## **APPENDIX F.**

# State Historic Preservation Division Letter Dated February 27, 2007

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#### STATE OF HAWA'II DEPARTMENT OF LAND AND NATURAL RESOURCES

STATE HISTORIC PRESERVATION DIVISION 601 KAMOKILA HOULEVARD, ROOM 555 KAPOLEI, HAWAII 96707

February 27, 2007

Dr. Michael Dega Scientific Consultant Services, Inc. 711 Kapiolani Boulevard. Suite 975 Honolulu, Hawaji 96813 LOG NO: 2007.0636 DOC NO: 0702MK21 Archaeology

Dear Dr. Dega:

#### SUBJECT: Chapter 6E-42 Historic Preservation Review -Archaeological Inventory Survey on 48.117 Acres for Clayton Nishikawa Kealahou Ahupusa, Makawao District, Island of Maui TMK (2) 2-3-001:174

Thank you for the opportunity to review this revised report which was received by our staff on November 13, 2006 (McGerty et al. 2006, An Archaeological Inventory Survey Report on 48.117 Acres Located in Kealahou Ahupuaa, Kula, Makawao District, Maui Island, Hawaii [TMK: 2-3-001:174])...Scientific Consultant Services, Inc., ms. We have previously provided comments on the draft archaeological inventory survey report (DOC NO: 0610MK35) and recommended the following revisions.

#### 13-276-5 (I) a summary of findings

- (2) Map or maps locating all historic properties, with boundaries and one site location map being a relevant portion of the USGS survey topo map
- (3) Table presenting sites with SIHP number, formal type and possible function
- (4) If multiple sites within a major functional type (religious, burial, perm hab and temp hab) include a summary of each type
- (5) Re-evaluation of ideas on historic land use
- (6) If more than five sites within a major functional type, include:
  - (A) A table itemizing each site and relevant constituent structures
  - (B) Map showing distribution of sites within that functional type

The above revisions have been acceptably addressed in the revised report and accompanying correspondence.

We agree that all of the sites are significant under Criterion "D" for information content. As indicated in the review of the draft report, the historic properties represent pre-Contact agricultural use of the area, and post-Contact use for ranching, agriculture and historic habitation.

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Dr. Michael Dega Page 2

1 - 1

We also believe that archaeological monitoring is warranted. We will await submittal of an archaeological monitoring plan for review and acceptance concurrent with applications for proposed development.

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The report is acceptable. If you have any questions, please contact Dr. Melissa Kirkendall at (808) 243-5169.

Aloha, π Melahie Chinen, Administrator

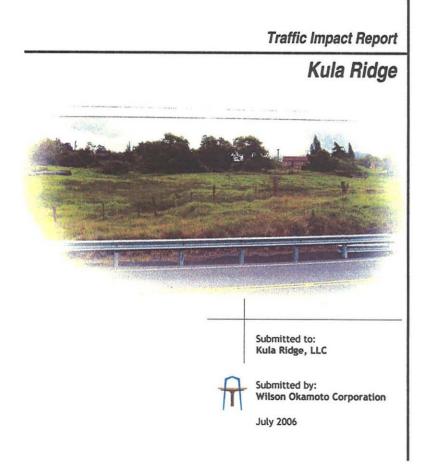
State Historic Preservation Division

MK:kf

Bert Ratte, DPWEM, County of Maui
 Jeff Hunt, Director, Dept. of Planning, 250 S. High Street, Wailuku, HI 96793
 Maui Cultural Resources Commission, Dept. of Planning, 250 S. High Street, Wailuku, HI 96793

## **APPENDIX G.**

# **Traffic Impact Assessment Report, July 2006**



#### TRAFFIC IMPACT REPORT

#### FOR THE

#### KULA RIDGE DEVELOPMENT

Prepared for:

Kula Ridge, LLC 1849 Wili Pa Loop Wailuku, Hawaii 96793

Prepared by:

Wilson Okamoto Corporation 1907 S. Beretania Street, Suite 400 Honolulu, Hawaii 96826 WOC Ref #7551-01

July 2006

#### Traffic Impact Report for the Kula Ridge Development

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#### I. INTRODUCTION

#### A. Purpose of Study

The purpose of this study is to identify and assess the traffic impacts resulting from the proposed Kula Ridge development in Kula on the island of Maui. The project site for the proposed residential development is located east of Lower Kula Road near the Kula Community Center.

#### B. Scope of Study

This report presents the findings and conclusions of the traffic study, the scope of which includes:

- I. Description of the proposed project.
- 2. Evaluation of existing roadway and traffic operations in the vicinity.
- Analysis of future roadway and traffic conditions without the proposed project.
- Analysis and development of trip generation characteristics for the proposed project.
- 5. Superimposing site-generated traffic over future traffic conditions.
- The identification and analysis of traffic impacts resulting from the proposed project.
- Recommendations of improvements, if appropriate, that would mitigate the traffic impacts resulting from the proposed project.

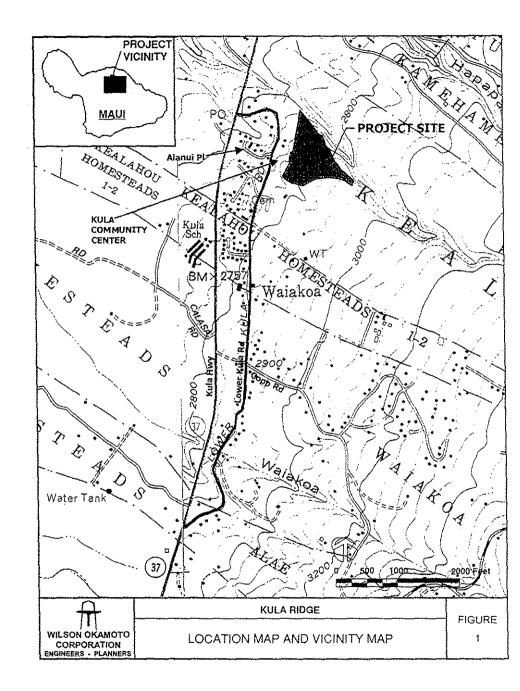
#### **II. PROJECT DESCRIPTION**

#### A. Location

The project site is located along Lower Kula Road east of the Kula Community Center in Kula on the island of Maui (see Figure 1) and is further identified as Tax Map Key: 2-3-001: 174. Access to the project site will be provided via a new access road off Lower Kula Road south of Alanui Place.

B. Project Characteristics

The proposed Kula Ridge development will be located on an approximately 48.117-acre site located east of Lower Kula Road. The project site will be divided into 42 residential lots, 70 affordable housing residential lots, 4 agricultural lots, and



approximately 3-acre park that will be dedicated to the County of Maui. Each residential and agricultural lot is expected to house a residential dwelling that is anticipated to be completed and occupied by the Year 2009. Access to the project site will be provided via a new access road off Lower Kula Road. Figure 2 shows the proposed project site plan.

#### III. EXISTING TRAFFIC CONDITIONS

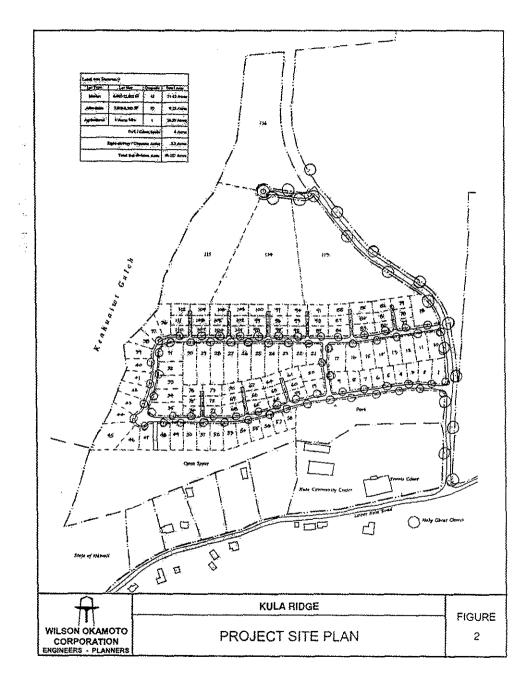
#### A. General

The proposed development will be located east of Lower Kula Road southeast of the intersection with Kula Highway. Kula Highway is a predominately two-way, two-lane State of Hawaii roadway generally oriented in the north-south direction that serves as the primary access road through central Maui between Haleakala Highway in Pukalani and Ulupalakua.

#### B. Area Roadway System

In the vicinity of the project site, Lower Kula Road is a predominantly twoway, two-lane roadway generally oriented in the north-south direction that intersects Kula Highway several times along its alignment. Northwest of proposed project site, Lower Kula Road intersects Alanui Place and the driveway for the Kula Community Center. At this unsignalized intersection, both approaches of Lower Kula Road have one lane that serves all traffic movements. Alanui Place is a two-way, two-lane roadway that provides access to the residential properties along its alignment. At the intersection with Lower Kula Road, the Alanui Place approach has one lane that serves all traffic movements. The westbound approach of the intersection is comprised of the driveway for the Kula Community Center which has one lane that serve all traffic movements at this intersection.

Northwest of intersection with Alanui Place, Lower Kula Road intersects Kula Highway. At this unsignalized T-intersection, the Lower Kula Road approach has one lane that serves left-turn and right-turn traffic movements. The northbound approach of the highway has one lane at this intersection that serves through and right-turn



Traffic Impact Report for the Kula Ridge Development

traffic movements while the southbound approach has one lane that serves left-turn and through traffic movements.

South of the intersection with Alanui Place, Lower Kula Road intersects Copp Road. At this unsignalized intersection, both approaches of Lower Kula Road have one lane that serves all traffic movements. Copp Road is a two-way, two-lane roadway generally oriented in the east-west direction that provides access to the residential neighborhoods along its alignment. At the intersection with Lower Kula Road, both approaches of Copp Road have one lane that serves all traffic movements.

Further southwest, Lower Kula Road intersects Kula Highway again. At this unsignalized t-intersection, the Lower Kula Road approach has one lane that serves left-turn and right-turn traffic movements. The northbound approach of the highway has one lane at this intersection that serves through and right-turn traffic movements while the southbound approach has one lane that serves left-turn and through traffic movements.

- C. Traffic Volumes and Conditions
  - 1. General
    - a. Field Investigation

A field investigation was conducted on May 31 and June 1, 2005, and April 25-26, 2006 and consisted of manual turning movement count surveys during the morning peak period between 6:00 AM and 8:00 AM, and the afternoon peak period between 3:00 PM and 6:00 PM at the following intersections:

- Lower Kula Road, Alanui Place, the Kula Community Center driveway
- Lower Kula Road and Kula Highway (North)
- Lower Kula Road and Copp Road
- · Lower Kula Road and Kula Highway (South)

In addition, 24-hour mechanical traffic count surveys were collected along Lower Kula Road and Kula Highway to verify the peak traffic periods in the project vicinity. Appendix A includes the existing traffic count data.

b. Capacity Analysis Methodology

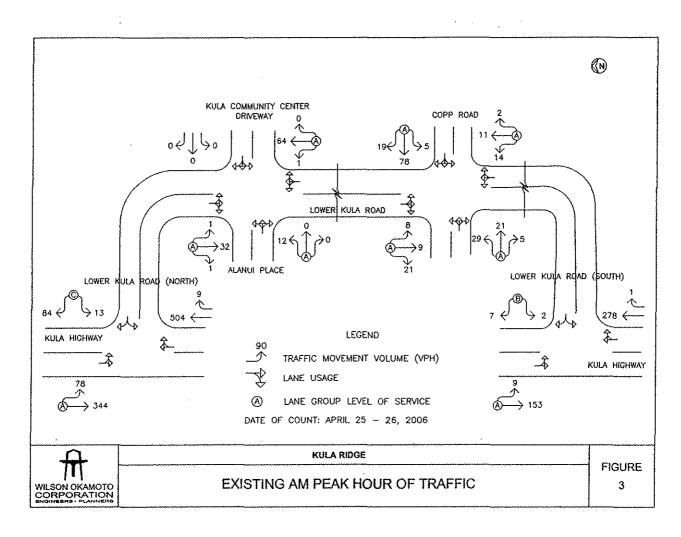
The highway capacity analysis performed in this study is based upon procedures presented in the "Highway Capacity Manual", Transportation Research Board, 2000, and the "Highway Capacity Software", developed by the Federal Highway Administration. The analysis is based on the concept of Level of Service (LOS) to identify the traffic impacts associated with traffic demands during the peak periods of traffic.

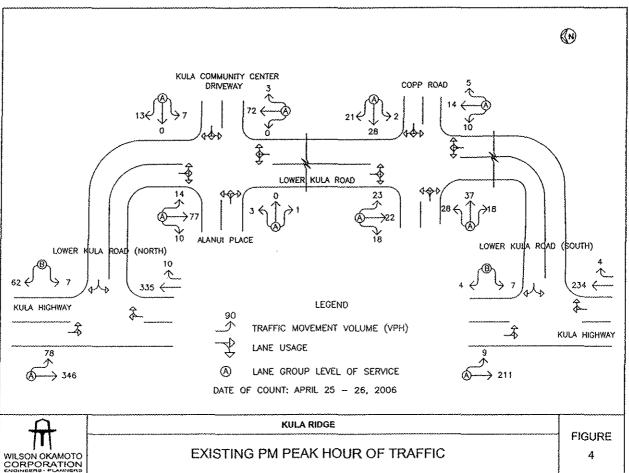
LOS is a quantitative and qualitative assessment of traffic operations. Levels of Service are defined by LOS "A" through "F"; LOS "A" representing ideal or free-flow traffic operating conditions and LOS "F" unacceptable or potentially congested traffic operating conditions.

"Volume-to-Capacity" (v/c) ratio is another measure indicating the relative traffic demand to the road carrying capacity. A v/c ratio of one (1.00) indicates that the roadway is operating at or near capacity. A v/c ratio of greater than 1.00 indicates that the traffic demand exceeds the road's carrying capacity. The LOS definitions are included in Appendix B.

- 2. Existing Peak period Traffic
  - a. Generai

Figures 3 and 4 illustrate the existing AM and PM peak period traffic volumes and operating conditions. The morning peak hour of traffic generally occurs between 7:00 AM and 8:00 AM in the project vicinity. In the afternoon, the peak hour of traffic generally occurs between the hours of 3:45 PM and 4:45 PM. Although the peak hours of traffic generally occur around the same time periods at each of the study intersections, the absolute commuter peak hour time periods for





#### Traffic Impact Report for the Kula Ridge Development

each intersection may differ slightly as shown in Table 1.

#### Table 1: Peak Periods of Traffic

Intersection	AM Peak	PM Peak		
Lower Kula Road/Alanui Place/Kula	7:00 AM to	3:45 PM to		
Community Center Driveway	8:00 AM	4:45 PM		
Lower Kula Road/Kula Highway	7:00 AM to	3:30 PM to		
(North)	8:00 AM	4:30 PM		
Lower Kula Road/Copp Road	7:00 AM to 8:00 AM	3:45 PM to 4:45 PM		
Lower Kula Road/Kula Highway	7:00 AM to	4:00 PM to		
(South)	8:00 AM	5:00 PM		

The analysis is based on the above absolute commuter peak hour time periods for each intersection to identify the traffic impacts resulting from the proposed project. LOS calculations are included in Appendix C.

#### b. Lower Kula Road, Alanui Place, the Kula Community Center Driveway

At the intersection with Alanui Place and the Kula Community Center driveway, Lower Kula Road carries 65 vehicles northbound and 34 vehicles southbound during the AM peak period. During the PM peak period, traffic volumes are higher with 75 vehicles traveling northbound and 101 vehicles traveling southbound. Both approaches of Lower Kula Road operate at LOS "A" during both peak periods.

The Alanui Place approach of the intersection carries 12 vehicles and 4 vehicles eastbound during the AM and PM peak periods, respectively, while the Kula Community Center driveway carries no vehicles during the AM peak period and 20 vehicles during the PM peak period. Both approaches of the intersection operate at LOS "A" during both peak periods.

 Lower Kula Road and Kula Highway (North) At the northern intersection with Kula Highway, Lower Kula
 Road carries 97 vehicles westbound during the AM peak period. During the PM peak period, the traffic volume is less with 69 vehicles traveling westbound. The Lower Kula Road approach of the intersection operates at LOS "C" and LOS "B" during the AM and PM peak periods, respectively.

The Kula Highway approaches of the intersection carry 513 vehicles northbound and 422 vehicles southbound during the AM peak period. During the PM peak period, the overall traffic volume is less with 345 vehicles traveling northbound and 424 vehicles traveling southbound. The critical traffic movement on the highway approaches at this intersection is the southbound left-turn and through traffic movement which operates at LOS "A" during both peak periods.

#### d. Lower Kula Road and Copp Road

At the intersection with Copp Road, Lower Kula Road carries 27 vehicles northbound and 38 vehicles southbound during the AM peak period. During the PM peak period, traffic volumes are slightly higher with 29 vehicles traveling northbound and 63 vehicles traveling southbound. Both approaches of Lower Kula Road operate at LOS "A" during both peak periods.

The Copp Road approaches of the intersection carry 55 vehicles eastbound and 102 vehicles westbound during the AM peak period. During the PM peak period, the overall traffic volume is less with 83 vehicles traveling eastbound and 51 vehicles traveling westbound. Both approaches of Copp Road operate at LOS "A" during both peak periods.

e. Lower Kula Road and Kula Highway (South)

At the southern unsignalized intersection with Kula Highway, Lower Kula Road carries 9 vehicles westbound during the AM peak period. During the PM peak period, the traffic volume is slightly higher with 11 vehicles traveling westbound. The Lower Kula Road

approach of this intersection operates at LOS "B" and LOS "A" during the AM and PM peak periods, respectively.

The Kula Highway approaches of the intersection carry 279 vehicles northbound and 162 vehicles southbound during the AM peak period. During the PM peak period, the overall traffic volume is approximately the same with 238 vehicles traveling northbound and 220 vehicles traveling southbound. The critical traffic movement on the highway approaches at this intersection is the southbound left-turn and through traffic movement which operates at LOS "A" during both peak periods.

#### IV. PROJECTED TRAFFIC CONDITIONS

#### A. Site-Generated Traffic

1. Trip Generation Methodology

The trip generation methodology used in this study is based upon generally accepted techniques developed by the Institute of Transportation Engineers (ITE) and published in "Trip Generation, 7<sup>th</sup> Edition," 2003. The ITE trip generation rates are developed empirically by correlating the vehicle trip generation data with various land use characteristics such as the number of vehicle trips generated per dwelling unit. Table 2 summarizes the project site trip generation characteristics applied to the AM and PM peak periods of traffic.

Table 2: Peak Hour Trip Generation

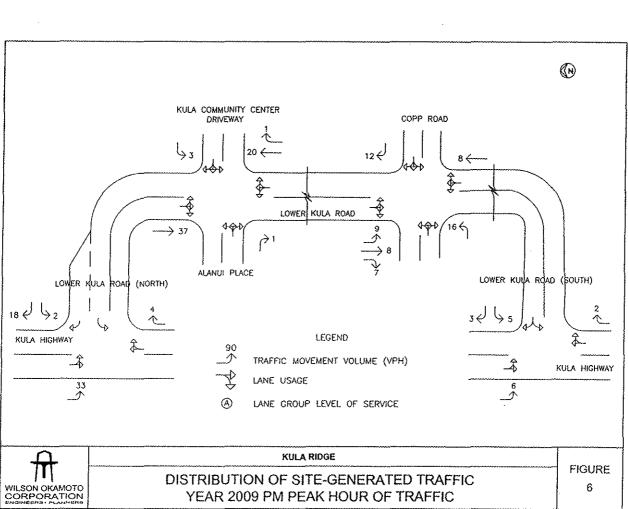
SINGLE-FAMI INDEPENDENT	LY DETACHED HO VARIABLE	DUSING Dwelling Units = 210
		PROJECTED TRIP ENDS
AM PEAK	ENTER	23
	EXIT	68
	TOTAL	91
PM PEAK	ENTER	77
	* EXIT	45
	TOTAL	123

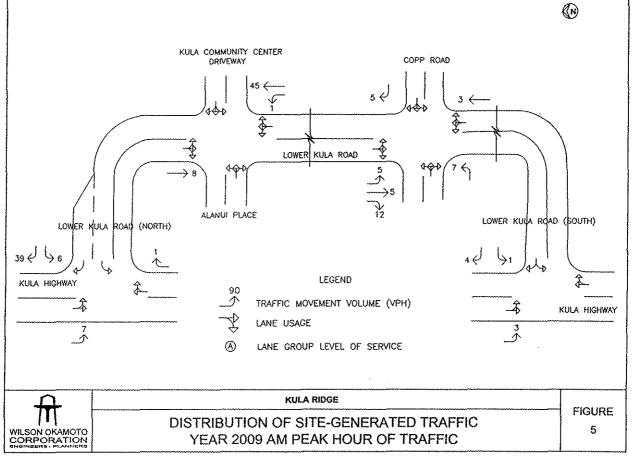
#### Table 2: Peak Hour Trip Generation (Cont'd)

COUNTY PARK INDEPENDENT		Acres of Development = 5
		PROJECTED TRIP ENDS
AM PEAK	ENTER	0
	EXIT	0
	TOTAL	0
PM PEAK	ENTER	0
	EXIT	0
	TOTAL	0
TOTALS		
		PROJECTED TRIP ENDS
AM PEAK	ENTER	23
	EXIT	68
	TOTAL	91
PM PEAK	ENTER	77
	EXIT	45
	TOTAL	123

#### 2. Trip Distribution

Figures 5 and 6 show the distribution of site-generated traffic during the AM and PM peak periods. Access to the proposed Kula Ridge development will be provided via a new access road off Lower Kula Road. The directional distribution of site-generated traffic was based on the prevalent distribution of traffic along Lower Kula Road. As such, 46.9% of the vehicles were assumed to be traveling northbound while 53.1% were assumed to be traveling southbound during the AM peak period. Similarly, during the PM peak period, 67.0% were assumed to be traveling northbound while 33.0% were assumed to be traveling southbound. The directional distribution of traffic at the study intersections was assumed to remain similar to existing conditions.





#### B. Through Traffic Forecasting Methodology

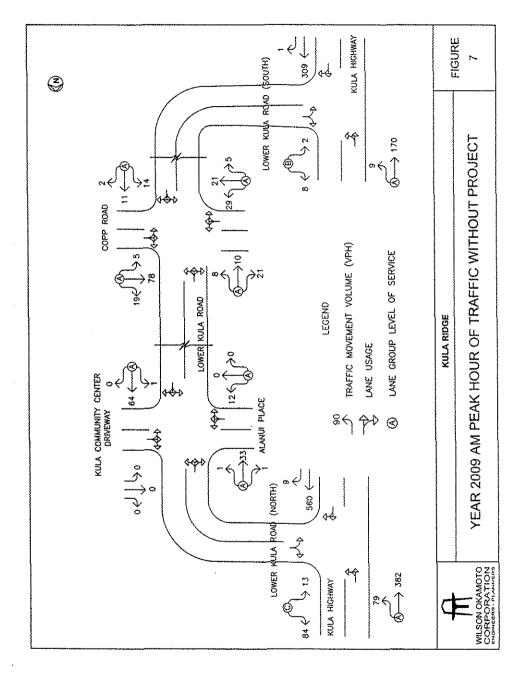
An analysis of both historical traffic data and traffic projections contained within the Maui Long-Range Land Transportation Plan (MLRLTP) was made to determine an appropriate ambient growth of traffic demands in the project vicinity. Using linear regression analyses, historical data indicates an average annual traffic growth rate in the vicinity of approximately 2.7%, while the MLRLTP indicates an average annual traffic growth rate of less than 0.5%. Therefore, for conservative analysis purposes, the travel forecast used in this study is based upon the historical traffic count data obtained from the State Department of Transportation (DOT). Using Year 2006 as the base year, a growth factor of 1.11 was applied to the existing traffic demands on the highways to achieve the projected ambient traffic demands for Year 2009.

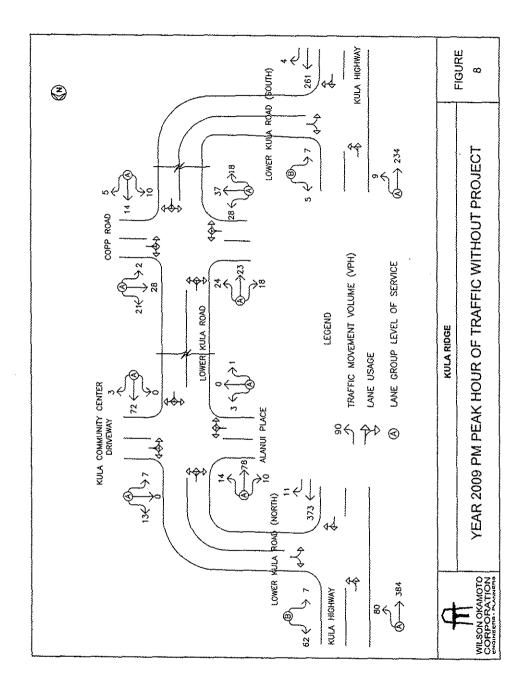
#### C. Other Considerations

The Kula Senior Community Housing project is located southwest of the project site adjacent to Kula Highway across from Kula Elementary School. The proposed residential project is expected to be completed by Year 2006 and is expected to provide approximately 36 one-bedroom units for senior citizens with limited annual incomes. As detailed in the "Traffic Impact Report for the Kula Senior Community Housing" dated December 2005, the proposed development is anticipated to generate 2 trips and 4 trips during the AM and PM peak periods, respectively. These trips were assigned to the street network in the study area to account for trips generated by the proposed senior housing project.

#### D. Total Traffic Volumes Without Project

The projected Year 2009 AM and PM peak period traffic volumes and operating conditions without the proposed Kula Ridge development are shown in Figures 7 and 8, and summarized in Table 3. The existing levels of service are provided for comparison purposes. LOS calculations are included in Appendix D.





		A	M	PM			
Intersection	Critical Approach/ Movement	Exist	Year 2009 w/out Proj	Exist	Year 2009 w/out Proj		
Lower Kula Road/	Eastbound	A	A	A	A		
Alanui Place/	Westbound	-		A	A		
Kula Community Center Driveway	Northbound	A	A	A	A		
Diliveway	Southbound	A	A	A	A		
Lower Kula Road/	Westbound	С	C	В	B		
Kula Highway (North)	Southbound	A	A	A	A		
Lower Kula Road/	Eastbound	A	A	A	A		
Copp Road	Westbound	A	A	A	A		
	Northbound	A	A	A	A		
	Southbound	A	A	A	A		
Lower Kula Road/	Westbound	В	В	B	В		
Kula Highway (South)	Southbound	A	A	A	A		

#### Table 3: Existing and Projected (Without Project) LOS Traffic Operating Conditions

Traffic operations under Year 2009 without project conditions are expected to remain similar to existing conditions. The approaches of the intersections of Lower Kula Road with Alanui Place/Kula Community Center Driveway and Copp Road are expected to continue operating at LOS "A" while the westbound and southbound approaches of the southern intersection with Kula Highway are anticipated to continue operating at LOS "B" and LOS "A," respectively, during the AM and PM peak periods. Similarly, at the northern intersection of Lower Kula Road with Kula Highway, the westbound approach is anticipated to continue operating at LOS "C" and LOS "B" during the AM and PM peak periods, respectively, while the southbound approach is anticipated to continue operating at LOS "A" during both peak periods.

#### E. Total Traffic Volumes With Project

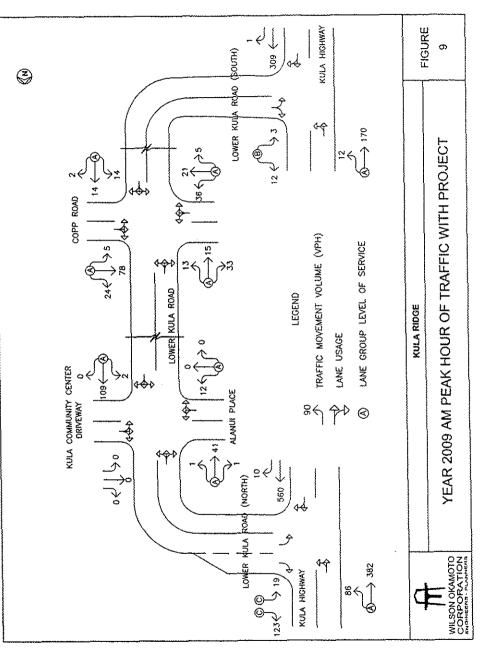
The projected Year 2009 AM and PM peak period traffic volumes and operating conditions with the development of the proposed Kula Ridge development are shown in Figures 9 and 10. The cumulative volumes consist of site-generated traffic superimposed over Year 2009 projected traffic demands. The traffic impacts resulting from the proposed project are addressed in the following section.

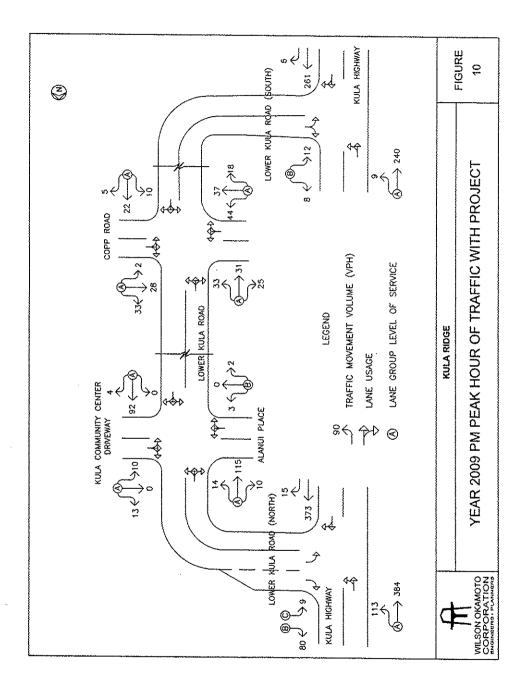
#### V. TRAFFIC IMPACT ANALYSIS

The Year 2009 cumulative AM and PM peak hour traffic conditions with the development of the Kula Ridge development are summarized in Table 4. The westbound approach of the northern intersection of Lower Kula Road with Kula Highway is assumed to have been modified to provide dedicated turning lanes. The existing and projected Year 2009 (Without Project) operating conditions are provided for comparison purposes. LOS calculations are included in Appendix E.

### Table 4: Existing and Projected Year 2009 (With and Without Project) Traffic Operating Conditions

				AM		PM			
Intersection	Critical App Moveme		Exist	Year 2009 w/out w/ Proj Proj		Exist	w/out	2009 w/ Proj	
Lower Kula Road/	Eastbour	nd	A	A	A	A	A	A	
Alanui Place/	Westbou	nd	-	-	-	A	A	A	
Kula Community Center Driveway	Northbou	ınd	A	A	A	A	A	Α	
Direnay	Southbou	nd	A	A	A	A	A	В	
Lower Kula Road/	Westbound	LT	C	C	C	В	В	С	
Kula Highway (North)		RT	1		C	}		В	
	Southbou	A	A	A	A	A	A		
Lower Kula Road/	Eastbou	nd	A	A	A	A	A	A	
Copp Road	Westbou	nd	A	A	A	A	A	A	
	Northbou	und	A	A	A	A	A	A	
	Southbou	A	A	A	A	A	A		
Lower Kula Road/	Westbou	ind	В	B	В	В	В	В	
Kula Highway (South)	Southbor	und	A	A	A	A	A	A	





Traffic operations in the vicinity of the proposed Kula Ridge development are expected, in general, to remain similar to existing and Year 2009 without project conditions despite the anticipated increases in traffic along the surrounding roadways due to the project. The critical movements at the intersection of Lower Kula Road with Alanui Place/Kula Community Center Driveway, Copp Road, and Kula Highway (South) are expected to operate at levels of service similar to Year 2009 without project conditions during both peak hours of traffic with the exception of the southbound approach of the intersection with Alanui Place/Kula Community Center driveway which is expected to deteriorate from LOS "A" to LOS "B" during the PM peak period. At the northern intersection of Lower Kula Road with Kula Highway, the westbound left-turn traffic movement is anticipated to operate at LOS "C" and LOS "B" during the AM and PM peak periods, respectively.

#### VI. RECOMMENDATIONS

Based on the analysis of the traffic data, the following are the recommendations of this study to be incorporated in the project design.

- Maintain sufficient sight distance for motorists to safely enter and exit all project roadways.
- Provide adequate on-site loading and off-loading service areas and prohibit off-site loading operations.
- Provide adequate turn-around area for service, delivery, and refuse collection vehicles to maneuver on the project site to avoid vehicle-reversing maneuvers onto public roadways.
- Provide sufficient turning radii at all project roadways to avoid or minimize vehicle encroachments to oncoming traffic lanes.
- Provide exclusive left-turn and right-turn lanes on the westbound approach of Lower Kula Road at the northern intersection with Kula Highway to minimize the impact of left-turning vehicles on the higher volume of right-turning vehicles on that approach.

#### VII. CONCLUSION

The proposed Kula Ridge development is expected to include 42 residential lots, 70 affordable housing residential lots, 4 agricultural lots, and an approximately 3-acre park that will be dedicated to the County of Maui. With the implementation of the aforementioned recommendations, the proposed Kula Ridge development is not expected to have a significant impact on traffic operations in the vicinity of the project site. The critical movements at the study intersection along Lower Kula Road are expected continue operating at acceptable levels of service despite the addition of site-generated vehicles to the surrounding roadway network due to the provision of exclusive turning lanes at the northerm intersection of Lower Kula Road with Kula Highway.

APPENDIX A

#### EXISTING TRAFFIC COUNT DATA

### Wilson Okamoto Corporation 1907 S. Beretania Street, Suite 400 Honolulu, HI 96826

Counter: D1-0769 Counted By: GMT Weather: CLEAR

													Pag	e No 11	
							Groups Pri						-		
			Kula Hi			L	ower Kula F	)		Kula Hi					
			Southb	bound			Westba				Northb				
	Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	App. Total	Int, Total
{	Factor	1.0	1.0	1.0	}	1.0	1.0	1.0		1.0	1.0	1.0			
	06:00 AM	2	17	0	19	0	0	10	10	0	59	0	59	0	88
	06:15 AM	2	29	0	31	0	0	7	7	0	68	0	68	0]	106
	06:30 AM	3	50	0	53	1	0	8	9	0	63	1	64 (	0	126
	06:45 AM	11.	45	0	56	3	0	10	13 ]	Q	99	0	99	0	168
	Total	18	141	0	159	4	0	35	39	0	289	1	290	0	488
	07:00 AM	11	63	٥	74	3	0	17	20	0	103	2	105	0	199
	07:15 AM	13	94	ó	107	1	Û	22	23	0	139	0	139	0)	269
	07:30 AM	15	122	ō	137	3	0	22	25	0	140	2	142	0	304
	07;45 AM	39	65	Ó	104	6	0	23	29	Ó	122	5	127	0	260
	Total	78	344	0	422	13	0	84	97	0	504	9	513	0	1032
	Grand Total	96	485	0	581	17	0	119	136	0	793	10	803 (	0	1520
	Apprch %	16.5	83,5	0.0		12.5	0.0	87.5		0.0	98.8	1.2	1	1	
	Total %	6.3	31.9	0.0	38.2	1.1	0.0	7.8	8.9	0.0	52.2	0.7	52.8	0.0	

		Kula Hig Southb			Lower Kula Hwy (North) Westbound					Kula Hi Northb				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	App. Total	Int, Total
Peak Hour From 06:00	AM to 07:45	AM - Peak 1	f of 1											
Intersection	07:00 AM								1					
Volume	78	344	Ó	422	13	0	84	97	0	504	9	513	0	1032
Percent	18.5	81.5	0.0		13.4	0.0	86.6		0.0	98.2	1,8	1		
07:30 Volume	15	122	Q	137	3	0	22	25	0	140	2	142	0]	304
Peak Factor														0.849
High Int.	07:30 AM				07:45 AM				07:30 AM				5:45:00 AM	
Voluma	15	122	0	137	6	0	23	29	0	140	2	142		
Peak Factor				0.770				0.836	1			0.903	1	

### Wilson Okamoto Corporation 1907 S. Beretania Street, Suite 400 Honolulu, HI 96826

Counter: D1-0769 Counted By: GMT Weather: **ĆLEAR** 

File Name : KulLkul-nP Site Code : 00000001 Start Date : 5/31/2005 Page No : 1

								Groups Pr						
				Kula Hig		h)		ver Kula Hiş	Lov		ighway			
			Northbe				Westb			bound				
Int To	App. Total	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right [	Theu	Left	Start Time
			1.0	1.0	1.0		1.0	1.0	1.0		1.0	1.0	1.0	Factor
1	0	59	0	59	0	24	23	0	1	70	0	54	16	03:00 PM
1	0	81	4	77	0	16	13	0	3	72	0	59	13	03:15 PM
2	0 {	89	1	88	0	15	13	0	2	118	0	91	27	03:30 PM
	<u>0</u> [	71	0	71	0	20	17	0	3	98	0	83	15	03:45 PM
7	0	300	5	295	0	75	66	0	9	358	0	287	71	Total
2	ol	100 į	3	97	0	21	20	0	1	106	0	86	20	04:00 PM
2	0	85	6	79	0	13)	12	0	1	103	0	86	17	04:15 PM
1	0	74	1	73	0	20	19	0	1	93	0	75	18	04:30 PM
2	0	87	4	83	0	13	12	0	1	113	0	90	23	04:45 PM
8	0	346	14	332	0	67	63	0	4	415	0	337	78	Total
1	0	57	1	56	Ø	23	22	0	1	103	0	82	21	05:00 PM
2	0	78	2	76	0	17	16	0	1	106	0	72	34	05:15 PM
1	0	75	1	74	0	22	21	0	1	99	0	68	31	05:30 PM
1	0	54	1	63	0	6	6	0	0	106	0	77	29	05:45 PM
7	.01	274	5	269	0	68	65	0	3	414	0	299	115	Total
23	0	920	24	896	0	210	194	0	16	1187	0	923	264	Grand Total
			2.6	97.4	0.0	1	92.4	0.0	7.6		0.0	77.8	22.2	Apprch %
	0.0	39.7	1.0	36.7	0.0	9.1	8.4	0.0	0.7	51.2	0.0	39.8	11,4	Total %

	T	Kula H South	ighway bound		Lower Kula Highway (North) Westbound				]	Kula Hi North				
Start Tim		Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	App. Total	Int. Total
Peak Hour From 03:00 PM to 05:45 PM - Peak 1 of 1														
Intersectio	n 03:30 PM								1			1	· 1	
Valum	a 79	346	0	425	7	0	62	69	0	335	10	345	0	839
Percer	t 18.6	81.4	0.0		10.1	0.0	89.9		0.0	97.1	2.9			
04:00 Volum	20	86	0	106	1	0	20	21	0	97	3	100	Q	227
Peak Facto	r												ļ	0.924
High In	03:30 PM				04:00 PM				04:00 PM			1	2:45:00 PM	
Votum	27	91	0	118	3	0	20	21	0	97	3	100		
Peak Facto	r			0.900				0.821				0.863	ļ	

WILSON OKAMOTO CORPORATION 1907 S. Beretania Street, Suite 400 Honolulu, Hawaii 95826

Counter:D4-3891 Counted:TO Weather:Clear

		Lower Ke			Dwy.	To Kula		enter		Lower Ke		1		Alanu			
		South				West				Northt	ound			Eastb	ound		
Start Time	Left	Thru	Right A	pp. Total	Left	Thru	Right	App. Total	Left	Thru	Right A	pp. Total	Left	Thru	Right A	po. Total	Int. Tota
06;00 AM	0	6	0	6	Ő	0	0	0	1	9	0	10	4	0	1	5	2
06:15 AM	0	5	0	5	0	Û	0	ol	0	5	0	5	2	0	1	3	1
08:30 AM	0	6	0	6	0	0	0	D	0	6	0	6	0	0	0	0	1
06:45 AM	1	7	0	8	0	0		1	1	13	Ó	14	2	0	Ó	2	2
Total	1	24	0	25	Ō	Q	1	1	2	33	0	35	8	0	2	10	7
07:00 AM	0	5	0	5	0	0	0	0	1	12	0	13	4	0	Û	4	2
07:15 AM	0	7	0	7	Ó	0	0	0	0	22	ó	22	5	Ó	ō	5	â
07:30 AM	0	5	0	5	Ó	Ó	Ó	ŏ	Ó	18	ŏ	18	2	õ	ŏ	2	2
07:45 AM	1	15	1	17	0	Ó	Ó	ól	Ð	12	ò	12	1	ō	ó	ĩ	3
Total	1	32	1	34	0	Ó	0	Ó	1	64	Ö	65	12	Ō	Ŏ	12	11
Grand Total	2	56	1	59	0	0	1	11	3	97	0	100	20	0	2	22	18
Apprch %	3.4	94,9	1.7	1	Ď	Ó	t00		3	97	ò		90.9	õ	9,1		
Total %	1.1	30.8	0.5	32.4	Ó	Ó	0.5	0.5	1.6	53.3	õ	54.9	\$1	ō	1.1	12.1	

	1	Lower Ki	ula Road		Dwy	. To Kula	Comm. Ce	nter	1		ula Road	Ĩ		Alanul	Place		
		South				Westt	pound			North	bound			Eastb	ound		
Start Time		Thru		pp. Total	Lett	Thru	Right /	App. Total	Left	Thru	Right A	op. Total	Left	Thru	Right A	App. Total	Int. Total
Peak Hour Analysis				ak 1 of 1	CL											area and and a	
Peak Hour for Entire		1 Begins a	t 07:00 AM														
07:00 AM	0	5	0	5	0	0	0	0	1	12	0	13 İ	4	0	٥	4	22
07:15 AM		7	0	7	0	0	0	٥	0	22	ò	22	5	ō	ō	5	34
07:30 AM	0	5	0	5	0	0	0	0	0	18	0	18	2	Ó	Ó	2	25
07:45 AM	1	15	1	17	0	0	0	0	0	12	Ó	12	1	Ó	ō	1	30
Total Volume	1	32	1	34	0	0	0	0	1	64	0	65	12	0	0	12	111
% App. Total	2.9	94.1	2.9		0	0	0	1	1.5	98.5	0		100	Ó	Ó	1	
PHF	.250	.533	.250	.500	.000	.000	.000	.000	,250	.727	.000	.739	.600	.000	.000	.600	.816

#### WILSON OKAMOTO CORPORATION 1907 S. Beretania Street, Suite 400 Honotulu, Hawaii 95826

Counter:D4-3891 Counted:TO Weather:Clear

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File Name : LowAlaP Site Code : 0000000: Start Date : 4/25/2001 Page No : 1

40-000									ps Printed	Unshifted								
	· · · · · · · · · · · · · · · · · · ·		Lower Ki		1	Dwy		Comm. Co	enter			ula Road	(			Place		
			South				West					bound				ound		
	Start Time	Left	Thru	Right A	pp. Total	Left	Thru	Right	App. Total	Left	Thni	Right	App. Total	Left	Thru	Right {	App. Total	int. Total
	03:00 PM	3	13	1	17	1	Q	01	1	1	16	. 1	18	0	0	0	0	36
	03:15 PM	3	17	1	21	0	0	1	1	0	`t5	1	t6	1	1	Û	2	40
	03:30 PM	3	17	0	20	0	1	2	. 3	1	7	1	9	1	0	0	1	33
	03:45 PM	5	22	3	30	.1	0	. 5	6	0	18	. 1	19	0	0	0	0	55
	Total	14	69	5	85	2	1	8	11	2	56	4	62	2	1	0	3	164
	04:00 PM	3	17	4	24	3	0	4	7	0	11	0	11	0	0	1	1	43
	04:15 PM	4	23	2	29	t	0	1	2	0	16	2	18	0	0	0	0	49
	04:30 PM	2	15	1	18	2	0	3	5	0	27	0	27	3	0	0	3	53
	04:45 PM	3	19	1	23	0		1	1	0	9	0	9	0	0	1	. 1	34 179
	Totai	12	74	8	94	6	0	9	15	0	63	2	65	3	Q	2	5	179
	05:00 PM	0	13	1	14	0	0	0	0	0	17	3	. 20	0	0	0	0	34
	05:15 PM	1	11	1	13	t	0	3	4	0	13	0	13	1	0	0	1	31
1	05:30 PM	1	17	2	20	1	0	5	6	1	12	2	15	2	0	t	3	44
	05:45 PM	0	15	2	17	0	0	0	0	1	16	0	17	. 1	0	0	1	35
	Totai	2	56	6	64	2	0	8	10	2	58	5	65	4	0	1	. 5	144
Gr	and Total	28	199	19	246	10	1	25	36	4	177	11	192	9	1	3	13	487
	Apprch %	11.4	80.9	7.7		27,8	2.8	69.4	j	2.1	92.2	5.7		69.2	7.7	23.1	1	
	Total %	5.7	40.9	3.9	50.5	2,1	0.2	5.1	7.4	0.8	36.3	2.3	39.4	1.8	0.2	0.6	2.7	
	•				,													

[]		Lower Ki	ula Road		Dwy	To Kula C	comm. Cer	iter		Lower Ki	la Road	T		Alanui	Place		
		South	bound			Westb				Northt		1		Eastb	ound		
Start Time	Left	Thru	Right A	pp. Total	Left	Thru	Right	op. Total	Left	Thru	Right A	pp. Total	Left	Thru	Right A	pp. Total	Int, Total
Peak Hour Analysis I																	
Peak Hour for Entire	Intersection	i Beglins a	103:45 PM														
03:45 PM	5	22	Э	30	1	0	5	6	0	18	1	19	0	0	0	0	55
04:00 PM	3	17	4	24	3	0	4	7	0	11	0	11	0	0	1	1	43
04:15 PM	4	23	2	29	1	0	1	2	0	16	2	18	0	0	0	0	49
04:30 PM	2	15	1	18	2	0	3	5	0	27	0	27	3	0	0	3	53
Totał Volume	14	77	10	101	7	0	13	20	0	72	3	75	3	0	1	- 4	200
% App. Total	13.9	76.2	9.9		35	0	65		0	96	4		75	0	25		
PHF	.700	.837	.625	.842	.583	.000	.650	.714	.000	.667	.375	.694	.250	.000	.250	.333	.909

#### WILSON OKAMOTO CORPORATION 1907 S. Beretania Street, Suite 400 Honolulu, Hawali 96826

Counter:T-1839 Counted:KT Weather:Clear

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								ps Printed-	Unshifted								
		Lower Ku	Ia Road			Сорр	Road	1		Lower K				Copp	Road		
		South				Westl				North					ound		
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
06:00 AM	3	0	2	5	1	8	2	11	2	0	0	2	1	0	0	1	19
06:15 AM (	4	1	0	5	0	14	0	14	2	2	0	4	3	1	0	4	27
06:30 AM	0	1	3	4	0	18	2	20	2	1	1	4	5	0	1	6	34
06:45 AM	2	4	3	9	0		6	13	4	2	1	7	2	2	2	6	35
Total	9	6	8	23	1	47	10	58	10	5	2	17	11	3	3	17	115
07:00 AM	2	1	4	7	1	18	6	25	3	2	0	5	3	2	1	6	43
07:15 AM	2	4	4	t0	3	24	5	32	6	5	0	11	9	3	0	12	65
07:30 AM	3	3	6	12 (	0	25	4	29	3	1	1	5	9	7	1	17	63
07:45 AM	1	1	7	9	1	11	4	16	2	3	1	6	8	9	3	20	51
Total	8	9	21	38	5	78	19	102	14	11	2	27	29	21	5	55	222
				-													
Grand Total	17	15	29	61	6	125	29	160	24	16	4	44	40	24	8	72	337
Apprch %	27.9	24.6	47.5	1	3,8	78.1	18.1		54.5	36.4	9.1		55.6	33.3	11,1	1	
Total %	5	4.5	8.6	18.1	1.8	37.1	8.6	47.5	7.1	4.7	1.2	13.1	11.9	7.1	2.4	21.4	

		Lower Ke Southi				Copp West	Road			Lower K North	ula Road bound	1		Copp Eastb	Road		
Start Time	Left	Thru		op. Total	Left	Thru	Right	App. Total	Left	Thru	Right A	pp, Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis I	From 06:00	AM to 07:	45 AM - Pe	ak 1 of 1													
Peak Hour for Entire	Intersection	Begins a	t 07:00 AM														
07:00 AM	2	1	4	7	1	18	6	25	3	2	0	5	3	2	1	6	43
07:15 AM	2	4	4	10	3	24	5	32	6	5	0	11	9	3	0	12	65
07:30 AM	3	3	6	12	0	25	4	29	3	1	· 1	5	9	7	1	17	63
07:45 AM	1	1	7	9	1	11	4	16	2	з	1	6	8	9	3	20	51
Total Volume	8	9	21	38	5	78	19	102	14	11	2	27	29	21	5	55	222
% App. Total	21.1	23.7	55.3		4.9	76.5	18.6	(	51.9	40,7	7.4		52.7	38.2	9.1	h	
PHF	.667	.563	.750	.792	.417	.780	.792	.797	.583	.550	.500	.614	.806	.583	.417	.688	.854

Wilson Okamoto Corporation 1907 S. Beretania Street, Suite 400 Honolulu, HI 96826

Counter:T-1839 Counted:KT Weather:Clear File Name : LowCopP Site Code : 00000001 Start Date : 4/25/2006 Page No : 1

							Grou	os Printed-	Unshifted								
1		Lower Ki	ula Road	1		Copp	Road				ula Road			Copp			
		South	bound			West				North				Eastb			
Start Time	Left	Thru	Right A	pp. Total	Left	Thru	Right	App. Total	Left	Thru	Right A		Left	Thru	Right /	App. Total	Int. Total
03:00 PM [	5	Ç	5	10 (	1	11	5	17 {	3	7	3	13	3	6	1	10	50 55
03:15 PM	7	3	5	15 [	1	8	6	15	4	5	0	9	3	10	3	16	55 47
03:30 PM	4	3	5	12	1	10	7	18	Ū,	3	Ű	3	4		3	14   21	57
03:45 PM	5	7	5	17		7		13	<u>.</u>	3					****		209
Total	21	13	20	54 }	3	36	24	63	10	18	3	31)	19	31	11	61	209
											•	0.1	•	0	£	103	55
04:00 PM	9	7	5	21	1	6	4	11	2	4.	2	8	2	13	3	15	60
04:15 PM	5	3	6	14	0	7	5	12	1	4	2	(1	13	13		20	54
04:30 PM	4	5	2	11)	1	8	6	15	4	3	1	<u></u>	6	8	0	20	45
04:45 PM	8	1	6	15	0		2	10			<u> </u>		25	38	16	79	214
Total	26	16	19	61	2	29	17	48 ]	9	12	5	26	20	-30	10	191	214
									•	•			7	17	e	29	56
05:00 PM ]	3	3	5	11	0	7	3	10	0	5	0	2		11	5	18	39
05:15 PM	1	4	0	5	2	4	6	12	1	1	2	4	4	13	3	24	52
05:30 PM	6	10	1	17	2	3	3	8	Ű	3	0	3	0		2	541	66
05:45 PM	1	11	2	14	3	6	3	12	3				25	22	14	102	213
Total	11	28	8	47	7	20	15	42	4	15	3	22	25	63	14	1021	213
												79	69	132	41	242	636
Grand Total	58	57	47	162	12	85	56	153	23	45	11	19	28.5	54.5	16.9	242	030
Approh %	35.8	35.2	29		7.8	55.6	36.6		29.1	57 7.1	13.9 1.7	12.4	28.5	20.8	6.4	38.1	
Total %	9.1	9	7,4	25.5	1.9	13.4	8.8	24.1	3.6	7.1	1.7	12.4 (	10.8	20.0	0.4	30.11	

ſT		Lower Ku	la Road	<u> </u>		Сорр	Road			Lower Ke		-		Copp	Road		
l ì		Southb	ound			Westb				Northi				Eastb			
Start Time	Left	Thru	Right A		Left	Thru	Right	App. Total	Left	Thru	Right Ap	p. Total	Leít	Thru	Right A	op. Total	Int. Total
Peak Hour Analysis I				k 1 of 1													
Peak Hour for Entire	Intersection	Begins at	03:45 PM									~ 1	•	•	•	011	67
03:45 PM	5	7	5	17	0	7	6	13	3	3	0	6	a	8	4	21	57
04:00 PM	9	7	5	21	1	6	4	11	2	4	2	8	2	8	5	15	55
04:15 PM	5	3	6	14	0	7	5	12 [	1	4	2	71	11	13	3	27	60
04:30 PM	4	5	2	21	1	6	6	15	4	3		8	6	8	6	20	54
Total Volume	23	22	18	63	2	28	21	51	10	14	5	29	28	37	18	83	226
% App, Total	36.5	34.9	28.6		3.9	54.9	41.2		34.5	48.3	17.2		33.7	44.8	21.7		
PHF	.639	.786	.750	750	.500	.875	.875	.850	.625	.875	.625	.906	,636	.712	.750	.769	.942

### Wilson Okamoto Corporation 1907 S. Beretania Street, Suite 400 Honolulu, HI 96826

Counter: D1-0528 Counted By: TO Weather: CLEAR

File Name : KulLkul-sA Site Code : 00000004 Start Date : 6/1/2005

Page No :1

												Pag	IENO :1	
						Groups Pr								
		Kula Hi			Low	er Kula Hig		uth)		Kula H				
		Southb	bnuo			Westb				North				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	App. Total	Int. Total
Factor	1.0	1.0	1.0		1.0	1.0	1.0		1.0	1.0	1.0			
06:00 AM	0	15	0	15	0	0	0	0	0	35	0	35	0	50
06:15 AM	1	23	0	24	0	0	0	0	0	36	0	36	0	60
06:30 AM	0	38	0	38	2	0	1	3	0	47	1	48	0	89
06:45 AM	. 0	36	0	36	1	0	. 1	2	0		2	59	0	97
Total	1	112	0	113	3	0	. 2	5	0	175	3	178	0	296
07:00 AM	1	28	0	29	0	0	2	2	0	61	1	62	0	93
07:15 AM	2	15	0	17	1	0	2	3	0	80	0	80	0	100
07;30 AM	3	52	0	55	t	0	2	3	C	84	0	84	0	142
07:45 AM	3	58	0	61	0	0	1	1	0	53	0	53	0	115
Total	9	153	0	162	2	0	7	9	0	278	1	279 }	0	450
Grand Total	10	265	0	275	5	٥	9	14 }	0	453	4	457	01	746
Apprch %	3.6	96.4	0.0		35.7	0.0	64.3		0,0	99.1	0.9		1	
Total %	1.3	35.5	0.0	36.9	0.7	0,0	1.2	1.9	0.0	60,7	0.5	51.3	0.0	

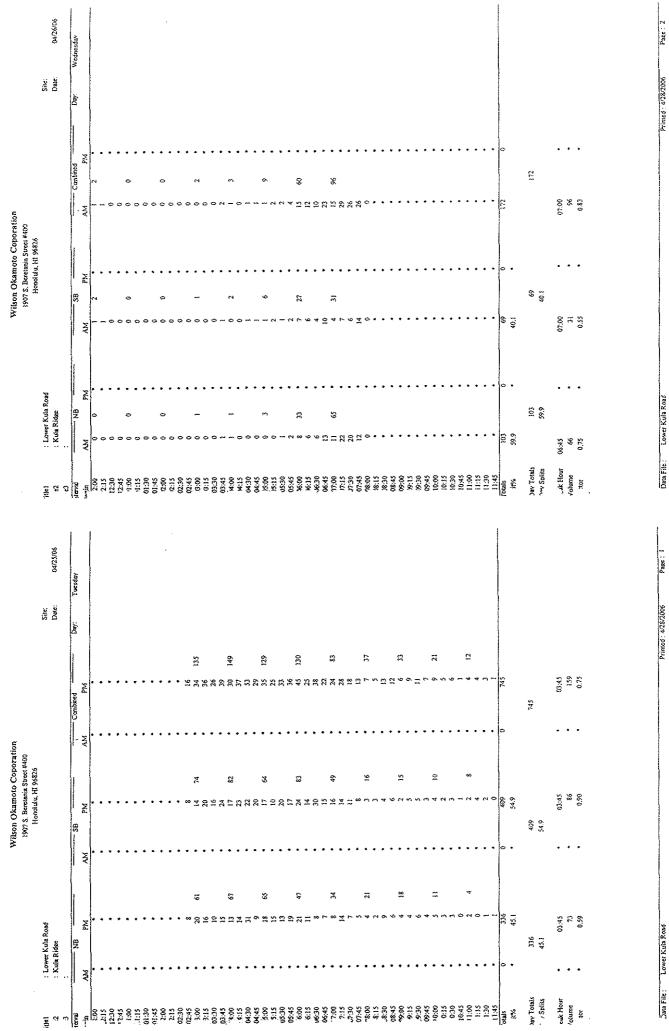
		Kula Hig Southb			Low	er Kula Hig Westb		(b)		Kula Hi Northt				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	App. Total	Int. Total
Peak Hour From 06:00	AM to 07:45	AM - Peak 1	l of 1											
Intersection	07:00 AM			ł					1			1	ł	
Volume	9	153	0	\$62	2	0	7	9	0	278	1	279	0	450
Percent	5.6	94.4	0.0		22.2	0.0	77.8		0.0	99.6	0.4	)		
07:30 Volume	3	52	0	55	1	0	2	3	0	84	0	84	0	142
Peak Factor									1			1		0.792
High Int.	07:45 AM			}	07;15 AM				07:30 AM				5:45:00 AM	
Volume	3	58	0	61 (	1	0	2	3	0	84	0	84	1	
Peak Factor				0.664				0.750				0.830	1	
												•		

#### Wilson Okamoto Corporation 1907 S. Beretania Street, Suite 400 Honolulu, HI 96826

Counter: D1-0528 Counted By: TO Weather; CLEAR

File Name : KulLkul-sP Site Code : 00000004 Start Date : 5/31/2005 Page No : 1

							rinted- Uns							
		Kula H			Lo	wer Kula Hi		uth)		Kula H				
Start Time	Left	South Thru	Right	App. Total	Left	West Thru	Right	App. Total	Left	Northi Thru	Right	App. Total	App. Total	Int, Total
Factor		1,0	1,0	App. 10(a)	1.0	1.0	1.0	App. rotat	1.0	1.0	1.0	App. Lota:	App. Total	
03:00 PM		39		39		······		2		44		44	0	
03:15 PM		40	õ	41	2	ถ้	ī	ŝ	Ŏ	56	ĭ	57	ŏ	101
03:30 PM		52	ō	54	ō	ŏ	3	ŝ	Ìõ	61	1	62	ō	119
03:45 PM	3	49	ŏ	52	ō	õ	ō	õ	Ō	50	Ó	50	ŏ	102
Total	6	180	0	186	2	0	6	8	0	211	2	213	0	407
04:00 PM	1	60	0	61	5	0	1	6	1 0	61	2	63	0)	130
04:15 PM	3	50	ō	53	ž	ŏ	ò	ž		62	1	63	õ	118
04:30 PM	2	51	0	53	4	ō	3	7	0	51	2	53	0	113
04:45 PM	. 1	58	0	59	1	0	1	2	0	63	4	67	0	128
Total	7	219	0	226	12	0	5	17	0	237	9	246	0	489
05:00 PM	1	53	0	54	0	0	5	5	1 0	53	1	54	01	113
05:15 PM	1	55	Ó	56	1	0	2	3	0	60	Û	60	0	119
05:30 PM	2	42	0	44	1	0	0	1	0	52	2	54	0	99
05:45 PM	1	54	0	55	1	0	1	2	0	49	4	53	0	110
Total	5	204	0	209	3	0	8	11	0	214	7	221	0	441
Grand Total	18	603	0	621	17	0	19	36	0	662	18	680	0]	1337
Apprch %		97.1	0.0		47.2	0.0	52.8		0.0	97.4	2.6	1	-	
Total %	1.3	45.1	0.0	46.4	1.3	0.0	1.4	2.7	0.0	49.5	1.3	50.9	0.0	
	1	Kula Hig			LOY	ver Kula Hk		ith)		Kula Hi			-	
Start Time		Southb				Westb				Northb				
Poak Hour From 03:00	Left	Thru	Right	App. Tolal	Left	Thru	Right	App. Total	Left	Thru	Right	App, Total	App, Total	Int. Total
Intersection		PM Peak	1 01 1						(			,	1	
Volume	04.00 PM	219	0	226	12	0	5	17	0	237	9	246	0	489
Percent	3.1	96.9	0.0	220	70.6	0.0	29.4		0.0	96.3	3.7	240	•	405
04:00 Volume	1	60	0	61	5	0.0	1	6	Ň	61	2	63	0	130
Peak Factor	•		v		5	v	•	0	Ť		•	00	~	0.940
	04:00 PM				04:30 PM				04:45 PM				2:45:00 PM	
Volume	1	60	0	61	4	0	3	7	0	63	4	67		
Peak Factor				0.926				0.607		- •		0.918		



Page: 1

Frinted: 4/28/2006

Data File : Lower Kula Road

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.t ke2		Highway of school drive	way							Site: Date	: 05	01 /31/05
3	: 7410-	01										
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2:30	•	67		•	58		•	125				
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7:35	•	65		•	68		•	133				
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06:00	•	66	234	•	62	195	•	128	42.9			
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79:00		44	122	•	16	49		60	171			
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7:30	*	26		•	12		•	38				
1:45	•	31		•	31		•	42				
10:00	:	29	81	•	10	19	:	39	100			
10:15 11:30	•	18 15		•	3		•	21 19				
1:45	•	19		•	2		•	21				
:00	•	16	48	•	6	21	•	22	69			
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y Splits		\$6.2			43.8							
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stor	•	0.91		,	0,94		•	0.96				

	•					5. Beretania Stre Ionolulu, HI 968					
35	: Kula									Site:	01
e2			ool driveway							Date:	06/01/05
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01:00	3	<b>\$2</b>		ō	3	•	3	15	•		
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1:30	3		•	0		•	3		•		
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^1:15	4		•	4		•	8		•		
1:30	i		•	4		•	Ś		•		
. 4:45	3		•	11		•	}4		•		
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ns:15	5		•	19		•	24		•		
5:30	7		•	30		•	37		•		
5:45	11		•	31		•	42		•		
06:00	38	122	•	58	275	•	76	397	•		
06:15	25		•	63			88		•		
5:30 K:45	38			62		-	100				
5:45 07:00	41 32	234		92 96	436	•	133 128	670	•		
07:15	32 49	234	4	124	430	•	173	070	•		
7:30	49 80		•	124		•	204		•		
7:45	73		•	92			165		•		
08:00	0		•	0		٠	0		٠		
08:15	•		•	*		+	•		•		
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y Splits		441 33.8			863 66,2			1.304	r		
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.ctor	0.73		•	0.88		•	0.82				

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#### LEVEL OF SERVICE DEFINITIONS

#### LEVEL-OF-SERVICE CRITERIA FOR UNSIGNALIZED INTERSECTIONS

Level of Service (LOS) criteria are given in Table 1. As used here, control delay is defined as the total elapsed time from the time a vehicle stops at the end of the queue to the time required for the vehicle to travel from the last-in-queue position to the first-inqueue position, including deceleration of vehicles from free-flow speed to the speed of vehicles in the queue.

