),veh/h/ln	1175	0	1695	1645	0	1695	1058	0	1663	1645	0	1675
Q Serve(g_s), s	1.2	0.0	5.1	0.5	0.0	2.3	0.6	0.0	2.2	0.4	0.0	2.5
Cycle Q Clear(g_c), s	1.2	0.0	5.1	0.5	0.0	2.3	0.6	0.0	2.2	0.4	0.0	2.5
Prop In Lane	1.00		0.11	1.00		0.11	1.00		0.22	1.00		0.18
Lane Grp Cap(c), veh/h	55	0	385	200	0	512	24	0	212	41	0	217
V/C Ratio(X)	0.75	0.00	0.67	0.14	0.00	0.27	0.74	0.00	0.51	0.48	0.00	0.57
Avail Cap(c_a), veh/h	179	0	1526	251	0	1526	161	0	1405	251	0	1415
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	0.00	1.00
Uniform Delay (d), s/veh	17.0	0.0	12.7	14.2	0.0	9.6	17.5	0.0	14.7	17.4	0.0	14.8
Incr Delay (d2), s/veh	18.1	0.0	2.1	0.3	0.0	0.3	35.6	0.0	1.9	8.5	0.0	2.4
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	0.7	0.0	2.5	0.3	0.0	1.1	0.4	0.0	1.1	0.3	0.0	1.3
LnGrp Delay(d),s/veh	35.1	0.0	14.8	14.5	0.0	9.9	53.1	0.0	16.6	25.8	0.0	17.1
LnGrp LOS	D		B	B		A	D		B	C		B
Approach Vol, veh/h		301			167			127			144	
Approach Delay, s/veh		17.5			10.6			21.8			18.3	
Approach LOS		B			B			C			B	

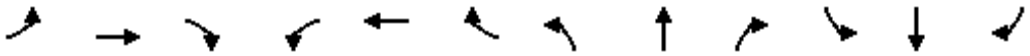
Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	8.9	12.7	5.3	9.2	6.2	15.4	5.4	9.1
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	5.5	32.5	5.5	30.5	5.5	32.5	5.5	30.5
Max Q Clear Time (g_c+I1), s	2.5	7.1	2.6	4.5	3.2	4.3	2.4	4.2
Green Ext Time (p_c), s	0.0	1.3	0.0	0.5	0.0	0.6	0.0	0.5

Intersection Summary	
HCM 2010 Ctrl Delay	16.9
HCM 2010 LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	55	65	44	26	4	11	126	34	9	145	6
Future Volume (veh/h)	10	55	65	44	26	4	11	126	34	9	145	6
Number	5	2	12	1	6	16	3	8	18	7	4	14
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
Adj Sat Flow, veh/h/ln	1727	1727	1900	1727	1727	1900	1727	1703	1900	1727	1725	1900
Adj Flow Rate, veh/h	11	62	74	50	30	5	12	143	39	10	165	7
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	1	1	0
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	10	10	10	10	10	10	10	12	12	10	10	10
Cap, veh/h	196	86	102	131	115	19	218	227	62	197	268	11
Arrive On Green	0.12	0.12	0.12	0.08	0.08	0.08	0.13	0.18	0.18	0.12	0.16	0.16
Sat Flow, veh/h	1645	718	858	1645	1444	241	1645	1289	352	1645	1643	70
Grp Volume(v), veh/h	11	0	136	50	0	35	12	0	182	10	0	172
Grp Sat Flow(s),veh/h/ln	1645	0	1576	1645	0	1685	1645	0	1641	1645	0	1713
Q Serve(g_s), s	0.2	0.0	3.0	1.0	0.0	0.7	0.2	0.0	3.7	0.2	0.0	3.3
Cycle Q Clear(g_c), s	0.2	0.0	3.0	1.0	0.0	0.7	0.2	0.0	3.7	0.2	0.0	3.3
Prop In Lane	1.00		0.54	1.00		0.14	1.00		0.21	1.00		0.04
Lane Grp Cap(c), veh/h	196	0	188	131	0	134	218	0	289	197	0	280
V/C Ratio(X)	0.06	0.00	0.72	0.38	0.00	0.26	0.06	0.00	0.63	0.05	0.00	0.61
Avail Cap(c_a), veh/h	1085	0	1039	1224	0	1253	254	0	1220	254	0	1082
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	0.00	1.00
Uniform Delay (d), s/veh	13.9	0.0	15.1	15.6	0.0	15.4	13.5	0.0	13.6	13.9	0.0	13.9
Incr Delay (d2), s/veh	0.1	0.0	5.2	1.8	0.0	1.0	0.1	0.0	2.3	0.1	0.0	2.2
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	1.6	0.5	0.0	0.4	0.1	0.0	1.8	0.1	0.0	1.7
LnGrp Delay(d),s/veh	14.0	0.0	20.4	17.4	0.0	16.4	13.6	0.0	15.9	14.0	0.0	16.1
LnGrp LOS	B		C	B		B	B		B	B		B
Approach Vol, veh/h		147			85			194			182	
Approach Delay, s/veh		19.9			17.0			15.7			15.9	
Approach LOS		B			B			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		8.7	9.2	10.3		7.3	8.8	10.8
Change Period (Y+Rc), s		4.5	4.5	4.5		4.5	4.5	4.5
Max Green Setting (Gmax), s		23.5	5.5	22.5		26.5	5.5	26.5
Max Q Clear Time (g_c+I1), s		5.0	2.2	5.3		3.0	2.2	5.7
Green Ext Time (p_c), s		0.6	0.0	0.7		0.3	0.0	0.8

Intersection Summary	
HCM 2010 Ctrl Delay	17.0
HCM 2010 LOS	B



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	3	2	2	3	37	12	8	116	25	97	161	24
Future Volume (vph)	3	2	2	3	37	12	8	116	25	97	161	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.96			0.97		1.00	0.97		1.00	0.98	
Flt Protected		0.98			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1626			1668		1641	1621		1641	1694	
Flt Permitted		0.98			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1626			1668		1641	1621		1641	1694	
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	3	2	2	3	42	14	9	132	28	110	183	27
RTOR Reduction (vph)	0	2	0	0	13	0	0	7	0	0	4	0
Lane Group Flow (vph)	0	5	0	0	46	0	9	153	0	110	206	0
Heavy Vehicles (%)	10%	10%	10%	10%	10%	10%	10%	15%	10%	10%	10%	10%
Turn Type	Split	NA		Split	NA		Prot	NA		Prot	NA	
Protected Phases	2	2		6	6		3	8		7	4	
Permitted Phases												
Actuated Green, G (s)		0.7			2.3		0.6	11.0		6.6	17.0	
Effective Green, g (s)		0.7			2.3		0.6	11.0		6.6	17.0	
Actuated g/C Ratio		0.02			0.06		0.02	0.28		0.17	0.44	
Clearance Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		29			99		25	461		280	746	
v/s Ratio Prot		c0.00			c0.03		0.01	0.09		c0.07	c0.12	
v/s Ratio Perm												
v/c Ratio		0.17			0.46		0.36	0.33		0.39	0.28	
Uniform Delay, d1		18.7			17.6		18.8	10.9		14.2	6.9	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		2.8			3.4		8.7	0.4		0.9	0.2	
Delay (s)		21.5			21.0		27.5	11.3		15.1	7.1	
Level of Service		C			C		C	B		B	A	
Approach Delay (s)		21.5			21.0			12.2			9.8	
Approach LOS		C			C			B			A	

