Draft Environmental Assessment

PROPOSED ASTRONAUT ELLISON S. ONIZUKA SPACE CENTER AT KEAHOLE, NORTH KONA, HAWAI`I

Prepared for:

State of Hawai`i,
Department of Transportation,
Airports Division

August 2009

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Executive Summary

Project Name:	Proposed Astronaut Ellison S. Onizuka Space Center at Keahole, North Kona, Hawai`i
Type of Document:	Draft Environmental Assessment
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Applicable Environmental Assessment Review "Trigger":	Use of State Lands and Funds
Location:	TMK: (3) 7-3-043:003 (por.) Kona, Hawai`i
Applicant:	State of Hawai`i, Department of Transportation, Airports Division 400 Rodgers Blvd., Suite 700 Honolulu, Hawai`i 96819-1880
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Project Summary:	The State of Hawai`i, Department of Transportation, Airports Division (DOT-A) proposes to construct a new Astronaut Ellison S. Onizuka Space Center at Tax Map Key Number (3) 7-3-043:003 (por.) in Keahole, North Kona, Hawai`i. The proposed Onizuka Space Center will be located on Kona International Airport property south of Keahole Street, which is the primary access roadway to the airport. The Astronaut Ellison S. Onizuka Space Center will permanently replace the current Astronaut Ellison S. Onizuka Space Center located in front of the airport terminal building, which will be improved

for other uses in the near future.

The proposed Astronaut Ellison S. Onizuka Space Center will initially occupy approximately 7,335 square feet (with future expansion of less than 2,000 square feet) on a site that is approximately two (2) acres in size. The facility's primary access will be from Keahole Street. The proposed project will also include related supporting infrastructure, bus and visitor parking, and site landscaping. The purpose of the Astronaut Ellison S. Onizuka Space Center is to memorialize NASA astronaut Ellison S. Onizuka, to promote the advancement of space exploration, and provide an educational resource to supplement the Grade 4 Natural Science curriculum.

I. PROJECT OVERVIEW

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A. PROJECT LOCATION, EXISTING USE, AND LAND OWNERSHIP

The project site is located at the Kona International Airport at Keahole (KOA) at Tax Map Key No. (3) 7-3-043:003 (por.) (Parcel 3) in Keahole, North Kona, on the west side of the island of Hawai`i. See **Figure 1**. The portion of the KOA lands within Parcel 3 covers an area of approximately 3,450 acres. However, the proposed project will be limited to an area spanning approximately two (2) acres adjacent to Keahole Street, directly east of the main airport terminal and approximately 1,200 feet west of Queen Ka`ahumanu Highway. See **Figure 2**. The KOA is approximately seven (7) miles northwest of Kailua-Kona and serves as the primary entry and departure point for the west side of the island, with interisland, domestic mainland, and international flights scheduled daily.

The Astronaut Ellison S. Onizuka Space Center is currently located in the main terminal area. However, due to expansion of the terminal facilities, the space center will be relocated to the project site. The south side of Keahole Street, including the project site, is largely vacant and undeveloped. Refer to **Figure 2**. The proposed project will complement other supporting airport businesses located across Keahole Street in the vicinity of the project site.

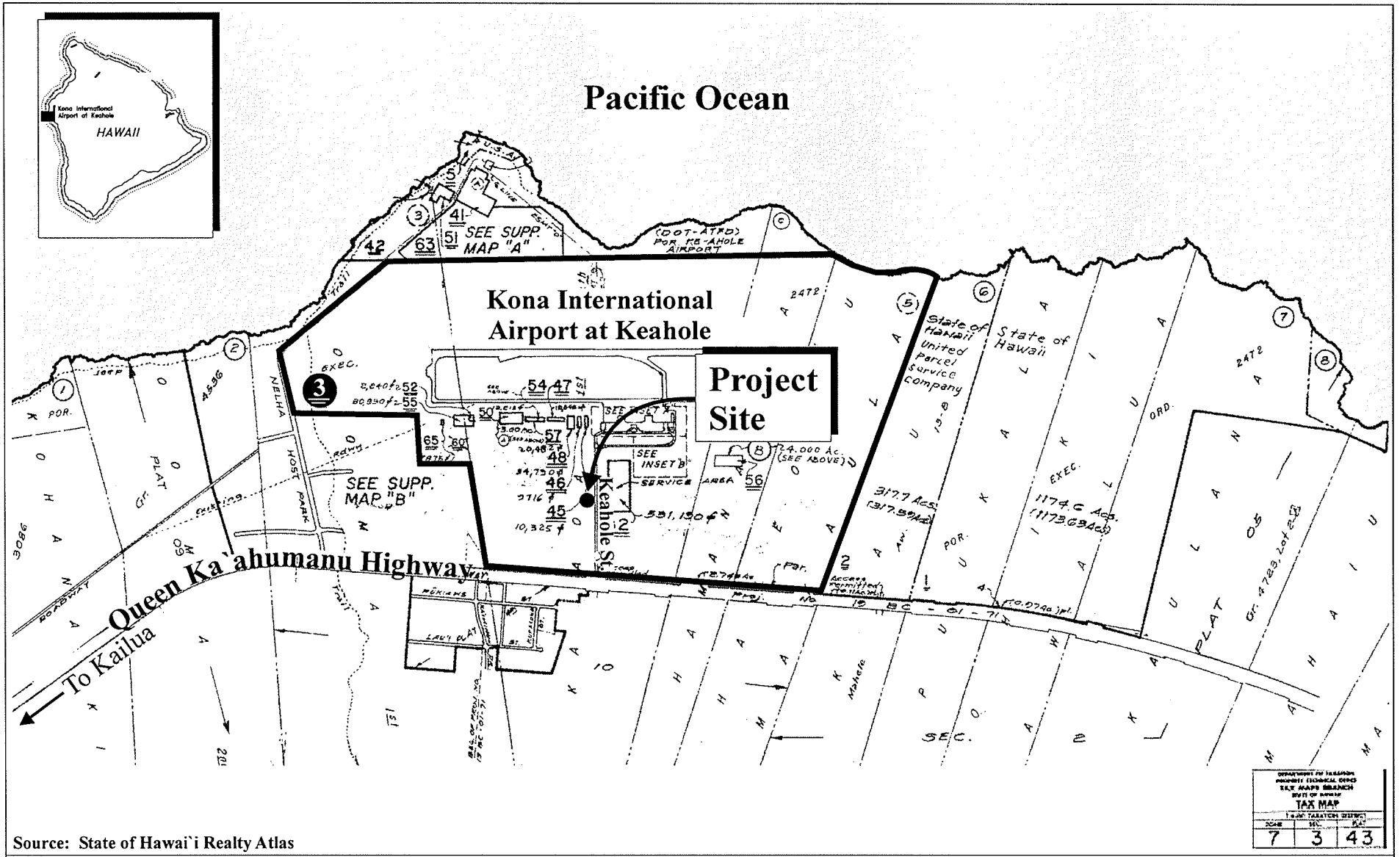
The KOA lands, including the project site, are owned by the State of Hawai`i.

B. PROPOSED ACTION

1. Proposed Improvements

The applicant, the State of Hawai`i, Department of Transportation, Airports Division (DOT-A) proposes to construct a new Astronaut Ellison S. Onizuka Space Center at the KOA. The proposed Astronaut Ellison S. Onizuka Space Center will initially occupy approximately 7,335 square feet (with future expansion of less than 2,000 square feet) on a site that is approximately two (2) acres in size. The facility's primary access will be from Keahole Street. The new site is located on the south side of Keahole Street, approximately 1,200 feet west of Queen Ka`ahumanu Highway and 350 feet east of Halalu Street.

The proposed project will include related supporting infrastructure, bus and visitor



Source: State of Hawai`i Realty Atlas

Figure 1 Proposed Astronaut Ellison S. Onizuka Space Center

Regional Location Map

NOT TO SCALE

Prepared for: State of Hawai`i, Department of Transportation, Airports Division

MUNEKIYO & HIRAGA, INC.

KYA\onizuka\regional

Source: KYA Design Group

Figure 2

Proposed Astronaut Ellison S. Onizuka Space Center

Project Location Map

NOT TO SCALE

Prepared for: State of Hawai`i, Department of Transportation, Airports Division

MUNEKIYO & HIRAGA, INC.

KYA\onizuka\location

parking, and site landscaping. See **Figure 3** and **Figure 4**. Major interior elements of the proposed Astronaut Ellison S. Onizuka Space Center include exhibition space, a library, a theater, office space, a gift shop, and washrooms. See **Figure 5**.

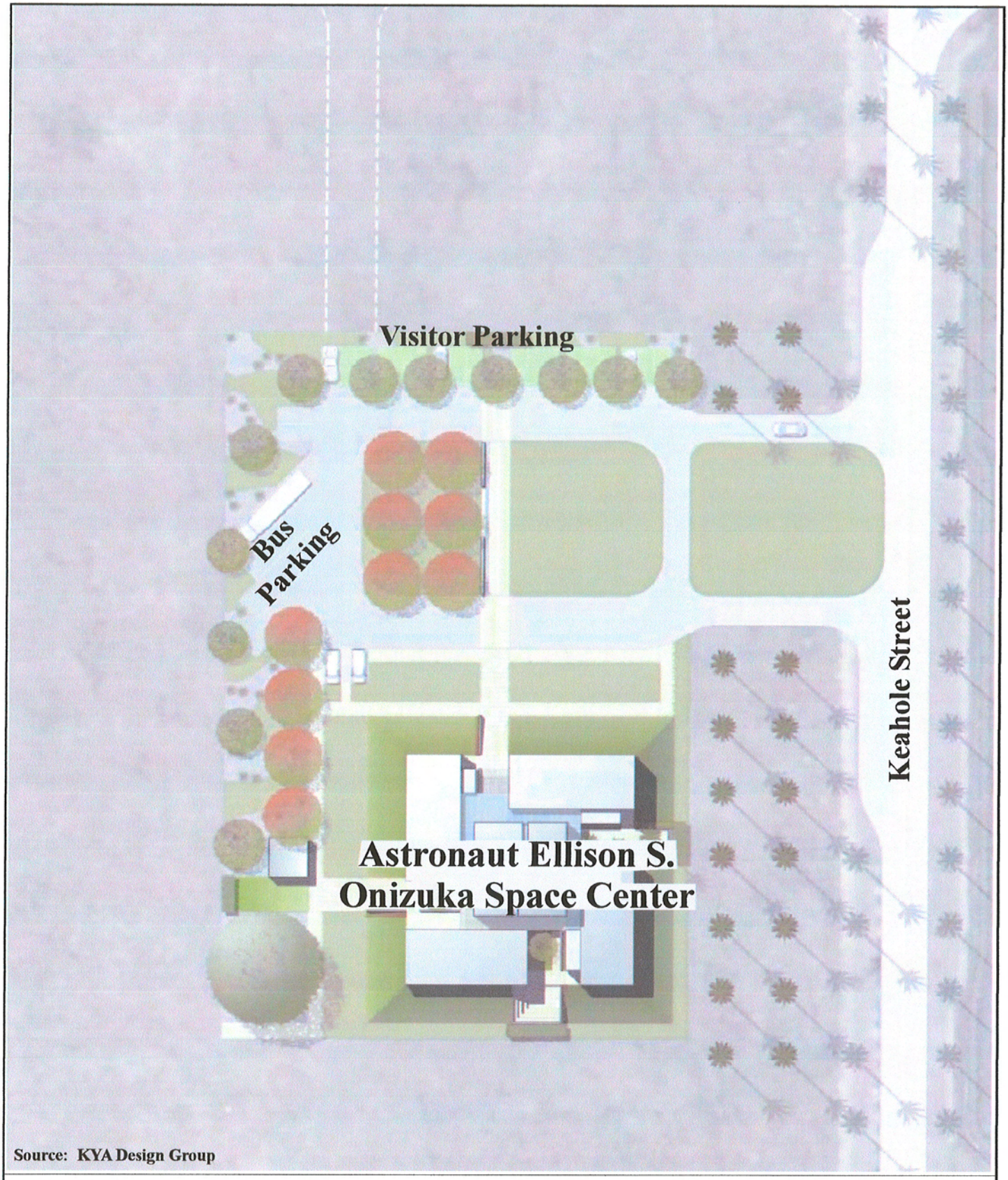
The space center building has been designed in compliance with State HB 2175, A Bill for an Act Relating to Energy (Act 96). The proposed space center building will be registered for LEED's Silver certification. LEED stands for Leadership in Energy and Environmental Design. The U.S. Green Building Council has established a LEED Green Building rating system which provides standards for environmentally sustainable construction. The sustainable goals and strategies of the project are as follows.

1. **Sustainable Sites**

- Capture and treat 90 percent of stormwater by using pervious paving, bioswales, and a green roof
- Shed site hardscaping with landscape elements and design hardscape using high-albedo and open grid paving materials
- Limit off-site pollution through the use of automatic light controls and minimal, carefully designed site lighting
- 90 percent of materials to be regionally extracted, harvested, and manufactured including lava rock, and local wood species
- 50 percent of wood to be certified by the Forest Stewardship Council

2. **Indoor Environmental Quality**

- 100 percent of adhesives, sealants, coatings, paints, flooring, and composite wood products meet applicable low-emitting standards
- Building design fosters a strong connection to the environment which will translate to daylighting of over 75 percent of spaces, and views for over 90 percent of spaces



Source: KYA Design Group

Figure 3 Proposed Astronaut Ellison S. Onizuka Space Center
Site Plan

NOT TO SCALE

Prepared for: State of Hawai`i, Department of Transportation, Airports Division

MUNEKIYO & HIRAGA, INC.

KYA\onizuka\SitePlan

Source: KYA Design Group

Figure 4

Proposed Astronaut Ellison S. Onizuka Space Center
Building Rendering

NOT TO SCALE

Prepared for: State of Hawai`i, Department of Transportation, Airports Division

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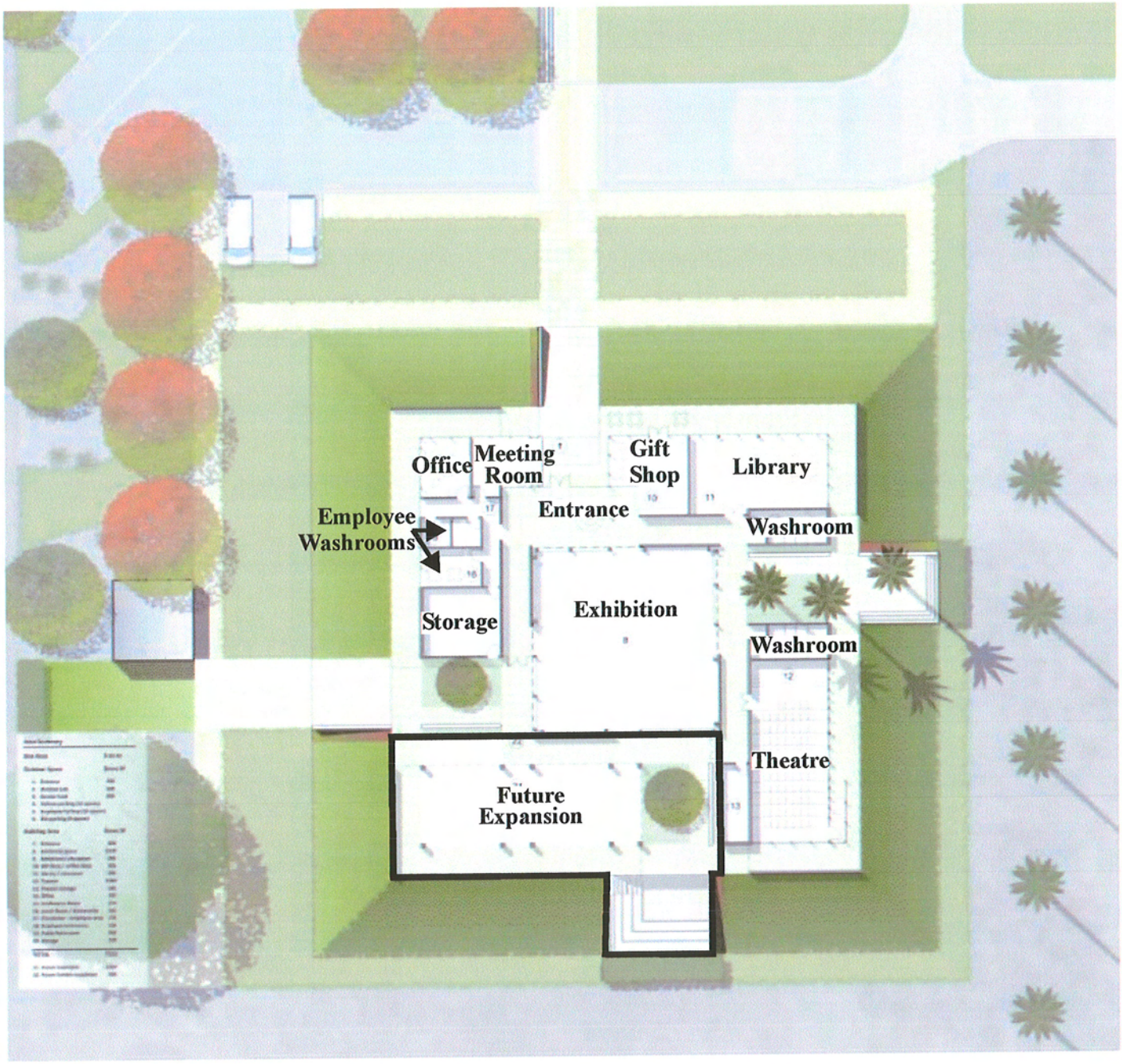
KYA/onizuka/buildingrendering



Source: KYA Design Group

Figure 5 Proposed Astronaut Ellison S. Onizuka Space Center Floor Plan

NOT TO SCALE

Prepared for: State of Hawai`i, Department of Transportation, Airports Division

MUNEKIYO & HIRAGA, INC.

KYA\onizuka\FloorPlan

3. **Innovation and Design Process**

- Reduce potable water use for landscaping by over 50 percent by designing landscaping with drought tolerant native or adapted plant species
- 50 percent reduction in potable water use for wastewater and 40 percent reduction in overall building potable water use

4. **Energy in Atmosphere**

- The Astronaut Ellison S. Onizuka Space Center will participate in the airport wide goals of energy efficiency, innovative systems, and renewable energy production. Mechanical systems will be designed to tap into a planned seawater chilled water loop which will provide cooling to the entire airport campus. The space center will also participate in a renewable energy program based on a future solar array associated with airport expansion
- 30 percent reduction in energy use through the use of radiant heating and cooling system with supplemental displacement air system
- Extensive daylighting to offset lighting energy
- Building massing designed to limit direct solar gain
- Energy efficient building envelope system
- 5 percent of energy generated by onsite solar array

5. **Materials and Resources**

- 75 percent of construction waste to be diverted from landfill through use of salvage and recycling programs

2. **Current and Proposed Operations**

The existing Onizuka Space Center, located near the main terminal, is currently staffed with one (1) full-time programer/educational tour leader and up to two (2) to three (3) part-time volunteer staff to assist in the floor area and to handle sales in the gift shop, as required. The full-time programmer is funded through an agreement between the State of Hawai`i, Department of Education, and the Onizuka Memorial Committee. The programmer is a qualified teacher, who arranges the educational

tours which are made available to the elementary schools in Hawai`i County and other island schools. The formal educational tour is geared to the Grade 4 (Natural Sciences) curriculum and consists of a formal introduction to the space center, review of the NASA DVD presentations which are school specific and interactive display areas related to space travel. The programmer arranges the educational tours directly with the schools and conducts the educational program at the space center. The space center is open from 8:00 a.m. to 4:30 p.m., daily. The space center is managed by the Onizuka Board.

There were approximately 16,500 visitors to the space center from October 2006 to September 2007. Approximately 8,000 visitors were from organized school tours and 8,500 were from the general public. The total visitor counts declined slightly to approximately 16,225 over the same period from October 2007 to September 2008.

It is anticipated that the new relocated Astronaut Ellison S. Onizuka Space Center will receive increased levels of visitors in the future. The same program will be offered for the formal educational tours. It is not anticipated that the current full-time staff will be increased. However, it is anticipated that there may be a need for up to five (5) part-time staff to assist in the floor area and gift shop. In total, however, it is not anticipated that more than four (4) staff members (1 full-time and 3 part-time) will be at the space center at the same time.

C. PROJECT NEED

Currently, the Astronaut Ellison S. Onizuka Space Center is located fronting the main KOA airport terminal building. However, the KOA Master Plan proposes to expand the main airport terminal with a centralized check-in area in the near future. Implementation of the centralized check-in area requires the relocation of the existing Astronaut Ellison S. Onizuka Space Center.

The new proposed Astronaut Ellison S. Onizuka Space Center will be located along Keahole Street and will permanently replace the aforementioned Onizuka Space Center at the airport terminal building. Further, the project site is not currently designated for other uses in the KOA Master Plan. The overall purposes of the Onizuka Space Center is to memorialize NASA astronaut Ellison S. Onizuka, to promote the advancement of space exploration, and to provide an educational experience to supplement the Grade 4 Natural Science curriculum.

Implementation of the proposed project will meet these objectives.

D. PROJECT IMPLEMENTATION CONSIDERATIONS

The State Land Use designation for the KOA airport is "Urban". In addition, the County General Plan Land Use Pattern Allocation Guide (LUPAG) map designates the project site as "Industrial". The airport is zoned "General Industrial (MG-1a)" by the County of Hawai`i. The proposed project serves an auxiliary airport purpose; consequently, no land use entitlements related to State Land Use, County general plan, and zoning designations are required for project implementation.

Moreover, the project will utilize State lands and funds, which is a trigger for an environmental assessment pursuant to Chapter 343, Hawai`i Revised Statutes (HRS). This Environmental Assessment (EA) has been prepared to address the Chapter 343, HRS requirements.

An environmental assessment for the KOA at Keahole Master Plan Update was completed in 2000. The details of the Astronaut Ellison S. Onizuka Space Center were not identified in the Final Environmental Assessment, Kona International Airport at Keahole, Master Plan Update (Keahole Associates, Inc., 2000). The State DOT-A is currently carrying out a KOA Master Plan review in association with a Noise Compatibility Study. However, since the Astronaut Ellison S. Onizuka Space Center project will need to be relocated to make way for the main terminal improvements, which were identified in the 2000 update, and the environmental assessment associated with the current master plan review has not been completed, an independent environmental assessment is being carried out for the Astronaut Ellison S. Onizuka Space Center project to facilitate the relocation of the facility from the main terminal.

The property falls within the limits of the County of Hawai`i's Special Management Area (SMA). The proposed project is considered a development activity under the SMA rules; therefore, a SMA Major permit will be required prior to project implementation. The applicant will prepare and submit a SMA Major permit application upon completion of the EA process. The project site is located on lands which are not shore-fronting; therefore, a Shoreline Setback Assessment is not required.

E. PROJECT COST AND IMPLEMENTATION TIMEFRAME

The estimated cost of the proposed Astronaut Ellison S. Onizuka Space Center is $5.5 million. Construction will commence upon receipt of applicable permits and approvals. Construction is estimated to begin in late 2009 and is anticipated to occur over 18 months.

II. DESCRIPTION OF THE EXISTING ENVIRONMENT, POTENTIAL IMPACTS AND MITIGATION MEASURES

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A. LAND USE

1. Existing Conditions

The project site is located within the KOA property in Keahole, North Kona District, Island of Hawai`i. The KOA is approximately seven (7) miles north of Kailua-Kona and is located to the west of Queen Ka`ahumanu Highway. Access from the Highway to the airport is provided by Keahole Street.

The gross area of the airport land owned by the State of Hawai`i is 4,244.1 acres. The total net area available for airport use is 3,407.18 acres. The airport roadways, terminal area, and runways encompass 548 acres. Approximately 421.12 acres to the south have been leased to the Hawai`i Ocean Science and Technology (HOST) Park; 321.80 acres to the west have been leased to the Natural Energy Laboratory of Hawai`i Authority (NELHA); 50 acres have been set aside to the Department of Land and Natural Resources (DLNR) in a 1984 Triparty Agreement between the Department of Transportation (DOT), DLNR, and the Department of Hawaiian Home Lands (DHHL); and four (4) acres have been set aside for a U.S. Postal Service facility (Keahole Associates, Inc., 2000).

2. Potential Impacts and Mitigation Measures

The proposed action will consist of the development of a space center at an area of the airport site already dedicated to airport uses. The proposed space center's architectural design will not conflict with the existing terminal facilities since it will be located away from the main terminal facilities.

B. CLIMATE, TOPOGRAPHY, AND SOILS

1. Existing Conditions

Like most areas of the State, the island of Hawai`i's climate is relatively uniform

year-round. Characteristic of Hawai`i's climate, the project site experiences mild and uniform temperatures year round, moderate humidity, and a relatively consistent northeasterly tradewind. Variation in climate on the island is largely left to local terrain.

Average temperatures in the Kailua-Kona region range from 72 degrees Fahrenheit in the coolest month to 77 degrees in the warmest month. August is generally the warmest month while January is historically the coolest. KOA is located in the drier region of the island with an average annual precipitation of twenty-five (25) inches (County of Hawai`i Data Book, 2006).

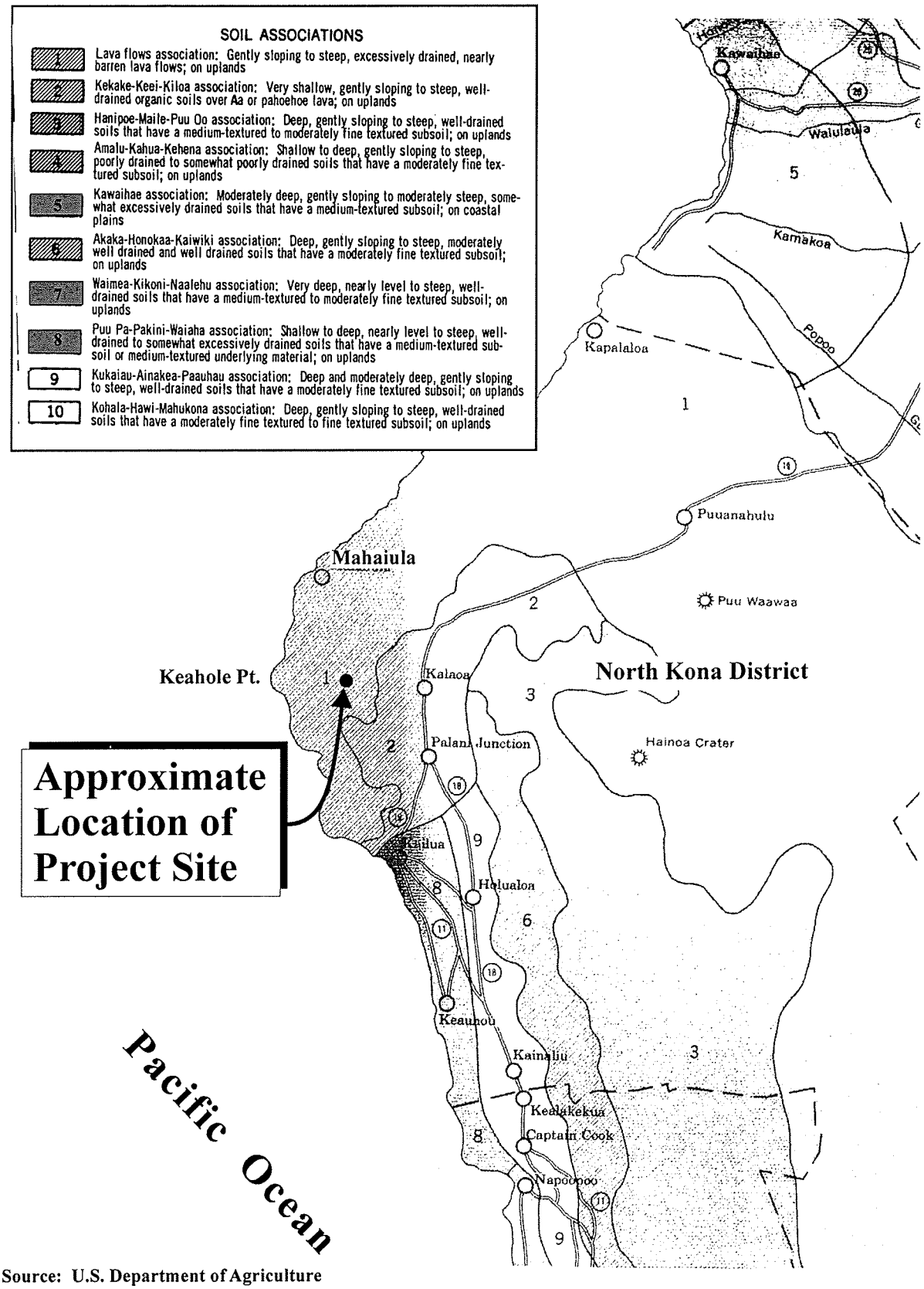
The project site is located in the "lava flows" soil association, generally characterized by gently sloping to steep, excessively drained, nearly barren lava flows, on uplands. See **Figure 6**.

Underlying the project site the soil type is classified as pahoehoe (rLW) lava flows. See **Figure 7**. Pahoehoe lava is characterized by a billowy, glassy surface that is relatively smooth. In some areas, pahoehoe lava is rough and broken, and may have hummock and pressure domes. This lava has no soil covering and is typically bare of vegetation except for mosses and lichens. However, in areas of higher rainfall, scattered ohia trees, ohelo berry, and `a`ali`i grow in cracks and crevices (U.S. Department of Agriculture, Soil Conservation Service, 1973).

The existing land is generally level to gently sloping, with slopes in the 2 to 4 percent range. See **Appendix "A"**. Elevations at the project site range from 113 feet to 117 feet above mean sea level.

2. Potential Impacts and Mitigation Measures

The proposed space center at the KOA will not have an adverse effect on the vicinity's topographic characteristics, since the lands are relatively flat and minimal grading is anticipated with the development of the space center. Lava tubes may be encountered within the rLW soil types. Lava tubes may create dangerous conditions in the event that a tube collapses during excavation or construction. Precautions will be taken while grading in the event that lava tubes are discovered at the project site.



Source: U.S. Department of Agriculture

Figure 6 Proposed Astronaut Ellison S. Onizuka Space Center

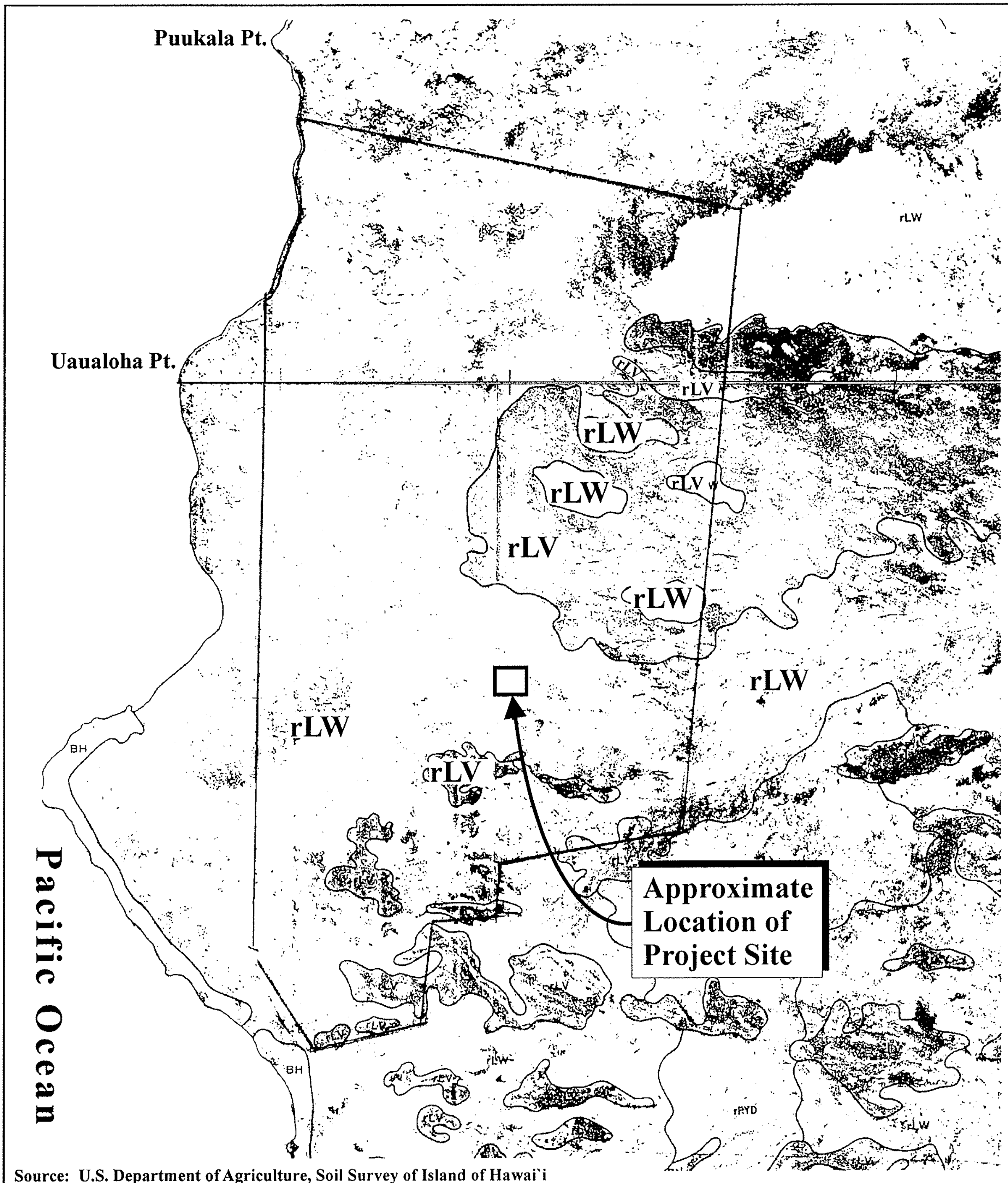
NOT TO SCALE

General Soil Association Map for Island of Hawai`i

Prepared for: State of Hawai`i, Dept. Of Transportation, Airports Division

MUNEKIYO & HIRAGA, INC.

