

# **EXHIBIT E**

## **Agricultural Land Assessment For Proposed Important Agricultural Land**

**Kamehameha Schools  
Island of Kaua‘i**

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## **Introduction/Purpose**

To support a Petition for Declaratory Order to Designate ‘Important Agricultural Lands’ (‘IAL’), an Agricultural Lands Assessment was prepared for lands owned by Kamehameha Schools on Kaua‘i.

HRS § 205-44(c) provides the standards and criteria to identify IAL. HRS § 205-44(a) provides that lands identified as IAL need not meet every standard and criteria listed in HRS § 205-44(c); rather, lands meeting any of the criteria in HRS § 205-44(c) shall be given initial consideration, provided that the designation of IAL shall be made by weighing the standards and criteria with each other to meet the constitutionally mandated purposes in article XI, section 3, of the Hawai‘i Constitution and the objectives and policies for IAL in section 205-42 and 205-43. The standards and criteria of section 205-44(c) are as follows:

- 1) *Land currently used for agricultural production;*
- 2) *Land with soil qualities and growing conditions that support agricultural production of food, fiber, or fuel-and energy-producing crops;*
- 3) *Land identified under agricultural productivity rating systems, such as the agricultural lands of importance to the State of Hawai‘i (ALISH) system adopted by the board of agriculture on January 28, 1977;*
- 4) *Land types associated with traditional native Hawaiian agricultural uses, such as taro cultivation, or unique agricultural crops and uses, such as coffee, vineyards, aquaculture, and energy production;*
- 5) *Land with sufficient quantities of water to support viable agricultural production;*
- 6) *Land whose designation as important agricultural lands is consistent with general, development and community plans of the county;*
- 7) *Land that contributes to maintaining a critical land mass important to agricultural operation productivity;*
- 8) *Land with or near support infrastructure conducive to agricultural productivity, such as transportation to markets, water or power.*

Located in Hanalei, Kaua‘i, approximately 190 acres of lands owned by Kamehameha Schools are proposed to be designated IAL. The proposed IAL lands are divided into two areas by a mountain ridge, defining Lumaha‘i Valley to the west and Waipā to the east. The following assessment provides an overview of the various characteristics of the proposed Kamehameha Schools IAL. The attached exhibits (Figure 1 through Figure 10) illustrate and quantify the land characteristics.

## **Agricultural History of Lumaha‘i and Waipā Lands**

The three dominant pre-contact Hawaiian agricultural systems were lo‘i, dryland field systems, and a third mixed cropping system occurring on the slopes of valleys, termed “colluvial-slope” agriculture. Within these ahupua‘a of Waipā and Lumaha‘i, there is

evidence that these lands have supported all these types of pre-contact agricultural systems.

Lo'i agriculture, based on taro (*Colocasia esculenta*; kalo) occurred in the flat bottoms of stream-fed windward valley, such as Lumaha'i and Waipā, and was especially prominent on the geologically older islands including Kaua'i.

Conversely, dryland field systems, based upon sweet potato (*Ipomoea batatas*; 'uala), were confined to geologically young soils with a specific rainfall gradient. This type of agriculture did not occur at large scales on Kaua'i as it did on other islands mainly because of the older age of soils present on Kaua'i which are leached of rock-derived nutrients, such as nitrogen and phosphorus, unless rejuvenated by some type of stream or erosion transport of sediment.

The colluvial-slope system is a rain-fed system based upon root, tuber, and tree crops and non-food crops, such as dryland taro, sweet potato, banana (*Musa* spp.; mai'a), breadfruit (*Artocarpus alilis*; 'ulu), olonā (*Touchardia latifolia*), paper mulberry (*Broussontia papyrifera*; wauke), kava (*piper methysticum*; 'awa), ti (*cordyline fruticosa*; kī), and more. This system occurred in the lower slopes of broad valleys on the older islands, where mass-wasting and fluvial erosion cause the release of new supplies of rock-derived nutrients into the soil, allowing the soil to support a complex population of crops.

Hawaiian colluvial-slope agriculture has been recorded in ethnohistoric and archaeological records as occurring in sloped areas up to 30 degrees in slope, but is also determined by colluvial soil type, temperature, and a lower rainfall boundary (750mm/year). Modeling of traditional Hawaiian agricultural systems has predicted large areas of colluvial-slope agriculture (1,312 acres) in both Lumaha'i and Waipā valleys, surrounding a predicted 441 acres of lo'i agriculture. Modeling also indicates that these areas in these two valleys alone could produce 8,760 tons/year of traditional Hawaiian food.

