Exhibit H.1

Traffic Impact Assessment Report Kapa'a Highlands Subdivision
Kapa'a, Kaua'i, Hawai'i
TMK: (4) 4-3-03:01

Phillip Rowell and Associates
47-273 'D' Hui Iwa Street Kaneohe, Hawaii 96744 Phone: (808) 239-8206 FAX: (808) 239-4175 Email:prowell@hawii.rr.com

December 9, 2013

Mr. Greg Allen
Kapa'a Highlands
161 Wailua Road
Kapa'a Hawaii 96746

Re: Traffic Impact Assessment Report Kapa'a Highlands Subdivision
Kapa'a, Kauai, Hawaii
TMK: (4) 4-3-03:01

Phillip Rowell and Associates have completed the following Traffic Impact Assessment Report (TIAR) for Kapa'a Highlands Subdivision. The report is presented in the following format:

A. Project Location and Description
B. Purpose and Objective of Study
C. Study Approach
D. Description of Existing Streets and Intersection Controls
E. Existing Peak Hour Traffic Volumes
F. Public Transportation
G. Level-of-Service Concept
H. Existing Levels-of-Service
J. Background Traffic Projections
K. Project Trip Generation
L. Background Plus Project Projections
M. Traffic Impact Assessment
N. Project Road System
O. Other Traffic Related Issues
P. Summary and Recommendations

A. Project Location and Description

1. The proposed project is located west of Kapa'a Town and adjacent to Kapa'a Intermediate School, generally in the southwest quadrant of the intersection of Olohena Road and Kapa'a Bypass. See Attachment A.

2. The project is a residential subdivision with single-family and multi-family residences and neighborhood supporting retail. The project has two phases as shown on Attachment B. The development plan is summarized as follows:

Phase 1	Phase 2
16 Single-Family Units	100 Single-Family Units
	700 Multi-Family Units
	8,000 SF Neighborhood Retail

3. Access to and egress from Phase 1 will be via driveways along the south side of Olohena Road west of Kapa'a Intermediate School.

4. Access to and egress from Phase 2 will be provided via a new intersection along the north side of Kapa'a Bypass and a new intersection along the south side of Olohena Road. These two intersections will be connected by a new curvilinear roadway running through the project. For purposes of discussion in the report, this roadway is referred to as Road 'A.'

B. Purpose and Objective of Study

1. Quantify and describe the traffic related characteristics of the proposed project.

2. Identify potential deficiencies adjacent to the project that will impact traffic operations in the vicinity of the proposed project.

C. Study Approach

1. A preliminary trip generation analysis was performed to define the scope of work and study area. This analysis determined that the proposed project will generate less than 500 trips during either the morning or afternoon peak hour. Based on Institute of Transportation Engineers standards, the traffic study should be a "small development: traffic impact assessment."[1] Accordingly, the study area was defined to include the intersection of Kapa'a Bypass at Olohena Road and the intersections providing access to and egress from Phase 2 of the project (Kapaa Bypass at Road 'A' and Olohena Road at Road 'A'). Phase 1 lots are serviced by individual driveways which will have negligible traffic volumes.

   State of Hawaii Department of Transportation reviewed the first draft of the report and directed that the study area be expanded to include the intersections of Kuhio Highway at Kukui Street and Kuhio Highway at Kapaa Bypass. See Attachment O.

   The County of Kauai directed that the intersection of Olohena Road at Kaapuni Road and Kaehula Road be included in the study area. See Attachment P.

2. A field reconnaissance was performed to identify existing roadway cross-sections, intersection lane configurations, traffic control devices, and surrounding land uses.

3. Current weekday peak hour traffic volumes were obtained from manual traffic counts at the study intersections.

4. Existing intersection levels-of-service were determined using the methodology described in the *2000 Highway Capacity Manual*. Existing deficiencies were identified based on the results of the level-of-service analysis and field observations.

5. Peak hour traffic that the proposed project will generate was estimated using trip generation analysis procedures recommended by the Institute of Transportation Engineers. Project generated traffic was distributed and assigned to the adjacent roadway network.

6. A level-of-service analysis for future traffic conditions with traffic generated by the study project was performed.

[1] Institute of Transportation Engineers, *Transportation and Land Development*, Washington, D.C., 2002, p. 3-6

7. The impacts of traffic generated by the proposed project were quantified and summarized.

8. A report documenting the conclusions of the analyses performed and recommendations was prepared.

D. Description of Existing Streets and Intersection Controls

Kapa'a Bypass is a two-lane, two-way roadway along the southern and eastern boundaries of the project. This section of Kapa'a Bypass is owned by the Kapa'a Highlands developer, who has entered a memorandum of understanding with State of Hawaii Department of Transportation to dedicate the roadway to the State upon approval of Kapa'a Highlands subdivision[2]. According to State of Hawaii Department of Transportation traffic count data from 2010, Kapa'a Bypass has a weekday traffic volume of 7,400 vehicles per day.

Olohena Road is a two-lane, two-way roadway along the northern boundary of the project. Olohena Road also provides service to Kapa'a Intermediate School.

Kuhio Highway though Kapaa Town is a two-lane, two-way State highway along the east of the study area.

Existing Intersections

The intersection of Kuhio Highway at Kukui Street is a four-legged, signalized intersection located approximately 1,600 feet east of the project. The northbound and southbound approaches are Kuhio Highway and the eastbound and westbound approaches are Kukui Street. The northbound and southbound left turns are protected-permissive.

The intersection of Kuhio Highway at Kapaa Bypass is a three-legged, unsignalized intersection approximately two miles south of Kukui Street. The northbound and southbound approaches are Kuhio Highway. The eastbound approach is the Kapaa Bypass and is the controlled approach. The northbound approach is coned during the morning peak hours to provide on left turn and one through lane. The coning also allows the eastbound to southbound left turn to operate as a free right turn. During the afternoon peak hours and off peak hours, there is one left turn lane and two through lanes. The southbound approach has one through lane and one right turn lane. The eastbound approach has one left turn lane and one right turn lane.

The intersection Kapa'a Bypass and Olohena Road is a four-legged roundabout. All approaches are one lane only. The north leg of the intersection is one-way southbound into the intersection. The remaining three legs are two-way.

The intersection of Olohena Road at Kaapuni Road and Kaehula Road is actually two intersections. Olohena Road is the eastbound and westbound approaches and Kaapuni Road is the STOP sign controlled approach at Olohena Road. Kaehula Road intersects Kaapuni Road west of Olohena Road.

The intersection configurations are summarized on Attachment C.

[2] Honua Engineering, Inc., *Traffic Considerations Kapa'a Highlands Project*, March 28, 2012

E. Existing Peak Hour Traffic Volumes

Current weekday peak hour traffic volumes at the intersection of Kapa'a Bypass at Olohena Road were obtained from manual traffic counts. The counts at the intersection of Olohena Road at Kapaa Bypass were performed Tuesday, May 15, 2012. The counts at the intersection of Kuhio Highway were performed Thursday, August 8, 2013, and the counts at the intersection of Kuhio Highway at Kapaa Bypass were performed on Tuesday, October 29, 2013.

The traffic counts include mopeds, motorcycles, buses, trucks and other large vehicles.

During the surveys, the following was observed at the intersection of Olohena Road at Kapaa Bypass:

1. The number of pedestrians crossing the approaches to the intersection are minimal, even with the bus stop and transfer site at the park along the north side of Olohena Road east of the intersection.

2. Long queues of 15 vehicles or more along the westbound approach of Olohena Road were noted during the morning peak hour.

The existing peak hour traffic volumes are summarized on Attachments D and E.

F. Public Transportation

The Kauai Bus operates along Olohena Road and Kapa'a Bypass. A major bus stop and transfer point is located along Olohena Road east of Kapa'a Bypass in the parking lot adjacent to the park.

G. Level-of-Service Concept

"Level-of-Service" is a term which denotes any of an infinite number of combinations of traffic operating conditions that may occur on a given lane or roadway when it is subjected to various traffic volumes. Level-of-service (LOS) is a qualitative measure of the effect of a number of factors which include space, speed, travel time, traffic interruptions, freedom to maneuver, safety, driving comfort and convenience.

There are six levels-of-service, A through F, which relate to the driving conditions from best to worst, respectively. The characteristics of traffic operations for each level-of-service are summarized in Table 1. In general, LOS A represents free-flow conditions with no congestion. LOS F, on the other hand, represents severe congestion with stop-and-go conditions. *Level-of-service D is typically considered acceptable for peak hour conditions in urban areas.*[3]

Corresponding to each level-of-service shown in the table is a volume/capacity ratio. This is the ratio of either existing or projected traffic volumes to the capacity of the intersection. Capacity is defined as the maximum number of vehicles that can be accommodated by the roadway during a specified period of time. The capacity of a particular roadway is dependent upon its physical

[3] Institute of Transportation Engineers, *Transportation Impact Analyses for Site Development: A Recommended Practice*, 2006, page 60

characteristics such as the number of lanes, the operational characteristics of the roadway (one-way, two-way, turn prohibitions, bus stops, etc.), the type of traffic using the roadway (trucks, buses, etc.) and turning movements.

Table 1 Level-of-Service Definitions for Signalized Intersections[1]

Level of Service	Interpretation	Volume-to-Capacity Ratio[2]	Stopped Delay (Seconds)
A, B	Uncongested operations; all vehicles clear in a single cycle.	0.000-0.700	<20.0
C	Light congestion; occasional backups on critical approaches	0.701-0.800	20.1-35.0
D	Congestion on critical approaches but intersection functional. Vehicles must wait through more than one cycle during short periods. No long standing lines formed.	0.801-0.900	35.1-55.0
E	Severe congestion with some standing lines on critical approaches. Blockage of intersection may occur if signal does not provide protected turning movements.	0.901-1.000	55.1-80.0
F	Total breakdown with stop-and-go operation	>1.001	>80.0

Notes:
(1) Source: *Highway Capacity Manual*, 2000.
(2) This is the ratio of the calculated critical volume to Level-of-Service E Capacity.

Like signalized intersections, the operating conditions of intersections controlled by stop signs can be classified by a level-of-service from A to F. However, the method for determining level-of-service for unsignalized intersections is based on the use of gaps in traffic on the major street by vehicles crossing or turning through that stream. Specifically, the capacity of the controlled legs of an intersection is based on two factors: 1) the distribution of gaps in the major street traffic stream, and 2) driver judgement in selecting gaps through which to execute a desired maneuver. The criteria for level-of-service at an unsignalized intersection is therefore based on delay of each turning movement. Table 2 summarizes the definitions for level-of-service and the corresponding delay.

Table 2 Level-of-Service Definitions for Unsignalized Intersections[1]

Level-of-Service	Expected Delay to Minor Street Traffic	Delay (Seconds)
A	Little or no delay	<10.0
B	Short traffic delays	10.1 to 15.0
C	Average traffic delays	15.1 to 25.0
D	Long traffic delays	25.1 to 35.0
E	Very long traffic delays	35.1 to 50.0
F	See note (2) below	>50.1

Notes:
(1) Source: *Highway Capacity Manual*, 2000.
(2) When demand volume exceeds the capacity of the lane, extreme delays will be encountered with queuing which may cause severe congestion affecting other traffic movements in the intersection. This condition usually warrants improvement of the intersection.

H. Existing Levels-of-Service

The results of the level-of-service analysis of the intersection of Kuhio Highway at Kukui Street is summarized in Table 3. Since this intersection is signalized, the volume-to-capacity ratio, delay and level-of-service is shown for the overall intersection and each controlled movement. The traffic signal timing was estimated by manually timing the traffic signals during the peak hours.

Table 3 Existing Levels-of-Service - Signalized Intersections [1]

Intersection and Movement	AM Peak Hour V/C[2]	AM Peak Hour Delay[3]	AM Peak Hour LOS[4]	PM Peak Hour V/C	PM Peak Hour Delay	PM Peak Hour LOS
Kuhio Highway at Kuhio Street	Cycle Length = 60 Seconds[5]			Cycle Length = 60 Seconds		
	0.51	***11.5***	***B***	***0.49***	***11.1***	***B***
Eastbound Left & Thru	0.10	17.0	B	0.09	16.9	B
Eastbound Right	0.03	16.4	B	0.01	16.3	B
Westbound Right	0.00	16.2	B	0.01	16.2	B
Northbound Left	0.03	5.0	A	0.02	5.0	A
Northbound Thru & Right	0.68	11.5	B	0.61	10.1	B
Southbound Left & Thru	0.65	10.9	B	0.67	11.5	B
Southbound Right	0.00	4.8	A	0.00	4.8	A

NOTES:
(1) See Attachments F and G for Level-of-Service Worksheets.
(2) Volume-to-Capacity ratio.
(3) Delay is in seconds per vehicle.
(4) Level-of-Service calculated using the operations method described in *Highway Capacity Manual*. Level-of-Service is based on delay.
(5) Traffic signal cycle length determined by timing the traffic signal during peak hours.

The overall intersection operates at Level-of-Service B during both peak periods. All controlled lane groups operate at Level-of-Service A or B. This indicates good operating conditions.

The results of the level-of-service analysis of the intersection of Kapa'a Bypass and Olohena Road are summarized in Table 4. For roundabout intersections, the HCS methodology calculates volume-to-capacity ratios for the intersection approaches, which is then related to the volume-to-capacity ratio definitions for levels-of-service discussed previously. The levels-of-service calculations indicate that the eastbound approach is near capacity during the morning peak hour with a volume-to-capacity ratio of 0.92. All the remaining movements operate at Level-of-Service A or B.

Table 4 Existing Levels-of-Service - Kapa'a Bypass at Olohena Road

Approach	AM Peak Hour Without Project V/C [1]	AM Peak Hour Without Project LOS[2]	PM Peak Hour Without Project V/C	PM Peak Hour Without Project LOS
Overall Intersection	***0.92***	***E***	***0.50***	***A***
Eastbound Approach	0.92	E	0.49	A
Westbound Approach	0.18	A	0.42	A
Northbound Approach	0.09	A	0.38	A
Southbound Approach	0.63	B	0.62	B

NOTES:
(1) V/C. denotes volume-to-capacity ratio.
(2) LOS denotes Level-of-Service.
(3) See Attachments F and G for Level-of-Service Worksheets.

The results of the level-of-service analysis of the remaining unsignalized intersections are summarized in Table 5. The HCM methodology calculates only delays for controlled lane groups only. Volume-to-capacity ratios are not calculated. The 95th percentile queue lengths as reported by Synchro are also shown.