The average total delay for any particular minor movement is a function of the service rate or capacity of the approach and the degree of saturation. If the degree of saturation is greater than about 0.9, average control delay is significantly affected by the length of the analysis period.

#### Table 1: Level-of-Service Criteria for Unsignalized Intersections

Level of Service	Average Control Delay (Sec/Veh)
A	≤10.0
В	>10.0 and $\leq$ 15.0
С	>15.0 and $\leq$ 25.0
D	>25.0 and ≤35.0
E	>35.0 and ≤50.0
F	>50.0

#### APPENDIX B

#### LEVEL OF SERVICE DEFINITIONS

"Highway Capacity Manual," Transportation Research Board, 2000.

#### \_\_TWO-WAY STOP CONTROL SUMMARY\_\_

Analyst: Agency/Co.: ΣW Wilson Okamoto Corporation Date Performed: 6/9/2006 Analysis Time Period: AM Peak Period Alanui Dr/Lower Kula Rd Intersection: Jurisdiction: City Units: U. S. Customary Analysis Year: Existing Project ID: 7551-01 Kula Ridge East/West Street: Alanui Dr North/South Street: Lower Kula Rd Intersection Orientation: NS

Study period (hrs): 1.00

Major Street: Approach	Noi	thbound			Sou	thbour	d	
Movement	1	2	3	1	4	5	6	
	L	T	R	ł	L	T	R	
Volume	1	64	0		1	32	1	
Peak-Hour Factor, PHF	0.74	0.74	0.74		0.50	0.50	0.50	
Hourly Flow Rate, HFR	1	86	0		2	64	2	
Percent Heavy Vehicles	2				2			
Median Type/Storage RT Channelized?	Undivi	lded			/			
Lanes	0	1 0			0	1	0	
Configuration	Ľ	rr.			$L_{c}$	FR		
Upstream Signal?		No				No		
Minor Street: Approach	We	stbound			Eas	stbound	3	
Movement	7	8	9	E	10	11	12	
•••	L	T	R	i	L	T	R	
Volume	0	0	0		12	0	0	
Peak Hour Factor, PHF	1.00	1.00	1.00		0,60	0.60	0.60	
Hourly Flow Rate, HFR	0	0	0		19	0	0	
Percent Heavy Vehicles	2	2	2		2	2	2	
Percent Grade (%)		0				0		
Flared Approach: Exists	?/Storage		No	1			No	1
Lanes	ò	1 (	)		0	1	0	

Approach	NB	SB		Westbound			Ξa	astbound	
Movement	1	4	7	8	9	}	10	11	12
Lane Config	LTR	LTR		LTR		l		LTR	
v (vph)	3	2		0				19	· · · · · ·
C(m) {vph}	1536	1510						808	
v/c	0.00	0.00						0.02	
95% queue length	0.00	0.00						0.07	
Control Delay	7.3	7.4						9.6	
LOS	А	А						А	
Approach Delay								9.6	
Approach LOS								А	

#### APPENDIX C

#### CAPACITY ANALYSIS CALCULATIONS EXISTING PEAK PERIOD TRAFFIC ANALYSIS

#### \_\_\_\_\_TWO-WAY STOP CONTROL SUMMARY\_\_\_\_\_

Analyst:	,
Agency/Co.:	Wilson Okamoto Corporation
Date Performed:	6/9/2006
Analysis Time Period:	PM Peak Period
Intersection:	Alanui Dr/Lower Kula Rd
Jurisdiction:	City
Units: U. S. Customar	,
Analysis Year:	Existing
Project ID: 7551-01	Kula Ridge
East/West Street:	Alanui Dr
North/South Street;	Lower Kula Rd
Intersection Orientat	ion: NS Study period (hrs): 1.00

Major Street:	Approach	Noi	thboun	đ		Sou	thbour	d	
-	Movement	1	2	З		4	5	6	
		L	T	R	ł	L	т	R	
Volume		0	72	3		14	77	10	·
Peak-Hour Fact	or, PHF	0.69	0.69	0.69		0.84	0.84	0.84	
Hourly Flow Ra	te, HFR	0	103	4		16	91	11	
Percent Heavy	Vehicles	2	- ~	~ +		2		~	
Median Type/St RT Channelized		Undiv:	ided			/			
Lanes		0	1	0		0	1	0	
Configuration		Ľ	FR			Lī	rR		
Upstream Signa	11?		No				No		
Minor Street:	Approach	We	stbound			Eas	stbound	1	
	Movement	7	8	9	1	10	11	12	
		L	Ť	R	1	L	т	R	
Volume		7	0	13		3	0	1	
Peak Hour Fact	tor, PHF	0.71	0.71	0.71		0.33	0.33	0.33	
Hourly Flow Ra	ate, HFR	9	0	18		9	0	3	
Percent Heavy	Vehicles	2	2	2		2	2	2	
Percent Grade	(8)		Ð				0		
Flared Approa	ch: Exists?	/Storage		No	1			No	1
Lanes		0	1	0		0	1	0	
Configuration			LTR				LTR		

Approach	NB	SB	Westbound	Eastbound
Movement Lane Config	1 LTR	4 LTR	7 8 9 LTR	10 11 12 LTR
v (vph)	0	16	27	12
C(m) (vph)	1490	1484	854	744
v/c	0.00	0.01	0.03	0.02
95% queue length	0.00	0.03	0.10	0.05
Control Delay	7.4	7.5	9.4	9,9
LOS	A	А	A	A
Approach Delay			9.4	9.9
Approach LOS			А	А

#### HCS+: Unsignalized Intersections Release 5.1

	TWO	-WAY STO	P CONTR	ROL SUM	MARY				
Analyst:	IW								
Agency/Co.:	Wils	on Okamo	to Corr	oratio	n				
Date Performed:		2006	-						
Analysis Time Peri			ođ						
Intersection:		Hwy/Low		a Rd (N	orthi				
Jurisdiction:	Stat				0				
Units: U. S. Custo									
Analysis Year:		ting							
Project ID: 7551-									
East/West Street:		er Kula F	d (Nor	• <b>b</b> 1					
North/South Street		si Kula r NWY		-117					
Intersection Orier				C F		oric	d (hrs	۱.	
Incersection offer	leacion,	NO		30	uay p	erre	0 (1113	* •	
		cle Volu			tment				
	broach		thbound				outhbou		
Mox	rement	1	2	3	4		5	6	
		L	Ť	R	L		T	R	
Volume			504	9	7	8	344		
Peak-Hour Factor,	PHF		0.90	0,90		.77			
Hourly Flow Rate,			560	10		01	446		
Percent Heavy Vehi					2		***	~	
Median Type/Storag		Undivi			, "			-	
RT Channelized?		0.101 V 3			,				
Lanes			1	0		0	1		
Configuration			T				ur i		
Upstream Signal?			No	ix i			No		
opstream signar:			NO				110		
Minor Street: App	proach	Wes	tbound		······································	Ea	estboun	d	
Mor	vement	7	8	9	1 1	0	11	12	
		L	T	R	L		т	R	
Volume		13		84					
Peak Hour Factor,	PHF	0.84		0.84					
Hourly Flow Rate,		15		100					
Percent Heavy Veh.		2		2			•		
Percent Grade (%)		2	0	~			0		
Flared Approach:	Exists?	/Storage		No	1		•		1
Lanes		0		0	•				
Configuration		•	LR	-					
······					···				
<u></u>		Queue Lei			el of	Ser			
Approach	NB	SB		tbound				tbound	
Movement	1	4	7	8	9	1	10	11	12
Lane Config		LT		LR					
v (vph)		101		115					·····
C(m) (vph)		1002		420					
v/c		0.10		0.27					
95% queue length		0.34		1,10					
Control Delay		9.0		15.8					
LOS		A		20.0 C					
				16,8					
Approach Delay									
Approach Delay Approach LOS				C 70'0					

TWO-WAY STOP CONTROL SUMMARY Analyst: IW Agency/Co.: Wilson Okamoto Corporation Date Performed: Analysis Time Period: PM Peak Period Intersection: Kula Hwv/Lower Kula Rd (North) Jurisdiction: State Units: U. S. Customary Analysis Year: . Existing Project ID: 7551-01 Kula Ridge East/West Street: Lower Kula Rd (North) North/South Street: Kula Hwy Intersection Orientation: NS Study period (hrs): 1.00 Vehicle Volumes and Adjustments Major Street: Approach Northbound Southbound Movement 2 3 4 5 6 1 τ. τ R ъ т R Volume 335 10 79 346 Peak-Hour Factor, PHF 0.86 0.86 0.90 0.90 Hourly Flow Rate, HFR 389 11 87 384 Percent Heavy Vehicles -----~ ~ 2 -----Median Type/Storage Undivided 1 RT Channelized? 0 Lanes 0 3 1 Configuration TR  $\mathbf{LT}$ Upstream Signal? No No Minor Street: Approach Westbound Eastbound 7 10 11 Movement. 8 4 12 R L т R L т Volume 7 62 Peak Hour Factor, PHF 0.82 0.82 Hourly Flow Rate, HFR 8 75 Percent Heavy Vehicles 2 2 Percent Grade (%) 0 Q Flared Approach: Exists?/Storage No Lanes 0 0 Configuration LR Delay, Queue Length, and Level of Service

Approach	NB	58	Westbound		Es	istbound	1
Movement	1	4 7	89	1	10	11	12
Lane Config		LT	LR	Ì			
v (vph)		87	83				
C(m) (vph)		1159	574				
v/c		0.08	0.14				
95% queue length		0.24	0.51				
Control Delay		8.4	12.3				
LOS		A	в				
Approach Delay			12.3				
Approach LOS			В				

HCS+: Unsignalized Intersections Release 5.1

Wilson Okamoto Corporation 1907 S. Beretania St., Suite 400 Honolulu, HI 96826

Phone: (808) 946-2277

E-Mail:

Fax: (808) 946-2253

#### \_\_\_\_ALL-WAY STOP CONTROL(AWSC) ANALYSIS\_

Analyst: τw Agency/Co.: Wilson Okamoto Corporation Date Performed: 6/9/2006 Analysis Time Period: AM Peak Period Intersection: Copp Rd/Lower Kula Rd Jurisdiction: City Units: U. S. Customary Analysis Year: Existing Project ID: 7551-01 Kula Ridge East/West Street: Copp Rd North/South Street: Lower Kula Rd 

$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		Ea	stbo	und	( w	estbo	und	ł	N	orthbo	ound	s	outhb	ound	1
		L	r	R	L	T	R	ł	L	т	R	L	T	R	
* Thrus Left Lane	Volume	 29	21	5	5	78	19	- -	4	11	2	- 8	9	21	-

	Easth	ound	West	bound	North	bound	South	bound
	Ll	L2	L1	$\mathbf{F5}$	Ll	L2	Ll	L2
Configuration	L/TR		LTR		LTR		LTR	
PHF	0.69		0.80		0.61		0.79	
Flow Rate	79		126		42		47	
% Heavy Veh	2		2		2		2	
No. Lanes	1			1		1	~	1
Opposing-Lanes	1			1		1		1
Conflicting-lanes	1			L		1		1
Geometry group	1			1		1		î
Duration, T 1.00	hrs.			_		-		-

#### \_\_\_\_\_\_Worksheet 3 - Saturation Headway Adjustment Worksheet\_\_\_\_

	Eastbound	Westbound	Northbound	Southbound
	L1 L2	L1 L2	L1 L2	L1 L2
Flow Rates:				
Total in Lane	79	126	42	47
Left-Turn	42	б	22	10
Right-Turn	7	23	3	26
Prop. Left-Turns	0.5	0.0	0.5	0.2
Prop. Right-Turns	0.1	0.2	0.1	0.6
Prop. Heavy Vehic	le0.0	0.0	0.0	0.0
Geometry Group	1	1	1	1
Adjustments Exhib	it 17-33:			-
hLT-adj	0.2	0.2	0.2	0.2
hRT-adj	-0.6	-0.5	-0.6	-0.6
hHV-adj	1.7	1.7	1.7	1.7
hadj, computed	0.1	-0.1	0.1	~0.3

Wor	ksheet	4 - Dep	arture l	Headway	and Ser	vice Tim	ne	
	East	bound	West	bound	North	oound	South	ound
	L1	L2	L1	L2	1.1	L2	L1	L2
Flow rate	79		126		, 42		47	
hd, initial value	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
x, initial	0.07		0.11		0.04		0.04	
hd, final value	4.32		4.12		4.50		4.15	
x, final value	0.09		0.14		0.05		0,05	
Move-up time, m	:	2.0	:	2.0	:	2.0	:	2.0
Service Time	2.3		2.1		2.5		2.1	

\_\_\_\_Worksheet 5 - Capacity and Level of Service\_\_\_\_\_

	Easth	ound	Westb	ound	North	oound	South	oound
	Ll	P5	Ll	L2	L1	L2	Ll	L2
Flow Rate	79		126		42		47	
Service Time	2.3		2.1		2.5		2.1	
Utilization, x	0.09		0.14		0.05		0.05	
Dep. headway, hd	4.32		4.12		4.50		4.15	
Capacity	329		376		292		297	
Delay	7.77		7.81		7.75		7.38	
LOS	A		А		А		A	
Approach:								
Delay	5	77.1	5	. 81	·	7.75		7.38
LOS	7	3	7	\$		A		A
Intersection Delay	y 7.72		Inte	ersecti	on LOS A			

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Wilson Okamoto Corporation 1907 S. Beretania St., Suite 400 Honolulu, HI 96826

Phone: (808) 946-2277

E-Mail:

Fax: (808) 946-2253

ALL-WAY STOP CONTROL (AWSC) ANALYSIS

Analyst: тω Agency/Co.: Wilson Okamoto Corporation Date Performed: 6/9/2006 Analysis Time Period: PM Peak Period Intersection: Copp Rd/Lower Kula Rd City Jurisdiction: Units: U. S. Customary Analysis Year: Existing Project ID: 7551-01 Kula Ridge East/West Street: Copp Rd North/South Street: Lower Kula Rd \_\_\_\_\_Worksheet 2 - Volume Adjustments and Site Characteristics\_\_\_\_\_

Ea	stbou	nd	We	stbou	nđ	No	rchbe	und	So	uthbo	unđ	l
L	т	R	Ĺ.	T	R	L	T	R	L	т	R	1
			I			1			i			

 Volume
 28
 37
 18
 2
 28
 21
 10
 14
 5
 23
 22
 18
 18

 % Thrus Left Lane
 2
 2
 2
 2
 18
 10
 14
 5
 12
 2
 18
 16

Eastbound Westbound Northbound Southbound L1 L2Ll L2L 1 · L2 L1 L2 Configuration LTR LTR LTR LTR Phf 0.94 0.85 0.91 0.75 Flow Rate 87 58 31 83 % Heavy Veh 2 2 2 2 No. Lanes 1 1 1 1 Opposing-Lanes 1 1 1 1 Conflicting-lanes 1 1 1 1 Geometry group 1 1 1 1 Duration, T 1.00 hrs.

	Eastbound	Westbound	Northbound	Southbound
	L1 L2	L1 L2	L1 L2	L1 L2
Flow Rates:				
Total in Lane	87	58	31	83
Left-Turn	29	2	11	30
Right-Turn	19	24	5	24
Prop. Left-Turns	0.3	0.0	0.4	0.4
Prop. Right-Turns	0.2	0.4	0.2	0.3
Prop. Heavy Vehicl	e0.0	0.0	0.0	0.0
Geometry Group	1	1	ì	1
Adjustments Exhibi	t 17-33:			
hLT-adj	0.2	0.2	0.2	0.2
hRT-adj	-0.5	~0.6	~0.6	-0.6
hHV-adj	1.7	1.7	1.7	1.7
hadj, computed	-0.0	-0.2	0.0	-0.1

	Easth	ound	Westh	oound	North	oound	South	pung
	L1	L2	Ll	L2	Ll	L2	Ll	L2
Flow rate	87		58		, 31		83	
hd, initial value	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
x, initial	0.08		0.05		0.03		0.07	
hd, final value	4.18		4.04		4.31		4.18	
x, final value	0.10		0.07		0.04		0.10	
Move-up time, m	2	. 0	2	2.0	:	2.0	:	2.0
Service Time	2.2		2.0		2.3		2.2	
	Easth	ound	West	oound	North	oound	South	bound
	Easth L1	ound L2	West Ll	oound L2	North L1	oound L2	South) Ll	bound L2
_1 .	L1		Ll		Ll		Ll	
	L1 87		L1 58		L1 31		L1 83	
Service Time	L1 87 2.2		L1 58 2.0		L1 31 2.3		L1 83 2.2	
Service Time Utilization, x	L1 87 2.2 0.10		L1 58 2.0 0.07		L1 31 2.3 0.04		L1 83 2.2 0.10	
Flow Rate Service Time Utilization, x Dep. headway, hd	L1 87 2.2 0.10 4.18		L1 58 2.0 0.07 4.04		L1 31 2.3 0.04 4.31		L1 83 2.2 0.10 4.18	
Service Time Utilization, x Dep. headway, hd Capacity	L1 87 2.2 0.10 4.18 337		L1 58 2.0 0.07 4.04 308	L2	L1 31 2.3 0.04 4.31 281		L1 83 2.2 0.10 4.18 333	
Service Time Utilization, x Dep. headway, hd Capacity Delay	L1 87 2.2 0.10 4.18 337 7.65		L1 58 2.0 0.07 4.04 308 7.32	L2	L1 31 2.3 0.04 4.31 281 7.48		L1 83 2.2 0.10 4.18 333 7.63	
Service Time Utilization, x Dep. headway, hd Capacity Delay LOS	L1 87 2.2 0.10 4.18 337		L1 58 2.0 0.07 4.04 308	L2	L1 31 2.3 0.04 4.31 281		L1 83 2.2 0.10 4.18 333	
Service Time Utilization, x Dep. headway, hd Capacity Delay LOS Approach:	L1 87 2.2 0.10 4.18 337 7.65 A	L2	L1 58 2.0 0.07 4.04 308 7.32 A	L2	L1 31 2.3 0.04 4.31 281 7.48 A	L2	L1 83 2.2 0.10 4.18 333 7.63 A	L2
Service Time Utilization, x Dep. headway, hd Capacity	L1 87 2.2 0.10 4.18 337 7.65 A		L1 58 2.0 0.07 4.04 308 7.32 A	L2	L1 31 2.3 0.04 4.31 281 7.48 A		L1 83 2.2 0.10 4.18 333 7.63 A	

Delay	7.65	7.32	7.48	7.63
LOS	А	А	А	А
Intersection Dela	y 7.55	Intersection	LOS A	

	TW(	-WAY S	FOP CONTI	ROL SUM	MARY		_,	
Analyst:	IW				·			
Agency/Co.:		son Okar	noto Corj	poratio	n			
Date Performed:	6/9							
Analysis Time Perio			rind					
			ower Kul	a Rd (S	outh)			
Jurisdiction:	Stat							
Units: U. S. Custon								
Analysis Year:		sting						
Project ID: 7551-								
East/West Street:			Rd (Sou	ተከነ				
North/South Street				,				
Intersection Orien		-		St	udy perio	d (brs)	1.00	
				•••	aa, parre			
	Veh	icle Vo	lumes an	d Adjus	tments			
Major Street: App	roach	N	orthboun	ď	So	uthbound	1	
Mov	ement	1	2	3	4	5	6	
		L	T	R	Γ	T	R	
Volume			278	1	9	153		
Peak-Hour Factor,	PHF		0.83	0.83	0.66	0.66		
Hourly Flow Rate,	HFR		334	1	13	231		
Percent Heavy Vehi	cles				2	<b></b>		
Median Type/Storag RT Channelized?	e	Undi	videđ		1			

Configuration Upstream Signa	1?		No	TR		3	NO NO		
Minor Street:	Approach		estboun	đ		Ea	astbound	d	
	Movement	7	8	9	}	10	11	12	
		L	т	R	Ì	L	т	R	
Volume		2		7					
Peak Hour Fact	or, PHF	0.75		0.75					
Hourly Flow Ra	te, HFR	2		9					
Percent Heavy	Vehicles	2		2					
Percent Grade	(&)		0				0		
Flared Approac	h: Exists?,	Storag	e	No	1	,			1
Lanes		Ō	ł	0					
Configuration			LR						

1 0

0 1

Lanes

Approach	NB	SB			Westbound	l	E	astbound	3
Movement Lane Config	1	4 L/T		7	8 LR	9	 10	11	12
v (vph)		13			11		 		
C(m) (vph)		122	4		647				
v/c		0.0	1		0.02				
95% queue length		0,0	3		0.05				
Control Delay		8.0			10.7				
LOS		А			в				
Approach Delay					10.7				
Approach LOS					в				

	TWO-WAY STOP CONTROL SUMMARY
Analyst:	IW
Agency/Co :	Wilson Okamoto Corporation
Date Performed:	6/9/2006
Analysis Time Period:	PM Peak Period
Intersection:	Kula Hwy/Lower Kula Rd (South)
Jurisdiction:	State
Units: U. S. Customar	y ·
Analysis Year:	Existing
Project ID: 7551-01	Kula Ridge
East/West Street:	Lower Kula Rd (South)
North/South Street:	Kula Hwy
Intersection Orientat	ion: NS Study period (hrs): 1.00

Major Street: Approach	icle Vol	orthboun		Cilles		uthboun	A	
Movement	1	2	3	ł	4 50	5	6	
Hoveldent	Ľ	Ť	8		L.	T	R	
	4	7	r.	1	4	۴.	ĸ	
Volume		234	4		9	211		
Peak-Hour Factor, PHF		0.92	0.92		0.93	0.93		
Hourly Flow Rate, HFR		254	4		9	226		
Percent Heavy Vehicles					2			
Median Type/Storage	Undi	vided			1			
RT Channelized?								
Lanes		1	0		0	1		
Configuration		T	R		L	T		
Upstream Signal?		No				No		
Minor Street: Approach	W	estbound			Ea	stbound		
Movement	7	8	9		10	11	12	
	L	T	R	I	L	т	R	
Volume	7		4					
Peak Hour Factor, PHF	0.61		0.61					
Hourly Flow Rate, HFR	11		6					
Percent Heavy Vehicles	2		2					
Percent Grade (%)		0				0		
Flared Approach: Exists	?/Storag	e	No	1				1
Lanes	0		0					
Configuration		LR						

Approach	NB	SB			Westbound			E	astboun	â
Movement	1	4	I	7	8	9		10	11	12
Lane Config		$\mathbf{LT}$	j		LR		Ì			
v (vph)		9			17					
C(m) {vph}		130	7		595					
v/c		0.0	1		0.03					
95% queue length		0.0	2		0.09					
Control Delay		7.8			11.2					
LOS		А			В					
Approach Delay					11.2					
Approach LOS					в					

#### APPENDIX D

#### CAPACITY ANALYSIS CALCULATIONS PROJECTED YEAR 2009 PEAK PERIOD TRAFFIC ANALYSIS WITHOUT PROJECT

\_\_\_\_\_TWO-WAY STOP CONTROL SUMMARY\_\_\_\_

Analyst:					
-					
Agency/Co.:	Wilson Okamoto Corpora	tion			
Date Performed:	6/9/2006				
Analysis Time Period:	AM Peak Period				
Intersection:	Alanui Dr/Lower Kula R	d			
Jurisdiction:	City				
Units: U. S. Customar	Y				
Analysis Year:	2009 Without Project				
Project ID: 7551-01	Kula Ridge				
East/West Street:	Alanui Dr				
North/South Street:	Lower Kula Rd				
Intersection Orientat	ion: NS	Study	period	(hrs):	1.00

	hicle Volu	thboun			thbound		
Major Street: Approach							
Movement	1	2	3	4	5	6	
	L	T	R	L	T	R	
Volume	1	64	0	1	33	1	
Peak-Hour Factor, PHF	0.74	0.74	0.74	0.50	0.50	0.50	
Hourly Flow Rate, HFR	1	86	0	2	66	2	
Percent Heavy Vehicles	2			2			
Median Type/Storage RT Channelized?	Undiv	ided		1			
Lanes	0	1	0	0	1 (	D	
Configuration	Ľ	FR		Ľ	TR		
Upstream Signal?		No		-	No		
Minor Street: Approach		stbound	<u>,</u>		stbound		
Minor acreet. Approach Movement	7	8	9	i 10	11	12	
HOVEMENC	L	о Т	R	L	T	R	
1	1	T	ĸ	łг	т	ĸ	
Volume	0	0	0	12	0	0	
Peak Hour Factor, PHF	1.00	1.00	1.00	0.60	0.50	0.60	
Hourly Flow Rate, HFR	0	0	0	19	0	0	
Percent Heavy Vehicles	2	2	2	2	2	2	
Percent Grade (%)		0			0		
Flared Approach: Exist:	s?/Storage		No	1		No	7
Lanes	ō	1	0	0	1	0	
Configuration		LTR			LTR		

Approach	_Deray, NB	SB		and Lev estbound		Service Ea	stbound	
Novement Lane Config	1 LTR	4 LTR	7	8 LTR	9	10 	11 LTR	12
v (vph)	1	2		0		······	19	
C(m) (vph)	1533	1510					806	
v/c	0.00	0.00					0.02	
95% queue length	0.00	0.00					0.07	
Control Delay	7.3	7.4					9.6	
LOS	A	А					A	
Approach Delay							9.6	
Approach LOS							А	

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н	CS+: Uກs	ignaliz€	d Inter	section	ns Release	2 5.2		
	TWO	-WAY STO	P CONTR	OL SUM	IARY			
	IW							
malyst:								
gency/Co.:		on Okamo	sto Corr	poration	1			
ate Performed:	6/9/		_					
unalysis Time Peri								
Intersection:		ui Dr/Lo	ower Kul	la Rd				
Jurisdiction:	Cíty	•						
mits: U. S. Custo								
halysis Year:		Without	: Projec	st				
	01 Kula							
Cast/West Street:		ui Dr						
North/South Street		r Kula H	Rđ					
Intersection Orien	tation:	NS		Stu	udy period	l (hrs)	: 1.00	
	Vehi	cle Volu	umes and	d Adjust	ments			
Major Street: App	roach		thbound			thbound	a	
Mov	rement	1	2	3	4	5	6	
		L	т	R	L	т	R	
/olume		0	72	3	14	78	10	
Peak-Hour Factor,	PHE	0.69	0,69	0,69	0.84	0.84	0.84	
Hourly Flow Rate,		0	104	4	16	92	11	
Percent Heavy Vehi		2			2			
Median Type/Storag	e	Undiv:	raea		1			
RT Channelized?						-	_	
Lanes		0		0	0		0	
Configuration		Ľ	FR		Ľ	TR		
Upstream Signal?			No			No		
Minor Street: App	roach	We	stbound		Ea	stbound		
Mov	vement	7	8	9	10	11	12	
		L	т	R	L	т	ਸ	
Volume		7	0	13	3	0	1	
Peak Hour Factor,	PHF	0.71	0.71	0.71	0.33	0.33	0.33	
Hourly Flow Rate,		9	0	18	9	0	3	
Percent Heavy Vehi		2	2	2	2	2	2	
Percent Grade (%)		~	õ	~	2	õ	4	
Flared Approach:	Friete?	Storade		No	,	v	No	7
rinten ubbroacu.	GAISCS()	0 0		0	ý 0	1	0	,
1 1000		~	1	v	U U	*	v	
			LTR			LTR		
			·					
Configuration			ngth, a		l of Serv	ice	hound	
Configuration Approach	NB	SB	ngth, a Wes	tbound		ice East	bound	12
Configuration Approach Movement		SB 4 }	ngth, a		9	ice East 10	11	12
Configuration Approach Movement Lane Config	NB 1 LTR	SB 4   LTR	ngth, a Wes	tbound 8 LTR		ice East 10	11 LTR	12
Approach Movement Lane Config v (vph)	NB 1 LTR 0	SB 4   LTR   16	ngth, a Wes	tbound 8 LTR 27	9	ice East 10	11	12
Approach Movement Lane Config v (vph) C(m) (vph)	NB 1 LTR 0 1489	SB 4 LTR 16 1483	ngth, a Wes	27 852	9	ice East 10	11 LTR 12 741	12
Configuration Approach Movement Lane Config v (vph) C(m) (vph) v/c	NB 1 LTR 0 1489 0.00	SB 4 LTR 16 1483 0.01	ngth, a Wes	tbound 8 LTR 27	9	ice East 10	11 LTR 12	12
Configuration Approach Movement Lane Config v (vph) C(m) (vph) v/c	NB 1 LTR 0 1489 0.00 0.00	SB 4 LTR 16 1483	ngth, a Wes	27 852	9	ice East 10	11 LTR 12 741	12
Approach Movement Lane Config v (vph) C(m) (vph) v/c 95% queue length	NB 1 LTR 0 1489 0.00	SB 4 LTR 16 1483 0.01	ngth, a Wes	27 852 0.03	9	ice East 10	11 LTR 12 741 0.02	12
Approach Movement Lane Config V (Vph) C(m) (vph) V/C 95% queue length Control Delay	NB 1 LTR 0 1489 0.00 0.00	SB 4 LTR 16 1483 0.01 0.03	ngth, a Wes	27 852 0.03 0.10	9	ice East 10	11 LTR 12 741 0.02 0.05	12
Lanes Configuration Approach Movement Lane Config v (vph) C(m) (vph) C(m) (vph) v/c 95% queue length Control Delay LOS Approach Delay	NB 1 LTR 0 1489 0.00 0.00 7.4	SB 4 LTR 16 1483 0.01 0.03 7.5	ngth, a Wes	27 852 0.03 0.10 9.4	9	ice East 10	11 LTR 12 741 0.02 0.05 9.9	12

TWO-WAY STOP CONTROL SUMMARY\_\_\_\_\_

Analyst:	IW			
Agency/Co.:	Wilson Okamoto Corpora:	tion		
Date Performed:	6/9/2006			
Analysis Time Period:	AM Peak Period			
Intersection:	Kula Hwy/Lower Kula Rd	(North)		
Jurisdiction:	State			
Units: U. S. Customar	Y			
Analysis Year:	2009 Without Project			
Project ID: 7551-01	Kula Ridge			
East/West Street:	Lower Kula Rd (North)			
North/South Street:	Kula Hwy			
Intersection Orientat	ion: NS	Study period	(hrs):	0.25

Vehi	cle Volu	umes and	Adjus	cme	nts		·····	
Major Street: Approach	NO	rthbound			Sou	uthbound	3	
Movement	1	2	3		4	5	6	
	L	т	R	ł	L	T	R	
Volume		560	9		79	382		
Peak-Hour Factor, PHF		0.90	0.90		0.77	0.77		
Hourly Flow Rate, HFR		622	10		102	496		
Percent Heavy Vehicles		÷			2	** **		
Median Type/Storage RT Channelized?	Undiv	ided			/			
Lanes		1 0	)		0	1		
Configuration			2		L	T		
Upstream Signal?		No			-	No		
Minor Street: Approach	We	stbound			Ea.	stbound	····.	·
Movement	7	8	9	ł	10	11	12	
	L	T	R	I	L	T	R	
Volume	13		84					
Peak Hour Factor, PHF	0.84		0.84					
Hourly Flow Rate, HFR	15		100					
Percent Heavy Vehicles	2		2					
Percent Grade (%)		0				0		
Flared Approach: Exists?/	'Storage		No	/	,			1
			)					
Lanes	0							

Approach	Delay, NB	Queue SB	Le		, and Leve Vestbound	el of	Ser		astboun	
Movement Lane Config	1	4 LT		7	8 LR	9		10	11	12
v (vph)		102			115					
C(m) (vph)		951			377					
v/c		0.1	1		0.31					
95% queue length		0.3	6		1.27					
Control Delay		9.2			18.7					
LOS		A			с					
Approach Delay					18.7					
Approach LOS					С					

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	HCS+: Uns	∋ignali	zed Inte:	rsectio	ns Rel	lease	5.2		
	TWO	D-WAY S	TOP CONT	ROL SUM	MARY		<u> </u>		
malyst:	IW								
Agency/Co.:		ton Oka	moto Corj	Doratio	n				
ate Performed:				poracro					
Analysis Time H			wind						
intersection:			ower Kul						
urisdiction:	Stat		Ower Kul	a nu th	orcar				
nits: U. S. Cu		Le .							
		o witho	up Brose	<b>~</b> b					
unalysis Year: Project ID: 75	51-01 Kula		ut Proje						
			D.2 (21	au Tu 1					
Bast/West Stree			Rd (Nor	cn)					
North/South Sti Intersection Oi		a Hwy		~-			(	1 00	
Intersection Of	ientation:	145		25	ααγ ρε	erioa	(nrs):	1.00	1
			lumes an		tments	s			
lajor Street:		N	lorthboun	đ		Sout	hbound	3	
	Movement	1	2	3	4		5	6	
		L	т	Ŕ	j L		т	R	
Volume			373	11		<u></u>	384		
	-					-			
Peak-Hour Facto			0.86	0.86	8	.90	0.90		
Hourly Flow Rat			433	12		8	426		
Percent Heavy		**		** -*	2				
dedian Type/Sto		Unai	vided		/				
RT Channelized	f					_			
Lanes				0		0	1		
Configuration			T	R		LT			
Jpstream Signa	1?		No				No		
linor Street:	Approach	 V	Vestbound		······································	East	bound		
	Movement	7	8	9	1 1		11	12	
		L	т	R	L		т	R	
Volume	~	7		<u> </u>				····	
				62					
Peak Hour Fact		0.82	2	0.82					
Hourly Flow Ra		8		75					
Percent Heavy		2	-	2					
Percent Grade			0				0		
Plared Approac	n: Exists?		-	No	1				1
Lanes		{	)	0					
Configuration			LR						
Approach	Delay, NB	Queue 1 SB	Length, a		el of	Servi			
	1			tbound	•	1 -		bound	
Movement	1	4	7	8	9	1	J	11	12
Lane Config		LT	1	LR		I			
v (vph)		88	,	83					
C(m) (vph)		1115		534					
v/c		0.08		0.16					
95% queue leng	th	0.26		0.55					
		8.5		13.0					
control herav		A		в.					
Control Delay LOS									
LOS				13.0					
				13.0 B					

.

нс	S+: Unsignal	ized Intersectio	ons Release 5.2	2	Prop. Heavy Vehic Geometry Group Adjustments Exhik	1 pit 17-33:	0.0	0.0	0.0
					hLT-adj	0.2	0.2	0.2	0.2
Wilson Okamoto Corp					hRT-adj	-0.6	-0.6	-0.6	-0.6
1907 S. Beretania S	St., Suite 40	10			hHV-adj	1.7	1.7	1.7	1.7
Honolulu, HI 96826					hadj, computed	0.1	-0.1	0.1	-0.2
Phone: (808) 946-2 E-Mail:	. 2277	I	Pax: (808) 946	5-2253	W	orksheet 4 - Dep	parture Headway	and Service Tir	ne
d nall.						Eastbound	Westbound	Northbound	Southbound
	ALL-WAY STOP	CONTROL (AWSC)	ANALYSIS			L1 L2	L1 L2	L1 L2	L1 L2
					Flow rate	79	126	43	48
malyst:	IW				hd, initial value	≥ 3.20 3.20	3.20 3.20	3.20 3.20	3.20 3.1
Agency/Co.:	Wilson Ok	amoto Corporatio	άn		x, initial	0.07	0.11	0.04	0.04
Date Performed:	6/9/2006				hd, final value	4.32	4,13	4.50	4.15
Analysis Time Perio		boird			x, final value	0.09	0.14	0.05	0.06
Intersection:		Jower Kula Rd			Move-up time, m	2.0	2.0	2.0	2.0
Jurisdiction:	City	ower Vara ug			Service Time	2.3	2.1	2.5	2,2
					SCLVAUE INE		aa a .d.		4,5
Units: U. S. Custor		nout Project			5.7	orksheet 5 - Ca	macity and town	1 of Complete	
Analysis Year:						nryaneer 2 - ca	pacity and neve	i or service	
Project ID: 7551-6		2				Eastbound	Westbound	Northbound	Southbound
East/West Street:	Copp Rd					Las coolid L1 L2	L1 L2	LI L2	L1 L
North/South Street						UL 112	کادا کارنا	101 102	ىنى خىز
	Z - Volume A	Adjustments and	Site Character	istics	Flow Rate	79	126	10	4.0
								43	48
			Northbound	Southbound	Service Time	2.3	2.1	2.5	2.2
L	TRL	TRL	TR	LTR	Utilization, x	0.09	0.14	0.05	0.06
		[	!		Dep. headway, hd		4.13	4.50	4.15
Volume 29 2	15 5	78 19 14	11 2	8 10 21	Capacity	329	376	293	298
Thrus Left Lane					Delay	7,78	7.82	7.76	7.40
					LOS	A	А	A	A
					Approach:				
	Eastbound	Westbound	Northbound	Southbound	Delay	7.78	7.82	7,76	7.40
	L1 L2	L1 L2	L1 L2	L1 L2	LOS	A	А	A	A
					Intersection Del	ay 7.73	Intersecti	on LOS A	
Configuration	LTR	LTR	LTR	LTR					
PHF	0.69	0.80	0.61	0.79					
Flow Rate	79	126	43	48					
8 Heavy Veh	2	2	2	2					
No. Lanes	1	1	<i>"</i> 1	2 1					
Opposing-Lanes	1	1	1	1	• •				
Conflicting-lanes	1	1	1	1					
	1	1	1	1					
Geometry group Duration, T 1.00		1	ŗ	1					
Derecton, 1 1.00									
Workshe	et 3 - Satur	ation Headway Ad	ijustment Works	heet					
	Eastbound	Westbound	Northbound	Southbound	-				

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	East	Eastbound		oound	North	hbound Sou		outhbound	
	Ll	L2	Ll	L2	L1	L2	Ll	L2	
Flow Rates:									
Total in Lane	79		126		43		48		
Left-Turn	42		6		22		10		
Right-Turn	7		23		3		26		
Prop. Left~Turns	0.5		0.0		0.5		0.2		
Prop. Right-Turns	0.1		0.2		0.1		0.5		

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HC	S+: Unsignalized Inters	sections Release 5	.2	Geometry Group	1	1	1	1
				Adjustments Exhibi	t 17-33:			
				hLT-adj	0.2	0.2	0.2	0.2
Wilson Okamoto Corp	oration			hRT-adj	-0.6	~0.6	-0.6	-0.5
1907 S. Beretania S	t., Suite 400			hHV-adj	1.7	1.7	1.7	1.7
Honolulu, HI 96826				hadj, computed	-0.0	-0.2	0.0	-0.1
Phone: (808) 946-2 E-Mail:	277	Fax: (808) 9	46-2253	Wor	ksheet 4 - Deg	arture Headway	and Service Tim	ne
S-Mail:					Eastbound	Westbound	Northbound	Southbound
	ALL-WAY STOP CONTROL (A	VSC   ANALYSIS			L1 L2	L1 L2	L1 L2	L1 L2
				Flow rate	87	58	30	86
Analyst:	IW			hd, initial value	3.20 3.20	3.20 3.20	3.20 3.20	3.20 3.20
Agency/Co.:	Wilson Okamoto Corp	oration		x, initial	0.08	0.05	0.03	0.08
Date Performed:	6/9/2006			hd, final value	4.19	4.04	4.31	4.19
Analysis Time Perio	d: PM Peak Period			x, final value	0.10	0.07	0.04	0.10
Intersection:	Copp Rd/Lower Kula	Rđ		Move-up time, m	2.0	2.0	2.0	2.0
Jurisdiction:	City			Service Time	2.2	2.0	2.3	2.2
Units: U. S. Custom	arv							
Analysis Year:	2009 Without Projec	t		Woz	ksheet 5 - Car	pacity and Level	l of Service	
Project ID: 7551-0	1 Kula Ridge							
East/West Street:	Copp Rd				Eastbound	Westbound	Northbound	Southbound
North/South Street:					L1 L2	L1 L2	L1 L2	L1 L2
Worksheet	2 - Volume Adjustments	and Site Characte	eristics					
				Flow Rate	87	58	30	86
Eastb	ound Westbound	Northbound	Southbound	Service Time	2.2	2.0	2.3	2.2
LT		LTR		Utilization, x	0.10	0.07	0.04	0.10
i				then bendway bd	4 19	4 04	A 33	4 19

Prop. Heavy Vehicle0.0

28 37 18 2 28 21 10 14 5 24 23 18 Volume % Thrus Left Lane

.

	Easth	ound	Westl	bound	Northi	oound	Southl	ound
	L1	L2	Ll	L2	L1	L2	Ll	L2
Configuration	LTR		LTR		LTR		LTR	
PHF	0.94		0.85		0.91		0,75	
Flow Rate	87		58		30		86	
% Heavy Veh	2		2		2		2	
No. Lanes	2			1	:	1	:	L
Opposing-Lanes	1		:	1	:	£.	1	L
Conflicting-lanes	1			1		1	-	Ł
Geometry group	1			1	-	1	2	L
Duration T 1.00	) hrs.							

#### \_\_Worksheet 3 - Saturation Headway Adjustment Worksheet\_\_\_\_

	Eastbound		West	bound	North	bound	Southbound		
	L1	L2	L1	L2	Ll	L2	L1	$L_2$	
Flow Rates:									
Total in Lane	87		58		30		86		
Left-Turn	29		2		10		32		
Right-Turn	19		24		5		24		
Prop. Left-Turns	0.3		0.0		0.3		0.4		
Prop. Right-Turns	0.2		0.4		0.2		0.3		

20 Dep. headway, hd 4.19 4.19 4.04 4.31 337 Capacity 308 280 336 Delay 7.66 7.32 7.47 7.66 A LOS A А А Approach: 7.47 Delay 7.66 7.32 7.66 LOS А А А А Intersection Delay 7.56 Intersection LOS A

0.0

0.0

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TWO-WAY STOP CONTROL SUMMARY\_\_\_\_\_

Analyst:	IW		
Agency/Co.:	Wilson Okamoto Corporat	tion	
Date Performed:	6/9/2006		
Analysis Time Period:	AM Peak Period		
Intersection:	Kula Hwy/Lower Kula Rd	(South)	
Jurisdiction:	State		
Units: U. S. Customar	у		
Analysis Year:	2009 Without Project		
Project ID: 7551-01	Kula Ridge		
East/West Street:	Lower Kula Rd (South)		
North/South Street:	Kula Hwy		
Intersection Orientat	ion: NS	Study period (hrs):	1.00

	Vehi	icle Vo	lumes ar	ud Adjus	stme	nts			
Major Street: A	Approach	N	orthbour	nđ	Southbound				
	Movement	1	2	3	1	4	S	6	
		L	т	R	l	r	т	R	
Volume			309	1		9	170		
Peak-Hour Fact	or, PHF		0.83	0.83		0.66	0.65		
Hourly Plow Ra	te, HFR		372	l		13	257		
Percent Heavy	Vehicles		-~ .	~		2			
Median Type/St RT Channelized		Undi	videđ			/			
Lanes			2	0		0	1		
Configuration				TR		I	/T		
Upstream Signa	11?		No				No		
Minor Street:	Approach	W	estboun	d		Ea	stbound		
	Movement	7	8	9		io	11	12	
		L	r	Ŕ	Ì	L	T	R	
Volume		2		8		<u>.                                    </u>			
Peak Hour Fact	cor, PHF	0.75		0.75					
Hourly Flow Ra	ate, HFR	2		10					
Percent Heavy	Vehicles	2		2					
Percent Grade	(8)		0				0		
Plared Approa	ch: Exists?	/Storag	ie .	No		,			1
Lanes		(		0					
Configuration			LR						

Approach	NB	SB		Westbound				Eastbound			
Movement	1	4		7	8	9		10	11	12	
Lane Config		LT	l		LR		l				
v (vph)		13			12						
C(m) (vph)		118	5		614						
v/c		0.0	1		0,02						
95% gueue length		0.0	3		0.06						
Control Delay		8.1			11.0						
LOS		А			в						
Approach Delay					11.0						
Approach LOS					в						

HCS+: Unsignalized Intersections Release 5.2

Analyst:	IW							
Agency/Co.:		on Okar	noto Corg	oratio	n			
Date Performed:		2006						
Analysis Time P			riod					
Intersection:			ower Kula	Rd (S	outh)			
Jurisdiction:	Stat				,			
Units: U. S. Cu		-						
Analysis Year:		Withou	ut Projec	•t:				
Project ID: 75								
East/West Stree			Rd (Sout	-b)				
North/South Str		Hwy		*/				
Intersection Or				St	udy perio	d (brs)	: 1.00	
	10.00010.000				adg parts	·······		
	Vehi	cle Vo	lumes and	Adius	tments			
Major Street:	Approach		orthbound			uthboun	d	
	Movement	1	2	3	4	5	6	
	10.000110	Ĺ	Ť	Ř	L	r	Ř	
		*	•	**	1 2	•		
Volume			261	4	9	234		
Peak-Hour Facto	ਕਸ਼ ਕ		0.92	0.92	0.93	0.93		
Hourly Flow Rat			283	4	9	251		
Percent Heavy V			205	-	2			
Median Type/Sto		Undi	vided		,			
RT Channelized?		Onor	videa		,			
Lanes			1	0	0	1		
Configuration			î T			UT Î		
Upstream Signal	2		No			No		
ODBCLEON SIGNO	• •		NO			NO		
Minor Street:	Approach	W	estbound		E	astbound	1	
	Movement	7	8	9	10	11	12	
		L	T	R	1 L	Ŧ	R	
		-			, –	-		
Volume		7		5				
Peak Hour Facto	or, PHF	0.61		0.51				
Hourly Flow Rat	e, HFR	11		8				
Percent Heavy		2		2				
Percent Grade			0			0		
Flared Approach		/Storad	e	No	1			1
Lanes				0				
Configuration			LR	•				
	Delay,	Queue I	enoth, a	nd Lev	el of Ser	vice_		
Approach	NB	SB		tbound			:bound	
Movement	1	4	7	8	9	10		12
Lane Config		LT		LR	i			
		·						
v (vph)		9		19				
C(m) (vph)		1275		575				
v/c		0.01		0.03				
95% queue leng	th	0.02		0.10				
		7,8		11.5				
Control Delay								
Control Delay LOS		A						
				В 11.5				

#### \_\_\_\_TWO-WAY STOP CONTROL SUMMARY\_\_\_\_

Analyst: IW Wilson Okamoto Corporation Agency/Co.: Date Performed: 6/9/2006 Analysis Time Period: AM Peak Period Intersection: Alanui Dr/Lower Kula Rd Jurisdiction: City Units: U. S. Customary . 2009 With Project Analysis Year: Project ID: 7551-01 Kula Ridge East/West Street: Alanui Dr North/South Street: Lower Kula Rd Intersection Orientation: NS Study period (hrs): 1.00 Vehicle Volumes and Adjustments Major Street: Approach Southbound Northbound 5 Movement 1 2 3 4 6 7 R T R Ł L ł Volume 2 64 109 1 41 1 Peak-Hour Factor, PHF 0.74 0.74 0.74 0.50 0.50 0.50 Hourly Flow Rate, HFR 2 86 147 2 82 2 Percent Heavy Vehicles 2 -----2 ----------Median Type/Storage Undivided 7 RT Channelized? Lanes 0 1 0 0 1 0 Configuration LTR LTR Upstream Signal? No No Minor Street: Approach Westbound Eastbound Movement 7 10 11 12 8 9 Ļ т R L т R Volume 0 0 0 12 0 33 Peak Hour Factor, PHF 1,00 1.00 1.00 0.60 0.60 0.60 Hourly Flow Rate, HFR 0 0 0 19 0 54 Percent Heavy Vehicles 2 2 2 2 2 2 Percent Grade (%) 0 0 Flared Approach: Exists?/Storage No No Lanes 0 1 0 0 1 0 Configuration LTR LTR Delay, Queue Length, and Level of Service, SB Approach NB Westbound Eastbound Movement 1 4 8 10 11 12 9 7 Lane Config LTR LTR LTR Ì LTR v (vph) 2 2 0 73 C(m) (vph) 1513 1335 885 v/c 0.00 0.00 0.08 95% queue length 0.00 0.00 0.27 Control Delay 7.4 7.7 9.4 LOS A A А Approach Delay 9.4 Approach LOS А

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#### APPENDIX E

## CAPACITY ANALYSIS CALCULATIONS PROJECTED YEAR 2009 PEAK PERIOD TRAFFIC ANALYSIS WITH PROJECT

## TWO-WAY STOP CONTROL SUMMARY\_\_\_\_\_

Analyst: IW												
	son Okamo	co corr	oratio	11								
	2006											
Analysis Time Period: PM B Intersection: Alar	eak Peri nui Dr/Lo											
		wer Kul	la Ku									
Jurisdiction: City Units: U. S. Customary	<i>(</i>											
	With Pr											
Project ID: 7551-01 Kula		OJect										
	nui Dr											
		Kula Rđ										
Intersection Orientation:			C+		noriod	(hra)	: 1.00					
intersection offentation;	10		. 30	uuy	period	(1115)	: 1.00					
	icle Volu			tme								
Major Street: Approach		thbound				thboun	-					
Movement	1	2	3	ļ	4	5	6					
	L	т	R	I	L	т	R					
Volume	0	92	4		14	115	10					
Peak-Hour Factor, PHF	0.69	0.69	0.69		0.84	0.84	0.84					
Hourly Flow Rate, HFR	0	133	5		16	136	11					
Percent Heavy Vehicles	2				2	~ <b>-</b>						
Median Type/Storage	Undiv:	ided			1							
RT Channelized?												
Lanes	0	1 (	)		0	1	0					
Configuration	Ľ	ľR			UI	R						
Upstream Signal?		No				No						
Minor Street: Approach	We	stbound			Eas	tbound		······				
Movement	7	8	9	ł	10	11	12					
	L	T	R	ł	L	r	R					
<u> </u>	10	0	13		3	0	2					
Volume		0.71	0.71		0.33	0.33	0.33					
	0.71						6					
Peak Hour Factor, PHF			18		9	0						
Peak Hour Factor, PHF Hourly Flow Rate, HFR	14	0	18 2		9 2	-	2					
Peak Hour Factor, PHF Hourly Flow Rate, HFR Percent Heavy Vehicles			18 2			0 2 0						
Volume Peak Hour Factor, PHF Hourly Flow Rate, HFR Percent Heavy Vehicles Percent Grade (%) Flared Approach: Exists?	14 2	0 2 0	2	/	2	2	2	,				
Peak Hour Factor, PHF Hourly Flow Rate, HFR Percent Heavy Vehicles	14 2	0 2 0		/	2	2		1				

Approach	NB	SB	We	stbound					
Movement Lane Config	l LTR	4 LTR	7	8 LTR	9		10	11 LTR	12
v (vph)	0	16	··-·	32				15	
C(m) (vph)	1435	1446		764				707	
v/c	0.00	0.01		0.04				0.02	
95% queue length	0.00	0.03		0.13				0.07	
Control Delay	7.5	7.5		9.9				10.2	
LOS	А	A		A				в	
Approach Delay				9.9				10.2	
Approach LOS				А				В	