Intersection Summary			
HCM 2000 Control Delay	11.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	38.6	Sum of lost time (s)	18.0
Intersection Capacity Utilization	29.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	69	243	11	19	207	21	12	136	48	16	92	38
Future Volume (veh/h)	69	243	11	19	207	21	12	136	48	16	92	38
Number	5	2	12	1	6	16	3	8	18	7	4	14
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
Adj Sat Flow, veh/h/ln	1727	1727	1900	1727	1727	1900	1727	1727	1900	1727	1727	1900
Adj Flow Rate, veh/h	78	276	12	22	235	24	14	155	55	18	105	43
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	1	1	0
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	10	10	10	10	10	10	10	10	10	10	10	10
Cap, veh/h	176	375	16	175	351	36	169	221	79	159	205	84
Arrive On Green	0.11	0.23	0.23	0.11	0.23	0.23	0.10	0.18	0.18	0.10	0.18	0.18
Sat Flow, veh/h	1645	1643	71	1645	1542	157	1645	1219	432	1645	1166	477
Grp Volume(v), veh/h	78	0	288	22	0	259	14	0	210	18	0	148
Grp Sat Flow(s),veh/h/ln	1645	0	1715	1645	0	1699	1645	0	1651	1645	0	1643
Q Serve(g_s), s	2.1	0.0	7.2	0.6	0.0	6.5	0.4	0.0	5.6	0.5	0.0	3.8
Cycle Q Clear(g_c), s	2.1	0.0	7.2	0.6	0.0	6.5	0.4	0.0	5.6	0.5	0.0	3.8
Prop In Lane	1.00		0.04	1.00		0.09	1.00		0.26	1.00		0.29
Lane Grp Cap(c), veh/h	176	0	391	175	0	387	169	0	300	159	0	289
V/C Ratio(X)	0.44	0.00	0.74	0.13	0.00	0.67	0.08	0.00	0.70	0.11	0.00	0.51
Avail Cap(c_a), veh/h	265	0	1198	194	0	1114	194	0	1082	194	0	1077
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	0.00	1.00
Uniform Delay (d), s/veh	19.5	0.0	16.7	18.8	0.0	16.4	18.9	0.0	17.9	19.2	0.0	17.4
Incr Delay (d2), s/veh	1.8	0.0	2.7	0.3	0.0	2.0	0.2	0.0	3.0	0.3	0.0	1.4
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	1.0	0.0	3.7	0.3	0.0	3.2	0.2	0.0	2.8	0.2	0.0	1.8
LnGrp Delay(d),s/veh	21.2	0.0	19.4	19.1	0.0	18.4	19.1	0.0	20.8	19.5	0.0	18.8
LnGrp LOS	C		B	B		B	B		C	B		B
Approach Vol, veh/h		366			281			224			166	
Approach Delay, s/veh		19.8			18.4			20.7			18.9	
Approach LOS		B			B			C			B	

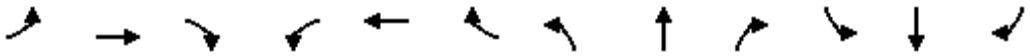
Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.5	15.1	9.3	12.7	9.5	15.1	9.0	12.9
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	5.5	32.5	5.5	30.5	7.5	30.5	5.5	30.5
Max Q Clear Time (g_c+I1), s	2.6	9.2	2.4	5.8	4.1	8.5	2.5	7.6
Green Ext Time (p_c), s	0.0	1.4	0.0	0.7	0.0	1.2	0.0	1.0

Intersection Summary	
HCM 2010 Ctrl Delay	19.5
HCM 2010 LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	22	45	10	36	71	12	36	184	80	12	84	10
Future Volume (veh/h)	22	45	10	36	71	12	36	184	80	12	84	10
Number	5	2	12	1	6	16	3	8	18	7	4	14
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
Adj Sat Flow, veh/h/ln	1727	1727	1900	1727	1727	1900	1727	1727	1900	1727	1727	1900
Adj Flow Rate, veh/h	25	51	11	41	81	14	41	209	91	14	95	11
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	1	1	0
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	10	10	10	10	10	10	10	10	10	10	10	10
Cap, veh/h	129	108	23	163	142	25	207	288	126	175	354	41
Arrive On Green	0.08	0.08	0.08	0.10	0.10	0.10	0.13	0.25	0.25	0.11	0.23	0.23
Sat Flow, veh/h	1645	1378	297	1645	1435	248	1645	1142	497	1645	1520	176
Grp Volume(v), veh/h	25	0	62	41	0	95	41	0	300	14	0	106
Grp Sat Flow(s),veh/h/ln	1645	0	1675	1645	0	1683	1645	0	1640	1645	0	1696
Q Serve(g_s), s	0.6	0.0	1.4	0.9	0.0	2.1	0.9	0.0	6.5	0.3	0.0	2.0
Cycle Q Clear(g_c), s	0.6	0.0	1.4	0.9	0.0	2.1	0.9	0.0	6.5	0.3	0.0	2.0
Prop In Lane	1.00		0.18	1.00		0.15	1.00		0.30	1.00		0.10
Lane Grp Cap(c), veh/h	129	0	131	163	0	167	207	0	414	175	0	395
V/C Ratio(X)	0.19	0.00	0.47	0.25	0.00	0.57	0.20	0.00	0.72	0.08	0.00	0.27
Avail Cap(c_a), veh/h	996	0	1014	1123	0	1150	233	0	1120	233	0	983
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	0.00	1.00
Uniform Delay (d), s/veh	16.7	0.0	17.1	16.2	0.0	16.7	15.2	0.0	13.3	15.6	0.0	12.2
Incr Delay (d2), s/veh	0.7	0.0	2.6	0.8	0.0	3.0	0.5	0.0	2.4	0.2	0.0	0.4
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	0.7	0.4	0.0	1.1	0.4	0.0	3.2	0.1	0.0	1.0
LnGrp Delay(d),s/veh	17.5	0.0	19.7	17.0	0.0	19.7	15.7	0.0	15.7	15.8	0.0	12.5
LnGrp LOS	B		B	B		B	B		B	B		B
Approach Vol, veh/h		87			136			341			120	
Approach Delay, s/veh		19.1			18.9			15.7			12.9	
Approach LOS		B			B			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		7.5	9.4	13.5		8.3	8.6	14.3
Change Period (Y+Rc), s		4.5	4.5	4.5		4.5	4.5	4.5
Max Green Setting (Gmax), s		23.5	5.5	22.5		26.5	5.5	26.5
Max Q Clear Time (g_c+I1), s		3.4	2.9	4.0		4.1	2.3	8.5
Green Ext Time (p_c), s		0.3	0.0	0.4		0.5	0.0	1.4