Table 5 Existing Levels-of-Service of Unsignalized Intersections

Intersection, Approach and Movement	AM Peak Hour Delay [1]	AM Peak Hour LOS [2]	AM Peak Hour 95th Queue[3]	PM Peak Hour Delay	PM Peak Hour LOS	PM Peak Hour 95th Queue
Kuhio Highway at Kapaa Bypass	***95.3***	***F***	***NC***	***12.3***	***B***	***NC***
Eastbound Left	273.5	F	999	57.9	F	227
Eastbound Right	Uncontrolled Lane Group			Uncontrolled Lane Group		
Northbound Left	9.2	A	8	13.2	B	82
Northbound Thru	Uncontrolled Lane Group			Uncontrolled Lane Group		
Southbound Thru	Uncontrolled Lane Group			Uncontrolled Lane Group		
Southbound Right	Uncontrolled Lane Group			Uncontrolled Lane Group		
Olohena Road at Kaapuni Road	***9.8***	***A***	***NC***	***3.1***	***A***	***NC***
Eastbound Left & Thru	0.9	A	2	1.7	A	2
Westbound Thru & Right	Uncontrolled Lane Group			Uncontrolled Lane Group		
Southbound Left & Right	22.5	C	112	13.5	B	26
Kaapuni Road at Kaehula Road	***0.7***	***A***	***NC***	***0.3***	***A***	***NC***
Westbound Left & Right	11.5	B	4	11.4	B	1
Northbound Thru & Right	Uncontrolled Lane Group			Uncontrolled Lane Group		
Southbound Left & Thru	0.0	A	0	0.1	A	0

NOTES:
(1) Delay is in seconds per vehicle.
(2) LOS denotes Level-of-Service.
(3) 95th percentile queue in feet as reported by Synchro.
(4) NC = Not calculated
(5) See Attachments F and G for Level-of-Service Worksheets.

The intersection of Kuhio Highway at Kapaa Bypass operates at Level-of-Service F during the morning peak hour and Level-of-Service B during the afternoon peak hour. It is the eastbound left turn lane with a delay so long that is impacts of the overall intersection, resulting in the poor level-of-service.

The intersection of Olohena Road at Kaapuni Road and Kaehula Road is actually two intersections. Olohena Road is the eastbound and westbound approaches and Kaapuni Road is the STOP sign controlled approach at Olohena Road. Kaehula Road intersects Kaapuni Road west of Olohena Road. Therefore, the level-of-service results are shown for two intersections. The intersections of Olohena Road at Kaapuni Road and Olohena Road at Kaehula Road both operate at Level-of-Service A during both peak periods.

I. Existing Deficiencies

The eastbound approach at the intersection of Olohena Road at Kapaa Bypass is at or near capacity during the morning peak hour with a volume-to-capacity ratio of 0.92 and a Level-of-Service of E. The deficient movement is mitigated when the project is constructed as traffic will be redistributed as a result of constructing Road A through the project. This redistribution will be addressed later in this report as part of the traffic impact analysis of the project.

The eastbound to northbound left turns at the intersection of Kuhio Highway at Kapaa Bypass operate at Level-of-Service F during both peak hours. However, the morning and afternoon volumes are only 5 and 12 vehicles, respectively. Since the volumes are so low, mitigation has been deferred. It should also be noted that the proposed development project adds no traffic to these movements.

J. Background Traffic Projections

Based on data in the *Kauai Long-Range Land Transportation Plan*[4], population growth in the Kawaihau District, which includes Kapa'a, will be less than one percent per year until 2020. Also, we are not aware of any approved projects in the vicinity that will impact traffic conditions along Kapa'a Bypass or Olohena Road before the design year of this project. Therefore, for this particular study, it was assumed that there will be no significant increase in peak hour traffic at the study intersections as a result of regional background growth or traffic generated by approved new projects in the vicinity of the project. Future 2020 background (without project) traffic volumes were estimated to be comparable to existing peak hour traffic volumes at the study intersections.

K. Project Trip Generation

Future traffic volumes generated by Kapa'a Highlands Subdivision (Phases 1 and 2) were estimated using the methodology described in the *Trip Generation Handbook*[5] and data provided in *Trip Generation*[6]. This method uses trip generation equations or rates to estimate the number of trips that the project will generate during the peak hours of the project and along the adjacent street.

[4] Austin, Tsutsumi & Associates, *Kauai Long-Range Land Transportation Plan*, May 2004

[5] Institute of Transportation Engineers, *Trip Generation Handbook*, Washington, D.C., 2004, p. 7-12

[6] Institute of Transportation Engineers, *Trip Generation, 7th Edition,* Washington, D.C., 2003

The equations used for the trip generation analysis are summarized in Table 6. The trip generation equations for the residential uses are based on the number of planned residential units. The equations for the retail portion of the project are based on the gross leasable square footage of the retail area. The equations shown estimate the number of peak hour trips during the peak hours of the generator, which may or may not coincide with the peak hour of the adjacent street. *Trip Generation* does not note the peak hours of the generators.

A portion of the trips to and from the retail area will be from the adjacent traffic stream. These trips are referred to as "pass by trips" and are deducted from the total number of trip to estimate the number of new trips generated by the project. However, these trips are added to the driveway volumes at the retail areas. The equation for estimating the percent pass by trips is also provided. This equation is based on the gross leasable square footage of the retail area. Pass by equations are provided of the PM peak hour only.

It should be noted that the percentage of pass by trip estimated from the equation provided in the *Trip Generation Handbook* is 81%. State of Hawaii Department of Transportation felt that this percentage was too high. It was agreed with State of Hawaii Department of Transportation that 34% would be used for the trip generation calculations. Refer to Attachment O.

Table 6 Trip Generation Equations(1)

Period & Direction		Single Family Units (Land Use Code 210)	Multi-Family Units (Land Use Code 230	Neighborhood Commercial (Land Use Code 820)	Pass By Trips
		Equation or Percent(1)	Equation or Percent(1)	Equation or Percent(1)	Equation or Percent(2)
Weekday Total		Ln(T) = 0.92 Ln(X) + 2.71	Ln(T) = 0.85 Ln(X) + 2.55	Ln(T) = 0.65 Ln (x) + 5.83	No Equation Provided
AM Peak Hour	Total	T = 0.70(X) + 12.05	Ln(T) = 0.82 Ln(X) +0.171	Ln(T) = 0.60Ln(A)+2.29	No Equation Provided
	Inbound	25%	18%	61%	
	Outbound	75%	82%	39%	
PM Peak Hour	Total	Ln(T) = 0.89Ln(X) + 9.61	T = 0.34(X) + 38.31	Ln(T) = 0.66Ln(A)+3.40	Ln (T) = - 0.29 Ln(A)+5.00
	Inbound	63%	64%	48%	50%
	Outbound	37%	36%	52%	50%

Notes:
(1) Source: Institute of Transportation Engineers, *Trip Generation, 7th Edition,* Washington, D.C., 2003
(2) Source: Institute of Transportation Engineers, *Trip Generation Handbook*, Washington, D.C., 2004, p 47
(3) T = Trips, X = Number of Units, A = Gross Leasable Square Feet

The results of the trip generation analysis are summarized in Table 7. The conclusion of the trip generation analysis is that Phases 1 and 2 will generate a total of 394 trips during the morning peak hour and 487 trips during the afternoon peak hour. As noted earlier, the numbers of peak hour trips shown are the trips generated during the peak hour of the generator, which may or may not coincide with the peak hours of the adjacent streets.

Table 7 Trip Generation Calculations

Period & Direction		Phase 1 Single Family 16 Units Trips	Phase 2 Single Family 100 Units Trips	Phase 2 Multi-Family 700 Units Trips	Phase 2 Neighborhood Commercial 8,000 TLSF Trips	Pass By Trips[1]	New Trips	Phase 2 Total Trip Trips	Pass By Trips	New Trips	Total Project Trips (Phases 1 and 2) Total Trips	Pass By Trips	New Trips
AM Peak Hour	Total	23	82	255	34	0	34	371	0	371	394	0	394
	Inbound	6	21	46	21	0	21	88	0	88	94	0	94
	Outbound	17	61	209	13	0	13	283	0	283	300	0	300
PM Peak Hour	Total	22	111	276	118	40	78	505	96	409	527	40	487
	Inbound	14	71	177	57	20	37	305	48	257	319	20	299
	Outbound	8	40	99	61	20	41	200	48	152	208	20	188

Notes:
(1) The percentage of pass by trips is 34% of the afternoon peak hour trips.

Project trips were distributed and assigned based on existing traffic approach and departure patterns of traffic into and out of the study area as estimated from the traffic counts. Given the location of the retail, which is the center of Phase 2, it was assumed that all the pass by trips would be diverted from the internal road system of Phase 2. The project trip assignments for Phases 1 and 2 are shown on Attachment H and I, respectively.

L. Background Plus Project Projections

Background plus project traffic projections were estimated by superimposing the peak hourly traffic generated by the proposed project on the background (without project) peak hour traffic projections. This assumes that the peak hourly trips generated by the project coincide with the peak hour of the adjacent street. This represents a worse-case condition as it assumes that the peak hours of the intersection approaches and the peak hour of the study project coincide.

As noted earlier, construction of Road 'A' will divert traffic from the eastbound to southbound right turns and northbound to westbound left turns from the intersection of Olohena Road at Kapaa Bypass. The redistribution of traffic is summarized on Attachment J.

The resulting background plus project peak hour traffic projections are shown in Attachments K and L.

M. Traffic Impact Assessment

The traffic impact of the proposed project was assessed by analyzing changes in traffic volumes at the study intersections and changes on the level-of-service.

Changes in Total Intersection Volumes

An analysis of the project's share of 2020 background plus project intersection approach volumes at the study intersections is summarized in Table 8. The table summarizes the project's share of total 2020 peak hour approach volumes at each intersection. Also shown are the percentages of 2020 background plus project traffic that is the result of background growth and traffic generated by related projects. The negative percentages reflect the redistribution of traffic as a result of Road 'A'.

Table 8 Analysis of Project's Share of Total Intersection Approach Volumes [1]

Intersection	Period	Existing	2020 Background Plus Project	Project Traffic	
Kukui Highway at Kukui Street	AM	1441	1453	12	0.8%
	PM	1370	1385	15	1.1%
Olohena Road at Kapaa Bypass	AM	1447	1372	-75	-5.5%
	PM	1459	1407	-52	-3.7%
Kuhio Highway at Kapaa Bypass	AM	1990	2266	276	12.2%
	PM	2176	2518	342	13.6%

Notes:
(1) Volumes shown are total intersection approach volumes or projections.
(2) Percentage of total 2015 background plus project traffic.
(3) Data to be provided in final draft report.

The percentage of project traffic at the intersection of Kuhio Highway at Kukui Street is 0.8% during the morning peak hour and 1.1% during the afternoon peak hour. The analysis indicates that the peak hour traffic volumes at the intersection of Olohena Road at Kapaa Bypass will be less than existing because of the redistribution of traffic to Road 'A.'

The analysis indicates that peak hour traffic at the intersection of Kuhio Highway at Kapaa Bypass will increase 12.2 % during the morning peak hour and 13.6% during the afternoon peak hour. These increases are higher than desirable but the intersection is over two miles from the project. Typically, the study area for a project that generates the amount of traffic that this project generates should be limited to one-half mile, or less.

Changes of Levels-of-Service

A level-of-service analysis was performed for "without project" and "with project" conditions to confirm that the intersections will operate at an acceptable level-of-service and that there are no traffic operational deficiencies.

The results of the 2020 level-of-service analysis of the intersection of Kuhio Highway at Kukui Street are summarized in Table 9. The overall intersection and all controlled movements will

operate at Level-of-Service B without and with project generated traffic. There are no changes in the level-of-service of the intersections or controlled lane groups as a result of project related traffic.

Table 9 2020 Levels-of-Service - Kuhio Highway at Kukui Street [1]

Intersection and Movement	AM Peak Hour						PM Peak Hour					
	Without Project			With Project			Without Project			With Project		
	V/C[2]	Delay[3]	LOS[4]	V/C	Delay	LOS	V/C	Delay	LOS	V/C	Delay	LOS
Overall Intersection	Cycle Length = 60 Seconds[5]						Cycle Length = 60 Seconds					
	0.51	***11.5***	***B***	***0.51***	***11.6***	***B***	***0.49***	***11.1***	***B***	***0.50***	***11.1***	***B***
Eastbound Left & Thru	0.10	17.0	B	0.11	17.1	B	0.09	16.9	B	0.10	17.0	B
Eastbound Right	0.03	16.4	B	0.04	16.5	B	0.01	16.3	B	0.02	16.3	B
Westbound Right	0.00	16.2	B	0.00	16.2	B	0.01	16.2	B	0.01	16.2	B
Northbound Left	0.03	5.0	A	0.03	5.1	A	0.02	5.0	A	0.04	5.2	A
Northbound Thru & Right	0.68	11.5	B	0.68	11.5	B	0.61	10.1	B	0.61	10.1	B
Southbound Left & Thru	0.65	10.9	B	0.65	10.9	B	0.67	11.5	B	0.67	11.5	B
Southbound Right	0.00	4.8	A	0.00	4.8	A	0.00	4.8	A	0.00	4.8	A

NOTES:
(1) See Attachment M for AM peak hour Level-of-Service Worksheets and Attachment N for PM peak hour Level-of-Service Worksheets.
(2) Volume-to-Capacity ratio.
(3) Delay is in seconds per vehicle.
(4) Level-of-Service calculated using the operations method described in *Highway Capacity Manual*. Level-of-Service is based on delay.
(5) Traffic signal cycle length determined by timing the traffic signal during peak hours.

The results of the level-of-service analysis for the intersection of the Kapa'a Bypass at Olohena Road, the only existing study intersection, are summarized in Table 10. The Highway Capacity Manual methodology for analysis of roundabouts calculates only the volume-to-capacity ratio of each intersection approach. The volume-to-capacity ratio is then referenced to the level-of-service definitions for signalized intersection to determine the level-of-service of each approach.

Table 10 Future (2020) Levels-of-Service - Kapa'a Bypass at Olohena Road

Approach	AM Peak Hour				PM Peak Hour			
	Without Project		With Project		Without Project		With Project	
	V/C [1]	LOS[2]	V/C	LOS	V/C	LOS	V/C	LOS
Overall Intersection	***0.92***	***E***	***0.83***	***D***	***0.50***	***A***	***0.64***	***B***
Eastbound Approach	0.92	E	0.83	D	0.49	A	0.43	A
Westbound Approach	0.18	A	0.19	A	0.42	A	0.42	A
Northbound Approach	0.09	A	0.05	A	0.38	A	0.30	A
Southbound Approach	0.63	B	0.63	B	0.62	B	0.64	B

NOTES:
(1) V/C. denotes volume-to-capacity ratio.
(2) LOS denotes Level-of-Service.
(3) See Attachment M for AM peak hour Level-of-Service Worksheets and Attachment N for PM peak hour Level-of-Service Worksheets.

The analysis concluded that the eastbound approach is over-capacity (Level-of-Service E) during the morning peak hour without the project but will operate at Level-of-Service D with the project. This improvement is because eastbound to southbound traffic will be diverted to Road A.

The results of the level-of-service analysis for the remaining unsignalized intersections are summarized in Table 11. Shown are the delays, levels-of-service and 95th percentile queues.