HCS+: Unsignalized Intersections Release 5.2

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Analyst:	IW								
Agency/Co.:			oto Corj	poratio	n				
Date Performed:		2006							
Analysis Time Peri									
Intersection:			wer Kula	a Rot (N	ortn)				
Jurisdiction:	Stat	e							
Units: U. S. Custo									
Analysis Year:		With P	roject						
Project ID: 7551~ East/West Street:			Rd (Nor:	+ h \					
North/South Street		Hwy Bwy	10 (10)1						
Intersection Orien				St	udy per	boi (	brs)	: 1.0	0
10013000100 01100		.,.			aaj per				•
			umes an						
	roach		rthboun			South			
Mov	ement	1 L	2 T	3 R	4	5 T		6 R	
		يد	.7.	R	ļL	.1		к	
Volume			560	10	86	3	82		
Peak-Hour Factor,	PHF		0.90	0.90	0.7	7 0	.77		
Hourly Flow Rate,			622	11	111	4	96		
Percent Heavy Vehi					2	-	-	~ -	
Median Type/Storag	le	Undiv	ided		/				
RT Channelized?									
Lanes				0		0 1			
Lanes Configuration			T			LT			
						LT	10		
Lanes Configuration Upstream Signal?	roach	We	T No	R	<u> </u>	LT	10		
Lanes Configuration Upstream Signal? Minor Street: App	proach	We 7	T	R	10	LT P Easth	10	12	
Lanes Configuration Upstream Signal? Minor Street: App			T No stbound	R	10   L	LT P Easth	lo ound		
Lanes Configuration Upstream Signal? Minor Street: App Mov		. 7 L	T No stbound 8	9 R		LT N Easth	lo ound	12	
Lanes Configuration Upstream Signal? Minor Street: App Mov Volume	vement	. 7 L 19	T No stbound 8	9 R 123		LT N Easth	lo ound	12	
Lanes Configuration Upstream Signal? Minor Street: App Mov Volume Peak Hour Factor,	PHF	7 L 19 0.84	T No stbound 8	9 R 123 0.84		LT N Easth	lo ound	12	
Lanes Configuration Upstream Signal? Minor Street: App Mov Volume Peak Hour Factor, Hourly Flow Rate,	PHF PFR	7 L 19 0.84 22	T No stbound 8	R 9 R 123 0.84 146		LT N Easth	lo ound	12	
Lanes Configuration Upstream Signal? Minor Street: App Mov Volume Peak Hour Factor, Hourly Flow Rate, Percent Heavy Vehi	PHF PFR	7 L 19 0.84	T No stbound 8 T	9 R 123 0.84		LT N Easth	lo pound 1	12	
Lanes Configuration Upstream Signal? Minor Street: App Mow Volume Peak Hour Factor, Hourly Flow Rate, Percent Heavy Vehi Percent Grade (%)	PHF HFR icles	7 L 19 0.84 22 2	T No Stbound 8 T	R 9 R 123 0.84 146		LT P Easth J	lo pound 1	12	
Lanes Configuration Upstream Signal? Minor Street: App Mov Volume Peak Hour Factor, Hourly Flow Rate, Percent Heavy Vehi Flared Approach:	PHF HFR icles	7 L 19 0.84 22 2 /Storage	T No Estbound 8 T	R 9 R 123 0.84 146 2	L	LT P Easth J	lo pound 1	12	/
Lanes Configuration Upstream Signal? Minor Street: App Mow Volume Peak Hour Factor, Hourly Flow Rate, Percent Heavy Vehi Percent Grade (%)	PHF HFR icles	7 L 19 0.84 22 2	T No stbound 8 T 0	R 9 R 123 0.84 146 2	L	LT P Easth J	lo pound 1	12	1
Lanes Configuration Upstream Signal? Minor Street: App Mov Volume Peak Hour Factor, Hourly Flow Rate, Percent Heavy Vehi Percent Grade (%) Flared Approach: Lanes	PHF HFR icles	7 L 19 0.84 22 2 /Storage	T No stbound 8 T 0	R 9 R 123 0.84 146 2	L	LT P Easth J	lo pound 1	12	,
Lanes Configuration Upstream Signal? Minor Street: App Mov Volume Peak Hour Factor, Hourly Flow Rate, Percent Heavy Vehi Percent Grade (%) Flared Approach: Lanes	PHF HFR icles	7 L 19 0.84 22 2 /Storage 1 I	T No Stbound 8 T 0	R 9 R 123 0.84 146 2	L /	LT P Easth J	No pound 1 7	12	,
Lanes Configuration Upstream Signal? Minor Street: App Mov Volume Peak Hour Factor, Hourly Flow Rate, Percent Heavy Vehi Percent Grade (%) Flared Approach: Lanes	PHF HFR icles Exists?	7 L 19 0.84 22 2 /Storage 1 I	T No Stbound 8 T 0 S R ength, a	R 9 R 123 0.84 146 2	L /	LT P Easth J	No Dound .1 .2	12	,
Lanes Configuration Upstream Signal? Minor Street: App Mov Volume Peak Hour Factor, Hourly Flow Rate, Percent Heavy Vehi Percent Grade (%) Flared Approach: Lanes Configuration	PHF HFR icles Exists?, Delay, (	7 L 19 0.84 22 2 /Storage 1 I Queue Le	T No Stbound 8 T 0 S R ength, a	R 9 R 123 0.84 146 2 1 	L /	LT P Easth J	lo pound 1 }	12 R	/
Lanes Configuration Upstream Signal? Minor Street: App Mov Volume Peak Hour Factor, Hourly Flow Rate, Percent Heavy Vehi Percent Grade (%) Flared Approach: Lanes Configuration	PHF HFR icles Exists?, Delay, o NB	7 L 19 0.84 22 2 /Storage 1 I Ugueue Le SB	T No Stbound 8 T 0 2 R 2 R 2 R 2 R 2 R 2 R 2 R 2 R 2 R 2	R 9 R 123 0.84 146 2 1 	L / 21 of Se	LT P Easth I 1 1	lo pound 1 }	12 R bound	
Lanes Configuration Upstream Signal? Minor Street: App Mov Volume Peak Hour Factor, Hourly Flow Rate, Percent Heavy Vehi Percent Grade (%) Flared Approach: Lanes Configuration Approach Movement Lane Config	PHF HFR icles Exists?, Delay, o NB	7 L 19 0.84 22 2 /Storage 1 I Queue Le SB 4 LT	T No Stbound 8 T 0 4 S R ength, a Wes 7 L	R 9 R 123 0.84 146 2 1 	/ / cl of Se P R	LT P Easth I 1 1	lo pound 1 }	12 R bound	
Lanes Configuration Upstream Signal? Minor Street: App Mov Volume Peak Hour Factor, Hourly Flow Rate, Percent Heavy Vehi Percent Grade (%) Flared Approach: Lanes Configuration Approach Movement Lane Config V (Vph)	PHF HFR icles Exists?, Delay, o NB	7 L 19 0.84 22 2 /Storage 1 I Queue La SB 4	T No Stbound 8 T 0 S C R ength, a Wes 7	R 9 R 123 0.84 146 2 1 	L / 21 of Se 9	LT P Easth I 1 1	lo pound 1 }	12 R bound	
Lanes Configuration Upstream Signal? Minor Street: App Mov Volume Peak Hour Factor, Hourly Flow Rate, Percent Heavy Vehi Percent Grade (%) Flared Approach: Lanes Configuration Approach Movement Lane Config v (vph) C(m) (vph)	PHF HFR icles Exists?, Delay, o NB	7 L 19 0.84 22 2 /Storage 1 I Queue La SB 4 LT [ 111	T No Stbound 8 T 0 2 2 22	R 9 R 123 0.84 146 2 1 	/ / 21 of Se 9 R 146	LT P Easth I 1 1	lo pound 1 }	12 R bound	
Lanes Configuration Upstream Signal? Minor Street: App Mov Volume Peak Hour Factor, Hourly Flow Rate, Percent Heavy Vehi Percent Grade (%) Flared Approach: Lanes Configuration Approach Movement Lane Config v (vph) C(m) (vph) v/c	PHF HFR icles Exists?, Delay, o NB	7 L 19 0.84 22 2 2 2 2 2 2 2 2 2 2 2 2	T No Stbound 8 T 0 2 2 8 7 L 22 214	R 9 R 123 0.84 146 2 1 	L / 21 of Se 9 R 146 483	LT P Easth I 1 1	lo pound 1 }	12 R bound	
Lanes Configuration Upstream Signal? Minor Street: App Mow Volume Peak Hour Factor, Hourly Flow Rate, Percent Beavy Vehi Percent Grade (%) Flared Approach: Lanes Configuration Approach Movement Lane Config V (vph) C(m) (vph) V/C 95% queue length	PHF HFR icles Exists?, Delay, o NB	7 L 19 0.84 22 2 /Storage 3 I I Queue Le SB 4 LT [ 111 950	T No Stbound 8 T 0 8 R R R R R 2 2 2 1 4 0.10	R 9 R 123 0.84 146 2 1 	/ / Pl of Se 9 R 146 483 0.30	LT P Easth I 1 1	lo pound 1 }	12 R bound	
Lanes Configuration Upstream Signal? Minor Street: App Mov Volume Peak Hour Factor, Hourly Flow Rate, Percent Heavy Vehi Percent Grade (%) Flared Approach: Lanes Configuration Approach Movement Lane Config v (vph) C(m) (vph) v/c	PHF HFR icles Exists?, Delay, o NB	7 L 19 0.84 22 2 /Storage 3 1 2 2 2 2 2 2 2 2 2 2 1 1 2 2 2 2 2 2 2 2 2 2 2 2 2	T No estbound 8 T 0 0 2 2 2 2 1 4 0.10 0.34	R 9 R 123 0.84 146 2 1 	/ / 21 of Se 9 R 146 483 0.30 1.29	LT P Easth I 1 1	lo pound 1 }	12 R bound	
Lanes Configuration Upstream Signal? Minor Street: App Mov Volume Peak Hour Factor, Hourly Flow Rate, Percent Beavy Vehi Percent Grade (%) Flared Approach: Lanes Configuration Approach Movement Lane Config V (Vph) C(m) (vph) V/C 95% queue length Control Delay	PHF HFR icles Exists?, Delay, o NB	7 L 19 0.84 22 2 /Storage 3 SB 4 LT 111 950 0.12 0.40 9.3	T No stbound 8 T 0 2 2 2 2 1 4 0.34 2 3.7	R 9 R 123 0.84 146 2 1 	/ / / R 146 483 0.30 1.29 15.7	LT P Easth I 1 1	lo pound 1 }	12 R bound	

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\_\_\_\_TWO-WAY STOP CONTROL SUMMARY\_\_\_\_\_

Analyst:	IW	
Agency/Co.:	Wilson Okamoto Corpora	tion
Date Performed:	6/9/06	
Analysis Time Period:	PM Peak Period	
Intersection;	Kula Hwy/Lower Kula Rd	(North)
Jurisdiction:	State	
Units: U. S. Customar	У	
Analysis Year:	2009 With Project	
Project ID: 7551-01	Kula Ridge	
East/West Street:	Lower Kula Rd (North)	
North/South Street:	Kula Hwy	
Intersection Orientat	ion: NS	Study period (hrs): 1.00

Major Street:	Approach	Noz	thbound			Sou	thbound		
	Movement.	1	2	3	ł	4	5	5	
		L	T	R	i	Ļ	т	R	
Volume			373	15	~	113	384		
Peak-Hour Fact	or, PHF		0.86	0.86		0.90	0,90		
Hourly Flow Ra	te, HFR		433	17		125	426		
Percent Heavy	Vehicles					2		~-	
Median Type/St RT Channelized	edian Type/Storage F Channelized?					1			
Lanes			1 (	)		Ø	1		
onfiguration			TF	2		LJ	2		
Upstream Signa	17		No				No		
Minor Street:	Approach	Wes	stbound			Eas	thound		
	Movement	7	8	9	}	10	11	12	
		L,	T	R	ł	L	T	R	
Volume		9		80					
Peak Hour Fact	or, PHF	0.82		0.82					
Hourly Flow Ra	te, HFR	10		97					
Percent Heavy	Vehicles	2		2					
Percent Grade	(%)		0				0		
Flared Approac	h: Exists?	Storage			1	,			1
Lanes		1	:	L					
Configuration		L	R						

Approach	_Delay, NB	Queue 1 SB		and Lev estbound		Serv		astboun	
Movement	1	4	7	8	. 9	1	10	11	12
Lane Config		L/T	ļΣ.		R	1			
v (vph)		125	10	·····	97				
C(m) (vph)		1110	277		615				
v/c		0.11	0.04	l	0.16	5			
95% queue length		0.38	0.11		0.56	5			
Control Delay		8.7	18.5	÷	11.5	}			
LOS		А	С		в				
Approach Delay				12.6					
Approach LOS				B					

## HCS+: Unsignalized Intersections Release 5.2

Wilson Okamoto Corporation 1907 S. Beretania St., Suite 400 Honolulu, HI 96826

Phone: (808) 946-2277

E-Mail:

Fax: (808) 946-2253

\_\_\_\_\_ALL-WAY STOP CONTROL(AWSC) ANALYSIS\_\_\_\_

Analyst: IW Agency/Co.: Wilson Okamoto Corporation Date Performed: 6/9/2005 Analysis Time Period: AM Peak Period Intersection: Copp Rd/Lower Kula Rd Jurisdiction: City Units: U. S. Customary Analysis Year: 2009 With Project Project ID: 7551-01 Kula Ridge East/West Street: Copp Rd North/South Street: Lower Kula Rd \_\_\_\_\_\_Worksheet 2 - Volume Adjustments and Site Characteristics\_\_\_\_\_

	Ea	istboi	ınd	W				orthb	ound	j so	Southbound		
	L L	т	R	L	T	R	L	Ţ	R	L	T	R	ł
		·		!									
Volume	36	21	5	5	78	24	14	14	2	13	15	33	
% Thrus Lef	t Lar	le					-						

	Eastbound	Westbound	Northbound	Southbound
	L1 L2	L1 L2	L1 L2	L1 L2
Configuration	LTR	LTR	LTR	LTR
PHF	0.69	0.80	0.61	0.79
Flow Rate	89	132	47	75
% Heavy Veh	2	2	2	2
No. Lanes	1	1	1	1
Opposing-Lanes	1	1	1	1
Conflicting-lanes	1	1	1	1
Geometry group	1	1	1	1
Duration, T 1.00	hrs.			

#### \_\_\_\_\_\_Worksheet 3 - Saturation Headway Adjustment Worksheet\_\_\_\_

	East	bound	West	oound	North	bound	South	bound
	L1	L2	Li	L2	LI	L2	Ll	L2
Flow Rates:								
Total in Lane	89		132		47		75	
Left-Turn	52		б		22		16	
Right Turn	7		29		3		41	
Prop. Left-Turns	0.6		0.0		0.5		0.2	
Prop. Right-Turns	0.1		0.2		0.1		0.5	

	op. Heavy Vehicle0.0 ometry Group 1				0.0		0.0		
Geometry Group			1		1		1	L	
Adjustments Exhibi					,				
hLT-adj		).2		1.2		).2	0.2		
hRT-adj	(		-	.6		).6	-{	0.6	
hHV-adj		1.7		.7		7	-	L.7	
hadj, computed	0.1		-0.1		0.1		~0.3		
Wor	ksheet	4 - Dep	arture P	ieadway	and Serv	ice Tim	e		
	East)	oound	Westi	wund	North	ound	South	oound	
	L1	L2	1.1	L2	L1	L2	L1	L2	
Flow rate	89		132		47		75		
hd, initial value		3.20	3.20	3.20	3.20	3.20	3.20	3.20	
x, initial	0.08		0.12		0.04		0.07		
hd, final value			4.19		4.57		4.20 0.09		
x, final value	0.11		0.15		0.06				
Move-up time, m	2.0		2.0		2	2.0	1	2.0	
Service Time	2.4		2.2		2.6		2.2		
Woz	ksheet	5 - Cap	acity ar	nd Level	of Serv	vice			
	East	bound	Westl	ound	North	bound	South	oound	
	L1	L2	Ll	L2	L1	Ľ2	F1	L2	
Flow Rate	89		132		47		75		
	2.4		2.2		2.6		2.2		
Utilization, x	0.11		0.15		0.06		0.09		
Dep. headway, hd	4.42		4.19		4.57		4.20		
Capacity	339		382		297		325		
Delay	7,97		7.95		7.86		7.61		
LOS	A		A		A		А		
Approach:									
D-1	•	7.97	-	7.95		7.86		7.61	
Delay									
LOS		A y 7.87		A		Α.		A.	

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HCS+: Unsignalized Intersections Release 5.2

Wilson Okamoto Corporation 1907 S. Beretania St., Suite 400 Honolulu, HI 96826

Phone: (808) 946-2277 E-Mail:

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Fax: (808) 946-2253

Analyst:	IW
Agency/Co.:	Wilson Okamoto Corporation
Date Performed:	6/9/2006
Analysis Time Peric	d: PM Peak Feriod
Intersection:	Copp Rd/Lower Kula Rd
Jurisdiction:	City
Units: U. S. Custon	ary
Analysis Year:	2009 With Project
Project ID: 7551-0	01 Kula Ridge
East/West Street:	Copp Rd
North/South Street:	Lower Kula Rd
	2 - Volume Adjustments and Site Characteristics

	E	astbou	und	W	Westbound		1	Northbound			Southbound		
	[ L	T	R	L	т	R		L T	R	↓ L	т	R	
							_1_			{			
Volume	44	37	18	2	28	33	11	0 22	5	(33	31	25	
% Thrus Lei	Et La	ne											

	Eastbou	ınd	Westb	ound	North	bound	Southh	ound
	Ll	L2	Ll	L2	Ll	L2	Ll	L2
Configuration	LTR		LTR		LTR		LTR	
PHF	0.94		0.85		0.91		0.75	
Flow Rate	104		72		39		118	
% Heavy Veh	2		2		2		2	
No. Lanes	1		1	L		1	1	
Opposing-Lanes	1		1			1	1	
Conflicting-lanes	1		1	Ł		1	3	
Geometry group	1		1	E		1	3	
Duration, T 1.00	hrs.							

	Eastl	bound	West	bound	North	bound	South	bound
	L1	L2	L1	L2	L1	L2	Ll	L2
Flow Rates:								
Total in Lane	104		72		39		118	
Left-Turn	46		2		10		44	
Right-Turn	19		38		5		33	
Prop, Left-Turns	0.4		0.0		0.3		0.4	
Prop. Right-Turns	0.2		0.5		0.1		0.3	

#### Prop. Heavy VehicleC.0 Geometry Group 1 0.0 0.0 0.0 1 Geometry Group 1 1 . Adjustments Exhibit 17-33: hLT-adj 0.2 0.2 0.2 0.2 hRT-adj -0.6 -0.6 ~0.6 -0.5 hHV-adj 1.7 1.7 1.7 . 1.7 0.0 -0.3 0.0 -0.1 hadj. computed \_\_\_\_\_\_Worksheet 4 - Departure Headway and Service Time\_\_\_\_ .......

	East	bound	West)	oound	North	oound	South	bound
	L1	L2	L1	L2	Ll	L2	L1	L2
Flow rate	104		72		39		118	
hd, initial value	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
x, initial	0.09		0.06		0.03		0.10	
hd, final value	4.35		4.10		4.43		4.28	
x, final value	0.13		0.08		0.05		0.14	
Move-up time, m		2.0	:	2.0	:	2.0		2.0
Service Time	2.3		2.1		2.4		2.3	

## \_\_\_\_\_\_Worksheet 5 - Capacity and Level of Service\_\_\_\_

	Easth	bound	West!	oound	North	bound	South	ound
	L1	Γ5	L1	L2	L1	L2	L1	L2
Flow Rate	104		72		39		118	
Service Time	2.3		2.1		2.4		2.3	
Utilization, x	0.13		0.08		0.05		0.14	
Dep. headway, hd	4.35		4.10		4,43		4.28	
Capacity	354		322		289		368	
Delay	7.97		7.46		7.66		7,98	
LOS	А		А		A		А	
Approach:								
Delay	•	7.97		7.46		7,66	-	7.98
LOS	ز ن	A	1	A		A	2	A
Intersection Delay	y 7.83		Inte	ersecti	on LOS A			

## TWO-WAY STOP CONTROL SUMMARY

Analyst:	IW				_			
Agency/Co.: Date Performed:		son Ox /2006	anoto Co	orporatio.	21			
			oried					
Analysis Time Perio Intersection:				ula Rd (S	outh			
Intersection: Jurisdiction:	Sta		DOMGL KI	ита KØ (S	ouch)			
Units: U. S. Custon								
Analysis Year:		a with	Project	<b>k</b>				
Project ID: 7551-6				<b>.</b>				
East/West Street:			a Rd (S	outhl				
North/South Street		a Hwy	a na (0)	ouch;				
Intersection Orien				51	udy period	< (hre)	: 1.0	0
110010000101 01101					auj perio			~
	Veh			and Adjus				
Major Street: App:	roach		Northbo	und	So	uthboun	d	
Mov	ement	1	2	3	4	5	6	
		L	Ť	R	] L	T	R	
								·
Volume			309		12	170		
Peak-Hour Factor,			0.8		0.66	0.66		
Hourly Flow Rate, 1			372		18	257		
Percent Heavy Vehi					2	~~		
Median Type/Storag	e	Unc	livided		/			
RT Channelized?			1	<u>^</u>	~			
Lanes			1	0	0	1		
Configuration			h1-	TR	Ľ			
Upstream Signal?			No			No		
Minor Street: App	roach		Westbou	nd	Ea	stbound		
Mov	ement	7	8	9	10	11	12	
		L	т	R	L	Т	R	
Volume		3		12				
Peak Hour Factor,	PHE	0.7	5	0.75				
Hourly Flow Rate,		4.7	-	16				
Percent Heavy Vehi		2		2				
Percent Grade (%)		4	0			0		
	Exists?	/Stora	-	No	1	Ŷ		1
Lanes		,	0	0	,			r
Configuration			LR	-				
				···	····			
	Delav	Oveue	Length	and Leve	el of Serv	ice		
Approach	NB	SB		estbound			bound	
Movement	1	4	1 7	8	9	10	11	12
Lane Config		LT		LR				
					·····			
v (vph)		18		20				
C(m) (vph) V/c		1185		601 0.03				
V/C		0.0		-				
050		- U.O.	>	0.10				
95% queue length				1				
Control Delay		8.1		11.2				
Control Delay LOS				В				
Control Delay		8.1						

HCS+: Unsignalized Intersections Release 5.2 \_TWO-WAY STOP CONTROL SUMMARY\_ Analyst: IW Agency/Co.: Wilson Okamoto Corporation Date Performed: 6/9/2006 Analysis Time Period: PM Peak Period Intersection: Kula Hwy/Lower Kula Rd (South) Jurisdiction: State Units: U. S. Customary 2009 With Project Analysis Year: Project ID: 7551-01 Kula Ridge Lower Kula Rd (South) East/West Street: Kula Hwy North/South Street: Study period (hrs): 1.00 Intersection Orientation: NS \_Vehicle Volumes and Adjustments\_ Major Street: Approach Northbound Southbound Movement 2 5 6 1 ٦ 4 R т R L Τ L Volume 261 6 9 240 Peak-Hour Factor, PHF 0.92 0.92 0.93 0.93 Hourly Flow Rate, HFR 283 258 б 9 Percent Heavy Vehicles ~~ 2 ----~ ~ - -Undivided Median Type/Storage 1 RT Channelized? Lanes 0 0 1 1 Configuration LTΤR Upstream Signal? No No Minor Street: Approach Eastbound Westbound Movement 8 9 11 7 10 12 T R L Т R ĩ Volume 12 8 Peak Hour Factor, PHF 0.61 0.61 Hourly Flow Rate, HFR 19 13 Percent Heavy Vehicles 2 2 Percent Grade (%) 0 0 Flared Approach: Exists?/Storage No 1 0 Lanes 0 Configuration LR \_\_\_Delay, Queue Length, and Level of Service\_

Approach	NB	ŚB	Westbound	Eastbound
Movement	1	4 7	8 9	10 11 12
Lane Config		LT ]	LR	
v (vph)		9	32	
C(m) (vph)		1273	567	
v/c		0.01	0.06	
95% queue length		0.02	0.18	
Control Delay		7.8	11.7	
LOS		А	в	
Approach Delay			11.7	
Approach LOS			B	
95% queue length Control Delay LOS Approach Delay		0.02 7.8	0.18 11.7 B 11.7	

# **APPENDIX G-1.**

# Supplemental Traffic Assessment



1907 South Beretania Street Artesian Plaza, Suite 400 Honolulu, Hawaii, 96826 USA Phone: 808.946.2277 Fax: 808.946.2253 www.wilsonokamoto.com 7551-02 June 16, 2008

Mr. Clayton Nishikawa Kula Ridge, LLC 1849 Wili Pa Loop Wailuku, HI 96793

Subject: Kula Ridge

Dear Mr. Nishikawa:

As requested, we assessed an alternate trip distribution scenario for the Kula Ridge project to address comments provided by DOT. The following is a summary of our findings.

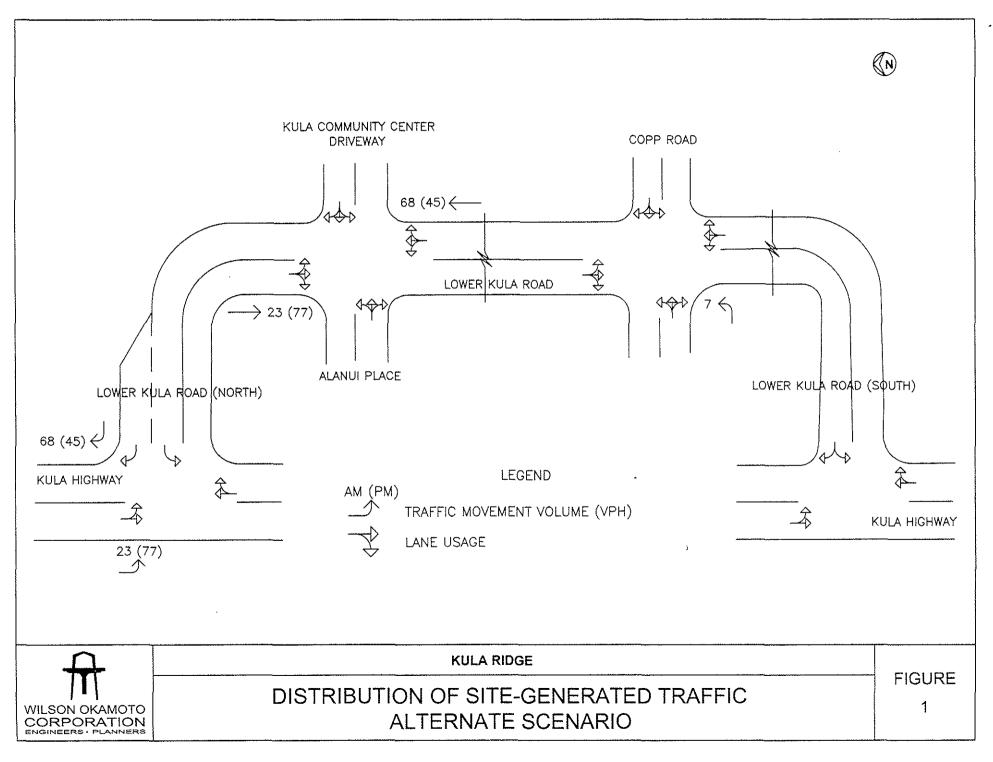
...

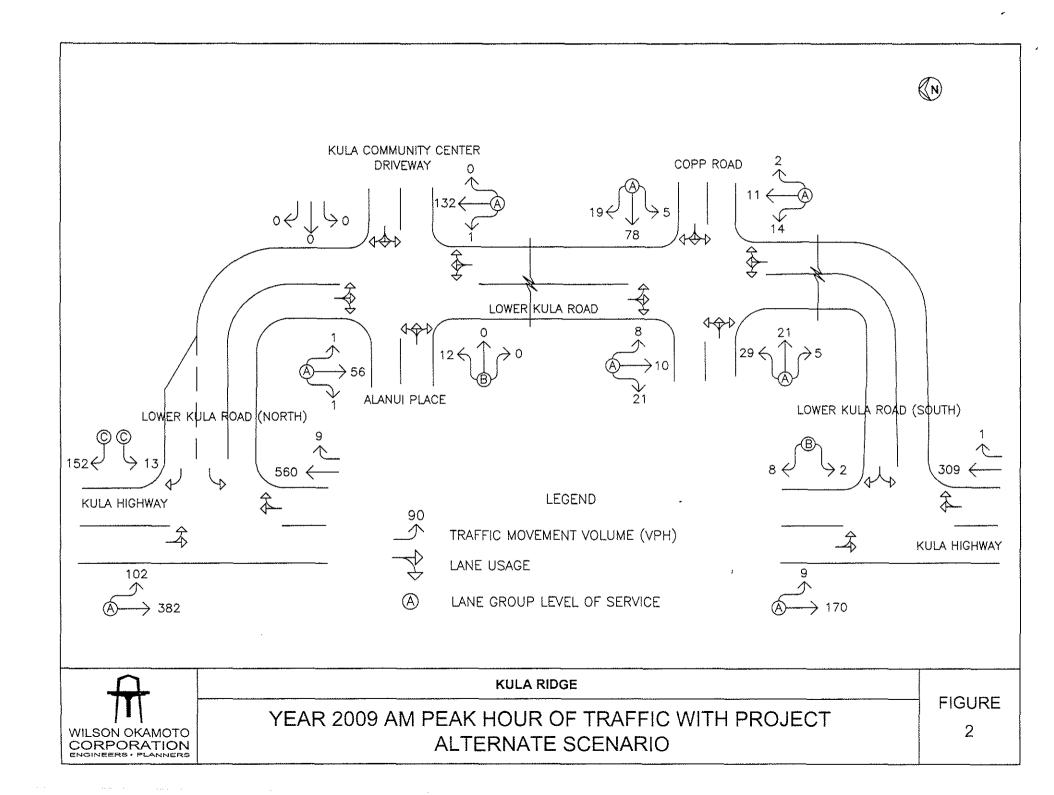
## **Trip Distribution**

In comments provided on April 22, 2008, DOT indicated that they did not agree with the trip distribution detailed in the Traffic Impact Report prepared for the Kula Ridge project dated July 2006. To address these comments, an alternate scenario was assessed in which all site-generated trips were assumed to travel from origins and to destinations to the north of the project site. It should be noted, however, that this trip distribution methodology assumes that all site-generated trips are work related and do not have any linked or pass-by destinations. As such, all entering vehicles were assumed to turn left from Kula Highway onto Lower Kula Road via the northern intersection of that roadway with the highway, and then utilized Lower Kula Road to access the project site. Similarly, all exiting vehicles were assumed to turn right onto Lower Kula Road and then right onto Kula Highway. Figure 1 shows the distribution of site-generated vehicles during the AM and PM peak periods for this alternate scenario.

## Year 2009 With Project Conditions

The projected Year 2009 AM and PM peak period traffic volumes and operating conditions under the alternate scenario are shown in Figures 2 and 3, and summarized in Table 1. The projected Year 2009 operating conditions based upon the trip distribution included in the original TIAR are provided for comparison purposes. LOS calculations are included in the appendix.







7551-02 Letter to Mr. Clayton Nishikawa Page 6 June 16, 2008

Lower Kula Road as suggested by the DOT is not required. However, the provision of an exclusive turning lane on this approach would minimize the impact of turning vehicles on through traffic along the highway.

Should you have any questions or require additional information, please contact Mr. Pete Pascua or myself at 946-2277.

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Sincerely.

Cathy Leong, J.E.

## APPENDIX CAPACITY ANALYSES CALCULATIONS ALTERNATE SCENARIO

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TWO-WAY STOP CONTROL SUMMARY\_\_\_\_\_

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Analyst:	cl.				
Agency/Co.:	Wilson Okamoto Corpora	tion			
Date Performed:	6/9/2008				
Analysis Time Period:	AM Peak Period				
Intersection:	Alanui Dr/Lower Kula F	۱đ			
Jurisdiction:					
Units: U. S. Customar	У				
Analysis Year:	2009 With Project				
Project ID: Alternat	e Scenario				
East/West Street:	Alanui Dr				
North/South Street:	Lower Kula Rd				
Intersection Orientat	ion: NS	Study	period	(hrs):	1.00

Veh	icle Volu	umes and	d Adjus	tments			
Major Street: Approach	Noi	thbound	£	So	uthbour	nd	
Movement	1	2	3	4	5	6	
	L	Τ	R	Ĺ	Т	R	
Volume	1	132	0	1	56	1	
Peak-Hour Factor, PHF	0.74	0.74	0.74	0.50	0.50	0.50	
Hourly Flow Rate, HFR	1	178	0	2	112	2	
Percent Heavy Vehicles	2	مىر		2			
Median Type/Storage RT Channelized?	Undivi	ded		1			
Lanes	0	1 (	)	0	1	0	
Configuration	Ľ	ľR		L	TR		
Upstream Signal?		No			No		
Minor Street: Approach	Wes	tbound		Ea	stbound	3	
Movement	7	8	9	10	11	12	
	L	$\mathbf{T}$	R	L	Т	R	
Volume	0	0	0	12	0	0	
Peak Hour Factor, PHF	1.00	1.00	1.00	0.60	0.60	0.60	
Hourly Flow Rate, HFR	0	0	0	19	0	0	
Percent Heavy Vehicles	2	2	2	2	2	2	
Percent Grade (%)		0			0		
Flared Approach: Exists?	/Storage		No	1		No	1
Lanes	0	1. (	С	0	1.	0	
Configuration		LTR			LTR		

Approach	_Delay, ( NB	SB	ngth, and Level of Westbound	Eastbound	
Movement	1	4	7 8 9	10 1.1	12
Lane Config	LTR	LTR	LTR	L'I'R	
v (vph)	1	2	0	1.9	
C(m) (vph)	1475	1398		654	
v/c	0.00	0.00		0.03	
95% queue length	0.00	0.00		0.09	
Control Delay	7.4	7.6		10.7	
LOS	А	A		В	
Approach Delay				10.7	
Approach LOS				В	

TWO-WAY STOP CONTROL SUMMARY\_\_\_\_\_

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Analyst:	CL			
Agency/Co.:	Wilson Okamoto Corpora	tion		
Date Performed:	6/9/2008			
Analysis Time Period:	PM Peak Period			
Intersection:	Alanui Dr/Lower Kula R	d		
Jurisdiction:				
Units: U. S. Customar	У			
Analysis Year:	2009 With Project			
Project ID: Alternat	e Scenario			
East/West Street:	Alanui Dr			
North/South Street:	Lower Kula Rd			
Intersection Orientat	ion: NS	Study period	l (hrs):	1.00

Major Street:	Approach	Noi	thbound	9		Sou	ıthbour	nd	
	Movement	1	2	3		4	5	б	
		Ľ	$\mathbf{T}$	R		Ь	$\mathbf{T}$	R	
Volume		0	117	3		14	156	10	
Peak-Hour Fact	or, PHF	0.69	0.69	0.69		0.84	0.84	0.84	
Hourly Flow Ra	te, HFR	0	169	4		16	185	11	
Percent Heavy	Vehicles	2				2	****	-	
Median Type/St RT Channelized		Undivi	ided			/			
Lanes		0	1	)		0	1	0	
Configuration		L	ΓR			$\mathbf{L}_{\mathbf{C}}^{*}$	ΓR		
Upstream Signa	1?		No				No		
Minor Street:	Approach	Wes	stbound		. <u> </u>	Eas	tbound	3	
	Movement	7	8	9		10	11	1.2	
		L	$\mathbf{T}$	R		L	Т	R	
Volume		7	0	13	~~~~	3	0	1	
Peak Hour Fact	or, PHF	0.71	0.71	0.71		0.33	0.33	0.33	
Hourly Flow Ra	ite, HFR	9	0	1.8		9	0	3	
Percent Heavy	Vehicles	2	2	2		2	2	2	
Percent Grade	(%)		0				0		
Flared Approac	h: Exists?/	'Storage		No	1			No	1
Lanes		0	1 (	)		0	1	0	
Configuration			LTR				LTR		

Approach	_Delay, NB	Queue Leng SB	th, and Level of Westbound	Service Eastbound
Movement Lane Config	1 LTR	4   7 LTR	8 9 LTR	10 11 12 LTR ·
v (vph)	0	1.6	27	12
C(m) (vph)	1377	1404	734	596
v/c	0.00	0.01	0.04	0.02
95% queue length	0.00	0.03	0.11	0.06
Control Delay	7.6	7.6	10.1	11.2
LOS	А	А	В	В
Approach Delay			10.1	11.2
Approach LOS			В	В

TWO-WAY STOP CONTROL SUMMARY

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Analyst:	CL	
Agency/Co.:	Wilson Okamoto Corpora	tion
Date Performed:	6/9/2008	
Analysis Time Period:	AM Peak Period	
Intersection:	Kula Hwy/Lower Kula Rd	(North)
Jurisdiction:		
Units: U. S. Customar	У	
Analysis Year:	2009 With Project	
Project ID: Alternat	e Scenario	
East/West Street:	Lower Kula Rd (North)	
North/South Street:	Kula Hwy	
Intersection Orientat	ion: NS	Study period (hrs): 1.00

	Vehi	cle Volu	umes ar	ıd Adjus	tments			
Major Street: Ap	proach	Nor	thbour	ıd	S	outhbour	nd	
Мо	vement	1	2	3	4	5	6	
		L	$\mathbf{T}$	R	L	Т	R	
Volume			560	9	102	382		
Peak-Hour Factor,	PHF		0.90	0.90	0.77	0.77		
Hourly Flow Rate,	Hourly Flow Rate, HFR			10	132	496		
Percent Heavy Veh				2				
Median Type/Stora	Undivi	ded		/				
RT Channelized?								
Lanes			1	0	0	1		
Configuration			Г	'R		$\mathbf{LT}$		
Upstream Signal?			No			No		
Minor Street: Ap	proach	Wes	stbound		E	astbound		
Мо	vement	7	8	9	10	11	12	
		L	$\mathbf{T}$	R	L	$\mathbf{T}$	R	
Volume		13		152				
Peak Hour Factor,	PHF	0.84		0.84				
Hourly Flow Rate,	HFR	15		180				
Percent Heavy Veh	icles	2		2				
Percent Grade (%)			0			0		
Flared Approach:	Exists?/	'Storage			1			/
Lanes		1		1				
Configuration		$\mathbf{L}$	F	l				

Approach	_Delay, NB	Queue Le SB		and Leve stbound			astbound	Ē
Movement	1	4	7	8	9	10	11	12
Lane Config		LT	L		R	ĺ		•
v (vph)		132	15		180			
C(m) (vph)		951	200		484			
v/c		0.14	0.08		0.37			
95% queue length		0.48	0.24		1.76			
Control Delay		9.4	24.5		16.8			
LOS		A	С		С			
Approach Delay				17.4				
Approach LOS				С				

TWO-WAY STOP CONTROL SUMMARY

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Analyst:	CL		
Agency/Co.:	Wilson Okamoto Corpora	tion	
Date Performed:	6/9/2008		
Analysis Time Period:	PM Peak Period		
Intersection:	Kula Hwy/Lower Kula Rd	(North)	
Jurisdiction:			
Units: U. S. Customar	У		
Analysis Year:	2009 With Project		
Project ID: Alternat	e Scenario		
East/West Street:	Lower Kula Rd (North)		
North/South Street:	Kula Hwy		
Intersection Orientat	ion: NS	Study period (hrs): 1.00	

	Vehi	.cle Volu	mes and	Adjus	tme	nts		
Major Street:	Approach	Nor	thbound			Sou	thbound	1
	Movement	1	2	3		4	5	6
		L	T	R	Ì	L	T	R
Volume			373	11		157	384	
Peak-Hour Fact	or, PHF		0.86	0.86		0.90	0.90	
Hourly Flow Ra	te, HFR		433	12		174	426	
Percent Heavy	Vehicles					2		
Median Type/St RT Channelized		Undivi	ded			/		
Lanes			1 0			0	1	
Configuration			TR			LT		
Upstream Signa	1?		No				No	
Minor Street:	Approach	Wes	tbound		·····	Eas	tbound	
	Movement	7	8	9		10	11	12
		L	T	R	l	L	Т	R
Volume		7		107				
Peak Hour Fact	or, PHF	0.82		0.82				
Hourly Flow Ra	te, HFR	8		130				
Percent Heavy	Vehicles	2		2				
Percent Grade	(%)	\$	0				0	
Flared Approac	h: Exists?/	Storage			1			1
Lanes		1.	1					
Configuration		$\mathbf{L}$	R					

Approach	NB	SB	Wes	tbound		Ea	astbound	3
Movement	1	4	7	8	9	10	11	12
Lane Config		LT	L		R			•.
v (vph)		174	8		130			
C(m) (vph)		1115	237		618			
v/c		0.16	0.03		0.21			
95% queue length		0.55	0.10		0.80			
Control Delay		8.8	20.7		12.4			
LOS		A	С		В			
Approach Delay				12.9				
Approach LOS				В				

Wilson Okamoto Corporation 1907 S. Beretania St., Suite 400 Honolulu, HI 96826

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\_\_\_\_\_ALL-WAY STOP CONTROL(AWSC) ANALYSIS\_\_\_\_\_\_

HCS+: Unsignalized Intersections Release 5.21

	Analyst:	CL
	Agency/Co.:	Wilson Okamoto Corporation
	Date Performed:	6/9/2008
•	Analysis Time Period:	AM Peak Period
	Intersection:	Copp Rd/Lower Kula Rd
	Jurisdiction:	1
	Units: U. S. Customary	<i>l</i>
	Analysis Year:	
	Project ID: Alternate	e Scenario
	East/West Street:	Copp Rd
	North/South Street:	Lower Kula Rd
	Worksheet 2 ·	- Volume Adjustments and Site Characteristics

	Eastbound			W	Westbound			Northbound			Southbound			
	L	$\mathbf{T}$	R	L	$\mathbf{T}$	R		L	T	R	L	т	R	
Volume	29	21	5	5	78	19		1.4	11	2	8	10	21	
8 Thrue Loft Land														

% Thrus Left Lane

	Eastbound		Westh	ound	Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	Г1	L2
Configuration	LTR		LTR		LTR		LTR	
PHF	0.69		0.80		0.61		0.79	
Flow Rate	79		126		43		48	
% Heavy Veh	2		2		2		2	
No. Lanes	1		1	L	-	1		1
Opposing-Lanes	1.		1			L		1
Conflicting-lanes	1		1		-	L		1
Geometry group	1		1					1.
Duration, T 1.00	hrs.							

\_\_\_\_\_Worksheet 3 - Saturation Headway Adjustment Worksheet\_\_\_\_\_

	Eastbound		Westl	oound	Northbound		Southbound	
	L1	L2	L1.	L2	L1	L2	L:1	L2
Flow Rates:								
Total in Lane	79		126		43		48	
Left-Turn	42		6		22		10	
Right-Turn	7		23		3		26	
Prop. Left-Turns	0.5		0.0		0.5		0.2	
Prop. Right-Turns	0.1		0.2		0.1		0.5	

Prop. Heavy Vehicle0.0			0.0		0.0		0.0	
Geometry Group	1		1			1.	]	L
Adjustments Exhibi	t 17-33	:						
hLT-adj	0	. 2	C	).2	(	0.2	(	).2
hRT-adj			- (	).6	- (	0.6	- (	).6
hHV-adj			1	. 7	-	1.7	1	.7
hadj, computed			-0.1		0.1		-0.2	
Wor	ksheet	4 - Dep	arture H	leadway	and Ser	vice Tim	e	
	Eastb	ound	Westh	ound	North	oound	South	ound
	L1	L2	L1	L2	L1	L2	L1	L2
Flow rate	79		126		43		48	
hd, initial value	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
x, initial	0.07		0.11		0.04		0.04	
hd, final value	4.32		4.13		4.50	-	4.15	
x, final value	0.09		0.14		0.05		0.06	
Move-up time, m	2	.0	2	2.0		2.0	2	2.0
Service Time	2.3		2.1		2.5		2.2	
Wor	ksheet	5 - Cap	acity ar	nd Level	of Ser	vice	······································	
	Eastb	ound	Westh	bound	Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	Ll	L2
Flow Rate	79		126		43		48	

2.1

0.14

4.13

376

7.82

7.82

A

Intersection LOS A

А

2.5

0.05

4.50

293

7.76

7.76

А

А

2.2

0.06

4.15

298

7.40

7.40

А

А

2.3

329

7.78

7.78

А

А

0.09

Service Time Utilization, x

Capacity

Approach:

Delay LOS

Delay

LOS

Dep. headway, hd 4.32

Intersection Delay 7.73

`

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ALL-WAY STOP CONTROL(AWSC) ANALYSIS\_\_\_\_\_

Analyst:	CL	
Agency/Co.:	Wilson Okamoto Corporation	
Date Performed:	6/9/2008	
Analysis Time Period:	PM Peak Period	
Intersection:	Copp Rd/Lower Kula Rd	
Jurisdiction:	,	
Units: U. S. Customary	Y	
Analysis Year:	2009 With Project	
Project ID: Alternate	e Scenario	
East/West Street:	Copp Rd	
North/South Street:	Lower Kula Rd	
Worksheet 2 -	- Volume Adjustments and Site Characterist	ics_

	Ea	istbou	ınd	W	Westbound			Northbound			S	Southbound		
	L	$\mathbf{T}$	R	L	T	R		$\mathbf{L}$	т	R	Ĺ	т	R	1
Volume	  28	37	18	2	28	21	 	10	14	5	$-\frac{1}{24}$	23		_
% Thrus Lei	1		10		20	2	I	ŢŶ		5	1.4.	20	1.0	1

	Eastb	ound	Westh	ound	North	oound	South	bound
	ГJ	L2	L1	L2	L1	L2	L1	L2
Configuration	LTR		LTR		LTR		LTR	
PHF	0.94		0.85		0.91		0.75	
Flow Rate	87		58		30		86	
% Heavy Veh	2		2		2		2	
No. Lanes	1		1	-	1	L		1
Opposing-Lanes	1.		1			L		1
Conflicting-lanes	1		1		1	L		1
Geometry group	1.		1	-	1	L		1
Duration, T 1.00	hrs.							

Worksheet 3 - Saturation Headway Adjustment Worksheet

	Easth	ound	Westl	oound	North	oound	South	oound
	L1	L2	L1	L2	L1	L2	L1	L2
Flow Rates:								
Total in Lane	87		58		30		86	
Left-Turn	29		2		10		32	
Right-Turn	19		24		5		24	
Prop. Left-Turns	0.3		0.0		0.3		0.4	
Prop. Right-Turns	0.2		0.4		0.2		0.3	

Prop. Heavy Vehicl	e0.0	0.0	0.0	0.0
Geometry Group	1	1	1	1
Adjustments Exhibi	t 17-33:			
hLT-adj	0.2	0.2	0.2	0.2
hRT-adj	-0.6	-0.6	-0.6	-0.6
hHV-adj	1.7	1.7	1.7	1.7
hadj, computed	-0.0	-0.2	0.0	-0.1

Worksheet 4 - Departure Headway and Service Time\_\_\_\_\_

	East	bound	West	oound	North	ound	South	bound
	L1	L2	L1	L2	L.1	L2	L1	L2
Flow rate	87		58		30		86	
hd, initial value	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
x, initial	0.08		0.05		0.03		0.08	
hd, final value	4.19		4.04		4.31		<b>4.19</b>	
x, final value	0.10		0.07		0.04		0.10	
Move-up time, m		2.0		2.0	2	2.0		2.0
Service Time	2.2		2.0		2.3 .		2.2	

\_\_\_\_\_\_Worksheet 5 - Capacity and Level of Service\_\_\_\_\_\_

	Eastb	ound	Westh	oound	North	oound	Southl	oound
	L1	L2	L1	L2	L1	L2	L1	L2
Flow Rate	87		58		30		86	
Service Time	2.2		2.0		2.3		2.2	
Utilization, x	0.10		0.07		0.04		0.10	
Dep. headway, hd	4.19		4.04		4.31		4.19	
Capacity	337		308		280		336	
Delay	7.66		7.32		7.47		7.66	
LOS	А		А		А		А	
Approach:								
Delay	7	.66	5	7.32	5	1.47		7.66
LOS	A		1	ł	1	J	1	ž
Intersection Delay	7.56		Inte	ersectio	on LOS A			

TWO-WAY STOP CONTROL SUMMARY

3

Configuration

	CL Wilson Okamoto Corpora 6/9/2008	tion	
Analysis Time Period: Intersection:	Kula Hwy/Lower Kula Rd	l (South)	
Jurisdiction:			
Units: U. S. Customar	У		
Analysis Year:	2009 With Project		
Project ID: Alternat	e Scenario		
East/West Street:	Lower Kula Rd (South)		
North/South Street:	Kula Hwy		
Intersection Orientat	-	Study period (hrs	): 1.00
	Vehicle Volumes and Ad	ljustments	

Major Street:	Approach		thbound			uthbound	d
	Movement	1	2	3	4	5	6
		L	$\mathbf{T}$	R	L	т	R
Volume		** ******************************	309	1	9	170	
Peak-Hour Fact	or, PHF		0.83	0.83	0.66	0.66	
Hourly Flow Ra	ate, HFR		372	1	13	257	
Percent Heavy	Vehicles				2		
Median Type/St RT Channelized	-	Undivi	ded		1		
Lanes			1 (	)	0	1	
Configuration			T	ર	L	т	
Upstream Signa	11?		No			No	
Minor Street:	Approach	Wes	stbound		Ea	stbound	
	Movement	7	8	9	1.0	11	12
		Г	Т	R	L	$\mathbf{T}$	R
Volume		2		8			
Peak Hour Fact	or, PHF	0.75		0.75			
Hourly Flow Ra	ate, HFR	2		10			
Percent Heavy	Vehicles	2		2			
Percent Grade	(%)		0			0	
Flared Approac	h: Exists?,	/Storage		No	1		/
Lanes		0	(	)			

Approach	NB	SB		Westbound			Ea	astbound	E
Movement	1	4	7	8	9		10	11	12
Lane Config		LT		LR					
v (vph)		13		12					
C(m) (vph)		1185		614					
v/c		0.01		0.02					
95% queue length		0.03		0.06					
Control Delay		8.1		11.0					
LOS		А		В					
Approach Delay				11.0					
Approach LOS				В					

LR

TWO-WAY STOP CONTROL SUMMARY

**`** 

Analyst: Agency/Co.: Date Performed Analysis Time Intersection: Jurisdiction: Units: U. S. C Analysis Year: Project ID: A East/West Stre	W : 6 Period: P K ustomary lternate et: L	ula Hwy/L Scenario ower Kula	riod ower Kula	a Rd (S				
North/South St		<u>~</u>		C F	udu nani	al (hara)	1 00	
Intersection 0	rientatio	n: NS		50	udy peric	a (nrs)	: 1.00	
	V	ehicle Vo	lumes and	d Adjus	tments			
Major Street:	Approach	N	orthbound	£	Sc	outhboun	d	
	Movement	1.	2	3	4	5	6	
		L	т	R	L	$\mathbf{T}$	R	
Volume			261	4	9	234		
Peak-Hour Fact	or, PHF		0.92	0.92	0.93	0.93		
Hourly Flow Ra	te, HFR		283	4	9	251		
Percent Heavy	Vehicles				2			
Median Type/St		Undi	vided		1			
RT Channelized	?							
Lanes			1 (	)	0	1		
Configuration			TI	२	I	л		
Upstream Signa	1?		No			No		
Minor Street:	Approach	W	estbound		Ea	stbound		
	Movement		8	9	10	11	12	
		Ť.	ሞ	R	İτ.	ጥ	R	

	Ĺ	T	R	L	Т	R	
Volume	7		5				,
Peak Hour Factor, PHF	0.61		0.61				
Hourly Flow Rate, HFR	11		8				
Percent Heavy Vehicles	2		2				
Percent Grade (%)		0			0		
Flared Approach: Exists?/	Storage		No	1		/	
Lanes	0		0				
Configuration		LR					

Approach	_Delay, NB	Queue Le SB		and Lev estbound		Service Ea	astbound	
Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR		ĺ		¢
v (vph)		9		1.9				
C(m) (vph)		1275		575				
v/c		0.01		0.03				
95% queue length		0.02		0.10				
Control Delay		7.8		11.5				
LOS		А		В				
Approach Delay				11.5				
Approach LOS				В				

# **APPENDIX H.**

# Preliminary Engineering and Drainage Reports, September 2006

## TABLE OF CONTENTS

## PRELIMINARY DRAINAGE REPORT

## FOR

## KULA RIDGE SUBDIVISION

## Kula, Maui, Hawaii

## T.M.K.: (2) 2-3-001: 174

## Prepared for:

Kula Ridge, LLC 1849 Wili Pa Loop Wailuku, Maul, Hawaii 96793



Prepared by:



September 2006

- I. INTRODUCTION
- II. SITE LOCATION AND PROJECT DESCRIPTION
- III. EXISTING TOPOGRAPHY AND SOIL CONDITIONS
- IV. EXISTING DRAINAGE CONDITIONS
- V. FLOOD AND TSUNAMI ZONE
- VI. PROPOSED DRAINAGE PLAN
- VII. HYDROLOGIC CALCULATIONS
- VIII. CONCLUSION
- IX. REFERENCES

## **EXHIBITS**

- 1 Location Map
- Vicinity Map
- 3 Soil Survey Map

## **APPENDICES**

• ••

A Hydrologic and Hydraulic Calculations

PRELIMINARY DRAINAGE REPORT FOR KULA RIDGE SUBDIVISION Kula, Maul, Hawaii

## I. INTRODUCTION

The purpose of this report is to examine both the existing and proposed drainage conditions for the proposed project.

## II. SITE LOCATION AND PROJECT DESCRIPTION

The subject property is identified as T.M.K.: (2) 2-3-001: 174, which encompasses an area of 48.117 acres. It is also Lot 2 of the G and R Von Tempsky Trust Subdivision. The project site is bordered by Keahuaiwi Gulch and Lot 1 of the G and R Von Tempsky Trust Subdivision to the north, Lot 1 of the G and R Von Tempsky Trust Subdivision to the east, and Lot 3 of the G and R Von Tempsky Trust Subdivision to the south.

The development plan includes approximately 112 residential lots, 4 agricultural lots, and a 5-acre park site which will be dedicated to the County. Associated improvements include grading, paved roadways, underground utilities and landscaping.

## III. EXISTING TOPOGRAPHY AND SOIL CONDITIONS

The project site is presently undeveloped and used as an open pasture. The majority of the site is overgrown with weeds and various grasses.

The elevation on the site ranges from elevation 3,085 feet above sea level at the northeastern corner of the property to 2,700 feet above mean sea level at the northwesterly corner, averaging approximately 14.8%.

According to the "Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii (August, 1972)," prepared by the United States Department of Agriculture Soil Conservation Service, the soil within the project site is classified as Kula cobbly loam, (KxaD). Kula cobbly loam is characterized as having moderately rapid permeability, medium runoff, and a moderate erosion hazard.

## IV. EXISTING DRAINAGE CONDITIONS

Presently, the majority of the onsite runoff sheet flows across the project site in a northeast to southwest direction toward the adjacent properties. A portion of the runoff sheet flows directly into Keahuaiwi Gulch. The runoff eventually discharges into the ocean.

It is estimated that the existing 50-year storm runoff from the undeveloped project site is 55.66 cfs.

## V. FLOOD AND TSUNAMI ZONE

According to Panel Number 150003 0001-0400 of the Flood Insurance Rate Map, dated March 16, 1995, prepared by the United States Federal Emergency Management Agency, it appears that the project site is situated in Flood Zone C. Flood Zone C represents areas of minimal flooding.

## VI. PROPOSED DRAINAGE PLAN

After the development of the proposed project, it is estimated that the 50-year storm runoff will be 164.59 cfs, a net increase of 108.93 cfs. Onsite runoff will be intercepted by grated catch basins located within the grassed shoulder areas. The runoff will be conveyed to an onsite detention basin, which will be located in the northwestern corner fo the project site.

Overflows from the detention basin will be allowed to sheet flow into Keahuaiwi Gulch at a rate less than the present condition. The detention basin will be designed and sized to accommodate the increase in surface runoff volume from a 50-year 1-hour storm generated from the proposed project.

The drainage design criteria will be to minimize any alterations to the natural pattern of the existing onsite surface runoff. This is in accordance with the drainage standards for the County of Maui.

## VII. HYDROLOGIC CALCULATIONS

The hydrologic calculations are based on the "Rules for the Design of Storm Drainage Facilities in the County of Maui," and the "Rainfall Frequency Atlas of the Hawaiian Islands," Technical Paper No. 43, U.S. Department of Commerce, Weather Bureau.

## Rational Formula Used: Q = CIA

- Where Q = rate of flow (cfs)
  - C = rainfall coefficient
  - rainfall intensity for a duration equal to the time of concentration (inches/hour)
  - A = drainage area (Acres)

## See Appendix A for Hydrologic Calculations

## VIII. CONCLUSION

Onsite runoff will be intercepted by grated catch basins located within the grassed shoulder areas. The runoff will be conveyed to an onsite detention basin, which will be located in the northwestern corner fo the project site. Overflows from the detention basin will be allowed to sheet flow into Keahuaiwi Gulch at a rate less than the existing condition. The detention basin will be designed and sized to accommodate the increase in surface runoff volume from a 50-year 1-hour storm generated from the proposed project.

There will be no increase in runoff sheet flowing from the project site onto the adjoining or downstream properties. This is in accordance with Chapter 4, Rules for the Design of Storm Drainage Facilities in the County of Maui.

Therefore, it is our professional opinion that the proposed development will not have an adverse effect on the adjoining or downstream properties.