Intersection Summary	
HCM 2010 Ctrl Delay	16.3
HCM 2010 LOS	B



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	27	37	7	24	2	82	2	203	7	36	134	6
Future Volume (vph)	27	37	7	24	2	82	2	203	7	36	134	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.99			0.90		1.00	0.99		1.00	0.99	
Flt Protected		0.98			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1672			1533		1641	1689		1641	1716	
Flt Permitted		0.98			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1672			1533		1641	1689		1641	1716	
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	31	42	8	27	2	93	2	231	8	41	152	7
RTOR Reduction (vph)	0	4	0	0	80	0	0	1	0	0	1	0
Lane Group Flow (vph)	0	77	0	0	42	0	2	238	0	41	158	0
Heavy Vehicles (%)	10%	10%	10%	10%	10%	10%	10%	12%	10%	10%	10%	10%
Turn Type	Split	NA		Split	NA		Prot	NA		Prot	NA	
Protected Phases	2	2		6	6		3	8		7	4	
Permitted Phases												
Actuated Green, G (s)		4.2			5.6		0.7	10.5		1.4	11.2	
Effective Green, g (s)		4.2			5.6		0.7	10.5		1.4	11.2	
Actuated g/C Ratio		0.11			0.14		0.02	0.26		0.04	0.28	
Clearance Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		176			216		28	446		57	484	
v/s Ratio Prot		c0.05			c0.03		0.00	c0.14		c0.02	0.09	
v/s Ratio Perm												
v/c Ratio		0.43			0.19		0.07	0.53		0.72	0.33	
Uniform Delay, d1		16.6			15.1		19.2	12.5		19.0	11.3	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.7			0.4		1.1	1.2		35.1	0.4	
Delay (s)		18.4			15.5		20.3	13.7		54.0	11.7	
Level of Service		B			B		C	B		D	B	
Approach Delay (s)		18.4			15.5			13.8			20.3	
Approach LOS		B			B			B			C	

Intersection Summary			
HCM 2000 Control Delay	16.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	39.7	Sum of lost time (s)	18.0
Intersection Capacity Utilization	33.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	56	320	39	39	171	21	28	135	38	35	173	37
Future Volume (veh/h)	56	320	39	39	171	21	28	135	38	35	173	37
Number	5	2	12	1	6	16	3	8	18	7	4	14
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
Adj Sat Flow, veh/h/ln	1234	1727	1900	1727	1727	1900	1111	1727	1900	1727	1727	1900
Adj Flow Rate, veh/h	64	364	44	44	194	24	32	153	43	40	197	42
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	1	1	0
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	54	10	10	10	10	10	71	10	10	10	10	10
Cap, veh/h	69	480	58	160	537	66	38	218	61	106	271	58
Arrive On Green	0.06	0.32	0.32	0.10	0.36	0.36	0.04	0.17	0.17	0.06	0.20	0.20
Sat Flow, veh/h	1175	1512	183	1645	1508	187	1058	1298	365	1645	1381	294
Grp Volume(v), veh/h	64	0	408	44	0	218	32	0	196	40	0	239
Grp Sat Flow(s),veh/h/ln	1175	0	1695	1645	0	1694	1058	0	1663	1645	0	1675
Q Serve(g_s), s	2.8	0.0	11.0	1.3	0.0	4.8	1.5	0.0	5.7	1.2	0.0	6.8
Cycle Q Clear(g_c), s	2.8	0.0	11.0	1.3	0.0	4.8	1.5	0.0	5.7	1.2	0.0	6.8
Prop In Lane	1.00		0.11	1.00		0.11	1.00		0.22	1.00		0.18
Lane Grp Cap(c), veh/h	69	0	538	160	0	603	38	0	279	106	0	329
V/C Ratio(X)	0.93	0.00	0.76	0.28	0.00	0.36	0.85	0.00	0.70	0.38	0.00	0.73
Avail Cap(c_a), veh/h	127	0	1081	178	0	1081	114	0	996	178	0	1003
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	0.00	1.00
Uniform Delay (d), s/veh	23.9	0.0	15.6	21.3	0.0	12.1	24.4	0.0	20.0	22.8	0.0	19.2
Incr Delay (d2), s/veh	36.4	0.0	2.2	0.9	0.0	0.4	36.9	0.0	3.2	2.2	0.0	3.1
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	1.6	0.0	5.4	0.6	0.0	2.3	0.8	0.0	2.9	0.6	0.0	3.4
LnGrp Delay(d),s/veh	60.3	0.0	17.9	22.3	0.0	12.5	61.3	0.0	23.2	25.0	0.0	22.2
LnGrp LOS	E		B	C		B	E		C	C		C
Approach Vol, veh/h		472			262			228			279	
Approach Delay, s/veh		23.6			14.1			28.6			22.6	
Approach LOS		C			B			C			C	

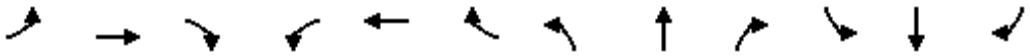
Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.5	20.7	6.3	14.5	7.5	22.6	7.8	13.0
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	5.5	32.5	5.5	30.5	5.5	32.5	5.5	30.5
Max Q Clear Time (g_c+I1), s	3.3	13.0	3.5	8.8	4.8	6.8	3.2	7.7
Green Ext Time (p_c), s	0.0	3.1	0.0	1.2	0.0	3.4	0.3	0.9

Intersection Summary	
HCM 2010 Ctrl Delay	22.3
HCM 2010 LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	18	99	117	79	46	8	20	226	60	16	260	10
Future Volume (veh/h)	18	99	117	79	46	8	20	226	60	16	260	10
Number	5	2	12	1	6	16	3	8	18	7	4	14
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
Adj Sat Flow, veh/h/ln	1727	1727	1900	1727	1727	1900	1727	1703	1900	1727	1726	1900
Adj Flow Rate, veh/h	20	112	133	90	52	9	23	257	68	18	295	11
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	1	1	0
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	10	10	10	10	10	10	10	12	12	10	10	10
Cap, veh/h	337	148	175	148	129	22	199	328	87	161	379	14
Arrive On Green	0.20	0.20	0.20	0.09	0.09	0.09	0.12	0.25	0.25	0.10	0.23	0.23
Sat Flow, veh/h	1645	721	856	1645	1435	248	1645	1299	344	1645	1653	62
Grp Volume(v), veh/h	20	0	245	90	0	61	23	0	325	18	0	306
Grp Sat Flow(s),veh/h/ln	1645	0	1576	1645	0	1683	1645	0	1642	1645	0	1715
Q Serve(g_s), s	0.5	0.0	7.4	2.7	0.0	1.7	0.6	0.0	9.3	0.5	0.0	8.5
Cycle Q Clear(g_c), s	0.5	0.0	7.4	2.7	0.0	1.7	0.6	0.0	9.3	0.5	0.0	8.5
Prop In Lane	1.00		0.54	1.00		0.15	1.00		0.21	1.00		0.04
Lane Grp Cap(c), veh/h	337	0	323	148	0	151	199	0	414	161	0	393
V/C Ratio(X)	0.06	0.00	0.76	0.61	0.00	0.40	0.12	0.00	0.78	0.11	0.00	0.78
Avail Cap(c_a), veh/h	763	0	731	860	0	880	199	0	859	179	0	761
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	0.00	1.00
Uniform Delay (d), s/veh	16.2	0.0	19.0	22.2	0.0	21.8	19.9	0.0	17.7	20.8	0.0	18.3
Incr Delay (d2), s/veh	0.1	0.0	3.7	4.0	0.0	1.7	0.3	0.0	3.3	0.3	0.0	3.4
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	3.5	1.4	0.0	0.9	0.3	0.0	4.6	0.2	0.0	4.4
LnGrp Delay(d),s/veh	16.3	0.0	22.6	26.2	0.0	23.5	20.1	0.0	21.0	21.1	0.0	21.7
LnGrp LOS	B		C	C		C	C		C	C		C
Approach Vol, veh/h		265			151			348			324	
Approach Delay, s/veh		22.2			25.1			20.9			21.6	
Approach LOS		C			C			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		14.9	10.6	16.1		9.1	9.5	17.3
Change Period (Y+Rc), s		4.5	4.5	4.5		4.5	4.5	4.5
Max Green Setting (Gmax), s		23.5	5.5	22.5		26.5	5.5	26.5
Max Q Clear Time (g_c+I1), s		9.4	2.6	10.5		4.7	2.5	11.3
Green Ext Time (p_c), s		1.2	0.5	1.1		0.5	0.0	1.4