Table 11 2020 Levels-of-Service of Unsignalized Intersections

Intersection, Approach and Movement	AM Peak Hour						PM Peak Hour					
	Without Project			With Project			Without Project			With Project		
	Delay [1]	LOS [2]	95th Queue[3]	Delay	LOS	95th Queue	Delay	LOS	95th Queue	Delay	LOS	95th Queue
Kuhio Highway at Kapaa Bypass	***95.3***	***F***	***NC***	***191.4***	***F***	***NC***	***12.3***	***B***	***NC***	***42.4***	***E***	***NC***
Eastbound Left	273.5	F	999	479.7	F	1676	57.9	F	227	190.1	F	1116
Eastbound Right	Uncontrolled Lane Group			Uncontrolled Lane Group			Uncontrolled Lane Group			Uncontrolled Lane Group		
Northbound Left	9.2	A	8	9.6	A	15	13.2	B	82	21.0	C	203
Northbound Thru	Uncontrolled Lane Group			Uncontrolled Lane Group			Uncontrolled Lane Group			Uncontrolled Lane Group		
Southbound Thru	Uncontrolled Lane Group			Uncontrolled Lane Group			Uncontrolled Lane Group			Uncontrolled Lane Group		
Southbound Right	Uncontrolled Lane Group			Uncontrolled Lane Group			Uncontrolled Lane Group			Uncontrolled Lane Group		
Olohena Road at Kaapuni Road	***9.8***	***A***	***NC***	***10.1***	***B***	***NC***	***3.1***	***A***	***NC***	***3.3***	***A***	***NC***
Eastbound Left & Thru	0.9	A	2	0.9	A	2	1.7	A	2	1.5	A	2
Westbound Thru & Right	Uncontrolled Lane Group			Uncontrolled Lane Group			Uncontrolled Lane Group			Uncontrolled Lane Group		
Southbound Left & Right	22.5	C	112	24.0	C	121	13.5	B	26	14.4	B	32
Kaapuni Road at Kaehula Road	***0.7***	***A***	***NC***	***0.6***	***A***	***NC***	***0.3***	***A***	***NC***	***0.3***	***A***	***NC***
Westbound Left & Right	11.5	B	4	11.7	B	4	11.4	B	1	11.6	B	1
Northbound Thru & Right	Uncontrolled Lane Group			Uncontrolled Lane Group			Uncontrolled Lane Group			Uncontrolled Lane Group		
Southbound Left & Thru	0.0	A	0	0.0	A	0	0.1	A	0	0.1	A	0

NOTES:
(1) Delay is in seconds per vehicle.
(2) LOS denotes Level-of-Service.
(3) 95th percentile queue in feet as reported by Synchro.
(4) NC = Not calculated
(5) See Attachment M for AM peak hour Level-of-Service Worksheets and Attachment N for PM peak hour Level-of-Service Worksheets.

The intersection of Kuhio Highway at Kapaa Bypass will operate at Level-of-Service F without and with the project during the morning and afternoon peak hours. The delay of the eastbound to northbound left turn increases even though the project adds no traffic to this movement. The delay of this movement is so long that it affects the level-of-service of the overall intersections.

The remaining unsignalized intersections will operate at Level-of-Service A without and with project traffic.

The results of the level-of-service analysis of the new STOP sign controlled intersections are summarized in Table 12. As shown, all lane groups will operate at Level-of-Service C, or better.

Table 12 2020 Levels-of-Service - New Intersections

Intersection and Movement	AM Peak Hour Delay [1]	AM Peak Hour LOS [2]	AM Peak Hour Queue [3] (Feet)	PM Peak Hour Delay	PM Peak Hour LOS	PM Peak Hour Queue (Feet)
Kapa'a Bypass at Road 'A'	***6.5***	***A***	***NC***	***5.3***	***A***	***NC***
Eastbound Left & Thru	6.2	A	10	5.3	A	24
Southbound Left & Right	16.5	C	93	12.0	B	33
Olohena Road at Road 'A'	***3.0***	***A***	***NC***	***3.7***	***A***	***NC***
Westbound Left & Thru	1.5	A	2	1.5	A	4
Northbound Left & Right	17.1	C	36	16.8	C	35

NOTES:
(1) Delay is in seconds per vehicle.
(2) LOS denotes Level-of-Service. Level-of-Service is based on delay.
(3) 95th Percentile in feet as reported by Synchro.
(4) See Attachment M for AM peak hour Level-of-Service Worksheets and Attachment N for PM peak hour Level-of-Service Worksheets.
(5) NC = Not calculated.

N. Project Road System

For signalized intersections, Level-of-Service D is the minimum acceptable Level-of-Service[7] and that this standard is applicable to the overall intersection rather than each controlled lane group. Minor movements, such as left turns, and minor side street approaches may operate at Level-of-Service E or F for short periods of time during the peak hours so that the overall intersection and major movements along the major highway will operate at Level-of-Service D, or better. All volume-to-capacity ratios must be 1.00 or less[8].

A standard has not been established for unsignalized intersections. Therefore, we have used a standard that Level-of-Service D is an acceptable level-of-service for any major controlled lane groups, such as left turns from a major street to a minor street. Side street approaches may operate at Level-of-Service E or F for short periods of time. This is determined from the delays of the individual lane groups. If the delay of any of the side street approaches appears to be so long that it will affect the overall level-of-service of the intersection, then roadway improvements should be identified and accessed.

Using this standard, no additional roadway improvements are recommended to accommodate project related traffic.

The eastbound to northbound left turns at the intersection of Kuhio Highway at Kapaa Bypass will operate at Level-of-Service F, without and with project traffic. The proposed project adds no traffic to this movement. The proposed project adds traffic to the northbound to westbound left turn, which increases the delay to the eastbound to northbound left turn.

[7] Institute of Transportation Engineers, *Transportation Impact Analyses for Site Development: A Recommended Practice*, 2006, page 60.

[8] Transportation Research Board, *Highway Capacity Manual*, Washington, D.C., 2000, p. 16-35.

The level-of-service of the eastbound approach of Olohena Road to Kapa'a Bypass improves from Level-of-Service E to Level-of-Service D with project as a result of construction of Road 'A' between Kapa'a Bypass and Olowena Road, providing an alternate route and diverting traffic from the intersection. Thus, Road 'A' running through the project connecting these two intersections, redistributes traffic and reduces traffic of the overcapacity movement at this intersection during the AM peak hour.

O. Other Traffic Related Issues

1. Impacts of Closing Kapaa Bypass

Based on the traffic counts performed for this study, the Kapa'a Bypass accommodates between 600 and 700 vehicles per hour during the peak hours. A closure of the bypass would force this traffic to use Kuhio Highway. During the field reconnaissance for this project, it was noted that traffic flow along Kuhio Highway is congested, especially during the afternoons, with very slow speeds and long delays indicating low levels-of-service. It would be difficult for the intersections along Kuhio Highway in Kapa'a Town to accommodate this additional traffic at acceptable levels-of-service. The addition of traffic that now uses kapa'a Bypass to current traffic along Kuhio Highway would result in longer delays and therefore lower levels-of-service. The conclusion is that Kapa'a Bypass serves as a major mitigation to potential traffic congestion and low levels-of-service along Kuhio Highway.

2. Pedestrian and Traffic

It is reasonable that there will be a small amount of pedestrian and bicycle activity along Olohena Road in the vicinity of Kapa'a Intermediate School. Some of this pedestrian activity may be generated from Kapa'a Highlands Subdivision. Accordingly, the intersections into and out of the subdivisions should provide pedestrian crosswalks to accommodate this activity.

3. Speed Control Along Road 'A'

As noted earlier in this report, Road 'A' will provide an alternate route to Kapa'a Intermediate School since it will be a more direct route for northbound traffic. Since Road 'A' will be through a residential area, traffic calming measure should be provided to control vehicle speeds and enhance the safety of pedestrians. Measures that should be considered include four-way stops, speed humps or tables.

P. Summary and Recommendations

1. Kapa'a Highlands subdivision is located west of Kapa'a Town and adjacent to Kapa'a Intermediate High School. The project is a residential subdivision with single-family and multi-family residences and neighborhood supporting retail.

2. The project has two phases. Phase 1 will be 16 single-family agricultural lots. Access to and egress from these lot will via driveways along Olohena Road west of Kapa'a Intermediate School.

3. The second phase will consists of 100 single-family units, 700 multi-family units and 8,000 square feet of neighborhood supporting retail. Access to and egress from Phase 2 will be provided via a new intersection along the north side of Kapa'a Bypass and a new intersection along the south side of Olohena Road.

4. The conclusion of the trip generation analysis is that Phases 1 and 2 will generate a total of 394 trips during the morning peak hour and 487 trips during the afternoon peak hour.

5. The level-of-service analysis of the intersection of Kuhio Highway at Kukui Street determined that the overall intersection and all controlled movements will operate at Level-of-Service B without and with project generated traffic. There are no changes in the level-of-service of the intersections or controlled lane groups as a result of project related traffic.

6. A level-of-service analysis of the intersection of Kapa'a Bypass at Olohena Road concluded that the eastbound approach to the roundabout is currently over-capacity (Level-of-Service E) during the morning peak hour without the project but will operate at Level-of-Service D with the project. This improvement is because eastbound to southbound traffic will be diverted from the intersection to Road A.

7. The intersection of Kuhio Highway at Kapaa Bypass will operate at Level-of-Service F without and with the project during the morning and afternoon peak hours. The delay of the eastbound to northbound left turn increases even though the project adds no traffic to this movement. The delay of this movement is so long that it affects the level-of-service of the overall intersections. The proposed project adds no traffic to this movement. The proposed project adds traffic to the northbound to westbound left turn, which increases the delay to the eastbound to northbound left turn, but is not considered significant. The morning and afternoon peak hour projections for this lane group are 5 and 12 vehicles per hour, respectively. Traffic impacts due to the project are not considered significant.

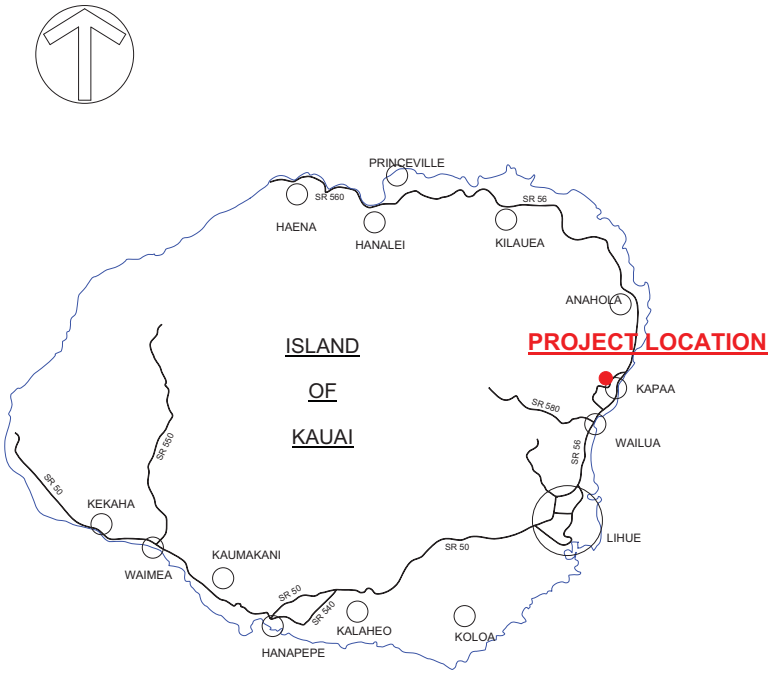
8. Based on the results of the level-of-service analysis, no roadway improvements are recommended to accommodate project related traffic. The project actually has a positive impact as a result of constructing Road 'A', which will divert traffic away from the intersection of Olohena Road and Kapaa Bypass. The eastbound to southbound movement will be over-capacity without Road 'A'.

