



STATE OF HAWAII
DEPARTMENT OF EDUCATION
P.O. BOX 2360
HONOLULU, HAWAII 96804

OFFICE OF FACILITIES AND OPERATIONS

July 30, 2021

TO: Mary Alice Evans
Director, Office of Planning and Sustainable Development
Department of Health

FROM: Edward S. Ige *Edward S. Ige*
Facilities Director, Facilities Development Branch

SUBJECT: **Kihei High School, Kihei, Maui**
Additional Environmental Review of 343 Compliance Not Required
DOE Job No. Q55000-17 and State Project No. HWY-02-17
Rights-of-Way TMKs: (2)2-2-002:083, (2)2-2-002:038; (2)2-2-025:999,
and (2)2-2-999-999

Pursuant to Section 11-200.1-11, Hawaii Administrative Rules (HAR), the State of Hawaii Department of Education (HIDOE) has determined that the installation of a roundabout at the intersection of Piilani Highway and Kulanihakoi Street has been adequately reviewed under the previous Kihei High School Final Environmental Impact Statement (FEIS) (2012).

The installation of a signalized intersection was analyzed as a component of the previous Kihei High School FEIS. The proposed roundabout is comparable to the signalized intersection analyzed in the prior FEIS and would not result in changes in size, scope, intensity, use, location, or timing. Therefore, the HIDOE requests that you publish this determination in the next edition of "The Environmental Notice" on August 8, 2021.

Use of Prior Accepted Environmental Impact Statement:

Per HAR §11-200.1-11 (as adopted in August 2019), a proposing agency may determine that a prior Finding of No Significant Impact (FONSI) or accepted Environmental Impact Statement (EIS) satisfies Chapter 343, Hawaii Revised Statutes (HRS), for a proposed action if the following criteria are met:

1. The proposed action was a component of, or is substantially similar to, an action that received an exemption, FONSI, or an accepted EIS;
2. The proposed action is anticipated to have direct, indirect, and cumulative effects similar to those analyzed in a prior exemption, final Environmental Assessment (EA), or accepted EIS; and
3. In the case of a final EA or an accepted EIS, the proposed action was analyzed within the range of alternatives.

The Agency must submit a brief written determination explaining its rationale to the Environmental Review Program for publication pursuant to §11.200.1-4 and the proposed action may then proceed without further Chapter 343, HRS, environmental review.

Kihei High School Project Description:

The HIDOE proposes to develop a new high school campus in Kihei on 77.2 acres of undeveloped land mauka of Piilani Highway between Kulanihakoi and Waipuilani Gulches on the island of Maui. The proposed school will serve grades 9-12 in the South Maui Region. Site improvements would include construction of approximately 215,000 square feet of buildings to support an enrollment capacity of 1,650 students and approximately 206 supporting faculty and staff. The campus was master planned to include athletic fields (e.g., tennis, track and field, football, soccer, baseball and softball fields) and associated infrastructure improvements (e.g., new roadways, utilities, drainage, wastewater and water systems). An extension of Kulanihakoi Street mauka of Piilani Highway will serve as the main campus access road.

The State of Hawaii Department of Transportation (HIDOT) is developing the proposed intersection improvements to provide access to the new high school. Since the improvements to Piilani Highway are necessary for the larger high school development, State regulations require that the intersection improvements be treated as a single action with the Kihei High School (HAR 11-200-7(2) and 11-200.1-19(2)1). While the HIDOE remains the proposing agency for the new Kihei High School, HIDOT, as the highway owner, is overseeing the necessary improvements to Piilani Highway.

The proposed improvements include the construction of a two-lane roundabout with bypass lanes to connect the Kihei High School Access Road to the Piilani Highway and Kulanihakoi Street. The roundabout is designed to slow higher speed traffic along Piilani Highway and provide numerous operational and safety benefits.

Pedestrian safety enhancements include advance warning beacons and Rectangular Rapid Flashing Beacon Pedestrian Crosswalk Systems for school zone crossing on the highway approaches. Raised pedestrian crossings will also be provided in the right-turn bypass lanes to assure that motorists using these lanes slow and are prepared to yield to pedestrians.

Impact Analysis:

A FEIS for Kihei High School was prepared by the HODOE and accepted by the Hawaii State Governor in 2012. The FEIS discloses the traffic impacts and need for improvements to Piilani Highway to provide access to the school, and to mitigate impacts generated by school traffic. The EIS analyzed projected traffic conditions of the proposed action (development of the new high school), as well as the no action alternative.

The trips generated by the Kihei High School project are expected to be associated with the existing and new high school students. High school students from Kihei currently attend high schools in Kahului and Wailuku and these students are expected to transfer to the new high school. Overall, increases in traffic are anticipated due to ambient growth in traffic and the inclusion of the proposed access for the high school.

To mitigate potential impacts, the FEIS recommended the provision of turning lanes and a traffic signal system at the intersection of Piilani Highway and Kulanihako'i Street coupled with a grade-separated access for pedestrians.

Upon evaluation of the intersection recommendations presented in the FEIS, HODOE has determined that grade separation and signalization is not the optimal solution for traffic operations and pedestrian safety at this new intersection. As an alternative, HODOE commissioned an evaluation for a roundabout as a means to control operations and facilitate access (Attachment 1). The evaluation was completed in 2020 by WSP which identified the roundabout as the preferred option for the intersection (Attachment 2). The roundabout was selected over a traffic signal system to better slow vehicular traffic along Piilani Highway and to improve safety for high school aged pedestrians for at-grade crossing from neighborhoods to the high school.

The roundabout is expected to have similar construction period impacts to the signalized intersection. Plans to mitigate construction related impacts include scheduling off-peak movement of equipment and materials to minimize the disruption to traffic flow and inconvenience to the motoring public, bicyclists, and pedestrians. Dust and noise pollution will be contained through job-site construction management practices and adherence to State and County laws which pertain to construction dust

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management and noise control. A Construction Traffic Management Plan will be prepared to minimize conflicts with traffic along roadways during construction.

Conclusions:

On January 12, 2021, the HDOE and HIDOT held a virtual public meeting to inform and receive feedback from the community regarding the roundabout. Based on a review of the FEIS with regard to changes in size, scope, location, intensity, use, and timing; the traffic study; and community coordination, the scope of the proposed intersection improvements is not expected to increase environmental impacts from the previous disclosure for the Kihei High School project. A Supplemental EIS (or new EIS or EA) is therefore not warranted. HIDOT has expressed concurrence with this determination in their letter dated June 24, 2021 (Attachment 3).

The roundabout, in terms of significant adverse effects on the environment, is comparable to a signalized intersection. The roundabout is expected to have similar direct, indirect, and cumulative effects as those analyzed in the prior FEIS and is anticipated to result in net beneficial effects on the environment by alleviating impacts related to increased traffic and increasing pedestrian safety.

For questions regarding this determination, please feel free to contact Gaylyn Nakatsuka, Architect of the Facilities Development Branch, Planning Section, at (808) 784-5088 or gaylyn.nakatsuka@k12.hi.us.

ESI:gn

Attachments Attachment 1 – Roundabout Design

Attachment 2 – WSP Traffic Study

Attachment 3 – June 24, 2021 HIDOT letter

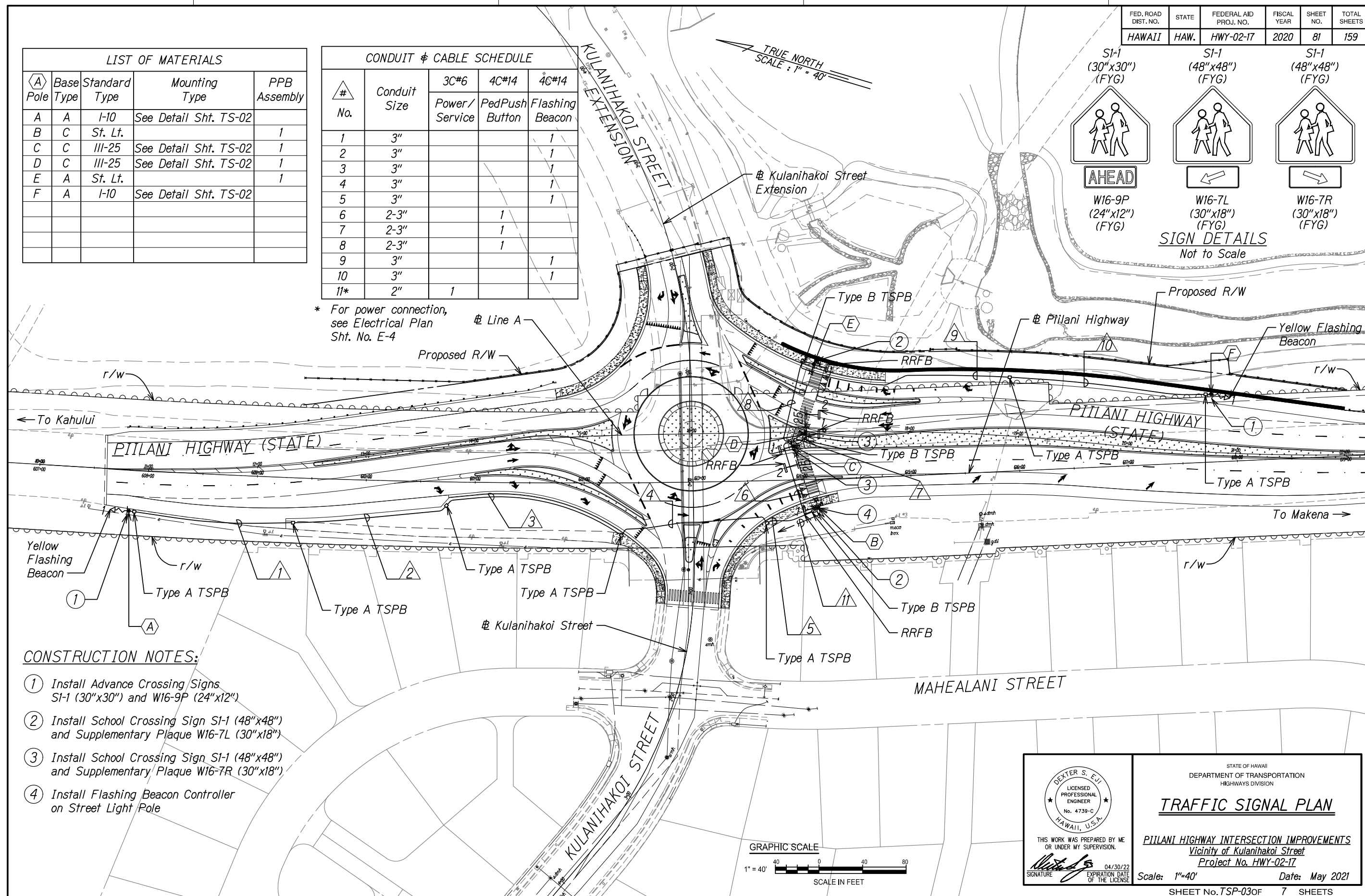
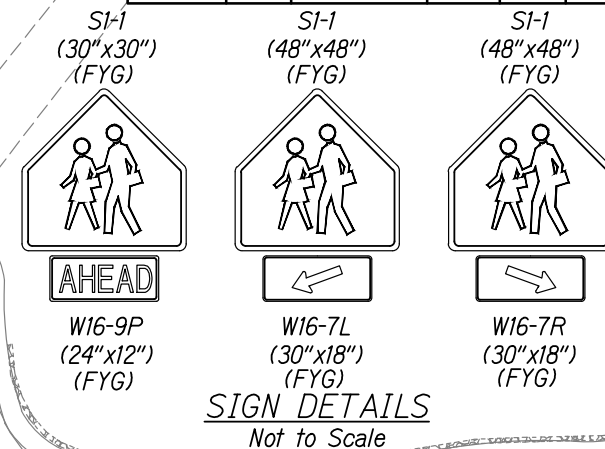
c: Robin Shishido, HIDOT Highways – Maui District
Facilities Development Branch

FED. ROAD DIST. NO.	STATE	FEDERAL AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	HWY-02-17	2020	81	159

△ Pole	Base Type	Standard Type	Mounting Type	PPB Assembly
A	A	I-10	See Detail Sht. TS-02	
B	C	St. Lt.		1
C	C	III-25	See Detail Sht. TS-02	1
D	C	III-25	See Detail Sht. TS-02	1
E	A	St. Lt.		1
F	A	I-10	See Detail Sht. TS-02	

△ # No.	Conduit Size	3C#6	4C#14	4C#14
		Power/Service	PedPush Button	Flashing Beacon
1	3"			1
2	3"			1
3	3"			1
4	3"			1
5	3"			1
6	2-3"		1	
7	2-3"		1	
8	2-3"		1	
9	3"			1
10	3"			1
11*	2"	1		

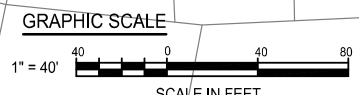
* For power connection, see Electrical Plan Sht. No. E-4



CONSTRUCTION NOTES:

- ① Install Advance Crossing Signs SI-1 (30"x30") and W16-9P (24"x12")
- ② Install School Crossing Sign SI-1 (48"x48") and Supplementary Plaque W16-7L (30"x18")
- ③ Install School Crossing Sign SI-1 (48"x48") and Supplementary Plaque W16-7R (30"x18")
- ④ Install Flashing Beacon Controller on Street Light Pole

SURVEY PLOTTED BY: _____ DATE: _____
 DRAWN BY: _____
 CHECKED BY: _____
 ORIGINAL PLAN NO. _____
 NOTE BOOK No. _____



DEXTER S. E.J.I.
LICENSED PROFESSIONAL ENGINEER
No. 4739-C
HAWAII, U.S.A.

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

TRAFFIC SIGNAL PLAN

PILI HAWAY INTERSECTION IMPROVEMENTS
Vicinity of Kulanihako'i Street
Project No. HWY-02-17

Scale: 1"=40' Date: May 2021

SHEET No. TSP-030F 7 SHEETS

**Memorandum**

300 4th Street, Suite 1200
Las Vegas, NV 89101
Tel: (725) 724-4322
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TO: Robin Shishido, HDOT-Highways, Maui District
FROM: Kevin French, Senior Transportation Engineer
Dexter Eji, Project Manager
DATE: July 28, 2020
SUBJECT: Piilani Highway/Kihei High School Roundabout Evaluation

The State of Hawaii Department of Education (DOE) is developing a new high school to be located in Kihei, Hawaii. Primary access to the new school will be across from Kulanihakoi Street along Piilani Highway. A Traffic Impact Study (TIR), an Environmental Impact Statement, multi-modal, and intersection control studies have been completed to determine the most effective means for controlling traffic and maximizing pedestrian safety the main intersection providing access to the high school. The currently approved means for controlling the intersection is a traffic signal coupled with a future grade separation for pedestrians. Other options for controlling the intersection that were studied included a multi-lane roundabout with an at-grade crossing and with a grade separated pedestrian crossing.

The State of Hawaii Transportation Department (DOT) has retained WSP to further develop multi-lane roundabout alternatives that maximizes the traffic calming and traffic safety benefits of roundabouts and provides a safe at-grade pedestrian crossing at the intersection. DOT's primary concerns are that traffic speeds along Piilani Highway need to be reduced and that pedestrians need to be safely accommodated. In addition the DOT is tasked with assuring reasonable long-term traffic operations for mobility along state highways, including Piilani Highway.

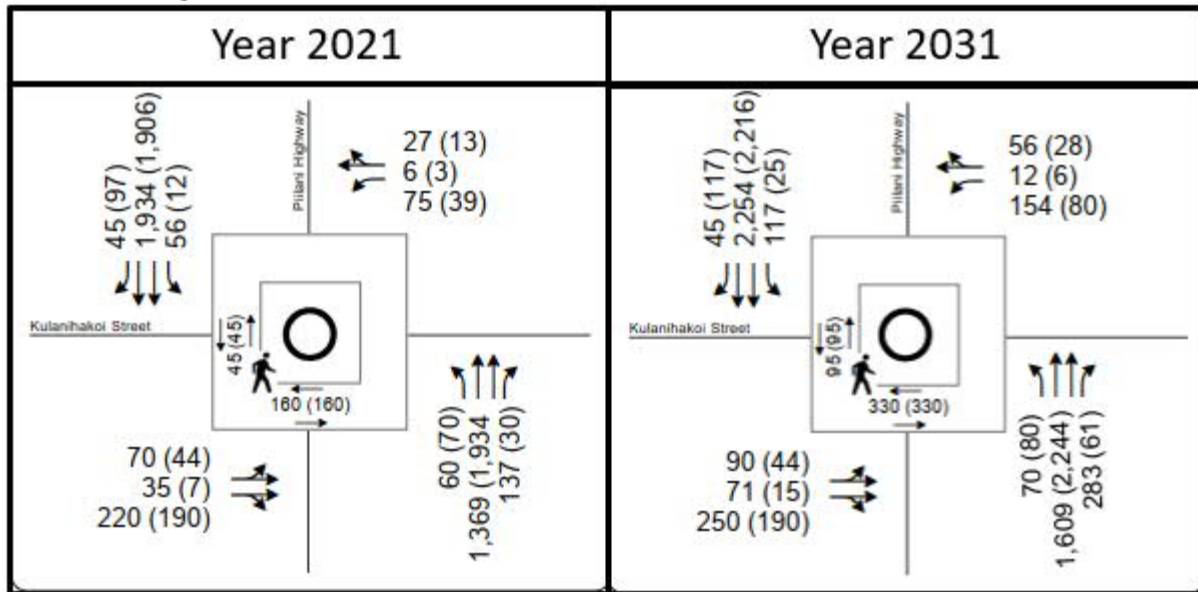
A grade separated pedestrian crossing would require climbing of stairs or extensive out-of-direction travel along accessible ramps in order for pedestrians to use the crossing, and without significant, potentially infeasible pedestrian barriers, the grade separated crossing may be rendered ineffective. Pedestrian barriers are feasible in the raised medians or perhaps along the roadway; however, openings will be required at the intersection to allow vehicular movement. These openings would present an opportunity for pedestrians to illegally cross the highway without benefit of the grade separated crossing or any at-grade pedestrian safety features.

Traffic Analysis:

As stated a significant amount of traffic evaluation work has been completed at the proposed intersection. Traffic volumes for use in evaluating the roundabout options were extracted from the Fehr & Peers Technical Memorandum, *Kihei High School – Multimodal Operations Alternatives Evaluation of the Kulanihakoi Street/Piilani Highway Intersection*, dated August 1, 2019. These volumes are shown in Figure 1, Year 2021 and Year 2031 Traffic and Pedestrian Volumes. For consistency WSP used these traffic volumes and information about how these

were developed is included in the August 2019 technical memorandum. In summary, the Year 2021 traffic volumes were based on 800 students with 20% of trips arriving by walking or bicycling, and Year 2031 traffic volumes were based on 1,650 students with 20% arriving by walking or bicycling.

Figure 1, Year 2021 and Year 2031 Traffic and Pedestrian Volumes



WSP utilized the SIDRA INTERSECTION 9.0 traffic analysis software to evaluate the anticipated traffic operating conditions for the differing roundabout alternatives. SIDRA allows the user to select the traffic analysis methodology to be used in the analysis, and for consistent evaluations completed in the United States, the Highway Capacity Manual (HCM 6) was selected. In addition, the level-of-service (LOS) criteria selected was unsignalized intersections, again consistent with evaluations for unsignalized intersections evaluated in the United States.

Four roundabout options were evaluated and are discussed below.

1. Two-lane roundabout, two-lane approaches on Piilani Highway, one-lane approach on Kulanihakoai Street, and one-lane approach from Kihei HS driveway. In this option the left-turn, through, and right-turn approach volumes would be serviced by one lane on minor approaches.
2. Two-lane roundabout, two-lane approaches on Piilani Highway, two-lane approaches on Kulanihakoai Street and Kihei HS driveway. In this option the left-turn and through approach volumes with be accomodated in one lane and an additional lane would be provided for right-turns.
3. Two-lane roundabout, two-lane approaches on Piilani Highway, two-lane approaches on Kulanihakoai Street and Kihei HS driveway with right-turn bypass lanes on west side of intersection.
4. Two-lane roundabout, two-lane approaches on Piilani Highway, two-lane approaches on Kulanihakoai Street and Kihei HS driveway with right-turn bypass lanes on east side of intersection.

A fifth option was developed deemed the “optimized” option that combined the benefits of the west side bypasses along with a northbound Piilani Highway to Kihei HS bypass. The



westbound Kihei HS to northbound bypass showed incremental benefits but also had additional, potentially unnecessary impacts to the high school site.

The results of the analysis for Year 2021 and Year 2031 are shown in Tables 1 and 2, respectively, and the analysis worksheets are attached.

Table 1, Year 2021, Intersection LOS/Delay (HCM 6)

Piilani Hwy/Kulanihako St	Piilani Hwy - South		Kihei HS Drwy		Piilani Hwy - North		Kulanihako St		Overall	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
Year 2021 - Single Lane - AM	19.8	C	17.2	C	31.8	D	409.9	F	57.2	F
Year 2021 - Single Lane - PM	28.6	D	26.6	D	26.3	D	166.9	F	35.2	E
Year 2021 - Two Lane - AM	22.5	C	15.3	C	31.8	D	142.0	F	36.6	E
Year 2021 - Two Lane - PM	29.2	D	24.2	C	26.3	D	78.4	F	30.5	D
Year 2021 - Two Lane w/ West Bypasses - AM	22.5	C	15.3	C	28.1	D	18.2	C	24.8	C
Year 2021 - Two Lane w/ West Bypasses - PM	29.2	D	24.2	C	20.8	C	9.5	A	24.1	C
Year 2021 - Two Lane w/ East Bypasses - AM	16.4	C	12.6	B	31.8	D	142.0	F	34.2	D
Year 2021 - Two Lane w/ East Bypasses - PM	26.9	D	19.3	C	26.3	D	78.4	F	29.4	D
Year 2021 - Two Lane Optimized - AM	16.4	C	15.3	C	28.1	D	18.2	C	22.4	C
Year 2021 - Two Lane Optimized - PM	26.9	D	24.2	C	20.8	C	9.5	A	23.1	C

As shown Table 1, the single lane approaches on Kulanihako Street would experience significant delay with only one approach lane. The delays are significantly improved with two approach lanes, but only improved to LOS C or better with right-turn bypass lanes for right-turn movements to and from Kulanihako Street. A minimum of two approach lanes on the minor streets are required for reasonable traffic operations in the Year 2021.

Table 2, Year 2031, Intersection LOS/Delay (HCM 6)

Piilani Hwy/Kulanihako St	Piilani Hwy - South		Kihei HS Drwy		Piilani Hwy - North		Kulanihako St		Overall	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
Year 2031 - Single Lane - AM	86.9	F	39.2	E	118.8	F	671.8	F	148.2	F
Year 2031 - Single Lane - PM	93.3	F	46.9	E	75.6	F	270.0	F	92.7	F
Year 2031 - Two Lane - AM	116.5	F	22.2	C	117.1	F	236.9	F	122.5	F
Year 2031 - Two Lane - PM	100.7	F	32.8	D	75.2	F	120.8	F	88.4	F
Year 2031 - Two Lane w/ West Bypasses - AM	125.6	F	22.0	C	105.9	F	47.3	E	105.1	F
Year 2031 - Two Lane w/ West Bypasses - PM	101.2	F	32.7	D	54.7	F	13.2	B	73.9	F
Year 2031 - Two Lane w/ East Bypasses - AM	50.1	F	29.4	D	121.9	F	228.4	F	98.4	F
Year 2031 - Two Lane w/ East Bypasses - PM	87.1	F	29.3	D	75.9	F	119.9	F	82.2	F
Year 2031 - Two Lane Optimized - AM	54.7	F	33.4	D	110.3	F	45.5	E	79.8	F
Year 2031 - Two Lane Optimized - PM	87.5	F	35.4	E	55.2	F	13.2	B	67.8	F

As noted in Table 2, operating conditions will degrade substantially in the Year 2031 with the increase in traffic expected along Piilani Highway coupled with the full development of the 1,650 student high school. The two-lane approach on Kulanihako Street with bypasses is required to provide LOS E in the morning peak hour. The bypasses on the east side for the high school are not as critical; however, the northbound right-turn bypass to the high school improves conditions for northbound Piilani Highway approaching the intersection. The “optimized” alternative provides overall peak hour LOS delays that might be comparable to delays that would be experienced at a very busy intersection with traffic signal control.

As stated earlier, the SIDRA intersection analysis software allows the user to select differing analysis methodology including its own SIDRA methodology. This methodology differs from the HCM 6 and is based on research from areas in which motorists have more experience

navigating roundabouts. For comparison purposes, the Year 2031 with full build out of the high school was evaluated using the SIDRA methodology and is listed in Table 3.

Table 3, Year 2031, Intersection LOS/Delay (SIDRA)

Piilani Hwy/Kulanihako St	Piilani Hwy - South		Kihei HS Drwy		Piilani Hwy - North		Kulanihako St		Overall	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
Year 2031 - Single Lane - AM	53.6	E	31.2	C	89.1	F	589.0	F	113.6	F
Year 2031 - Single Lane - PM	63.1	E	29.6	C	42.1	D	231.9	F	60.9	E
Year 2031 - Two Lane - AM	88.9	F	16.1	B	86.5	F	68.4	E	82.8	F
Year 2031 - Two Lane - PM	70.3	F	19.0	B	41.8	D	32.4	C	54.2	E
Year 2031 - Two Lane w/ West Bypasses - AM	94.3	F	15.9	B	18.6	B	39.6	B	49.8	D
Year 2031 - Two Lane w/ West Bypasses - PM	71.2	F	19.0	B	7.1	A	15.1	B	37.7	D
Year 2031 - Two Lane w/ East Bypasses - AM	8.7	A	13.7	B	89.0	F	66.1	E	52.3	E
Year 2031 - Two Lane w/ East Bypasses - PM	6.0	A	19.9	B	45.1	D	31.4	C	25.6	C
Year 2031 - Two Lane Optimized - AM	9.2	A	15.0	B	19.8	B	40.0	D	17.1	B
Year 2031 - Two Lane Optimized - PM	6.1	A	21.9	C	7.6	A	15.2	B	7.6	A

As noted in Table 3, the anticipated operating conditions using SIDRA methodology appear to be much improved over the conditions calculated by HCM 6 methodology. There is confirmation that the single lane approached on the minor streets will not function effectively with extreme delay on the Kulanihako Street approach. The two-lane approaches without bypasses will still operate poorly in the morning peak hour although the delays are much lower and comparable to a very busy intersection with traffic signal control. The addition of the west side bypasses to Kulanihako Street and the northbound right-turn bypass to high school appears to operate very favorably with overall operations at LOS B or better in both peak hours.

Based on the traffic evaluation of the roundabout alternatives, two alternatives have been carried forward for preliminary design, the two-lane alternative with no bypasses and the “optimized” alternative with bypasses on the west side and a northbound Piilani Highway to eastbound Kihei High School bypass. The SIDRA conceptual exhibits for these two alternatives are shown in Figures 2 and 3.

Figure 2, SIDRA Conceptual Exhibit, Two-lane without Bypasses

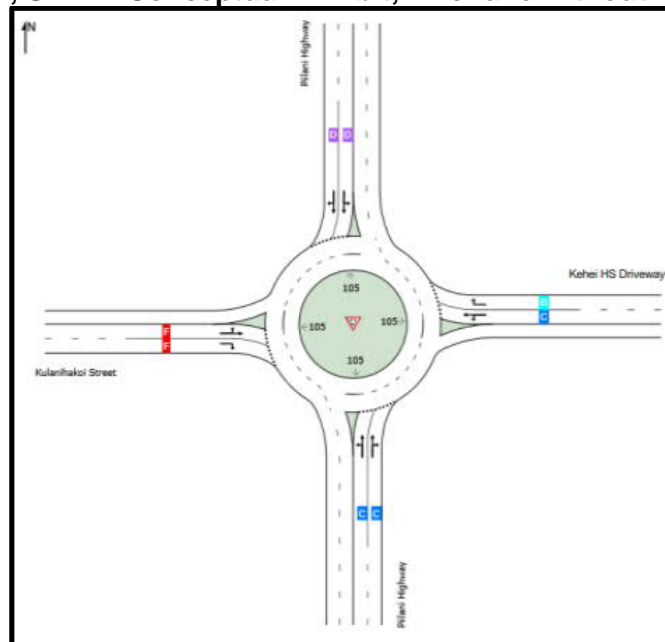
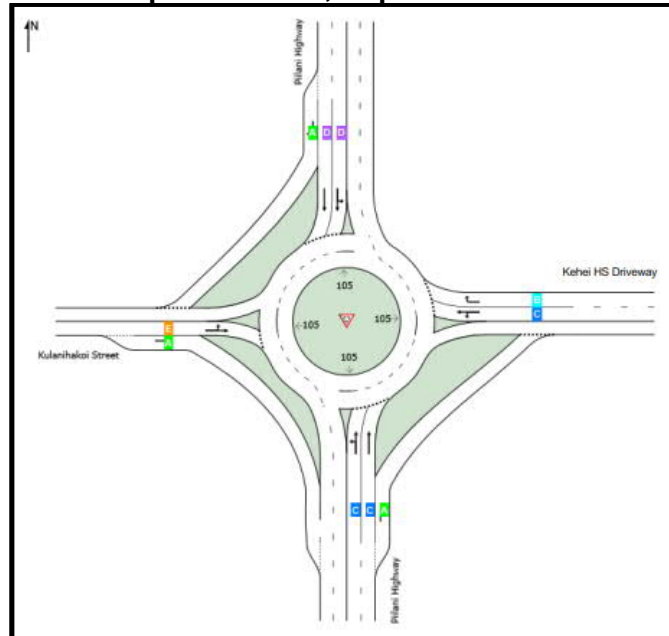


Figure 3, SIDRA Conceptual Exhibit, “Optimized” Two-lane with Bypasses



In addition to delay and level-of-service another measure to be considered in the performance of the roundabout options is the anticipated back of queue (or number of stored vehicles) that might extend back from the roundabout. For the purposes of this analysis it is assumed that the average length between the front of vehicles is 25’ which includes the length of the vehicle and a reasonable distance between queued vehicles. As congestion increases, the delay is longer and more vehicles are stored or queued on the approaches. For comparison, the estimated queue lengths for the Years 2021 and 2031 for the two roundabout alternatives are presented in Table 4.

Table 4, Queue Lengths

Piilani Hwy/Kulanihakai St	Morning Peak Hour				Afternoon Peak Hour			
	South	East	North	West	South	East	North	West
Year 2021 - Two Lane (HCM6)	540'	20'	1,265'	480'	390'	15'	935'	170'
Year 2021 - Two Lane Optimized (HCM6)	325'	20'	1,105'	55'	365'	15'	625'	20'
Year 2031 - Two Lane (HCM6)	2,495'	55'	3,120'	820'	3,690'	40'	2,715'	315'
Year 2031 - Two Lane Optimized (HCM6)	1,450'	75'	2,960'	165'	3,350'	40'	2,260'	30'
Year 2031 - Two Lane (SIDRA)	1,840'	65'	2,240'	290'	2,435'	45'	1,525'	150'
Year 2031 - Two Lane Optimized (SIDRA)	275'	55'	920'	180'	455'	50'	415'	35'

As noted in Table 4, the queue lengths will be reduced with the provision of the bypass lanes included in the “optimized” two-lane roundabout alternative. Without the bypass lanes queue lengths may extend over one half mile from the intersection along Piilani Highway. The Kihei HS driveway on the east leg of the roundabout will not experience significant queuing in either alternative. On the west, Kulanihakai Street, the queue for left-turning and through vehicles will likely extend back through the adjacent local intersection, while the right-turn lane will flow freely with the eastbound to southbound bypass lane.

Geometric Design:

The preliminary design of the roundabouts is based on the concepts included in NCHRP Report 672, *Roundabouts: An Informational Guide*, 2010. The characteristics or design parameters are discussed below with supporting information.

- The roadway alignment along Piilani Highway will be adjusted to provide deflection on entry to slow motorists at the roundabout and encourage motorists to yield at the entry point. Additionally, raised median and curb/gutter sections will be provided to delineate the entry curves, approaches, circulating lanes, and exits to encourage motorist to stay within designated travel lanes.
- The roundabout will be designed with two circulating lanes for northbound and southbound Piilani Highway with one circulating lane on the north and south sides of the roundabout to accommodate left-turns to and from the minor street approaches.
- For the two-lane alternative with no bypasses, northbound and southbound traffic on Piilani Highway will be accommodated in two lanes, a combined left-turn/through lane, and a combined through/right-turn lane. Eastbound and westbound traffic from the minor streets will be accommodated in one combined left-turn/through lane and a second lane for right-turns. The right-turn bypass options will remove the right-turns from the combined through/right-turn lanes for the respective movements.
- WB-67 trucks will be accommodated at the roundabout with 165' inscribed (outside) diameter. Trucks will be accommodated on the minor streets by utilizing both approach lanes and a truck apron. As much as practical trucks will be accommodated on Piilani Highway without requiring encroachment into adjacent entry, circulating, and exit lanes. This will require trucks in left/through lanes to use the truck apron as they traverse the roundabout.
- Pedestrians will be accommodated on the west, south, and east legs of the intersection. The relatively high numbers of pedestrians associated with the high school coupled with the multiple approach/exit lanes on Piilani Highway will require additional pedestrian safety devices for the south leg of the intersection. The raised median width will be maximized to accommodate a high number of pedestrians waiting to cross the street, and Rectangular Rapid Flashing Beacons (RRFB) or High-Intensity Activated crossWalk (HAWK) traffic signals will be used for the crossing. Raised pedestrian crossings will be added in the right-turn bypass lanes.

The preliminary design for the two-lane roundabout alternative and the “optimized” roundabout alternative are included as Attachments 1 and 2. Note that the single-lane approach option was eliminated due to very poor and unacceptable delays and level-of-service. The bypass options were combined into the “optimized” roundabout due to the improved operations including right-turn bypasses to and from Kulanihakoi Street along with the northbound right-turn bypass to the Kihei High School.

Discussion:

The following operational characteristics are discussed further to determine the roundabout option that best serves the various traffic safety and traffic operational characteristics of the two remaining roundabout options.

- Pedestrian Safety
- Traffic Operations

- Right-of-way/Limits of Construction
- Utility/Infrastructure Impacts
- Construction cost

The primary reason for choosing roundabout control over a traffic signal control was to slow vehicular traffic along Piilani Highway and improve safety for high school aged pedestrians for at-grade crossing from neighborhoods to the high school. Both roundabout options will slow the majority of the traffic approaching the intersection northbound and southbound on Piilani Highway. Pedestrian safety enhancements including rectangular rapid flashing beacons (RRFB) or HAWK signal are would be included for the crossing on south side of the roundabout.

The two-lane roundabout alternative without bypass lanes would be an incrementally better option for pedestrian safety because it would have shorter pedestrian crossing distances and all traffic would be required to slow at the entry to the roundabout. Pedestrians would cross only two lanes of traffic, or approximately 28'-29', with a pedestrian refuge area, then cross the remaining two lanes of traffic. The crossing distances are illustrated in Figure 4.