## IX. <u>REFERENCES</u>

- A. <u>Soil Survey of Islands of Kaual, Oahu, Maul, Molokai and Lanai, State of Hawaii</u>, prepared by U.S. Department of Agriculture, Soil Conservation Service, August, 1972.
- B. <u>Rainfall-Frequency Atlas of the Hawaiian Islands</u>, Technical Paper No. 43, U.S. Department of Commerce, Weather Bureau, 1962.

C. Flood Insurance Rate Maps of the County of Maui, March, 1995.

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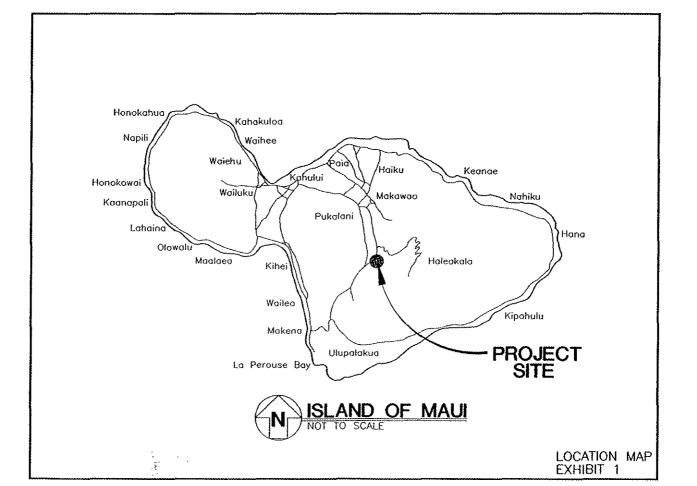
D. <u>Chapter 4, Rules for the Design of Storm Drainage Facilities in the County of Maui</u>, prepared by the Department of Public Works and Waste Management, County of Maui, 1995.

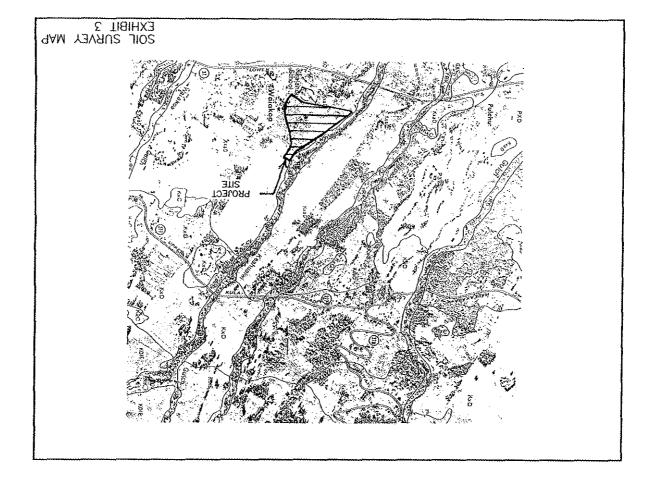


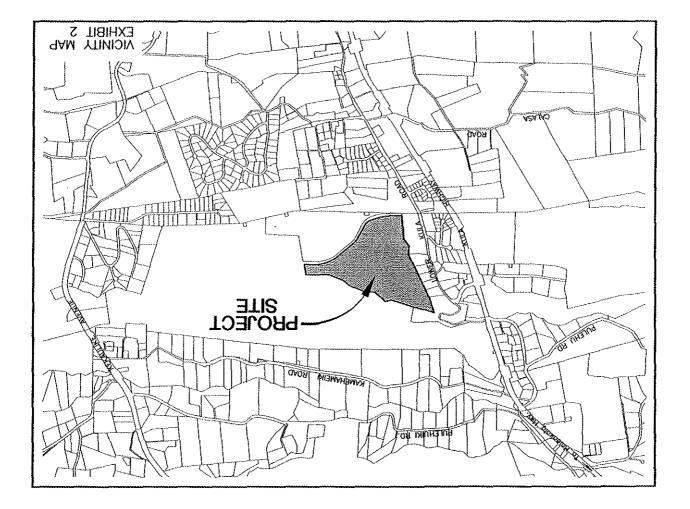
N

3 Soil Survey Map

EXHIBITS







## Hydrologic Calculations

Purpose: Determine the increase in surface runoff from the development of the proposed project based on a 50-year storm.

A. Determine the Runoff Coefficient (C):

EXISTING CONDITION:	
Infiltration (Medium)	= 0.07
Relief (Rolling)	= 0.06
Vegetal Cover (Good)	= 0.03
Development Type (Ag)	= <u>0.15</u>
	C = 0.31

## ROADWAY AREAS:

Infiltration (Negligible)	= 0.20
Relief (Rolling)	= 0.03
Vegetal Cover (None)	= 0.07
Development Type (Pavement)	= <u>0.55</u>
С	= 0.85

## RESIDENTIAL AREAS:

Infiltration (Slow)	= 0.14
Relief (Rolling)	= 0.03
Vegetal Cover (Good)	= 0.03
Development Type (Residential)	= <u>0.40</u>
С	= 0.60

## EXISTING CONDITION:

Area = 48.117 Acres C = 0.31

## **DEVELOPED CONDITIONS:**

Roadway Area = 1.20 Acres Residential Area = 46.917 Acres WEIGHTED C = 0.61

## APPENDIX A

## HYDROLOGIC CALCULATIONS

۰.

B. Determine the 50-year 1-hour rainfall:

i<sub>50</sub> = 3.0 inches

Adjust for time of concentration to compute Rainfall Intensity (I):

Existing Condition:

T<sub>c</sub> = 40 minutes

I = 3.73 inches/hour

Developed Condition:

- $T_c = 16 \text{ minutes}$
- I = 5.61 inches/hour
- C. Drainage Area (A) = 48.117 Acres
- D. Compute the 50-year storm runoff volume (Q):

Q = CIA

Existing Conditions:

Q = (0.31)(3.73)(48.117) = 55.66 cfs

Developed Conditions:

Q = (0.61)(5.61)(48.117)

= 164.59 cfs

The increase in runoff due to the proposed development is 164.59 - 55.66 = 108.93 cfs.

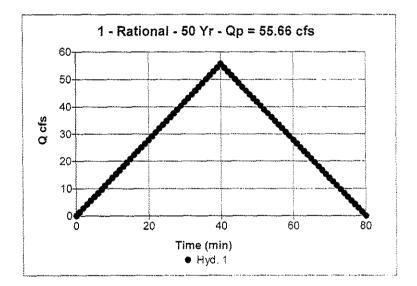
## Hydrograph Plot Hyd. No. 1 Kula Ridge - Existing Condition

Hydrograph type	= Rational
Storm frequency	= 50 yrs
Drainage area	= 48.1 ac
Intensity	= 3.73 in
I-D-F Curve	= 3-0.IDF

Peak discharge = 55.66 cfs Time interval = 1 min Runoff coeff. = 0.31Time of conc. (Tc) = 40 min Reced. limb factor = 1

Total Volume = 133,577 cuft

English



## Hydrograph Plot

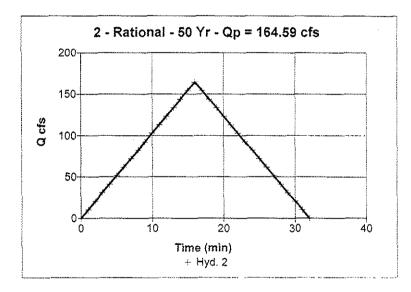
## Hyd. No. 2

Kula Ridge - Developed Conditions

Hydrograph type	= Rational	Peak discharge = 164.59 cfs
Storm frequency	= 50 yrs	Time interval = 1 min
Drainage area	= 48.1 ac	Runoff coeff. = 0.61
Intensity	= 5.61 in	Time of conc. (Tc) = 16 min
I-D-F Curve	= 3-0.IDF	Reced. limb factor = 1

Total Volume = 158,003 cuft

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English

## TABLE OF CONTENTS

## PRELIMINARY ENGINEERING REPORT

## FOR

## KULA RIDGE SUBDIVISION

Kula, Maui, Hawaii

T.M.K.: (2) 2-3-001: 174

## Prepared for:

Kula Ridge, LLC 1849 Wili Pa Loop Wailuku, Maui, Hawaii 96793

# + No. 5115-C + Hang U. Other

Prepared by:



September 2006

## 1.0 INTRODUCTION

- 2.0 EXISTING INFRASTRUCTURE
  - 2.1 ROADWAYS
  - 2.2 DRAINAGE
  - 2.3 SEWER
  - 2.4 WATER
  - 2.5 ELECTRIC, TELEPHONE AND CABLE TV

## 3.0 ANTICIPATED INFRASTRUCTURE IMPROVEMENTS

- 3.1 ROADWAYS
- 3.2 DRAINAGE
- 3.3 SEWER
- 3.4 WATER
- 3.5 ELECTRIC, TELEPHONE AND CABLE TV

PRELIMINARY ENGINEERING REPORT FOR KULA RIDGE SUBDIVISION T.M.K.: (2) 2-3-001: 174

## 1.0 INTRODUCTION

The purpose of this report is to provide information on the existing infrastructure which will be servicing the proposed project. It will also evaluate the adequacy of the existing infrastructure and anticipated improvements which may be required for the proposed project.

The subject property is identified as T.M.K.: (2) 2-3-001: 174, which encompasses an area of 48.117 acres. It is also Lot 2 of the G and R Von Tempsky Trust Subdivision. The project site is bordered by Keahuaiwi Gulch and Lot 1 of the G and R Von Tempsky Trust Subdivision to the north, Lot 1 of the G and R Von Tempsky Trust Subdivision to the east, and Lot 3 of th G and R Von Tempsky Trust Subdivision to the south.

The development plan includes approximately 112 residential lots, 4 agricultural lots, and a 5-acre park site which will be dedicated to the County. Associated improvements include grading, paved roadways, underground utilities and landscaping.

#### 2.0 EXISTING INFRASTRUCTURE

## 2.1 ROADWAYS

Lower Kula Road in the vicinity of the project site is a two-way, two-lane roadway oriented in the north-south direction. It intersects with Kula Highway several times along its alignment. Lower Kula Road intersects with Alanui Place and the Kula Community Center driveway. Alanui Place is a two-way, two-lane roadway that provide access to the adjacent residential area. The driveway for the Kula Community Center has one lane that serves all traffic movements at the westbound approach of this intersection.

Northwest of the Lower Kula Road-Alanui Place intersection, Lower Kula Road intersects with Kula Highway. At this unsignalized intersection, Lower Kula Road has one lane that serves left and right turn movements. The northbound approach of the highway has one lane the serves left and right turn traffic movements and the southbound approach has one lane that serves leftturn and through traffic movements. South of its intersection with Alanui Place, Lower Kula Road intersects Copp Road. Copp Road is a two-way, two-lane roadway oriented in the east-west direction that provides access to the residential neighborhoods.

Further southwest, Lower Kula Road intersects with Kula Highway.

## 2.2 DRAINAGE

The elevation on the site ranges from elevation 3,085 feet above sea level at the northeastern corner of the property to 2,700 feet above mean sea level at the northwesterly corner, averaging approximately 14.8%.

According to Panel Number 150003 0001-0400 of the Flood Insurance Rate Map, dated March 16, 1995, prepared by the United States Federal Emergency Management Agency, it appears that the project site is situated in Flood Zone C. Flood Zone C represents areas of minimal flooding.

It is estimated that the existing 50-year storm runoff from the project site is 55.66 cfs. Presently, the majority of the onsite runoff sheet flows across the project site in a northeast to southwest direction toward the adjacent properties. A portion of the runoff sheet flows directly into Keahuaiwi Gulch. The runoff eventually discharges into the ocean.

## 2,3 <u>SEWER</u>

There are no public sewer facilities in this part of Maui. Sewerage from residential and commercial developments is handled by individual wastewater systems.

## 2.4 <u>WATER</u>

Domestic water and fire flow will be provided by the County's water system. There is an existing 8-inch waterline along Lower Kula Road, in the vicinity of the Kula Community Center. There is an existing fire hydrant located near the Community Center.

Storage for the project area is provided by a 2.1 million-gallon steel tank, known as the Ornaopio tank (elevation 3,890.0 feet). It is located above Haleakala Highway, approximately a 1,200 feet to the northeast of the project site.

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## 2.5 ELECTRIC. TELEPHONE AND CABLE TV

The existing electrical and telephone distribution systems on Lower Kula Road are located overhead. These overhead facilities serve the developed properties in the area.

## 3.0 ANTICIPATED INFRASTRUCTURE IMPROVEMENTS

## 3.1 ROADWAYS

Access for the proposed project will be from Lower Kula Road via an existing utility and access Easement "B-1." Easement "B-1" is 56 feet wide and traverses along the southern boundary of the Kula Community Center to the southwestern corner of the subject parcel. The driveway pavement section will be 24-feet wide for ingress and egress.

In accordance with the requirements for a building permit, roadway improvements consisting of concrete curb, gutters and sidewalks will be constructed along the frontage of the property to Lower Kula Road.

The Traffic Impact Report prepared by Wilson Okamoto Corporation, dated June 2006, recommended and concluded the following:

- Maintain sufficient sight distance for motorists to safely enter and exit all project roadways.
- Provide adequate on-site loading and off-loading service areas and prohibit off-site loading operations.
- Provide adequate turn-around area for service, delivery and refuse collection vehicles to maneuver on the project site to avoid vehiclereversing maneuvers onto public roadways.
- Provide sufficient turning radii at all project roadways to avoid or minimize vehicle encroachments to oncoming traffic lanes.
- Provide exclusive left-turn and right-turn lanes on the westbound approaches of Lower Kula Road at the northern intersection with Kula Highway to minimize the impact of left-turning vehicles on the higher volume of right-turning vehicles on that approach.

"The proposed Kula Ridge development is expected to include 53 residential lots, 59 affordable housing residential lots, 4 agricultural lots, and an approximately 5-acre park that will be dedicated to the County of Maui. With the implementation of the aforementioned recommendations, the proposed Kula Ridge development is not expected to have a significant impact on traffic operations in the vicinity of the project site. The critical movements at the study intersection along Lower Kula Road are expected to continue operating at acceptable levels of service despite the addition of site-generated vehicles to the surrounding roadway network due to the provision of exclusive turning lanes at the northern intersection of Lower Kula Road with Kula Highway."

## 3.2 DRAINAGE

After the development of the proposed project, it is estimated that the 50year storm runoff will be 164.59 cfs, a net increase of 108.93 cfs. Onsite runoff will be intercepted by grated catch basins located within the grassed shoulder areas. The runoff will be conveyed to an onsite detention basin, which will be located in the northwestern corner fo the project site. Overflows from the detention basin will be allowed to sheet flow into Keahuaiwi Gulch at a rate less than the existing condition. The system will be designed and sized to accommodate the increase in surface runoff volume from a 50-year 1-hour storm generated from the proposed project.

The drainage design criteria will be to minimize any alterations to the natural pattern of the existing onsite surface runoff.

## 3.3 <u>SEWER</u>

The proposed 112-lot residential subdivision and 4-lot agricultural subdivision will generate approximately 40,600 gallons of wastewater daily. Each residence will connect to an aerobic individual wastewater system. The developer is working closely with a company to install and maintain these systems. This company is also working with the State Department of Health to allow the use of the aerobic systems for a development that has more than 50 homes.

## 3.4 <u>WATER</u>

In accordance with the Department of Water Supply's Domestic Consumption Guidelines for residential and agricultural development is approximately 175,709 gallons per day. Fire flow demand for residential development is 1,000 gallons per minute for a 2-hour duration and 500 gallons per minute for a 2-hour duration for agriculture. Fire hydrants will be installed with a maximum spacing of 350 feet for residential areas and 500 feet in agriculture areas.

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The developer is presently working with the Department of Water Supply and private landowners who are planning to develop wells in the Upcountry area. When completed, the wells will be dedicated to the County of Maui. The developer will pay a prorata share in the development of these wells for an allocation of the water source for the Kula Ridge Subdivision.

As part of the subdivision approval process, domestic water and fire flow calculations will be provided to determine the adequacy of the existing water system, in accordance with the rules of the Department of Water Supply.

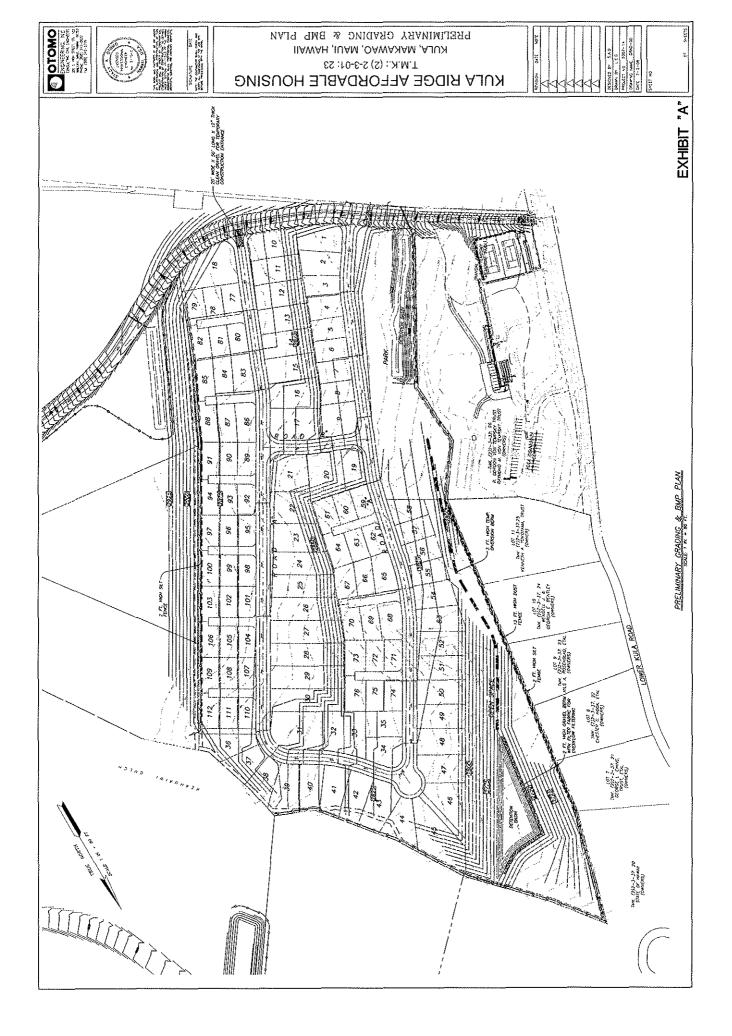
## 3.5 ELECTRIC, TELEPHONE AND CABLE TV

The proposed electrical and telephone distribution systems in the subject development will be installed underground from Lower Kula Road. Interior project lighting will be provided as approved by the Department of Planning. All project lighting will be fully shielded.

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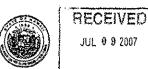
# **APPENDIX H-1.**

# Preliminary Grading and Best Management Practices Plan



# **APPENDIX I.**

Department of Health, Wastewater Branch Individual Wastewater Systems Variance Approval Letter, IWS Project Plan, and Findings of Fact and Conclusions of Law



7 OHYOME LEINAALA FUKINO, M.D.

to reply please release to

UNDA LINGLE GOVERNOR OF HAWAI

> STATE OF HAWAII DEPARTMENT OF HEALTH P.O BOX 3378 HONOLULU HAWAII 96901-3378

> > WW 242 FINAL DEC CL

<sup>\*</sup> June 29, 2007

#### CERTIFIED MAIL 7005 1160 0001 8381 4502 RETURN RECEIPT REQUESTED

Mr. Clayton Nishikawa Managing Member Kula Ridge, LLC 1849 Wili Pa Loop Wailuku, Hawaii 96793

### Dear Mr. Nishikawa:

Subject: Variance Application No. WW 242 Docket No. 06-VWW-31 Proposed Development of 116 Units consisting of 59 Affordable Lots, sizes 5,600 - 6,000 square feet, 53 Market Lots - sizes 6,000 - 21,000 square fee, and 4 agricultural lots - sizes 4 acres minimum Lower Kula Road, Lot 2, Walluku, Maui, TMK: (2) 2-3-001: 174

Please find enclosed the Department of Health's Decision and Order regarding the above mentioned application for variance request which was **GRANTED** on **June 20, 2007** for five (5) years. We are enclosing for your information the Findings of Fact and Conclusions of Law.

Please note the variance conditions and if there are any guestions relative to the variance, please do not hesitate to contact Mr. Harold Yee, Chief of the Wastewater Branch at our direct toll free phone number 984-2400 ext 64294, fax (808) 586-4300.

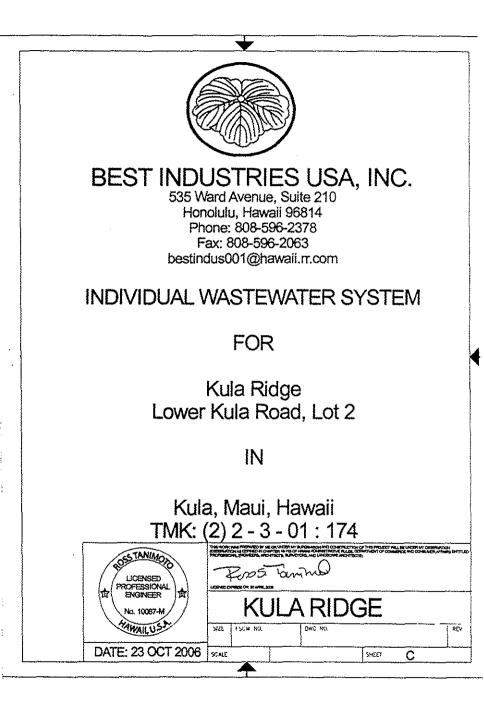
Sincerely,

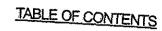
THOMAS E ARIZUMI. P.E

Environmental Management Division

Enclosures: Final Decision and Order Findings of Fact and Conclusions of Law

c: Clean Water Branch Environmental Planning Office Safe Drinking Water Branch Wastewater Branch - Maui Staff Engineer Department of Water Supply - County of Maui District Health Office - Maui Mr. Harold Nageto, Best Industrias USA





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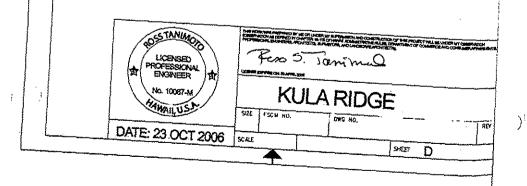


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# STATE OF HAWAE

Percolation Test Data Sheet
General Notes
Design Criteria
Vidnity Maps
Site Plan
Individual Wastewater System & Disposal System Profile
Individual Wastewater System Specifications
Distribution Box Details
Inspection Pipe Detail
Appendix



		RTMENT OF HEALTH RANKING KNEIKI HAWA MAN		in table, plants (plant) (pl BMD / WS
		HEALTH - WASTEWATER E	RANCH	
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Date/Time: 9/30/0	6	Test Performed by: Ha	rold Nagato	
Owner: Kula Ridg	eLLC	TMR: (2) 2 3	. 01 : 174	
Elevation: N/A				
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Dismeter of Hole;	earved): Not Obs		ic .	
Depta to Hole Bottom:		fect below grade		
Depth, inches below an	N2	Soil Profile (color, texture,		
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and water drop than 30 minute	s at least every 10 minute	aked the test hole for at least 4 s for 1 hour of time for the firm of water drops at lest every 30 1 an 1/16 inch.	t 6 inches to seep away	in greater mil 2
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10 min	2.25 in		·	WALLUS
Percolation Rate (time/	inal water level drop): _	4.5 minutes/inches		j.j.
fact that above site infor provisions of Chapter 1 suitable soil exist betwee layer.	unation is scenate and th 1-62, "Wastewater System on the bottom of the soil s	viding site information and pe at the site evaluation was could at and the results were accept the results were accept baception system and the grou	ucted in accordance wit ible. I also stiest that th	h the tree feet of
Tero 5. 1	animal		12/14/06	
Engineer's Signature/St			Dated	
WE the Desination & Perceio	tion Test.upd BCL at of Jamery	<b>1, 29</b> 43		

### **GENERAL NOTES**

1. All work shall conform to the Building Codes, Standards of Industry, Department of Health, Uniform Plumbing Codes, and other related items.

The installation indicates the overall Scope of Work and Intent, Contractor to provide verification at the job site for adjustment and to inform the engineer of change.

3. Gravel shall be #3 Coarse, no bigger that 3/4" in size with no fines or washed rock.

4. Engineer's drawing herewith does not indicate underground lines, and as such, Contractor shall inspect or tone the area for said underground lines.

5. All work shall be guaranteed for 1 year after completion by Contractor.

6. No trees or shrubs shall be planted within 5 feet of the Sewage Treatment Unit or Disposal System.

7. Sewage Treatment Unit and Disposal System shall be located in a Non-vehicular Traffic Area.

8. Depths of pipe inverts of the Sewage Treatment Unit and Disposal System are controlled by Topographic Features. The existing pipe invert may impact the depths shown on the drawings.

9. The Sewage Treatment Unit shall be at least 5 feet from the Disposal System.

10. The Sewage Treatment Unit or Disposal System shall be at least 5 feet from any wall line of any structure or building.

11. Disposal System shall be at least 5 feet from property line.

12. Sewage Treatment Unit shall be at least 5 feet from property line.

13. Seepage Pits shall be at least 12 feet from another Seepage Pit.

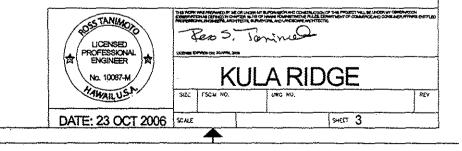
	POSSTANIA OTO	PARTICIPATION AND AND AN ADDRESS	16-115-CP Service ACLERATION/TAX PLACE			
.)	No. 10087-M MAILUSA	SLITE FOCK NO		DGE		R
	DATE: 23 OCT 2006	SCALE		SHEET	2	

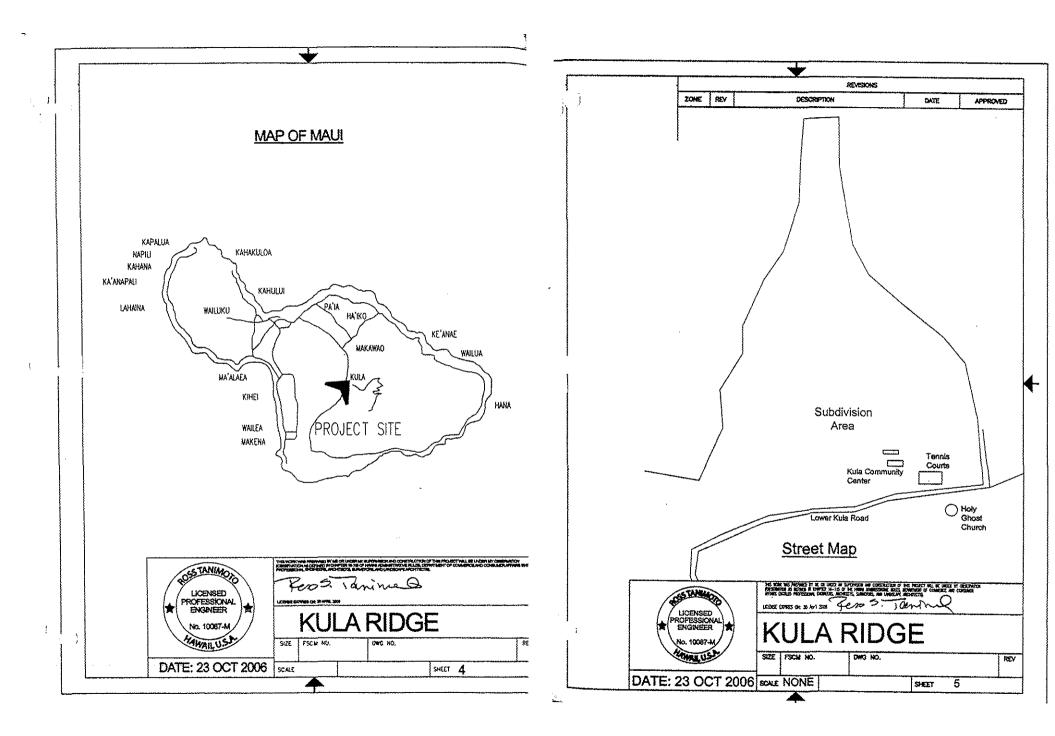
### **DESIGN CRITERIA**

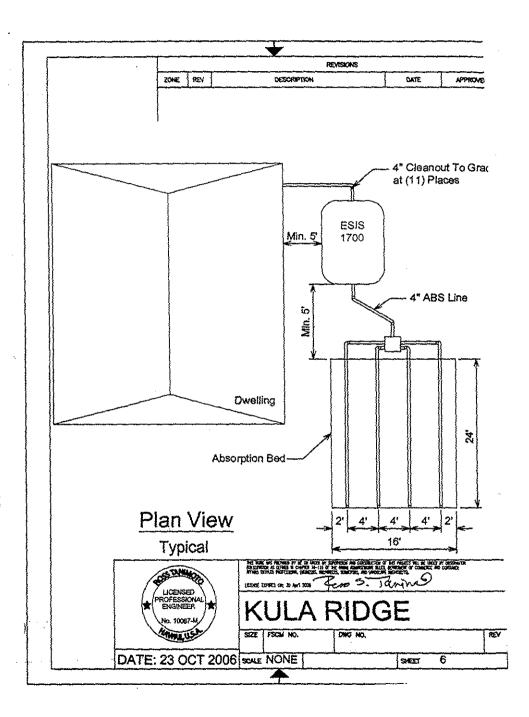
Owner Name: Clayton Nishikawa Residential Zoning TMK: (2) 2 - 3 - 01 : 174 Description: 48.117 Acres divided into (116) Lots consisting of a (1) 3-Bedroom Dwelling each

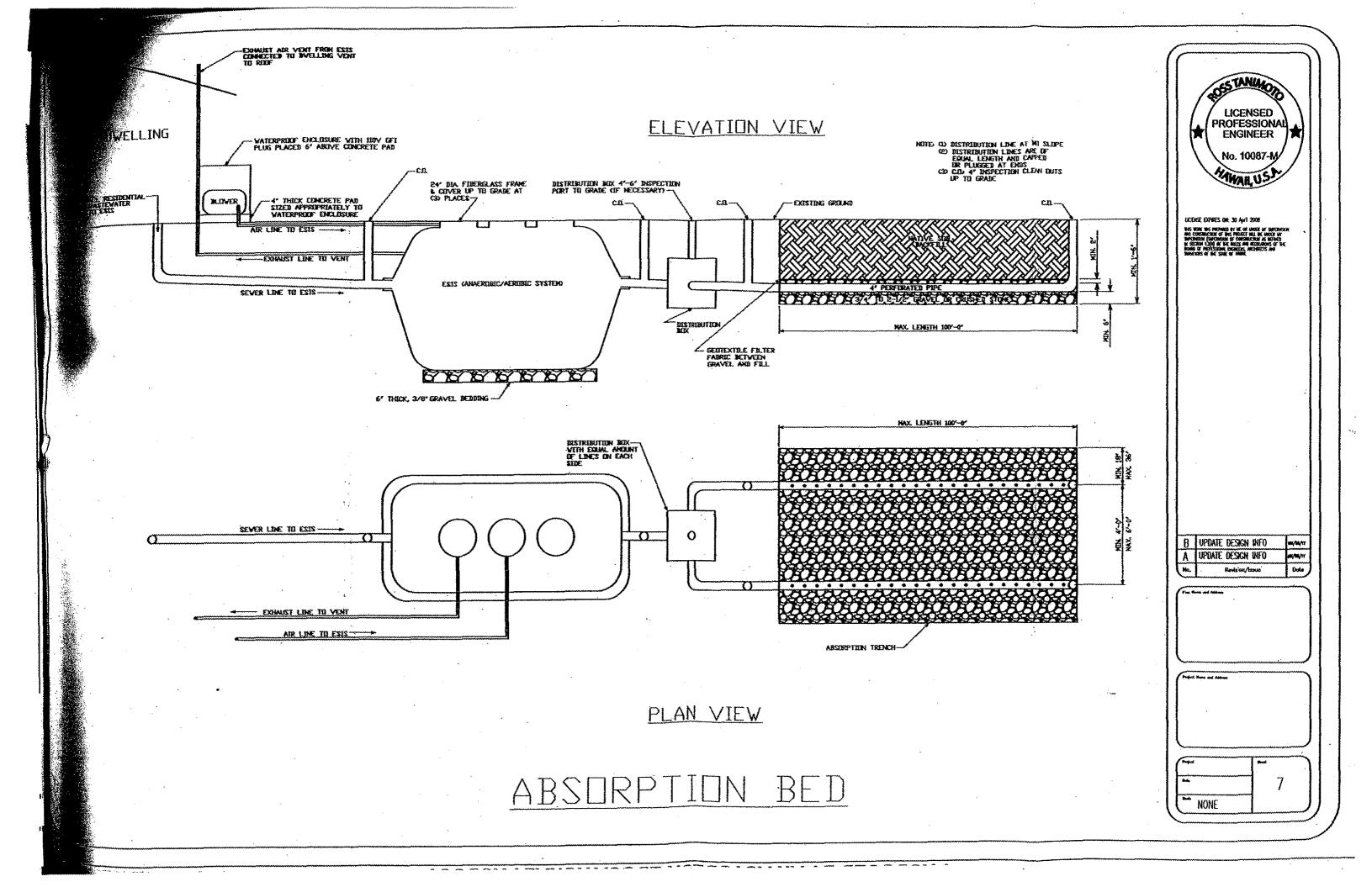
1.

- 2. Flow: 600 gallons per day (gpd) per dwelling
- IWS Selection: (1) ESIS 1700 per dwelling Max Flow: 1000 gpd Max Volume: 1700 gallons
- 4. Disposal System Design Disposal System Selection: (1) Absorption Bed per IWS Percolation Rate = 4.5 min/in. Reqired Absorption Area (Assume 5 min/in.) (600 gpd) x (125 sq. ft./200 gpd) = 375 sq. ft. Absorption Bed Dimensions: 16 ft. x 24 ft. Absorption Bed Area = 384 sq. ft.









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	ZONE REA	/	DESCRIPTION		DATE	APPROM
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1300	11'-1"	5'-9"	6'-1"	800 lb	24	
1700	11'-3*	7'-11"	8'-4"	925 lb	24	
	1000 1300 1700	600 800 1000	4	1000 1300 1700		
ESIS Model	Excava		ensions	Excas	ated S	
1000 1300 1700	Length 12'-0' 13'-0' 13'-6'	Width 7'-6* 8'-0* 10'-0"	Depth 7'-6" 8'-0" 10'-6"	25.0	olumes cu. yds cu. yds cu. yds	5.
<u>1000</u> 1300	12'-0' 13'-0' 13'-6' Pump Length 8'	7'-6" 8'-0" 10'-0" Dimens Width 5" 5 6' Pow	Depth 7'-6" 8'-0" 10'-6" ions Depth 9" ver Cord	Vatts	cu. yds cu. yds cu. yd Outlet 3/4" GFI Du	5. 5. Max
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### STATE OF HAWAII

### DEPARTMENT OF HEALTH

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Docket No. 06-VWW-31

In the Matter of the Application Variance Application No. WW 242 for Individual Wastewater System

Proposed Development of 116 Units of Which 59 Affordable Lots - Sizes 5,600 - 6,000 SF, Approximately 53 Market Lots - Sizes 6,000 - 21,000 SF and 4 Agricultural Lots - Sizes 4 acres Minimum, Lower Kula Road, Lot 2 Wailuku, Maui TMK: (2) 2-3-001: 174

### DECISION AND ORDER

Pursuant to Chapter 342D, Hawaii Revised Statutes, and Chapter 62 of Title 11, Administrative Rules and based upon the application and staff review, the Variance Request from the provisions of Chapter 11-62, Section 11-62-31.1(a)(1) is hereby **GRANTED** under the following conditions:

- 1 The draft Operation and Maintenance Service Contract provided to the Department between Kula Ridge, LLC ("developers") and Best Industries shall be executed and recorded once the 116 unit subdivision is approved by the County of Maui.
- 2 The developer shall also execute and record deed restrictions/covenants onto each of the 116 lots binding the property owner to the applicable provisions in the Operation and Maintenance Service Contract. The deed restrictions/covenants shall also require the property owner(s) to utilize the wastewater system specified in the Operation and Maintenance Service Contract.
- 3. The developer and/or the Association of Lot Owners must advise buyers/homeowners to avoid discharging hazardous chemicals to drains and toilets, and to utilize low-flow fixtures and devices on faucets, showerheads, urinals, water closets and hose bibs to minimize the amount of water flowing in the IWS. Information on Low-flow fixtures and devices are available, at no cost to DWS customer at the Water Resources & Planning Division, located at 59 Kanoa Street, Wailuku.
- 4 An engineer shall design a wastewater system (IWS plan) consistent with the Operation and Maintenance Service Contract for each lot and at the time of building permit application for the construction of homes, the IWS plan shall be submitted to the Department for review and approval. Seepage pits and injection wells shall not be used to dispose of effluent from the aerobic units and to the maximum extent possible, all effluent disposal systems shall be as shallow as possible.

- 5. The variance shall be null and void if the developers are unable to obtain the necessary County of Maui subdivision approvals such that the project can proceed
- 6 The variance is valid for a period not to exceed five (5) years after which, the developer or the Association of Lot Owners must apply for a variance renewal
- 7 The developer and subsequent lot owners agree that no further subdivision of the lots will be undertaken.
- 8 Provisions should be made for system operation in the event of a power outage The developer and/or the Association of Lot Owners must advise homeowners to minimize usage of water during power outage Homeowners may also wish to connect the blowers and/or pumps of the aerobic unit to a standby power source
- 9. The O&M service provider shall provide an annual report to the Department of Health. The annual report shall at a minimum contain a summary of the service inspections and maintenance visits conducted, summary of major replacement or repairs undertaken at each site and summary of sludge/scum/solids removed from each unit

DATED: Honolulu, Hawaii,

June 20, 2007

THOMAS E. ARIZUMI, P.E., CHIEF Environmental Management Division

### STATE OF HAWAII

### DEPARTMENT OF HEALTH

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In the Matter of the Application Variance Application No. WW 242 for Individual Wastewater System Docket No. 06-VWW-31

Proposed Development of 116 Units Consisting of 59 Affordable Lots - Sizes 5,600 - 6,000 SF, 53 Market Lots - Sizes 6,000 - 21,000 SF and 4 Agricultural Lots - Sizes 4 acres Minimum, Lower Kula Road, Lot 2 Wailuku, Maui TMK: (2) 2-3-001: 174

### FINDINGS OF FACT AND CONCLUSIONS OF LAW

An application from Kula Ridge, LLC, Wailuku, Maui, Hawaii for a five (5) year variance from Hawaii Administrative Rules, Chapter 62 of Title 11, Section 11-62-31 1(a)(1) was reviewed by the Department of Health staff. A public notice of the application was printed in the January 22, 1007 issue of the Honolulu Star Bulletin and the January 22, 2007 issue of The Maui News publications Seven (7) comments pertaining to the application were received during the 30 days following the publication of the public notice.

### Findings of Fact

The applicant is proposing a development located in the vicinity of Lower Kula road, Lot 2, Kula, Maui, consisting of 116 units. The development will consist of approximately 59 Affordable Lots - sizes 5,600 - 6,000 square feet in area, approximately 53 Market Lots - sizes 6,000 - 21,000 square feet in area, and 4 agricultural lots - sizes 4 acres minimum. There are no existing cesspools and no centralized sewer system in the area or planned for the near future. Well locations should not be an issue based on the location of the existing wells. Current rules prohibit individual wastewater systems (IWSs) on properties less than 10,000 square feet and above the CWDA; however, variances could be issued.

The Critical Wastewater Disposal Area (CWDA) issue and the minimum lot size pose regulatory obstacles. Insofar as treatment is concerned, the recommendation, consistent with EPA's decentralization approach, is to propose aerobic units (NSF 40 approved) with chlorine disinfection (i.e., Individual Wastewater Systems), in lieu of septic tanks. Because of the treatment level and

disinfection, impacts to the existing ground water, assuming it exists, will be reduced. Presently the DOH allows approved NSF 40 Class I aerobic systems to be used within 1,000 feet of drinking wells. Disposal of treated effluent is proposed through absorption beds which again is consistent with DOH guidelines. The purpose of this approach is to develop the maximum distance between the existing ground water and grade. Also associated with this proposal is a mandatory maintenance program. The maintenance provider will submit an annual report to DOH, copy the owner, and cite the maintenance activities completed in the applicable year. To further the reliability of the proposed IWS, the mandatory maintenance program will be included in all individual property deeds as covenants. The project is located on Lower Kula Road, Lot 2, Wailuku, Maui TMK: (2) 2-3-001: 174.

The applicant has made the following comments

- 1 This application is for a variance from Section 11-62-31 1(a)(1) of the Hawaii Administrative Rules (HAR).
- 2 The aerobic individual wastewater system (IWS) to be constructed shall comply with the wastewater rules at the time the fee simple owner applies for building permit
- 3 The volume of treated R-2 wastewater generated on each lot shall not exceed a design flow of 1,000 gallons per day
  - 4. The aerobic IWS unit meets the requirements of Hawaii Administrative Rule (HAR), Title 11-62, Section 33 1 (b)(2) and thus can be used in the State of Hawaii as an aerobic unit.
  - 5 Wastewater Management Policies (WMP2) "Only one (1) IWS shall be allowed per lot of record. The IWS shall consist of a minimum of an aerobic unit, chlorinator and horizontal soil absorption system or surface disposal systems such as evapotranspiration system. The IWS shall be located as far from the well as possible and down gradient of the well if possible."
  - 6 Department of Health, Amendments and Compliance of Chapter 11-62, Hawaii Administrative Rules: (SS11-62-33.1) indicated specific requirements for new and proposed treatment units (b) Household aerobic units. (5) In areas below (makai of) the Underground Injection Control Line established pursuant to chapter 11-23, a household aerobic unit may discharge its effluent directly into the groundwater provided the effluent is disinfected.
  - 7 As indicated in the State of Hawaii Chapter 62, Best USA's ESIS unit has met all the rules. In fact, the ESIS can be used within 1,000 feet of a drinking well, which the above development has no drinking wells within a 1,000 feet.
  - 8. Letter from State of Hawaii, Department of Health, Mr. Dennis Tulang, P.E., Chief, Wastewater Branch, dated December 7, 1999, states "our recommendation is based in part on both aerobic and anaerobic processes to achieve Class I effluent criteria "
  - Best USA is proposing to use its tested aerobic system ESIS which can treat effluent on each property with a low profile leach bed.

- 10. Each ESIS unit will have an operation and maintenance (O&M) program to keep this system always performing well. This O&M program will be written into each deed as a covenant that this system must always be maintained and a report of its quality sent to DOH annually. As stated in the State of Hawaii Chapter 62, all of these systems must be maintenance by one entity
- 11. Best USA and the ESIS unit have been tested by the University of Hawaii in 1999 and have successfully installed and maintained over 100 units throughout the State of Hawaii.
- 12. This development presently has no central sewer facilities now or in the near future, and the properties in the surrounding area are currently using old cesspools and septic tanks with minimal treatment.
- 13 This proposed development, see Figure 1, located in the vicinity of Lower Kula Road, Lot 2; Kula, Maui consisting of 116 units (60% affordable). Of these, approximately 59 Affordable Lots - sizes 5,600 - 6,000 square feet and approximately 53 market lots - sizes 6,000 - 21,000 square feet and 4 agricultural lots - sizes 4 acres minimum. There are no existing cesspools and no centralized sewer system in the area or planned for the near future. Well locations should be not be an issue based on the location of the existing wells.
- 14 The proposed development will use aerobic systems to dispose R-2 treated effluent into the existing cleaned cesspools, in accordance with the USEPA, Office of Water & Office of Wastewater Management, EPA 832-R97-001B, "Response to Congress on Use of Decentralized Wastewater Treatment Systems WWBKGN93".
- 15 The above report by the USEPA supports and gives guidelines to the exact way that we are planning this project with proven NSF 40 tested equipment and long term operations and maintenance programs.
- 16. Best USA has a long term proven record of installed and maintained systems in the State of Hawaii.
- 17. In compliance with HRS 342D-6 (4), the public interest shall be served in a method that will prove to be safer, and have minimal health impact on the environment. The use of an approved aerobic Individual Wastewater Systems (IWSs) as the means of wastewater treatment and disposal for each lot is deemed prudent because the system is NSF 40 approved with effluent quality of R-2 and allowed by "Title 11 Department of Health Chapter 62 Wastewater Systems" to be used within a mere 1,000 feet of a drinking well, it's only appropriate is to allow the ESIS to be used on this project, which has no drinking wells within 1,000 feet and will not harm the safety and welfare of the public. Furthermore, the costs associated with the alternative of designing and constructing a secondary wastewater treatment facility and effluent disposal system, including sewer transmission mains and sewer laterals for 116 lots, would be prohibitive. The use of an ESIS 1700 unit will bring a long-term higher and safer wastewater treatment to this property.
- 18. All of the new homes will have the same treatment standards to its wastewater in the present and future.

Kula Ridge LLC Variance Application WW 242, Docket No. 06-VWW-31 Findings of Fact and Conclusions of Law, Page 3

- 19. The treated effluent will help to safely recharge the water supply as reported in USEPA report to congress
- 20. As indicated in the State of Hawaii Chapter 62, Best USA's ESIS unit has met all the rules. In fact, the ESIS can be used within 1,000 feet of a drinking well, which the above development has no drinking wells within 1,000 feet.
- 21. Therefore, if the ESIS system complies with "Title 11, Department of Health, Chapter 62, Wastewater Systems" to be used within a mere 1,000 feet of a drinking well, it is only appropriate to allow the ESIS to be used on this project, which has no drinking wells within 1,000 feet and will not harm the safety and welfare of the public
- 22. Allowance of the requested variance to use a proven aerobic treatment system with a continuous maintenance service program will definitely have a positive and greater health and environmental benefit to the public because it will not be detrimental to the public
- 23 The maximum time period of five (5) years is requested for this request Requests for future renewals will be made at five (5) year intervals until a municipal sewer system becomes available in the project vicinity

The following items were submitted with the variance application but can not be shown here: EPA response to Congress on use of decentralized Wastewater Treatment Systems; NSF 40 testing report; DOH chapter on 1000 feet ruling; and map of well location.

The following agencies submitted the following comments:

1. The Clean Water Branch submitted the following comment:

Recommend to deny this variance application.

- 2 The Environmental Planning Office:
  - A These are some of the issues which needs to be addressed:
    - (1) Are we moving away from a private sewage treatment plant for residential developments greater than 50 lots (i.e. usage of individual wastewater systems for a large development)?
    - (2) Will we be creating problems of magnitude by allowing IWSs of such number to be built with absorption beds in an area of less than 10,000 square feet? The 59 Affordable lots (5,600 - 6,000) plus some of the 53 Market Lots (6,000 - 21,000) will be less than 10,000 square feet in size.
  - B. I am not sure if this is the trend for developments to address affordable housing, however, form the contrarian perspective, this is what should be considered:

Kula Ridge LLC Variance Application WW 242, Docket No 06-VWW-31 Findings of Fact and Conclusions of Law, Page 4

- (1) Aerobic units are run by electricity which can be turned off by the owner. If that happens, I understand that the system becomes a conduit to the absorption field. Also, over a period of time, these electrical systems will ultimately fail. The same situation as stated above will happen. Once the absorption field is compromised, I hope that the solution will not revert to digging seepage pits. We know that aerobic units with seepage pits become essentially cesspools if the electricity is not working. These were all issues of the past when the decision to use the non-electric septic tank system was made in the 1980's.
- (2) I like the concept of a single maintenance point of contact However, if that concept fails as times goes on, then the scenario described above happens.
- (3) I am just remembering why we made some of those decisions in Chapter 11-62 back in the 1980's.

Thank you for allowing EPO the opportunity to comment.

- 3. The Safe Drinking Water Branch submitted the following comments:
  - A. The project site is situated "mauka" or above the Underground Injection Control (UIC) line;
  - B. Land areas above the UIC line overlie or recharge existing or potential underground sources of drinking water. Construction of any new injection well for sewage effluent or industrial wastewater disposal is prohibited; and
  - C. We have no objection to this variance application.

Please contact Mr. Jamie Rimando at telephone (808)586-4258 if you have any questions.

4. The District Health Office - Maui Branch has the following to offer:

We have no objection to the granting of this variance application provided all of the conditions set forth in the application are complied with.

- 5. The County of Maui, Department of Water Supply submitted the following comments:
  - A The proposed development is located in Kula and not in Wailuku as is stated in the Subject heading of your May 29, 2007 letter to the Department of Water Supply.
  - B. The Department of Water Supply (DWS) acknowledges that the proposed aerobic treatment systems will reduce the introduction of pathogens into groundwater resources as compared to cesspools or septic systems

However, we are concerned about the continuing increase in density of communities where facilities are not available to protect underlying aquifers from nitrogen and chemical pollutants that would otherwise be carried away by sewer systems

- C DWS highly recommends that the applicant advise buyers to avoid discharging hazardous chemicals to drains and toilets, and to utilize low-flow fixtures and devices on faucets, showerheads, urinals, water closets and hose bibs to minimize the amount of water flowing into the IWS Low-flow fixtures and devices are available, at no cost to DWS customers, at our Water Resources & Planning Division, located at 59 Kanoa Street, Wailuku.
- D. Some provision should be made for system operation in the event of power failure. According to comments presented in the Findings of Fact by the Environmental Planning Office, if the unit is powered off by the owner, the aerobic unit will become a conduit to the absorption field; this will ultimately compromise the system. Although it is unlikely that the owner would turn off the power, it is highly likely that the Kula area will experience occasional power failures. Some provision should be made for system operation in the event of such a power outage.

Should you have any questions, please contact our Water Resources & Planning Division at 244-8550

Sincerely, Jeffrey K. Eng, Director

6. The Wastewater Branch Maui Staff Engineer recommends a granting this variance application with the following provision:

The ESIS aerobic unit or individual treatment unit must be operated and maintained by the ESIS manufacturer and with supervision of the consulting engineer based on the O&M "Operation & Maintenance" manual.

7 The Wastewater Branch states that there is no existing sewer service system available in the area. Public benefit is that 59 of the 116 lots are to be marketed as affordable units. One wastewater solution is to use a centralized system. Another is to utilize individual wastewater systems (IWSs) that are properly operated and maintained by a utility like organization.

Please contact the Planning & Design Section of the Wastewater Branch at (808) 586-4294 if you have any questions.

### Conclusions of Law

Chapter 342D, Hawaii Revised Statutes, Section 342D-7(c), states that no variance shall be granted by the Department unless the application and supporting information clearly show that:

- 1 The granting of the variance is in the public interest as defined in the Hawaii Revised Statutes, Section 342D-6(c)(4).
- 2 The granting of this variance will not substantially endanger human health or safety
- 3. Compliance with the rules, regulations or standards from which the variance is sought would produce serious hardship without equal or greater benefits to the public

Based upon the foregoing findings of fact, it is concluded that the above requirements have been met

### Comment and Recommendation

Based upon the foregoing findings of fact and conclusions of law, it is my recommendation that the variance request be **GRANTED** under the following conditions:

- The draft Operation and Maintenance Service Contract provided to the Department between Kula Ridge, LLC ("developers") and Best Industries shall be executed and recorded once the 116 unit subdivision is approved by the County of Maui.
- 2 The developer shall also execute and record deed restrictions/covenants onto each of the 116 lots binding the property owner to the applicable provisions in the Operation and Maintenance Service Contract. The deed restrictions/covenants shall also require the property owner(s) to utilize the wastewater system specified in the Operation and Maintenance Service Contract.
- 3. The developer and/or the Association of Lot Owners must advise buyers/homeowners to avoid discharging hazardous chemicals to drains and toilets, and to utilize low-flow fixtures and devices on faucets, showerheads, unnals, water closets and hose bibs to minimize the amount of water flowing in the IWS Information on Low-flow fixtures and devices are available, at no cost to DWS customer at the Water Resources & Planning Division, located at 59 Kanoa Street; Wailuku.
- An engineer shall design a wastewater system (IWS plan) consistent with the Operation and Maintenance Service Contract for each lot and at the time of building permit application for the construction of homes, the IWS plan shall be submitted to the Department for review and approval. Seepage pits and injection wells shall not be used to dispose of effluent from the aerobic units and to the maximum extent possible, all effluent disposal systems shall be as shallow as possible.

- 5 The variance shall be null and void if the developers are unable to obtain the necessary County of Maul subdivision approvals such that the project can proceed.
- 6. The variance is valid for a period not to exceed five (5) years after which, the developer or the Association of Lot Owners must apply for a variance renewal.
- 7 The developer and subsequent lot owners agree that no further subdivision of the lots will be undertaken.
- 8 Provisions should be made for system operation in the event of a power outage. The developer and/or the Association of Lot Owners must advise homeowners to minimize usage of water during power outage Homeowners may also wish to connect the blowers and/or pumps of the aerobic unit to a standby power source.
- 9. The O&M service provider shall provide an annual report to the Department of Health. The annual report shall at a minimum contain a summary of the service inspections and maintenance visits conducted, summary of major replacement or repairs undertaken at each site and summary of sludge/scum/solids removed from each unit

DATED:

Honolulu, Hawaii, \_\_\_

June 20, 2007

Thomas E. Arizumi, P.E.

Chief, Environmental Management Division

The foregoing findings of fact and conclusions of law are hereby adopted.

# **APPENDIX J.**

# Meeting Minutes With Residents Dated July 13, 2006



MICHAEL T. MUNEKIYO GWEN OHASHI HIRAGA MITSURU "MICH" HIRANO

KARLYNN KAWAHARA

November 20, 2006

## MEETING MEMORANDUM

Date of Meeting: July 13, 2006

From: Rowena Dagdag, Planner

Subject: Kula Ridge Affordable Housing Subdivision

Participants: Clayton Nishikawa, (Architectural Design & Construction, Inc.) Stacy Otomo, (Otomo Engineering, Inc.) Michael Munekiyo, (Munekiyo & Hiraga, Inc.) Rowena Dagdag, (Munekiyo & Hiraga, Inc.) Community Participants, (See Attached)

The purpose of the meeting was to introduce the proposed Kula Ridge Subdivision project to residents and community members living in proximity to the proposed project site. The project would require a district boundary amendment and seek exemptions from the community plan amendment and change in zoning process through the Section 201G-118, Hawaii Revised Statutes (HRS) application process.

- 1. C. Nishikawa provided a brief summary of the project's description and displayed the proposed house plan designs. He noted that the project will involve the development of 116 improved lots, with 70 (60 percent) affordable house/lot packages and 46 (40 percent) market lots.
- 2. A rendering of what the affordable units would look like using a private access easement for 6 of the lots was displayed. C. Nishikawa stated that one of his reasons for developing affordable housing was to provide well designed affordable homes for Maui residents and their children.
- 3. The project is moving ahead to obtain the proper sequence of approvals. C. Nishikawa has already met with the Kula Community Association, the Maui County Council members, and with the Mayor. All had recommended that he meet with the residents living near the proposed project to answer any questions or address any concerns that they have regarding the project.

4. M. Munekiyo explained that the project was in its preliminary stages in terms of the environmental assessment and Land Use Commission process. He further explained that the environmental assessment process would help identify areas that would be impacted and suggest improvements that need to be made to mitigate or minimize project impacts.

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- 5. M. Munekiyo stated that the project will need to go through the State Land Use Commission for a district boundary amendment to reclassify the land use from Agricultural to Rural and Urban. Exemptions from the community plan amendment and change in zoning process will be requested as part of the Section 201G-118, HRS application process.
- 6. The project is to be processed as a Section 201G, HRS application, which allows an affordable housing project to be expedited through exemptions. The regular process would take approximately 3 to 4 years. During the application process, there will be formal opportunities for the public to comment and provide feedback.
- 7. A resident expressed her concern over water rights and asked if the project would receive water before others who have been waiting for a water meter. M. Munekiyo replied that although the Section 201G, HRS process allows for certain exemptions, it would not permit exemptions relating to the provision of water source and water infrastructure.
- 8. C. Nishikawa stated that he recently met with the Water Director, who suggested that he find his own water. C. Nishikawa is currently negotiating with Maui Land and Pineapple Company and A&B who are drilling wells in the Upcountry area. The water from these wells could service the project site. He further indicated that he would pay for a percentage of the well being drilled by the companies.
- 9. The well would eventually be connected to the County water system.
- 10. D. Mayer stated that the Kula Community Association board members met with C. Nishikawa about two (2) months ago and reviewed the project with him. The association has provided C. Nishikawa with comments and concerns regarding the project. D. Mayer indicated that he was not satisfied with the update regarding the water situation, but was willing to be of help to resolve the issues.
- 11. A septic tank system will be installed in the homes. C. Nishikawa stated the benefits of a septic system and pointed out the disadvantages of a larger single wastewater system. C. Nishikawa is coordinating with the Department of Health to obtain permission to utilize individual wastewater systems as being proposed.
- 12. A resident asked if the homes could be expanded to accommodate growing families. C. Nishikawa stated that there would be enough room on the individual lots for expansion. He noted that there would be no need for a larger water meter,

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- 23. M. Munekiyo stated that there will be several meetings where residents will be able to testify and provide comments over the project. The public will be able to give testimony before the State Land Use Commission during meetings regarding the environmental assessment. After a draft of the environmental assessment has been published, a 30-day comment period will be held for residents to provide feedback. The applicant will review and address the comments received during the draft environmental assessment comment period.
- 24. M. Munekiyo noted that residents living within 500 feet of the proposed project site were invited to the meeting, but welcomed others in the Kula area to attend. He added that more meetings could be held to update residents on the status of the project and to gather more comments.
- 25. A resident noted that 6:00 p.m. may be too early in the evening to hold a meeting. A better time would be at 7:00 p.m.
- Residents asked D. Mayer if the Kula Community Association could act as the 26. spearhead for upcoming meetings. They want to be informed of any meetings or hearings regarding the projects that impact the entire Kula Community. D. Mayer responded that a website is available at www.kulamaui.org. The website includes information that residents would find useful.
- 27. C. Nishikawa stated that water and roadway infrastructure are very important issues that need to be addressed and resolved. He is willing to work with residents and the Kula Community Association on these issues.

