HoKua Place
Section 343-5e HRS Draft
Environmental Impact Statement
Volume II

Prepared for:
Accepting Authority
State of Hawai'i Land Use Commission
&
Petitioner
HG Kaua'i Joint Venture LLC

Prepared by:
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... to take responsibility ...

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Volume II

HoKua Place Draft EIS

Exhibits

Comments - Responses to EISPN

Exhibit A

Kapa‘a Housing Market Study

I. INTRODUCTION

The Data@Work is a market research firm that specializes in analyzing residential real estate markets for developers and lenders. We have been retained to perform a study analyzing the market for proposed master planned community on the island of Kauai, called Kapaa Highlands.

This study focuses on the historical and projected market conditions and trends in accessing the ability of the project to be successful in selling its residential properties at a price and at a velocity. The study entailed collecting, comparing and analyzing information that has a bearing on the numerous aspects of market demand for the proposed project, including but not limited to publicly available real property, economic and commercial data.

The author makes every effort to verify that all of the information in study and in particular the market description and analysis is accurate, but is aware that 100% accuracy is unlikely. Finally, the analysis and statements herein are based on independent research by the author.

II. PROJECT DESCRIPTION & STUDY OUTLINE

Project

Kapaa Highlands is a master planned project on the Island of Kauai targeting primary housing demand from local and in-migrant families, as well as offshore second home demand for view estate ownership. It sits above the historic town of Kapaa and below the foothills of the mountain chain that forms the island. It is equidistant from the two major resorts on the island (and at the center of the third, the Coconut Coast). Thus, it is at or close to the centers of employment and commercial activity.

As Kapaa is arguably at the center of the island, the target market for this development will be spread across a wide range of households, but mainly appealing to local families looking for reasonably priced housing that is well-located with regard to the centers of employment in the county, as well as to a good range of shopping, recreational and social facilities.

The development contains a portion of the Kapaa bypass road, a major arterial road adjacent to the property. As such, the property is accessible from three sides and is adjacent to already improved county roads. Furthermore, the property has no significant restraints relative to adequate water availability and wastewater. Finally, the Kapaa Middle School is located adjacent to the property and adds to the attractiveness of the site to the local population.

KAPAA HIGHLANDS PRODUCT MIX AND SALES PROJECTION

Product	Units
House Lot Packages, On Large Lots (10,000 sf)	36
House Lot Packages, On Medium Lots (7,500 sf)	50
Multi-Family Dwelling Units (4 Plex, 8 DU/Ac)	500
Affordable Housing Dwelling Units (12 DU/Ac)	183

The units described above include condominiums (Multi-Family pads and Affordable Housing) and single-family homes (House Lot package).

[Note that some of the House/Lot package units may be sold as home sites, depending on future demand and market conditions].

The condominium units will be designed in a range of bedroom configurations that will best meet the demand for housing by providing designs that apply to different family types, including starter families, empty nesters, families with children, and households that qualify for affordably priced housing.

The design of the single family units will appeal to some of those in the aforementioned condominium demographic groupings, but will go further by addressing the needs of large families, families wanting to be close to the Middle School, trans-generational families needing adequate (read larger and more defined) living space, and professional families or those with multiple wage-earners.

The design of the condominiums could include stacked flats and townhomes, both of which have cost and livability advantages. They will located in multi-unit buildings (four and six-plex, etc.) and laid out in a way that will be taking advantage of the site's benefits: including those of the ocean views, the cooling winds, the warming sunlight, etc. Their density would range from 8 to 12 units per acre.

The single-family units will be designed to take advantage of the area topography, as well as wind and sun direction and views. By having two different lot sizes allows for the land plan to address two demographics: the smaller lot size units would be most appropriate to starter families, and larger lot size units would be appropriate for larger families and multigenerational households.

It is worth being mindful that, generally speaking, the high cost of housing production in Hawaii, and Kauai in particular, often pushes housing prices beyond what local families, particularly workforce families, can afford. To counter that, often Kauai home purchasers include a number of income earners into the purchase, both family members and non-family members. It is this market demand segment that the larger lot size and house size units will address.

In keeping with the county's affordable housing requirement, the requisite number of units will be produced and priced according to the existing income guidelines when marketed. The current affordable requirement is 30%, and the fulfillment of that will be a benefit to the local families seeking better housing or a more convenient location.

Additionally, while the market homes will be priced to the market, and done so at the time of the start of construction, they will also be more affordably priced, relative to much of the new construction on the island. This is because the large size of the overall development (750+ units) is conducive to achieving construction economies of scale, both for infrastructure and vertical construction - which can be passed on to the consumer.

Further, these homes and condos will also be designed with the needs of local families in mind, as opposed to the offshore buyer market. This will thus 'lessen' the overall demand for them, resulting in a more moderate price point. This stands in contrast to many other new home construction projects and developments on the island and in the state, which seek to address the needs of the offshore buyer (and are priced accordingly higher).

Finally, it is important to note that this development will benefit those in the community who will not be purchasing here, but who nonetheless are in the market for affordable housing. This is because this, or any, provision of new housing acts to soften the pressures that push housing prices higher – national and local studies and data has shown that the supply of new housing into an existing market place results in a moderating trend in prices.

Study Outline

In an effort to evaluate the proposed project, the study will begin by describing the area, the housing stock and the economy. It will take account of the economic factors and trends that affect housing relative to the county and to the proposed project. Thereafter, it will describe the housing market in general, and in particular to this project. In doing so, it will describe and analyze the factors and trends behind the general and specific supply and demand for housing. And it will summarize the findings and finish with some concluding remarks and expectations.

III. OVERVIEW of COUNTY and MARKET

Subject Property's Community

Kauai County is the fourth largest county in the state, as ranked by population and economic activity, behind the City & County of Honolulu (Oahu), Maui County and the Big Island of Hawaii.

The majority of the island's roughly 52,000 residents lives and works in the coastal areas leaving the interior of Kauai natural and pristine. Kauai's weather is near perfect year round with daytime temperatures ranging from the mid 70's to the mid 80's, slightly warmer in the summer. The northeast trade winds average about 15 mph for most of the year, and provide refreshing breezes. Rain showers usually fall in the evening and early morning hours, predominantly over the mountain ranges. The temperature of the ocean ranges from 68 to 80 degrees Fahrenheit.

It has one of the strongest brands in the global visitor industry, as well as arguably the most diversified visitor industry of any of the islands, combining large resort master planned communities, cruise ship visitations, time share developments and small-scale bed and breakfasts.

The breadth and depth of this economic base, like the rest of the state, rests on the county's economy's unique comparative advantage relative to the other visitor destinations world-wide: it has a very high quality of life, a function of a naturally beautiful setting, with a benign environment and near perfect climate. Indeed, the proof of its attractiveness can be found in the quality of the number of 'rich and famous' who have bought in Hawaii, starting with Lawrence Rockefeller in 1960 (followed by John Wayne, George Harrison, Peter Gruber, Charles Schwab, Michael Dell, Ben Stiller, Oprah Winfrey, Akio Morita, Michael Creighton, etc.)

Kauai has three major resort destinations:

- **Princeville**, a 45-minute drive from the Airport, is a resort that runs across a large plateau overlooking one of the largest deep-water bays in Hawaii. The view of the sunset, looking west, is extraordinarily beautiful.
- **Poipu**, also a 45-minute drive from the airport, sits above the south shore, with numerous bays and beaches safe for swimming. It has the largest concentration of hotels and golf courses on the island. .
- **Coconut Coast**, a 20 minute drive from the airport, this area was the favored area of Hawaiian royalty and the original site of resort development on the island and, save for Waikiki, the state. It today hosts one of the largest percentage of accommodations, shops, recreation, restaurants and historical sites on the island.

The majority of the primary housing development is located within the Kapaa and Lihue urban zones, with secondary sources located areas in and around Poipu, Kilauea/Hanalei, and Hanapepe and Waimea. Second home development is located within and around the three major resort communities, as well as in locations that are close to the coastline and/or in westward facing locales).

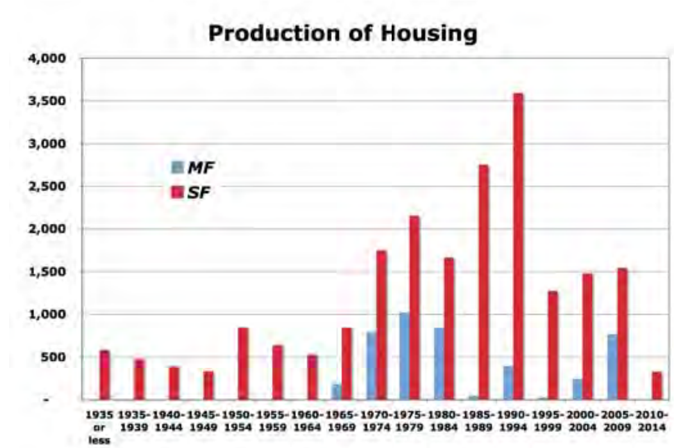
Subject Property's Housing Stock

Most of the primary housing inventory and on-going development is located within the Kapaa and Lihue urban zones. Primary housing is also concentrated, but to a lesser degree, in and around the communities of Poipu, Kilauea/Hanalei, and Hanapepe and Waimea.

Since the 1990s, Kauai's housing stock has grown faster than the population, as measured by the average annual growth rate for dwellings: it grew by 3.5% p.a. between 1990 and 2000, the highest in the State. The growth rate dropped to around 1.7% over the 2000-2010 period. Many of these new units have been targeted for the visitor or second home industry.

For instance, in 1990, the percentage of occupied housing units was about 92.5% of the county's total housing stock. By 2006, according to the Hawaii Housing Study, that dropped to 76.2 percent, the greatest rate of change among the four counties. Since 2006, however, there has been a reversal of that trend, with the percent of housing stock being build for primary homeownership has increased to 89.6%.

By way of context, housing development and construction was most active on Kauai during the time when the major resorts were developed in the 1970 and 1980s. Thereafter, primary housing production reached only half that level, save for periods of housing reconstruction that followed a major hurricane event.



In the years after the establishment of the resorts, there was a boom in condominium production, but many of these projects that were developed targeted the offshore buyer market. TMK records

show that over 70% of the condo units and 12% of the single-family homes are owned by out of state residents.

Census records have shown that a quarter of the County's housing stock did not house residents in 2000. Thus, while the Census categorizes these units as "vacant," they may be actually rented to vacationers, reserved by owners as a second home, or both. Demand in the housing market hence comes from residents, investors, and non-residents.

As a result, the average prices for housing units are skewed upwards and do not necessarily reflect residents' ability to pay for housing. Kauai housing stock is 78% owner occupied and 22% vacant, per their definition (it includes seasonal or recreational use, which itself constitutes 64% of all vacant units, with rental units constituting 20% of that total).

Indeed, housing inventory shows that about 3,000 of the 4,000 condominium units in the county, or 73%, are owned out-of-state. This would account for the high prices of condos in the county, the second highest in the state. Median resale price this May 2013 for a condo on Kauai is $323,000.

HOUSING CHARACTERISTICS OF THE MARKET

Kauai County	Units
Occupied housing units	23,051
Owner-occupied housing units	13,968
Renter-occupied housing units	9,272
Vacant housing units	6,553
For rent	1,312
Rented, not occupied	61
For sale only	251
Sold, not occupied	51
For seasonal, recreational use	4,172
All other vacant units	706
Homeowner vacancy rate (percent)	1.8%
Rental vacancy rate (percent)	12.3%

Note that the homeowner vacancy rate is low but the rental vacancy rate is high. This is indicative of a community that has high priced houses – therefore the homeowner vacancy rates are low. Additionally, as it is a very desirable place to live, there are a lot of rental units for vacation rental – and therefore the rental vacancy rate is high.

HOUSING CHARACTERISTICS OF THE MARKET, BY AREA

	Waimea	Koloa	Lihue	Kawaihau	Hanalei	Total
Detached Home	2,270	4,843	4,706	5,212	2,013	19,044
Townhouse	57	128	142	36	113	484
Condominium	0	195	326	190	366	1,082
Duplex/multiplex	85	201	24	142	22	484
Apartment	328	139	564	202	185	1,428
Co-op	0	67	107	0	0	184
Other/Not	0	179	65	148	52	345
	2,739	5,752	5,935	5,930	2,751	23,051

Note that the area of the proposed development is Kawaihau, highlighted in blue, and that area has very few dwellings that are attached units (condo, townhouse, etc.).

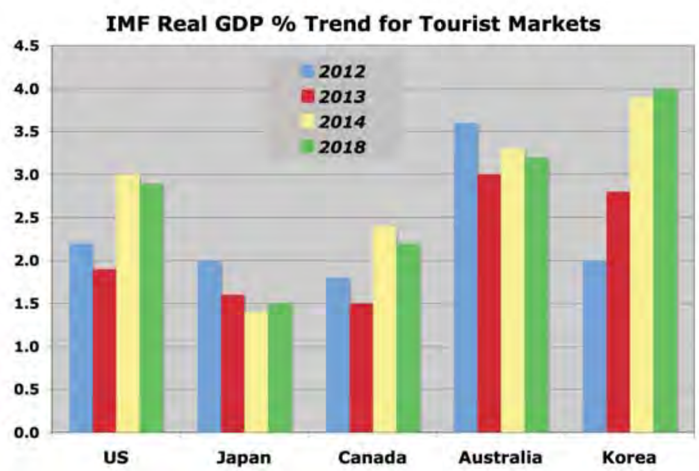
IV. THE ECONOMY

Simply put, residential for-sale and rental values move closely in synch with an area's economic growth, and economic growth is determined in the short run by the balance of trade between the area and it's major trading partners. And the mechanism by which this growth in values occurs is via rising incomes and higher job counts. We start by looking at the economic outlook for the state and the county. As the major industry is tourism, the county's significant visitor sources would be the US, Canada and Asia

As such, we look at the economic trends in all three sources.

GLOBAL ECONOMY:

The overall global economic forecast by the IMF earlier this year noted that the recovery had solidified, but the unemployment remained high. It said global financial risks have shrunk, including the chance of a fallback in economic activity (a double dip).

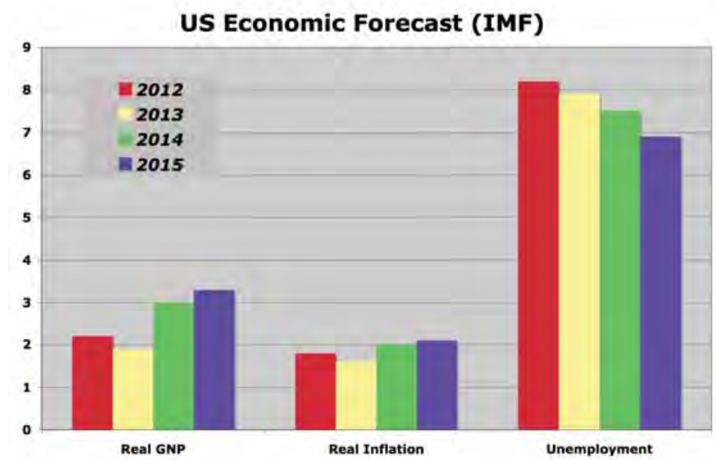


If the advanced economies continue to repair their public and financial balance sheets, and stimulate employment, and if emerging markets do not overheat their economies, global financial markets and property markets will stabilize and grow.

UNITES STATES:

The US economy is projected to grow by 3 percent in 2014, as firmer private final demand takes the burden to stimulate the economy off of federal fiscal policy. More and more, the risks to the economic outlook are abating: the recovery in housing prices and the slight growth in the job

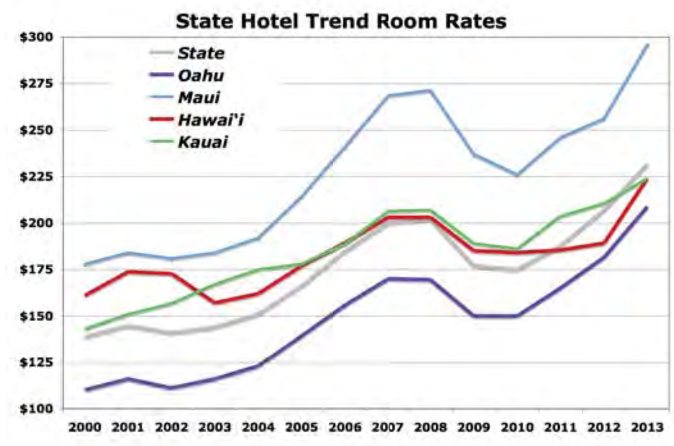
market are big positives looking ahead. Given the slack in the economy, inflation is expected to remain subdued, but with a rise in the interest rates in the cards.



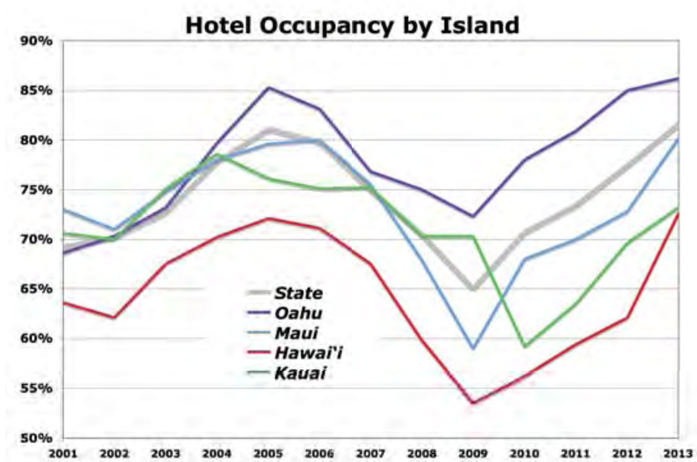
Looking ahead, the US economy will be on the rise. That, plus the perception of a growing economy, should be sufficient to grow the Hawaii state and the Oahu county economies. As an improved US economy is manifested in terms of higher visitor industry revenues, this commensurate growth in state economic activity will then put pressure on housing, via higher job counts (immigration) and incomes.

HAWAII STATE:

According to the state economic forecasters, Hawaii's economy continues to grow strongly in 2013 at an accelerating rate. The state has very low unemployment relative to the rest of the nation, thanks to a resurgent demand in the visitor industry, which is the major engine of economic growth in the county and the state (as seen below).

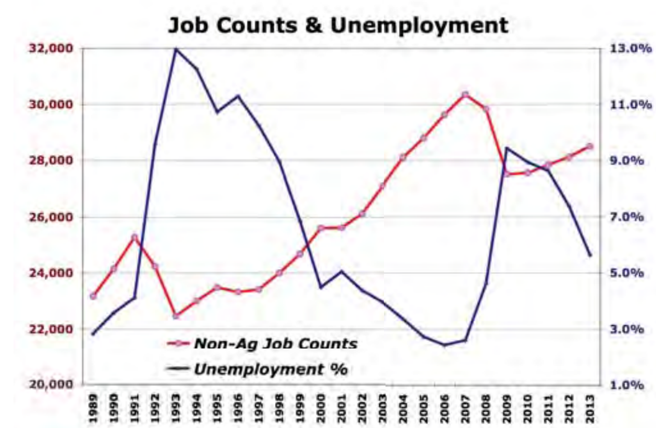


Historically, Hawaii's economy follows those of the Pacific Rim countries, which bodes well for the future.



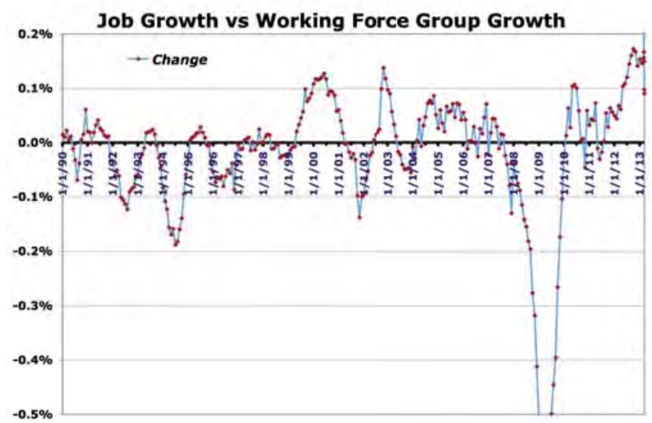
KAUAI:

Kauai is enjoying economy growth again, thanks to a resurgent demand in the visitor industry, which is the major engine of economic growth in the county and the state (as seen in job counts rising and unemployment rates falling).

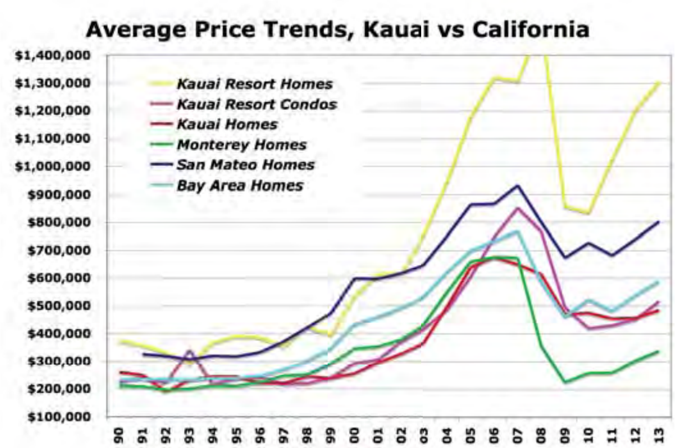


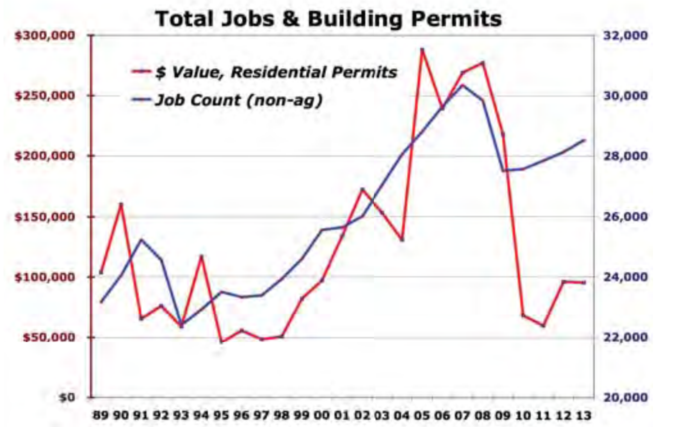
Going forward, Kauai will begin to experience tight labor conditions, with immigration occurring in order to meet rising job growth. Indeed, this is happening already, as seen next.

This chart shows that the recent growth in jobs is outpacing the natural growth in the workforce, i.e., population growth. Thus, in-migration will occur (which leads to increased housing demand).

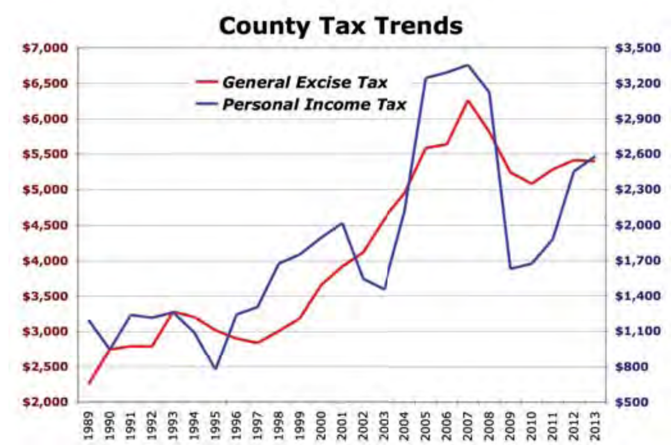


Housing demand will also grow thanks to offshore demand. As seen, when California's residential markets improve, prices (demand) for second homes in Kauai also rises.





Finally, Kauai's economy and real estate market are closely tied, as an increase in one leads to an increase in the activity of the other (per the following chart). In sum, economic indicators look to growth for the island's residential market.



V. HOUSING MARKET

Overview: Much like the state, Kauai's residential real estate supply is inflexible and constrained, but to a greater degree – the cost constraints are even tighter (higher costs of transporting material inputs to a remote locale, plus of sourcing labor in a small community), and the political climate there is generally unfavorable to housing development, particularly at the high end and/or in areas that are highly visible (but decidedly less so, relative to affordable and senior housing, as well as work force housing, which this project is proposing).

At the same time, demand for residential real estate is both flexible and strong, particularly in good economic times and over the long run. It can be, and is currently, constrained to an uncharacteristic degree, thanks to havoc in the financial markets the last few years and the drastic fall off in economic activity globally and nationally.

The first condition, limited supply, arises due to Kauai having a very small landmass, coupled with inadequate infrastructure and challenging geographic conditions (atop the aforementioned political, social and legal impediments).

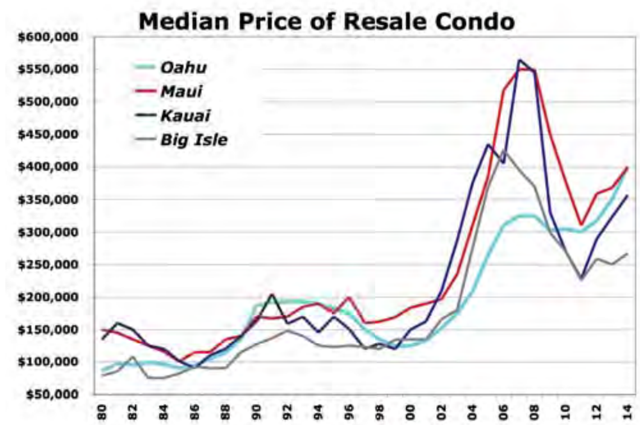
The second starts with the very high quality (defined a high quality of life, in terms of being a place that is environmentally safe, aesthetically pleasing, socially accommodating, politically stable, etc.). This is coupled by a deep and broad appreciation of that lifestyle by very large population accustomed to visiting the island (mainly West Coast and East Asia), which has one of the highest rankings in brand awareness and acceptance.

In combination, this results in a market that can dramatically volatile, up and down, in terms of sales and, to a lesser extent, prices. We note that in the past cycles, prices have been relatively 'sticky' downward, i.e., generally holding on to accumulated values. In this cycle, however, the price appreciation was so extensive and lasted so long, that the ensuing price depreciation during the down cycle has also been extensive.

Currently, Kauai's residential markets are now at the beginning of the up-cycle. The question is, going forward, how long this will last. The rule of thumb for the residential market is that the upswing in the cycle, the up cycle, generally lasts about 6.5 years, and is about twice as long as the down cycles. In addition, the up cycle, through to peak, results a tripling of the number of closings.

For the condo market, the up cycles last about 7 years, almost more than twice as long as the down cycles. In addition, the movement trough to peak of closings can be 300% or 400%, while for prices, it can be 400% or higher (note that this condition is not just particular to Kauai, but to all the neighbor islands).

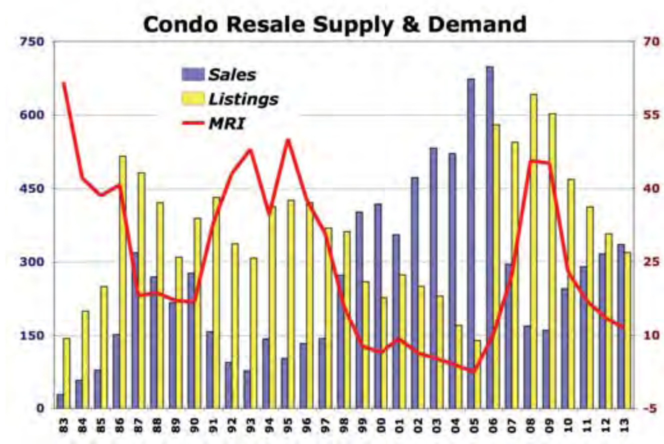
The following charts illustrate this, starting with price appreciation trends.



For the condo market on Kauai, the one that relates to this project, the up cycles last about 7 years, almost more than twice as long as the down cycles.

Next, we describe the balance between supply and the demand using sales and listings island-wide for condos, as well as the indicator showing the balance between the two, MRI or Months of Remaining Inventory.

Right now, the MRI trend is declining, per the growth of sales and shrinkage of listings, indicative of a tight market. A normal reading is between 8 and 12 months, with the two balanced.

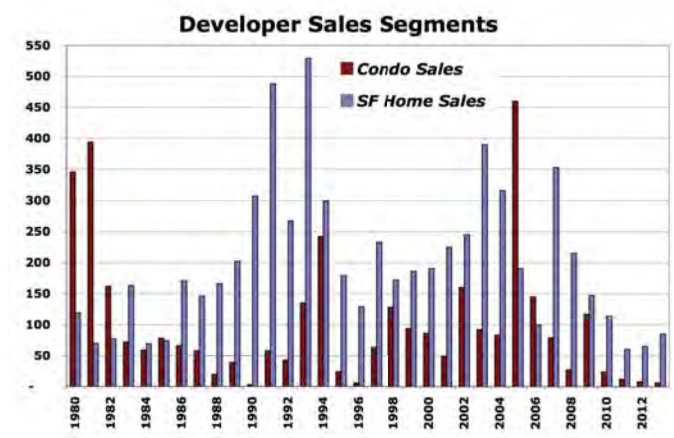


Looking ahead, we assume that the sales will continue to grow (as a function of low interest rates, plus the spread of the economic recovery in the areas where buyers of Kauai real estate reside (basically on Kauai, plus on the west coast of North America).

In this case, the proper market response to tight supply is for sellers to raise their prices. As seen in other charts, this has already started two years ago, and continues this year as well.

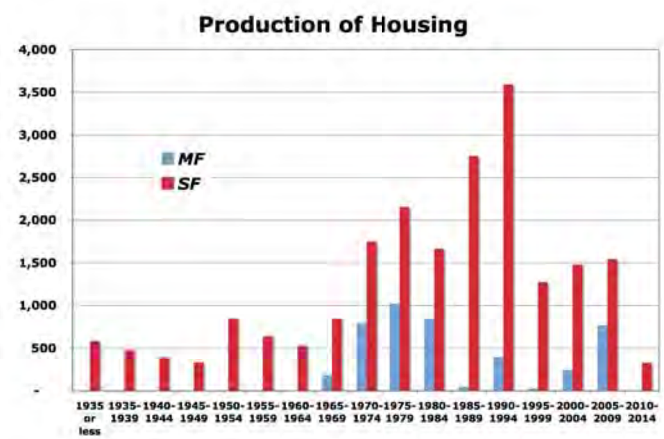
The following chart shows the price trend over the last 32 years for the four basic housing products: single-family resales and developer (newly construct4ed) sales, plus condominium resales and developer sales. As seen, the price trend over the last four years has been down, with the recovery taking hold first with single-family product, followed by condos.

Next, we look at the market for developer sales. As seen in the next chart, the level of new housing production is at a historic low. This is a condition of scarcity and it leads to price movement to the upside.



When that happens, the general public will get a sense that there is a housing shortage, and pressure will be brought politically to increase the supply of affordable housing. In and of itself, that will help to alleviate the demand existing for affordable rental units. That said, it is likely that the demand for reasonably priced housing will vastly outpace the supply.

Another way of seeing this is the long-term production of housing chart. Not only has housing production been low of late, but this also says that the current stock of housing is old, and dated.



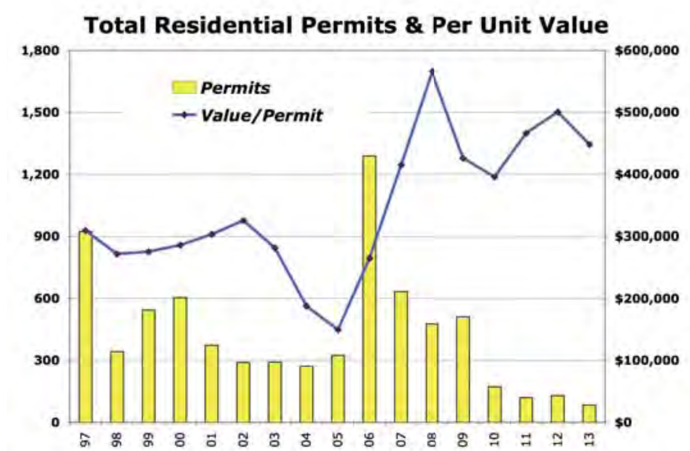
VI. FUTURE KAUAI HOUSING SUPPLY

PERMITS

The easiest way to look ahead to where the housing market is going in the short-term is by examining the activity in permits (where developers apply for permission, and pay their fees, for building residential units). A high level of activity indicates more supply is in the works, which means that more demand will be met, and the potential for prices adjusting downwards. With less supply in the works, prices will feel pressure upwards (and higher prices in the future, when demand recovers).

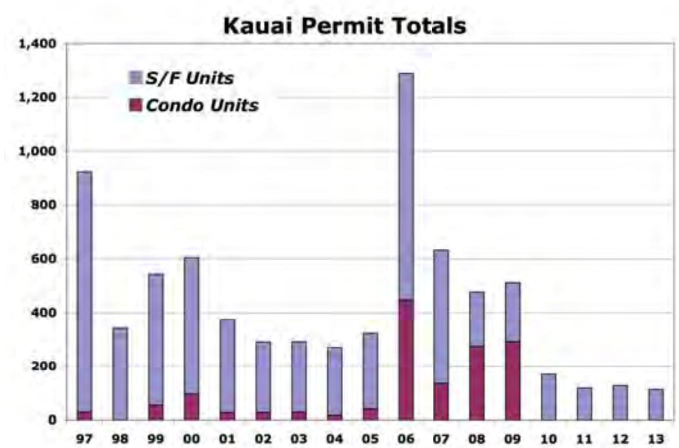
In addition, low levels of per unit value indicate that the units being built are for the lower end of the market (and vice versa). And, this has not been the case overtime on Kauai, indicating that most of the new housing has been targeted on the upper income end of the housing market.

An overview of the TOTAL RESIDENTIAL PERMITS AND VALUES Chart shows that the number of permitted units has sunk so low that it is at an all-time historical low. On the other hand, the value per permitted unit is at a record high.

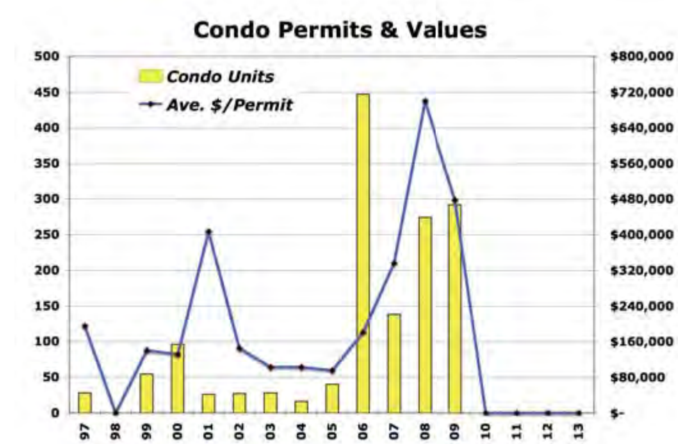


Note that the 2013 data is extrapolated, using actual data through April 2013.

The following chart shows the actual breakdown between condos and single-family homes.



As seen, the number of permits is very low – caused mainly by the condo market.



VII. HOUSING DEMAND

The prime determinant of housing demand is household formation, itself is a function of the economy and demographic and social trends. As noted above, in the short term, residential housing demand is driven by economics – specifically of job creation/income growth, as well as interest rate trends.

Incomes to buy homes, and they drive immigration, which is a prime source of housing demand (sometimes linked to population growth). This linkage is best illustrated in the RESIDENTIAL SALES & JOB GROWTH Chart.

Note how closely the two trends track one another, up until the 2004-2005 period, when high prices prevented many families from buying a house. This then shows how the lack of housing supply on an on-going basis drives prices higher, and thus lowers the sales of homes.

Further note, the gap that has opened up between the two trends starting in 2005. In previous recessions, a similar pattern occurred, with the sales of homes (blue line) picking up during the recovery. This was because a lot of families doubled up (multiple families living in one dwelling) during the recession. Thereafter, they took the economic gains they made in the recovery and invested it in housing. This will be happening in the next few years.

If the subject property were under construction, then this unmet housing demand would turn to this project as a source of housing supply.

VIII. HOUSING DEMAND POTENTIAL & PROJECTION

JOB GROWTH TO HOUSING DEMAND: In the tables below, we describe DBEDT's predictions for wage and salary job creation on Kauai for the next 10-15 years, and derive from that a general expectation for housing demand over the next five to ten years (in other words, we will translate it into housing demand). Note that the model* used here ran from 2007, but was updated in 2009

HOUSING DEMAND, FROM DBEDT'S 2035 JOB FORECAST FOR WAGE & SALARY JOBS

	2007	2015	2020	2025
Total civilian wage and salary jobs	44,077	46,900	49,500	51,900
5 Year Growth		2,823	2,600	2,400
Annual Job Growth		565	520	480
Annual Housing Demand (1.75 Jobs: 1 Home)		332	306	282

*(http://hawaii.gov/dbedt/info/economic/data_reports/2035LongRangeSeries/LRFreport_2035series_revised_Aug09.pdf)

As seen, we use the annual changes in job counts to derive housing demand on the premise that it will take an average of 1.75 new jobs to generate demand for one new house.

However, the job counts used in the charts and tables above are just the number of wage and salary jobholders, and do not encompass the self-employed or home worker. According to DBEDT's projections, self-employed workers consist of about 20% of the total work force, but are growing to 25% in the next ten to twenty years. As such, we want to add this demand for housing into our projections.

The following transforms those projections into annual job growth projections, and then summarizes it in a complete DBEDT projection table.

HOUSING DEMAND, FROM DBEDT'S 2035 JOB FORECAST, SELF-EMPLOYED

	2007	2015	2020	2025
Annual Housing Demand (1.75 Jobs: 1 Home)		332	306	282
Self Employed Housing Demand (15% of total)		33	31	28
Total Annual Housing Demand		365	336	311

Finally, we want to take into consideration offshore demand, relative to housing demand. Studies have shown that this demand varies from a low of 15% on Oahu to a high of 60% on Maui. For Kauai and our purposes here, we use a very conservative factor of 20%. Thus, the total amount of housing demanded in the future should see an increase of another 20%. The following table shows this:

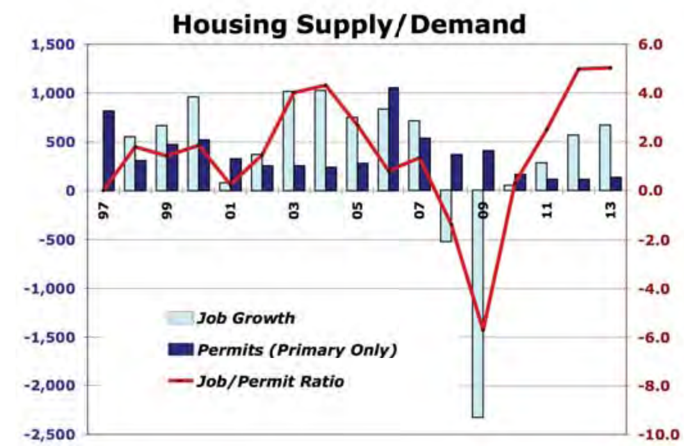
HOUSING DEMAND, FROM DBEDT'S 2035 JOB FORECAST PLUS OFFSHORE DEMAND

	2007	2015	2020	2025
Total Annual Housing Demand		365	336	311
Offshore Buyer Housing Demand (20% of total)		66	61	56
Total Annual Housing Demand		431	397	367

Note that the average number of residential permits taken out in the last five years for the county is 373 units p.a., but the average over the last 2 years (projecting 2011 using YTD numbers through September, is 125 units, p.a.

In sum, housing production in the past has not satisfied housing demand, as driven by job growth, leading to higher priced housing and overcrowding in existing housing.

Looking ahead, this will only continue, as the level of permitting this year has been below what is would house just the recent growth in potential homebuyers.