Figure 4, Two-Lane Roundabout, Pedestrian Crossing Distances

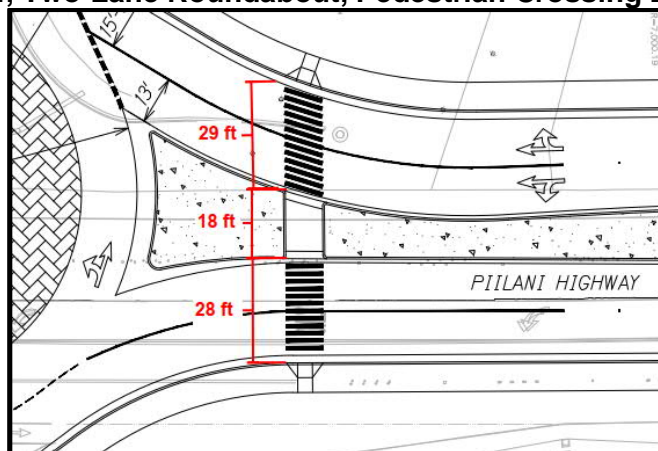
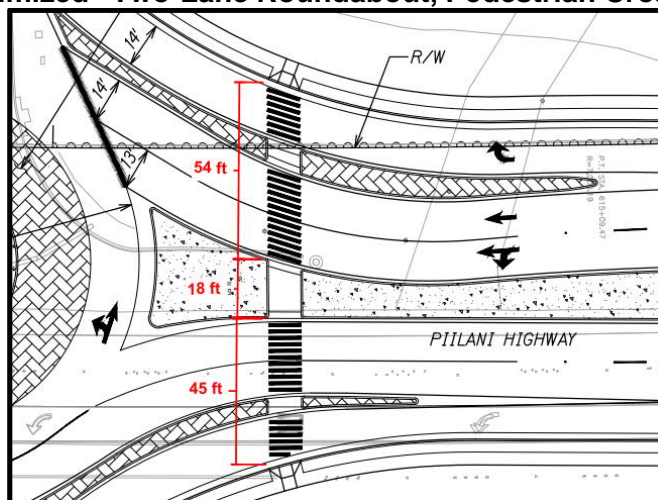


Figure 5, “Optimized” Two-Lane Roundabout, Pedestrian Crossing Distances



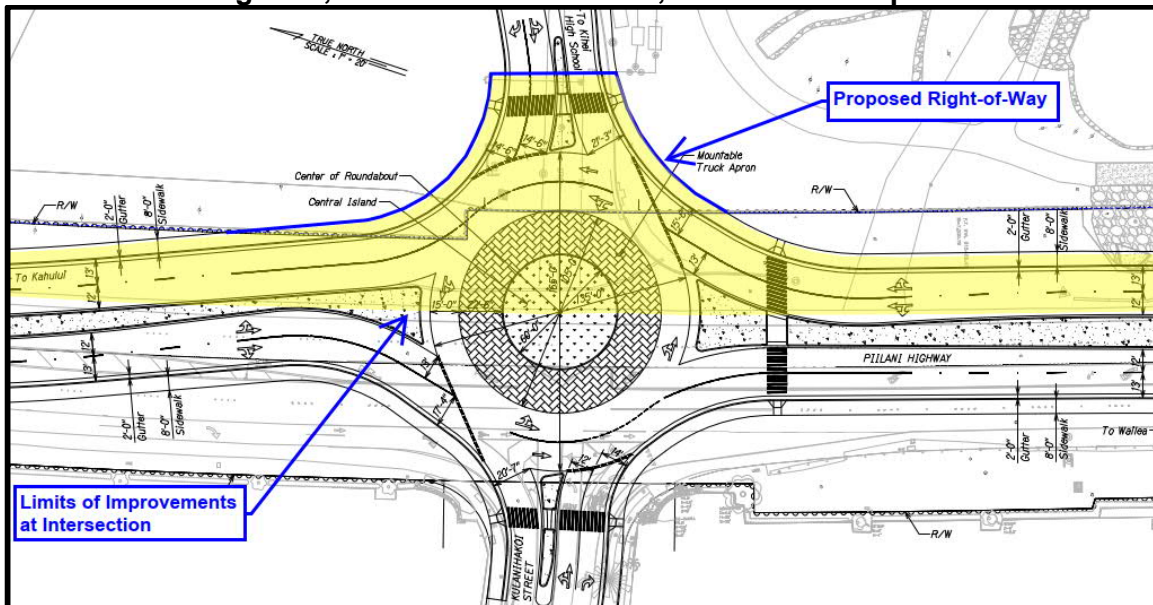
The two-lane roundabout alternative with bypasses would require crossing three lanes of traffic, approximately 45'-54', then traverse the median refuge area, and then cross an additional three lanes of traffic as illustrated in Figure 5. The additional width and exposure to right-turning traffic in the turn lanes can be partially mitigated by providing raised pedestrian crosswalks in the right-turn bypass lanes.

As discussed earlier, the two-lane roundabout without bypass lanes is expected to operate with higher levels of delay and worse levels-of-service during peak hours. The SIDRA methodology indicates that the overall levels of service will be LOS F in the morning peak hour and LOS E in the afternoon peak hour. It should be noted that the Kihei High School approach is expected to operate at good levels of service during both peak hours, and the Kulanihako Street approach is expected to operate at LOS E in the morning peak hour and LOS C in the afternoon peak hour. The majority of the traffic delays will be on Piilani Highway.

The “optimized” two-lane roundabout will have improved traffic operations by providing right-turn bypass lanes to acceleration lanes for three of the four right-turn movements at the intersection. The westbound right-turn exit from the high school to northbound Piilani Highway was not included in the “optimized” design as it did not substantially improve operations at the intersection and had additional impacts to the northeast corner of the intersection.

The anticipated limits of construction and resulting right-of-way for the two-lane roundabout are illustrated in Figure 6. The geometric footprint for the two-lane roundabout without bypasses is contained to the intersection along with minor widening along Piilani Highway to provide a raised median. As shown, the additional right-of-way from the high school property is in the immediate vicinity of the intersection. The limits of the improvements on the east side of the intersection are highlighted as compared to the existing edge of pavement.

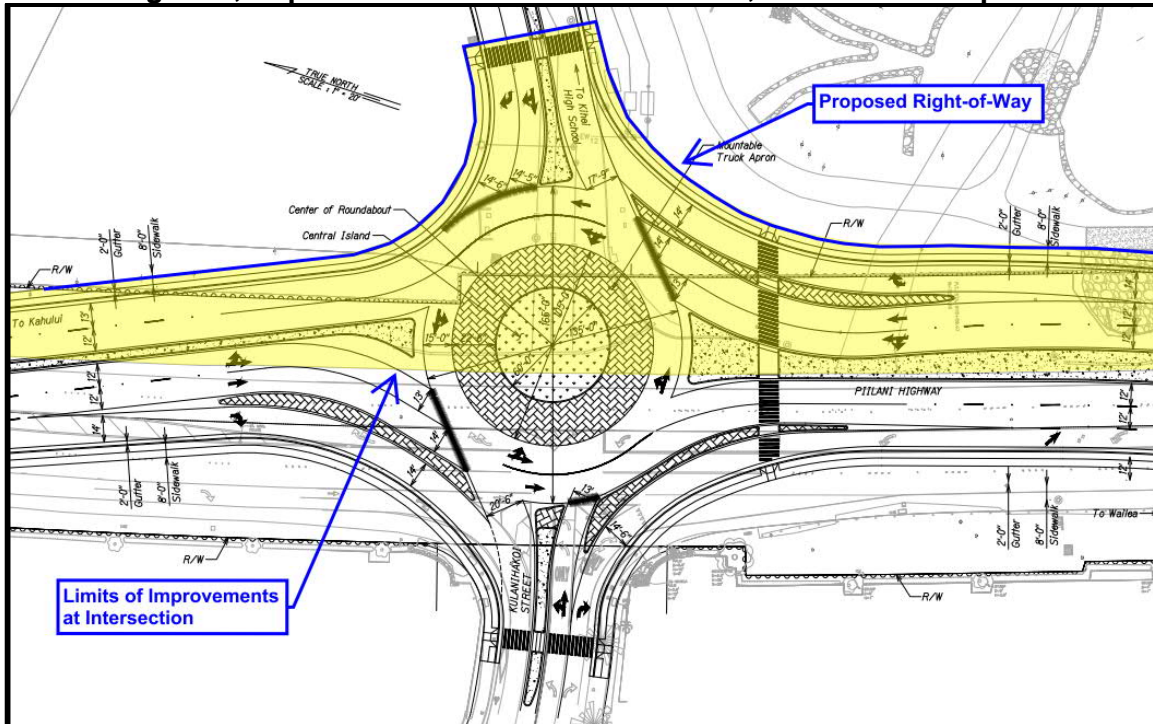
Figure 6, Two-Lane Roundabout, Geometric Footprint



A similar exhibit showing the geometric footprint of the “optimized” roundabout with bypass lanes is shown in Figure 7. As noted the limits of construction and the additional right-of-way pushes farther into the school property and extends further away from the intersection. This is due to holding the west side of the roundabout adjacent to the neighborhood and shifting the

roundabout to the east for the additional lanes. A longer length of Piilani Highway will also require reconstruction to align with the shifted roundabout and provide the acceleration and deceleration lanes.

Figure 7, "Optimized" Two-Lane Roundabout, Geometric Footprint



The Kihei High School development site is currently under construction and a number of utilities and other infrastructure improvements such as drainage facilities and internal circulating roads have been constructed. Both roundabouts will have impacts to these facilities as shown in Figure 8 and Figure 9.

Figure 8, Two-Lane Roundabout, Utility/Infrastructure Impacts

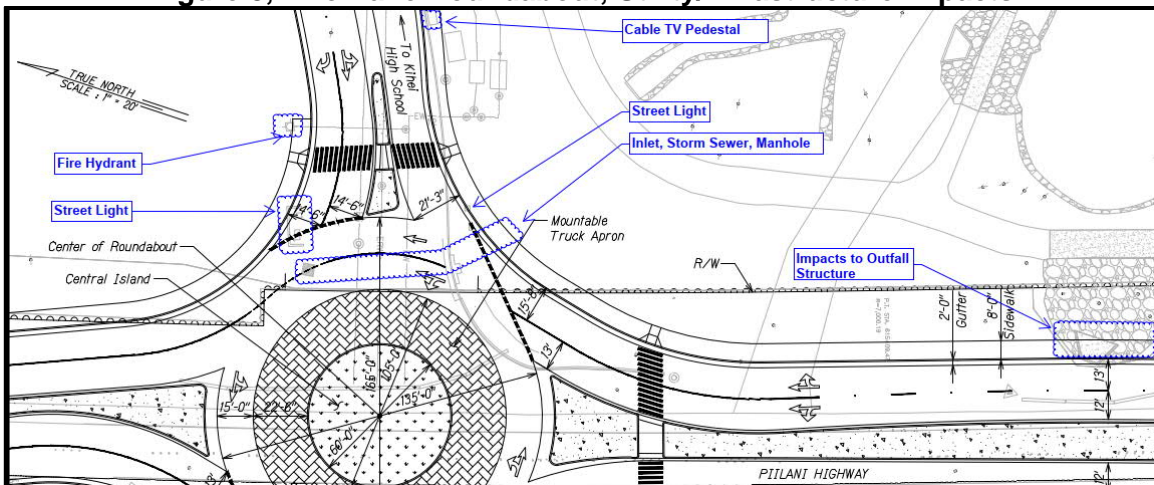
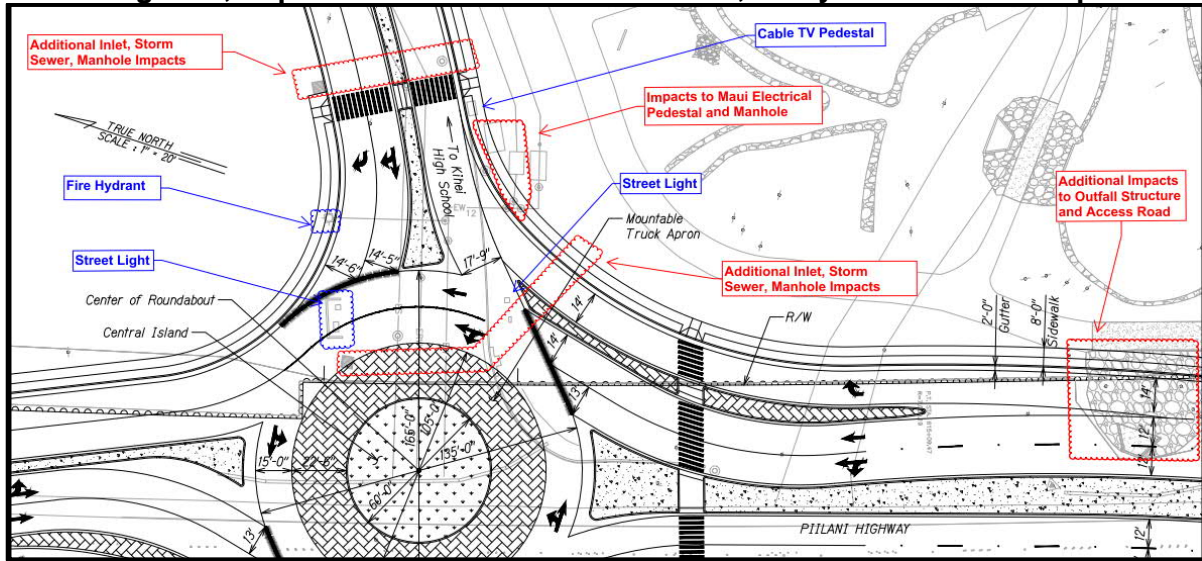


Figure 9, “Optimized” Two-Lane Roundabout, Utility/Infrastructure Impacts



As noted in the figures there will be similar impacts to the electrical service pedestals and the overhead street lights. The “optimized” two-lane roundabout would affect additional utilities in the southeast corner of the roundabout as well as the access road and outfall structure on east side of Piilani Highway.

Quantitative information regarding the cost estimates for both roundabout options are not available at this time. Qualitatively, the “optimized” option will have a higher construction cost due to the realignment of the Piilani Highway approaches, the additional lanes of travel and the additional infrastructure impacts.

Table 5 shows a comparison of the characteristics of the two roundabout options.

Table 5, Roundabout Option Summary Table

Characteristic	Rating		Notes	Rating		
	Two-Lane Roundabout	Two-lane Roundabout with Bypasses				
Pedestrian Safety	☐	◐	- Piilani Highway traffic slowed in both alternatives - Pedestrian crossing distances shorter without bypass lanes	Excellent	●	More Favorable
Traffic Operations	○	●	- Peak hour delays and extensive queues on Piilani Highway - Traffic operations improved with bypass lanes			
ROW/Construction Limits	◐	◑	- Additional ROW required on school site for bypass lanes			
Utility/Infrastructure Impacts	◑	◐	- Additional utilities and infrastructure impacts with bypass lanes			
Construction Cost	◑	◐	- Construction costs higher with bypass lanes and utility/infrastructure relocation costs			

As shown in Table 5, the table the two-lane roundabout without bypasses is somewhat safer for pedestrians because of the shorter pedestrian crossing distances. Both roundabout options would provide the slowing of traffic and the reduced chance of high speed crashes involving pedestrians and vehicles.

The addition of bypass lanes will provide a more efficient intersection for carrying vehicular traffic leading to improved traffic operations especially during peak school access periods.

Without the bypass lanes there will be significant delays and extensive queuing during peak hours. It should be noted that the Year 2031 traffic volumes were used for this analysis. Additional development and growth on the west side of the island will likely increase traffic beyond Year 2031, potentially exacerbating poor operating conditions. The “optimized” roundabout with the bypass lanes will provide additional capacity and accommodate traffic growth past the Year 2031 time horizon.

The remaining characteristics favor the two-lane roundabout for the reduced overall footprint, including less right-of-way requirement, less impact to the Kihei High School site, and reduced construction costs.

Recommendation:

The “optimized” two-lane roundabout with bypass lanes should be carried forward as the preferred two-lane roundabout alternative. The roundabout will slow higher speed traffic along Piilani Highway and the provision of RRFB or HAWK signal will further improve safety for the southerly pedestrian crossing at the intersection. Raised pedestrian crossings should be provided in the right-turn lane bypass lanes to assure that motorists using these lanes slow and are prepared to yield to pedestrians.

Attachments:

- Attachment 1: Kihei Roundabout Concept
- Attachment 2: Kihei Roundabout (Optimized) Concept
- Attachment 3: SIDRA Analysis Worksheets
 - 2021 HCM6 Methodology
 - 2031 HCM6 Methodology
 - 2031 SIDRA Methodology

Piilani Highway/Kihei High School Roundabout Evaluation

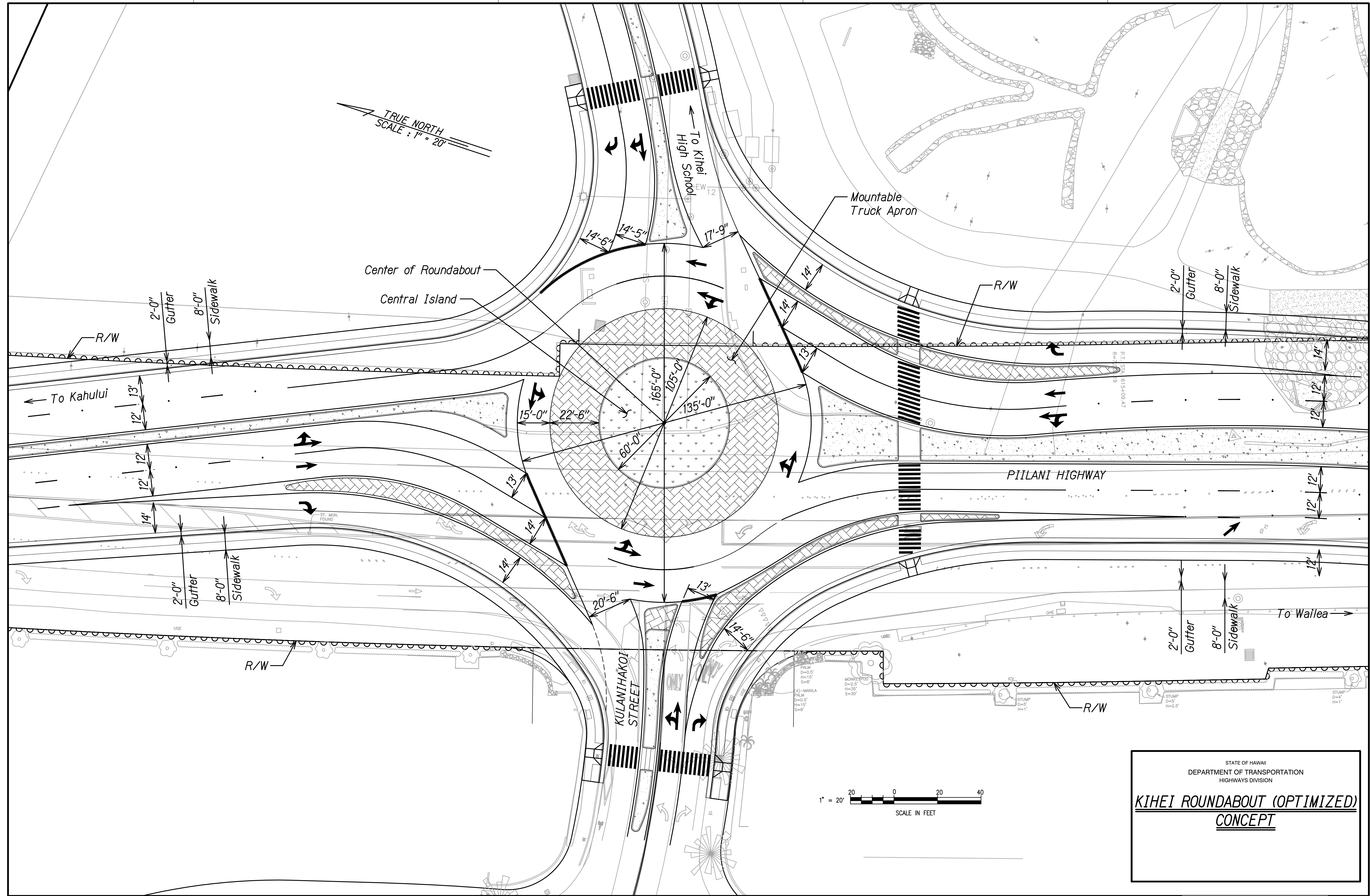
July 28, 2020

Attachment 1 – Kihei Roundabout Concept

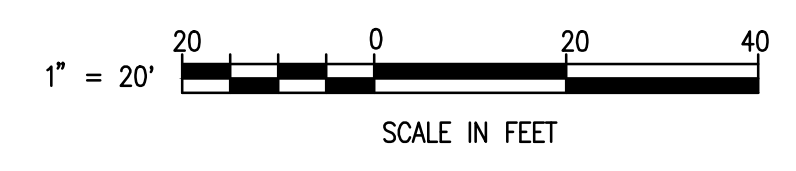
Piilani Highway/Kihei High School Roundabout Evaluation

July 28, 2020

Attachment 2 – Kihei Roundabout (Optimized) Concept



ORIGINAL PLAN
 SURVEY PLOTTED BY _____ DATE _____
 TRACED BY _____
 NOTE BOOK DESIGNED BY _____
 QUANTITIES BY _____
 CHECKED BY _____
 N.



STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION
KIHEI ROUNDABOUT (OPTIMIZED)
CONCEPT

Piilani Highway/Kihei High School Roundabout Evaluation
July 28, 2020

Attachment 3 – SIDRA Analysis Worksheets
2021 HCM6 Methodology

Summary Table, Delay/LOS, Year 2021 HCM6

Piilani Hwy/Kulanihakoi St	Piilani Hwy - South		Kihei HS Drwy		Piilani Hwy - North		Kulanihakoi St		Overall	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
Year 2021 - Single Lane - AM	19.8	C	17.2	C	31.8	D	409.9	F	57.2	F
Year 2021 - Single Lane - PM	28.6	D	26.6	D	26.3	D	166.9	F	35.2	E
Year 2021 - Two Lane - AM	22.5	C	15.3	C	31.8	D	142.0	F	36.6	E
Year 2021 - Two Lane - PM	29.2	D	24.2	C	26.3	D	78.4	F	30.5	D
Year 2021 - Two Lane w/ West Bypasses - AM	22.5	C	15.3	C	28.1	D	18.2	C	24.8	C
Year 2021 - Two Lane w/ West Bypasses - PM	29.2	D	24.2	C	20.8	C	9.5	A	24.1	C
Year 2021 - Two Lane w/ East Bypasses - AM	16.4	C	12.6	B	31.8	D	142.0	F	34.2	D
Year 2021 - Two Lane w/ East Bypasses - PM	26.9	D	19.3	C	26.3	D	78.4	F	29.4	D
Year 2021 - Two Lane Optimized - AM	16.4	C	15.3	C	28.1	D	18.2	C	22.4	C
Year 2021 - Two Lane Optimized - PM	26.9	D	24.2	C	20.8	C	9.5	A	23.1	C

- Notes:
- 1) Model results from SYDRA with HCM 6 Delay, v/c, and LOS method
 - 2) HCM 6 Unsignalized intersection delays for LOS.
 - 3) All options have two approach lanes on Piilani Highway and two circulating lanes in roundabout.
 - 4) Single Lane is one combined approach lane on Kulanihakoi St and Kihei HS approaches.
 - 5) Two Lane is two approaches, one for left turn and through, and second for right-turns.
 - 6) Two lane with west bypass has right-turn lanes with bypass on to neighborhood.
 - 7) Two lane with east bypass has right-turn lanes with bypass to the highschool.
 - 8) Two lane optimized, has right-turn bypasses to neighborhood and northbound right-turn to highschool.

LANE LEVEL OF SERVICE

Lane Level of Service

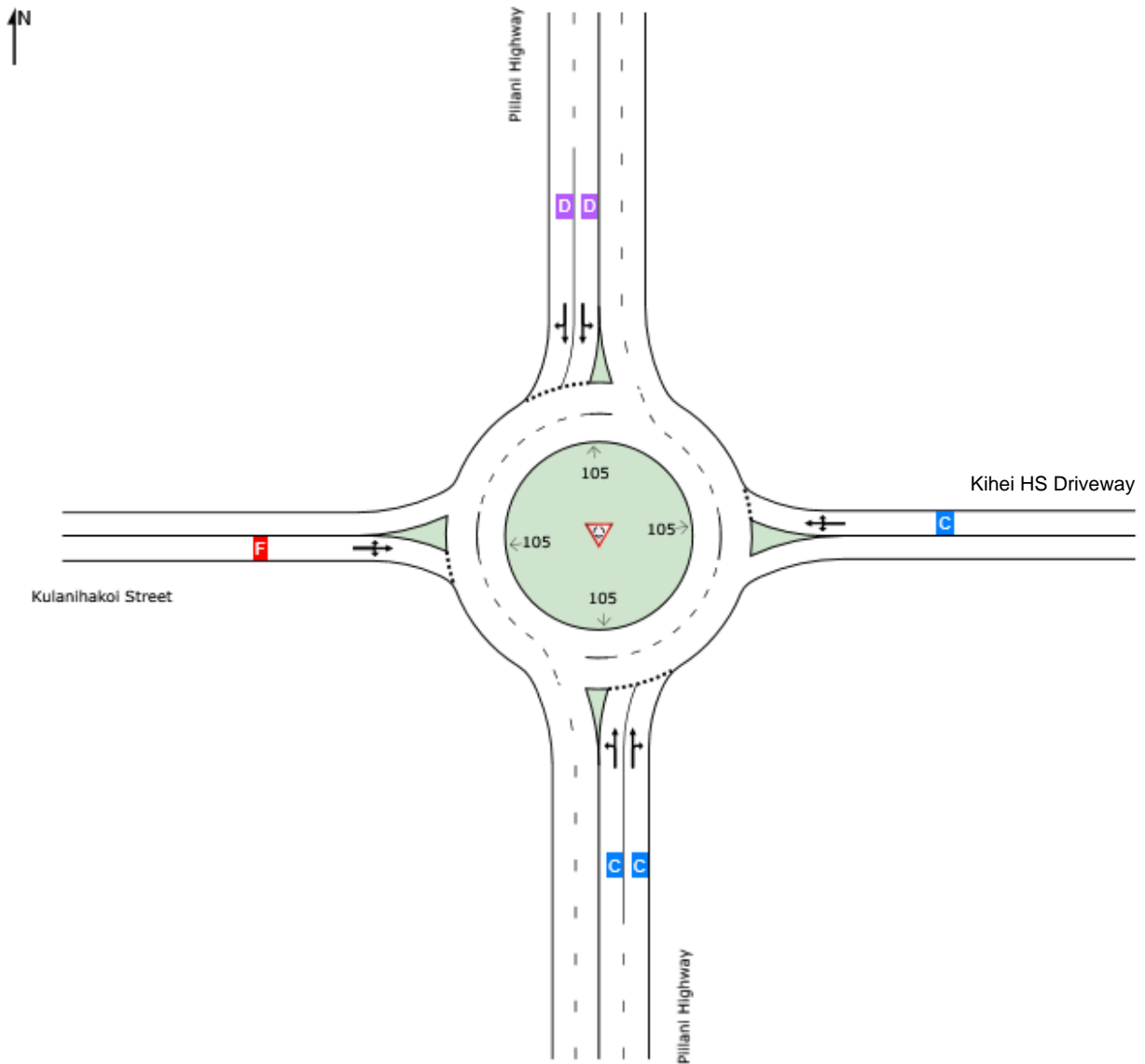
 **Site: 102 [1-Lane 2021 - AM (Site Folder: General)]**

New Site

Site Category: (None)

Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	C	C	D	F	F



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 Sign Control.
 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).
 Delay Model: HCM Delay Formula (Geometric Delay is not included).

LANE SUMMARY

Site: 102 [1-Lane 2021 - AM (Site Folder: General)]

New Site
 Site Category: (None)
 Roundabout

Lane Use and Performance													
	DEMAND FLOWS		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
	[Total veh/h	HV %						[Veh	Dist] ft				
South: Piilani Highway													
Lane 1	826	2.0	1025	0.805	100	20.2	LOS C	11.3	288.2	Full	1600	0.0	0.0
Lane 2 ^d	877	2.0	1088	0.805	100	19.4	LOS C	9.0	229.3	Full	1600	0.0	0.0
Approach	1702	2.0		0.805		19.8	LOS C	11.3	288.2				
East: Kulanihakoi Street													
Lane 1 ^d	117	2.0	348	0.338	100	17.2	LOS C	1.2	30.6	Full	1600	0.0	0.0
Approach	117	2.0		0.338		17.2	LOS C	1.2	30.6				
North: Piilani Highway													
Lane 1	1072	2.0	1146	0.935	100	32.4	LOS D	49.0	1245.8	Full	1600	0.0	0.0
Lane 2 ^d	1140	2.0	1219	0.935	100	31.2	LOS D	49.9	1267.4	Full	1600	0.0	0.0
Approach	2212	2.0		0.935		31.8	LOS D	49.9	1267.4				
West: Kulanihakoi Street													
Lane 1 ^d	353	2.0	199	1.776	100	409.9	LOS F	55.1	1399.9	Full	1600	0.0	1.2
Approach	353	2.0		1.776		409.9	LOS F	55.1	1399.9				
Intersection	4385	2.0		1.776		57.2	LOS F	55.1	1399.9				

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 Sign Control.

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: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)											
South: Piilani Highway											
Mov.	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL %	Ov. Lane No.	
From S To Exit:	W	N	E								
Lane 1	65	760	-	826	2.0	1025	0.805	100	NA	NA	
Lane 2	-	728	149	877	2.0	1088	0.805	100	NA	NA	
Approach	65	1488	149	1702	2.0		0.805				
East: Kulanihakoi Street											
Mov.	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL %	Ov. Lane No.	
From E To Exit:	S	W	N								
Lane 1	82	7	29	117	2.0	348	0.338	100	NA	NA	
Approach	82	7	29	117	2.0		0.338				
North: Piilani Highway											

Mov. From N To Exit:	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	61	1011	-	1072	2.0	1146	0.935	100	NA	NA
Lane 2	-	1091	49	1140	2.0	1219	0.935	100	NA	NA
Approach	61	2102	49	2212	2.0		0.935			
West: Kulanihako Street										
Mov. From W To Exit:	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	76	38	239	353	2.0	199	1.776	100	NA	NA
Approach	76	38	239	353	2.0		1.776			
Total %HV Deg. Satn (v/c)										
Intersection	4385	2.0		1.776						

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis												
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane % veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Capacity Flow Rate veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec		
South Exit: Piilani Highway												
Merge Type: Not Applied												
Full Length Lane	1		Merge Analysis not applied.									
Full Length Lane	2		Merge Analysis not applied.									
East Exit: Kulanihako Street												
Merge Type: Not Applied												
Full Length Lane	1		Merge Analysis not applied.									
North Exit: Piilani Highway												
Merge Type: Not Applied												
Full Length Lane	1		Merge Analysis not applied.									
Full Length Lane	2		Merge Analysis not applied.									
West Exit: Kulanihako Street												
Merge Type: Not Applied												
Full Length Lane	1		Merge Analysis not applied.									

LANE LEVEL OF SERVICE

Lane Level of Service

 Site: 102 [1-Lane 2021 - PM (Site Folder: General)]

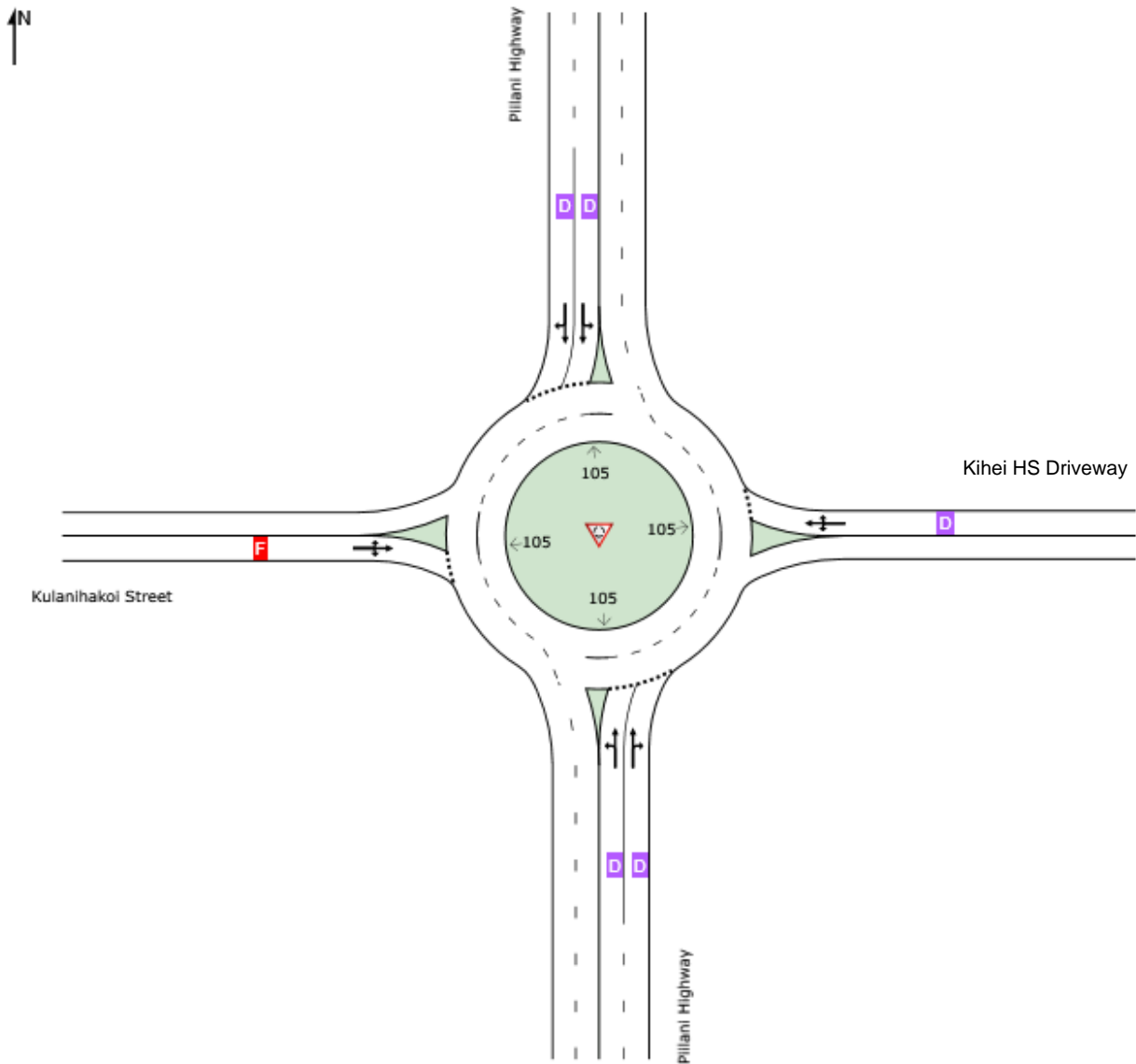
New Site

Site Category: (None)

Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	D	D	D	F	E

Note: 1/3 of the AM volume, 50 pedestrians along the south leg and 15 pedestrians along the west leg, was used for all PM analyses.



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 Sign Control.
 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).
 Delay Model: HCM Delay Formula (Geometric Delay is not included).

LANE SUMMARY

Site: 102 [1-Lane 2021 - PM (Site Folder: General)]

New Site
 Site Category: (None)
 Roundabout

Lane Use and Performance													
	DEMAND FLOWS		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
	[Total veh/h]	[HV %]						[Veh]	[Dist] ft				
South: Piilani Highway													
Lane 1	1075	2.0	1173	0.917	100	29.1	LOS D	15.2	386.7	Full	1600	0.0	0.0
Lane 2 ^d	1136	2.0	1239	0.917	100	28.1	LOS D	15.1	383.2	Full	1600	0.0	0.0
Approach	2211	2.0		0.917		28.6	LOS D	15.2	386.7				
East: Kulanihakoi Street													
Lane 1 ^d	60	2.0	203	0.295	100	26.6	LOS D	0.9	23.2	Full	1600	0.0	0.0
Approach	60	2.0		0.295		26.6	LOS D	0.9	23.2				
North: Piilani Highway													
Lane 1	1063	2.0	1181	0.900	100	26.8	LOS D	36.8	933.5	Full	1600	0.0	0.0
Lane 2 ^d	1128	2.0	1253	0.900	100	25.8	LOS D	35.2	894.2	Full	1600	0.0	0.0
Approach	2190	2.0		0.900		26.3	LOS D	36.8	933.5				
West: Kulanihakoi Street													
Lane 1 ^d	262	2.0	220	1.190	100	166.9	LOS F	19.7	500.0	Full	1600	0.0	0.0
Approach	262	2.0		1.190		166.9	LOS F	19.7	500.0				
Intersection	4723	2.0		1.190		35.2	LOS E	36.8	933.5				

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 Sign Control.