KYA/Onizuka/General Soil



Source: U.S. Department of Agriculture, Soil Survey of Island of Hawai`i

Figure 7 Proposed Astronaut Ellison S. Onizuka Space Center
Soil Classification Map

NOT TO SCALE

Prepared for: State of Hawai`i, Dept. Of Transportation, Airports Division

MUNEKIYO & HIRAGA, INC.

KYA/Onizuka/SoilAssoc

C. FLOOD AND TSUNAMI HAZARDS

1. Existing Conditions

The Flood Insurance Rate Map (FIRM) of the area indicates that the majority of the airport site, including the proposed space center site, falls within Zone X, an area that is considered to be outside the 1 percent and 0.2 percent annual chance flood plains. See **Figure 8**. A portion of the KOA property is located within the tsunami evacuation zone. The tsunami evacuation zone limits are west of the airport runway (Keahole Associates, Inc., 2000). It is noted that the project site is located outside of the evacuation zone for tsunami hazards. Refer to **Figure 8**.

2. Potential Impacts and Mitigation Measures

The area of the proposed space center is not located within a flood hazard district or tsunami evacuation zone. As such, no adverse impacts from the effects of flood hazard districts or tsunami evacuation zones are anticipated.

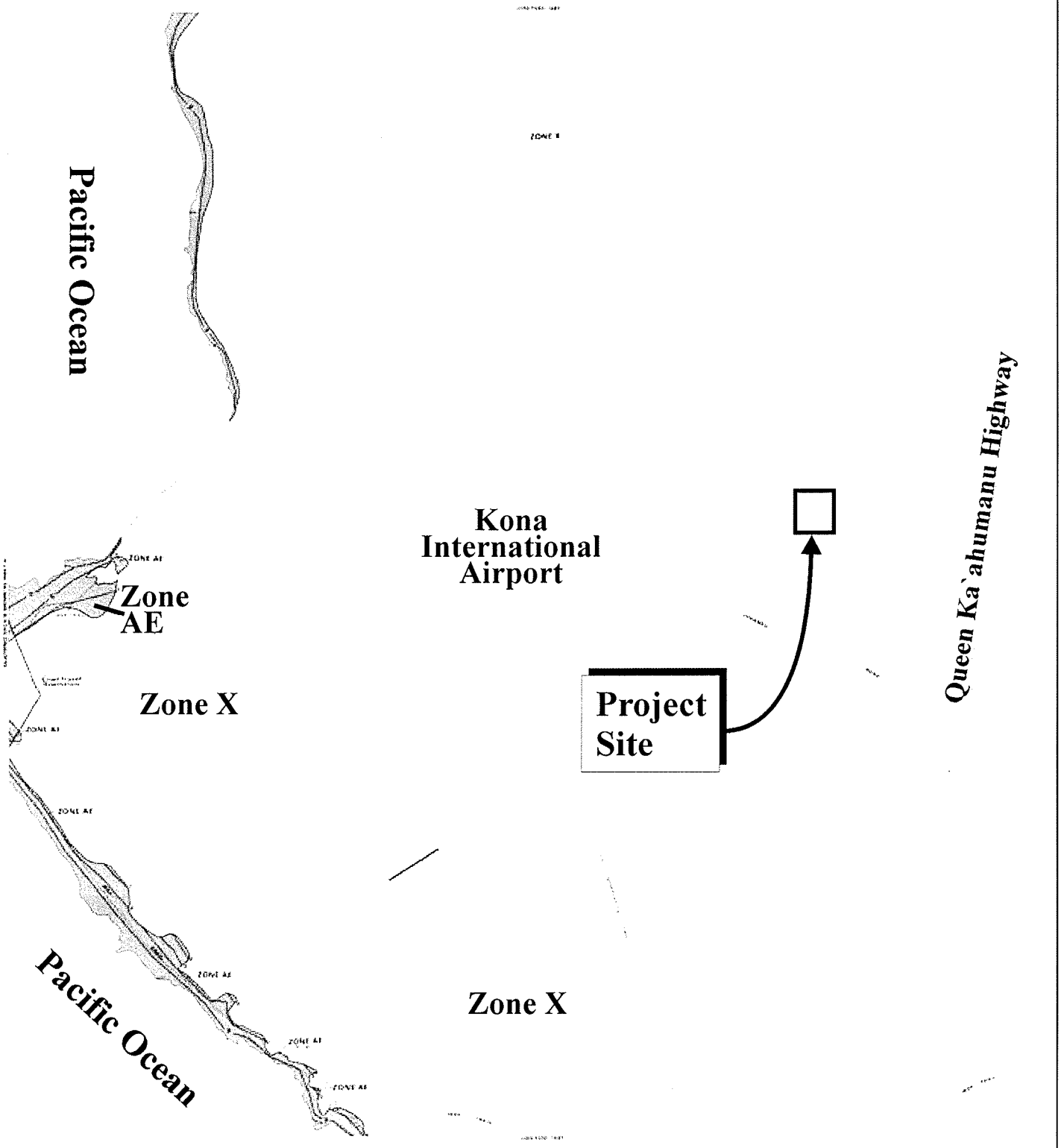
D. FLORA AND FAUNA

1. Existing Conditions

A botanical survey and fauna survey were conducted for the Kona International Airport at Keahole Master Plan Update in 2000 (Keahole Associates, Inc., 2000). A botanical survey of the undeveloped portions of the urban designated lands at KOA was undertaken by Char & Associates on November 20 and 21, 1999. Fountain grass and scrub vegetation covered large parts of the airport property while ruderal or weedy vegetation was found on areas which have been graded or disturbed.

The botanical survey found 67 plant species, including 52 introduced, 2 introduced with Polynesian origin, and 13 native species. Of the native species, ten (10) are indigenous (native to Hawai`i and elsewhere), while three (3) are endemic (native only to the Hawaiian Islands). None of the identified species are threatened or endangered (Char & Associates, 2000).

Native and endemic species identified on the undeveloped urban lands of the KOA site include:



Source: Flood Insurance Rate Map, Island of Hawai`i
Community Panel No: 155166 0681C

Figure 8 Proposed Astronaut Ellison S. Onizuka Space Center
Flood Insurance Rate Map

NOT TO SCALE

Prepared for: State of Hawai`i, Dept. Of Transportation, Airports Division

MUNEKIYO & HIRAGA, INC.

KYA/Onizuka/FIRM

Native Hawaiian or Indigenous Species

Moa (*Psilotum nudum*)

Koali'awa (*Ipomoea indica*)

Naupaka (*Scaevola sericea*)

Spurflower or 'ala'ala wai nui pua ki (*Plectranthus parviflorus*)

'Ilima (*Sida fallax*)

'A'ali'i (*Dodonaea viscosa*)

Naio (*Myoporum sandwicense*)

'Uhaloa (*Waltheria indica*)

Fimbristylis cymosa

Pili grass (*Heteropogon contortus*)

Native Only to Hawai`i or Endemic Species

Nehe (*Lipochaeta lavarum*)

Maiapilo (*Capparis sandwichiana*)

Fimbristylis hawaiiensis

A fauna survey of the site was also conducted for the Kona International Airport at Keahole Master Plan Update (Keahole Associates, Inc., 2000) on December 7 and 8, 1999 to determine the presence of any federally listed endangered, threatened, proposed, or candidate avian or mammalian species on or in the vicinity of the KOA. The only mammalian species encountered during the survey was the Indian mongoose (*Herpestes a. auropunctatus*). In addition, skeletal remains of two (2) feral goats (*Capra h. hircus*) and one (1) domestic cow (*Bos taurus*) were found. Evidence of domestic dog (*Canis f. familiaris*), cat (*Felis catus*), donkey (*Equus a. asinus*), and goat was encountered in numerous places within the site. No live rodents were detected during the survey. However, it is likely that roof rats (*Rattus r. rattus*), Norway rats (*Rattus norvegicus*), European house mice (*Mus domesticus*), and possibly Polynesian rats (*Rattus exulans hawaaiiensis*) utilize various habitats within the KOA site (Rana Productions, Ltd., 2000).

Fourteen (14) avian species from ten (10) families were detected in the survey. Of the fourteen (14) species identified, the Pacific Golden-Plover (*Pluvialis fulva*) was

the only native species; the remaining thirteen (13) species recorded are considered to be alien to Hawai`i. The most common species detected during the survey was the House Sparrow (*Passer domesticus*). All of the avian species detected are commonly found throughout the leeward lowlands on the island of Hawai`i. No endangered or threatened avian species were detected within the KOA site (Ibid).

It is also noted from coordination with the U.S. Fish and Wildlife Service that the threatened Newell's shearwater and endangered Hawaiian Petrel are known to traverse the project site.

There is a small anchialine wetland system (26 x 19 meters) located approximately 48 meters east of the southwest fence corner at the southern end of the runway. Brackish water located in an extensive crack system around the edge of a pahoehoe depression suggests that it holds water following either very high tides or periods of extensive rain. The indigenous sedge species (*Fimbristylis dichotoma*) is the main vegetation around the edges of the wetland (Ibid).

2. Potential Impacts and Mitigation Measures

The proposed space center will not impact endangered or threatened flora or fauna species. The proposed improvements will be limited to the 2-acre project site of the KOA and are not anticipated to impact flora and fauna conditions. Furthermore, the modification of the project site is not anticipated to negatively impact native botanical resources in the greater South Kohala region.

The botanical survey recommended that when possible, native plant species be utilized for new landscaping features associated with the KOA improvements. Consequently, the project landscaping plan will reflect the use of native plant species, where appropriate. Potential impacts to seabirds from outdoor lighting will be mitigated by shielding and downcasting all outdoor lighting.

E. AIR AND NOISE CHARACTERISTICS

1. Existing Conditions

Air quality monitoring was undertaken in July of 1997 at KOA to fulfill requirements of the KOA Special Management Area (SMA) Use Permit No. 325. Follow-up with

the State Department of Health, Clean Air Branch indicated the particulate material levels were well within State standards for the period May to July 1997. Because the study found no adverse air quality impact results, the air monitoring station was removed (Keahole Associates, Inc., 2000). A Noise Compatibility Study (NCP) is currently being updated for KOA. The NCP study is a federally required study to promote control of aircraft noise and minimize noise generated in and out of the airport and surrounding land uses.

A December 1997 Federal Aviation Regulation (FAR) Part 150 Noise Compatibility Program Report (NCPR) indicated that there are no existing incompatible land uses within the 5-year Noise Exposure Map for the KOA site. As a result, corrective noise measures are not required (Ibid).

2. Potential Impacts and Mitigation Measures

Short-term noise and air impacts may result from construction-related activities. Appropriate Best Management Practices (BMPs) will be utilized to minimize negative impacts to noise levels and air quality. Additionally, the applicant will comply with all applicable Department of Health air and noise quality requirements during construction.

In the long term, there are no air or noise impacts associated with the proposed space center. The proposed improvements are not anticipated to increase noise levels at the KOA.

F. WATER QUALITY

1. Surface and Groundwater Resources

a. Existing Conditions

The existing KOA site is located over a large lava flow. There are no fresh water perennial or intermittent streams located within or in the vicinity of the KOA. The area is not classified as a groundwater recharge area.

b. Potential Impacts and Mitigation Measures

The proposed improvements are not anticipated to have adverse impacts to surface and groundwater resources. As appropriate, pollution control devices will be installed in the drainage system, including screens in the drainage inlets to filter out petroleum products from the rainstorm water runoff from the parking lots.

2. Shoreline and Nearshore Water Quality

a. Existing Conditions

The coastal nearshore waters in the vicinity of the KOA are classified "AA" according to the State Department of Health Water Quality Standards Map of the Island of Hawai`i (October 1987). Class "AA" waters are intended to remain in their natural pristine state as nearly as possible with an absolute minimum of pollution or alteration of water quality from any human caused source or actions.

b. Potential Impacts and Mitigation Measures

The project generated increase in stormwater runoff will be retained onsite and disposed of in existing and proposed drainage injection wells. Pollution control will be incorporated into the Best Management Practices (BMPs) Plan during construction, such as silt fences and temporary retention basins. In the long term, potential adverse impacts to downstream and adjacent properties are not anticipated by the proposed improvements. Refer to **Appendix "A"**.

G. ARCHAEOLOGICAL RESOURCES

1. Existing Conditions

An Archaeological Inventory Survey of the project site was carried out to assess potential impacts of the proposed action. See **Appendix "B"**. The lands of the project area had limited use from settlement of the leeward side of the island of Hawai`i until the construction of the KOA in 1969 and 1970. Land use was restricted to small coastal settlements focused on fishing and trail systems connecting these

coastal settlements. There were no Land Commission awards granted in the project area or surrounding lands. There are four (4) known cultural resources within the KOA facilities. They are a pre-Contact era cave habitation site; a pre-Contact era temporary habitation feature with several low, circular stone alignments; a short segment of the Mamalahoa trail, and an area with several petroglyphs. No cultural resources were located on the project site.

However, a site (Site 26868) consisting of three (3) small pahoehoe excavations was identified on the southeastern edge of the study area. Refer to **Appendix "B"**, **Figure 6** of the archaeological inventory survey. The features appear as small subangular slabby cobbles and small boulders resting upside down on the ground surface. The pahoehoe excavations were interpreted to be pre-contact features and not associated with abrader (tool for polishing) production, but were simple one-time exploratory efforts.

2. Potential Impacts and Mitigation Measures

The temporary habitation site and pre-contact cave habitation site have been fully documented and are not significant for inclusion on the National Register of Historic Places (NRHP). The Mamalahoa trail segment is located in a restricted area and is fenced off for protection. The collection of petroglyphs is protected by a three (3) foot high rock wall. Both these sites are significant for inclusion for the NRHP. None of these formerly known sites are within or in close proximity to the area proposed for the space center. The small pahoehoe excavations (Site 26868) identified during the current archaeological inventory survey have been fully documented and no further work is recommended. Furthermore, the site is outside the project area and will not be impacted by the proposed development. As such, the proposed action is not anticipated to adversely impact archaeological resources.

H. CULTURAL RESOURCES

1. Existing Conditions

A cultural impact assessment (CIA) was carried out for the proposed action pursuant to Act 50, enacted by the Legislature of the State of Hawai`i (2000) for purposes of the environmental assessment. See **Appendix "C"**. There is a paucity of prehistoric information pertaining to the lands of the project area and surrounding lands.

Modern use of the lands associated with the KOA and the Natural Energy Laboratory of Hawai`i (NELH) Authority continues to be primarily focused on fishing and coastal access and activities.

An interview with Aunty Josephine Palacat Barney of Kailua-Kona was carried out in February 2009 as part of the cultural impact assessment. She lived in the area and is knowledgeable of the coastal area from Kohanaiki to Kailua-Kona during the period from 1925 to 1935, when her father was supervisor of the opai ponds, which were thought to belong to Greenwell's HueHue Ranch. The ponds provided fish such as *awa* and mullet and were the property of the person leasing the ponds. The ponds also had shrimp. All people had the privilege of using the shrimp without permission.

The Palacats first lived in a beach house just south of Kaloko fish pond. They used the tax trail (Mamalahoa Trail) and traveled by donkey up and down the coast. They traveled north on the trail to Kalaoa to gather taro and breadfruit, and south to Kailua. Later in around 1930 to 1935 they lived at Kohanaiki. During the Palacats stay at Kohanaiki, only one (1) other family, Pedro Espigata, lived in the area. People at that time had respect for one another and for the *`aina*, and the fishermen had respect for the ocean. Aunty Josephine mentioned the tradition that was practiced to catch shrimp so as not to deplete them and talked about her brother making fish imu at Honokohau. She mentioned there were strong notions of keeping things the way they were and putting things back, and not being disruptive. Refer to **Appendix "C"**.

2. Potential Impacts and Mitigation Measures

A CIA consultation letter was sent to the Office of Hawaiian Affairs (OHA), the Kuakini Civic Club, and the Kona Hawaiian Civic Club. Although, OHA acknowledged receipt of the letter, none of the organizations responded with information concerning the potential for cultural resources to occur in the project area, or with additional suggestions for further contacts. Refer to **Appendix "C"**.

Based on historical research data, the project area has not been used for traditional cultural purposes within recent times. The cultural interview indicated the area was sparsely settled and the people used the opai ponds to raise fish and gather shrimp and frequent fishing sites along the coast during the 1930s. The findings of the CIA concluded that Hawaiian rights related to gathering, access or other customary

activities within the project area, are not anticipated to be affected and as such, it is anticipated the project will not have a direct adverse effect upon cultural practices or beliefs.

I. SCENIC AND OPEN SPACE RESOURCES

1. Existing Conditions

The KOA is surrounded by open fields of a`a and pahoehoe lava. The airport facilities are west of the Queen Ka`ahumanu Highway. Eastern views from the airport present a panoramic view of Hualalai while the North Kona coastline can be viewed from the highway (Keahole Associates, Inc., 2000).

2. Potential Impacts and Mitigation Measures

The proposed improvements will be carried out within the existing KOA lands. The proposed improvements are located in an undeveloped area of the airport property and is not anticipated to adversely impact scenic open space resources, view corridors, and view planes.

J. SOCIO-ECONOMIC ENVIRONMENT

1. Existing Conditions

The population of the County of Hawai`i has exhibited relatively strong growth with a growth rate of 23 percent between 1990 and 2000. The estimated County population for 2005 was 167,293 (U.S. Census Bureau).

Domestic visitor arrivals to the County of Hawai`i were at 1,305,218 in 2007 while international visitor arrivals totaled 317,141 in 2007, the most recent reporting year (State of Hawai`i Data Book, 2008).

Before the 1970s, agriculture represented the primary economic activity in the Kona area where more than 50 percent of the workforce was employed. Since then, the visitor industry has emerged as the dominant sector in the economy. The Kona area is particularly noteworthy in terms of tourism and visitor accommodations. In 2006, there were 4,968 available visitor accommodation units in Kona, representing 44.1

percent of the total Big Island visitor units (State DBEDT, 2007).

The seasonally unadjusted unemployment rate for Hawai`i County was 9.7 percent in April 2009, while the statewide rate for the same period was 6.9 percent (Hawai`i Workforce Informer, June 2009).

2. Potential Impacts and Mitigation Measures

Short-term economic benefits are expected as a result of project construction. In the long term, the proposed space center is anticipated to experience a steady stream of patrons year-round and employ roughly six (6) individuals (one (1) full-time and five (5) part-time), which will contribute to the area's economic well-being. There are no adverse impacts to the socio-economic environment anticipated with the proposed action.

K. PUBLIC SERVICES

1. Recreation

a. Existing Conditions

The Kona region offers a number of recreational opportunities for residents and visitors alike. In addition to resort recreational complexes, activities such as snorkeling, scuba, biking, and hiking are available.

b. Potential Impacts and Mitigation Measures

The proposed space center is not anticipated to create new demands on existing recreational facilities. The space center is anticipated to provide an additional recreational resource for those individuals and families interested in space exploration. However, no increase in airport passenger traffic is anticipated by the proposed improvements.

2. Police and Fire Protection

a. Existing Conditions

All certified airports are required to have an aircraft rescue and fire fighting (ARFF) facility. The level of ARFF services required ranges from A to E and is based on the length of aircraft and scheduled daily flight frequency. The KOA falls within ARFF Index D and is required to maintain a fleet of equipment and trained personnel consistent with this standard.

The KOA has a 6,034 square foot ARFF facility that is centrally located on the airfield to the south of the airport traffic control tower (ATCT). The facility stores and maintains one 3,000 gallon storage capacity fire fighting vehicle and two 1,500 gallon storage capacity fire fighting vehicles, as well as a chief vehicle, captain truck, and a reserve 3,000 gallon Oshkosh T-series vehicle. A mobile incident command post vehicle is programmed to be added to the fleet in around 2011.

The airport also has an ARFF training facility (burn pit) located northeast of the terminal area which is used for live-fire exercises.

The KOA area is served by the Hawai`i County Police Department's Area II Operations Bureau. The Kona district encompasses approximately 834 square miles and is staffed by a captain, a lieutenant, sergeants and police officers with a total authorized 78 positions. Services are provided from the Department's Kailua-Kona Stations.

Fire protection and related emergency services are provided by the Hawai`i County Fire Department. The station closest to the project site is the Kailua-Kona Station. Back-up fire protection service is provided by the Waikaloa and Waimea Fire Stations as needed.

b. Potential Impacts and Mitigation Measures

The proposed space center improvements will replace an existing facility and will not extend service areas for emergency services provided by the police and fire departments. As the space center is limited to an infill area of the

KOA, adverse impacts to these services are not anticipated. Emergency equipment and fire fighting vehicular access will not be impeded by the proposed space center.

3. Solid Waste

a. Existing Conditions

The County's Department of Environmental Management, Solid Waste Division, operates and maintains all solid waste collection and disposal facilities in the County of Hawai'i. The Division's facilities include two (2) landfills and twenty-one (21) transfer stations. Refuse collected in the region is taken to the Puuanahulu Landfill for disposal.

b. Potential Impacts and Mitigation Measures

As applicable, construction waste, including cleared and grubbed material from the site, will be recycled or disposed at an approved construction waste facility. The proposed space center improvements are not anticipated to adversely impact County solid waste collection or disposal capabilities and capacities.

4. Medical Services

a. Existing Conditions

The West Hawai`i region is served by the Hawai`i Health Systems Corporation's (HHSC) Kohala Hospital and Kona Community Hospital. Kohala Hospital, located in North Kohala, is a 26-bed critical access hospital providing 24-hour emergency care, skilled nursing, and intermediate care services. Kona Community Hospital, located in Kealakekua, Kona, is a 94-bed full service medical center which provides acute inpatient care and related services.

In addition to the two (2) HHSC facilities, there is the North Hawai`i Community Hospital located in Waimea. This 40-bed facility, with 24-hour emergency services is affiliated with Adventist Health, a private entity.

In addition to these major health care facilities, there are numerous privately operated medical and dental services available in West Hawai`i.

b. Potential Impacts and Mitigation Measures

The proposed space center at the KOA is not anticipated to adversely impact regional medical service delivery capabilities.

5. Educational Facilities

a. Existing Conditions

There are six (6) public schools in the Kailua-Kona district with approximately 4,337 students (Hawai`i State Department of Education, 2007). They are: Kahakai Elementary School, serving Pre-Kindergarten to grade 5; Kealakehe Elementary School, serving Pre-Kindergarten to grade 5; Kealakehe Intermediate School, serving grades 6 to 8; Kealakehe High School, serving grades 9 to 12; Innovations Public Charter School, serving Pre-Kindergarten to grade 6; and West Hawai`i Explorations Academy Public Charter School, serving grades 7 to 12. There are also a number of private schools in the Kailua-Kona region. The University of Hawai`i, located in Hilo, is a fully accredited, comprehensive liberal arts university. The main Hawai`i Community College campus is also in Hilo, adjacent to the University of Hilo. Hawai`i Community College also administers the UH Center at West Hawai`i, in Kona.

b. Potential Impacts and Mitigation Measures

The proposed Astronaut Ellison S. Onizuka Space Center is not a population generator. As such, adverse impacts to local educational facilities and schools are not anticipated. The existing space center and proposed new space center will be an educational resource to local schools. The State Department of Education has an agreement with the State Department of Transportation (SDOT) to operate an educational program at the space center. The programs are developed with the local schools for field trips and educational resources in space exploration geared to the Grade 4 curriculum. In this context, the proposed project will have a positive and beneficial impact on local educational facilities.

L. INFRASTRUCTURE

1. Roadways

a. Existing Conditions

Access to the KOA is provided off of the Queen Ka`ahumanu Highway, which is the primary State highway serving the area. Queen Ka`ahumanu Highway is a two-lane highway that extends from Kailua-Kona to Kawaihae. An access road, Keahole Street, stretches 3,050 feet from the Queen Ka`ahumanu Highway to the airport. The intersection of Queen Ka`ahumanu Highway and Keahole Street is signalized.

Access to the proposed space center will be off of Keahole Street. Kupipi Street, a peripheral street surrounding the main parking lot, provides one-way automobile circulation to the terminal and baggage claim areas (Keahole Associates, Inc., 2000). It begins with a two (2) lane road on the east side of the parking lot and widens to four (4) lanes in the curve around the north end of the parking lot. In front of the northern and southern terminal, Kupipi Street widens to six (6) lanes with a median curb. The outside lanes are dedicated to commercial transportation providers, such as car rentals and hotel shuttles. The three (3) inside lanes are reserved for private vehicles and passenger drop-off and pick-up. Bus service is provided fronting the terminal.

A Traffic Impact Assessment Report (TIAR) was carried out to quantify and assess the traffic related characteristics of the proposed project. See **Appendix "D"**. The traffic analysis was performed using traffic counts performed by the State of Hawai`i, Department of Transportation along Keahole Street. However, the surrounding roadway configuration, right-of-way controls and surrounding land use conditions were verified during a field reconnaissance of the study area during the traffic assessment. Traffic counts indicate approximately 350 westbound (towards the terminal) vehicular trips and 135 eastbound vehicular trips (towards Queen Ka`ahumanu Highway) occur during the morning peak hour and 200 westbound vehicular trips and 345 eastbound vehicular trips occur during the afternoon peak hour. As the study intersection (Keahole Street at the project driveway) currently does not exist, an assessment of the existing traffic operating conditions could not be

performed.

No pedestrian traffic was observed along Keahole Street and there are no sidewalks on Keahole Street.

b. Potential Impacts and Mitigation Measures

The traffic generated by the space center consists of three (3) components: school students, general public visitors, and employees. Based on the past level of total visitors to the space center (approximately 16,600 visitors per year) and accounting for a modest growth in the future, it is anticipated that there will be approximately 20 inbound and 17 outbound trips during the morning peak hour and approximately 12 inbound and 15 outbound trips during the afternoon peak hour. Refer to **Appendix "D"**. Based on the anticipated traffic generated by the proposed project and taking into account the existing traffic conditions in and around the project area, it is anticipated that all movements at the new project driveway and Keahole Street intersection will operate at Level-of-Service (LOS) A or B. LOS is a qualitative measure to assess traffic conditions, ranging from Level A, which represents free flowing conditions to Level F, which represents severe congestion with stop-and-go conditions. As such, it is anticipated the project driveway and Keahole Street intersection will operate well and will have a minimal impact on non-project related traffic along Keahole Street.

In regards to pedestrian safety, the TIAR noted that since the space center is some distance from the existing terminal area (over 1,000 feet) and since there are no sidewalks in and around the project site, pedestrians should not be encouraged to walk to the space center from other locations at the KOA. Convenient parking, drop-off and pick up of visitors at the space center is provided at the proposed onsite parking lot.

Although the project site is located outside the evacuation zone for tsunami hazards, there is a direct evacuation route from the project driveway onto Queen Ka`ahumanu Highway via Keahole Street.

2. Water System

a. Existing Conditions

The County of Hawai`i, Department of Water Supply's (DWS) North Kona Water System serves the project vicinity. There are parallel 16-inch and 12-inch diameter waterlines within the Airport Access Road serving the KOA. These lines are connected to a 12-inch waterline within Queen Ka`ahumanu Highway.

The main lines are connected to the airport water distribution system at the intersection of Keahole Street and Pao`o Street. Within the KOA site there are existing 8-inch and 12-inch waterlines that branch from the 16-inch and 12-inch waterlines to serve various parts of KOA. The project site is located approximately 130 feet south of a 12-inch ductile iron pipe.

b. Potential Impacts and Mitigation Measures

The proposed space center improvements can be accommodated within the design parameters of the existing onsite water system serving the KOA. The water demand flow rate for the proposed space center is estimated to be 60 gallons per minute for potable water and 300 gallons per minute for fire water demand per day. See **Appendix "E"**. The estimated discharge pressure of the existing system is adequate for domestic potable water and fire flow purposes. Refer to **Appendix "E"**. There are no anticipated adverse impacts to the County or airport's water system infrastructure.

3. Wastewater

a. Existing Conditions

The project site currently does not generate any wastewater flows. The KOA has an onsite wastewater treatment plant with a capacity of 0.13 million gallons (mgd) per day. The current average daily treatment capacity peaks at 0.06 mgd. The wastewater discharged from the proposed space center will flow to a new lift station which will pump flows into an existing 10-inch gravity line, which will then convey flows to the onsite wastewater treatment plant. Refer to **Appendix "E"**. The wastewater treatment plant is located

north of the terminal area and is maintained under contract.

b. Potential Impacts and Mitigation Measures

The proposed space center water supply will be 60 gallons per minute, therefore, the maximum sewage flow will be 60 gallons per minute. Refer to **Appendix "E"**. The existing wastewater infrastructure (gravity lines and treatment plant) have sufficient capacity to handle the additional flows associated with the proposed space center. Consequently, there are no adverse impacts anticipated to the wastewater infrastructure system.

4. Drainage

a. Existing Conditions

Stormwater runoff in the KOA complex is collected through a system of swales, ditches, and concrete bridge culverts. It is noted that lands within the KOA boundaries do not contain any naturally defined gulches or drainageways. Runoff rapidly infiltrates into the ground due to the porous nature of the underlying lava formations. There are 65 existing drainage injection dry wells, having diameters ranging between approximately two (2) to six (6) feet, and depths between two (2) to thirty (30) feet. The injection wells are permitted by the State Department of Health under Underground Injection Control Permit Number UH-1673. There are no major ponding areas within the airport boundaries. Refer to **Appendix "A"**.

Stormwater runoff at the project site generally flows in an east to west direction.

b. Potential Impacts and Mitigation Measures

Based on engineering analysis of the drainage areas affected by the proposed improvements, the additional runoff generated by the project can be accommodated by the existing injection wells and the provision of new injection dry well which will be designed to a discharge rate of 6.52 cubic feet per second (cfs) for the post-development condition in order to meet the Hawai`i County storm drainage design criteria. The proposed injection dry well will be located in the northwestern corner of the project site. Refer to

Appendix "A". With this drainage system improvement, no adverse drainage or flooding impacts are anticipated to airport operations areas, nor are there any adverse impacts anticipated to adjacent and downstream properties.

5. Electrical and Communication Systems

a. Existing Conditions

Electrical services to the airport is provided by Hawai`i Electric Light Company (HELCo) via the Keahole substation, which is located east of the Queen Ka`ahumanu Highway. The power lines enter the electrical control building located adjacent to and east of the airport traffic control tower (ATCT). In addition, KOA has a 175 kilowatt (KW) diesel engine emergency generator located in the electrical control building. A 1,000 gallon diesel storage tank, which is located adjacent to the control building, supplies the emergency generator with fuel. A 23 kilowatt diesel engine generator provides a separate emergency power system for the airfield. Telephone service is provided by Hawaiian Telcom.

b. Potential Impacts and Mitigation Measures

Early coordination has been carried out with the electrical and communication system providers to ensure service delivery. HELCO indicated electrical service to the space center can be provided from existing electrical facilities located on Keahole Street. It is anticipated the proposed space center will not adversely impact electrical and communication system services or capacity.

M. CUMULATIVE AND SECONDARY IMPACTS

Cumulative impacts are defined as the impact on the environment which results from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions.

The proposed project is not part of a larger action as it essentially entails the relocation and expansion of a space center, which currently exists on KOA lands. There are no community growth impacts resulting from or occurring with the project. The lands impacted by the

relocated space center are currently vacant and undeveloped.

Secondary impacts are those which have the potential to occur later in time or farther in distance, but are still reasonably foreseeable. They can be viewed as actions of others that are taken because of the presence of the project. Secondary impacts from highway projects, for example, can occur because they can induce development by removing one of the impediments to growth - transportation access.