IX. FORECAST

As seen earlier, the cycle for both the economy and real estate is coming off of a dramatic fall-off in overall activity and in values. Going forward, we believe the markets will right themselves and the county will resume the normal pattern of multi-year periods of both economic growth and job and personal income expansion. In turn, this will lead to housing demand. As seen in the past, the housing market will begin to overheat, manifested by rising housing prices that outrun people's rising incomes. This will lead again to an affordable housing 'crisis' – where demand outstrips supply. A major part of this problem, one of the county's own making, is that there will be limited amounts of land suitable and zoned for housing.

Given this, we believe the development this project will contribute to the satisfaction of housing demand, that has been deep and persistent, from both off-shore and on-island. We also believe that the development will be successful, particularly so in light of the coming up cycle in the housing market. Finally, the historically low level of permitting activity indicates there will little or no competitive interference coming in the short run from other housing development on the island.

The following table describes the potential pricing at the retail level for each product type in the development (note that, in the eventuality that some or all of the house/lot package units are sold as simple home sites, the prices will be lower, as reflected in the final column below).

KAPAA HIGHLANDS PRODUCT SALES PRICE PROJECTION

Housing Produced	Total Units	Retail Price Per Unit	Home Site Only Prices
A House Lot Package, Large Lots (10,000 sf)	36	$800,000-$950,000	$266,000-$316,000
A House Lot Package, Medium Lots (7,500 sf)	50	$650,000-$700,000	$216,000-$233,000
Multi-Family Dwellings (4 Plex, 8 DU/Ac)	500	$250,000-$350,000	
Affordable Housing Dwellings (12 DU/Ac)	183	$125,000-$175,000	

Given that these prices, particularly the affordable ones, are below the historical trend for housing, we expect that sales will start up strongly. We expect them then to hold this momentum over the first three years, coinciding with the market's expansion. Thereafter, they will experience a gradual fall-off, coinciding with the downturn in the cycle. After that, the market will recover, as will sales of the final units.

KAPAA HIGHLANDS PRODUCT CLOSING PROJECTION

Product	2016	2017	2018	2019	2020	2021	2022	2023
Large Lot Homes	11	9	9	7				
Medium Lot Homes	15	15	14	6				
Multi-Family Units	90	100	90	70	50	30	30	40
Affordable Housing Units	40	40	40	35	28			

Exhibit B

Kapa'a Highlands II Sustainability Plan

Kapaʻa Highlands II Sustainability Plan

Prepared by:
Hoʻokuleana LLC
… to take responsibility …

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Kapa'a Highlands II Project Information

Kapa'a Highlands II is a proposed development of a mix of single-family and multi-family residential, market and affordable rate homes. This 163-acre Ocean View "Planned" community is positioned to be the pride of Kapa'a. The development seeks to fill the housing needs of Kapa'a within the Urban Center of the district. Situated in close proximity to schools and commercial areas, Kapa'a Highlands II is proposed to be a sustainable community that preserves the rural character of Kapa'a while meeting its growing housing needs.

Kapa'a Highlands II has received letters of support from the County Mayor, County Planning Department and County Housing Department. Letters of approval have been received from the County Department of Public Works regarding wastewater, State Department of Transportation and the County Water Department.

Project Name:	Kapa'a Highlands Phase II
Location:	Wailua, Kaua'i, Hawai'i
TMK:	(4) 4-3-003:001
Total Area:	163-acres
Existing Use:	Vacant, undeveloped, former sugarcane land
County Zoning:	Agriculture
General Plan Land Use Designation:	Urban Center
State Land Use:	Agricultural
Approvals Required:	LUC Boundary Amendment; County Class IV Zoning & Use Permits; County Council Approval for Zoning Change; Building Permits

Project Components:

Mix of single-family and multi-family residential.

Approximately 69-acres subdivided into:

- 86-single family (lots ranging from 5,000 to 8,000 SqFt.)
  - $180,000.00 to $250,000.00
- 683-multi-family (lots from 1-5 acre parcels)
  - $220,000.00 to $450,000.00
- Totals above include – 167-affordable units on site
  - $189,000.00 to $363,000.00

Open space encompassing 14.3-acres including:

- 3.1-acre park adjacent to Kapa'a Middle School
  - Relocation of County Swimming Pool
- Greenways surrounding development

Commercial Areas totaling 1.4-acres

- Stores, personal services
- Land for police/fire sub-stations

Project Components:

Infrastructure Improvements:

Water:

- Contributions to repairs of Kapa'a Sewer Treatment Plant
- Water Master Plan approved by County Water Department
- Well on site to be dedicated to County Water Department

Transportation:

- Dedication of Kapa'a By-Pass Road to the State
- Complete multi-modal roadway running thru the property
- Bus stops located along roadway
- Bike/Walking path

Aerial Image Overlooking Kapa'a Highlands II Project Area

Kapa'a Highlands II Sustainability Plan

This Kapa'a Highlands II Sustainability Plan is a comprehensive set of goals, strategies and actions focused on improving environmental quality, economic strength and social benefit within the Kapa'a Highlands II project, as well as the broader community.

This Plan serves as a roadmap guiding Kapa'a Highlands II toward a more sustainable future, with implementation of actions through a comprehensive, inclusive stakeholder process.

Before discussing the global context of "sustainability," we explore the Hawaiian view of "' *āina* " – core to the term "sust*aina*bility."

In a traditional Hawaiian context, nature and culture are one and the same; there is no division between the two. The wealth and limitations of the land and ocean resources gave birth to and shaped the Hawaiian worldview. In Hawaiian culture, natural and cultural resources are one and the same.

All forms of the natural environment, from the skies and mountain peaks, to the watered valleys and lava plains, and to the shoreline and ocean depths are believed to be embodiments of Hawaiian gods and deities. (Maly)

'Āina – That Which Sustains the People
(Context, here, primarily provided from writings of Kepa Maly)

The *'āina*, that which feeds, nourishes and sustains life (in English referred to as "land"), *wai* (water), *kai* (ocean), and *lewa* (sky) were the foundation of life and the source of the spiritual relationship between people and their environs. Hawaiian *mo'olelo*, or traditions, express the attachment felt between the Hawaiian people and the earth around them.

In any discussion of Hawaiian land - 'āina, that which sustains the people - and its place in culture, it is also appropriate to briefly discuss traditional Hawaiian land terms, as the terms demonstrate an intimate knowledge of the environment about them. In the Hawaiian mind, all aspects of natural and cultural resources are interrelated. All are culturally significant.

Hawaiian culture revolves around the value of "aloha 'āina" or love of the land. This love is not a passing sentiment, a summer fling or a fair weather affair. It is a deep-seated commitment to the wellbeing of the earth, which sustains us like a parent.

The Hawaiian concept of malama 'āina (literally, caring for or living in harmony with the land,) demands conservation, sustainable use and enhancement of the local, regional and global environment. By simply taking care and respecting the land, it will sustain life. This straightforward relationship has been honored for thousands of years, since the Polynesians followed the stars to the shores of Hawaii.

The traditional land use in the Hawaiian Islands evolved from shifting cultivation into a stable form of agriculture around 1200 AD (Kirch, 2000). Stabilization required a new form of land use. It is widely believed 'Umi a Līloa, the ruler of the Island of Hawai'i, was the first ruler to create the ancient Hawaiian land division, according to a chiefly management system, nearly 600 years ago.

This was the *ahupua'a* land use system, which consisted of vertical landscape segments from the mountains to the near-shore ocean environment, and into the ocean as deep as a person could stand in the water (Isabella Aiona Abbott).

For hundreds of years since, on the death of all *mō'ī* (kings or queens), the new monarch re-divided the land, giving control of it to his or her favorite chiefs. The common people never owned or ruled land.

In the term *ahupua'a*, the words *ahu* (stone altar or stone mound) and *pua'a* (pig) are combined. The *pua'a* was a carved wooden image of a pig head. These stone altars served as border markers and deposition places for offerings to the agricultural god *Lono* and a high chief (*ali'i nui*), who was the god's representative.

Each *ahupua'a* in turn was ruled by a lower chief, or *ali'i 'ai*. He in turn appointed a headman, or *konohiki*. The *konohiki* served as general manager responsible for the use of an *ahupua'a* as a resource system. He in turn was assisted by specialists, or *luna*. For example, the *luna wai* was responsible for the fresh water flow and irrigation system (Kamehameha Schools, 1994).

Manageable parcels of land would typically run *mauka* (upland) to *makai* (toward to ocean) and would be marked with stonewall alignments. Tenants cultivated smaller crops for family consumption, to supply the needs of chiefs and provide tributes.

Kapu (restrictions/prohibitions) were observed as a matter of resource and land management among other things. Access to resources was tied to residency and earned as a result of taking responsibility to steward the environment and supply the needs of *ali'i*. The social structure reinforced land management.

Sustainability – United Nations Context

In 1983, the United Nations Secretary General invited Norwegian Prime Minister Gro Harlem Brundtland to chair a World Commission on Environment and Development. The Report of the Brundtland Commission, Our Common Future, was transmitted to the General Assembly as an Annex to *document A/42/427* - Development and International Co-operation: Environment, in 1987

Chapter 2, "Towards Sustainable Development" of the Brundtland "Our Common Future" defines "sustainable development" as:

> Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts:
>
> - the concept of 'needs', in particular the essential needs of the world's poor, to which overriding priority should be given; and
> - the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs.
>
> In its broadest sense, the strategy for sustainable development aims to promote harmony among human beings and between humanity and nature.

Sustainability in Hawai'i (Hawai'i 2050)

The following definition, vision and guiding principles are incorporated in the Hawai'i 2050.

Definition:
A Hawai'i that achieves the following:

- Respects the culture, character, beauty and history of our state's island communities
- Strikes a balance between economic, social and community, and environmental priorities
- Meets the needs of the present without compromising the ability of future generations to meet their own needs

Vision:
Living responsibly and within our own means is top-of-mind for all individuals and organizations. We learn about the virtues and values of a sustainable Hawai'i. As a result, our goals of economic prosperity, social and community well-being and environmental stewardship are in balance and achieved.

Hawai'i 2050 Guiding Principles of Sustainability

- Balance economic, social, community and environmental priorities.
- Respect and live within the natural resources and limits of our islands.
- Achieve a diversified and dynamic economy.
- Honor the host culture.
- Make decisions based on meeting the present needs without compromising the needs of future generations.
- Principles of the ahupua'a system guide our resource management decisions.
- Everyone — individuals, families, communities, businesses and government — has a responsibility for achieving a sustainable Hawai'i.

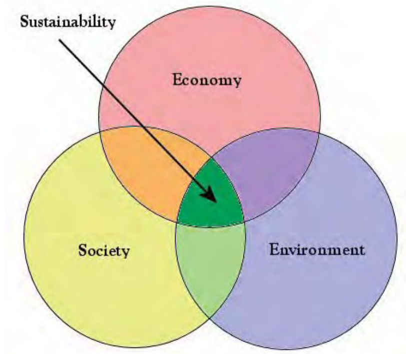
Sustainability in Hawai'i means achieving a quality of life that achieves the following goals:

- It emphasizes respect for the culture, character, beauty and history of our state's island communities.
- It strikes a balance between economic prosperity, social and community well-being, and environmental stewardship.
- It meets the needs of the present community without compromising the ability of future generations to meet their own needs.

Typically, "sustainability" is depicted in a three-themed Venn diagram (noted below,) highlighting the economy, environment and society. The achievement of sustainable development requires integration of these components at all levels.

With respect to Kapa'a Highlands II, sustainable development is achieved when it is:

- economically feasible in order to be successful as a development, while also providing for economic opportunities for future generations who reside, work or visit Kapa'a Highlands II
- protecting and preserving the environment, for today and tomorrow, serving as a model for others to follow
- addressing the needs of a wide variety of people, including their cultural values, as well as providing opportunities for people to interact, grow and learn together



Sustainability is not contradictory to growth, profit and development. Sustainability means that we plan to our limits; sustainable community development draws from and gives back to local strengths, resources and uniqueness. Local development can become more sustainable by having a better environmental, economic and social balance.

Ultimately, a goal is to meld Hawaiian traditional wisdom with modern sustainability concepts and take an integrated approach in the design and operation at Kapa'a Highlands II. This plan was created to highlight the actions of the Kapa'a Highlands II development in terms of sustainability.

In developing this plan, a variety of recognized programs and plans were reviewed, summarized and their recommendations were incorporated into this plan. These include:

- Smart Growth
- SmartCode
- Hawai'i 2050 Sustainability Plan
- OEQC Sustainable Building Design Guidelines
- Hawaii BuiltGreen Program
- US Green Building Council Leadership in Energy and Environmental Design (LEED)
- Energy Star Program
- Whole Building Design Guide (WBDG,) of the National Institute of Building Sciences
- EPA Low Impact Development
- One Planet Living

Further discussion on these programs and plans follow in the next Chapter of this Kapa'a Highlands II Sustainability Plan. Following this are chapters addressing issue-specific sustainability concerns. These include:

- **Natural and Cultural Resources:** Protecting and preserving archaeological sites, trails and dryland forest, for present and future generations
- **Land Use:** Focuses on consistency with local land use planning, fulfilling the community's vision for development in the future
- **Design Features:** Incorporating design features to fit development into natural features, protecting the resources, while taking advantage of natural elements
- **Transportation:** Focuses on sustainable modes of transportation and an improved infrastructure including: multi-modal bicycle, pedestrian and vehicular infrastructure, complete streets, etc
- **Economic Opportunities:** Encourages a vibrant economy through diversity of employment and sustainable business opportunities
- **Open Space and Parks:** Encourages protection of urban open spaces by focusing on the urban landscaping, green spaces and mixed-use development and recreational opportunities
- **Water Management**: Focuses on reducing and conserving water use, as well as minimizing impacts to nearby ecosystems from source to stormwater systems
- **Energy Management:** Encourages energy conservation, energy efficiency and renewable energy
- **Health:** Encourages healthy lifestyles through places to walk and recreate, as well as provide state of the art medical facilities to address community needs
- **Education:** Encourages understanding and practice of sustainable lifestyles, as well as providing opportunities for life-long learning
- **Housing:** Responds to the market and demographic trends and community needs, providing a broad range of housing types and price points

Anticipated beneficial impacts from the Kapa'a Highlands II project include the following:

- Provision of 86 single family homes and 683 multi-family units
- Increased housing choices, including affordable housing
- Increase housing inventory to meet future demands
- Provision of 3.1-acre park with area for relocation of Kapa'a County swimming pool
- Planned growth in an area designated for urban growth by the General Plan of the County of Kaua'i
- Provision of a pedestrian and transit-friendly community

Kapa'a Highlands II will be a sustainable community and will incorporate the following:

Sustainability Programs and Plans: Kapa'a Highlands will incorporate the core principles of the various sustainability programs and plans.

Natural and Cultural Resources: No archaeological sites are known to exist on the property. Should any archaeologically significant artifacts, bones, or other indicators be uncovered during construction, Kapa'a Highlands II is committed to strict compliance with State laws and rules.

Land Use: Kapa'a Highlands is consistent with local land use plans including the General Plan of the County of Kaua'i, the Kapa'a Town Development Plan and the Kapa'a-Wailua Basin Community Plan.

Design Features: Kapa'a Highlands II will include sustainable design features including strategies to reduce solar heat gain through roofs, walls and windows; using site planning and landscaping to improve natural ventilation; daylighting design; and energy efficient light fixtures.

Transportation: Kapa'a Highlands II will incorporate bus stops into its road system; multi-modal interconnected roads; and complete streets design.

Economic Opportunities: Kapa'a Highlands proposes two areas for commercial uses which will provide a variety of job opportunities; construction and construction-related employment will have direct beneficial impact on the local economy during construction.

Open Space and Parks: Kapa'a Highlands II proposes open space and open greenway areas encompassing 14.3-acres including a 3.1-acre park for the proposed relocation of the Kapa'a county swimming pool.

Water Management: Kapa'a Highlands II will install water efficient fixtures, appliances and high efficiency toilets to reduce indoor water use.

Energy Management: Kapa'a Highlands II will incorporate energy conservation and efficiency measures; solar energy for water heating; encourage photovoltaic systems and other renewable energy sources.

Health: Kapa'a Highlands II's layout and design will create an opportunity for both residents and the community to have a positive effect on their health through walkable and bikable transportation options.

Education: Kapa'a Highlands II will coordinate with the DOE to ensure that the facility assessment policy is addressed. In addition, a 3.1-acre park will be included in the plan and the Kapa'a county swimming pool will be relocated within the park.

Housing: Kapa'a Highlands II conforms to the Kaua'i County Affordable Housing Ordinance No. 860 and offers a variety of housing types that will address a portion of the housing needs of the island.

Social: Kapa'a Highlands II promotes social sustainability through socially-focused actions that will support quality of life, sense of place and community livability for all residents and the community.

Sustainability Programs and Plans

In developing this Kapa'a Highlands II Sustainability Plan, a variety of recognized sustainability programs and plans were reviewed, summarized and incorporated into this plan. In part, the recommendations from these programs and plans serve as guides to the sustainability actions noted in this Plan.
These include:

- Smart Growth
- SmartCode
- Hawai'i 2050 Sustainability Plan (Hawai'i 2050)
- OEQC Sustainable Building Design Guidelines
- Hawaii BuiltGreen Program
- US Green Building Council Leadership in Energy and Environmental Design (LEED)
- ENERGY STAR Program
- Whole Building Design Guide (WBDG,) of the National Institute of Building Sciences
- EPA Low Impact Development
- One Planet Living
- Complete Streets

In this chapter, these various programs and plans are summarized.

As you will see, there are several consistent principles and themes that run through the various programs and plans. While some are broad-based and include several of these, others are focused on single issues.

Following are some of the consistent messages found in these programs and plans:

- Soft touch on the land
- Respect and protection of natural and cultural resources
- Use of natural elements (shading, ventilation, lighting, etc)
- Diversity of land uses, housing types, prices
- Live, work, play, shop and learn
- Walking, bicycle and transit transportation focused
- Reuse and minimization of waste
- Renewable and efficient electric
- People and community focused

Kapa'a Highlands II will implement, to the extent feasible and practicable, measures to promote energy conservation, sustainable design, environmental stewardship and protection of the natural and cultural resources into the project. These actions are in part, based on the recommendations noted in the following sustainability programs and plans.

Smart Growth Network

In 1996, the U.S. Environmental Protection Agency joined with several non-profit and government organizations to form the Smart Growth Network. The Network was formed in response to increasing community concerns about the need for new ways to grow that boost the economy, protect the environment, and enhance community vitality.

Smart growth refers to the management of growth to make it possible "for communities to grow in ways that support economic development and jobs; create strong neighborhood with a range of housing, commercial, and transportation options; and achieve healthy communities that provide families with a clean environment." (Smart Growth Network)

There are 10 accepted principles that define Smart Growth

1. Mix land uses
2. Take advantage of compact building design
3. Create a range of housing opportunities and choices
4. Create walkable neighborhoods
5. Foster distinctive, attractive communities with a strong sense of place
6. Preserve open space, farmland, natural beauty, and critical environmental areas
7. Strengthen and direct development towards existing communities
8. Provide a variety of transportation choices
9. Make development decisions predictable, fair, and cost effective
10. Encourage community and stakeholder collaboration in development decisions

SmartCode

The SmartCode is a form-based code that incorporates Smart Growth and New Urbanism principles. It is a unified development ordinance, addressing development at all scales of design, from regional planning on down to the building signage.

The SmartCode is also a transect-based code. A "transect" is usually seen as a continuous cross-section of natural habitats for plants and animals, ranging from shorelines to wetlands to uplands. It is based on the rural-to-urban transect rather than separated-use zoning, thereby able to integrate a full range of environmental techniques.

The SmartCode is a model transect-based planning and zoning document based on environmental analysis. It addresses all scales of planning, from the region to the community to the block and building. The SmartCode is distributed by the nonprofit Center for Applied Transect Studies (CATS.)

Kapa'a Highlands II has incorporated the SmartCode principles and transects into its layout and design.

Hawai'i 2050 Sustainability Plan (Hawai'i 2050)

The Hawai'i State Plan, embodied in Chapter 226, Hawai'i Revised Statutes (HRS), serves as a guide for goals, objectives, policies, and priorities for the State.

The Hawaii State Planning Act (HRS 226) states that the State shall strive to improve the quality of life for Hawaii's present and future population through the pursuit of desirable courses of action in six major areas of statewide concern which merit priority attention: economic development, population growth and land resource management, affordable housing, crime and criminal justice, quality education and principles of sustainability.

In 2005, the legislature authorized the creations of a task force to review the Hawaii state plan and the State's planning process and to prepare the Hawai'i 2050 Plan. The creation of the Hawaii 2050 sustainability plan raises questions about the long-term limits of growth in the State and highlights the need to begin planning and acting to assure Hawaii's future. Thus, the objectives of the Hawaii 2050 sustainability plan focuses on the revitalization of the State's long-term planning process to better guide the future development of Hawaii.

The Plan offers detailed strategic actions and indicators to serve as a guide towards meeting the Plan's sustainability goals. The Plan incorporates tangible targets and benchmarks. Priority actions for 2020, to be addressed immediately, include:

1. Increase affordable housing opportunities for households up to 140% of median income.
2. Strengthen public education.
3. Reduce reliance on fossil (carbon-based) fuels.
4. Increase recycling, reuse and waste reduction strategies.
5. Develop a more diverse and resilient economy.
6. Create a sustainability ethic.
7. Increase production and consumption of local foods and products, particularly agriculture.
8. Provide access to long-term care and elderly housing.
9. Preserve and perpetuate our Kanaka Maoli and island cultural values.

In 2011, the State established sustainability as a state priority by incorporating the Hawaii 2050 sustainability plan definitions, guiding principles and goals, into chapter 226, Hawaii Revised Statutes (the Hawaii state planning act).

"Sustainability" definition was added to the Planning Act as: "achieving the following:

(1) Respect of the culture, character, beauty, and history of the State's island communities;
(2) Striking a balance between economic, social, community, and environmental priorities; and
(3) Meeting the needs of the present without compromising the ability of future generations to meet their own needs."

The Act also added "principles of sustainability" as one of the six major areas of statewide concern which merit priority attention, economic development, population growth and land resource management, affordable housing, crime and criminal justice, quality education and principles of sustainability."

OEQC's Sustainable Building Design Guidelines

The Environmental Council, as part of a "Planner's Checklist," adopted Guidelines for Sustainable Building Design in Hawai`i (October 13, 1999.) These guidelines do not constitute rules or law. A sustainable building is built to minimize energy use, expense, waste and impact on the environment. It seeks to improve the region's sustainability by meeting the needs of Hawai`i's residents and visitors today without compromising the needs of future generations. Compared to conventional projects, a resource-efficient building project will:

1. Use less energy for operation and maintenance
2. Contain less *embodied* energy (i.e. locally produced building products often contain less *embodied* energy than imported products because they require less energy-consuming transportation.)
3. Protect the environment by preserving/conserving water and other natural resources and by minimizing impact on the site and ecosystems
4. Minimize health risks to those who construct, maintain and occupy the building
5. Minimize construction waste
6. Recycle and reuse generated construction wastes
7. Use resource-efficient building materials (e.g. materials with recycled content and low embodied energy, and materials that are recyclable, renewable, environmentally benign, non-toxic, low VOC (Volatile Organic Compound) emitting, durable, and that give high life cycle value for the cost.)
8. Provide the highest quality product practical at competitive (affordable) first and life cycle costs.

In the design and construction of Kapa'a Highlands II, Three Stooges, LLC will seek to implement feasible measures to conform to these general guidelines.

Hawaii BuiltGreen Program

The Hawaii BuiltGreen Program is a statewide program to "incentivize" the designing and building of energy and resource efficient homes in Hawaii. Originally developed in 2000 by a public/private partnership between the State Dept. of Business, Economic Development & Tourism (DBEDT), USDOE and five other partners. Now promoted by the State, BIA, Hawaii utility companies and other organizations.

Hawai'i BuiltGreen is a self-certification program administered by the Building Industry Association of Hawai'i, which is a professional trade organization affiliated with the National Association of Home Builders. This is a local initiative based on homegrown knowledge of professionals familiar with the unique conditions of Hawaii. The Hawaii BuiltGreen program focuses on design choices through:

- Protecting Site Features and Functions
- Energy Performance and Comfort
- Health and Indoor Air Quality
- Durability and Materials Conservation
- Environmentally-Friendly Home Operations

US Green Building Council
Leadership in Energy and Environmental Design (LEED)

The US Green Building Council's Leadership in Energy and Environmental Design (LEED) program is a voluntary green building certification system, providing third-party verification that a building or community was designed and built using strategies aimed at improving performance across all the metrics that matter most: energy savings, water efficiency, CO_2 emissions reduction, improved indoor environmental quality, and stewardship of resources and sensitivity to their impacts.

Specific LEED programs include:

- Homes
- Neighborhood Development
- New Commercial Construction and Major Renovation projects
- Existing Building Operations and Maintenance
- Commercial Interiors projects

LEED for Homes is a voluntary rating system that promotes the design and construction of high performance "green" homes. A green home uses less energy, water and natural resources; creates less waste; and is healthier and more comfortable for the occupants.

LEED for Neighborhood Development is a collaboration between the U.S. Green Building Council, the Congress for the New Urbanism and the Natural Resources Defense Council. The LEED for Neighborhood Development Rating System integrates the principles of smart growth and green building into the first national standard for neighborhood design. LEED for Neighborhood Development recognizes development projects that successfully protect and enhance the overall health, natural environment and quality of life of our communities. The rating system encourages urban smart growth best practices, promoting the design of neighborhoods that reduce vehicle miles traveled and communities where jobs and services are accessible by foot or public transit.

ENERGY STAR Program

ENERGY STAR is a joint program of the U.S. Environmental Protection Agency and the U.S. Department of Energy.

In 1992, the US Environmental Protection Agency (EPA) introduced ENERGY STAR as a voluntary labeling program designed to identify and promote energy-efficient products to reduce greenhouse gas emissions. Computers and monitors were the first labeled products. Through 1995, EPA expanded the label to additional office equipment products and residential heating and cooling equipment. In 1996, EPA partnered with the US Department of Energy for particular product categories.

The ENERGY STAR label is now on major appliances, office equipment, lighting, home electronics, and more. EPA has also extended the label to cover new homes and commercial and industrial buildings.

National Institute of Building Sciences
Whole Building Design Guide (WBDG)

The goal of 'Whole Building' Design is to create a successful high-performance building by applying an integrated design and team approach to the project during the planning and programming phases. The WBDG program is a collaborative effort among federal agencies, private sector companies, non-profit organizations and educational institutions. In buildings, to achieve a truly successful holistic project, these design objectives must be considered in concert with each other:

- Accessible: to address the specific needs of disabled people.
- Aesthetics: the physical appearance and image of building elements and spaces
- Cost-Effective: weighing options during concepts, design development and value engineering
- Functional/Operational: spatial needs and requirements, system performance durability and efficiency
- Historic Preservation: whereby building elements and strategies are classifiable into preservation, rehabilitation, restoration or reconstruction.
- Productive: physical and psychological comfort—including air distribution, lighting, workspaces, systems, and technology.
- Secure/Safe: physical protection of occupants and assets from man-made and natural hazards.
- Sustainable: Pertains to environmental performance of building elements and strategies.

Land Use and Development Practices - Low Impact Development (LID)

Land use practices can improve air quality, reduce stormwater runoff, increase energy efficiency and reduce greenhouse emissions to improve the quality of life for citizens. LID is a land development approach that allows land to be developed but in a manner that helps lessen potential environmental impacts. LID employs principles such as preserving and recreating natural landscape features, minimizing effective imperviousness to create functional and appealing site drainage that treat stormwater as a resource rather than a waste product.

By implementing LID principles and practices, water can be managed in a way that reduces the impact of built areas and promotes the natural movement of water within an ecosystem or watershed. LID has been characterized as a sustainable stormwater practice by the Water Environment Research Foundation and others.

In general, implementing integrated LID practices can result in enhanced environmental performance while at the same time reducing development costs when compared to traditional stormwater management approaches. LID techniques promote the use of natural systems, which can effectively remove nutrients, pathogens and metals from stormwater.

Conservation designs can be used to minimize the generation of runoff by preserving open space. Examples of Conservation Design include:

- Cluster development
- Open space preservation
- Reduced pavement widths (streets, sidewalks)
- Shared driveways

One Planet Living

One Planet Living is a vision of a sustainable world, in which people everywhere can enjoy a high quality of life within the productive capacity of the planet, with space left for wildlife and wilderness. Organizations around the world are using the one planet living approach to take measurable steps towards genuine sustainability. From zero carbon buildings to procurement policies that support the green economy, one planet living solutions are cost-effective, creative, inspirational and replicable.

- Zero Carbon - Making buildings more energy efficient and delivering all energy with renewable technologies
- Zero Waste - Reducing waste, reusing where possible, and ultimately sending zero waste to landfill
- Sustainable Transport - Encouraging low carbon modes of transport to reduce emissions, reducing the need to travel
- Sustainable Materials - Using sustainable and healthy products, such as those with low embodied energy, sourced locally, made from renewable or waste resources
- Local and Sustainable Food - Choosing low impact, local, seasonal and organic diets and reducing food waste
- Sustainable Water - Using water more efficiently in buildings and in the products we buy; tackling local flooding and water course pollution
- Land and Wildlife - Protecting and restoring existing biodiversity and natural habitats through appropriate land use and integration into the built environment
- Culture and Heritage - Reviving local identity and wisdom; supporting and participating in the arts
- Equity and Local Economy - Creating bioregional economies that support fair employment, inclusive communities and international fair trade
- Health and Happiness - Encouraging active, sociable, meaningful lives to promote good health and well being

Complete Streets

Complete Streets are designed and operated to enable safe access for all users. Pedestrians, bicyclists, motorists and transit riders of all ages and abilities must be able to safely move along and across a complete street. Complete Streets make it easy to cross the street, walk to shops and bicycle to work. They allow buses to run on time and make it safe for people to walk to and from train stations.

By adopting a Complete Streets policy, communities direct their transportation planners and engineers to routinely design and operate the entire right of way to enable safe access for all users, regardless of age, ability or mode of transportation. This means that every transportation project will make the street network better and safer for drivers, transit users, pedestrians and bicyclists – making your town a better place to live.

Natural and Cultural Resources

The preservation of the natural and cultural resources is essential for a prosperous and sustainable future. Kapa'a Highlands II holds respect for the culture and the environment and will interlink natural features and cultural features as core components of the community. Archaeological and cultural sites will be protected and maintained with appropriate treatment and buffers from adjacent uses, as necessary.

No archaeological or cultural historic sites are known to exist on the property.

Brief discussions separately with historians of the subject area, Randy Wichman, Walter Smith and Albert Fukushima, concluded that the subject property has been in sugar cultivation since the 1800s until the early 1990s.

Albert Fukushima, who was employed by Lihue Plantation and worked in the subject area, said that no evidence of artifacts, bones, or other indicators of previous historic on-site activity were uncovered during the cultivation of sugar. Randy Wichman and Walter Smith concurred that the subject land was consistently cultivated for sugar for nearly a hundred years.

In 1995 SHPD stated for the "Site Selection EIS" for the adjacent Kapa'a Middle School that the site may not be Archaeological or Historically rich because of the consistent cultivation of sugar for nearly a hundred years.

In the late 1999, the State Historic Preservation Division (SHPD) issued a letter of "no significance" to the potential developer at that time.

There exists sparingly, evidence of inactive sugar irrigation ditches. Nearly all have lost their banks and flattened out. Currently, SHPD has requested that the applicant record the locations of the remaining remnants of the former irrigation ditches prior to the development stages. The Applicant is committed to conducting and Archaeological Inventory Survey at the time of design and development phase in order to properly record the remains of the plantation irrigation ditches.

Should any archaeologically significant artifacts, bones, or other indicators of previous historic on-site activity be uncovered during construction, the Applicant is committed to their treatment being conducted in strict compliance with the requirements of SHPD.

Additionally, whenever existing rock walls must be removed, the rocks from these walls will be set aside and reused in the construction of new screen, buffer and retaining walls built within Kapa'a Highlands II. Whenever feasible, rocks from Kapa'a Highlands II will be used for such walls (minimize importation of rock from offsite).

Greenbelts

Greenbelts are undeveloped areas that surround the developed areas. Greenbelt is a strategic planning tool to prevent urban sprawl by keeping land permanently open. The purpose of the Greenbelt is to prevent urban sprawl, prevent neighboring towns from merging into one another, and to preserve the setting and the character of the area. Approximately 14.3-acres are proposed for open greenway areas.

Consistency with Regional Land Use Planning

Consistency with local land use planning documents is an essential element of sustainability. The local plans articulate and illustrate the community's vision. Without consistency with that vision, a development project cannot be sustainable.

Two primary planning documents address land use development in Kapa'a, the General Plan of the County of Kaua'i and the Kapa'a-Wailua Basin Community Plan. Following are brief summaries of each.

The General Plan of the County of Kaua'i (General Plan)

The General Plan of the County of Kauai ("General Plan") was adopted in 1971 and updated in November 2000. The General Plan is a statement of the County's vision for Kaua'i and establishes strategies for achieving that vision. Section 7-1.2 of the amended Chapter 7 of the Kauai County Code states:

Pursuant to the provision of the Charter for the County of Kaua'i, the General Plan sets forth in graphics and text, policies to govern the future physical development of the county. The General Plan is intended to improve the physical environment of the County and the health, safety and general welfare of Kaua'i's people.

The General Plan states the County's vision for Kaua'i and establishes strategies for achieving that vision. The strategies are expressed in terms of policies and implementing actions. They may be augmented and changed as new strategies are developed.

The General Plan is a direction-setting policy document. It is not intended to be regulatory. It is intended to be a guide for future amendments to the lands regulations and to be considered in reviewing specific zoning amendment and development applications.

The vision, the maps and text policies, and the implementing actions are intended to guide the county actions and decisions. In addition, the maps and text policies are intended to guide the County in specific types of actions: making revisions to land use and land development Regulations; deciding on zoning changes; preparing and adopting Development Plans and Public Facility Plans; and preparing and adopting capital improvement plans.

The General Plan contains six major themes, each with various policies for implementation. The major themes are as follows:

1. Caring for Land, Water and Culture
2. Developing Jobs and Businesses
3. Preserving Kaua'i's Rural Character
4. Enhancing Towns & Communities and Providing for Growth
5. Building Public Facilities and Services
6. Improving Housing, Parks and Schools

In particular, the proposed reclassification of the Property responds and conforms to Theme No. 6. Market studies have shown that the population growth and correlating need and demand for housing is extremely high on Kaua'i.

The proposed reclassification, which will allow residents to purchase an affordable house and lot as well as allow other residents to purchase a lot to design and build their own homes, will present an opportunity to address the critical community need for residential housing. It should also be noted that the proposed development will assist in maintaining a viable economy as construction-related employment opportunities for residents would be generated.

Kapa'a-Wailua Basin Community Plan

The Kapa'a-Wailua Basin community plan outlines the regional issues and opportunities that will be subjects for future community planning. A "Build-Out Analysis" of the Kapa'a-Wailua Basin was prepared in the General Plan Update. As of 1998, this area had an estimated 4,700 dwelling units, making it the largest residential community on Kauai.

Based on the General Plan Land Use Map designations, the analysis found that an additional 4,000 units could be developed if the General Plan-designated lands were fully zoned, subdivided and built out. About 2,400 more units could be built in Urban Residential areas, about 500 more in Rural Residential areas and approximately 1,100 more units in the Agricultural areas. This would increase the housing units and population of the area by 85%.

The "Build-Out Analysis" specifically included the subject property as an "expansion area". The new General Plan Land Use Map designates the subject property as Urban Center.

The Kapa'a Highlands II project conforms to and implements the policies of the Kaua'i General Plan by developing within the designated Urban District, contiguous to Kapa'a town and its neighboring residential community.

Sustainable Design Features

Thoughtful planning of site, neighborhood and improvements design, incorporating mixed-use land uses, walkable streets, encouraging walking, bicycling and public transportation, and respect for the natural and cultural features creates opportunities for more environmentally-responsible and sustainable development. These sustainable neighborhoods are beneficial to the community, the individual and the environment.

Several sustainability programs and plans (noted previously in Chapter 2) identify and address a wide variety of design features that may be incorporated into a development project to enhance its sustainability. These items design features include:

- **Site Planning**
    - Respect for the Land – Work with topography
    - Siting - Proximity to mass transit, shopping, employment centers, recreation, schools
    - Interconnectivity – Connection with neighbors, Multi-modal transportation (to be discussed in another section of this Plan)
    - Intensity of Layout – Village Center; Clustering into compact villages
    - Natural/Cultural Resources – Protection of natural and cultural resources (to be addressed in another section of this Plan)

- **Improvements Planning**
    - Alternatives – Provide a range of housing options at various price levels (to be discussed in another section of this Plan)
    - Orientation – Ventilation; Take advantage of natural air flow
    - Shading – Eve overhang; Vegetation
    - Landscaping – Native plants; Low irrigation
    - Energy Efficiency – (to be discussed in another section of this Plan)

The objectives of Kapa'a Highlands II are to create an attractive master-planned residential community with a variety of housing opportunities and mixed uses, as well as recreational resources.

<u>Site Planning</u>

As a mixed-use community, the objectives of Kapa'a Highlands II are to:

- Create a diverse, sustained community of mixed uses, including residential, retail and commercial spaces, recreational spaces, and open space.
- Cultivate intrinsic respect for the land and natural surroundings, develop an inherent Hawaiian sense of place and nourish a sustaining living environment.
- Provide housing for the working families of Hawai'i nearby areas of workforce demand, resultantly improving overall quality of life through the reduction of commuting and facilitation of everyday function.
- Openly embrace a diversity of people and activities through offering mixed uses and housing types.
- Contribute to the social fabric of the community by providing infrastructure and facilities, and by including recreational, and civic sites.
- Engender and incorporate intelligent, planned sustainability by design.
- Emphasize non-vehicular transit for mainstream community-wide travel.

Kapaʻa Highlands II is strategically located north of Kapaʻa town. The Kapaʻa By-Pass Road separates the Kapaʻa town and the Kapaʻa Highlands II development. Kapaʻa Highlands II is on the north-west corner of the Kapaʻa By-Pass Road and Olohena Road. Olohena Road runs along and adjacent to the east and north boundaries of the Property. The Kapaʻa Middle School is located on the northern end of the Property fronted by Olohena Road. The area also has a long-standing and growing residential base.

This area will continue to be the focus of such development as the Island's population grows. This region is also the near commercial and industrial heart of Kauaʻi, serving the needs of the visitor, residents and other industries of the western half of the Island.

Kapaʻa Highlands II is a compact, mixed-use, master-planned community offering a wide range of housing types and affordability, and a variety of businesses and employment opportunities with supporting retail, commercial, infrastructure, recreational and open space uses.

The Project proposes to develop Phase II of Kapaʻa Highlands into an approximately 97-acre single-family and multi-family residential subdivision. Approximately 69-acres will be subdivided into single family lots ranging from 5,000 to 8,000 square feet and multi-family lots from 1-acre to 5-acre parcels. A total of 683 multi-family units and 86 single family units are planned. Open space encompassing 14.3-acres will be developed and associated infrastructure (e.g., new roadways, utilities, drainage, wastewater). Affordable housing will be provided in accordance with County of Kaua`i requirements.

A 3.1-acre park is proposed adjacent to the existing Kapaʻa Middle School. The park will have an area for the county's proposed relocation of the Kapaʻa county swimming pool. A 0.4-acre parcel is proposed for commercial use. A country type store and small personal service types of use are anticipated. A remnant parcel of a one acre on the Makai side of the Kapa a Bypass road is also proposed as commercial use or for sub-stations for the police and fire departments. Approximately 14.3-acres are proposed for open greenway areas.