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: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)											
South: Piilani Highway											
Mov.	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL %	Ov. Lane No.	
From S To Exit:	W	N	E								
Lane 1	76	999	-	1075	2.0	1173	0.917	100	NA	NA	
Lane 2	-	1103	33	1136	2.0	1239	0.917	100	NA	NA	
Approach	76	2102	33	2211	2.0		0.917				
East: Kulanihakoi Street											
Mov.	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL %	Ov. Lane No.	
From E To Exit:	S	W	N								
Lane 1	42	3	14	60	2.0	203	0.295	100	NA	NA	
Approach	42	3	14	60	2.0		0.295				
North: Piilani Highway											

Mov. From N To Exit:	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	13	1050	-	1063	2.0	1181	0.900	100	NA	NA
Lane 2	-	1022	105	1128	2.0	1253	0.900	100	NA	NA
Approach	13	2072	105	2190	2.0		0.900			
West: Kulanihakoi Street										
Mov. From W To Exit:	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	48	8	207	262	2.0	220	1.190	100	NA	NA
Approach	48	8	207	262	2.0		1.190			
Total %HV Deg.Satn (v/c)										
Intersection	4723	2.0		1.190						

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis												
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane % veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Capacity Flow Rate veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec		
South Exit: Piilani Highway												
Merge Type: Not Applied												
Full Length Lane	1											Merge Analysis not applied.
Full Length Lane	2											Merge Analysis not applied.
East Exit: Kulanihakoi Street												
Merge Type: Not Applied												
Full Length Lane	1											Merge Analysis not applied.
North Exit: Piilani Highway												
Merge Type: Not Applied												
Full Length Lane	1											Merge Analysis not applied.
Full Length Lane	2											Merge Analysis not applied.
West Exit: Kulanihakoi Street												
Merge Type: Not Applied												
Full Length Lane	1											Merge Analysis not applied.

LANE LEVEL OF SERVICE

Lane Level of Service

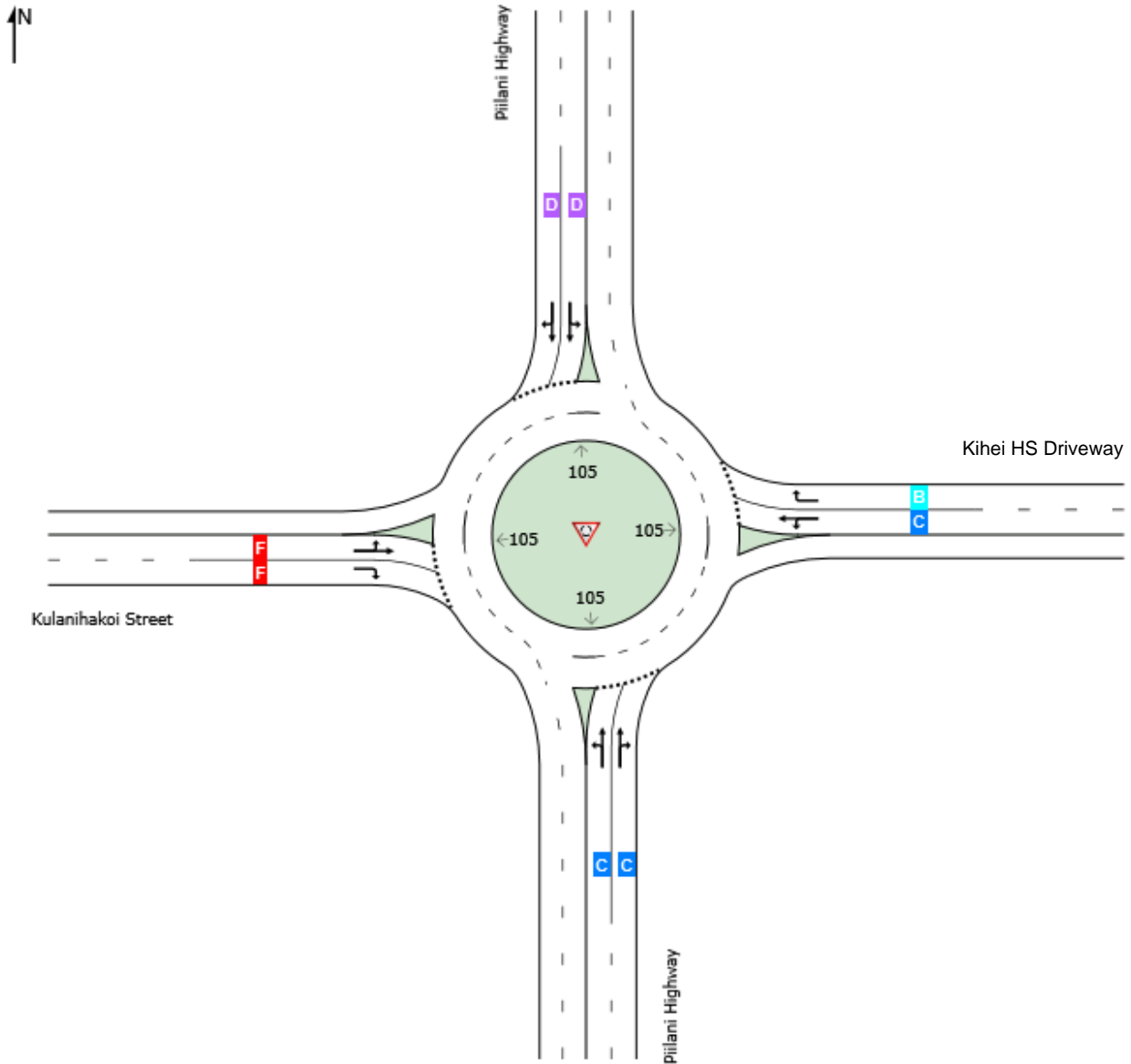
 **Site: 102 [2-Lane 2021 - AM (Site Folder: General)]**

New Site

Site Category: (None)

Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	C	C	D	F	E



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 Sign Control.
 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).
 Delay Model: HCM Delay Formula (Geometric Delay is not included).

LANE SUMMARY

Site: 102 [2-Lane 2021 - AM (Site Folder: General)]

New Site
 Site Category: (None)
 Roundabout

Lane Use and Performance													
	DEMAND FLOWS		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
	[Total veh/h	HV %						[Veh	Dist] ft				
South: Piilani Highway													
Lane 1	824	2.0	988	0.834	100	23.0	LOS C	21.3	540.3	Full	1600	0.0	0.0
Lane 2 ^d	878	2.0	1052	0.834	100	22.0	LOS C	21.1	536.9	Full	1600	0.0	0.0
Approach	1702	2.0		0.834		22.5	LOS C	21.3	540.3				
East: Kulanihakoi Street													
Lane 1 ^d	88	2.0	339	0.260	100	15.6	LOS C	0.9	21.8	Full	1600	0.0	0.0
Lane 2	29	2.0	287	0.102	100	14.5	LOS B	0.3	8.0	Full	1600	0.0	0.0
Approach	117	2.0		0.260		15.3	LOS C	0.9	21.8				
North: Piilani Highway													
Lane 1	1072	2.0	1146	0.935	100	32.4	LOS D	49.0	1245.8	Full	1600	0.0	0.0
Lane 2 ^d	1140	2.0	1219	0.935	100	31.2	LOS D	49.9	1267.4	Full	1600	0.0	0.0
Approach	2212	2.0		0.935		31.8	LOS D	49.9	1267.4				
West: Kulanihakoi Street													
Lane 1	114	2.0	161	0.709	100	67.2	LOS F	2.9	73.0	Full	1600	0.0	0.0
Lane 2 ^d	239	2.0	199	1.203	100	177.6	LOS F	18.8	478.6	Full	1600	0.0	0.0
Approach	353	2.0		1.203		142.0	LOS F	18.8	478.6				
Intersection	4385	2.0		1.203		36.6	LOS E	49.9	1267.4				

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 Sign Control.
 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: US HCM 6.
 Delay Model: HCM Delay Formula (Geometric Delay is not included).
 Queue Model: HCM Queue Formula.
 Gap-Acceptance Capacity: Traditional M1.
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)											
South: Piilani Highway											
Mov.	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL %	Ov. Lane No.	
From S To Exit:	W	N	E								
Lane 1	65	759	-	824	2.0	988	0.834	100	NA	NA	
Lane 2	-	729	149	878	2.0	1052	0.834	100	NA	NA	
Approach	65	1488	149	1702	2.0		0.834				
East: Kulanihakoi Street											
Mov.	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL %	Ov. Lane No.	
From E To Exit:	S	W	N								
Lane 1	82	7	-	88	2.0	339	0.260	100	NA	NA	

Lane 2	-	-	29	29	2.0	287	0.102	100	NA	NA
Approach	82	7	29	117	2.0		0.260			
North: Piilani Highway										
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.
From N						Cap.	Satn	Util.	SL	Lane
To Exit:	E	S	W			veh/h	v/c	%	%	No.
Lane 1	61	1011	-	1072	2.0	1146	0.935	100	NA	NA
Lane 2	-	1091	49	1140	2.0	1219	0.935	100	NA	NA
Approach	61	2102	49	2212	2.0		0.935			
West: Kulanihako Street										
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.
From W						Cap.	Satn	Util.	SL	Lane
To Exit:	N	E	S			veh/h	v/c	%	%	No.
Lane 1	76	38	-	114	2.0	161	0.709	100	NA	NA
Lane 2	-	-	239	239	2.0	199	1.203	100	NA	NA
Approach	76	38	239	353	2.0		1.203			
Total %HV Deg.Satn (v/c)										
Intersection	4385	2.0		1.203						

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis												
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate % veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Piilani Highway												
Merge Type: Not Applied												
Full Length Lane	1											
Full Length Lane	2											
East Exit: Kulanihako Street												
Merge Type: Not Applied												
Full Length Lane	1											
North Exit: Piilani Highway												
Merge Type: Not Applied												
Full Length Lane	1											
Full Length Lane	2											
West Exit: Kulanihako Street												
Merge Type: Not Applied												
Full Length Lane	1											

LANE LEVEL OF SERVICE

Lane Level of Service

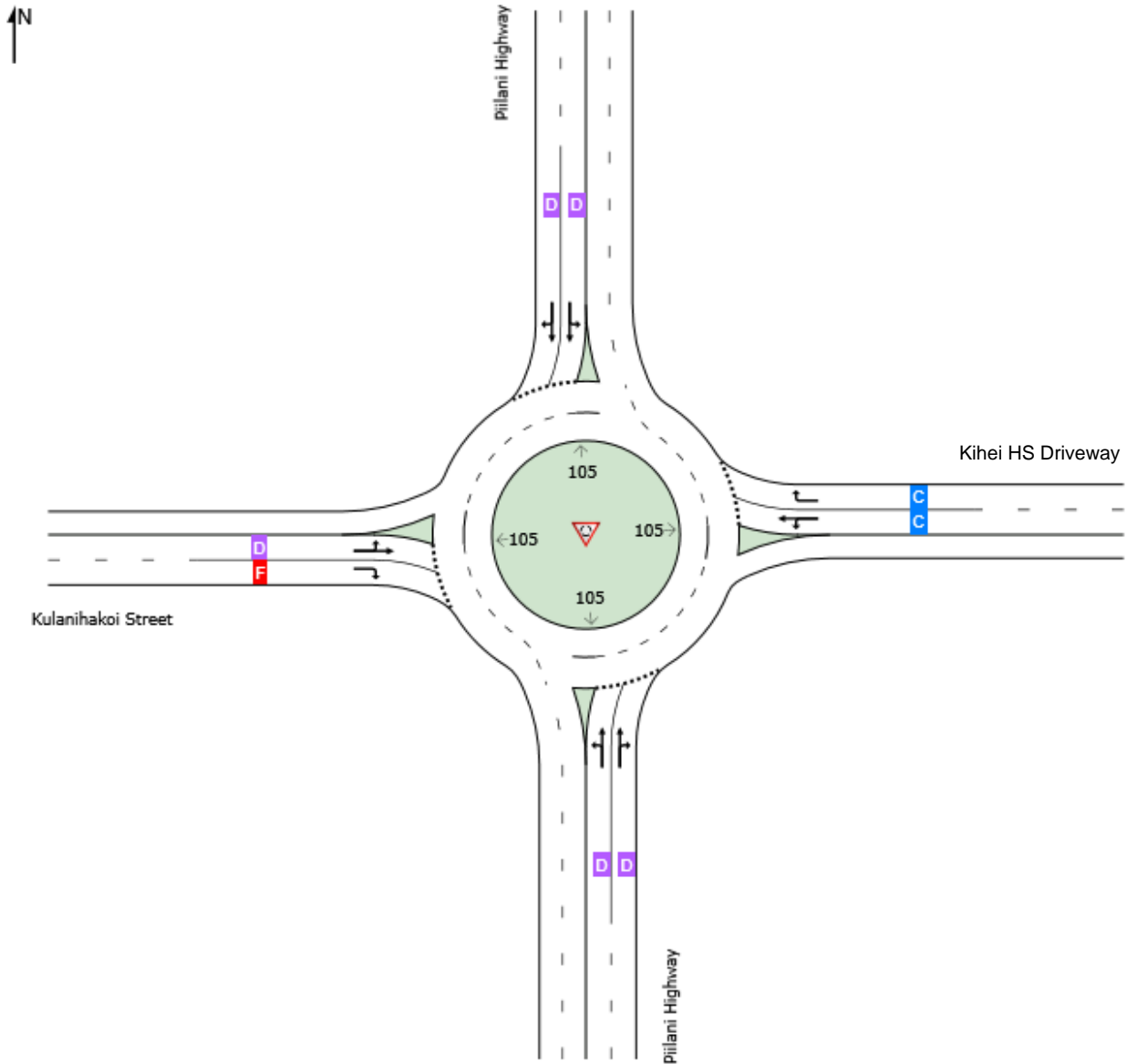
 **Site: 102 [2-Lane 2021 - PM (Site Folder: General)]**

New Site

Site Category: (None)

Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	D	C	D	F	D



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 Sign Control.
 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).
 Delay Model: HCM Delay Formula (Geometric Delay is not included).

LANE SUMMARY

Site: 102 [2-Lane 2021 - PM (Site Folder: General)]

New Site
 Site Category: (None)
 Roundabout

Lane Use and Performance													
	DEMAND FLOWS		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
	[Total veh/h	HV %						[Veh	Dist] ft				
South: Piilani Highway													
Lane 1	1075	2.0	1168	0.920	100	29.7	LOS D	15.3	389.3	Full	1600	0.0	0.0
Lane 2 ^d	1136	2.0	1235	0.920	100	28.7	LOS D	15.2	386.2	Full	1600	0.0	0.0
Approach	2211	2.0		0.920		29.2	LOS D	15.3	389.3				
East: Kulanihakoi Street													
Lane 1 ^d	46	2.0	202	0.226	100	24.1	LOS C	0.7	17.0	Full	1600	0.0	0.0
Lane 2	14	2.0	164	0.086	100	24.5	LOS C	0.2	6.2	Full	1600	0.0	0.0
Approach	60	2.0		0.226		24.2	LOS C	0.7	17.0				
North: Piilani Highway													
Lane 1	1063	2.0	1181	0.900	100	26.8	LOS D	36.8	933.5	Full	1600	0.0	0.0
Lane 2 ^d	1128	2.0	1253	0.900	100	25.8	LOS D	35.2	894.2	Full	1600	0.0	0.0
Approach	2190	2.0		0.900		26.3	LOS D	36.8	933.5				
West: Kulanihakoi Street													
Lane 1	55	2.0	180	0.308	100	30.2	LOS D	1.0	24.5	Full	1600	0.0	0.0
Lane 2 ^d	207	2.0	220	0.938	100	91.3	LOS F	6.7	171.4	Full	1600	0.0	0.0
Approach	262	2.0		0.938		78.4	LOS F	6.7	171.4				
Intersection	4723	2.0		0.938		30.5	LOS D	36.8	933.5				

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 Sign Control.
 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: US HCM 6.
 Delay Model: HCM Delay Formula (Geometric Delay is not included).
 Queue Model: HCM Queue Formula.
 Gap-Acceptance Capacity: Traditional M1.
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)											
South: Piilani Highway											
Mov.	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
From S To Exit:	W	N	E								
Lane 1	76	999	-	1075	2.0	1168	0.920	100	NA	NA	
Lane 2	-	1103	33	1136	2.0	1235	0.920	100	NA	NA	
Approach	76	2102	33	2211	2.0		0.920				
East: Kulanihakoi Street											
Mov.	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
From E To Exit:	S	W	N								
Lane 1	42	3	-	46	2.0	202	0.226	100	NA	NA	

Lane 2	-	-	14	14	2.0	164	0.086	100	NA	NA
Approach	42	3	14	60	2.0		0.226			
North: Piilani Highway										
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.
From N						Cap.	Satn	Util.	SL	Lane
To Exit:	E	S	W			veh/h	v/c	%	%	No.
Lane 1	13	1050	-	1063	2.0	1181	0.900	100	NA	NA
Lane 2	-	1022	105	1128	2.0	1253	0.900	100	NA	NA
Approach	13	2072	105	2190	2.0		0.900			
West: Kulanihako Street										
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.
From W						Cap.	Satn	Util.	SL	Lane
To Exit:	N	E	S			veh/h	v/c	%	%	No.
Lane 1	48	8	-	55	2.0	180	0.308	100	NA	NA
Lane 2	-	-	207	207	2.0	220	0.938	100	NA	NA
Approach	48	8	207	262	2.0		0.938			
Total %HV Deg.Satn (v/c)										
Intersection	4723	2.0		0.938						

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis												
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate % veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Piilani Highway												
Merge Type: Not Applied												
Full Length Lane	1											
Full Length Lane	2											
East Exit: Kulanihako Street												
Merge Type: Not Applied												
Full Length Lane	1											
North Exit: Piilani Highway												
Merge Type: Not Applied												
Full Length Lane	1											
Full Length Lane	2											
West Exit: Kulanihako Street												
Merge Type: Not Applied												
Full Length Lane	1											

LANE LEVEL OF SERVICE

Lane Level of Service

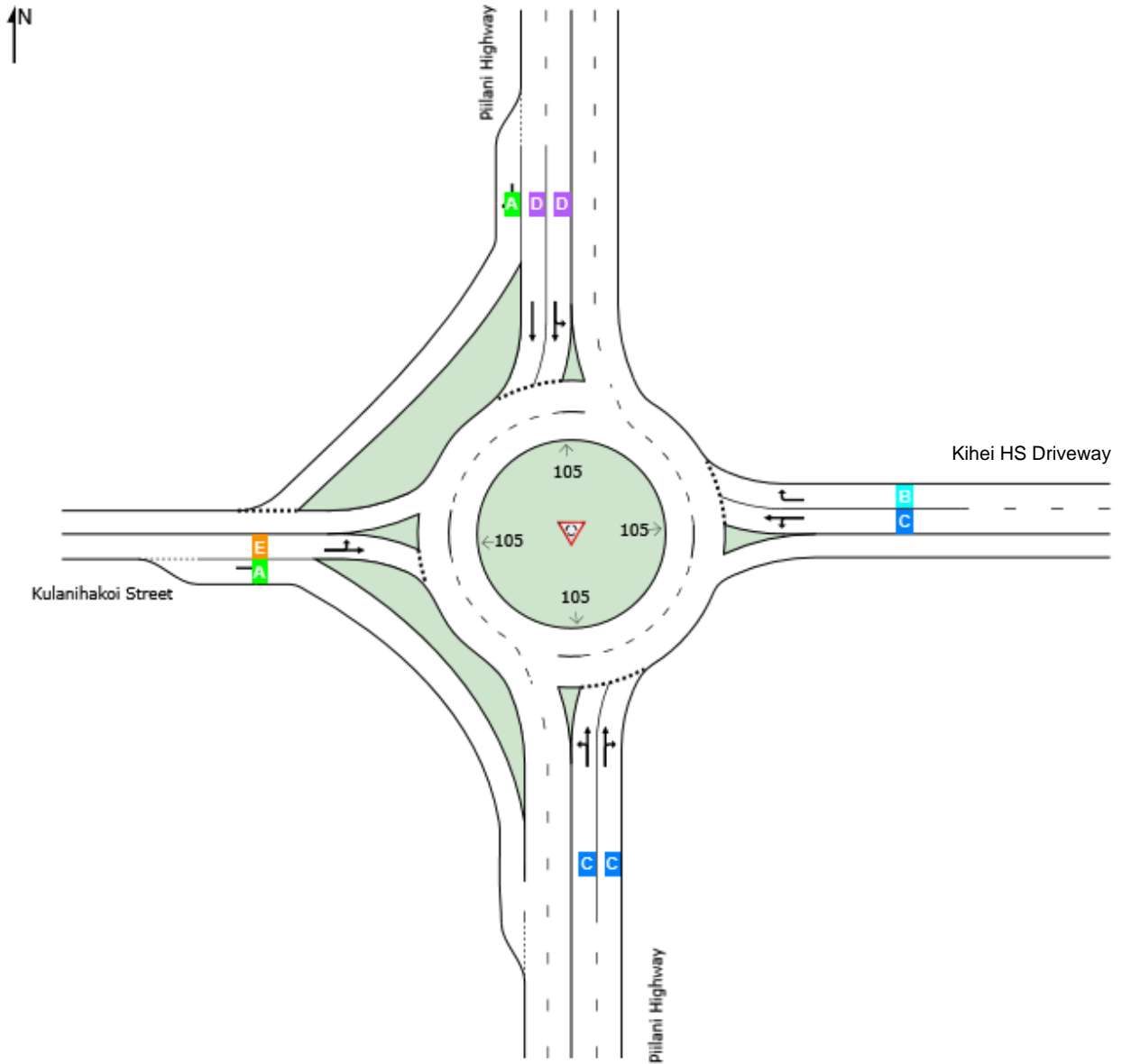
 Site: 102 [2-Lane 2021 West Bypass - AM (Site Folder: General)]

New Site

Site Category: (None)

Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	C	C	D	C	C



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 Sign Control.
 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).
 Delay Model: HCM Delay Formula (Geometric Delay is not included).

To Exit:	S	W	N							
Lane 1	82	7	-	88	2.0	339	0.260	100	NA	NA
Lane 2	-	-	29	29	2.0	287	0.102	100	NA	NA
Approach	82	7	29	117	2.0		0.260			
North: Piilani Highway										
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.
From N						Cap.	Satn	Util.	SL	Lane
To Exit:	E	S	W			veh/h	v/c	%	%	No.
Lane 1	61	987	-	1048	2.0	1146	0.915	100	NA	NA
Lane 2	-	1115	-	1115	2.0	1219	0.915	100	NA	NA
Lane 3	-	-	49	49	2.0	1308	0.037	100	0.0	2
Approach	61	2102	49	2212	2.0		0.915			
West: Kulanihako Street										
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.
From W						Cap.	Satn	Util.	SL	Lane
To Exit:	N	E	S			veh/h	v/c	%	%	No.
Lane 1	76	38	-	114	2.0	199	0.574	100	NA	NA
Lane 2	-	-	239	239	2.0	1642	0.146	100	0.0	1
Approach	76	38	239	353	2.0		0.574			
Total %HV Deg.Satn (v/c)										
Intersection	4385	2.0		0.915						

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis												
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Piilani Highway												
Merge Type: Priority												
Exit Short Lane	3	500	0.0	1115	1137	3.00	2.00	239	941	0.254	3.8	6.4
Merge Lane	2	-	100.0	Merge Lane is not Opposed				1115	1800	0.619	0.0	0.0
East Exit: Kulanihako Street												
Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Piilani Highway												
Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
West Exit: Kulanihako Street												
Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										

LANE LEVEL OF SERVICE

Lane Level of Service

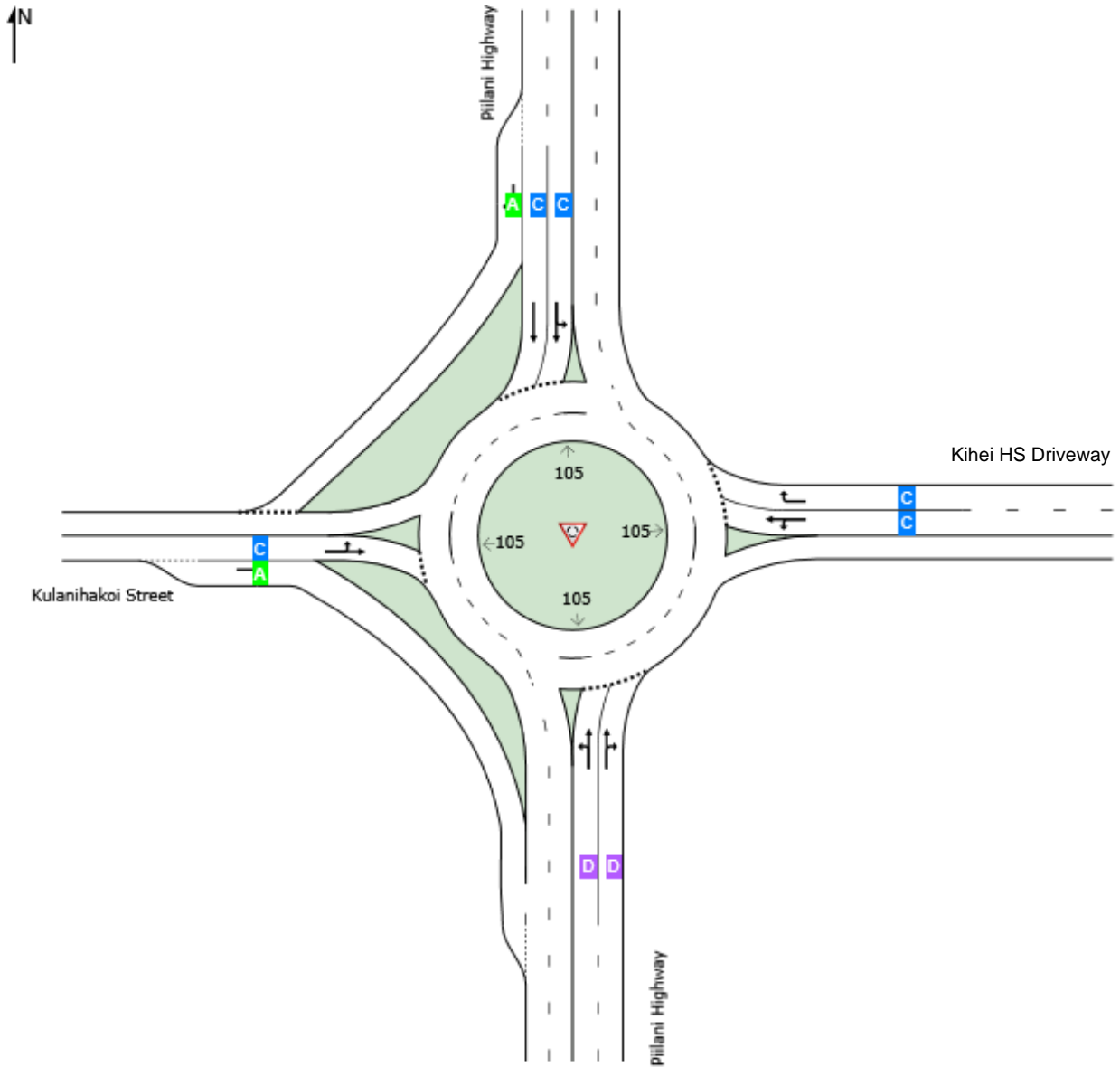
 Site: 102 [2-Lane 2021 West Bypass - PM (Site Folder: General)]

New Site

Site Category: (None)

Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	D	C	C	A	C



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 Sign Control.
 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).
 Delay Model: HCM Delay Formula (Geometric Delay is not included).

To Exit:	S	W	N							
Lane 1	42	3	-	46	2.0	202	0.226	100	NA	NA
Lane 2	-	-	14	14	2.0	164	0.086	100	NA	NA
Approach	42	3	14	60	2.0		0.226			
North: Piilani Highway										
Mov.	L2	T1	R2	Total	%HV					
From N						Cap.	Deg.	Lane	Prob.	Ov.
To Exit:	E	S	W			veh/h	satn	Util.	SL	Lane
Lane 1	13	998	-	1012	2.0	1181	0.857	100	NA	NA
Lane 2	-	1073	-	1073	2.0	1253	0.857	100	NA	NA
Lane 3	-	-	105	105	2.0	1300	0.081	100	0.0	2
Approach	13	2072	105	2190	2.0		0.857			
West: Kulanihako Street										
Mov.	L2	T1	R2	Total	%HV					
From W						Cap.	Deg.	Lane	Prob.	Ov.
To Exit:	N	E	S			veh/h	satn	Util.	SL	Lane
Lane 1	48	8	-	55	2.0	220	0.252	100	NA	NA
Lane 2	-	-	207	207	2.0	1642	0.126	100	0.0	1
Approach	48	8	207	262	2.0		0.252			
Total %HV Deg.Satn (v/c)										
Intersection	4723	2.0		0.920						

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis												
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Lane Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Piilani Highway												
Merge Type: Priority												
Exit Short Lane	3	500	0.0	1073	1095	3.00	2.00	207	965	0.214	3.7	5.8
Merge Lane	2	-	100.0	Merge Lane is not Opposed				1073	1800	0.596	0.0	0.0
East Exit: Kulanihako Street												
Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Piilani Highway												
Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
West Exit: Kulanihako Street												
Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										

LANE LEVEL OF SERVICE

Lane Level of Service

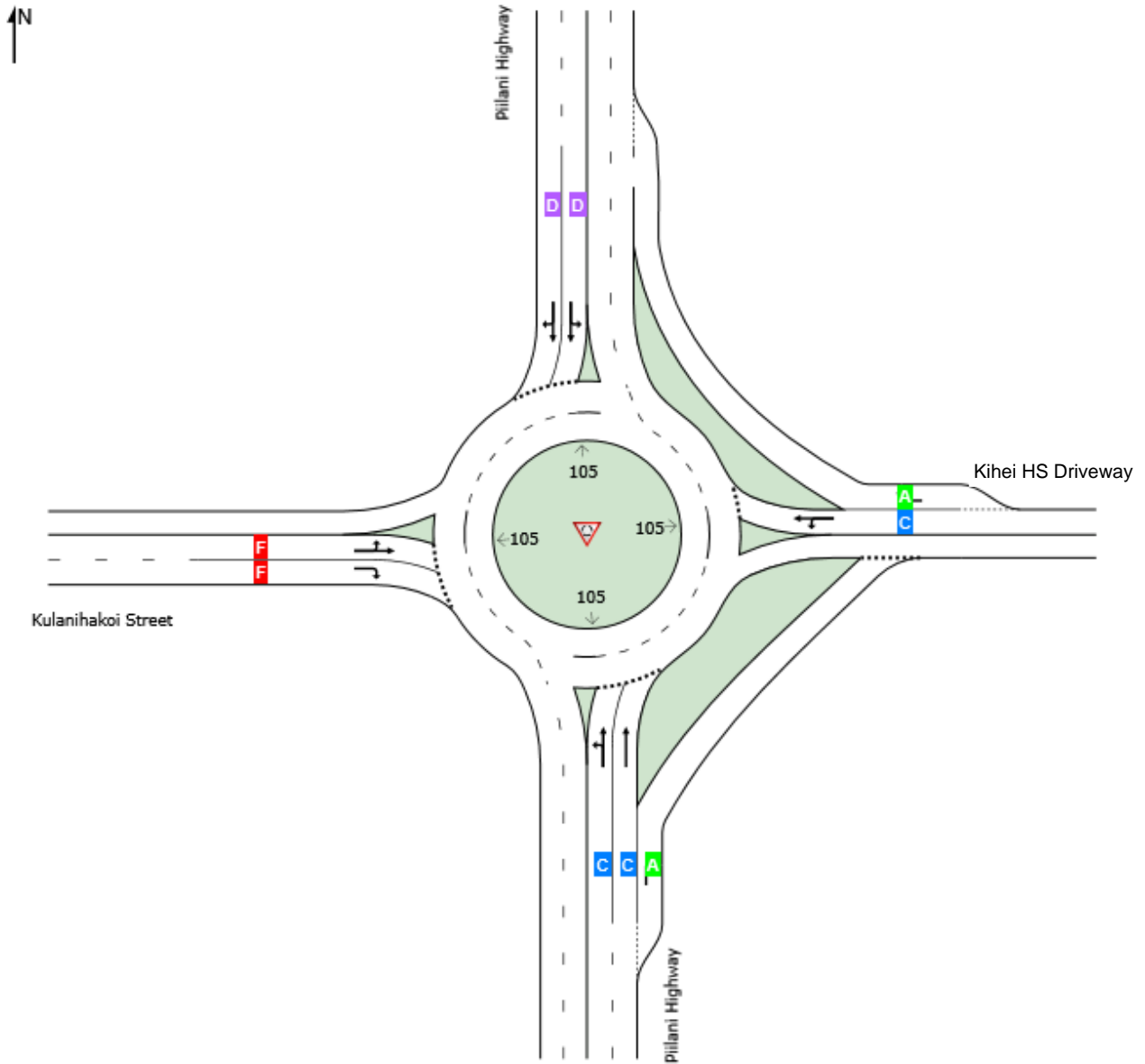
 Site: 102 [2-Lane East Bypass 2021 - AM (Site Folder: General)]

New Site

Site Category: (None)

Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	C	B	D	F	D



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 Sign Control.
 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).
 Delay Model: HCM Delay Formula (Geometric Delay is not included).