The evidence of agricultural use in Lumaha'i Valley by the early Hawaiians is difficult to be determined due to the detrimental impacts of ranching use of these lands. However, the expansive flat lands alongside Lumaha'i River in the lower valley suggest that Lumaha'i would have been an ideal location for cultivation. Some literature and archaeological surveys suggest that Lumaha'i likely cultivated lo'i. From 1860s to 1930s, rice and taro were primarily cultivated in Lumaha'i and from 1930s to 1960s ranching replaced the early rice and taro agricultural practice. From 1990s to present, taro cultivation has returned to Lumaha'i as primary agricultural use, along with on-going pasture use.

In Waipā, lo'i systems were recorded during the Mahele (the division of Hawaiian lands) of 1848, indicating that the irrigated flat plain alongside Waipā Stream was utilized for taro cultivation. From approximately 1860s to 1940, all flat lands in Waipā were rice fields. From 1945 to 1985, these lands were converted to pasture use to raise livestock.



In 1986, Waipā was leased by Hawaiian Farmers of Hanalei, Inc. (HFH) and HFH began farming taro using the ancient irrigation ‘auwai.

HFH formed the Waipā Foundation in 1994 as a non-profit to manage the ahupua‘a. The mission of the Waipā Foundation is to:

“Restore the Waipā ahupua‘a as a Hawaiian community learning center and to create a sustainable, cultural and community-based model for land use and management inspired by the traditional values of the ahupua‘a.”

Waipā Foundation's agricultural goals include:

- Grow Hawaiian crops/plants for food, cultural practice, ahupua'a restoration, teaching, learning, and community-based economic development.
- Maximize use of agricultural areas by restoring areas not in production to managed, productive healthy lands.
- Farm in manner that continuously improves quality and health of soil, water, natural ecosystems, and other resources, while maximizing production of high-quality crops.
- Grow crops in ahupua'a context for mutual benefit of 'āina and crops.

In 2004, a master plan was prepared for the Waipā Foundation. Figure 1: Waipā Master Site Plan shows the existing and planned agricultural uses in relation to the proposed IAL land. As illustrated, the proposed IAL land includes areas for pasture, field crops and lo‘i and excludes the area for an education complex and other mission supporting uses. In addition, there are several kuleana parcels (owned by others) that are highlighted on Figure 1 and thus not included in the proposed IAL.

### **Current and Future Agricultural Operation**

As described above, the Lumaha‘i and Waipā areas proposed to be IAL have a long history of agricultural use; both pre-contact Hawaiian agricultural systems and current agricultural uses. Figure 2: Current and Future Agricultural Operation illustrates the current and planned general agricultural uses of the proposed IAL lands.

Lumaha‘i is currently encumbered by a 5-year license agreement to the Harada ‘Ohana. The current agricultural use includes approximately 37 acres of pasture and 6 acres of taro lo‘i. Taro cultivation has the potential to be increased by an additional 6 acres under the current irrigation system. In addition to the taro and pasture use, the diversified agricultural plantings include beans, squash, sugar cane, papaya, bananas, ti leaf, pumpkin, chili pepper, fruit trees and heliconias. For security purposes, video cameras with day/night vision, sound and movement sensors are set up around the property. The

balance of the proposed IAL lands, approximately 17 acres, are suitable for a variety of crops and are planned to be incrementally cleared and put into agricultural uses.

In Waipā, Kamehameha Schools is currently in partnership with the Waipā Foundation to expand agricultural and traditional kalo productivity, and to implement an ‘āina based learning program. The Waipā Foundation has a long-term lease agreement ending in 2050. The current agricultural uses include approximately 45 acres of pasture and 15 acres of diversified agriculture including taro lo‘i, organic vegetable farming, native plant nurseries, and Hawaiian plant gardens. By the end of the current lease term, the agricultural use in Waipā is expected to include 45 acres of pasture and 49 acres of diversified agriculture. Critical to achieving the mission of the Waipā Foundation, the lands along Kuhio Highway that are excluded from the proposed IAL include the Hawaiian Farmers of Hanalei (HFH) "Historic Piko" that serves as a central gathering area and includes the HFH house, equipment shed and caretaker's home. Some of the uses and facilities planned within this area include:

- Kahua - open multi-use area that would continue to host Farmers Market
- Community Complex - certified kitchen, Hale Imu, a multi-purpose building, administration building, and bunkhouse
- Education Complex - four school buildings, including a preschool, small scale farm and garden, and supporting infrastructure
- Kupuna and Worker Housing - housing for workers and Kupuna that are a resource for operations and programs at Waipā.