The site is presently fallow, undeveloped, and predominantly vegetated with weeds. The undesirable dumping of old cars, appliances, rubbish associated with undeveloped lands continue to exist on the property. The proposed project will increase the productive use of the property and significantly upgrade the immediate vicinity.

The proposed development will have minimal impact in terms of agriculture. Although the Property was previously used as part of large scale agricultural activities, it is presently fallow, and undeveloped. With the closing of the sugar plantations on Kauaʻi, close proximity to existing residential areas, and demand for affordable housing, large-scale agricultural operations were not deemed feasible.

Construction of the proposed development will involve grading, excavation and trenching of presently undeveloped areas within the project site. The project will require alteration of existing landforms to create more efficient land development areas. Appropriate engineering, design and construction measures will be undertaken to minimize potential erosion of soils during construction.

On-Site grading and infrastructure improvements and residential construction will result in an increase in dust, storm run-offs and noise. The prevailing trade wind pattern is from the north-east directions. Potential airborne matters will generally be carried in the south-west direction, away from the school and existing residential areas. However, on occasions, the westerly winds may carry the potential

airborne matters towards the school and existing residential neighborhoods. Construction noise relating to infrastructure installations will be expected.

In the short term, during construction, measures will be taken to minimize impacts such as increased dust, noise and traffic. Construction activities shall comply with the provisions of Hawaii Administrative Rules, S-11-60.11.33 on Fugitive Dust. Dust preventive measures will include;

- Planning of construction phases to minimize the amount of dust generating materials and activities, centralizing on-site vehicular traffic routes and locating of potential dust-generating equipment in areas of the least impact.
- Provide adequate water source at the site prior to start of construction.
- Landscape and provide rapid covering of bare areas developed during construction.
- Minimize dust from shoulders and access roads.
- Provide dust control measures during weekends, after hours, and prior to daily construction.
- Control dust from debris being hauled away from the site.

A national Pollutant Discharge Elimination System (NPDES) general permit will be acquired prior to construction to minimize storm run-offs during construction.

Mitigation measures will be instituted following site-specific assessments, incorporating structural and non-structural BMPs such as minimizing soil exposure and implementing erosion control measures such as silt fences and sediment basins. Following construction, erosion is anticipated to decrease since the soils will have been graded, built over, paved over or landscaped. Landscaping in turn will provide erosion control. Mass grading of the development areas will be in compliance with the County of Kauaʻi's grading ordinance requirements and will require NPDES permit from the State DOH for storm water construction activities, including BMPs to minimize off-site impacts.

The Property is encompassed by the Kapaʻa By-Pass Road to the south and Olohena Road to the east and the north side. The by-pass road is owned by the Applicant and the Applicant intends to dedicate said road to the Department of Transportation (DOT) for continued public use.

There is a round-about located at the south east corner of Olohena Road and the Kapaʻa By-Pass Road. Kuhio Highway is accessible from the Property by driving south on Olohena and Kukui Street approximately 0.5 mile. The project will have a complete multi-modal roadway from the Kapaʻa By-Pass Road running north through the Property to Olohena Road. A couple of bus stops will be located along the roadway. A bike/walking path is proposed from the south of the property to the Kapaʻa Middle School located on the North portion of the Property.

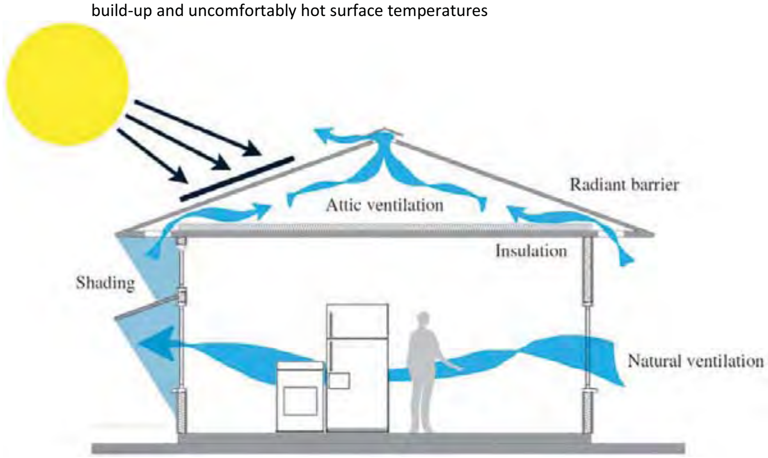
Improvements Planning

There are three major sources of unwanted heat in homes: direct solar impacts on a building and through windows and skylights; heat transfer and infiltration, of exterior high temperatures, through the materials and elements of the structure; and the internal heat produced by appliances, equipment and inhabitants.

The DBEDT Field Guide for Energy Performance, Comfort and Value in Hawaii Homes provides a number of recommended ways to incorporate effective design options to address home temperatures. These items to be considered in the development of Kapa'a Highlands II are summarized and illustrated below:

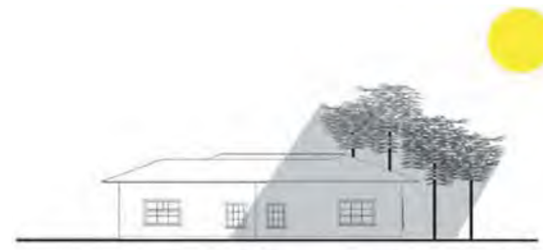
Design for Comfort and Value

A. Control Heat Gain: Use strategies to reduce solar heat gain through roofs, walls and windows.
   1. Orient and arrange building to control heat gain
   2. Landscape and design outdoor surfaces to reduce air temperatures and glare; minimize paving area and use grassed and planted areas to provide lowered site temperatures, shade and evaporative cooling
   3. Shade roofs, walls and windows with:
      a. Architectural elements such as eaves, awnings and carports, and
      b. Window treatments such as blinds and shutters
   4. Use insulation and/or radiant heat barriers in roofs and walls exposed to the sun
   5. Use high performance windows (Low-e, spectrally selective, or tinted glazing) to keep solar heat out of interior spaces while admitting daylight
   6. Use light colored roofing and wall finishes
   7. Shade or insulate materials with high thermal mass, such as concrete floors, to avoid heat build-up and uncomfortably hot surface temperatures



B. Use Natural Ventilation: Provide ample fresh air ventilation for living spaces and areas where hot air and humidity accumulate, such as attics, high ceiling spaces, kitchens, bathrooms and laundry areas.
   1. Orient buildings to maximize the cooling potential of prevailing winds and minimize morning and afternoon heat gain
   2. Design floor plans and opening placement and type to provide effective cross ventilation with good air circulation throughout room areas and at body level
   3. Provide generous screened openings well protected from the rain

   4. Use architectural design elements such as vents and casement windows to improve interior air circulation
   5. Enhance natural ventilation with fans as needed:
      a. Use ceiling and whole house fans to provide comfort on warm, humid or still days
      b. Use solar powered attic vent fans when appropriate and economically feasible



Shaded areas stay cooler

Consistent with the principles and recommendations noted in the DBEDT publication *Hawai'i Homeowner's Guide to Energy, Comfort & Value*, to the extent feasible and practical, Kapa'a Highlands II will incorporate the following:

Site Planning and Landscaping

Orientation of homes is important. Try to minimize the area of east- and west-facing walls and windows because they are difficult to shade from the sun.

Landscaping and the design of outdoor surfaces can reduce air temperatures and glare. Landscaping minimizes paving area provides lowered site temperatures, shade and evaporative cooling.

Low impact landscaping. Selection and distribution of plants must be carefully planned when designing a functional landscape. Aesthetics are a primary concern, but it is also important to consider long-term maintenance goals to reduce inputs of labor, water, and chemicals. Properly preparing soils and selecting species adapted to the microclimates of a site greatly increases the success of plant establishment and growth, thereby stabilizing soils and allowing for biological uptake of pollutants. Dense, healthy plant growth offers such benefits as pest resistance (reducing the need for pesticides) and improved soil infiltration from root growth. Low impact landscaping can thus reduce impervious surfaces, improve infiltration potential and improve the aesthetic quality of the site.

Protect and retain existing landscaping and natural features. Select plants that have low water and pesticide needs, and generate minimum plant trimmings. Use compost and mulches. This will save water and time.

Examples of Low Impact Landscaping

- Planting native, drought tolerant plants
- Converting turf areas to shrubs and trees
- Reforestation
- Encouraging longer grass length
- Planting wildflower meadows rather than turf along medians and in open space

Control Heat Gain

By using strategies to reduce solar heat gain through roofs, walls and windows, a house can stay cool. Roofs, walls, windows and outdoor flooring can be shaded with architectural elements such as eaves, awnings and carports, and shutters.

Walls

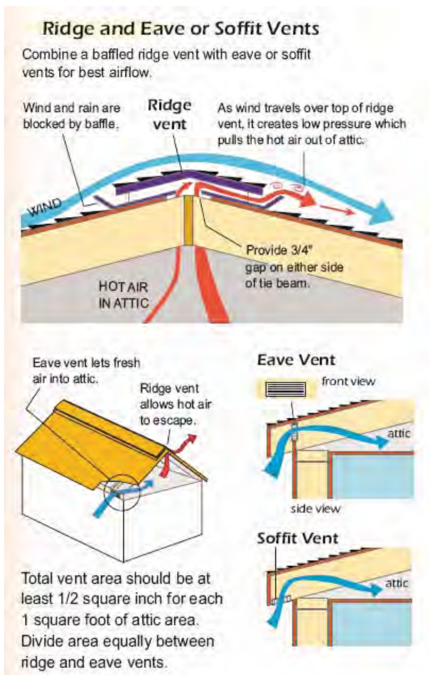
Unshaded walls can get very hot and make your home uncomfortable. The best "cool wall" strategy is shading with overhanging eaves, lanais, or landscaping. If complete shade isn't feasible, use insulation or radiant barriers in the exposed walls. Use a white exterior finish to improve cool wall performance.

Windows

The use of high performance windows (Low-e, spectrally selective, or tinted glazing) helps keep solar heat out of interior spaces while admitting daylight. Overhangs, awning and trees can keep the sun from striking windows directly.

Roofs and Roofing Material

A cool roof is essential for a comfortable home. Insulation keeps roofs and homes cool by blocking heat on the roof thus, the attic, the ceiling and the rest of the house stay cool and comfortable. Installing a white roof will keep a home cooler.



Ventilation is another tool for keeping homes cool. For houses with attics good ventilation is recommended. Ridge and Eave or Soffit Vents work as well. If a ridge vent is not feasible, use a solar powered vent fan in combination with eave or soffit vents, to push warm air out of the house and attic.

Solar Water Heating

Minimizing the energy required for water heating is the most important energy saving step for a Hawaii home. Conventional water heating is a big expense and accounts for about 40% of the utility bill in a Hawaii house.

Hawaii was the first state in the nation to require solar water heaters in new home construction. Act 204 SLH 2008, requires all building permits for single-family homes issued after Jan. 1, 2010, to include solar water heaters. Exceptions are allowed where homes have poor sunlight; if it is cost-prohibitive after 15 years; when the dwelling has a substitute renewable energy source; or if there is an approved tankless water heater and another appliance, both powered by gas.

Additionally insulating hot water supply lines and pipes with at least ½" foam or 1" fiberglass insulation and setting heater thermostats adjustable for 120F or less, can add additional energy savings to a homeowner.

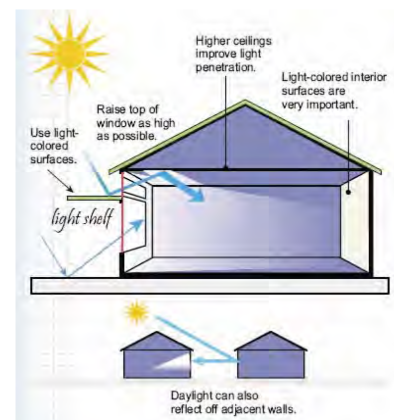
Photovoltaic systems

Alternative energy sources such as photovoltaics and fuel cells that are now available in new products and applications will be available as a house feature option. Renewable energy sources provide a great symbol of emerging technologies for the future.

Lighting

Energy Efficient Light Design

Energy efficient light design features help minimize electric lighting energy demand and heat gain. An efficient lighting system uses fluorescent lamps as the primary light source and may selectively use incandescent (also halogen, a type of incandescent) for accent lighting and for applications where the light is usually off (like exterior lights on motion sensor controls). Modern fluorescent lighting can provide excellent color rendering and be free of flicker and hum. Additionally, start up is nearly instantaneous with electronic instant-start and rapid-start ballasts. Fluorescent lamps last 10 to 20 times longer than incandescents, saving energy all the while, so the lifetime cost is much lower and fluorescent lights do not emit as much heat as incandescents.

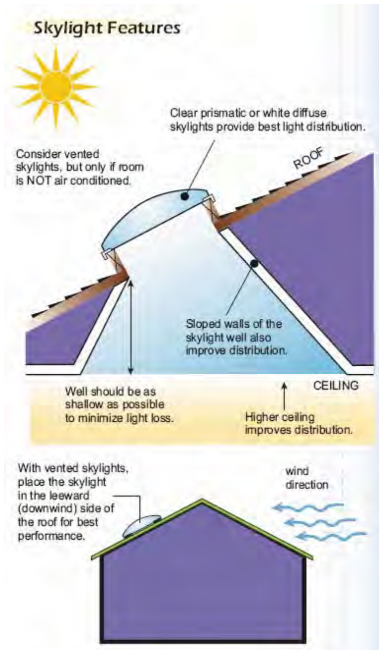


Providing controls such as timers, dimmers, sensors and separate fan/light controls to limit power use to the times and levels needed, also helps reduce lighting power consumption.

The use of solar powered landscape lighting when economically feasible is another energy saving design feature which can be used for both residential homes as well as business and civic buildings and spaces.

Daylighting

Daylighting is the use of natural sunlight to light interior spaces. Using controlled, filtered and indirect daylighting to light interior spaces reduces electric lighting loads. The effectiveness of daylighting can be increased with generous wall openings, open floor plans and light colored interior finishes.



Windows are usually a home's main source of daylight. Blocking direct sunlight and bouncing light on to the ceiling helps facilitate daylighting. Minimizing areas of east- or west-facing windows and using blue or green glass help.

Skylights (traditional, vented, tubular) can provide significant daylighting opportunities.

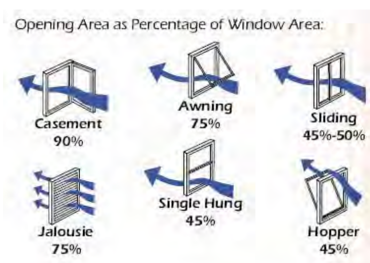
Light-colored interior finishes are critical for good light distribution thus, white ceiling is recommended.

Rooms with higher ceilings and narrow floor plans are easier to daylight. Consider several smaller skylights instead of one larger skylight for better light distribution.

Natural Ventilation

Kapa'a Highlands II will optimize air-flow by designing homes that capture cooling breezes to keep homes comfortable. Utilizing natural ventilation also helps reduce health hazards such as mold and mildew.

Buildings should be oriented to maximize the cooling potential of prevailing winds and minimize morning and afternoon heat gain. Floor plan design will include effective cross ventilation with good air circulation throughout room areas and at body level.



Providing generous screened openings and using architectural design elements such as vents and casement windows will improve interior air circulation.

Ceiling fans are a great way to enhance natural ventilation. Use ceiling and whole house fans to provide comfort on warm, humid or still days.

Transportation

The Property is encompassed by the Kapa'a By-Pass Road to the south and Olohena Road to the east and the north side. The by-pass road is owned by the Kapa'a Highlands II which is working with the Department of Transportation (DOT) and has been allowing for the continuous public use of the road. The by-pass road is in the process of being dedicated to DOT. The agreement of transfer will include that all mitigating measures will be the shared responsibility of DOT and Kapa'a Highlands II.

There is a round-about located at the south east corner of Olohena Road and the Kapa'a By-Pass Road. Kuhio Highway is accessible from the Property by driving south on Olohena and Kūkuī Street approximately 0.5-mile. The project will have a main roadway from the Kapa'a By-Pass Road running north through the Property to Olohena Road. The roadway will follow the county's resolution for complete roads and as such will be a multi-modal roadway. A couple of bus stops will be located along the roadway. A bike/walking path from the round-about south east of the property will follow the bypass road, connect to the main road and continue to the Kapa'a Middle School located on the North portion of the Property. Kapa'a Highlands II is continuing to work with the DOT on potential traffic issues.

Transportation, housing, land use and infrastructure need to be integrated and incorporated into Kaua'i's long-term transportation policies as the population continues to grow in the years ahead. The Kaua'i General Plan, includes the following policies:

Bus Transit.

- Continue to operate The Kaua'i Bus; seek to increase ridership and expand service, subject to the availability of funds.
- Improve bus stops to increase safety and convenience of service.
  - Improvements to pullover areas along roadways in order to create safe and accessible bus stops.
  - Designated areas at housing projects (particularly those with elderly and disabled residents) that provide safe and accessible paratransit stops.

Bikeways.

- Support funding to develop Kaua'i's bikeway system to provide for alternative means of transportation, recreation, and visitor activities (economic development).

Regional Highways and Roads.

- Use General Plan policies concerning rural character, preservation of historic and scenic resources, and scenic roadway corridors as part of the criteria for long-range highway planning and design. The goal of efficient movement of through traffic should be weighed against community goals and policies relating to community character, livability, and natural beauty.
- Consider transportation alternatives to increasing the size and capacity of roadways. Alternatives include increased utilization of public transit.
- Planning for the Kapa'a By-Pass should incorporate connector roads between the By-Pass and the coastal highway and between the By-Pass and roads serving the valley.
- The State and the County should jointly undertake a study of the existing roadway network and the future transportation needs within the Kapa'a-Wailua homesteads area.

- Reserve corridors for future roadways as shown on the General Plan Land Use Map. The corridors are conceptual only and are subject to environmental assessment and evaluation of alternative alignments.

Kapa'a Highlands II is committed to Multi-modal, Interconnected and Concurrent Transportation for its residents and community.

Multi-modal Interconnected Roads and Streets

The proposed main complete, multi-modal roadway through the development will include bus stops, sidewalks and a bike and walking path connecting from Kapa'a Middle School down through the development to the round-about, facilitating green travel to and from Kapa'a's town core.

Kapa'a Highlands II incorporates multiple road interconnections with neighbors.

Kapa'a Highlands II will incorporate a system of interconnected roads that will provide residents alternative transportation routes within the project. The internal circulation pattern will provide safe and convenient choices for drivers, bicyclists and pedestrians.

Additional sustainable connectivity concepts including bikeways and walkways to and from the planned County pool, neighborhood commercial areas, the middle school and Kapa 'a's town core are planned.

Complete Streets

Through recent legislation, the State of Hawaii Department of Transportation (HDOT) and county transportation departments are required to ensure the accommodation of all users of the road, regardless of their age, ability, or preferred mode of transportation. In addition, the concept of "Complete Streets" is prioritized where:

> "(T)ransportation facilities ... are planned, designed, operated and maintained to provide safe access and mobility for all users, including bicyclists, pedestrians, transit riders, freight and motorists".

In addition to providing vehicle access, roadway networks are a vital part of the livability of our communities. Complete streets will provide an ease of use and access to destinations by providing an appropriate path of travel for all users, and enhance the ability to move people and goods throughout the state and its counties.

Additionally, complete streets principles will help contribute to a clean and secure energy future for Hawaii by offering flexibility and better accommodation for safe transit, walking, bicycling and alternate fuel vehicles that together, will decrease demand for imported oil.

Complete Streets are streets for everyone. They are designed and operated to enable safe access for all users. Pedestrians, bicyclists, motorists and public transportation users of all ages and abilities are able to safely move along and across a complete street.

Complete Streets make it easy to cross the street, walk to shops, and bicycle to work. They allow buses to run on time and make it safe for people to walk to and from transit stations.

Economic Opportunities

Kapa'a Highlands II provides significant, on-going economic and fiscal benefits for residents of Kaua'i, as well as for the County and State governments.

Development of facilities would generate employment and consequent income and taxes. In addition, by providing the opportunity for new residents to the Island of Kaua'i and generating additional real estate sales activity, the Project is expected to support long-term impacts, including additional consumer expenditures, employment opportunities, personal income and government revenue enhancement.

On a short-term basis, the proposed development will have a direct beneficial impact on the local economy during construction through construction and construction-related employment. It should also be noted that the proposed development will assist in maintaining a viable economy as construction-related employment opportunities for residents would be generated.

Over the long term, the residential homeowners will require various services related to home maintenance and improvement that will further support the local economy.

On-Site Employment Generators

Kapa'a Highlands II proposes two areas for commercial uses that, ultimately, will serve to promote and provide a variety of job opportunities. A 0.4-acre parcel is proposed for commercial uses such as a country store and small personal service type uses are anticipated. A 1-acre site on the Makai side of the Kapa'a Bypass Road is also proposed for commercial development or for use as sub-stations for the police and/or fire department.

Open Space and Parks

Kapa'a Highlands II holds respect for the environment by interlinking natural features and open space as core components of the community.

There are several parks within Kapa'a town, including a beach park. A County-owned 1.9-acre park is located within walking distance from the Property, just south east of the corner of Olohena Road and the by-pass road round-about. The park consists of a baseball field, football field, basketball courts, restroom facilities, picnic tables and a barbecue area.

Open space and open greenway areas encompassing 14.3-acres will be developed within the project. A 3.1-acre park is proposed within the project for outdoor recreation. Land for the proposed relocation of the Kapa'a county swimming pool will be available within the 3.1-acre park. The provision of a 3.1-acre park with a county swimming pool within the proposed development will provide residents with an opportunity for leisurely recreational activities.

Kapa'a Highlands II is conforms with HRS § 205-a-2(B) (3) (A) which states that CZM's objective is to "protect, preserve and, where desirable, restore or improve the quality of coastal scenic and open space resources."

The policies to achieve this objective are as follows:

1. Identify valued scenic resources in the coastal zone management area;
2. Ensure that new developments are compatible with their visual environment by designing and locating such developments to minimize the alteration of natural landforms and existing public views to and along the shoreline;
3. Preserve, maintain, and, where desirable, improve and restore shoreline open space and scenic resources; and
4. Encourage those developments which are not coastal dependent to locate in inland area.

No scenic, historic, cultural spaces exist or will be created on the subject site and the site is well away from the shoreline. There are no natural wildlife, forest, marine, or unique ecological preserves on or near the subject site. Thus, open space and recreation will not be adversely affected. Park and beaches of Kapa'a are within walking distances from the project.

The proposed project will not adversely impact scenic or open space resources. The proposed project will not involve significant alteration of the existing topographic character of the site and will not affect public views to and along the shoreline.

Water Management

As an overarching philosophy in all source alternatives, Kapa'a Highlands II is committed to water conservation strategies to reduce consumption, conserve resources and minimize water use. The goal is to reduce the total water use through a combination of water saving equipment and strategies.

A number of measures may be implemented to facilitate end-use conservation, including water restrictions during drier periods, public education and more efficient landscaping practices. Consumption could be significantly reduced through end-user conservation.

Efficient fixtures and appliances will reduce indoor water use. The water distribution system will be maintained to prevent water loss and homeowners and businesses will be encouraged to maintain fixtures to prevent leaks. Landscaping will emphasize climate-adapted native and other appropriate plants suitable for coastal locations. Best management practices will be designed and implemented to minimize infiltration and runoff from daily operations.

WaterSense

WaterSense, a partnership program by the U.S. Environmental Protection Agency, seeks to protect the future of our nation's water supply by offering people a simple way to use less water with water-efficient products, new homes, and services. WaterSense brings together a variety of stakeholders to:

- Promote the value of water efficiency.
- Provide consumers with easy ways to save water, as both a label for products and an information resource to help people use water more efficiently.
- Encourage innovation in manufacturing.
- Decrease water use and reduce strain on water resources and infrastructure.

The program seeks to help consumers make smart water choices that save money and maintain high environmental standards without compromising performance. Products and services that have earned the WaterSense label have been certified to be at least 20 percent more efficient without sacrificing performance.

If one in every 10 homes in the United States were to install WaterSense labeled faucets or faucet accessories in their bathrooms, it could save 6 billion gallons of water per year, and more than $50 million in the energy costs to supply, heat, and treat that water!

Water Efficient Fixtures

Water is a finite resource—even though about 70 percent of the Earth's surface is covered by water, less than 1 percent is available for human use. Each American uses an average of 100 gallons of water a day at home. We can all use 30 percent less water by installing water-efficient fixtures and appliances. The average household spends as much as $500 per year on their water and sewer bill and can save about $170 per year by installing water-efficient fixtures and appliances.

Water-efficient fixtures reduce water and sewer costs, reduce demand on water supplies and treatment facilities, and reduce heating energy consumption and associated greenhouse gas emissions.

High efficiency toilets: (HETs) reduce flush volumes by no less than 20% compared to conventional ultra-low flow (ULFT) toilets. Dual-flush HETs allow users to choose one of two flushes: liquids or solids. In actual operation, dual-flush HETs average about 1.2 to 1.4 gpf. Pressure-assist HETs use a pressurized tank that creates for a more forceful flush with less water.

Faucets: Water flow is reduced by ***Flow limiters*** which are built into the faucet or are installed as after-market fittings. Aerators or laminar flow devices are types of flow limiters.

- Aeration injects air into the stream of water, displacing much of the water content.
- Laminar flow uses multiple small diameter parallel streams of water that are not aerated.

Flow control valves can limit water flow down to 1.5 to 0.5 gpm per side (hot and cold).

Showerheads: Federal law since 1994 mandates that all showerheads sold in the United States use 2.5 gpm or less. Despite this, some showerheads actually use much more than 2.5 gpm, and shower towers that include multiple showerheads or jets can total 12.5 gpm or more. A better option is a good quality low-flow showerhead designed to use 2.0 gpm or less while providing a satisfying shower.

Groundwater

A Water Master Plan has been approved, in concept, by the County Department of Water (DOW). Kapa'a Highlands II has a proven well site that will be dedicated to the DOW to feed the Department of Water's storage tanks and existing water system. Kapa'a Highlands II is committed to working with the DOW on pertinent water issues during the design and development phase.

The proposed water system will be subject to regulation as a public water system and will meet conditions of the State Department of Health, including HAR Chapter 11-20, 11-21 and 11-25.

Kapa'a Highlands, Phase II consists of approximate 97-acres on the eastern half of the 163.123-acres of Kapa'a Highlands. The proposed development is not anticipated to have significant adverse impacts on ground water because no active water systems are on the 97-acres. The irrigation facility for this former sugar land is no longer available.

A stream exists on Kapa'a Highlands I, flowing from north to south along the western border of the 163.123-acres of Kapa'a Highlands II. Kapa'a Highlands II is committed to keeping the flow of the stream consistent to prevent any potential health and mosquito problems associated with streams when not flowing naturally.

Storm and Surface Water Runoff

A Preliminary Drainage Report has been prepared. A detailed Drainage and Erosion Mitigation Plan will be prepared and submitted to the County Engineer for approval during the design and development stages. The Applicant will be providing major drainage improvements in connection with development of the property. Multiple detention ponds are proposed for the property. Additionally, a series of catch basins, drainage, pipes and culverts will be utilized to direct run off to major drainage areas on the property.

The project's proposed drainage system will be designed to minimize impacts to near shore coastal waters. Water quality treatment and detention basins will be built to prevent runoff and sedimentation from impacting groundwater resources. Prior to the occupancy of any residential or commercial unit within the project, Kapa'a Highlands II shall implement and maintain storm and surface-water runoff BMPs, subject to any applicable review and approval of the State DOH, designed to prevent violations of State water quality standards as a result of storm-water discharges originating from the project. These BMPs will be documented in a declaration of covenants, conditions and restrictions that will be recorded against the property and will run with the land.

Potential water quality impacts during construction of the project will be mitigated by adherence to State and County water quality regulations governing grading, excavation and stockpiling. The County's grading ordinance includes provisions related to reducing and minimizing the discharge of pollutants associated with soil disturbing activities in grading, grubbing and stockpiling.

Construction BMPs will be utilized in compliance with County ordinances pertaining to grading, grubbing, stockpiling, soil erosion and sedimentation during construction. BMPs will also be implemented for long term development and operation of activities occurring on the site as part of pollution prevention measures.

BMPs include storm water runoff and non-storm water sources control measures and practices that will be implemented to minimize the discharge of erosion and other pollutants from entering into the receiving State waters. The erosion control plan for the proposed project include temporary and permanent control measures BMPs that will be implemented in accordance with Chapter 10 of the Hawai'i County Code.

Post construction BMPs to prevent erosion and storm water runoff after construction is completed includes the installation of drain inlets and shallow drywells within the project site, and landscaping and grassing of disturbed areas.

Prior to occupancy, Kapa'a Highlands II will implement and maintain storm and surface-water runoff BMPs, subject to any applicable review and approval of the DOH. Those BMPs will be designed to prevent violations of State water quality standards as a result of storm-water discharges originating from the Project.

Wastewater

Kapa'a Highlands II The project will be contributing to the deferred maintenance and repair of the Kapa'a Waste Water Treatment plant. The project will not be a detriment to the capacity of the Plant.

Energy Management

Pursuant to Chapter 344 (State Environmental Policy) and Chapter 226 (Hawai'i State Planning Act), HRS, all Kapa'a Highlands II activities, buildings and grounds will be designed with a significant emphasis on energy conservation and efficiency. Efficient design practices and technologies will be the cornerstone of Kapa'a Highlands II's design phase. Buildings within Kapa'a Highlands II will further comply with the County of Kaua'i Energy Conservation Code (Kaua'i County Ordinance 890). Furthermore, solar water heaters will be utilized as made requisite under Section 196-6.5, HRS. Kapa'a Highlands II will confer with KIUC in regards to suggestions and proposals for customized demand-oriented management programs offering rebates for the installation of alternative energy efficient technologies and measures

	Kaua'i	Oahu	State
Medium Income (2009)	$55,723	$67,019	$63,741
Electricity Price (May 2011)	44.27 cents/kWh	30.1 cents/kWh	-

Kapa'a Highlands II is committed to renewable energy and energy efficiently as ways to reduce environmental harm and self sufficiency. Kapa'a Highlands II will continue to improve programs and create new programs as the development is initiated.

Residents of the State of Hawaii pay the highest electricity rates in the US. The average American paid 10.5 cents/kWh in 2010. In the state of Hawaii, O'ahu currently has the lowest residential electricity rates, while Lana'i has the highest. Residential rates on Kaua'i average between 40-45 cents/kWh. Hawaii relies on imported oil for approximately 76% of its total electricity production. The price variation across the state is largely a result of difference in power plant efficiencies, power purchasing agreement and other infrastructure.

The Kaua'i Island Utility Cooperative ("KIUC") is the sole electric utility on Kaua'i. KIUC began serving the people of Kauai on November 1, 2002, when it purchased Kauai Electric from Connecticut-based Citizens Communications. KIUC is America's newest electric cooperative, but it's by no means the only one. It is one of approximately 900 electric cooperatives serving electric consumers in 47 states. Like all cooperatives, KIUC operates as a not-for-profit organization that is owned and controlled by the people it serves. KIUC serves over 23,300 customers with 92% of KIUC's electricity coming from the burning of imported fossil fuels.

In 2009 the State Legislature codified the need for energy efficiency by enacting the statewide energy efficiency portfolio standard with a target of reducing energy consumption by 30% of forecasted energy consumption by 2030 (4,300 GWh) and beginning the process for separating efficiency from the existing renewable portfolio standard.

Energy efficiency in homes and buildings

- Hawai'i Revised Statutes section 46-19.6 requires all county agencies to place a "priority on processing of permit applications for construction projects incorporating energy and environmental design building standards."

To reduce net energy consumption and demand, Kapa'a Highlands II will consider the implementation of elements of the United States Environmental Protection Agency (EPA) Energy Star Program; including efficient insulation, high performance windows, compact construction, efficient ventilation systems, and energy efficient lighting elements and appliances.

Kapa'a Highlands II will furthermore seek to harness energy conservations and technologies to facilitate the possibility of net energy metering in building design to empower residents and tenants to reduce their electricity costs and provide energy back to the grid.

Energy conservation and efficiency measures will be implemented and emphasized where applicable in the design of Kapa'a Highlands II. Energy-efficiency technologies to be considered include:

- Solar energy for water heating
- Photovoltaic systems, fuel cells, biofuels and other renewable energy sources
- Optimal utilization of daytime sunlight
- High efficiency light fixtures
- Roof and wall insulation, radiant barriers and energy efficient windows
- Optimized air-flow
- Installation of heat resistant roofing
- Intelligent Landscaping to provide for shading, dust control, and heat-mitigation
- Portable solar lighting (i.e. parking lots)

A photovoltaic system that can generate up to 1.18 MW of electricity is situated in Phase I of the Kapa'a Highlands project. Its operator entered into an agreement to sell to Kaua'i Island Utility Cooperative electricity generated from the solar farm for 20 years. "Creating more renewable energy alternatives is one of the most critical challenges we face," Kauai Mayor Bernard Carvalho said at a dedication ceremony for the solar farm.

The project spreads over five acres of a 165-acre property, and has 5,376 solar panels mounted on posts and piers. The panels average about 12-feet off the ground.

Health and Active Lifestyles

Through the layout and design of Kapa'a Highlands II, there is an overall opportunity for a positive effect on the health of its residents. Communities that make it easy and safe to walk and ride bikes are opening the door to a wide range of health benefits for their residents. They are reducing barriers to being physically active and helping individuals integrate physical activity into their daily lives.

Active living is a way of life that integrates physical activity into daily routines. For individuals, the goal is to get a total of at least 30 minutes of activity each day by, for example, walking, bicycling, playing in the park, working in the yard, taking the stairs, or using recreation facilities. For communities, the goal is to provide opportunities for people of all ages and abilities to engage in routine physical activity and to create places and policies that encourage better physical health.

The burden of physical inactivity:
The Problem:
- 25% of adults are sedentary
- 60% of adults not active enough

The Outcome:
- Obesity, cardiovascular disease, cancer, diabetes, depression
- Physical inactivity is a primary factor in over 250,000 deaths annually.
- Medical costs associated with physical inactivity and its consequences may exceed $76 billion annually. (hawaii.gov/health/healthy-lifestyles)

Walkable and bikable communities increase active living. Active living can improve health by:
- Reducing the risk of dying prematurely.
- Reducing the risk of dying from heart disease.
- Reducing the risk of developing diabetes, colon cancer and high blood pressure.
- Reducing feelings of depression and anxiety.
- Helping control weight.
- Helping build and maintain healthy bones, muscles and joints.
- Promoting psychological well being. (Michigan Department of Community Health)

Growing body of evidence:
- San Diego study: 70 minutes more physical activity/week among residents in walkable neighborhood; 35% vs. 60% overweight (Saelens, Sallis, et. al. 2003)
- 6 lb weight difference in sprawling vs. compact counties
- King County study: 5% increase in neighborhood's "walkability index" correlated with 32% increase in active transportation; 0.23 point reduction in BMI (Frank, Sallis, et. al. 2006) (hawaii.gov/health/healthy-lifestyles)

Community Design Policies Work! The Task Force on Community Preventive Services concluded that:
- Community-scale policies & design are effective
  - Zoning for compact, mixed-use development
  - Transit-oriented development
  - Policies related to street design & connectivity

Kapa'a Highlands II Sustainability Plan

- Street-scale policies & design are effective:
  - Traffic calming
  - Street lighting
  - Improving street crossings (hawaii.gov/health/healthy-lifestyles)

Education

Schools servicing the project include Kapa‘a Elementary, Kapa‘a Middle School and Kapa‘a High School.

Kapa‘a Middle School borders the project site to the north. Kapa‘a Elementary School and Kapa‘a High School share a campus which is approx imately 2-miles from the project site.

Kapa‘a Elementary School serves grads K-5 and is one of the largest elementary schools in the state. It shares a campus with Kapa‘a High School. Kapa‘a E lementary School's capacity is 1,373 students, and the 2009/2010 school year enrollment was 827 students (Department of Education, 2010a).

Kapa‘a Middle School, with facilities for 1,059 students, was opened in 1997 and has an enrollment of 652 students (Department of Education, 2010b).

Kapa‘a High School currently has a student body numbering 1,033 with a capacity of 1,445 (Department of Education, 2010c).

The proposed project will generate increased demand on student enrollment within the region. Kapa‘a Highlands II will coordinate with the DOE to ensure that the DOE's facility assessment policy provisions are appropriately addressed.

Additionally, a 3.1-acre park is proposed adjacent to the existing Kapa‘a Middle School. The park will have an area for the county's proposed relocation of the Kapa‘a county swimming pool. Kapa‘a Highlands II also plans to develop a bike/walking path from the south of the property to the Kapa‘a Middle School to facilitate biking and walking around the development.

Housing

Kapa‘a Highlands II is a well located master planned project on the Island of Kaua‘i targeting primary housing demand from local and in-migrant families, as well as offshore second home demand for view estate ownership. Located in the middle of the island, the project is close to the centers of employment and resort activity, plus the airport, beaches, shopping, recreation, etc. It sits above the historic town of Kapaa and below the foothills of the mountain chain that forms the island.

The proposed development, Kapa‘a Highlands Phase II, will utilize 163-acres of land for single-family and multi-family residential and commercial purposes. Development of the Property will address a portion of the significant demand for affordable housing in the County of Kaua‘i, without significantly affecting reserve areas for foreseeable urban growth.

Kapa‘a Highlands II will respond to varying spectrums of demand for housing within Kaua‘i by providing a wide range of housing opportunities inclusive of affordable housing alternatives. Kapa‘a Highlands II will seek to create and sustain a mixed-income community allowing for unparalleled social diversity.

Affordable housing demands exhibited a significant upward trend over the last several years. Recent market studies have indicated a current shortage of single-family housing in the East Kaua‘i area. The forecast is that demand for housing will continue to increase, especially in the area of affordable housing. The proposed development will assist in alleviating some of the current supply-and-demand pressures on Kaua‘i's current housing market by providing a variety of additional housing products and opportunities for long-term local residents.

The Kawaihau Planning District has substantial capacity for additional residential development, as described in Section 6.2.3.1 (Build-Out Analysis) of the Kaua‘i General Plan. "Lands previously designated for urban use but as yet mostly undeveloped include an area located near Kapa‘a, south of Olohena Road. This area was previously designated for Urban Mixed Use and is shown as Urban Center on the new GP Land Use Map. Owned partly by the State and partly by Amfac/JMB (or its successor), this "expansion area" for Kapa‘a has already accommodated the Kapa‘a Middle School."

In a 2010 letter to the applicant, the Planning Director wrote "We are writing in general support of Three Stooges LLC's petition to amend 97-acres in Kapa‘a to the Urban district. The proposed amendment is in conformance with the County of Kaua‘i's General Plan and will provide 231 units of affordable housing. Affordable housing remains an acute need on Kaua'i, even with a falling real estate market and as such the County is generally supportive of any petition that proposes additional affordable housing, particularly when contiguous to developed urban areas, infrastructure and consistent with our General Plan."

Current Housing Stock

The housing stock on Kaua‘i is primarily single family, 69%, with attached housing only at 31%. Around 40% of all single-family homes are built on lots sized less than 10,000 sf. The condominium stock is 64% fee-simple and 34% leasehold. It is also only 10% owner occupied, with the balance of the units investor-owned, either in a rental pool, or part of a hotel operation. About 30% of the condo units were built since 1990, with most of the rest around 25 years or more in age. 38% of the condominium units are one bedrooms, with two bedrooms at 45%.