Respectfully submitted,
PHILLIP ROWELL AND ASSOCIATES

Phillip J. Rowell, P.E.
Principal

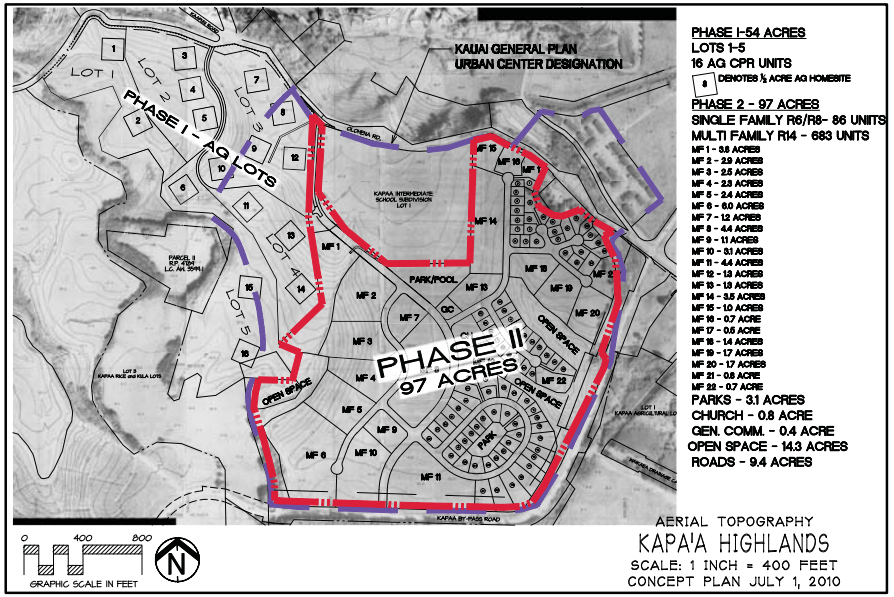
List of Attachments

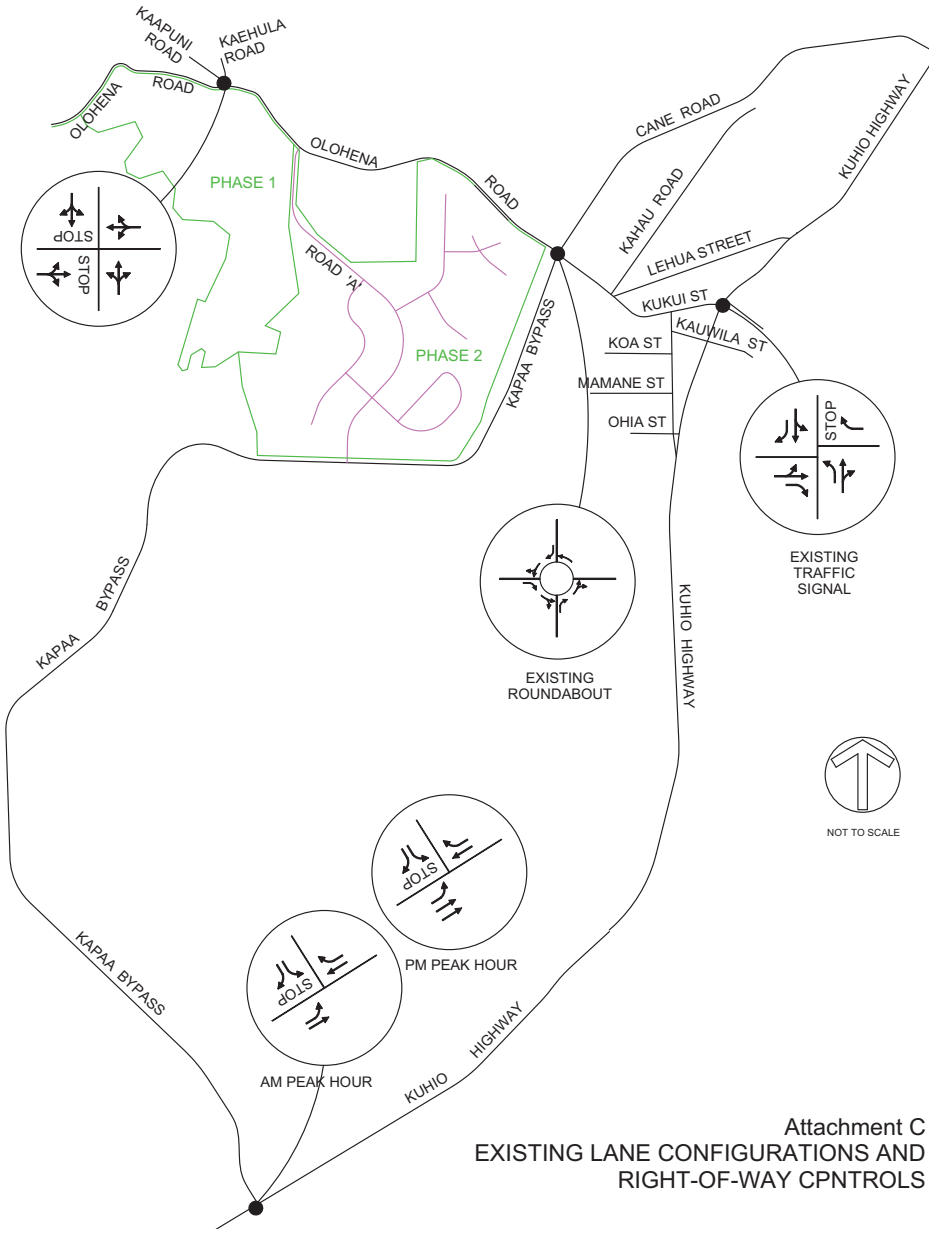
A. Project Location of Kauai
B. Subdivision Plan
C. Existing Lane Configurations
D. Existing AM Peak Hour Traffic Volumes
E. Existing PM Peak Hour Traffic Volumes
F. Level-of-Service Worksheets for Existing AM Peak Hour Conditions
G. Level-of-Service Worksheets for Existing PM Peak Hour Conditions
H. Phase 1 Trip Assignments
I. Phase 2 Trip Assignments
J. Reassignment of Existing Trips
K. 2020 Background Plus Project AM Peak Hour Traffic Projections
L. 2020 Background Plus Project PM Peak Hour Traffic Projections
M. Level-of-Service Worksheets for 2020 Background Plus Project AM Peak Hour Conditions
N. Level-of-Service Worksheets for 2020 Background Plus Project PM Peak Hour Conditions
O. Comments from State of Hawaii Department of Transportation and Responses
P. Comments from County of Kauai Department of Public Works and Responses



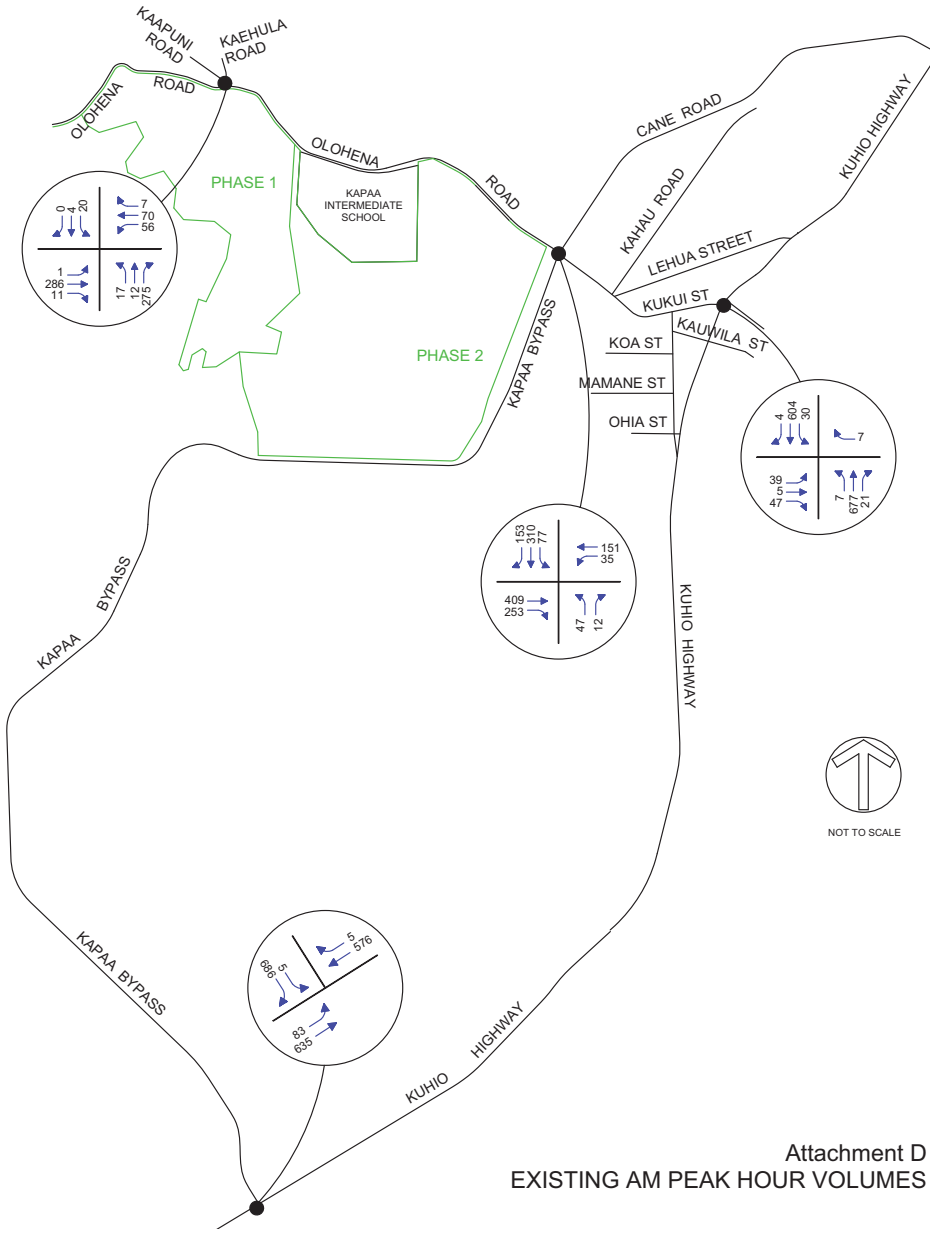
Attachment A
PROJECT LOCATION ON KAUAI

Attachment B
Subdivision Plan
(Provided By Others)

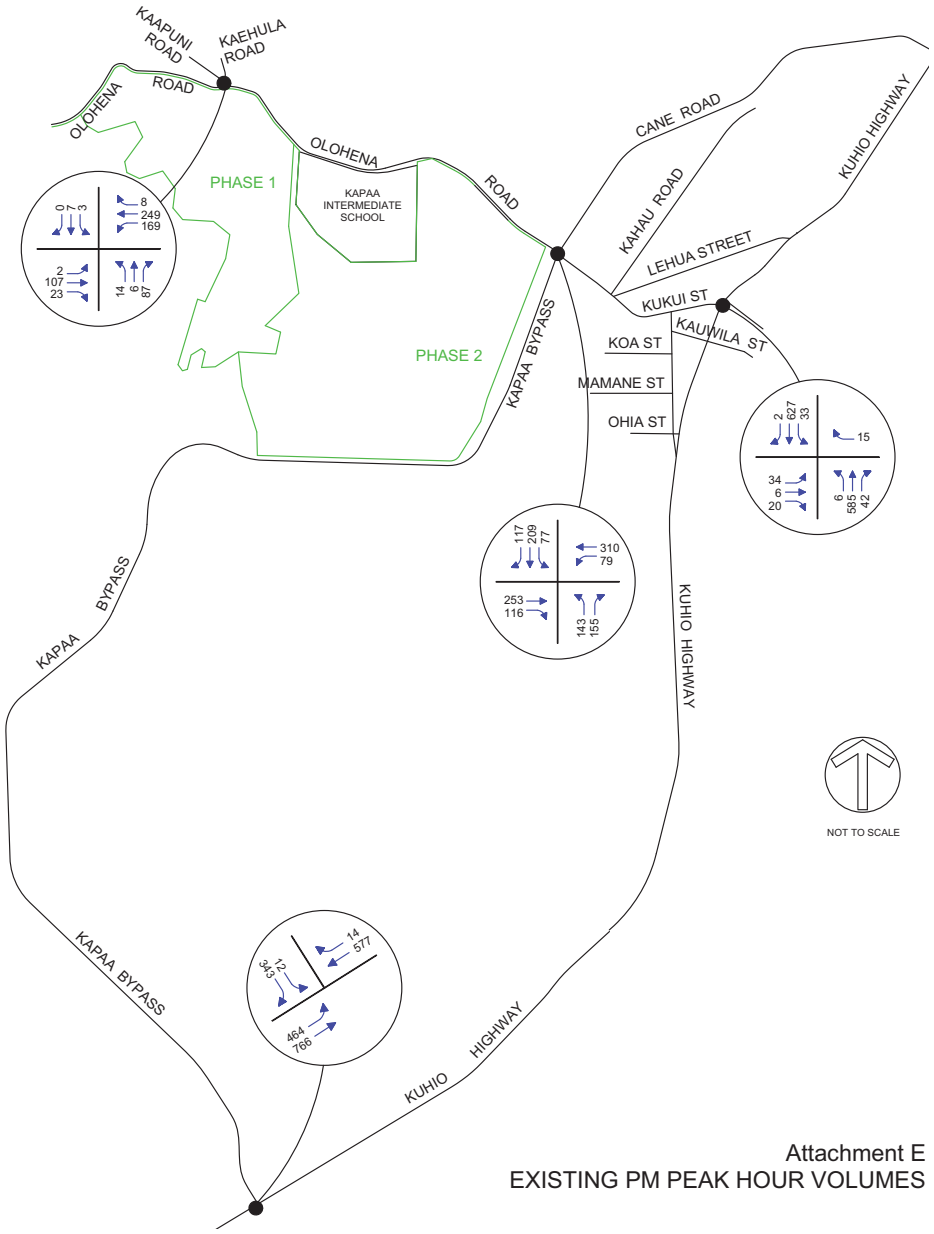




Attachment C
EXISTING LANE CONFIGURATIONS AND
RIGHT-OF-WAY CPNTROLS



Attachment D
EXISTING AM PEAK HOUR VOLUMES



Attachment E
EXISTING PM PEAK HOUR VOLUMES

Attachment F
Level-of-Service Worksheets for Existing AM Peak Hour Conditions

HCM Signalized Intersection Capacity Analysis
1: KUKUI STREET & KUHIO HIGHWAY 11/15/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0			4.0	4.0	4.0			4.0	4.0
Lane Util. Factor		1.00	1.00			1.00	1.00	1.00			1.00	1.00
Frt		1.00	0.85			0.86	1.00	1.00			1.00	0.85
Flt Protected		0.96	1.00			1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)		1783	1583			1611	1770	1854			1858	1583
Flt Permitted		0.96	1.00			1.00	0.28	1.00			0.95	1.00
Satd. Flow (perm)		1783	1583			1611	523	1854			1774	1583
Volume (vph)	39	5	47	0	0	7	7	677	21	30	604	4
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	42	5	51	0	0	8	8	736	23	33	657	4
RTOR Reduction (vph)	0	0	37	0	0	6	0	2	0	0	0	2
Lane Group Flow (vph)	0	47	14	0	0	2	8	757	0	0	690	2
Turn Type	Perm		Perm			custom	Perm			Perm		Perm
Protected Phases		4						2			6	
Permitted Phases	4		4			8	2			6		6
Actuated Green, G (s)		16.0	16.0			16.0	36.0	36.0			36.0	36.0
Effective Green, g (s)		16.0	16.0			16.0	36.0	36.0			36.0	36.0
Actuated g/C Ratio		0.27	0.27			0.27	0.60	0.60			0.60	0.60
Clearance Time (s)		4.0	4.0			4.0	4.0	4.0			4.0	4.0
Lane Grp Cap (vph)		475	422			430	314	1112			1064	950
v/s Ratio Prot								c0.41				
v/s Ratio Perm		0.03	0.03			0.00	0.02				0.39	0.00
v/c Ratio		0.10	0.03			0.00	0.03	0.68			0.65	0.00
Uniform Delay, d1		16.6	16.3			16.2	4.9	8.1			7.9	4.8
Progression Factor		1.00	1.00			1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2		0.4	0.1			0.0	0.1	3.4			3.1	0.0
Delay (s)		17.0	16.4			16.2	5.0	11.5			10.9	4.8
Level of Service		B	B			B	A	B			B	A
Approach Delay (s)		16.7			16.2			11.4			10.9	
Approach LOS		B			B			B			B	

Intersection Summary				
HCM Average Control Delay	11.5	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.51			
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	66.2%	ICU Level of Service	C	
Analysis Period (min)	15			

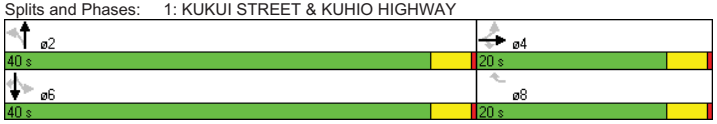
c Critical Lane Group

Queues
1: KUKUI STREET & KUHIO HIGHWAY 11/15/2013

Lane Group	EBT	EBR	WBR	NBL	NBT	SBL	SBT	SBR
Lane Configurations								
Volume (vph)	5	47	7	7	677	30	604	4
Lane Group Flow (vph)	47	51	8	8	759	0	690	4
Turn Type		Perm	custom	Perm		Perm		Perm
Protected Phases	4				2		6	
Permitted Phases		4	8	2		6		6
Minimum Split (s)	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	20.0	20.0	20.0	40.0	40.0	40.0	40.0	40.0
Total Split (%)	33.3%	33.3%	33.3%	66.7%	66.7%	66.7%	66.7%	66.7%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lead/Lag								
Lead-Lag Optimize?								
v/c Ratio	0.10	0.11	0.01	0.03	0.68		0.65	0.00
Control Delay	17.3	6.6	0.0	5.1	12.0		11.5	3.5
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Delay	17.3	6.6	0.0	5.1	12.0		11.5	3.5
Queue Length 50th (ft)	13	0	0	1	160		141	0
Queue Length 95th (ft)	34	21	0	5	270		241	3
Internal Link Dist (ft)	1654				6852		2720	
Turn Bay Length (ft)								
Base Capacity (vph)	475	460	591	314	1114		1064	951
Starvation Cap Reductn	0	0	0	0	0		0	0
Spillback Cap Reductn	0	0	0	0	0		0	0
Storage Cap Reductn	0	0	0	0	0		0	0
Reduced v/c Ratio	0.10	0.11	0.01	0.03	0.68		0.65	0.00

Intersection Summary
Cycle Length: 60
Actuated Cycle Length: 60
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 55
Control Type: Pretimed