There are no foreseeable secondary impacts associated with the proposed project. It is not considered a generating component for population, nor will it place a significant additional burden upon infrastructure or the environment. The project involves the relocation of the existing Astronaut Ellison S. Onizuka Space Center to enable the expansion of the long-term master plan improvements at KOA.

III. RELATIONSHIP TO GOVERNMENTAL PLANS, POLICIES AND CONTROLS

III. RELATIONSHIP TO GOVERNMENTAL PLANS, POLICIES AND CONTROLS

A. STATE LAND USE DISTRICTS

Pursuant to Chapter 205A, HRS, all lands in the State have been divided and placed into one (1) of four (4) land use districts by the State Land Use Commission. These land use districts have been designated "Urban", "Rural", "Agricultural", and "Conservation". The KOA site is located within the State "Urban" and "Conservation" districts. The airport roadways, terminal area, and runways are classified as "Urban" and encompasses approximately 548 acres. The proposed improvements fall within "Urban" lands and are permitted within this district. See **Figure 9**.

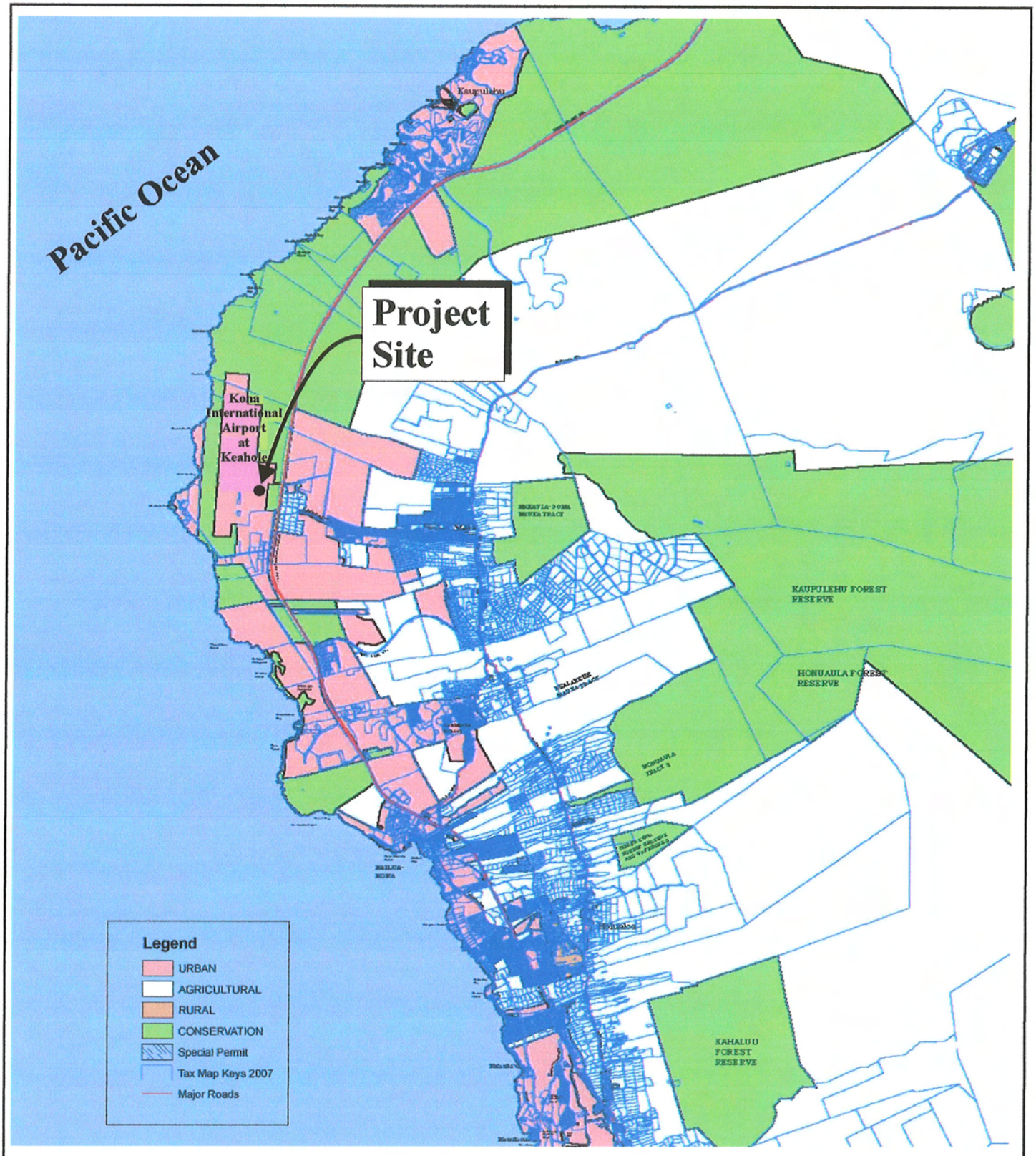
B. HAWAI`I COUNTY GENERAL PLAN

An updated version of the Hawai`i County General Plan was enacted in February 2005. The General Plan is the policy document for the long range comprehensive development on the island of Hawai`i. Purposes of the General Plan include:

- Guide the pattern of future development in this County based on long-term goals;
- Identify the visions, values and priorities important to the people of this County; and
- Effect political and technical coordination in community improvement and development.

The General Plan includes an assessment of elements relative to new data, laws, and methods of analysis. Each study element is analyzed and evaluated in relation to all other elements, County and district goals and the land use pattern. The KOA site is categorized as "Industrial" in the General Plan. See **Figure 10**. The proposed improvements are in compliance with the General Plan "Industrial" land use category.

The proposed improvements are supportive of the following General Plan goals and policies.



Source: State of Hawai`i Land Use Commission

Figure 9 Proposed Astronaut Ellison S. Onizuka Space Center

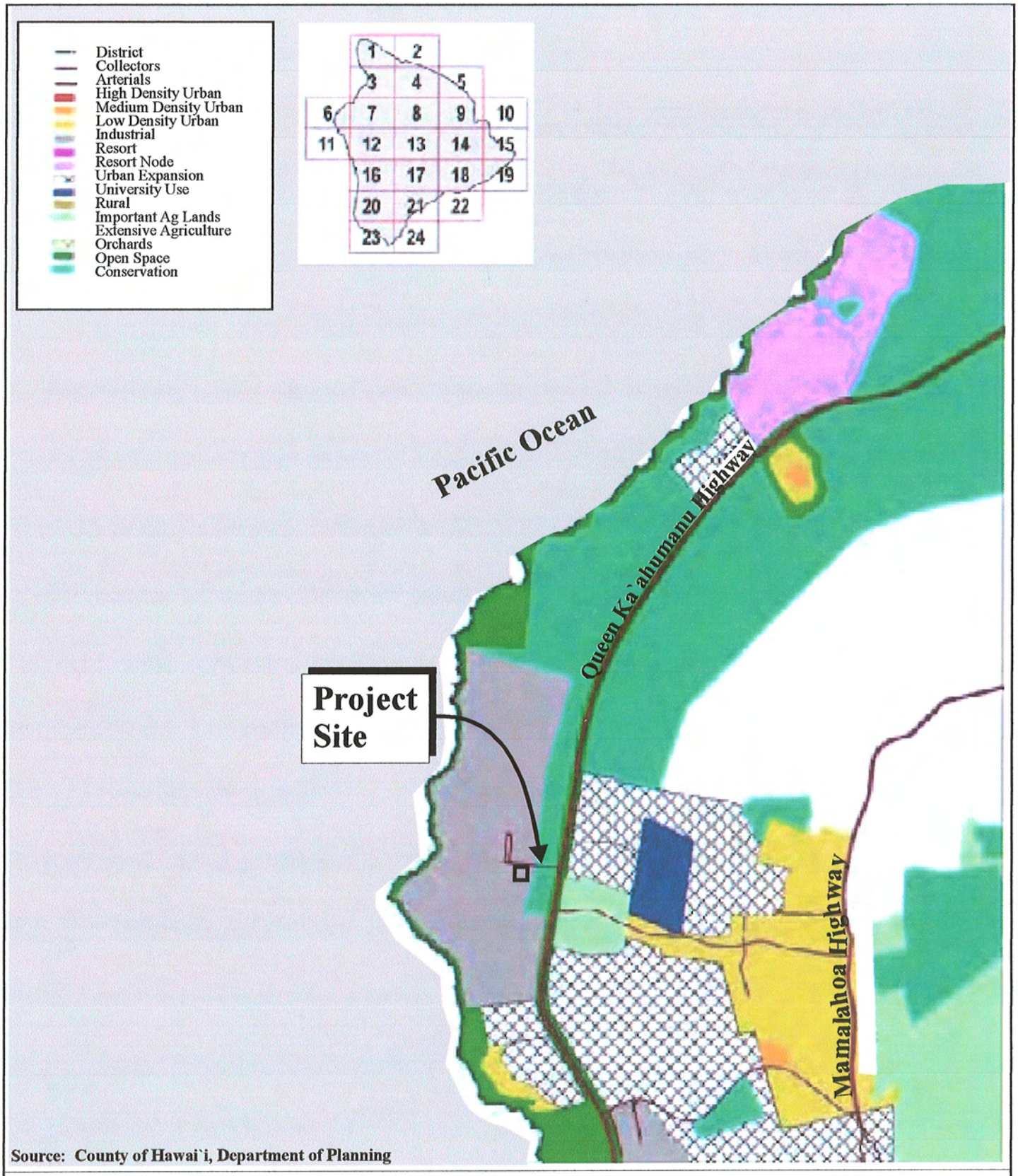
State Land Use District Boundary Map

NOT TO SCALE

Prepared for: State of Hawai`i, Dept. Of Transportation, Airports Division

MUNEKIYO & HIRAGA, INC.

KYA/Onizuka/StateLandUseDistrictBoundaryZoom



Source: County of Hawai`i, Department of Planning

Figure 10 Proposed Astronaut Ellison S. Onizuka Space Center

Land Use Pattern Allocation Guide Map

NOT TO SCALE

Prepared for: State of Hawai`i, Dept. Of Transportation, Airports Division

MUNEKIYO & HIRAGA, INC.

KYA/Onizuka/Land Use Pattern

ECONOMIC

Goals

- Provide residents with opportunities to improve their quality of life through economic development that enhances the County's natural and social environments.

- Economic development and improvement shall be in balance with the physical, social, and cultural environments of the island of Hawai`i.

- Strive for diversity and stability in the economic system.

- Provide an economic environment that allows new, expanded, or improved economic opportunities that are compatible with the County's cultural, natural and social environment.

- Strive for an economic climate that provides its residents an opportunity for choice of occupation.

- Strive for diversification of the economy by strengthening existing industries and attracting new endeavors.

Policies

- Encourage the development of a visitor industry that is in harmony with the social, physical, and economic goals of the residents of the County.

- Support all levels of educational, employment and training opportunities and institutions.

- Promote a distinctive identity for the island of Hawai`i to enable government, business and travel industries to promote the County of Hawai`i as an entity unique within the State of Hawai`i.

PUBLIC FACILITIES

Goal

- Encourage the provision of public facilities that effectively service community and visitor needs and seek ways of improving public service through better and more functional facilities in keeping with the environmental and aesthetic concerns of the community.

Policy

- Continue to seek ways of improving public services through the coordination of service and maximizing the use of personnel and facilities.

RECREATION

Goals

- Provide a wide variety of recreational opportunities for the residents and visitors of the County.
- Provide a diversity of environments for active and passive pursuits.

Policies

- Recreational facilities shall reflect the natural, historic, and cultural character of the area.
- The use of land adjoining recreation areas shall be compatible with community values, physical resources, and recreation potential.
- Provide facilities and a broad recreational program for all age groups, with special considerations for the handicapped, the elderly, and young children.
- Coordinate recreational programs and facilities with governmental and private agencies and organizations. Innovative ideas for improving recreational facilities and opportunities shall be considered.

TRANSPORTATION – AIRPORTS AND HARBORS

Goal

- Provide transportation terminals and related facilities for the safe, efficient, and comfortable movement of people and goods.

Policies

- The State Department of Transportation should continue to implement its plans for transportation terminals and related facilities to promote and influence desired land use policies.

- Encourage the maximum use of the island's airport and harbor facilities.

LAND USE

Goal

- Designate and allocate land uses in appropriate proportions and mix and in keeping with the social, cultural and physical environments of the County.

Policy

- Encourage urban development within existing zoned areas already served by basic infrastructure, or close to such areas, instead of scattered development.

LAND USE - PUBLIC LANDS

Policy

- Utilize publicly owned lands in the best public interest and to the maximum benefit for the greatest number of people.

Policy

- Encourage uses of public lands that will satisfy specific public needs, such as housing, recreation, open space and education.

C. KONA COMMUNITY DEVELOPMENT PLAN (KONA CDP)

In September 2008 the Hawaii County Council passed Ordinance 0831 and Bill 333 approving the Kona CDP document, entitled, Mapping the Future: Kona Community Development Plan Volume 1. The Kona CDP translates the broad General Plan statements to specific actions, as they apply to specific geographic areas. The proposed space center project is supportive of the following general goals, objectives, policies and actions.

1. Public Facilities, Infrastructure, Services Goal

A community where the public infrastructure and facilities are sustainably built and maintained with innovation and pride, promote a sense of community, and support a quality of life where visitors and residents feel healthy and inspired.

a. Objective PUB-8.1

To promote the cooperation between government, citizens and organizations, and to facilitate the development of programs to strengthen families and communities.

2. Energy Goal

Establish Kona as a model for sustainability and energy self-sufficiency.

D. COUNTY ZONING

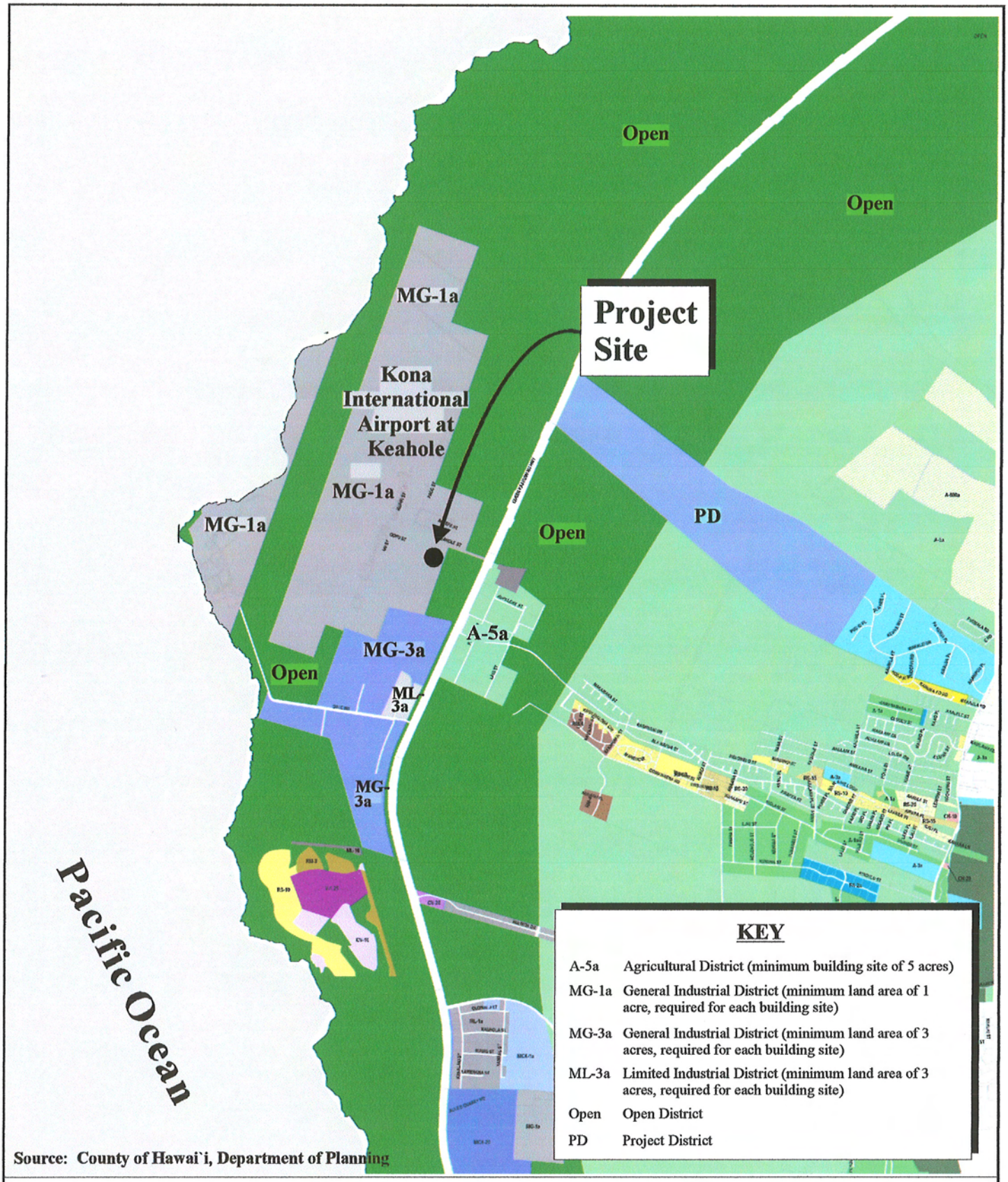
The project site is zoned "MG-1a, General Industrial" by Hawai`i County zoning. See **Figure 11**. Industrial development includes manufacturing and processing, wholesaling, large storage and transportation facilities, power plants, and government baseyards. Therefore, airport related uses, such as the proposed space center, are permitted uses in the MG-1a district. The 1a designation requires a minimum land area of one (1) acre. Portions of the KOA property are zoned "Open", however, the proposed project is within the MG-1a zone.

E. COUNTY OF HAWAI`I - SPECIAL MANAGEMENT AREA

The subject property is located within the County of Hawai`i's Special Management Area (SMA). See **Figure 12**. Pursuant to Chapter 205A, HRS, and the Rules of Practice Procedure of the Hawai`i Planning Commission, actions proposed within the SMA are evaluated with respect to SMA objectives, policies and guidelines. The proposed action will require the subsequent processing of a SMA Use Permit application. This section addresses the project's relationship to applicable coastal zone management considerations, as set forth in Chapter 205A, HRS.

(1) Recreational Resources

Objective: Provide coastal recreational opportunities accessible to the public.



Source: County of Hawai`i, Department of Planning

Figure 11 Proposed Astronaut Ellison S. Onizuka Space Center

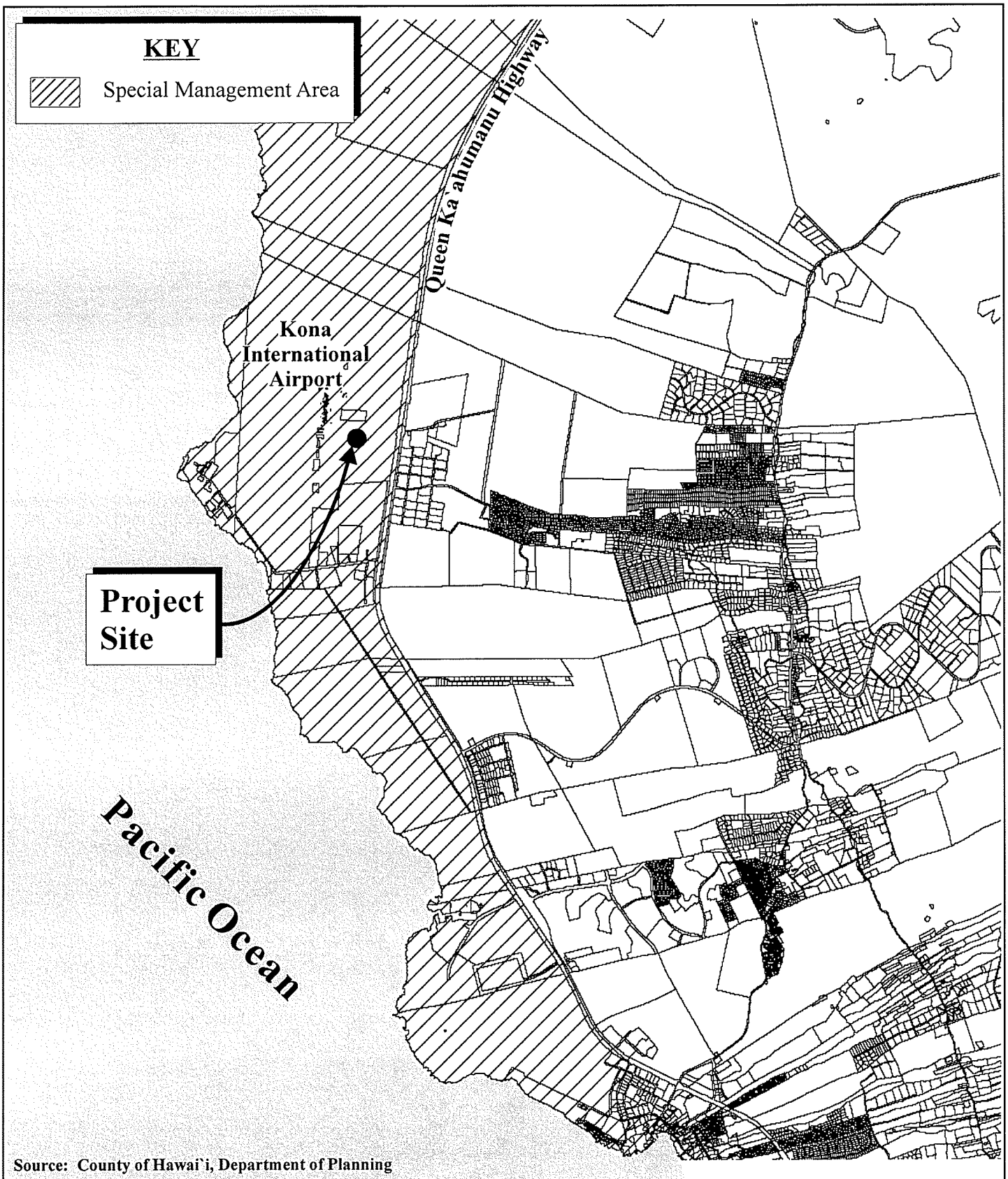
North Kona Zone Map

NOT TO SCALE

Prepared for: State of Hawai`i, Department of Transportation, Airports Division

MUNEKIYO & HIRAGA, INC.

KYA\onizuka\zone map



Source: County of Hawai`i, Department of Planning

Figure 12 Proposed Ellison S. Onizuka Space Center

Special Management Area (SMA) Map

NOT TO SCALE

Prepared for: State of Hawai`i, Department of Transportation, Airports Division

MUNEKIYO & HIRAGA, INC.

KYA\onizuka\SMA Map

Policies:

(A) Improve coordination and funding of coastal recreational planning and management; and

(B) Provide adequate, accessible, and diverse recreational opportunities in the coastal zone management area by:

(i) Protecting coastal resources uniquely suited for recreational activities that cannot be provided in other areas;

(ii) Requiring replacement of coastal resources having significant recreational value, including but not limited to, surfing sites, fishponds, and sand beaches, when such resources will be unavoidably damaged by development; or requiring reasonable monetary compensation to the State for recreation when replacement is not feasible or desirable;

(iii) Providing and managing adequate public access, consistent with conservation of natural resources, to and along shorelines with recreational value;

(iv) Providing an adequate supply of shoreline parks and other recreational facilities suitable for public recreation;

(v) Ensuring public recreational use of county, state, and federally owned or controlled shoreline lands and waters having recreational value consistent with public safety standards and conservation of natural resources;

(vi) Adopting water quality standards and regulating point and non-point sources of pollution to protect, and where feasible, restore the recreational value of coastal waters;

(vii) Developing new shoreline recreational opportunities, where appropriate, such as artificial lagoons, artificial beaches, and artificial reefs for surfing and fishing; and

(viii) Encouraging reasonable dedication of shoreline areas with recreational value for public use as part of discretionary approvals or permits by the land use commission, board of land and natural resources, and county authorities; and crediting such dedication against the requirements of Section 46-6.

Response: The proposed project is not anticipated to impact existing coastal

recreational opportunities. There is currently a beach access provided through the airport property. The proposed project will not affect the beach access road. As such, the proposed space center will not alter shoreline recreational access.

(2) Historic Resources

Objective: Protect, preserve and, where desirable, restore those natural and manmade historic and prehistoric resources in the coastal zone management area that are significant in Hawaiian and American history and culture.

Policies:

(A) Identify and analyze significant archeological resources;

(B) Maximize information retention through preservation of remains and artifacts or salvage operations; and

(C) Support state goals for protection, restoration, interpretation, and display of historic resources.

Response: The proposed actions are not anticipated to adversely impact archaeological resources or Native Hawaiian cultural practices.

Refer to **Appendix "B"** and **Appendix "C"**.

(3) Scenic and Open Space Resources

Objective: Protect, preserve and, where desirable, restore or improve the quality of coastal scenic and open space resources.

Policies:

(A) Identify valued scenic resources in the coastal zone management area;

(B) 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;

(C) Preserve, maintain, and, where desirable, improve and restore shoreline open space and scenic resources; and

(D) Encourage those developments which are not coastal dependent to locate in

inland areas.

Response: Scenic and open space resources are not anticipated to be adversely affected by the proposed action. The project site is located within the KOA property. The space center will be a low-rise structure and is not anticipated to adversely impact view corridors.

(4) Coastal Ecosystems

Objective: Protect valuable coastal ecosystems, including reefs, from disruption and minimize adverse impacts on all coastal ecosystems.

Policies:

(A) Exercise an overall conservation ethic, and practice stewardship in the protection, use, and development of marine and coastal resources;

(B) Improve the technical basis for natural resource management;

(C) Preserve valuable coastal ecosystems, including reefs, of significant biological or economic importance;

(D) Minimize disruption or degradation of coastal water ecosystems by effective regulation of stream diversions, channelization, and similar land and water uses, recognizing competing water needs; and

(E) Promote water quantity and quality planning and management practices that reflect the tolerance of fresh water and marine ecosystems and maintain and enhance water quality through the development and implementation of point and nonpoint source water pollution control measures.

Response: The proposed project is not anticipated to result in any adverse impacts to coastal ecosystems. Applicable Best Management Practices (BMPs) and erosion-control measures will be implemented to mitigate runoff from construction-related activities. Onsite drainage improvements will be designed to retain and safely discharge project-generated storm water runoff. Refer to **Appendix "A"**.

(5) Economic Uses

Objective: Provide public or private facilities and improvements important to the State's economy in suitable locations.

Policies:

(A) Concentrate coastal dependent development in appropriate areas;

(B) Ensure that coastal dependent development such as harbors and ports, and coastal related development such as visitor industry facilities and energy generating facilities, are located, designed, and constructed to minimize adverse social, visual, and environmental impacts in the coastal zone management area; and

(C) Direct the location and expansion of coastal dependent developments to areas presently designated and used for such developments and permit reasonable long-term growth at such areas, and permit coastal dependent development outside of presently designated areas when:

(i) Use of presently designated locations is not feasible;

(ii) Adverse environmental effects are minimized; and

(iii) The development is important to the State's economy.

Response: The proposed project will generate short-term construction-related employment which will benefit the local economy. The proposed action does not contradict the objectives and policies for economic uses. The improvements proposed are limited to an area of the airport property already designated for urban use. It is anticipated that approximately one (1) full-time and up to five (5) part-time staff will be employed to operate and maintain the space center.

(6) Coastal Hazards

Objective: Reduce hazard to life and property from tsunami, storm waves, stream flooding, erosion, subsidence and pollution.

Policies:

(A) Develop and communicate adequate information about storm wave, tsunami, flood, erosion, subsidence, and point and nonpoint source pollution hazards;

(B) Control development in areas subject to storm wave, tsunami, flood, erosion, hurricane, wind, subsidence, and point and nonpoint source pollution hazards;

(C) Ensure that developments comply with requirements of the Federal Flood

Insurance Program; and

(D) Prevent coastal flooding from inland projects.

Response: The project site is located in Zone X, an area outside the 1 percent to 0.2 percent annual chance flood plain. While the western portion of the KOA is located within a tsunami evacuation zone, the proposed space center is beyond the evacuation boundary. The proposed action will be developed in compliance with Federal Flood Insurance Program requirements, as applicable. All project generated storm water runoff will be retained onsite and will not adversely impact adjacent and downstream properties. Refer to **Appendix "A"**.

(7) Managing Development

Objective: Improve the development review process, communication, and public participation in the management of coastal resources and hazards.

Policies:

(A) Use, implement, and enforce existing law effectively to the maximum extent possible in managing present and future coastal zone development;

(B) Facilitate timely processing of applications for development permits and resolve overlapping or conflicting permit requirements; and

(C) Communicate the potential short and long-term impacts of proposed significant coastal developments early in their life cycle and in terms understandable to the public to facilitate public participation in the planning and review process.

Response: Project information will be disseminated through the Environmental Assessment (EA) pursuant to Chapter 343, Hawai`i Revised Statutes (HRS), as well as through the County of Hawai`i SMA process.

(8) Public Protection

Objective: Stimulate public awareness, education, and participation in coastal management.

Policies:

(A) Promote public involvement in coastal zone management processes;

(B) Disseminate information on coastal management issues by means of educational materials, published reports, staff contact, and public workshops for persons and organizations concerned with coastal issues, developments, and government activities; and

(C) Organize workshops, policy dialogues, and site-specific mediations to respond to coastal issues and conflicts.

Response: As discussed above, public awareness and participation for the project are facilitated through the Chapter 343, HRS EA, and County of Hawai`i SMA processes.

(9) Beach Protection

Objective: Protect beaches for public use and recreation.

Policies:

(A) Locate new structures inland from the shoreline setback to conserve open space, minimize interference with natural shoreline processes, and minimize loss of improvements due to erosion;

(B) Prohibit construction of private erosion-protection structures seaward of the shoreline, except when they result in improved aesthetic and engineering solutions to erosion at the sites and do not interfere with existing recreational and waterline activities; and

(C) Minimize the construction of public erosion-protection structures seaward of the shoreline.

Response: The proposed space center improvements will be located approximately 6,000 feet away from the shoreline and within the existing KOA property. Impacts to beach processes are not anticipated. Appropriate BMPs will be incorporated during construction to minimize impacts.

(10) Marine Resources

Objective: Promote the protection, use, and development of marine and coastal resources to assure their sustainability.

Policies:

(A) Ensure that the use and development of marine and coastal resources are ecologically and environmentally sound and economically beneficial;

(B) Coordinate the management of marine and coastal resources and activities to improve effectiveness and efficiency;

(C) Assert and articulate the interests of the State as a partner with federal agencies in the sound management of ocean resources within the United States exclusive economic zone;

(D) Promote research, study, and understanding of ocean processes, marine life, and other ocean resources in order to acquire and inventory information necessary to understand how ocean development activities relate to and impact upon ocean and coastal resources; and

(E) Encourage research and development of new, innovative technologies for exploring, using, or protecting marine and coastal resources.

Response: Appropriate BMPs and drainage improvements will be implemented to mitigate potential impacts to marine or coastal resources in the vicinity.

In addition to the foregoing objectives and policies, SMA permit review criteria pursuant to Act 244 (2005) provides that:

> *No special management area use permit or special management area minor permit shall be granted for structures that allow artificial light from floodlights, uplights, or spotlights used for decorative or aesthetic purposes when the light:*
>
> *(1) Directly illuminates the shoreline and ocean waters; or*
>
> *(2) Is directed to travel across property boundaries toward the shoreline and ocean waters.*

Response: As applicable, all exterior lighting at the project site will be fully shielded, downcast, and designed to mitigate potential impacts to seabirds from light spillage across property boundaries toward the shoreline and into the night sky.

IV. SUMMARY OF UNAVOIDABLE IMPACTS ON THE ENVIRONMENT AND RESOURCES

IV. SUMMARY OF UNAVOIDABLE IMPACTS ON THE ENVIRONMENT AND RESOURCES

The proposed project will result in certain unavoidable construction-related environmental impacts as outlined in Chapter II.

In the short-term, construction associated with the project will generate noise impacts. These impacts will be limited to the immediate vicinity of the project construction areas. Sound attenuating construction equipment will be used, where practicable, to mitigate noise impacts caused by construction.

Unavoidable air quality impacts will also arise as a result of construction activities, such as the generation of dust and other airborne pollutants. Appropriate BMPs will be incorporated in the construction process to mitigate adverse impacts such as frequent watering of exposed surfaces and regular maintenance of construction equipment to minimize construction-related impacts.

In the long term, the proposed project is not anticipated to result in any significant, long-term, adverse environmental effects.

V. ALTERNATIVES TO THE PROPOSED ACTION

V. ALTERNATIVES TO THE PROPOSED ACTION

The applicant has looked at a variety of options in accommodating the proposed project.