From E To Exit:	S	W	N			Cap. veh/h	Satn v/c	Util. %	SL %	Ov. %	Lane No.
Lane 1	82	7	-	88	2.0	339	0.260	100	NA	NA	
Lane 2	-	-	29	29	2.0	1642	0.018	100	0.0	1	
Approach	82	7	29	117	2.0		0.260				
North: Piilani Highway											
Mov. From N To Exit:	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL %	Ov. %	Ov. Lane No.
Lane 1	61	1011	-	1072	2.0	1146	0.935	100	NA	NA	
Lane 2	-	1091	49	1140	2.0	1219	0.935	100	NA	NA	
Approach	61	2102	49	2212	2.0		0.935				
West: Kulanihako Street											
Mov. From W To Exit:	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL %	Ov. %	Ov. Lane No.
Lane 1	76	38	-	114	2.0	161	0.709	100	NA	NA	
Lane 2	-	-	239	239	2.0	199	1.203	100	NA	NA	
Approach	76	38	239	353	2.0		1.203				
Total %HV Deg.Satn (v/c)											
Intersection	4385	2.0		1.203							

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis												
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane % veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Capacity Flow Rate veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec		
South Exit: Piilani Highway Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
East Exit: Kulanihako Street Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Piilani Highway Merge Type: Priority												
Exit Short Lane	3	500	0.0	801	817	3.00	2.00	29	1133	0.026	3.2	3.4
Merge Lane	2	-	100.0	Merge Lane is not Opposed			801	1800	0.445	0.0	0.0	
West Exit: Kulanihako Street Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										

LANE LEVEL OF SERVICE

Lane Level of Service

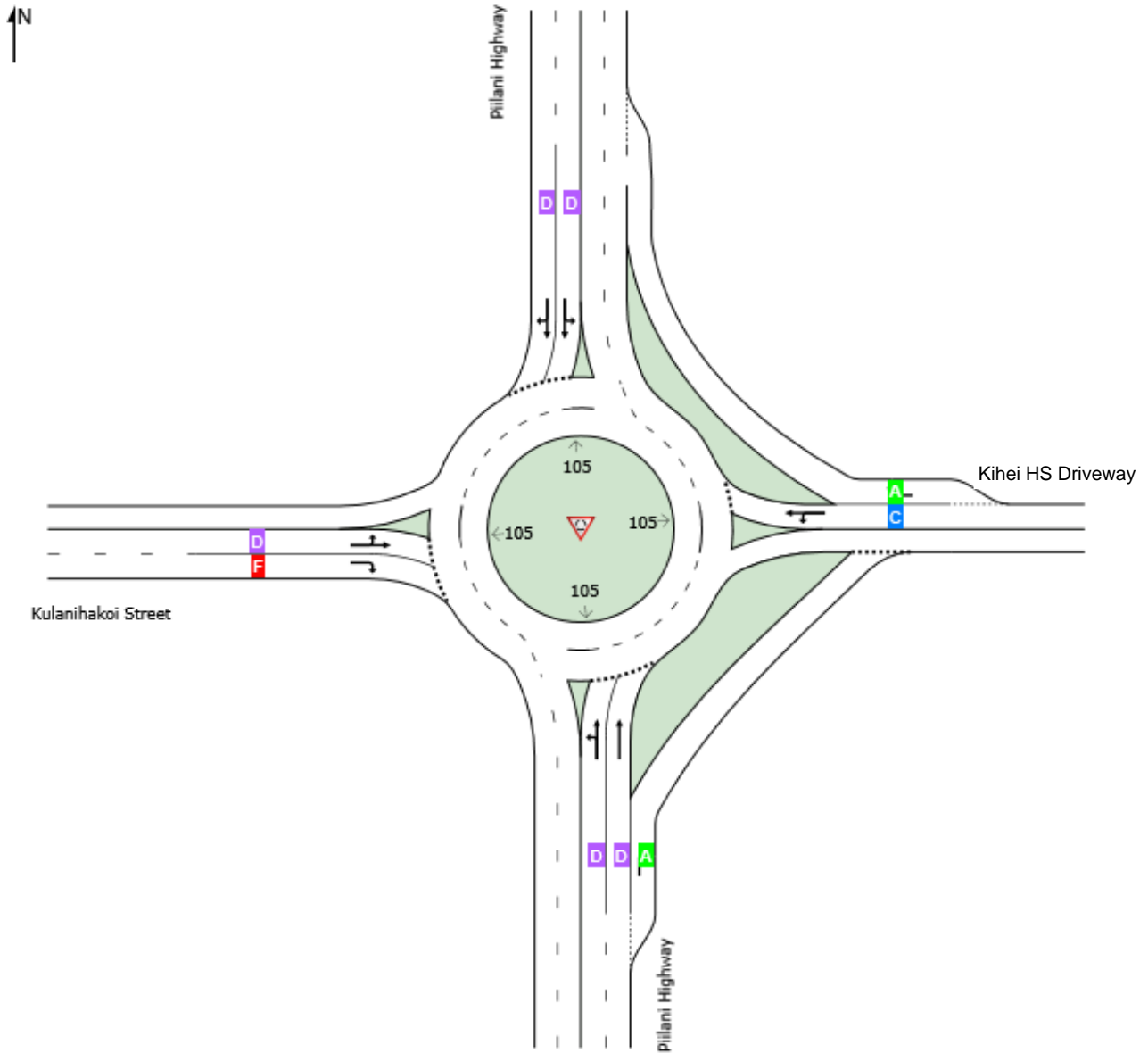
 **Site: 102 [2-Lane East Bypass 2021 - PM (Site Folder: General)]**

New Site

Site Category: (None)

Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	D	C	D	F	D



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 Sign Control.
 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).
 Delay Model: HCM Delay Formula (Geometric Delay is not included).

LANE SUMMARY

Site: 102 [2-Lane East Bypass 2021 - PM (Site Folder: General)]

New Site
 Site Category: (None)
 Roundabout

Lane Use and Performance													
	DEMAND FLOWS		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
	[Total veh/h	HV %						[Veh	Dist] ft				
South: Piilani Highway													
Lane 1	1059	2.0	1168	0.907	100	27.8	LOS D	14.3	362.7	Full	1600	0.0	0.0
Lane 2 ^d	1119	2.0	1235	0.907	100	26.8	LOS D	14.1	359.3	Full	1600	0.0	0.0
Lane 3	33	2.0	1284	0.025	100	3.0	LOSA	0.1	2.2	Short	200	0.0	NA
Approach	2211	2.0		0.907		26.9	LOS D	14.3	362.7				
East: Kulanihakoi Street													
Lane 1 ^d	46	2.0	202	0.226	100	24.1	LOS C	0.7	17.0	Full	1600	0.0	0.0
Lane 2	14	2.0	1642	0.009	100	4.0	LOSA	0.0	0.0	Short	200	0.0	NA
Approach	60	2.0		0.226		19.3	LOS C	0.7	17.0				
North: Piilani Highway													
Lane 1	1063	2.0	1181	0.900	100	26.8	LOS D	36.8	933.5	Full	1600	0.0	0.0
Lane 2 ^d	1128	2.0	1253	0.900	100	25.8	LOS D	35.2	894.2	Full	1600	0.0	0.0
Approach	2190	2.0		0.900		26.3	LOS D	36.8	933.5				
West: Kulanihakoi Street													
Lane 1	55	2.0	180	0.308	100	30.2	LOS D	1.0	24.5	Full	1600	0.0	0.0
Lane 2 ^d	207	2.0	220	0.938	100	91.3	LOS F	6.7	171.4	Full	1600	0.0	0.0
Approach	262	2.0		0.938		78.4	LOS F	6.7	171.4				
Intersection	4723	2.0		0.938		29.4	LOS D	36.8	933.5				

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 Sign Control.
 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: US HCM 6.
 Delay Model: HCM Delay Formula (Geometric Delay is not included).
 Queue Model: HCM Queue Formula.
 Gap-Acceptance Capacity: Traditional M1.
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)										
South: Piilani Highway										
Mov.	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
From S To Exit:	W	N	E							
Lane 1	76	983	-	1059	2.0	1168	0.907	100	NA	NA
Lane 2	-	1119	-	1119	2.0	1235	0.907	100	NA	NA
Lane 3	-	-	33	33	2.0	1284	0.025	100	0.0	2
Approach	76	2102	33	2211	2.0		0.907			
East: Kulanihakoi Street										
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.

From E To Exit:	S	W	N			Cap. veh/h	Satn v/c	Util. %	SL Ov. %	Lane No.
Lane 1	42	3	-	46	2.0	202	0.226	100	NA	NA
Lane 2	-	-	14	14	2.0	1642	0.009	100	0.0	1
Approach	42	3	14	60	2.0		0.226			
North: Piilani Highway										
Mov. From N To Exit:	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	13	1050	-	1063	2.0	1181	0.900	100	NA	NA
Lane 2	-	1022	105	1128	2.0	1253	0.900	100	NA	NA
Approach	13	2072	105	2190	2.0		0.900			
West: Kulanihakoi Street										
Mov. From W To Exit:	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	48	8	-	55	2.0	180	0.308	100	NA	NA
Lane 2	-	-	207	207	2.0	220	0.938	100	NA	NA
Approach	48	8	207	262	2.0		0.938			
Total %HV Deg. Satn (v/c)										
Intersection	4723	2.0		0.938						

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis												
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane % veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec		
South Exit: Piilani Highway Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
East Exit: Kulanihakoi Street Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Piilani Highway Merge Type: Priority												
Exit Short Lane	3	500	0.0	1119	1142	3.00	2.00	14	939	0.015	3.8	4.0
Merge Lane	2	-	100.0	Merge Lane is not Opposed			1119	1800	0.622	0.0	0.0	
West Exit: Kulanihakoi Street Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										

LANE LEVEL OF SERVICE

Lane Level of Service

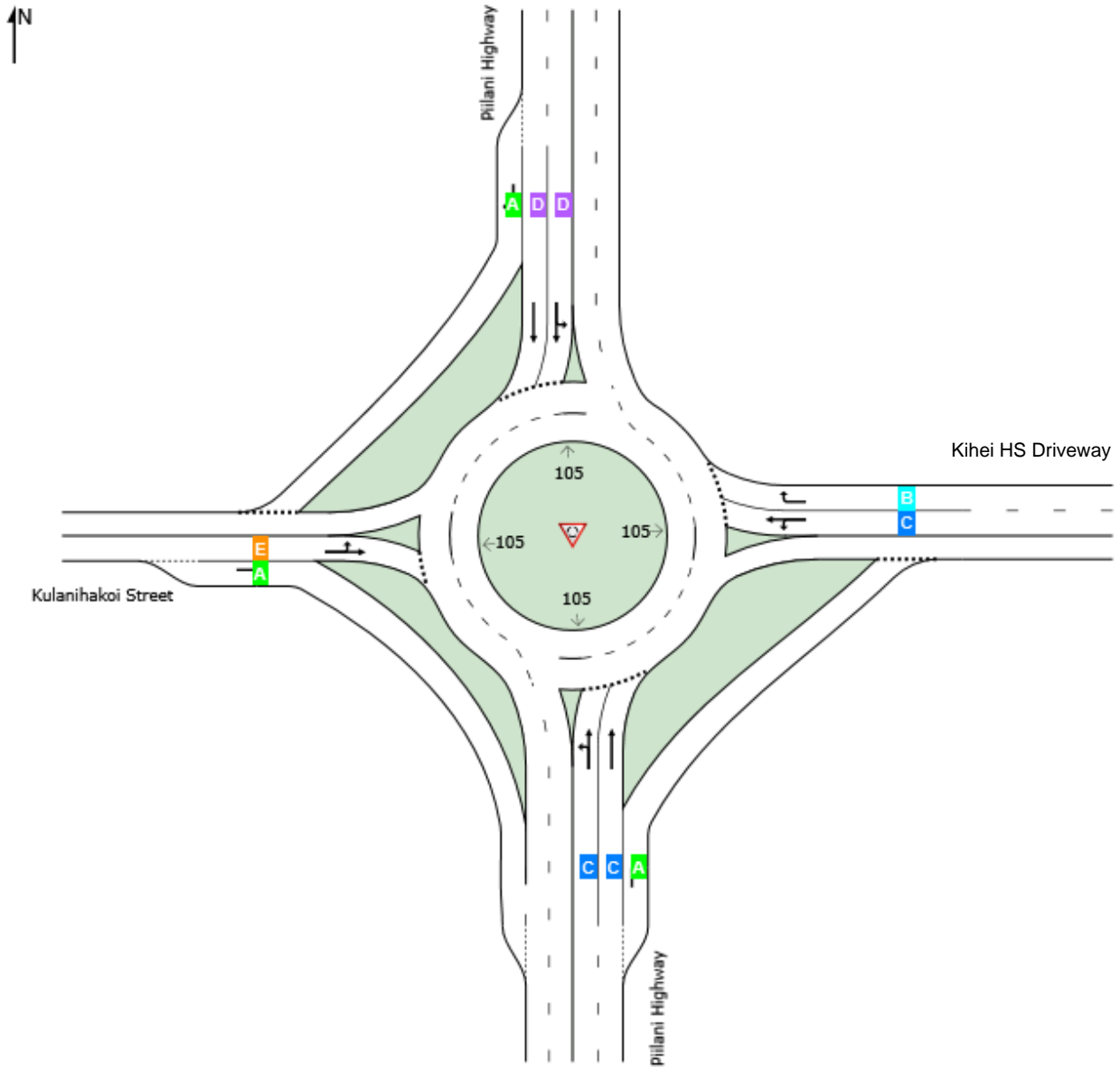
 **Site: 102 [RTL NES 2021 - AM (Site Folder: General)]**

New Site

Site Category: (None)

Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	C	C	D	C	C



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 Sign Control.
 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).
 Delay Model: HCM Delay Formula (Geometric Delay is not included).

From E To Exit:	S	W	N			Cap. veh/h	Satn v/c	Util. %	SL Ov. %	Lane No.
Lane 1	82	7	-	88	2.0	339	0.260	100	NA	NA
Lane 2	-	-	29	29	2.0	287	0.102	100	NA	NA
Approach	82	7	29	117	2.0		0.260			
North: Piilani Highway										
Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	61	987	-	1048	2.0	1146	0.915	100	NA	NA
Lane 2	-	1115	-	1115	2.0	1219	0.915	100	NA	NA
Lane 3	-	-	49	49	2.0	1308	0.037	100	0.0	2
Approach	61	2102	49	2212	2.0		0.915			
West: Kulanihako Street										
Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	76	38	-	114	2.0	199	0.574	100	NA	NA
Lane 2	-	-	239	239	2.0	1642	0.146	100	0.0	1
Approach	76	38	239	353	2.0		0.574			
Total %HV Deg. Satn (v/c)										
Intersection	4385	2.0					0.915			

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis												
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Piilani Highway												
Merge Type: Priority												
Exit Short Lane	3	500	0.0	1115	1137	3.00	2.00	239	941	0.254	3.8	6.4
Merge Lane	2	-	100.0	Merge Lane is not Opposed				1115	1800	0.619	0.0	0.0
East Exit: Kulanihako Street												
Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Piilani Highway												
Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
West Exit: Kulanihako Street												
Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										

LANE LEVEL OF SERVICE

Lane Level of Service

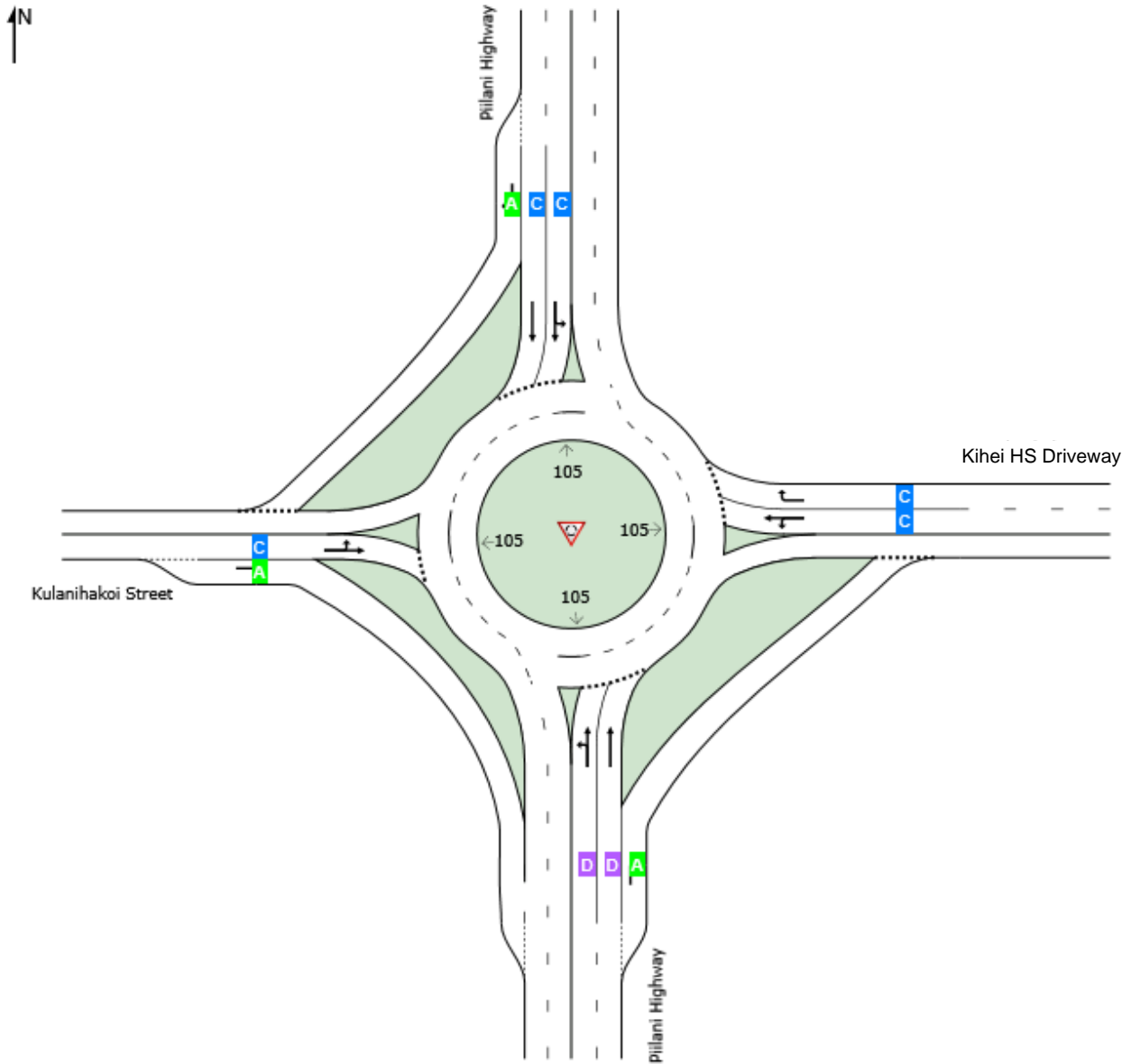
 **Site: 102 [RTL NES 2021 - PM (Site Folder: General)]**

New Site

Site Category: (None)

Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	D	C	C	A	C



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 Sign Control.
 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).
 Delay Model: HCM Delay Formula (Geometric Delay is not included).

LANE SUMMARY

Site: 102 [RTL NES 2021 - PM (Site Folder: General)]

New Site
 Site Category: (None)
 Roundabout

Lane Use and Performance													
	DEMAND FLOWS		Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	[Total	HV]						[Veh	Dist]				
	veh/h	%	veh/h	v/c	%	sec			ft		ft	%	%
South: Piilani Highway													
Lane 1	1059	2.0	1168	0.907	100	27.8	LOS D	14.3	362.7	Full	1600	0.0	0.0
Lane 2 ^d	1119	2.0	1235	0.907	100	26.8	LOS D	14.1	359.3	Full	1600	0.0	0.0
Lane 3	33	2.0	1284	0.025	100	3.0	LOSA	0.1	2.2	Short	200	0.0	NA
Approach	2211	2.0		0.907		26.9	LOS D	14.3	362.7				
East: Kulanihakoi Street													
Lane 1 ^d	46	2.0	202	0.226	100	24.1	LOS C	0.7	17.0	Full	1600	0.0	0.0
Lane 2	14	2.0	164	0.086	100	24.5	LOS C	0.2	6.2	Full	1600	0.0	0.0
Approach	60	2.0		0.226		24.2	LOS C	0.7	17.0				
North: Piilani Highway													
Lane 1	1012	2.0	1181	0.857	100	22.2	LOS C	24.7	627.4	Full	1600	0.0	0.0
Lane 2 ^d	1073	2.0	1253	0.857	100	21.3	LOS C	22.4	568.6	Full	1600	0.0	0.0
Lane 3	105	2.0	1300	0.081	100	3.4	LOSA	0.3	7.8	Short	200	0.0	NA
Approach	2190	2.0		0.857		20.8	LOS C	24.7	627.4				
West: Kulanihakoi Street													
Lane 1 ^d	55	2.0	220	0.252	100	23.0	LOS C	0.8	19.5	Full	1600	0.0	0.0
Lane 2	207	2.0	1642	0.126	100	5.9	LOSA	0.0	0.0	Short	200	0.0	NA
Approach	262	2.0		0.252		9.5	LOSA	0.8	19.5				
Intersection	4723	2.0		0.907		23.1	LOS C	24.7	627.4				

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 Sign Control.
 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: US HCM 6.
 Delay Model: HCM Delay Formula (Geometric Delay is not included).
 Queue Model: HCM Queue Formula.
 Gap-Acceptance Capacity: Traditional M1.
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)										
South: Piilani Highway										
Mov.	L2	T1	R2	Total	%HV	Cap.	Deg.	Lane	Prob.	Ov.
From S	W	N	E			veh/h	Satn	Util.	SL	Lane
To Exit:							v/c	%	%	No.
Lane 1	76	983	-	1059	2.0	1168	0.907	100	NA	NA
Lane 2	-	1119	-	1119	2.0	1235	0.907	100	NA	NA
Lane 3	-	-	33	33	2.0	1284	0.025	100	0.0	2
Approach	76	2102	33	2211	2.0		0.907			
East: Kulanihakoi Street										
Mov.	L2	T1	R2	Total	%HV	Deg.	Lane	Prob.	Ov.	

From E To Exit:	S	W	N			Cap. veh/h	Satn v/c	Util. %	SL Ov. %	Lane No.
Lane 1	42	3	-	46	2.0	202	0.226	100	NA	NA
Lane 2	-	-	14	14	2.0	164	0.086	100	NA	NA
Approach	42	3	14	60	2.0		0.226			
North: Piilani Highway										
Mov. From N To Exit:	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	13	998	-	1012	2.0	1181	0.857	100	NA	NA
Lane 2	-	1073	-	1073	2.0	1253	0.857	100	NA	NA
Lane 3	-	-	105	105	2.0	1300	0.081	100	0.0	2
Approach	13	2072	105	2190	2.0		0.857			
West: Kulanihako Street										
Mov. From W To Exit:	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	48	8	-	55	2.0	220	0.252	100	NA	NA
Lane 2	-	-	207	207	2.0	1642	0.126	100	0.0	1
Approach	48	8	207	262	2.0		0.252			
Total %HV Deg. Satn (v/c)										
Intersection	4723	2.0		0.907						

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis												
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Piilani Highway												
Merge Type: Priority												
Exit Short Lane	3	500	0.0	1073	1095	3.00	2.00	207	965	0.214	3.7	5.8
Merge Lane	2	-	100.0	Merge Lane is not Opposed				1073	1800	0.596	0.0	0.0
East Exit: Kulanihako Street												
Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Piilani Highway												
Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
West Exit: Kulanihako Street												
Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										

Piilani Highway/Kihei High School Roundabout Evaluation
July 28, 2020

Attachment 3 – SIDRA Analysis Worksheets

2031 HCM6 Methodology

Summary Table, Delay/LOS, Year 2031 HCM6

Piilani Hwy/Kulanihakoi St	Piilani Hwy - South		Kihei HS Drwy		Piilani Hwy - North		Kulanihakoi St		Overall	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
Year 2031 - Single Lane - AM	86.9	F	39.2	E	118.8	F	671.8	F	148.2	F
Year 2031 - Single Lane - PM	93.3	F	46.9	E	75.6	F	270.0	F	92.7	F
Year 2031 - Two Lane - AM	116.5	F	22.2	C	117.1	F	236.9	F	122.5	F
Year 2031 - Two Lane - PM	100.7	F	32.8	D	75.2	F	120.8	F	88.4	F
Year 2031 - Two Lane w/ West Bypasses - AM	125.6	F	22.0	C	105.9	F	47.3	E	105.1	F
Year 2031 - Two Lane w/ West Bypasses - PM	101.2	F	32.7	D	54.7	F	13.2	B	73.9	F
Year 2031 - Two Lane w/ East Bypasses - AM	50.1	F	29.4	D	121.9	F	228.4	F	98.4	F
Year 2031 - Two Lane w/ East Bypasses - PM	87.1	F	29.3	D	75.9	F	119.9	F	82.2	F
Year 2031 - Two Lane Optimized - AM	54.7	F	33.4	D	110.3	F	45.5	E	79.8	F
Year 2031 - Two Lane Optimized - PM	87.5	F	35.4	E	55.2	F	13.2	B	67.8	F

- Notes:
- 1) Model results from SYDRA with HCM 6 Delay, v/c, and LOS method
 - 2) HCM 6 Unsignalized intersection delays for LOS.
 - 3) All options have two approach lanes on Piilani Highway and two circulating lanes in roundabout.
 - 4) Single Lane is one combined approach lane on Kulanihakoi St and Kihei HS approaches.
 - 5) Two Lane is two approaches, one for left turn and through, and second for right-turns.
 - 6) Two lane with west bypass has right-turn lanes with bypass on to neighborhood.
 - 7) Two lane with east bypass has right-turn lanes with bypass to the highschool.
 - 8) Two lane optimized, has right-turn bypasses to neighborhood and northbound right-turn to highschool.

LANE LEVEL OF SERVICE

Lane Level of Service

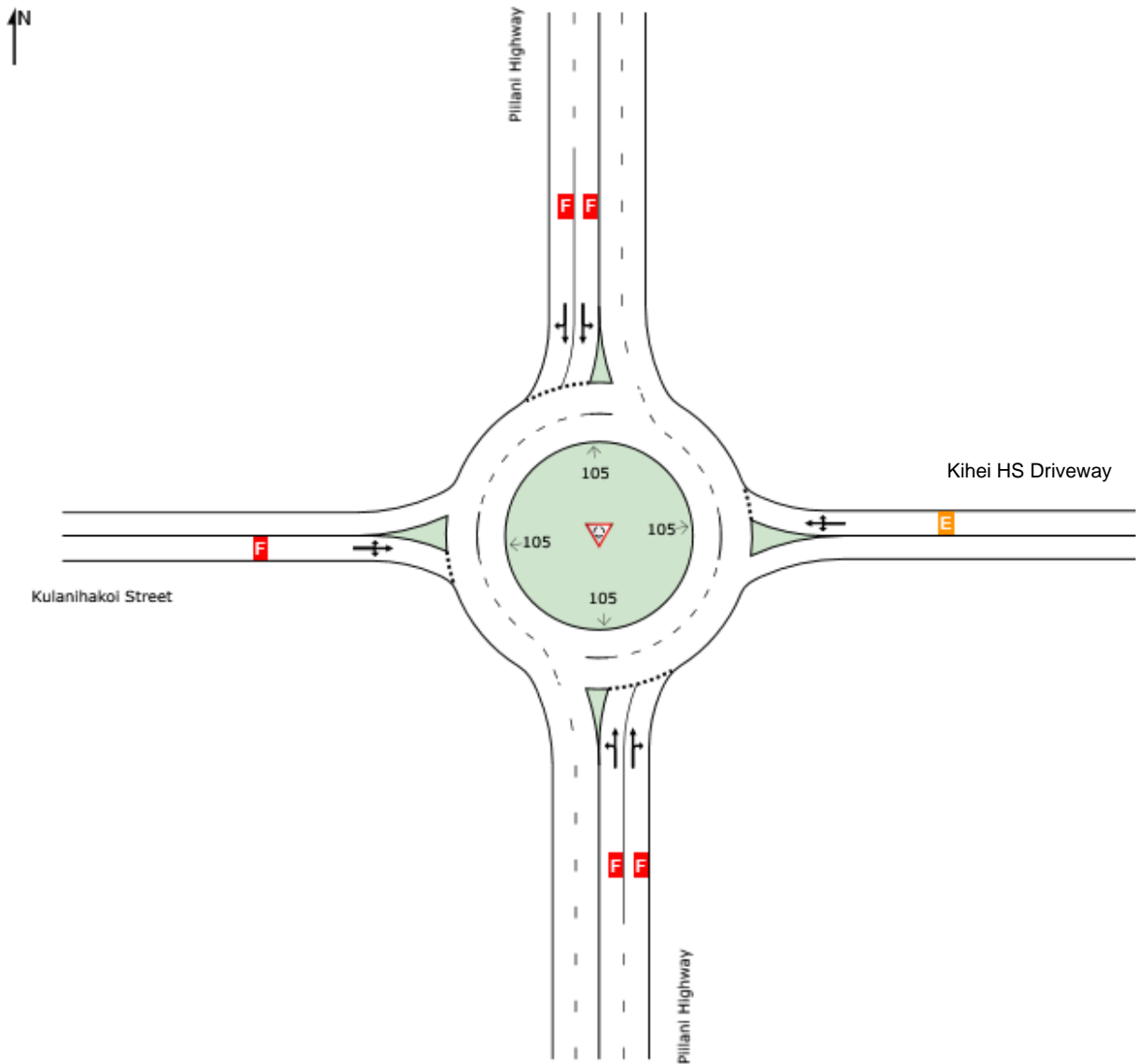
 **Site: 102 [1-Lane 2031 - AM (Site Folder: General)]**

New Site

Site Category: (None)

Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	F	E	F	F	F



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 Sign Control.
 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).
 Delay Model: HCM Delay Formula (Geometric Delay is not included).

LANE SUMMARY

Site: 102 [1-Lane 2031 - AM (Site Folder: General)]

New Site
 Site Category: (None)
 Roundabout

Lane Use and Performance													
	DEMAND FLOWS		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
	[Total veh/h]	[HV %]						[Veh]	[Dist] ft				
South: Piilani Highway													
Lane 1	1032	2.0	922	1.120	100	87.7	LOS F	89.3	2269.1	Full	1600	0.0	16.5
Lane 2 ^d	1100	2.0	983	1.120	100	86.2	LOS F	94.1	2391.4	Full	1600	0.0	18.5
Approach	2133	2.0		1.120		86.9	LOS F	94.1	2391.4				
East: Kulanihakoi Street													
Lane 1 ^d	241	2.0	330	0.731	100	39.2	LOS E	4.0	101.4	Full	1600	0.0	0.0
Approach	241	2.0		0.731		39.2	LOS E	4.0	101.4				
North: Piilani Highway													
Lane 1	1268	2.0	1049	1.209	100	119.4	LOS F	115.9	2942.9	Full	1600	0.0	27.7
Lane 2 ^d	1358	2.0	1123	1.209	100	118.2	LOS F	123.2	3128.5	Full	1600	0.0	31.0
Approach	2626	2.0		1.209		118.8	LOS F	123.2	3128.5				
West: Kulanihakoi Street													
Lane 1 ^d	447	2.0	189	2.370	100	671.8	LOS F	89.0	2259.6	Full	1600	0.0	16.3
Approach	447	2.0		2.370		671.8	LOS F	89.0	2259.6				
Intersection	5447	2.0		2.370		148.2	LOS F	123.2	3128.5				

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 Sign Control.

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: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)											
South: Piilani Highway											
Mov.	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL %	Ov. Lane No.	
From S To Exit:	W	N	E								
Lane 1	76	956	-	1032	2.0	922	1.120	100	NA	NA	
Lane 2	-	793	308	1100	2.0	983	1.120	100	NA	NA	
Approach	76	1749	308	2133	2.0		1.120				
East: Kulanihakoi Street											
Mov.	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL %	Ov. Lane No.	
From E To Exit:	S	W	N								
Lane 1	167	13	61	241	2.0	330	0.731	100	NA	NA	
Approach	167	13	61	241	2.0		0.731				
North: Piilani Highway											

Mov. From N To Exit:	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	127	1141	-	1268	2.0	1049	1.209	100	NA	NA
Lane 2	-	1309	49	1358	2.0	1123	1.209	100	NA	NA
Approach	127	2450	49	2626	2.0		1.209			
West: Kulanihakoi Street										
Mov. From W To Exit:	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	98	77	272	447	2.0	189	2.370	100	NA	NA
Approach	98	77	272	447	2.0		2.370			
Total %HV Deg.Satn (v/c)										
Intersection	5447	2.0		2.370						

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis												
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane % veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Capacity Flow Rate veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec		
South Exit: Piilani Highway												
Merge Type: Not Applied												
Full Length Lane	1		Merge Analysis not applied.									
Full Length Lane	2		Merge Analysis not applied.									
East Exit: Kulanihakoi Street												
Merge Type: Not Applied												
Full Length Lane	1		Merge Analysis not applied.									
North Exit: Piilani Highway												
Merge Type: Not Applied												
Full Length Lane	1		Merge Analysis not applied.									
Full Length Lane	2		Merge Analysis not applied.									
West Exit: Kulanihakoi Street												
Merge Type: Not Applied												
Full Length Lane	1		Merge Analysis not applied.									

LANE LEVEL OF SERVICE

Lane Level of Service

 Site: 102 [1-Lane 2031 - PM (Site Folder: General)]

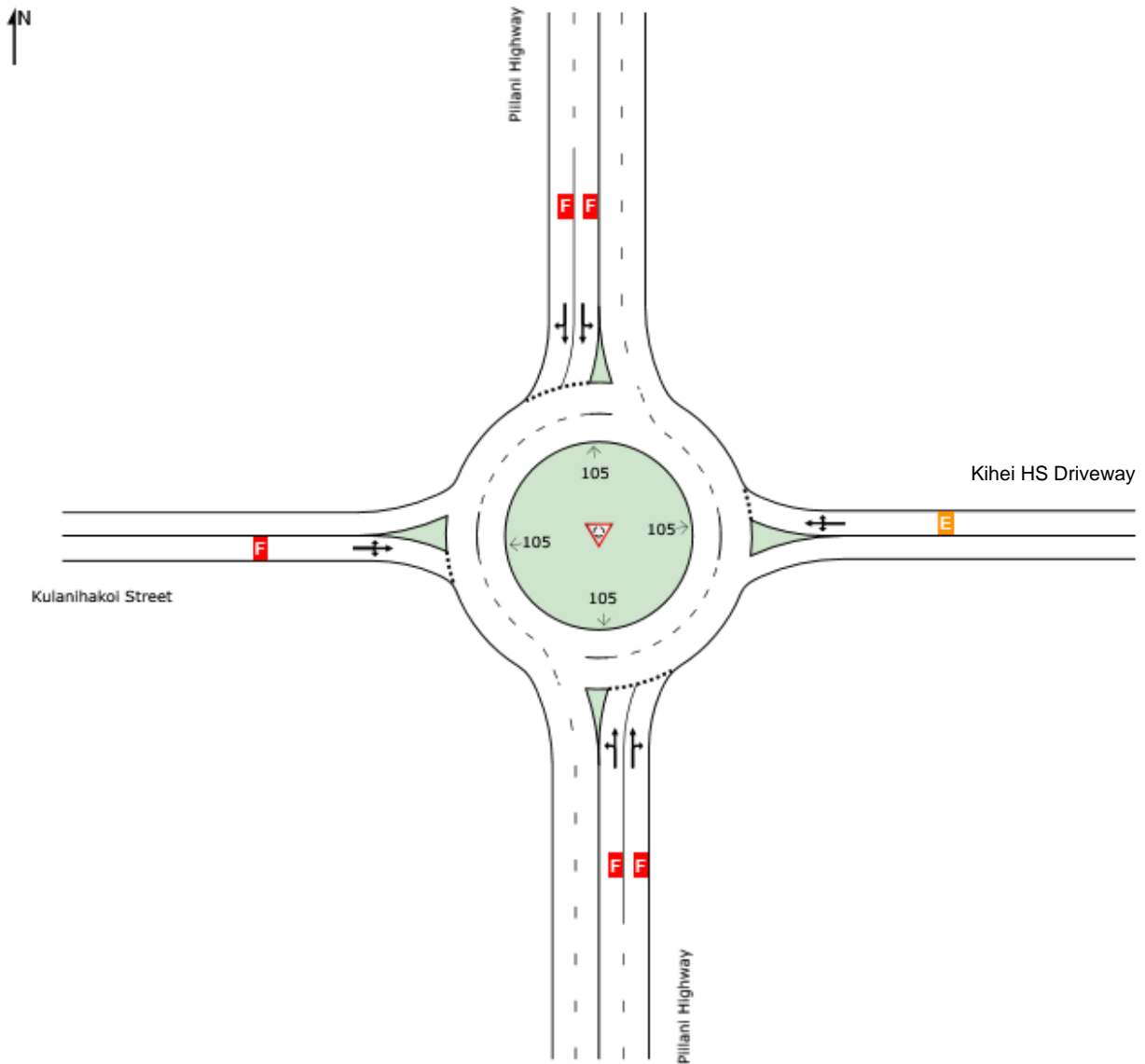
New Site

Site Category: (None)

Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	F	E	F	F	F

Note: 1/3 of the AM pedestrian volume, 110 along the south leg and 30 along the west leg, was used for all PM analyses.



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 Sign Control.
 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).
 Delay Model: HCM Delay Formula (Geometric Delay is not included).