Intersection Summary	
HCM 2010 Ctrl Delay	22.0
HCM 2010 LOS	C



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	6	4	4	6	66	22	14	207	44	173	288	42
Future Volume (vph)	6	4	4	6	66	22	14	207	44	173	288	42
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.96			0.97		1.00	0.97		1.00	0.98	
Flt Protected		0.98			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1625			1667		1641	1621		1641	1694	
Flt Permitted		0.98			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1625			1667		1641	1621		1641	1694	
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	7	5	5	7	75	25	16	235	50	197	327	48
RTOR Reduction (vph)	0	5	0	0	13	0	0	6	0	0	4	0
Lane Group Flow (vph)	0	12	0	0	94	0	16	279	0	197	371	0
Heavy Vehicles (%)	10%	10%	10%	10%	10%	10%	10%	15%	10%	10%	10%	10%
Turn Type	Split	NA		Split	NA		Prot	NA		Prot	NA	
Protected Phases	2	2		6	6		3	8		7	4	
Permitted Phases												
Actuated Green, G (s)		0.9			6.5		0.7	18.1		6.2	23.6	
Effective Green, g (s)		0.9			6.5		0.7	18.1		6.2	23.6	
Actuated g/C Ratio		0.02			0.13		0.01	0.36		0.12	0.47	
Clearance Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		29			218		23	590		204	804	
v/s Ratio Prot		c0.01			c0.06		0.01	0.17		c0.12	c0.22	
v/s Ratio Perm												
v/c Ratio		0.42			0.43		0.70	0.47		0.97	0.46	
Uniform Delay, d1		24.1			19.9		24.4	12.1		21.6	8.8	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		9.4			1.4		63.9	0.6		52.7	0.4	
Delay (s)		33.6			21.3		88.3	12.7		74.3	9.2	
Level of Service		C			C		F	B		E	A	
Approach Delay (s)		33.6			21.3			16.7			31.6	
Approach LOS		C			C			B			C	

Intersection Summary			
HCM 2000 Control Delay	26.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	49.7	Sum of lost time (s)	18.0
Intersection Capacity Utilization	39.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	108	380	17	29	323	32	22	244	87	31	177	72
Future Volume (veh/h)	108	380	17	29	323	32	22	244	87	31	177	72
Number	5	2	12	1	6	16	3	8	18	7	4	14
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
Adj Sat Flow, veh/h/ln	1727	1727	1900	1727	1727	1900	1727	1727	1900	1727	1727	1900
Adj Flow Rate, veh/h	123	432	19	33	367	36	25	277	99	35	201	82
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	1	1	0
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	10	10	10	10	10	10	10	10	10	10	10	10
Cap, veh/h	166	541	24	114	462	45	114	341	122	114	328	134
Arrive On Green	0.10	0.33	0.33	0.07	0.30	0.30	0.07	0.28	0.28	0.07	0.28	0.28
Sat Flow, veh/h	1645	1642	72	1645	1549	152	1645	1216	435	1645	1167	476
Grp Volume(v), veh/h	123	0	451	33	0	403	25	0	376	35	0	283
Grp Sat Flow(s),veh/h/ln	1645	0	1715	1645	0	1700	1645	0	1651	1645	0	1643
Q Serve(g_s), s	5.2	0.0	17.2	1.4	0.0	15.7	1.0	0.0	15.2	1.5	0.0	10.8
Cycle Q Clear(g_c), s	5.2	0.0	17.2	1.4	0.0	15.7	1.0	0.0	15.2	1.5	0.0	10.8
Prop In Lane	1.00		0.04	1.00		0.09	1.00		0.26	1.00		0.29
Lane Grp Cap(c), veh/h	166	0	565	114	0	508	114	0	463	114	0	461
V/C Ratio(X)	0.74	0.00	0.80	0.29	0.00	0.79	0.22	0.00	0.81	0.31	0.00	0.61
Avail Cap(c_a), veh/h	172	0	776	126	0	722	126	0	701	126	0	698
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	0.00	1.00
Uniform Delay (d), s/veh	31.4	0.0	21.9	31.7	0.0	23.2	31.6	0.0	24.1	31.8	0.0	22.4
Incr Delay (d2), s/veh	15.4	0.0	4.1	1.4	0.0	4.0	0.9	0.0	4.3	1.5	0.0	1.3
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	3.1	0.0	8.8	0.7	0.0	7.8	0.5	0.0	7.5	0.7	0.0	5.0
LnGrp Delay(d),s/veh	46.8	0.0	26.1	33.1	0.0	27.2	32.5	0.0	28.4	33.3	0.0	23.8
LnGrp LOS	D		C	C		C	C		C	C		C
Approach Vol, veh/h		574			436			401			318	
Approach Delay, s/veh		30.5			27.6			28.7			24.8	
Approach LOS		C			C			C			C	

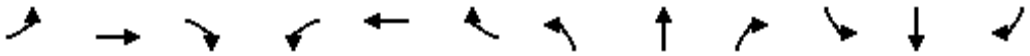
Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.5	28.2	9.5	24.7	11.7	25.9	9.5	24.7
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	5.5	32.5	5.5	30.5	7.5	30.5	5.5	30.5
Max Q Clear Time (g_c+I1), s	3.4	19.2	3.0	12.8	7.2	17.7	3.5	17.2
Green Ext Time (p_c), s	0.0	3.9	0.0	3.3	0.0	3.8	0.0	2.9

Intersection Summary	
HCM 2010 Ctrl Delay	28.3
HCM 2010 LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	40	81	18	64	127	22	64	330	143	22	151	18
Future Volume (veh/h)	40	81	18	64	127	22	64	330	143	22	151	18
Number	5	2	12	1	6	16	3	8	18	7	4	14
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
Adj Sat Flow, veh/h/ln	1727	1727	1900	1727	1727	1900	1727	1727	1900	1727	1727	1900
Adj Flow Rate, veh/h	45	92	20	73	144	25	73	375	162	25	172	20
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	1	1	0
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	10	10	10	10	10	10	10	10	10	10	10	10
Cap, veh/h	164	137	30	233	203	35	138	429	185	137	568	66
Arrive On Green	0.10	0.10	0.10	0.14	0.14	0.14	0.08	0.37	0.37	0.08	0.37	0.37
Sat Flow, veh/h	1645	1375	299	1645	1434	249	1645	1145	495	1645	1519	177
Grp Volume(v), veh/h	45	0	112	73	0	169	73	0	537	25	0	192
Grp Sat Flow(s),veh/h/ln	1645	0	1675	1645	0	1683	1645	0	1640	1645	0	1696
Q Serve(g_s), s	1.5	0.0	3.9	2.4	0.0	5.7	2.5	0.0	18.2	0.8	0.0	4.8
Cycle Q Clear(g_c), s	1.5	0.0	3.9	2.4	0.0	5.7	2.5	0.0	18.2	0.8	0.0	4.8
Prop In Lane	1.00		0.18	1.00		0.15	1.00		0.30	1.00		0.10
Lane Grp Cap(c), veh/h	164	0	167	233	0	238	138	0	614	137	0	634
V/C Ratio(X)	0.27	0.00	0.67	0.31	0.00	0.71	0.53	0.00	0.87	0.18	0.00	0.30
Avail Cap(c_a), veh/h	647	0	659	730	0	747	151	0	727	151	0	639
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	0.00	1.00
Uniform Delay (d), s/veh	24.9	0.0	25.9	23.0	0.0	24.5	26.2	0.0	17.4	25.5	0.0	13.2
Incr Delay (d2), s/veh	0.9	0.0	4.6	0.8	0.0	3.9	3.1	0.0	10.2	0.6	0.0	0.3
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	0.7	0.0	2.0	1.1	0.0	2.9	1.3	0.0	9.9	0.4	0.0	2.3
LnGrp Delay(d),s/veh	25.8	0.0	30.5	23.8	0.0	28.3	29.4	0.0	27.6	26.1	0.0	13.5
LnGrp LOS	C		C	C		C	C		C	C		B
Approach Vol, veh/h		157			242			610			217	
Approach Delay, s/veh		29.1			27.0			27.8			14.9	
Approach LOS		C			C			C			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		10.5	9.5	26.8		13.0	9.5	26.9
Change Period (Y+Rc), s		4.5	4.5	4.5		4.5	4.5	4.5
Max Green Setting (Gmax), s		23.5	5.5	22.5		26.5	5.5	26.5
Max Q Clear Time (g_c+I1), s		5.9	4.5	6.8		7.7	2.8	20.2
Green Ext Time (p_c), s		0.6	0.0	3.6		0.9	0.0	2.2