Housing Mix

The target market for this development is relatively broad, as Kapaʻa is arguably at the center of the island, with strong retail and recreational facilities, and easy commute to two out of the three major resort areas on the island. The demand for affordable housing is also significant. The proposed development will not only address a critical community need, it will also provide residents with a unique opportunity to purchase a lot and construct a home that best fits their needs on the proposed development's market-priced lots.

Kapaʻa Highlands II – Market Housing Mix (2010 dollars)

Type	Average Sales Price	Lot Size	Total Units
Single-Family Lots	$180,000 to $250,000	5,000 to 8,000 Sq. Ft.	86-lots
Multi-Family Units	$220,000 to $450,000	1 to -acre Parcels	683-units

Kapaʻa Highlands II – Affordable Housing Mix (2010 dollars)

Type	Average Sales Price	Lot Size	Total Units
Single-Family	$189,000 to $363,000	1,100 to 1,200 Sq. Ft. living area	13-lots
Multi-Family Units	$189,000 to $363,000	750 to 1,200 Sq. Ft. living area	154-units

Affordable Housing

An affordable housing element of the project is proposed and will conform to Kaua'i County Ordinance No. 860, Kaua'i's new housing policy wherein developers contribute up to thirty percent (30%) of the total residential units for affordable housing.

The Kaua'i housing policy provides incentives to developers who provide the required affordable units on-site and for providing single family affordable units. Kapa'a Highlands will be providing all of its affordable units on site and will include affordable single family units. This will reduce the number of affordable units required from approximately 205 units (30%) to approximately 167 units (21.7%), assuming a mix of 13 single family units and 154 multi-family units. The number of affordable units required will fluctuate depending on how many affordable single family units are provided. The proposed development will provide much needed affordable housing in the East Kaua'i region.

Under the proposed development's preliminary marketing concept, the affordable units are anticipated to be sold in the range of $189,000.00 to $363,000.00, which will be affordable to families earning from 80% up to 140% of the County's annual median income.

Anticipated Buyer Markets

The proposed products respond to the market opportunities identified above as follows:

Entry-level markets – Those units designated as affordable units, as well as many of the multifamily market units are conceived to appeal to entry-level markets, typified by the rapidly increasing 25- to 34-year-old Echo Boom cohort.

Move-up markets – Kapaʻa Highlands II's single-family lot products could appeal to move-up markets and growing families.

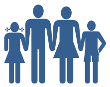
- The first level move-up market, typified by persons aged 35 to 44, is projected to grow particularly rapidly in the 2020 to 2030 period as the Echo Boomers mature.
- A more affluent move-up market could also be attracted to the views, convenient location and lifestyle offerings at Kapaʻa Highlands II.

Based on the Project location, development concept and the comparison projects surveyed, some 75% of Kapaʻa Highlands II residents are anticipated to be long-term Island residents. However, some product types could also appeal to second home buyers, relocating retirees or others that may come from off-Island

There has been strong demand historically for these products offerings at these price ranges, and the future should be no different. The location is very desirable, particularly for local buyers, but also for offshore second homeowners who want to feel a part of a 'normal' (but new or upgraded) neighborhood (to say nothing of wanting to take advantage of the views).

Despite current economic conditions, there is capacity amongst prospective buyers, thanks to a strong build up in their own home equity. Coupled with a desire to secure a central location for their home, there should be a goodly number of lots purchased when they come to market (particularly if there is advanced notification).

Social Sustainability



A community is composed of people, as well as places where they live; it is as much a social environment as a physical development. Thus, communities must not only be environmentally sustainable, they must also be socially sustainable.

A socially sustainable development supports more equitable distribution of resources, supports diversity within the community, meets the basic needs of residents and invests in social and human capital, thereby sustaining the quality of life and community livability for all residents into the future.

Socially sustainable development includes the following:

- recognizes, respects and values cultural and social diversity;
- preserve and maintains a high quality of life for all of its residents;
- meets basic needs of food, shelter, education, work, income and safe living and working;
- is equitable, ensuring that the benefits of development are distributed fairly across society;
- promotes education, creativity and the development of human potential;
- preserves our cultural and biological heritage, thus strengthening our sense of connectedness to our history and environment;
- is democratic, promoting citizen participation and involvement;
- promotes the context of “Live Aloha,” with people living together harmoniously and in mutual support and respect for each other

We saved the concept of Social Sustainability for the end of the analysis, to serve as a summary of the many socially-focused actions suggested in prior sections of this Sustainability Plan. Following are just a few of the issues previously mentioned:

- Affordable housing will be incorporated within the development, allowing for a diversity and mix of housing types and options
- Complete streets with walkways and bile lanes, allowing for slow movement through the neighborhoods for easy social interaction
- Space for the relocated County swimming pool
- Allocation for commercial spaces, affording project residents the opportunity to work near where they live
- Proximity to the Middle School affords multi-generation al interaction and learning
- Cooperation with the State by making land available for the Kapa‘a Bypass Road, helping regional residents
- Project layout and design will create an opportunity for both residents and the community to have a positive effect on their health through walkable and bikable transportation options.
- Consistency with long range planning documents, implementing the community’s vision for the future

Exhibit C

Kapaʻa Highlands Agricultural Master Plan

Kapaa Highlands
Agricultural Master Plan

June 1, 2007

Agricon Hawaii LLC
P.O. Box 95
Kamuela, HI 96743

Table of Contents

A. SUMMARY

Livestock (goats) can be raised successfully at Kapaa Highlands. Climate conditions will allow for normal pasture rotation the year around. The ratio of livestock to fenced pasture should be 3 animal units (AU) to 1 acre or better.

The climate and soils at Kapaa Highlands are not ideal for the growing of most commercially viable crops due to the poor soil, strong trade winds, and the salt spray from the ocean.

Goats are sold for their meat value and the local markets on all of the islands are excellent. The intended markets for goats raised on the property are the local Kauai market and the Honolulu market.

The Economics for Goats included in this report provides a picture of expected revenue and classifications of operating expenses associated with a livestock (goat) operation ("Project").

The Association of Condominium Owners of the Kapaa Highlands Condominium ("Association") may choose to operate the Project on behalf of participating owners. Alternatively, the Association may choose to enter into a contractual relationship with a livestock contractor pursuant to a license agreement in which the livestock contractor will pay an annual rent per acre to graze the property, plus a percentage of gross profits.

Livestock grazing is a permissible use within the agricultural districts as outlined under Hawaii Revised Statutes (HRS) Chapter 205, Section 205-4.5.

B. DESCRIPTION

The Kapaa Highlands Subdivision is located in Kapaa, above the Kapaa Bypass Road and adjacent to Kapaa Middle School. The property is further identified by Kauai Tax Map Key No. (4) 4-3-03:01. The total land area is 163.125 acres and the combined grazing area is approximately 101.573 acres.

Almost all of the property is located in the State Land Use Commission Agricultural District and within the Agriculture District of the Comprehensive Zoning Ordinance of the County of Kauai (CZO). As such, owners of subdivision lots will be required to comply with the requirements of HRS Chapter 205 and the CZO. Individual lot owners, through the Association, will be required either to provide a portion of their lot for the grazing of livestock as outlined in this Agricultural Master Plan, or to obtain an amendment to this Agricultural Master Plan to conduct alternative agricultural activities. The Kapaa Highlands is shown on the map attached hereto as Exhibit "A".

C. ENVIRONMENTAL SUITABILITY

1. Climate

The property is exposed to the northeast trade winds and, due to the proximity of the property to the ocean the trade winds will carry some salt spray to the property. This is problematic for most commercial crops, but should have no impact on livestock and minimal impact on salt resistant grasses. Annual rainfall is generally between 40 and 50 inches.

2. Soil

The soils are generally well-drained, dark reddish-brown silty clay and silty clay loam. The soil depth is generally between 10 and 15 inches.

The property was previously planted to sugar cane and due to the nature of sugar cane cultivation, these soils can be expected to be low in organic matter and have a low pH (very acid).

A Soils Map for the property is attached hereto as Exhibit "B", and a Soils Inventory (containing technical descriptions of soil types) is attached hereto as Exhibit "C".

The Land Study Bureau Land Classification for this property is B, C, D and E lands, as shown on the Detailed Land Classification Maps attached hereto as Exhibits "D" and "E".

3. Drainage

All the soils on the property are well drained indicating that, if good conservation practices are used, they should not erode.

D. CROP SUITABILITY

Due to the generally poor soils and harsh climate, the commercial crops most suited to the area are sugar and pineapple. Both of these industries are declining in Hawaii. Pineapple is no longer grown on Kauai and there is only one sugar mill that remains in operation. With appropriate irrigation and management, both tropical orchard crops (including trees) and some vegetable crops could be grown on the property, although with some difficulty and risk given the physical conditions at the property.

E. LIVESTOCK

1. Association Project

The Association may choose to operate the Project on behalf of all participating owners. In such case, the Association would be responsible for the rotation, care and marketing of the animals. The participating owners would be responsible for providing fixed assets (fences, gates, and water systems) on the owners' lots. The participating owners would be required to pay their proportionate share of all operational costs to the Association, and would be entitled to their proportionate share of all profits generated by the Project.

2. Contractor Operation

As an alternative, the Association could hire an independent contractor ("Contractor") to operate the Project. In such a case, the Contractor would own the goats and be responsible for the rotation, care, and marketing of the animals. The Association, through the participating owners, would be responsible for the fixed assets. These assets would include the fences, gates, and water systems. The Contractor would pay the Association a fixed rent per acre of pasture plus a percentage of gross profits, and would be responsible for normal maintenance of the fixed assets associated with the livestock operation.

3. Individual Goat Operators

The Owner may elect to engage in individual goat raising operations within the Owner's Agricultural Area of the Owner's Lot ("Owner's Operation"). In such case, the following shall apply:

a. The Owner shall be solely responsible for the costs of the Owner's Operation.

b. The Owner shall raise a minimum of three (3) goats for each acre within the Owner's Agricultural Area.

c. The Owner shall submit reports to, and as required by, the Association providing pertinent information concerning the Owner's Operation and in such detail as to comply with and satisfy the reporting requirement contained in the Agricultural Subdivision Agreement and the County Subdivision Approval.

4. Goat Husbandry

It is recommended that a breeding herd with a ratio of 1 buck to 50 does be maintained. Does will produce an average 1.5 kids per year. Kids can be weaned at approximately 5 to 6 months and should be separated from the breeding herd at this point. The gestation period for a doe is approximately 5 months.

The carrying capacity of the pasture at Kapaa Highlands is approximately 3 to 4 animal units (AU) to the acre. The breeding herd that consists of bucks and does is considered to be one AU per animal. Kids are ½ AU per animal. Therefore, assuming all of the owners became participants in the Project, there would be 101.573 acre of pasture available to carry 355 AU at 3.5 AU per acre. Attached hereto as Exhibit "F" is a spreadsheet entitled "Economics for Goats" which contains detailed assumptions regarding carrying capacity.

The breeding herd should be given good pasture and be kept on a strict health program so that its production of kids is at its optimum. The herd should be wormed every 30 to 60 days and provided with a mineral supplement. The water requirement for goats is between 2 and 3 gallons per day per AU. This will be dependent upon climatic conditions. Supplemental feeding is generally not required unless rainfall diminishes over several months to a point where the grass growth is insufficient to maintain the herd. At this point, the contractor has the option of providing supplemental feed or moving some or all of the goats to another location.

Goats are marketed at between 6 and 9 months of age at a weight of between 60 and 80 pounds. The estimate market price per goat ranges from $140 and $180. The primary market is the Kauai Island market that commands a higher price. The secondary market is Honolulu. The freight to Honolulu is paid by the buyer. Goats are generally sold to individuals who slaughter them for their meat. The market in Hawaii for goats is very stable.

The Economics for Goats spreadsheet contains details on the economics of the livestock (goat) operation.

F. HRS 205 COMPLIANCE

Hawaii Revised Statutes Chapter 205 establishes classifications of lands and requirements for land use. Section 205-4.5 defines permissible uses within the agricultural districts. This section also defines the soil classification rating that applies to the Chapter.

Section 205-4.5 uses the Land Study Bureau's (LSB) soil classification productivity rating system to determine which lands are to be governed by the Chapter. The LSB ratings for Kapaa Highlands are B, C, D and E. Land classification ratings A and B are restricted to the permitted uses as outlined in the section. The cultivation of crops and the raising of livestock are permitted uses. Uses on C, D and E lands also include crop cultivation and the raising of livestock.

G. CONCLUSION

The climate and soils at Kapaa Highlands are not ideal for the growing of most commercially viable crops due to the poor soil, strong trade winds, and the salt spray from the ocean. Thus a livestock operation provides an economically viable agricultural use for the property.

Either the Association operation of a livestock project, or a contractual relationship between the Association and a livestock Contractor, would allow the agricultural component of the property to be managed as one unit. Individual lot owners would also have the option of compliance with alternate methods of livestock grazing or with the cultivation of agricultural crops, provided they obtained the approval of the Planning Commission of the County of Kauai, Subdivision Committee, for an amendment to this Agricultural Master Plan for such alternative agricultural activities.

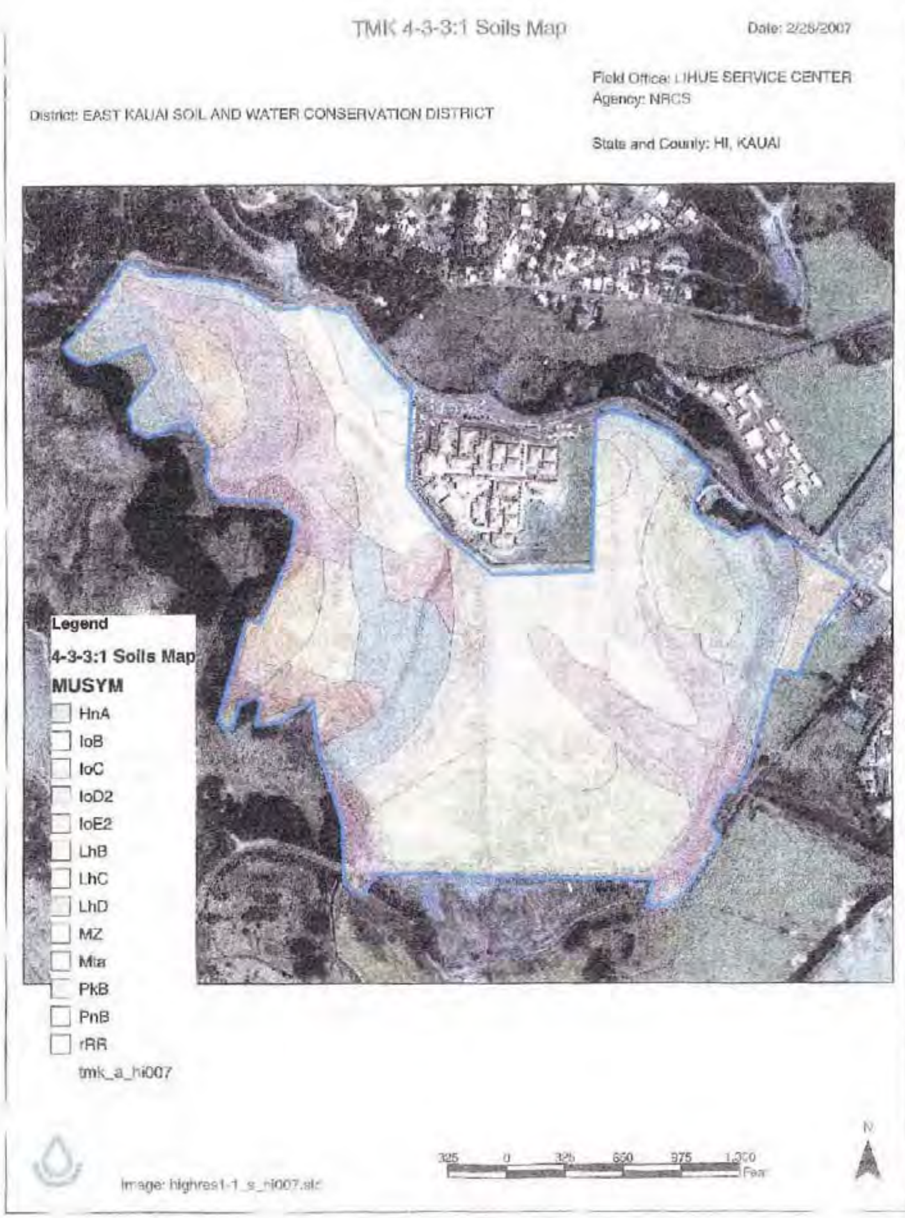
Livestock grazing is a permissible use within the agricultural districts as outlined under HRS Chapter 205, Section 205-4.5.

Exhibit "A"

Subdivision Map

Exhibit "B"

Soils Map



Kapaa Highlands Agricultural Master Plan
June 1, 2007

Exhibit "C"

Soils Inventory Report

Soils Inventory Report

TMK (4) 4-3-3:1

Map Unit Symbol	Acres	Percent
HnA	1.4	1%
IoB	44.5	27%
IoC	16.2	10%
IoD2	10.7	7%
IoE2	24.7	15%
LhB	8.4	5%
LhC	0.8	0%
LhD	4	2%
Mta	3.2	2%
MZ	0.3	0%
PkB	0.9	1%
PnB	31.9	20%
rRR	15	9%
Total:	162	

Hanalei Series

This series consists of somewhat poorly drained to poorly drained soils on bottom lands on the islands of Kauai and Oahu. These soils developed in alluvium derived from basic igneous rock. They are level to gently sloping. Elevations range from nearly sea level to 300 feet. The annual rainfall amounts to 20 to 120 inches. The mean annual soil temperature is 74° F. Hanalei soils are geographically associated with Haleiwa, Hihimanu, Mokuleia, and Pearl Harbor soils.

These soils are used for taro, pasture, sugarcane, and vegetables. The natural vegetation consists of paragrass, sensitiveplant, honohono, Java plum, and guava.

Hanalei silty clay, 0 to 2 percent slopes (HnA).

This soil is on stream bottoms and flood plains. Included in the areas mapped on Kauai along the Waimea River and in Waipaoiki Valley are small areas where the surface layer is 8 to 10 inches of reddish-brown silty clay. Included in the areas mapped on Oahu were small areas of very deep, well-drained alluvial soils and small areas of very poorly drained to poorly drained clay soils that are strongly mottled and are underlain by peat, muck, or massive marine clay.

In a representative profile the surface layer, about 10 inches thick, is dark-gray and very dark gray silty clay that has dark-brown and reddish mottles. The subsurface layer is very dark gray and dark-gray silty clay about 3 inches thick. The subsoil, about 13 inches thick, is mottled, dark gray and dark grayish-brown silty clay loam that has angular blocky structure. The substratum is stratified alluvium. The soil is strongly acid to very strongly acid in the surface layer and neutral in the subsoil.

Permeability is moderate. Runoff is very slow, and the erosion hazard is no more than slight. The available moisture capacity is about 2.1 inches per foot of soil. Roots penetrate to the water table. Flooding is a hazard.

Representative profile: Island of Kauai, lat. 22°12'37.8" N. and long. 159°28'47" W.

Ap-0 to 6 inches, dark-gray (10YR 4/1) silty clay; common distinct mottles of dark brown (7.5YR 4/4), red (2.5YR 5/8), and dark reddish brown (5YR 3/4) ; weak, coarse and medium, granular structure; very hard, friable, sticky and plastic; abundant fine and medium roots; many fine and medium pores; very strongly acid; abrupt, wavy boundary. 4 to 6 inches thick.

A1g-6 to 10 inches, very dark gray (10YR 3/1) silty clay; many distinct mottles of dark reddish brown (5YR 3/4), yellowish red (5YR 4/8), dark brown (7.5YR 4/4), and dark grayish brown (10YR 4/2); weak, coarse, prismatic structure; very hard, firm, sticky and plastic; abundant fine and medium roots; common fine and medium pores; strongly acid; gradual, smooth boundary. 3 to 5 inches thick.

A3g-10 to 13 inches, mixed, very dark gray (10YR 3/1) and dark gray (10YR 4/1) silty clay; many distinct mottles of yellowish red (5YR 4/6) and dark reddish brown (2.5YR 3/4); weak, coarse, prismatic structure; very hard, firm, sticky and plastic; common medium and fine roots; many fine and medium pores; slightly acid; gradual, smooth boundary. 2 to 4 inches thick.

B21g-13 to 18 inches, mixed, dark-gray (10YR 4/1) and dark grayish-brown (10YR 4/2) silty clay loam; many distinct mottles of strong brown and dark red (2.5YR 3/6); massive, but a few pockets have weak, medium, angular blocky structure; hard, firm, sticky and plastic; few medium and fine roots; many fine and medium pores; neutral; gradual, smooth boundary. 4 to 7 inches thick.

B22g-18 to 26 inches, dark grayish-brown (10YR 4/2) silty clay loam; many distinct mottles of dark red (2.5YR 3/6) and strong brown (7.5YR 5/6); weak, coarse, prismatic structure breaking to weak, fine and medium, angular blocky; slightly hard, firm, sticky and plastic; few medium and fine roots; many fine and medium pores; neutral; gradual, smooth boundary. 7 to 9 inches thick.

C-26 to 36 inches, dark grayish-brown (10YR 4/2) silty clay loam; common distinct mottles of strong brown (7.5YR 5/6), dark red (2.5YR 3/6), and red (2.5YR 4/8); massive; slightly hard, friable, sticky and plastic; few medium roots; many, fine and medium, tubular pores; slightly acid; water stands above this layer.

The A horizon ranges from 10YR to 2.5Y in hue, from 3 to 4 in value, and from 1 to 2 in chroma. Mottles range from a few faint ones to many distinct ones. The B horizon ranges from 10YR to 2.5Y in hue, from 2 to 4 in value, and from 1 to 2 in chroma. Mottles in the B and C horizons range from few to many. The depth to the seasonal high water table ranges from 2 to 5 feet. The C horizon is stratified. It ranges from silty clay to sand in texture.

This soil is used for taro, pasture, and sugarcane. (Capability classification IIw, irrigated or nonirrigated; sugarcane group 3; pasture group 7; woodland group 4)

Hanalei silty clay, 2 to 6 percent slopes (HnB).

On this soil, runoff is slow and the erosion hazard is slight. This soil is used for sugarcane, taro, and pasture. (Capability classification IIw, irrigated or nonirrigated; sugarcane group 3; pasture group 7; woodland group 4)

Hanalei stony silty clay, 2 to 6 percent slopes (HoB).

This soil has a profile like that of Hanalei silty clay, 0 to 2 percent slopes, except that it is stony. Runoff is slow, and the erosion hazard is slight. Stones hinder machine cultivation.

This soil is used for sugarcane and pasture. (Capability classification IIw, irrigated or nonirrigated; sugarcane group 3; pasture group 7; woodland group 4)

Hanalei silty clay, deep water table, 0 to 6 percent slopes (HrB).

This soil has a profile like that of Hanalei silty clay, 0 to 2 percent slopes, except that it has fewer mottles and the water table is at a depth of more than 3 feet. Included in mapping were small areas of stony soils.

This soil is used for sugarcane, taro, pasture, and vegetables. (Capability classification IIw, irrigated or nonirrigated; sugarcane group 3; pasture group 7; woodland group 4)

Hanalei silty clay loam, 0 to 2 percent slopes (HmA).

This soil has a profile like that of Hanalei silty clay, 0 to 2 percent slopes, except for the texture of the surface layer. Also, this soil is underlain by sand at a depth of 30 to 50 inches. Included in mapping was an area on the Hanalei River bottom that is less than 30 inches deep over sand.

This soil is used for taro, pasture, and sugarcane. (Capability classification IIw, irrigated or nonirrigated; sugarcane group 3; pasture group 7; woodland group 4)

Hanalei peaty silty clay loam, 0 to 2 percent slopes (HpA).

This soil has a profile like that of Hanalei silty clay, 0 to 2 percent slopes, except for the texture of the surface layer. Also, the water table is at the surface.

This soil is used for pasture. (Capability classification IVw, irrigated or nonirrigated; sugarcane group 3; pasture group 7; woodland group 4)

Ioleau Series

This series consists of well-drained soils on uplands on the island of Kauai. These soils developed in material weathered from basic igneous rock, probably mixed with volcanic ash. They are gently sloping to steep. Elevations range from 100 to 750 feet. The annual rainfall amounts to 40 to 70 inches. The mean annual soil temperature is 72° F. Ioleau soils are geographically associated with Lihue and Puhi soils.

These soils are used for irrigated sugarcane, pasture, pineapple, irrigated orchards, irrigated truck crops, wildlife habitat, and woodland. The natural vegetation consists of lantana, koa haole, guava, and associated shrubs and grasses.

Ioleau silty clay loam, 6 to 12 percent slopes (IoC).

This soil is on ridgetops in the uplands.

In a representative profile the surface layer is darkbrown and yellowish-red silty clay loam 15 inches thick. The subsoil, 40 to 60 inches thick, is dark-brown and dark reddish-brown silty clay that has subangular blocky structure and is very compact in place. The substratum is soft, weathered rock. The soil is very strongly acid to extremely acid throughout.

Permeability is slow. Runoff is medium, and the erosion hazard is moderate. The available water capacity is about 1.4 inches per foot of soil. Roots penetrate to a depth of 15 to 25 inches or to the plow depth.

Representative profile: Island of Kauai, lat. 22°07'32.9" N. and long. 157°13'03" W.

Ap1-0 to 6 inches, dark-brown (7.5YR 3/4) silty clay loam, brown (7.5YR 4/4) when dry; cloddy, breaking to moderate, fine and very fine, subangular blocky structure; hard, firm, sticky and plastic; abundant medium and fine roots and plentiful very fine roots; very strongly acid; abrupt, wavy boundary. 6 to 8 inches thick.

Ap2-6 to 15 inches, mixture of yellowish-red (5YR 4/6) silty clay loam, strong brown (7.5YR 5/6) when dry; massive; slightly hard, friable, sticky and plastic; and yellowish-red (5YR 4/8) silty clay, reddish brown (5YR 4/4) when dry; strong, very fine, subangular blocky structure; hard, firm, sticky and plastic; few medium roots and plentiful fine and very fine roots; common fine pores; very strongly acid, abrupt, wavy boundary. 7 to 10 inches thick.

B21t-15 to 27 inches, dark reddish-brown (5YR 3/4) silty clay, reddish brown (5YR 4/4) when dry; strong, fine and very fine, subangular blocky structure, very hard, firm, sticky and plastic; very few fine and very fine roots; common very fine pores; very compact in place; many moderately thick clay films on ped faces; very strongly acid; clear, wavy boundary. 5 to 12 inches thick.

B22t-27 to 38 inches, dark-brown (7.5YR 3/2) silty clay, yellowish red (5YR 3/6) in pores, dark brown (7.5YR 4/4) when dry; strong, fine and very fine, subangular blocky structure; very hard, firm, sticky and plastic; very few fine and very fine roots; few medium pores and many very fine pores; compact in place; many moderately thick clay films on ped faces and in pores; few pebbles; very strongly acid; clear, wavy boundary. 9 to 11 inches thick.

B23t-38 to 57 inches, dark-brown (7.5YR 3/3) light silty clay, dark brown (7.5YR 4/4) in pores, dark brown (7.5YR 4/4) when dry; strong, fine and very fine, subangular blocky structure; slightly hard, firm, slightly sticky and slightly plastic; few medium, fine, and very fine roots; many very fine pores; patchy, moderately thick clay films on ped faces; continuous in pores; few pebbles; extremely acid; clear, wavy boundary. 15 to 22 inches thick.

B24t-57 to 61 inches, dark reddish-brown (5YR 3/4) silty clay loam, reddish brown (5YR 4/4) when dry; moderate, fine and very fine, subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; no roots; many very fine pores patchy, moderately thick clay films on ped faces; continuous in pores; extremely acid.

The A horizon ranges from 5YR to 10YR in hue. In places the texture of the A horizon is clay loam. The B horizon ranges from 2.5YR to 7.5YR in hue, from 3 to 4 in value, and from 2 to 6 in chroma. The depth to the very compact B21t ranges from 15 to 25 inches.

This soil is used for sugarcane, pasture, pineapple, orchards, and truck crops. (Capability classification IIIe, irrigated or nonirrigated; sugarcane group I; pineapple group 6; pasture group 6; woodland group 6)

Ioleau silty clay loam, 2 to 6 percent slopes (IoB).

This soil has a profile like that of Ioleau silty clay loam, 6 to 12 percent slopes, except that it is 10 to 20 inches deeper to the compact layer. Runoff is slow, and the erosion hazard is slight. Roots penetrate to a depth of 25 to 40 inches.

This soil is used for sugarcane, pasture, pineapple, orchards, and truck crops. (Capability classification IIe, irrigated or nonirrigated; sugarcane group 1; pineapple group 5; pasture group 6; woodland group 6)

Ioleau silty clay loam, 12 to 20 percent slopes, eroded (IoD2).

This soil is similar to Ioleau silty clay loam, 6 to 12 percent slopes, except that it is moderately steep and part of the surface layer has been removed by erosion. Runoff is rapid, and the erosion hazard is moderate to severe.

This soil is used for sugarcane, pineapple, and pasture. (Capability classification IVe, irrigated or nonirrigated; sugarcane group 1; pineapple group 6; pasture group 6; woodland group 6)

Ioleau silty clay loam, 20 to 35 percent slopes, eroded (IoE2).

This soil is similar to Ioleau silty clay loam, 6 to 12 percent slopes, except that it is steep and most of the surface layer has been removed by erosion. Runoff is rapid, and the erosion hazard is severe.

This soil is used for pasture, woodland, sugarcane, pineapple, and water supply. (Capability classification VIe, nonirrigated; pasture group 6; woodland group 6)

Lihue Series

This series consists of well-drained soils on uplands on the island of Kauai. These soils developed in material weathered from basic igneous rock. They are gently sloping to steep. Elevations range from nearly sea level to 800 feet. The annual rainfall amounts to 40 to 60 inches. The mean annual soil temperature is 73° F. Lihue soils are geographically associated with Ioleau and Puhi soils.

These soils are used for irrigated sugarcane, pineapple, pasture, truck crops, orchards, wildlife habitat, woodland, and homesites. The natural vegetation consists of lantana, guava, koa haole, joee, kikuyugrass, molassesgrass, guineagrass, bermudagrass, and Java plum.

Lihue silty clay, 0 to 8 percent slopes (LhB).

This soil is on the tops of broad interfluves in the uplands. Included in mapping were small areas of a soil that has a very dark grayish-brown surface layer and a mottled subsoil.

In a representative profile the surface layer is duskyred silty clay about 12 inches thick. The subsoil, more than 48 inches thick, is dark-red and dark reddish-brown, compact silty clay that has subangular blocky structure. The substratum is soft, weathered rock. The surface layer is strongly acid. The subsoil is slightly acid to neutral.

Permeability is moderately rapid. Runoff is slow, and the erosion hazard is no more than slight. The available water capacity is about 1.5 inches per foot of soil. In places roots penetrate to a depth of 5 feet or more.

Representative profile: Island of Kauai, lat. 21°59'06.7" N. and long. 159°21'50" W.

Ap1-0 to 6 inches, dusky-red (2.5YR 3/2) silty clay, yellowish red (5YR 4/8) when dry; cloddy breaking to weak, fine and medium, subangular blocky structure; very hard, firm, sticky and plastic; abundant roots; common very fine and fine pores; many black concretions; strong effervescence with hydrogen peroxide; strongly acid; abrupt, smooth boundary. 4 to 8 inches thick.

Ap2-6 to 12 inches, dusky-red (2.5YR 3/2) silty clay, yellowish red (5YR 4/6) when dry; massive; very hard, friable, sticky and plastic; many roots; many very fine and fine pores; many, very fine, black concretions; strong effervescence with hydrogen peroxide; strongly acid; abrupt, smooth boundary. 4 to 8 inches thick.

B21-12 to 21 inches, dark reddish-brown (2.5YR 3/4) silty clay, red (2.5YR 4/6) when dry; moderate, medium to very fine, subangular blocky structure; hard, friable, sticky and plastic; abundant roots; many very fine and fine pores; many, fine, black concretions; moderate effervescence with hydrogen peroxide; nearly continuous glaze on ped surfaces, glaze looks like clay films; slightly acid; clear, broken boundary. 7 to 10 inches thick.

B22-21 to 27 inches, dark reddish-brown (2.5YR 3/4) silty clay, red (2.5YR 4/6) when dry; strong, very fine, subangular blocky structure; very hard, friable, sticky and plastic; many roots; many very fine and fine pores; nearly continuous glaze on ped faces; common, black concretions; weak effervescence with hydrogen peroxide; few, fine, black, manganese dioxide stains on ped faces; neutral; clear, smooth boundary. 5 to 8 inches thick.

B23-27 to 48 inches, dark reddish-brown (2.5YR 3/4) silty clay, red (2.5YR 4/6) when dry; strong, very fine, subangular and angular blocky structure; hard, firm, sticky and plastic; few roots; many very fine and fine pores; continuous glaze on ped faces, glaze looks like thick clay films; superimposed on the glaze is dark-red (10R 3/6) material that looks like pseudosand under magnification; large, black coatings on primary structural units; neutral; gradual, smooth boundary. 15 to 30 inches thick

B24-48 to 60 inches, dark-red (2.5YR 3/6) silty clay, red (2.5YR 4/6) when dry; strong, very fine, subangular and angular blocky structure; hard, firm, slightly sticky and plastic; no roots; many very fine and fine pores; thin, patchy coatings that look like clay films; many distinct pressure cutans; ped surfaces have superimposed on them stringy, dark-red (10R 3/6) pseudosand or frostlike coatings; this condition is more prevalent than in the B23 horizon; neutral.

The A horizon ranges from 10R to 5YR in hue, from 2 to 3 in chroma, and from 2 to 3 in value. The B horizon ranges from 10R to 2.5YR in hue and from 4 to 6 in chroma.

This soil is used for sugarcane, pineapple, pasture, truck crops, orchards, wildlife habitat, and homesites. (Capability classification IIe, irrigated or nonirrigated; sugarcane group 1; pineapple group 5; pasture group 5; woodland group 5)

Lihue silty clay, 8 to 15 percent slopes (LhC).

On this soil, runoff is slow and the erosion hazard is slight. This soil is used for sugarcane, pineapple, pasture, truck crops, orchards, wildlife habitat, and homesites. (Capability classification IIIe, irrigated or nonirrigated; sugarcane group 1; pineapple group 6; pasture group 5; woodland group 5)

Lihue silty clay, 15 to 25 percent slopes (LhD).

On this soil, runoff is medium and the erosion hazard is moderate. This soil is used for sugarcane, pineapple, pasture, wildlife habitat, and woodland. (Capability classification IVe, irrigated or nonirrigated; sugarcane group 1; pineapple group 6; pasture group 5; woodland group 5)

Lihue silty clay, 25 to 40 percent slopes, eroded (LhE2).

This soil is similar to Lihue silty clay, 0 to 8 percent slopes, except that the surface layer is thin. Runoff is rapid, and the erosion hazard is severe.

This soil is used for pasture, woodland, and wildlife habitat. Small areas are used for pineapple and sugarcane. (Capability classification VIe, nonirrigated; pasture group 5; woodland group 5)

Lihue gravelly silty clay, 0 to 8 percent slopes (LIB).

This soil is similar to Lihue silty clay, 0 to 8 percent slopes, except that it contains ironstone-gibbsite pebbles and has brighter colors in the B horizon. Included in mapping in the Eleele area and north of the town of Hanamaulu were small areas of soils that have a dark yellowish-brown, friable subsoil.

This soil is used for sugarcane, pasture, and homesites. (Capability classification IIe, irrigated or nonirrigated; sugarcane group 1; pineapple group 5 ; pasture group 5 ; woodland group 5)

Lihue gravelly silty clay, 8 to 15 percent slopes (LIC).

On this soil, runoff is slow and the erosion hazard is slight. Included in mapping were areas where the slope is as much as 25 percent.

This soil is used for sugarcane, pasture, wildlife habitat, and homesites. (Capability classification IIIe, irrigated or nonirrigated; sugarcane group 1; pineapple group 6; pasture group 5; woodland group 5)

Marsh

Marsh (MZ) consists of wet, periodically flooded areas covered dominantly with grasses and bulrushes or other herbaceous plants. It occurs as small, low-lying areas along the coastal plains. Water stands on the surface, but marsh vegetation thrives. The water is fresh or brackish, depending on proximity to the ocean. Included in mapping were small areas of mangrove swamp and small areas of open water. (Capability classification VIIIw, nonirrigated)

Mokuleia Series

This series consists of well-drained soils along the coastal plains on the islands of Oahu and Kauai. These soils formed in recent alluvium deposited over coral sand. They are shallow and nearly level. Elevations range from nearly sea level to 100 feet. The annual rainfall amounts to 15 to 40 inches on Oahu and 50 to 100 inches on Kauai. The mean annual soil temperature is 74° F. Mokuleia soils are geographically associated with Hanalei, Jaucas, and Keaau soils.

In this survey area a poorly drained variant of the Mokuleia series was mapped. This soil, Mokuleia clay loam, poorly drained variant, is described in alphabetical order, along with other mapping units of this series.

These soils are used for sugarcane, truck crops, and pasture. The natural vegetation consists of kiawe, klu, koa haole, and bermudagrass in the drier areas and napiergrass, guava, and joee in the wetter areas.

Mokuleia clay loam (Mt).

This soil occurs as small areas on the coastal plains. It is nearly level. Included in mapping were small areas of Jaucas soils; small areas of very deep, well-drained soils in drainageways; and small areas of poorly drained clay soils underlain by reef limestone.

In a representative profile the surface layer is very dark grayish-brown clay loam about 16 inches thick. The next layer, 34 to more than 48 inches thick, is dark-brown and light-gray, single-grain sand and loamy sand. The surface layer is neutral in reaction, and the underlying material is moderately alkaline.

Permeability is moderate in the surface layer and rapid in the subsoil. Runoff is very slow, and the erosion hazard is no more than slight. The available water capacity is about 1.9 inches per foot in the surface layer and about 1.0 inches per foot in the subsoil. In places roots penetrate to a depth of 5 feet or more.

Representative profile: Island of Oahu, lat. 21°34'49" N. and long. 158°10'09" W.

Ap-0 to 16 inches, very dark grayish-brown (10YR 3/2) Clay loam, dark grayish brown (10YR 4/2) when dry; moderate, very fine and fine, granular and subangular blocky structure; hard, firm, sticky and plastic; plentiful fine roots; many, very fine and fine, interstitial pores; few, fine and very fine, tubular pores; common wormholes and worm casts; horizon consists of about 25 percent coral sand; slight effervescence with hydrogen peroxide; violent effervescence with hydrochloric acid; neutral; abrupt, wavy boundary. 10 to 16 inches thick.

IIC1-16 to 22 inches, dark-brown (10YR 4/3) loamy sand, brown (10YR 5/3) when dry; massive; soft, slightly hard, nonsticky and nonplastic; plentiful fine roots; porous; few pieces of reef limestone; horizon consists of about 80 percent coral sand; violent effervescence with hydrochloric acid; moderately alkaline; abrupt, smooth boundary. 6 to 20 inches thick.

IIC2-22 to 50 inches, light-gray (10YR 7/2), moist and dry, coral sand; single grain; loose when moist or dry, nonsticky and nonplastic; few fine roots; porous; few pieces of coral; violent effervescence with hydrochloric acid; moderately alkaline.

The depth to coral sand ranges from 12 to 30 inches. The A horizon ranges from 10YR to 5YR in hue and from 1 to 3 in value when moist and 3 to 5 when dry. It ranges from 1 to 3 in chroma when moist and 1 to 3 when dry. The IIC1 horizon ranges from 10YR to 7.5YR in hue, from 3 to 6 in value when moist and 4 to 7 when dry, and from 1 to 3 in chroma.