LANE SUMMARY

Site: 102 [1-Lane 2031 - PM (Site Folder: General)]

New Site
 Site Category: (None)
 Roundabout

Lane Use and Performance													
	DEMAND FLOWS		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
	[Total veh/h]	[HV %]						[Veh]	[Dist] ft				
South: Piilani Highway													
Lane 1	1260	2.0	1099	1.146	100	93.9	LOS F	152.7	3877.4	Full	1600	0.0	47.1
Lane 2 ^d	1332	2.0	1162	1.146	100	92.8	LOS F	161.5	4101.6	Full	1600	0.0	53.9
Approach	2592	2.0		1.146		93.3	LOS F	161.5	4101.6				
East: Kulanihakoi Street													
Lane 1 ^d	124	2.0	199	0.622	100	46.9	LOS E	2.4	60.8	Full	1600	0.0	0.0
Approach	124	2.0		0.622		46.9	LOS E	2.4	60.8				
North: Piilani Highway													
Lane 1	1241	2.0	1129	1.100	100	76.3	LOS F	101.7	2582.9	Full	1600	0.0	21.7
Lane 2 ^d	1322	2.0	1202	1.100	100	75.0	LOS F	106.9	2716.3	Full	1600	0.0	23.9
Approach	2563	2.0		1.100		75.6	LOS F	106.9	2716.3				
West: Kulanihakoi Street													
Lane 1 ^d	271	2.0	189	1.435	100	270.0	LOS F	31.7	805.1	Full	1600	0.0	0.0
Approach	271	2.0		1.435		270.0	LOS F	31.7	805.1				
Intersection	5550	2.0		1.435		92.7	LOS F	161.5	4101.6				

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 Sign Control.

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: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)											
South: Piilani Highway											
Mov.	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL %	Ov. Lane No.	
From S To Exit:	W	N	E								
Lane 1	87	1173	-	1260	2.0	1099	1.146	100	NA	NA	
Lane 2	-	1266	66	1332	2.0	1162	1.146	100	NA	NA	
Approach	87	2439	66	2592	2.0		1.146				
East: Kulanihakoi Street											
Mov.	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL %	Ov. Lane No.	
From E To Exit:	S	W	N								
Lane 1	87	7	30	124	2.0	199	0.622	100	NA	NA	
Approach	87	7	30	124	2.0		0.622				
North: Piilani Highway											

Mov. From N To Exit:	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	27	1214	-	1241	2.0	1129	1.100	100	NA	NA
Lane 2	-	1194	127	1322	2.0	1202	1.100	100	NA	NA
Approach	27	2409	127	2563	2.0		1.100			
West: Kulanihakoi Street										
Mov. From W To Exit:	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	48	16	207	271	2.0	189	1.435	100	NA	NA
Approach	48	16	207	271	2.0		1.435			
Total %HV Deg. Satn (v/c)										
Intersection	5550	2.0		1.435						

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis												
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane % veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Capacity Flow Rate veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec		
South Exit: Piilani Highway												
Merge Type: Not Applied												
Full Length Lane	1											Merge Analysis not applied.
Full Length Lane	2											Merge Analysis not applied.
East Exit: Kulanihakoi Street												
Merge Type: Not Applied												
Full Length Lane	1											Merge Analysis not applied.
North Exit: Piilani Highway												
Merge Type: Not Applied												
Full Length Lane	1											Merge Analysis not applied.
Full Length Lane	2											Merge Analysis not applied.
West Exit: Kulanihakoi Street												
Merge Type: Not Applied												
Full Length Lane	1											Merge Analysis not applied.

LANE LEVEL OF SERVICE

Lane Level of Service

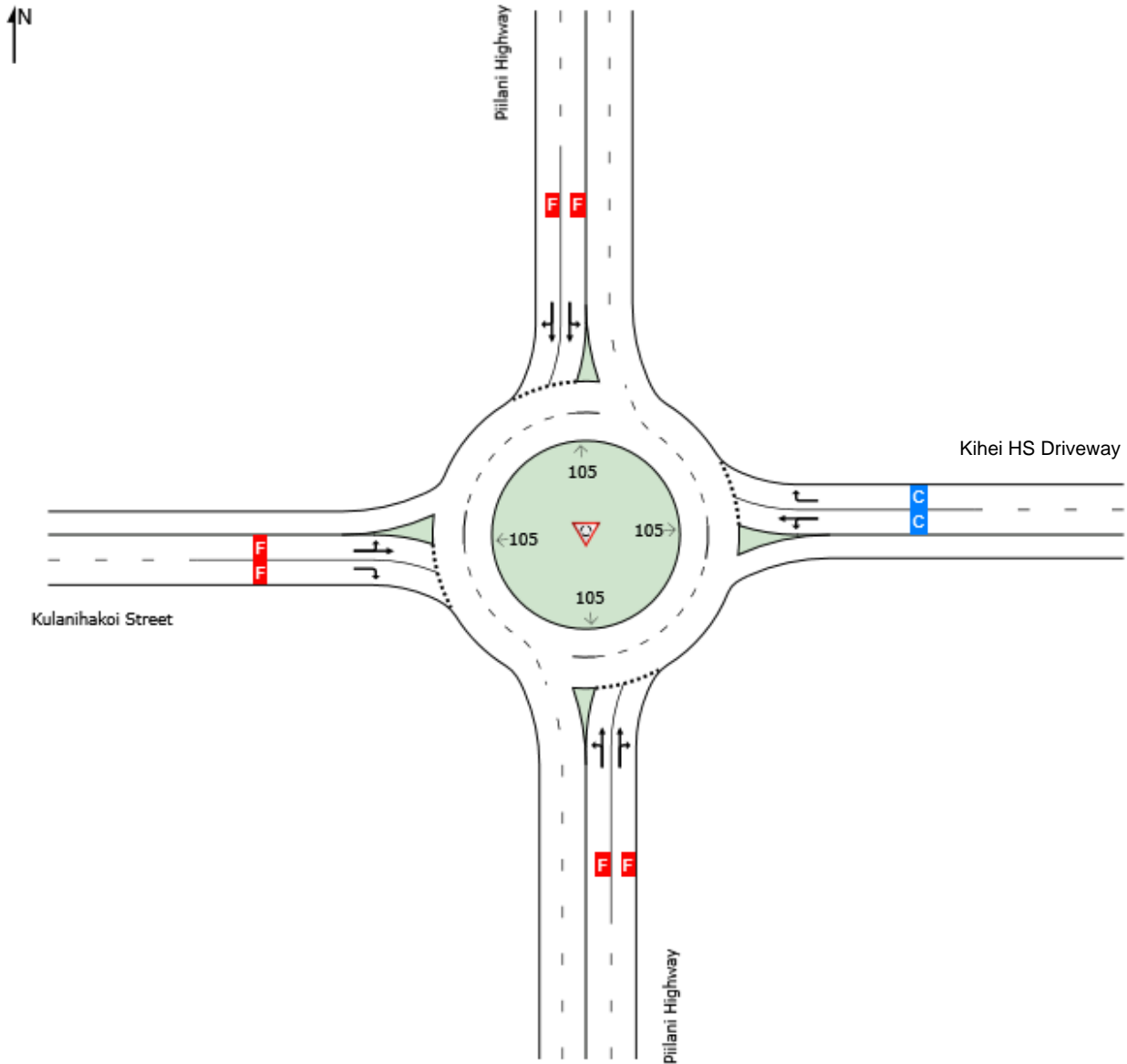
 **Site: 102 [2-Lane 2031 - AM (Site Folder: General)]**

New Site

Site Category: (None)

Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	F	C	F	F	F



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 Sign Control.
 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).
 Delay Model: HCM Delay Formula (Geometric Delay is not included).

LANE SUMMARY

Site: 102 [2-Lane 2031 - AM (Site Folder: General)]

New Site
 Site Category: (None)
 Roundabout

Lane Use and Performance													
	DEMAND FLOWS		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
	[Total veh/h	HV %						[Veh	Dist] ft				
South: Piilani Highway													
Lane 1	1029	2.0	862	1.194	100	117.2	LOS F	92.4	2348.0	Full	1600	0.0	17.8
Lane 2 ^d	1103	2.0	924	1.194	100	115.8	LOS F	98.3	2497.0	Full	1600	0.0	20.2
Approach	2133	2.0		1.194		116.5	LOS F	98.3	2497.0				
East: Kulanihakoi Street													
Lane 1 ^d	180	2.0	343	0.526	100	24.1	LOS C	2.2	56.8	Full	1600	0.0	0.0
Lane 2	61	2.0	291	0.209	100	16.6	LOS C	0.7	16.7	Full	1600	0.0	0.0
Approach	241	2.0		0.526		22.2	LOS C	2.2	56.8				
North: Piilani Highway													
Lane 1	1268	2.0	1052	1.205	100	117.8	LOS F	115.5	2934.3	Full	1600	0.0	27.6
Lane 2 ^d	1358	2.0	1126	1.205	100	116.6	LOS F	122.8	3118.3	Full	1600	0.0	30.8
Approach	2626	2.0		1.205		117.1	LOS F	122.8	3118.3				
West: Kulanihakoi Street													
Lane 1	175	2.0	152	1.149	100	177.6	LOS F	13.0	330.2	Full	1600	0.0	0.0
Lane 2 ^d	272	2.0	188	1.447	100	275.1	LOS F	32.3	820.1	Full	1600	0.0	0.0
Approach	447	2.0		1.447		236.9	LOS F	32.3	820.1				
Intersection	5447	2.0		1.447		122.5	LOS F	122.8	3118.3				

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 Sign Control.
 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: US HCM 6.
 Delay Model: HCM Delay Formula (Geometric Delay is not included).
 Queue Model: HCM Queue Formula.
 Gap-Acceptance Capacity: Traditional M1.
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)											
South: Piilani Highway											
Mov.	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
From S To Exit:	W	N	E								
Lane 1	76	953	-	1029	2.0	862	1.194	100	NA	NA	
Lane 2	-	796	308	1103	2.0	924	1.194	100	NA	NA	
Approach	76	1749	308	2133	2.0		1.194				
East: Kulanihakoi Street											
Mov.	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
From E To Exit:	S	W	N								
Lane 1	167	13	-	180	2.0	343	0.526	100	NA	NA	

Lane 2	-	-	61	61	2.0	291	0.209	100	NA	NA
Approach	167	13	61	241	2.0		0.526			
North: Piilani Highway										
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.
From N						Cap.	Satn	Util.	SL	Lane
To Exit:	E	S	W			veh/h	v/c	%	%	No.
Lane 1	127	1141	-	1268	2.0	1052	1.205	100	NA	NA
Lane 2	-	1309	49	1358	2.0	1126	1.205	100	NA	NA
Approach	127	2450	49	2626	2.0		1.205			
West: Kulanihako Street										
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.
From W						Cap.	Satn	Util.	SL	Lane
To Exit:	N	E	S			veh/h	v/c	%	%	No.
Lane 1	98	77	-	175	2.0	152	1.149	100	NA	NA
Lane 2	-	-	272	272	2.0	188	1.447	100	NA	NA
Approach	98	77	272	447	2.0		1.447			
Total %HV Deg.Satn (v/c)										
Intersection	5447	2.0		1.447						

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis												
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate % veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Piilani Highway												
Merge Type: Not Applied												
Full Length Lane	1											
Full Length Lane	2											
East Exit: Kulanihako Street												
Merge Type: Not Applied												
Full Length Lane	1											
North Exit: Piilani Highway												
Merge Type: Not Applied												
Full Length Lane	1											
Full Length Lane	2											
West Exit: Kulanihako Street												
Merge Type: Not Applied												
Full Length Lane	1											

LANE LEVEL OF SERVICE

Lane Level of Service

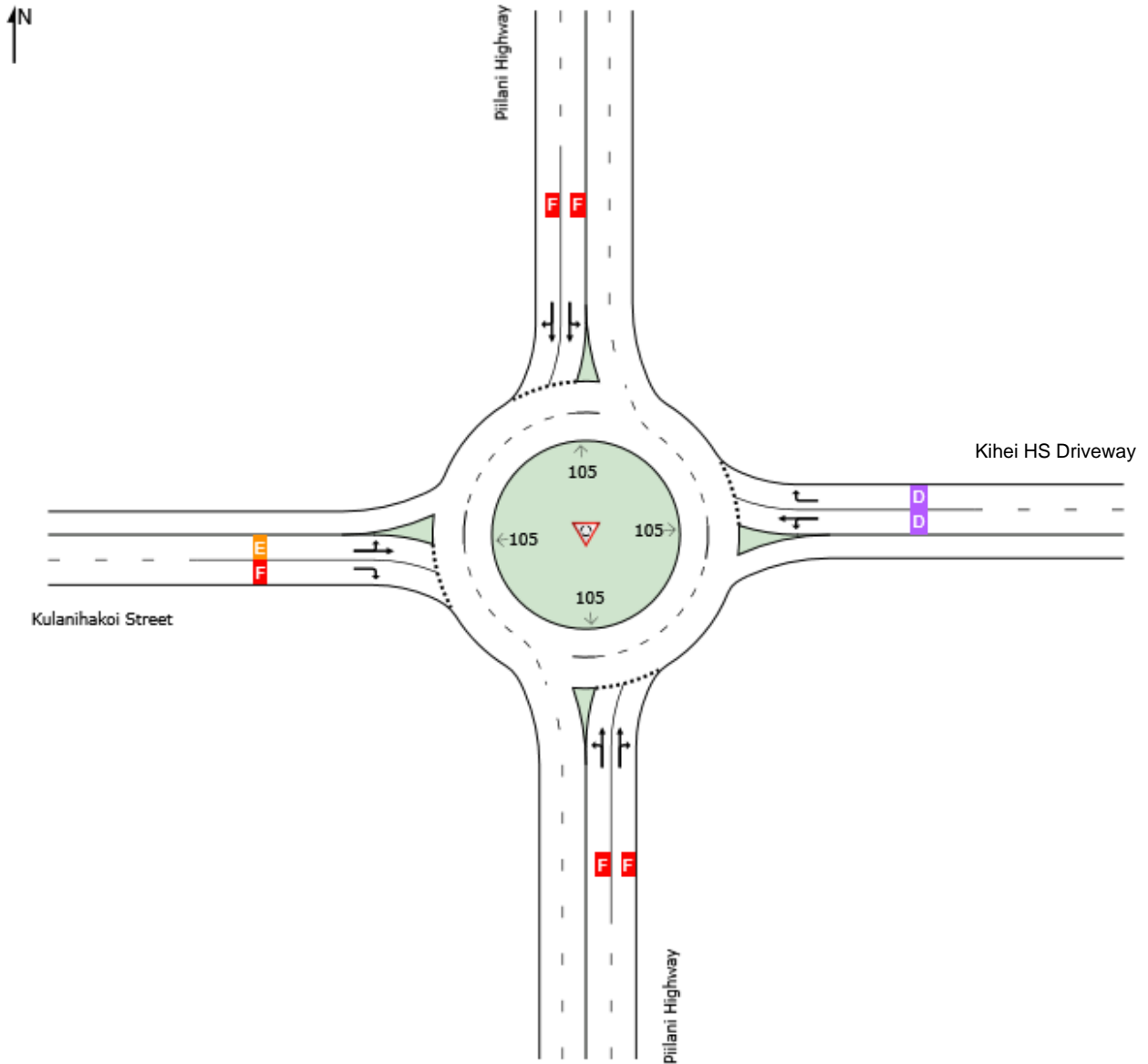
 **Site: 102 [2-Lane 2031 - PM (Site Folder: General)]**

New Site

Site Category: (None)

Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	F	D	F	F	F



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 Sign Control.
 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).
 Delay Model: HCM Delay Formula (Geometric Delay is not included).

LANE SUMMARY

Site: 102 [2-Lane 2031 - PM (Site Folder: General)]

New Site
 Site Category: (None)
 Roundabout

Lane Use and Performance													
	DEMAND FLOWS		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
	[Total veh/h	HV %						[Veh	Dist] ft				
South: Piilani Highway													
Lane 1	1259	2.0	1081	1.165	100	101.2	LOS F	139.7	3549.3	Full	1600	0.0	39.3
Lane 2 ^d	1333	2.0	1145	1.165	100	100.2	LOS F	145.2	3689.3	Full	1600	0.0	42.4
Approach	2592	2.0		1.165		100.7	LOS F	145.2	3689.3				
East: Kulanihakoi Street													
Lane 1 ^d	93	2.0	202	0.463	100	34.4	LOS D	1.6	40.1	Full	1600	0.0	0.0
Lane 2	30	2.0	164	0.186	100	27.6	LOS D	0.5	13.4	Full	1600	0.0	0.0
Approach	124	2.0		0.463		32.8	LOS D	1.6	40.1				
North: Piilani Highway													
Lane 1	1241	2.0	1130	1.099	100	75.9	LOS F	101.7	2582.5	Full	1600	0.0	21.7
Lane 2 ^d	1322	2.0	1203	1.099	100	74.6	LOS F	106.9	2715.4	Full	1600	0.0	23.9
Approach	2563	2.0		1.099		75.2	LOS F	106.9	2715.4				
West: Kulanihakoi Street													
Lane 1	64	2.0	152	0.422	100	42.0	LOS E	1.4	34.5	Full	1600	0.0	0.0
Lane 2 ^d	207	2.0	188	1.097	100	145.3	LOS F	12.3	313.5	Full	1600	0.0	0.0
Approach	271	2.0		1.097		120.8	LOS F	12.3	313.5				
Intersection	5550	2.0		1.165		88.4	LOS F	145.2	3689.3				

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 Sign Control.
 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: US HCM 6.
 Delay Model: HCM Delay Formula (Geometric Delay is not included).
 Queue Model: HCM Queue Formula.
 Gap-Acceptance Capacity: Traditional M1.
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)										
South: Piilani Highway										
Mov.	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
From S To Exit:	W	N	E							
Lane 1	87	1172	-	1259	2.0	1081	1.165	100	NA	NA
Lane 2	-	1267	66	1333	2.0	1145	1.165	100	NA	NA
Approach	87	2439	66	2592	2.0		1.165			
East: Kulanihakoi Street										
Mov.	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
From E To Exit:	S	W	N							
Lane 1	87	7	-	93	2.0	202	0.463	100	NA	NA

Lane 2	-	-	30	30	2.0	164	0.186	100	NA	NA
Approach	87	7	30	124	2.0		0.463			
North: Piilani Highway										
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.
From N						Cap.	Satn	Util.	SL	Lane
To Exit:	E	S	W			veh/h	v/c	%	%	No.
Lane 1	27	1214	-	1241	2.0	1130	1.099	100	NA	NA
Lane 2	-	1194	127	1322	2.0	1203	1.099	100	NA	NA
Approach	27	2409	127	2563	2.0		1.099			
West: Kulanihako Street										
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.
From W						Cap.	Satn	Util.	SL	Lane
To Exit:	N	E	S			veh/h	v/c	%	%	No.
Lane 1	48	16	-	64	2.0	152	0.422	100	NA	NA
Lane 2	-	-	207	207	2.0	188	1.097	100	NA	NA
Approach	48	16	207	271	2.0		1.097			
Total %HV Deg.Satn (v/c)										
Intersection	5550	2.0		1.165						

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis												
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate % veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Piilani Highway												
Merge Type: Not Applied												
Full Length Lane	1											
Full Length Lane	2											
East Exit: Kulanihako Street												
Merge Type: Not Applied												
Full Length Lane	1											
North Exit: Piilani Highway												
Merge Type: Not Applied												
Full Length Lane	1											
Full Length Lane	2											
West Exit: Kulanihako Street												
Merge Type: Not Applied												
Full Length Lane	1											

LANE LEVEL OF SERVICE

Lane Level of Service

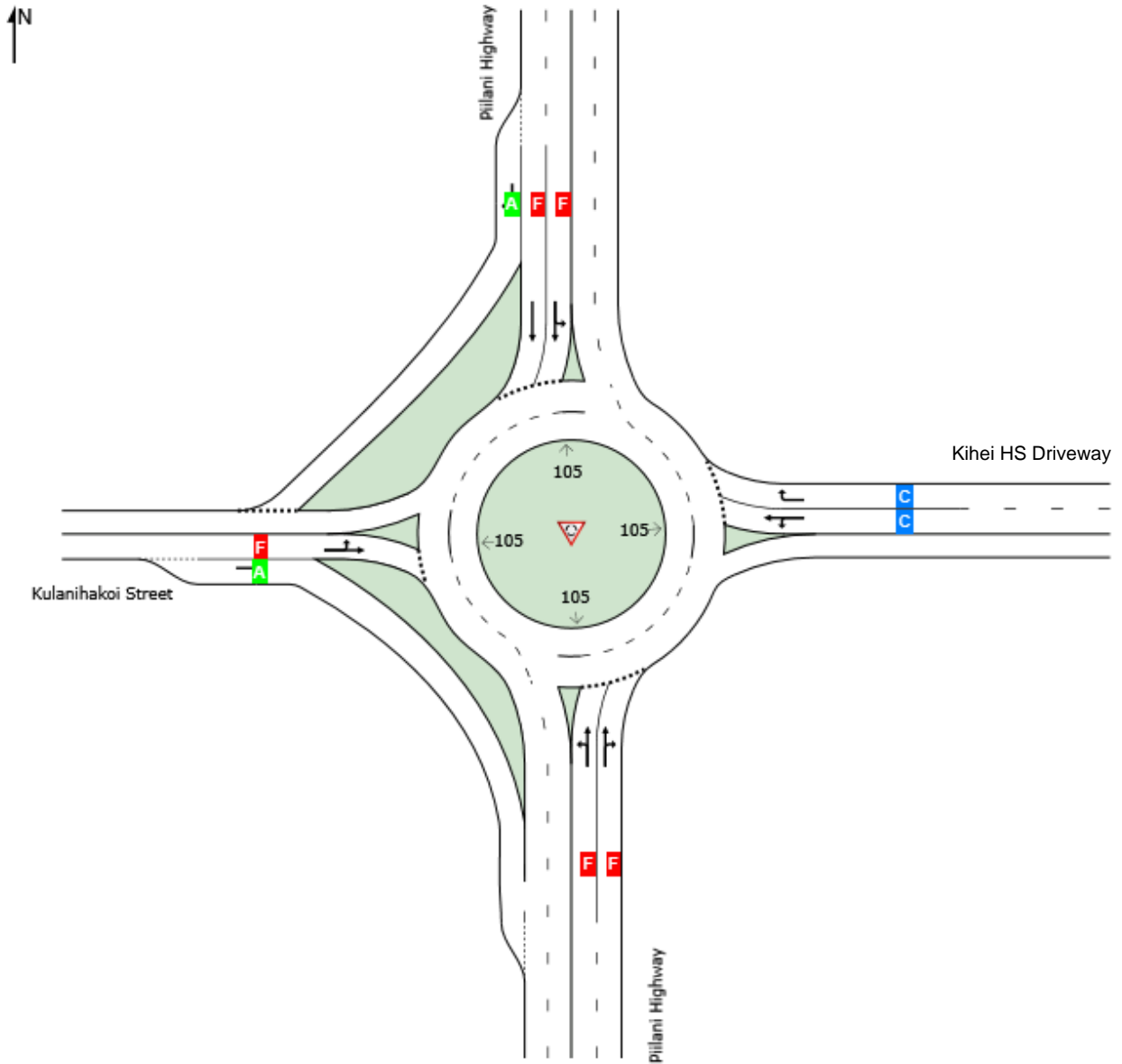
 Site: 102 [2-Lane 2031 West Bypass - AM (Site Folder: General)]

New Site

Site Category: (None)

Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	F	C	F	E	F



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 Sign Control.
 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).
 Delay Model: HCM Delay Formula (Geometric Delay is not included).

To Exit:	S	W	N							
Lane 1	167	13	-	180	2.0	345	0.523	100	NA	NA
Lane 2	-	-	61	61	2.0	293	0.208	100	NA	NA
Approach	167	13	61	241	2.0		0.523			
North: Piilani Highway										
Mov.	L2	T1	R2	Total	%HV					
From N						Cap.	Deg.	Lane	Prob.	Ov.
To Exit:	E	S	W			veh/h	satn	Util.	SL	Lane
Lane 1	127	1118	-	1245	2.0	1053	1.182	100	NA	NA
Lane 2	-	1332	-	1332	2.0	1127	1.182	100	NA	NA
Lane 3	-	-	49	49	2.0	1303	0.038	100	0.0	2
Approach	127	2450	49	2626	2.0		1.182			
West: Kulanihako Street										
Mov.	L2	T1	R2	Total	%HV					
From W						Cap.	Deg.	Lane	Prob.	Ov.
To Exit:	N	E	S			veh/h	satn	Util.	SL	Lane
Lane 1	98	77	-	175	2.0	181	0.965	100	NA	NA
Lane 2	-	-	272	272	2.0	1642	0.166	100	0.0	1
Approach	98	77	272	447	2.0		0.965			
Total %HV Deg.Satn (v/c)										
Intersection	5447	2.0		1.216						

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis												
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Piilani Highway												
Merge Type: Priority												
Exit Short Lane	3	500	0.0	1127	1150	3.00	2.00	272	934	0.291	3.9	6.9
Merge Lane	2	-	100.0	Merge Lane is not Opposed				1127	1800	0.626	0.0	0.0
East Exit: Kulanihako Street												
Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Piilani Highway												
Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
West Exit: Kulanihako Street												
Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										

LANE LEVEL OF SERVICE

Lane Level of Service

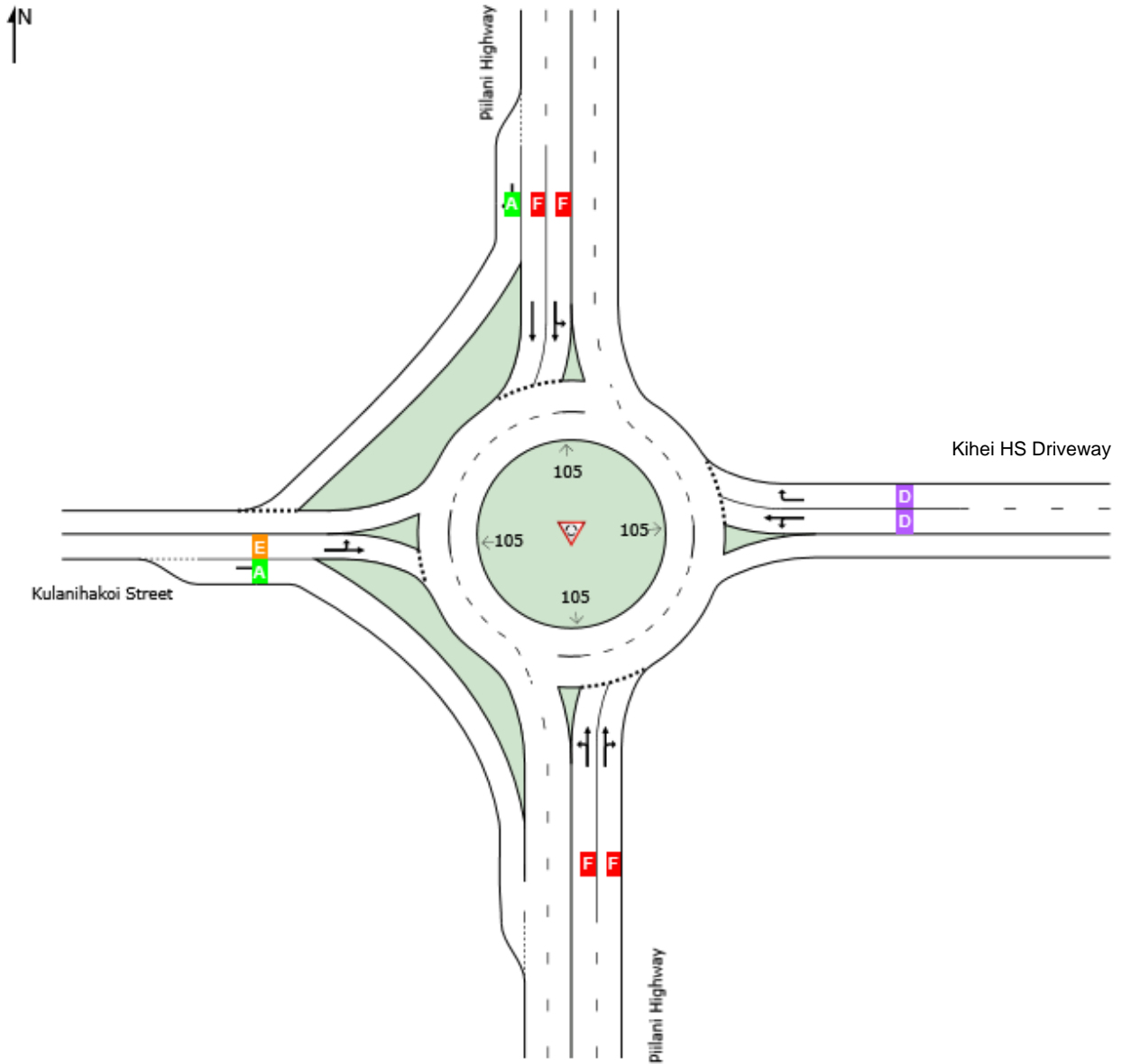
 **Site: 102 [2-Lane 2031 - West Bypass - PM (Site Folder: General)]**

New Site

Site Category: (None)

Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	F	D	F	B	F



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 Sign Control.
 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).
 Delay Model: HCM Delay Formula (Geometric Delay is not included).

To Exit:	S	W	N							
Lane 1	87	7	-	93	2.0	202	0.462	100	NA	NA
Lane 2	-	-	30	30	2.0	164	0.185	100	NA	NA
Approach	87	7	30	124	2.0		0.462			
North: Piilani Highway										
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.
From N						Cap.	Satn	Util.	SL	Lane
To Exit:	E	S	W			veh/h	v/c	%	%	No.
Lane 1	27	1153	-	1180	2.0	1130	1.044	100	NA	NA
Lane 2	-	1256	-	1256	2.0	1203	1.044	100	NA	NA
Lane 3	-	-	127	127	2.0	1297	0.098	100	0.0	2
Approach	27	2409	127	2563	2.0		1.044			
West: Kulanihako Street										
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.
From W						Cap.	Satn	Util.	SL	Lane
To Exit:	N	E	S			veh/h	v/c	%	%	No.
Lane 1	48	16	-	64	2.0	171	0.375	100	NA	NA
Lane 2	-	-	207	207	2.0	1642	0.126	100	0.0	1
Approach	48	16	207	271	2.0		0.375			
Total %HV Deg.Satn (v/c)										
Intersection	5550	2.0		1.166						

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis												
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Piilani Highway												
Merge Type: Priority												
Exit Short Lane	3	500	0.0	1203	1227	3.00	2.00	207	893	0.231	4.0	6.4
Merge Lane	2	-	100.0	Merge Lane is not Opposed				1203	1800	0.668	0.0	0.0
East Exit: Kulanihako Street												
Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Piilani Highway												
Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
West Exit: Kulanihako Street												
Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										

LANE LEVEL OF SERVICE

Lane Level of Service

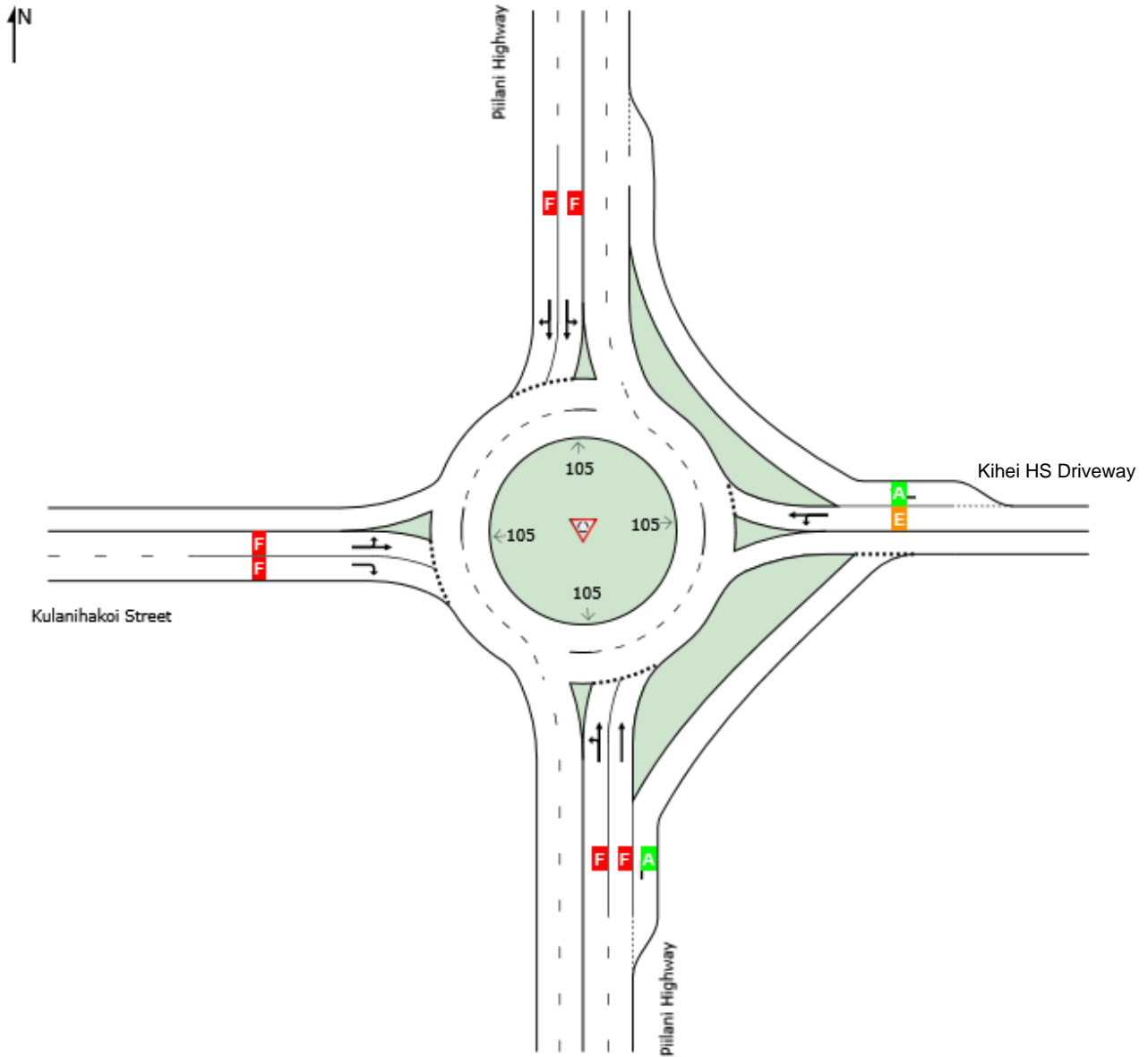
 Site: 102 [2-Lane East Bypass 2031 - AM (Site Folder: General)]

New Site

Site Category: (None)

Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	F	D	F	F	F



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 Sign Control.
 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).
 Delay Model: HCM Delay Formula (Geometric Delay is not included).