Intersection Summary	
HCM 2010 Ctrl Delay	25.5
HCM 2010 LOS	C



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	48	66	12	42	4	147	4	384	12	64	240	10
Future Volume (vph)	48	66	12	42	4	147	4	384	12	64	240	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.99			0.90		1.00	1.00		1.00	0.99	
Flt Protected		0.98			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1673			1534		1641	1689		1641	1717	
Flt Permitted		0.98			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1673			1534		1641	1689		1641	1717	
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	55	75	14	48	5	167	5	436	14	73	273	11
RTOR Reduction (vph)	0	4	0	0	135	0	0	1	0	0	1	0
Lane Group Flow (vph)	0	140	0	0	85	0	5	449	0	73	283	0
Heavy Vehicles (%)	10%	10%	10%	10%	10%	10%	10%	12%	10%	10%	10%	10%
Turn Type	Split	NA		Split	NA		Prot	NA		Prot	NA	
Protected Phases	2	2		6	6		3	8		7	4	
Permitted Phases												
Actuated Green, G (s)		8.8			9.2		0.9	27.7		4.0	30.8	
Effective Green, g (s)		8.8			9.2		0.9	27.7		4.0	30.8	
Actuated g/C Ratio		0.13			0.14		0.01	0.41		0.06	0.45	
Clearance Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		217			208		21	691		96	781	
v/s Ratio Prot		c0.08			c0.06		0.00	c0.27		c0.04	c0.16	
v/s Ratio Perm												
v/c Ratio		0.64			0.41		0.24	0.65		0.76	0.36	
Uniform Delay, d1		28.0			26.8		33.1	16.1		31.4	12.0	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		6.4			1.3		5.8	2.1		29.2	0.3	
Delay (s)		34.4			28.1		38.9	18.2		60.6	12.3	
Level of Service		C			C		D	B		E	B	
Approach Delay (s)		34.4			28.1			18.4			22.2	
Approach LOS		C			C			B			C	

Intersection Summary			
HCM 2000 Control Delay	23.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	67.7	Sum of lost time (s)	18.0
Intersection Capacity Utilization	49.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Intersection: 1: County Road 98 & W. Covell Blvd

Movement	EB	WB	NB	NB	SB	SB
Directions Served	LTR	LTR	L	TR	L	TR
Maximum Queue (ft)	151	126	49	121	68	107
Average Queue (ft)	73	50	13	44	14	47
95th Queue (ft)	122	94	40	89	46	91
Link Distance (ft)	359	422		394		574
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)			185		145	
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 2: County Rd 98 & Russell Blvd

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	110	88	103	144
Average Queue (ft)	34	37	50	53
95th Queue (ft)	75	76	90	101
Link Distance (ft)	331	515	458	195
Upstream Blk Time (%)				0
Queuing Penalty (veh)				0
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 3: County Rd 98 & Primate Dr/Hutchinson Dr

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	30	87	42	66
Average Queue (ft)	5	30	2	11
95th Queue (ft)	22	64	17	39
Link Distance (ft)	248	298	313	243
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Network Summary

Network wide Queuing Penalty: 0

Intersection: 1: County Road 98 & W. Covell Blvd

Movement	EB	WB	NB	NB	SB	SB
Directions Served	LTR	LTR	L	TR	L	TR
Maximum Queue (ft)	178	159	41	143	58	118
Average Queue (ft)	84	71	7	64	13	49
95th Queue (ft)	140	123	30	112	41	91
Link Distance (ft)	359	422		394		574
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)			185		145	
Storage Blk Time (%)				0		0
Queuing Penalty (veh)				0		0

Intersection: 2: County Rd 98 & Russell Blvd

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	87	97	169	99
Average Queue (ft)	36	45	66	44
95th Queue (ft)	77	84	119	83
Link Distance (ft)	331	515	458	195
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 3: County Rd 98 & Primate Dr/Hutchinson Dr

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	110	101	23	63
Average Queue (ft)	37	42	1	7
95th Queue (ft)	85	83	7	32
Link Distance (ft)	248	298	313	243
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Network Summary

Network wide Queuing Penalty: 0

Intersection: 1: County Road 98 & W. Covell Blvd

Movement	EB	WB	NB	NB	SB	SB
Directions Served	LTR	LTR	L	TR	L	TR
Maximum Queue (ft)	422	196	144	167	91	171
Average Queue (ft)	211	82	39	73	26	80
95th Queue (ft)	391	148	104	134	64	139
Link Distance (ft)	359	422		394		574
Upstream Blk Time (%)	7					
Queuing Penalty (veh)	0					
Storage Bay Dist (ft)			185		145	
Storage Blk Time (%)				0		1
Queuing Penalty (veh)				0		0

Intersection: 2: County Rd 98 & Russell Blvd

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	262	109	218	186
Average Queue (ft)	72	56	86	88
95th Queue (ft)	164	95	153	151
Link Distance (ft)	331	515	458	195
Upstream Blk Time (%)	0			0
Queuing Penalty (veh)	0			0
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 3: County Rd 98 & Primate Dr/Hutchinson Dr

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	64	128	92	246
Average Queue (ft)	11	50	9	62
95th Queue (ft)	37	102	47	157
Link Distance (ft)	248	298	313	243
Upstream Blk Time (%)				0
Queuing Penalty (veh)				0
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Network Summary

Network wide Queuing Penalty: 0

Intersection: 1: County Road 98 & W. Covell Blvd

Movement	EB	WB	NB	NB	SB	SB
Directions Served	LTR	LTR	L	TR	L	TR
Maximum Queue (ft)	422	468	201	390	118	248
Average Queue (ft)	389	284	46	194	24	107
95th Queue (ft)	504	524	186	417	61	197
Link Distance (ft)	359	422		394		574
Upstream Blk Time (%)	86	24		17		
Queuing Penalty (veh)	0	0		0		
Storage Bay Dist (ft)			185		145	
Storage Blk Time (%)				24		6
Queuing Penalty (veh)				5		2