A. PREFERRED ALTERNATIVE

The proposed development plan, outlined in Section I. Project Overview, represents the preferred alternative. This alternative, which entails development of a new relocated Astronaut Ellison S. Onizuka Space Center on vacant KOA lands, appropriately fulfills the project objectives.

B. NO ACTION ALTERNATIVE

As previously mentioned, there is already a need to relocate the Astronaut Ellison S. Onizuka Space Center to a new location. The no action alternative would not sufficiently address the current need to relocate the Astronaut Ellison S. Onizuka Space Center prior to needed improvements to the main terminal at the KOA. The "no action" alternative will delay the planned improvements to the main terminal.

C. POSTPONED ACTION ALTERNATIVE

Similar to the no action alternative, the postponed action alternative does not address the need to relocate the Astronaut Ellison S. Onizuka Space Center and will also delay the planned improvements to the main terminal.

D. ALTERNATIVE LOCATIONS

The SDOT-A evaluated four (4) alternative sites (A, B, C, and D) for the proposed space center. In addition to the selected site (B), two (2) sites were located adjacent to Queen Ka`ahumanu Highway. Site D was located at the intersection with the NELHA access road, and Site A was located on the west side of the highway, across the intersection with Kaiminani Drive. The fourth site (Site C) was located to the east of Kupipi Street, across

from the main terminal and the existing Astronaut Ellison S. Onizuka Space Center. Site B, the preferred site, was chosen due to its access, proximity to infrastructure, and consideration of long-term development around the airport terminal area.

VI. SIGNIFICANCE CRITERIA ASSESSMENT

VI. SIGNIFICANCE CRITERIA ASSESSMENT

The "Significance Criteria", Section 12 of the Administrative Rules, Title 11, Chapter 200, Environmental Impact Statement Rules, were reviewed and analyzed to determine whether the proposed project will have significant impacts to the environment. The following criteria and analysis are provided.

1. **Involves an irrevocable commitment to loss or destruction of any natural or cultural resource.**

   The proposed project will not result in any adverse environmental impacts. There are no known, rare, threatened, or endangered species of flora, fauna or avifauna located within the project site.

   The proposed improvements will be limited to an area of the KOA already designated for urban use. The project area is not being used for traditional cultural resources. Adverse impacts to archaeological and cultural resources are not anticipated. Refer to **Appendix "B"** and **Appendix "C"**.

2. **Curtails the range of beneficial uses of the environment.**

   The proposed project and the commitment of land resources would not curtail the range of beneficial uses of the environment. The proposed action will be carried out within an existing, undeveloped portion of the KOA property for public benefit.

3. **Conflicts with the state's long-term environmental policies or goals and guidelines as expressed in chapter 344, HRS, and any revisions thereof and amendments thereto, court decisions, or executive orders.**

   The State's Environmental Policy and Guidelines are set forth in Chapter 344, Hawai`i Revised Statutes (HRS). The proposed project will foster activities compatible with the surrounding airport environment and will represent a facility which provides a sense of identity and social satisfaction in harmony with the environment through the development of an architecturally designed building, site

design, and project landscaping. In addition, the applicant is committed to management practices which conserve natural resources where possible and will implement the planting of native vegetation in an effort to enhance the surrounding environment. As a result, the proposed action does not contravene provisions of Chapter 344, HRS.

4. **Substantially affects the economic welfare, social welfare, and cultural practices of the community or State.**

The proposed project would have a direct beneficial effect on the local economy during construction and ongoing operations. The improvements would enhance travelers' experiences and benefit the tourism industry, which drives the island's economy in the Kailua-Kona region. The proposed space center will also enhance local school programs with access to educational material and displays of space technologies.

5. **Substantially affects public health.**

The proposed project is consistent with the public health goals of the State Department of Health. Infrastructure systems will be provided to ensure the sound delivery of drinking water and the timely disposal of solid waste and wastewater. Best Management Practices will be implemented to minimize air quality and noise impacts during construction. Consequently, the proposed project is not anticipated to have a significant detrimental effect on public health.

6. **Involves substantial secondary impacts, such as population changes or effects on public facilities.**

Population changes are not anticipated as a result of the proposed project. In addition, the proposed project will not change the existing airport use for the site and is consistent with State and County plans, policies, and controls.

No adverse impacts to water and wastewater capacities and facilities are anticipated. Post-development onsite surface runoff will be accommodated by the proposed drainage system improvements. There are no adverse impacts upon educational, recreational, and solid waste collection and disposal facilities anticipated as a result of the proposed space center.

7. **Involves a substantial degradation of environmental quality.**

During the construction phase of the project, there will be short-term air quality and noise impacts as a result of the project. In the long term, effects upon air quality and ambient noise levels should be minimal. The project is not anticipated to significantly affect the open space and scenic character of the area. A small anchialine wetland system has been identified approximately 48 meters east at the southern end of the runway away from the project site. There are no sensitive environments in the vicinity of the proposed space center. Consequently, no substantial degradation of environmental quality resulting from the project is anticipated.

8. **Is individually limited but cumulatively has considerable effect upon the environment or involves a commitment for larger actions.**

The proposed project does not involve a commitment to larger actions. While the impacts assessed in this document are based on the entire action, the design of the project considers long-range planning opportunities as discussed in the "Cumulative and Secondary Impacts" Section II.M. herein.

9. **Substantially affects a rare, threatened, or endangered species, or its habitat.**

There are no rare, threatened or endangered species of flora, fauna, avifauna, or their habitats that will be adversely affected by the proposed action. As previously noted, a flora and fauna assessment of the KOA was completed in 1999. No significant flora or fauna were identified in the survey.

10. **Detrimentally affects air or water quality or ambient noise levels.**

Construction activities will result in short-term air quality and noise impacts. Dust control measures, such as regular watering and sprinkling, will be implemented to minimize wind-blown emissions. Noise impacts will occur primarily from construction-related activities. It is anticipated that construction will be limited to daylight working hours. Water quality is not expected to be affected.

In the long term, the project is not anticipated to have a significant impact on air and water quality. The proposed project will not affect aircraft traffic in the long term. As such, the proposed improvements are not expected to significantly add to ambient noise levels.

11. **Affects or is likely to suffer damage by being located in an environmentally sensitive area such as a flood plain, tsunami zone, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters**.

The proposed improvements are not located within and would not affect environmentally sensitive areas. The location of the space center is not subject to flooding or tsunami inundation. Soils within the project site are not erosion-prone. There are no geologically hazardous lands, estuaries, or coastal waters within or adjacent to the project site.

12. **Substantially affects scenic vistas and viewplanes identified in county or state plans or studies.**

The project site is not identified as a scenic vista or viewplane. The proposed project will not affect scenic corridors and coastal scenic and open space resources.

13. **Requires substantial energy consumption.**

The proposed project will involve the short-term commitment of fuel for equipment, vehicles, and machinery during construction activities. However, this use is not anticipated to result in a substantial consumption of energy resources. In addition, further coordination with the Hawai`i Electric Light Company, Inc. will be undertaken during the preparation of the electrical plans to ensure all operational parameters are addressed for the proposed project.

Based on the foregoing analysis, it is anticipated that the proposed Astronaut Ellison S. Onizuka Space Center project will result in a Finding of No Significant Impact (FONSI).

VII. LIST OF PERMITS AND APPROVALS

VII. LIST OF PERMITS AND APPROVALS

The following permits and approvals will be required prior to the implementation of the project.

State of Hawai`i

1. Community Noise Permit (as applicable)

2. National Pollutant Discharge Elimination System (NPDES) (as applicable)

County of Hawai`i

1. Special Management Area (SMA) Use Permit

2. Construction Permits (Grading, Building, Electrical, Plumbing)

VIII. AGENCIES CONSULTED DURING THE PREPARATION OF THE DRAFT ENVIRONMENTAL ASSESSMENT; LETTERS RECEIVED; AND RESPONSES TO SUBSTANTIVE COMMENTS

VIII. AGENCIES CONSULTED DURING THE PREPARATION OF THE DRAFT ENVIRONMENTAL ASSESSMENT; LETTERS RECEIVED; AND RESPONSES TO SUBSTANTIVE COMMENTS

The following agencies were consulted during the preparation of the Draft Environmental Assessment. Agency comments received during the early consultation phase, as well as responses to substantive comments, are included in this section. In addition, comments received after the early consultation comment period deadline and letters responding to substantive comments are contained in this section as well.

1. **Natural Resources Conservation Service**
   U.S. Department of Agriculture
   300 Ala Moana Blvd., Rm. 4-118
   Honolulu, Hawai`i 96850

2. George Young
   Chief, Regulatory Branch
   U.S. Department of the Army
   U.S. Army Engineer District, Honolulu
   Regulatory Branch
   Building 230
   Fort Shafter, Hawai`i 96858-5440

3. Airports District Office
   U.S. Department of Transportation
   Federal Aviation Administration
   P.O. Box 50244
   300 Ala Moana Boulevard, Room 7-126
   Honolulu, Hawai`i 96813

4. Air Traffic Manager
   U.S. Department of Transportation
   Federal Aviation Administration
   P.O. Box 50244
   300 Ala Moana Boulevard, Room 7-128
   Honolulu, Hawai`i 96813

5. Patrick Leonard, Field Supervisor
   U. S. Fish and Wildlife Service
   300 Ala Moana Blvd., Rm. 3-122
   Box 50088
   Honolulu, Hawai`i 96813

6. Russ Saito, State Comptroller
   Department of Accounting and General Services
   1151 Punchbowl Street, #426
   Honolulu, Hawai`i 96813

7. Theodore E. Liu, Director
   State of Hawai`i
   Department of Business, Economic Development & Tourism
   P.O. Box 2359
   Honolulu, Hawai`i 96804

8. Micah Kane, Chairman
   Department of Hawaiian Home Lands
   P. O. Box 1879
   Honolulu, Hawai`i 96805

9. Laura Thielen, Chairperson
   State of Hawai`i
   Department of Land and Natural Resources
   1151 Punchbowl Street
   Honolulu, Hawai`i 96813

10. Pua Aiu, Administrator
State of Hawai`i
Department of Land and Natural Resources
State Historic Preservation Division
601 Kamokila Blvd., Room 555
Kapolei, Hawai`i 96707

11. Brennon Morioka, Director
State of Hawai`i
Department of Transportation
869 Punchbowl Street
Honolulu, Hawai`i 96813

12. Katherine Puana Kealoha, Director
Office Of Environmental Quality Control
235 S. Beretania Street, Suite 702
Honolulu, Hawai`i 96813

13. Clyde Nāmu`o, Adminstrator
Office of Hawaiian Affairs
711 Kapiolani Boulevard, Suite 500
Honolulu, Hawai`i 96813

14. Mary Lou Kobayashi, Planning Program Administrator
State of Hawai`i
Office of Planning
P.O. Box 2359
Honolulu, Hawai`i 96804

15. State of Hawai`i
Department of Health
Environmental Planning Office
P.O. Box 3378
Honolulu, Hawai`i 96801

16. Milton Pavao, Director
Department of Water Supply
County of Hawai`i
345 Kekuanaoa Street, Suite 20
Hilo, Hawai`i 96720

17. Galen Kuba, P.E., Interim Director
Department of Public Works
County of Hawai`i
101 Pauahi Street, Suite 7
Aupuni Center
Hilo, Hawai`i 96720-4224

18. Daryn Arai, Director
Planning Department
County of Hawai`i
101 Pauahi Street, Suite 3
Hilo, Hawai`i 96720

19. Diane Ley, Interim Director
Department of Research and Development
County of Hawai`i
25 Aupuni Street
Hilo, Hawai`i 96720

20. Darryl J. Oliveira, Fire Chief
Hawai`i Fire Department
County of Hawai`i
25 Aupuni Street
Hilo, Hawai`i 96720

21. Lawrence K. Mahuna, Police Chief
Hawai`i Police Department
County of Hawai`i
349 Kapiolani Street
Hilo, Hawai`i 96720

22. Bobby Jean Leithead-Todd, Director
Department of Environmental Management
County of Hawai`i
25 Aupuni Street
Hilo, Hawai`i 96720

23. **Hawaiian Telecom Headquaters**
1177 Bishop Street
Honolulu, Hawai`i 96813

24. **Librarian**
Kailua-Kona Library
75-138 Hualalai Road
Kailua-Kona, Hawai`i 96740

25. **Hawai`i Electric Light Company, Inc.**
P. O. Box 102
Hilo, Hawai`i 96721-1027

26. **Librarian**
UHH Library
P.O. Box 1357
Hilo, Hawai`i 96720

JAN 1 6 2009

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, HONOLULU
FORT SHAFTER, HAWAII 96858-5440

REPLY TO
ATTENTION OF:

January 14, 2008

Regulatory Branch

File Number POH-2009-11

Mr. Kyle Ginoza
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawaii 96793

Dear Mr. Ginoza:

We have received your December 30, 2008, request for early consultation comments for the proposed Ellison S. Onizuka Space Center. The based on the information you provided, the proposed new facility is located within tax map key (TMK) 373043003 at Latitude 19.731° N. and Longitude 156.035° W., in Keahole, North Kona, Hawaii Island, Hawaii. The file number assigned POH-2009-11 should be referred to in any future correspondence with us.

Based on the information you submitted, it appears the proposed project site consist entirely of uplands and is absent of waters of the U.S., including adjacent wetlands, subject to our jurisdiction; therefore, **a DA permit will not be required.** This determination does not relieve you of the responsibility to obtain any other permits, licenses, or approvals that may be required under County, State, or Federal law for your proposed work.

Section 404 of the Clean Water Act requires that a Department of the Army (DA) permit be obtained for the discharge of dredged and/or fill material into waters of the U.S., including jurisdictional wetlands (33 U.S.C. 1344). The Corps defines wetlands as those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

Section 10 of the Rivers and Harbors Act of 1899 requires that a DA permit be obtained for structures or work in or affecting navigable waters of the U.S. (33 U.S.C. 403). Section 10 waters are those waters subject to the ebb and flow of the tide extending shoreward to the mean high water mark.

This approved jurisdictional determination is valid for a period of five (5) years from the date of this letter, unless new information supporting a revision is provided to us before the expiration date.

Should you have any questions regarding this approved jurisdictional determination, please contact Ms. Joy Anamizu of my staff at (808) 438-7023 or at joy.n.anamizu@usace.army.mil. For additional information about our Regulatory Program, visit our web site at http://www.poh.usace.army.mil/EC-R/EC-R.htm.

Sincerely,

George P. Young, P.E.
Chief, Regulatory Branch

APPROVED JURISDICTIONAL DETERMINATION FORM
U.S. Army Corps of Engineers

SECTION I: BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION (JD): 14-Jan-2009

B. DISTRICT OFFICE, FILE NAME, AND NUMBER: Honolulu District, POH-2009-00011-JNA-JD1

C. PROJECT LOCATION AND BACKGROUND INFORMATION:

State :	HI - Hawaii
County/parish/borough:	Hawaii
City:	Keahole
Lat:	19.731
Long:	-156.035
Universal Transverse Mercator	Folder UTM List *UTM list determined by folder location* • NAD83 / UTM zone 34S Waters UTM List *UTM list determined by waters location* • NAD83 / UTM zone 34S
Name of nearest waterbody:	Pacific Ocean
Name of nearest Traditional Navigable Water (TNW):	Pacific Ocean
Name of watershed or Hydrologic Unit Code (HUC):	Keahole (20010000)

Check if map/diagram of review area and/or potential jurisdictional areas is/are available upon request.

Check if other sites (e.g., offsite mitigation sites, disposal sites, etc¿) are associated with the action and are recorded on a different JD form.

D. REVIEW PERFORMED FOR SITE EVALUATION:

Office Determination Date: 09-Jan-2009

Field Determination Date(s):

SECTION II: SUMMARY OF FINDINGS

A. RHA SECTION 10 DETERMINATION OF JURISDICTION

There [ ] "navigable waters of the U.S." within Rivers and Harbors Act (RHA) jurisdiction (as defined by 33 CFR part 329) in the review area.

Waters subject to the ebb and flow of the tide.

Waters are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce.

Explain:

B. CWA SECTION 404 DETERMINATION OF JURISDICTION.

There [ ] "waters of the U.S." within Clean Water Act (CWA) jurisdiction (as defined by 33 CFR part 328) in the review area.

1. Waters of the U.S.

a. Indicate presence of waters of U.S. in review area:[1]

Water Name	Water Type(s) Present
Ellison S. Onizuka Space Center (Uplands)	Uplands

b. Identify (estimate) size of waters of the U.S. in the review area:

Area: (m²)
Linear: (m)

c. Limits (boundaries) of jurisdiction:

based on: [ ]
OHWM Elevation: (if known)

2. Non-regulated waters/wetlands:[3]

Potentially jurisdictional waters and/or wetlands were assessed within the review area and determined to be not jurisdictional. Explain:

SECTION III: CWA ANALYSIS

A. TNWs AND WETLANDS ADJACENT TO TNWs

1.TNW
Not Applicable.

2. Wetland Adjacent to TNW
Not Applicable.

B. CHARACTERISTICS OF TRIBUTARY (THAT IS NOT A TNW) AND ITS ADJACENT WETLANDS (IF ANY):

1. Characteristics of non-TNWs that flow directly or indirectly into TNW

(i) General Area Conditions:
Watershed size: [ ]
Drainage area: [ ]
Average annual rainfall: inches
Average annual snowfall: inches

(ii) Physical Characteristics
(a) Relationship with TNW:

Tributary flows directly into TNW.

Tributary flows through [ ] *tributaries before entering* TNW.
:Number of tributaries

Project waters are [ ] river miles from TNW.
Project waters are [ ] river miles from RPW.
Project Waters are [ ] aerial (straight) miles from TNW.
Project waters are [ ] aerial(straight) miles from RPW.

Project waters cross or serve as state boundaries.

Explain:

Identify flow route to TNW:[5]

Tributary Stream Order, if known:
Not Applicable.

(b) General Tributary Characteristics:

Tributary is:
Not Applicable.

Tributary properties with respect to top of bank (estimate):
Not Applicable.

Primary tributary substrate composition:
Not Applicable.

Tributary (conditions, stability, presence, geometry, gradient):
Not Applicable.

(c) Flow:

Not Applicable.

Surface Flow is:
Not Applicable.

Subsurface Flow:
Not Applicable.

Tributary has:
Not Applicable.

If factors other than the OHWM were used to determine lateral extent of CWA jurisdiction:

High Tide Line indicated by:
Not Applicable.

Mean High Water Mark indicated by:
Not Applicable.

(iii) Chemical Characteristics:
Characterize tributary (e.g., water color is clear, discolored, oily film; water quality;general watershed characteristics, etc.).
Not Applicable.

(iv) Biological Characteristics. Channel supports:
Not Applicable.

2. Characteristics of wetlands adjacent to non-TNW that flow directly or indirectly into TNW

(i) Physical Characteristics:
(a) General Wetland Characteristics:
Properties:
Not Applicable.

(b) General Flow Relationship with Non-TNW:

Flow is:
Not Applicable.

Surface flow is:
Not Applicable.

Subsurface flow:
Not Applicable.

(c) Wetland Adjacency Determination with Non-TNW:
Not Applicable.

(d) Proximity (Relationship) to TNW:
Not Applicable.

(ii) Chemical Characteristics:
Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).
Not Applicable.

(iii) Biological Characteristics. Wetland supports:
Not Applicable.

3. Characteristics of all wetlands adjacent to the tributary (if any):

All wetlands being considered in the cumulative analysis:
Not Applicable.

Summarize overall biological, chemical and physical functions being performed:
Not Applicable.

C. SIGNIFICANT NEXUS DETERMINATION

A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by any wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical, and biological integrity of a TNW. For each of the following situations, a significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or insubstantial effect on the chemical, physical and/or biological integrity of a TNW. Considerations when evaluating significant nexus include, but are not limited to the volume, duration, and frequency of the flow of water in the tributary and its proximity to a TNW, and the functions performed by the tributary and all its adjacent wetlands. It is not appropriate to determine significant nexus based solely on any specific threshold of distance (e.g. between a tributary and its adjacent wetland or between a tributary and the TNW). Similarly, the fact an adjacent wetland lies within or outside of a floodplain is not solely determinative of significant nexus.

Significant Nexus: Not Applicable

D. DETERMINATIONS OF JURISDICTIONAL FINDINGS. THE SUBJECT WATERS/WETLANDS ARE:

1. TNWs and Adjacent Wetlands:
Not Applicable.

2. *RPWs that flow directly or indirectly into TNWs:*
Not Applicable.

Provide estimates for jurisdictional waters in the review area:
Not Applicable.

3. Non-RPWs that flow directly or indirectly into TNWs:[8]
Not Applicable.

Provide estimates for jurisdictional waters in the review area:

Not Applicable.

4. Wetlands directly abutting an RPW that flow directly or indirectly into TNWs.
Not Applicable.

Provide acreage estimates for jurisdictional wetlands in the review area:
Not Applicable.

5. Wetlands adjacent to but not directly abutting an RPW that flow directly or indirectly into TNWs:
Not Applicable.

Provide acreage estimates for jurisdictional wetlands in the review area:
Not Applicable.

6. Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs:
Not Applicable.

Provide estimates for jurisdictional wetlands in the review area:
Not Applicable.

7. Impoundments of jurisdictional waters:[9]
Not Applicable.

E. ISOLATED [INTERSTATE OR INTRA-STATE] WATERS INCLUDING ISOLATED WETLANDS, THE USE, DEGRADATION OR DESTRUCTION OF WHICH COULD AFFECT INTERSTATE COMMERCE, INCLUDING ANY SUCH WATERS:[10]
Not Applicable.

Identify water body and summarize rationale supporting determination:
Not Applicable.

Provide estimates for jurisdictional waters in the review area:
Not Applicable.

F. NON-JURISDICTIONAL WATERS, INCLUDING WETLANDS

If potential wetlands were assessed within the review area, these areas did not meet the criteria in the 1987 Corps of Engineers Wetland Delineation Manual and/or appropriate Regional Supplements:

Review area included isolated waters with no substantial nexus to interstate (or foreign) commerce:

Prior to the Jan 2001 Supreme Court decision in "SWANCC," the review area would have been regulated based soley on the "Migratory Bird Rule" (MBR):

Waters do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction (Explain):

Other (Explain):

The review area (approximately 2 acres) consist entirely of uplands and is absent of waters of the U.S.

Provide acreage estimates for non-jurisdictional waters in the review area, where the sole potential basis of jurisdiction is the MBR factors (ie., presence of migratory birds, presence of endangered species, use of water for irrigated agriculture), using best professional judgment:
Not Applicable.

Provide acreage estimates for non-jurisdictional waters in the review area, that do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction.
Not Applicable.

SECTION IV: DATA SOURCES.

A. SUPPORTING DATA. Data reviewed for JD
(listed items shall be included in case file and, where checked and requested, appropriately reference below):

Data Reviewed	Source Label	Source Description
–Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant	Figures 1 to 3.	Submitted with request letter from K. Ginoza of Munekiyo and Hiraga, Inc. (agent).

B. ADDITIONAL COMMENTS TO SUPPORT JD:
Not Applicable.

---

[1]-Boxes checked below shall be supported by completing the appropriate sections in Section III below.

[2]-For purposes of this form, an RPW is defined as a tributary that is not a TNW and that typically flows year-round or has continuous flow at least "seasonally" (e.g., typically 3 months).

[3]-Supporting documentation is presented in Section III.F.

[4]-Note that the Instructional Guidebook contains additional information regarding swales, ditches, washes, and erosional features generally and in the arid West.

[5]-Flow route can be described by identifying, e.g., tributary a, which flows through the review area, to flow into tributary b, which then flows into TNW.

[6]-A natural or man-made discontinuity in the OHWM does not necessarily sever jurisdiction (e.g., where the stream temporarily flows underground, or where the OHWM has been removed by development or agricultural practices). Where there is a break in the OHWM that is unrelated to the waterbody's flow regime (e.g., flow over a rock outcrop or through a culvert), the agencies will look for indicators of flow above and below the break.

[7]-Ibid.

[8]-See Footnote #3.

[9]-To complete the analysis refer to the key in Section III.D.6 of the Instructional Guidebook.

[10]-Prior to asserting or declining CWA jurisdiction based solely on this category, Corps Districts will elevate the action to Corps and EPA HQ for review consistent with the process described in the Corps/EPA Memorandum Regarding CWA Act Jurisdiction Following Rapanos.

MUNEKIYO & HIRAGA, INC.

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

MARK ALEXANDER ROY

August 5, 2009

George P. Young, P.E., Chief
Regulatory Branch
Department of Army
U.S. Army Engineer District
Honolulu, Fort Shafter, Hawaii 96858-5440

SUBJECT: Proposed Astronaut Ellison S. Onizuka Space Center At Keahole, North Kona, Hawaii, POH-2009-11

Dear Mr. Young:

Thank you for your letter dated January 14, 2008, received on January 16, 2009 by our office, providing comments on our request for early consultation on the subject project. We acknowledge your determination that the proposed project will not require a Department of Army permit.

Again, thank you for your comments.

Very truly yours,

Mich Hirano, AICP
Principal

MH:tn
cc: Kevin Funasaki, Department of Transportation, Airports Division
Richard Wong, KYA Design Studios
F:\DATA\KYA\Onizuka\Armyresp.ltr.wpd

JAN 2 6 2009

LINDA LINGLE
GOVERNOR

RUSS K. SAITO
COMPTROLLER

BARBARA A. ANNIS
DEPUTY COMPTROLLER

(P)1030.9

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P.O. BOX 119, HONOLULU, HAWAII 96810

JAN 2 3 2009

Mr. Kyle Ginoza
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawaii 96793

Dear Mr. Ginoza:

Subject: Early Consultation Request
Proposed Ellison S. Onizuka Space Center
Keahole, North Kona
Island of Hawaii, TMK: (3) 7-3-043:003

Thank you for the opportunity to provide comments for the subject project. The proposed project does not impact any of the Department of Accounting and General Services' projects or existing facilities, and we have no comments to offer at this time.

If you have any questions, please have your staff call Mr. David DePonte of the Planning Branch at 586-0492.

Sincerely,

ERNEST Y. W. LAU
Public Works Administrator

DD:mo
c: Ms. Katherine Kealoha, DOH OEQC
Mr. Glenn Okada, DAGS Hilo

JAN 2 6 2009

LINDA LINGLE
GOVERNOR
THEODORE E. LIU
DIRECTOR
MARK K. ANDERSON
DEPUTY DIRECTOR
ABBEY SETH MAYER
DIRECTOR
OFFICE OF PLANNING

DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM

OFFICE OF PLANNING
235 South Beretania Street, 6th Floor, Honolulu, Hawaii 96813
Mailing Address: P.O. Box 2359, Honolulu, Hawaii 96804

Telephone: (808) 587-2846
Fax: (808) 587-2824

Ref. No.: P-12402

January 22, 2009

Mr. Kyle Ginoza, AICP
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawaii 96793

Dear Mr. Ginoza:

Subject: Early Consultation for Draft Environmental Assessment (DEA) for Proposed Ellison S. Onizuka Space Center
TMK: (3) 7-3-043:003; Keahole, North Kona, Hawaii

Thank you for the opportunity for an early consultation regarding the Environmental Assessment (EA) for the above referenced proposal. The Office of Planning has no comments at this time. In so stating, the Office offers no judgment of either the adequacy of the document/application itself or the merits of the proposed project.

If you have any questions, please contact Debra Mendes of our Land Use Division at 587-2840.

Sincerely,

Abbey Seth Mayer
Director

LINDA LINGLE
GOVERNOR
THEODORE E. LIU
DIRECTOR
MARK K. ANDERSON
DEPUTY DIRECTOR
ABBEY SETH MAYER
DIRECTOR
OFFICE OF PLANNING

DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM

OFFICE OF PLANNING

235 South Beretania Street, 6th Floor, Honolulu, Hawaii 96813
Mailing Address: P.O. Box 2359, Honolulu, Hawaii 96804

Telephone: (808) 587-2846
Fax: (808) 587-2824

Ref. No.: P-12402

January 22, 2009

Mr. Kyle Ginoza, AICP
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawaii 96793

Dear Mr. Ginoza:

Subject: Early Consultation for Draft Environmental Assessment (DEA) for Proposed Ellison S. Onizuka Space Center
TMK: (3) 7-3-043:003; Keahole, North Kona, Hawaii

Thank you for the opportunity for an early consultation regarding the Environmental Assessment (EA) for the above referenced proposal. The Office of Planning has no comments at this time. In so stating, the Office offers no judgment of either the adequacy of the document/application itself or the merits of the proposed project.

If you have any questions, please contact Debra Mendes of our Land Use Division at 587-2840.

Sincerely,

Abbey Seth Mayer
Director

JAN 2 9 2009

LINDA LINGLE
GOVERNOR
STATE OF HAWAI'I

MICAH A. KĀNE
CHAIRMAN
HAWAIIAN HOMES COMMISSION

KAULANA H. PARK
DEPUTY TO THE CHAIRMAN

ROBERT J. HALL
EXECUTIVE ASSISTANT

Wailuku

STATE OF HAWAI'I
DEPARTMENT OF HAWAIIAN HOME LANDS
P.O. BOX 1879
HONOLULU, HAWAI'I 96805

January 27, 2009

Munekiyo & Hiraga, Inc.
Attention: Kyle Ginoza
305 High Street, Suite 104
Wailuku, Hawai'i 96793

SUBJECT: Early Consultation Request for the Proposed Ellison S. Onizuka Space Center; TMK: (3) 7-3-043:003; Keahole,North Kona, Hawai'i

Dear Mr. Ginoza:

The Department of Hawaiian Home Lands has reviewed the enclosed Proposed Ellison S. Onizuka Space Regional Location Map (Figure 1), Project Location Map (Figure 2) and the Space Center Site Plan (Figure 3) and has "No Comment" regarding the proposed action.

Sincerely,

Darrell Yagodich
Planning Program Manager
Department of Hawaiian Home Lands

JAN 1 3 2009

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

January 12, 2009

Munekiyo & Hiraga, Inc.
305 High Street Suite 104
Wailuku, Hawaii 96793

Attention: Mr. Kyle Ginoza

Ladies and Gentlemen:

Subject: Proposed Ellison S. Onizuka Space Center

Thank you for the opportunity to review and comment on the subject matter. The Department of Land and Natural Resources' (DLNR) has no other comments to offer on the subject matter. Should you have any questions, please feel free to call our office at 587-0433. Thank you.

Sincerely,

Morris M. Atta
Administrator

17

JAN 2 1 2009

LINDA LINGLE
GOVERNOR

BRENNON T. MORIOKA
DIRECTOR

Deputy Directors
MICHAEL D. FORMBY
FRANCIS PAUL KEENO
BRIAN H. SEKIGUCHI
JIRO A. SUMADA

IN REPLY REFER TO:

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

STP 8.3093

January 14, 2009

Mr. Kyle Ginoza, AICP
Project Manager
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawaii 96793

Dear Mr. Ginoza:

Subject: Ellison Onizuka Space Center
Early Consultation
TMK: 7-3-043:003

Thank you for requesting the State Department of Transportation's (DOT) review of the subject project at Kona International Airport.

DOT is in full support of this project and will provide and coordinate our internal review, as needed with our DOT Airports Planning Section. Also, any further submittals for the project can be directed to the Airports Division which is the lead division for handling projects by the airports staff.

DOT appreciates the opportunity to provide comments. If there are any questions, please contact Mr. David Shimokawa of the DOT Statewide Transportation Planning Office at (808) 587-2356.

Very truly yours,

BRENNON T. MORIOKA, PH.D., P.E.
Director of Transportation

c: Christopher Yuen, Hawaii Planning Department

JAN 1 6 2009

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RUSSELL Y. TSUJI
FIRST DEPUTY

KEN C. KAWAHARA
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

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

January 12, 2009

Kyle Ginoza, AICP, Project Manager
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawaii 96793

LOG NO: 2009.0021
DOC NO: 0901TD04
Archaeology

Dear Mr. Ginoza:

Subject: **Chapter 6E-8 Historic Preservation Review –**
Early Consultation for an Environmental Assessment, Ellison Onizuka Space Center
Kalaoa Ahupua'a, North Kona District, Island of Hawai'i
TMK: (3) 7-3-43: 3 (por.)

Thank you for notifying us of this proposed project and of your intent to complete an Environmental Assessment (EA). The project will involve construction of a new 7,335 square foot building on a two-acre project area, with future expansion of the building anticipated. The project area is located along the south side of Keahole Street, which provides access to the Kona International Airport. The proposed project site appears to be well outside the airport area and undeveloped at this time.