Splits and Phases: 1: KUKUI STREET & KUHIO HIGHWAY



HCM Unsignalized Intersection Capacity Analysis
2: OLOHENA ROAD & KAPAA BYPASS 11/15/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Volume (veh/h)	0	409	253	35	151	0	47	0	12	77	310	153
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	445	275	38	164	0	51	0	13	84	337	166
Approach Volume (veh/h)		720			202			64			587	
Crossing Volume (veh/h)		459			51			528			253	
High Capacity (veh/h)		965			1331			913			1135	
High v/c (veh/h)		0.75			0.15			0.07			0.52	
Low Capacity (veh/h)		782			1112			736			935	
Low v/c (veh/h)		0.92			0.18			0.09			0.63	

Intersection Summary				
Maximum v/c High		0.75		
Maximum v/c Low		0.92		
Intersection Capacity Utilization	73.5%	ICU Level of Service	D	

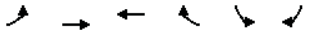
HCM Unsignalized Intersection Capacity Analysis
3: KAPAA BYPASS & KUHIO HIGHWAY 11/15/2013

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	5	686	83	635	576	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	746	90	690	626	5
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		10				
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1497	626	632			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1497	626	632			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	96	0	91			
cM capacity (veh/h)	122	484	951			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	751	90	690	626	5
Volume Left	5	90	0	0	0
Volume Right	746	0	0	0	5
cSH	488	951	1700	1700	1700
Volume to Capacity	1.54	0.09	0.41	0.37	0.00
Queue Length 95th (ft)	999	8	0	0	0
Control Delay (s)	273.5	9.2	0.0	0.0	0.0
Lane LOS	F	A			
Approach Delay (s)	273.5	1.1		0.0	
Approach LOS	F				

Intersection Summary				
Average Delay		95.3		
Intersection Capacity Utilization	79.5%	ICU Level of Service	D	
Analysis Period (min)		15		

HCM Unsignalized Intersection Capacity Analysis
4: OLOHENA ROAD & KAAPUNI ROAD 11/15/2013



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	29	275	66	77	306	15
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	32	299	72	84	333	16
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	155				476	114
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	155				476	114
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				38	98
cM capacity (veh/h)	1425				536	939

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	330	155	349
Volume Left	32	0	333
Volume Right	0	84	16
cSH	1425	1700	547
Volume to Capacity	0.02	0.09	0.64
Queue Length 95th (ft)	2	0	112
Control Delay (s)	0.9	0.0	22.5
Lane LOS	A		C
Approach Delay (s)	0.9	0.0	22.5
Approach LOS			C

Intersection Summary			
Average Delay	9.8		
Intersection Capacity Utilization	52.1%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
5: KAEHULA ROAD & KAAPUNI ROAD 11/15/2013

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	24	0	87	19	1	298
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	26	0	95	21	1	324
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	431	105			115	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	431	105			115	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	96	100			100	
cM capacity (veh/h)	581	950			1474	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	26	115	325
Volume Left	26	0	1
Volume Right	0	21	0
cSH	581	1700	1474
Volume to Capacity	0.04	0.07	0.00
Queue Length 95th (ft)	4	0	0
Control Delay (s)	11.5	0.0	0.0
Lane LOS	B		A
Approach Delay (s)	11.5	0.0	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	26.5%	ICU Level of Service	A
Analysis Period (min)	15		

Attachment G
Level-of-Service Worksheets for Existing PM Peak Hour Conditions

HCM Signalized Intersection Capacity Analysis
1: KUKUI STREET & KUHIO HIGHWAY 11/15/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0			4.0	4.0	4.0			4.0	4.0
Lane Util. Factor		1.00	1.00			1.00	1.00	1.00			1.00	1.00
Frt		1.00	0.85			0.86	1.00	0.99			1.00	0.85
Flt Protected		0.96	1.00			1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)		1788	1583			1611	1770	1844			1858	1583
Flt Permitted		0.96	1.00			1.00	0.26	1.00			0.95	1.00
Satd. Flow (perm)		1788	1583			1611	489	1844			1776	1583
Volume (vph)	34	6	20	0	0	15	6	585	42	33	627	2
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	37	7	22	0	0	16	7	636	46	36	682	2
RTOR Reduction (vph)	0	0	16	0	0	12	0	4	0	0	0	1
Lane Group Flow (vph)	0	44	6	0	0	4	7	678	0	0	718	1
Turn Type	Perm		Perm			custom	Perm			Perm		Perm
Protected Phases		4						2			6	
Permitted Phases	4		4			8	2			6		6
Actuated Green, G (s)		16.0	16.0			16.0	36.0	36.0			36.0	36.0
Effective Green, g (s)		16.0	16.0			16.0	36.0	36.0			36.0	36.0
Actuated g/C Ratio		0.27	0.27			0.27	0.60	0.60			0.60	0.60
Clearance Time (s)		4.0	4.0			4.0	4.0	4.0			4.0	4.0
Lane Grp Cap (vph)		477	422			430	293	1106			1066	950
v/s Ratio Prot								0.37				
v/s Ratio Perm		0.02	0.01			0.01	0.01				c0.40	0.00
v/c Ratio		0.09	0.01			0.01	0.02	0.61			0.67	0.00
Uniform Delay, d1		16.5	16.2			16.2	4.9	7.6			8.1	4.8
Progression Factor		1.00	1.00			1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2		0.4	0.1			0.0	0.2	2.5			3.4	0.0
Delay (s)		16.9	16.3			16.2	5.0	10.1			11.5	4.8
Level of Service		B	B			B	A	B			B	A
Approach Delay (s)		16.7			16.2			10.1			11.4	
Approach LOS		B			B			B			B	

Intersection Summary				
HCM Average Control Delay	11.1	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.49			
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	69.9%	ICU Level of Service	C	
Analysis Period (min)	15			

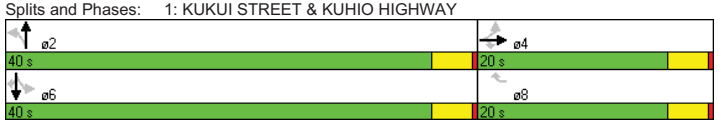
c Critical Lane Group

Queues
1: KUKUI STREET & KUHIO HIGHWAY 11/15/2013

Lane Group	EBT	EBR	WBR	NBL	NBT	SBL	SBT	SBR
Lane Configurations								
Volume (vph)	6	20	15	6	585	33	627	2
Lane Group Flow (vph)	44	22	16	7	682	0	718	2
Turn Type		Perm	custom	Perm		Perm		Perm
Protected Phases	4				2		6	
Permitted Phases		4	8	2		6		6
Minimum Split (s)	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	20.0	20.0	20.0	40.0	40.0	40.0	40.0	40.0
Total Split (%)	33.3%	33.3%	33.3%	66.7%	66.7%	66.7%	66.7%	66.7%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lead/Lag								
Lead-Lag Optimize?								
v/c Ratio	0.09	0.05	0.03	0.02	0.61		0.67	0.00
Control Delay	17.3	8.3	0.1	5.2	10.5		12.1	3.5
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Delay	17.3	8.3	0.1	5.2	10.5		12.1	3.5
Queue Length 50th (ft)	12	0	0	1	132		151	0
Queue Length 95th (ft)	33	14	0	5	223		257	2
Internal Link Dist (ft)	1654				6852		2720	
Turn Bay Length (ft)								
Base Capacity (vph)	477	438	631	293	1111		1066	951
Starvation Cap Reductn	0	0	0	0	0		0	0
Spillback Cap Reductn	0	0	0	0	0		0	0
Storage Cap Reductn	0	0	0	0	0		0	0
Reduced v/c Ratio	0.09	0.05	0.03	0.02	0.61		0.67	0.00

Intersection Summary
Cycle Length: 60
Actuated Cycle Length: 60
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 55
Control Type: Pretimed

Splits and Phases: 1: KUKUI STREET & KUHIO HIGHWAY



HCM Unsignalized Intersection Capacity Analysis
2: OLOHENA ROAD & KAPAA BYPASS 11/15/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Volume (veh/h)	0	253	116	79	310	0	143	0	155	77	209	117
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	275	126	86	337	0	155	0	168	84	227	127
Approach Volume (veh/h)		401			423			324			438	
Crossing Volume (veh/h)		397			155			359			578	
High Capacity (veh/h)		1014			1226			1045			877	
High v/c (veh/h)		0.40			0.34			0.31			0.50	
Low Capacity (veh/h)		826			1017			854			704	
Low v/c (veh/h)		0.49			0.42			0.38			0.62	

Intersection Summary					
Maximum v/c High		0.50			
Maximum v/c Low		0.62			
Intersection Capacity Utilization	88.5%	ICU Level of Service		E	

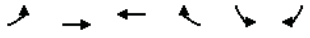
HCM Unsignalized Intersection Capacity Analysis
3: KAPAA BYPASS & KUHIO HIGHWAY 11/15/2013

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	12	343	464	766	577	14
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	13	373	504	833	627	15
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		10				
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2052	627	642			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2052	627	642			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	41	13	46			
cM capacity (veh/h)	22	426	938			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	386	504	416	416	627	15
Volume Left	13	504	0	0	0	0
Volume Right	373	0	0	0	0	15
cSH	441	938	1700	1700	1700	1700
Volume to Capacity	0.87	0.54	0.24	0.24	0.37	0.01
Queue Length 95th (ft)	227	82	0	0	0	0
Control Delay (s)	57.9	13.2	0.0	0.0	0.0	0.0
Lane LOS	F	B				
Approach Delay (s)	57.9	5.0			0.0	
Approach LOS	F					

Intersection Summary				
Average Delay	12.3			
Intersection Capacity Utilization	69.4%	ICU Level of Service	C	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
4: OLOHENA ROAD & KAAPUNI ROAD 11/15/2013



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	20	87	169	257	110	30
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	95	184	279	120	33
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	463				461	323
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	463				461	323
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				78	95
cM capacity (veh/h)	1098				547	718

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	116	463	152
Volume Left	22	0	120
Volume Right	0	279	33
cSH	1098	1700	577
Volume to Capacity	0.02	0.27	0.26
Queue Length 95th (ft)	2	0	26
Control Delay (s)	1.7	0.0	13.5
Lane LOS	A		B
Approach Delay (s)	1.7	0.0	13.5
Approach LOS			B

Intersection Summary				
Average Delay	3.1			
Intersection Capacity Utilization	39.2%	ICU Level of Service	A	
Analysis Period (min)	15			

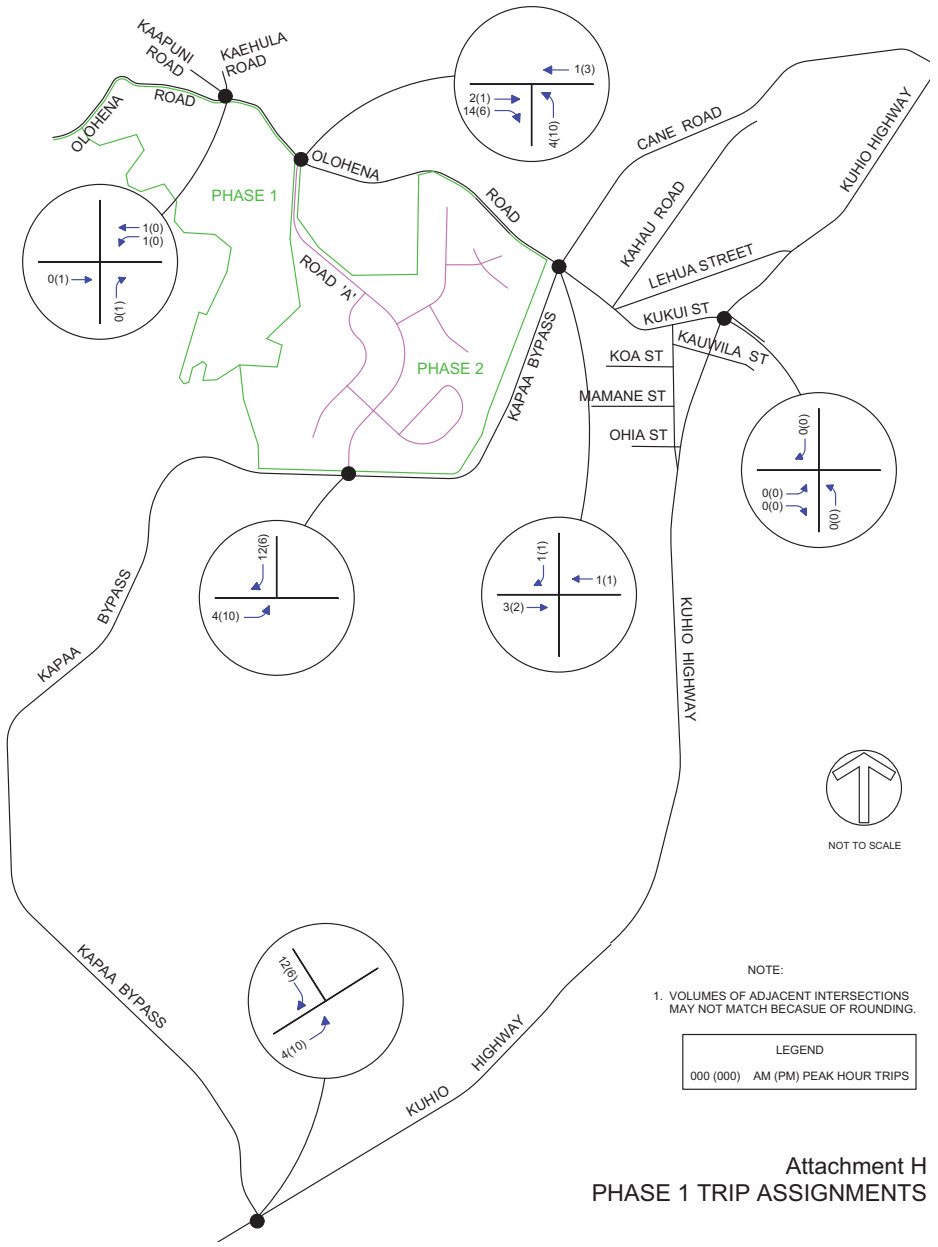
HCM Unsignalized Intersection Capacity Analysis
5: KAEHULA ROAD & KAAPUNI ROAD