Intersection: 2: County Rd 98 & Russell Blvd

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	151	195	492	146
Average Queue (ft)	55	82	208	68
95th Queue (ft)	106	154	386	122
Link Distance (ft)	331	514	457	195
Upstream Blk Time (%)			2	
Queuing Penalty (veh)			0	
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 3: County Rd 98 & Primate Dr/Hutchinson Dr

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	164	209	48	139
Average Queue (ft)	70	85	3	34
95th Queue (ft)	136	163	23	98
Link Distance (ft)	248	298	313	243
Upstream Blk Time (%)	0			
Queuing Penalty (veh)	0			
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Network Summary

Network wide Queuing Penalty: 7

Intersection: 1: County Road 98 & W. Covell Blvd

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	TR
Maximum Queue (ft)	119	130	58	108	82	79	45	96
Average Queue (ft)	39	55	16	37	21	32	11	40
95th Queue (ft)	91	109	44	83	65	64	36	80
Link Distance (ft)		359		422		390		570
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	200		150		185		145	
Storage Blk Time (%)	0							0
Queuing Penalty (veh)	0							0

Intersection: 2: County Rd 98 & Russell Blvd

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	TR
Maximum Queue (ft)	34	99	70	70	36	95	56	125
Average Queue (ft)	6	45	28	18	7	38	9	48
95th Queue (ft)	24	82	59	54	28	77	35	102
Link Distance (ft)		325		508		451		189
Upstream Blk Time (%)								0
Queuing Penalty (veh)								0
Storage Bay Dist (ft)	100		125		150		100	
Storage Blk Time (%)		0						1
Queuing Penalty (veh)		0						0

Intersection: 3: County Rd 98 & Primate Dr/Hutchinson Dr

Movement	EB	WB	NB	NB	SB	SB
Directions Served	LTR	LTR	L	TR	L	TR
Maximum Queue (ft)	26	71	35	93	89	72
Average Queue (ft)	3	28	6	32	36	20
95th Queue (ft)	17	62	25	72	66	55
Link Distance (ft)	242	292		313		242
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)			100		175	
Storage Blk Time (%)				0		
Queuing Penalty (veh)				0		

Network Summary

Network wide Queuing Penalty: 0

Intersection: 1: County Road 98 & W. Covell Blvd

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	TR
Maximum Queue (ft)	80	158	51	166	43	134	63	93
Average Queue (ft)	36	63	15	68	10	60	14	42
95th Queue (ft)	71	121	43	131	36	107	43	78
Link Distance (ft)		705		327		390		570
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	200		150		185		145	
Storage Blk Time (%)		0		0		0		
Queuing Penalty (veh)		0		0		0		

Intersection: 2: County Rd 98 & Russell Blvd

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	TR
Maximum Queue (ft)	70	74	57	96	58	142	38	105
Average Queue (ft)	15	29	18	36	24	51	7	34
95th Queue (ft)	47	62	46	77	54	103	29	73
Link Distance (ft)		325		508		451		189
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	100		125		150		100	
Storage Blk Time (%)	0			0		0		0
Queuing Penalty (veh)	0			0		0		0

Intersection: 3: County Rd 98 & Primate Dr/Hutchinson Dr

Movement	EB	WB	NB	NB	SB	SB
Directions Served	LTR	LTR	L	TR	L	TR
Maximum Queue (ft)	82	78	17	134	61	115
Average Queue (ft)	32	32	1	56	22	35
95th Queue (ft)	68	61	12	105	50	81
Link Distance (ft)	242	292		313		242
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)			100		175	
Storage Blk Time (%)				1		
Queuing Penalty (veh)				0		

Network Summary

Network wide Queuing Penalty: 0

Intersection: 1: County Road 98 & W. Covell Blvd

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	TR
Maximum Queue (ft)	264	308	104	185	167	190	107	230
Average Queue (ft)	86	125	29	75	49	75	33	89
95th Queue (ft)	191	240	75	148	127	144	82	162
Link Distance (ft)		359		422		390		570
Upstream Blk Time (%)		0						
Queuing Penalty (veh)		0						
Storage Bay Dist (ft)	200		150		150		100	
Storage Blk Time (%)	2	2	0	1	0	0	0	1
Queuing Penalty (veh)	6	1	0	0	0	0	0	1

Intersection: 2: County Rd 98 & Russell Blvd

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	TR
Maximum Queue (ft)	69	225	121	113	114	274	144	240
Average Queue (ft)	14	91	50	35	20	105	17	104
95th Queue (ft)	48	163	102	79	65	210	71	193
Link Distance (ft)		325		508		451		189
Upstream Blk Time (%)							0	2
Queuing Penalty (veh)							0	0
Storage Bay Dist (ft)	100		125		150		100	
Storage Blk Time (%)	0	5	1	0		3		9
Queuing Penalty (veh)	0	1	0	0		1		1

Intersection: 3: County Rd 98 & Primate Dr/Hutchinson Dr

Movement	EB	WB	NB	NB	SB	SB
Directions Served	LTR	LTR	L	TR	L	TR
Maximum Queue (ft)	68	155	66	216	201	232
Average Queue (ft)	13	49	12	83	86	66
95th Queue (ft)	40	107	41	164	165	161
Link Distance (ft)	242	292		313		242
Upstream Blk Time (%)					0	0
Queuing Penalty (veh)					0	0
Storage Bay Dist (ft)			100		175	
Storage Blk Time (%)			0	5	1	1
Queuing Penalty (veh)			0	1	3	1

Network Summary

Network wide Queuing Penalty: 16

Intersection: 1: County Road 98 & W. Covell Blvd

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	TR
Maximum Queue (ft)	244	363	235	371	156	351	99	288
Average Queue (ft)	92	157	38	162	27	158	34	103
95th Queue (ft)	188	285	129	288	94	279	80	196
Link Distance (ft)		705		327		390		570
Upstream Blk Time (%)				1		0		
Queuing Penalty (veh)				0		0		
Storage Bay Dist (ft)	200		150		150		100	
Storage Blk Time (%)	2	4		10		5		4
Queuing Penalty (veh)	9	4		3		1		1

Intersection: 2: County Rd 98 & Russell Blvd

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	TR
Maximum Queue (ft)	108	144	121	194	255	443	103	196
Average Queue (ft)	29	62	42	82	56	195	19	85
95th Queue (ft)	75	116	91	158	137	381	59	156
Link Distance (ft)		325		508		451		189
Upstream Blk Time (%)						2	0	0
Queuing Penalty (veh)						0	0	0
Storage Bay Dist (ft)	100		125		150		100	
Storage Blk Time (%)	1	2	0	3	0	15	0	7
Queuing Penalty (veh)	1	1	0	2	1	10	0	2

Intersection: 3: County Rd 98 & Primate Dr/Hutchinson Dr

Movement	EB	WB	NB	NB	SB	SB
Directions Served	LTR	LTR	L	TR	L	TR
Maximum Queue (ft)	185	205	39	376	134	232
Average Queue (ft)	74	81	4	169	47	79
95th Queue (ft)	141	152	22	314	98	169
Link Distance (ft)	242	292		313		242
Upstream Blk Time (%)	0	0		3		0
Queuing Penalty (veh)	0	0		0		0
Storage Bay Dist (ft)			100		175	
Storage Blk Time (%)				20	0	1
Queuing Penalty (veh)				1	0	0

Network Summary

Network wide Queuing Penalty: 37

LANE SUMMARY

Site: 101 [1 - CR 98/ Covell Blvd - Yr 2020 AM]