Our records indicate that archaeological inventory surveys and assessments have been conducted for a number of airport expansion projects since 1979 (cf. Barrera 1979, 1990, Escott and Spear 2008); however, it is not clear whether any of the prior study areas include the subject project area. We therefore request that a literature review of previous archaeological surveys in the general airport area be included in the EA, as well as the results of an archaeological field survey of the two-acre project area. If the field survey results in the identification of historic properties, we request that an inventory survey report be completed of the project area. If no historic properties are identified, an assessment report is sufficient. If possible, we would like the opportunity to review the inventory survey or assessment report prior to its attachment to the EA.

If you have any questions at this time, please contact Theresa Donham at (808) 933-7653.

Aloha,

Nancy A. McMahon

Nancy McMahon, Deputy SHPO/State Archaeologist
and Historic Preservation Manager
Historic Preservation Division

14

MUNEKIYO & HIRAGA, INC.

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

MARK ALEXANDER ROY

August 5, 2009

Nancy McMahon, State Archaeologist
State Historic Preservation Division
Department of Land and Natural Resources
601 Kamokila Boulevard, Room 555
Kapolei, Hawai`i 96709

SUBJECT: Proposed Astronaut Ellison S. Onizuka Space Center At Keahole, North Kona, Hawaii, TMK: (3) 7-3-043:003 (por.)

Dear Ms. McMahon:

Thank you for your letter dated January 12, 2009 providing comments on our request for early consultation on the subject project. We note your comments and confirm that the Draft Environmental Assessment (EA) document will include a literature review of previous archaeological surveys in the general airport area and an archaeological field survey of the 2-acre project site. A copy of the archaeological field survey will be sent to you upon completion. The Draft EA will also be provided for your review and comment.

Again, thank you for your comments.

Very truly yours,

Mich Hirano, AICP
Principal

MH:tn
cc: Kevin Funasaki, Department of Transportation, Airports Division
Richard Wong, KYA Design Studios
F:\DATA\KYA\Onizuka\SHPDresp.ltr.wpd

Hawaii Electric Light Company, Inc. • 74-5519 Kaiwi Street • Kailua-Kona, HI 96740-1684

JAN 0 7 2009

Cust 3-3-1
H-W/G

January 6, 2009

Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawaii 96793

Attention: Kyle Ginoza

Subject: Early Consultation Request for the Proposed
Ellison S. Onizuka Space Center
TMK: (3) 7-3-043:003, Keahole, North Kona, Hawaii

Gentlemen:

Hawaii Electric Light Company (HELCO) has received a request for early consultation comments from your office dated December 30, 2008.

HELCO is capable of serving the project from existing electrical facilities located on Keahole Street. The customer should submit electrical requirements for the project as early as possible in order to maintain their desired schedule.

Thank you for the opportunity to comment.

Best regards,

Kevin Whitener
Supervisor, Customer Engineering
Hawaii Electric Light Company, Inc.

KW:kkd

MUNEKIYO & HIRAGA, INC.

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

MARK ALEXANDER ROY

August 5, 2009

Kevin Whitener, Supervisor, Customer Engineering
Hawai`i Electric Light Company, Inc.
74-5519 Kaiwi Street
Kailua-Kona, Hawai`i 96740-1684

SUBJECT: Proposed Astronaut Ellison S. Onizuka Space Center At Keahole, North Kona, Hawai`i, TMK: (3) 7-3-043:003 (por.)

Dear Mr. Whitener:

Thank you for your letter dated January 6, 2009 providing comments on our request for early consultation on the subject project. We note your comments and confirm that the project design team will submit the electrical requirements for the project as soon as practicable and coordinate with Hawai`i Electric Light Company in the timely delivery of electrical services to the project site.

Again, thank you for your comments.

Very truly yours,

Mich Hirano, AICP
Principal

MH:tn
cc: Kevin Funasaki, Department of Transportation, Airports Division
Richard Wong, KYA Design Studios
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MAR 1 0 2009

PHONE (808) 594-1888

FAX (808) 594-1865

STATE OF HAWAI'I
OFFICE OF HAWAIIAN AFFAIRS
711 KAPI'OLANI BOULEVARD, SUITE 500
HONOLULU, HAWAI'I 96813

HRD09/4117

March 4, 2009

Kyle Ginoza
Munekiyo & Hiraga, Inc
305 High Street, Suite 104
Wailuku, Hawai'i 96793

RE: Early Consultation Request for the proposed Ellison S. Onizuka Space Center, Keahole, North Kona, Hawai'i Island, TMK: (3) 7-3-043: 003.

Aloha e Kyle Ginoza,

The Office of Hawaiian Affairs (OHA) received the above-mentioned letter on January 5, 2009. The State of Hawai'i, Department of Transportation, Airports Division proposes to develop a new Ellison S. Onizuka Space Center. The proposed project will also include bus and visitor parking, landscaping, and related supporting infrastructure. The project site is approximately 7,335 square feet located on Kona Airport property south of Keahole Street. OHA apologizes for the delayed response, and offers the following comments.

OHA has substantive obligations to protect the cultural and natural resources of Hawai'i for its beneficiaries, the people of this land. The Hawaii Revised Statutes mandate that OHA "[s]erve as the principal public agency in the State of Hawaii responsible for the performance, development, and coordination of programs and activities relating to native Hawaiians and Hawaiians; . . . and [t]o assess the policies and practices of other agencies impacting on native Hawaiians and Hawaiians, and conducting advocacy efforts for native Hawaiians and Hawaiians." (HRS § 10-3)

Chapter 343 of the Hawaii Revised Statues (HRS) requires that the Draft EA include a Cultural Impact Assessment (CIA). The CIA should include information relating to the traditional and customary practices and beliefs of the area's Native Hawaiians, and the community should be involved in this assessment. Consideration must also be afforded to any individuals accessing the project area for constitutionally protected traditional and customary purposes, in accordance with the Hawai'i State Constitution, Article XII, Section 7.

OHA requests clarification whether an archaeological inventory survey for the project will be submitted to the State Historic Preservation Division for review and approval. If so, OHA should be allowed the opportunity to comment on the criteria assigned to any cultural or archaeological sites identified within the archaeological inventory survey.

We request the applicant's assurances that should iwi kūpuna or Native Hawaiian cultural or traditional deposits be found during the construction of the project, work will cease, and the appropriate agencies will be contacted pursuant to applicable law.

In addition, OHA recommends that the applicant use native vegetation in its landscaping plan for the subject parcel. Landscaping with native plants furthers the traditional Hawaiian concept of mālama 'āina and creates a more Hawaiian sense of place.

Thank you for the opportunity to comment. If you have further questions, please contact Heidi Guth by phone at (808) 594-1962 or e-mail her at heidig@oha.org.

'O wau iho nō me ka 'oia'i'o,

Clyde W. Nāmu'o
Administrator

C: OHA West Hawai'i CRC Office

MUNEKIYO & HIRAGA, INC.

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

MARK ALEXANDER ROY

August 5, 2009

Clyde W. Namu`o, Administrator
Office of Hawaiian Affairs
711 Kapi'olani Boulevard, Suite 500
Honolulu, Hawai`i 96813

SUBJECT: Proposed Astronaut Ellison S. Onizuka Space Center At Keahole, North Kona, Hawai`i, TMK: (3) 7-3-043:003 (por.)

Dear Mr. Namu`o:

Thank you for your letter dated March 4, 2009 providing comments on our request for early consultation on the subject project. We note your comment that the Office of Hawaiian Affairs (OHA) has a mandate to protect the cultural and natural resources of Hawai`i for its beneficiaries. We confirm the Draft Environmental Assessment (EA) will include a Cultural Impact Assessment to identify potential impacts to the traditional and customary practices and beliefs of the area's native Hawaiians.

We also confirm an archaeological field survey will be carried out on the proposed 2-acre site. The survey report will be submitted to the State Historic Preservation Division for review and approval. We note your comment regarding any discovery of iwi kupuna, native Hawaiian cultural or traditional deposits and confirm that if discovered, all work will stop in the area of the find and the appropriate agencies will be contacted.

In response to your comment on the use of native plants in the site landscaping, we note that native vegetation will be used in the site landscaping, as practicable.

A copy of the Draft EA will be forwarded to OHA for review and comment.

Again, thank you for your comments.

Very truly yours,

Mich Hirano, AICP
Principal

MH:tn
cc: Kevin Funasaki, Department of Transportation, Airports Division
Richard Wong, KYA Design Studios
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JAN 0 7 2009

William P. Kenoi
Mayor

Lono A. Tyson
Director

County of Hawai'i
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
25 Aupuni Street • Hilo, Hawai'i 96720
(808) 961-8083 · Fax (808) 961-8086
http://co.hawaii.hi.us/directory/dir_envmng.htm

January 6, 2009

Mr. Kyle Ginoza, AICP
Project Manager
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, HI 96793

RE: Early Consultation Request for the Proposed Ellison S. Onizuka Space Center, TMK: (3) 7-3-043:003; Keahole, North Kona, Hawai'i

Dear Mr. Ginoza,

We offer the following comments:

Wastewater
The airport is currently served by a privately operated wastewater treatment plant.

Thank you for allowing us to review and comment on this project.

Sincerely,

Lono A Tyson

Lono A. Tyson
DIRECTOR

cc: WWD

1/4/09

William P. Kenoi
Mayor

Diane L. Ley
Interim Deputy Director

County of Hawaii

DEPARTMENT OF RESEARCH AND DEVELOPMENT

25 Aupuni Street, Room 109 • Hilo, Hawaii 96720-4252
(808) 961-8366 • Fax (808) 935-1205
E-mail: chresdev@co.hawaii.hi.us

January 23, 2009

Kyle Ginoza
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawai`i 96793

RE: Early Consultation Request for the Proposed Ellison S. Onizuka Space Center
TMK: (3) 7-3-043:003; Keahole, North Kona, Hawai`i

Dear Mr. Ginoza:

On behalf of the County of Hawai`i's Department of Research and Development, thank you for this opportunity to provide comments related to the Early Consultation Request for the Proposed Ellison S. Onizuka Space Center TMK: (3) 7-3-043:003; Keahole, North Kona, Hawai`i.

The proposed relocation of the Ellison S. Onizuka Space Center will enhance the overall accessibility for students, residents and visitors. Currently, its location with in the central terminal area is not conducive to visits due to limited visibility and parking. With added parking for passenger vehicles and buses expanded uses are foreseen such as events like AstroDay, which attracts thousands of interested families and visitors. Additionally, the relocation of the Center will support the Kona International Airport Master Plan's proposed expansion and improvements at the airport terminal.

With respect to issues and concerns, we encourage the review of the North and South Kona Community Development Plan (CDP), which was passed as a County ordinance in 2008. Through the CDP process, there has been a wealth of information gathered relative to the community's concerns and desires for the future of the region. The plan is available at www.hawaiiislandplan.com, or contact the Planning Department for further details about the plan and the implementation process.

The Department also recommends that the environmental assessment address the proposed level of energy consumption foreseen. Issues related to energy conservation and energy sustainability should be addressed as means of supporting and moving

toward the State's energy policies and those of the County of Hawai'i, as listed in the bullets below.

- All facilities should meet the minimum standards of the United States Environmental Protection Agency's Energy Star rating.
- All hot water requirements should be met with solar water heater units.
- All facilities should include radiative barriers or R-19 equivalent in roofs and R-11 in walls.
- Consideration should be given to the installation of a net-metered photovoltaic system.

The delivery and use of water is the single largest use of energy on the Island of Hawai'i; therefore, finding ways to reduce consumption of water will have the ancillary benefit of reducing energy consumption. The Department encourages the consideration of such features as low-flow faucets and toilets. In addition, landscaping that utilizes native and drought-tolerant plantings will reduce the need for watering.

Energy conservation and sustainability initiatives may afford the proposed project the ability to significantly offset its continuing electrical utility expenses and reduce its global footprint. Certification as a Leadership in Energy and Environmental Design (LEED) project would be a higher-recognition effort towards this end.

Again, thank you for this opportunity to provide comments.

Sincerely,

Diane Ley

Diane Ley
Interim Deputy Director

C: William Kenoi, Mayor County of Hawai'i

MUNEKIYO & HIRAGA, INC.

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

MARK ALEXANDER ROY

August 5, 2009

Diane Ley, Interim Deputy Director
County of Hawai`i
Department of Research and Development
25 Aupuni Street, Room 109
Hilo, Hawai`i 96720-4252

SUBJECT: Proposed Astronaut Ellison S. Onizuka Space Center At Keahole, North Kona, Hawai`i, TMK: (3) 7-3-043:003 (por.)

Dear Ms. Ley:

Thank you for your letter dated January 23, 2009 providing comments on our request for early consultation on the subject project.

We note your comment regarding review of the North and South Kona Community Development Plan and will include the information as pertinent in the Draft Environmental Assessment (EA).

We also note your comment that the Draft EA address the proposed level of energy consumption foreseen and address the energy saving features of the building design. In this regard, we note the space center building will be registered for LEEDs silver certification and will incorporate a number of energy saving and water conservation design features which adhere to environmentally sustainable construction methods. Specific goals include 30 percent reduction in energy use through use of radiant heating and cooling system with supplemental displacement air system; extensive daylighting to offset lighting energy; building massing to limit direct solar gain; and 5 percent of energy use will be generated by an onsite solar array.

We note your comments on the use of native vegetation and confirm the native and drought tolerant plantings will be used in the site landscaping as part of the LEED certification.

A copy of the Draft EA will be forwarded to you for review and comment.

Again, thank you for your comments.

Very truly yours,

Mich Hirano, AICP
Principal

MH:tn
cc: Kevin Funasaki, Department of Transportation, Airports Division
Richard Wong, KYA Design Studios
F:\DATA\KYA\Onizuka\DeptResearchresp.ltr.wpd

JAN 2 8 2009

DEPARTMENT OF WATER SUPPLY • COUNTY OF HAWAI'I
345 KEKŪANAŌ'A STREET, SUITE 20 • HILO, HAWAI'I 96720
TELEPHONE (808) 961-8050 • FAX (808) 961-8657

January 22, 2009

Mr. Kyle Ginoza
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, HI 96793

PRE-ENVIRONMENTAL ASSESSMENT CONSULTATION
PROPOSED ELLISON S. ONIZUKA SPACE CENTER
TAX MAP KEY 7-3-043:003 (PORTION)

We have reviewed the subject Pre-Environmental Assessment consultation information and have the following comments.

Water can be made available from an existing 12-inch waterline within Keahole Street fronting the proposed project site. It is not anticipated that the proposed project will generate a significant increase in water demand, as the project involves the replacement of the existing Ellison S. Onizuka Space Center, located at the main terminal building. However, the Department will still request estimated maximum daily water usage calculations, prepared by a professional engineer licensed in the State of Hawai'i, to determine the appropriate meter size(s) to serve the project. The water usage calculations should include the estimated maximum daily water demand for domestic and landscaping purposes in gallons per day as well as the estimated peak flow in gallons per minute.

Please be informed that the applicant will be required to install a reduced pressure type backflow prevention assembly must be installed on private property within five (5) feet of any meter serving the project; the installation of which must be inspected and approved by the Department before water service can be activated.

Should there be any questions, you may contact Mr. Finn McCall of our Water Resources and Planning Branch at 961-8070, extension 255.

Sincerely yours,

Milton D. Pavao, P.E.
Manager

FM:dfg

... Water brings progress...

MUNEKIYO & HIRAGA, INC.

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

MARK ALEXANDER ROY

August 5, 2009

Milton D. Pavao, P.E., Manager
Department of Water Supply
County of Hawai`i
345 KeKuanao`a Street, Suite 20
Hilo, Hawai`i 96720

SUBJECT: Proposed Astronaut Ellison S. Onizuka Space Center At Keahole, North Kona, Hawai`i, TMK: (3) 7-3-043:003 (por.)

Dear Mr. Pavao:

Thank you for your letter dated January 22, 2009 providing comments on our request for early consultation on the subject project.

We note your comment regarding water service availability from the existing 12-inch line within Keahole Street fronting the proposed project site.

We acknowledge and confirm that an estimed maximum daily water usage caclulations, prepared by a profession engineer licensed in the State of Hawai`i will be provided for your department's review and approval.

We also note the State Department of Transportation, Airports Division will install a reduced pressure type backflow prevention assembly as per the Department of Water Supply requirements and design standards.

A copy of the Draft EA will be forwarded to you for review and comment.

Again, thank you for your comments.

Very truly yours,

Mich Hirano, AICP
Principal

MH:tn
cc: Kevin Funasaki, Department of Transportation, Airports Division
Richard Wong, KYA Design Studios
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William P. Kenoi
Mayor

Darryl J. Oliveira
Fire Chief

Glen P. I. Honda
Deputy Fire Chief

County of Hawai'i
HAWAII FIRE DEPARTMENT
25 Aupuni Street • Suite 103 • Hilo, Hawai'i 96720
(808) 981-8394 • Fax (808) 981-2037

JAN 2 3 2009

January 20, 2009

Mr. Kyle Ginoza
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawai'i 96793

SUBJECT: EARLY CONSULTATION FOR DRAFT ENVIRONMENTAL ASSESSMENT
PROJECT: NEW ELLISON S. ONIZUKA SPACE CENTER, KEAHOLE
TMK: (3) 7-3-043:003

In regards to the above-mentioned early consultation, the following shall be in accordance:

Fire apparatus access roads shall be in accordance with UFC Section 10.207:

"**Fire Apparatus Access Roads**

"**Sec. 10.207.** (a) **General.** Fire apparatus access roads shall be provided and maintained in accordance with the provisions of this section.

"(b) **Where Required.** Fire apparatus access roads shall be required for every building hereafter constructed when any portion of an exterior wall of the first story is located more than 150 feet from fire department vehicle access as measured by an unobstructed route around the exterior of the building.

"**EXCEPTIONS:** 1. When buildings are completely protected with an approved automatic fire sprinkler system, the provisions of this section may be modified.

"2. When access roadways cannot be installed due to topography, waterways, nonnegotiable grades or other similar conditions, the chief may require additional fire protection as specified in Section 10.301 (b).

"3. When there are not more than two Group R, Division 3 or Group M Occupancies, the requirements of this section may be modified, provided, in the opinion of the chief, fire-fighting or rescue operations would not be impaired.

"More than one fire apparatus road may be required when it is determined by the chief that access by a single road may be impaired by vehicle congestion, condition of terrain, climatic conditions or other factors that could limit access.

"For high-piled combustible storage, see Section 81.109.

"(c) **Width.** The unobstructed width of a fire apparatus access road shall meet the requirements of the appropriate county jurisdiction.

"(d) **Vertical Clearance.** Fire apparatus access roads shall have an unobstructed vertical clearance of not less than 13 feet 6 inches.

"**EXCEPTION:** Upon approval vertical clearance may be reduced, provided such reduction does not impair access by fire apparatus and approved signs are installed and maintained indicating the established vertical clearance.

"(e) **Permissible Modifications.** Vertical clearances or widths required by this section may be increased when, in the opinion of the chief, vertical clearances or widths are not adequate to provide fire apparatus access.

"(f) **Surface.** Fire apparatus access roads shall be designed and maintained to support the imposed loads of fire apparatus and shall be provided with a surface so as to provide all-weather driving capabilities." (20 tons)

"(g) **Turning Radius.** The turning radius of a fire apparatus access road shall be as approved by the chief." (45 feet)

"(h) **Turnarounds.** All dead-end fire apparatus access roads in excess of 150 feet in length shall be provided with approved provisions for the turning around of fire apparatus.

"(i) **Bridges.** When a bridge is required to be used as access under this section, it shall be constructed and maintained in accordance with the applicable sections of the Building Code and using designed live loading sufficient to carry the imposed loads of fire apparatus.

"(j) **Grade.** The gradient for a fire apparatus access road shall not exceed the maximum approved by the chief." (15%)

"(k) **Obstruction.** The required width of any fire apparatus access road shall not be obstructed in any manner, including parking of vehicles. Minimum required widths and clearances established under this section shall be maintained at all times.

"(l) **Signs.** When required by the fire chief, approved signs or other approved notices shall be provided and maintained for fire apparatus access roads to identify such roads and prohibit the obstruction thereof or both."

Water supply shall be in accordance with UFC Section 10.301(c):

"(c) **Water Supply.** An approved water supply capable of supplying required fire flow for fire protection shall be provided to all premises upon which buildings or portions of buildings are hereafter constructed, in accordance with the respective county water requirements. There shall be provided, when required by the chief, on-site fire hydrants and mains capable of supplying the required fire flow.

"Water supply may consist of reservoirs, pressure tanks, elevated tanks, water mains or other fixed systems capable of providing the required fire flow.

"The location, number and type of fire hydrants connected to a water supply capable of delivering the required fire flow shall be protected as set forth by the respective county water requirements. All hydrants shall be accessible to the fire department apparatus by roadways meeting the requirements of Section 10.207.

DARRYL OLIVEIRA
Fire Chief

GN:lpc

MUNEKIYO & HIRAGA, INC.

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

MARK ALEXANDER ROY

August 5, 2009

Darryl Oliveira, Fire Chief
Hawai`i Fire Department
County of Hawai`i
25 Aupuni Street, Suite 103
Hilo, Hawai`i 96720

SUBJECT: Proposed Astronaut Ellison S. Onizuka Space Center At Keahole, North Kona, Hawai`i, TMK: (3) 7-3-043:003 (por.)

Dear Chief Oliveira:

Thank you for your letter dated January 20, 2009 providing comments on our request for early consultation on the subject project.

We note your comments regarding design compliance with applicable fire regulations and code requirements. Early coordination with the project architect and the Hawai`i Fire Department will be carried to ensure that the proposed project meets all applicable codes and regulations.

A copy of the Draft EA will be forwarded to you for review and comment.

Again, thank you for your comments.

Very truly yours,

Mich Hirano, AICP
Principal

MH:tn
cc: Kevin Funasaki, Department of Transportation, Airports Division
Richard Wong, KYA Design Studios
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JAN 1 6 2009

William P. Kenoi
Mayor

Daryn S. Arai
Acting Planning Director

County of Hawaii

PLANNING DEPARTMENT
Aupuni Center • 101 Pauahi Street, Suite 3 • Hilo, Hawaii 96720
Phone (808) 961-8288 • Fax (808) 961-8742

January 14, 2009

Mr. Kyle Ginoza
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawaii 96793

Dear Mr. Ginoza:

Subject: **Early Consultation for Draft Environmental Assessment**
Project: **Onizuka Space Center**
TMK: **(3) 7-3-043:003; Keahole Airport, North Kona, Hawaii**

Thank you for your letter dated December 30, 2008, requesting comments from this office regarding the preparation of a Draft Environmental Assessment.

The subject parcel is zoned General Industrial (MG-1a) and Open by the County. However, the project site is in the General Industrial designated area. The property is designated Urban and Conservation by the State Land Use Commission. However, the proposed space center project site is located in the Urban designated area. According to the General Plan's Land Use Pattern Allocation Guide Map (LUPAG), the entire parcel is designated Industrial, Conservation and Open. The project site for the proposed space center is in the Industrial designated area. In addition, the entire subject parcel is in the County's Special Management Area (SMA).

Our department has not yet received the Kona International Airport Master Plan update. Please ensure that the plan provides for this proposed relocation, and include that discussion in your Draft Environmental Assessment (EA).

Please note that although there have been several SMA Use Permits approved for the subject parcel. This project will require an additional SMA Use Permit be submitted to the County of Hawaii Planning Commission for their review and approval.

We have no further comments to offer, at this time. If you have any further questions or if you need further assistance, please feel free to contact Bethany Morrison of this office at 961-8288 extension 252.

Sincerely,

DARYN S. ARAI
Acting Planning Director

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cc: Planning Department- Kona

Mr. Richard Wong
KYA Design Group
934 Pumehana Street
Honolulu, HI 96826

Mr. Kevin Funasaki, Project Engineer
Airports Division
Department of Transportation
State of Hawaii
400 Rodgers Blvd., Suite 700
Honolulu, HI 96819-1880

MUNEKIYO & HIRAGA, INC.

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

MARK ALEXANDER ROY

August 5, 2009

Daryn S. Arai, Acting Planning Director
Department of Planning
County of Hawaii
101 Pauahi Street, Suite 3
Hilo, Hawai`i 96720

SUBJECT: Proposed Astronaut Ellison S. Onizuka Space Center At Keahole, North Kona, Hawai`i, TMK: (3) 7-3-043:003 (por.)

Dear Mr. Arai:

Thank you for your letter dated January 14, 2009 providing comments on our request for early consultation on the subject project.

We note your comments regarding the land use designations for the subject property.

We acknowledge your comments regarding the Kona International Airport Master Plan update and will provide information on the proposed Astronaut Ellison S. Onizuka Space Center in the context of the airport plan update in the Draft Environmental Assessment (EA).

We also note the project site is in the Special Management Area (SMA) and an SMA Use Permit will be required for the proposed project. We will coordinate the submission of the SMA Use Permit with your department upon completion of the EA review.

A copy of the Draft EA will be forwarded to you for review and comment.

Again, thank you for your comments.

Very truly yours,

Mich Hirano, AICP
Principal

MH:tn
cc: Kevin Funasaki, Department of Transportation, Airports Division
Richard Wong, KYA Design Studios
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JAN 2 8 2009

William P. Kenoi
Mayor

Harry S. Kubojiri
Police Chief

Paul K. Ferreira
Deputy Police Chief

County of Hawaii

POLICE DEPARTMENT
349 Kapiolani Street • Hilo, Hawaii 96720-3998
(808) 935-3311 • Fax (808) 961-2389

January 12, 2009

Mr. Kyle Ginoza, AICP
Project Manager
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawaii 96793

Dear Mr. Ginoza:

SUBJECT: Early Consultation Request for the Proposed Ellison S. Onizuka Space Center
Keahole, North Kona, Island of Hawaii
TMK: 7-3-043:003

This responds to your December 30, 2008, letter requesting comments on the above proposed project.

Staff has reviewed the above referenced document and submits the following comments:

- Recommends development address issues or concerns related to traffic safety and flow.
- Ensure traffic design addresses emergency response plans.
- Implement strategies to address pedestrian safety.

Should you have any questions, please contact Captain Chad Basque, Commander of Kona Patrol, at 326-4646, extension 249.

Mahalo,

HARRY S. KUBOJIRI
POLICE CHIEF

HENRY J. TAVARES JR.
ASSISTANT CHIEF
AREA II OPERATIONS

MUNEKIYO & HIRAGA, INC.

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

MARK ALEXANDER ROY

August 5, 2009

Harry S. Kubojiri, Police Chief
Police Department
County of Hawai`i
349 Kapiolani Street
Hilo, Hawai`i 96720

SUBJECT: Proposed Astronaut Ellison S. Onizuka Space Center At Keahole, North Kona, Hawai`i, TMK: (3) 7-3-043:003 (por.)

Dear Chief Kubojiri:

Thank you for your letter dated January 12, 2009 providing comments on our request for early consultation on the subject project.

We note your comments regarding concerns related to traffic safety and flow, emergency response plans, and pedestrian safety and will address these issues in the Draft Environmental Assessment (EA). A Traffic Impact Assessment Report (TIAR) will be carried out for the proposed project and will be included in the findings of the Draft EA.

A copy of the Draft EA will be forwarded to you for review and comment.

Again, thank you for your comments.

Very truly yours,

Mich Hirano, AICP
Principal

MH:tn
cc: Kevin Funasaki, Department of Transportation, Airports Division
Richard Wong, KYA Design Studios
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IX. REFERENCES

IX. REFERENCES

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U.S. Department of Agriculture Soil Conservation Service. Soil Survey of Island of Hawai`i, State of Hawai`i, 1973.

APPENDIX A.

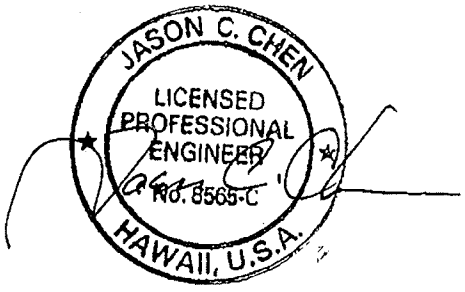
Engineering Report - Storm Drainage System for Astronaut Ellison S. Onizuka Space Center

ENGINEERING REPORT

Storm Drainage System
for
Astronaut Ellison S. Onizuka Space Center Site Preparation Phase I
AH2081-12
Kona International Airport

June, 2009

Prepared by



JC Engineering, LLC

1.0 PURPOSE

This report is prepared for the engineering analysis of the proposed Astronaut Ellison S. Onizuka Space Center Site Preparation Phase I project, AH2081-12 at Kona International Airport.

2.0 PRE-DEVELOPMENT CONDITION

2.1 TOPOGRAPHY CONDITION

The proposed Astronaut Ellison S. Onizuka Space Center site, approximately 250-foot-wide (north-to-south) by 325-foot-long (east-to-west), is located on the south side of Keahole Street (airport access road), approximately 1,200 feet west of Queen Kaahumanu Highway, the southeast corner of Kona International Airport property (Tax Key Number of 3rd Division 7-3-43:3), western edge of Hualalai Mountain, and consists almost entirely of barren a'a and pahoehoe lava flows created during the eruption 1801 (see Figure 1). The existing land is generally level to gently sloping, with slopes in the 2 to 4 percent range (see Figure 2).

2.2 SOIL CONDITION

The U.S. Department of Agriculture Soil Conservation Service has classified the soil type as lava flows, a'a (rLV) and pahoehoe (rLW). The lava flows have practically no soil covering and are virtually devoid of vegetation. Detailed Land Classification Report for the island of Hawaii, published by the Land Study Bureau, has designated the lands at the airport as Class E (lands that are very poor and least suited for agriculture).

2.3 CLIMATIC CONDITION

The Climate of Hawaii is relatively moderate throughout most of the State and most of the year, significant differences in these parameters may occur from one location to another. Most differences in regional and local climates within the State are caused by the mountainous topography.

The climate on the northwest side of the Island of Hawaii is influenced more by local heating and cooling of the ground than by the effect of trade-winds prevalent in the rest of the State. This is characteristic of the Kona area, which experiences a diurnal land/sea wind pattern. Normal trade-winds are blocked by the mountain masses of Mauna Kea (13,784 feet above MSL), Mauna Loa (13,680 feet above MSL), the Kohala Mountains, Kilauea, and Hualalai (8,251 feet above MSL). During the day, the land is warmer than the ocean and the resulting pressure gradient causes winds to blow from the ocean towards the land. In the evening, the reverse occurs and as the land cools, the evening and night breezes blow from the land towards the warmer ocean.

The average temperature in the area is about 75 degrees Fahrenheit and annual rainfall is less than 25 inches along the coastline. The heaviest rains are brought by winter storms during the October to April season (Atlas of Hawaii, 1983).

The rainfall within the airport boundaries by Plate 1 of the Storm Drainage Standard, published by the Department of Public Works, County of Hawaii, 1970, is 1.95 inches for the intensity of rain for 1-hour 10-year. This is the criterion for storm drainage design in accordance with the Storm Drainage Standard required by the Department of Public Works, County of Hawaii.

Evaporation rates are typically high, in the general range of 0.18 inches per day during winter and 0.36 inches during summer as measured at Anaehoomalu. There are no pan evaporation measurements for the Keahole area. This analysis will not consider the evaporation rate to reduce the quantity of runoff.

2.4 DRAINAGE CONDITION

The land within the Kona International Airport boundaries does not contain any naturally defined waterways. Runoff rapidly infiltrates into the ground due to the porous nature of the lava fields.

The coastline surrounding the airport area is rough, rocky, and low. Near-shore waters are classified "AA" according to the Water Quality Standards Map of the Island of Hawaii, October 1987 (Figure 3), by the Office of Environmental Planning and State Department of Health (DOH). Class "AA" waters are one of two designations of open coastal waters by the State DOH. Class "AA" waters are intended to remain in their natural pristine state as nearly as possible with an absolute minimum of pollution or alteration of water quality from any human caused source or actions. Class "AA" waters are the most stringently regulated of open coastal water classifications.

Minimizing runoff directly discharges into Class "AA" water from the airport boundaries, 65 drainage injection wells, having a diameters of approximately 2 to 6 feet and a depth of approximately 9 to 30 feet, have been constructed within the airport boundaries, under "Underground Injection Control (UIC) Permit Number of UH-1673, Facility Identification Number of 8-4462.02", issued by the State DOH. The existing dry well locations within the airport boundary are shown in Figure 4.

The permit regulates operating conditions as follows:

A. Injectant Characteristics

Untreated rainfall water from the roadway and pavement areas.

B. Injection Limitations and Prohibitions

(1) Injectant in this permit is exclusively limited to the injectant described in above; furthermore, any injectant not described in above is explicitly prohibited unless the injectant characteristics of the permit are revised accordingly.

(2) No discharge of hazardous wastes as defined by Title 40, Code of Federal Regulations (CFR), Part 261.

(3) Injection Pressure. Result of gravity flow of the runoff water into the injection well.

(4) Disposal Quantity and Rate. Intermittent and variable up to approximately 150,921

gallons per minute, gpm, at peak flow conditions for the entire drainage system.