LANE SUMMARY

Site: 102 [2-Lane East Bypass 2031 - AM (Site Folder: General)]

New Site
 Site Category: (None)
 Roundabout

Lane Use and Performance													
	DEMAND FLOWS		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
	[Total veh/h	HV %						[Veh	Dist] ft				
South: Piilani Highway													
Lane 1	881	2.0	862	1.022	100	58.3	LOS F	53.0	1345.4	Full	1600	0.0	0.1
Lane 2 ^d	944	2.0	923	1.022	100	56.5	LOS F	55.9	1421.0	Full	1600	0.0	1.6
Lane 3	308	2.0	988	0.311	100	6.8	LOSA	1.1	29.0	Short	200	0.0	NA
Approach	2133	2.0		1.022		50.1	LOS F	55.9	1421.0				
East: Kulanihakoi Street													
Lane 1 ^d	180	2.0	276	0.654	100	37.9	LOS E	2.9	74.7	Full	1600	0.0	0.0
Lane 2	61	2.0	1642	0.037	100	3.9	LOSA	0.0	0.0	Short	200	0.0	NA
Approach	241	2.0		0.654		29.4	LOS D	2.9	74.7				
North: Piilani Highway													
Lane 1	1268	2.0	1042	1.217	100	122.5	LOS F	116.6	2962.2	Full	1600	0.0	28.1
Lane 2 ^d	1358	2.0	1116	1.217	100	121.3	LOS F	124.1	3151.0	Full	1600	0.0	31.4
Approach	2626	2.0		1.217		121.9	LOS F	124.1	3151.0				
West: Kulanihakoi Street													
Lane 1	175	2.0	155	1.131	100	170.4	LOS F	12.4	314.2	Full	1600	0.0	0.0
Lane 2 ^d	272	2.0	191	1.426	100	265.8	LOS F	31.4	798.4	Full	1600	0.0	0.0
Approach	447	2.0		1.426		228.4	LOS F	31.4	798.4				
Intersection	5447	2.0		1.426		98.4	LOS F	124.1	3151.0				

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 Sign Control.

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: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)											
South: Piilani Highway											
Mov.	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
From S To Exit:	W	N	E								
Lane 1	76	805	-	881	2.0	862	1.022	100	NA	NA	
Lane 2	-	944	-	944	2.0	923	1.022	100	NA	NA	
Lane 3	-	-	308	308	2.0	988	0.311	100	0.0	2	
Approach	76	1749	308	2133	2.0		1.022				
East: Kulanihakoi Street											
Mov.	L2	T1	R2	Total	%HV	Deg.	Lane	Prob.	Ov.		

From E To Exit:	S	W	N			Cap. veh/h	Satn v/c	Util. %	SL Ov. %	Lane No.
Lane 1	167	13	-	180	2.0	276	0.654	100	NA	NA
Lane 2	-	-	61	61	2.0	1642	0.037	100	0.0	1
Approach	167	13	61	241	2.0		0.654			
North: Piilani Highway										
Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	127	1141	-	1268	2.0	1042	1.217	100	NA	NA
Lane 2	-	1309	49	1358	2.0	1116	1.217	100	NA	NA
Approach	127	2450	49	2626	2.0		1.217			
West: Kulanihako Street										
Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	98	77	-	175	2.0	155	1.131	100	NA	NA
Lane 2	-	-	272	272	2.0	191	1.426	100	NA	NA
Approach	98	77	272	447	2.0		1.426			
Total %HV Deg. Satn (v/c)										
Intersection	5447	2.0		1.426						

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis												
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane % veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec		
South Exit: Piilani Highway Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
East Exit: Kulanihako Street Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Piilani Highway Merge Type: Priority												
Exit Short Lane	3	500	0.0	923	942	3.00	2.00	61	1055	0.058	3.4	3.9
Merge Lane	2	-	100.0	Merge Lane is not Opposed			923	1800	0.513	0.0	0.0	
West Exit: Kulanihako Street Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										

LANE LEVEL OF SERVICE

Lane Level of Service

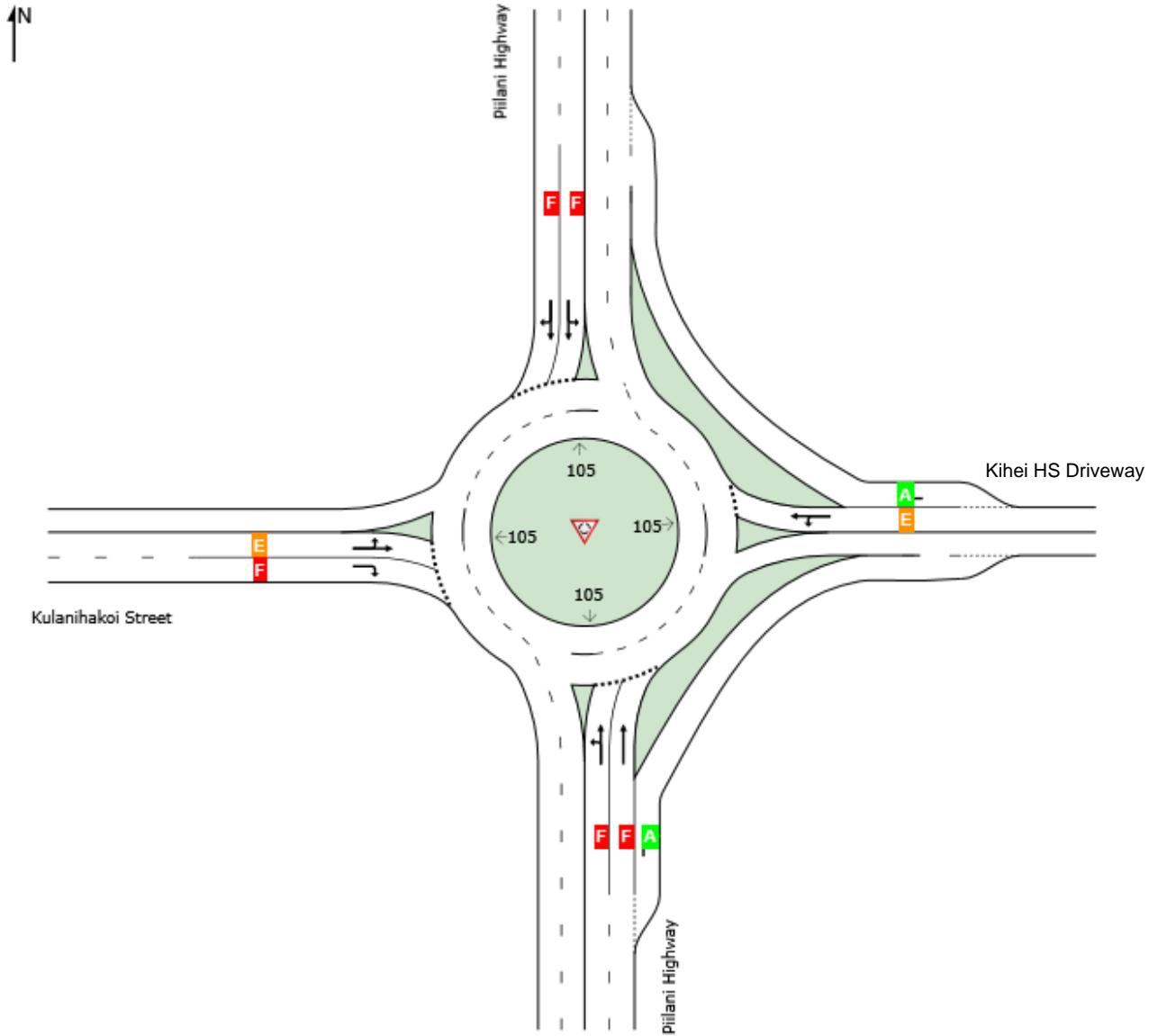
 Site: 102 [2-Lane East Bypass 2031 - PM (Site Folder: General)]

New Site

Site Category: (None)

Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	F	D	F	F	F



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 Sign Control.
 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).
 Delay Model: HCM Delay Formula (Geometric Delay is not included).

From E To Exit:	S	W	N			Cap. veh/h	Satn v/c	Util. %	SL Ov. %	Lane No.
Lane 1	87	7	-	93	2.0	193	0.485	100	NA	NA
Lane 2	-	-	30	30	2.0	1642	0.019	100	0.0	1
Approach	87	7	30	124	2.0		0.485			
North: Piilani Highway										
Mov. From N To Exit:	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	27	1214	-	1241	2.0	1128	1.101	100	NA	NA
Lane 2	-	1195	127	1322	2.0	1201	1.101	100	NA	NA
Approach	27	2409	127	2563	2.0		1.101			
West: Kulanihakai Street										
Mov. From W To Exit:	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	48	16	-	64	2.0	152	0.421	100	NA	NA
Lane 2	-	-	207	207	2.0	189	1.094	100	NA	NA
Approach	48	16	207	271	2.0		1.094			
Total %HV Deg. Satn (v/c)										
Intersection	5550	2.0		1.135						

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis												
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate % veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec	
South Exit: Piilani Highway Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
East Exit: Kulanihakai Street Merge Type: Priority												
Exit Short Lane	2	500	0.0	41	42	3.00	2.00	66	1759	0.038	2.0	2.3
Merge Lane	1	-	100.0	Merge Lane is not Opposed				41	1800	0.023	0.0	0.0
North Exit: Piilani Highway Merge Type: Priority												
Exit Short Lane	3	200	0.0	1145	1167	3.00	2.00	30	925	0.033	3.9	4.2
Merge Lane	2	-	100.0	Merge Lane is not Opposed				1145	1800	0.636	0.0	0.0
West Exit: Kulanihakai Street Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										

LANE LEVEL OF SERVICE

Lane Level of Service

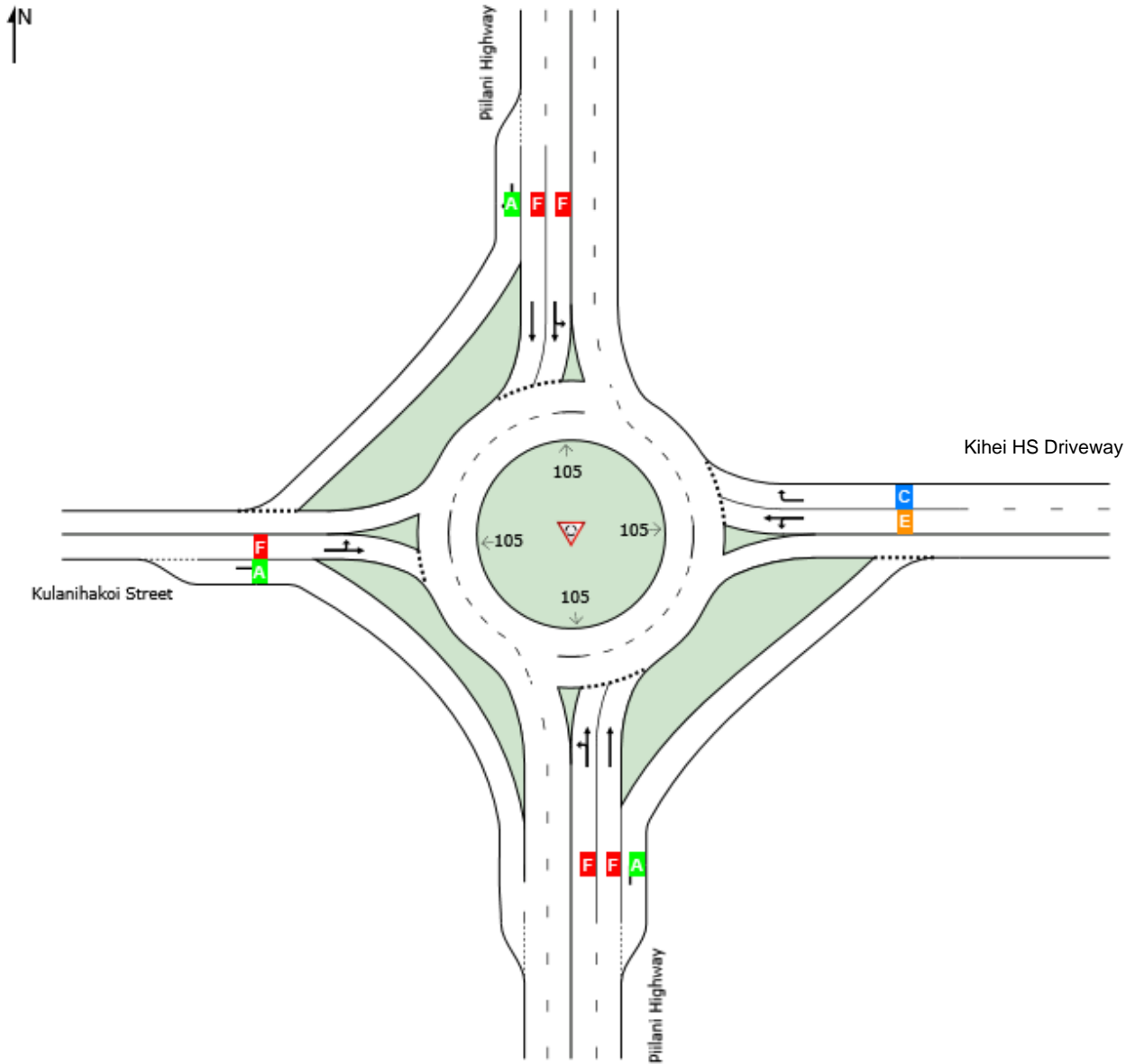
 Site: 102 [RTL NES 2031 - AM (Site Folder: General)]

New Site

Site Category: (None)

Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	F	D	F	E	F



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 Sign Control.
 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).
 Delay Model: HCM Delay Formula (Geometric Delay is not included).

LANE SUMMARY

Site: 102 [RTL NES 2031 - AM (Site Folder: General)]

New Site
 Site Category: (None)
 Roundabout

Lane Use and Performance													
	DEMAND FLOWS		Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	[Total	HV]						[Veh	Dist]				
	veh/h	%	veh/h	v/c	%	sec			ft	ft	%	%	
South: Piilani Highway													
Lane 1	880	2.0	847	1.040	100	63.7	LOS F	53.9	1369.3	Full	1600	0.0	0.6
Lane 2 ^d	945	2.0	908	1.040	100	61.9	LOS F	57.1	1449.8	Full	1600	0.0	2.2
Lane 3	308	2.0	980	0.314	100	6.9	LOSA	1.2	29.2	Short	200	0.0	NA
Approach	2133	2.0		1.040		54.7	LOS F	57.1	1449.8				
East: Kulanihakoi Street													
Lane 1 ^d	180	2.0	279	0.647	100	37.1	LOS E	2.9	73.5	Full	1600	0.0	0.0
Lane 2	61	2.0	232	0.262	100	22.3	LOS C	0.8	21.2	Full	1600	0.0	0.0
Approach	241	2.0		0.647		33.4	LOS D	2.9	73.5				
North: Piilani Highway													
Lane 1	1244	2.0	1043	1.193	100	113.0	LOS F	109.6	2784.9	Full	1600	0.0	25.0
Lane 2 ^d	1333	2.0	1117	1.193	100	111.8	LOS F	116.6	2960.6	Full	1600	0.0	28.0
Lane 3	49	2.0	1292	0.038	100	3.1	LOSA	0.1	3.5	Short	200	0.0	NA
Approach	2626	2.0		1.193		110.3	LOS F	116.6	2960.6				
West: Kulanihakoi Street													
Lane 1 ^d	175	2.0	184	0.951	100	105.3	LOS F	6.4	163.0	Full	1600	0.0	0.0
Lane 2	272	2.0	1642	0.166	100	6.9	LOSA	0.0	0.0	Short	200	0.0	NA
Approach	447	2.0		0.951		45.5	LOS E	6.4	163.0				
Intersection	5447	2.0		1.193		79.8	LOS F	116.6	2960.6				

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 Sign Control.
 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: US HCM 6.
 Delay Model: HCM Delay Formula (Geometric Delay is not included).
 Queue Model: HCM Queue Formula.
 Gap-Acceptance Capacity: Traditional M1.
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)										
South: Piilani Highway										
Mov.	L2	T1	R2	Total	%HV	Cap.	Deg.	Lane	Prob.	Ov.
From S	W	N	E			veh/h	Satn	Util.	SL	Lane
To Exit:							v/c	%	%	No.
Lane 1	76	804	-	880	2.0	847	1.040	100	NA	NA
Lane 2	-	945	-	945	2.0	908	1.040	100	NA	NA
Lane 3	-	-	308	308	2.0	980	0.314	100	0.0	2
Approach	76	1749	308	2133	2.0		1.040			
East: Kulanihakoi Street										
Mov.	L2	T1	R2	Total	%HV	Deg.	Lane	Prob.	Ov.	

From E To Exit:	S	W	N			Cap. veh/h	Satn v/c	Util. %	SL Ov. %	Lane No.
Lane 1	167	13	-	180	2.0	279	0.647	100	NA	NA
Lane 2	-	-	61	61	2.0	232	0.262	100	NA	NA
Approach	167	13	61	241	2.0		0.647			
North: Piilani Highway										
Mov. From N To Exit:	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	127	1117	-	1244	2.0	1043	1.193	100	NA	NA
Lane 2	-	1333	-	1333	2.0	1117	1.193	100	NA	NA
Lane 3	-	-	49	49	2.0	1292	0.038	100	0.0	2
Approach	127	2450	49	2626	2.0		1.193			
West: Kulanihako Street										
Mov. From W To Exit:	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	98	77	-	175	2.0	184	0.951	100	NA	NA
Lane 2	-	-	272	272	2.0	1642	0.166	100	0.0	1
Approach	98	77	272	447	2.0		0.951			
Total %HV Deg. Satn (v/c)										
Intersection	5447	2.0		1.193						

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis												
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Piilani Highway												
Merge Type: Priority												
Exit Short Lane	3	500	0.0	1117	1140	3.00	2.00	272	940	0.289	3.8	6.8
Merge Lane	2	-	100.0	Merge Lane is not Opposed				1117	1800	0.621	0.0	0.0
East Exit: Kulanihako Street												
Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Piilani Highway												
Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
West Exit: Kulanihako Street												
Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										

LANE LEVEL OF SERVICE

Lane Level of Service

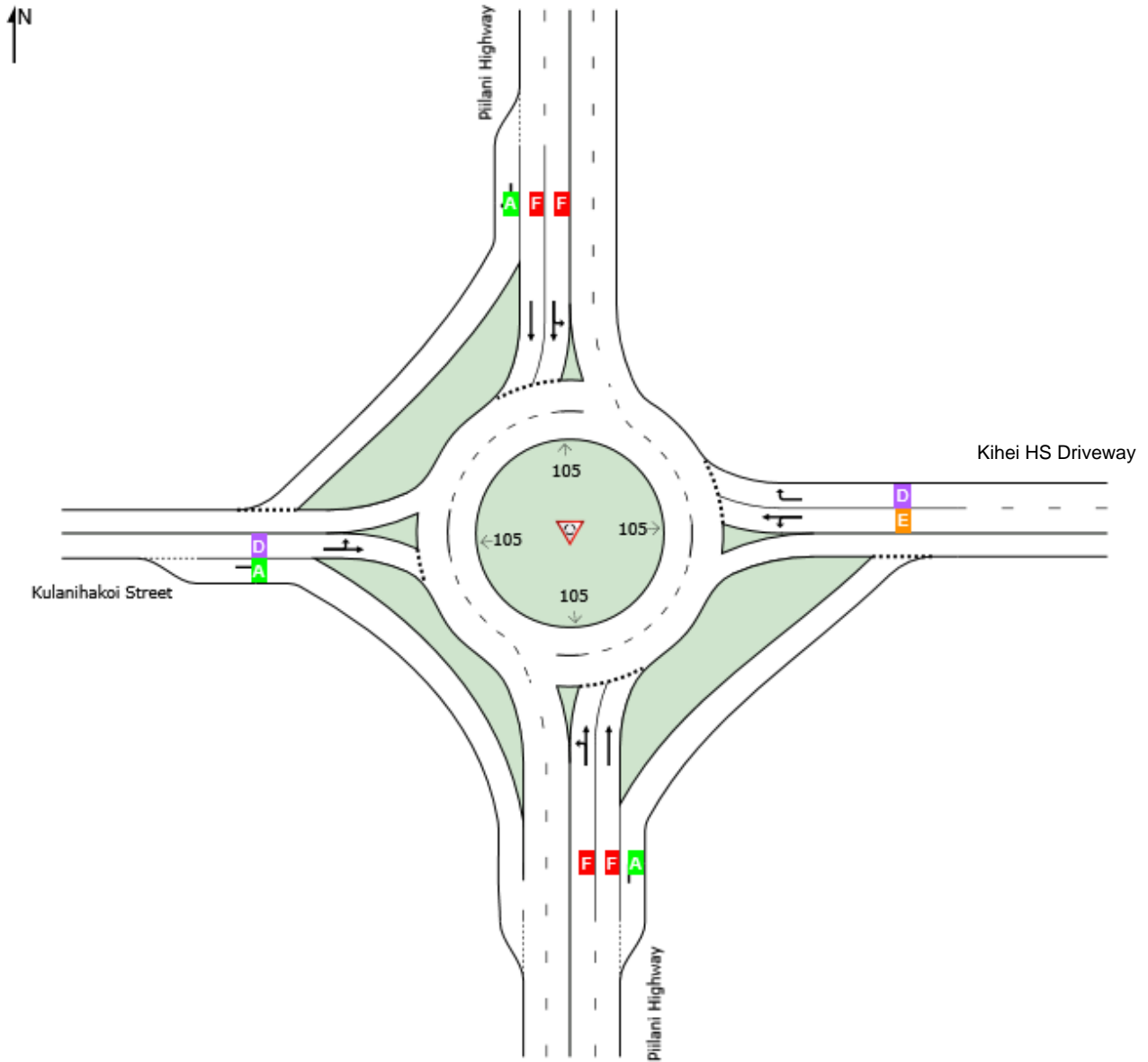
 **Site: 102 [RTL NES 2031 - PM (Site Folder: General)]**

New Site

Site Category: (None)

Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	F	E	F	B	F



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 Sign Control.
 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).
 Delay Model: HCM Delay Formula (Geometric Delay is not included).

LANE SUMMARY

Site: 102 [RTL NES 2031 - PM (Site Folder: General)]

New Site
 Site Category: (None)
 Roundabout

Lane Use and Performance													
	DEMAND FLOWS		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
	[Total veh/h	HV %						[Veh	Dist] ft				
South: Piilani Highway													
Lane 1	1227	2.0	1080	1.136	100	90.3	LOS F	127.9	3249.4	Full	1600	0.0	33.3
Lane 2 ^d	1299	2.0	1143	1.136	100	89.2	LOS F	131.8	3348.3	Full	1600	0.0	35.2
Lane 3	66	2.0	1186	0.056	100	3.5	LOSA	0.2	4.6	Short	200	0.0	NA
Approach	2592	2.0		1.136		87.5	LOS F	131.8	3348.3				
East: Kulanihakoi Street													
Lane 1 ^d	93	2.0	193	0.485	100	37.3	LOS E	1.7	42.2	Full	1600	0.0	0.0
Lane 2	30	2.0	156	0.195	100	29.4	LOS D	0.6	14.1	Full	1600	0.0	0.0
Approach	124	2.0		0.485		35.4	LOS E	1.7	42.2				
North: Piilani Highway													
Lane 1	1180	2.0	1128	1.046	100	58.6	LOS F	84.8	2154.8	Full	1600	0.0	14.6
Lane 2 ^d	1256	2.0	1201	1.046	100	57.3	LOS F	88.9	2258.5	Full	1600	0.0	16.3
Lane 3	127	2.0	1295	0.098	100	3.6	LOSA	0.4	9.6	Short	200	0.0	NA
Approach	2563	2.0		1.046		55.2	LOS F	88.9	2258.5				
West: Kulanihakoi Street													
Lane 1 ^d	64	2.0	171	0.374	100	34.9	LOS D	1.2	29.9	Full	1600	0.0	0.0
Lane 2	207	2.0	1642	0.126	100	6.4	LOSA	0.0	0.0	Short	200	0.0	NA
Approach	271	2.0		0.374		13.2	LOS B	1.2	29.9				
Intersection	5550	2.0		1.136		67.8	LOS F	131.8	3348.3				

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 Sign Control.
 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: US HCM 6.
 Delay Model: HCM Delay Formula (Geometric Delay is not included).
 Queue Model: HCM Queue Formula.
 Gap-Acceptance Capacity: Traditional M1.
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)										
South: Piilani Highway										
Mov.	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
From S To Exit:	W	N	E							
Lane 1	87	1140	-	1227	2.0	1080	1.136	100	NA	NA
Lane 2	-	1299	-	1299	2.0	1143	1.136	100	NA	NA
Lane 3	-	-	66	66	2.0	1186	0.056	100	0.0	2
Approach	87	2439	66	2592	2.0		1.136			
East: Kulanihakoi Street										
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.

From E To Exit:	S	W	N			Cap. veh/h	Satn v/c	Util. %	SL %	Ov. %	Lane No.
Lane 1	87	7	-	93	2.0	193	0.485	100	NA	NA	
Lane 2	-	-	30	30	2.0	156	0.195	100	NA	NA	
Approach	87	7	30	124	2.0		0.485				
North: Piilani Highway											
Mov. From N To Exit:	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL %	Ov. %	Lane No.
Lane 1	27	1153	-	1180	2.0	1128	1.046	100	NA	NA	
Lane 2	-	1256	-	1256	2.0	1201	1.046	100	NA	NA	
Lane 3	-	-	127	127	2.0	1295	0.098	100	0.0	2	
Approach	27	2409	127	2563	2.0		1.046				
West: Kulanihako Street											
Mov. From W To Exit:	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL %	Ov. %	Lane No.
Lane 1	48	16	-	64	2.0	171	0.374	100	NA	NA	
Lane 2	-	-	207	207	2.0	1642	0.126	100	0.0	1	
Approach	48	16	207	271	2.0		0.374				
Total %HV Deg. Satn (v/c)											
Intersection	5550	2.0		1.136							

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis												
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Piilani Highway Merge Type: Priority												
Exit Short Lane	3	500	0.0	1201	1225	3.00	2.00	207	894	0.231	4.0	6.4
Merge Lane	2	-	100.0	Merge Lane is not Opposed				1201	1800	0.667	0.0	0.0
East Exit: Kulanihako Street Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Piilani Highway Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
West Exit: Kulanihako Street Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										

Piilani Highway/Kihei High School Roundabout Evaluation
July 28, 2020

Attachment 3 – SIDRA Analysis Worksheets

2031 SIDRA Methodology

Summary Table, Delay/LOS, Year 2031 SIDRA

Piilani Hwy/Kulanihakoi St	Piilani Hwy - South		Kihei HS Drwy		Piilani Hwy - North		Kulanihakoi St		Overall	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
Year 2031 - Single Lane - AM	53.6	E	31.2	C	89.1	F	589.0	F	113.6	F
Year 2031 - Single Lane - PM	63.1	E	29.6	C	42.1	D	231.9	F	60.9	E
Year 2031 - Two Lane - AM	88.9	F	16.1	B	86.5	F	68.4	E	82.8	F
Year 2031 - Two Lane - PM	70.3	F	19.0	B	41.8	D	32.4	C	54.2	E
Year 2031 - Two Lane w/ West Bypasses - AM	94.3	F	15.9	B	18.6	B	39.6	D	49.8	D
Year 2031 - Two Lane w/ West Bypasses - PM	71.2	F	19.0	B	7.1	A	15.1	B	37.7	D
Year 2031 - Two Lane w/ East Bypasses - AM	8.7	A	13.7	B	89.0	F	66.1	E	52.3	E
Year 2031 - Two Lane w/ East Bypasses - PM	6.0	A	19.9	B	45.1	D	31.4	C	25.6	C
Year 2031 - Two Lane Optimized - AM	9.2	A	15.0	B	19.8	B	40.0	D	17.1	B
Year 2031 - Two Lane Optimized - PM	6.1	A	21.9	C	7.6	A	15.2	B	7.6	A

- Notes:
- 1) Model results from SIDRA Standard with SIDRA Delay and LOS method
 - 2) SIDRA Roundabout LOS delays for roundabout LOS.
 - 3) All options have two approach lanes on Piilani Highway and two circulating lanes in roundabout.
 - 4) Single Lane is one combined approach lane on Kulanihakoi St and Kihei HS approaches.
 - 5) Two Lane is two approaches, one for left turn and through, and second for right-turns.
 - 6) Two lane with west bypass has right-turn lanes with bypass on to neighborhood.
 - 7) Two lane with east bypass has right-turn lanes with bypass to the highschool.
 - 8) Two lane optimized, has right-turn bypasses to neighborhood and northbound right-turn to highschool.

LANE LEVEL OF SERVICE

Lane Level of Service

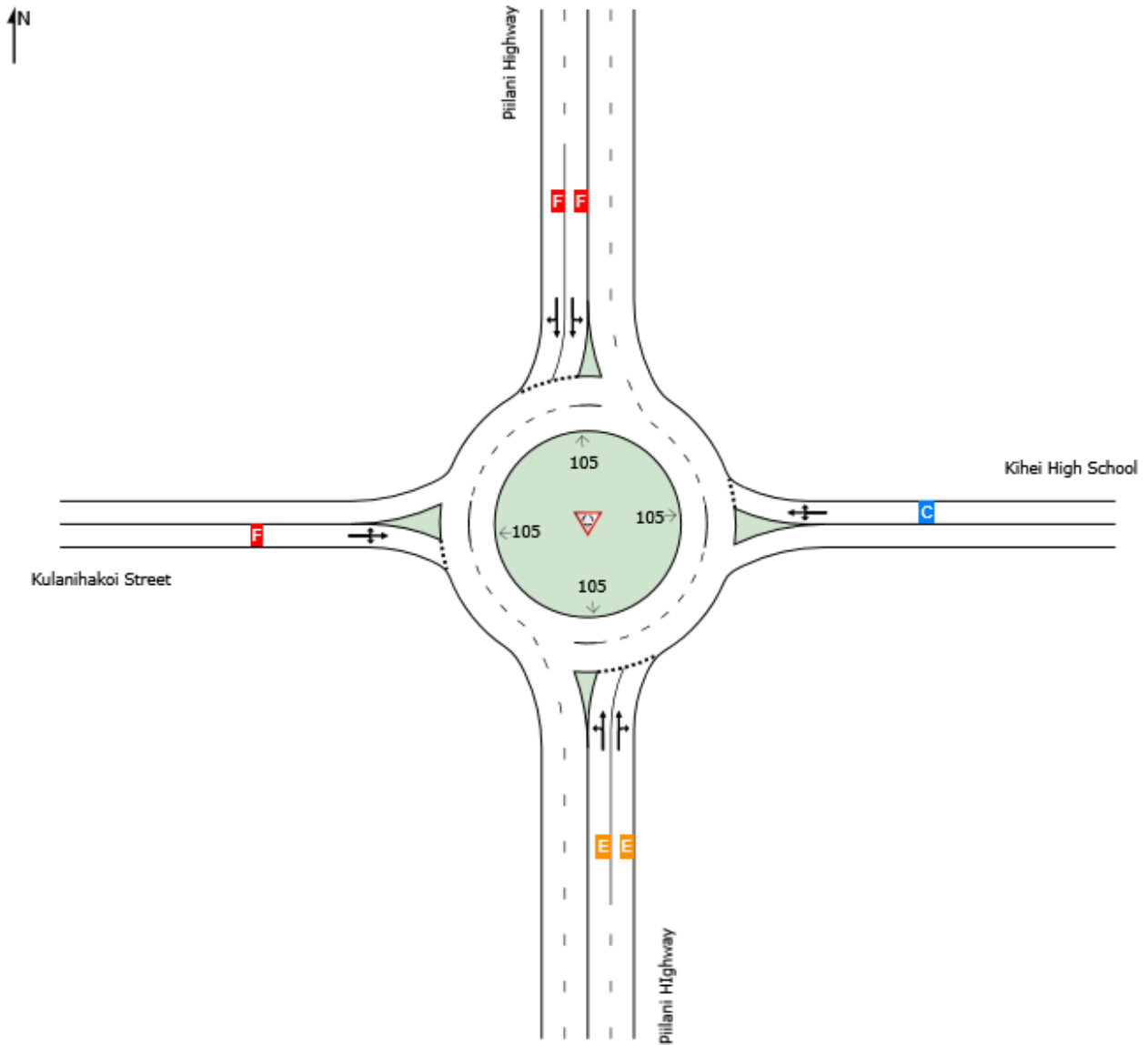
 **Site: 101 [1-Lane WW 2031 - AM (Site Folder: Standard)]**

New Site

Site Category: (None)

Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	E	C	F	F	F



Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
 Roundabout LOS Method: SIDRA Roundabout LOS.
 Lane LOS values are based on average delay per lane.
 Intersection and Approach LOS values are based on average delay for all lanes.
 Delay Model: SIDRA Standard (Geometric Delay is included).

LANE SUMMARY

Site: 101 [1-Lane WW 2031 - AM (Site Folder: Standard)]

New Site
 Site Category: (None)
 Roundabout

Lane Use and Performance													
	DEMAND FLOWS		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
	[Total veh/h	HV %						[Veh	Dist] ft				
South: Piilani Highway													
Lane 1	1036	2.0	954	1.086	100	54.2	LOS E	54.3	1379.7	Full	1600	0.0	0.8
Lane 2 ^d	1096	2.0	1009	1.086	100	53.0	LOS E	56.3	1430.9	Full	1600	0.0	1.8
Approach	2133	2.0		1.086		53.6	LOS E	56.3	1430.9				
East: Kihei High School													
Lane 1 ^d	241	2.0	299	0.807	100	31.2	LOS C	6.0	152.1	Full	1600	0.0	0.0
Approach	241	2.0		0.807		31.2	LOS C	6.0	152.1				
North: Piilani Highway													
Lane 1	1271	2.0	1086	1.170	100	89.7	LOS F	85.3	2167.6	Full	1600	0.0	14.8
Lane 2 ^d	1356	2.0	1158	1.170	100	88.4	LOS F	89.8	2280.4	Full	1600	0.0	16.7
Approach	2626	2.0		1.170		89.1	LOS F	89.8	2280.4				
West: Kulanihakoi Street													
Lane 1 ^d	447	2.0	198	2.256	100	589.0	LOS F	90.7	2304.1	Full	1600	0.0	17.1
Approach	447	2.0		2.256		589.0	LOS F	90.7	2304.1				
Intersection	5447	2.0		2.256		113.6	LOS F	90.7	2304.1				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: SIDRA Roundabout LOS.

Lane LOS values are based on average delay per lane.

Intersection and Approach LOS values are based on average delay for all lanes.

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: HCM Queue Formula.

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

Approach Lane Flows (veh/h)											
South: Piilani Highway											
Mov.	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
From S To Exit:	W	N	E								
Lane 1	76	960	-	1036	2.0	954	1.086	100	NA	NA	
Lane 2	-	789	308	1096	2.0	1009	1.086	100	NA	NA	
Approach	76	1749	308	2133	2.0		1.086				
East: Kihei High School											
Mov.	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
From E To Exit:	S	W	N								
Lane 1	167	13	61	241	2.0	299	0.807	100	NA	NA	
Approach	167	13	61	241	2.0		0.807				
North: Piilani Highway											
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.	