New Site
Roundabout

Lane Use and Performance	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: County Rd 98													
Lane 1[d]	127	18.7	835	0.152	100	5.8	LOS A	0.8	23.3	Full	1600	0.0	0.0
Approach	127	18.7		0.152		5.8	LOS A	0.8	23.3				
East: W. Covell Blvd													
Lane 1[d]	167	10.0	1075	0.155	100	4.7	LOS A	0.9	23.0	Full	1600	0.0	0.0
Approach	167	10.0		0.155		4.7	LOS A	0.9	23.0				
North: County Rd 98													
Lane 1[d]	144	10.0	1066	0.135	100	4.6	LOS A	0.7	19.6	Full	1600	0.0	0.0
Approach	144	10.0		0.135		4.6	LOS A	0.7	19.6				
West: W. Covell Blvd													
Lane 1[d]	301	16.0	1061	0.284	100	6.2	LOS A	1.7	48.6	Full	1600	0.0	0.0
Approach	301	16.0		0.284		6.2	LOS A	1.7	48.6				
Intersection	740	13.9		0.284		5.5	LOS A	1.7	48.6				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: SIDRA Standard.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

LANE SUMMARY

Site: 101 [1 - CR 98/ Covell Blvd - Yr 2020 PM]

New Site
Roundabout

Lane Use and Performance	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: County Rd 98													
Lane 1[d]	223	10.0	879	0.253	100	6.7	LOS A	1.5	40.4	Full	1600	0.0	0.0
Approach	223	10.0		0.253		6.7	LOS A	1.5	40.4				
East: W. Covell Blvd													
Lane 1[d]	281	10.0	997	0.282	100	6.4	LOS A	1.7	46.4	Full	1600	0.0	0.0
Approach	281	10.0		0.282		6.4	LOS A	1.7	46.4				
North: County Rd 98													
Lane 1[d]	166	10.0	967	0.171	100	5.3	LOS A	1.0	26.3	Full	1600	0.0	0.0
Approach	166	10.0		0.171		5.3	LOS A	1.0	26.3				
West: W. Covell Blvd													
Lane 1[d]	367	10.0	1145	0.321	100	6.2	LOS A	2.1	56.6	Full	1600	0.0	0.0
Approach	367	10.0		0.321		6.2	LOS A	2.1	56.6				
Intersection	1036	10.0		0.321		6.3	LOS A	2.1	56.6				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: SIDRA Standard.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

LANE SUMMARY

Site: 101 [2 - CR 98 & Russell Blvd - Yr 2020 AM]

New Site
Roundabout

Lane Use and Performance	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: County Rd 98													
Lane 1[d]	194	11.5	1199	0.162	100	4.4	LOS A	0.9	24.9	Full	1600	0.0	0.0
Approach	194	11.5		0.162		4.4	LOS A	0.9	24.9				
East: Russell Blvd													
Lane 1[d]	84	10.0	1081	0.078	100	4.0	LOS A	0.4	10.6	Full	1600	0.0	0.0
Approach	84	10.0		0.078		4.0	LOS A	0.4	10.6				
North: County Rd 98													
Lane 1[d]	182	10.2	1196	0.152	100	4.3	LOS A	0.8	22.5	Full	1600	0.0	0.0
Approach	182	10.2		0.152		4.3	LOS A	0.8	22.5				
West: Russell Blvd													
Lane 1[d]	148	10.0	1029	0.144	100	4.8	LOS A	0.8	20.4	Full	1000	0.0	0.0
Approach	148	10.0		0.144		4.8	LOS A	0.8	20.4				
Intersection	608	10.5		0.162		4.4	LOS A	0.9	24.9				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: SIDRA Standard.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

LANE SUMMARY

Site: 101 [2 - CR 98 & Russell Blvd - Yr 2020 PM]

New Site
Roundabout

Lane Use and Performance	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: County Rd 98													
Lane 1[d]	341	10.0	1242	0.274	100	5.4	LOS A	1.7	45.8	Full	1600	0.0	0.0
Approach	341	10.0		0.274		5.4	LOS A	1.7	45.8				
East: Russell Blvd													
Lane 1[d]	135	10.0	979	0.138	100	5.0	LOS A	0.7	19.9	Full	1600	0.0	0.0
Approach	135	10.0		0.138		5.0	LOS A	0.7	19.9				
North: County Rd 98													
Lane 1[d]	120	10.0	1083	0.111	100	4.3	LOS A	0.6	15.9	Full	1600	0.0	0.0
Approach	120	10.0		0.111		4.3	LOS A	0.6	15.9				
West: Russell Blvd													
Lane 1[d]	88	10.0	1101	0.079	100	3.9	LOS A	0.4	10.9	Full	1000	0.0	0.0
Approach	88	10.0		0.079		3.9	LOS A	0.4	10.9				
Intersection	684	10.0		0.274		4.9	LOS A	1.7	45.8				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: SIDRA Standard.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

LANE SUMMARY

Site: 101 [3 - CR 98 & Hutchinson Dr - Yr 2020 AM]

New Site
Roundabout

Lane Use and Performance													
	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: County Rd 98													
Lane 1[d]	169	13.9	1112	0.152	100	4.6	LOS A	0.8	22.5	Full	1600	0.0	0.0
Approach	169	13.9		0.152		4.6	LOS A	0.8	22.5				
East: Hutchinson Dr													
Lane 1[d]	59	10.0	1099	0.054	100	3.7	LOS A	0.3	7.3	Full	1600	0.0	0.0
Approach	59	10.0		0.054		3.7	LOS A	0.3	7.3				
North: County Rd 98													
Lane 1[d]	320	10.0	1319	0.243	100	4.8	LOS A	1.5	39.7	Full	1600	0.0	0.0
Approach	320	10.0		0.243		4.8	LOS A	1.5	39.7				
West: Hutchinson Dr													
Lane 1[d]	8	10.0	965	0.008	100	3.8	LOS A	0.0	1.1	Full	1600	0.0	0.0
Approach	8	10.0		0.008		3.8	LOS A	0.0	1.1				
Intersection	557	11.2		0.243		4.6	LOS A	1.5	39.7				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: SIDRA Standard.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

LANE SUMMARY

Site: 101 [3 - CR 98 & Hutchinson Dr - Yr 2020 PM]

New Site
Roundabout

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: County Rd 98													
Lane 1[d]	241	10.0	1178	0.204	100	4.9	LOS A	1.2	31.2	Full	1600	0.0	0.0
Approach	241	10.0		0.204		4.9	LOS A	1.2	31.2				
East: Hutchinson Dr													
Lane 1[d]	123	10.0	989	0.124	100	4.8	LOS A	0.7	17.7	Full	1600	0.0	0.0
Approach	123	10.0		0.124		4.8	LOS A	0.7	17.7				
North: County Rd 98													
Lane 1[d]	200	10.0	1354	0.148	100	3.9	LOS A	0.9	23.0	Full	1600	0.0	0.0
Approach	200	10.0		0.148		3.9	LOS A	0.9	23.0				
West: Hutchinson Dr													
Lane 1[d]	81	10.0	1038	0.078	100	4.1	LOS A	0.4	10.3	Full	1600	0.0	0.0
Approach	81	10.0		0.078		4.1	LOS A	0.4	10.3				
Intersection	644	10.0		0.204		4.4	LOS A	1.2	31.2				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: SIDRA Standard.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

LANE SUMMARY

Site: 101 [1 - CR 98/ Covell Blvd - Yr 2040 AM]