In total, the 124 acres of proposed IAL lands are planned to be in productive agricultural uses consistent with the Waipā Foundation agricultural master plan and includes essential elements of active agricultural operation, such as stream buffers, drainage ways, ditches, and access roads.

The “colluvial-slope” agricultural lands within Waipā and Lumaha‘i have not been included in the proposed IAL lands since the current tenants are not pursuing this type of farming. The feasibility of active farming of traditional or other crops in these colluvial-slope areas may be explored by Kamehameha Schools in the future and considered for IAL designation.

### **Agricultural Soils Productivity Ratings**

The Detailed Land Classification System and Agricultural Land Productivity Ratings by the Land Study Bureau (LSB), University of Hawai‘i are based on a five-class productivity rating system using the letters A, B, C, D, and E, with A representing the class of highest productivity and E the lowest. As illustrated in Figure 3: Land Study Bureau – Detailed Land Classification, about 74% of the proposed IAL lands in Lumaha‘i and Waipā are rated C, 2% are rated D, and 24% are rated E.

The following table summarizes the productivity rating of the proposed IAL lands as illustrated in Figure 3:

Detailed Land Classification System/Ag. Land Productivity Ratings

<b>Productivity Rating</b>	<b>Lumaha'i</b>		<b>Waipā</b>		<b>Total IAL</b>	
	<b>Acres</b>	<b>% of IAL</b>	<b>Acres</b>	<b>% of IAL</b>	<b>Acres</b>	<b>% of IAL</b>
A	-	-	-	-	-	-
B	-	-	-	-	-	-
C	64.37	34%	75.70	40%	140.07	74%
D	-	-	3.73	2%	3.73	2%
E	1.70	1%	44.25	23%	45.95	24%
Not LSB	0.05	0.03%	-	-	0.05	0%
<b>Totals:</b>	<b>66.12</b>	<b>35%</b>	<b>123.68</b>	<b>65%</b>	<b>189.80</b>	<b>100%</b>

Although the proposed IAL lands have relatively low productivity ratings, these lands have been historically used for agriculture and at present are productive for taro and other diversified crop cultivations along with some pasture use, for cattle, horses and goats.

**Solar Radiation**

Figure 4: Solar Radiation is based on the Sunshine Maps prepared in 1985 by the State Department of Business, Economic Development and Tourism, formerly known as the State Department of Planning and Economic Development, Energy Division. The entire proposed IAL land in Lumaha'i and Waipā receives an annual average of 350 calories of solar energy per square centimeter per day. The level of solar radiation is very beneficial towards supporting diversified agricultural uses.

**Agricultural Lands of Importance to the State of Hawai'i (ALISH)**

The Agricultural Lands of Importance to the State of Hawai'i (ALISH) classification system were developed in 1977 by the State Department of Agriculture. The system was primarily, but not exclusively, based on the soil characteristics of lands and existing cultivation. There are three classes of ALISH lands – Prime, Unique, and Other. Figure 5 illustrates approximately 89% of the proposed IAL lands in both Lumaha'i and Waipā are classified in ALISH: 5% in Prime ALISH, 6% in Unique ALISH, and 78% in Other ALISH. The balance of the proposed lands is not classified under ALISH classification but includes essential elements of the active agricultural operation, such as streams and drainage ways and most of the unclassified land is currently use for pasture.



The following table summarizes the ALISH classifications for the proposed IAL lands:

<b>ALISH Classifications</b>	<b>Lumaha'i</b>		<b>Waipā</b>		<b>Total IAL</b>	
	<b>Acres</b>	<b>% of IAL</b>	<b>Acres</b>	<b>% of IAL</b>	<b>Acres</b>	<b>% of IAL</b>
Prime	-	-	10.31	5%	10.31	5%
Unique	-	-	10.93	6%	10.93	6%
Other	61.38	32%	86.56	46%	147.94	78%
Not ALISH	4.74	2%	15.88	8%	20.62	11%
<b>Totals:</b>	<b>66.12</b>	<b>35%</b>	<b>123.68</b>	<b>65%</b>	<b>189.80</b>	<b>100%</b>

### **Agricultural Infrastructure and Water Resources**

As shown in Figure 6, the proposed IAL lands are irrigated by ditch ('auwai) systems in both Lumaha'i and Waipā from the centrally located perennial streams and tributaries of the streams. In Lumaha'i, the existing 'auwai irrigation system is currently in disrepair. The current licensee farming the property expects to repair the system to increase the water delivery capacity. There are no recent ditch capacity measurements that quantify the water being used. The primary water source is Lumaha'i River that, based on historical records 1914 -1938, has a minimum flow of over 13 million gallons per day. It is likely that the current flow has decreased but is still a significant watershed that has ample water resources to support the proposed IAL when the water delivery system is improved.