11/15/2013

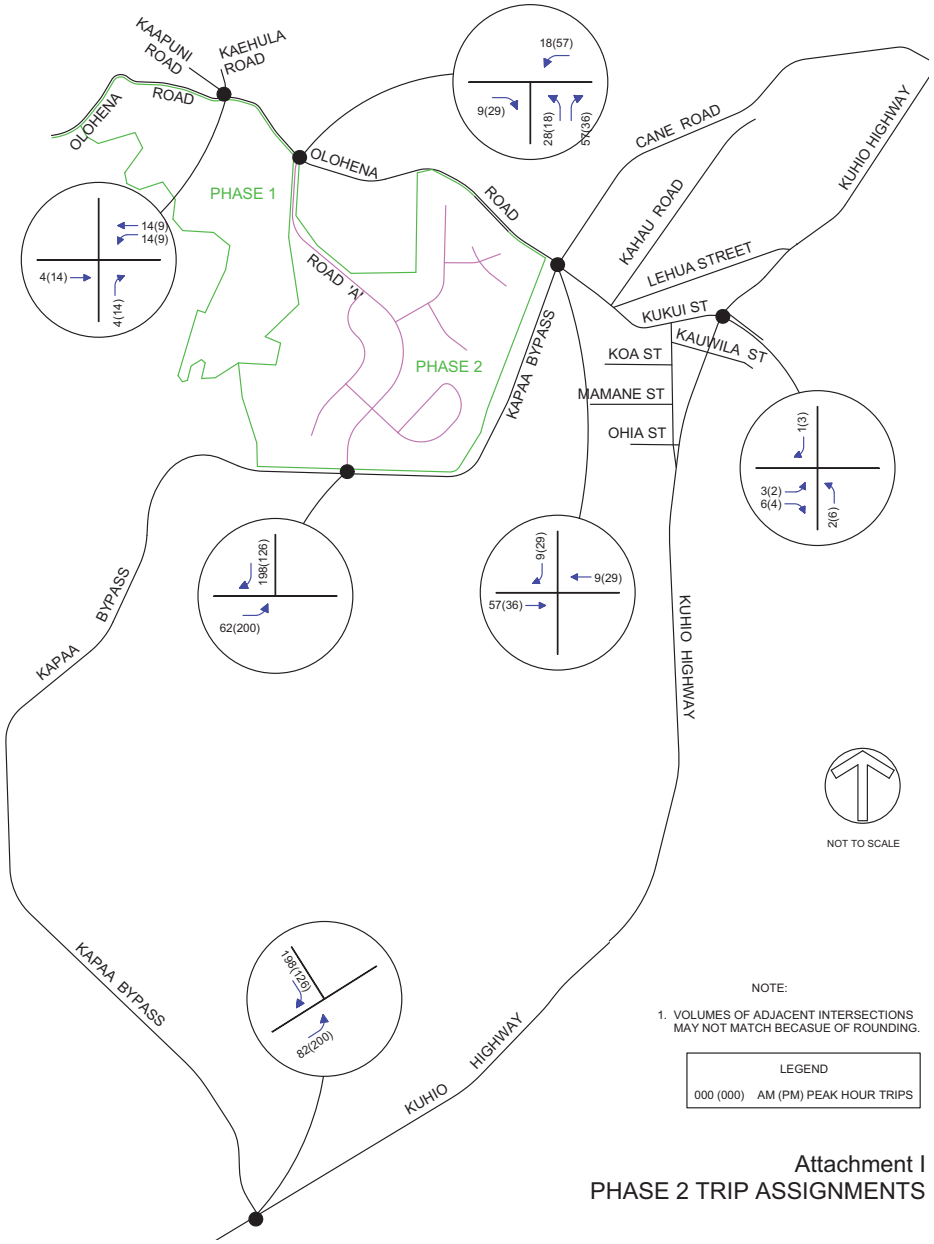
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	10	0	263	14	2	130
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	0	286	15	2	141
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	439	293			301	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	439	293			301	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	98	100			100	
cM capacity (veh/h)	574	746			1260	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	11	301	143
Volume Left	11	0	2
Volume Right	0	15	0
cSH	574	1700	1260
Volume to Capacity	0.02	0.18	0.00
Queue Length 95th (ft)	1	0	0
Control Delay (s)	11.4	0.0	0.1
Lane LOS	B		A
Approach Delay (s)	11.4	0.0	0.1
Approach LOS	B		

Intersection Summary			
Average Delay		0.3	
Intersection Capacity Utilization		24.7%	ICU Level of Service A
Analysis Period (min)		15	



Attachment H
PHASE 1 TRIP ASSIGNMENTS

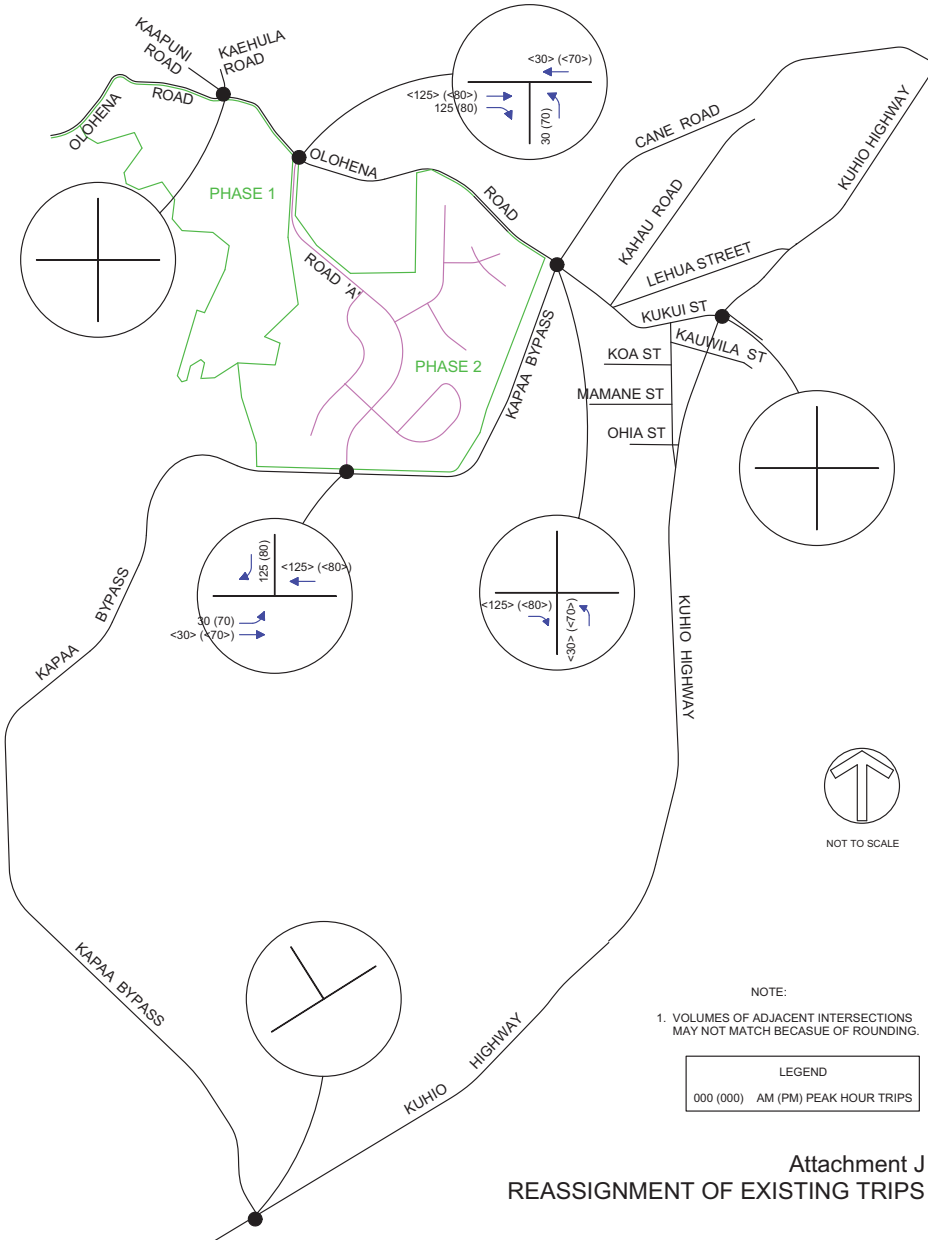


NOTE:

1. VOLUMES OF ADJACENT INTERSECTIONS MAY NOT MATCH BECASUE OF ROUNDING.

LEGEND	
000 (000)	AM (PM) PEAK HOUR TRIPS

Attachment I
PHASE 2 TRIP ASSIGNMENTS

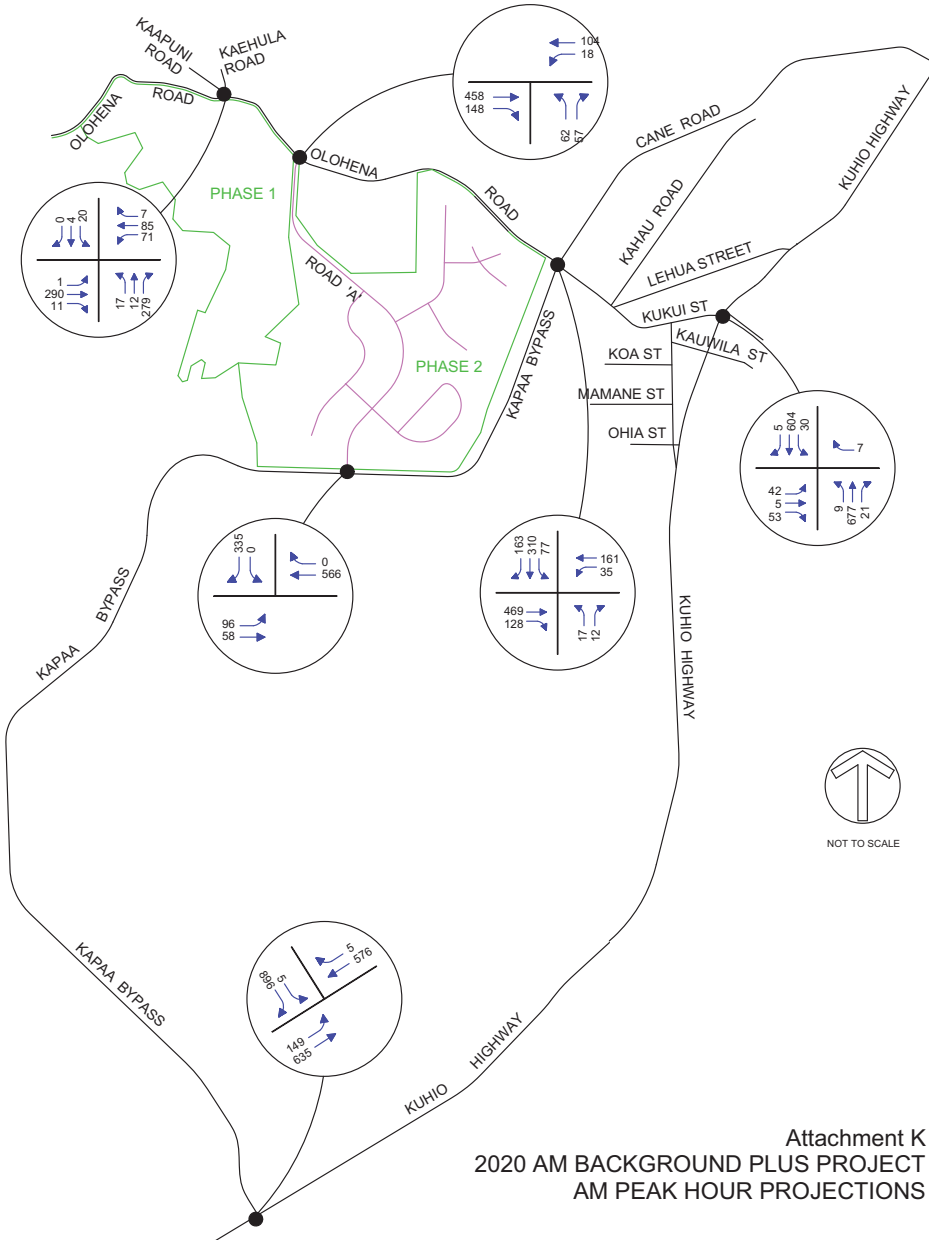


NOTE:

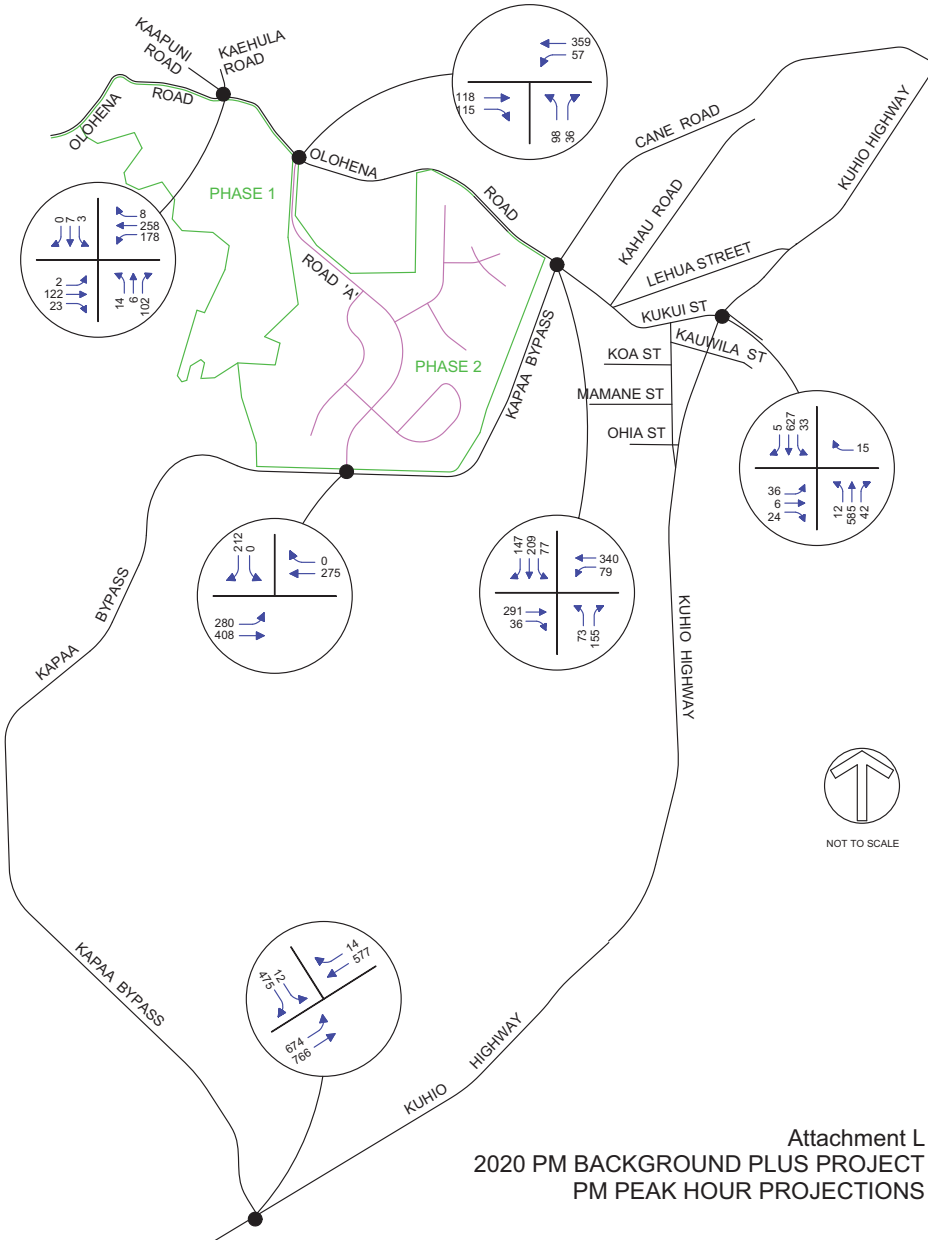
1. VOLUMES OF ADJACENT INTERSECTIONS MAY NOT MATCH BECASUE OF ROUNDING.