In closing the meeting, M. Munekiyo stated that the applicant would like to come back to the community to provide updates and receive comments as the project progresses.

MAN K S ena M. Dagdag, Planner

RMD:yp

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Attachment

Clayton Nishikawa, Architectural Design & Construction, Inc. (w/attachment) CC: Stacy Otomo, Otomo Engineering, Inc. (w/out attachment) Dick Mayer, Kula Community Association (w/attachment) F:\DATA\Nishikawa\KulaAH\071306.meetIngmemo.wpd

# 5. PRELIMINARY DEVELOPMENT PLANS AND DESCRIPTION OF MATERIALS FOR AFFORDABLE UNITS

Form RD 1924-2 (Rev. 7-99)			OPMENT-FEDERAL	Form Approved OMB NO. 0575-0042
Proposed Construction	DESCRIPTION		DIALS No	be inserted by Agency)
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Contractor or Builder Archit	ectural Design & Construction, (Name)	, Inc.	(Addm 1849 Wili Pa Loop Wai (Addm	Luku, HI 96793
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3. CHIMNEYS: Material	Prefabricated (make	e and size)		
Vents (material and size): gas o	or oil heater		heater	
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	burning; 🔲 circulator (make and size)			
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but that the homes may need a larger septic system. Homes would have a 5/8-inch meter.

- 13. A question was raised regarding the community plan designation, and if there was any mention of density to the area. Residents were concerned that the 116 improved lots would result in increased traffic. They were concerned about the safety of the roads and a large number of cars in the subdivision.
- C. Nishikawa indicated that the smaller homes would be able to accommodate two (2) cars off-street, with the larger homes accommodating up to four (4) cars offstreet. Parking on the access driveway would not be allowed for the affordable homes with a private access driveway.
- 15. The larger density (116 improved lots) is required to keep the affordable housing cost lower.
- 16. Ohana units will not be allowed on the individual lots.

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- 17. A resident raised concern about the four (4) large lots on the eastern boundary of the property. Residents are concerned about it becoming a "gentlemen" ranch. M. Munekiyo stated that the current state land use designation will be kept as agricultural or rural.
- 18. A resident raised concern over the sidewalk along Lower Kula Road and suggested improvements to it. Residents also felt that Lower Kula Road was too narrow to accommodate traffic leading up to the 116 lot subdivision. M. Munekiyo stated that a traffic impact analysis was being done to identify improvements and mitigation measures that need to be made before approval of the subdivision.
- 19. A resident raised a concern over outdoor lights and its negative impact on the Haleakala Observatory. He suggested that we contact the University of Hawaii Institute For Astronomy for their comments.
- 20. C. Nishikawa noted that the Maui Police Department would like to see adequate lighting in the new neighborhood to address safety concerns. Residents felt that the police officers would be able to continue their work safely with low lighting.
- 21. A resident commented that some years ago, the Carden Academy proposed to build a school on Lower Kula Road but was denied approval by the Maui Planning Commission due to traffic impact reasons.
- 22. A resident felt that the project should be located somewhere else where there is less impact to the surrounding neighborhood. An affordable housing project could be done somewhere else.

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Additional information	drip edge		, gage of weigh	it		6.**		suow guards
13. GUITERS AND D	WNSPOUIS:	; gage or weight	: size	;	shape			
Downenoute: materia		; gage or weight	: 5176 -		shame		: number	
		; 🛛 sanitary sewer; 🗍 d						
Additional informati		, L sandary sewer; L c	ily-well, tul c	ipiasu moeks	. material and	I SIZC		
14. LATH AND PLAS	ER:	; weight or	thickness		ster: coats	; finish -		
Dry-wall 🕢 walls	ceilings material	Gyp. bd.	1/2*		Light oran	ige peel		
Joint treatment Tag	ed and sanded							
15. DECORATING: (Pa	nt, wallpaper, etc.)							
ROOMS	WALL FINI	SH MATERIAL AND APPL	ICATION	CEI	LING FINISH	MATERIAL	AND APPLIC	ATION
	Interior Latex				r Latex Fl			
Kitchen	Interior Latex				r Latex Fl.			
Bath Liv Bedr	Interior Latex				r Latex Fl			
Other							·····	
	on:				·····			<u> </u>
16. INTERIOR DOORS	Core		terial <u>Hardb</u> se: type <u>S2S</u>	oard		thickness-	1 3/8*	
Door trim: type	3 \$2\$	Poplar Ba	se: type		; material	olar	; size	2°x5 1/2"
Finish: doors Alkyo	Semi-Gloss		.; trimAlkyd	Semi-Glos	Ś			
17. WINDOWS: HO	it Sliden	Alpine or Milgard		linyl			2 75*	
Windows: type	; make		; material			sash thick	1035	Tane
Glass: grade		Alpine or Milgard	es, type			; head flash	ing	
Trim: type	materi	al Douglas Pir	Paint	Latex Set	11-G1089	; numbe	r coats	
Weatherstripping; ty	pe	; mate	rial <u>Rubber</u>			. Storm sash, Fibergl	number	
Screens: 📋 full; 💽	half-, type Hecal	t auc	- ; number —	; scre	en cloth mate	rial Troerge		
Basement windows:	type	; material	; scre	ens, number		- ; Storm sas	h, number	
Special windows		· · · · · · · · · · · · · · · · · · ·						
Additional informat								
18. ENTRANCES AND	EXTERIOR DETA	1L: 7ir 31-0	•	1 3/4 "		., Douglas	s Fig	3/4
Main entrance door:	material	Fir ; width 3'-0 Pir , width 3'-0	; thicknes:	<sup>3</sup> 1. 3/4 -	rrame; mater	Douglas	s Figs	ness
Uner entrance door	: matenat	Width		5	riame: mater	184	; шіск	ness ——
Head flashing	- number		ing: type		; 52	1010105	: number	
Screen doors; micking			епаі	3(0) ath	im doors: unc	Kness	_,	
Shutters f binard		kness number Wood balusters, 2x2	; screen c		TI 00476			<u>.</u>
Exterior millurede	rade and gravian Dou	Wood balusters, 2x2 glas Fir, Select Mer	chant Doint	Latex Semi	-Gloss		nber coats $\frac{2}{2}$	
Additional informat	on.	· · ·	x ank _			; ELUE:	noci coais	
19. CABINETS AND I								
Kitchen cabinets, w		ywood		• lines	l faat of chab	TBD .	chalfwidth	
Race units: mat	erial Plywood	; counter top	Laminate	· · ·	a neet of silerv	es TBD Laminate	2 2	
Back and end s	plash Laminate	Finish of cal	inets Facto	ry stain f	; edgin inish		number coats	2
Medicine cabinets: 1	nake NA	ruian of ca	; model			····· ,		
	uilt-in furniture		, model					
Additional informat							,	
20, STAIRS:								
	TREADS	RISERS	STR	NGS	HAN	DRAIL	BALU	STERS
STAIR	faterial Thickness	Material Thickness	Material	Thickness	Material	Thickness	Material	Thickness
		1 Hill Hill (2)3	4.40004881					
Basement	g. Fir 2x12	<u> -  -  -</u>	Doug. Fir	4x12	Doug. Fir	1 1/2" d	Doug. Fir	2x2
Main		<u> </u>	1					1
Attic	· <u> </u>				£			
Disappearing: make				<u>_</u>				······
Additional informat	on:							1 m 7 000
HUD-FHA 2005 VA Form 26-1852			2.				RD 1924	-2 (Rev. 7-99)

### 21. SPECIAL FLOORS AND WAINSCOT: (Describe carpet as listed in Certified Products Directory.)

	Location	Material, Color, Border, Sizes, Gage, Etc.	Threshold Material	Wall Base Material	Underfloor Material
	Kitchen	tchen Resilient Flooring		Poplar	Plywd.
ş	Bath	Resilient Flooring		Poplar	Plywd.
Flo		Carpet		Poplar	Plywd.
cot	Location	Material, Color, Border, Sizes, Gage, Euc.	Height	Heighi Over Tub	Height in Showers (From Floor)
Vains	Bath				
				1	
		<u> </u>		1	1

Bathroom accessories: 🔲 Recessed; material \_\_\_\_\_; number \_\_\_\_; datached; material Chrome \_\_\_\_; number \_\_\_\_; Additional information: ----

#### 22. PLUMBING

Fixture	Number	Location	Make	Mfr's Fixture Identification No.	Size	Calor
Sink	1	Kitchen	Kohler Cadence	K-3145-4	33x22	Stainles
Lavatory	2	Baths	Sterling	65020140	19" round	White
Water closet	2	Baths	Sterling Windham	402215	29"x16"x29"	White
Bathtub	2	Baths	Sterling Advantage	61030110	60"x30"x72"	White
Shower over tub _	2	Baths	Delta Classic Shower	T13420		Chrome
Stall shower						
Laundry trays						
<u></u>	Ţ					
	1					
						1
House drain (inside);	e individi Cal	ual system in cal st iron; 🗍 tile:	mpiere detail in separate dram	wings and specifications according to ouse sewer (outside): Cast iron; [	requirements.	ABS Plasti
Water piping:	galvanize	d steel; 🚺 copj	per tubing; 🔲 other	St heem Solaraide; heatin	ill cocks, number	
Water piping:	galvanize iter: type	d steel; 🕢 copp Solar	per tubing; dother; make and model	heem Solaraide ; heatin	ill cocks, number g capacity gal	
Water piping:	galvanize iter: type gph. 1	d steel; 🔽 copp Solar 00' tise. Storage	per tubing; [] other ; make and model tank: material	heem Solaraide ; heatin	ill cocks, number g capacity capacity	gallo
Water piping: Domestic water her	galvanize uer: type gph. 1 fility com	d steel; 🔽 copp Solar 00' rise. Storage pany; 🗌 liq. pe	per tubing; [] other; make and model; tank: material et. gas; [] other	heem Solaraide ; heatin ; heatin ; Gas piping:	ill cocks, number g capacity capacity cooking;	gallo
Water piping: Domestic water hes Gas service: U ut Footing drains connection	galvanize ater: type gph. 1 tility com ected to	d steel; 🔽 copp Solar 00' rise. Storage pany; 🔲 liq. pe 📋 storm sev	per tubing; [] other ; make and model e tank: material et. gas; [] other wer; [] sanitary sewer; [] d	heem Solaraide ; heatin ; heatin ; Gas piping: Iry well. Sump pump; make and mode	ill cocks, number g capacity capacity cooking; 1	gallo house beati
Water piping: Domestic water hes Gas service: U ut Footing drains connection	galvanize ater: type gph. 1 tility com ected to _; capaci	d steel; 🔽 cop Solar 00' rise. Storage pany; 🔲 liq. pa Storm sev	per tubing;      other; make and model _R; t tank: material; t gas;      other; discharg	St heem Solaraide ; heatin ; heatin ; Gas piping: Iry well. Sump pump; make and mode (cs into	ill cocks, number g capacity capacity cooking; 1	gallo house beati
Water piping: Domestic water her Domestic water her Gas service: Uut Footing drains conn	galvanize nter: type gph. 1 tility com ected to ; capaci Steam	d steel; [7] copp Solar 00' rise. Storage pany; [1] liq. po storm sev ty	per tubing;  other; make and model _R; tank: material; et. gas;  other; wer;  sanitary sewer;  dother; discharg One-pipe system,	St heem Solaraide ; heatin ; heatin Gas piping: Iry well. Sump pump; make and mode res into [Wo-pipe system.	ill cocks, number g capacity capacity Cooking; 1	galloi house beating
Water piping: Domestic water hea Gas service: U ut Footing drains comm	galvanize nter: type gph. 1 tility com ected to ; capaci Steam	d steel; [7] copp Solar 00' rise. Storage pany; [1] liq. po storm sev ty	per tubing;  other; make and model _R; tank: material; et. gas;  other; wer;  sanitary sewer;  dother; discharg One-pipe system,	St heem Solaraide ; heatin ; heatin ; Gas piping: Iry well. Sump pump; make and mode (cs into	ill cocks, number g capacity capacity Cooking; 1	gallou ] house beatin
Water piping: Domestic water hes Gas service:u Footing drains comm HEATING Hot water Radiators.	galvanize ter: type gph. 1 fility com ected to ; capaci Steam. Con	d steel; [7] copj Solar 00' rise. Storage pany; [] liq. po [] storm sev ty [] Vapor. vectors. [] F	per tubing;  other; make and model _R; tank: material; et. gas;  other; discharg wer;  sanitary sewer;  discharg One-pipe system.	St heem Solaraide ; heatin ; heatin Gas piping: Iry well. Sump pump; make and mode res into [Wo-pipe system.	ill cocks, number g capacity capacity [] cooking; 1	gallon house heatin
Water piping: Domestic water hes Gas service:u Footing drains comm HEATING Hot water Radiators.	galvanize ter: type gph. 1 tility com ected to ; capaci Steam. Con floor	d steel; [7] copj Solar 00' rise. Storage pany; [] liq. po istorm sev ty Vapor. vectors. [] F r; [] wall;	per tubing;  organization of the per tubing;  results and model  results and  results	St heem Solaraide ; heatin ; heatin ; Gas piping: Gas piping: Gas piping: fry well. Sump pump; make and mode (cs into	ill cocks, number g capacity capacity [] cooking; 1	gallor ] house beatin
Water piping: Dormestic water hes Gas service:ur Footing drains conn HEATING Hot water Radiators. Radiators. Radiator.	galvanize ter: type gph. 1 iility com ected to -; capaci Steam. Con floor Roo	d steel;  cop <u>Solar</u> 00' rise. Storage pany;  liq. pu storm sev ty Vapor. vectors.  F r,  wall; sturn pump. Mal	per tubing;  other; make and model _R; e tank: material; et. gas;  other; wer;  sanitary sewer;  other; discharg One-pipe system.  One-pipe system.  Contend addition. Make and Coll: materiake and model;	St heem Solaraide ; heatin ; heatin ; Gas piping: Gas piping: Gas piping: fry well. Sump pump; make and mode (cs into	ill cocks, number g capacity capacity cooking; 1; capacity;	gallon ] house beatin gr
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Water piping: U Domestic water hes Gas service: U Footing drains conn HEATING Hot water. C Radiant panel: Circulator. Boiler: make and Additional informat	galvanize gph. 1 gph. 1 iility com- ected to ; capaci   Steam.   Con   floor   Ro d model - ion:	d steel;  cop <u>Solar</u> 00' rise. Storage pany;  liq. pu storm sev ty Vapor. vectors.  L F r;  wall; sturn pump. Mal	per tubing; [] other; make and model _R; make and model _R; task: material; discharg; disch	St heem Solaraide ; hestin Gas piping: Lry well. Sump pump; make and mode (cs into Fwo-pipe system. d model al Output B	ill cocks, number g capacity <u>80 gal</u> capacity cooking; [] 1; capacity tuh.; net rating	gallon ] house beatin    Bt
Water piping: Dornestic water hes Gas service: U Footing drains conne HEATING Hot water. Radiators. Radiant panel: Circulator. Boiler: make and Additional informat Warm air: Gravi	galvanize ater: type gph. 1 iility com- ected to ; capaci Steam. Con floor Ro d model - ion: ity.	d steel;  cop <u>Solar</u> 00' rise. Storage pany;  liq. pu storm sev ty Vapor. vectors.  E r,  wall; turn pump. Mal Forced. Type o	per tubing; [] other ; make and model _R et ank: material et. gas; [] other wer; [] sanitary sewer; [] d ; discharg [] One-pipe system. [] 7 Baseboard radiation. Make and [] ceiling. Panel coil: materi ke and model of system	St heem Solaraide ; hestin Gas piping; Lry well. Sump pump; make and mode (res into	ill cocks, number g capacity capacity cooking: 1; capacity tuh.; net rating	gallon ] house beatin gr gr Bt
Water piping: Dornestic water hes Gas service: U Footing drains conne HEATING Hot water. Radiators. Radiant panel: Circulator. Boiler: make and Additional informat Warm air: Duct material:	galvanize ater: type gph. 1 iility com- ected to ; capaci Steam. Con toon: Red d model - ion: iy. supply	d steel;  cop <u>Solar</u> 00' rise. Storage pany;  liq. pu storm sev ty Vapor. vectors.  fr r;  wali; forced. Type o	per tubing; [] other; make and model _R; make and model _R; task: material; discharg et. gas; [] other; discharg wer; [] sanitary sewer; [] discharg [] One-pipe system. [] ] ] 3aseboard radiation. Make and [] ceiling. Panel coil: materi ke and model; distance and model; fsystem; return; teurn;	St heem Solaraide ; hestin Gas piping; Lry well. Sump pump; make and mode (cs into	ill cocks, number g capacity <u>&amp;0 gal</u> capacity capacity cooking; [ 1; capacity tuh.; net rating ss [] On	gallon ] house beatin ] house beatin gamma gamma Bt utside air intal
Water piping: Dornestic water hes Gas service: U Footing drains conne HEATING Hot water. Radiators. Radiators. Radiator. Boiler: make and Additional informat Warm air: Gravi Duct material: Fumance: make	galvanize 	d steel;  cop <u>Solar</u> 00' rise. Storage pany;  liq. pu storm sev ty Vapor. vectors.  E r,  wall; tturn pump. Mal Forced. Type o del	per tubing; [] other; make and model _R; make and model _R; task: material; discharg et. gas; [] other; discharg wer; [] sanitary sewer; [] discharg [] One-pipe system. [] 7 Baseboard radiation. Make and [] ceiling. Panel coil: matericke and model; fsystem; return; return; return; return; fsystem; return; return; fsystem; return; fsystem; return; fsystem; return; fsystem; return; fsystem; fsystem; return; fsystem;  fsystem _]];	St heem Solaraide ; hestin 	ill cocks, number g capacity <u>&amp;0 gal</u> capacity capacity cooking; [ 1; capacity tuh.; net rating ss [] On	gallon ] house beatin ] house beatin gamma gamma Bt utside air intal
Water piping: U Dornestic water hes Gas service: U Footing drains conn HEATING Hot water. C Radiators. Radiant panel: Circulator. Boiler: make and Additional informat: Furmance: makk Additional in for	galvanize ater: type gph. 1 iility com- ected to ; capaci ; capaci	d steel;  cop Solar 00' rise. Storage pany;  liq. py storm sev Vapor. Vapor. vectors.  F r:  wall; sturn pump. Mal Forced. Type o del	per tubing; [] other; make and model _R; make and model _R; tank: material; make; and model _R; discharg generation, make and model; discharg ceiling. Panel coil: materiake and model; fsystem; return; return; discharg generation, make and model; fsystem; return; return; fsystem; return; return; discharg generation, make and model; fsystem; return; return; fsystem; return; fsystem; return; fsystem; fsystem; return; fsystem; fsystem; return; fsystem; return; fsystem; fsystem; return; fsystem;  fsystem;  fsystem]; fsystem; fsystem]; fsystem; fsystem]; fsys	St heem Solaraide ; hestin 	ill cocks, number g capacity <u>80 sqa1</u> capacity capacity cooking; [] 1 ; capacity tuh.; net rating ss [] Ou Btuh.; output	gallon ] house beatin     gr  Br  utside air intal

Controls: make and types Additional information: Fuel: Coal; Coil; Cgas; Cliq. pet. gas; Celectric; Cother ....; storage capacity Additional information: Firing equipment furnished separately: Gas burner, conversion type. Stoker: hopper feed ; bin feed Oil burner: pressure atomizing; yaporizing \_\_\_\_\_\_ Make and model ... Control , Additional information: \_ Electric heating system: type .... \_\_\_\_\_ volts; output \_\_ Btuh. ...... watts;@ \_\_\_\_ Input \_\_\_\_ Additional information: capacity \_ cfm. Ventilating equipment: attic fan, make and model -GE Standard Range Hood JV338HBB Kitchen exhaust fan, make and model Other heating, ventilating, or cooling equipment -24. ELECTRIC WIRING: Service; Overhead; U underground, Panel: fuse box; C circuit-breaker, make 200 AMP's \_\_\_\_\_No. circuits \_ Wiring: 🔽 conduit: 🗋 armored cable; 🔲 nonmetallic cable; 🗌 knob and tube; 🛄 other\_ Special outlets: 7 range; 1 water heater; 1 other Doorbell. 🗹 Chimes. Push-button locations. \_\_\_\_ Additional information: -

25. LIGHTING FIXTURES: 500.00 5 Total number of fixtures \_. Total allowance for fixtures, typical installations, Nontypical installation -Additional information: HUD-FHA 2005

### 26. INSULATION:

0. INSULATI	UN:		
Location	Thickness	Material, Type, and Method of Installation	Vapor Barrier
Roof			
Ceiling	6 1/4	R-19 Piberglass Batt Insulation	
Wall			Tyvek
Floor	1		
	}		

27. MISCELLANEOUS: (Describe any main dwelling materials, equipment, or construction items not shown elsewhere; or use to provide additional information where the space provided was inadequate. Always reference by item number to correspond to numbering used on this form.)

HARDWARE: (make, material, and finish.) Schlage Avanti 625 Bright Chrome Door Hardware

SPECIAL EQUIPMENT: (State material or make, model and quantity. Include only equipment and appliances which are acceptable by local law, custom and applicable FHA standards. Do not include items which, by established custom, are supplied by occupant and removed when he vacates premises or chattels prohibited by law from becoming realty.)

#### PORCHES:

Entry Porch with wood deck or concrete slab

TERRACES:

### GARAGES:

5/8*	Туре	"X"	Gyp.	Bđ,	@ walls	anđ	đ ceiling	
<u>20 m</u>	in. r	ated	door.	لتنع	h.closer	fro	om garage to dwelling	
WALK	(S AN	Ð DF	RIVEW	AYS	:			

Driveway: width; base material; thickness;		ickness
Front walk; width	vice walk: width; the transmission of the second s	nickness
Steps: material; treads; risers .	; Check walls;	

#### **OTHER ONSITE IMPROVEMENTS:**

(Specify all exterior onsite improvements not described elsewhere, including items such as unusual grading, drainage structures, relaining walls, fence, railings, and accessory structures.)

LANDSCAPING, PLANTING, AND FINISH GRADING:	
Topsoil " thick: [] front yard: [] side yards; [] rear yard to	feet behind main building.
Lawns (seeded, sodded, sprigged):.	, 🛄 rear yard
Planting: as specified and shown on drawings; as follows:	·
Shade trees, deciduous aliper.	Evergreen trees, to
Low flowering trees, deciduous	Evergreen shrubsto
High-growing shrubs, deciduous to	Vines, 2-years
Medium-growing shrubs, deciduous, to to	
Low-growing shrubs, deciduous.	

IDENTIFICATION. This exhibit shall be identified by the signature of the builder, or sponsor, and/or the proposed mortgagor if the latter is known at the time of application.

Date

Signature

Signature -

4

# Preliminary Outline Specifications for Kula Ridge Affordable Housing

Kula Ridge will have four Architectural styles within the neighborhood project. The four styles are commonly found within Hawaii's unique cultural and historic heritage:

## **Plantation Style**

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The "Plantation" architectural style takes its historical architectural context from old Plantation villages found throughout Hawaii. Front porches were a common design element. Materials proposed to be used with the plantation style will be corrugated metal roofing and board and batten wood siding. T1-11 siding will also be incorporated in some plans.

### **Bungalow Style**

The Bungalow style is another architectural style that is commonly found in many parts of Hawaii. It can also be commonly found in Kula. Gable roofs with front porches were a common element associated with the Bungalow style. Exterior materials proposed with the Bungalow style will be Asphalt shingle roofing and a composite exterior lap siding for durability.

# Craftsmen Style

The Craftsmen style is also commonly found architectural style in the Hawaiian Islands as well as in Kula. Gable roofs with detailed porches were common with this style as well as cedar shingle siding. Asphalt shingle roofing is proposed with this style of architecture as well as a composite exterior siding that will have the appearance of real cedar shingle exterior siding.

### Contemporary Hawaiian

One of the more popular styles of architecture in Hawaii today can be described as "Contemporary Hawaiian" architecture. Incorporating the front porch or covered lanai, the Contemporary Hawaiian style integrates a double pitched roof as its distinctive characteristic. Exterior plaster for its exterior wall material will be used and concrete tiled roofs will be used on some of the plans to facilitate blending with market priced homes on adjacent lots. <u>Foundation</u> All of the homes foundations will be either post and pier construction or poured in place concrete slab foundation on grade.

<u>Framing</u> Wall and roof construction will be wood framed construction. A wood framed, panelized system is proposed to be integrated to facilitate faster wall erection. Integration of pre-fabricated wood trusses will facilitate faster roof construction.

<u>Roofing</u> Roofing material will vary according to Architectural character. Roofing materials proposed are corrugated metal roofing, asphalt shingle roofing and concrete tile roofing.

<u>Doors and Windows</u> Exterior windows will be low maintenance, vinyl windows. Door to be solid wood doors at entry door and hollow core at interior doors.

<u>Interior walls</u> Gypsum board over wood framing, taped, sanded, textured and painted.

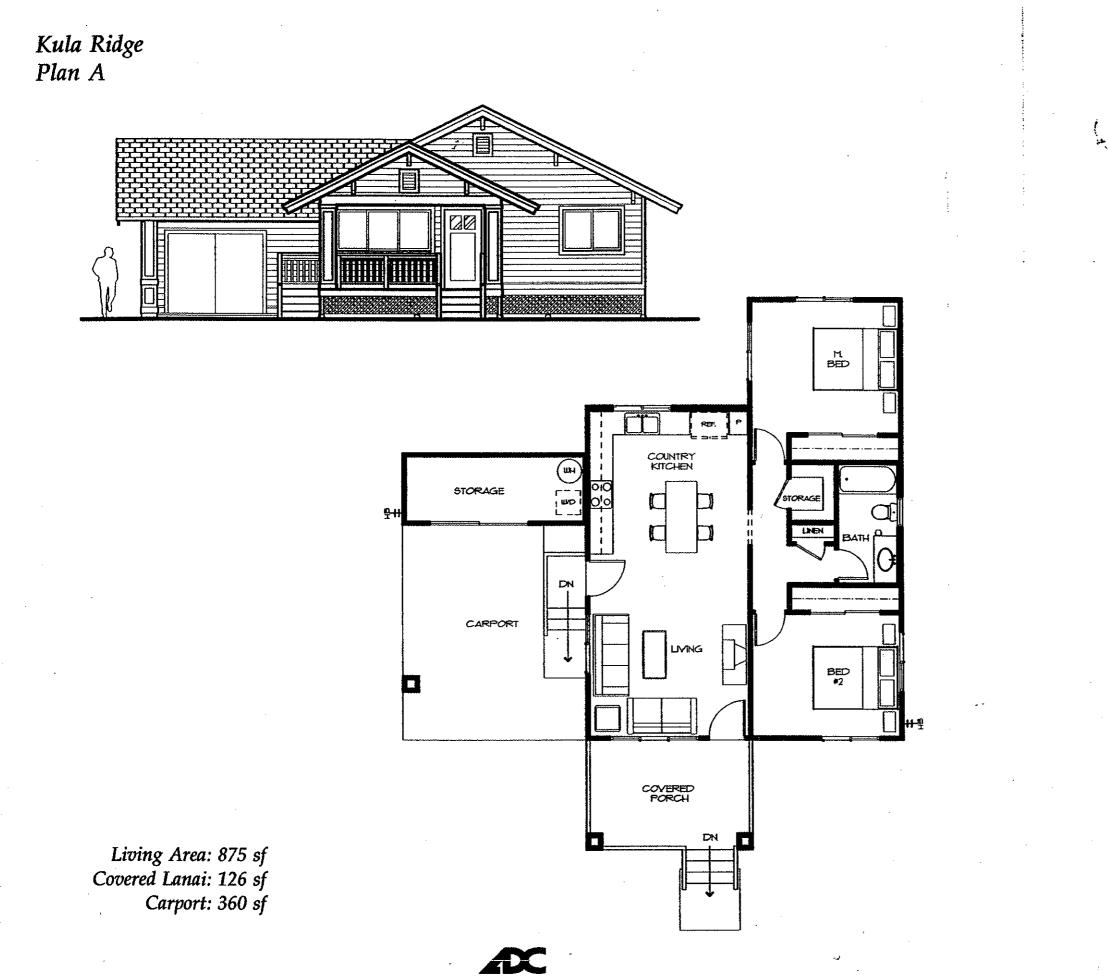
<u>Flooring</u> Carpet with pad in Bedrooms and sheet vinyl in baths and Kitchen. Upgrades may include wood laminate flooring.

<u>Countertops</u> Plastic laminate. Upgrades may include granite countertops.

<u>Appliances</u> To be selected.

<u>Plumbing fixtures</u> To be selected.

<u>Cabinets</u> To be selected.



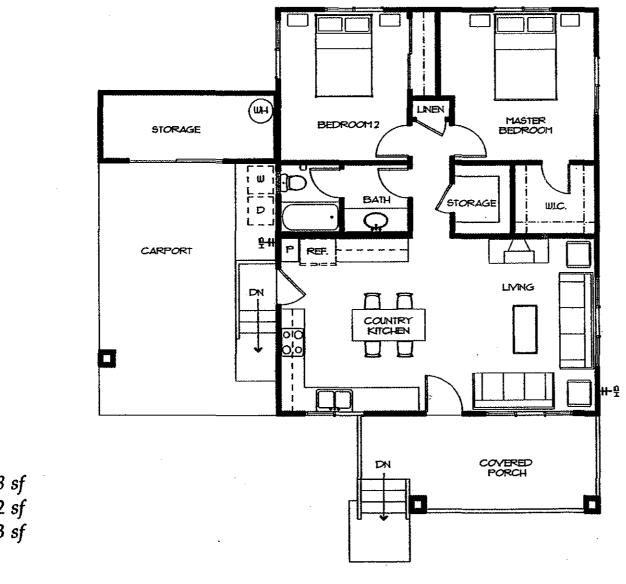
Architectural Design & Construction, Inc.

a .z



Kula Ridge Affordable Homes Plan B Post & Pier





Living Area: 918 sf Covered Lanai: 162 sf Carport: 343 sf

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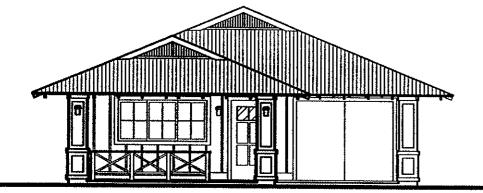
Architectural Design & Construction, Inc.

1849 Wili Pa Loop • Wailuku, Maui, Hawaii 96793 Telenhoner (808) 986-8300 • Farr (808) 986-8301 • Farail: adcRadcmaui.com

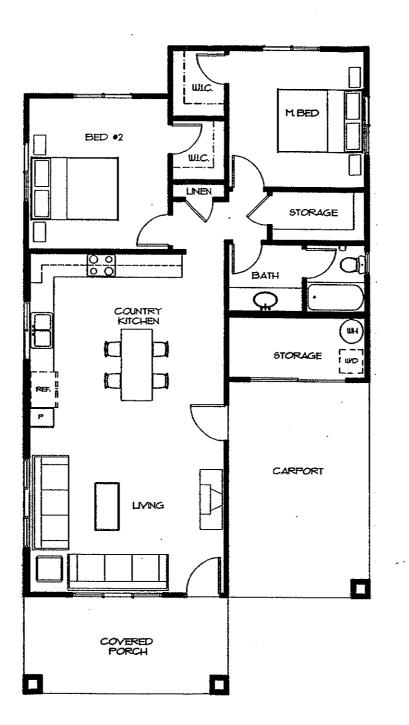


Kula Ridge Affordable Homes-Plan C

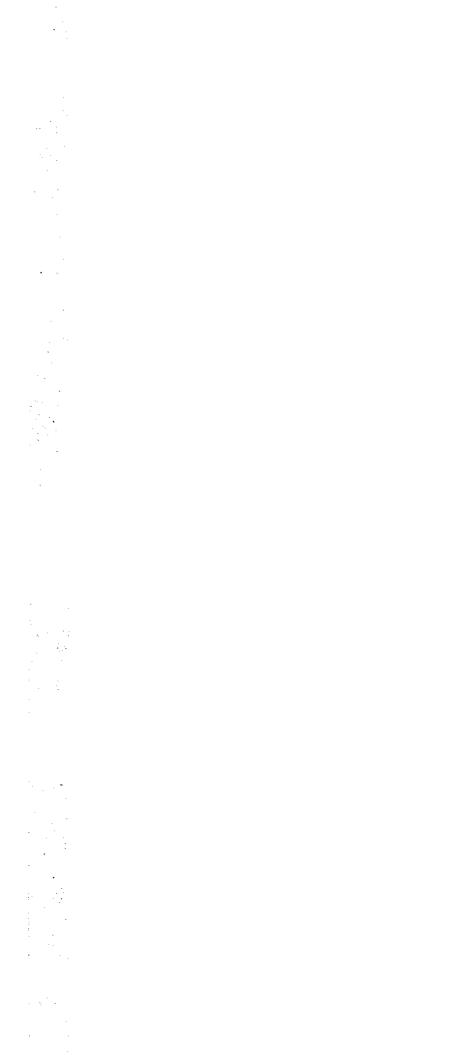
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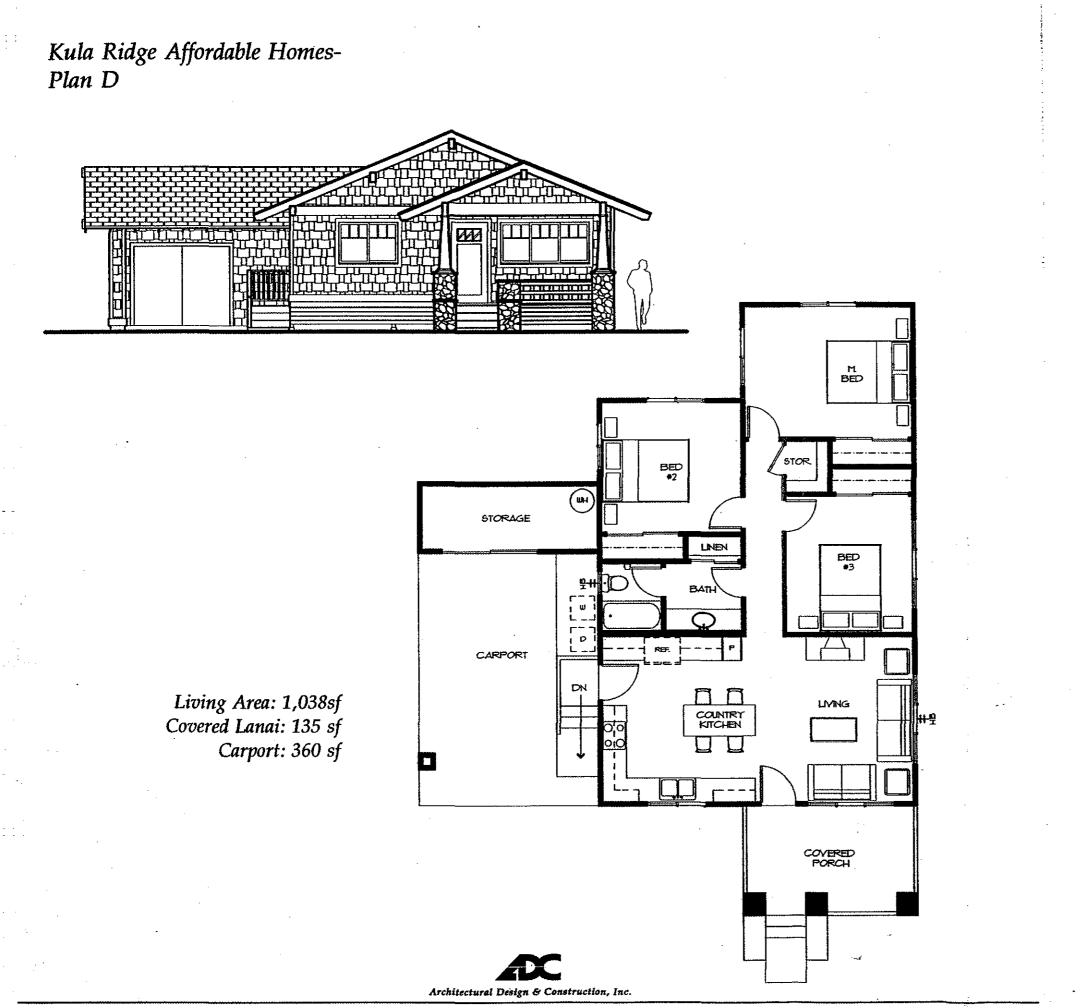


Living Area: 1,010 sf Covered Lanai: 137 sf Carport: 277 sf



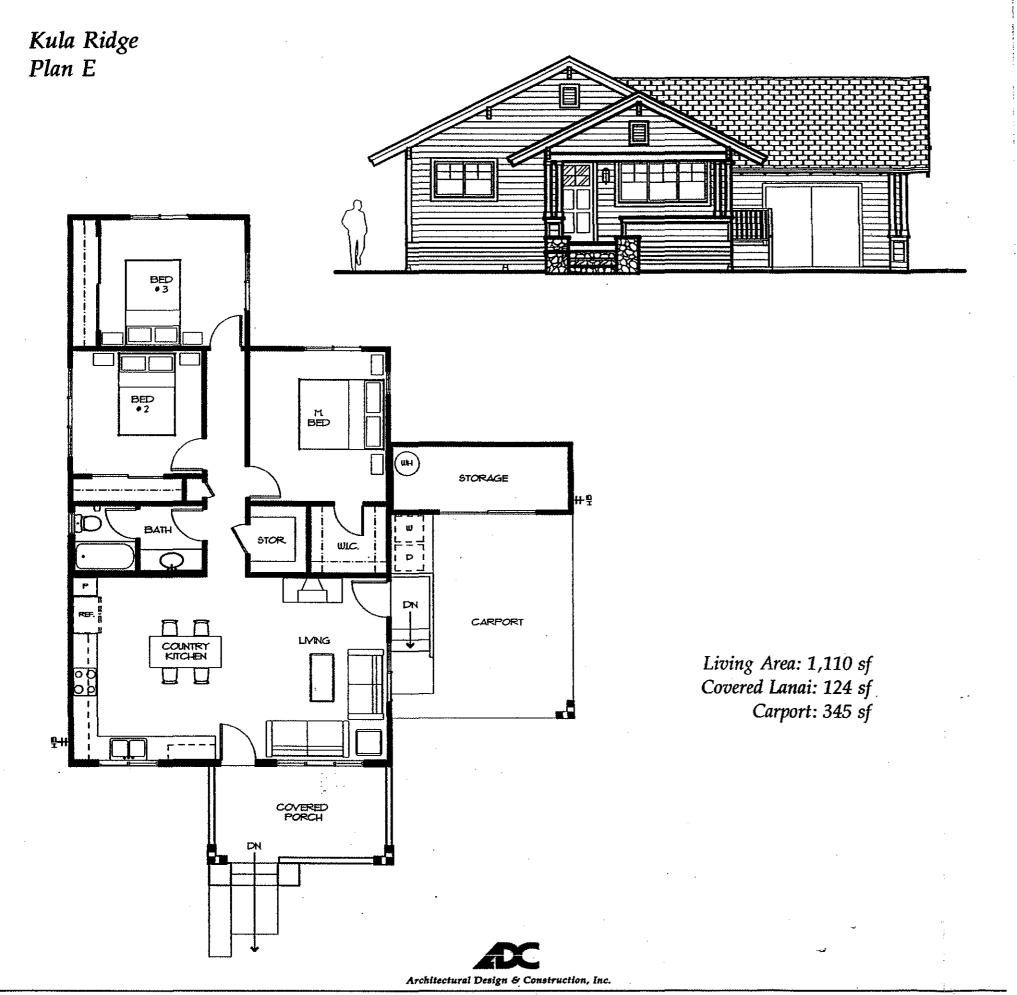






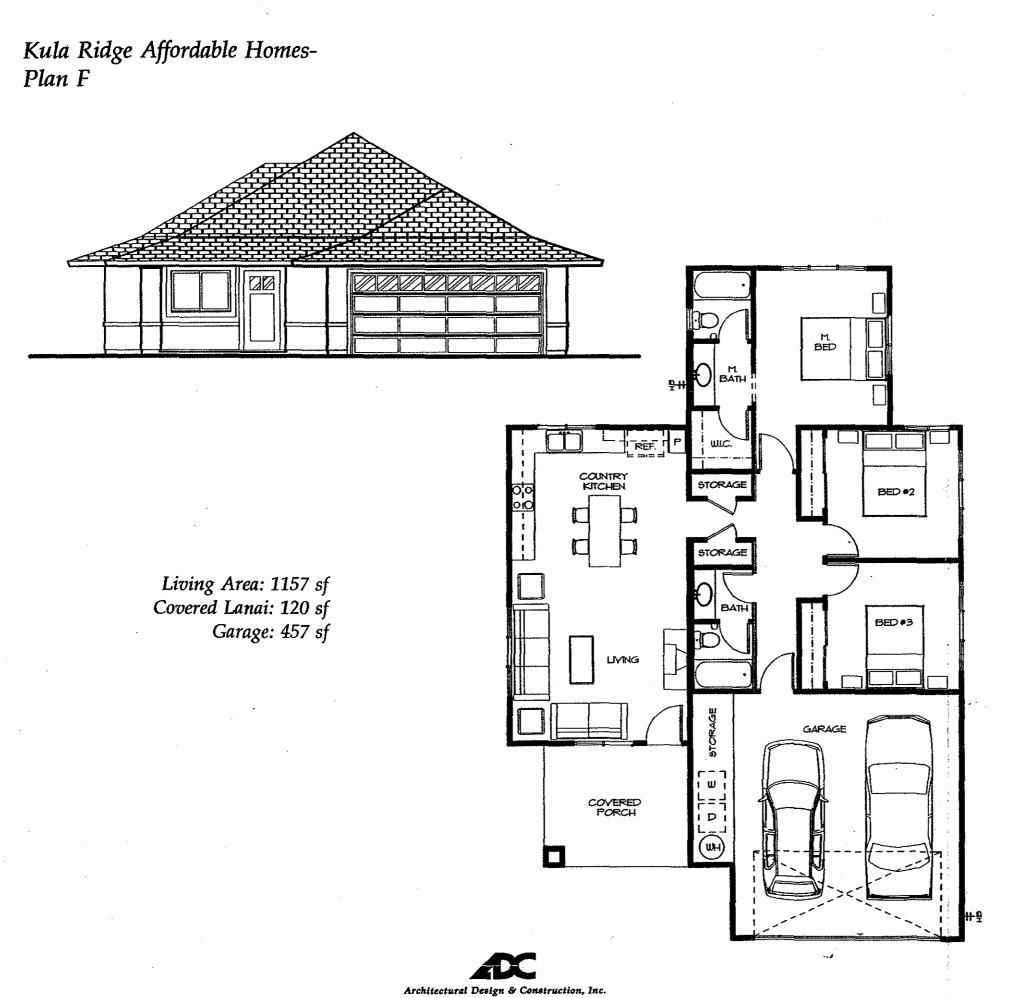
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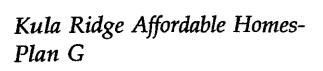


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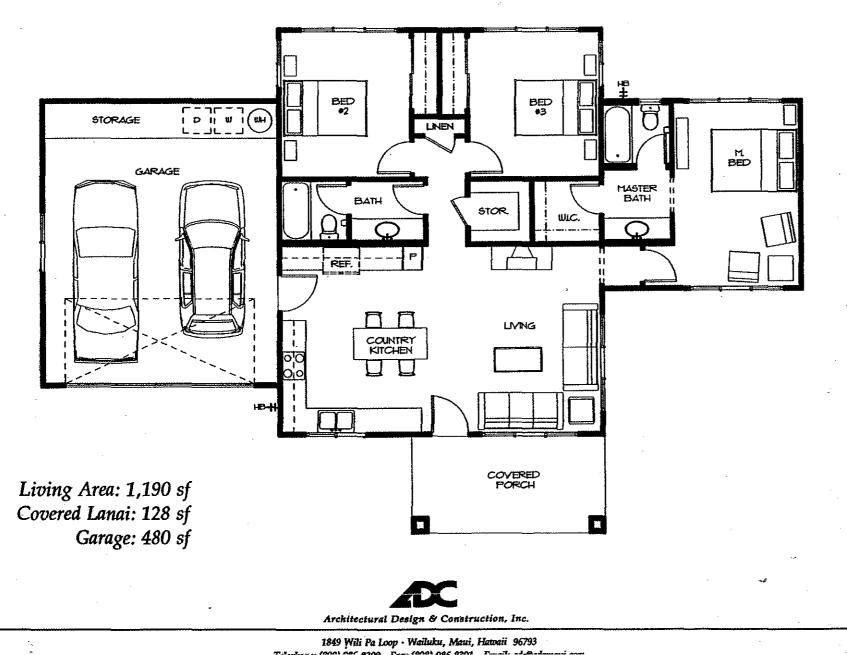
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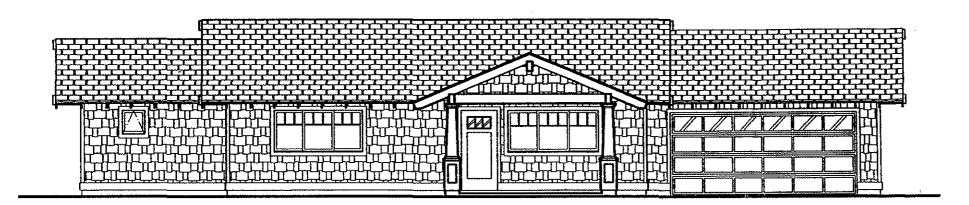


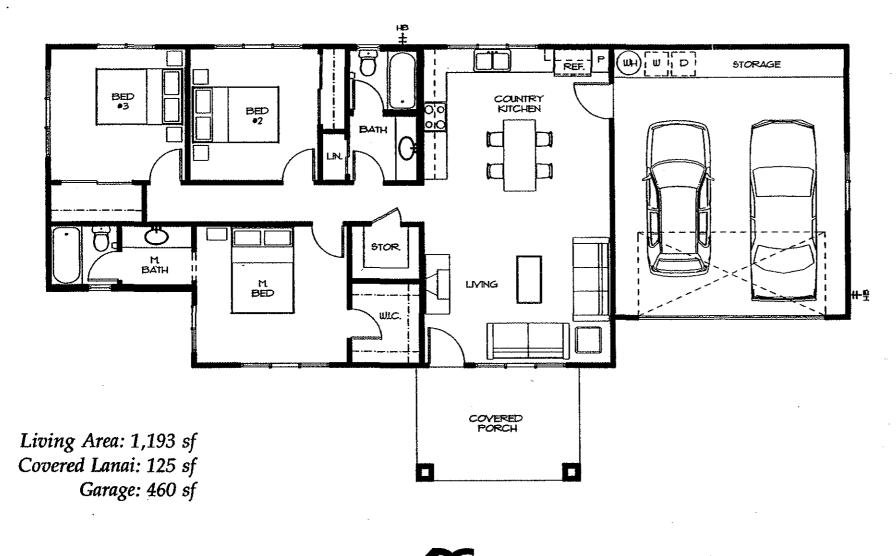


1849 Wili Pa Loop · Wailuku, Maui, Hawaii 96793 T.J. .........







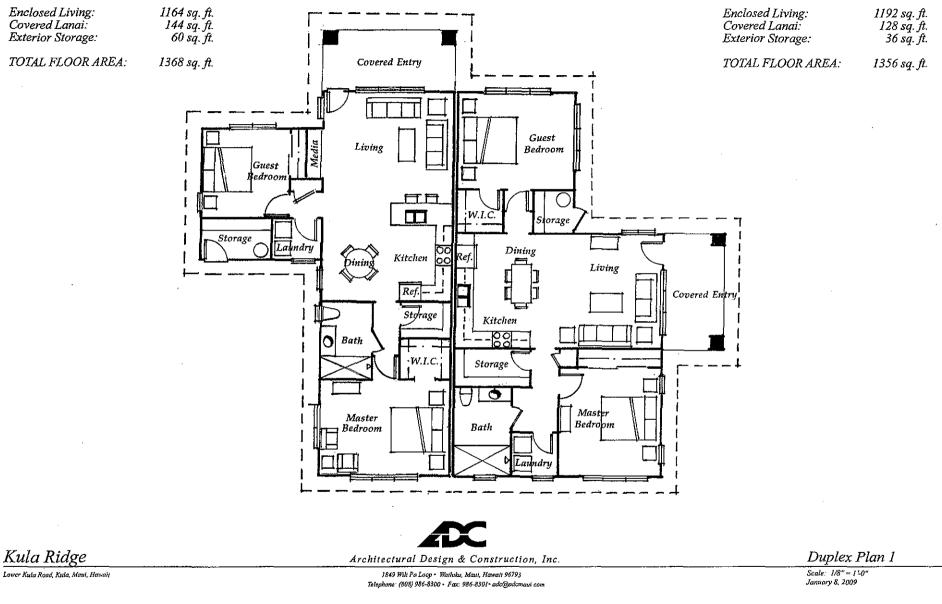




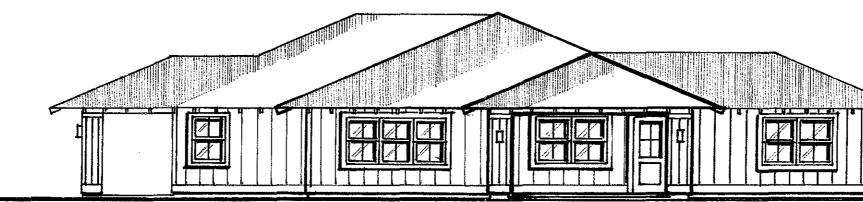
1849 Wili Pa Loop • Wailuku, Maui, Hawaii 96793 Falankara (909) 026 9200 . Kar (909) 026 9201 . Karit adaladamani am



#### Floor Area- Unit A



Floor Area- Unit B









1849 Wili Pa Loop • Wailuku, Maui, Hawaii 96793 Telephone: (808) 986-8300 • Fax: 986-8301• adc@adcmaui.com

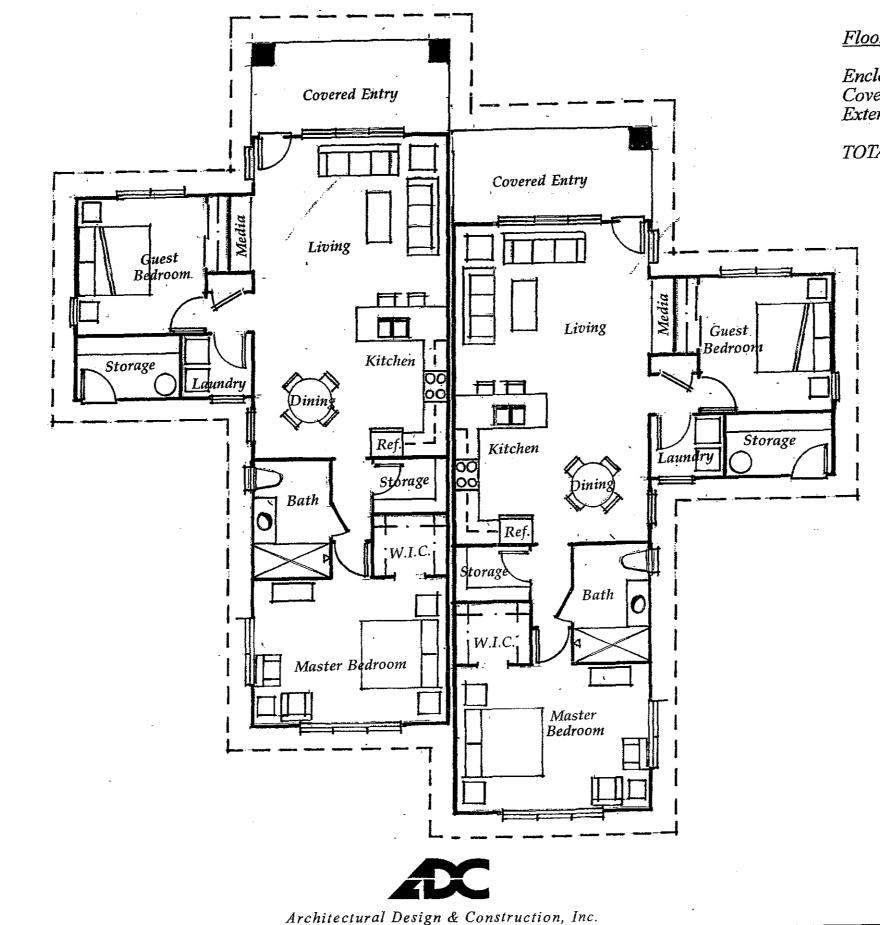
Lower Kula Road, Kula, Maui, Hawaii



•

Duplex 1 - Elevations

Scale: 1/8" = 1'-0" January 8, 2009



Kula Ridge

Lower Kula Road, Kula, Maui, Hawaii

1849 Wili Pa Loop • Wailuku, Maui, Hawaii 96793

1849 Will Pa Loop • Waltukai, Maui, Hawaii 96793 Telephone: (808) 986-8300 • Fax: 986-8301• adc@adcmaui.com <u>Floor Area- Unit A</u>

Enclosed Living: Covered Lanai: Exterior Storage:

TOTAL FLOOR AREA:

1164 sq. ft. 144 sq. ft. 60 sq. ft.

1368 sq. ft.

Duplex Plan 2

Scale: 1/8" = 1'-0" January 8, 2009







Lower Kula Road, Kula, Maui, Hawaii



Architectural Design & Construction, Inc.

1

Duplex 2 - Elevations

Scale: 1/8" = 1'-0" January 8, 2009

# 6. AGREEMENT REGARDING WATER SOURCE FOR PROJECTS

### AGREEMENT REGARDING WATER SOURCE FOR PROJECTS

THIS AGREEMENT REGARDING WATER SOURCE FOR PROJECTS (the "Agreement") is entered into by and between Pi'iholo Investors LLC ("Pi'iholo"), and Kula Ridge, LLC ("KR") and Kula Ridge Mauka, LLC ("KRM"), effective this 16th day of March, 2009.

### **RECITALS:**

WHEREAS, Pi'iholo has developed a private well and related improvements known as the Pi'iholo South well located approximately in the area shown on Exhibit "A" attached hereto and incorporated herein by reference; and

WHEREAS, the estimated water yield for the Pi'iholo South well is approximately 1.7 million gallons per day (gpd"); and

WHEREAS, Pi'iholo is currently in discussions with the County of Maui, Department of Water Supply ("DWS") concerning an agreement which dedicates the Pi'iholo South well to DWS and under which the County of Maui accepts said dedication (the "Dedication Agreement"); and

WHEREAS, KR intends to develop the parcel identified on the map attached hereto as Exhibit "B" for affordable housing, senior housing, and market lots, and KRM intends to develop the parcel identified on the map attached hereto as Exhibit "B" for market lots (collectively, the "Projects"); and

WHEREAS, Pi'iholo understands that in order for the Projects to be developed, KR and KRM must first secure necessary land entitlements and project approvals from the Maui County Council and the State Land Use Commission; and

WHEREAS, KR and KRM require a total of 120,000 gpd to meet the estimated water needs of the foregoing projects.

### AGREEMENT:

Pi'iholo agrees to provide KR and KRM with a water source allocation of 120,000 gpd (the "Allocation") for the Projects upon the condition that Pi'iholo and the County of Maui shall have successfully agreed upon and executed the Dedication Agreement, which shall give Pi'iholo the right to assign source allocation credits, including the assignment to KRM and KR of the Allocation.

In the event that (a) the foregoing condition shall not be satisfied, or (b) KR and KRM shall have failed to secure the necessary land entitlements and approvals from the Maui County Council and the State Land Use Commission for the Projects, then this

Agreement shall be deemed null and void, and neither party shall have any liability or further obligations to each other.

In the event Pi'iholo in its sole discretion determines that it is unable or unwilling to meet the requirements of DWS for the Dedication Agreement or determines that it is unwilling to proceed for any reason, Pi'iholo shall notify KR and KRM in writing, and this Agreement shall be deemed null and void, and neither party shall have any liability or further obligations to each other.

This Agreement shall be governed by the laws of the State of Hawaii without giving effect to any conflict of laws principles.

IN WITNESS WHEREOF, the parties hereto have caused this instrument to be duly executed effective on the day and year first above written.