2.5 WATERSHED ANALYSES

The existing watershed for the existing Dry Well #33 is approximately 35.87 acres of lava field. The location of existing Dry Well #33 is approximately 19°43'56"N and 156°02'18"W. Current permitted injection rate for Dry Well #33 is 507 gpm or 1.13 cubic feet per second (cfs). The highest elevation within the watershed is 138 feet above MSL and the lowest elevation is 98 feet MSL at the dry well location. The longest line of flow is 2,290 feet.

Based on above data and the Storm Drainage Standards, published by the Department of Public Works, County of Hawaii, the peak injection rate for Dry Well #33 is estimated to be as follows:

A. Runoff Coefficient ("C")

Runoff coefficient, "C", determined from Table 1 of the Storm Drainage Standards, is 0.0049.

B. Determine Time of Concentration ("T_c") based on Plate 5 of the Storm Drainage Standards,

$$K = L / (S)^{0.5} \text{ and } T_c = 0.0078\ K^{0.77}$$

Where, L = 2,290 feet and S = (138 – 98) / 2,290 = 0.0175

Thus, K = 17,311 and T_c = 14.31 minutes

C. Determine Intensity-Duration (1-Hour 10-Year) rainfall based on Plate 4 of the Storm Drainage Standards,

When T_c is 14.31 minutes, the rainfall intensity, I, is 3.60 in/hr.

D. Estimate Pre-Development Condition Runoff Discharge Rate for Watershed of Dry Well #33,

$$\begin{aligned} Q &= CIA \\ &= 0.0049 \times 3.60 \times 35.87 \\ &= 0.63 \text{ cfs} < 1.13 \text{ cfs (permitted discharge rate)} \end{aligned}$$

Where, C = 0.0049, I = 3.60 in/hr, and A= 35.87 acres

The discharge rate of 0.63cfs (runoff for intensity of 1-hour, Tm = 10-Year) for pre-development condition meets both the DOH UIC permit and Hawaii County storm drainage criteria.

3.0 POST-DEVELOPMENT CONDITION

3.1 PROJECT IMPROVEMENTS

The project will subdivide the existing Dry Well #33 into two watersheds, #33-A and #33-B. The proposed dry well, Dry Well #33A, will be constructed in the watershed #33-A to discharge the runoff from the watershed (see Figure 5), runoff from the Watershed #33-B area will discharge into the existing Dry Well #33.

3.2 WATERSHED ANALYSES

A Watershed #33-B

The total area of Watershed #33-B is approximately 17.14 acres of existing lave field. The existing Dry Well #33 will discharge the area runoff from the watershed. The permitted injection rate for Dry Well #33 is 507 gpm or 1.13 cubic feet per second (cfs). The highest elevation within the watershed is 104 feet above MSL and the lowest elevation is 98 feet MSL at the dry well location. The longest line of flow is 860 feet.

Based on above data and the Storm Drainage Standards, published by the Department of Public Works, County of Hawaii, the peak injection rate for existing Dry Well #33 is estimated to be as follows:

(1) Runoff Coefficient ("C")

Runoff coefficient, "C", determined from Table 1 of the Storm Drainage Standards, is 0.008.

(2) Determine Time of Concentration ("T_c") based on Plate 5 of the Storm Drainage Standards,

$$K = L / (S)^{0.5} \text{ and } T_c = 0.0078\ K^{0.77}$$

Where, L = 860 feet and S = (103 – 98) / 860 = 0.0058

Thus, K = 11,292 and T_c = 10.30 minutes

(3) Determine Intensity-Duration (1-Hour 10-Year) rainfall based on Plate 4 of the Storm Drainage Standards,

When T_c is 10.30 minutes, the rainfall intensity, I, is 4.05 in/hr.

(4) Estimate Pre-Development Condition Runoff Discharge Rate for Watershed of Dry Well #14,

$$Q = CIA$$
$$= 0.0049 \times 4.05 \times 17.14$$
$$= 0.34 \text{ cfs} < 1.13 \text{ cfs (permitted discharge rate)}$$

Where, C = 0.0049, I = 4.05 in/hr, and A= 17.14 acres

The discharge rate of 0.34 cfs (runoff for intensity of 1-hour, Tm = 10-Year) for post-development condition meets both the DOH UIC permit and Hawaii County storm drainage criteria.

B. Watershed #33-A

The total area of Watershed #33-A is approximately 18.73 acres, including an improvement area of 2.61 acres and existing lave field area of 16.12 acres. The proposed Dry Well #33A will discharge the area runoff from the watershed. The location of proposed Dry Well #33A is located at 19°43'58"N and 156°02'05"W. The highest elevation within the watershed is 138 feet above MSL and the lowest elevation is 103 feet MSL at the dry well location. The longest line of flow is 1,430 feet.

Based on above data and the Storm Drainage Standards, published by the Department of Public Works, County of Hawaii, the peak injection rate for existing Dry Well #33A is estimated to be as follows:

(1) Weighted Runoff Coefficient ("C")

Land Cover	Runoff "C"	Area	Weighed "C"
Existing Lava Field Area	0.0049	16.12 acres	0.0790
Proposed Improved Area	0.5500	2.61 acres	1.4355
Weighed Coefficient	**0.0809**	**18.73 acres**	**1.5145**

Runoff coefficient, "C", is determined from Table 1 of the Storm Drainage Standards.

(2) Determine Time of Concentration ("T_c") based on Plate 5 of the Storm Drainage Standards,

$$K = L / (S)^{0.5} \text{ and } T_c = 0.0078\ K^{0.77}$$

Where, L = 1,430 feet and S = (138 – 103) / 1,430 = 0.0245

Thus, K = 9,141and T_c = 8.75 minutes

(3) Determine Intensity-Duration (1-Hour 10-Year) rainfall based on Plate 4 of the Storm Drainage Standards,

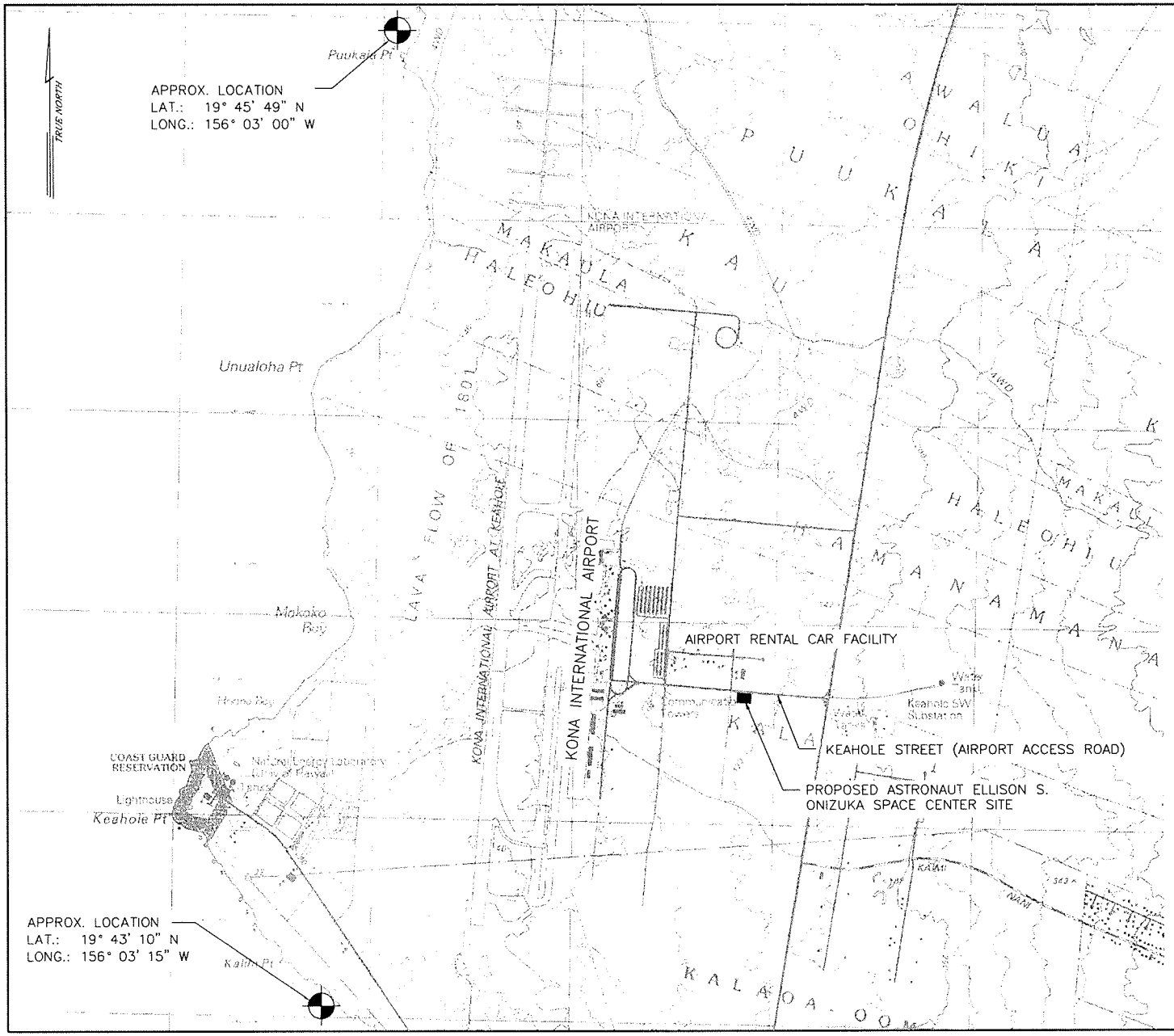
When T_c is 8.75 minutes, the rainfall intensity, I, is 4.30 in/hr.

(4) Estimate Pre-Development Condition Runoff Discharge Rate for Watershed of Dry Well #14,

$$Q = CIA$$
$$= 0.0809 \times 4.30 \times 18.73$$
$$= 6.52 \text{ cfs}$$

Where, C = 0.0809, I = 4.30 in/hr, and A= 18.73 acres

The proposed Dry Well #33A will be designed to a discharge rate of 6.52 cfs (runoff for intensity of 1-hour, Tm = 10-Year) for post-development condition in order to meet the Hawaii County storm drainage criteria.



Airports Division
DEPARTMENT OF TRANSPORTATION
STATE OF HAWAII

JASON C. CHEN
LICENSED PROFESSIONAL ENGINEER
no. 8580-C
HAWAII, U.S.A.

This work was prepared by me or under my supervision and construction of this project will be under my observation.

signature 4/30/10 expiration date of this license

DSGN.	DRWN.	CHKD.	APPD.
H.S.	D.C.	A.Y.	J.C.

KEY PLAN / NOTES:

NO.	DATE	REVISIONS

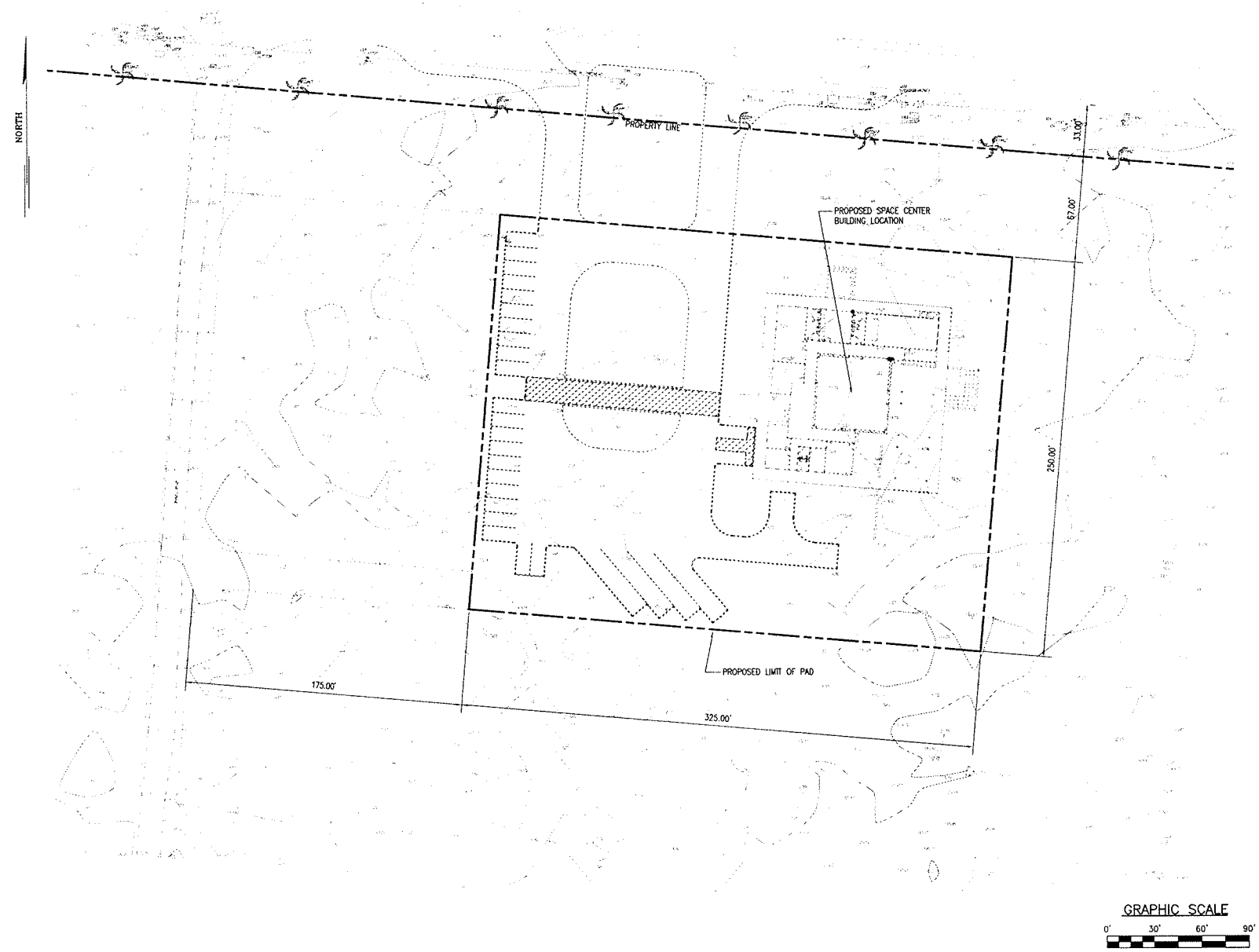
PROJECT TITLE:
ASTRONAUT ELLISON S. ONIZUKA SPACE CENTER SITE PREPARATION PHASE I
AT
KONA INTERNATIONAL AIRPORT

PROJECT NO.:
STATE PROJECT NO. AH2081-12
TMK 7-3-43:3

SHEET TITLE:
PROJECT LOCATIONS

DATE:
JUNE 2009

DWG. NO.:
FIGURE 1



Airports Division
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This work was prepared by me or under my supervision and construction of this project will be under my observation.

signature 4/30/10 expiration date of this license

DSGN.	DRWN.	CHKD.	APPD.
H.S.	D.C.	A.Y.	J.C.

KEY PLAN / NOTES:

NO.	DATE	REVISIONS

PROJECT TITLE:

ASTRONAUT ELLISON S. ONIZUKA SPACE CENTER
SITE PREPARATION PHASE I

AT

KONA INTERNATIONAL AIRPORT

PROJECT NO.:

STATE PROJECT NO. AH2081-12
TMK 7-3-43:3

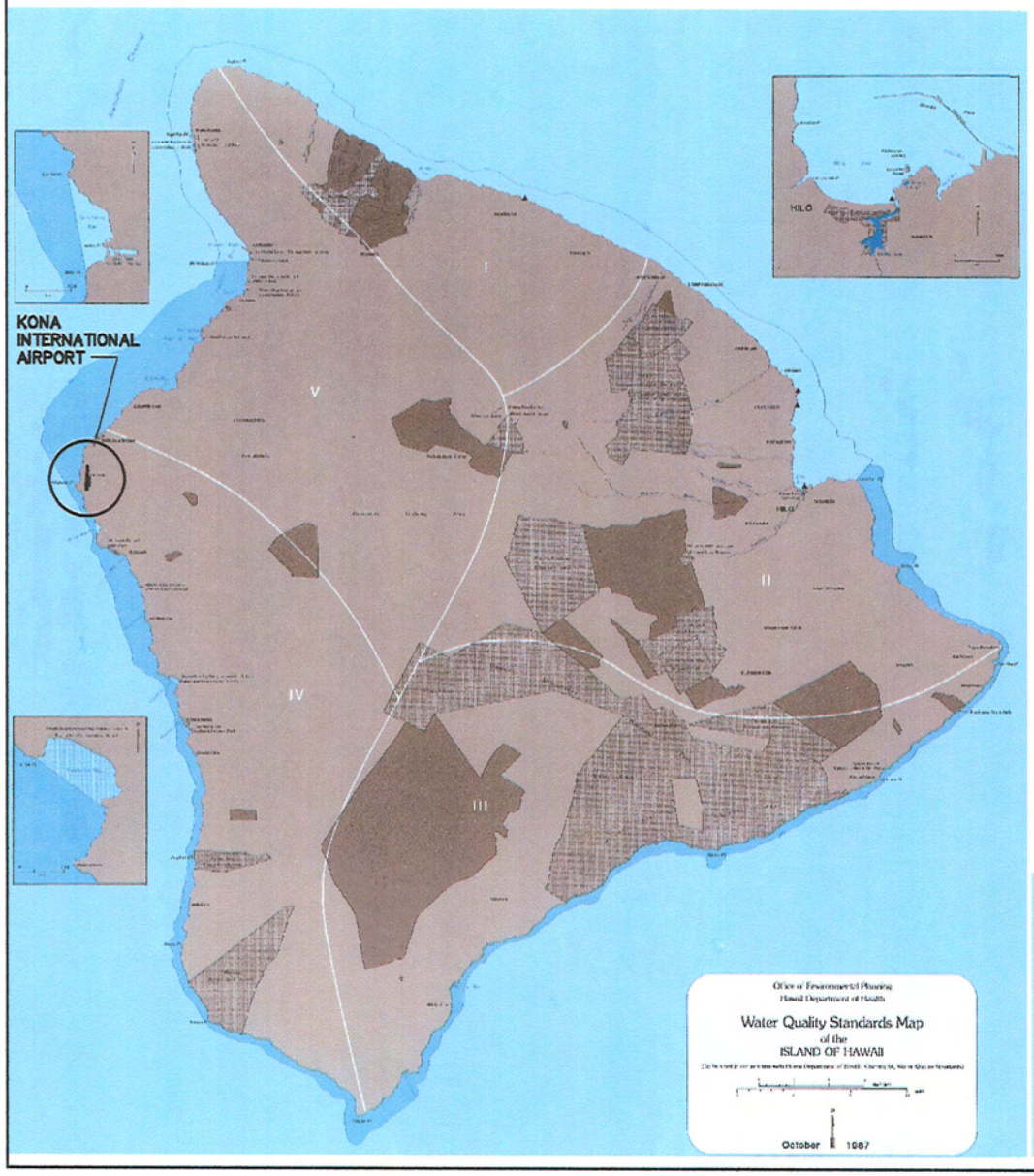
SHEET TITLE:

SITE PRE-DEVELOPMENT CONDITION

DATE:
JUNE 2009

DWG. NO.:

FIGURE 2



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KEY PLAN / NOTES:

NO.	DATE	REVISIONS

PROJECT TITLE:

ASTRONAUT ELLISON S. ONIZUKA SPACE CENTER
SITE PREPARATION PHASE I
AT
KONA INTERNATIONAL AIRPORT

PROJECT NO.:

STATE PROJECT NO. AH2081-12
TMK 7-3-43:3

SHEET TITLE:

WATER QUALITY STANDARDS MAP

DATE:
JUNE 2009

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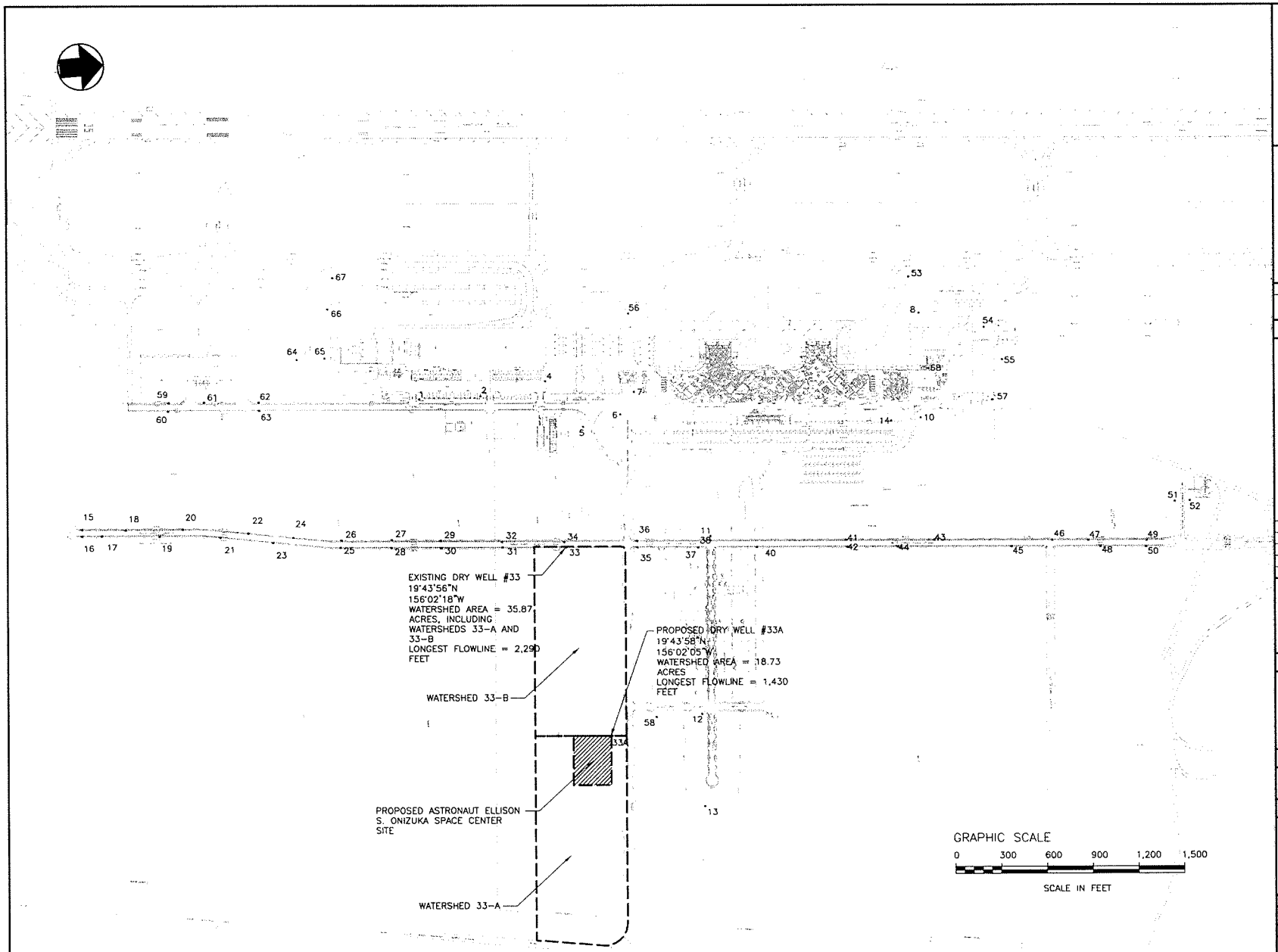
FIGURE 3



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KEY PLAN / NOTES:

NO.	DATE	REVISIONS

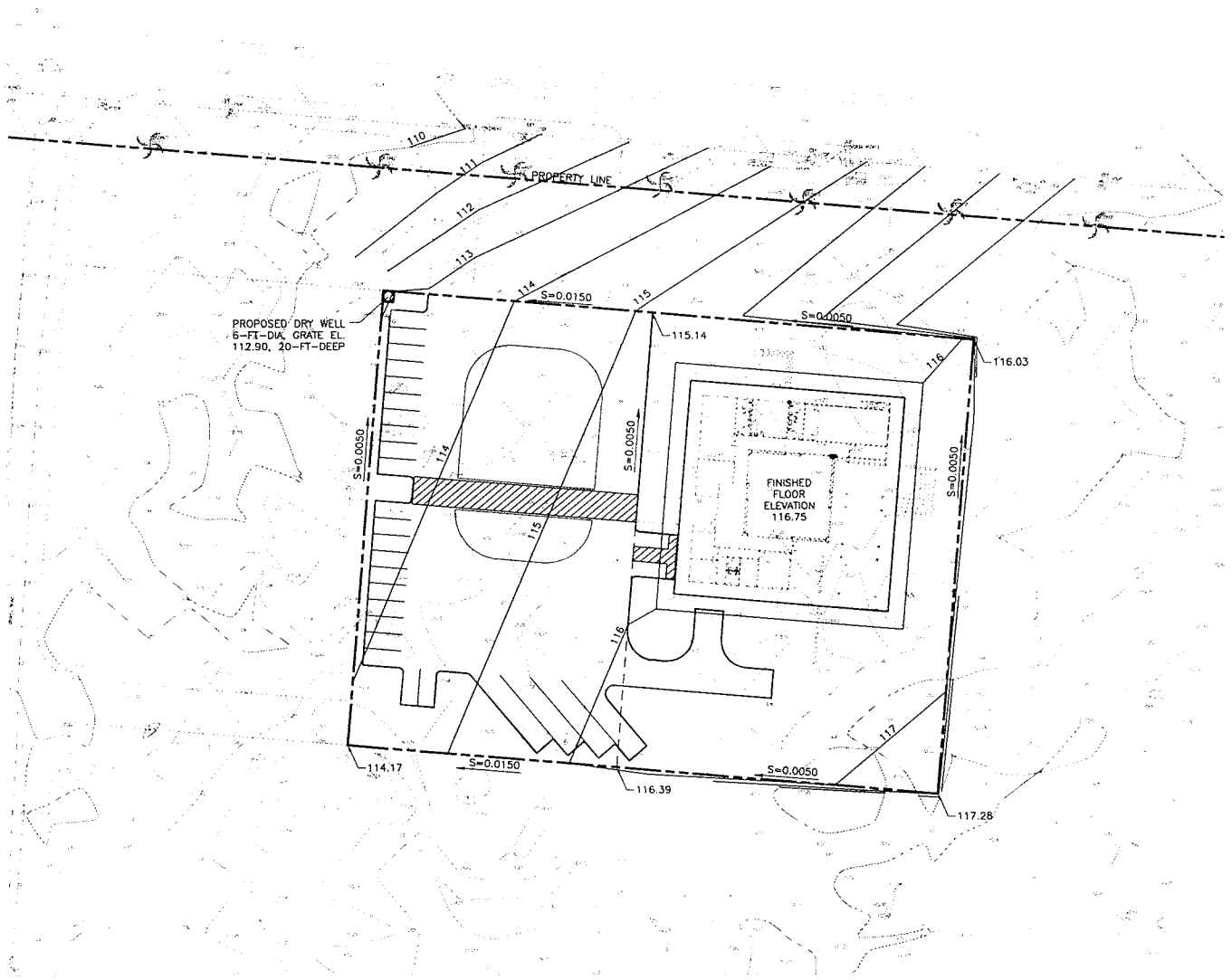
PROJECT TITLE:
ASTRONAUT ELLISON S. ONIZUKA SPACE CENTER
SITE PREPARATION PHASE I
AT
KONA INTERNATIONAL AIRPORT

PROJECT NO.:
STATE PROJECT NO. AH2081-12
TMK 7-3-43:3

SHEET TITLE:
EXISTING DRY WELL LOCATION PLAN

DATE:
JUNE 2009
DWG. NO.:

FIGURE 4



GRAPHIC SCALE

0' 30' 60' 90'

Airports Division
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DSGN.	DRWN.	CHKD.	APPD.
H.S.	D.C.	A.Y.	J.C.

KEY PLAN / NOTES:

NO.	DATE	REVISIONS

PROJECT TITLE:

ASTRONAUT ELLISON S. ONIZUKA SPACE CENTER
SITE PREPARATION PHASE I
AT
KONA INTERNATIONAL AIRPORT

PROJECT NO.:

STATE PROJECT NO. AH2081-12
TMK 7-3-43:3

SHEET TITLE:

SITE POST-DEVELOPMENT CONDITION FOR ROUGH GRADING PHASE

DATE:
JUNE 2009

DWG. NO.:

FIGURE 5

APPENDIX B.

Archaeological Inventory Survey Report

SCS Project Number 1040-1

AN ARCHAEOLOGICAL INVENTORY SURVEY OF 5.423 ACRES FOR THE PROPOSED ONIZUKA SPACE CENTER, KALAOA 3rd AHUPUA'A , NORTH KONA DISTRICT, ISLAND OF HAWAI'I, HAWAI'I [TMK (3) 7-3-043:003 POR.]

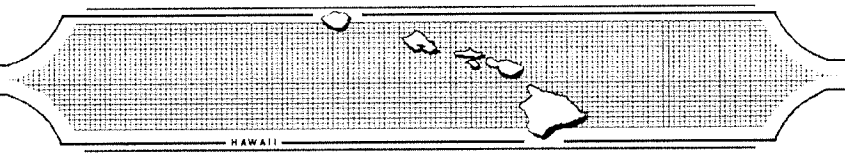
Prepared By:
Glenn G. Escott, M.A.
and
Suzan Keris, B.A.

June 2009

Draft Report

Prepared For:
Munekiyo & Hiraga, Inc.
305 High Street
Wailuku, HI 96793

SCIENTIFIC CONSULTANT SERVICES Inc.



711 Kapiolani Blvd. Suite 975 Honolulu, Hawai'i 96813

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INTRODUCTION

At the request of Munekiyo & Hiraga, Inc., Scientific Consultant Services, Inc. (SCS) conducted an archaeological inventory survey (AIS) of a 5.423-acre parcel of land [TMK: (3)-7-3-43:003 por.] located at the Kona International Airport in the Ahupua'a of Kalaloa 3rd, North Kona District, Island of Hawai'i (Figures 1, 2, and 3). Scientific Consultant Services (SCS), Inc. conducted the AIS to identify and evaluate historical properties pursuant to state cultural resource management regulations (HAR § 275 and 276). A single archaeological site (Site 50-10-27-26868) consisting of three *pāhoehoe* excavations was recorded during the current project.

The parcel is being considered for the proposed Onizuka Space Center. The center will replace an existing space museum and memorial at the Kona International Airport dedicated to Astronaut Colonel Ellison S. Onizuka who perished during the January 28, 1986 space shuttle Challenger explosion. Colonel Onizuka was born and raised in Kealakekua, Hawai'i and is a graduate of Konawaena High School. He is the first Japanese American astronaut in American history.

PROJECT AREA AND VICINITY ENVIRONMENT

The location for the proposed Onizuka Space Center is on roughly 5.423 acres of undisturbed *pāhoehoe* with sparse fountain grass. The proposed project area is on a Hualālai lava flow dated between 1,500 and 3,000 years before present. The *pāhoehoe* surface is slabby and naturally cracked. Ground cover is non-existent to extremely sparse fountain grass and ground surface visibility is excellent. Average annual rainfall in the project area is from ten to twenty inches. The project area is located in an ecological zone characterized as barren.

Regionally, there are three zones; the coastal zone, the barren zone, and the upland forest zone. The coastal zone is located from the coast to 300m inland (0-30ft amsl) and consists of rocky shoreline, bays, isolated coralline beaches, small ponds, brackish water, and isolated springs. Soil deposits are shallow and sparse but do support vegetation. The barren zone is located from roughly 300m to 1,030m inland (30-426ft amsl) and consists of bare lava flows with extremely sparse vegetation (fountain grass, lantana, and *noni*). The upland forest zone is located from 1,030m to 6,000m inland (426-3,379ft amsl) and consists of lava flows with thin to moderate soil deposits. Average annual rainfall in the upland forest zone is from twenty to thirty inches. The lower elevations support koa haole and Christmas-berry and the mid to upper reaches support broadleaf forest vegetation.