LEGEND	
000 (000)	AM (PM) PEAK HOUR TRIPS

Attachment J
REASSIGNMENT OF EXISTING TRIPS



Attachment K
2020 AM BACKGROUND PLUS PROJECT
AM PEAK HOUR PROJECTIONS



Attachment L
2020 PM BACKGROUND PLUS PROJECT
PM PEAK HOUR PROJECTIONS

Attachment M
Level-of-Service Worksheets for 2020 Background Plus Project
AM Peak Hour Conditions

HCM Signalized Intersection Capacity Analysis
1: KUKUI STREET & KUHIO HIGHWAY 12/2/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0			4.0	4.0	4.0			4.0	4.0
Lane Util. Factor		1.00	1.00			1.00	1.00	1.00			1.00	1.00
Frt		1.00	0.85			0.86	1.00	1.00			1.00	0.85
Flt Protected		0.96	1.00			1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)		1782	1583			1611	1770	1854			1858	1583
Flt Permitted		0.96	1.00			1.00	0.28	1.00			0.95	1.00
Satd. Flow (perm)		1782	1583			1611	523	1854			1774	1583
Volume (vph)	42	5	53	0	0	7	9	677	21	30	604	5
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	46	5	58	0	0	8	10	736	23	33	657	5
RTOR Reduction (vph)	0	0	43	0	0	6	0	2	0	0	0	2
Lane Group Flow (vph)	0	51	15	0	0	2	10	757	0	0	690	3
Turn Type	Perm		Perm			custom	Perm			Perm		Perm
Protected Phases		4						2			6	
Permitted Phases	4		4			8	2			6		6
Actuated Green, G (s)		16.0	16.0			16.0	36.0	36.0			36.0	36.0
Effective Green, g (s)		16.0	16.0			16.0	36.0	36.0			36.0	36.0
Actuated g/C Ratio		0.27	0.27			0.27	0.60	0.60			0.60	0.60
Clearance Time (s)		4.0	4.0			4.0	4.0	4.0			4.0	4.0
Lane Grp Cap (vph)		475	422			430	314	1112			1064	950
v/s Ratio Prot								c0.41				
v/s Ratio Perm		0.03	0.04			0.00	0.02				0.39	0.00
v/c Ratio		0.11	0.04			0.00	0.03	0.68			0.65	0.00
Uniform Delay, d1		16.6	16.3			16.2	4.9	8.1			7.9	4.8
Progression Factor		1.00	1.00			1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2		0.5	0.2			0.0	0.2	3.4			3.1	0.0
Delay (s)		17.1	16.5			16.2	5.1	11.5			10.9	4.8
Level of Service		B	B			B	A	B			B	A
Approach Delay (s)		16.7			16.2			11.4			10.9	
Approach LOS		B			B			B			B	

Intersection Summary					
HCM Average Control Delay	11.6	HCM Level of Service		B	
HCM Volume to Capacity ratio	0.51				
Actuated Cycle Length (s)	60.0	Sum of lost time (s)		8.0	
Intersection Capacity Utilization	66.2%	ICU Level of Service		C	
Analysis Period (min)	15				

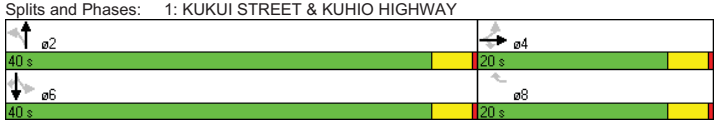
c Critical Lane Group

Queues
1: KUKUI STREET & KUHIO HIGHWAY 12/2/2013

Lane Group	EBT	EBR	WBR	NBL	NBT	SBL	SBT	SBR
Lane Configurations								
Volume (vph)	5	53	7	9	677	30	604	5
Lane Group Flow (vph)	51	58	8	10	759	0	690	5
Turn Type		Perm	custom	Perm		Perm		Perm
Protected Phases	4				2		6	
Permitted Phases		4	8	2		6		6
Minimum Split (s)	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	20.0	20.0	20.0	40.0	40.0	40.0	40.0	40.0
Total Split (%)	33.3%	33.3%	33.3%	66.7%	66.7%	66.7%	66.7%	66.7%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lead/Lag								
Lead-Lag Optimize?								
v/c Ratio	0.11	0.12	0.01	0.03	0.68		0.65	0.01
Control Delay	17.4	6.4	0.0	5.3	12.0		11.5	3.2
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Delay	17.4	6.4	0.0	5.3	12.0		11.5	3.2
Queue Length 50th (ft)	14	0	0	1	160		141	0
Queue Length 95th (ft)	36	23	0	6	270		241	3
Internal Link Dist (ft)	1654				6852		2720	
Turn Bay Length (ft)								
Base Capacity (vph)	475	465	591	314	1114		1064	952
Starvation Cap Reductn	0	0	0	0	0		0	0
Spillback Cap Reductn	0	0	0	0	0		0	0
Storage Cap Reductn	0	0	0	0	0		0	0
Reduced v/c Ratio	0.11	0.12	0.01	0.03	0.68		0.65	0.01

Intersection Summary
Cycle Length: 60
Actuated Cycle Length: 60
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 55
Control Type: Pretimed

Splits and Phases: 1: KUKUI STREET & KUHIO HIGHWAY



HCM Unsignalized Intersection Capacity Analysis
2: OLOHENA ROAD & KAPAA BYPASS 12/2/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Volume (veh/h)	0	469	128	35	161	0	17	0	12	77	310	163
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	510	139	38	175	0	18	0	13	84	337	177
Approach Volume (veh/h)		649			213			32			598	
Crossing Volume (veh/h)		459			18			593			232	
High Capacity (veh/h)		965			1365			866			1155	
High v/c (veh/h)		0.67			0.16			0.04			0.52	
Low Capacity (veh/h)		782			1143			695			953	
Low v/c (veh/h)		0.83			0.19			0.05			0.63	

Intersection Summary					
Maximum v/c High		0.67			
Maximum v/c Low		0.83			
Intersection Capacity Utilization		75.6%	ICU Level of Service		D

HCM Unsignalized Intersection Capacity Analysis
3: KAPAA BYPASS & KUHIO HIGHWAY 12/2/2013

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	5	896	149	635	576	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	974	162	690	626	5
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		10				
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1640	626	632			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1640	626	632			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	94	0	83			
cM capacity (veh/h)	91	484	951			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	979	162	690	626	5
Volume Left	5	162	0	0	0
Volume Right	974	0	0	0	5
cSH	487	951	1700	1700	1700
Volume to Capacity	2.01	0.17	0.41	0.37	0.00
Queue Length 95th (ft)	1676	15	0	0	0
Control Delay (s)	479.7	9.6	0.0	0.0	0.0
Lane LOS	F	A			
Approach Delay (s)	479.7	1.8		0.0	
Approach LOS	F				

Intersection Summary			
Average Delay	191.4		
Intersection Capacity Utilization	92.5%	ICU Level of Service	F
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
4: OLOHENA ROAD & KAAPUNI ROAD 12/2/2013

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	29	279	71	92	310	15
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	32	303	77	100	337	16
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	177				493	127
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	177				493	127
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				36	98
cM capacity (veh/h)	1399				523	923

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	335	177	353
Volume Left	32	0	337
Volume Right	0	100	16
cSH	1399	1700	534
Volume to Capacity	0.02	0.10	0.66
Queue Length 95th (ft)	2	0	121
Control Delay (s)	0.9	0.0	24.0
Lane LOS	A		C
Approach Delay (s)	0.9	0.0	24.0
Approach LOS			C

Intersection Summary			
Average Delay	10.1		
Intersection Capacity Utilization	53.7%	ICU Level of Service	A
Analysis Period (min)	15		

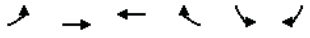
HCM Unsignalized Intersection Capacity Analysis
5: KAEHULA ROAD & KAAPUNI ROAD 12/2/2013

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	24	0	102	19	1	301
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	26	0	111	21	1	327
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	451	121			132	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	451	121			132	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	95	100			100	
cM capacity (veh/h)	566	930			1454	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	26	132	328
Volume Left	26	0	1
Volume Right	0	21	0
cSH	566	1700	1454
Volume to Capacity	0.05	0.08	0.00
Queue Length 95th (ft)	4	0	0
Control Delay (s)	11.7	0.0	0.0
Lane LOS	B		A
Approach Delay (s)	11.7	0.0	0.0
Approach LOS	B		

Intersection Summary				
Average Delay		0.6		
Intersection Capacity Utilization		26.6%	ICU Level of Service	A
Analysis Period (min)		15		

HCM Unsignalized Intersection Capacity Analysis
6: KAPAA BYPASS & ROAD 'A' 12/2/2013



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	96	58	0	566	0	335
Peak Hour Factor	0.87	0.87	0.90	0.90	0.80	0.80
Hourly flow rate (vph)	110	67	0	629	0	419
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	629				602	314
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	629				602	314
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	88				100	42
cM capacity (veh/h)	953				409	726

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	177	629	419
Volume Left	110	0	0
Volume Right	0	629	419
cSH	953	1700	726
Volume to Capacity	0.12	0.37	0.58
Queue Length 95th (ft)	10	0	93
Control Delay (s)	6.2	0.0	16.5
Lane LOS	A		C
Approach Delay (s)	6.2	0.0	16.5
Approach LOS			C

Intersection Summary				
Average Delay		6.5		
Intersection Capacity Utilization		74.2%	ICU Level of Service	D
Analysis Period (min)		15		

HCM Unsignalized Intersection Capacity Analysis
7: OLOHENA ROAD & ROAD 'A' 12/2/2013

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	458	148	18	104	62	57
Peak Hour Factor	0.95	0.95	0.91	0.91	0.80	0.80
Hourly flow rate (vph)	482	156	20	114	78	71
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			638		714	560
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			638		714	560
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		80	87
cM capacity (veh/h)			946		390	528

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	638	134	149
Volume Left	0	20	78
Volume Right	156	0	71
cSH	1700	946	446
Volume to Capacity	0.38	0.02	0.33
Queue Length 95th (ft)	0	2	36
Control Delay (s)	0.0	1.5	17.1
Lane LOS		A	C
Approach Delay (s)	0.0	1.5	17.1
Approach LOS			C

Intersection Summary			
Average Delay	3.0		
Intersection Capacity Utilization	46.7%	ICU Level of Service	A
Analysis Period (min)	15		

Attachment N
Level-of-Service Worksheets for 2020 Background Plus Project
PM Peak Hour Conditions

HCM Signalized Intersection Capacity Analysis
1: KUKUI STREET & KUHIO HIGHWAY 11/15/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0			4.0	4.0	4.0			4.0	4.0
Lane Util. Factor		1.00	1.00			1.00	1.00	1.00			1.00	1.00
Frt		1.00	0.85			0.86	1.00	0.99			1.00	0.85
Flt Protected		0.96	1.00			1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)		1787	1583			1611	1770	1844			1858	1583
Flt Permitted		0.96	1.00			1.00	0.26	1.00			0.95	1.00
Satd. Flow (perm)		1787	1583			1611	489	1844			1776	1583
Volume (vph)	36	6	24	0	0	15	12	585	42	33	627	5
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	39	7	26	0	0	16	13	636	46	36	682	5
RTOR Reduction (vph)	0	0	19	0	0	12	0	4	0	0	0	2
Lane Group Flow (vph)	0	46	7	0	0	4	13	678	0	0	718	3
Turn Type	Perm		Perm			custom	Perm			Perm		Perm
Protected Phases		4						2			6	
Permitted Phases	4		4			8	2			6		6
Actuated Green, G (s)		16.0	16.0			16.0	36.0	36.0			36.0	36.0
Effective Green, g (s)		16.0	16.0			16.0	36.0	36.0			36.0	36.0
Actuated g/C Ratio		0.27	0.27			0.27	0.60	0.60			0.60	0.60
Clearance Time (s)		4.0	4.0			4.0	4.0	4.0			4.0	4.0
Lane Grp Cap (vph)		477	422			430	293	1106			1066	950
v/s Ratio Prot								0.37				
v/s Ratio Perm		0.03	0.02			0.01	0.03				c0.40	0.00
v/c Ratio		0.10	0.02			0.01	0.04	0.61			0.67	0.00
Uniform Delay, d1		16.6	16.2			16.2	4.9	7.6			8.1	4.8
Progression Factor		1.00	1.00			1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2		0.4	0.1			0.0	0.3	2.5			3.4	0.0
Delay (s)		17.0	16.3			16.2	5.2	10.1			11.5	4.8
Level of Service		B	B			B	A	B			B	A
Approach Delay (s)		16.7			16.2			10.0			11.4	
Approach LOS		B			B			B			B	

Intersection Summary				
HCM Average Control Delay	11.1	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.50			
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	69.9%	ICU Level of Service	C	
Analysis Period (min)	15			

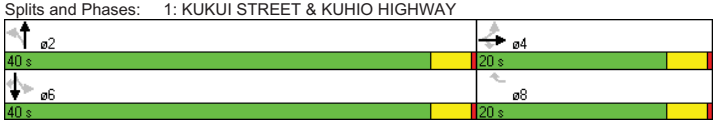
c Critical Lane Group

Queues
1: KUKUI STREET & KUHIO HIGHWAY 11/15/2013

Lane Group	EBT	EBR	WBR	NBL	NBT	SBL	SBT	SBR
Lane Configurations								
Volume (vph)	6	24	15	12	585	33	627	5
Lane Group Flow (vph)	46	26	16	13	682	0	718	5
Turn Type		Perm	custom	Perm		Perm		Perm
Protected Phases	4				2		6	
Permitted Phases		4	8	2		6		6
Minimum Split (s)	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	20.0	20.0	20.0	40.0	40.0	40.0	40.0	40.0
Total Split (%)	33.3%	33.3%	33.3%	66.7%	66.7%	66.7%	66.7%	66.7%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lead/Lag								
Lead-Lag Optimize?								
v/c Ratio	0.10	0.06	0.03	0.04	0.61		0.67	0.01
Control Delay	17.3	8.0	0.1	5.5	10.5		12.1	3.2
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Delay	17.3	8.0	0.1	5.5	10.5		12.1	3.2
Queue Length 50th (ft)	13	0	0	2	132		151	0
Queue Length 95th (ft)	34	15	0	7	223		257	3
Internal Link Dist (ft)	1654				6852		2720	
Turn Bay Length (ft)								
Base Capacity (vph)	476	441	631	293	1111		1066	952
Starvation Cap Reductn	0	0	0	0	0		0	0
Spillback Cap Reductn	0	0	0	0	0		0	0
Storage Cap Reductn	0	0	0	0	0		0	0
Reduced v/c Ratio	0.10	0.06	0.03	0.04	0.61		0.67	0.01

Intersection Summary
Cycle Length: 60
Actuated Cycle Length: 60
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 55
Control Type: Pretimed