**PI'IHOLO INVESTORS LLC** 

By PI'IHOLO SOUTH LLC Its Manager

B۱

ZACHARY/FRANKS Its Managing Member

KULA RIDGE, LLC By CI N NISHIKAWA

Its Manager

KULA RIDGE MAUKA By CL

Its Manager

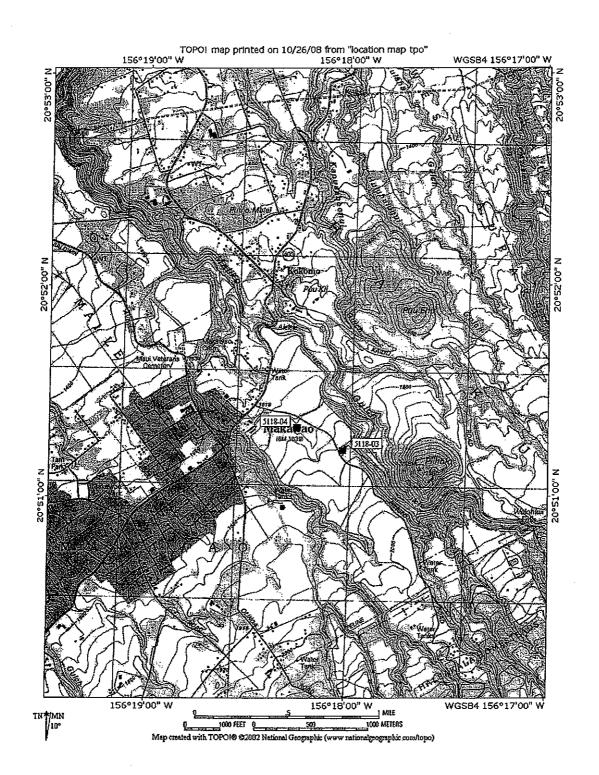
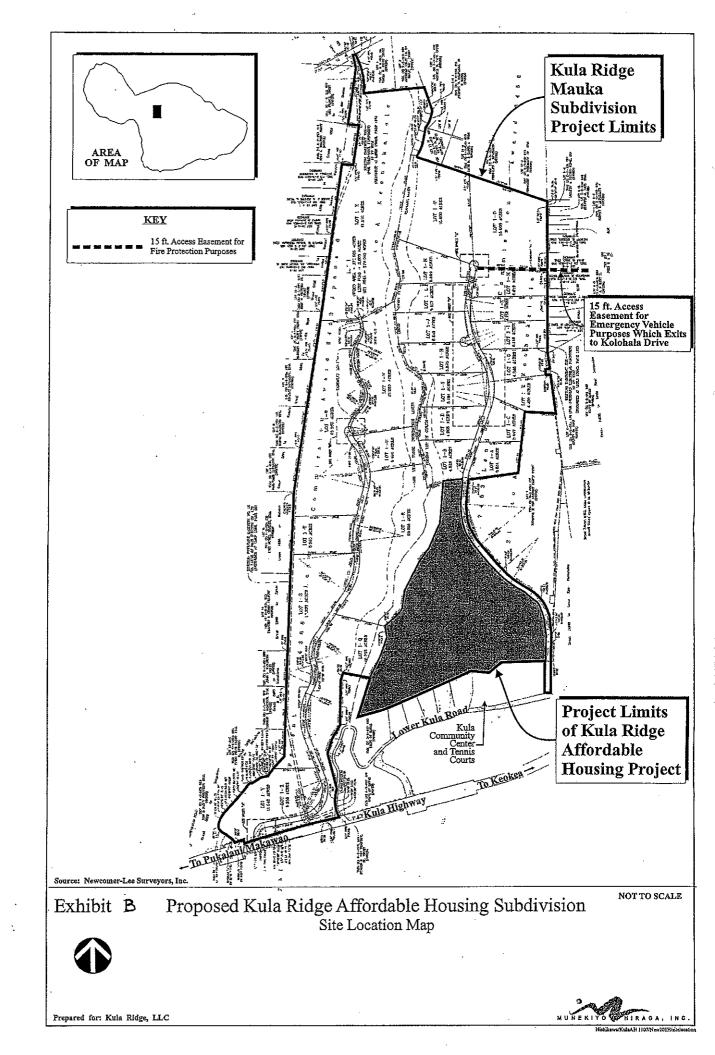


Figure 1

Exhibit "A"



# 7. LETTER DATED SEPTEMBER 2, 2009 TO DEPARTMENT OF WATER SUPPLY FROM PIIHOLO SOUTH LLC

# **Piiholo South LLC**

875 KUMULANI DRIVE KIHEI, HI 96753 TEL: 808 879 5234 EMAIL: PiiholoSouthLLC@aol.com

MANAGING MEMBERS ZACH FRANKS, CINDY WARNER

September 2, 2009

Jeffrey K. Eng, Director Department of Water Supply 200 S. High Street Wailuku, HI 96793

Dear Mr. Eng,

It was a pleasure meeting with you, Herb, and Alan last Friday, August 28, 2009. I know that all of you are extremely busy, and I appreciated the time that all of you set aside to discuss the Piiholo South well. My colleague, Cindy Warner, has made arrangements to obtain the documentation that Herb requested at our meeting.

As discussed at our meeting, and by this letter, Piiholo Investors LLC is firmly committed to allocating 120,000 gallons of water per day from the Piiholo South well to Clayton Nishikawa's Kula Ridge and Kula Ridge Mauka projects which will provide much needed senior and affordable housing. Whether the allocation comes about through the well's dedication to the Department of Water Supply ("DWS") or simply as a pass through from Piiholo Investors LLC's system to DWS remains to be determined by all of us.

I look forward with great anticipation to further constructive meetings with you and your staff. Should you have any questions, please feel free to contact me.

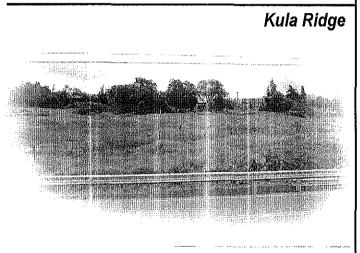
Best personal regards,

Zachary Franks Piiholo South, LLC

Cc: JoAnn Ridao, Department of Housing and Human Concerns Councilmember Michael Victorino, Chairman, Water Resource Committee Clayton Nishikawa, Kula Ridge, LLC, Kula Ridge Mauka, LLC

# 8. REVISED TRAFFIC IMPACT REPORT

### Traffic Impact Report



Submitted to: Kula Ridge, LLC

Submitted by: Wilson Okamoto Corporation July 2006

(Revised)

#### TRAFFIC IMPACT REPORT

.....

#### FOR THE

#### KULA RIDGE DEVELOPMENT

#### Prepared for:

Kula Ridge, LLC 1849 Wili Pa Loop Wailuku, Hawaii 96793

#### Prepared by:

Wilson Okamoto Corporation 1907 S. Beretania Street, Suite 400 Honolulu, Hawaii 96826 WOC Ref #7551-01

> July 2006 (Revised)

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#### Traffic Impact Report for the Kula Ridge Development

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APPENDIX A	Existing Traffic Count Data
APPENDIX B	Level of Service Definitions
APPENDIX C	Capacity Analysis Calculations
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#### I. INTRODUCTION

#### A. Purpose of Study

The purpose of this study is to identify and assess the traffic impacts resulting from the proposed Kula Ridge development in Kula on the island of Maui. The project site for the proposed residential development is located east of Lower Kula Road near the Kula Community Center.

#### B. Scope of Study

This report presents the findings and conclusions of the traffic study, the scope of which includes:

- 1. Description of the proposed project.
- 2. Evaluation of existing roadway and traffic operations in the vicinity.
- Analysis of future roadway and traffic conditions without the proposed project.
- Analysis and development of trip generation characteristics for the proposed project.
- 5. Superimposing site-generated traffic over future traffic conditions.
- 6. The identification and analysis of traffic impacts resulting from the proposed project.
- Recommendations of improvements, if appropriate, that would mitigate the traffic impacts resulting from the proposed project.

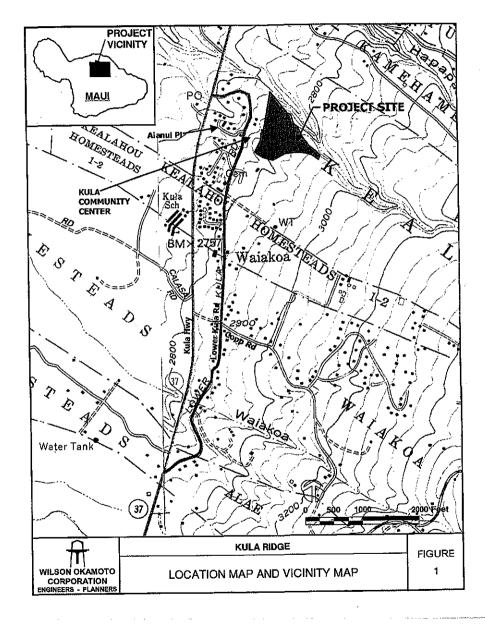
#### **II. PROJECT DESCRIPTION**

#### A. Location

The project site is located along Lower Kula Road east of the Kula Community Center in Kula on the island of Maui (see Figure 1) and is further identified as Tax Map Key: 2-3-001: 174. Access to the project site will be provided via a new access road off Lower Kula Road south of Alanui Place.

B. Project Characteristics

The proposed Kula Ridge development will be located on an approximately 48.117-acre site located east of Lower Kula Road. The project site will be divided into 42 residential lots, 70 affordable housing residential lots, 4 agricultural lots, and



an approximately 3-acre park that will be dedicated to the County of Maui. Each residential and agricultural lot is expected to house a residential dwelling that is anticipated to be completed and occupied by the Year 2009. Access to the project site will be provided via a new access road off Lower Kula Road. Figure 2 shows the proposed project site plan.

#### III. EXISTING TRAFFIC CONDITIONS

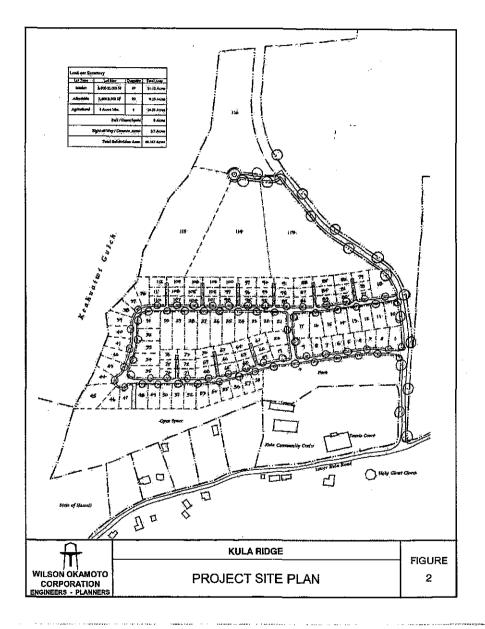
#### A. General

The proposed development will be located east of Lower Kula Road southeast of the intersection with Kula Highway. Kula Highway is a predominately two-way, two-lane State of Hawaii roadway generally oriented in the north-south direction that serves as the primary access road through central Maui between Haleakala Highway in Pukalani and Ulupalakua.

#### B. Area Roadway System

In the vicinity of the project site, Lower Kula Road is a predominantly twoway, two-lane roadway generally oriented in the north-south direction that intersects Kula Highway several times along its alignment. Northwest of proposed project site, Lower Kula Road intersects Alanui Place and the driveway for the Kula Community Center. At this unsignalized intersection, both approaches of Lower Kula Road have one lane that serves all traffic movements. Alanui Place is a two-way, two-lane roadway that provides access to the residential properties along its alignment. At the intersection with Lower Kula Road, the Alanui Place approach has one lane that serves all traffic movements. The westbound approach of the intersection is comprised of the driveway for the Kula Community Center which has one lane that serves all traffic movements at this intersection.

Northwest of intersection with Alanui Place, Lower Kula Road intersects Kula Highway. At this unsignalized T-intersection, the Lower Kula Road approach has one lane that serves left-turn and right-turn traffic movements. The northbound approach of the highway has one lane at this intersection that serves through and right-turn



traffic movements while the southbound approach has one lane that serves left-turn and through traffic movements.

South of the intersection with Alanui Place, Lower Kula Road intersects Copp Road. At this all-way stop controlled intersection, both approaches of Lower Kula Road have one lane that serves all traffic movements. Copp Road is a two-way, twolane roadway generally oriented in the east-west direction that provides access to the residential neighborhoods along its alignment. At the intersection with Lower Kula Road, both approaches of Copp Road have one lane that serves all traffic movements.

Further southwest, Lower Kula Road intersects Kula Highway again. At this unsignalized t-intersection, the Lower Kula Road approach has one lane that serves left-turn and right-turn traffic movements. The northbound approach of the highway has one lane at this intersection that serves through and right-turn traffic movements while the southbound approach has one lane that serves left-turn and through traffic movements.

- C. Traffic Volumes and Conditions
  - 1. General
    - a. Field Investigation

A field investigation was conducted on May 31 and June 1, 2005, and April 25-26, 2006 and consisted of manual turning movement count surveys during the morning peak period between 6:00 AM and 8:00 AM, and the afternoon peak period between 3:00 PM and 6:00 PM at the following intersections:

- Lower Kula Road, Alanui Place, the Kula Community Center driveway
- Lower Kula Road and Kula Highway (North)
- Lower Kula Road and Copp Road
- · Lower Kula Road and Kula Highway (South)

In addition, 24-hour mechanical traffic count surveys were collected along Lower Kula Road and Kula Highway to verify the peak

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#### Traffic Impact Report for the Kula Ridge Development

traffic periods in the project vicinity. Appendix A includes the existing traffic count data.

b. Capacity Analysis Methodology

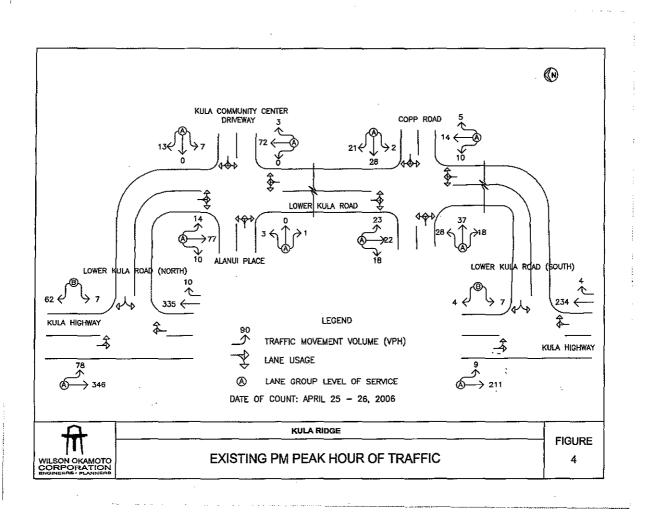
The highway capacity analysis performed in this study is based upon procedures presented in the "Highway Capacity Manual", Transportation Research Board, 2000, and the "Highway Capacity Software", developed by the Federal Highway Administration. The analysis is based on the concept of Level of Service (LOS) to identify the traffic impacts associated with traffic demands during the peak periods of traffic.

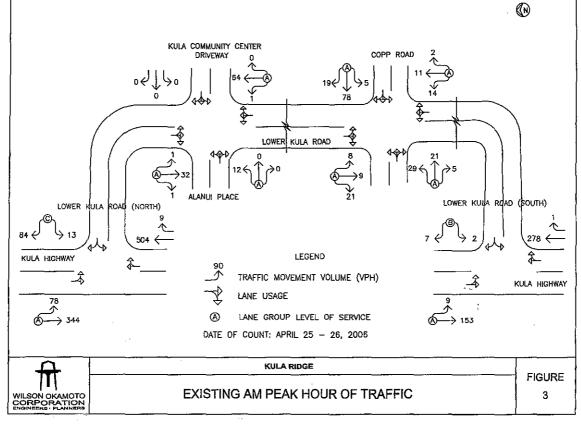
LOS is a quantitative and qualitative assessment of traffic operations. Levels of Service are defined by LOS "A" through "F"; LOS "A" representing ideal or free-flow traffic operating conditions and LOS "F" unacceptable or potentially congested traffic operating conditions.

"Volume-to-Capacity" (v/c) ratio is another measure indicating the relative traffic demand to the road carrying capacity. A v/c ratio of one (1.00) indicates that the roadway is operating at or near capacity. A v/c ratio of greater than 1.00 indicates that the traffic demand exceeds the road's carrying capacity. The LOS definitions are included in Appendix B.

- 2. Existing Peak period Traffic
  - a. General

Figures 3 and 4 illustrate the existing AM and PM peak period traffic volumes and operating conditions. The morning peak hour of traffic generally occurs between 7:00 AM and 8:00 AM in the project vicinity. In the afternoon, the peak hour of traffic generally occurs between the hours of 3:45 PM and 4:45 PM. Although the peak hours of traffic generally occur around the same time periods at each of the study intersections, the absolute commuter peak hour time periods for





#### each intersection may differ slightly as shown in Table 1.

#### Table 1: Peak Periods of Traffic

Intersection	AM Peak	PM Peak
Lower Kula Road/Alanui Place/Kula	7:00 AM to	3:45 PM to
Community Center Driveway	8:00 AM	4:45 PM
Lower Kula Road/Kula Highway	7:00 AM to	3:30 PM to
(North)	8:00 AM	4:30 PM
Lower Kula Road/Copp Road	7:00 AM to 8:00 AM	3:45 PM to 4:45 PM
Lower Kula Road/Kula Highway	7:00 AM to	4:00 PM to
(South)	8:00 AM	5:00 PM

The analysis is based on the above absolute commuter peak hour time periods for each intersection to identify the traffic impacts resulting from the proposed project. LOS calculations are included in Appendix C.

#### b. Lower Kula Road, Alanui Place, the Kula Community Center Driveway

At the intersection with Alanui Place and the Kula Community Center driveway, Lower Kula Road carries 65 vehicles northbound and 34 vehicles southbound during the AM peak period. During the PM peak period, traffic volumes are higher with 75 vehicles traveling northbound and 101 vehicles traveling southbound. Both approaches of Lower Kula Road operate at LOS "A" during both peak periods.

The Alanui Place approach of the intersection carries 12 vehicles and 4 vehicles eastbound during the AM and PM peak periods, respectively, while the Kula Community Center driveway carries no vehicles during the AM peak period and 20 vehicles during the PM peak period. Both approaches of the intersection operate at LOS "A" during both peak periods.

 Lower Kula Road and Kula Highway (North) At the northern intersection with Kula Highway, Lower Kula
 Road carries 97 vehicles westbound during the AM peak period.

#### Traffic Impact Report for the Kula Ridge Development

During the PM peak period, the traffic volume is less with 69 vehicles traveling westbound. The Lower Kula Road approach of the intersection operates at LOS "C" and LOS "B" during the AM and PM peak periods, respectively.

The Kula Highway approaches of the intersection carry 513 vehicles northbound and 422 vehicles southbound during the AM peak period. During the PM peak period, the overall traffic volume is less with 345 vehicles traveling northbound and 424 vehicles traveling southbound. The critical traffic movement on the highway approaches at this intersection is the southbound left-turn and through traffic movement which operates at LOS "A" during both peak periods.

d. Lower Kula Road and Copp Road

At the intersection with Copp Road, Lower Kula Road carries 27 vehicles northbound and 38 vehicles southbound during the AM peak period. During the PM peak period, traffic volumes are slightly higher with 29 vehicles traveling northbound and 63 vehicles traveling southbound. Both approaches of Lower Kula Road operate at LOS "A" during both peak periods.

The Copp Road approaches of the intersection carry 55 vehicles eastbound and 102 vehicles westbound during the AM peak period. During the PM peak period, the overall traffic volume is less with 83 vehicles traveling eastbound and 51 vehicles traveling westbound. Both approaches of Copp Road operate at LOS "A" during both peak periods.

e. Lower Kula Road and Kula Highway (South) At the southern unsignalized intersection with Kula Highway, Lower Kula Road carries 9 vehicles westbound during the AM peak period. During the PM peak period, the traffic volume is slightly higher with 11 vehicles traveling westbound. The Lower Kula Road

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approach of this intersection operates at LOS "B" and LOS "A" during the AM and PM peak periods, respectively.

The Kula Highway approaches of the intersection carry 279 vehicles northbound and 162 vehicles southbound during the AM peak period. During the PM peak period, the overall traffic volume is approximately the same with 238 vehicles traveling northbound and 220 vehicles traveling southbound. The critical traffic movement on the highway approaches at this intersection is the southbound left-turn and through traffic movement which operates at LOS "A" during both peak periods.

#### IV. PROJECTED TRAFFIC CONDITIONS WITHOUT PROJECT

#### A. Through Traffic Forecasting Methodology

An analysis of both historical traffic data and traffic projections contained within the Maui Long-Range Land Transportation Plan (MLRLTP) was made to determine an appropriate ambient growth of traffic demands in the project vicinity. Using linear regression analyses, historical data indicates an average annual traffic growth rate in the vicinity of approximately 2.7%, while the MLRLTP indicates an average annual traffic growth rate of less than 0.5%. Therefore, for conservative analysis purposes, the travel forecast used in this study is based upon the historical traffic count data obtained from the State Department of Transportation (DOT). Using Year 2006 as the base year, a growth factor of 1.11 was applied to the existing traffic demands on the highways to achieve the projected ambient traffic demands for Year 2009.

#### B. Other Considerations

The Kula Senior Community Housing project is located southwest of the project site adjacent to Kula Highway across from Kula Elementary School. The proposed residential project is expected to be completed by Year 2006 and is expected to provide approximately 36 one-bedroom units for senior citizens with limited annual incomes. As detailed in the "Traffic Impact Report for the Kula Senior

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#### Traffic Impact Report for the Kula Ridge Development

Community Housing" dated December 2005, the proposed development is anticipated to generate 2 trips and 4 trips during the AM and PM peak periods, respectively. These trips were assigned to the street network in the study area to account for trips generated by the proposed senior housing project.

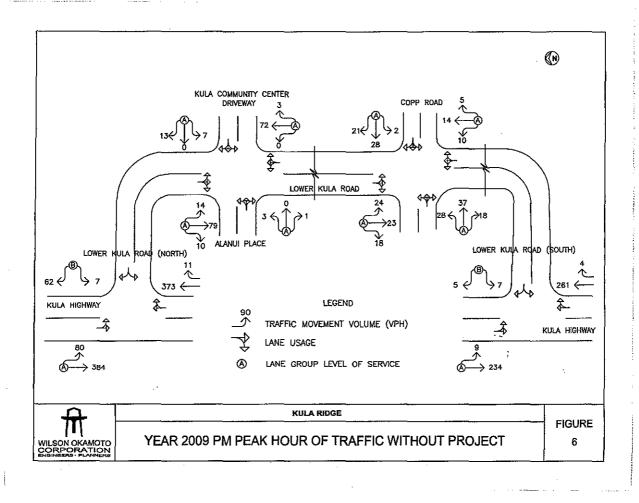
C. Total Traffic Volumes Without Project

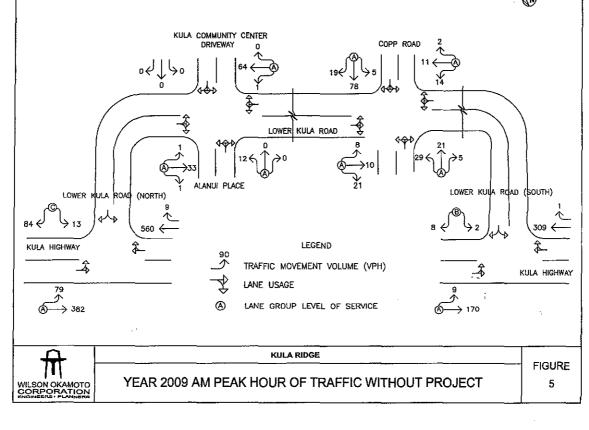
The projected Year 2009 AM and PM peak period traffic volumes and operating conditions without the proposed Kula Ridge development are shown in Figures 5 and 6, and summarized in Table 2. The existing levels of service are provided for comparison purposes. LOS calculations are included in Appendix D.

#### Table 2: Existing and Projected (Without Project) LOS Traffic Operating Conditions

		A	М	P	М
Intersection	Critical Approach/ Movement	Exist	Year 2009 w/out Proj	Exist	Year 2009 w/out Proj
Lower Kula Road/	Eastbound	A	A	A	A
Alanui Place/	Westbound	-	-	A	A
Kula Community Center Driveway	Northbound	A	A	A	A
Direway	Southbound	A	A	A	A
Lower Kula Road/	Westbound	C	С	В	В
Kula Highway (North)	Southbound	A	A	A	A
Lower Kula Road/	Eastbound	A	A	A	A
Copp Road	Westbound	A	A	A	A
	Northbound	A	A	A	A
	Southbound	A	A	A	A
Lower Kula Road/	Westbound	B	В	В	B
Kula Highway (South)	Southbound	A	A	A	. A

Traffic operations under Year 2009 without project conditions are expected to remain similar to existing conditions. The approaches of the intersections of Lower Kula Road with Alanui Place/Kula Community Center Driveway and Copp Road are expected to continue operating at LOS "A" while the westbound and southbound





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approaches of the southern intersection with Kula Highway are anticipated to continue operating at LOS "B" and LOS "A," respectively, during the AM and PM peak periods. Similarly, at the northern intersection of Lower Kula Road with Kula Highway, the westbound approach is anticipated to continue operating at LOS "C" and LOS "B" during the AM and PM peak periods, respectively, while the southbound approach is anticipated to continue operating at LOS "A" during both peak periods.

#### V. PROJECTED TRAFFIC CONDITIONS WITH PROJECT

#### A. Site-Generated Traffic

#### 1. Trip Generation Methodology

The trip generation methodology used in this study is based upon generally accepted techniques developed by the Institute of Transportation Engineers (ITE) and published in "Trip Generation, 7<sup>th</sup> Edition," 2003. The ITE trip generation rates are developed empirically by correlating the vehicle trip generation data with various land use characteristics such as the number of vehicle trips generated per dwelling unit. Table 3 summarizes the project site trip generation characteristics applied to the AM and PM peak periods of traffic.

#### Table 3: Peak Hour Trip Generation

SINGLE-FAMIL INDEPENDENT	Y DETACHED HC	Dising Units = 116
		PROJECTED TRIP ENDS
AM PEAK	ENTER	23
	EXIT	68
	TOTAL	91
PM PEAK	ENTER	77
	EXIT	45
	TOTAL	123

#### Traffic Impact Report for the Kula Ridge Development

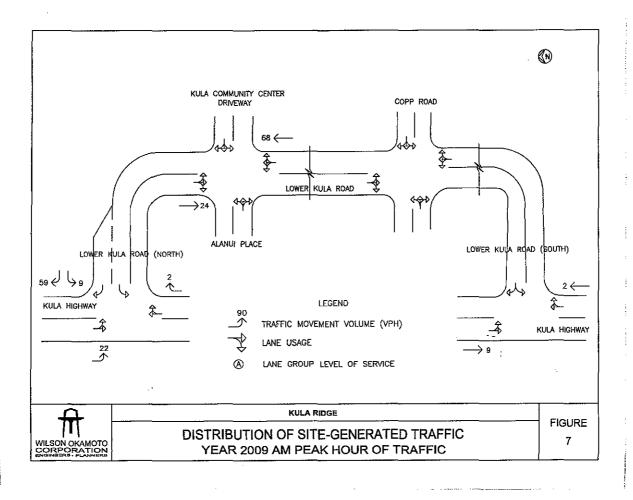
#### Table 3: Peak Hour Trip Generation (Cont'd)

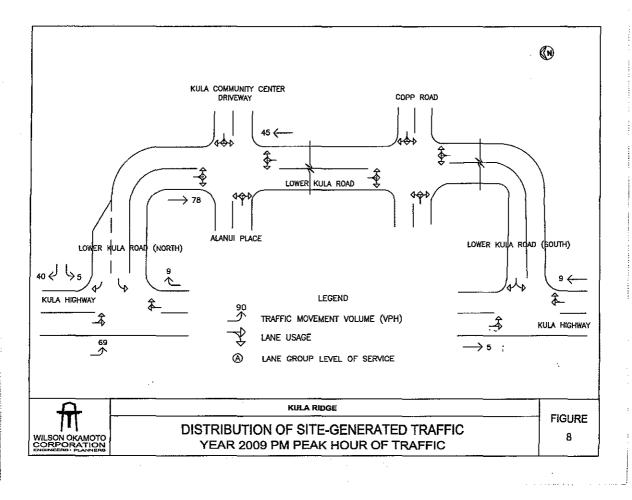
COUNTY PARK		Acres of Development = 3				
		PROJECTED TRIP ENDS				
AM PEAK	ENTER	-1-				
	EXIT	<u>'</u> 0				
	TOTAL	1				
PM PEAK	ENTER	1				
	EXIT	0				
	TOTAL	1				
TOTALS						
		PROJECTED TRIP ENDS				
AM PEAK	ENTER	23				
	EXIT	68				
	TOTAL	91				
PM PEAK	ENTER	77				
	EXIT	45				
	TOTAL	123				

\*Utilizing the ITE Trip Generation rates, 0.03 and 0.18 trips are expected during the AM and PM peak periods, respectively. Although the park will most likely function as a neighborhood park that serves the residences that surround it, the total number of trips during the peak periods was conservatively rounded up to 1 trip during each peak period.

#### 2. Trip Distribution

Figures 7 and 8 show the distribution of site-generated traffic during the AM and PM peak periods. Access to the proposed Kula Ridge development will be provided via a new access road off Lower Kula Road. All site-generated trips were conservatively assumed be traveling to/from Kula Highway via the northern intersection with Lower Kula Road and have origins and destinations outside the immediate area (i.e., no linked or pass-by trips). The directional distribution of traffic at the intersection of Kula Highway with Lower Kula Road (North) was assumed to remain similar to existing conditions.



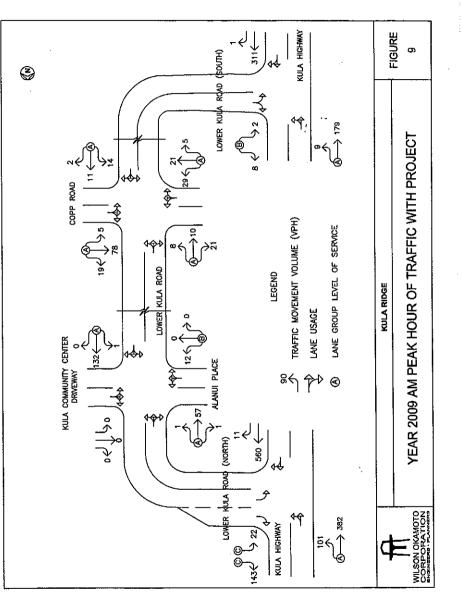


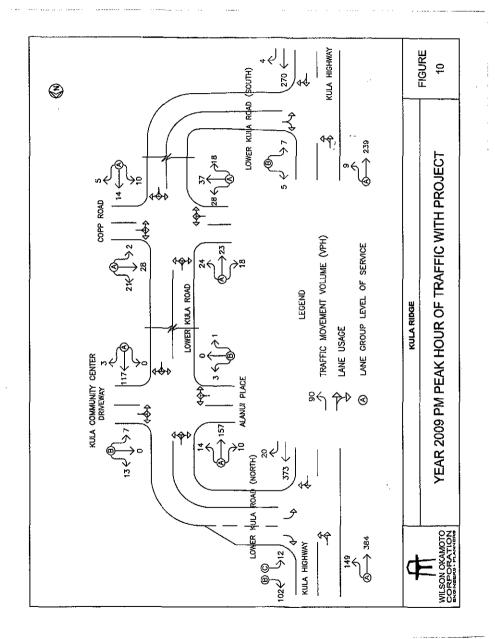
#### B. Total Traffic Volumes With Project

The Year 2009 cumulative AM and PM peak hour traffic conditions with the development of the Kula Ridge development are shown in Figures 9 and 10, and summarized in Table 4. The cumulative volumes consist of site-generated traffic superimposed over Year 2009 projected traffic demands. The westbound approach of the northern intersection of Lower Kula Road with Kula Highway is assumed to have been modified to provide dedicated turning lanes. The existing and projected Year 2009 (Without Project) operating conditions are provided for comparison purposes. LOS calculations are included in Appendix E.

## Table 4: Existing and Projected Year 2009 (With and Without Project) Traffic Operating Conditions

				AM			PM	
				Year	2009		Year	2009
Intersection	Critical App Movem		Exist	w/out Proj	w/ Proj	Exist	w/out Proj	w/ Proj
Lower Kula Road/	Eastbou	nd	A	A	В	A	A	В
Alanui Place/	Westbor	ınd	~	-	~	Α	Α	В
Kula Community Center Driveway	Northbo	und	A	A	A	Α	A	Α
	Southbo	und	Α	A	A	A	A	A
Lower Kula Road/	Westbound	LT	С	С	С	В	В	С
Kula Highway		RT	1		C			В
(North)	Southbo	und	A	A	A	A	A	A
Lower Kula Road/	Eastbou	nd	A	A	A	A	A	A
Copp Road	Westbou	ınd	A	A	A	A	A	A
	Northbo	und	A	A	Â	A	A	A
	Southbo	und	A	A	A	A	A	A
Lower Kula Road/	Westbo	ınd	В	В	В	В	В	В
Kula Highway (South)	Southbo	und	A	A	A	A	A	A





Traffic operations in the vicinity of the proposed Kula Ridge development are expected, in general, to remain similar to existing and Year 2009 without project conditions despite the anticipated increases in traffic along the surrounding roadways due to the project. The critical movements at the intersection of Lower Kula Road with Alanui Place/Kula Community Center Driveway, Copp Road, and Kula Highway (South) are expected to operate at levels of service similar to Year 2009 without project conditions during both peak hours of traffic with the exception of the eastbound and westbound approaches of the intersection with Alanui Place/Kula Community Center driveway which is expected to deteriorate from LOS "A" to LOS "B" during both peak periods. At the northern intersection of Lower Kula Road with Kula Highway, the westbound left-turn traffic movement is anticipated to operate at LOS "C" and LOS "B" during the AM and PM peak periods, respectively.

VI. RECOMMENDATIONS

Based on the analysis of the traffic data, the following are the recommendations of

this study to be incorporated in the project design.

- Maintain sufficient sight distance for motorists to safely enter and exit all project roadways.
- Provide adequate on-site loading and off-loading service areas and prohibit off-site loading operations.
- Provide adequate turn-around area for service, delivery, and refuse collection vehicles to maneuver on the project site to avoid vehicle-reversing maneuvers onto public roadways.
- Provide sufficient turning radii at all project roadways to avoid or minimize vehicle encroachments to oncoming traffic lanes.
- Provide exclusive left-turn and right-turn lanes on the westbound approach of Lower Kula Road at the northern intersection with Kula Highway to minimize the impact of left-turning vehicles on the higher volume of right-turning vehicles on that approach.
- Consider providing an exclusive southbound left-turn lane along Kula Highway at the northern intersection with Lower Kula Road to minimize the impact of turning vehicles on through traffic along the highway.

#### VII. CONCLUSION

The proposed Kula Ridge development is expected to include 42 residential lots, 70 affordable housing residential lots, 4 agricultural lots, and an approximately 3-acre park that will be dedicated to the County of Maui. With the implementation of the aforementioned recommendations, the proposed Kula Ridge development is not expected to have a significant impact on traffic operations in the vicinity of the project site. The critical movements at the study intersection along Lower Kula Road are expected continue operating at acceptable levels of service despite the addition of site-generated vehicles to the surrounding roadway network due to the provision of exclusive turning lanes at the northerm intersection of Lower Kula Road with Kula Highway.

APPENDIX A

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i.

#### EXISTING TRAFFIC COUNT DATA

#### Wilson Okamoto Corporation 1907 S. Beretania Street, Suite 400 Honolulu, HI 96826

Counter: D1-0769 Counted By: GMT Weather: CLEAR File Name : KulLkul-nA Site Code : 00000001 Start Date : 6/1/2005 Page No : 1

			ahway	Kula Hi		Lower Kula Hwy (North)			10		ohway	Kula H			
				Northb		″	Westbound				Southbound				
Int	App. Total	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	Start Time	
			1.0	1.0	1.0		ĭ.o	1.0	1.0		1.0 1	1.0	1.0	Factor	
	0	59	0	59	0	10	10	0	0	19	0	17	2	06:00 AM	
	0	68	0	68	0	7	7	٥	D	31	0	29	2	06:15 AM	
	0	64	1	63	0	9	8	0	1	53	0	50	3	06:30 AM	
	0	99	0	99	Ō	13	10	0	3	56	Û	45	11	06:45 AM	
	0	290	1	289	0	39	35	0	4	159	0	141	18	Total	
	0	105	2	103	0	20	17	0	3	74	Q	63	11	07:00 AM	
	0	139	0	139	Ó	23	22	0	1	107	0	94	13	07:15 AM	
	0	142	2	140	0	25	22	0	3	137	0	122	15	07:30 AM	
	0	127	5	122	0	29	23	0	6	104	0	65	39	07:45 AM	
	0/	513	9	504	0	97	84	0	13	422	0	344	78	Total	
	0	803	10	793	0	136	119	0	17	581	0	485	96	Grand Total	
			1.2	98.8	0.0		87.5	0.0	12.5		0.0	83.5	16.5	Apprch %	
	0.0	52.8	0,7	52.2	0.0	8.9	7.8	0.0	1.1	38.2	0.0	31,9	6.3	Total %	

		Kula Hi Southt			Lower Kula Hwy (North) Westbound				Kola Highway Northbound					
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Peak Faclor												1		0.649
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Volume	15	122	0	137	6	0	23	29	0	140	2	- 142		
Peak Factor				0.770				0.836				0.903		

#### Wilson Okamoto Corporation 1907 S. Beretania Street, Suite 400 Honolulu, HI 96826

Counter: D1-0769 Counted By: GMT Weather: CLEAR File Name : KulLkul-nP Site Code : 00000001 Start Date : 5/31/2005

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1	0	81	4	77	0	16	13	0	3	72	0	59	13	03:15 PM
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2	0	100	3	97	0	21	20	0	1	106	0	86	20	04:00 PM
2	0	85	6	79	0	13	12	0	1	103	0	86	17	04:15 PM
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2	0	87	4	83	0	13	12	0	1	113	0	90	23	04:45 PM
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1	0)	57 [	1	56	0	23	22	0	1	103	0	82	21	05:00 PM
2	0	78	2	76	0	17	16	0	1	106	0	72	34	05:15 PM
1	0	75	1	74	0	22	21	0	1	99	0	68	31	05:30 PM
_ 1	0	64	1	63	0	6	6	0	0	106	0	77	29	05:45 PM
7	0	274	5	269	0	68	65	0	3	414	0	299	115	Total
23	0	920	24	896	σ	210	194	o	16	1187	0	923	264	Grand Total
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# WILSON OKAMOTO CORPORATION 1907 S. Beretania Street, Suite 400 Honolulu, Hawaii 96826

Counter:D4-3891 Counted:TO Weather:Clear

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#### WILSON OKAMOTO CORPORATION 1907 S. Beretania Street, Suite 400 Honolulu, Hawaii 96826

Counter:T-1839 Counted:KT Weather:Clear

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		4	4	4	10	3	24	5	32	6	5	0	11	9	3	0	12	65
07:30		3	3	6	12	0	25	4	29	3	1	1	5	9	7	1	17	63
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Ti	otal	8	9	21	38 )	5	78	19	102	14	- 11	2	27	29	21	5	55	222
Grand To	lai	17	15	29	61	6	125	29	160	24	16	A	44	40	24	. 8	72	337
Approl	%	27.9	24.6	47,5		3.8	78.1	18.1	100	54.5	36.4	9.1		55.6	33.3	11.1	12	331
Tola		5	4.5	8.6	18.1	1.8	37.1	8.6	47.5	7.1	4.7	1.2	13.1	11.9	7.1	2.4	21.4	

	-,,	Lower Ku South	bound				Road bound			Lower Ki North					Road		
Start Time	Left	Thru	Right Ar		Left	Thru	Right	App. Total	Left	Thru	Right A	pp. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis F				k 1 of 1										· · ·		<u></u>	
Peak Hour for Entire	Intersection	i Begins a	t 07:00 AM														
07:00 AM	2	1	4	7	1	18	6	25	3	2	Ø	5	3	2	1	6	43
07:15 AM	2	4	4	10	3	24	5	32	6	5	Ď	11	ă	3	ò	12	65
07:30 AM	3	3	6	12	Ó	25	4	29	3	í	1	5	ğ	7	Ť	17	63
07:45 AM	1	_ 1	7	8	1	11	4	16	2	3	1	6	8	9	3	20	51
Total Volume	8	9	21	38	5	78	19	102	14	11	2	27	29	21	5	55	222
% App. Total	21.1	23.7	59.3		4.9	76.5	18.6		51.9	40.7	7.4		52.7	38.2	9.1	~	1
PHF	.667	.563	.750	,792	.417	.780	.792	.797	.583	.550	.500	.614	.806	.583	.417	.688	.854

Counter:T-1839 Counted:KT Weather:Clear Wilson Okamoto Corporation 1907 S. Beretania Street, Suite 400 Honolulu, HI 96826

File Name : LowCopP Site Code : 00000001 Start Date : 4/25/2006 Page No : 1

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		Lower Ku South	bound			West				Lower Ku Northi	ound			Copp Eastb	ound		
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right A	pp. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. To
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03:15 PM	7	3	5	15	1	8	6	15 [	4	5	0	9/	3	10	3	16 ]	
03;30 PM	4	3	5	12	1	10	7	18	0	3	0	3	4	7	3	14	
03:45 PM	5	7	5	17	0	7	6	13	3	3	Ó	6	9	8	4	21	
Total	21	13	20	54	3	36	24	63	10	18	3	31	19	31	11	61	2
04:00 PM	9	7	5	21	1	6	4	11	2	4	2	8	2	8	5	15 (	
04:15 PM	5	3	6	14	0	7	5	12	1	4	2	7	11	13	3	27	
04:30 PM	4	5	2	11	1	8	6	15	4	э	1	8	6	8	6	20	
04;45 PM	8	1	6	15	0	8	2	10	2	1	0	3	6	9	2	17	
Total	26	16	19	61 (	2	29	17	48	9	12	5	26	25	38	16	79]	
05:00 PM	з	3	5	11]	0	7	3	10	0	6	0	6	7	17	5	29	
05:15 PM	1	4	0	5	2	4	6	12	1	1	2	4	4	11	3	18	
05;30 PM	6	10	1	17	· 2	3	3	81	0	3	0	3	6	13	5	24	
05:45 PM	1	. 11	2	14	3	6	3	12 (	3	5	1	9	8	22	1	31 /	
Total	11	28	8	47	7	20	15	42	4	15	3	22	25	63	14	102	2
Grand Total	58	57	47	162	12	85	56	153	23	45	11	79	69	132	41	242	
Approh %	35.8	35.2	29		7.8	55.6	36.6	1	29.1	57	13,9	L	28.5	54.5	16.9	1	
Total %	9.1	9	7.4	25.5	1.9	13.4	8.8	24.1	3.6	7.1	1.7	12,4	10.8	20.8	6,4	38.1	

		Lower Ku Southt	ound			Copp West	ound			Lower Ku Northi	ound			Copp Eastb			
Start Time	Left	Thru	Right A	p. Total	Left	Thru	Right A	pp. Total	Left	Thru	Right /	vpp, Total	Left	Thru	Right A	pp. Total	Int. Total
eak Hour Analysis F	rom 03:00	PM to 05:4	45 PM - Pee	k1of1													-
eak Hour for Entire I	intersection	Begins at	t 03:45 PM														
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04:00 PM	9	7	5	21	1	6	4	11	2	4	2	8	2	8	5	15	55
04:15 PM	5	3	6	14	٥	7	5	12	1	4	2	7	- 11	13	3	27	60
04:30 PM	4	5	2	11	1	8	6	15	_ 4	3	1	8	6	8	6	20	. 54
Total Volume	23	22	18	63	2	28	21	51	10	14	5	29	28	37	18	83	226
% App. Total	36.5	34.9	28.6		3.9	54.9	41.2	1	34.5	48.3	17.2		33.7	44,6	21.7	1	
PHF {	.639	.786	.750	.750	.500	.875	.875	.850	.625	.875	.625	.906	.636	.712	.750	.769	.942

Wilson Okamoto Corporation 1907 S. Beretania Street, Suite 400 Honolulu, HI 96826

Counter: D1-0528 Counted By: TO

File Name : Kull\_kul-sA Site Code : 00000004

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Start Time	Left	Kula Hi Southt Theu	ghway bound Right	App. Total	Lov	ver Kula Hig Westb Thru	nway (Sou ound 	th) App. Tetal	Left	Kula Hig Northb Thru	ound Right	App. Totai	App. Total	Int. Tota
Factor 06:00 AM	1.0	1.0	1.0	15	1.0	1.0	1.0	0	1.0	1.0	1.0	35	0	50
06:15 AM 06:30 AM	1	23 38	0	24 38	02	0 0	0	0	0	36 47	0 1	36 48 i	0	60 69
06:45 AM Total	0	<u>36</u>	0	36 113	<u>1</u> 3	0		2	<u>0</u>	57 175	2	59 178	0	97
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07:45 AM Total	3	58 153		61 162	2	<u>0</u>	- 1	1	0	53	. <u>0</u> . 1	53	0	115
Grand Total	9 10	265	D D	275	2 5	0	7 9	9) (e	0	278 453	4	279   457	0; 0	746
Approh %	3.6 1.3	96,4 35,5	0,0	36.9	35.7	0.0	64.3	14	0.0	99.1	0.9	1	0.0	740
Total %	1,3	22,2	0.0	36.9	0.7	0.0	1.2	1.9	0.0	60.7	0.5	61.3	0.01	
		Kula Hig Southb	hway		Low	ver Kula Hig Westb	hway (Sou	th)		Kula Hig Northb	hway			
Start Time Hour From 06:00	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	App. Total	Int. Tota
Intersection				100			-							
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07:30 Volume Peak Factor	3	52	0	55	1	0	2	3	0	84	0	84	0	142 0.792
Volume	07:45 AM 3	58	0	61	07:15 AM 1	0	2	3	07:30 AM 0	84	٥	84	5:45:00 AM	
Peak Factor				0.664				0.750				0.830	I	
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Split%	59.9		•	40.L		•				·. ·.	
Day Totals		103			69			172			
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YCAK PLOBE											
Peak Hour Volume	66		•	31		•	96		•		

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#### Data File : Lower Kula Road

Printed : 4/28/2006 Page : 1

Data File : Lower Kula Road

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itlel	: Kula Hi	Rhway								Site:		91
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Factor	•	0.91			0.94			0.96				

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~	55.5					-					
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		33.8						1,304			
Day Splits		33.8-			66.2						
Deels Trave	07.00			01.17		•	a <b>n</b>				
Peak Hour	07:00		-	06:45		•	07:00		*		
Volume	234		*	436		•	670		•		
Factor	0.73		•	0.88			0.82				

Data File ; Kula Hwy

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### APPENDIX B

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#### LEVEL OF SERVICE DEFINITIONS

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#### LEVEL OF SERVICE DEFINITIONS

#### LEVEL-OF-SERVICE CRITERIA FOR UNSIGNALIZED INTERSECTIONS

Level of Service (LOS) criteria are given in Table 1. As used here, control delay is defined as the total elapsed time from the time a vehicle stops at the end of the queue to the time required for the vehicle to travel from the last-in-queue position to the first-inqueue position, including deceleration of vehicles from free-flow speed to the speed of vehicles in the queue.

The average total delay for any particular minor movement is a function of the service rate or capacity of the approach and the degree of saturation. If the degree of saturation is greater than about 0.9, average control delay is significantly affected by the length of the analysis period.

#### Table 1: Level-of-Service Criteria for Unsignalized Intersections

Level of Service	Average Control Delay (Sec/Vch)
A	≤10.0
В	>10.0 and $\leq 15.0$
С	>15.0 and ≤25.0
D	>25.0 and ≤35.0
В	>35.0 and ≤50.0
F	>50.0

## APPENDIX C

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#### CAPACITY ANALYSIS CALCULATIONS EXISTING PEAK PERIOD TRAFFIC ANALYSIS

#### HCS+: Unsignalized Intersections Release 5.1

يرابين بدواجه بتوجه الراجع والمعادية

TWO-WAY	STOP	CONTROL	SUMMARY

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Analyst:	IW			
Agency/Co.:	Wilson Okamoto Corpora	tion		
Date Performed:	6/9/2006			
Analysis Time Period:	AM Peak Period			
Intersection:	Alanui Dr/Lower Kula R	à		
Jurisdiction:	City			
Units: U. S. Customar	У		1	
Analysis Year:	Existing			
Project ID: 7551-01	Kula Ridge			
East/West Street:	Alanui Dr			
North/South Street:	Lower Kula Rd			
Intersection Orientat	ion: NS	Study period	(hrs):	1.00

Major Street: Approach	Noz	thbour	nd		Sou	thbound	3	
Movement	1	2	3	1	4	5	6	
	L	T	R	İ	L	т	R	
Volume	1	64	C	···+-,	1	32	1	
Peak-Hour Factor, PHF	0.74	0.74	0.74		0.50	0.50	0.50	
Hourly Flow Rate, HFR	1	86	0		2	64	2	
Percent Heavy Vehicles	2				2			
Median Type/Storage RT Channelized?	Undiv	ided			/			
Lanes	C	1	C		0	1	0	
Configuration	L	rr –			L7	R		
Upstream Signal?		No				No		
Minor Street: Approach	We:	Westbound			Easthound			
Movement	7	8	9	1	10	11	12	
	L	Т	R	1	L	т	R	
Volume	0	0	0		12	0	0	
Peak Hour Factor, PHF	1.00	1.00	1.00		0.60	0.60	0.60	
Hourly Flow Rate, HFR	0	0	0		19	0	0	
Percent Heavy Vehicles	2	2	2		2	2	2	
Percent Grade (%)		D				0		
Flared Approach: Exists?	/Storage		No	1			No	1
Lanes	ō	1	0		0	1	0	
Configuration		LTR				LTR		

Approach	NB	SB	Westbound	Eastbound			
Movement Lane Config	1 LTR	4 LTR	7 8 LTR	9	10	11 '12 LTR	
v (vph)	1	2	0			19	
C(m) (vph)	1536	1510				808	
v/c	0.00	0.00				0.02	
95% queue length	0.00	0.00				0.07	
Control Delay	7.3	7.4				9.6	
LOS	А	А				A	
Approach Delay						9.6	
Approach LOS						A	

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#### \_\_\_\_\_TWO-WAY STOP CONTROL SUMMARY\_\_\_\_

energy and the second second second second second second second second second second second second second second

Analyst:								
Agency/Co.:	Wils	on Okamo	oto Corr	poratio	n			
Date Performed	l: 6/9/	2006						
Analysis Time	Period: PM B	eak Peri	iod					
Intersection:		ui Dr/Lo		la Rd				-
Jurisdiction:	City	,					1	
Units: U. S. C	ustomary							
Analysis Year: Existing								
Project ID: 7								
ast/West Street: Alanui Dr								
North/South St								
Intersection C				St	udy	perio	d (hrs)	: 1.00
	Vehi	cle Vol	umes and	d Adjus	tmen	ts		
Major Street:	Approach	No	rthbound	đ		So	uthboun	d
	Movement	1	2	3	I	4	5	6
		L	т	R	Í	г	т	R
Volume		0	72	3		14	77	10
Peak-Hour Fact	or, PHF	0.69	0.69	0.69		0.84	0.84	0.84
Hourly Flow Ra		0	103	4		16	91	11

nourry rion water min	-		-			_	
Percent Heavy Vehicles	2			2			
Median Type/Storage	Undivi	.ded		1			
RT Channelized?							
Lanes	0	1	0	0	1	0	
Configuration	LT	R		I	TR		
Upstream Signal?		No			No		
Minor Street: Approac	h Wes	thoun	d	Ea	astboun	đ	
Movemen	t 7	8	9	10	11	12	
	г	т	R	L	т	R	
Volume	7	0	13	3	0	1	· · · ·
Peak Hour Factor, PHF	0.71	0.71	0.71	0.33	0.33	0.33	
Hourly Flow Rate, HFR	9	0	18	9	0	3	
Percent Heavy Vehicles	2	2	2	2	2	2	
Percent Grade (%)		0			0		
Flared Approach: Exis	ts?/Storage		No	/		No	/
Lanes	ō	1	0	0	1	0	
Configuration		LTR			LTR		
-							

Approach	NB	SB	Westbound	Eastbound
Movement	1	4	7 8 9	10 11 12
Lane Config	LTR	LTR į	LTR	LTR
v (vph)	٥	16	27	12
C(m) (vph)	1490	1484	854	744
v/c	0.00	0.01	0.03	0.02
95% queue length	0.00	0.03	0.10	0.05
Control Delay	7.4	7.5	9.4	9.9
LOS	А	A	А	λ
Approach Delay			9.4	9.9
Approach LOS			А	A

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	_TWO-WAY STOP CONTROL :	SUMMARY	·
Analyst:	IW		
Agency/Co.:	Wilson Okamoto Corporat	tion	
Date Performed:	6/9/2006		
Analysis Time Period:	AM Peak Period		
Intersection:	Kula Hwy/Lower Kula Rd	(North)	•
Jurisdiction:	State		÷
Units: U. S. Customary	Y		•
Analysis Year:	Existing		
Project ID: 7551-01	Kula Ridge		
	Lower Kula Rd (North)		
North/South Street:			
Intersection Orientat:	ion: NS	Study period	(hrs):

	Vehicle Vo			stme					
Major Street: Approacl		orthbou					hbour		
Movement		2	3	1	4		5	6	
	L	т	R	I	Ľ		т	R	
Volume	· · · · · · · · · · · · · · · · · · ·	504	9		78		344		
Peak-Hour Factor, PHF		0.90	0.90		0.7	7	0.77		
Hourly Flow Rate, HFR		560	10		101		446		
Percent Heavy Vehicles					2				
Median Type/Storage RT Channelized?	Undi	vided			/				
Lanes		1	0			0	1		
Configuration			TR			LT			
Upstream Signal?		No					No		
Minor Street: Approaci	h W	estbour	1d			East	bound		
Movemen		8	9	1	10		11	12	
	L	Ť	R	i	L		т	R	
Volume	13		84						
Peak Hour Factor, PHF	0.84		0.84						
Hourly Flow Rate, HFR	15		100						
Percent Heavy Vehicles	2	_	2				_		
Percent Grade (%)		0					0		
Flared Approach: Exis	_		No						/
Lanes	C		0						
Configuration		LR							
Dolo	y, Queue I			-1 -					
Approach NB			estbound		1 30			tbound	•
Movement 1	4	7	8	9	1	10	)	11	12
Lane Config	LT		LR		i				
-			115		., ,				
v (vph)	101								
	101 1002		420						
v (vph)									
v (vph) C(m) (vph) v/c	1002		420						
v (vph) C(m) (vph) v/c 95% queue length	1002 0.10		420 0.27						
v (vph) C(m) (vph) v/c 95% queue length Control Delay	1002 0.10 0.34		420 0.27 1.10						
v (vph) C(m) (vph) v/c 95% queue length	1002 0.10 0.34 9.0		420 0.27 1.10 16.8						

#### TWO-WAY STOP CONTROL SUMMARY\_\_\_\_

second and a second second second second second second second second second second second second second second

Analyst: Agency/Co.:	IW Wilson Okamoto Com	rporat	ion		
Date Performed: Analysis Time Period:	PM Besk Doried				
Intersection:	Kula Hwy/Lower Kuj	la Rd	(North)		
Jurisdiction:	State			•	
Units: U. S. Customar					
Analysis Year:	Existing				
Project ID: 7551-01	Kula Ridge				
East/West Street:		rth)			
North/South Street:	Kula Hwy				
Intersection Orientat	ion: NS		Study period	(hrs):	1.00

	ere vorr	nues ano	l Adjust	ments			
Major Street: Approach	Nor	thbound	l	So	thbound	đ	
Movement	1	2	3	4	5	6	
	L	т	R.	L	т	R	
Volume		335	10	79	346		
Peak-Hour Factor, PHF		0.86	0.86	0.90	0.90		
Hourly Flow Rate, HFR		389	11	87	384		
Percent Heavy Vehicles				2			
Median Type/Storage RT Channelized?	Unđivi	ded		1			
Lanes		1 0	)	0	1		
Configuration		TF	ł	Ŀ	г		
Upstream Signal?		No			No		
Minor Street: Approach	Westbound			Eastbound			
Movement	7	8	9	10	11	12	
	L	т	R	L	т	R	
Volume	7		62				
Peak Hour Factor, PHF	0.82		0.82				
Hourly Flow Rate, HFR	8		75				
Percent Heavy Vehicles	2		2				
Percent Grade (%)		0			0		
Flared Approach: Exists?/	Storage		No	1			1
Lanes	Ó	(	2				
Configuration		LR					

Approach	NB	SB		We:	stbound				Eastbound	
Movement	1	4	1	7	8	9		10	11	12
Lane Config		$\mathbf{LT}$	Í		LR		- I			
v (vph)		87			B3		· · ·			
C(m) (vph)		115	9		574					
v/c		0.0	8		0.14					
95% queue length		0.2	4		0.51					
Control Delay		8.4			12.3					
LOS		A			в					
Approach Delay					12.3					
Approach LOS					в					

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Honolulu, HI 9682	6		

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Fax: (808) 946-2253

AL	L-WAY STOP CONTROL (AWSC) ANALYSIS
Analyst:	IW
Agency/Co.:	Wilson Okamoto Corporation
Date Performed:	6/9/2006
Analysis Time Period:	AM Peak Period
Intersection:	Copp Rd/Lower Kula Rd
Jurisdiction:	City
Units: U. S. Customar	y _
Analysis Year:	Existing
Project ID: 7551-01	Kula Ridge
East/West Street:	Copp Rd
North/South Street:	Lower Kula Rd
Worksheet 2	- Volume Adjustments and Site Characteristics

E	astbo	und	W	Westbound			orthb	ound	i s	Southbound		
L	т	R	Г	т	R	L	т	R	ĹĿ	т	R	į
29 t La	21	5	5	7B	19	14	11	2	8	9	21	-

	Easth	ound	Westh	ound	North	ound	Southb	ound
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	LTR		LTR		LTR		LTR	
PHF	0.69		0,80		0.61		0.79	
Flow Rate	79		126		42		47	
% Heavy Veh	2		2		2		2	
No. Lanes	1		1		1		1	
Opposing-Lanes	1		1		1		1	
Conflicting-lanes	1		1	-	1		1	
Geometry group	1		1	-	1		1	
Duration, T 1.00	hrs.							