New Site
Roundabout

Lane Use and Performance	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: County Rd 98													
Lane 1[d]	228	18.5	669	0.341	100	9.9	LOS A	2.1	61.5	Full	1600	0.0	0.0
Approach	228	18.5		0.341		9.9	LOS A	2.1	61.5				
East: W. Covell Blvd													
Lane 1[d]	263	10.0	946	0.278	100	6.6	LOS A	1.7	46.3	Full	1600	0.0	0.0
Approach	263	10.0		0.278		6.6	LOS A	1.7	46.3				
North: County Rd 98													
Lane 1[d]	278	10.0	953	0.292	100	6.8	LOS A	1.8	48.9	Full	1600	0.0	0.0
Approach	278	10.0		0.292		6.8	LOS A	1.8	48.9				
West: W. Covell Blvd													
Lane 1[d]	472	15.9	911	0.518	100	10.7	LOS B	3.9	110.3	Full	1600	0.0	0.0
Approach	472	15.9		0.518		10.7	LOS B	3.9	110.3				
Intersection	1241	13.8		0.518		8.8	LOS A	3.9	110.3				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: SIDRA Standard.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

LANE SUMMARY

Site: 101 [1 - CR 98/ Covell Blvd - Yr 2040 PM]

New Site
Roundabout

Lane Use and Performance	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: County Rd 98													
Lane 1[d]	401	10.0	666	0.602	100	16.2	LOS B	5.7	154.8	Full	1600	0.0	0.0
Approach	401	10.0		0.602		16.2	LOS B	5.7	154.8				
East: W. Covell Blvd													
Lane 1[d]	436	10.0	815	0.535	100	12.1	LOS B	4.5	122.3	Full	1600	0.0	0.0
Approach	436	10.0		0.535		12.1	LOS B	4.5	122.3				
North: County Rd 98													
Lane 1[d]	318	10.0	804	0.396	100	9.4	LOS A	2.8	74.4	Full	1600	0.0	0.0
Approach	318	10.0		0.396		9.4	LOS A	2.8	74.4				
West: W. Covell Blvd													
Lane 1[d]	574	10.0	986	0.582	100	11.5	LOS B	5.2	140.9	Full	1600	0.0	0.0
Approach	574	10.0		0.582		11.5	LOS B	5.2	140.9				
Intersection	1730	10.0		0.602		12.3	LOS B	5.7	154.8				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: SIDRA Standard.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

LANE SUMMARY

Site: 101 [2 - CR 98 & Russell Blvd - Yr 2040 AM]

New Site
Roundabout

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: County Rd 98													
Lane 1[d]	348	11.5	1107	0.314	100	6.3	LOS A	2.1	56.9	Full	1600	0.0	0.0
Approach	348	11.5		0.314		6.3	LOS A	2.1	56.9				
East: Russell Blvd													
Lane 1[d]	151	10.0	943	0.160	100	5.3	LOS A	0.9	24.1	Full	1600	0.0	0.0
Approach	151	10.0		0.160		5.3	LOS A	0.9	24.1				
North: County Rd 98													
Lane 1[d]	325	10.2	1104	0.294	100	6.1	LOS A	1.9	50.5	Full	1600	0.0	0.0
Approach	325	10.2		0.294		6.1	LOS A	1.9	50.5				
West: Russell Blvd													
Lane 1[d]	266	10.0	866	0.307	100	7.5	LOS A	1.9	50.7	Full	1000	0.0	0.0
Approach	266	10.0		0.307		7.5	LOS A	1.9	50.7				
Intersection	1090	10.5		0.314		6.4	LOS A	2.1	56.9				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: SIDRA Standard.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

LANE SUMMARY

Site: 101 [2 - CR 98 & Russell Blvd - Yr 2040 PM]

New Site
Roundabout

Lane Use and Performance	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: County Rd 98													
Lane 1[d]	610	10.0	1147	0.532	100	9.3	LOS A	4.4	118.4	Full	1600	0.0	0.0
Approach	610	10.0		0.532		9.3	LOS A	4.4	118.4				
East: Russell Blvd													
Lane 1[d]	242	10.0	777	0.312	100	8.3	LOS A	2.0	53.6	Full	1600	0.0	0.0
Approach	242	10.0		0.312		8.3	LOS A	2.0	53.6				
North: County Rd 98													
Lane 1[d]	217	10.0	947	0.229	100	6.1	LOS A	1.4	37.0	Full	1600	0.0	0.0
Approach	217	10.0		0.229		6.1	LOS A	1.4	37.0				
West: Russell Blvd													
Lane 1[d]	158	10.0	976	0.162	100	5.2	LOS A	0.9	24.2	Full	1000	0.0	0.0
Approach	158	10.0		0.162		5.2	LOS A	0.9	24.2				
Intersection	1227	10.0		0.532		8.0	LOS A	4.4	118.4				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: SIDRA Standard.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

LANE SUMMARY

Site: 101 [3 - CR 98 & Hutchinson Dr - Yr 2040 AM]

New Site
Roundabout

Lane Use and Performance	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: County Rd 98													
Lane 1[d]	301	13.9	1005	0.300	100	6.6	LOS A	1.8	51.3	Full	1600	0.0	0.0
Approach	301	13.9		0.300		6.6	LOS A	1.8	51.3				
East: Hutchinson Dr													
Lane 1[d]	107	10.0	970	0.110	100	4.7	LOS A	0.6	16.1	Full	1600	0.0	0.0
Approach	107	10.0		0.110		4.7	LOS A	0.6	16.1				
North: County Rd 98													
Lane 1[d]	572	10.0	1255	0.455	100	7.5	LOS A	3.6	96.3	Full	1600	0.0	0.0
Approach	572	10.0		0.455		7.5	LOS A	3.6	96.3				
West: Hutchinson Dr													
Lane 1[d]	16	10.0	762	0.021	100	4.9	LOS A	0.1	3.0	Full	1600	0.0	0.0
Approach	16	10.0		0.021		4.9	LOS A	0.1	3.0				
Intersection	995	11.2		0.455		6.9	LOS A	3.6	96.3				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: SIDRA Standard.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

LANE SUMMARY

Site: 101 [3 - CR 98 & Hutchinson Dr - Yr 2040 PM]

New Site
Roundabout

Lane Use and Performance													
	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: County Rd 98													
Lane 1[d]	432	10.0	1075	0.402	100	7.6	LOS A	2.8	74.3	Full	1600	0.0	0.0
Approach	432	10.0		0.402		7.6	LOS A	2.8	74.3				
East: Hutchinson Dr													
Lane 1[d]	219	10.0	798	0.275	100	7.6	LOS A	1.7	45.8	Full	1600	0.0	0.0
Approach	219	10.0		0.275		7.6	LOS A	1.7	45.8				
North: County Rd 98													
Lane 1[d]	357	10.0	1311	0.272	100	5.1	LOS A	1.9	50.3	Full	1600	0.0	0.0
Approach	357	10.0		0.272		5.1	LOS A	1.9	50.3				
West: Hutchinson Dr													
Lane 1[d]	143	10.0	887	0.161	100	5.6	LOS A	0.9	23.7	Full	1600	0.0	0.0
Approach	143	10.0		0.161		5.6	LOS A	0.9	23.7				
Intersection	1151	10.0		0.402		6.6	LOS A	2.8	74.3				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: SIDRA Standard.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

about GHD

GHD is one of the world's leading professional services companies operating in the global markets of water, energy and resources, environment, property and buildings, and transportation. We provide engineering, environmental, and construction services to private and public sector clients.

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