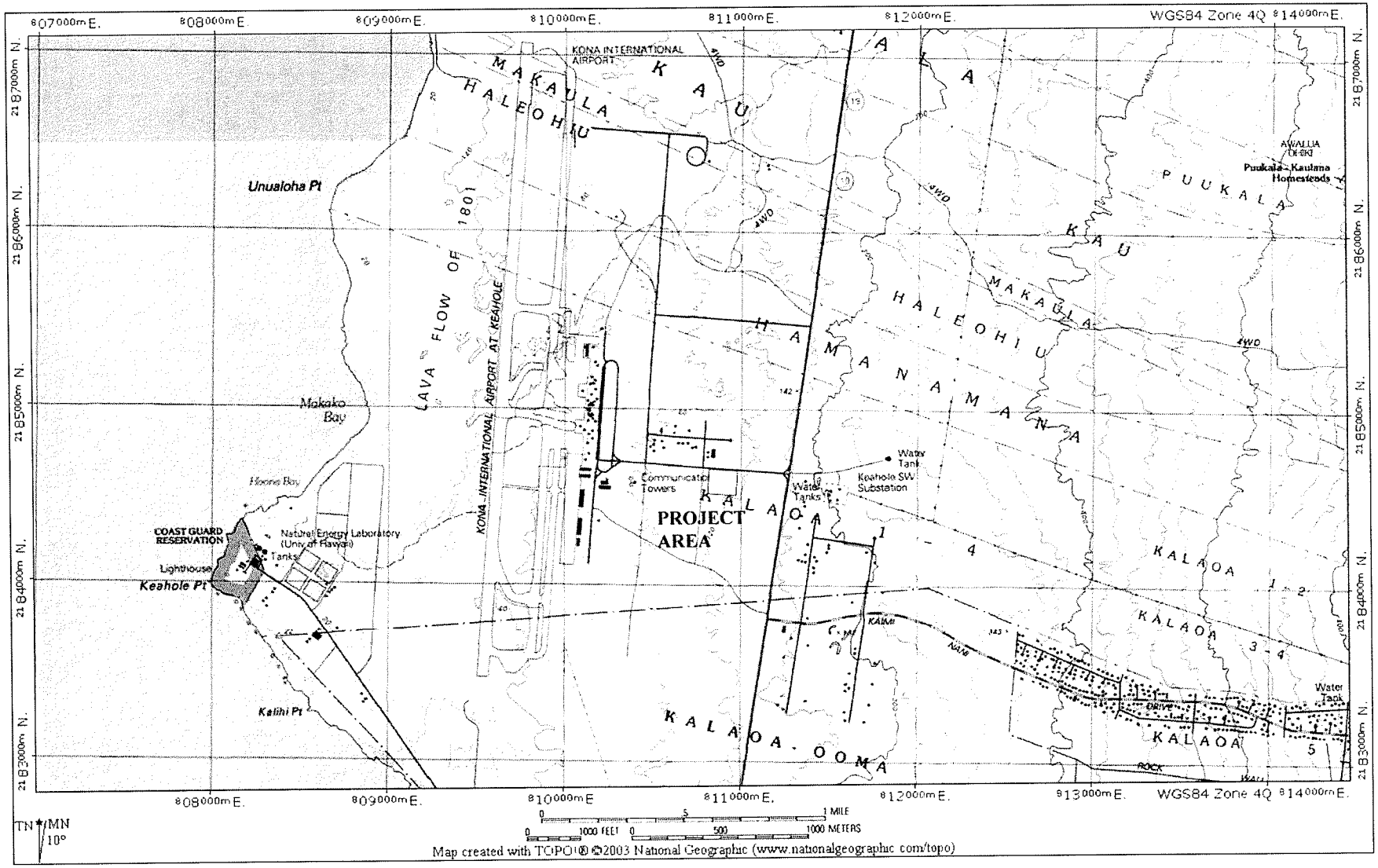

Figure 1: Onizuka Space Center Project Area at Kona International Airport USGS Quad.

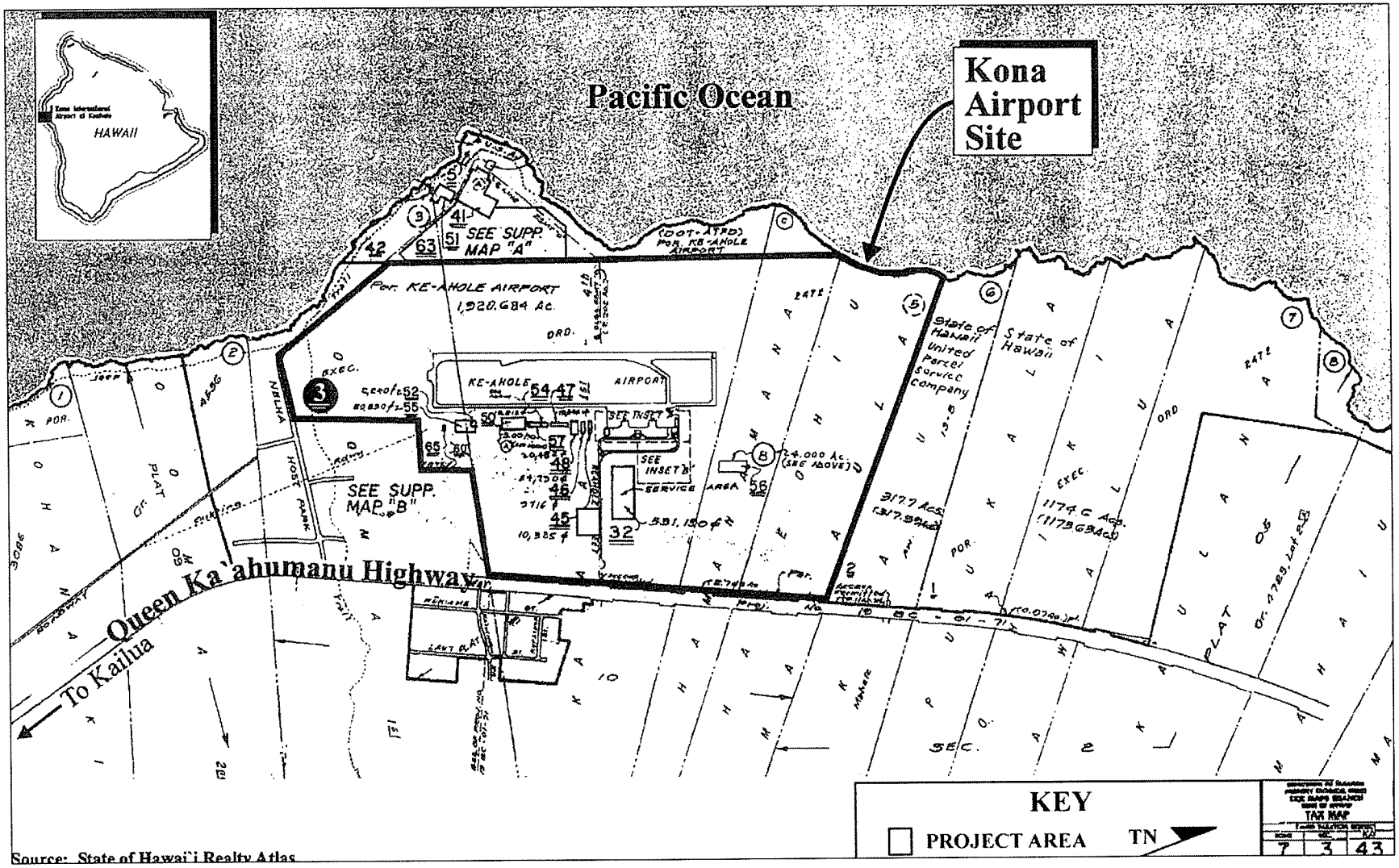

Figure 2: Onizuka Space Center Project Area on TMK Map.

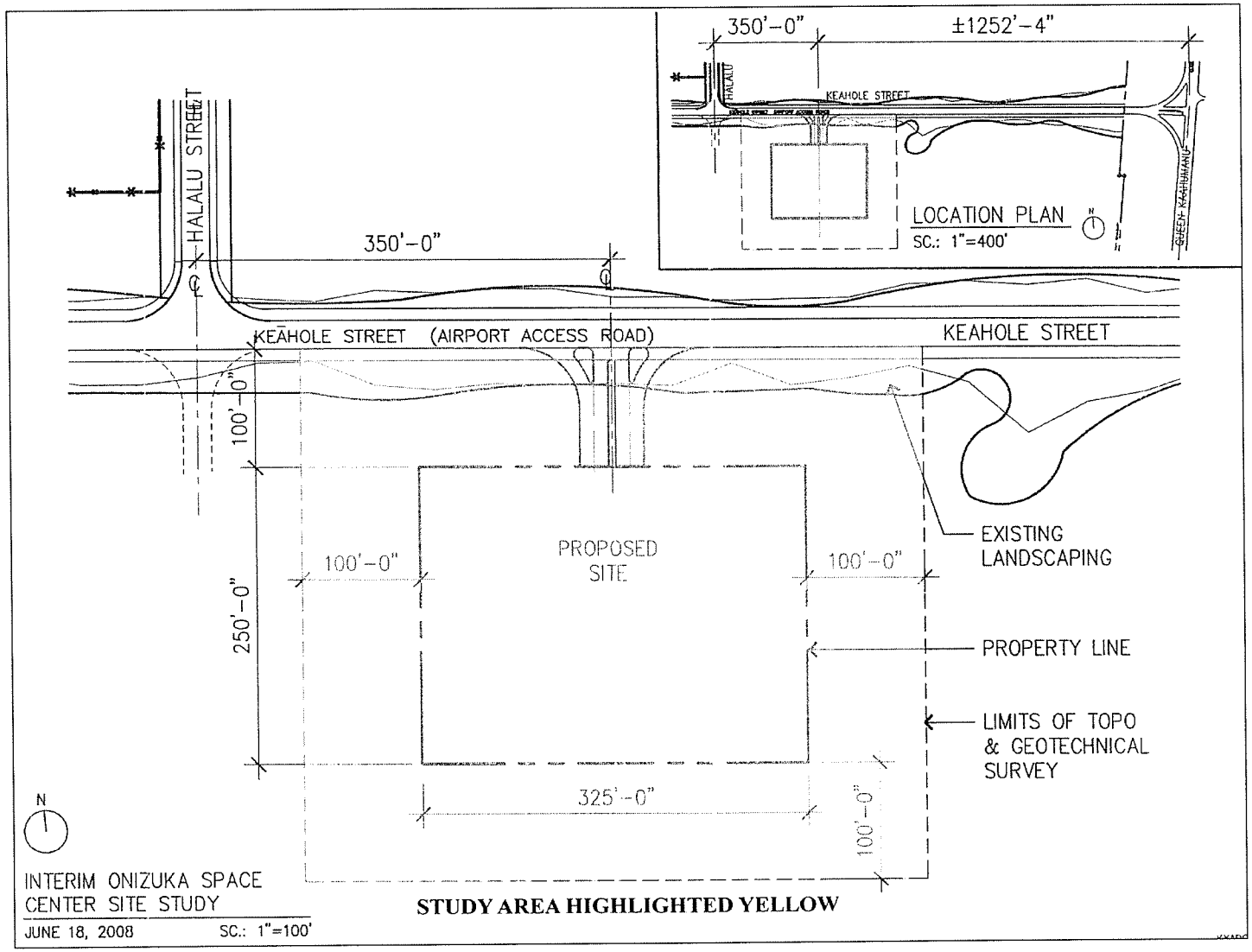

Figure 3: Onizuka Space Center Site and Study Area Map.

CULTURAL HISTORICAL CONTEXT

EARLY SETTLEMENT AND EXPANSION

Archaeological evidence suggests Hawai'i was first settled between A.D. 0 and 700 by people sailing from the Marquesas (Cordy 2000). Early settlements on the Island of Hawai'i were founded on the windward shores in likely places such as Waipi'o, Waimanu, and Hilo Bay. The windward, or *ko 'olau* shores receive abundant rainfall and have numerous streams that facilitated agricultural and fishpond production (Maly and Maly 2002). The windward shores also provide rich benthic and pelagic marine resources.

Historical accounts of residential patterns, land-use, and subsistence horticulture are believed to be indicative of traditional practices developed long before contact with Europeans (McEldowney 1979). Early accounts of settlements along the windward shores describe the area as divided into several distinct environmental regions (Ellis 1963: 291-292). At Hilo Bay, from the coast to a distance of five or six miles scattered subsistence agriculture was evident, followed by a region of tall fern and bracken, flanked at higher elevations by a forest region between 10 and 20 miles wide, beyond which was an expanse of grass and lava (Ellis 1963:403).

The American Missionary C.S. Stewart wrote, "the first four miles of the country is open and uneven, and beautifully sprinkled with clumps, groves, and single trees of the bread-fruit, pandanus, and candle tree" (Stewart 1970:361-363). The majority of inhabitants (in 1825) lived within this coastal region (Ellis1963: 253). Taro, plantains, bananas, coconuts, sweet potatoes, and breadfruit were grown individually or in small garden plots. Fish, pig, dog, and birds were also raised and captured for consumption. Wood, such as *'ōhi'a* and *koa* for house construction, canoe building, and fires was obtained from the upland agricultural zone (McEldowney 1979:18-19), and from the dense forests above (Ellis 1963:236). Wood products and bird feathers were obtained from upland regions.

The dry leeward shores of Hawai'i Island presented a very different environment requiring a modified set of subsistence strategies. Archaeologists and historians are uncertain about the motives that lead to the establishment and spread of settlements on the leeward side of Hawai'i, but archaeological evidence suggests the process was underway between the A.D. 900s and 1100s (Cordy 2000). Coastal sites in Kona-Kailua, South Kohala District, *makai* of Waikōloa, at Kalāhuipua'a and 'Anaeho'omalu and inland sites in the *ahupua'a* of Waimea have been dated to the A.D. 800s to 900s (Kirch 1979: 198, Cordy 2000: 130).

The early coastal settlements are located on, or adjacent to, the dry rocky shoreline and consist of temporary habitation caves containing midden, fishing tools, and fish remains; and two possibly permanent habitation sites (Barrera 1971, Jenson 1989a, 1989b, 1990a, and 1990b). The earlier phases of occupation were likely temporary habitations used when fishing, and later permanent habitations associated with fishpond production. Cordy suggests people who lived at inland Waimea occasionally frequented the Kalāhuipua'a and 'Anaeho'omalu area for its anchialine pond and marine resources (Cordy 2000:131). The implication is that, along the barren leeward coast, inland settlements and agriculture may have developed first, perhaps spreading from nearby Waimanu and Waipi'o. Maly suggests that people living permanently along the dry shoreline shared extended family relations with people inland, allowing for an exchange system that distributed marine resources to inland agriculturalists and brought inland agricultural products to people at the coastal settlements (Maly and Maly 2002).

The fertile plain of Waimea and the area of Kailu-Kona receive roughly 40 to 80 inches of rainfall annually and Waimea is watered by streams from the Kohala Mountains (the Waikōloa, Wai'aka, and Keanu'i'omanō streams). Inhabitants of these areas planted taro and sweet potato for subsistence. Sweet potato was the dominant crop at elevations that received from 30 to 60 inches (Cordy 2000: 135). Leeward expansion away from the coastline, at least on a permanent basis, is believed to have occurred only with the development or improvement of dry-land cultivation methods, possibly spurred by the introduction of sweet potato. Current evidence suggests that significant inland leeward settlement did not occur until 600 to 900 years after initial settlement, *i.e.*, between AD 1100 and 1400 (Green 1980; Hommon 1976; Cordy 2000). At lower elevations in North Kona and South Kohala Districts, especially along the coast, rainfall is less than thirty inches and soils are shallow or nonexistent. It is possible that mulching with rocks or cut plant materials allowed for a limited amount of root crop and arboreal agriculture in pockets of sandy soil.

In South Kona, Waimea, and Kohala, new settlements and agricultural field systems continued to spread and intensify during the A.D. 1200s to 1400s. Permanent communities were developing at Kona, Lapakahi, and along the coastal region from 'Upolu Point to Kawaihae (Cordy 2000: 140). Temporary residences and an agricultural field system were also established in the mid-elevations of Kona-Kailua and the uplands of the Waikōloa-Waimea area (Moffat and Fitzpatrick 1995, Maly and Maly 2002: 4). As communities grew and agriculture intensified during this period, polities began to form, along with competition between polities. Large polities influencing communities within modern district-size boundaries emerged in the 1300s (Cordy 2000: 142). Cordy notes that just north of the project area "two different settlement and

political zones seem to have developed prior to the 1200s and to have lasted until late in prehistory—one focused on Waimea and Kawaihae in the south, and the other in north Kohala up to 'Upolu Point" (Cordy 2000:385, footnote 15). Kona-Kailua also became an important political center south of the current project area.

By the late 1700s extensive permanent field systems were well established in the Kona-Kailua area, North Kohala, Waimea, and Lālāmilo (Clark 1981, Clark and Kirch 1983, Cordy 2000). Lands of the current project area remained barren and unoccupied except for small fishing villages located at some distance along the coast.

TRADITIONAL SETTLEMENT PATTERNS

The Hawaiian economy was based on agricultural production and marine exploitation, as well as raising livestock and collecting wild plants and birds. Extended household groups settled in various *ahupua`a*. During pre-Contact times, there were primarily two types of agriculture, wetland and dry land, both of which were dependent upon geography and physiography. River valleys provided ideal conditions for wetland *kalo* (*Colocasia esculenta*) agriculture that incorporated pond fields and irrigation canals. Other cultigens, such as *kō* (sugar cane, *Saccharum officinaruma*) and *mai`a* (banana, *Musa* sp.), were also grown and, where appropriate, such crops as *`uala* (sweet potato, *Ipomoea batatas*) were produced. This was the typical agricultural pattern seen during traditional times on all the Hawaiian Islands (Kirch and Sahlins 1992, Vol. 1:5, 119; Kirch 1985). Between A.D. 600-1100, sometimes referred to as the Developmental Period, the major focus of permanent settlement continued to be the fertile and well-watered windward valleys.

Current archaeological, linguistic, and ethnological data suggest that Hawaiian social organization initially followed a Polynesian conical clan-pattern in which individual status was based upon genealogical ranking (Green 1980:72). Kinship formed the basis for regional and island-wide societal integration; however, the most important social subsistence unit was the localized, territorial community-based, corporate kin group. Leadership within this group fell to the "highest ranking individual of the locally dominant, socially ranked lineage" (*ibid*:73). This individual acted as the local chief, overseeing the social, political, and economic functioning of the community.

The subsequent development of a uniquely Hawaiian institution, the *ahupua`a*, resulted in a more complex level of social and political integration (Cordy 1978; Hommon 1976; Green 1980; Kirch 1985). The *ahupua`a* was the fundamental land division in late pre-contact Hawai`i.

Ideally this land extended from the coast to the mountains–often corresponding with a valley drainage–and thus theoretically crosscut all primary resource zones, allowing each *ahupua`a* relative economic self-sufficiency. With the emergence of the *ahupua`a*, however, production shifted from the kinship-based relationship between chief and community to an incipient state-structured hierarchy. On his succession, the paramount chief chose the best lands for himself, and allocated the rest to his...

> warrior chiefs who had assisted in his conquests...[who], after retaining...land for themselves, reallotted the remaining lands to the inferior chiefs, who in turn reallotted portions of their lands to their own followers [and so on] down the scale to the lowest tenants, the common farmers who actually tilled the soil [Chinen 1961:7].

The chief (*konohiki*) responsible for the *ahupua`a* was now a member of a non-localized ruling elite (*ali`i*) and extracted rents or tribute from the common people (*maka`ainana)* working the land. "All of these allotments to lands, from warrior chiefs down to the commoners, were on a revocable basis," and Chinen wryly notes that, "what the superior gave, he was able to take away at pleasure" (*ibid*).

WAHI PANA (LEGENDARY PLACES)

The most informative *mo'olelo* describing events that took place in the barren lands of North Kona District is The Heart Stirring Story of Ka-Miki (*Ka'ao Ho'oniua Pu'uwai no Ka-Maiki*) recorded and published between 1914 and 1917 in the weekly Hawaiian Newspaper *Ko Hōkū o Hawai'i* and translated by Maly (excerpts cited in Maly 1992). The *mo'olelo* is set in the 1300s, though it is an early 20th Century collection of narratives about local traditions, tales, and family histories. The tales do have some time depth as they have been handed down through generations. They contain a mixture of "ancient" and 20th Century descriptions of the areas through which Ka-Miki and his brother Maka-'iole traveled. Descriptions of three places directly related to the current project area, Hale'ohi'u, Kalaoa, and 'O'oma, are described in the story.

Hale-'ohi'u is translated as "house made with a thatching shuttle". Kalua'ōlapa was the priest of Hale'ohi'u and Kamāhoe, also referred to as Nā-Kalaoa-wai'ole, translated as "the waterless Kalaoa lands" (Maly 1992:220). Kalua'ōlapa dwelt along the *'ilima (Sidafallax)* covered upland plain of Māulukua. Ka'elehuluhulu is the name of the land, Hale'ohi'u is the sub-district, Kanāhāhā is the fishing ground, and Keawehala is the landing (ibid: 220). 'O'oma is also only mentioned for its famous fishermen (ibid: 386).

EARLY ACCOUNTS OF PREHISTORIC EVENTS IN NORTH KONA

There is a paucity of prehistoric information pertaining to the lands of the project area and surrounding lands. Cordy notes that the "oral traditions are silent" for the years of early settlement of and expansion along the leeward shores of Hawai'i (Cordy 2000: 130). The little information that does exist concerns the activities of *ali'i* and was collected and published by Fornander, I'i, and Kamakau.

Hale'ohi'u is the only area within the project area to be mentioned in these early accounts. Hale'ohi'u was a well-known fishing village at the time of 'Umi-a-liloa (Kamakau 1992:216) and is a well-known place to catch "sweet-tasting *aku* fish" up through the time of Kamehameha (*ibid*:185). During the fourth year of Kamehameha's reign, he was advised by a *kaula* (a seer devoted to Pele) to go to Kekaha to make sacrifices to Pele in order to stop the lava flow threatening his fishponds and the homes of the people in the area. The lava had already flowed through the adjacent lands of Mahai'ula, Ka'ūpūlehu, and Kīholo. It was believed that Pele desired *awa* from the fishponds of Ka'ūpūlehu, the *'ahi* of Kīholo, and the *aku* from Hale'ohi'u and Ka'elehuluhulu. The flow stopped soon after Kamehameha made sacrifices to Pele.

Descriptions of lands both north and south of the project area are brief. 'Ōhiki is a stretch of sand and Kaloko has a large walled fishpond (*ibid*:56). 'O'oma is also mentioned by Kamamkau, but only as an out of way place, where the prince Ke-aweawe'ula was raised until he was five years old. (*ibid*:264).

HISTORIC ERA LAND USE

William Ellis described two trips he made between Kawaihae and Kailua. He traveled by boat during the first trip and only remarked on the coast to say it was "a rugged and barren shore of lava" (Ellis 2004:83). During his second trip, Ellis traveled by canoe from Kawaihae to Kailua. He left the former at six in the morning, stopped at Kapalaoa around 9:00am, and arrived in Kīholo around 4:00pm. He described Kīholo as "a straggling village, inhabited principally by fishermen" (Ellis 2004:418). He also described the large fishpond created by order of Kamehameha at that village. He left Kīholo just before sunset and arrived at Ka'ūpūlehu between 7:00 and 8:00pm. He records little about the village except that everyone was asleep. When the moon had risen, by 11:00pm, he continued his journey by moonlight, arriving in Kailua an hour before sunrise. In all Ellis makes little description of the coastal area of North Kona Disctrict, perhaps because he was traveling at night.

Isabella Bird, who traveled from Kailua to Kawaihae some fifty years later described the coastal region by writing, "We sailed for some hours along a lava coast, streamless, rainless, verdureless, blazing under the fierce light of a tropical sun and some time after noon anchored in the scorching bay of Kawaihae" (Bird 2007:144).

There were no Land Commission awards granted in the project area. The area of the project area remained unusable for homesteading, ranching, or farming during the Contact and Historic eras. A review of early historic maps showed no man-made features within the project area. The only known cultural resources within the Kona International Airport facilities are a pre-Contact era cave habitation site (carbon-dated between A.D.1430-1650), a pre-Contact era temporary habitation feature with several low, circular stone alignments, a short segment of the Mamalahoa trail, and an area with several petroglyphs (Dye and Prasad 2000) (Figure 4). Both habitation areas have been fully documented and are not significant for inclusion on the National Register of Historic Places (NRHP). The Mamalahoa trail segment and the petroglyphs are significant for inclusion for the NRHP. The Mamalahoa trail segment is located in a restricted (fenced-off) area between Alpha and Delta runways, and the collection of petroglyphs is protected by a three foot high rock wall constructed around them. None of the sites are within, or in close proximity to, the three areas of proposed improvements detailed in this report. No cultural resources were encountered during a March 2008 pedestrian reconnaissance survey of all three areas of proposed improvements.

MODERN LAND USE

The lands of the current project area had limited use from settlement of the leeward side of the Island of Hawai'i until the construction of the Kona International Airport in 1969 and 1970. Land use was restricted to small coastal settlements focused on fishing, and trail systems situated between these coastal villages and larger, socio-politically important populations centered in Kawaihae to the north and Kailua-Kona to the south. The Mamalaho trail and associated features (*ahu* and two habitation sites) are the only major cultural resources located in the general vicinity of the current project area, and none of these will be impacted by the proposed improvements documented in this report.

The following interview conducted February 12, 2009 with Aunty Josephine Palacat Barney of Kailua-Kona documents her knowledge of the coastal area from Kohanaiki to Kailua-Kona during the period from 1925 to 1935. Josephine is the daughter of Palacat Catalino (father) and Pararat Philipa (mother) of the Philippines. Palacat Catalino arrived in Hawaii in 1912 at the age of 15. Pararat Philipa was brought to Hawaii by her adoptive father.

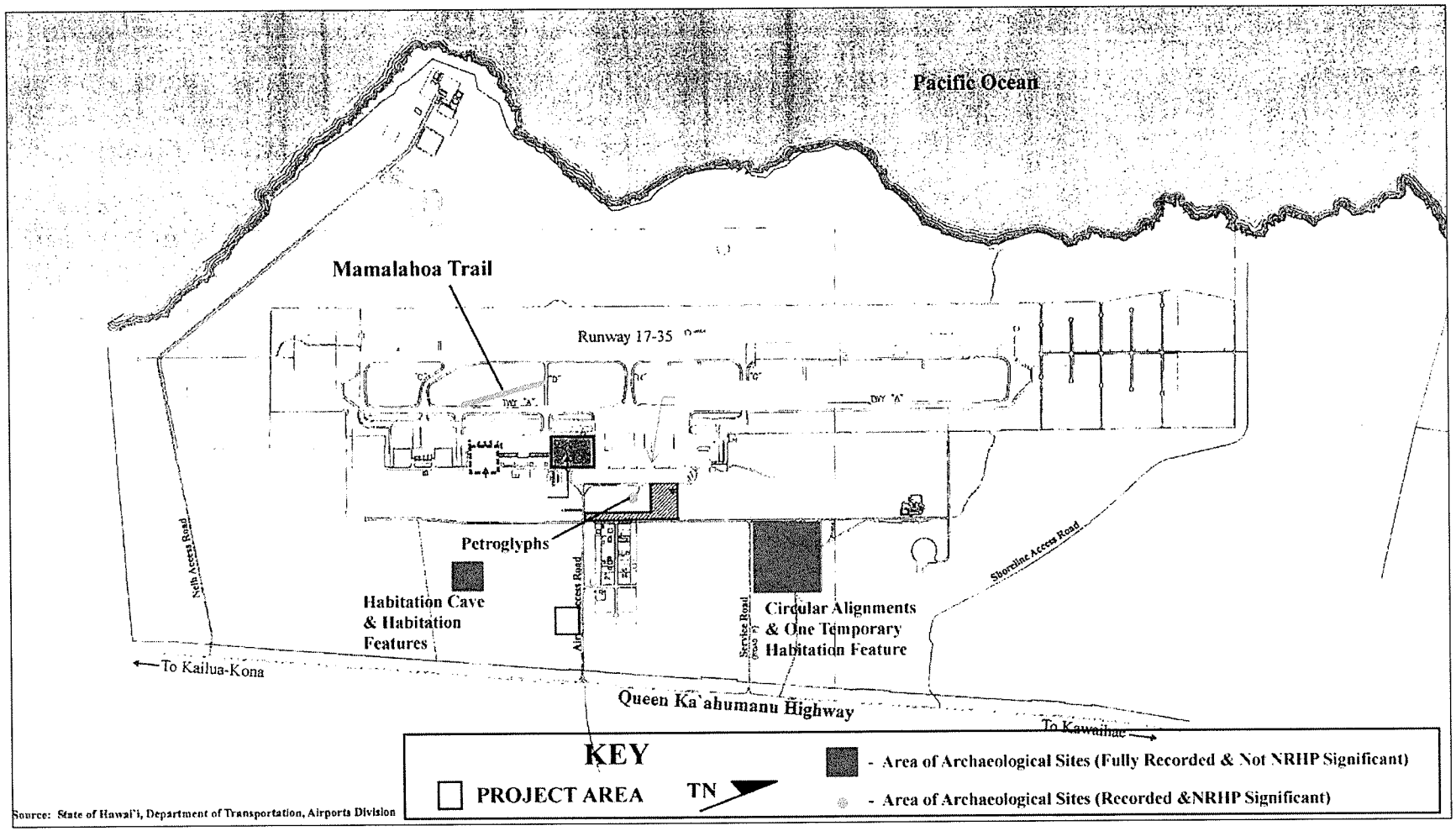

Figure 4: Map of Known Archaeological Sites and their Relationship to Project Area.

Palacat Catalino and Pararat Philipa met in Onomea when she was 14. He was a field supervisor for Hamakua Sugar. They later married and moved to Kona.

Josephine is one of fifteen children. She is fifth born and the oldest girl. They lived in Kaloko, Honokohau, and Kohanaiki between 1925 and 1935 during which time her father was the supervisor of the *opai* ponds. He was hired to care for and maintain the ponds and was responsible for keeping them in pristine condition, for all people had the privilege of using the shrimp without permission. The fish in those ponds such as *awa* and mullet were the property of the person leasing the ponds, and only they had access to them. Most land in the area belonged to Greenwell's HueHue Ranch, so the ponds were probably leased through them. Other individuals would help clean the ponds, removing algae and debris. The algae was burned so it didn't make its way back into the pond.

The Palacats first beach house was just south of the Kaloko fish pond. They also lived in homes along the beach in Honokohau and Kohanaiki. They used the tax trail (Mamalahoa Trail) and traveled by donkey up and down the coast. By that time the trail was no longer used for collecting taxes. That ended after Kamehamehas death. They traveled north on the trail to Kalaoa to gather taro and breadfruit, and south to Kailua.

The house they lived in at Kohanaiki was already standing when they arrived (Figure5). It was a ranch house that Josephine's father proceeded to repair and enlarge. They began their stay there in 1930 and continued on there until 1935. The house belonged to the Greenwell's, and was probably obtained through payment of unpaid taxes. The Keanaaina family claimed that land. At one time they lived there because they have two family members buried there. This was before the Palacats lived there.

There was once a village near there prior to the 1801 lava flow. The flow stopped before it got to the ocean. The legend is that Kamehameha was concerned about the village taken by Pele, and feared that she was headed for Kailua. Kamehameha went to Hualalai but forgot *ho'okupu* (gifts). All the Kahuna were with him, and he asked them to make peace with Pele. As he had forgotten the gifts, he grasped his hair and cut it off as he was chanting and the lava stopped flowing.

During the Palacats stay at Kohanaiki, only one other family lived in the area. Pedro Espigata was from the same province in the Philippines as Josephine's father, so they were good friends, and he and his family moved wherever the Palacats happened to be.