In Waipā, the water sources include Waipā Stream, Kīwa'a Spring and the County of Kaua'i's Hanalei water system. Although the capacity of the sources have not been quantified, the stream and related 'auwai irrigation system is in the process of being restored and utilized for irrigating the proposed IAL. Historically, these water sources have supported the agricultural use of the Waipā lands.

In addition to the above water resources, the proposed IAL lands in Lumaha'i and Waipā receive an average of 100 inches of rain annually. Therefore, based on historic agricultural uses and current agricultural production, the proposed IAL lands have adequate quantities of water to support viable agricultural production. On-going and planned restoration of the agricultural water systems will continue to improve the irrigation water delivery system.

### **Kaua'i General Plan**

The General Plan of the County of Kaua'i is a policy document that is intended to help guide development for the enhancement and improvement of life on Kaua'i. It was last updated in 2000 and provides the County's vision for Kaua'i and establishes the strategies to help achieve that vision.

According to the 2000 General Plan Update and the North Shore Planning District Land Use Map published in this document, the Lumaha'i proposed IAL land in Figure 7 is

designated as Open and the Waipā proposed IAL land is primarily designated as Agriculture, except for a few small pieces of land along Kuhio Highway designated as Open.

### **State Land Use District Boundary Map**

Referencing the 2013 State Land Use District Boundary prepared by State of Hawai'i Land Use Commission, the proposed IAL lands in Figure 8 are illustrated to confirm that all the proposed IAL lands in Lumaha'i and Waipā are within the Agricultural District. Where the proposed IAL lands are contiguous to the Conservation District boundary, the proposed IAL boundary follows the Conservation District boundary.

### **Kaua'i County Important Agricultural Land Study**

In August 2009, the County of Kaua'i undertook a planning effort to define the Important Agricultural Lands on Kaua'i. Utilizing a criteria based analysis and geographic information system (GIS), a series of maps were prepared to illustrate IAL at varying thresholds of the number of criteria included to define the IAL. In 2013, the County of Kaua'i has been using the IAL study to propose a methodology and process to identify and designate IAL. Although the public review and comment period including notification of affected land owners has not been completed, the County has been utilizing the "28 Point Threshold" IAL maps.

To illustrate how the proposed IAL lands at Lumaha'i and Waipā are generally consistent with the County's IAL mapping, Figures 9A and 9B are provided.

As illustrated in Figures 9A and 9B, Kamehameha School proposes two IAL areas within their lands; one contiguous area in Lumaha'i of approximately 66 acres and another contiguous area in Waipā of approximately 124 acres. These proposed IAL areas are generally consistent with the County of Kaua'i proposed IAL in Lumaha'i and Waipā.

In Figure 9A, the County's Proposed IAL mapping at the 28 Point Threshold is illustrated within Kamehameha School lands. The Kamehameha School's proposed IAL lands overlap with approximately 75 acres (73%) of the County's IAL lands and additionally include approximately 115 acres of lands in IAL. Based on the historic, current, and planned agricultural uses at Waipā, the 115 acres of the proposed IAL lands not identified by the County under the 28 Point Threshold are lands that meet the IAL criteria when examined in greater detail than the County study.

In Figure 9B, the County's IAL mapping at the 25 Point Threshold is illustrated within Kamehameha School lands. As noted above, the proposed IAL include lands identified under the 25 Point Threshold. At the 25 Point Threshold, the County's proposed IAL lands have more than doubled the amount at the 28 Point Threshold. Other than more detailed mapping methods and utilizing logical geographically defined boundaries of the



proposed IAL (i.e. streams, roads, etc.), the proposed IAL is consistent with County's proposed IAL at the 25 point Threshold. As illustrated on Figure 9A, the County's proposed IAL includes some smaller non-contiguous lands in Lumaha'i Valley that have not been included in the proposed IAL since these lands are not planned to be put into active agricultural use in the near-term. At Waipā, the proposed IAL has excluded some of the County's identified IAL. As described under Current and Future Agricultural Operations, these excluded lands are planned to support the Waipā Foundation's education complex, community complex, worker housing, camp site and other uses supporting the Foundation's mission.

## References

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