This soil is used for sugarcane, truck crops, and pasture. Capability classification Its if irrigated, VIs if nonirrigated; sugarcane group 1; pasture group 3)

Mokuleia clay (Mtb).

This soil has a profile like that of Mokuleia clay loam, except for the texture of the surface layer. It is nearly level. Permeability is slow in the surface layer. Workability is difficult because of the sticky, plastic clay.

This soil is used for sugarcane and pasture. (Capability classification IIIs if irrigated, VIs if nonirrigated; sugarcane group 1; pasture group 3)

Mokuleia fine sandy loam (Mr).

This soil occurs on the eastern and northern coastal plains of Kauai. It is nearly level. This soil has a profile like that of Mokuleia clay loam, except for the texture of the surface layer.

Permeability is moderately rapid in the surface layer and rapid in the subsoil. Runoff is very slow, and the erosion hazard is slight. The available water capacity is about 1 inch per foot in the surface layer and 0.7 inch per foot in the subsoil. Included in mapping were small areas where the slope is as much as 8 percent.

This soil is used for pasture. (Capability classification IIIs if irrigated, IVs if nonirrigated; sugarcane group 1; pasture group 3)

Mokuleia loam (Ms).

This soil has a profile like that of Mokuleia clay loam, except that the surface layer is loam and in most places is about 8 inches thick. It is nearly level.

This soil is used for sugarcane, truck crops, and pasture. (Capability classification Its if irrigated, VIs if nonirrigated; sugarcane group 1; pasture group 3)

Mokuleia clay loam, poorly drained variant (Mta).

This soil occurs on Kauai. It is nearly level. The soil is poorly drained, and in this way, it differs from other soils of the Mokuleia series. The surface layer is dark brown to black and is mottled.

This soil is used for sugarcane, taro, and pasture. (Capability classification IIIw, irrigated or nonirrigated; sugarcane group 3; pasture group 3)

Pohakupu Series

This series consists of well-drained soils on terraces and alluvial fans on the islands of Oahu and Kauai. These soils formed in old alluvium derived from basic igneous material. They are nearly level to moderately sloping. Elevations range from 50 to 250 feet. The annual rainfall amounts to 40 to 60 inches. The mean annual soil temperature is 73° F. Pohakupu soils are geographically associated with Alaeloa, Papaa, and Lihue soils.

These soils are used for sugarcane, pineapple, truck crops, pasture, and homesites. The natural vegetation consists of guava, Christmas berry, Japanese tea, koa haole, and kikuyugrass.

Pohakupu silty clay loam, 0 to 8 percent slopes (PkB).

This soil has smooth slopes and occurs on terraces and alluvial fans. The slopes are mainly 3 to 8 percent. Included in mapping were small areas of Alaeloa and Waialua soils and small areas where the slope is as much as 15 percent. Also included on Kauai were small areas where the texture is silty clay and small areas that have a hue of 2.5YR in the subsoil.

In a representative profile the surface layer is dark reddish-brown silty clay loam about 13 inches thick. The subsoil, 40 to more than 60 inches thick, is dark reddishbrown and dark-brown silty clay loam that has angular and subangular blocky structure. The substratum is strongly weathered gravel. The soil is slightly acid to medium acid.

Permeability is moderately rapid. Runoff is slow, and the erosion hazard is slight. The available water capacity is about 1.5 inches per foot of soil. In places roots penetrate to a depth of 5 feet or more.

Representative profile: Island of Oahu, lat. 21°22'53" N. and long. 157°45'16" W.

Ap-0 to 13 inches, dark reddish-brown (5YR 3/3) silty clay loam, reddish brown (5YR 4/3) when dry; strong, very fine, subangular blocky structure; hard, friable, sticky and plastic; abundant roots; many very fine and fine pores; common wormholes and worm casts; moderate effervescence with hydrogen peroxide; slightly acid; abrupt, smooth boundary. 8 to 13 inches thick.

B21-13 to 21 inches, dark reddish-brown (5YR 3/3) silty clay loam, reddish brown (5YR 4/4) when dry; moderate, very fine, subangular blocky structure; hard, friable, slightly sticky and plastic; abundant roots; many, very fine and fine, tubular pores; common, patchy pressure cutans; slight effervescence with hydrogen peroxide; slightly acid; abrupt, smooth boundary. 4 to 9 inches thick.

B22-21 to 38 inches, dark-brown (7.5YR 3/4) silty clay loam, brown (7.5YR 4/4) when dry; strong, very fine, blocky and subangular blocky structure; hard, friable, sticky and plastic; plentiful roots; many, very fine and fine, tubular pores; continuous pressure cutans on ped surfaces; few highly weathered pebbles; many black stains in pores and on peds; stains show strong effervescence with hydrogen peroxide; slightly acid; clear, irregular boundary. 4 to 17 inches thick.

B23-38 to 50 inches, dark-brown (7.5YR 3/4) silty clay loam, brown (7.5YR 4/4) when dry; strong, very fine, angular and subangular blocky structure; hard, friable, sticky and plastic; few roots; many, very fine and fine, tubular pores; strong, continuous pressure cutans; few highly weathered pebbles; common black stains that effervesce with hydrogen peroxide; slightly acid; clear, irregular boundary. 12 to 20 inches thick.

B3-50 to 76 inches, dark-brown (7.5YR 3/4) silty clay loam, brown (7.5YR 4/4) when dry; strong, very fine, angular and subangular blocky structure; hard, friable, slightly sticky and plastic; few roots; many, very fine and fine tubular pores; nearly continuous pressure cutans; few highly weathered pebbles; few, fine, black stains that effervesce with hydrogen peroxide; slightly acid.

Effervescence with hydrogen peroxide ranges from slight to moderate in the upper part of the profile and from slight to none below. The structure in the B horizon ranges from moderate to strong. In places a few boulder cores occur within the lower part of the profile. The A horizon ranges from 2 to 3 in chroma and value when moist. The B horizon ranges from 7.5YR to 5YR in hue and from 3 to 4 in chroma and value when moist.

This soil is used for pasture, truck crops, and homesites on Oahu and for sugarcane and pineapple on Kauai. (Capability classification IIe if irrigated, IIIe if nonirrigated; sugarcane group 1; pasture group 6; woodland group 5)

Pohakupu silty clay loam, 8 to 15 percent slopes (PkC).

On this soil, runoff is slow to medium and the erosion hazard is slight to moderate. Workability is slightly difficult because of the slope.

Included in mapping were small areas where the surface layer and part of the subsoil have been removed. Also included, near the drainageways, were areas where the slope ranges from 15 to 25 percent.

This soil is used for pasture. (Capability classification IIIe, nonirrigated; sugarcane group 1; pasture group 6; woodland group 5)

Puhi Series

This series consists of well-drained soils on uplands on the island of Kauai. These soils developed in material derived from basic igneous rock. They are nearly level to steep. Elevations range from 175 to 500 feet. The annual rainfall amounts to 60 to 80 inches. The mean annual soil temperature is 73° F. Puhi soils are geographically associated with Lihue and Kapaa soils.

These soils are used for sugarcane, pineapple, truck crops, orchards, pasture, woodland, wildlife habitat, water supply, and homesites. The natural vegetation consists of guava, Java plum, pangolagrass, kikuyugrass, elephantopus, joee, yellow foxtail, and rhodomyrtus.

Puhi silty clay loam, 0 to 3 percent slopes (PnA).

This soil is on broad interfluves on the uplands.

In a representative profile the surface layer is brown silty clay loam about 12 inches thick. The subsoil, about 48 inches thick, is reddish-brown and dark reddish-brown silty clay loam and silty clay that has subangular blocky structure. The substratum is silty clay. The surface layer is very strongly acid. The subsoil is slightly acid to medium acid.

Permeability is moderately rapid. Runoff is very slow, and there is no erosion hazard. The available water capacity is about 1.3 inches per foot of soil. In places, roots penetrate to a depth of 5 feet or more.

Representative profile: Island of Kauai, lat. 22°01'14" N. and long. 159°23'8.1" W.

Ap-0 to 12 inches, brown (10YR 4/3) silty clay loam, brown (10YR 4/3) when rubbed, yellowish brown (10YR 5/4) when dry; moderate very fine, subangular blocky structure; hard, friable, slightly sticky and slightly plastic; abundant roots; many, very fine and fine, tubular pores and common interstitial pores; many gritty particles that are hard to break down; delayed efforvescence with hydrogen peroxide; very strongly acid; abrupt, wavy boundary. 11 to 14 inches thick.

B21-12 to 21 inches, reddish-brown (5YR 4/4) silty clay loam, yellowish red (5YR 4/6) when dry; weak, very fine and fine, subangular blocky structure; hard, friable, slightly sticky and slightly plastic; plentiful fine and very fine roots; many very fine pores and common fine pores; nearly continuous, shiny glaze on peds; patchy coatings that look like clay films on some peds; medium acid; gradual, smooth boundary. 7 to 11 inches thick.

B22-21 to 33 inches, dark reddish-brown (5YR 3/4) silty clay loam, yellowish red (5YR 4/6) when dry; common black specks; moderate, very fine and fine, sub angular blocky structure; hard, friable, slightly sticky and slightly plastic; plentiful fine and very fine roots; many very fine pores and common fine pores; nearly continuous, shiny glaze on peds, patchy coatings that look like clay films on some peds; stringy coatings of stronger chroma; slightly acid; gradual, smooth boundary. 10 to 14 inches thick.

B23-33 to 41 inches, dark reddish-brown (2.5YR 3/4) silty clay loam, yellowish red (5YR 4/6) when dry; moderate, very fine, subangular blocky structure; hard, friable, slightly sticky and plastic; few very fine roots; many very fine pores and common medium pores; continuous, shiny glaze on peds ; patchy coatings that look like clay films on peds ; many shiny particles; many, very fine, black specks; medium acid; gradual, smooth boundary. 6 to 9 inches thick.

B24-41 to 60 inches, dark reddish-brown (5YR 3/3) silty clay, yellowish red (5YR 4/8) when dry; strong, very fine and fine, subangular blocky structure; hard, firm, sticky and plastic; few very fine roots; many very fine and fine pores and common medium pores; continuous, shiny glaze on peds; many, very fine, black specks and shiny particles; medium acid.

The A horizon ranges from 7.5YR to 10YR in hue, from 2 to 4 in value, and from 2 to 4 in chroma. The B horizon ranges from 2.5YR to 7.5YR in hue, from 3 to 4 in value, and from 3 to 4 in chroma.

This soil is used for sugarcane, pineapple, orchards, truck crops, pasture, and homesites. (Capability classification IIs, irrigated or nonirrigated; sugarcane group 1; pineapple group 4; pasture group 8; woodland group 7)

Puhi silty clay loam, 3 to 8 percent slopes (PnB).

On this soil, runoff is slow and the erosion hazard is slight. This soil is used for sugarcane,

pineapple, orchards, pasture, truck crops, and homesites. (Capability classification IIe, irrigated or nonirrigated; sugarcane group 1; pineapple group 5; pasture group 8; woodland group 7)

Puhi silty clay loam, 8 to 15 percent slopes (PnC).

On this soil, runoff is slow and the erosion hazard is slight. This soil is used for sugarcane, pineapple, pasture, and orchards. (Capability classification IIIe, irrigated or nonirrigated; sugarcane group 1; pineapple group 6; pasture group 8; woodland group 7)

Puhi silty clay loam, 15 to 25 percent slopes (PnD).

On this soil, runoff is medium and the erosion hazard is moderate. Included in mapping were small, eroded areas.

This soil is used for sugarcane, pineapple, orchards, pasture, woodland, wildlife habitat, and water supply. (Capability classification IVe, irrigated or nonirrigated; sugarcane group 1, pineapple group 6; pasture group 8; woodland group 7)

Puhi silty clay loam, 25 to 40 percent slopes (PnE).

On this soil, runoff is rapid and the erosion hazard is severe.

This soil is used for pasture, woodland, wildlife habitat, and water supply. (Capability classification VIe, nonirrigated; pasture group 8; woodland group 7)

Rough Broken Land

Rough broken land (rRR) consists of very steep land broken by numerous intermittent drainage channels. In most places it is not stony. It occurs in gulches and on mountainsides on all the islands except Oahu. The slope is 40 to 70 percent. Elevations range from nearly sea level to about 8,000 feet. The local relief is generally between 25 and 500 feet. Runoff is rapid, and geologic erosion is active. The annual rainfall amounts to 25 to more than 200 inches.

These soils are variable. They are 20 to more than 60 inches deep over soft, weathered rock. In most places some weathered rock fragments are mixed with the soil material. Small areas of rock outcrop, stones, and soil slips are common. Included in mapping were areas of colluvium and alluvium along gulch bottoms.

This land type is used primarily for watershed and wildlife habitat. In places it is used also for pasture and woodland. The dominant natural vegetation in the drier areas consists of guava, lantana, Natal redtop, bermudagrass, koa haole, and molassesgrass. Ohia, kukui, koa, and ferns are dominant in the wetter areas. Puakeawe, aalii, and sweet vernalgrass are common at the higher elevations. (Capability classification VIIe, nonirrigated)

Exhibit "D"

LSB Map 100

EXHIBIT "D"

Exhibit "E"

LSB Map 107

EXHIBIT "E"

Exhibit "F"

Economics For Goats

Kapaa Highlands Agricultural Master Plan
June 1, 2007

Economics for Goats
01-Jun-07

General Assumptions:	Ratio	Units
Acreage		102
Animal units per acre		3.5
Total animal units (AU)		357
Breeding herd :		206
Bucks (1)	3%	6
Does (30)	97%	200
Kids per doe per year	1.5	300
Total animal units (AU)		356

Note: Bucks & Does = 1 AU each, Kids = 1/2 AU each.

Annual Revenue from Goat Sales:	Ratio	Units	Unit Price		Annual Revenue
Local Kauai Sales	75%	225	$ 180		$ 35,968
Honolulu Sales (FOB Lihue)	25%	75	$ 140		$ 10,491
Totals		300			$ 46,458

Expense:	Units	Unit Cost	Fixed Cost	Annual Cost
Labor:				
Part-time labor (hours)	520	$ 15.00		$ 7,800
Feed:				
Barley-Corn (per head)	206	$ 2.90		$ 597
Minerals:				
Mineral block (per head)	206	$ 12.00		$ 2,472
Veterinary Supplies:				
Worming (per head)	206	$ 1.20		$ 247
Water:				
Annual requirement (3 gallons per head per day)	206	$ 2.03		$ 417
Repair & Maintenance:				
Repair fences, gates, water system			$ 1,200	$ 1,200
Vehicle - Repair , Maintenance and Fuel			$ 2,000	$ 2,000
Hauling Goats (per head):	206	$ 0.70		$ 144
Total Direct Costs				$ 14,878
Overhead:				
Lease Rent (unit cost per acre per year)		$ 35.00		$ 3,570
Administration			$ 500	$ 500
Management			$ 5,000	$ 5,000
Other			$ 250	$ 250
Total Overhead				$ 9,320
Net Operating Profit (Loss)				$ 22,260

Exhibit D

Department of Water, Kaua'i County
Manger's Report 12-10

MANAGER'S REPORT 12-10:

July 21, 2011

Re: Kapaa Highland Request

RECOMMENDATION:
Your concurrence is requested to allow the staff to enter into an agreement in accordance with Part III Section XII of the rules with Kapaa Highland subject to county attorney concurrence. This exchange should be on a dollar for dollar basis not gallon for gallon.

BACKGROUND:
The developer is proposing the following exchange: the developer will give the DOW undeveloped water and in return, the DOW will provide the developer with storage for the developer's project; both will be built to department standards.
The project has a large portion of land that shows in the community plan to be affordable housing though not currently zoned as such. I have checked with the county housing department and the Mayor's office and both want to see the affordable housing go forward. This concurrence is verbal.
The planned storage for planned water exchange will allow this project to move forward when other developments have been stopped due to inadequate storage. There appears to be an overall county benefit and the implementation would be subject to finally getting the storage and source completed.
Our storage project is scheduled to be completed in 3-4 years. The source development could be sooner. The issue with this proposal is wells in different locations have different yields and DOW storage is only subject to available funds.
The developer has drilled a well and tested it. The well is too crooked to be used as a normal source of water and have to be redrilled in another location. The next one may not provide the same yield. It is low enough risk that this is being recommended.

Respectfully submitted,

David R. Craddick, P.E.
Manager and Chief Engineer

Department of Water
County of Kaua'i

Water has no substitute.......Conserve it

August 22, 2011

Mr. Gregg Allen
161 Wailua Road
Kapaa, HI 96746

Dear Mr. Allen:

Subject: Water Master Plan for the Kapa'a Highlands Project on TMK: 4-3-03:001

At the Department of Water, Water Board July 28th 2011 meeting, via Managers Report 12-10, in response to your letters of April 22, 2011 and May 11, 2011, accepted the proposed exchange of source for storage on a dollar for dollar basis. This acceptance is based on your commitment to proceed with zoning changes in your development to match the county zoning. That zoning change requires affordable housing in certain portions of your proposed development.

This acceptance is based on building permits and County water meter service not being issued if the source and storage requirements have not been completed as of the date of requested building permit approval. We ask that you submit a proposed draft of an agreement to memorialize this action. We would expect that this agreement runs with the land.

If you have any questions, please contact Mr. Gregg Fujikawa at (808) 245-5416.

Sincerely,

David R. Craddick, P.E.
Manager and Chief Engineer

GF/WE:bdm
Bill/Gregg Allen Response Letter/July Board Mtg.

4398 Pua Loke St., P.O. Box 1706, Lihue, HI 96766 Phone: 808-245-5400
Engineering and Fiscal Fax: 808-245-5813, Operations Fax: 808-245-5402, Administration Fax: 808-246-8628

Exhibit E

Irrigation Supply For the Kapa'a Highlands Agricultural Subdivision
Water Master Plan

TNWRE
Tom Nance Water
Resource Engineering

No. of pages: 8
Email: gallen@harbormall.net

Original ☑ will ☐ will not
be mailed to you.

October 27, 2006
06-281 (05-41)

MEMORANDUM

TO:	Greg Allen
FROM:	Tom Nance
SUBJECT:	Irrigation Supply for the Kapaa Highlands Agricultural Subdivision

Introduction

This memo report assesses the feasibility of developing an onsite well (or wells) to provide the necessary irrigation supply for the Kapaa Highlands Agricultural Subdivision. The total area of the project is 163 acres. Wagner Engineering Services, Inc. has determined that up to 113 acres of the site is suitable for agricultural use (Figure 1). The Kauai Department of Water (DOW) standards require an average supply for irrigation for 2500 GPD/acre. For 113 acres, this translates to a year-round average of 0.283 MGD. Applying a maximum seasonal use factor of 1.5 results in a required summertime supply capability of 0.424 MGD (equivalent to 295 GPM operating continuously).

Results of an Onsite Exploratory Borehole

To investigate the possibility of providing the irrigation supply with an onsite well or wells, an exploratory borehole was drilled and pump tested. The location of this exploratory borehole is shown on Figures 1 and 2. Ground elevation at the well site is 25 feet. It was drilled to a depth of 260 feet or 235 feet below sea level. During the course of drilling, two separate aquifers were encountered. The upper aquifer has a static water level of about 19 feet above sea level (MSL) and it extends to a depth of about 80 feet (ie. to 55 feet below sea level). It has very limited yield (less than 30 GPM) as it is essentially a collection of water in the soil mantle perched on poorly permeable Koloa lavas beneath it.

The strata between 80- and 210-foot depth are poorly permeable and function as an aquiclude separating the upper and lower aquifers. The lower aquifer, which starts at 210-foot depth and extends below the 260-foot depth of the exploratory borehole, has a static water level about 13 feet (MSL). This lower aquifer is quite productive.

A pump test was run at my direction to define the potential yield and quality of water from the lower aquifer. Using a combination of casing and grout, water from the upper aquifer was sealed off for this test. Results of the 12-hour test conducted on October 19, 2006 are presented on Figures 3, 4, and 5. A series of flowrate steps were run initially to define hydraulic performance (Figure 3). Using a curve fitting technique, these results define expectable drawdown for a range of pumping rates (Figure 4). For example, at 500 GPM, the drawdown would be 7.5 feet.

The remainder of the 12-hour test was run at 550 GPM to see if any salinity change would occur. These results are shown on Figure 5 and Table 1. The salinity (as measured by conductivity) actually decreased for the first two hours and stabilized after that. Chlorides of just 53 MG/L demonstrate that the water is quite fresh and obviously suitable for irrigation use.

Conclusions and Recommendations Regarding the Irrigation Supply

1. Results of the exploratory borehole demonstrate that an adequate irrigation supply for the Agricultural Subdivision can be developed from a single onsite well located in the near proximity of the exploratory borehole.

2. The finished dimensions of the production well should be based on the following:

   a. A 17-inch borehole should be drilled to 300-foot depth.

   b. 220 feet of 8-inch solid casing and 80 feet of 8-inch perforated casing should be installed in the borehole.

   c. The annular space from 220 feet to the ground surface should be sealed with cement grout.

   d. Final pump testing at rates up to 550 GPM should be conducted to confirm the well's yield.

3. A companion report by ITC Water Management describes the delivery components of the irrigation system based on the following:

   a. A 7.5 horsepower, 450 GPM submersible pump and motor should be installed in the well at a depth of 30 to 40 feet.

   b. The well pump should deliver water to an adjacent storage tank of at least 30,000 gallons in size. Well pump cycles would be controlled by a level switch in the tank.

   c. An on-demand pump station of up to 600 GPM capacity should be installed next to the tank to draw water from the tank and deliver it to users in the agricultural subdivision.

Attachments

Specific Conductance and Chlorides of Samples
Collected During the 12-Hour Pump Test on October 19, 2006

Sample Time	Pumping Rate (GPM)	Specific Conductance (µS/cm @ 25° C.)	Chlorides (MG/L)
10:05	317	468	55
10:30	317	449	54
11:00	438	440	54
11:30	529	436	53
12:00	528	432	53
13:00	527	430	53
14:00	527	429	53
15:00	527	429	53
16:00	528	429	53
17:00	529	428	53
18:00	531	429	53
19:00	532	430	53
20:00	533	431	53
21:00	533	431	53
22:00	533	431	53

Notes:
1. Specific conductance measured in the TNWRE office using a HACH Sension5 meter calibrated with a 12.88 mS/cm standard.
2. Chlorides determined by mercuric nitrate titration in the TNWRE office. Samples were diluted 10 fold.

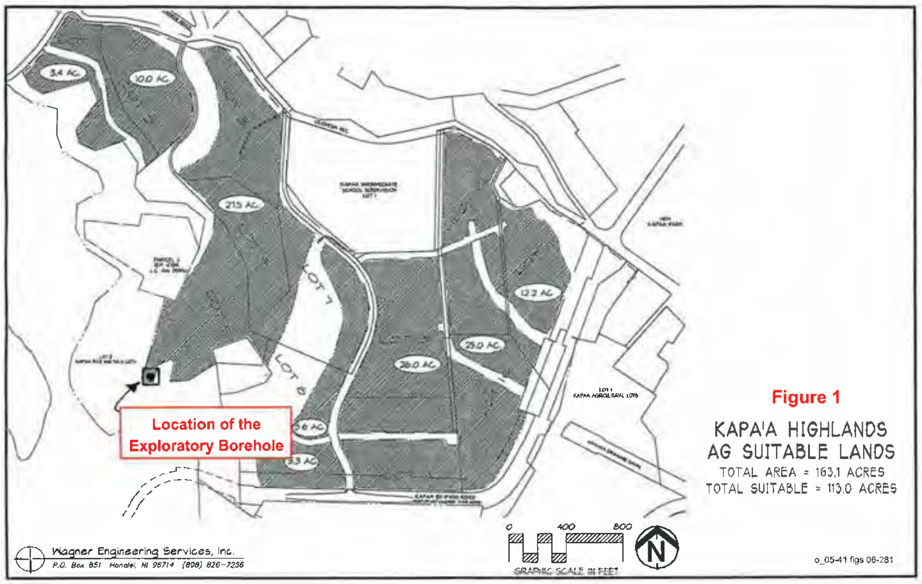


Figure 1

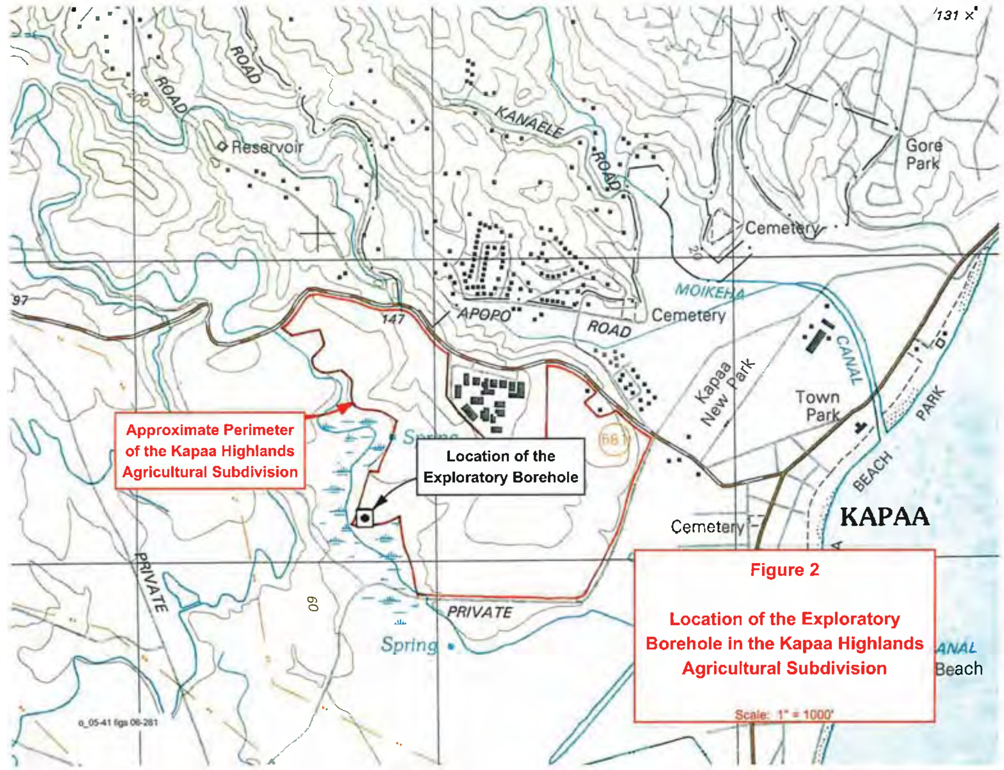


Figure 2

Location of the Exploratory Borehole in the Kapaa Highlands Agricultural Subdivision

Scale: 1" = 1000'

Figure 3. Pumping Rate and Water Level During the 12-Hour Test

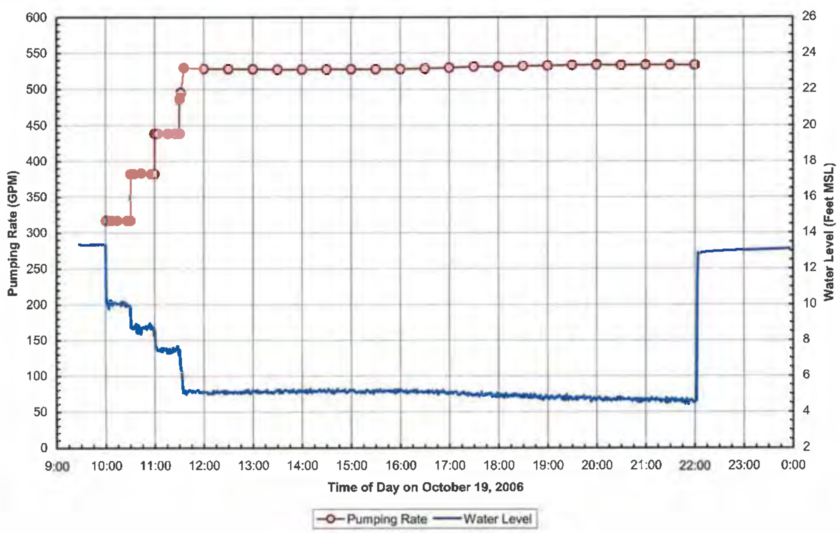


Figure 4. Hydraulic Performance of the Well Based on Step Test Data

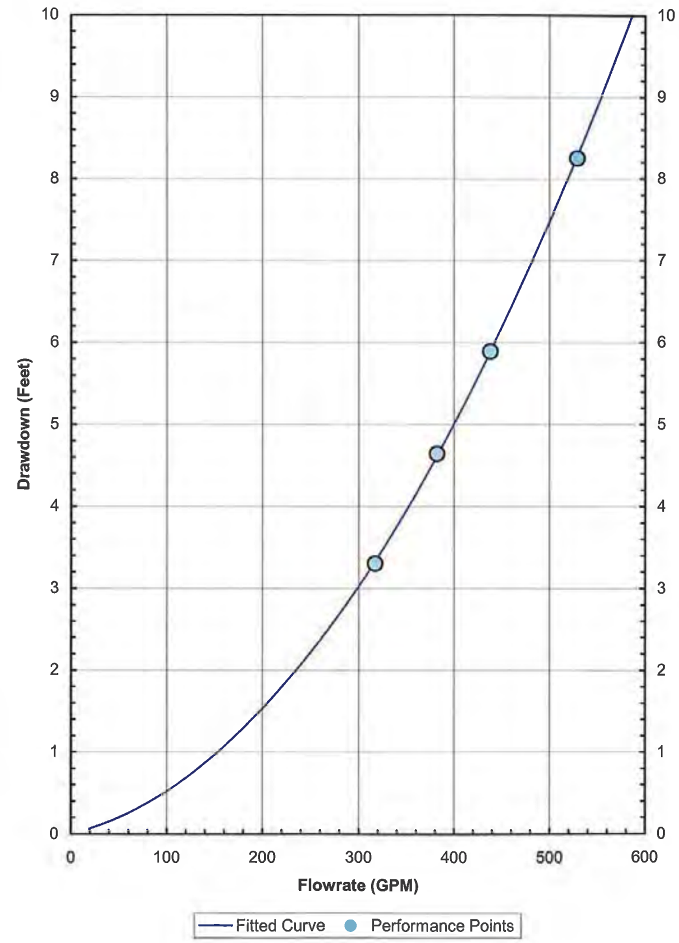


Figure 5. Pumped Water Conductivity through the 12-Hour Test

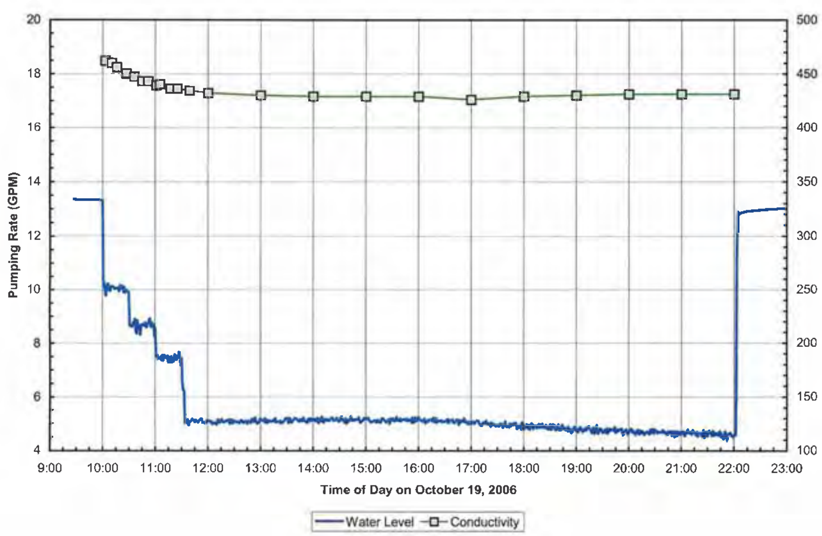


Exhibit E - Part 2

Private Water System

BELLES GRAHAM PROUDFOOT WILSON & CHUN, LLP

ATTORNEYS AT LAW

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OF COUNSEL
DAVID W. PROUDFOOT

COUNSEL
LORNA A. NISHIMITSU

October 2, 2012

Mr. David R. Craddick
Manager & Chief Engineer
Department of Water
County of Kauai
P. O. Box 1706
Lihue, Kauai, Hawaii 96766

VIA EMAIL & HAND DELIVERY

Re: **Kapaa Highlands Subdivision (S-99-45)**
(fna Kūlana Kai/Kauai Highlands)
Subdivision Of Parcel 1 Being A Portion Of
Grant 5266 To Rufus P. Spalding Into Lots 1 To 18, Inclusive
Kapaa and Waipouli, Kauai, Hawaii
Kauai Tax Map Key No. (4) 4-3-003:001 (por.)
Owner: Allen Family LLC; Moloaa Bay Ventures, LLC; and The Three Stooges LLC

Dear Mr. Craddick:

I am writing to you on behalf of the above-identified applicants ("Applicants") in the Kapaa Highlands Subdivision matter ("Subdivision"). In lieu of obtaining water for the Subdivision from the public water system operated by the Department of Water ("Department"), the Applicants have decided to construct an on-site private water system ("PWS").

The PWS is described in an enclosed Memorandum dated September 12, 2012 prepared by Tom Nance of Tom Nance Water Resource Engineering ("Nance Report"). The essential design specifications are described below.

A. Private Water System.

1. The Applicants will construct a well ("Well") and two storage tanks ("Tanks") on-site.

2. The Well will be located along the south boundary of Lot 5, as shown in Figure 3 of the Nance Report.

3. The Storage Tanks will be located on the north boundary of Lot 3, as shown in Figure 3 of the Nance Report.

4. The Well design is shown on Figure 2 of the Nance Report. The Well will be twelve (12) inches in diameter and operated by two identical 100 gallons per minute ("GPM") pumps, each driven by 7.5 horsepower motors. The first pump will supply the needs of the Subdivision, which is 97,310 gallons per day ("GPD") maximum day use, and the second will serve as a standby pump.

5. Based on the water needs for 50 farm dwelling units, the total maximum day demand is 93,750 GPD. The two 50,000 gallon Tanks will be adequately sized to provide necessary storage plus fire flowrate protection. The Tanks will be lined with bolted steel with reinforced concrete base and passive cathodic protection (zinc anode rods).

6. The pipelines ("Pipelines") for the PWS will be sized to provide: fire flowrate with coincident maximum day demand and a minimum residual pressure of 20 psi (velocities not exceeding 10 fps); and peak flowrate with minimum residual pressure of 40 psi (maximum velocity in Pipelines of 6 fps). NSF-approved, high density polyethylene (HPDE), pipes will be used for the PWS. The Pipeline system is shown on Figure 3 of the Nance Report.

7. Pursuant to the Agricultural Master Plan submitted in this matter, the agricultural activities in the Subdivision will be limited to a goat raising operation ("Goat Project"). The Goat Project will require minimal water (at the most, 3,560 GPD), which will be supplied by the PWS.

8. The on-site Tank elevations will not provide adequate gravity pressure to meet the Department's delivery pressure requirements. Providing the necessary pressure would be done with parallel domestic and fire flowrate pumping systems with a generator to provide back power. These pump systems would provide up to 70 GPM for peak domestic use and 500 GPM for the fire flowrate condition. Both pumping systems would be sized to produce a total dynamic head of 110 feet, in effect creating a single, 270-foot service pressure zone across the entire project site.

B. Modification Of Requirements.

The Applicants are requesting the Department and/or the Board of Water Supply ("Water Board") to grant a modification from the Department's Water System Standards for the PWS as follows:

1. DOW Rule Part 3, Section XII, provides as follows:

"**SECTION XII – MODIFICATION OF REQUIREMENTS**

When conditions pertaining to any subdivision are such that the public may be properly served with water and with fire protection without full and strict compliance with these rules and regulations, or where the subdivision site or layout is such that the public interest will be adequately protected, such modification thereof as is reasonably necessary or expedient, and not contrary to law or the intent and purposes of these rules and regulations, may be made by the Department."

2. As part of the Subdivision in this case, the Applicants propose to have water for potable, fire, and agricultural uses for the Subdivision supplied by the PWS.

3. The PWS does not comply strictly with all of the Department's Water System Standards ("DOW Standards") which typically apply to the DOW's public water systems. These differences are set forth in the enclosed Comparison Of Kapaa Highlands PWS With DOW Water System Standards.

4. The Applicants are requesting the Department and/or the Water Board to find that the PWS: will properly serve the water and fire protection needs of the Subdivision without full and strict compliance with the DOW Standards; that, given the fact that the Subdivision will be served by the PWS, the public interest will be adequately protected by the PWS; that the differences between the PWS and the DOW Standards are, under all of the circumstances of this case, reasonably necessary and expedient; and that such differences are not contrary to the law or the intent or purposes of the DOW Rules.

Based on the above, the Applicants are requesting the Department and/or the Water Board to approve the proposed PWS for the Subdivision, together with the requested modifications. In the event this matter needs to be referred to the Water Board, then I am requesting that it be placed on the next available agenda of the Water Board. For these purposes, I have enclosed a Supporting Information For The Board Of Water Supply, County of Kauai in compliance with the Department's requirements for persons wishing to testify at Water Board Meetings.

Thank you very much for your consideration of this request.

Sincerely yours,

BELLES GRAHAM PROUDFOOT
WILSON & CHUN, LLP

Max W. J. Graham, Jr.

MWJG:jgm
Enclosures
cc: Mr. Greg Allen, Jr., w/encls. (via email only)
Andrea A. Suzuki, Esq., w/encls. (via email only)
Mr. William Eddy, DOW, w/encls. (via email only)
Mr. Gregg Fujikawa, DOW, w/encls. (via email only)
Mr. Dale A. Cua, Staff Planner, w/encls. (via email only)

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Original ☑ will ☐ will not be mailed to you.

September 10, 2012
12-177 | 09-12

MEMORANDUM

To:	Greg Allen
From:	Tom Nance
Subject:	Sizing and Layout of a Private Water System to Supply the Kapaa Highlands Project

Introduction

This memo and its attachments present the sizing and layout of major infrastructure elements of a private water system that would be developed to supply the Kapaa Highlands project. The basis of the water system sizing assumes the project would be developed in two phases. Phase 1 would consist of 16 residential units on five lots in an agricultural subdivision. Phase 2 would consist of an urban residential development comprised of 86 SF residential units, 683 MF residential units, and parks (3.1 ac.), church (0.8 ac.), commercial (0.4 ac.), roads (9.4 ac.), and unirrigated open space (14.3 ac.). In the event that land use entitlements are not obtained for the residential development, Phase 2 would consist of 34 residential units on seven lots in an agricultural subdivision.

Required Water Supply

Due to the size of the residential lots in the agricultural subdivision, which vary from 1.47 to 6.67 acres in size for the Phase 1 development, an allocation of 2000 GPD as the average demand per residential lot is recommended, a rate which is four times greater than the Kauai Department of Water (DOW) design standard for single family residential units. For the residential subdivision in Phase 2, use of DOW's design criteria is recommended. Based on these recommendations, Tables 1 and 2 are tabulations of the average and maximum day demands for the private water system. Maximum day demand is defined as 1.5 times the average demand, also in accord with DOW design standards.

Required Water System Capacities

Well Supply. DOW's design criterion for well pumping capacity is to provide the maximum day demand in a 24-hour pumping day with the largest well pump out of service. For Phase 1, this requirement amounts to 48,000 GPD, equivalent to 33 GPM. With the addition of the Phase 2 residential development, this requirement becomes 496,275 MGD, equivalent to 345 GPM. If Phase 2 was limited to the agricultural subdivision, the ultimate well supply requirement would be 150,000 GPD or 104 GPM.