From N To Exit:	E	S	W			Cap. veh/h	Satn v/c	Util. %	SL %	Ov. %	Lane No.
Lane 1	127	1143	-	1271	2.0	1086	1.170	100	NA	NA	
Lane 2	-	1307	49	1356	2.0	1158	1.170	100	NA	NA	
Approach	127	2450	49	2626	2.0		1.170				
West: Kulanihako Street											
Mov.	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL %	Ov. %	Ov. Lane No.
From W To Exit:	N	E	S								
Lane 1	98	77	272	447	2.0	198	2.256	100	NA	NA	
Approach	98	77	272	447	2.0		2.256				
Total %HV Deg.Satn (v/c)											
Intersection	5447	2.0		2.256							

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis												
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Piilani Highway												
Merge Type: Not Applied												
Full Length Lane	1											
Full Length Lane	2											
East Exit: Kihei High School												
Merge Type: Not Applied												
Full Length Lane	1											
North Exit: Piilani Highway												
Merge Type: Not Applied												
Full Length Lane	1											
Full Length Lane	2											
West Exit: Kulanihako Street												
Merge Type: Not Applied												
Full Length Lane	1											

LANE LEVEL OF SERVICE

Lane Level of Service

 Site: 101 [1-Lane WW 2031 - PM (Site Folder: Standard)]

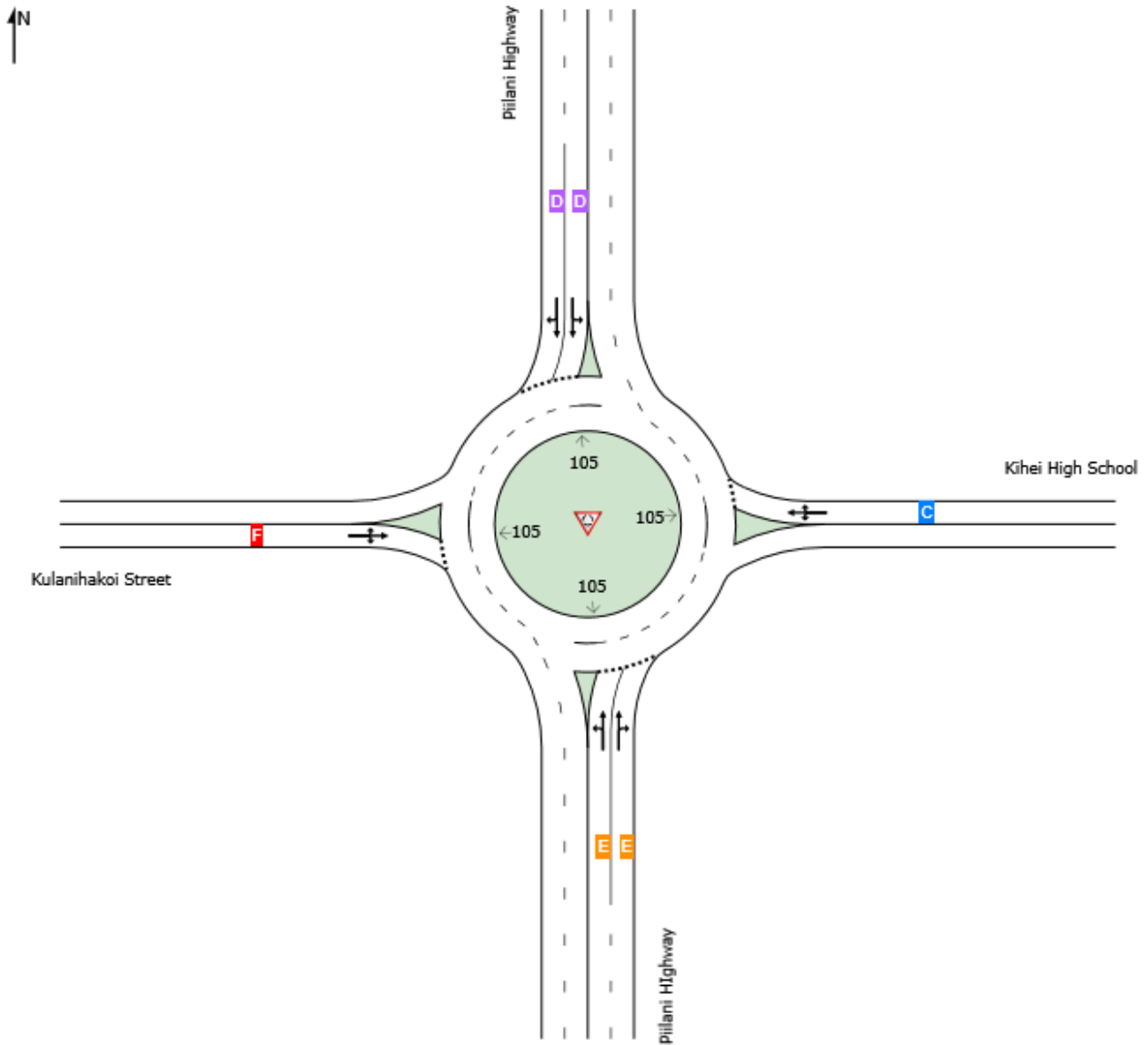
New Site

Site Category: (None)

Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	E	C	D	F	E

Note: 1/3 of the AM pedestrian volume, 110 along the south leg, and 30 along the west leg, was used for all PM analyses.



Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
 Roundabout LOS Method: SIDRA Roundabout LOS.
 Lane LOS values are based on average delay per lane.
 Intersection and Approach LOS values are based on average delay for all lanes.
 Delay Model: SIDRA Standard (Geometric Delay is included).

LANE SUMMARY

Site: 101 [1-Lane WW 2031 - PM (Site Folder: Standard)]

New Site
 Site Category: (None)
 Roundabout

Lane Use and Performance													
	DEMAND FLOWS		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
	[Total veh/h]	[HV %]						[Veh]	[Dist] ft				
South: Piilani Highway													
Lane 1	1270	2.0	1134	1.120	100	63.5	LOS E	96.9	2461.0	Full	1600	0.0	19.6
Lane 2 ^d	1322	2.0	1181	1.120	100	62.8	LOS E	100.5	2552.9	Full	1600	0.0	21.2
Approach	2592	2.0		1.120		63.1	LOS E	100.5	2552.9				
East: Kihei High School													
Lane 1 ^d	124	2.0	211	0.587	100	29.6	LOS C	3.4	85.7	Full	1600	0.0	0.0
Approach	124	2.0		0.587		29.6	LOS C	3.4	85.7				
North: Piilani Highway													
Lane 1	1247	2.0	1175	1.061	100	42.6	LOS D	58.1	1476.2	Full	1600	0.0	2.7
Lane 2 ^d	1316	2.0	1240	1.061	100	41.6	LOS D	60.1	1527.5	Full	1600	0.0	3.6
Approach	2563	2.0		1.061		42.1	LOS D	60.1	1527.5				
West: Kulanihakoi Street													
Lane 1 ^d	271	2.0	190	1.427	100	231.9	LOS F	34.5	877.2	Full	1600	0.0	0.0
Approach	271	2.0		1.427		231.9	LOS F	34.5	877.2				
Intersection	5550	2.0		1.427		60.9	LOS E	100.5	2552.9				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: SIDRA Roundabout LOS.

Lane LOS values are based on average delay per lane.

Intersection and Approach LOS values are based on average delay for all lanes.

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: HCM Queue Formula.

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

Approach Lane Flows (veh/h)											
South: Piilani Highway											
Mov.	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
From S To Exit:	W	N	E								
Lane 1	87	1183	-	1270	2.0	1134	1.120	100	NA	NA	
Lane 2	-	1256	66	1322	2.0	1181	1.120	100	NA	NA	
Approach	87	2439	66	2592	2.0		1.120				
East: Kihei High School											
Mov.	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
From E To Exit:	S	W	N								
Lane 1	87	7	30	124	2.0	211	0.587	100	NA	NA	
Approach	87	7	30	124	2.0		0.587				
North: Piilani Highway											
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane Util.	Prob. SL Ov.	Ov.	

From N To Exit:	E	S	W			Cap. veh/h	Satn v/c	Util. %	SL %	Ov.	Lane No.
Lane 1	27	1220	-	1247	2.0	1175	1.061	100	NA	NA	
Lane 2	-	1189	127	1316	2.0	1240	1.061	100	NA	NA	
Approach	27	2409	127	2563	2.0		1.061				
West: Kulanihako Street											
Mov.	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL %	Ov.	Ov. Lane No.
From W To Exit:	N	E	S								
Lane 1	48	16	207	271	2.0	190	1.427	100	NA	NA	
Approach	48	16	207	271	2.0		1.427				
Total %HV Deg.Satn (v/c)											
Intersection	5550	2.0					1.427				

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis												
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane % veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec	
South Exit: Piilani Highway												
Merge Type: Not Applied												
Full Length Lane	1											
Full Length Lane	2											
East Exit: Kihei High School												
Merge Type: Not Applied												
Full Length Lane	1											
North Exit: Piilani Highway												
Merge Type: Not Applied												
Full Length Lane	1											
Full Length Lane	2											
West Exit: Kulanihako Street												
Merge Type: Not Applied												
Full Length Lane	1											

LANE LEVEL OF SERVICE

Lane Level of Service

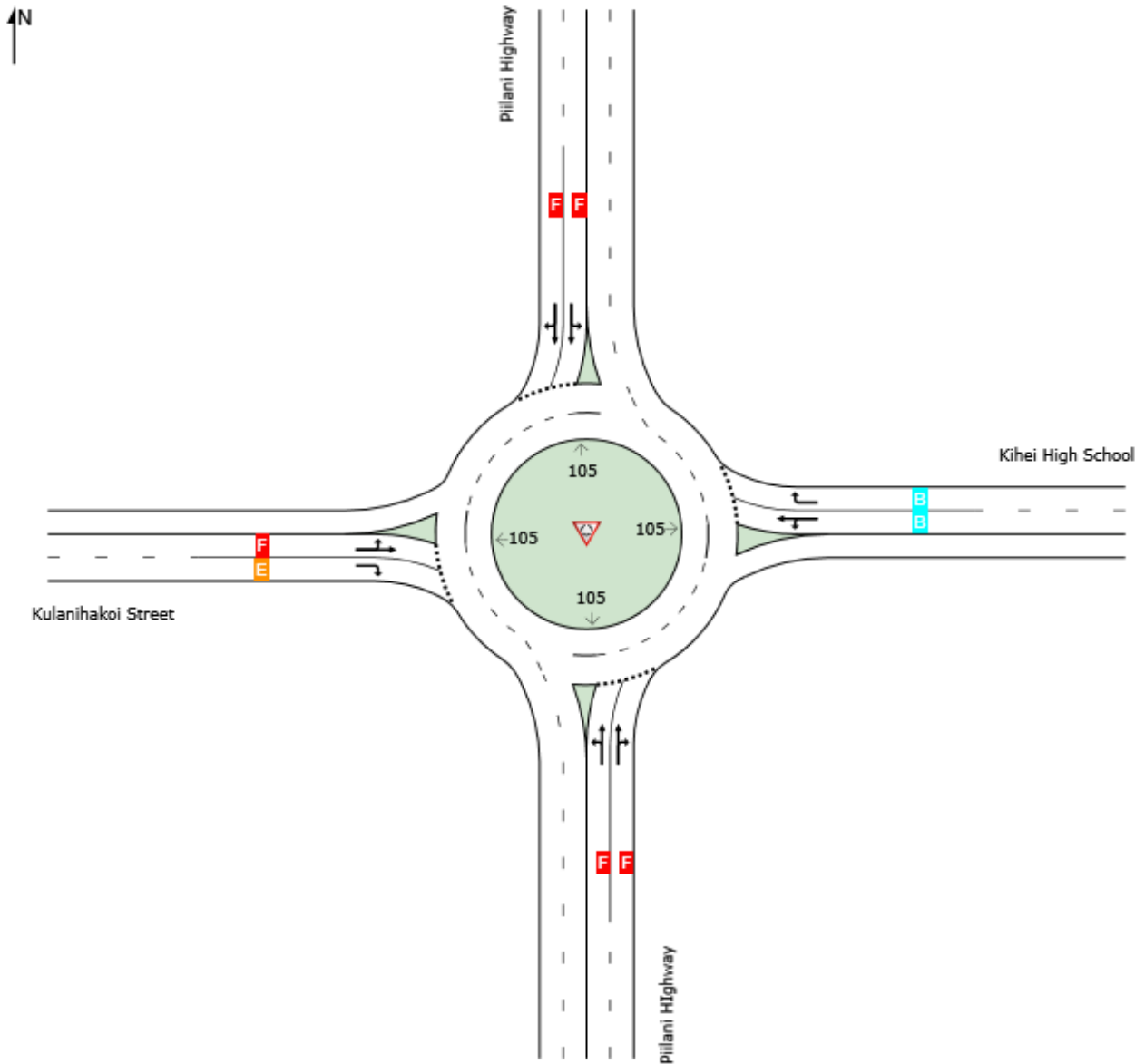
 Site: 101 [2-Lane WW 2031 - AM (Site Folder: Standard)]

New Site

Site Category: (None)

Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	F	B	F	E	F



Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
 Roundabout LOS Method: SIDRA Roundabout LOS.
 Lane LOS values are based on average delay per lane.
 Intersection and Approach LOS values are based on average delay for all lanes.
 Delay Model: SIDRA Standard (Geometric Delay is included).

LANE SUMMARY

Site: 101 [2-Lane WW 2031 - AM (Site Folder: Standard)]

New Site
 Site Category: (None)
 Roundabout

Lane Use and Performance													
	DEMAND FLOWS		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
	[Total veh/h	HV %						[Veh	Dist] ft				
South: Piilani Highway													
Lane 1	1029	2.0	882	1.167	100	89.5	LOS F	68.5	1739.6	Full	1600	0.0	7.5
Lane 2 ^d	1103	2.0	946	1.167	100	88.3	LOS F	72.4	1839.7	Full	1600	0.0	9.3
Approach	2133	2.0		1.167		88.9	LOS F	72.4	1839.7				
East: Kihei High School													
Lane 1 ^d	180	2.0	428	0.422	100	17.4	LOS B	2.6	66.8	Full	1600	0.0	0.0
Lane 2	61	2.0	288	0.211	100	12.3	LOS B	1.0	26.1	Full	1600	0.0	0.0
Approach	241	2.0		0.422		16.1	LOS B	2.6	66.8				
North: Piilani Highway													
Lane 1	1271	2.0	1091	1.165	100	87.2	LOS F	84.0	2133.1	Full	1600	0.0	14.2
Lane 2 ^d	1355	2.0	1164	1.165	100	85.9	LOS F	88.3	2242.7	Full	1600	0.0	16.1
Approach	2626	2.0		1.165		86.5	LOS F	88.3	2242.7				
West: Kulanihakoi Street													
Lane 1	175	2.0	182	0.962	100	76.1	LOS F	8.6	218.0	Full	1600	0.0	0.0
Lane 2 ^d	272	2.0	282	0.963	100	63.3	LOS E	11.5	291.0	Full	1600	0.0	0.0
Approach	447	2.0		0.963		68.4	LOS E	11.5	291.0				
Intersection	5447	2.0		1.167		82.8	LOS F	88.3	2242.7				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: SIDRA Roundabout LOS.

Lane LOS values are based on average delay per lane.

Intersection and Approach LOS values are based on average delay for all lanes.

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: HCM Standard Formula.

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

Approach Lane Flows (veh/h)											
South: Piilani Highway											
Mov.	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
From S To Exit:	W	N	E								
Lane 1	76	953	-	1029	2.0	882	1.167	100	NA	NA	
Lane 2	-	796	308	1103	2.0	946	1.167	100	NA	NA	
Approach	76	1749	308	2133	2.0		1.167				
East: Kihei High School											
Mov.	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
From E To Exit:	S	W	N								
Lane 1	167	13	-	180	2.0	428	0.422	100	NA	NA	
Lane 2	-	-	61	61	2.0	288	0.211	100	NA	NA	

Approach	167	13	61	241	2.0		0.422			
North: Piilani Highway										
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.
From N						Cap.	Satn	Util.	SL	Lane
To Exit:	E	S	W			veh/h	v/c	%	%	No.
Lane 1	127	1144	-	1271	2.0	1091	1.165	100	NA	NA
Lane 2	-	1306	49	1355	2.0	1164	1.165	100	NA	NA
Approach	127	2450	49	2626	2.0		1.165			
West: Kulanihako Street										
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.
From W						Cap.	Satn	Util.	SL	Lane
To Exit:	N	E	S			veh/h	v/c	%	%	No.
Lane 1	98	77	-	175	2.0	182	0.962	100	NA	NA
Lane 2	-	-	272	272	2.0	282	0.963	100	NA	NA
Approach	98	77	272	447	2.0		0.963			
Total %HV Deg.Satn (v/c)										
Intersection	5447	2.0		1.167						

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis												
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane % veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec	
South Exit: Piilani Highway												
Merge Type: Not Applied												
Full Length Lane	1											
Full Length Lane	2											
East Exit: Kihei High School												
Merge Type: Not Applied												
Full Length Lane	1											
North Exit: Piilani Highway												
Merge Type: Not Applied												
Full Length Lane	1											
Full Length Lane	2											
West Exit: Kulanihako Street												
Merge Type: Not Applied												
Full Length Lane	1											

LANE LEVEL OF SERVICE

Lane Level of Service

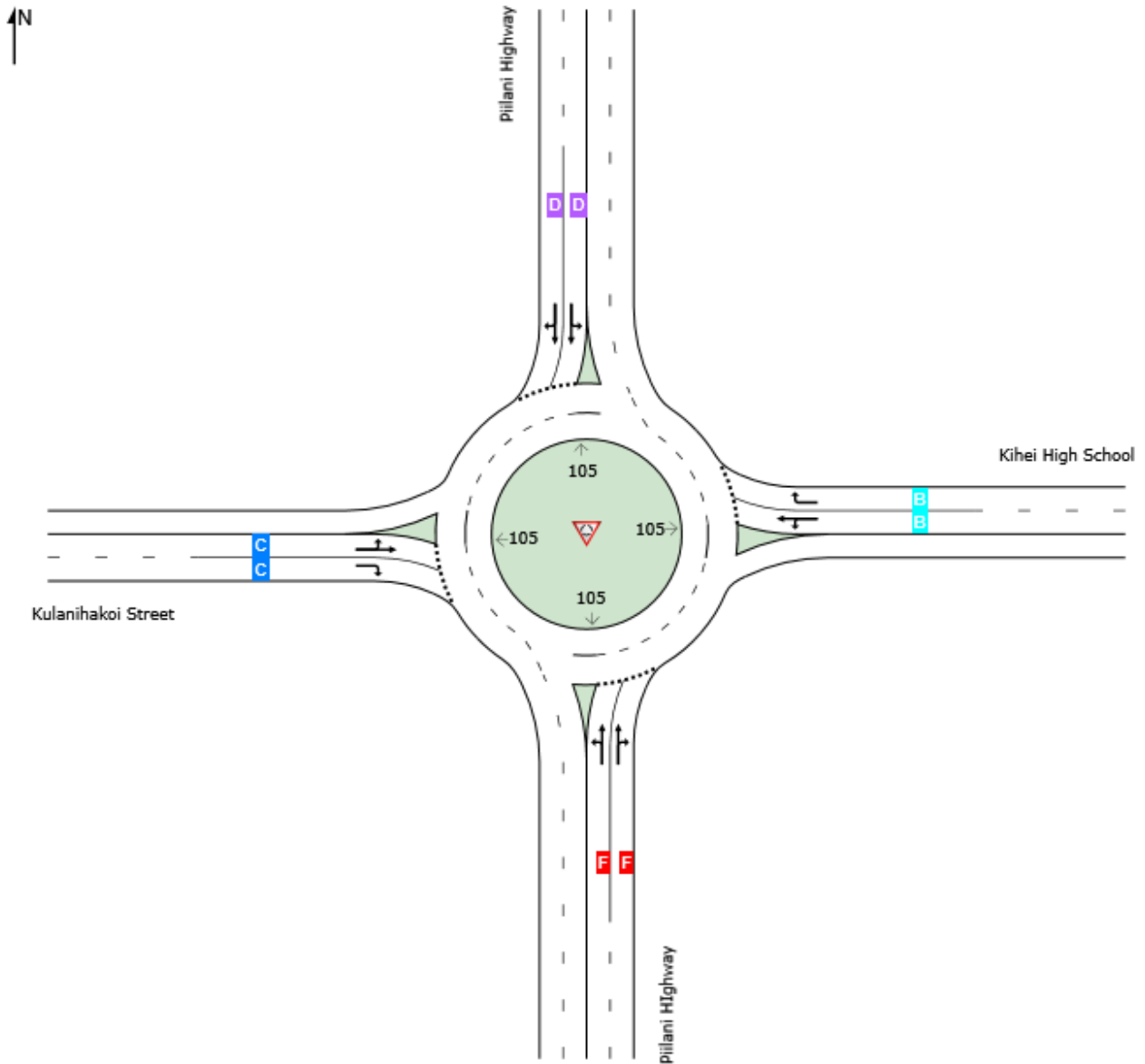
 **Site: 101 [2-Lane WW 2031 - PM (Site Folder: Standard)]**

New Site

Site Category: (None)

Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	F	B	D	C	E



Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
 Roundabout LOS Method: SIDRA Roundabout LOS.
 Lane LOS values are based on average delay per lane.
 Intersection and Approach LOS values are based on average delay for all lanes.
 Delay Model: SIDRA Standard (Geometric Delay is included).

LANE SUMMARY

Site: 101 [2-Lane WW 2031 - PM (Site Folder: Standard)]

New Site
 Site Category: (None)
 Roundabout

Lane Use and Performance													
	DEMAND FLOWS		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
	[Total veh/h	HV %						[Veh	Dist] ft				
South: Piilani Highway													
Lane 1	1269	2.0	1117	1.136	100	70.7	LOS F	92.3	2345.3	Full	1600	0.0	17.7
Lane 2 ^d	1324	2.0	1165	1.136	100	70.0	LOS F	95.9	2435.5	Full	1600	0.0	19.2
Approach	2592	2.0		1.136		70.3	LOS F	95.9	2435.5				
East: Kihei High School													
Lane 1 ^d	93	2.0	305	0.306	100	19.9	LOS B	1.8	45.8	Full	1600	0.0	0.0
Lane 2	30	2.0	212	0.143	100	16.4	LOS B	0.7	18.1	Full	1600	0.0	0.0
Approach	124	2.0		0.306		19.0	LOS B	1.8	45.8				
North: Piilani Highway													
Lane 1	1247	2.0	1176	1.061	100	42.3	LOS D	58.0	1473.5	Full	1600	0.0	2.6
Lane 2 ^d	1316	2.0	1241	1.061	100	41.3	LOS D	60.0	1524.2	Full	1600	0.0	3.6
Approach	2563	2.0		1.061		41.8	LOS D	60.0	1524.2				
West: Kulanihakoi Street													
Lane 1	64	2.0	194	0.330	100	24.8	LOS C	1.8	44.7	Full	1600	0.0	0.0
Lane 2 ^d	207	2.0	274	0.755	100	34.8	LOS C	6.0	152.0	Full	1600	0.0	0.0
Approach	271	2.0		0.755		32.4	LOS C	6.0	152.0				
Intersection	5550	2.0		1.136		54.2	LOS E	95.9	2435.5				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: SIDRA Roundabout LOS.

Lane LOS values are based on average delay per lane.

Intersection and Approach LOS values are based on average delay for all lanes.

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: HCM Queue Formula.

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

Approach Lane Flows (veh/h)											
South: Piilani Highway											
Mov.	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
From S To Exit:	W	N	E								
Lane 1	87	1182	-	1269	2.0	1117	1.136	100	NA	NA	
Lane 2	-	1257	66	1324	2.0	1165	1.136	100	NA	NA	
Approach	87	2439	66	2592	2.0		1.136				
East: Kihei High School											
Mov.	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
From E To Exit:	S	W	N								
Lane 1	87	7	-	93	2.0	305	0.306	100	NA	NA	
Lane 2	-	-	30	30	2.0	212	0.143	100	NA	NA	

Approach	87	7	30	124	2.0		0.306				
North: Piilani Highway											
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.	
From N						Cap.	Satn	Util.	SL	Ov.	Lane
To Exit:	E	S	W			veh/h	v/c	%	%	No.	
Lane 1	27	1220	-	1247	2.0	1176	1.061	100	NA	NA	
Lane 2	-	1188	127	1316	2.0	1241	1.061	100	NA	NA	
Approach	27	2409	127	2563	2.0		1.061				
West: Kulanihako Street											
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.	
From W						Cap.	Satn	Util.	SL	Ov.	Lane
To Exit:	N	E	S			veh/h	v/c	%	%	No.	
Lane 1	48	16	-	64	2.0	194	0.330	100	NA	NA	
Lane 2	-	-	207	207	2.0	274	0.755	100	NA	NA	
Approach	48	16	207	271	2.0		0.755				
Total %HV Deg.Satn (v/c)											
Intersection	5550	2.0		1.136							

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis												
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate % veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Piilani Highway												
Merge Type: Not Applied												
Full Length Lane	1											
Full Length Lane	2											
East Exit: Kihei High School												
Merge Type: Not Applied												
Full Length Lane	1											
North Exit: Piilani Highway												
Merge Type: Not Applied												
Full Length Lane	1											
Full Length Lane	2											
West Exit: Kulanihako Street												
Merge Type: Not Applied												
Full Length Lane	1											

LANE LEVEL OF SERVICE

Lane Level of Service

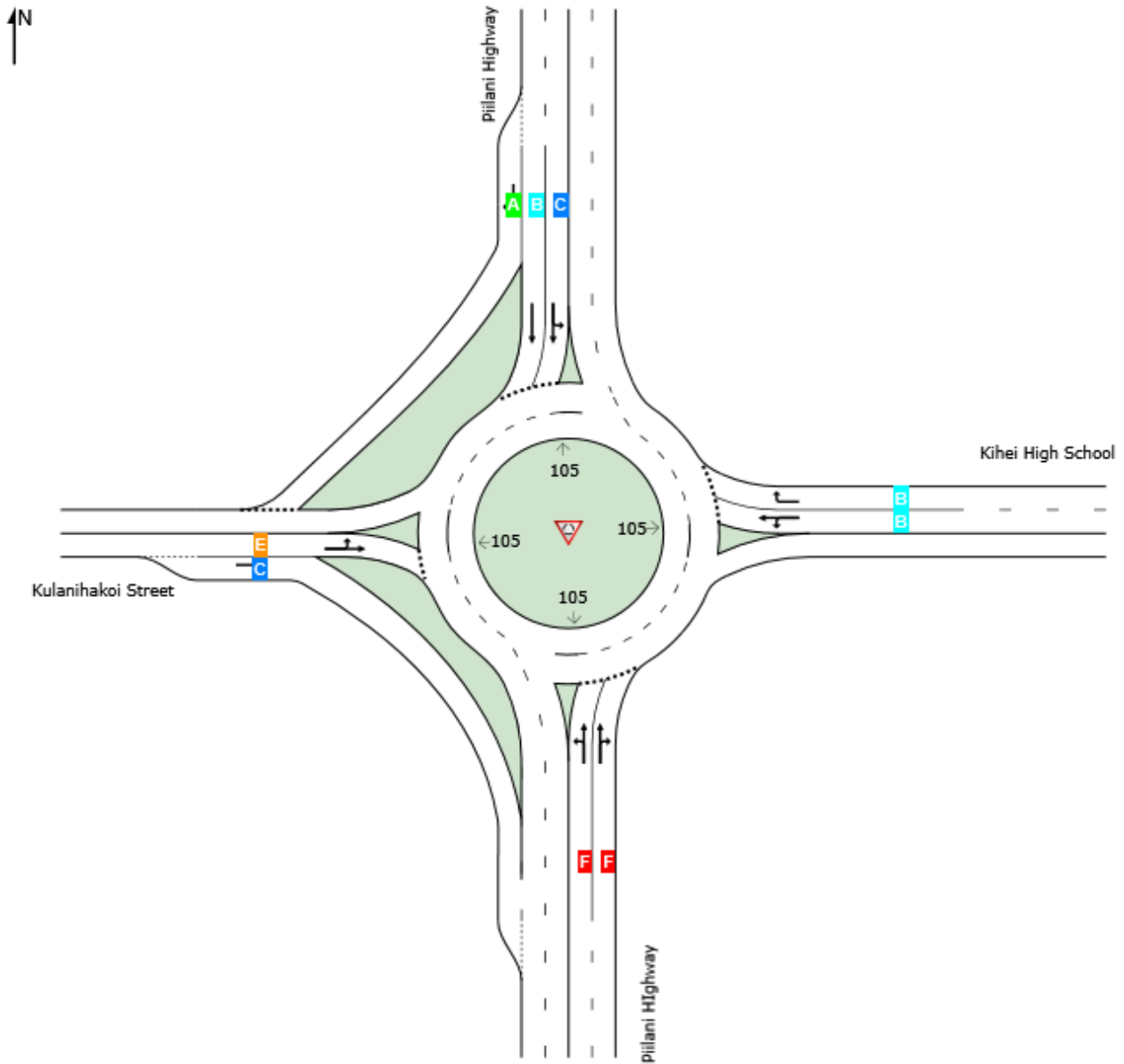
 **Site: 101 [2-Lane WW W Bypass 2031 - AM (Site Folder: Standard)]**

New Site

Site Category: (None)

Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	F	B	B	D	D



Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
 Roundabout LOS Method: SIDRA Roundabout LOS.
 Lane LOS values are based on average delay per lane.
 Intersection and Approach LOS values are based on average delay for all lanes.
 Delay Model: SIDRA Standard (Geometric Delay is included).

LANE SUMMARY

Site: 101 [2-Lane WW W Bypass 2031 - AM (Site Folder: Standard)]

New Site
 Site Category: (None)
 Roundabout

Lane Use and Performance													
	DEMAND FLOWS		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
	[Total veh/h	HV %						[Veh	Dist] ft				
South: Piilani Highway													
Lane 1	1028	2.0	872	1.178	100	94.9	LOS F	70.6	1792.0	Full	1600	0.0	8.4
Lane 2 ^d	1105	2.0	937	1.178	100	93.7	LOS F	74.8	1901.1	Full	1600	0.0	10.3
Approach	2133	2.0		1.178		94.3	LOS F	74.8	1901.1				
East: Kihei High School													
Lane 1 ^d	180	2.0	432	0.418	100	17.2	LOS B	2.6	65.7	Full	1600	0.0	0.0
Lane 2	61	2.0	290	0.210	100	12.1	LOS B	1.0	25.8	Full	1600	0.0	0.0
Approach	241	2.0		0.418		15.9	LOS B	2.6	65.7				
North: Piilani Highway													
Lane 1	1176	2.0	1198	0.982	100	21.0	LOS C	33.2	842.2	Full	1600	0.0	0.0
Lane 2 ^d	1401	2.0	1427 ¹	0.982	100	17.1	LOS B	35.2	894.5	Full	1600	0.0	0.0
Lane 3	49	2.0	1583	0.031	100	4.1	LOSA	0.2	4.1	Short	200	0.0	NA
Approach	2626	2.0		0.982		18.6	LOS B	35.2	894.5				
West: Kulanihakoi Street													
Lane 1 ^d	175	2.0	215	0.815	100	61.9	LOS E	7.1	180.1	Full	1600	0.0	0.0
Lane 2	272	2.0	1642	0.166	100	25.2	LOS C	0.0	0.0	Short	200	0.0	NA
Approach	447	2.0		0.815		39.6	LOS D	7.1	180.1				
Intersection	5447	2.0		1.178		49.8	LOS D	74.8	1901.1				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: SIDRA Roundabout LOS.

Lane LOS values are based on average delay per lane.

Intersection and Approach LOS values are based on average delay for all lanes.

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

¹ Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

^d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)										
South: Piilani Highway										
Mov.	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
From S To Exit:	W	N	E							
Lane 1	76	952	-	1028	2.0	872	1.178	100	NA	NA
Lane 2	-	797	308	1105	2.0	937	1.178	100	NA	NA
Approach	76	1749	308	2133	2.0		1.178			
East: Kihei High School										
Mov.	L2	T1	R2	Total	%HV	Deg.	Lane	Prob.	Ov.	

From E To Exit:	S	W	N			Cap. veh/h	Satn v/c	Util. %	SL %	Ov. %	Lane No.
Lane 1	167	13	-	180	2.0	432	0.418	100	NA	NA	
Lane 2	-	-	61	61	2.0	290	0.210	100	NA	NA	
Approach	167	13	61	241	2.0		0.418				
North: Piilani Highway											
Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL %	Ov. %	Ov. Lane No.
Lane 1	127	1049	-	1176	2.0	1198	0.982	100	NA	NA	
Lane 2	-	1401	-	1401	2.0	1427 ¹	0.982	100	NA	NA	
Lane 3	-	-	49	49	2.0	1583	0.031	100	0.0	2	
Approach	127	2450	49	2626	2.0		0.982				
West: Kulanihakoi Street											
Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL %	Ov. %	Ov. Lane No.
Lane 1	98	77	-	175	2.0	215	0.815	100	NA	NA	
Lane 2	-	-	272	272	2.0	1642	0.166	100	0.0	1	
Approach	98	77	272	447	2.0		0.815				
Total %HV Deg. Satn (v/c)											
Intersection	5447	2.0		1.178							

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

- ¹ Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Merge Analysis												
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane % veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec	
South Exit: Piilani Highway Merge Type: Priority												
Exit Short Lane	3	500	0.0	1401	1429	3.00	272	326	0.834	7.8	21.6	
Merge Lane	2	-	100.0	Merge Lane is not Opposed			1401	1800	0.778	0.0	0.0	
East Exit: Kihei High School Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Piilani Highway Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
West Exit: Kulanihakoi Street Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										

LANE LEVEL OF SERVICE

Lane Level of Service

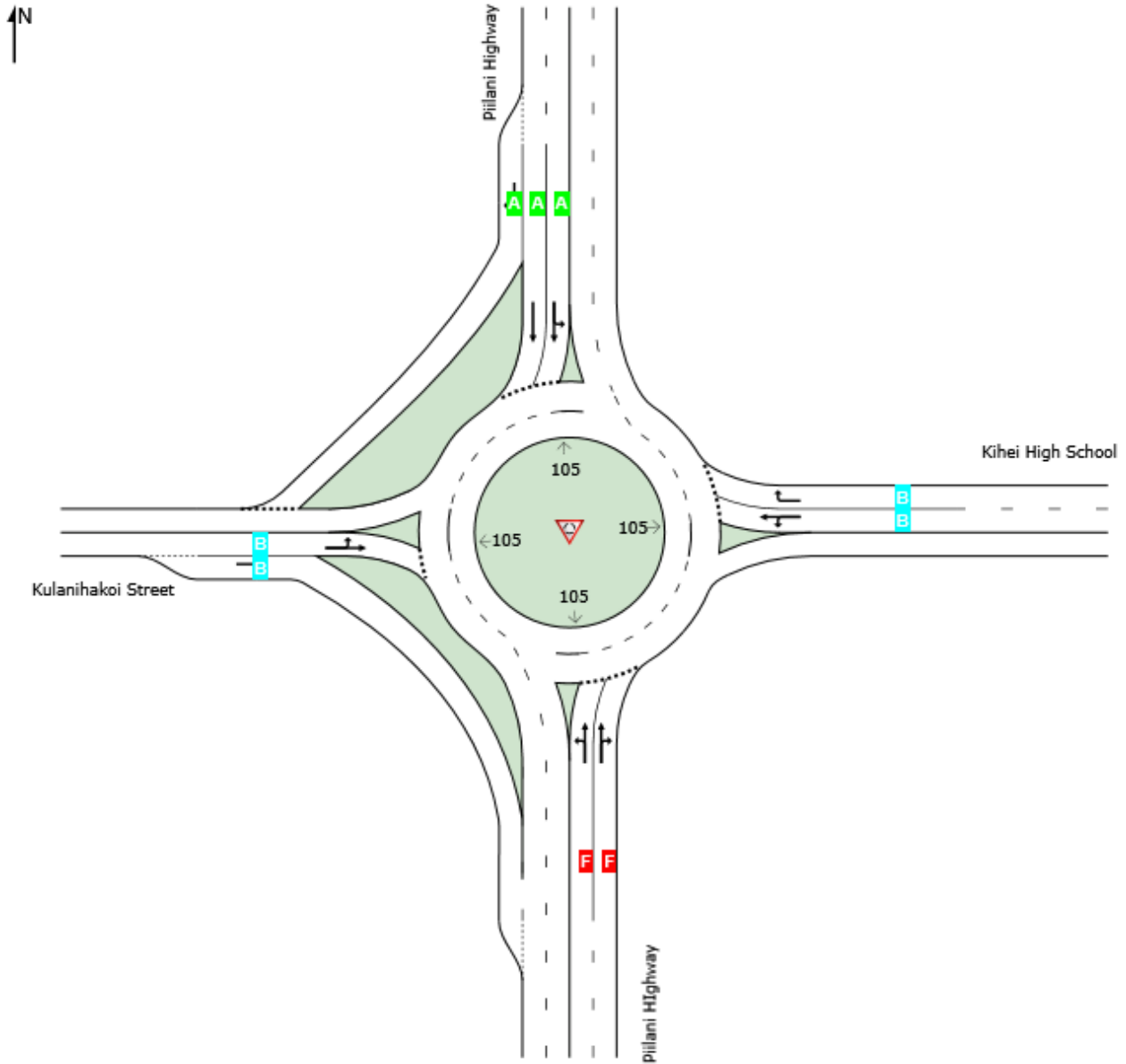
 **Site: 101 [2-Lane WW W Bypass 2031 - PM (Site Folder: Standard)]**

New Site

Site Category: (None)

Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	F	B	A	B	D



Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
 Roundabout LOS Method: SIDRA Roundabout LOS.
 Lane LOS values are based on average delay per lane.
 Intersection and Approach LOS values are based on average delay for all lanes.
 Delay Model: SIDRA Standard (Geometric Delay is included).