#### \_\_\_\_\_Worksheat 3 - Saturation Headway Adjustment Worksheet\_\_\_\_\_

	Eastbound	Westbound	Northbound	Southbound
	L1 L2	L1 L2	L1 L2	L1 . L2
Flow Rates:				
Total in Lane	79	126	42	47
Left-Turn	42	6	22	10
Right-Turn	7	23	3	26
Prop. Left-Turns	0.5	0.0	0.5	0.2
Prop. Right-Turns	0.1	0.2	0.1	0.6
Prop. Heavy Vehicl	Le0.0	0.0	0.0	0.0
Geometry Group	1	1	1	1
Adjustments Exhibit	Lt 17-33:			-
hLT-adj	0.2	0.2	0.2	0.2
hRT-adj	-0.6	-0.6	-0.6	-0.6
hHV-adj	1.7	1.7	1.7	1.7
hadj, computed	0.1	-0.1	0.1	-0.3

	Easth	oound	Westh	ound	North	oound	South	Dound
	г1	L2	L1	L2	L1	L2	L1.	L2
Flow rate	79		126		42		47	
hd, initial value	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
x, initial	0.07		0.11		0.04		0.04	
hd, final value	4.32		4.12		4.50		4.15	
x, final value	0.09		0.14		0.05		0.05	
Move-up time, m	5	2.0		2.0		2.0		2.0
Service Time	2.3		2.1		2.5	1	2.1	
		bnuoc		bound	North		South	
	East) Ll	oound L2	West) L1	bound L2	North L1	bound L2	South L1	bound L2
Ploy Pate	Ll		Ll		L1		L1	
	L1 79		L1 126		L1 42		L1. 47	
Service Time	L1 79 2.3		L1 126 2.1		L1 42 2,5		L1 47 2.1	
Service Time Utilization, x	L1 79 2.3 0.09		L1 126 2.1 0.14		11 42 2.5 0.05		L1 47 2.1 0.05	
Service Time Utilization, x Dep. headway, hd	L1 79 2.3 0.09 4.32		L1 126 2.1 0.14 4.12		1.1 42 2.5 0.05 4.50		L1. 47 2.1 0.05 4.15	
Service Time Utilization, x Dep. headway, hd Capacity	L1 79 2.3 0.09 4.32 329		L1 126 2.1 0.14 4.12 376		1.1 42 2.5 0.05 4.50 292		L1 47 2.1 0.05 4.15 297	
Service Time Utilization, x Dep. headway, hd Capacity Delay	L1 79 2.3 0.09 4.32 329 7.77		L1 126 2.1 0.14 4.12 376 7.81		11 42 2.5 0.05 4.50 292 7.75		L1. 47 2.1 0.05 4.15 297 7.38	
Service Time Utilization, x Dep. headway, hd Capacity Delay LOS	L1 79 2.3 0.09 4.32 329		L1 126 2.1 0.14 4.12 376		1.1 42 2.5 0.05 4.50 292		L1 47 2.1 0.05 4.15 297	
Service Time Utilization, x Dep. headway, hd Capacity Delay LOS	L1 79 2.3 0.09 4.32 329 7.77 A		L1 126 2.1 0.14 4.12 376 7.81 A		L1 42 2.5 0.05 4.50 292 7.75 A		L1 47 2.1 0.05 4.15 297 7.38 A	
Capacity Delay LOS Approach:	L1 79 2.3 0.09 4.32 329 7.77 A	L2	L1 126 2.1 0.14 4.12 376 7.81 A	1.2	L1 42 2.5 0.05 4.50 292 7.75 A	L2	L1. 47 2.1 0.05 4.15 297 7.38 A	L2

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HCS+: Unsignalized Intersections Release 5.1

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AL	L-WAY STOP CONTROL (AWSC) ANALYSIS
Analyst:	IW
Agency/Co.;	Wilson Okamote Corporation
Date Performed:	6/9/2006
Analysis Time Period:	PM Peak Period
Intersection:	Copp Rd/Lower Kula Rd
Jurisdiction:	City
Units: U. S. Customar	y -
Analysis Year:	Existing
Project ID: 7551-01	Kula Ridge
East/West Street:	Copp Rd
North/South Street:	Lower Kula Rd
Worksheet 2	- Volume Adjustments and Site Characteristics

	Ea	stbou	ınd	We	estbou	ınd	No	orthbo	ound	S	outhbo	ound	1
	L	т	R	ļΓ	т	R	г	т	R	L	Ť	R	
Volume	28	37	18	-  <u>-</u>	28	21	10	14	5	23	22	18	-
% Thrus Lef	Lar	le		•									

	Eastb	ound	West	oound	North	oound	South	bound
	ь1	$L_2$	ь1	ь2	L1	Ъ2	ЬÌ	L2
Configuration	LTR		LTR		LTR		LTR	
PHF	0.94		0.85		0.91		0.75	
Flow Rate	87		58		31		83	
% Heavy Veh	2		2		2		2	
No. Lanes	1		:	1	:	L		1
Opposing-Lanes	1		:	1	:	L		1
Conflicting-lanes	1		:	1	:	1		1 '
Geometry group	1		:	1	:	۱ ۱		1
Duration, T 1.00	hrs.							

\_\_\_\_\_Worksheet 3 - Saturation Headway Adjustment Worksheet\_\_\_\_\_

	Eastbound	Westbound	Northbound	Southbound
	L1 L2	L1 L2	L1 L2	L1 L2
Flow Rates:				
Total in Lane	87	58	31	83
Left⊷Turn	29	2	11	30
Right-Turn	19	24	5	24
Prop. Left-Turns	0.3	0.0	0.4	0.4
Prop. Right-Turns	0.2	0.4	0.2	0.3
Prop. Heavy Vehic	le0.0	0.0	0.0	0.0
Geometry Group	1	1	1	1
Adjustments Exhib	it 17-33:			
hLT-adi	0.2	0.2	0.2	0.2
hRT-adj	-0.6	-0.5	-0.6	~0.6
hHV-adj	1.7	1.7	1.7	1.7
hadj, computed	-0.0	-0.2	0.0	-0.1

	East)	bound	West	bound	North	oound	South	bound
	L1	ь2	Ll	L2	L1	L2	L1	L2
Flow rate	87		58		31		83	
hd, initial value	3.20	3.20	3,20	3.20	3.20	3.20	3.20	3.20
x, initial	0.08		0.05		0.03		0.07	
hd, final value	4.18		4.04		4.31		4.18	
x, final value	0.10		0.07		0.04		0.10	
Move-up time, m	:	2.0	2	0.5	:	2.0	2	2.0
Service Time	2.2		2,0		2.3		2.2	
Wo1		5 - Cap bound L2	-	nd Level bound L2	Northl		South L1	bound L2
Wo	East)	bound	West	bound	North	oound		
	East)	bound	West	bound	North	oound		
Flow Rate	East) L1	bound	West) Ll	bound	North L1	oound	L1	
Flow Rate Service Time	East) L1 87	bound	West L1 58	bound	North L1 31	oound	L1 83	
Flow Rate Service Time Utilization, x Dep. headway, hd	East) L1 87 2.2 0.10 4.18	bound	West L1 58 2.0	bound	North L1 31 2.3	oound	L1 83 2.2	
Flow Rate Service Time Utilization, x Dep. headway, hd Capacity	East) L1 87 2.2 0.10 4.18 337	bound	West L1 58 2.0 0.07	bound	North L1 31 2.3 0.04	oound	L1 83 2.2 0.10	
Flow Rate Service Time Utilization, x Dep. headway, hd Capacity Delay	East) L1 87 2.2 0.10 4.18 337 7.65	bound	West L1 58 2.0 0.07 4.04	bound	North L1 31 2.3 0.04 4.31	oound	L1 83 2.2 0.10 4.18	
Flow Rate Service Time Utilization, x Dep. headway, hd Capacity Delay LOS	East) L1 87 2.2 0.10 4.18 337	bound	West L1 58 2.0 0.07 4.04 308	bound	North L1 31 2.3 0.04 4.31 281	oound	L1 83 2.2 0.10 4.18 333	
Flow Rate Service Time Utilization, x Dep. headway, hd Capacity Delay LOS Approach:	East) L1 87 2.2 0.10 4.18 337 7.65 A	bound L2	West L1 58 2.0 0.07 4.04 308 7.32 A	bound L2	North L1 31 2.3 0.04 4.31 281 7.48 A	L2	L1 83 2.2 0.10 4.18 333 7.63 A	L2
Flow Rate Service Time Utilization, x	East) L1 87 2.2 0.10 4.18 337 7.65 A	bound	West L1 58 2.0 0.07 4.04 308 7.32 A	bound	North L1 31 2.3 0.04 4.31 281 7.48 A	oound	L1 83 2.2 C.10 4.18 333 7.63 A	

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	TWO-WAY STOP CONTROL	SUMMARY	·•	<u>.</u>
Analyst:	IW			
Agency/Co.:	Wilson Okamote Corpora	ation		
Date Performed:	6/9/2006			
Analysis Time Period:	AM Peak Period			
Intersection:	Kula Hwy/Lower Kula Rd	i (South)		
Jurisdiction:	State			
Units: U. S. Customar	v			
Analysis Year:	Existing			
Project ID: 7551-01	Kula Ridge			
East/West Street:	Lower Kula Rd (South)			
North/South Street:	Kula Hwy			
Intersection Orientat	ion: NS	Study period	(hrs):	1.00

Major Street: Appro				bound	l Ađjus			uthbou	nd	
Moven		1	2		3	1	4	5	6	
		L	Ţ	,	R	Í	r	т	R	
Volume			2	78	1		9	153	·	~
Peak-Hour Factor, PH	IF		c	.83	0.83		0.66	0.66		
Hourly Flow Rate, HF	R		3	34	1		13	231		
Percent Heavy Vehicl	les		-	-			2			
Median Type/Storage RT Channelized?		Und	livid∈	đ			/			
Lanes			1	. 0	1		0	1		
Configuration				TR	2		1	LT		
Upstream Signal?			N	ю				No		
Minor Street: Appro	ach		West	ound			E	astboun	3	
Moven	nent	7	E	3	9		10	11	12	
		ŗ,	r		R	1	г	т	R	
Volume		2			7					
Peak Hour Factor, PH	зF	0.7	75		0.75					
Hourly Flow Rate, HI		2			9					
Percent Heavy Vehicl	les	2			2					
Percent Grade (%)			C	)				0		
Flared Approach: Es	kists?/	Store	ige		No	1	'			1
Lanes			0	0	)					
Configuration			I	R						
	elay, 0	leuc	T onco		d I erro	.1 -	of Ecr			
Approach	NB	SB	nendi		bound	C	Y Der		bound	
Movement	1	4	1 7		8	9	1	10	11	12
Ime Config	-	L.M.	1		τ́р	-		<b>~</b> ~		

Movement Lane Config	1 4 L	r	7 8 LF	. 9	10	11	12	
v (vph)	1	3	11		 ••••			<u> </u>
C(m) (vph)	1	224	64	7				
v/c	0	.01	Ο.	02				
95% queue length	0	. 03	ο.	05				
Control Delay	8	. 0	10	.7				
LOS		A.	E					
Approach Delay			10	.7				
Approach LOS			1					

#### \_\_\_\_\_TWO-WAY STOP CONTROL SUMMARY\_\_\_\_

a second se

Analyst: IW Wilson Okamoto Corporation Agency/Co.: Date Performed: 6/9/2006 Analysis Time Period: PM Peak Period Intersection: Kula Hwy/Lower Kula Rd (South) Jurisdiction: State Units: U. S. Customary Analysis Year: Existing Project ID: 7551-01 Kula Ridge East/West Street: Lower Kula Rd (South) North/South Street: Kula Hwy Intersection Orientation: NS Study period (hrs): 1.00

<u> </u>		cle Vol						·
Major Street:	Approach		rthboun		S	outhbour	ıd	
	Movement	1	2	3	4	5	6	
		Ŀ	т	R	L	т	R	
Volume			234	4	9	211		
Peak-Hour Fact	or, PHF		0.92	0.92	0.93	0.93		
Hourly Flow Ra	te, HFR		254	4	9	226		
Percent Heavy	Vehicles				2			
Median Type/St	orage	Unđiv	ided		/			
RT Channelized	?							
Lanes			1	0	0	1		
Configuration			т	R	3	LT .		
Upstream Signa	1?		NO			No		
Minor Street:	Approach	We	stbound		E	astbound	1	
	Movement	7	в	9	10	11	12	
		L	т	R	L	т	R	
Volume		7		4				
Peak Hour Fact	or, PHF	0.61		0.61				
Hourly Flow Ra	te, HFR	11		6				
Percent Heavy	Vehicles	2		2				
Percent Grade	(%)		0			0		
Flared Approac	h: Exists?/	Storage		No	1			1
Lanes		ō		0				
Configuration			LR					

Approach	_Delay, NB	SE		and bev		Service_	astboun	đ
Movement Lane Config	1	4   LT	7	8 LR	9	10	11	1.2
v (vph)		9		17				·····
C(m) (vph)		1307		595				
v/c		0.01		0.03				
95% queue length		0.02		0.09				
Control Delay		7.8		11.2				
LOS		А		в				
Approach Delay				11.2				
Approach LOS				E				

#### APPENDIX D

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#### CAPACITY ANALYSIS CALCULATIONS PROJECTED YEAR 2009 PEAK PERIOD TRAFFIC ANALYSIS WITHOUT PROJECT

1

#### \_\_\_\_TWO-WAY STOP CONTROL SUMMARY\_\_\_\_\_

a company and the second second

Analyst:					
Agency/Co.:	Wilson Okamoto Corpora	tion			
Date Performed:	5/9/2006				
Analysis Time Period:	AM Peak Period				
Intersection:	Alanui Dr/Lower Kula R	đ			
Jurisdiction:	City				
Units: U. S. Customar				••	
Analysis Year:					
Project ID: 7551-01				•	
East/West Street:	Alanui Dr				
North/South Street:					
Intersection Orientat	ion: NS	Study	period	(hrs):	1.00

Vehi	cle Volu	unes an	d Adjus	tments			
Major Street: Approach	Not	thboun	d	Sou	thbour	nd	
Movement	1	2	3	4	5	б	
	L	т	R	ļΓ	т	R	
Volume	1	64	0	1	33	1	
Peak-Hour Factor, PHF	0.74	0.74	0.74	0.50	0.50	0,50	
Hourly Flow Rate, HFR	1	86	0	2	66	2	
Percent Heavy Vehicles	2			2			
Median Type/Storage RT Channelized?	Undiv	ided		/			
Lanes	0	1	0	0	1	0	
Configuration	Ť	rr -	-	1/	rr		
Upstream Signal?		No		-	No		
opottoox pagnati							
Minor Street: Approach	We:	stbound	1	Ea	stbound	1	
Movement	7	8	9	10	11	12	
	L	т	R	ļ L	T	R	
Volume	0	0	0	12	0	0	
Peak Hour Factor, PHF	1.00	1.00	1.00	0.60	0.60	0.60	
Hourly Flow Rate, HFR	0	0	0	19	0	0	
Percent Heavy Vehicles	2	2	2	2	2	2	
Percent Grade (%)		0			0		
Flared Approach: Exists?/	Storage		No	1		No	1
	õ	1	0	0	1	0	
Lanes							

Approach	NB	SB	ngth, and Lev Westbound			stbound
Movement Lane Config	1 LTR	4 LTR	7 8 LTR	9	10	11 1.2 LTR .
v (vph)	1	·2	0			19
C(m) (vph)	1533	1510				B06
v/c	0.00	0.00				0.02
95% queue length	0.00	0.00				0.07
Control Delay	7.3	7.4				9.6
LOS	A	A				А
Approach Delay						9.6
Approach LOS						А

#### HCS+: Unsignalized Intersections Release 5.2

Analyst:	IW			
Agency/Co.:	Wilson Okamoto Corpora	ation		
Date Performed:	6/9/2006			
Analysis Time Period:	PM Peak Period			
Intersection:	Alanui Dr/Lower Kula H	Rđ		
Jurisdiction:	City			
Units: U. S. Customar	<b>y</b>		••	
Analysis Year:	2009 Without Project		1	
Project ID: 7551-01	Kula Ridge		,	
East/West Street:	Alanui Dr			
North/South Street:	Lower Kula Rd			
Intersection Orientat	ion: NS	Study period	(hrs):	1.00

	Vehicl	e Volu	mes and	d Adjus	tmer	nts			
Major Street: App	roach	Nor	thbound	a		Sou	thboun	d	
Mov	ement	1	2	3	1	4	5	6	
		L	т	R	Ì	г	т	R	
Volume		0	72	3		14	78	10	
Peak-Hour Factor,	PHF	0.69	0.59	0.69		0.84	0.84	0.84	
Hourly Flow Rate,	HFR	0	104	4		16	92	11	
Percent Heavy Vehi	cles	2				2			
Median Type/Storag RT Channelized?	e	Undivi	deđ			/			
Lanes		0	1	0		0	1	0	
Configuration		LT	R			LT	R		
Upstream Signal?			No				No		
Minor Street: App	roach	Wes	thound			Eas	thound	1	
Mov	ement	7	8	9	1	10	11	12	
		L	Т	R	İ	L	T	R	
Volume		7	0	13		3	0	1	
Peak Hour Factor,	PHF	0.71	0.71	0.71		0.33	0.33	0.33	
Hourly Flow Rate,	HFR	9	0	18		9	0	3	
Percent Heavy Vehi	cles	2	2	2		2	2	2	
Percent Grade (%)			D				0		
Flared Approach:	Exists?/St	orage		No	1			No	1
Lanes		õ	1	0		0	1	0	
Configuration			LTR				LTR		
-									

Approach	NB	SB	Westbound		Ea	stbound	
Movement	1	4	7 8	9	10	11 13	2
Lane Config	LTR	LTR	LTR		i	LTR	
v (vph)	0	16	27			12	
C(m) (vph)	1489	1483	852			741	
v/c	0.00	0.01	0.03			0.02	
95% queue length	0.00	0.03	0.10			0,05	
Control Delay	7.4	7.5	9.4			9.9	
LOS	A	A	Α			А	
Approach Delay			9.4			9.9	
Approach LOS			A			А	

### TWO-WAY STOP CONTROL SUMMARY\_\_\_\_\_

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Analyst:	IW			
Agency/Co.:	Wilson Okamoto Corporat	tion		
Date Performed:	6/9/2006			
Analysis Time Period:	AM Peak Period			
Intersection:	Kula Hwy/Lower Kula Rd	(North)		
Jurisdiction:	State			
Units: U. S. Customary	Ŷ		•	
Analysis Year:	2009 Without Project		,	
Project ID: 7551-01	Kula Ridge		•	
East/West Street	Lower Kula Rd (North)			
North/South Street:	Kula Hwy			
Intersection Orientat.	ion: NS	Study period	(hrs):	0.25

	Vehi	cle Voly	mes and	l Adjus	tments		
Major Street:	Approach	No:	cthbound	1	So	uthbound	â
	Movement	1	2	3	4	5	6
		г	т	R	ļΓ	т	R
Volume			560	9	79	382	
Peak-Hour Fact	or, PHF		0.90	0.90	0.77	0.77	
Hourly Flow Ra	ate, HFR		622	10	102	496	
Percent Heavy	Vehicles				2		
Median Type/St RT Channelized		Undiv	ided		/		
Lanes			1 (	)	0	1	
Configuration			TI	3	I	т	
Upstream Signa	al?		No			No	
Minor Street:	Approach	We	stbound		Ea	stbound	
	Movement	7	8	9	10	11	12
		L	т	R	ļι	т	R
Volume		13		84	·		
Peak Hour Fact	LOT, PHF	0.84		0.84			
Hourly Flow Ra	ate, HFR	15		100			
Percent Heavy	Vehicles	2		2			
Percent Grade	(%)		0			0	
Flared Approa	h: Exists?	Storage		No	1		/
Lanes		ŏ		D			
Configuration			LR				
-							

Approach	_Delay, NB	Queue SB		and Leve	el of	Service Ea	astboun	d
Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				•.
v (vph)		102		115				
C(m) (vph)		951		377				
v/c		0.13	L.	0.31				
95% queue length		0.30	5	1,27				
Control Delay		9.2		18.7				
LOS		A		с				
Approach Delay				18.7				
Approach LOS				С				

#### HCS+: Unsignalized Intersections Release 5.2

Analyst:	IW								
Agency/Co.:		son Okam	oto Cor	poratio	n				
Date Performed									
Analysis Time 1			iođ						
Intersection:	Kul	a Hwy/Lo	wer Kul	a Rd (N	orth	1)			
Jurisdiction:	Sta			••••					
Units: U. S. C	ustomary								
Analysis Year:	200	9 Withou	t Proje	ct			,		
Project ID: 7	551-01 Kula	Ridge					•		
East/West Stre	et: Low	er Kula	Rd (Nor	th)					
North/South St:	reet: Kul	a Hwy							
Intersection O	rientation:	ns		St	udy	period	(hrs)	): 1.0	0
	Veh	icle Vol	umag an	d Adius	tro	-+			
Major Street:	Approach		rthboun		cuter		thbour	۰Ä	
	Movement	1	2	3 .	1	4	5	6	
		Ê	T	R		L	Ť	R	
		-	•		1	~	-	n,	
Volume			373	11		80	384		
Peak-Hour Fact			0.86	0.86		0.90	0.90		
Hourly Flow Ra	te, HFR		433	12		88	426		
Percent Heavy '						2			
Median Type/St	orage	Undiv	ided			/			
RT Channelized	?								
Lanes				0		0	1		
Configuration			т	R		LT	2		
Upstream Signa	17		No				No		
Minor Street:	Approach	1da	stbound			Eac	tbound	4	
	Movement	7	8	9	1	10	11	12	
		Ĺ	Ť	Ř	ł	L	T	R	
					,				
Volume		7		62					
Peak Hour Fact		0.82		0.82					
Hourly Flow Ra		8		75					
Percent Heavy		2	_	2					
Percent Grade			0		-		0		
Flared Approac	h: Exists?			No	/				/
Lanes		0		0		•			
Configuration			LR						
		Queue Le			l o	f Servi			
Approach	NB	SB		thound				thound	
Movement	1	4	7	8	9	1 1	10	11	12
Lane Config		LT		LR		1			·.
v (vph)		88		83					
C(m) (vph)		1115		534					
v/c		0.08		0.16					
	th	0.26		0.55					
95% queue leng				13.0					
		8.5		12.0					
95% queue leng Control Delay LOS		· 8.5 A		13.0					
Control Delay									

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Wilson Oka	mot	o Co1	porat	ion	
1907 S. Be	eret	ania	St.,	Suite	400
Honolulu,	ΗI	96826	5		

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E-Mail:	(000)	946-2277 ALL-WAY STOP	CONTROL (AWSC)		946-2253	
Analyst:		IW				

Agency/Co.:	Wilson Okamoto Corporation
Date Performed:	6/9/2006
Analysis Time Period:	AM Peak Period
Intersection:	Copp Rd/Lower Kula Rd
Jurisdiction:	City
Units: U. S. Customar	У
Analysis Year:	2009 Without Project
Project ID: 7551-01	Kula Ridge
East/West Street:	Copp Rd
North/South Street:	Lower Kula Rd
Worksheet 2	- Volume Adjustments and Site Characteristics

		Ea	astbo	ınd	Westbound				Northbound				Southbound			
		Ľ	т	R	L	т	R		L	т	R	Ì	L	т	R	
Volume		29	21	5	5	78	19	-12	14	11	2	8		10	21	
% Thrus	Left	Lar	1e		-											

	Eastbo	Eastbound		oound	North	ound	Southbound	
	L1	L2	L1	ь2	L1	L2	г1	L2
Configuration	LTR		LTR		LTR		LTR	
PHF	0.69		0.80		0.61		0.79	
Flow Rate	79		126		43		48	
% Heavy Veh	2		2		2		2	
No. Lanes	1		1	L	1	Ł	:	1
Opposing-Lanes	1		1	L	1	L	:	1
Conflicting-lanes	1			L	1	ι	:	1
Geometry group	1		-	1	3	L	:	1
Duration, T 1.00	hrs.							

#### Worksheet 3 - Saturation Headway Adjustment Worksheet\_\_\_\_\_

	Easth	oound	Westbound		Northbound		Southboun	
	ь1	L2	L1	$r_{5}$	L1.	L.2	L1	L2
Flow Rates:								
Total in Lane	79		126		43		48	
Left-Turn	42		6		22		10	
Right-Turn	7		23		3		26	
Prop. Left-Turns	0.5		0.0		0.5		0.2	
Prop. Right-Turns	0.1		0.2		0.1		0.5	

Prop. Heavy Vehic	cle0.0	0.0	0.0	0.0
Geometry Group	1	1	1	1
Adjustments Exhil	oit 17-33:			
hLT-adj	0.2	0.2	0.2	0.2
hRT-adj	-0.6	-0.6	-0.6	-0.6
hHV-adj	1.7	1.7	1.7	1.7
hadj, computed	0.1	-0.1	0.1	-0.2

Worksheet 4 - Departure Headway and Service Time\_\_\_\_

	East	bound	West!	bound	North	bound	South	bound
	L1	L2	L1	L2	Ll	L2	Ll	L2
Flow rate	79		126		43		48	
hd, initial value	3,20	3,20	3,20	3.20	3.20	3.20	3.20	3.20
x, initial	0.07		0.11		0.04		0.04	
hd, final value	4.32		4.13		4.50		4.15	
x, final value	0.09		0.14		0.05		0.06	
Move-up time, m		2.0		2.0		2.0		2.0
Service Time	2.3		2.1		2.5		2.2	

#### 

	Easth	xound	Westbound		North	oound	South	oound
	L1	L2	L1	L2	L1	L2	L1	L
Flow Rate	79		126		43		48	
Service Time	2.3		2.1		2.5		2.2	
Utilization, x	0.09		0.14		0.05		0.06	
Dep. headway, hd	4.32		4.13		4.50		4.15	
Capacity	329		376		293		298	
Delay	7.78		7.82		7.76		7.40	
LOS	A		А		A		А	
Approach:								
Delay	5	7.78		7.82		7.76		7.40
LOS	1	ł	j.	A	i	A		A
Intersection Delay	7.73		Inte	ersecti	on LOS A			

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Wilson Okamoto Corporation 1907 S. Beretania St., Suite 400 Honolulu, HI 96826	
Phone: (808) 946-2277 E-Mail:	Fax: (808) 946-2253
ALL-WAY STOP CONTROL (AWSC)	ANALYSIS

Duration, T 1.00 hrs.

Analyst:	IW
Agency/Co.:	Wilson Okamoto Corporation
Date Performed:	6/9/2006
Analysis Time Period:	PM Peak Period
Intersection:	Copp Rd/Lower Kula Rd
Jurisdiction:	City
Units: U. S. Customar	Y
Analysis Year:	2009 Without Project
Project ID: 7551-01	Kula Ridge
East/West Street:	Copp Rd
North/South Street:	Lower Kula Rd
Worksheet 2	- Volume Adjustments and Site Characteristics

	Ee	19500	una	y w	escoou	110	140	of cito	Jutic	0	Jucino	Jana	1
	ļr	T	R	L	T	R	L	Т	R	L	T	R	ļ
Volume	28	37	18	2	28	21	10	14	5	24	23	18	
% Thrus L	eft Lar	ıe											

1

Newthhound | Fouthhound

L2

Northbound Southbound Eastbound Westbound Ll L1 L1L2L1 L2L2Configuration LTR LTR LTR LTR 0.91 0.75 PHF 0.94 0.85 Flow Rate 87 58 30 86 2 2 % Heavy Veh 2 2 No. Lanes 1 1 1 1 1 Opposing-Lanes l 1 1 Conflicting-lanes 1 1 1 1 ī Geometry group 1 1 1

I Kinghhaung

#### \_\_Worksheet 3 ~ Saturation Headway Adjustment Worksheet\_\_

	Eastl	oound	West	bound	North	bound	South	bound
	L1	L2	Ll	L2	L1	L2	L1	L2
Flow Rates:								
Total in Lane	87		58		30		86	
Left-Turn	29		2		10		32	
Right~Turn	19		24		5		24	
Prop. Left-Turns	0.3		0.0		0.3		0.4	
Prop. Right-Turns	0.2		0.4		0.2		0.3	

Prop. Heavy Vehicl	e0.0	0.0	0.0	0.0
Geometry Group	1	1	1	1
Adjustments Exhibi	t 17-33;			
hLT-adj	0.2	0.2	0.2	0.2
hRT-adj	-0.б	-0.6	-0,6	-0.6
hHV-adj	1.7	1.7	1.7	1.7
hadj, computed	-0.0	-0.2	0.0	-0.1

\_Worksheet 4 - Departure Headway and Service Time\_

	East	Eastbound		oound	North	bound	South	thbound	
	L1	L2	L1	L2	L1	L2	L1	<b>L</b> 2	
Flow rate	87		58		30		86		
hd, initial value	3,20	3.20	3.20	3.20	3.20	3.20	3.20	3.20	
x, initial	0.08		0.05		0.03		0.08		
hd, final value	4.19		4.04		4.31		4.19		
x, final value	0.10		0.07		0.04		0.10		
Move-up time, m		2.0	:	2.0		2.0	:	2.0	
Service Time	2.2		2.0		2.3		2.2		

#### \_Worksheet 5 - Capacity and Level of Service\_\_

	Eastbound		West)	ound	ound	und Southbour		
	L1	L2	г1	L2	Ll	L2	L1	L
Flow Rate	87		58		30		86	
Service Time	2,2		2.0		2.3		2.2	
Utilization, x	0.10		0.07		0.04		0.10	
Dep. headway, hd	4.19		4.04		4.31		4.19	
Capacity	337		308		280		336	
Delay	7.66		7.32		7.47		7.66	
LOS	A		А		А		A	
Approach:								
Delay	7	7.66		7.32		7.47		7.66
LOS	7	ł	ź	A	1	A .		A
Intersection Delay	7.56		Inte	ersectio	on LOS A			

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TWO-WAY	GTOD	CONTRROT	STIMMARY	

Analyst:	IW			
Agency/Co.:	Wilson Okamoto Corpora	tion		
Date Performed:	6/9/2006			
Analysis Time Period:	AM Peak Period			
Intersection:	Kula Hwy/Lower Kula Rd	(South)		
Jurisdiction:	State			
Units: U. S. Customar	y		•	
Analysis Year:	2009 Without Project			
Project ID: 7551-01	Kula Ridge		•	
East/West Street:	Lower Kula Rd (South)			
North/South Street:	Kula Hwy			
Intersection Orientat	ion: NS	Study period	(hrs):	1.00

Major Street: A	pproach	Not	thbound		Sc	uthboun	a
	ovement	1	2	3	4	5	6
		ĩ	т	R	L	Ť	R
Volume			309	1	9	170	
Peak-Hour Factor	, PHF		0.83	0.83	0.66	0.66	
Hourly Flow Rate	, HFR		372	1	13	257	
Percent Heavy Ve	hicles				2		
Median Type/Stor RT Channelized?	age	Undiv:	ided		/		
Lanes			1 0		0	1	
Configuration			TR		ī	π	
Upstream Signal?			No			No	
Minor Street: A	pproach	We	stbound		Ea	stbound	·•
М	ovement	7	8	9	10	11	12
		L	T	R	L	Т	R
Volume		2		8			
Peak Hour Factor	, PHF	0.75		0.75			
Hourly Flow Rate	, HFR	2		10			
Percent Heavy Ve	hicles	2		2			
Percent Grade (%			0			0	
Flared Approach:	Exists?,	Storage		No	1		1
Lanes		0	C				
Configuration			LR				

Approach	_Delay, NB	Queue I SB		, and Leve Westbound	el of	Ser		astbound	9
Movement	1	4	7	8	9	t	10	11	12
Lane Config		LT		LR		l			·.
v (vph)		13		12					
C(m) (vph)		1185		614					
v/c		0.01		0.02					
95% queue length		0.03		0.06					
Control Delay		8.1		11.0					
LOS		А		в					
Approach Delay				11.0					
Approach LOS				в					

### HCS+: Unsignalized Intersections Release 5.2

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	TWO	-WAY STO	P CONT	ROL SUM	MARY				
Analyst:	IW								
Agency/Co.:		on Okamo	to Cor	poratio	n				
Date Performed:	6/9/			-					
Analysis Time Perio	d: PM P	eak Peri	od						
Intersection:	Kula	Hwy/Low	ver Kul	a Rd (S	outh	3			
Jurisdiction:	Stat			-					
Units: U. S. Custom	ary								
Analysis Year:	2009	Without	: Proje	ct			, .	~	
Project ID: 7551-0:	1 Kula :	Ridge					•		
East/West Street:		r Kula F	ld (Sou	th)					
North/South Street:	Kula								
Intersection Orienta	ation: 1	NS		St	udy	period	(hrs)	: 1.00	I
	Vehi	cle Volu	mes an	d Adjus	tmen	ts			
Major Street: Appro	oach		thbour				thboun	d	
Move	nent	1	2	3	1	4	5	6	
		L	т	R	I	L	т	R	
Volume			261	4		9	234		
Peak-Hour Factor, P	HF		0.92	0.92		0.93	0.93		
Hourly Flow Rate, H	FR		283	4		9	251		
Percent Heavy Vehic						2			
Median Type/Storage RT Channelized?		Undivi	ided		/				
Lanes			1	0		0	1		
Configuration			т	R		LT			
Upstream Signal?			No				No		
Minor Street: Appr	oach	Wei	tbound			Eas	tbound		
Move	ment	7	8	9		10	11	12	
		L	Τ.	R	1	L	т	R	
Volume	· -·	7		5	·· ~				
Peak Hour Factor, P		0.61		0.61					
Hourly Flow Rate, H		11		8					
Percent Heavy Vehic	les	2		2					
Percent Grade (%)			0				0		
Flared Approach: E	xists?/	Storage		No	1				1
Lanes		0		0					
Configuration			LR						
		ueue Ler	ath a	nd Loro	1 05	Eom-			
Approach	NB	SB		itbound	I OI	servi		bound	
Movement	1	4	7	8	9	1 1		11	12
Lane Config	-	LT	,	LR	2	1 1	•		14
						1			<u>.                                    </u>
v (vph)		9		19					
C(m) (vph)		1275		575					
v/c		0.01		0.03					
95% queue length		0.02		0.10					
Control Delay		7.8		11.5					
LOS		A		в					
Approach Delay				11 5					

11.5 в

Approach Delay Approach LOS

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\_TWO-WAY STOP CONTROL SUMMARY\_

Analyst: cl Wilson Okamote Corporation Agency/Co.: Date Performed: 10/17/08 Analysis Time Period: AM Peak Period Intersection: Alanui Dr/Lower Kula Rd Jurisdiction: Units: U. S. Customary Analysis Year: 2009 With Project Project ID: DOT Distribution East/West Street: Alanui Dr North/South Street: Lower Kula Rd Intersection Orientation: NS Study period (hrs): 1.00 \_Vehicle Volumes and Adjustments\_ Major Street: Approach Northbound Southbound Movement 2 5 4 б 1. 3 ĥ r L т Ŕ R Volume 1 132 0 1 57 1 Peak-Hour Factor, PHF 0.74 0.50 0.50 0.50 0.74 0.74 Hourly Flow Rate, HFR 114 1 178 0 2 2 Percent Heavy Vehicles 2 ----2 -----Median Type/Storage Undivided 1 RT Channelized? 0 1 0 Lanes 0 1 0 Configuration LTR LTR Upstream Signal? No No Minor Street: Approach Eastbound Westbound Movement 7 8 10 11 12 9 Ŀ т R L т R Volume 0 0 0 12 0 n Peak Hour Factor, PHF 1.00 1.00 1.00 0.60 0.60 0.60 Hourly Flow Rate, HFR 19 0 0 0 0 D Percent Heavy Vehicles 2 2 2 2 2 2 Percent Grade (%) 0 0 Flared Approach: Exists?/Storage No No 0 1 0 Lanes 0 1 0 Configuration LTR LTR

Approach	NB	SB	ngth, and Lev Westbound			astbound
Movement	1	4	7 8	9	10	11 12
Lane Config	LTR	LTR	LTR		I	LTR
v (vph)	1	2	0			19
C(m) (vph)	1473	1398				652
v/c	0.00	0.00				0.03
95% queue length	0.00	0.00				0.09
Control Delay	7.4	7.6				10.7
LOS	A	А				В
Approach Delay						10.7
Approach LOS						в

#### APPENDIX E

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#### CAPACITY ANALYSIS CALCULATIONS PROJECTED YEAR 2009 PEAK PERIOD TRAFFIC ANALYSIS WITH PROJECT

#### TWO-WAY STOP CONTROL SUMMARY\_

Analyst:	CL				
Agency/Co.:	Wilson Okamoto Corporat	tion			
Date Performed:	10/17/08				
Analysis Time Period:	PM Peak Period				
Intersection:	Alanui Dr/Lower Kula Re	d			
Jurisdiction:					
Units: U. S. Customar	Y			• -	
Analysis Year:	2009 With Project			÷	
Project ID: DOT Dist	ribution			•	
East/West Street:	Alanui Dr				
North/South Street:	Lower Kula Rd				
Intersection Orientat		Study	period	(hrs):	1.00

Vehi	cle Volu	mes and	l Adjust	tments			
Major Street: Approach	Nor	thbound	l I	Sou	thbound	1	
Movement	1	2	3	4	5	6	
	L	т	R	L	Ť	R	
Volume	0	117	3	14	157	10	
Peak-Hour Factor, PHF	0.69	0.69	0.69	0.84	0.84	0.84	
Hourly Flow Rate, HFR	0	169	4	16	186	11	
Percent Heavy Vehicles	2			2			
Median Type/Storage RT Channelized?	Undivi	ided		1			
Lanes	0	1 (	)	0	1	0	
Configuration	LJ	PR.		LĨ	R		
Upstream Signal?		No			No		
Minor Street: Approach	Wes	thound		Eas	thound		
Movement	7	8	9	10	11	12	
	L	Ť	R	L	T	R	
Volume	7	0	13	3	0	1	
Peak Hour Factor, PHF	0.71	0.71	0.71	0.33	0.33	0.33	
		٥	18	9	0	3	
	9						
Hourly Flow Rate, HFR	2	2	2	2	2	2	
Hourly Flow Rate, HFR Percent Heavy Vehicles	-	-			-		
Hourly Flow Rate, HFR Percent Heavy Vehicles Percent Grade (%)	2	2			2		1
Hourly Flow Rate, HFR Percent Heavy Vehicles	2	2	2 No	2	2 0	2	1

Approach	_Delay, NB	Queue Le SB	ngth, and Level of Westbound	Service Eastbo	ound
Movement Lane Config	1 LTR	4 LTR	7 8 9 LTR	10 11 L1	
v (vph)	0	16	27	12	2
C(m) (vph)	1376	1404	734	55	94
v/c	0.00	0.01	0.04	0.	.02
95% queue length	0.00	0.03	0.11	0	.05
Control Delay	7.6	7.6	10.1	1:	1.2
LOS	A	А	B	1	в
Approach Delay			10.1	1:	1.2
Approach LOS			в	1	в

#### HCS+: Unsignalized Intersections Release 5.3

	TW	0-WAY	STOP CO	NTROL SU	MMARY				
Analyst:	CL								
Agency/Co.:	wil	son Ok	amoto (	Corporati	on				
Date Performed		17/08							
Analysis Time			eriod						
Intersection:				Kula Rđ (	North	۰ <b>.</b>			
Jurisdiction:	Nut	a awy/	DOMET 1	ara na 1	*****	,			
Units: U. S. C									
Analysis Year:		0.141616	Projec	**				•	
			projec	2 <b>L</b>					
Project ID: D									
East/West Stre			aRd (1	North)					
North/South St		a Hwy		_					
Intersection 0	rientation:	NS		5	cudy ;	perio	d (hrs	): 1.0	00
	Veh	icle V	olumes	and Adju	stmen	ts			
Major Street:	Approach		Northbo	ound		So	uthbou	nd	
-	Movement	1	2	3	1	4	5	6	
		L	т	R	i	L	т	R	
		_	_				-		
Volume			560	) 11		101	382		• • • • • • • • •
Peak-Hour Fact	or. PHP		0.9			0.77	0.77		
Hourly Flow Ra			623			131	496		
Percent Heavy			52.			2	490		
		TT							
Median Type/St		vnc	livided		/				
RT Channelized	<i>.</i> ?								
Lanes			1	0		0	1		
Configuration	_			TR		$\mathbf{D}$			
Upstream Signa	17		No				No		
Minor Street:	Approach		Westbo	md		Fa	stbour	đ	
MINUL OURBEL.	Movement	7	8	9	1	10	11	12	
	Movement	Ĺ	т	R		L	т	R	
		Ц	7	2		1	T	R	
Volume		22		143					
Peak Hour Fact	or, PHF	0.9	10	0.90	)				
Hourly Flow Ra	te, HFR	24		158					
Percent Heavy	Vehicles	2		2					
Percent Grade			0				0		
Flared Approac		/Store			1		-		1
Lanes		,	1	1					'
Configuration			Ъ	8					
	<u>-</u>								
	Delaw	0	Longth	, and Lev		C	4-0		
Ammanch	Delay, NB	SB		, and Lev Westbound		Serv		thound	
Approach	NB 1								
Movement	Т	4	7	8	9		10	11	12
Lane Config		LT	L		R	I			•.
v (vph)		131	24		158				
C(m) (vph)		949	205		483				
v/c		0.14	0.1	2	0.3	3			
95% queue leng	rth	0.48	0.4	0	1.4	5			
Control Delay		9.4	24.		16.				
		A	č.	-	-0.	-			
			~						
LOS	,			17 2					
				17.2 C					

#### TWO-WAY STOP CONTROL SUMMARY\_

Analyst: Agency/Co.: Date Performed: Analysis Time Period: Intersection:	CL Wilson Okamoto Corporat 10/17/08 PM Peak Period Kula Hwy/Lower Kula Rd			*.s
Jurisdiction:				
Units: U. S. Customar;			• -	
Analysis Year:				
Project ID: DOT Dist:	ribution			
East/West Street:	Lower Kula Rd (North)			
North/South Street:	Kula Hwy			
Intersection Orientat	ion: NS	Study period	(hrs):	1.00

					ments	uthboun		
Major Street:	Approach		rthbour			5	6	
	Movement	1	2	3	4		-	
		г	т	R	г	т	R	
Volume			373	20	149	384		
Peak-Hour Fact	or, PHF		0.86	0.86	0.90	0.90		
Hourly Flow Ra	te, HFR		433	23	165	426		
Percent Heavy	Vehicles				2			
Median Type/St RT Channelized	orage	Undi	vided		/			
kr channelized Lanes			1	0	Q	1		
Configuration			-	Ŕ	Ľ	_		
Upstream Signa	10		No		~	No		
Minor Street:	Approach		estbound			stbound		
	Movement	7	8	9	10	11	12	
		ь	т	R	L	т	R	
Volume		12		102				.,
Peak Hour Fact	or, PHF	0.82		0.82				
Hourly Flow Ra	ate, HFR	14		124				
Percent Heavy		2		2				
Percent Grade	(%)		0			0		
Flared Approad	ch: Exists?	/Storag	е		1			1
Lanes		ī		1				
Configuration			ь	R				

Approach	_Delay, NB	Queue Le SB		and Lev stbound			astbound	đ
Movement	1	4	7	8	9	10	11	12
Lane Config		LT	г		R	1		
v (vph)		1.65	14		124			
C(m) (vph)		1105	242		614			
v/c		0.15	0.06		0.20			
95% queue length		0.53	0.18		0.76			
Control Delay		8.8	20.8		12.3			
LOS		A	С		в			
Approach Delay				13.2				
Approach LOS				в				

#### HCS+: Unsignalized Intersections Release 5.3

Wilson Okamoto Corporation 1907 S. Beretania St., Suite 400 Honolulu, HI 96826

Phone: (808) 946-2277

E-Mail:

Fax: (808) 946-2253

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ALL-WAY STOP CONTROL (AWSC) ANALYSIS\_

	Ea	stbou	ind	W	estbou	und	Ň	rthb	bund	S	outhbo	ound	1
	ļь	т	R	Ĺ	т	R	L L	Ŷ	R	L	Т	R	Í
Volume	   29	21	5	-	78	19		11	2	8	10	21	-
% Thrus Lef			-	1-			1		-	,-			

	Eastbound		Westb	ound	North	ound	Southbound		
	г1	L2	L1	Ľ2	L1	P5	Ll	L2	
Configuration	LTR		LTR		LTR		LTR		
PHF	0.69		0.80		0.61		0.79		
Flow Rate	79		126		43		48		
% Heavy Veh	2		2		2		2		
No. Lanes	1		1		1	L		1	
Opposing-Lanes	1		1		1	L		1	
Conflicting-lanes	1		1		1	L		1	
Geometry group	1		1	-	1	L		1	
Duration, T 1.00	hrs.								

#### \_\_\_\_\_Worksheet 3 - Saturation Headway Adjustment Worksheet\_\_\_\_\_

	Eastbound		Westbound		North	bound	Southbound		
	L1	L2	L1	L2	L1	L2	L1.	L2	
Flow Rates:									
Total in Lane	79		126		43		48		
Left-Turn	42		5		22		10		
Right-Turn	7		23		3		26		
Prop. Left-Turns	0.5		0.0		0.5		0.2		
Prop. Right-Turns	0.1		0.2		0.1		0.5		

Prop. Heavy Vehic	le0.0	0.0	0.0	0.0
Geometry Group	1	1	1	1
Adjustments Exhib	it 17-33:			
hLT-adj	0.2	0.2	0.2	0.2
hRT-adj	-0.6	-0.6	-0.6	-0.6
hHV-adj	1.7	1.7	1.7	1.7
hadj, computed	0.1	-0.1	0.1	-0.2
				·

\_\_\_\_\_Worksheet 4 - Departure Headway and Service Time\_\_\_\_

	Eastbound		Westbound		North	oound	Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow rate	79		126		43		48	
hd, initial value	3.20	3.20	3,20	3.20	3.20	3.20	3.20	3.20
x, initial	0.07		0.11		0.04		0.04	
hd, final value	4.32		4.13		4.50		4.15	
x, final value	0.09		0.14		0.05		0.06	
Move-up time, m		2.0	:	2.0	:	2.0		2.0
Service Time	2.3		2.1		2,5		2.2	

#### \_\_\_\_\_Worksheet 5 - Capacity and Level of Service\_\_\_\_\_

	Eastb	ound	Westh	ound	North	oound	South	bound
	L1	ь2	L1	$\Gamma S$	L1	L2	L1	L2
Flow Rate	79		126		43		48	
Service Time	2.3		2.1		2.5		2.2	
Utilization, x	0.09		0.14		0.05		0.06	
Dep. headway, hd	4.32		4,13		4.50		4.15	
Capacity	329		376		293		298	
Delay	7.78		7.82		7.76		7.40	
LOS	A		A		A		А	
Approach:								
Delay	7	.78	-	1.82		7.76		7.40
LOS	P		2	4		A		A
Intersection Dela	v 7.73		Inte	ersecti	on LOS A			

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#### ALL-WAY STOP CONTROL (AWSC) ANALYSIS\_

Analyst: СĿ Agency/Co.: Date Performed: Wilson Okamoto Corporation 10/17/08 Analysis Time Period: PM Peak Period Intersection: Copp Rd/Lower Kula Rd Jurisdiction: Units: U. S. Customary 2009 With Project Analysis Year: Project ID: DOT Distribution East/West Street: Copp Rd North/South Street: Lower Kula Rd \_\_\_\_\_Worksheet 2 - Volume Adjustments and Site Characteristics\_

	i Ea	stbou	nd	We	estbou	ind	No	rthbo	und	Sc	uthbo	bund	I
	L	т	R	L	T	R	L	т	R	L	т	R	1
Volume	28	37	18	2	28	21	10	14	5	24	23	18	

% Thrus Left Lane

	Eastb	ound	Westh	oound	North	oound	Soutl	bound
	L1	ь2	L1	L2	L1	L2	г1	L2
Configuration	LTR		LTR		LTR		LTR	
PHF	0.94		0.85		0.91		0.75	
Flow Rate	87		58		30		86	
% Heavy Veh	2		2		2		2	
No. Lanes	1		1	l	:	1		1
Opposing-Lanes	1		:	1	:	1		1
Conflicting-lanes	1		:	1.		1		1
Geometry group	1		:	1		1		1
Duration, T 1.00	hrs.							

#### \_\_\_\_\_Worksheet 3 - Saturation Headway Adjustment Worksheet\_\_\_\_\_

	Eastl	oound	West	bound	North	bound	South	oound
	L1	L2	Ll	L2	L1	L2	Ll	L2
Flow Rates:								
Total in Lane	87		58		30		86	
Left-Turn	29		2		10		32	
Right-Turn	19		24		5		24	
Prop. Left-Turns	0.3		0.0		0,3		0.4	
Prop. Right-Turns	0.2		0.4		0.2		0.3	

Prop. Heavy Vehicl	e0.0		0.0		0.0		0.0	
Geometry Group		1	3			1		1
Adjustments Exhibi	t 17-3	33:						
hLT-adj		0.2	(	).2		0.2		0.2
hRT-adj	-	-0.6	-(	.6		0.6	-	0.6
hHV-adj		1.7	1	1.7		1.7		1.7
hadj, computed	-0.0		-0.2		0.0		-0.1	
Wor	ksheel	t 4 - Depa	arture f	feadway a	and Ser	vice Țim	 .e	
	East	bound	Westl	ound	North	bound	South	bound
	L1	L2	L1	L2	ь1	L2	L1	L2
Flow rate	87		58		30		86	
hd, initial value	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
x, initial	0.08		0.05		0.03		0.08	
hd, final value	4.19		4.04		4.31		4.19	
x, final value	0.10		0.07		0.04		0.10	
Move-up time, m		2.0	:	2.0		2.0		2.0
Service Time	2.2		2.0		2.3		2,2	
Wor	kshee	t 5 - Cap	acity a	nd Level	of Ser	vice		
	Eas	tbound	West	oound	North	bound	South	bound
	L1	L2	г1	r5	<b>L1</b>	L2	L1	L2
Flow Rate	87		58		30		86	
Service Time	2.2		2.0		2.3		2.2	
Utilization, x	0.10		0.07		0.04		0.10	
Dep, headway, hd	4.19		4.04		4.31		4.19	
Capacity	337		308		280		336	
Delay	7.66		7.32		7.47		7.66	
LOS	Α		А		А		A	
Approach:								
Delay		7.66		7.32		7.47		7.66
LOS		A		A		A		А
Intersection Delay	7.56		Int	ersectio	n LOS A			

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#### HCS+: Unsignalized Intersections Release 5.3

Amolinet.	CL									
Analyst: Agency/Co.:			len -	to Corp						
Agency/Co.: Date Performed:		son ( 17/08		to corp	oratic	11				
				- 4						
Analysis Time Po					n					
Intersection: Jurisdiction:	Kül	а нжу	V POM	er Kula	RCI (2	outi	n)			
Units: U. S. Cu	rtoma m									
Analysis Year:		0 644 -	h P~	oject						
Project ID: DO				.01666				1		
East/West Street			la D	d (Sout	h١					
North/South Stree		a Hwv		a (804t						
Intersection Or:					SH		period	(hral.	1 00	
Incersection of.	concacion.	113			30	uuy	Period	(mra):	1.00	
	Veh	icle	Volu	mes and	Adjus	tne	nts			
Major Street: 1				thbound				hbound		
1	Novement	1		2	3	1	4	5	6	
		L		T	R	1	L	т	R	
				~						
Volume				311	1		9	179		
Peak-Hour Facto				0.83	0.83		0.66	0.66		
Hourly Flow Rat				374	1		13	271		
Percent Heavy V			<b>.</b>				2			
Median Type/Sto	rage	Ur	ldivi	aea			/			
RT Channelized? Lanes				1 0			0	1		
				TR			0 LT	1		
Configuration Upstream Signal	<b>。</b>			NO			DT.	Ma		
opacieda aignai	•			NO				No		
Minor Street:	Approach		Wes	stbound			Eas	tbound		
	Movement	7		8	9	1	10	11	12	
		L		т	R	i	L	т	R	
						<u>'</u>				
Volume		2			8					
Peak Hour Facto			75		0.75					
Hourly Flow Rat		2			10					
Percent Heavy V		2		_	2					
Percent Grade (				0				0		
Flared Approach	: Exists?	/Stoi			No	1				/
Lanes			0	0						
Configuration				LR						
· ·· ·			a Ler	ngth, an		al o	f Servi			
Approach	NB	SB			bound			Eastb		
Movement	1	4 1.00			8 1.9	9	1	01	1	12
Lang Config										

Approach	NB	SB	Westbound		E	astbound	1
Movement	1	4	7 8	9	10	11	12
Lane Config		LT	LR		İ		•.
v (vph)		13	12	···			
C(m) (vph)		1183	610				
v/c		0.01	0.02				
95% queue length		0.03	0.06				
Control Delay		8.1	11.0				
LOS		А	в				
Approach Delay			11.0				
Approach LOS			в				

1

#### \_\_\_\_TWO~WAY STOP CONTROL SUMMARY\_\_\_

Analyst: Agency/Co.: Date Performed:	CL Wilson Okamoto Corpora 10/17/08	tion		.1
Analysis Time Period:				
Intersection:	Kula Hwy/Lower Kula Rd	(South)		
Jurisdiction:	-			
Units: U. S. Customar	У		•-	
Analysis Year:			,	
Project ID: DOT Dist	ribution			
East/West Street:	Lower Kula Rd (South)			
North/South Street:	Kula Hwy			
Intersection Orientat	ion: NS	Study period	(hrs):	1.00

Major Street:	Approach		rthbound	3 Adjus <del>1</del>			thboun	a	
·····	Movement	1	2	3		4	5	6	
		L	т	R	Ì	L	Ţ	R	
Volume			270	4		9	239		
Peak-Hour Fact	or, PHF		0.92	0.92		0.93	0.93		
Rourly Flow Ra	te, HFR		293	4		9	256		
Percent Heavy	Vehicles					2			
Median Type/St	orage	Undiv	/ided			/			
RT Channelized									
Lanes			1	0		0	1		
Configuration			- T	-		Ľ			
Upstream Signa	17		No			2	- Na		
Minor Street:	Approach		estbound			Ea.	stbound		
	Movement	7	8	9		10	11	12	
		L	т	R	1	L	т	R	
Volume		7		5					
Peak Hour Fact	or, PHF	0.61		0.61					
Hourly Flow Ra	te, HFR	11		8					
Percent Heavy	Vehicles	2		2					
Percent Grade	(%)		0				0		
Flared Approac	h: Exists?	/Storage	•	No	1				1
Lanes		ö		0					
Configuration			LR						

Approach	NB	SB		W	lestbound	ι	E	astbound	4
Movement	1	4		7	8	9	10	11	12
Lane Config		LT	1		LR				÷.
v (vph)		9			19				
C(m) (vph)		126	4		565				
v/c		0.0	1		0.03				
95% queue length		0.0	2		0.10				
Control Delay		7.9			11.6				
LOS		A			В				
Approach Delay					11.6				
Approach LOS					B				

# 9. KULA RIDGE TIAR -SUPPLEMENTAL LETTER

.



1917 South Baratana Street Nets one Plans, Suno 430 Plans de Histon 98820 (55) e nord - 853 516 2277 Fri - 808 915 2275 no 2 Maganakanoto pom 7551-03 September 14, 2009

Mr. Clayton Nishikawa Kula Ridge, LLC 1849 Wili Pa Loop Wailuku, HI 96793

Subject: Kula Ridge TIAR – Supplemental Letter

Dear Mr. Nishikawa:

As requested, we conducted additional field investigations in the vicinity of the proposed project site for the Kula Ridge development to address concerns expressed by Kula Community Association (KCA) regarding the nearby Haleakala Waldorf School. The following is a summary of our findings.