A test well, identified as State No. 0419-05, was drilled and pump tested in October 2006. Over its 260-foot drilled depth, two aquifers were encountered. The upper aquifer can not provide a sufficient source of supply and it is also potentially subject to contamination due to its shallow depth. The lower and confined aquifer was reached at a depth of about 215 feet or 190 feet below sea level. Its piezometric head was about 13 feet above sea level or about 10 feet below ground. Pump testing showed that a properly designed well to exclusively tap this lower aquifer could develop up to 500 GPM of low salinity (chlorides of 55 MG/L), potable quality water. At its depth and overlying confining layers, it is not subject to contamination.

The low ground elevation (about 20 feet), high piezometric head (about 13 feet above sea level), and modest drawdown (3 feet or less at 350 GPM) provide the opportunity to develop one well configured with a pump sump that would enable two pumps to draw from the same well, thereby providing the necessary standby pumping capacity for a stand-alone system with a single well. The recommendation herein is to drill a new 12-inch well to 300-foot depth, complete it with a pump sump as shown on Figure 1, and outfit it with two, 25 horsepower, 350 GPM submersible pumps. Either of the 350 GPM pumps would provide the ultimate maximum demand requirement with the other providing full back-up capacity.

Reservoir Storage. With regard to the reservoir storage volume, DOW's two design criteria are appropriate for the private water system: (1) provide the maximum day demand with no credit for well inflow; and (2) provide the fire flowrate with coincident maximum day demand for the duration of the fire with the largest well pump out of service and the reservoir 3/4 full at the start of the fire. For the Phase 1 fire flowrate, DOW's standards require only 250 GPM for one hour. A stricter criterion of 500 GPM for two hours is used herein. Application of the two sizing criteria results in the required storage volumes tabulated below. In all cases, the maximum day sizing criterion governs.

Summary of Computed Required Reservoir Storage Volumes*

Design Criteria	Phase 1 Ag Subd.	Phase 2 Residential	Phased 2 Ag Subd.
(1) Maximum Day Demand (Gallons)	48,000	496,275	150,000
(2) Fire Flowrate			
• Fire Flowrate (GPM)	500	2000	500
• Fire Duration (Hours)	2	2	2
• Coincident Max. Demand (GPM)	33	345	104
• Well Inflow Credit (GPM)	350	350	350
• Required Storage Volume (Gallons)	29,280	319,200	40,640

*Phase 2 storage volumes include the Phase 1 requirement.

Based on the foregoing calculations, the recommended reservoir storage is as follows:

- For Phase 1, a 50,000-gallon storage tank would be installed.
- For the Phase 2 residential project, a second tank of 500,000-gallon capacity would be installed.
- In the event that Phase 2 consists of the 34 SF residential units in an agricultural subdivision, the second tank would be 100,000 gallons.
- All storage tanks would be lined and bolted steel with a concrete floor and passive cathodic protection.
- The tanks would be located at the project's highest elevation which is adjacent to residential Lot 7 in Phase 1. The Phase 1 and Phase 2 tanks would have identical floor and spillway elevations of 142 and 160 feet, respectively.
- Except at the project's lowest elevations, pumped delivery from the storage tanks will be necessary to provide adequate delivery pressures and fire flowrates. These pumping requirements are described in the section following.

Pumped Delivery for the Distribution System. DOW's design criteria for required delivery pressures are appropriate for this private water system. These are: (1) to provide a minimum of 40 psi residual pressure during the peak flowrate condition, with peak flowrate defined as three times the average demand; and (2) to provide a minimum 20 psi residual pressure at the critical hydrant during fire flowrate at that hydrant and coincident maximum day demand throughout the system.

The onsite storage reservoir elevations will not provide adequate gravity pressure to meet either of these criteria. In each development phase, this will require parallel domestic and fire flowrate pumping systems with a generator to provide back up power. For Phase 1, the pump systems would provide up to 70 GPM for peak domestic use and a 500 GPM fire pump. For the Phase 2 residential development, the domestic pumping capacity would be increased to 700 GPM and the fire pump to 2000 GPM. All pumping systems would be sized to produce a total dynamic head of 110 feet, in effect creating a single, 270-foot service pressure zone across the entire project site.

Water System Layout

Figure 2 illustrates all of the water system components described above with the assumption that Phase 2 would consist of the 769-unit residential development. By development phase, these would consist of:

Phase 1
- 12-inch, 300-foot deep well, pump sump, and two 350 GPM pumps in the pump sump located at the makai end of the Phase 1 development area.
- A dedicated 8-inch transmission pipeline from the well pumps to the storage reservoir.
- A 50,000-gallon storage tank.
- Parallel domestic and fire flowrate pump systems at the storage tank with backup generator power.
- A distribution pipeline loop consisting of 12-inch for the section that will also serve Phase 2 and 6-inch for the remainder of the loop.

Phase 2
- No change or additions to the well, well pumps, or transmission pipeline.
- Second storage tank of 500,000-gallon capacity.
- Substantial capacity increases for the parallel domestic and fire pumping systems and generator backup power.
- Distribution pipelines of 12-, 8-, and 6-inch size.

cc: Max Graham [Email Only]
greg@tnwre.com

Attachments

Table 1

Average and Maximum Day Demands for the
Phase 1 Agricultural Subdivision and Phase 2 Residential Development

Development Phase	Land Use	Design Criterion (GPD / Unit)	Average Demand (GPD)	Maximum Demand (GPD)
1	16 SF Residential	2,000	32,000	48,000
2	86 SF Residential	500	43,000	64,500
	683 MF Residential	350	239,050	358,575
	3.1 Ac. Parks	4,000	12,400	18,600
	0.8 Ac. Church	4,000	3,200	4,800
	0.4 Ac. Commercial	3,000	1,200	1,800
	Total for Phase 2		298,850	448,275
Total for Both Phases			330,850	496,275

Table 2

Average and Maximum Day Demands for Development of
Phases 1 and 2 as Agricultural Subdivisions

Development Phase	Land Use	Design Criterion (GPD / Unit)	Average Demand (GPD)	Maximum Demand (GPD)
1	16 SF Residential	2,000	32,000	48,000
2	34 SF Residential	2,000	68,000	102,000
Total for Both Phases			100,000	150,000

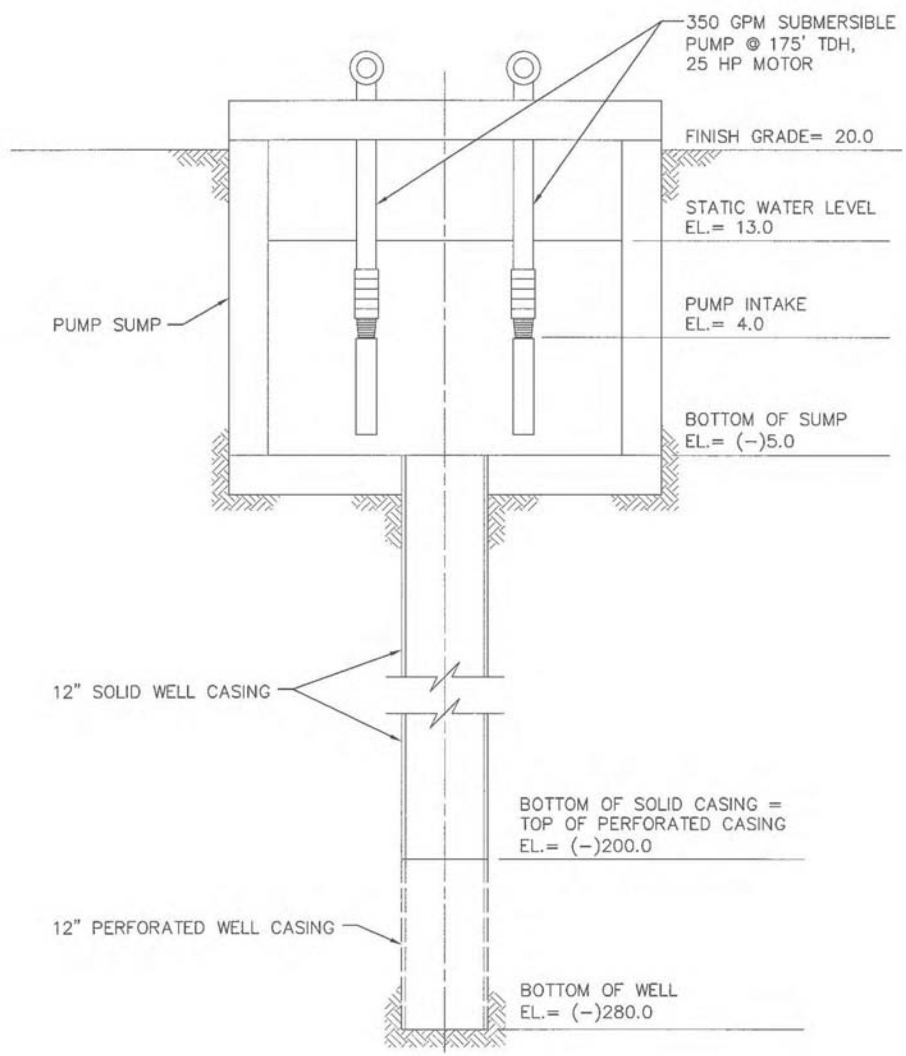

FIGURE 1
RECOMMENDED WELL DEVELOPMENT AND PUMP INSTALLATION
FOR THE KAPAA HIGHLANDS PROJECT
NOT TO SCALE

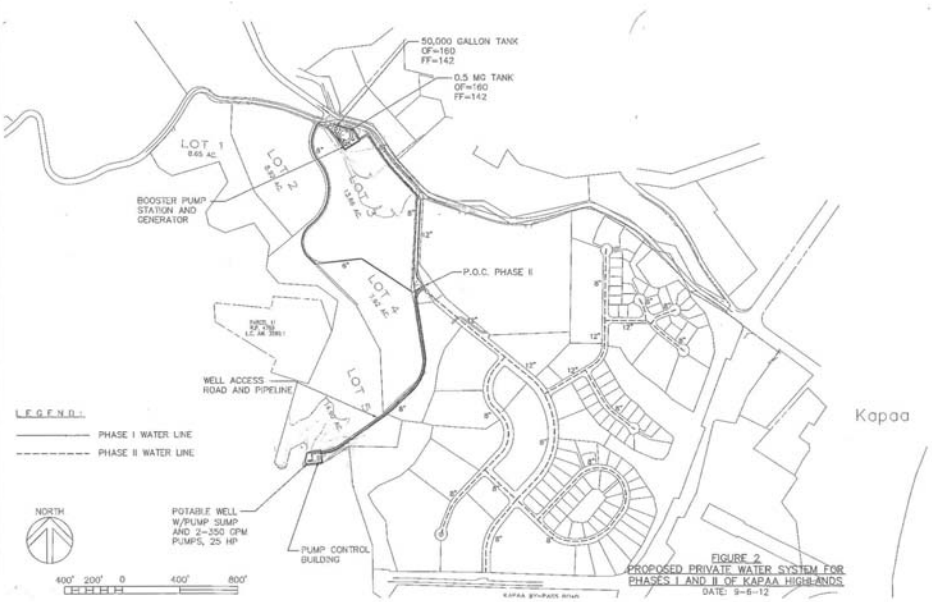

FIGURE 2
PROPOSED PRIVATE WATER SYSTEM FOR PHASES I AND II OF KAPAA HIGHLANDS
DATE: 9-6-12

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Original ☑ will ☐ will not be mailed to you.

September 12, 2012
12-183 | 09-12

MEMORANDUM

To:	Greg Allen
From:	Tom Nance
Subject:	Basis of Design of the Private Water System for the Kapaa Highlands Agricultural Subdivision

Introduction

This memo and its attachments describe the basis of design for a private water system to serve the 12-lot Kapaa Highlands Agricultural Subdivision. Figure 1 depicts the 12-agricultural lots and the 50-half acre homesites that ultimately would be developed on the 12 lots. The water system would consist of: one 12-inch, 300-foot deep well outfitted with two 100 GPM pumps, one of which would provide back-up capacity; two side-by-side and identical 50,000-gallon storage reservoirs located next to Homesite 7, the highest elevation on the property; two parallel pumping systems to provide pressure and flowrates for peak and fire flowrate conditions; and 8- and 6-inch distribution pipelines.

As described herein, there are differences between the standards used for the private system's design and the standards of the Kauai Department of Water (DOW). These differences are noted and discussed as appropriate in the sections following.

Required Water Supply

The agricultural use in the subdivision will be for raising goats for which no specific water allocation is made. An average demand of 1250 GPD for each of the 50-half acre homesites is recommended, a use rate which is 2.5 times DOW's standard for single family residential units. The higher use rate is an appropriate allowance due to the larger than typical size of the homesites.

For the 50 homesites, the total average demand is 62,500 GPD. In conformance with DOW's standards, maximum day use is defined as 1.5 times the average demand. For the 50 homesites, the total maximum day demand is 93,750 GPD.

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Required Well Supply

Well Configuration. A test well, identified as State No. 0419-05, was drilled and pump tested at the makai end of the project site in October 2006. Over its 260-foot drilled depth, two aquifers were encountered. The upper aquifer can not provide a sufficient source of supply and it is also potentially subject to contamination due to its shallow depth. The lower and confined aquifer was reached at a depth of about 215 feet or 190 feet below sea level. Its piezometric head was about 13 feet above sea level or about 10 feet below ground. Pump testing showed that a properly designed well to exclusively tap this lower aquifer could develop up to 500 GPM of low salinity (chlorides of 55 MG/L), potable quality water. At its depth and due to the presence of the overlying and poorly permeable confining layers, this lower aquifer is not subject to contamination.

The low ground elevation (about 20 feet), high piezometric head (about 13 feet above sea level), and modest drawdown provide the opportunity to develop one well configured with a pump sump that would enable two pumps to draw from the same well, thereby providing the necessary standby pumping capacity for a stand-alone system with a single well. The recommendation herein is to drill a new 12-inch well to 300-foot depth and complete it with a pump sump and two pumps as shown on Figure 2. This will enable one pump to provide the required supply and the other pump to provide full back up capacity.

Required Well Pumping Capacity. DOW's design criteria of having the well pumping capacity capable of delivering the maximum day use in a 24-hour pumping day with the largest well pump out of service is adopted for the private water system. The project's 93,750 GPD maximum day use translates to a required well pump capacity of 65 GPM. The proposal herein is to install two identical 100 GPM pumps, each driven by 7.5 horsepower motors. Either pump would provide the required capacity with the other as standby.

Reservoir Storage

DOW's two reservoir storage sizing criteria are appropriate for the private water system. The first, to provide the maximum day use with no credit for well inflow, translates to a required storage volume of 93,750 gallons. The second is to provide the fire flowrate plus the coincident maximum day demand for the duration of the fire with the reservoir 3/4 full at the start of the fire. There is credit for well inflow with the largest well pump considered to be out of service.

For an agricultural subdivision, DOW standards require a fire flowrate of 250 GPM for one hour. A stricter standard of 500 GPM for two hours is adopted for the private water system. With one of the two 100 GPM well pumps on, this higher fire flowrate and longer duration translates to reservoir storage of 74,417 gallons (calculation below). The first criterion governs.

$$\frac{4}{3}(120\text{ min})\left(500+\frac{93{,}750}{1{,}440}-100\right)=74{,}417\text{ gallons}$$

Proposed reservoir storage consists of two, side-by-side and identical 50,000-gallon tanks with 142- and 160-foot floor and spillway elevations, respectively. The storage tanks would be lined and bolted steel with reinforced concrete base and passive cathodic protection consisting of zinc anode rods suspended in the water. DOW's standards require storage tanks to be constructed of reinforced concrete. However, lined and bolted steel tanks have a successful operating history in Hawaii. With two side-by-side tanks, one can be taken offline when necessary for maintenance with no interruption of service to customers.

Pumping Systems for Peak and Fire Flowrate Design Conditions

DOW's design criteria for required delivery pressures are appropriate for this private water system. These are: (1) to provide a minimum of 40 psi residual pressure during the peak flowrate condition, with peak flowrate defined as three times the average demand; and (2) to provide a minimum 20 psi residual pressure at the critical hydrant during fire flowrate at that hydrant and coincident maximum day demand throughout the system.

The onsite storage reservoir elevations will not provide adequate gravity pressure to meet either of these delivery pressure requirements. Providing the necessary pressure would be done with parallel domestic and fire flowrate pumping systems with a generator to provide back up power. These pump systems would provide up to 70 GPM for peak domestic use and 500 GPM for the fire flowrate condition. Both pumping systems would be sized to produce a total dynamic head of 110 feet, in effect creating a single, 270-foot service pressure zone across the entire project site.

Distribution Pipelines

The design criteria used for pipeline sizing for the private system are equivalent to DOW's standards. Pipelines shall be sized to provide: (1) fire flowrate with coincident maximum day demand and a minimum residual pressure of 20 psi at the critical hydrant with velocities not exceeding 10 fps; and (2) peak flowrate with a minimum residual pressure of 40 psi and a maximum velocity in pipelines of 6 fps.

DOW's standards require pipelines to be of ductile iron or PVC, the latter conforming to ASTM C-900. However, NSF-approved, high density polyethylene (HPDE) pipes will be used for the private water system. SDR (pressure ratings) of the HDPE pipe will be selected so as not to exceed 80 percent of the recommended working pressure rating. Hazen-Williams "C" values of 130 will be used for all

HDPE pipes. This is less (ie. more conservative) than manufacturer's suggested values of 140 to 150 but greater than DOW's standards for ductile iron and PVC pipes.

Water System Layout

Figure 3 illustrates the water system components as described above. There would be a dedicated 6-inch pipeline from the well to the storage tanks. Distribution pipeline sizing, driven by the fire flowrate sizing criterion, would be 8- and 6-inch to the last hydrants and 4-inch beyond the last hydrants.

cc: Max Graham [Email Only]
greg@tnwre.com

Attachments

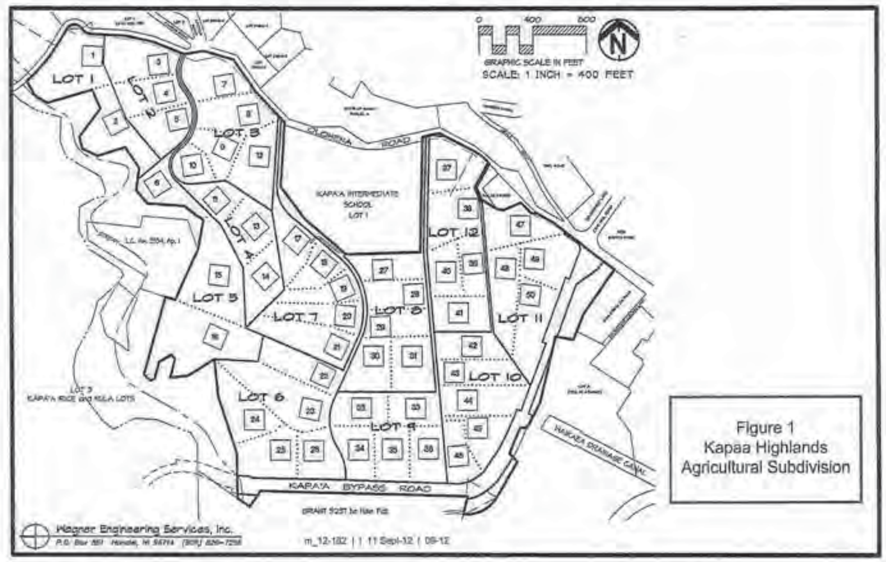

Figure 1
Kapaa Highlands
Agricultural Subdivision

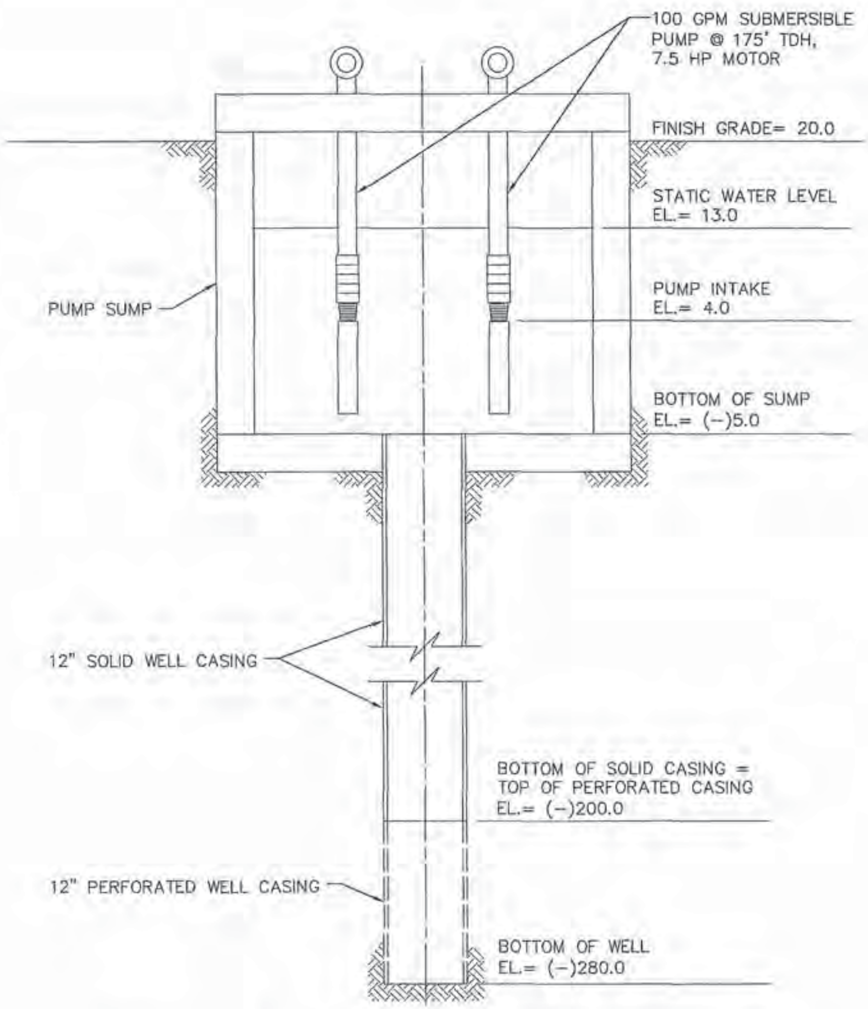

FIGURE 2
RECOMMENDED WELL DEVELOPMENT AND PUMP INSTALLATION FOR THE KAPAA HIGHLANDS AGRICULTURAL SUBDIVISION
NOT TO SCALE

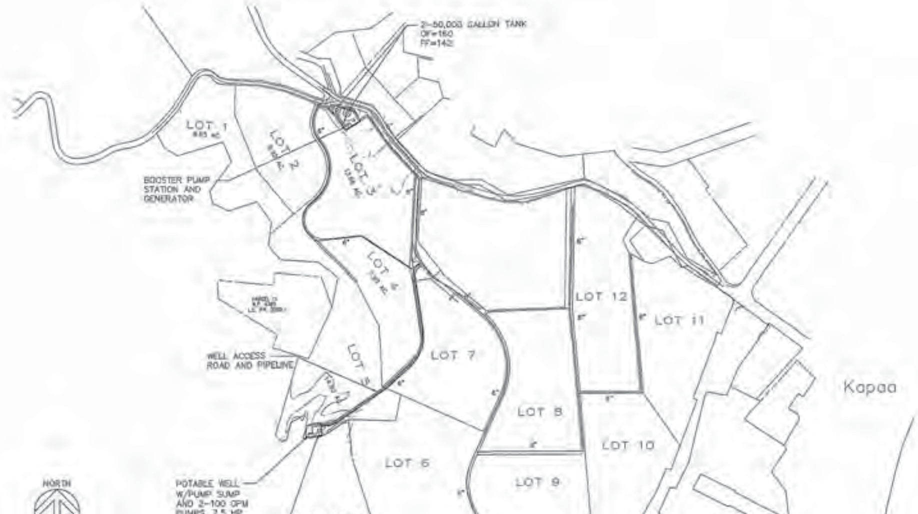

FIGURE 3
PROPOSED PRIVATE WATER SYSTEM FOR THE KAPAA HIGHLANDS AGRICULTURAL SUBDIVISION
DATE: 9-11-12

Table 1

Cost Estimate of the Major Water System Components
for Kapaa Highlands Phase I

Item Description	Quantity	Unit	Unit Price	Amount	Total
Drill, Case, and Pump Test Supply Well					
Mobilization		LS		15,000	
Drill 12-Inch Pilot Hole	300	LF	150	45,000	
Video Log Pilot Hole	1	EA	2,500	2,500	
Test Pump Pilot Hole	1	EA	12,500	12,500	
Ream Pilot Hole to 19 Inches	300	LF	125	37,500	
12" Solid Casing	220	LF	175	38,500	
12" Perforated Casing	80	LF	200	16,000	
Furnishing and Installing grout	215	LF	60	12,900	
Plumbness and Alignment Test	1	EA	3,000	3,000	
Furnishing and Installing Test Pump	1	EA	15,000	15,000	
Development and Test Pumping	72	HRS	250	18,000	
Demobilization		LS		5,000	
Total					$220,900
Well Site Work and Pump Outfitting					
Site Earthwork	450	CY	50	22,500	
Site Basecourse	805	SY	20	16,100	
Site Fencing	348	LF	35	12,180	
Site Gate	1	EA	2,500	2,500	
Site Drainage System		LS		15,000	
Wet Well Sump and Cover at Well Casing		LS		60,000	
Submersible Pump (350 GPM, 4-Pole, 25 HP)	2	EA	45,000	90,000	
Discharge Unit, includes Support Pads and Piping		LS		25,000	
Pump Control Building		LS		35,000	
Chlorination System		LS		25,000	
Control Building Mechanical		LS		15,000	
Pump and Building Electrical		LS		50,000	
KIUC Transformer Pad and Ducts		LS		35,000	
Metering, Motor Control Center, SCADA System		LS		150,000	
Back Generator with Fuel Tank (60 KW)		LS		40,000	
Transfer Switch for Generator		LS		3,000	
KIUC Facility Charge for Service (OH Service Available)		LS		50,000	
Total					$646,280
New Well Access Road (from existing culdesac)					
Access Road Excavation and Preparation	1,530	LF	50	76,500	
Basecourse	3,400	SY	25	85,000	
Drainage and Erosion Control		LS		30,000	
Total					$191,500

Table 1

Cost Estimate of the Major Water System Components
for Kapaa Highlands Phase I

Item Description	Quantity	Unit	Unit Price	Amount	Total
0.05 MG Tank					
Site Earthwork	1,935	CY	40	77,400	
Basecourse	1,890	SY	20	37,800	
Gravel Fill	452	SY	15	6,780	
Site Fencing	590	LF	35	20,650	
Site Gate	1	EA	2,500	2,500	
Site Drainage System		LS		20,000	
Tank Drainage System		LS		25,000	
Pipe Valves and Fittings		LS		15,000	
0.05 MG Steel Tank With Concrete Floor		LS		150,000	
Tank Level Transmitter System		LS		15,000	
Pipe and Tank Testing		LS		15,000	
Erosion and Dust Control		LS		10,000	
Construction Survey		LS		5,000	
Total					$400,130
Booster System					
Sitework for Booster Pump Station		LS		25,000	
Booster Station Connection Piping & Valves		LS		30,000	
Domestic Booster Pump Station (VFD 25 to 70 gpm, 5 HP)		LS		25,000	
Fire Pump Station (500 GPM at 110-ft TDH, 20 HP)		LS		80,000	
Power and Control Connections		LS		30,000	
MCC for both station with SCADA Controls		LS		125,000	
Back Generator with Fuel Tank (60 KW)		LS		50,000	
Transfer Switch for Generator		LS		3,000	
Total					$368,000
Pipeline in Phase I Subdivision (includes 8-inch well feed line)					
Main Installation Access and Site Preparation		LS		50,000	
12" HDPE Pipe	1,500	LF	85	127,500	
8" HDPE Pipe	3,115	LF	55	171,325	
6" HDPE Pipe	2,256	LF	40	90,240	
12" GV w/VB	2	EA	3,000	6,000	
8" GV w/VB	3	EA	2,500	7,500	
6" GV w/VB	2	EA	2,000	4,000	
12" DI Fittings	5	EA	1,800	9,000	
8" DI Fittings	6	EA	1,200	7,200	
6" DI Fittings	4	EA	800	3,200	
Fire Hydrant w/GV	5	EA	3,500	17,500	
Pipe Testing and Chlorination		LS		25,000	
Erosion and Dust Control		LS		30,000	
Construction Survey		LS		15,000	
Total					$563,465

Total for Construction	**$2,390,275**
Engineering Design (8%)	**190,725**
Construction Management (3%)	**73,000**
Total Cost	**$2,654,000**

Table 2

Cost Estimate of the Major Water System Components
for Kapaa Highlands Phase 2 Residential Project

Item Description	Quantity	Unit	Unit Price	Amount	Total
0.50 MG Tank and Booster Station					
Tank Foundation Earthwork	504	CY	40	20,160	
Basecourse	980	SY	20	19,600	
Tank Drainage System		LS		35,000	
Pipe Valves and Fittings		LS		30,000	
0.50 MG Steel Tank With Concrete Floor		LS		750,000	
Tank Level Transmitter System		LS		15,000	
Pipe and Tank Testing		LS		20,000	
Erosion and Dust Control		LS		15,000	
Construction Survey		LS		5,000	
Total					$909,760
Booster System (Upgrade both Booster Pump Stations)					
Modify Booster Pump Station		LS		40,000	
Booster Station Connection Piping & Valves		LS		45,000	
Domestic Booster Pump Station (VFD 200 to 625 gpm, 25 HP)		LS		120,000	
Fire Pump Station (2000 GPM at 110-ft TDH, 75 HP)		LS		125,000	
Power and Control Connections		LS		30,000	
Modify Existing MCC for New Pump Stations		LS		80,000	
New Back Generator with Fuel Tank for Fire Pump (175kw)		LS		75,000	
Transfer Switch for Generator		LS		6,000	
Total					$521,000
Pipeline in Phase 2 Subdivision					
Main Installation Access and Site Preparation		LS		60,000	
12" HDPE Pipe	2,100	LF	85	178,500	
8" HDPE Pipe	6,830	LF	50	341,500	
12" GV w/VB	3	EA	3,000	9,000	
8" GV w/VB	10	EA	2,500	25,000	
12" DI Fittings	6	EA	1,800	10,800	
8" DI Fittings	15	EA	1,200	18,000	
Fire Hydrant w/GV	14	EA	3,500	49,000	
Pipe Testing and Chlorination		LS		40,000	
Erosion and Dust Control		LS		30,000	
Construction Survey		LS		15,000	
Total					$776,800

Total for Construction	**$2,207,560**
Engineering Design (8%)	**176,440**
Construction Management (3%)	**66,000**
Total Cost	**$2,450,000**

o_09-12

Exhibit F

Preliminary Engineering Report Drainage Improvements
Kapaʻa Highlands Phase II

Preliminary Engineering Report
Drainage Improvements

KAPAA HIGHLANDS – PHASE II

Prepared for:
Greg Allen
161 Wailua Rd.
Kapa'a, HI 96746

Prepared by:
Honua Engineering, Inc.
P. O. Box 851
Hanalei, HI 96714

Project Description

The Kapa'a Highlands Subdivision is on former cane lands situated on a bluff adjacent to the coastal plain of Kapa'a Town. It is bordered by Olohena Road to the north and the Kapa'a Bypass Road on the south and east sides of the project. Kapa'a Intermediate School is near the middle of the north portion of the property. Phase I of the development will consist of five agricultural lots on the west side of the property. The remainder of the property to the south and east of the school are proposed to be developed during Phase II of the subdivision. The proposed Phase II development will consist of 86 single and 683 multi-family units, plus a neighborhood commercial site, parks, and a church site as shown on Exhibit 1. Ground elevation of the development ranges from 20 to 180 feet above mean sea level.

Per the County of Kauai's "Storm Water Runoff System Manual" 2001, all developments of this scope are required to maintain the existing stormwater flows and patterns as feasibly possible so that downstream properties are not subject to any additional stormwater flows that are created by the increases in impervious surfaces of the watershed by the proposed development. The report examines the existing drainage conditions of the property and the proposed measures to control the stormwater from the proposed Phase II development.

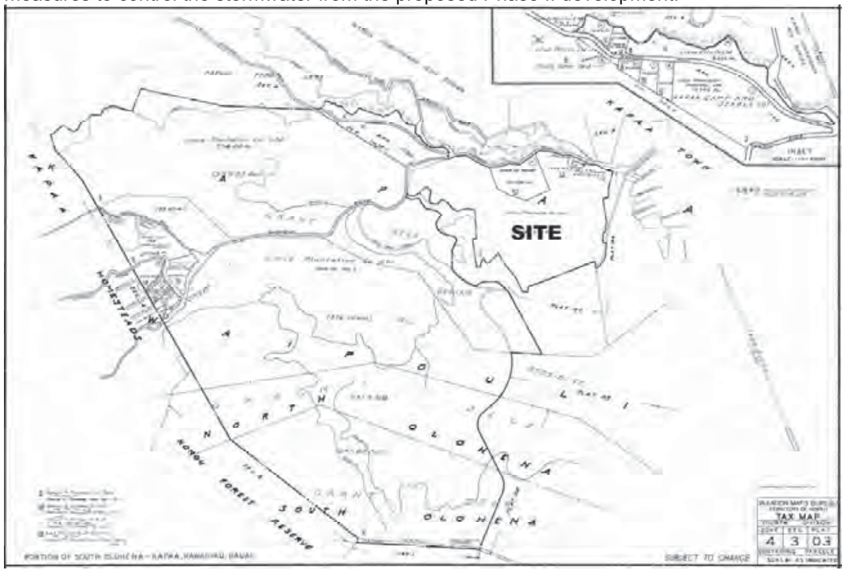

Figure 1: Tax Map Key 4-3-03 (4th Division)

Existing Conditions:

The property is located along Olohena Road about ½ mile mauka of Kapaa Town. The property rises from the coastal flat lands of Kapaa to an elevation of about 140 feet above mean sea level (msl). The Temporary Kapaa Bypass Road passes through a portion of the property along the east and south sides of the property. An unnamed stream flows along the west side of the property. The stream flows along the boundary, passes under a bridge on the By-Pass Road at the southwest corner of the property, and empties into the Waikaea drainage canal about 800' downstream from the property. Near the middle of the property on the north side, along Olohena Road, is the Kapaa Intermediate School site.

The Lihue Plantation had planted a majority of the 163-acre property in sugar cane, which since the property-changed owners has been allowed to go fallow. The Phase II portion of the property is approximately 97-acres. The fallow lands are presently overgrown with grass and remnant cane. A portion of the property on the northwest side near the unnamed stream is being used for cattle pasture. There are numerous abandoned irrigation ditches on the property that will be filled or rendered inoperable as the property is developed. There is also a small amount of the property that is overly steep for farming and is presently covered in brush and trees.

According to the Natural Resource Conservation Service (NRCS) soil survey the soils on the property are Ioleau and Puhi silt clay loams. The NRCS hydrologic classification for these soils is Group C for the Ioleau soils and Group B for the Puhi soils. Group B soils have a moderately low runoff potential, while the Group C soils have a moderately high runoff potential. Both soils are in Group I erosion resistance classification, which is the least erodible of the NRCS classifications.

The topography of the site varies from gently sloping, bluff top property, to steep areas that drop off into drainage gullies that lead to the unnamed stream and to the Bypass Road. The topography is illustrated on Exhibit 1 from aerial mapping done in 1975 for the County of Kauai.

Proposed Phase II:

The proposed Phase II development will consist of 86 single and 683 multi-family units, plus a neighborhood commercial site, parks, and a church site as shown on Exhibit 1. Stormwater generated from each of the Phase II lots will be directed to the nearest downstream street or natural drainageway. A drainage system along the streets will collect the stormwater and convey it to the detention basins shown on Exhibit 1. The detentions basins moderate the storm flows and allow infiltration back into the soil. They are sized so that the outlet peaks flows match or lower the existing stormwater flows prior to the development for both small rainfall events and the 100 year storm event.

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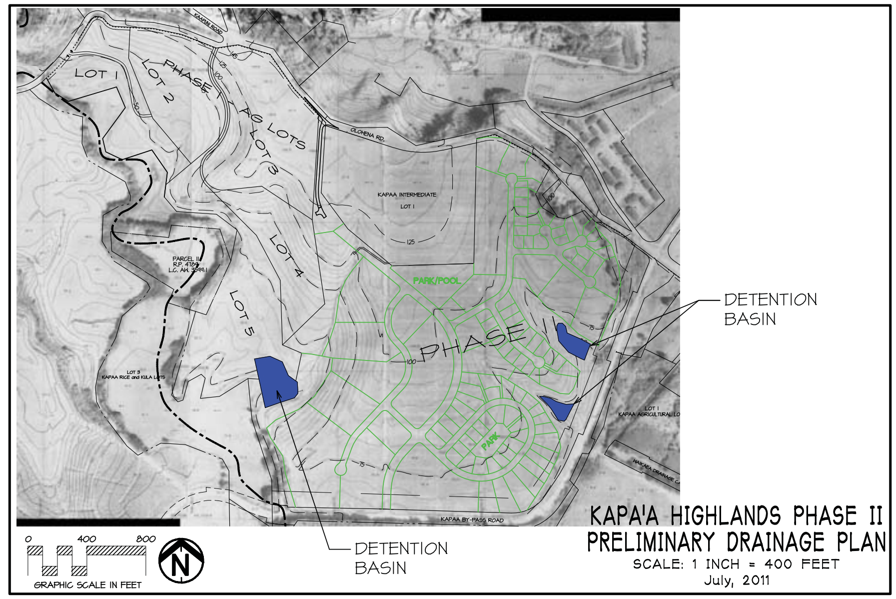


Exhibit G

Preliminary Engineering Report Wastewater Improvements
Kapa'a Highlands Phase II

Preliminary Engineering Report
Wastewater Improvements

KAPAA HIGHLANDS – PHASE II

Prepared for:
Greg Allen
161 Wailua Rd.
Kapa'a, HI 96746

Prepared by:
Honua Engineering, Inc.
P. O. Box 851
Hanalei, HI 96714

July 11, 2011
Project No: 1892

Project Description

The Kapa'a Highlands Subdivision is on former cane lands situated on a bluff adjacent to the coastal plain of Kapa'a Town. It is bordered by Olohena Road to the north and the Kapa'a Bypass Road on the south and east sides of the project. Kapa'a Intermediate School is near the middle of the north portion of the property. Phase I of the development will consist of five agricultural lots on the west side of the property. The remainder of the property to the south and east of the school are proposed to be developed during Phase II of the subdivision. The proposed Phase II development will consist of 86 single and 683 multi-family units, plus a neighborhood commercial site, parks, and a church site as shown on Exhibit 1. Ground elevation of the development ranges from 20 to 180 feet above mean sea level. Due to it's high density the Phase II development will require connection to the Wailua-Kapa'a Sewer System. The following report reviews the anticipated wastewater flows, the adequacy of the existing sewer collection system, and the proposed improvements needed to provide service for the development of Phase II.

Basis of Design

The *Sewer Design Standards, 1973* by the County of Kauai, Department of Public Works, together with the *Wailua Facility Plan, September 2008* by Fukunaga and Associates were the primary references for this report and will be abbreviated as SDS and WFP, respectively, when quoted in the report.

The WFP is a detailed study of the entire Wailua to Kapa'a wastewater system completed in 2008 to guide the County with the necessary expansion and management of the system through the year 2025. It broke down projected flows to the Wailua Treatment Plant in three phases, the current and near term flows up to the year 2010, middle term flows for the 2010-2015 period, and far term flows for the years 2015 to 2025.