Splits and Phases: 1: KUKUI STREET & KUHIO HIGHWAY



HCM Unsignalized Intersection Capacity Analysis
2: OLOHENA ROAD & KAPAA BYPASS 12/2/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Volume (veh/h)	0	291	36	79	340	0	73	0	155	77	209	147
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	316	39	86	370	0	79	0	168	84	227	160
Approach Volume (veh/h)		355			455			248			471	
Crossing Volume (veh/h)		397			79			400			535	
High Capacity (veh/h)		1014			1302			1011			908	
High v/c (veh/h)		0.35			0.35			0.25			0.52	
Low Capacity (veh/h)		826			1086			823			732	
Low v/c (veh/h)		0.43			0.42			0.30			0.64	

Intersection Summary					
Maximum v/c High		0.52			
Maximum v/c Low		0.64			
Intersection Capacity Utilization		77.3%	ICU Level of Service		D

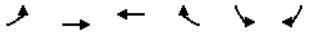
HCM Unsignalized Intersection Capacity Analysis
3: KAPAA BYPASS & KUHIO HIGHWAY 12/2/2013

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	12	475	674	766	577	14
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	13	516	733	833	627	15
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		10				
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2509	627	642			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2509	627	642			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	0	22			
cM capacity (veh/h)	5	426	938			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	529	733	416	416	627	15
Volume Left	13	733	0	0	0	0
Volume Right	516	0	0	0	0	15
cSH	208	938	1700	1700	1700	1700
Volume to Capacity	2.55	0.78	0.24	0.24	0.37	0.01
Queue Length 95th (ft)	1116	203	0	0	0	0
Control Delay (s)	190.1	21.0	0.0	0.0	0.0	0.0
Lane LOS	F	C				
Approach Delay (s)	190.1	9.8			0.0	
Approach LOS	F					

Intersection Summary				
Average Delay		42.4		
Intersection Capacity Utilization		81.0%	ICU Level of Service	D
Analysis Period (min)		15		

HCM Unsignalized Intersection Capacity Analysis
4: OLOHENA ROAD & KAAPUNI ROAD 12/2/2013



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	20	102	178	266	125	30
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	111	193	289	136	33
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	483				492	338
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	483				492	338
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				74	95
cM capacity (veh/h)	1080				525	704

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	133	483	168
Volume Left	22	0	136
Volume Right	0	289	33
cSH	1080	1700	552
Volume to Capacity	0.02	0.28	0.31
Queue Length 95th (ft)	2	0	32
Control Delay (s)	1.5	0.0	14.4
Lane LOS	A		B
Approach Delay (s)	1.5	0.0	14.4
Approach LOS			B

Intersection Summary			
Average Delay	3.3		
Intersection Capacity Utilization	41.1%	ICU Level of Service	A
Analysis Period (min)	15		

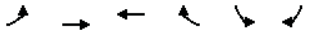
HCM Unsignalized Intersection Capacity Analysis
5: KAEHULA ROAD & KAAPUNI ROAD 12/2/2013

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	10	0	272	14	2	145
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	0	296	15	2	158
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	465	303			311	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	465	303			311	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	98	100			100	
cM capacity (veh/h)	555	736			1250	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	11	311	160
Volume Left	11	0	2
Volume Right	0	15	0
cSH	555	1700	1250
Volume to Capacity	0.02	0.18	0.00
Queue Length 95th (ft)	1	0	0
Control Delay (s)	11.6	0.0	0.1
Lane LOS	B		A
Approach Delay (s)	11.6	0.0	0.1
Approach LOS	B		

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	25.2%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
6: KAPAA BYPASS & ROAD 'A' 12/2/2013

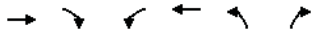


Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	280	408	275	0	0	212
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	304	443	299	0	0	230
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	299				1351	299
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	299				1351	299
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	76				100	69
cM capacity (veh/h)	1262				126	741

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	748	299	230
Volume Left	304	0	0
Volume Right	0	0	230
cSH	1262	1700	741
Volume to Capacity	0.24	0.18	0.31
Queue Length 95th (ft)	24	0	33
Control Delay (s)	5.3	0.0	12.0
Lane LOS	A		B
Approach Delay (s)	5.3	0.0	12.0
Approach LOS			B

Intersection Summary			
Average Delay	5.3		
Intersection Capacity Utilization	74.6%	ICU Level of Service	D
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
7: OLOHENA ROAD & ROAD 'A' 12/2/2013



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	118	115	57	359	98	36
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	128	125	62	390	107	39
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			253		705	191
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			253		705	191
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			95		72	95
cM capacity (veh/h)			1312		384	851

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	253	452	146
Volume Left	0	62	107
Volume Right	125	0	39
cSH	1700	1312	450
Volume to Capacity	0.15	0.05	0.32
Queue Length 95th (ft)	0	4	35
Control Delay (s)	0.0	1.5	16.8
Lane LOS		A	C
Approach Delay (s)	0.0	1.5	16.8
Approach LOS			C

Intersection Summary			
Average Delay	3.7		
Intersection Capacity Utilization	52.9%	ICU Level of Service	A
Analysis Period (min)	15		

Attachment O
Comments from State of Hawaii Department of Transportation and Responses Relative to DRAFT TIAR Submitted June 6, 2012

	Comment	Response
1.	The study area is too limited. The limits of the study area needs to be expanded to include the Kuhio Highway/Olohena Road intersection, Kuhio Highway/Temporary Kapaa Bypass Road intersection and other intersections along Kuhio Highway to a point where the development's project generated traffic impact is less than 3%.	Per our telephone conversation, we believe that the Kuhio Highway/Olohena Road intersection referred to is the intersection of Kuhio Highway at Kukui Street. It was also agreed that the study area would be expanded to include the two intersections noted. Based on the traffic distribution patterns noted during the traffic counts and the existing street network, only a small amount of will have a destination along Kuhio Highway between Kukui Street and Kapaa Bypass.
2.	The traffic volumes from the Kapaa County swimming pool and park on the 3.1 acre park site shall be in the trip generation and distribution calculations.	Based on trip generation data provided in Trip Generation, 8th Edition, the park will generate less than five (5) trips per hour during either the a morning or afternoon peak hour. This amount of traffic is too little to impact the level-of-service calculations. Therefore, this project was not included in the trip generation calcuations.
3.	The average pass-by trip percentage of approximately 80% for land use 820 appears to be too high for the commercial uses. The pass-by trip percentage shall be validated.	Per our telephone conversation, it was agreed that the trip generation calculations would be revised to use a pass-by percentage of 34% rather than 80%. The report has been revised accordingly.

Attachment P
Comments from County of Kauai Department of Public Works and Responses Relative to DRAFT TIAR Submitted June 6, 2012

	Comment	Response
1 & 2	Comments not related to TIAR.	
3.	The Traffic Impact Assessment Report (TIAR) needs to be finalized. The report states "A preliminary trip generation analysis was performed to define the scope of work and the study area." in compliance with Hawaii Administrative Rule 16–115-9 which states "all plans, specifications, maps, reports, survey descriptions, and every sheet in a set of design drawings prepared by or under the supervision of a licensed professional engineer, architect, land surveyor, or landscape architect **shall** be stamped with the authorized seal or stamp when filed with public officials, and under the seal or stamp, the authentication **shall** state, "This work was prepared by me or under my supervision," be signed by the licensee, and **shall** state the expiration date of the licensee.	Performing a preliminary trip generation study to define the scope of work is always the first step in the TIAR process. I think the reviewer has interpreted this to mean that the entire TIAR is "preliminary," which is not the case. The TIAR used the trip generation analysis discussed Section K (page 6) of the report. The remainder of the paragraph talks about attaching my engineer's seal. This is provided on the signature page of the report.
4	The TIAR needs to evaluate the development impacts and mitigation actions needed to improve the existing 3-way, skewed intersection of Olohena, Kaapuni and Kaehulua Roads. The report indicates Road 'A' will provide an alternate route to Kapaa Intermediate School since it will be a more direct route for northbound traffic. We are concerned that increased traffic volumes would increase the likelihood of accidents at the 3-way intersection. Realignment of the roadway angles of the intersection may be warranted to increase sight distances and ease turning movements at the intersection.	This intersection was added to the report. The proposed project added little traffic to the intersection and had a minimal impact on the turning movements. Therefore, the TIAR does not provide any recommendation to improve this intersection.
5	The Kapaa Bypass Road is under the jurisdiction of the State Department of Transportation (DOT), Highways Division. Comments relating to access and traffic improvements need to be solicited from State DOT, Highways Division.	See Attachment S.
6 - 24	Comments not related to TIAR.	

[illegible] 2013

[illegible]		[illegible]
1.	[illegible]	[illegible]
	[illegible]	[illegible]
3.	[illegible]	[illegible]

	[illegible]	[illegible]
4.	[illegible]	[illegible]
5.	[illegible]	[illegible]

NEIL ABERCROMBIE
GOVERNOR

GLENN M. OKIMOTO
DIRECTOR

Deputy Directors
FORD N. FUCHIGAMI
RANDY GRUNE
AUDREY HIDANO
JADINE URASAKI

IN REPLY REFER TO:
HWY-PS 2.6887

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

March 26, 2014

Mr. Phillip J. Rowell, P.E.
Phillip Rowell and Associates
47-273 D Hui Iwa Street
Kaneohe, Hawaii 96744

Dear Mr. Rowell:

Subject: Traffic Impact Assessment Report for Kapaa Highlands Subdivision
Kauai, Kapaa, TMK: (4) 4-3-003: 001

Thank you for the opportunity to review the subject Traffic Impact Assessment Report (TIAR) dated December 9, 2013, which evaluates the traffic impact of the proposed Kapaa Highlands Subdivision, a two-phase development consisting of a total of approximately 116 single-family and 700 multi-family units and an 8,000 square feet (SF) neighborhood retail area. The project is located approximately at the intersection of Olohena Road and the (temporary) Kapaa Bypass Road, State Route 5600, with proposed access to both roads. Olohena Road ends on the west side of the intersection with the Kapaa Bypass Road and continues as Kukui Street on the east side of the intersection and Kukui Street which intersects with Kuhio Highway, State Route 56. The Kapaa Bypass Road continues southwest past the proposed subdivision and intersects with Kuhio Highway to the south of Kapaa, thereby bypassing a heavily used segment of Kuhio Highway.

The portion of the Kapaa Bypass that borders the proposed subdivision is still privately owned, however the land owner has agreed by Memorandum of Understanding to dedicate the land under the road upon final subdivision approval being granted.

We have the following comments:

1. In Section K - Project Trip Generation, there is a typographical error for PM single-family units and the AM/PM multi-family formulas should be from 7:00-9:00 am and 4:00-6:00 pm rather than peak hour of generator.

2. In Section M - Traffic Impact Assessment, the southern termini of the Kapaa Bypass being more than two miles away from the project does not alter the fact that the bypass is a limited access facility so traffic on the bypass has limited chance to disperse to other destinations. The trip distribution and volume at the southern termini was not shown in any table. The increase in the amount of traffic is substantial at 12.2% AM and 13.6% PM. The results of the analysis of the Kuhio Highway at Kapaa Bypass Road intersection in Table 11 (2020 Level of Service (LOS) of Unsignalized Intersections) indicates significant increases in delay (LOS F becoming much worse LOS F) for the East to North (left-turn out of the bypass) in both AM and PM, and a moderate delay

increase for the North to West (left-turn into the bypass) (LOS B going to C) in PM. We do not agree with the TIAR conclusion that the project contribution to these LOS F conditions is not significant. A traffic signal warrant analysis of the intersection shall be prepared. Queuing analysis of the left-turn movements are required and queuing onto Kuhio Higway and Kapaa Bypass Road shall not be allowed. Transportation improvements shall be recommended to mitigate project generated impacts.

3. In Section M, the TIAR also makes reference to the project Road A serving as an alternative route from Olohena Road to the Kapaa Bypass, diverting traffic from and thereby improving LOS at the roundabout (Olohena Road and Kapaa Bypass). However, since Road A will pass through the project's Phase 2 residential area the TIAR recommends that various traffic calming measures, including possible all-way stops, be provided for pedestrian safety. Being that the foregoing objectives are in conflict with each other, the traffic diversion and LOS improvement must be verified. Otherwise, mitigation improvements at the eastbound approach of the roundabout may be required to achieve acceptable LOS.

4. The northern end of the Kapaa Bypass Road at its intersection with Kuhio Highway shall be included in the TIAR. Although it is a single lane, one-way road from Kuhio Highway to the Olohena Roundabout, the entry intersection needs to be evaluated.

5. A left-turn warrant study should be conducted for the Kapaa Bypass Road intersection with Road A and a conceptual configuration of the intersection should be provided in the TIAR. Queuing onto the through lanes of the Kapaa Bypass Road shall not be allowed. Access to the Kapaa Bypass Road must be coordinated with and constructed to the satisfaction of the Highways Division, Kauai District Engineer.

If there are any questions, please contact Ken Tatsuguchi, Engineering Program Manager, Highways Planning Branch, at 587-1830. Please reference File Review Number 2014-006 in all contacts and correspondence regarding these comments.

Very truly yours,

GLENN M. OKIMOTO, Ph.D.
Director of Transportation

c: Mr. Greg Allen, Kapaa Highlands

NEIL ABERCROMBIE
GOVERNOR

COPY

FORD N. FUCHIGAMI
INTERIM DIRECTOR

Deputy Directors
RANDY GRUNE
AUDREY HIDANO
ROSS M. HIGASHI
JADINE URASAKI

IN REPLY REFER TO:
HWY-PS 2.7311

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

June 6, 2014

Mr. Phillip J. Rowell, P.E.
Phillip Rowell and Associates
47-273 D Hui Iwa Street
Kaneohe, Hawaii 96744

Dear Mr. Rowell:

Subject: Traffic Consultant Response to HWY-PS 2.6887, Traffic Impact Assessment Report (December 9, 2013), Kapaa Highlands Subdivision, Kapaa, Kauai
TMK: (4) 4-3-003:001

Thank you for your response, transmitted by Greg Allen on April 9, 2014, via email, to our comment letter, HWY-PS 2.6887, dated March 26, 2014, on the traffic impact of the proposed Kapaa Highlands Subdivision.

We amend our prior comments as follows:

1. Comment 2 – Your justification that a traffic signal warrant and queue analysis would not be appropriate is acceptable.

2. Comment 3 – Our concern over "traffic calming" measures along Road A through the subdivision remain, since it would potentially reduce the utility that Road A would divert significant traffic; however your justification is acceptable.

3. Comment4 – Your explanation is acceptable.

4. Comment 5 – A left-turn storage lane from the Kapaa Bypass into Road A of the subdivision may be deferred for the immediate future but the subdivision is still required to provide one should traffic conditions warrant it at no cost to the Department of Transportation (DOT).

With reference to the executed Memorandum of Agreement dated May 30, 2002, the appropriate right-of-way of the Kapaa Bypass with "No Access Permitted" except at existing access (i.e. Road A) along the project frontage, shall be dedicated to the DOT as a condition of the Land Use Commission.

If you have any questions, please contact Gary Ashikawa, Systems Planning Engineer, Highways Division, Planning Branch, at 587-6336. Please reference file review number 2014-006-1 in all contacts and correspondence regarding these comments.

Very truly yours,

FORD N. FUCHIGAMI
Interim Director of Transportation

c: Mr. Greg Allen, Kapaa Highlands, LLC