Lane 1	87	7	-	93	2.0	305	0.307	100	NA	NA
Lane 2	-	-	30	30	2.0	212	0.144	100	NA	NA
Approach	87	7	30	124	2.0		0.307			
North: Piilani Highway										
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.
From N						Cap.	Satn	Util.	SL	Lane
To Exit:	E	S	W			veh/h	v/c	%	%	No.
Lane 1	27	1093	-	1120	2.0	1284	0.873	100	NA	NA
Lane 2	-	1315	-	1315	2.0	1507	0.873	100	NA	NA
Lane 3	-	-	127	127	2.0	1573	0.081	100	0.0	2
Approach	27	2409	127	2563	2.0		0.873			
West: Kulanihako Street										
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.
From W						Cap.	Satn	Util.	SL	Lane
To Exit:	N	E	S			veh/h	v/c	%	%	No.
Lane 1	48	16	-	64	2.0	287	0.223	100	NA	NA
Lane 2	-	-	207	207	2.0	1642	0.126	100	0.0	1
Approach	48	16	207	271	2.0		0.223			
Total %HV Deg.Satn (v/c)										
Intersection	5550	2.0		1.138						

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis												
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Piilani Highway												
Merge Type: Priority												
Exit Short Lane	3	500	0.0	1315	1342	3.00	2.00	207	407	0.507	6.0	10.2
Merge Lane	2	-	100.0	Merge Lane is not Opposed				1315	1800	0.731	0.0	0.0
East Exit: Kihei High School												
Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Piilani Highway												
Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
West Exit: Kulanihako Street												
Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										

LANE LEVEL OF SERVICE

Lane Level of Service

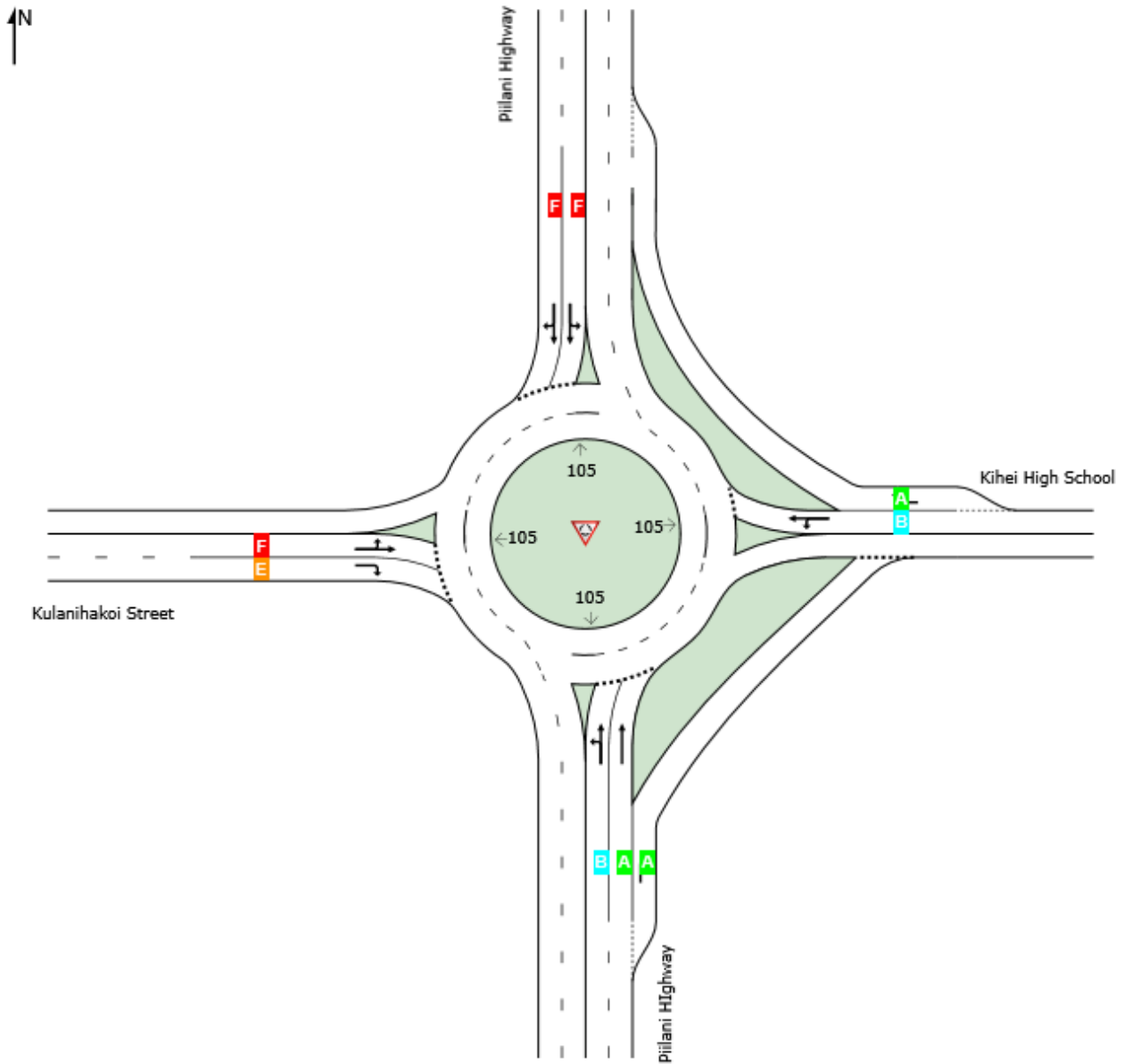
 **Site: 101 [2-Lane WW 2031 E Bypass - AM (Site Folder: Standard)]**

New Site

Site Category: (None)

Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	A	B	F	E	E



Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
 Roundabout LOS Method: SIDRA Roundabout LOS.
 Lane LOS values are based on average delay per lane.
 Intersection and Approach LOS values are based on average delay for all lanes.
 Delay Model: SIDRA Standard (Geometric Delay is included).

To Exit:	S	W	N			v/c	%	%	No.	
Lane 1	167	13	-	180	2.0	484	0.373	100	NA	NA
Lane 2	-	-	61	61	2.0	1642	0.037	100	0.0	1
Approach	167	13	61	241	2.0		0.373			
North: Piilani Highway										
Mov.	L2	T1	R2	Total	%HV		Deg. Satn	Lane Util.	Prob. SL Ov.	Ov. Lane No.
From N To Exit:	E	S	W			Cap. veh/h	v/c	%	%	No.
Lane 1	127	1143	-	1270	2.0	1086	1.170	100	NA	NA
Lane 2	-	1307	49	1356	2.0	1159	1.170	100	NA	NA
Approach	127	2450	49	2626	2.0		1.170			
West: Kulanihako Street										
Mov.	L2	T1	R2	Total	%HV		Deg. Satn	Lane Util.	Prob. SL Ov.	Ov. Lane No.
From W To Exit:	N	E	S			Cap. veh/h	v/c	%	%	No.
Lane 1	98	77	-	175	2.0	183	0.954	100	NA	NA
Lane 2	-	-	272	272	2.0	284	0.956	100	NA	NA
Approach	98	77	272	447	2.0		0.956			
Total %HV Deg.Satn (v/c)										
Intersection	5447	2.0		1.170						

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis													
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate % veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec	
South Exit: Piilani Highway													
Merge Type: Not Applied													
	Full Length Lane	1		Merge Analysis not applied.									
	Full Length Lane	2		Merge Analysis not applied.									
East Exit: Kihei High School													
Merge Type: Not Applied													
	Full Length Lane	1		Merge Analysis not applied.									
North Exit: Piilani Highway													
Merge Type: Priority													
	Exit Short Lane	3	500	0.0	996	1015	3.00	2.00	61	739	0.082	2.7	3.3
	Merge Lane	2	-	100.0	Merge Lane is not Opposed			996	1800	0.553	0.0	0.0	
West Exit: Kulanihako Street													
Merge Type: Not Applied													
	Full Length Lane	1		Merge Analysis not applied.									

LANE LEVEL OF SERVICE

Lane Level of Service

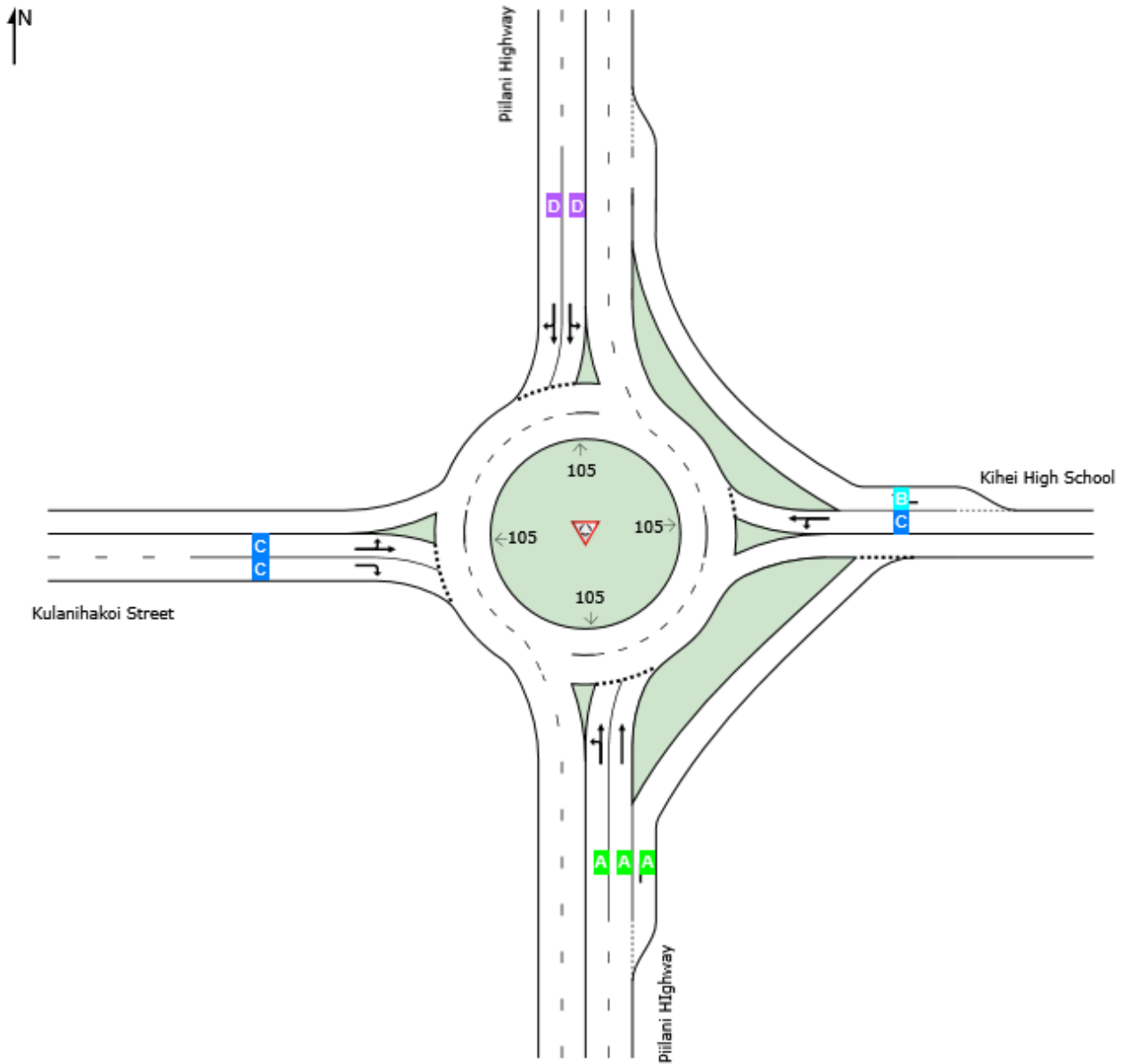
 Site: 101 [2-Lane WW 2031 E Bypass- PM (Site Folder: Standard)]

New Site

Site Category: (None)

Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	A	B	D	C	C



Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
 Roundabout LOS Method: SIDRA Roundabout LOS.
 Lane LOS values are based on average delay per lane.
 Intersection and Approach LOS values are based on average delay for all lanes.
 Delay Model: SIDRA Standard (Geometric Delay is included).


To Exit:	S	W	N			v/c	%	%	No.	
Lane 1	87	7	-	93	2.0	299	0.312	100	NA	NA
Lane 2	-	-	30	30	2.0	1642	0.019	100	0.0	1
Approach	87	7	30	124	2.0	0.312				
North: Piilani Highway										
Mov.	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
From N To Exit:	E	S	W							
Lane 1	27	1219	-	1246	2.0	1167	1.068	100	NA	NA
Lane 2	-	1189	127	1317	2.0	1233	1.068	100	NA	NA
Approach	27	2409	127	2563	2.0	1.068				
West: Kulanihako Street										
Mov.	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
From W To Exit:	N	E	S							
Lane 1	48	16	-	64	2.0	196	0.328	100	NA	NA
Lane 2	-	-	207	207	2.0	276	0.748	100	NA	NA
Approach	48	16	207	271	2.0	0.748				
Total %HV Deg.Satn (v/c)										
Intersection	5550	2.0	1.068							

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis												
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate % veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Piilani Highway												
Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
East Exit: Kihei High School												
Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Piilani Highway												
Merge Type: Priority												
Exit Short Lane	3	500	0.0	1354	1381	3.00	2.00	30	370	0.082	6.8	7.8
Merge Lane	2	-	100.0	Merge Lane is not Opposed				1354	1800	0.752	0.0	0.0
West Exit: Kulanihako Street												
Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										

LANE LEVEL OF SERVICE

Lane Level of Service

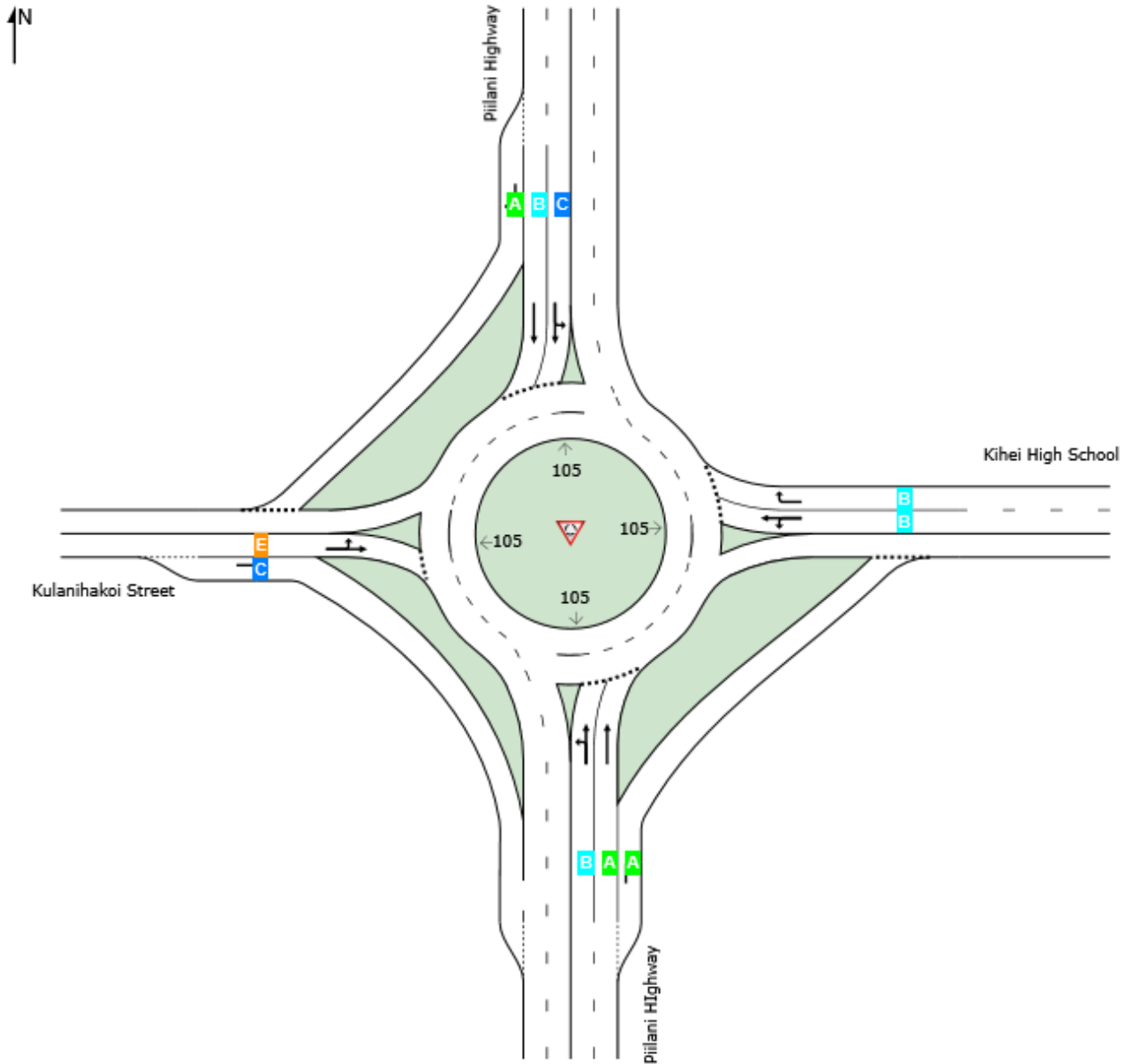
 Site: 101 [2-Lane WW 2031 NES RTL- AM (Site Folder: Standard)]

New Site

Site Category: (None)

Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	A	B	B	D	B



Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
 Roundabout LOS Method: SIDRA Roundabout LOS.
 Lane LOS values are based on average delay per lane.
 Intersection and Approach LOS values are based on average delay for all lanes.
 Delay Model: SIDRA Standard (Geometric Delay is included).

LANE SUMMARY

Site: 101 [2-Lane WW 2031 NES RTL- AM (Site Folder: Standard)]

New Site
 Site Category: (None)
 Roundabout

Lane Use and Performance													
	DEMAND FLOWS		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
	[Total veh/h	HV %						[Veh	Dist] ft				
South: Piilani Highway													
Lane 1	828	2.0	961	0.862	100	11.2	LOS B	10.8	274.3	Full	1600	0.0	0.0
Lane 2 ^d	997	2.0	1157	0.862	100	9.1	LOS A	10.9	276.6	Full	1600	0.0	0.0
Lane 3	308	2.0	1215	0.253	100	4.5	LOS A	1.2	30.1	Short	200	0.0	NA
Approach	2133	2.0		0.862		9.2	LOS A	10.9	276.6				
East: Kihei High School													
Lane 1 ^d	180	2.0	476	0.379	100	16.2	LOS B	2.2	55.3	Full	1600	0.0	0.0
Lane 2	61	2.0	322	0.189	100	11.6	LOS B	0.9	22.0	Full	1600	0.0	0.0
Approach	241	2.0		0.379		15.0	LOS B	2.2	55.3				
North: Piilani Highway													
Lane 1	1175	2.0	1191	0.986	100	22.3	LOS C	33.9	860.3	Full	1600	0.0	0.0
Lane 2 ^d	1403	2.0	1423	0.986	100	18.3	LOS B	36.2	919.4	Full	1600	0.0	0.0
Lane 3	49	2.0	1578	0.031	100	4.1	LOS A	0.2	3.8	Short	200	0.0	NA
Approach	2626	2.0		0.986		19.8	LOS B	36.2	919.4				
West: Kulanihako Street													
Lane 1 ^d	175	2.0	214	0.817	100	62.4	LOS E	7.1	181.2	Full	1600	0.0	0.0
Lane 2	272	2.0	1642	0.166	100	25.5	LOS C	0.0	0.0	Short	200	0.0	NA
Approach	447	2.0		0.817		40.0	LOS D	7.1	181.2				
Intersection	5447	2.0		0.986		17.1	LOS B	36.2	919.4				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
 Roundabout LOS Method: SIDRA Roundabout LOS.
 Lane LOS values are based on average delay per lane.
 Intersection and Approach LOS values are based on average delay for all lanes.
 Roundabout Capacity Model: SIDRA Standard.
 Delay Model: SIDRA Standard (Geometric Delay is included).
 Queue Model: HCM Queue Formula.
 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

Approach Lane Flows (veh/h)										
South: Piilani Highway										
Mov.	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL %	Ov. Lane No.
From S To Exit:	W	N	E							
Lane 1	76	752	-	828	2.0	961	0.862	100	NA	NA
Lane 2	-	997	-	997	2.0	1157	0.862	100	NA	NA
Lane 3	-	-	308	308	2.0	1215	0.253	100	0.0	2
Approach	76	1749	308	2133	2.0		0.862			
East: Kihei High School										
Mov.	L2	T1	R2	Total	%HV	Deg.	Lane	Prob.	Ov.	


From E To Exit:	S	W	N			Cap. veh/h	Satn v/c	Util. %	SL %	Ov. %	Lane No.
Lane 1	167	13	-	180	2.0	476	0.379	100	NA	NA	
Lane 2	-	-	61	61	2.0	322	0.189	100	NA	NA	
Approach	167	13	61	241	2.0		0.379				
North: Piilani Highway											
Mov. From N To Exit:	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL %	Ov. %	Lane No.
Lane 1	127	1047	-	1175	2.0	1191	0.986	100	NA	NA	
Lane 2	-	1403	-	1403	2.0	1423	0.986	100	NA	NA	
Lane 3	-	-	49	49	2.0	1578	0.031	100	0.0	2	
Approach	127	2450	49	2626	2.0		0.986				
West: Kulanihakoi Street											
Mov. From W To Exit:	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL %	Ov. %	Lane No.
Lane 1	98	77	-	175	2.0	214	0.817	100	NA	NA	
Lane 2	-	-	272	272	2.0	1642	0.166	100	0.0	1	
Approach	98	77	272	447	2.0		0.817				
Total %HV Deg. Satn (v/c)											
Intersection	5447	2.0		0.986							

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis												
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Piilani Highway												
Merge Type: Priority												
Exit Short Lane	3	500	0.0	1403	1431	3.00	2.00	272	324	0.838	7.8	22.0
Merge Lane	2	-	100.0	Merge Lane is not Opposed				1403	1800	0.779	0.0	0.0
East Exit: Kihei High School												
Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Piilani Highway												
Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
West Exit: Kulanihakoi Street												
Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										

LANE LEVEL OF SERVICE

Lane Level of Service

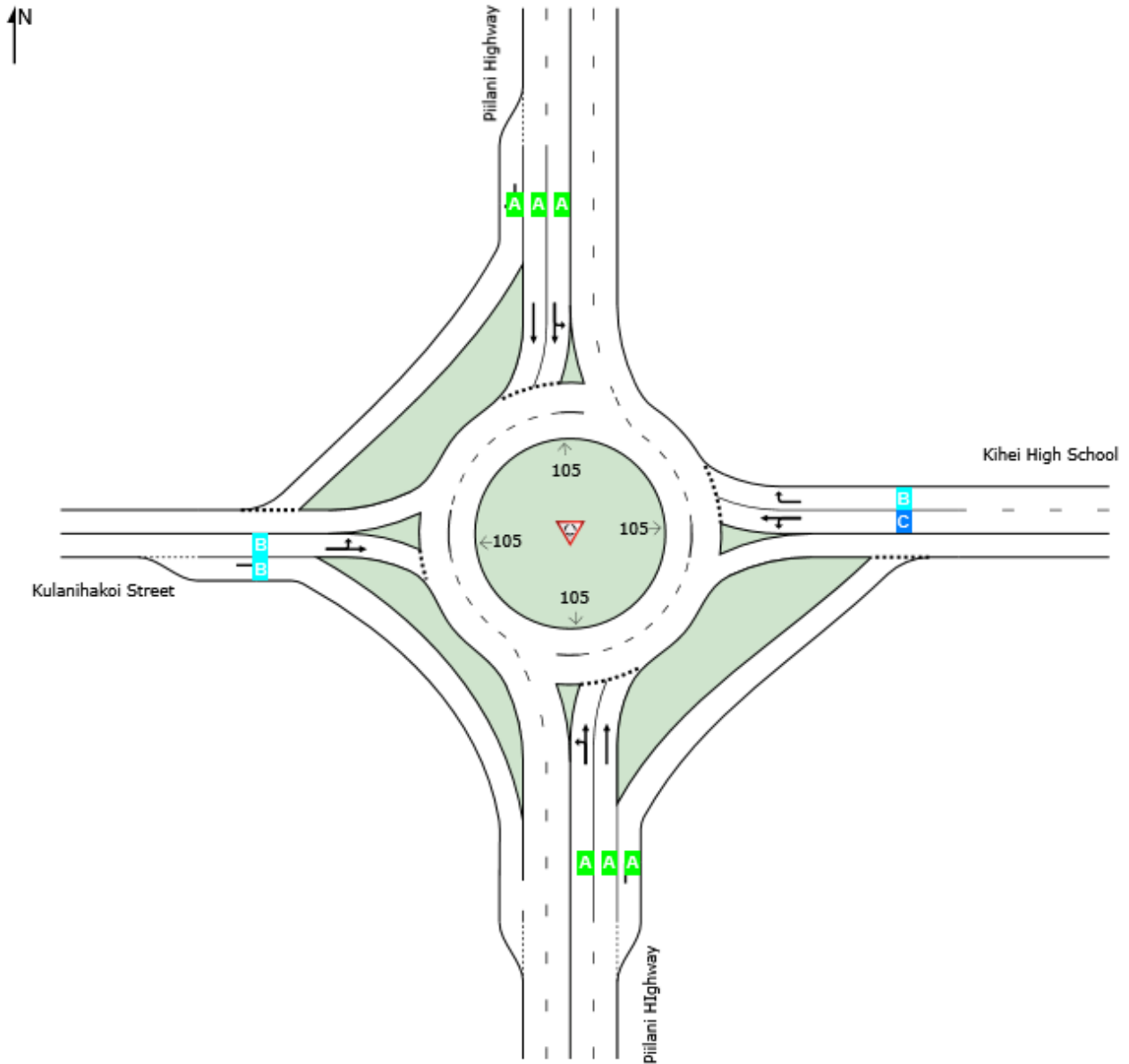
 Site: 101 [2-Lane WW 2031 NES RTL - PM (Site Folder: Standard)]

New Site

Site Category: (None)

Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	A	C	A	B	A



Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
 Roundabout LOS Method: SIDRA Roundabout LOS.
 Lane LOS values are based on average delay per lane.
 Intersection and Approach LOS values are based on average delay for all lanes.
 Delay Model: SIDRA Standard (Geometric Delay is included).

LANE SUMMARY

Site: 101 [2-Lane WW 2031 NES RTL - PM (Site Folder: Standard)]

New Site
 Site Category: (None)
 Roundabout

Lane Use and Performance													
	DEMAND FLOWS		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
	[Total veh/h	HV %						[Veh	Dist] ft				
South: Piilani Highway													
Lane 1	1172	2.0	1210	0.968	100	6.6	LOSA	16.8	427.7	Full	1600	0.0	0.0
Lane 2 ^d	1354	2.0	1399	0.968	100	5.8	LOSA	17.9	455.1	Full	1600	0.0	0.0
Lane 3	66	2.0	1441	0.046	100	4.0	LOSA	0.2	4.9	Short	200	0.0	NA
Approach	2592	2.0		0.968		6.1	LOSA	17.9	455.1				
East: Kihei High School													
Lane 1 ^d	93	2.0	297	0.315	100	22.8	LOS C	1.9	48.6	Full	1600	0.0	0.0
Lane 2	30	2.0	213	0.143	100	19.1	LOS B	0.7	18.7	Full	1600	0.0	0.0
Approach	124	2.0		0.315		21.9	LOS C	1.9	48.6				
North: Piilani Highway													
Lane 1	1119	2.0	1275	0.878	100	8.6	LOSA	16.3	414.7	Full	1600	0.0	0.0
Lane 2 ^d	1317	2.0	1500	0.878	100	7.1	LOSA	16.3	413.8	Full	1600	0.0	0.0
Lane 3	127	2.0	1570	0.081	100	4.2	LOSA	0.4	10.7	Short	200	0.0	NA
Approach	2563	2.0		0.878		7.6	LOSA	16.3	414.7				
West: Kulanihakoi Street													
Lane 1 ^d	64	2.0	282	0.227	100	19.7	LOS B	1.4	34.4	Full	1600	0.0	0.0
Lane 2	207	2.0	1642	0.126	100	13.8	LOS B	0.0	0.0	Short	200	0.0	NA
Approach	271	2.0		0.227		15.2	LOS B	1.4	34.4				
Intersection	5550	2.0		0.968		7.6	LOSA	17.9	455.1				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
 Roundabout LOS Method: SIDRA Roundabout LOS.
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 Roundabout Capacity Model: SIDRA Standard.
 Delay Model: SIDRA Standard (Geometric Delay is included).
 Queue Model: HCM Queue Formula.
 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

Approach Lane Flows (veh/h)										
South: Piilani Highway										
Mov.	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL %	Ov. Lane No.
From S To Exit:	W	N	E							
Lane 1	87	1085	-	1172	2.0	1210	0.968	100	NA	NA
Lane 2	-	1354	-	1354	2.0	1399	0.968	100	NA	NA
Lane 3	-	-	66	66	2.0	1441	0.046	100	0.0	2
Approach	87	2439	66	2592	2.0		0.968			
East: Kihei High School										
Mov.	L2	T1	R2	Total	%HV	Deg.	Lane	Prob.	Ov.	

From E To Exit:	S	W	N			Cap. veh/h	Satn v/c	Util. %	SL Ov. %	Lane No.
Lane 1	87	7	-	93	2.0	297	0.315	100	NA	NA
Lane 2	-	-	30	30	2.0	213	0.143	100	NA	NA
Approach	87	7	30	124	2.0		0.315			
North: Piilani Highway										
Mov. From N To Exit:	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	27	1092	-	1119	2.0	1275	0.878	100	NA	NA
Lane 2	-	1317	-	1317	2.0	1500	0.878	100	NA	NA
Lane 3	-	-	127	127	2.0	1570	0.081	100	0.0	2
Approach	27	2409	127	2563	2.0		0.878			
West: Kulanihakoi Street										
Mov. From W To Exit:	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	48	16	-	64	2.0	282	0.227	100	NA	NA
Lane 2	-	-	207	207	2.0	1642	0.126	100	0.0	1
Approach	48	16	207	271	2.0		0.227			
Total %HV Deg. Satn (v/c)										
Intersection	5550	2.0		0.968						

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis												
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Piilani Highway Merge Type: Priority												
Exit Short Lane	3	500	0.0	1317	1343	3.00	2.00	207	406	0.509	6.1	10.2
Merge Lane	2	-	100.0	Merge Lane is not Opposed				1317	1800	0.731	0.0	0.0
East Exit: Kihei High School Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Piilani Highway Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
West Exit: Kulanihakoi Street Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										

DAVID Y. IGE
GOVERNOR



**STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
MAUI DISTRICT
650 PALAPALA DRIVE
KAHULUI, HAWAII 96732**

ATTACHMENT 3

JADE T. BUTAY
DIRECTOR

Deputy Directors
LYNN A.S. ARAKI-REGAN
DEREK J. CHOW
ROSS M. HIGASHI
EDWIN H. SNIFFEN

IN REPLY REFER TO:
HWY-M 2.224-21

June 24, 2021

VIA EMAIL: mitch.tamayori@k12.hi.us

TO: MR. MITCH TAMAYORI
PROJECT COORDINATOR
HAWAII DEPARTMENT OF EDUCATION
OFFICE OF FACILITIES AND OPERATIONS
FACILITIES DEVELOPMENT BRANCH
PROJECT MANAGEMENT SECTION

FROM: ROBIN SHISHIDO *RS*
DISTRICT ENGINEER
HIGHWAYS DIVISION, MAUI DISTRICT

SUBJECT: HAWAII REVISED STATUTES (HRS) SECTION 343 COMPLIANCE
PIILANI HIGHWAY INTERSECTION IMPROVEMENTS, VICINITY OF
KULANIHAKOI STREET
STATE PROJECT NO. HWY-02-17
RIGHTS-OF-WAY (TMKS 2-2-002:083, 2 -2-025:999, AND 2-2-999:999)

The State of Hawaii Department of Transportation (HDOT) is developing the Piilani Highway Intersection Improvements Project to provide access to the State of Hawaii Department of Education's (DOE) new high school located in Kihei, Hawaii. Primary access to the new school will be from Piilani Highway, across from Kulanihakoi Street. Because the improvements to Piilani Highway are necessary for the larger high school development, State regulations require that the action (Piilani Highway Intersection Improvements) be treated as a single action with the Kihei High School (Hawaii Administrative Rules (HAR) 11-200-7(2) and 11-200.1-19(2)¹). While the DOE remains the proposing agency for the new Kihei High School, HDOT, as the highway owner, is overseeing the necessary improvements to Piilani Highway. The purpose of this letter is to coordinate and document compliance with Chapter 343 of the Hawaii Revised Statutes environmental review compliance, as well as any underlying regulations associated with the Piilani Highway Intersection Improvements, Vicinity of Kulanihakoi Street.

¹ HAR references are to both the 1996 and updated 2019 regulations because the FEIS was published under the 1996 Rules.

A Final Environmental Impact Statement (FEIS) for Kihei High School was prepared by the DOE and accepted by the Hawaii State Governor in 2012. The FEIS discloses the traffic impacts and need for improvements to Piilani Highway to provide access to the school, and to mitigate impacts generated by school traffic. The FEIS recommends that the intersection be controlled with a traffic signal coupled with a grade-separated access for pedestrians. Upon evaluation of these recommendations presented in the FEIS, HDOT has determined that grade separation and signalization is not the optimal solution for traffic operations and pedestrian safety at this new intersection. As an alternative, HDOT commissioned an evaluation for a roundabout as a means to control operations and facilitate access. The evaluation was completed in 2020 by WSP which shows the roundabout will improve the intersection operations and safety (enclosed).

On January 12, 2021, the DOE and HDOT held a virtual public meeting to inform and receive feedback from the community regarding the roundabout. Based on a review of the FEIS with respect to changes in size, scope, location, intensity, use, and timing; the traffic study; and community coordination, the scope of the proposed action has not increased environmental impacts in any manner that has not been previously disclosed. A Supplemental EIS (or new EIS or EA) is therefore not warranted. HDOT recognizes that such a determination is for the proposing agency (DOE) to decide.

Should DOE agree with this assessment, in accordance with HAR § 11-200-27 (1996 Rules) and HAR § 11-200.1-30 (2019 Rules), the Governor, as the Accepting Authority for the EIS in coordination with the proposing agency (DOE), this determination may be submitted to the Office of Environmental Quality for publication in the Environmental Notice.

Should you have any questions, please contact myself Robin Shishido, District Engineer, Highways Division, Maui District at (808) 873-3538 or by email at robin.k.shishido@hawaii.gov and reference letter number 2.224-21 as noted above.

Enclosure





07302021 Mary Alice Evans Kihei HS

Final Audit Report

2021-07-30

Created:	2021-07-30
By:	10119971@k12.hi.us
Status:	Signed
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