Wailua-Kapa'a Average Daily Wastewater Flows[1]	
Planning Interval	Average Wastewater Flow (mgd)
Current	0.70
Near Term (2010)	0.98
Middle Term (2015)	1.39
Far Term at Wailua WWTP(2025)	1.72
Kapaa Start-Up (2025)	0.40

The need for the WFP was partially based upon the rapid development that was occurring in the Wailua-Kapaa area during 2004-2007 period. Development has slowed considerably since this time and several of the developments anticipated in the WFP calculations have been put on hold or are no longer proposed. Of the proposed developments, the Coco Palms Hotel will be removed from the near term anticipate flows and be considered part of the middle term flows. The Coconut Beach Resort and Coconut Plantation Village will be removed from the middle term flows and be considered for the far term flows.

The proposed Kapa'a Highlands development is not expected to be at total capacity by 2015, but for the purposes of this report, it will be considered to be completed in the middle term planning period of the WFP. The table below is the adjusted Average Daily Flows (ADF) based upon the current flow to the Wailua Treatment Plant and adjustments due to slower development than anticipated by WFP.

Adjusted Wailua-Kapa'a Average Daily Wastewater Flows	
Planning Interval	Average Wastewater Flow (mgd)
Current	0.70
Near Term (2010)	0.98
Middle Term (2015)	1.39
Far Term at Wailua WWTP(2025)	1.72

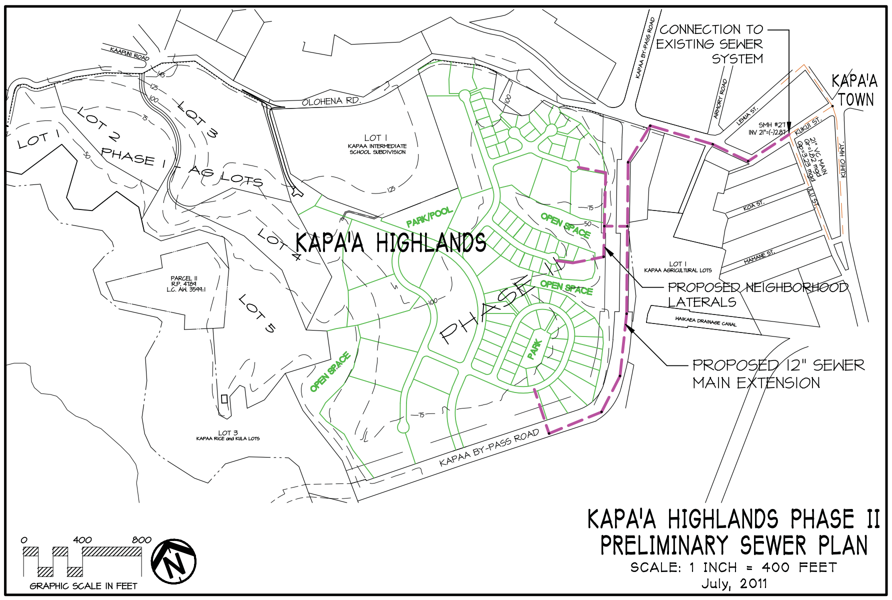
Kapa'a Highlands Phase II Wastewater Flow Estimates	
Item	Projected Wastewater Flow (gpd)
Single Family Homes	34,400
Multi-Family Homes	170,750
Neighborhood Commercial	4,800
Total	209,950

Note: Single Family Homes assumed to have 4 occupants/unit and Multi-Family Homes have 2.5 occupants/unit.

[1] Table ES-1, WFP, September 2008

Preliminary Design

Based upon the projected flow of 209,950 gpd (0.21 mgd), with a max load factor of 4.1, a 12" sewer main would be required to serve the development. The location of the main is shown on Exhibit 1. It would begin along the Kapa'a By-pass Road and terminate at an existing manhole near the intersection of Ulu and Kukui Streets. The length of the main within the existing public Right-of-Ways would be about 3,400 linear feet. At the existing manhole connection the existing main downstream of the connection is a 21" main with a capacity of 3.2 mgd. The 21" main currently has a peak flow of about 0.6 mgd, therefore the proposed flow is well within the capacity of the existing sewer system, including allowances for the future increases anticipated in the "Final Wailua Facility Plan", September 2008.



COMPUTATION OF SANITARY SEWAGE FLOW

SEWER: Kapaa

DISTRICT: Kawaihau

YEAR: 2010

REFERENCE MAPS:

PAGE: 1 of 1

COMPUTED BY: BH

DATE: 3-9-10

SEWER LOCATION			SANITARY SEWAGE (MGD)											SEWER DESIGN				
			TRIBUTARY AREA (ACRES)		TRIBUTARY POPULATION													
DISTRICT ZONE OR STREET	FROM	TO	INCREMENT	TOTAL	INCREMENT	TOTAL	AVERAGE FLOW	SUMMATION AVERAGE FLOW	MAX FLOW FACTOR	MAX FLOW	INFILTRATION @ 1,250 or 2,750 GAD	SUMMATION INFILTRATION	PEAK FLOW	SIZE (in.)	SLOPE (ft/100 f)	CAPACITY (mgd)	AVERAGE VELOCITY (fps)	PEAK VELOCITY (fps)
Kapaa Highlands				67				0.21	4.1	0.86	1,250	0.08	0.94	12	1	2.3	2.6	4.2

Remarks:

Exhibit H

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

Phillip Rowell and Associates

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

December 9, 2013

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

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

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

A. Project Location and Description

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

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

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

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

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

B. Purpose and Objective of Study

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

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

C. Study Approach

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

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

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

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

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

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

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

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

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

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

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

D. Description of Existing Streets and Intersection Controls

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

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

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

Existing Intersections

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

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

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

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

The intersection configurations are summarized on Attachment C.

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

E. Existing Peak Hour Traffic Volumes

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

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

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

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

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

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

F. Public Transportation

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

G. Level-of-Service Concept

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

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

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

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

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

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

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

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

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

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

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

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

H. Existing Levels-of-Service

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

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

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

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

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

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

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

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

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

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

Table 5 Existing Levels-of-Service of Unsignalized Intersections

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

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

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

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

I. Existing Deficiencies

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

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

J. Background Traffic Projections

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

K. Project Trip Generation

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

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

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

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

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

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

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

Table 6 Trip Generation Equations(1)

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

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

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

Table 7 Trip Generation Calculations

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

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

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

L. Background Plus Project Projections

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

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

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

M. Traffic Impact Assessment

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

Changes in Total Intersection Volumes

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

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

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

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

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

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

Changes of Levels-of-Service

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

The results of the 2020 level-of-service analysis of the intersection of Kuhio Highway at Kukui Street are summarized in Table 9. The overall intersection and all controlled movements will operate at Level-of-Service B without and with project generated traffic. There are no changes in the level-of-service of the intersections or controlled lane groups as a result of project related traffic.

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

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

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

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

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

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

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

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

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

Table 11 2020 Levels-of-Service of Unsignalized Intersections

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

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

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

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

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

Table 12 2020 Levels-of-Service - New Intersections

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

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

N. Project Road System

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

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

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

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

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

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

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

O. Other Traffic Related Issues

1. Impacts of Closing Kapaa Bypass

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

2. Pedestrian and Traffic

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

3. Speed Control Along Road 'A'

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

P. Summary and Recommendations

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

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

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

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

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

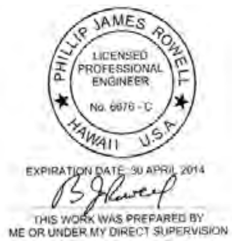
6. A level-of-service analysis of the intersection of Kapa'a Bypass at Olohena Road concluded that the eastbound approach to the roundabout is currently over-capacity (Level-of-Service E) during the morning peak hour without the project but will operate at Level-of-Service D with the project. This improvement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

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

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

Respectfully submitted,
PHILLIP ROWELL AND ASSOCIATES

Phillip J. Rowell, P.E.
Principal



List of Attachments

A. Project Location of Kauai

B. Subdivision Plan

C. Existing Lane Configurations

D. Existing AM Peak Hour Traffic Volumes

E. Existing PM Peak Hour Traffic Volumes

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

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

H. Phase 1 Trip Assignments

I. Phase 2 Trip Assignments

J. Reassignment of Existing Trips

K. 2020 Background Plus Project AM Peak Hour Traffic Projections

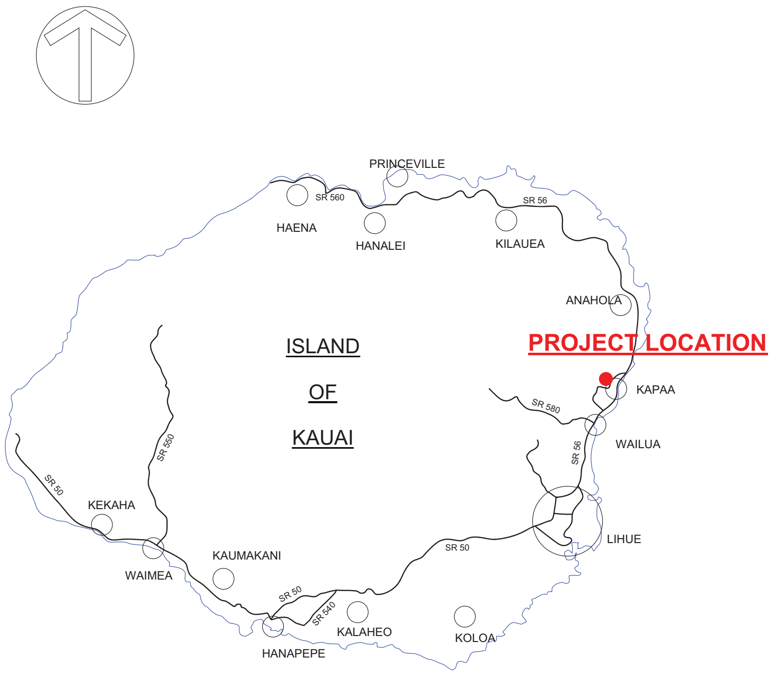
L. 2020 Background Plus Project PM Peak Hour Traffic Projections

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

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

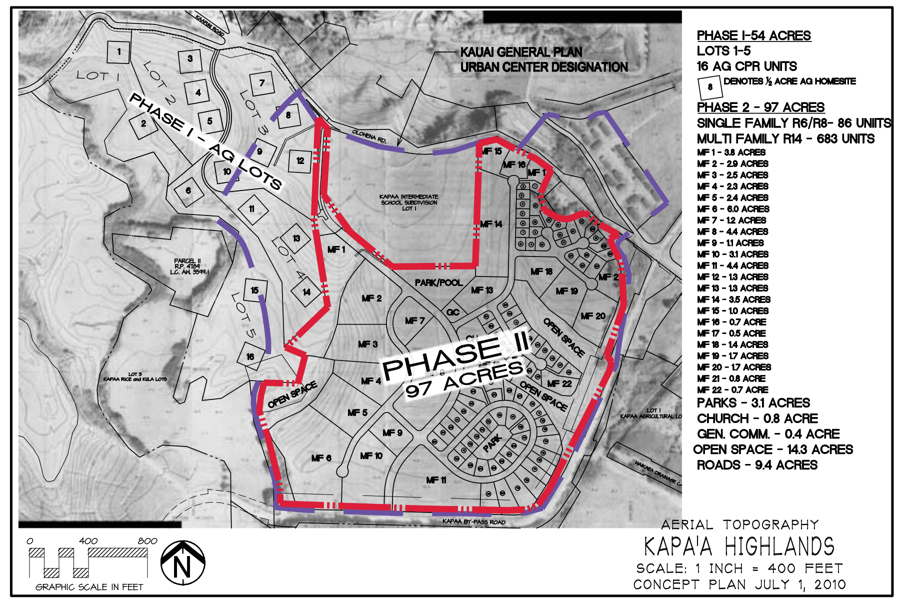
O. Comments from State of Hawaii Department of Transportation and Responses

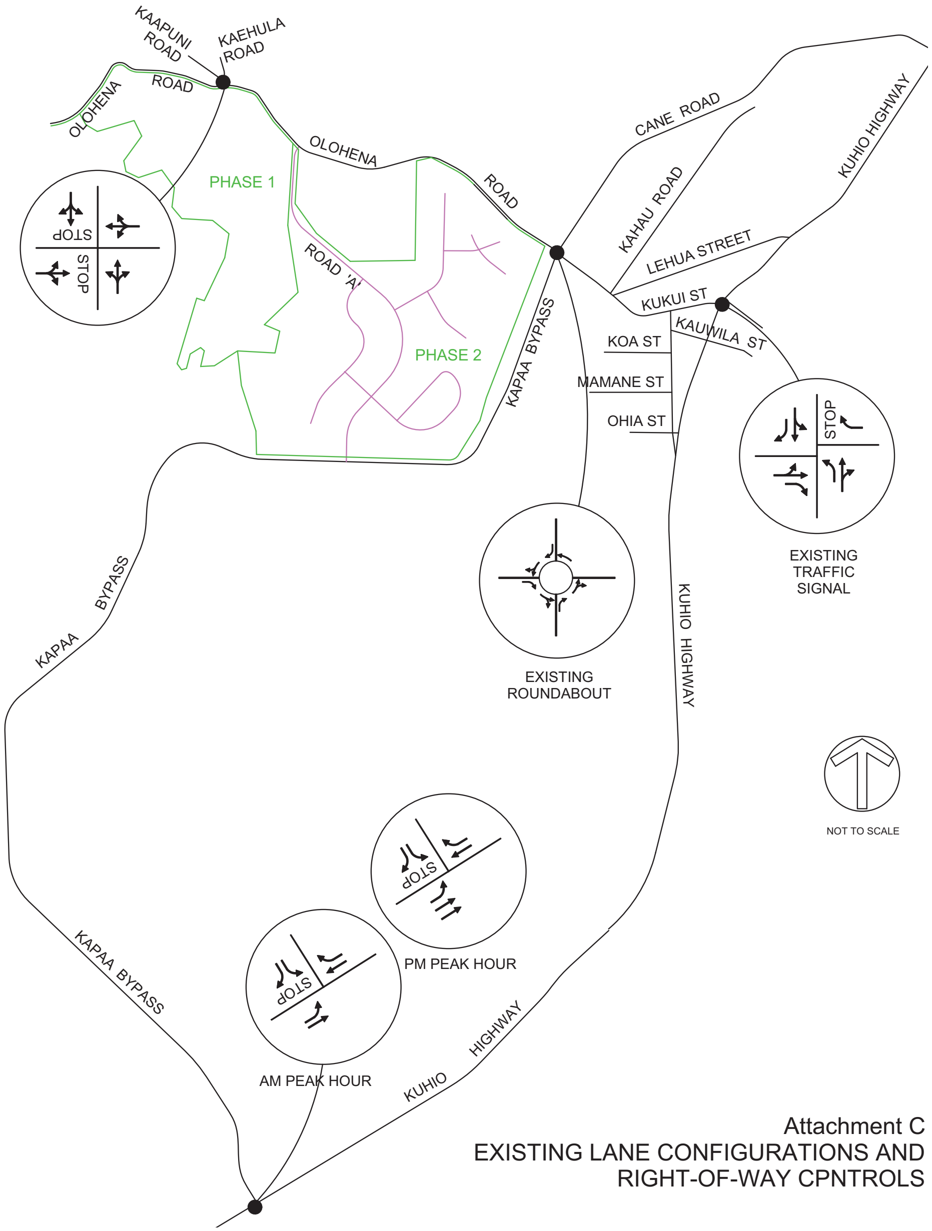
P. Comments from County of Kauai Department of Public Works and Responses



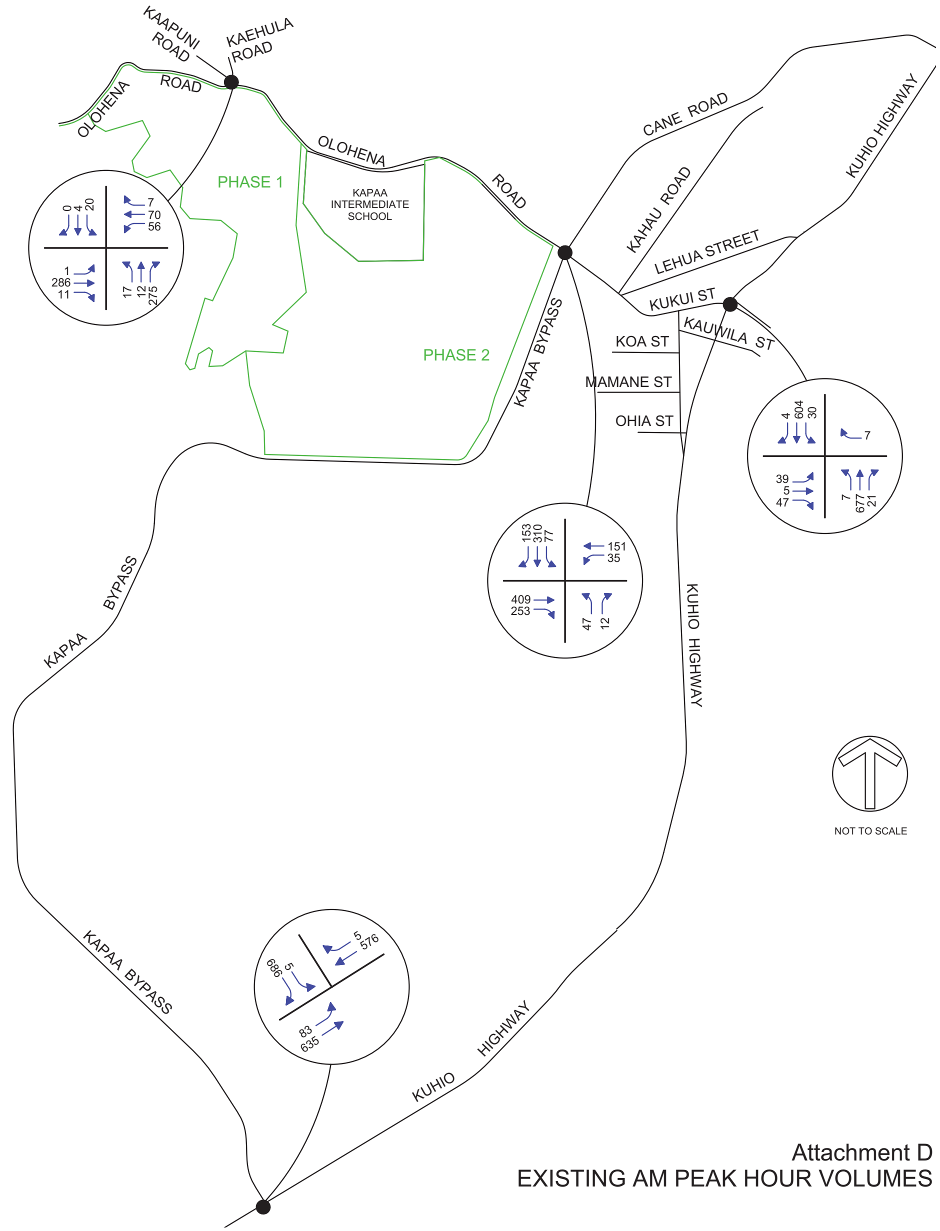
Attachment A
PROJECT LOCATION ON KAUAI

Attachment B
Subdivision Plan
(Provided By Others)

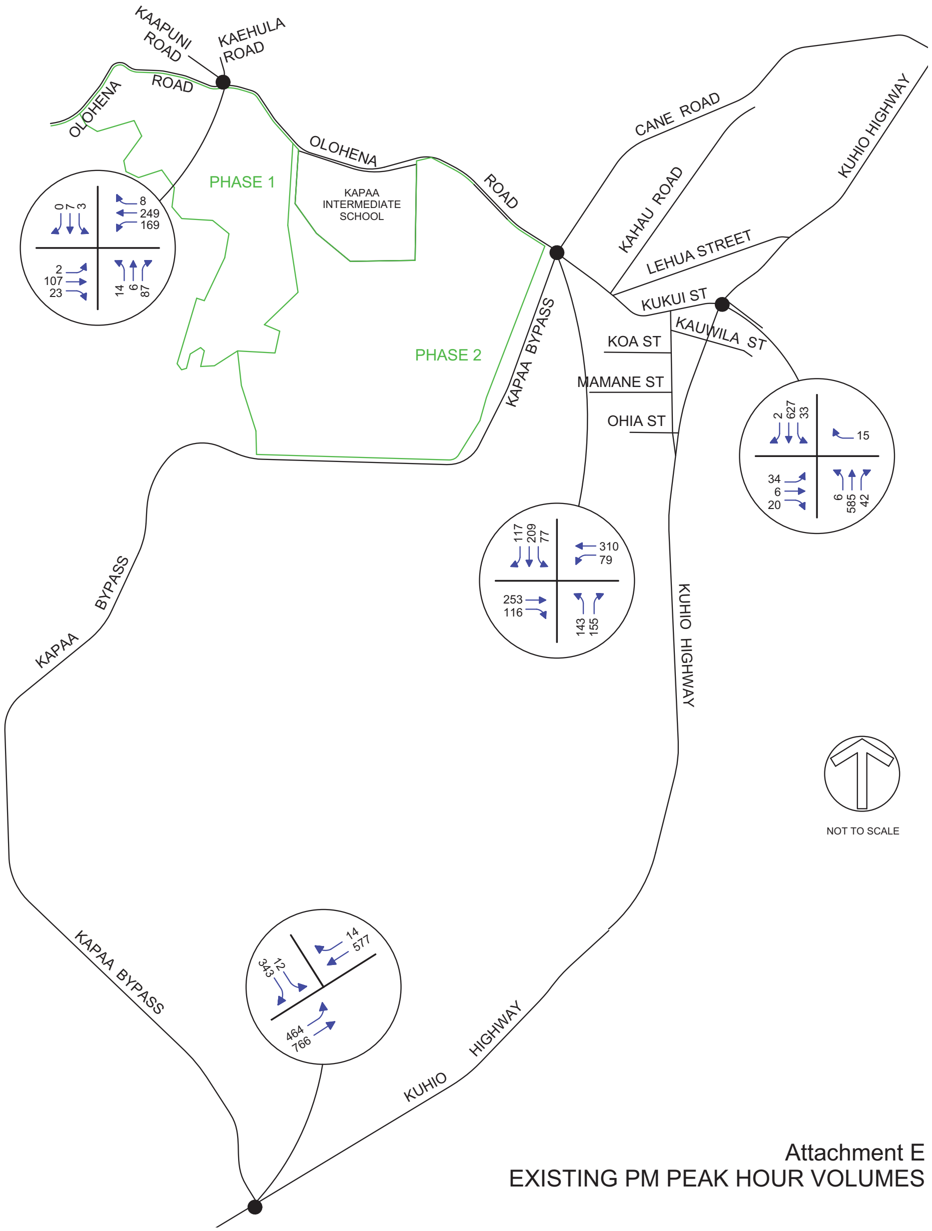




Attachment C
EXISTING LANE CONFIGURATIONS AND RIGHT-OF-WAY CPNTROLS



Attachment D
EXISTING AM PEAK HOUR VOLUMES



Attachment E
EXISTING PM PEAK HOUR VOLUMES

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

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

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

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

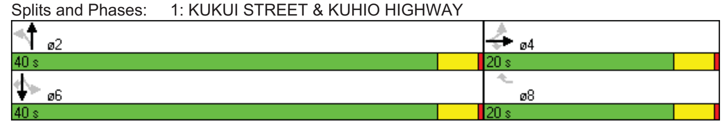
c Critical Lane Group

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

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

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

Splits and Phases: 1: KUKUI STREET & KUHIO HIGHWAY



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

11/15/2013

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

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

HCM Unsignalized Intersection Capacity Analysis
3: KAPAA BYPASS & KUHIO HIGHWAY

11/15/2013

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

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

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

HCM Unsignalized Intersection Capacity Analysis
4: OLOHENA ROAD & KAAPUNI ROAD

11/15/2013

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

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

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

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

11/15/2013

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

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

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

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

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

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

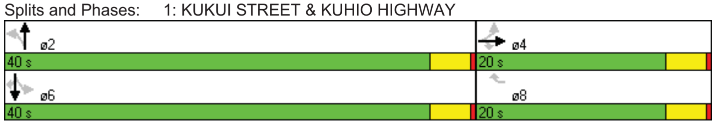
c Critical Lane Group

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

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

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

Splits and Phases: 1: KUKUI STREET & KUHIO HIGHWAY



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

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

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

HCM Unsignalized Intersection Capacity Analysis
3: KAPAA BYPASS & KUHIO HIGHWAY

11/15/2013

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

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

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

HCM Unsignalized Intersection Capacity Analysis
4: OLOHENA ROAD & KAAPUNI ROAD

11/15/2013

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

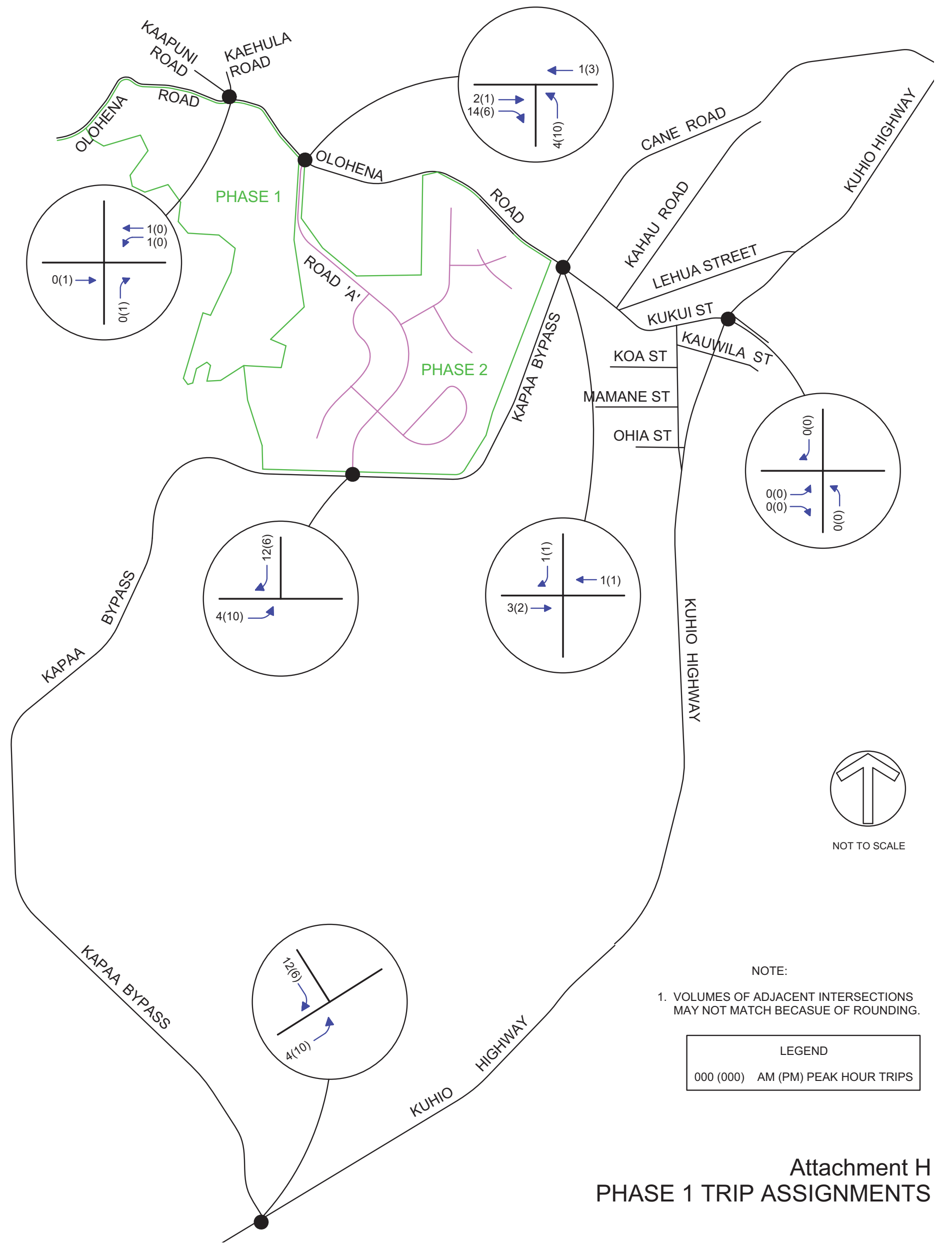
Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	116	463	152
Volume Left	22	0	120
Volume Right	0	279	33
cSH	1098	1700	577
Volume to Capacity	0.02	0.27	0.26
Queue Length 95th (ft)	2	0	26
Control Delay (s)	1.7	0.0	13.5
Lane LOS	A		B
Approach Delay (s)	1.7	0.0	13.5
Approach LOS			B

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

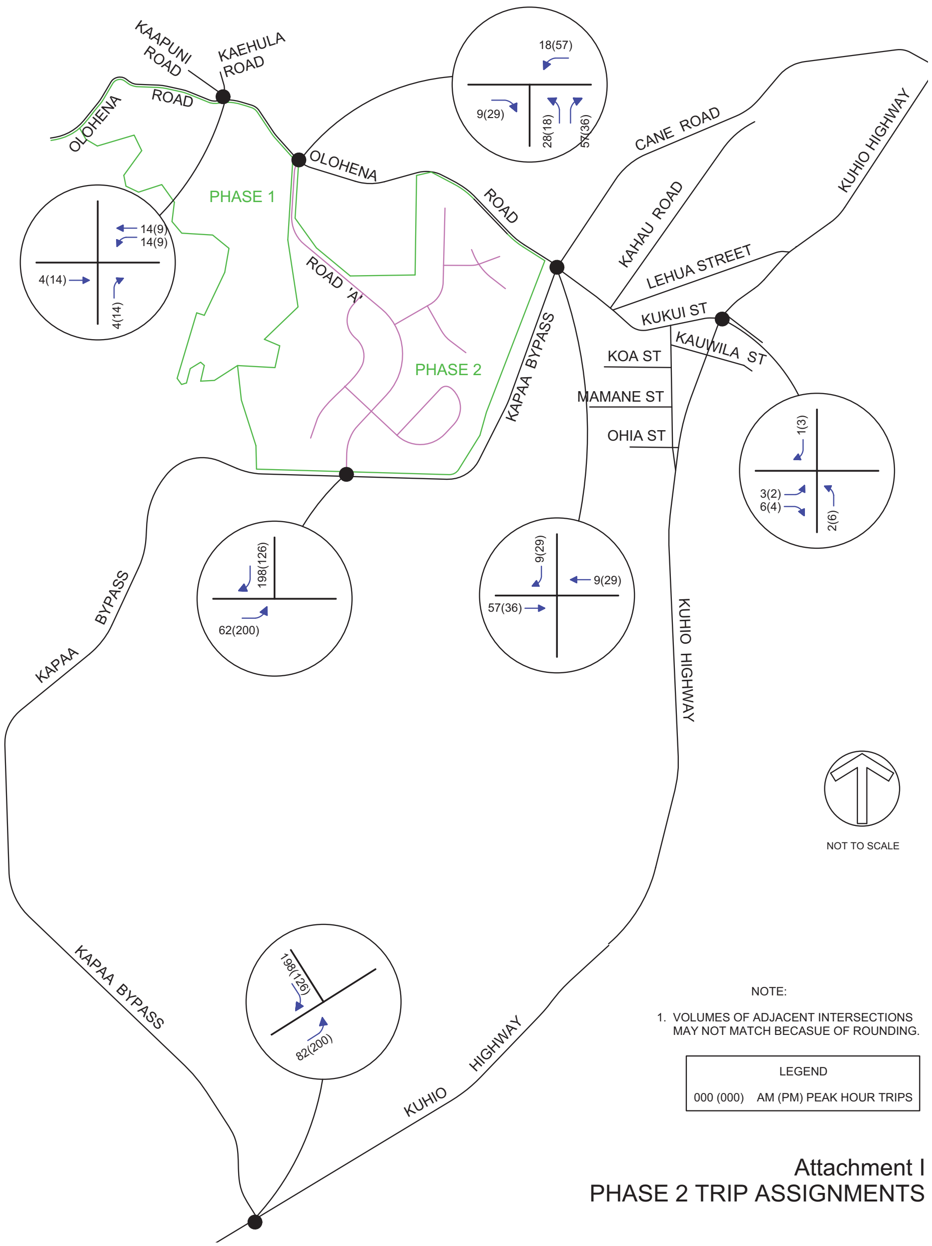
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	10	0	263	14	2	130
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	0	286	15	2	141
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent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

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

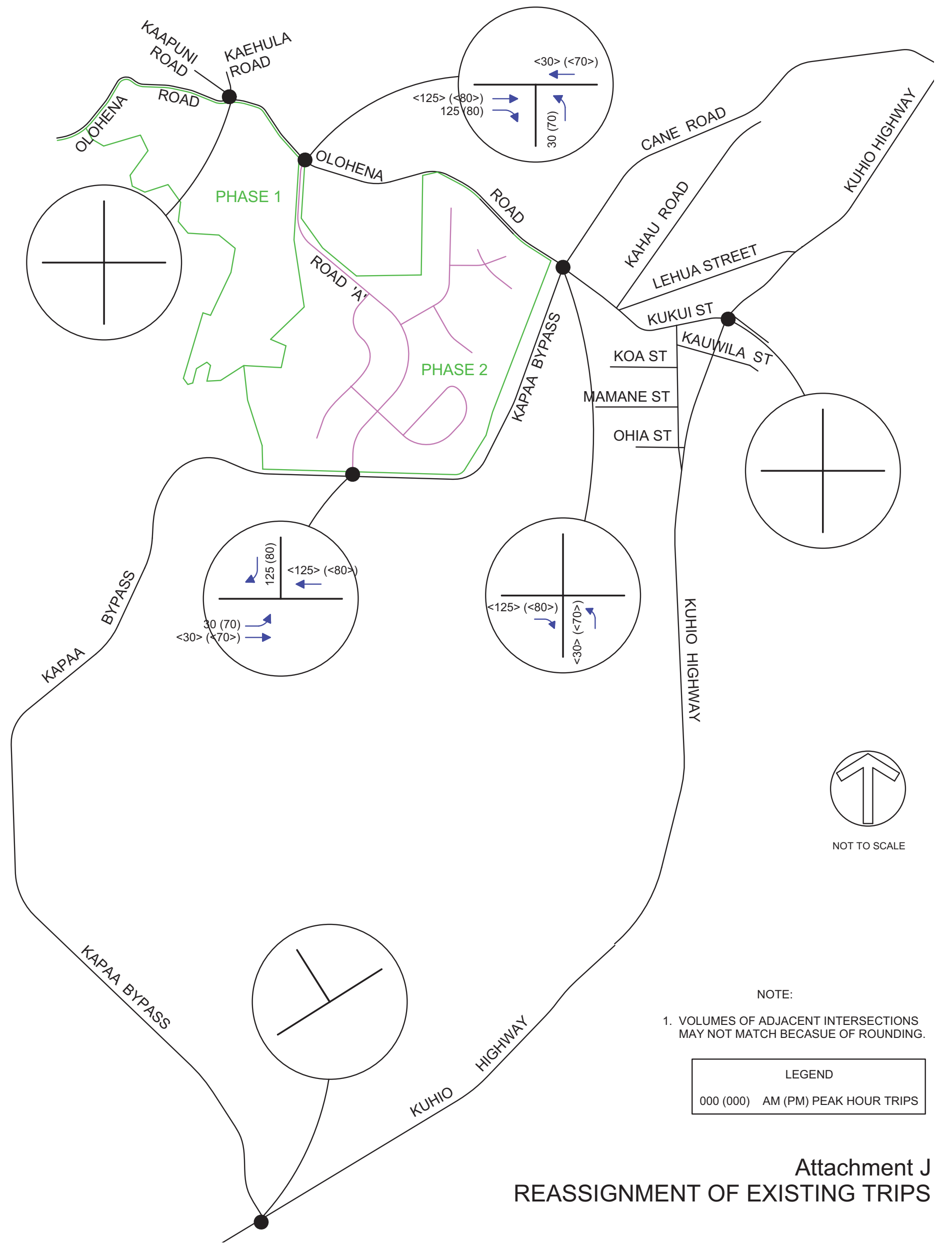
Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	24.7%	ICU Level of Service	A
Analysis Period (min)	15		