## Field Investigation

Turning movement count surveys were previously conducted in conjunction with the preparation of a traffic impact study for the proposed Kula Ridge development in 2005 and 2006. These surveys were conducted during the morning peak period between 6:00 AM and 8:00 AM, and the afternoon peak period between 3:00 PM and 6:00 PM to capture the commuter peak hours of traffic in the vicinity of the project. The commuter peak hours of traffic typically represent the highest volumes of traffic and, as such, are utilized as the basis of traffic studies to determine the greatest impact that proposed projects may have on the surrounding roadway network. However, due to concerns expressed by the KCA with regards to the school peak hours of traffic in the vicinity of the Haleakala Waldorf School, an additional field investigation was conducted on September 2-3, 2009 which consisted of manual turning movement count surveys during the morning hours of 6:00 AM and 9:00 AM, and the afternoon hours of 2:00 and 5:00 PM at the following locations:

- Lower Kula Road, Alanui Place, and the Kula Community Center driveway
- Lower Kula Road and the Haleakala Waldorf School driveways
- Lower Kula Road and Kula Highway (north)

Appendix A includes the traffic count data.



7551-03 Letter to Mr. Clayton Nishikawa Page 2 September 14, 2009

# Year 2009 Peak Hour Traffic

The commuter peak hours of traffic observed in 2005 and 2006 occurred during the morning hours of 7:00 AM and 8:00 AM, and the afternoon hours of 3:45 AM and 4:45 PM. The additional field investigation conducted in 2009 indicated similar morning and afternoon commuter peak hours of traffic at the intersections of Lower Kula Road with Kula Highway and Alanui Place. The morning school peak hour of traffic along Lower Kula Road at the intersection with the driveway for the Haleakala Waldorf School occurs between the hours of 7:30 AM and 8:30 AM, and the afternoon school peak hour of traffic occurs between the hours of 2:15 PM and 3:15 PM.

At the intersection of Lower Kula Road with Kula Highway, the southbound left-turn and through traffic movement along the highway operates at LOS "A" during both school peak periods. The westbound approach of Lower Kula Road operates at LOS "C" during the morning school peak period and LOS "B" during the afternoon school peak period. Traffic queues periodically formed on the westbound approach of the intersection with average queue lengths of 1-3 vehicles observed during both peak periods.

At the intersection of Lower Kula Road with the driveway for the Haleakala Waldorf School, all approaches of the intersection have one lane that serves all allowable movements. During the morning and afternoon school peak periods, the northbound left-turn and through traffic movement along Lower Kula Road operates at LOS "A" while the eastbound approach from the Haleakala Waldorf School operates at LOS "B." Traffic queues periodically formed on the school driveway approach with average queue lengths of 2-3 vehicles observed during both peak periods. In addition, vehicles entering the school occasionally created queues along the southbound approach of Lower Kula Road during the morning school peak hour of traffic with queue lengths of 1-2 vehicles observed during that period. Pedestrian traffic in the vicinity of the school was also monitored during the traffic count survey. During the 3 hour count periods, no pedestrians were observed traveling along Lower Kula Road during the morning peak period and 5 pedestrians were observed traveling along Lower Kula Road during the afternoon peak period.

# Projected Peak Hour Traffic With Project

As detailed in the traffic impact study, the trip generation methodology is based upon generally accepted techniques developed by the Institute of Transportation Engineers (ITE). The morning school peak hour of traffic overlaps with the morning commuter peak hour of traffic. As such, the trip generation characteristics during the morning school peak hour of traffic is expected to be



7551-03 Letter to Mr. Clayton Nishikawa Page 3 September 14, 2009

similar to the morning commuter peak hour of traffic with a total of 91 vehicles expected to be generated by the proposed project during that period. However, the afternoon school peak hour of traffic occurs earlier than the afternoon commuter peak period and, as such, site-generated traffic along the surrounding roadways is significantly less than during the commuter peak period. During an off-peak period, the project is expected to generate a total of 24 vehicles. These vehicles were distributed along the surrounding roadway networks utilizing the same methodology as the morning commuter peak period.

At the intersection of Lower Kula Road with Kula Highway, the southbound left-turn and through traffic movement along the highway is expected to continue operating at LOS "A" during both school peak periods. The westbound approach of Lower Kula Road is expected to be modified with the development of the Kula Ridge project to provide dedicated turning lanes at the highway. The left-turn traffic movement along Lower Kula Road is expected to operate at LOS "C" during both peak periods while the right-turn traffic movement is expected to operate at LOS "C" and LOS "B" during the morning and afternoon school peak periods, respectively.

At the intersection of Lower Kula Road with the driveway for the Haleakala Waldorf School, the northbound left-turn and through traffic movement along Lower Kula Road is expected to continue operating at LOS "A" during both school peak periods while the eastbound approach from the Haleakala Waldorf School is expected to continue operating at LOS "B" during both school peak periods.

LOS calculations are included in Appendix B.

### Recommendations and Conclusion

With the implementation of the recommendations included in the traffic impact study, the proposed Kula Ridge development is not expected to have a significant impact on vehicular and pedestrian traffic operations in the vicinity of the project site during school peak periods. The critical movements at the study intersections in the vicinity of the school are expected to continue operating at levels of service similar to without project conditions and minimal pedestrian traffic was observed along Lower Kula Road in the vicinity of the Haleakala Waldorf School during both school peak periods. In addition, enhanced management of traffic circulation within the school could eliminate the existing queuing of entering school traffic along Lower Kula Road thereby minimizing conflicts between school and project traffic along that roadway.



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Should you have any questions or require additional information, please contact Mr. Pete Pascua or myself at 946-2277.

Sincerely,

Cathy Leong, P .E.

# APPENDIX A

# TRAFFIC COUNT DATA

# Wilson Okamoto Corporation 1907 S. Beretania Street Suite 400 Honolulu, Hi 96826

Counter:D4-5675 Counted By:RY Weather:Clear . . .

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File Name : LKulaAlanui AM Site Code : 00000001 Start Date : 9/3/2009 Page No : 1

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		9	Kula Ro			K		munity C Vestbour	enter Dw			L	Kula Roa Iorthbour			_		lanui Plac astboun			) 
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Totai	Left	Thru	Right	Peds	App, Total	Left	Thru	Right	Peds	App. Total	Int. Totai
06:00 AM	0	4	0	0	4	0	0	0	0	0	0	4	0	0	4	1	0	0	- 0	1	9
06:15 AM	0	3	0	0	3	0	0	1	0	1	° 1	6	0	0	7	1	1	1	0	3	14
06:30 AM	0	2	0	0	2	0	0	0	0	0	0	7	0	2	9	0	0	0	0	0	11
06:45 AM	0	5	0_	0	5	0	0_	1	0	1	1	15	0	0	16	4	0	0	0	4	26
Total	0	14	0	0	14	0	0	2	0	2	2	32	0	2	36	6	1	1	0	8	
07;00 AM	0	7	1	D	8	0	0	0	٥	0	0	15	O	1	16	2	0	1	0	3	27
07:15 AM	1	5	0	0	6	Ō	Ō	1	Ō	1	1	15	Ō	ò	16	3	ŏ	D	ŏ	3	26
07:30 AM	0	11	1	0	12	0	0	0	0	0	Ó	14	Ō	Ō	14	Ō	Ō	2	ō	2	28
07:45 AM	0	13	0	1	. 14	1	0	1	0	2	3	16	2	Ō	21	Ó	1	ō	1	2	39
Total	1	36	2	1	40	1	0	2	0	3	4	60	2	1	67	5	1	3	1	10	
08:00 AM	0	10	0	0	10	0	0	0	0	01	1	21	0	0	22	2	0	2	0	4	36
08:15 AM	2	17	2	0	21	1	0	1	4	6	0	20	0	0	20	1	0	Ō	2	3	50
08:30 AM	4	8	0	0	12	0	0	0	0	0	0	7	2	0	9	0	0	Ó	0	0	21
08:45 AM	4	11	0	0	15	0	0	0	0	0	0	11	3	0	14	1	0	0	0	1	! 30
Total	10	46	2	0	58	1	0	1	4	6	1	59	5	0	65	4	0	2	2	- 8	
Grand Total	11	96	4	1	112	2	0	5	4	11	7	151	7	3	168	15	2	6	3	26	317
Apprch %	9.8	85.7	3.6	0.9	ł	18.2	0	45.5	36.4		4.2	89.9	4.2	1.8		57.7	7.7	23.1	11.5		l
Total %	3.5	30.3	1.3	0.3	35.3	0.6	0	1.6	1.3	3.5	2.2	47.6	2.2	0.9	53 j	4.7	0.6	1.9	0.9	8.2	I

			Kula Roa			Kula Community Center Dwy. Westbound							Kula Roa			Alanui Place Eastbound					
Start Time	Left	Thru	Right	Peds A	pp. Total	Left	Thru	Right		App. Total	Left	Thru	Right		App. Total	Left	Thru	Right	Peds	App. Total	Int, Total
Peak Hour Analys	is From 0	6:00 AM	to 08:45	AM - Pea	k1 of 1													······································			
Peak Hour for E	ntire Inte	rsection	Begins	at 07:30	AM																
07:30 AM	0	11	1	0	12	0	0	0	0	0	0	14	0	0	14	0	0	2	0	2 !	28
07:45 AM	0	13	0	1	14	1	0	1	0	2	3	16	2	0	21	0	1	0	1	2	39
08:00 AM	0	10	0	0	10	0	0	0	0	0	1	21	0	0	22	2	0	2	0	4	36
08:15 AM	2	17	2	0	21	1	0	1	4	6	0	20	0	0	20	1	0	0	2	3	50
Total Volume	2	51	3	1	57	2	0	2	4	8	4	71	2	0	77	3	1	4	3	11	153
% App. Total	3.5	89.5	5.3	1.8		25	0	25	50		5.2	92.2	2.6	0		27.3	9.1	36.4	27.3		
PHF	250	.750	.375	,250	.679	.500	.000	.500	.250	.333	.333	.845	.250	.000	.875	.375	.250	.500	.375	.688	.765

# Wilson Okamoto Corporation 1907 S. Beretania Street Suite 400 Honolulu, Hi 96826

Counter:D4-5675 Counted By:RY Weather:Clear . . .

File Name : LKulaAlanui PM Site Code : 00000001 Start Date : 9/2/2009 Page No : 1

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									Grou	ps Printed-	Unshifte	d								÷	
			. Kula Ro Southbou			K		munity Co Vestboun	enter D			L	Kula Roa Iorthboun					lanui Plao astooun			I
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02:00 PM	1	15	0	0	16	1	0	1	0	2	0	12	0	0	12	Ō	0	0	0	0	30
02:15 PM	0	13	1	0	14	0	0	0	0	0	1	19	1	0	21	1	0	0	0	1	36
02:30 PM	0	18	0	0	18	0	0	2	0	2	0	17	1	0	18	1	0	2	2	5	43
02:45 PM	4	_21	1	0	26	0	0	0	0	0	0	11	0	0	11	0	0	0	1	1	38
Total	5	67	2	0	74	1	0	3	0	4 ]	1	59	2	0	62	2	0	2	З	7	147
03:00 PM	1	18	1	0	20	0	0	0	4	4	0	13	0	0	13	0	0	0	0	0	37
03:15 PM	3	19	2	0	24	0	0	0	0	0	0	12	1	0	13	0	0	0	6	6	43
03:30 PM	2	14	2	0	18	0	0	1	0	1	0	13	1	0	14	1	0	0	1	2	35
03:45 PM	1	14	1	0	16	0	0	0	0	0	1	16	1	0	<u>18</u>	0	0	0	2	2	36
Total	7	65	6	0	78	0	0	1	4	5	1	54	3	0	58	1	0	0	9	10	151
04:00 PM	1	22	0	0	23	1	0	0	0	1	1	10	0	0	11	0	0	0	1	1	36
04:15 PM	2	22	1	0	25	0	0	0	0	0	0	17	1	1	19	1	0	1	0	2	46
04:30 PM	3	11	1	0	15	3	0	5	0	8	1	13	0	0	14	0	0	0	0	0	37
04:45 PM	0	23	1	0	24	. 1	0	1	0	2	1	18	0	0	19	0	0	0	0	0	
Total	6	78	3	0	87	5	0	6	0	11	3	58	1	1	63	1	0	1	1	3	164
Grand Total	18	210	11	0	239	6	0	10	4	20	5	171	6	1	183	4	0	3	13	20	462
Apprch %	7.5	87.9	4.6	0		30	0	50	20		2.7	93.4	3.3	0.5		20	0	15	65		
Total %	3.9	45.5	2.4	0	51.7	1.3	0	2.2	0.9	4.3	1.1	37	1.3	0.2	39.6 ¦	0.9	0	0.6	2.8	4.3	

		L	Kula Roa	ad		Kı	ila Com	munity C	enter Dv	vy.			Kula Roa					lanui Pla	ce		
		S	outhbour	nd			V	Vestbour	nd			N	orthbour	d				astooun		i	
Start Time	Left	Thru	Right	Peds A		Left	Դիտա	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analys	is From 0	2:00 PM	to 04:45	PM - Pea	k 1 of 1		_														
Peak Hour for E	ntire Inte	rsectior	Begins	at 04:00	PM																
04:00 PM	1	22	0	0	23	1	0	0	0	1	1	10	0	0	11	Û	0	0	1	1	36
04:15 PM	2	22	1	0	25	0	0	0	0	0	0	17	1	1	19	1	0	1	0	2	46
04:30 PM	3	11	1	0	15	3	0	5	0	8	1	13	0	0	14	0	0	0	0	0	37
04:45 PM	0	23	1	0	24	1	0	1	0	2	1	18	0	0	19	0	0	0	0	0	45
Total Volume	6	78	3	0	87	5	0	6	0	11	3	58	<sup></sup> 1	1	63	1	0	1	1	3	164
% App. Total	6.9	89.7	3.4	0	_	45.5	0_	54.5	0		4.8	92.1	1.6	1.6		33.3	0	<u>33.3</u>	33.3		
PHF	.500	.848	.750	.000	.870	.417	.000	.300	.000	.344	.750	.806	.250	.250	.829	.250	000	.250	.250	.375	.891

# Wilson Okamoto Corporation 1907 S. Beretania St., Suite 400 Honolulu, HI 96826

Counter:D4-5673 Counted By:TO Weather:Clear File Name : Waldorf Dwy. At School AM rev Site Code : 00000001 Start Date : 9/3/2009 Page No : 1

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			/er Kula Ro Southbound			Westboun d			ver Kula Ro Northbound					nool Drivev Eastbound			
Start Time	Left	Thru	Right	Peds	App. Total	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
06:00 AM	0	4	0	0	4	0	0	5	0	0	5	0	0	0	0	0	9
06:15 AM	0	7	0	0	7	0	0	8	0	0	8	0	0	0	0	0	15
06:30 AM	0	9	0	0	9	0	0	7	0	0	7	0	0	0	0	0	16
06:45 AM	0	16	0	0	16	0	1	19	0	0	20	1	0	0	0	1	37
Total	0	36	0	0	36	0	1	39	0	0	40	1	0	0	0	1	77
07:00 AM	0	16	0	0	16	0	0	17	0	0	17	0	. 0	0	0	0	33
07:15 AM	0	16	0	0	16	0	1	18	0	0	19	0	0	0	0	0	35
07:30 AM	Ó	16	4	0	20	Ó	2	12	0	0	14	Ó	Ó	0	0	0	34
07:45 AM	Ō	20	11	Ô	31	Ó	7	10	Ō	Ó	17	4	0	3	Ó	7	55
Total	0	68	15	0	83	0	10	57	0	0	67	4	ō	3	0	7	157
08:00 AM	0	22	35	0	57	01	8	10	0	0	18	17	0	1	0	18	93
08:15 AM	0	13	27	0	40	0	7	17	0	0	24	28	0	12	0	40	104
08:30 AM	Ó	5	0	0	5	0	0	9	0	0	9	15	0	4	0	19	33
08:45 AM	Ō	11	3	Ó	14	0	3	9	0	0	12	3	0	3	0	6	32
Total	0	51	65	0	116	0	18	45	0	0	63	63	0	20	0	83	262
Grand Total	0	155	80	0	235	0	29	141	0	0	170	68	0	23	0	91	496
Apprch %	Ō	66	34	Ō			17.1	82.9	Ó	0		74.7	0	25.3	0	i i	
Total %	Õ	31.2	16.1	Õ	47.4	0	5,8	28.4	0	0	34.3	13.7	0	4.6	0	18.3	

			er Kula Ro outhbound			Westboun d			wer Kula Ro Northbound					iool Drivew Eastbound		:	
Start Time	Left	Thru	Right	Peds	App. Total	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru [	Right	Peds	App. Total	Int. Total
Peak Hour Analysis F	rom 06:00 A	M to 08:4	5 AM - Pea	ak 1 of 1													
Peak Hour for Entire	Intersection	on Begins	at 07:30	AM													
07:30 AM	0	16	· 4	0	20	0	2	12	0	0	14	0	0	0	0	0	34
07:45 AM	0	20	11	0	31	0	7	10	0	0	17	4	0	3	0	7	55
08:00 AM	0	22	35	0	57	0	8	10	0	0	18	17	0	1	0	18	93
08:15 AM	0	13	27	0	40	0	7	17	0	0	24	28	0	12	0	40 :	104
Total Volume	0	71	77	0	148	0	24	49	0	0	73	49	0	16	0	65	286
% App. Total	0	48	52	0			32.9	67.1	0	0		75.4	0	24.6	0	I	
PHF	.000	.807	.550	.000	.649	.000	.750	.721	.000	.000	.760	.438	.000	.3 <u>33</u>	.000	.406 :	.688

# Wilson Okamoto Corporation 1907 S. Beretania St., Suite 400 Honolulu, HI 96826

File Name : Waldorf Dwy. At School PM rev Site Code : 0000001 Start Date : 9/2/2009 Page No : 1

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			ver Kula Ro Southbound			Westboun d			ver Kula Ro Northbound					iool Drivew Eastbound	ау		
Start Time	Left	Thru	Right	Peds	App. Total	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
02:00 PM	0	18	4	0	22	0	0	13	0	0	13	1	0	0	0	1	36
02:15 PM	0	13	30	0	43	0	7	15	0	0	22	5	0	0	0	5	70
02:30 PM	0	12	22	0	34	0	7	13	0	0	20	40	0	5	0	45	99
02:45 PM	0	21	6	0	27	0	_ 0	11	0	0	11	18	0	9	0	27	65
Total	0	64	62	0	126	0	14	52	0	0	66	64	0	14	0	78	270
03:00 PM	0	17	1	0	18	0	1	14	0	0	15	4	0	4	0	8	41
03:15 PM	0	22	1	0	23	0	0	13	0	0	13	4	0	3	0	7	43
03:30 PM	0	17	1	0	18	0	0	15	0	0	15	3	0	1	1	5	38
03:45 PM	Ó	14	1	0	15	0	0	19	0	0	19	1	0	1	0	2	36
Total	0	70	4	0	74	0	1	61	0	0	62	12	0	9	1	22	158
04:00 PM	0	23	0	0	23	0	0	10	0	0	10	3	0	0	1	4 j	37
04:15 PM	0	24	0	0	24	0	1	18	0	0	19	1	0	1	0	2	45
04:30 PM	0	13	0	0	13	0	1	18	0	0	19 ¦	3	0	4	0	7	39
04:45 PM	0	23	0	0	23	0	0	19	0	0	19	0	0	1	0	1	43
Total	0	83	0	0	83	0	2	65	Ö	0	67	7	0	6	1	14	164
Grand Total	0	217	66	0	283	0	17	178	0	0	195	83	0	29	2	114	592
Apprch %	0	76.7	23.3	0			8.7	91.3	0	0		72.8	0	25.4	1.8		
Total %	0	36.7	11.1	0	47.8	0	2.9	30.1	0	0	32.9	14	0	4.9	0.3	19.3	

			er Kula Ro		,	Westboun d			ver Kula Ro Northbound	-				iool Drivew Eastbound			
Start Time	Left	Thru	Right	Peds	App. Total	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds I	App. Total	Int. Total
Peak Hour Analysis F																	
Peak Hour for Entire	e Intersecti	on Begins	at 02:15	PM													
02:15 PM	0	13	30	0	43	0	7	15	0	0	22	5	0	0	0	5 j	70
02:30 PM	0	12	22	0	34	0	7	13	0	0	20	40	0	5	0	45 i	99
02:45 PM	0	21	6	0	27	0	0	11	0	0	11	18	0	9	0	27	65
03:00 PM	Ō	17	1	0	18	0	1	14	0	0	15	4	0	4	0	8	41
Total Volume	0	63	59	0	122	0	15	53	0	0	68	67	0	18	0	85	275
% App. Total	Ö	51.6	48.4	0			22.1	77.9	0	0		<u>78.8</u>	0	21.2	0		
PHF	.000	.750	.492	.000	.709	.000	.536	.883	.000	.000	.773	.419	.000	.500	.000	.472 ]	.694

# Counter:D4-5673 Counted By:TO Weather:Clear

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# Wilson Okamoto Corporation 1907 S. Beretania Street Suite 400 Honolulu, Hi 96826

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File Name : KulaHwy-KulaRd AM Site Code : 00000001 Start Date : 9/3/2009 Page No : 1

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			ula Highwa Southbound					. Kula Roa Vestbound					ula Highwa Northbound			Eastboun	
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	App. Total	Int. Total
06:00 AM	6	15	0	0	21	0	0	6	0	6	0	61	0	0	61	0	88
06:15 AM	2	27	0	0	29	0	0	8	0	8	0	81	0	0	81	0	118
06:30 AM	· 3	47	0	0	50	0	0	9	0	9	0	93	0	0	93	0	152
06:45 AM	7	54	0	0	61	1	0	19	0	20	0	96	0	0	96	0	177
Total	18	143	0	0	161	1	0	42	0	43	0	331	0	0	331	0	535
07:00 AM	6	66	0	0	72	2	0	20	0	22	0	143	0	0	143	0	237
07:15 AM	7	93	ŏ	ō	100	· 0	õ	16	õ	16	õ	152	ŏ	Ō	152	Ő,	268
07:30 AM	20	99	ŏ	ŏ	119	1	õ	11	õ	12	õ	117	1	ŏ	118	ő	249
07:45 AM	27	66	õ	1	94	i	ŏ	14	õ	15	ŏ	121	1	ō	122	ŏ	231
Total	60	324	0	1	385	4	0	61	ō	65	0	533	2	0	535	0	985
08:00 AM	44	65	0	0	109	3	0	32	0	35	0	72	3	0	75	ol	219
08:00 AM	38	53	ŏ	ŏ	91	3	ŏ	43	0	46	Ň	76	3	ŏ	79	ŏ	216
08:30 AM	30	45	0	Ň	52	0	0	43 24	0	24	ň	76	0	ň	76	ŏ	152
08:45 AM	16	52	ŏ	0	68	2	ŏ	12	0	14	0	68	2	0	70	0	152
Total	105	215	- 0	0	320	8	ŏ	111	<u>0</u>	119	0	292	8	<u> </u>	300	0	739
			-	-					-							- 1	
Grand Total	183	682	0	1	866	13	0	214	0	227	0	1156	10	0	1166	ο¦	2259
Apprch %	21.1	78.8	0	0.1		5.7	0	94.3	0		0	99.1	0.9	0			
Total %	8.1	30.2	0	0	38.3	0.6	0	9.5	0	10	0	51.2	0.4	0	51.6	0	

			la Highwa outhbound				-	. Kula Road Nestbound					la Highwa orthbound			Eastboun d	
Start Time	Left	Thru	Right	Peds   A	pp, Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	App. Total	Int. Total
Peak Hour Analysis F	rom 06:00	AM to 08:4	15 AM - Pe	eak 1 of 1													
Peak Hour for Entire	e Intersecti	on Begins	at 07:00 at	AM													
07:00 AM	6	66	0	0	72	2	0	20	0	22	0	143	0	0	143	0	237
07:15 AM	7	93	0	0	100	0	0	16	0	16	0	152	0	0	152	0	268
07:30 AM	20	99	0	0	119	1	0	11	0	12	0	117	1	0	118	0	249
07:45 AM	27	66	0	1	94	1	0	14	0	15	0	121	1	0	122	0	231
Total Volume	60	324	0	1	385	4	0	61	0	65	0	533	2	0	535	0	985
% App. Total	15.6	84.2	0	0.3		6.2	0	93.8	0		0	99.6	0.4	0		<u> </u>	
PHF	.556	.818	.000	.250	.809	.500	.000	.763	.000	.739	.000	.877	.500	.000	.880	,000	.919

# Wilson Okamoto Corporation 1907 S. Beretania Street Suite 400 Honolulu, Hi 96826

Counter:D4-5676 Counted By:ER Weather:Clear

,

File Name : KulaHwy-KulaRd PM Site Code : 00000001 Start Date : 9/2/2009 Page No : 1

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			<u> </u>	<u> </u>			Grou	s Printed	d- Unshift	ed							
			ula Highwa Southbound					Kula Roa /estbound					ula Highwa Iorthbound			Eastboun d	
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	App. Total	Int. Total
02:00 PM	18	66	0	0	84	1	0	13	0	14	0	66	3	0	69	0	167
02:15 PM	41	60	0	0	101	1	0	20	0	21	0	71	4	0	75	0	197
02:30 PM	33	72	0	0	105	5	0	50	0	55	0	77	5	0	82	0	242
02:45 PM	28	72	0	0	100	2	0	32	0	34	0	61	3	0	64	0	198
Total	120	270	0	0	390	9	0	115	0	124	0	275	15	0	290	0	804
03:00 PM	15	60	0	0	75	2	0	15	0	17	0	70	2	0	72	0	164
03:15 PM	21	73	0	0	94	0	0	14	0	14	0	85	4	0	89	0	197
03:30 PM	22	62	0	0	84	1	0	17	0	18	0	93	1	0	94	0	196
03:45 PM	15	66	0	0	81	3	0	21	0	24	0	75	2	0	77	0	182
Total	73	261	0	0	334	6	0	67	0	73	0	323	9	0	332	0	739
04:00 PM	20	104	0	0	124	4	0	10	0	14	0	80	4	0	84	0	222
04:15 PM	19	89	0	0	108	2	0	15	0	17	0	64	4	0	68	0	193
04:30 PM	17	82	0	0	99	4	0	21	0	25	0	76	1	0	77	0	201
04:45 PM	_21	100	0	0	121	3	0	19	0	22	0	_ 73	1	0	74	0	217
Total	77	375	0	0	452	13	0	65	0	78	0	293	10	0	303	0	833
Grand Total	270	906	0	0	1176	28	0	247	0	275	0	891	34	0	925	0 !	2376
Apprch %	23	77	0	0		10.2	0	89.8	0		0	96.3	3.7	0			
Total %	11.4	38.1	0	0	49.5	1.2	0	10.4	0	11.6	0	37.5	1.4	0	38.9	οį	

			ula Highwa outhbound				-	. Kula Road Nestbound		ĺ			ula Highwa Iorthbound		ĺ	Eastboun	
Start Time	Left	Thru	Right	_Peds /	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	App. Total	Int. Total
Peak Hour Analysis F																	
Peak Hour for Entire	e Intersecti	on Begin:	s at 04:00	) PM													
04:00 PM	20	104	0	0	124	4	0	10	0	14	· 0	80	4	0	84	0	222
04:15 PM	19	89	0	0	108	2	0	15	0	17	0	64	4	0	68	0	193
04:30 PM	17	82	0	0	99	4	0	21	0	25	0	76	1	0	77	0	201
04:45 PM	21	100	0	0	121	3	0	19	0	22	0	73	1	0_	74	0	217
Total Volume	77	375	0	0	452	13	0	65	0	78	0	293	10	0	303	0	833
% App. Total	17	83	0	0		16.7	0	83.3	0		0	96.7	3.3	0		L	
PHF	.917	.901	.000	.000	.911	.813	.000	.774	.000	.780	.000	.916	.625	.000	.902	.000	.938



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# APPENDIX B

# CAPACITY ANALYSIS CALCULATIONS

TWO-WAY STOP CONTROL SUMMARY

Analyst:	CL						
Agency/Co.:		-					
Date Performed:	9/12/200	9					
Analysis Time Period Intersection:	: AM Peak						
Jurisdiction:							
Units: U. S. Customa:	ry						
Analysis Year:	Year 200	9					
Project ID:							
East/West Street:	Lower Ku	la Road					
North/South Street:	Kula Hig	hway					
Intersection Orienta	tion: NS		St	udy perio	d (hrs):	: 1.00	)
	Vehicle	Volumes an	d Adjus	tments			
Major Street: Appro.		Northboun	_		uthbound	3	
Movem	ent 1	2	3	4	5	6	
	$\mathbf{L}$	т	R	L	т	R	
Volume		386	8	129	283		
Peak-Hour Factor, PH	ទ	0.81	0.81	0.87	0.87		
Hourly Flow Rate, HF		476	9	148	325		
Percent Heavy Vehicle				2			
Median Type/Storage		divided		1			
RT Channelized?							
Lanes			0	0	1		
Configuration			R	L			
Upstream Signal?		No			No		
Minor Street: Appro.	ach	Westbound		 Ea	stbound		
Movem		8	9	10	11	12	
	L	т	R	Ĺ	т	R	
Volume	8		100				
Peak Hour Factor, PH	F 0.	59	0.58				
Hourly Flow Rate, HF	R 13		172				
Percent Heavy Vehicl	es 2		2				
Percent Grade (%)		0			0		_
	ists?/Stor	0	No	/			/
Lanes Configuration		0 LR	0				
Contriguration		LK					
		Length, a		l of Serv			
	NB SB 1 4	wes	tbound 8	9		oound 11	12
Lane Config	1 4 LT		o LR	<i>&gt;</i>	10 .	1, 1,	14
		1	BR				
v (vph)	148		185				
C(m) (vph)	107		517				
v/c	0.1		0.36				
95% queue length	0.4		1.66				
Control Delay	8.9		15.8				
LOS Approach Delay	A		C 15.8				
Approach LOS			15.0 C				
The second second			C				
					· · ·		

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TWO-WAY STOP CONTROL SUMMARY\_\_\_\_\_

Analyst: Agency/Co.: Date Performed: Analysis Time Period Intersection: Jurisdiction:	l: PM Pe	/2009 ≥ak (Scł	nool)					
Units: U. S. Customa Analysis Year: Project ID:	-	2009						
East/West Street:	Lower	r Kula F	load					
North/South Street: Intersection Orienta		Highway MS	r	St	udy perio	od (hrs)	: 1.00	)
	57 - l	- 1 - 17-1						
Major Street: Appro			mes and thbound		tmentsS	outhbound		
Movem	ent	1	2	3	4	5	6	
		L	Т	R	L	т	R	
Volume	·		279	14	117	264	·····	
Peak-Hour Factor, PH			0.89	0.89	0.91	0.91		
Hourly Flow Rate, HF			313	15	128	290		
Percent Heavy Vehicl	es				,2			
Median Type/Storage RT Channelized?		Undivi	laea		/			
Lanes			1 (	0	0	1		
Configuration			ייד		-	L LT		
Upstream Signal?			No	n.		No		
opouroum orginaa.			110					
Minor Street: Appro	ach	Wes	stbound		Ea	astbound		
Movem	ent	7	8	9	10	11	12	
		L	т	R	L	T	R	
Volume		10		117				
Peak Hour Factor, PH	(F	0.58		0.57				
Hourly Flow Rate, HF	'R	17		205				
Percent Heavy Vehicl	es	2		2				
Percent Grade (%)			0			0		
	ists?/S	Storage		No	/			1
Lanes		0		0				
Configuration			LR					
	•				1.6.0			
	_		-	nd Leve tbound	el of Ser		bound	
Approach Movement	NB 1	SB 4	west	8	9		bound 11	12
Lane Config	T	4   LT	1	o LR	<b>,</b>	10	± ±	12
		<u>п</u> г		111	ا 			·
v (vph)		128		222				-
C(m) (vph)		1232		647				
v/c		0.10		0.34				
95% queue length		0.35		1.56				
Control Delay								
		8.3		13.5				
LOS		8.3 A		в				
LOS Approach Delay Approach LOS								

\_\_\_\_\_TWO-WAY STOP CONTROL SUMMARY\_\_\_\_\_\_

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Analyst:	CL							
Agency/Co.:								
Date Performed:								
Analysis Time Period:	AM Peak							
Intersection:								
Jurisdiction:								
Units: U. S. Customary	,							
Analysis Year:	Year 200	9						
Project ID:								
East/West Street:	Haleakal	a Waldorf I	Jwy					
North/South Street:	Lower Ku	la Road						
Intersection Orientati	on: NS		3	Study perio	d (hrs): 1.00			
		Volumes and						
Major Street: Approac		Northbound			uthbound			
Movemen		2	3	4	5 6			
	$\mathbf{L}$	т	R	L	T R			
Volume	24	49		······································	71 77			
Peak-Hour Factor, PHF		49 76 0.76			0.65 0.65			
Hourly Flow Rate, HFR	0. 31				109 118			
					109 118			
Percent Heavy Vehicles				/				
Median Type/Storage RT Channelized?	0n	divided		/				
Lanes		0 1			1 0			
Configuration		LT			TR			
Upstream Signal?		No			No			
operious orghor.								
Minor Street: Approac		Westbound			stbound			
Movemer	nt 7	8	9	10	11 12			
	$\mathbf{L}$	Т	R	L	T R			
Volume				49	16			
Peak Hour Factor, PHF				$49 \\ 0.41$	0.41			
				119	39			
Hourly Flow Rate, HFR Percent Heavy Vehicles	_			2				
	5	0		2	2			
Percent Grade (%)		0		,	0			
Flared Approach: Exis Lanes	sts?/Stor	age		/ 0	No / 0			
				0	LR			
Configuration					LR			
Dela	ıy, Queue	Length, a	nd Le	vel of Serv	ice			
Approach NE			boun		Eastbound			
Movement 1	4	7	8	9	10 11 12			
Lane Config L1					LR			
(					150			
v (vph) 31					158			
	341				721			
	02				0.22			
	07				0.84			
Control Delay 7.					11.4			
LOS	A				В			
Approach Delay					11.4			
Approach LOS					В			

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TWO-WAY STOP CONTROL SUMMARY

Analyst: CL Agency/Co.: Date Performed: 9/ Analysis Time Period: PM Intersection: Jurisdiction: Units: U. S. Customary	12/2009 Peak (Sc	hool)				
····· · · · · · · · · · · · · · · · ·	ar 2009					
Project ID: East/West Street: Ha	leakala W	aldorf E	)wy			
	wer Kula	Road	-			
Intersection Orientation	: NS		S	tudy peric	d (hrs):	: 1.00
Ve	hicle Vol	umes and	l Adju	stments		
Major Street: Approach		rthbound			uthbound	
Movement	1 r	2	3	4 L	5	6
	L	т	R		Т	R
Volume	15	53			63	59
Peak-Hour Factor, PHF	0.77	0.77			0.71	0.71
Hourly Flow Rate, HFR	19	68			88	83
Percent Heavy Vehicles	2					
Median Type/Storage	Undiv	ided		/		
RT Channelized?		-				<b>_</b>
Lanes Configuration	0 L	1			1 ( Ti	)
Upstream Signal?	L1	No			No	7
		110			1,0	
Minor Street: Approach	We	stbound		Ea	stbound	
Movement	7	8	9	10	11	12
	${\tt L}$	т	R	L	Т	Ŕ
Volume			·	67	·	18
Peak Hour Factor, PHF				0.47		0.47
Hourly Flow Rate, HFR				142		38
Percent Heavy Vehicles				2		2
Percent Grade (%)		0			0	
Flared Approach: Exists	?/Storage			/		No /
Lanes				0		0
Configuration					LR	
Delay,	Queue Le	ngth, ar	nd Lev	el of Serv	vice	
Approach NB	SB	West	bound			bound
Movement 1	4	7	8	9		11 12
Lane Config LT	I			I		LR
v (vph) 19	<u>.</u>					180
C(m) (vph) 1406						774
v/c 0.01						0.23
95% queue length 0.04						0.91
Control Delay 7.6						11.1
LOS A						В
Approach Delay						11.1
Approach LOS						В
			<u> </u>			

• • ? TWO-WAY STOP CONTROL SUMMARY\_\_\_\_\_

Analyst: Agency/Co.: Date Performed: Analysis Time Period: Intersection: Jurisdiction: Units: U. S. Customar Analysis Year: Project ID: East/West Street: North/South Street: Intersection Orientat	Y Projected w/ Lower Kula F Kula Highway	load	Stu	ıdy perio	d (hrs):	1.00
	_Vehicle Volu	umes and	Adjust	tments		
Major Street: Approa	ch Nor	thbound		So	uthbound	1
Moveme	ent 1	2	3	4	5	6
	L	$\mathbf{T}$	R	L	т	R
Volume Peak-Hour Factor, PHF Hourly Flow Rate, HFF	ł	386 0.81 476	10 0.81 12	151 0.87 173 2	283 0.87 325	
Percent Heavy Vehicle Median Type/Storage	undivi			2		
RT Channelized?	Olicitor	.ueu		,		
Lanes		1 0		0	1	
Configuration		TR		L	т	
Upstream Signal?		No			No	
Minor Street: Approa		tbound			stbound	
Moveme		8	9	10   L	11	12
	$\mathbf{L}$	T	R		T	R
Volume			159	<u>_</u>	····	
Peak Hour Factor, PHE			0.58			
Hourly Flow Rate, HFF	28		274			
Percent Heavy Vehicle	es 2		2			
Percent Grade (%)		0			0	
	.sts?/Storage			/		/
Lanes	1	_1				
Configuration	L	R				
	.ay, Queue Ler IB SB . 4   LT	West	d Leve bound 8	l of Serv 9   R	Eastl	bound 11 12
v (vph)	173	28		274		
C(m) (vph)	1075	215		584		
v/c	0.16	0.13		0.47		
95% queue length	0.57	0.45		2.61		
Control Delay	9.0	24.2		16.6		
LOS	А	С		С		
Approach Delay			17.3			
Approach LOS			С			
				<u> </u>		

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TWO-WAY STOP CONTROL SUMMARY\_\_\_\_\_

Analyst: Agency/Co.: Date Performed: Analysis Time Period: Intersection: Jurisdiction: Units: U. S. Customar Analysis Year: Project ID: East/West Street:		w/ proj						
North/South Street: Intersection Orientat	Kula Highw	-	St	udy perio	od (hrs)	: 1.0	0	
	_Vehicle Vo		-					_
Major Street: Approa		orthbound			outhboun			
Moveme		2	3	4	5	6		
	$\mathbf{L}$	Т	R	L	Т	R		
Volume Peak-Hour Factor, PHF Hourly Flow Rate, HFR		279 0.89 313	15 0.89 16	128 0.91 140	264 0.91 290			-
Percent Heavy Vehicle				2				
Median Type/Storage		vided		Ĩ				
RT Channelized?				-				
Lanes		1 0	)	0	1			
Configuration		TF	ł	3	LT			
Upstream Signal?		No			No			
				_				_
Minor Street: Approa	ch W	estbound		Ē	astbound			
Moveme	nt 7	8	9	10	11	12		
	L	т	R	L	т	R		
								-
Volume	11		128					
Peak Hour Factor, PHF			0.57					
Hourly Flow Rate, HFR			224					
Percent Heavy Vehicle	s 2	^	2		0			
Percent Grade (%)		0		,	0		,	
Flared Approach: Exi	-			/			/	
Lanes	1							
Configuration		L R						
·								
ň - 1	ay, Queue L	onath	d torre	l of Com	vice			
	ay, Queue L B SB		bound	I OI Ser		bound		
Approach N Movement 1			8	o	10 East	11	12	
Lane Config	LT	7 L	o	9   R	10	ΤT	12	
Balle Colling	DI I	Ц		K				
v (vph)	140	18		224				_
C(m) (vph)	1231	314		720				
v/c	0.11	0.06		0.31				
95% queue length	0.38	0.18		1.35				
Control Delay	8.3	17,2		12.3				
LOS	A 8	C		12.5 В				
Approach Delay	ъ	L.	12.6	2				
Approach LOS			в					

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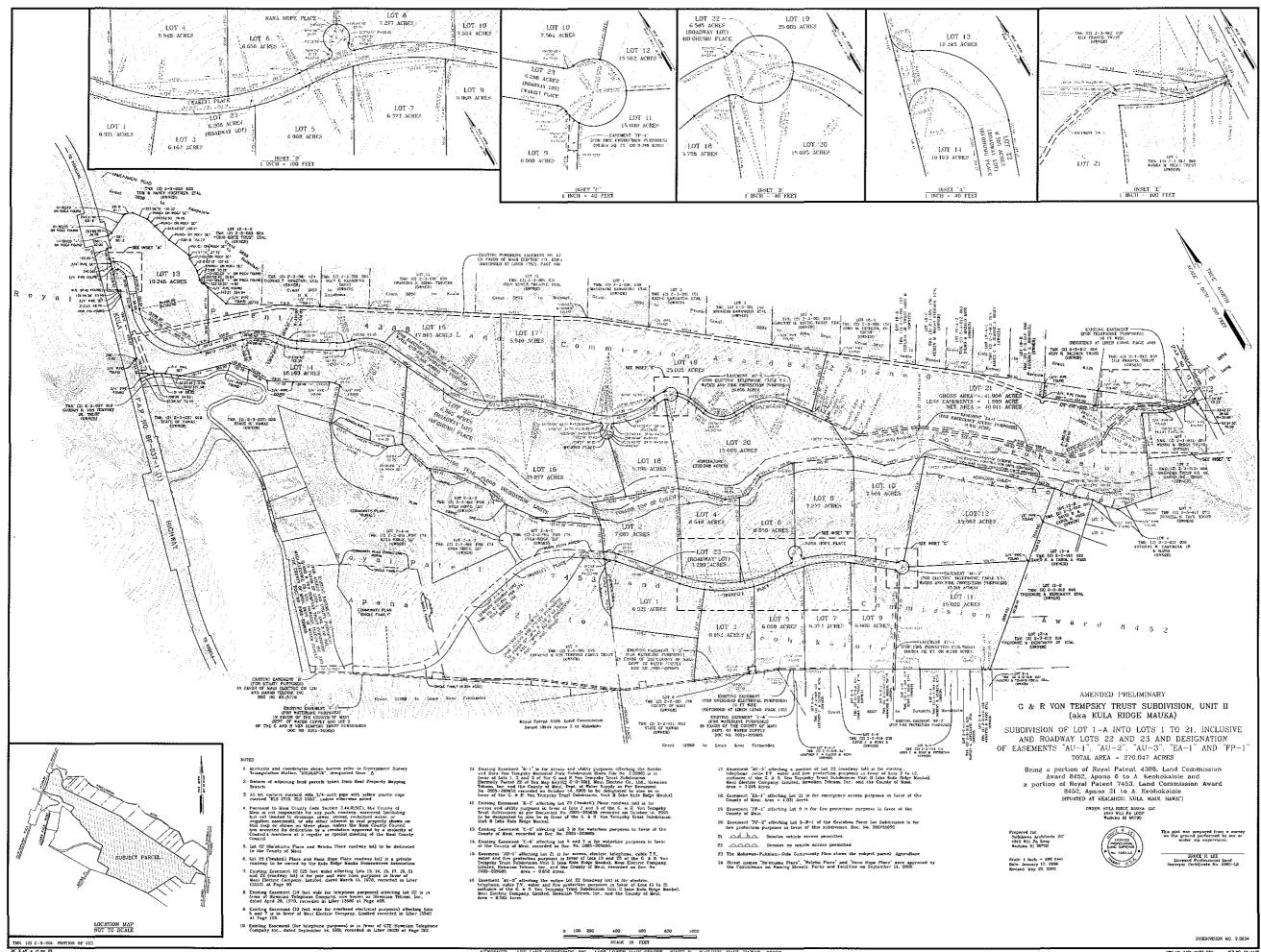
TWO-WAY STOP CONTROL SUMMARY

Analyst: Agency/Co.:	CL										
Date Performed: Analysis Time Period:	9/12/ : AM Pe										
Intersection:											
Jurisdiction: Units: U. S. Customan	ev.										
Analysis Year: Project ID:	Proj	w/pi	roje	ect							
East/West Street:	Halea	kala	Wal	dorf D	wy						
North/South Street: Intersection Orientat	Lower ion: N		a Ro	ad		Stu	dy	period	l (hrs)	: 1.00	)
	Vehic	le Vo	ດໄນທ	nes and	Adi	iust	me	nts			
Major Street: Approa				hbound	-	,			uthboun	d	
Moveme	ent	1		2	3		1	4	5	6	
		L		т	R		]	L	т	R	
Volume		24		117					95	77	
Peak-Hour Factor, PHI	<u>.</u>	0.70	6	0.76					0.65	0.65	
Hourly Flow Rate, HF	ર	31		153					146	118	
Percent Heavy Vehicle	25	2									
Median Type/Storage RT Channelized?		Und	ivid	leđ				/			
Lanes			0	1						0	
Configuration Upstream Signal?			LT	No					T No	R	
opscream signar:				NO	-				140		
Minor Street: Approa	ach		West	bound					stbound		
Moveme	ent	7		8	9		1	10	11	12	
		L		Т	R		I	L	Т	R	
Volume								49		16	
Peak Hour Factor, PH								0.41		0.41	
Hourly Flow Rate, HF								119		39	
Percent Heavy Vehicle	es							2		2	
Percent Grade (%)				0					0		
Flared Approach: Exi	ists?/9	Storag	ge				/			No	/
Lanes Configuration								0	LR	0	
Da	lay, Qu		Tom		- ۲ آه	1	~	f Com-	100		
	Iay, Qu NB	sB	nend	ytn, an West			0	r serv		bound	
	L	4	1 7		8		9			11	12
	1T							i		LR	
v (vph)	31									158	
	L300									624	
	D.02									0.25	
	0.07									1.01	
	7.8									12.7	
LOS	7.0 A									в	
Approach Delay										12.7	
Approach LOS										в	

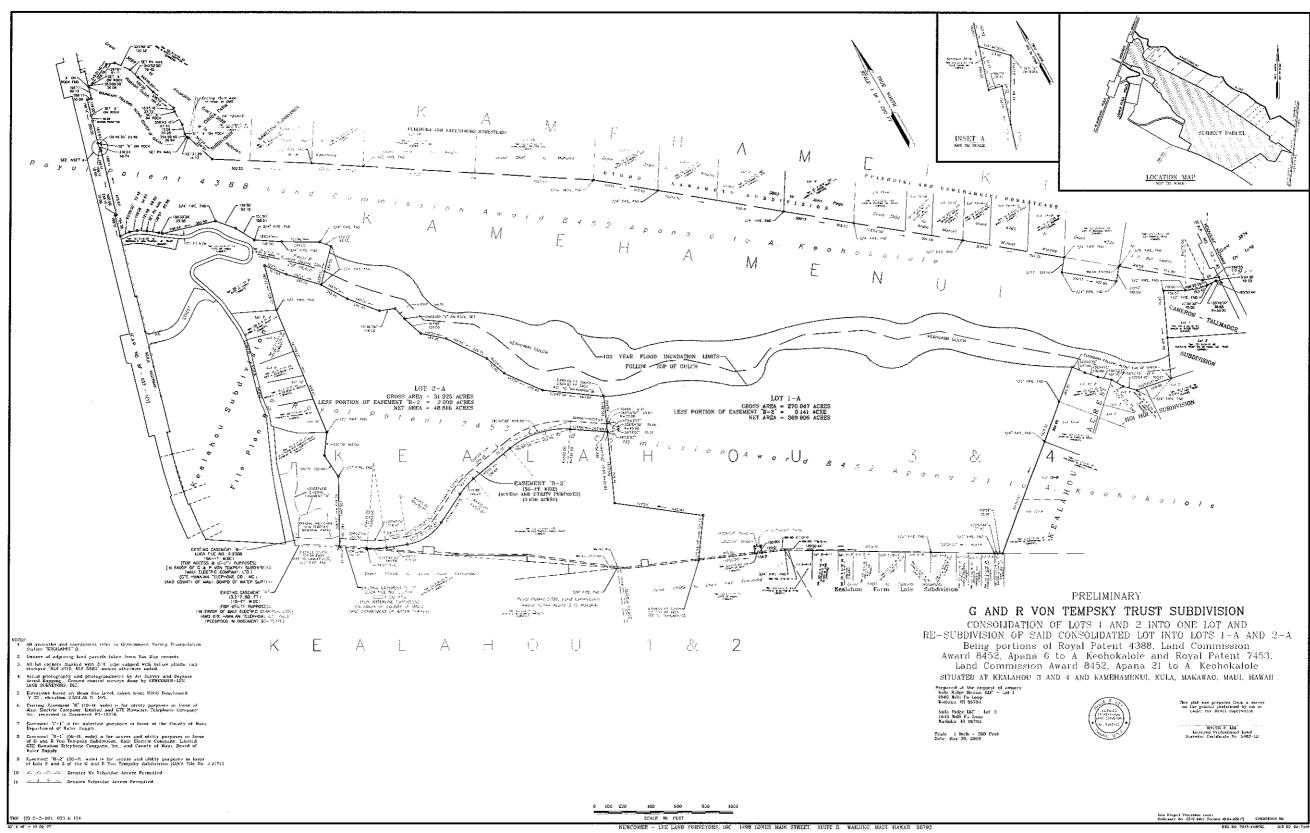
\_TWO-WAY STOP CONTROL SUMMARY\_\_

Analyst: CL Agency/Co.: Date Performed: 9/12/2009 Analysis Time Period: PM Peak (School) Intersection: Jurisdiction: Units: U. S. Customary Analysis Year: Projected w/ project Project ID: East/West Street: Haleakala Waldorf Dwy North/South Street: Lower Kula Road Intersection Orientation: NS Study period (hrs): 1.00 \_Vehicle Volumes and Adjustments\_ Northbound Southbound Major Street: Approach 2 4 5 Movement 1 3 6 т L т R L R 75 59 Volume 15 65 Peak-Hour Factor, PHF 0.77 0.77 0.71 0.71 Hourly Flow Rate, HFR 19 84 105 83 Percent Heavy Vehicles 2 \_ \_ ------Median Type/Storage Undivided **RT** Channelized? Lanes 0 1 1 0 Configuration LTТŔ Upstream Signal? No No Minor Street: Westbound Eastbound Approach 7 9 10 11 12 Movement 8 L т R  $\mathbf{L}$ Т R Volume 67 18 Peak Hour Factor, PHF 0,47 0.47 38 Hourly Flow Rate, HFR 142 Percent Heavy Vehicles 2 2 Percent Grade (%) 0 0 Flared Approach: Exists?/Storage No 1 1 0 Lanes 0 Configuration LR \_Delay, Queue Length, and Level of Service\_ Approach NB SB Westbound Eastbound Movement 1 4 7 8 9 10 11 12 Lane Config LTLR. 19 180 v (vph) 744 C(m) (vph) 1386 0.24 0.01 v/c 0.04 0.95 95% queue length Control Delay 7.6 11.4 LOS в А 11.4 Approach Delay в Approach LOS

# 10. KULA RIDGE MAUKA SUBDIVISION MAP AND KULA RIDGE CONSOLIDATION MAP



- LEE LAND SHEWEVORS 1498 LOWER MAIN STOPPET SHITT ATTIKE MATH VAWAL OC



# 11. REVISED SECTION 201H-38, HAWAFI REVISED STATUTES EXEMPTIONS

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# PROPOSED REVISED EXEMPTIONS FOR AFFORDABLE HOUSING SUBDIVISION PROPOSED SECTION 201H, HRS, EXEMPTIONS FROM THE MAUI COUNTY CODE ("MCC")

## A. <u>EXEMPTION FROM TITLE 2, MCC, ADMINISTRATION AND PERSONNEL</u>

- 1. An exemption from Chapter 2.80B, MCC, <u>General Plan and</u> <u>Community Plans</u>, shall be granted to permit the project without obtaining a general plan and community plan amendment.
- 2. An exemption from Chapter 2.96, MCC, <u>Residential</u> <u>Workforce Housing Policy</u> shall be granted for the project in accordance with Section 2.96.030.B.6, MCC.

## B. EXEMPTION FROM TITLE 14, PUBLIC SERVICES

1. Exemption from Chapter 14.74, <u>Impact Fees for Traffic and</u> <u>Roadway Improvements in Makawao-Pukalani-Kula, Maui,</u> <u>Hawaii</u>, to exempt the project from traffic impact fees should such fees be adopted prior to the issuance of building permits for the project.

## C. <u>EXEMPTIONS FROM TITLE 16, MCC, Buildings and Construction</u>

1. Exemptions from MCC Chapters 16.04A, <u>Fire Code</u>, 16.18A, <u>Electrical Code</u>, 16.20A, <u>Plumbing Code</u>, and 16.26, <u>Building Code</u>, shall be granted to exempt the project from fire, electrical, plumbing, building permit fees and demolition permit fees, as well as inspection fees.

## D. <u>EXEMPTIONS FROM TITLE 18, MCC, SUBDIVISIONS</u>

- 1. Exemptions from Section 18.04.030, MCC, <u>Administration</u>, and related land use consistency requirements of Title 18, shall be granted to exempt the project from obtaining a change in zoning and community plan amendment to enable subdivision approval.
- 2. An exemption from Section 18.16.320, MCC, <u>Parks and</u> <u>Playgrounds</u>, shall be granted to allow the 3.0 acres of park land and accompanying comfort station within the project to satisfy the park dedication and assessment requirements.

3. An exemption from Section 18.16.050 MCC, <u>Minimum Right-of-way and Pavement Widths</u>, shall be granted to allow <u>24</u> ft. right-of-way and <u>20</u> ft. pavement widths for private streets within the subdivision.

## E. EXEMPTIONS FROM TITLE 19, MCC, ZONING

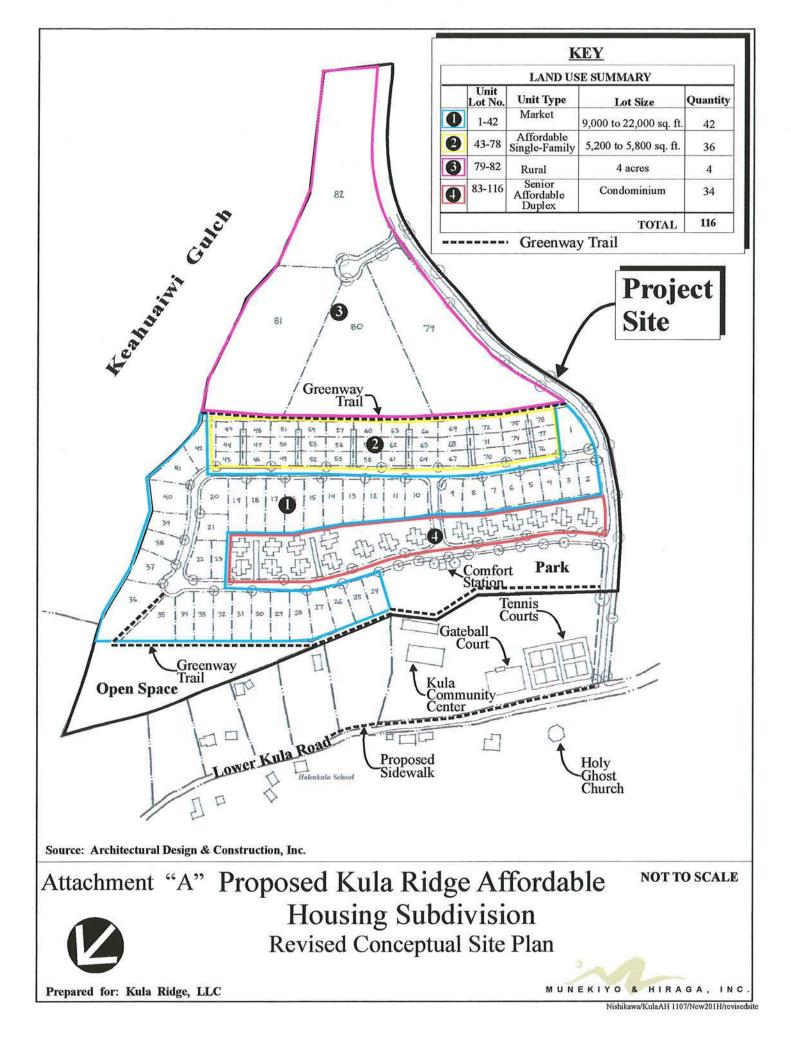
1. An exemption from Chapter 19, MCC, shall be granted to permit the development and use of the parcel for singlefamily, duplex, and rural residential purposes, including supporting infrastructure requirements. Further, this exemption shall allow the subdivision of the property in the plat configuration shown in Attachment "A". The following zoning standards shall apply to the proposed lots:

## Affordable Lots

Minimum Lot Size .		!	5,000 square feet
Minimum Lot Width .			60 feet
Front Yard Setback			10 feet
Zero Lot Line	. In conform	ance w	ith R-0 Standards
Access Yard Setback	Line		15 feet
Other Setback Lines		(	5 feet at 1-story
Height	No building	shall e	exceed 1-story or
	24 feet	in heig	ght from finished
	g	rade of	f the subdivision

## Duplex Standards

Minimum Lot Size
(There may be more than one duplex dwelling on any lot,
provided that there is not less than 7,500 square feet
for each two-family dwelling (duplex).)
Minimum Lot Width
Front Yard Setback
Side Yard Setback 6 feet at 1-story
Rear Yard Setback
Height No building shall exceed 1-story or
24 feet in height from finished
grade of the subdivision



## Market Lots

height from finished grade of the subdivision.

## F. EXEMPTIONS FROM TITLE 20, MCC, ENVIRONMENTAL PROTECTION

1. An exemption from Section 20.08.090, MCC, <u>Grubbing and</u> <u>Grading Permit Fees</u>, shall be granted to exempt the project from payment of grading, grubbing and excavation permit fees, as well as inspection fees.