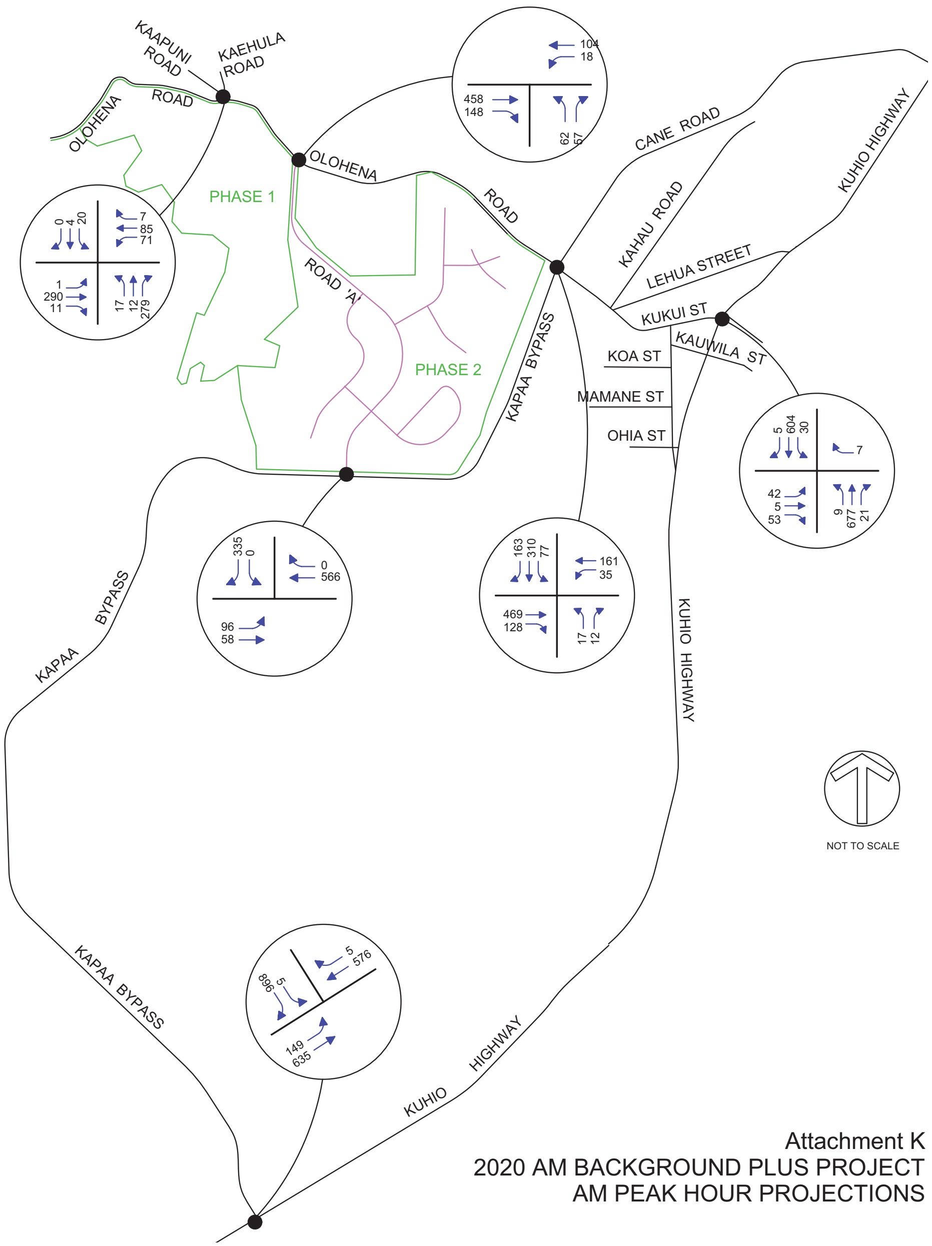
Attachment H
PHASE 1 TRIP ASSIGNMENTS



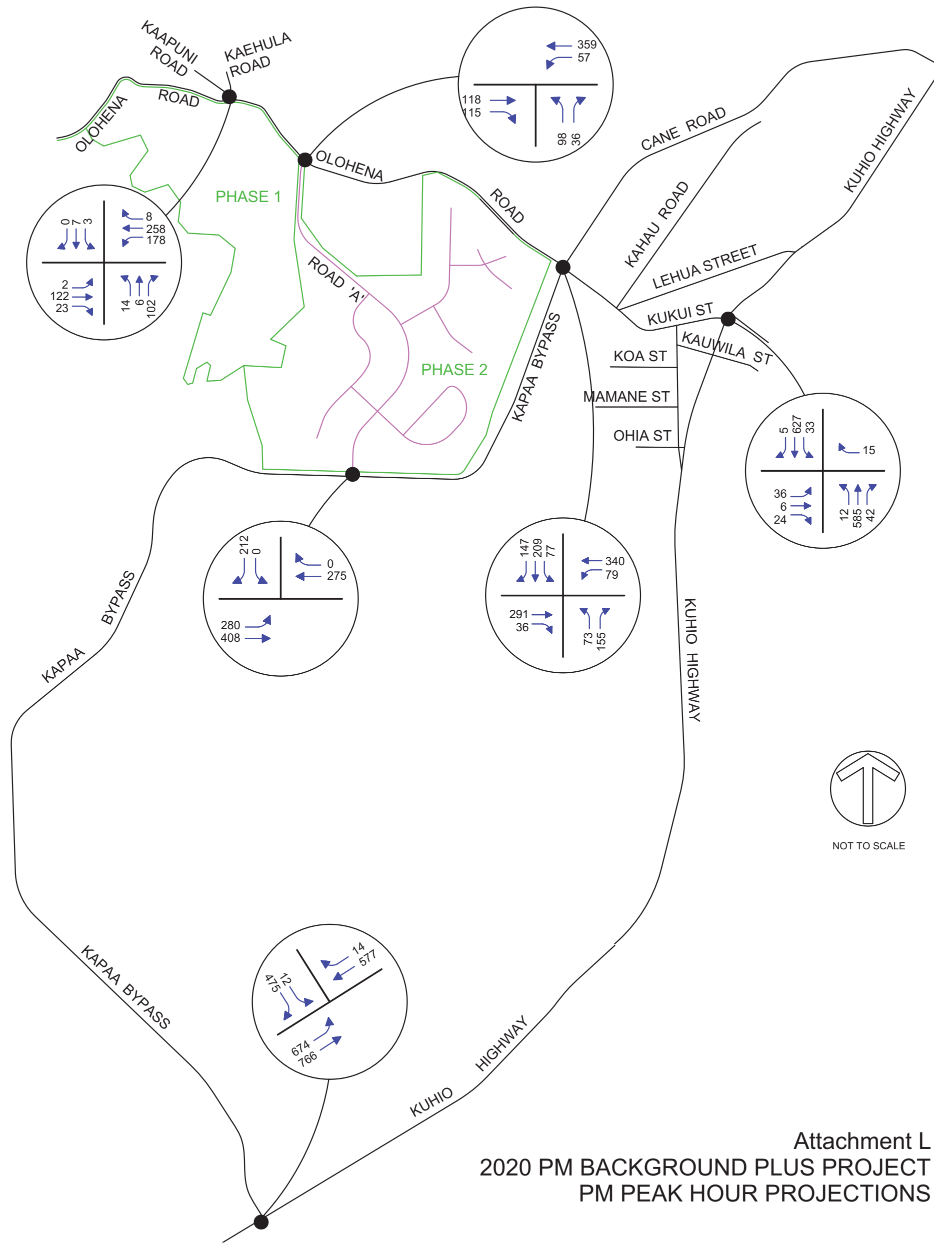
Attachment I
PHASE 2 TRIP ASSIGNMENTS



Attachment J
REASSIGNMENT OF EXISTING TRIPS



Attachment K
2020 AM BACKGROUND PLUS PROJECT
AM PEAK HOUR PROJECTIONS



Attachment L
2020 PM BACKGROUND PLUS PROJECT
PM PEAK HOUR PROJECTIONS

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

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

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

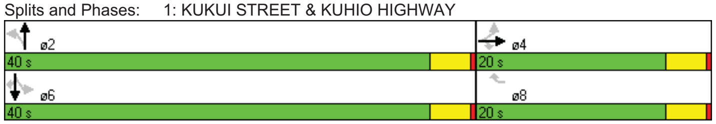
c Critical Lane Group

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

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

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

Splits and Phases: 1: KUKUI STREET & KUHIO HIGHWAY



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

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

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

HCM Unsignalized Intersection Capacity Analysis
3: KAPAA BYPASS & KUHIO HIGHWAY

12/2/2013

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

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

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

HCM Unsignalized Intersection Capacity Analysis
4: OLOHENA ROAD & KAAPUNI ROAD

12/2/2013

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

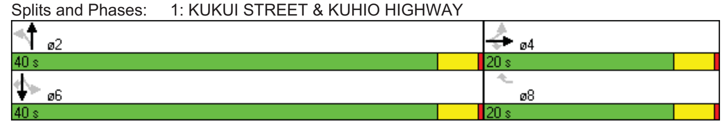
c Critical Lane Group

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

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

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

Splits and Phases: 1: KUKUI STREET & KUHIO HIGHWAY



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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Comments from State of Hawaii Department of Transportation[1] and Responses
Relative to TIAR Submitted December 9, 2013

	Comment	Response
1.	In Section K - Project Trip Generation, there is a typographical error for PM single-family units and the AM/PM multifamily formulas should be from 7:00-9:00 and from 4:00 to 6:00 rather than peak hour of generator.	Acknowledged.
2.	In Section M - Traffic Impact Assessment, the southern termini of the Kapaa Bypass being more than two miles away from the project does not alter the fact that the bypass is a limited access facility so traffic on the bypass has limited chance to disperse to other destinations. The trip distribution and volumes at the southern termini was no shown in any table. The increase in the amount of traffic is substantial at 12.2% AM and 13.6% PM. The results of the analysis of the Kuhio Highway at Kapaa Bypass intersection in Table 11 (2020 Level-of-Service (LOS) at Unsignalized Intersections) indicates significant increases in delay (LOS F becoming much worse LOS F) for the East to North (left turn out of the bypass) in both AM and PM, and moderate delay increase for the North to West (left turn into the bypass) (LOS B going to C) in the PM. We do not agree with the TIAR conclusion that the project contribution to these LOS conditions is not significant. A traffic signal warrant analysis for the intersection shall be prepared. Queuing analysis of the left-turn movements are required and queuing onto Kuhio Highway and Kapaa Bypass shall not be allowed. Transportation improvements shall be recommended to mitigate project generated impacts.	First, the project trip assignments are shown on Attachments H, I and J of the TIAR. Trip distributions are not typically included in a TIAR. The critical movement at this intersection is the eastbound to northbound left turn, which is 5 vehicles per hour during the morning peak hour and 12 vehicles per hour during the afternoon peak hour. The volumes of this movement did not change as a result of project generated traffic as the project did not add traffic to this movement. All outbound traffic from the project will make right turns at the intersection, which is a free movement during the morning peak hour and STOP sign controlled during the afternoon peak hour. It was determined that a signal warrant analysis of this intersection was not appropriate since the eastbound to southbound right turn is a free movement and therefore would not be considered in the side street approach volume and the eastbound to northbound volumes do not even approach the minimum approach volumes to trigger the signal warrants, which is 80 vehicles per hour for the Four Hour Volume Warrant. Lastly, since the developer has provided the Kapaa Bypass, he has already done more than his fair share to mitigate traffic in the Kapaa area. Without the Kapaa Bypass, traffic volumes and traffic congestion along Kuhio Highway in Kapaa would be intolerable.
3.	In Section M, the TIAR also makes reference to the project Road A serving as a alternative route from Olohena Road to the Kapaa Bypass, diverting traffic fro and thereby improving LOS at the roundabout (Olohena Road and Kapaa Bypass). However, since Road A will pass through the Project's Phase 2 residential area the TIAR recommended	The traffic calming recommendations for Road A are intended to slow traffic down, not to force traffic to another roadway. A simple look at the map indicates that Road A will be a shorter trip for traffic between Olohena Road, including traffic to and from the Kapaa Intermediate School, and the southern part of Kapaa Bypass. Since traffic will take the

1

	that various traffic calming measure, including all-way stops, be provided for pedestrian safety. Being that the foregoing objectives are in conflict with each other, the traffic diversion and LOS improvement must be verified. Otherwise, mitigation improvements at the eastbound approach of the roundabout my be required to achieve acceptable LOS.	shorter route, in terms of time and distance, it is appropriate to divert some traffic to Road A, especially during the morning peak hour when the eastbound approach of Olohena Road to the roundabout operates at a low LOS E.
4.	The northern end of the Kapaa Bypass Road intersection with Kuhio Highway shall be included in the TIAR. Although it is a single lane, one-way road from Kuhio Highway to the Olohena Roundabout, the entry intersections needs to be evaluated.	Per our discussions with the Planning Branch of SDOT, it was agreed that the study area would be expanded to include the intersection of Kuhio Highway at Kukui Street and the southern intersection of Kuhio Highway at Kapaa Bypass. Since Kapaa Bypass at the northern intersection of Kuhio Highway at Kapaa Bypass is one-way southbound, any project traffic added to the intersection would be free flow southbound. Since the movement is free flowing, it would no be considered in the LOS analysis.
5.	A left -turn warrant study should be conducted for the Kapaa Bypass Road intersection with Road A and a conceptual configuration of the intersection should be provided in the TIAR. Queuing onto the through lanes of the Kapaa Bypass Road shall not be allowed. Access to the Kapaa Bypass Road must be coordinated with and constructed to the satisfaction of the Highways Division, Kauai District Engineer.	First, both the FHWA and NCHRP data that are presented as "warrants" are actually "guidelines." It was decided that a separate left turn lane along Kapaa Bypass at Road A was not "needed" since this movement was projected to operate at LOS A during both morning and afternoon peak hours and that the 95th percentile queues are less than one vehicle. Refer to Table 12, page 14.

NEIL ABERCROMBIE
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
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GLENN M. OKIMOTO
DIRECTOR

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

IN REPLY REFER TO:
HWY-PS 2.6887

March 26, 2014

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

Dear Mr. Rowell:

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

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

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

We have the following comments:

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

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

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

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

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

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

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

Very truly yours,

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

c: Mr. Greg Allen, Kapaa Highlands

COPY

NEIL ABERCROMBIE
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
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IN REPLY REFER TO:
HWY-PS 2.7311

June 6, 2014

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

Dear Mr. Rowell:

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

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

We amend our prior comments as follows:

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

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

3. Comment4 – Your explanation is acceptable.

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

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

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

Very truly yours,

FORD N. FUCHIGAMI
Interim Director of Transportation

c: Mr. Greg Allen, Kapaa Highlands, LLC

Exhibit I

Kapa'a Highlands Legal Description and Maps

Portion of Parcel 1

All of that certain parcel of land, being a portion of Parcel 1 of Tax Map Key 4-3-03 (4th Division), being a portion of Grant 5266 to Rufus P. Spalding situate at Kapaa, Kauai, Hawaii and more particularly described as follows:

Beginning at the "+" on a concrete driveway at the East corner of this parcel of land at the North corner of Grant 8216 to Joe Martins on the Southwest side of Olohena Road, the coordinates of which referred to Government Survey Triangulation Station "NONOU" being 5,660.65 feet North and 11,159.65 feet East and running by azimuths measured clockwise from True South:

1.	35 ° 59'	385.90	feet along Grant 8216 to Joe Martin to a pipe;
2.	22 ° 52'	212.20	feet along Grant 8216 to Joe Martin; and Kapaa Agricultural Lot 1 to a pipe;
3.	100 ° 09'	134.70	feet along Kapaa Agricultural Lot 1 to a pipe;
4.	13 ° 38'	502.70	feet along Kapaa Agricultural Lot 1 to a pipe;
5.	27 ° 12'	171.70	feet along Kapaa Agricultural Lot 1 to a pipe;
6.	37 ° 25'	44.50	feet along Kapaa Agricultural Lot 1 to a "+" on the rock;
7.	96 ° 52'	41.00	feet along Kapaa Agricultural Lot 1 to a pipe;
8.	24 ° 40'	202.40	feet along Kapaa Agricultural Lot 1 to a pipe;
9.	318 ° 05'	87.36	feet along Kapaa Agricultural Lot 1 to a pipe;
10.	30 ° 57'	297.55	feet along Kapaa Agricultural Lot 1 to a pipe;

11. Thence along Kapaa Agricultural Lot 1 on a curve to the right with a radius of 253.97 feet, the chord azimuth and distance being:
62 ° 33' 30" 266.22 feet
to a pipe;

12.	94 ° 10'	11.52	feet along Kapaa Agricultural Lot 1 to a pipe;
13.	194 ° 30'	134.28	feet along the Cane Haul Road Right-of-Way (Part 4) and Grant 5237 to Hee Fat to a pipe;

14.	91 ° 26'	1538.50	feet along Grant 5237 to Hee Fat to a pipe;
15.	34 ° 24'	140.00	feet along Grant 5237 to Hee Fat and the Cane Haul Road Right-of-Way (part 4) to a pipe;
16.	124 ° 24'	109.44	feet along Grant 5237 to Hee Fat;
17.	179 ° 07'	328.20	feet along Lot 3, Kapaa Rice and Kula Lots to a pipe;
18.	161 ° 57'	433.00	feet along Lot 3, Kapaa Rice and Kula Lots to a pipe;
19.	174 ° 26'	278.80	feet along Lot 3, Kapaa Rice and Kula Lots to a pipe;
20.	58 ° 03'	228.00	feet along Lot 3, Kapaa Rice and Kula Lots to a pipe;
21.	83 ° 46'	130.50	feet along Lot 3, Kapaa Rice and Kula Lots;
22.	193 ° 34'	142.10	feet along Lot 3, Kapaa Rice and Kula Lots;
23.	134 ° 25'	37.50	feet along Lot 3, Kapaa Rice and Kula Lots;
24.	61 ° 13'	102.60	feet along Lot 3, Kapaa Rice and Kula Lots;
25.	15 ° 18'	130.60	feet along Lot 3, Kapaa Rice and Kula Lots;
26.	71 ° 49'	37.10	feet along Lot 3, Kapaa Rice and Kula Lots;
27.	137 ° 54'	63.20	feet along Lot 3, Kapaa Rice and Kula Lots;
28.	196 ° 07'	588.10	feet along Lot 3, Kapaa Rice and Kula Lots;
29.	287 ° 25'	74.30	feet along L.C. Aw. 3554:1 to Keo;
30.	204 ° 43'	402.60	feet along L.C. Aw. 3554:1 to Keo to a pipe;
31.	191 ° 23'	213.70	feet along Lot 3, Kapaa Rice and Kula Lots to a pipe;

32.	127 ° 12'	175.90	feet along Lot 3, Kapaa Rice and Kula Lots to a pipe;
33.	93 ° 47'	270.70	feet along Lot 3, Kapaa Rice and Kula Lots to a pipe;
34.	139 ° 40'	130.10	feet along Lot 3, Kapaa Rice and Kula Lots to a pipe;
35.	187 ° 18'	168.60	feet along Lot 3, Kapaa Rice and Kula Lots to a pipe;
36.	145 ° 21'	184.30	feet along Lot 3, Kapaa Rice and Kula Lots to a pipe;
37.	71 ° 54'	211.50	feet along Lot 3, Kapaa Rice and Kula Lots;
38.	115 ° 21'	123.70	feet along Lot 3, Kapaa Rice and Kula Lots;
39.	166 ° 33'	92.20	feet along Lot 3, Kapaa Rice and Kula Lots;
40.	216 ° 24'	260.40	feet along Lot 3, Kapaa Rice and Kula Lots to a pipe;
41.	156 ° 33'	153.00	feet along Lot 3, Kapaa Rice and Kula Lots to a pipe;
42.	73 ° 13'	340.60	feet along Lot 3, Kapaa Rice and Kula Lots to a pipe;
43.	122 ° 08'	107.50	feet along Lot 3, Kapaa Rice and Kula Lots to a pipe;
44.	150 ° 30'	118.03	feet along Lot 3, Kapaa Rice and Kula Lots to a pipe;
45.	226 ° 13'	49.22	feet along Olohena Road to a pipe;

46. Thence along Olohena Road on a curve to the left with a radius of 1,115.00 feet, the chord azimuth and distance being:
218 ° 45' 289.79 feet
to a P-K nail;

47. 211 ° 17' 145.50 feet along Olohena Road to a P-K nail;

48. Thence along Olohena Road on a curve to the right with a radius of 65.00 feet, the chord azimuth and distance being:
268 ° 48' 30" 109.67 feet
to a pipe;

49. Thence along Olohena Road on a curve to the left with a radius of 87.10 feet, the chord azimuth and distance being:
299 ° 32' 78.54 feet
to a pipe;

50. 272 ° 44' 249.69 feet along Olohena Road to a pipe;

51. 281 ° 55' 203.19 feet along Olohena Road to a pipe;

52. 291 ° 21' 251.40 feet along Olohena Road to a pipe;

53. 261 ° 28' 149.18 feet along Olohena Road to a pipe;

54. 286 ° 25' 226.46 feet along Olohena Road to a pipe;

55. 325 ° 04' 288.93 feet along Olohena Road to a pipe;

56. 317 ° 06' 310.87 feet along Olohena Road to a pipe;

57. 3 ° 37' 476.50 feet along Lot 2, Olohena Road widening parcel and Lot 1, Kapaa Intermediate School, and along the remainder of Grant 5266 to Rufus P. Spalding to a pipe;

58. 323 ° 35' 304.65 feet along Lot 1, Kapaa Intermediate School, and along the remainder of Grant 5266 to Rufus P. Spalding to a pipe;

59. 309 ° 45' 390.14 feet along Lot 1, Kapaa Intermediate School, and along the remainder of Grant 5266 to Rufus P. Spalding to a pipe;

60. 268 ° 25' 554.33 feet along Lot 1, Kapaa Intermediate School, and along the remainder of Grant 5266 to Rufus P. Spalding to a pipe;

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61. 181 ° 14' 848.53 feet along Lot 1, Kapaa Intermediate School, and Lot 2, Olohena Road widening Parcel and along the remainder of Grant 5266 to Rufus P. Spalding to a pipe;

62. 257 ° 37' 127.84 feet along Olohena Road;

63. 297 ° 22' 265.20 feet along Olohena Road to a pipe;

64. 298 ° 02' 25.00 feet along Olohena Road to a pipe;

65. Thence along Olohena Road on a curve to the right with a radius of 375.00 feet, the chord azimuth and distance being:
307 ° 06' 30" 118.30 feet;
to a pipe;

66. 316 ° 11' 29.85 feet along Olohena Road to a pipe;

67. 28 ° 30' 203.12 feet along TMK: 4-3-03:13 and along the remainder of Grant 5266 to Rufus P. Spalding to a pipe;

68. 335 ° 00' 100.00 feet along TMK: 4-3-03:13 and along the remainder of Grant 5266 to Rufus P. Spalding to a pipe;

69. 301 ° 35' 130.00 feet along TMK: 4-3-03:13 and along the remainder of Grant 5266 to Rufus P. Spalding to a pipe;

70. 278 ° 40' 50.00 feet along TMK: 4-3-03:13 and along the remainder of Grant 5266 to Rufus P. Spalding to a pipe;

71. 246 ° 30' 140.00 feet along TMK: 4-3-03:13 and along the remainder of Grant 5266 to Rufus P. Spalding to a pipe;

72. 316 ° 11' 110.00 feet along TMK: 4-3-03:13 and along the remainder of Grant 5266 to Rufus P. Spalding to a pipe;

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73.	272 ° 20'	46.00	feet along TMK: 4-3-03:13 and along the remainder of Grant 5266 to Rufus P. Spalding to a pipe;
74.	300 ° 02'	135.22	feet along Olohena Road;
75.	307 ° 00'	566.89	feet along Olohena Road to the point of beginning and containing an AREA of 163.125 Acres.

SUBJECT, HOWEVER to an easement for the Temporary Kapaa By-Pass Road Right-of-Way containing an AREA of 7.859 Acres.

ALSO, SUBJECT, HOWEVER to Easements E-1, E-2, E-3 (60.00 ft. wide) and E-4 for electrical transmission lines and poles and containing areas of 79,706 s.f., 31,444 s.f., 21,431 s.f., and 1,947 s.f., respectively.

Also subject to a 20 ft. future road widening setback line along Olohena Road.

WAGNER ENGINEERING SERVICES, INC.

RONALD J. WAGNER
LICENSED PROFESSIONAL LAND SURVEYOR
No. 5074
HAWAII, USA

Ronald J. Wagner

November 13, 1997
P.O. Box 851
Hanalei, Hawaii 96714

Ronald J. Wagner
Licensed Professional Land Surveyor Certificate No. 5074

URBAN STATE LAND USE
Portion of Parcel 1

All of that certain parcel of land being the Urban State Land Use District portion of Parcel 1 of Tax Map Key 4-3-03 (4th Division), being a portion of Grant 5266 to Rufus P. Spalding situate at Kapaa, Kauai, Hawaii and more particularly described as follows:

Beginning at the East corner of this parcel of land on the Southwest side of Olohena Road, the coordinates of which referred to Government Survey Triangulation Station "NONOU" being 5,934.74 feet North and 10,795.91 feet East and running by azimuths measured clockwise from True South:

1. 35 ° 13' — 14.72 feet over and across Parcel 1, Tax Map Key 4-3-03 along Kapaa By-Pass Road right-of-way easement;

2. 305 ° 13' — 121.57 feet over and across Parcel 1, Tax Map Key 4-3-03 along Kapaa By-Pass Road right-of-way easement;

3. Thence over and across Parcel 1, Tax Map Key 4-3-03 along Kapaa By-Pass Road right-of-way Easement on a curve to the right with a radius of 50.00 feet, the chord azimuth and distance being: 344 ° 48' 44" 63.74 feet;

4. Thence over and across Parcel 1, Tax Map Key 4-3-03 along Kapaa By-Pass Road right-of-way Easement on a curve to the left with a radius of 1,030.00 feet, the chord azimuth and distance being: 22 ° 40' 14" 62.45 feet;

5. 20 ° 56' — 150.64 feet over and across Parcel 1, Tax Map Key 4-3-03 along Kapaa By-Pass Road right-of-way easement;

6. 110 ° 56' — 30.00 feet over and across Parcel 1, Tax Map Key 4-3-03 along Kapaa By-Pass Road right-of-way easement;

7. 20 ° 56' — 500.00 feet over and across Parcel 1, Tax Map Key 4-3-03 along Kapaa By-Pass Road right-of-way easement;

8.	290 ° 56'	30.00	feet over and across Parcel 1, Tax Map Key 4-3-03 along Kapaa By-Pass Road right-of-way easement;
9.	20 ° 56'	531.65	feet over and across Parcel 1, Tax Map Key 4-3-03 along Kapaa By-Pass Road right-of-way easement;
10.	110 ° 56'	30.00	feet over and across Parcel 1, Tax Map Key 4-3-03 along Kapaa By-Pass Road right-of-way easement;
11.	Thence over and across Parcel 1, Tax Map Key 4-3-03 along Kapaa By-Pass Road right-of-way easement on a curve to the right with a radius of 940.00 feet, the chord azimuth and distance being: 22 ° 33' 53.04 feet;		
12.	24 ° 10'	136.41	feet over and across Parcel 1, Tax Map Key 4-3-03 along Kapaa By-Pass Road right-of-way easement;
13.	Thence over and across Parcel 1, Tax Map Key 4-3-03 along Kapaa By-Pass Road right-of-way easement on a curve to the right with a radius of 940.00 feet, the chord azimuth and distance being: 29 ° 13' 165.49 feet;		
14.	34 ° 16'	129.33	feet over and across Parcel 1, Tax Map Key 4-3-03 along Kapaa By-Pass Road right-of-way easement;
15.	Thence over and across Parcel 1, Tax Map Key 4-3-03 along Kapaa By-Pass Road right-of-way easement on a curve to the right with a radius of 265.00 feet, the chord azimuth and distance being: 63 ° 01' 254.92 feet;		
16.	91 ° 46'	938.55	feet over and across Parcel 1, Tax Map Key 4-3-03 along Kapaa By-Pass Road right-of-way easement;

17.	91 ° 04'	580.00	feet over and across Parcel 1, Tax Map Key 4-3-03 along Kapaa By-Pass Road right-of-way easement;
18.	181 ° 04'	10.00	feet over and across Parcel 1, Tax Map Key 4-3-03 along Kapaa By-Pass Road right-of-way easement;
19.	93 ° 59'	104.46	feet over and across Parcel 1, Tax Map Key 4-3-03 along Kapaa By-Pass Road right-of-way easement;
20.	179 ° 07'	165.42	feet along Lot 3, Kapaa Rice and Kula Lots to a pipe;
21.	161 ° 57'	433.00	feet along Lot 3, Kapaa Rice and Kula Lots to a pipe;
22.	174 ° 26'	278.80	feet along Lot 3, Kapaa Rice and Kula Lots to a pipe;
23.	273 ° 00'	324.19	feet over and across Parcel 1, Tax Map Key 4-3-03;
24.	192 ° 00'	193.74	feet over and across Parcel 1, Tax Map Key 4-3-03;
25.	113 ° 12'	141.30	feet over and across Parcel 1, Tax Map Key 4-3-03;
26.	225 ° 54'	399.65	feet over and across Parcel 1, Tax Map Key 4-3-03;
27.	171 ° 26'	478.33	feet over and across Parcel 1, Tax Map Key 4-3-03;
28.	261 ° 26'	128.70	feet over and across Parcel 1, Tax Map Key 4-3-03;
29.	233 ° 35'	89.98	feet over and across Parcel 1, Tax Map Key 4-3-03;

30. 323 ° 35'	47.54	feet along Lot 1, Kapaa Intermediate School;
31. 309 ° 45'	390.14	feet along Lot 1, Kapaa Intermediate School;
32. 268 ° 25'	554.33	feet along Lot 1, Kapaa Intermediate School;
33. 181 ° 14'	848.53	feet along Lot 1, Kapaa Intermediate School, and Lot 2, Olohena Road widening Parcel;
34. 257 ° 37'	127.84	feet along Olohena Road;
35. 297 ° 22'	265.20	feet along Olohena Road to a pipe;
36. 298 ° 02'	25.00	feet along Olohena Road to a pipe;

37. Thence along Olohena Road on a curve to the right with a radius of 375.00 feet, the chord azimuth and distance being:
307 ° 06' 30" 118.30 feet;
to a pipe;

38. 316 ° 11'	29.85	feet along Olohena Road to a pipe;
39. 28 ° 30'	203.12	feet along TMK: 4-3-03:13;
40. 335 ° 00'	100.00	feet along TMK: 4-3-03:13;
41. 301 ° 35'	130.00	feet along TMK: 4-3-03:13;
42. 278 ° 40'	50.00	feet along TMK: 4-3-03:13;
43. 246 ° 30'	140.00	feet along TMK: 4-3-03:13;
44. 316 ° 11'	110.00	feet along TMK: 4-3-03:13;
45. 272 ° 20'	46.00	feet along TMK: 4-3-03:13;
46. 300 ° 02'	135.22	feet along Olohena Road;

File: Urban State Land Use Project: 1892.2

47. 307 ° 00'	111.44	feet along Olohena Road to the point of beginning and containing an AREA of 96.060 Acres.

HONUA ENGINEERING INC.

BRIAN M. HENNESSY
LICENSED PROFESSIONAL LAND SURVEYOR
No. 14,484
HAWAII, USA

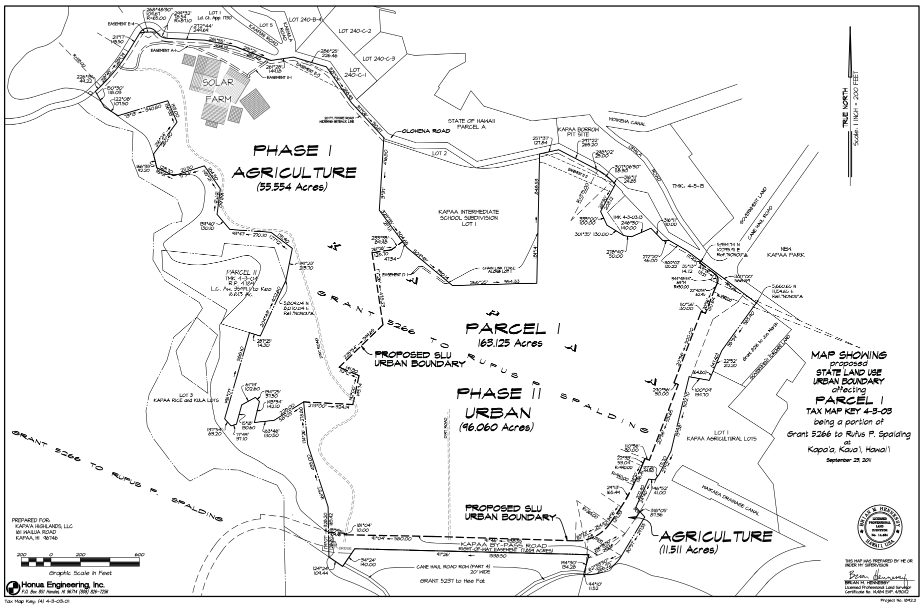
B. Hennessy

September 23, 2011
P.O. Box 851
Hanalei, Hawaii 96714

Brian M. Hennessy
Licensed Professional Land Surveyor
Certificate No. 14484
Expires: 04/30/2012

Exhibit J

Botanical Survey
Kapa'a Highlands Phase II
TMK (4) 4-3-003:001
Kaua'i, Hawai'i



Botanical Survey
Kapa`a Highlands Phase II
TMK (4) 4-3-003:001
Kaua`i, Hawai`i
April-May
2012

Prepared by

Kenneth R. Wood[1] / Research Biologist
Megan Kirkpatrick / M.S. Environmental Science
[1]P. O. Box 745, `Ele`ele, Kaua`i, Hawai`i, U.S.A. 96705
kwood@ntbg.org

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Botanical Survey
Kapa`a Highlands Phase II
TMK (4) 4-3-003:001
Kaua`i, Hawai`i
April 2012

Kenneth R. Wood, Research Biologist, & Megan Kirkpatrick, M.S. Environmental Science
P.O. Box 745, `Ele`ele, Kaua`i, Hawai`i, U.S.A. 96705, kwood@ntbg.org,

Summary: During April and May of 2012 a botanical survey was conducted on a 97 acre parcel in Kapa`a, Kaua`i, referred to as Kapa`a Highlands Phase II (TMK (4)3-8-003:001). This research documented 44 vascular plant species within the survey area. Forty taxa were non-native plant species, three taxa were very common indigenous native species, and one taxon was a Polynesian introduction (Table 1). NO FEDERALLY LISTED AS THREATENED OR ENDANGERED PLANT SPECIES WERE OBSERVED WITHIN OR NEAR THE SURVEY AREA. This report includes a general description of the study site; the methods of survey; and a vascular plant checklist of all plant species observed.

STUDY AREA. On April 19, 2012 and May 7, 2012, K. R. Wood (Endangered Species Specialist) and assistant Megan D. Kirkpatrick (M.S. Environmental Science) conducted a biological inventory on an undeveloped parcel of property in Kapa`a, Kaua`i (TMK [4]3-8-003:001) (Figures 1 & 2). The survey area is approximately 97 acres of undeveloped land. The primary objectives of this field survey were to:

a) search for threatened and endangered plant species as well as species of concern;
b) provide a complete vascular plant checklist of both native and non-native plant taxa observed on property; and
c) provide a summary concerning the conservation status of all native taxa observed;

SURVEY METHODS. A walk-through survey method was used. Transects included walking/driving around boundaries of property (TMK (4)3-8-003:001) and several transects through the interior portions of property. Plant identifications were made in the field and were recorded by the author (Table 1). Plant names and authors of dicots and monocots follow Wagner et al. (1990) and pteridophytes follow Palmer (2003). Plants of particular interest were collected by the second author (MK) as herbarium specimen vouchers and deposited at the National Tropical Botanical Garden (NTBG) herbarium. Specimens were placed in newspaper sheets and pressed in-between cardboard herbarium presses and dried at the NTBG.

DESCRIPTION OF VEGETATION.

The study area represents a lowland non-native mesic plant community dominated by secondary vegetation of trees, shrubs, and grasses, many of which are considered invasive. The land is vacant and currently undeveloped and has a past history of grazing and sugarcane cultivation. The non-native grass *Panicum maximum* (Poaceae – Guinea grass) and non-native shrub or small tree *Leucaena leucocephala* (Fabaceae – koa haole) are by far the dominant species found at the site. Additional common non-native trees and shrubs include: *Lantana camara* (Verbenaceae – lākana), *Indigofera suffruticosa* (Fabaceae – indigo), *Syzygium cumini* (Myrtaceae – Java plum), *Psidium guajava* (Myrtaceae – guava), *Spathodea campanulata* (Bignoniaceae – African tulip), and *Senna surattensis* (Fabaceae – kolomona). Several less common non-native trees and shrubs include: *Clidemia hirta* (Melastomataceae – Koster's curse), *Cinnamomum camphora* (Lauraceae – camphor tree), *Falcataria moluccana* (Fabaceae – albezia), *Ficus microcarpa* (Moraceae – Chinese banyan), and *Schefflera actinophylla* (Araliaceae – octopus tree). No Hawaiian endemic species (i.e., restricted to only Hawai`i) were observed. One Polynesian introduction was observed, namely *Aleurites moluccana* (Euphorbiaceae – kukui tree) which is common throughout the Hawaiian islands. The three indigenous species found at the site are quite common and include: *Hibiscus tiliaceus* (Malvaceae – hau) which is also often an invasive tree species, the fern species *Psilotum nudum* (Psilotaceae – moa), and Waltheria indica (Sterculiaceae - `uhaloa). For complete checklist of species see Table 1 which also includes the common names and status (i.e., indigenous/naturalized) category of each taxon.

CONCLUSION.

NO THREATENED OR ENDANGERED PLANT SPECIES WERE OBSERVED WITHIN OR ANYWHERE NEAR THE SURVEY AREA DURING RESEARCH -and therefore there are no concerns about possible impacts to rare plant species at the Kapa`a Highlands Phase II project. The current conditions of this study site indicate that the area has been dominated by non-native weedy species for a very long time. The senior author certifies his expertise with more than 25 years conducting biological inventories within the Hawaiian Islands and has specialized in the conservation of Hawai`i's *Federally Listed as Endangered* plant species, including those considered *Candidates* for listing, *Species of Concern*, or *Federally Listed as Threatened* (USFWS 1999a, 1999b, 2004, 2010).

TABLE 1. Checklist of Vascular Plants Observed in Kapa`a Highlands Phase II Survey Area (TMK (4) 4-3-003:001)

Status Symbols: ind=Indigenous (naturally occurring in Hawai`i, yet found in other areas of the world), nat=Naturalized (non-native), pol=Polynesian introduction. Note: Checklist alphabetical by genus. Flowering plants follow Wagner et al. 1990; pteridophytes follow Palmer 2003.

FAMILY	GENUS / SPECIES	COMMON NAME	STATUS
Asparagaceae	Agave sisalana Perrine	sisal, sisal hemp, century plant, malina	nat
Asteraceae	Ageratum conyzoides L.	maile hohono, maile honohono, maile kula	nat
Euphorbiaceae	Aleurites moluccana (L.) Willd.	kukui, kuikui, candlenut	pol
Blechnaceae	Blechnum appendiculatum Willd.		nat
Poaceae	Brachiaria mutica (Forssk.) Stapf	California grass, Para grass	nat
Fabaceae	Canavalia cathartica Thouars	maunaloa	nat
Fabaceae	Chamaecrista nictitans (L.) Moench var. glabrata (Vogel) H. S. Irwin & Barneby	partridge pea, laukī	nat
Poaceae	Chloris barbata (L.) Sw.	swollen fingergrass, mau'u lei	nat
Lauraceae	Cinnamomum camphora (L.) J.Presl	camphor tree	nat
Melastomataceae	Clidemia hirta (L.) D.Don	Koster's curse	nat
Asteraceae	Cyanthillium cinereum (L.) H.Rob.	little ironweed	nat
Thelypteridaceae	Cyclosorus dentatus (Forssk.) Ching	pai'i'ihā	nat
Poaceae	Cynodon dactylon (L.) Pers.	Bermuda grass, mānienie	nat
Cyperaceae	Cyperus pilosus Vahl		nat
Poaceae	Eragrostis brownii (Kunth) Nees ex Steud.	sheepgrass	nat
Fabaceae	Falcataria moluccana (Miq.) Barneby & J.W.Grimes		nat
Moraceae	Ficus microcarpa L.f.	Chinese banyan, Malayan banyan	nat
Cyperaceae	Fimbristylis miliacea (L.) Vahl		nat
Malvaceae	Hibiscus tiliaceus L.	hau	ind
Lamiaceae	Hyptis pectinata (L.) Poit.	comb hyptis	nat
Fabaceae	Indigofera suffruticosa Mill.	indigo, 'inikō, 'inikoa, kolū	nat
Verbenaceae	Lantana camara L.	lākana, lā'au kalakala, lanakana (Ni'ihau),	nat

FAMILY	GENUS / SPECIES	COMMON NAME	STATUS
Fabaceae	Leucaena leucocephala (Lam.) de Wit	koa haole, ēkoa, lilikoa	nat
Malvaceae	Malvastrum coromandelianum (L.) Garcke	false mallow	nat
Poaceae	Melinis repens (Willd.) Zizka	Natal redtop, Natal grass	nat
Fabaceae	Mimosa pudica L.	sensitive plant, sleeping grass, pua hilahila	nat
Fabaceae	Neonotonia wightii (Wight & Arn.) Verdc.		nat
Lomariopsidaceae	Nephrolepis brownii (Desv.) Hovenkamp & Miyam.		nat
Poaceae	Panicum maximum Jacq.	Guinea grass	nat
Asteraceae	Parthenium hysterophorus L.	false ragweed, Santa Maria	nat
Asteraceae	Pluchea carolinensis (Jacq.) G.Don	sourbush, marsh fleabane	nat
Myrtaceae	Psidium guajava L.	common guava, kuawa,	nat
Psilotaceae	Psilotum nudum (L.) P.Beauv.	moa, moa nahele	ind
Euphorbiaceae	Ricinus communis L.	castor bean, pāʻaila	nat
Araliaceae	Schefflera actinophylla (Endl.) Harms	octopus tree, umbrella tree	nat
Poaceae	Schizostachyum sp.	ʻohe	nat
Fabaceae	Senna surattensis (Burm.f.) H.S.Irwin & Barneby	kolomona, kalamona	nat
Malvaceae	Sida spinosa L.	prickly sida	nat
Bignoniaceae	Spathodea campanulata P.Beauv.	African tulip tree, fountain tree	nat
Asteraceae	Sphagneticola trilobata (L.) Pruski	wedelia	nat
Verbenaceae	Stachytarpheta jamaicensis (L.) Vahl	Jamaica vervain, ōwī	nat
Myrtaceae	Syzygium cumini (L.) Skeels	Java plum, jambolan plum	nat
Acanthaceae	Thunbergia fragrans Roxb.	white thunbergia, sweet clock-vine	nat
Sterculiaceae	Waltheria indica L.	ʻuhaloa, ʻalaʻala pū loa	ind

Figure 1. Aerial Image of Kapa`a Highlands Project Area.

Figure 2. Kapa`a Highlands Phase II concept plan.