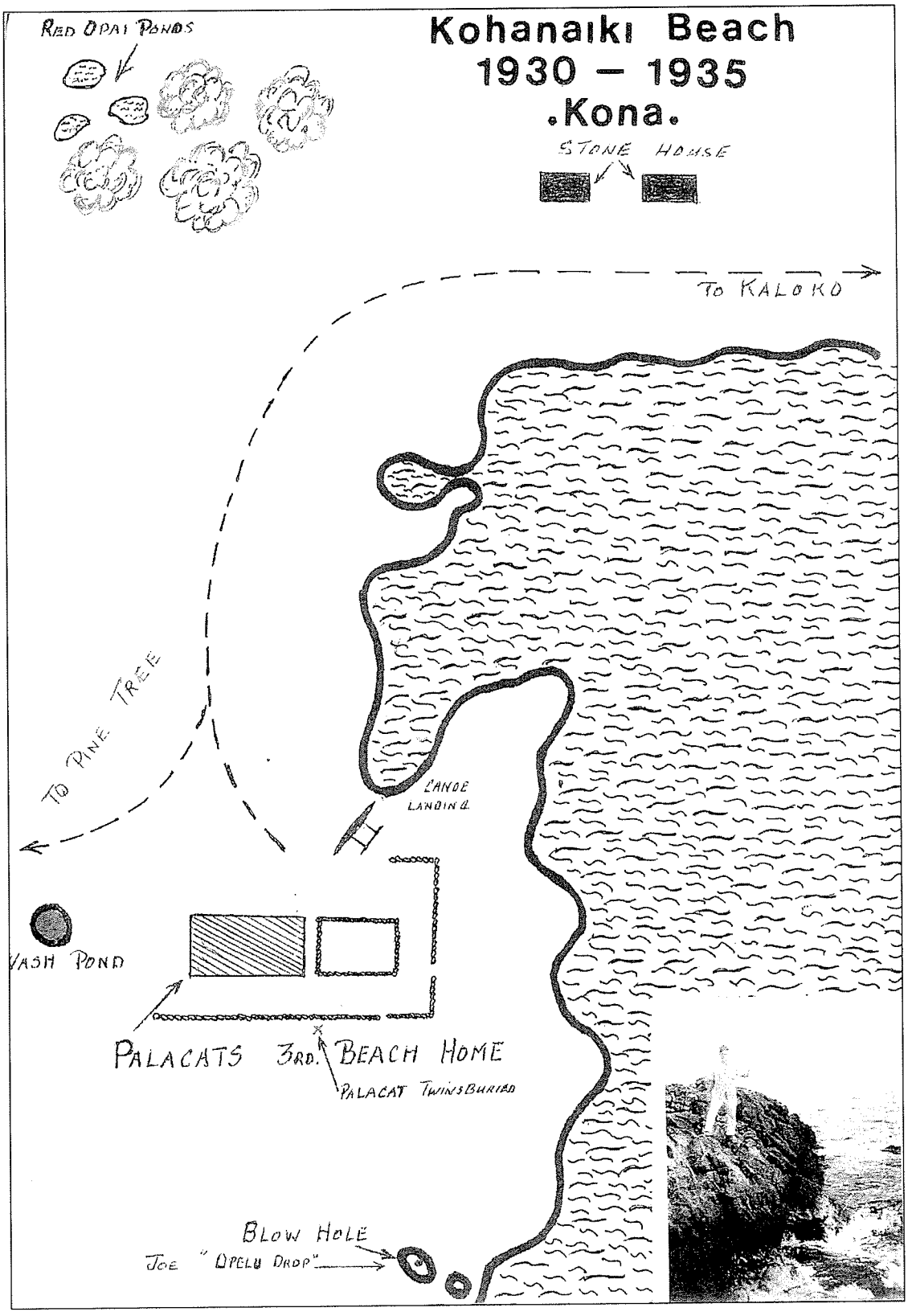

Figure 5: Palacat House at Kohanaiki Drawn by Mr. Joseph Palacat (in photo).

When the Palacats moved to Kaloko, the Espigatas moved to Kaloko. When the Palacats moved to Kohanaiki, the Espigatas moved to Kohanaiki. And when the Palacats moved to Kailua, the Espigatas moved there, too. He was married to Sarah Pai. She was very dedicated to her name because she was a descendent of an old Hawaiian Chief named Pai from ancient times. She was part Hawaiian, but also had ancestors from the Philippines, China and Portugal. She and Pedro had several children. There were no other individuals living near there during that time.

People at that time had respect for one another and for the *'aina*, and fishermen had respect for the ocean, as well. If a person used something, they were compelled to give something back in return. There were fishing traditions like the *Opelu Koa*. There were several on the west side of the island. The tradition was to fish one, then skip one. Then fish the next, and skip the one after that. Later, on there way back down the coast, they would feed the ones that they skipped. The next time they went fishing they would fish the ones that were skipped the last time.

There was a tradition that was practiced so that the shrimp were not depleted. *kanaoa* flower, which is also called the flower of Lanai is orange in color. It used to be plentiful along the coast, but the only place that it still exists is Makalawena. To chum the fish, it was customary to use a piece of cloth the size of a men's handkerchief. Josephine used soil from the base of the *keawe* tree made into mud, a pinch of shrimp and the orange *kanaoa* flower. The handkerchief was closed up and thrown out into the water. The handkerchief opens, the dirt forms a cloud, then the fish feed on the *kanaoa* because it's the same color as the shrimp. There was no need to deplete the shrimp population. This is not practiced by fishermen today, because there's not a fisherman alive today that has learned or even knows about this technique. Josephine and her brother remember this. Her sister doesn't because she wasn't involved.

Fish *imu* at Honokohau. Depending on the currents, Josephine's brother would go out and make fish *imu*. He would take rocks and depending on the way the waves were breaking, he would construct a mound, setting the rocks in such a way so that the waves wouldn't disturb them. Once the fish made a home there, inhabiting the rocks, a net could be thrown over it to catch the fish. In those days, those who fished using this method were free to use any *imu*, but were obligated to rebuild it for the next person to use. People at that time were respectful of others and of their efforts. There were strong notions concerning keeping things the way they were and putting things back, and not being disruptive.

Modern use of the lands associated with the airport facility and the Natural Energy Laboratories Hawaii (NELH) continues to be primarily focused on fishing, and coastal access and activities. A study conducted to address Public Access Shoreline Hawaii (PASH) Rights (Dye and Prasad 2000:23-30) concluded that the primary use and concern for continued use of the area were:

1. Limited access to shoreline within the vicinity of existing airport properties;
2. Compromising of archaeological and historical sites;
3. Access to prime fishing grounds;
4. Loss of native (traditional) plants'
5. Observation of traditional boundaries (need to treat an *ahupua'a* as one unit);
6. Impacts to aquifers and seabeds; and
7. Boundaries compromised and/or seen as inseparable from NELH.

Eight long-time Kona residents with specific knowledge of the lands of the Kona International Airport were interviewed (December 1999 to February 2000) for the PASH study. Concerns were that, while the airport did not appreciably limit vehicle access to camping and fishing areas, the construction of the NELH facility did (Dye and Prasad 2000:25, 26-17). Moreover, those interviewed voiced concern that the NELH operations might have resulted in a reduction in the area fish supply. There was a sense that pollutants from the airport and the NELH could degrade the local aquifers and seabeds. Cultural informants also voiced concern over the possible alteration of ancestral burials, archaeological sites, and native plant habitat.

PREVIOUS ARCHAEOLOGY

Approximately fifty individual archaeological studies have been conducted within, and in the vicinity of, the current project area (Figure 6). Archaeological evidence suggests the broad *ahupua'a* settlement pattern for the area is one of small coastal villages established in the early 800s AD through 1400AD. Initial habitation sites are seasonal and associated with fishing. Limited horticulture may have been practiced at coastal sites at this time. From the 1400s to the early historic period, there appears to be a limited expansion in the middle to upper reaches of the upland forest zone. Expansion in the upland zone is associated with dryland swidden agriculture (Henry *et al.* 1993:56). Likely dryland crops consisted of dryland taro, sweet potatoes, breadfruit, bananas, paper mulberry, *ti*, and sugar cane. During the historic era, there was increased population growth in the upland forest zone associated with the development of homesteads involved in the growing of coffee and sheep and cattle ranching. The barren zone does not appear to be a habitation zone at any time.

Barren zone archeological features include trail segments, *ahu*, and small rock pavements, small temporary habitation c-shape enclosures, and lava tubes (rest areas along trail segments). Sites suggesting resource extraction include excavated lava blisters, likely for the production of abraders. Other blister excavations appear to have been created while hunting nesting birds, or collecting eggs and chicks. Feature distribution is extremely sparse in this zone.

There are four areas of known archaeological sites near the current area of proposed development (see Figure 4). None of the proposed improvements are in close proximity to previously recorded archaeological resources, and those resources will not be impacted. The known cultural resources within the Kona International Airport facilities are a pre-Contact era cave habitation site (carbon-dated between A.D.1430-1650), a pre-Contact era temporary habitation feature with several low, circular stone alignments, a short segment of the Māmalahoa trail, and an area with several petroglyphs.

Both habitation areas have been fully documented and are not significant for inclusion on the National Register of Historic Places (NRHP). The Māmalahoa trail segment and the petroglyphs are significant for inclusion for the NRHP. The Māmalahoa trail segment is located in a restricted (fenced-off) area between Alpha and Delta runways, and the collection of petroglyphs is protected by a three foot high rock wall constructed around them.

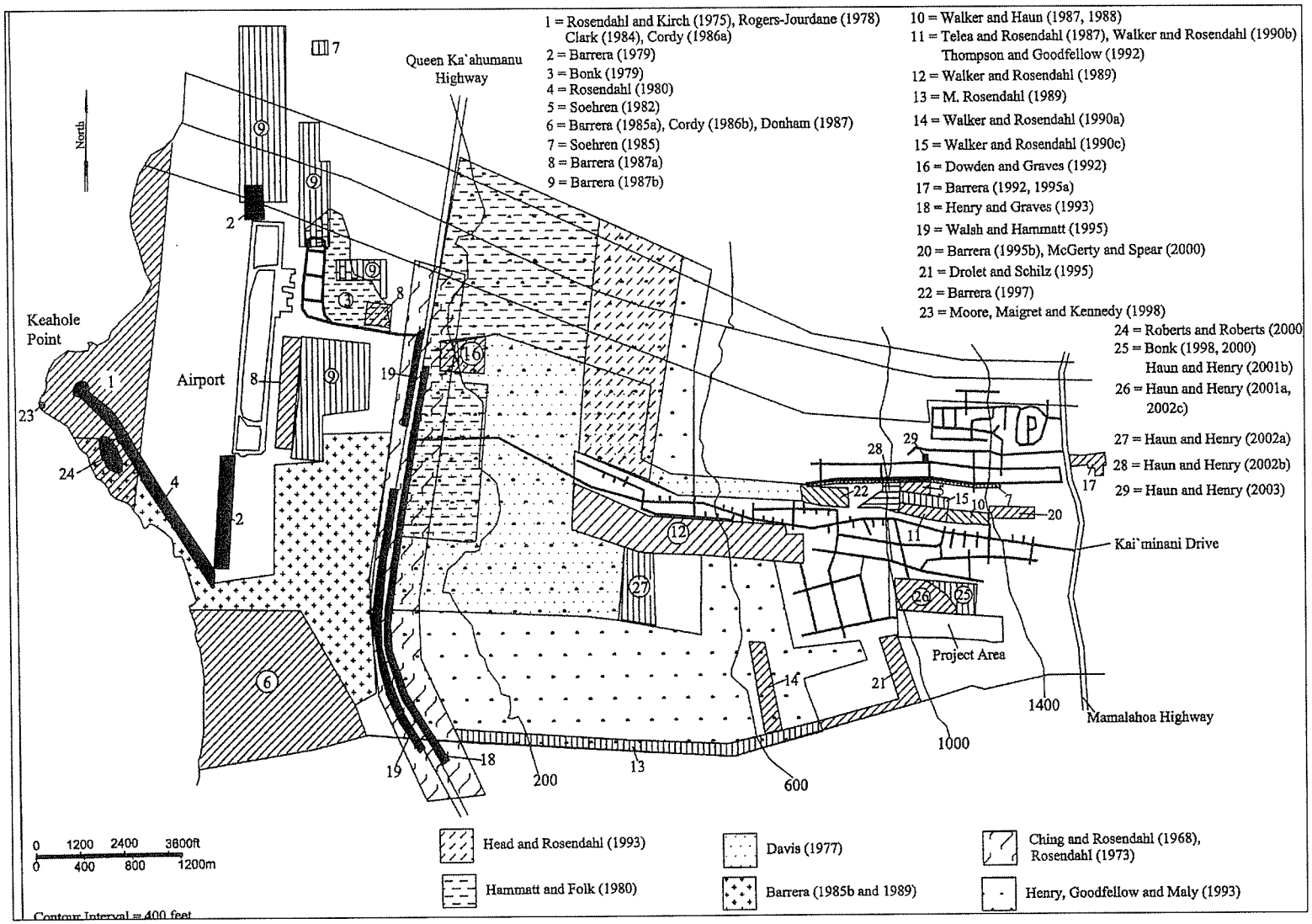

Figure 6: Map of Previous Archaeology (Haun and Henry 2004).

PROJECT AREA EXPECTATIONS

Given historical/archival resources and the previous archaeological studies, it is possible that trail segments, *ahu*, petroglyphs, and temporary habitation features will be located within the project area. Given that the distribution of these features is very sparse, it is most likely that few, if any features will be located in the current project area.

METHODS

ARCHIVAL METHODS

In addition to referencing available resources at SCS, archival research was conducted in the State Historic Preservation Division (SHPD) report database and library facility (Hilo, HI), the Hawaii County land records office, the *Waihona 'Aina Mahele* database website, the Hawaiian collections holdings at the University of Hawai'i-Hilo Library, and the Hawaii State Library system. Archival work consisted of general research on the history and archaeology of the project area, as well as specific searches of previous archaeological studies in and around the subject parcel. Historic land use data, land ownership, maps, and narrative information were obtained from the Hawaii County land records office, the *Waihona 'Aina Mahele* database website,and the University of Hawai`i, Hilo, Special Collections.

CONSULTATION

Consultation was sought from Kai Markell, the Director of Native Rights, Land and Culture, Office of Hawaiian Affairs on O'ahu; Bucky Lindsey of the Office of Hawaiian Affairs on Hawai'i Island; Ruby McDonald, Coordinator of the Hawai'i branch of the Office of Hawaiian Affairs; the Kuakini Civic Club; and the Kona Hawaiian Civic Club. Over the course of the archaeological inventory survey, oral interviews were conducted with Josephine Palacat Barney and Jacob Keanaaina.

FIELD METHODS

On April 16 and 17, 2009, SCS archaeologist Suzan Keris, BA surveyed the lot slated for the proposed construction. The parcel was surveyed at 5.0m to 10.m transects traversed from east to west and west to east. No cultural resources were located within the areas of proposed improvements. No natural soil or sediment deposits exist within the project area. A single site (SIHP 50-10-27-26868) was recorded just outside the southeast boundary of the study area.

RESULTS OF FIELDWORK

SITE	**50-10-27-26868 (T-Site 1)**
FORM	*Pāhoehoe* excavations
FUNCTION:	Resource Exploration
AGE:	Pre-Contact
DIMENSIONS:	Length: 15.0m (NW/SE°); Width: 9.0 m; Height: 0.15m (max. below ground surface)
CONDITION:	Fair
SURFACE ARTIFACTS:	None
EXCAVATION:	None

SITE 50-10-27-26868 (TEMP SITE 1)

Site 26868 is located on the slabby *pāhoehoe* surface of the project area (Figure 7). The site consists of three (Feature 1, 2, and 3) small *pāhoehoe* excavations situated along the southwestern edge of the study area (Figure 8). The site measures approximately 15.0m long (NW/SE) by 9.0m wide, and is 0.15m maximum depth below the ground surface. The three features are small areas of slabby *pāhoehoe* that are naturally cracked and loose on the ground surface. They appear as small subangular slabby cobbles and small boulders resting upside down on the ground surface.

The only obvious human modification is that they were flipped over and left on the ground next to where they were lying. It does not appear that any material was taken away from the area. These represent an exploratory human action and no quarrying or tool manufacture is associated with these features.

Feature 1 is a 3.2m long (E/W) by 2.5m wide area of disturbed slabby *pāhoehoe* located along the southeast edge of the study area (Figure 9). Feature 2 is a 1.5m long (E/W) by 1.4m wide area of disturbed slabby *pāhoehoe* located 1.3m southeast of Feature 1 (Figure 10). Feature 3 is a 5.3m long (N/S) by 2.3m wide area of disturbed slabby *pāhoehoe* located 2.9m southeast of Feature 2 (Figure 11).

Figure 7: View of Project Area Ground Surface Facing North.

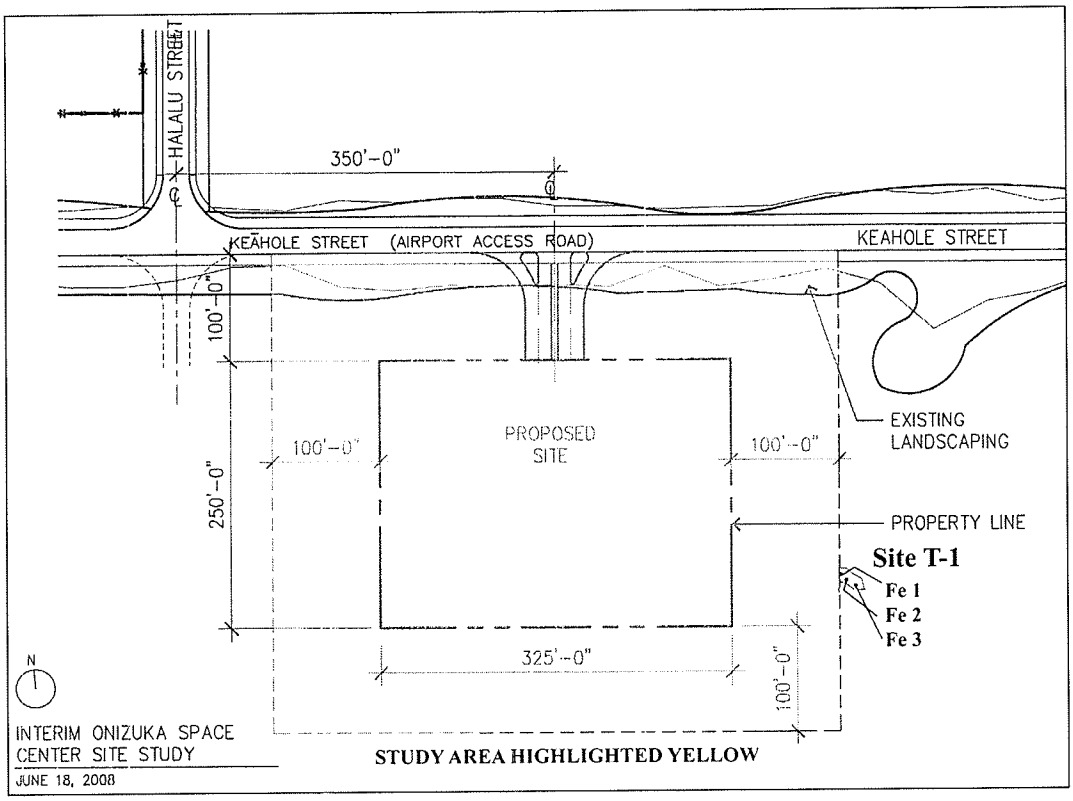

Figure 8: Location of Site T-1 Features 1, 2, and 3 on Project Area Map.

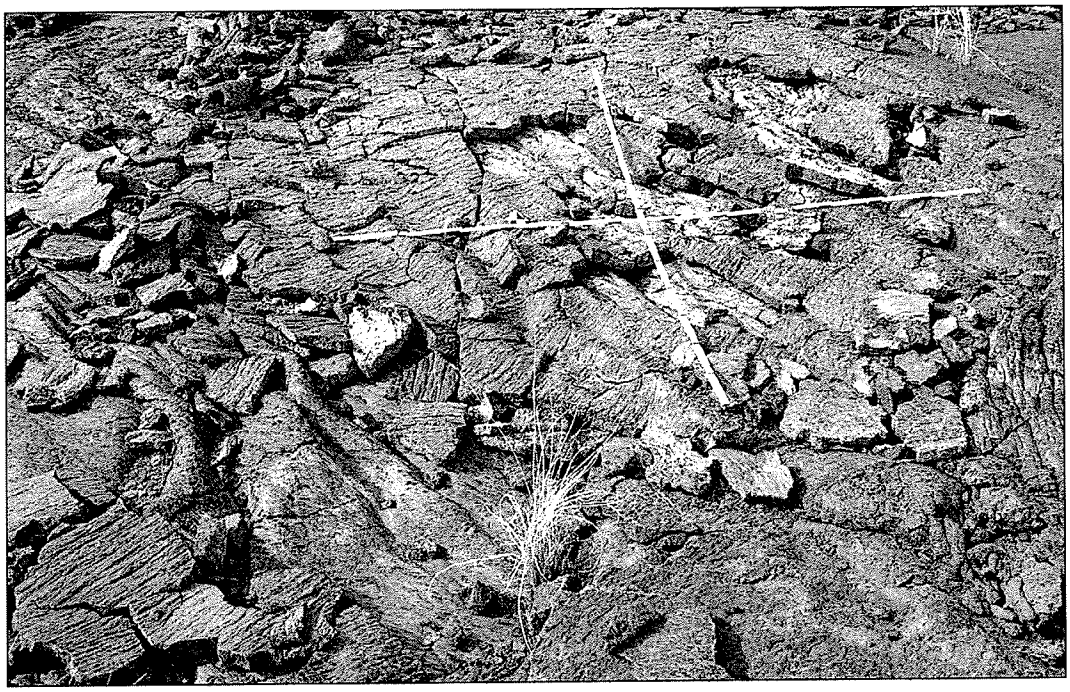

Figure 9: Site T-1, Feature 1 Looking North.

Figure 10: Site T-1, Feature 2 Looking North.

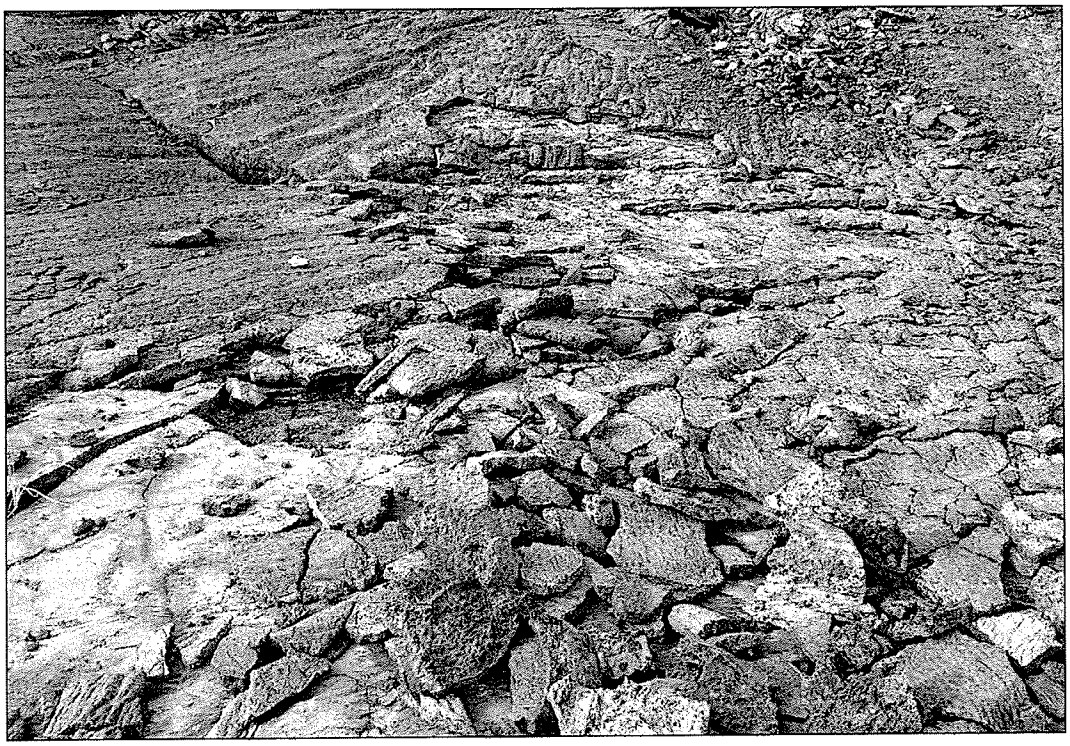

Figure 11: Site T-1, Feature 3 Looking North.

Generally, pahoehoe excavations (at Anaeho`omalu Bay area) are small quarry areas where the slabby *pāhoehoe* is pulled up, broken into smaller, hand-held sized blocks, which are then rubbed on all sides to form a smooth rectangular block. The smooth blocks are abrader tools used to sand. These features are obvious because the quarrying removes pieces of *pāhoehoe* and leaves small holes. Also, there are broken bits of *pāhoehoe* from breaking it into smaller pieces. Finally, there are depressions in the surrounding *pāhoehoe* surface where the small blocks are ground smooth.

A second type of *pāhoehoe* excavation is associated with bird hunting. Ground nesting birds often used small cracks in the pahoehoe to nest and lay eggs. Traditionally, Hawaiians would break open the cracks to collect eggs and chicks. These types of features leave easily identifiable modified cracks.

The features SCS documented at Site T-1 are neither of the two types of features mentioned above. It is possible that someone flipped up the loose *pāhoehoe* looking for nests, or were looking for other material. It appears as though they found nothing and went on their way. These *pāhoehoe* excavations are not associated with abrader production, but were simple, one-time exploratory efforts.

CONCLUSIONS

A single site (Site 26868) consisting of three small *pāhoehoe* excavations were identified on the 5.423-acres selected for the proposed Onizuka Space Center. The site is likely pre-Contact and is the result of people moving through the area and searching for resources, possibly bird nests or useful stone tool-making material. None of the surface or underlying material has been removed from the area.

SIGNIFICANCE ASSESSMENTS

The single site identified during this project was assessed for its significance as outlined in Hawai'i Administrative Rules §13-275-6. To be assessed as significant a site must be characterized by one or more of the following five criteria:

(A) It must be associated with events that have made a significant contribution to the broad patterns of our history, or be considered a traditional cultural property.

(B) It must be associated with the lives of persons significant in the past.

(C) It must embody distinctive characteristics of a type, period, or method of construction, or represent a significant and distinguishable entity whose components may lack individual distinction.

(D) It must have yielded or may be likely to yield, information important in prehistory or history.

(E) Have important value to native Hawaiian people or other ethnicities in the state, due to associations with cultural practices and traditional beliefs that were, or still are, carried out.

All of the sites documented in this report were evaluated for their significance regarding prehistory (Table 1).

Table 1: Site Significance and Recommended Treatments.

Site	Form	Age	Function	Criteria of Significance	Recommended Treatment
T-1	*Pāhoehoe* excavations	Pre-Contact	Exploratory	D	No Further Work

RECOMMENDATIONS

The single site addressed in this Archaeological Inventory Survey report (Site 26868) consists of three pre-Contact era features. Information recorded during the current study has adequately ascertained the timing and function of all features at all three features. The site is related to pre-Contact exploration of resources and none of the features contain known burials, none were found during the inventory survey work, and there are no remaining features to test that indicate they may contain burials.

No Further Work

Site 26868 requires no further work (see Table 1). The information on its location, function, chronology, construction has been collected directly through archival research, oral interview, and archaeological study. Full documentation of the site and its features are contained in this report and include historical information, maps, figures, and descriptions. There are no sites located on the current project area that are recommended for preservation.

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APPENDIX C.

Cultural Impact Assessment

SCS Project Number 1041-CIA-1

A CULTURAL IMPACT ASSESSMENT OF 5.423 ACRES FOR THE PROPOSED ONIZUKA SPACE CENTER, KALAOA 3rd AHUPUA'A , NORTH KONA DISTRICT, ISLAND OF HAWAI'I, HAWAI'I [TMK: (3) 7-3-043:003 POR.]

Prepared By:
Glenn G. Escott, M.A.
and
Robert L. Spear, Ph.D.

June 2009

Draft Report

Prepared For:
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INTRODUCTION

At the request of Munekiyo & Hiraga, Inc., Scientific Consultant Services, Inc. (SCS) conducted a Cultural Impact Assessment, of a 5.423-acre parcel of land [TMK: (3)-7-3-43:003 por.] located at the Kona International Airport in the Ahupua'a of Kalaloa 3rd,, North Kona District, Island of Hawai'i (Figures 1, 2, and 3). The parcel is being considered for the proposed Onizuka Space Center. The center will replace an existing space museum and memorial at the Kona International Airport dedicated to Astronaut Colonel Ellison S. Onizuka who perished during the January 28, 1986 space shuttle Challenger explosion. Colonel Onizuka was born and raised in Kealakekua, Hawai'i and is a graduate of Konawaena High School. He is the first Japanese American astronaut in American history.

The Constitution of the State of Hawai`i clearly states the duty of the State and its agencies is to preserve, protect, and prevent interference with the traditional and customary rights of native Hawaiians. Article XII, Section 7 requires the State to "protect all rights, customarily and traditionally exercised for subsistence, cultural and religious purposes and possessed by *ahupua`a* tenants who are descendants of native Hawaiians who inhabited the Hawaiian Islands prior to 1778" (2000). In spite of the establishment of the foreign concept of private ownership and western-style government, Kamehameha III (Kauikeaouli) preserved the peoples traditional right to subsistence. As a result in 1850, the Hawaiian Government confirmed the traditional access rights to native Hawaiian *ahupua`a* tenants to gather specific natural resources for customary uses from undeveloped private property and waterways under the Hawaiian Revised Statutes (HRS) 7-1. In 1992, the State of Hawai`i Supreme Court, reaffirmed HRS 7-1 and expanded it to include, "native Hawaiian rights...may extend beyond the *ahupua`a* in which a native Hawaiian resides where such rights have been customarily and traditionally exercised in this manner" (Pele Defense Fund v. Paty, 73 Haw.578, 1992).

Act 50, enacted by the Legislature of the State of Hawaii (2000) with House Bill 2895, relating to Environmental Impact Statements, proposes that:

> ...there is a need to clarify that the preparation of environmental assessments or environmental impact statements should identify and address effects on Hawaii's culture, and traditional and customary rights... [H.B. NO. 2895].

Act 50 requires state agencies and other developers to assess the effects of proposed land use or shore line developments on the "cultural practices of the community and State" as part of the HRS Chapter 343 environmental review process (2001).

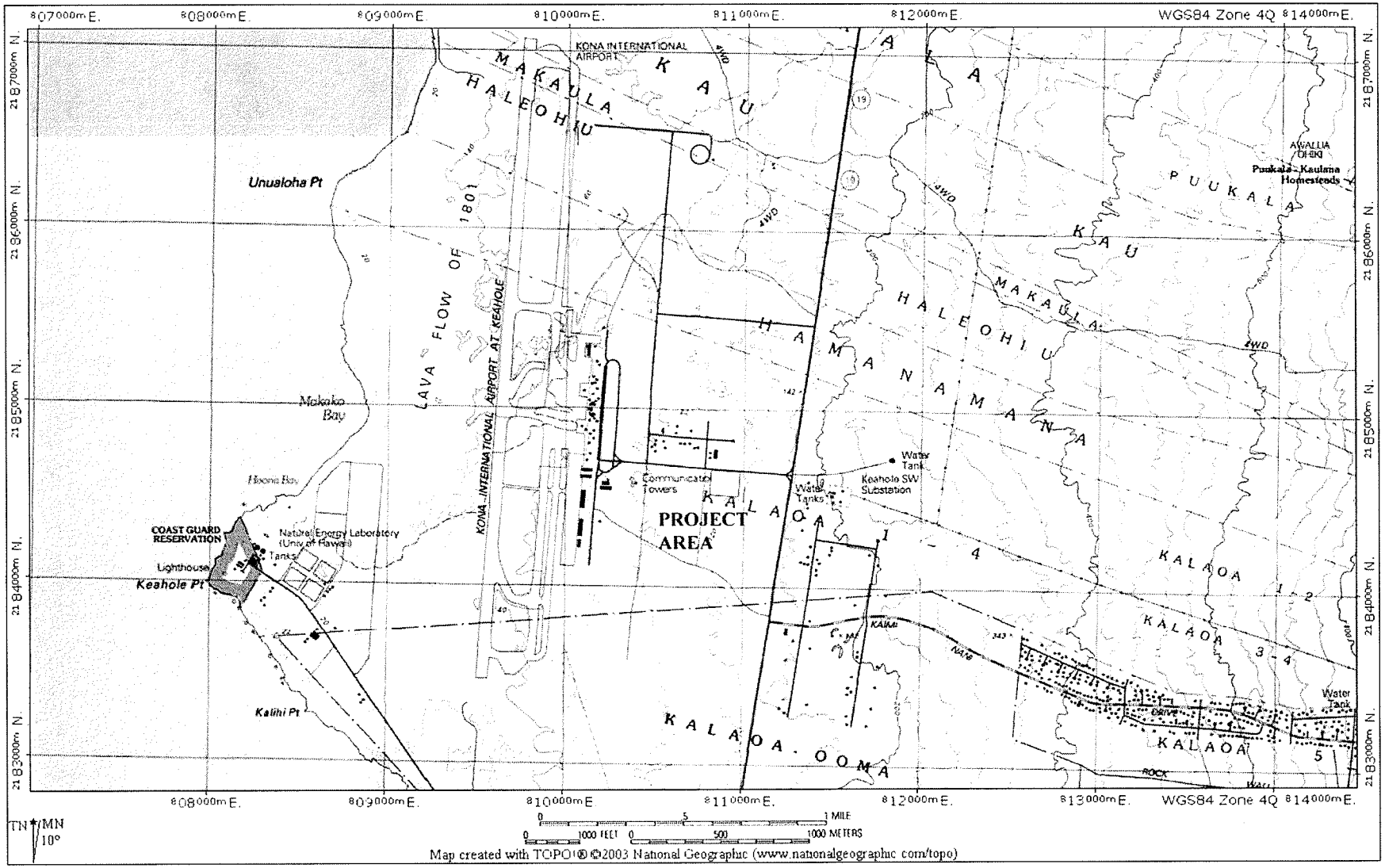

Figure 1: Onizuka Space Center Project Area at Kona International Airport USGS Quad.

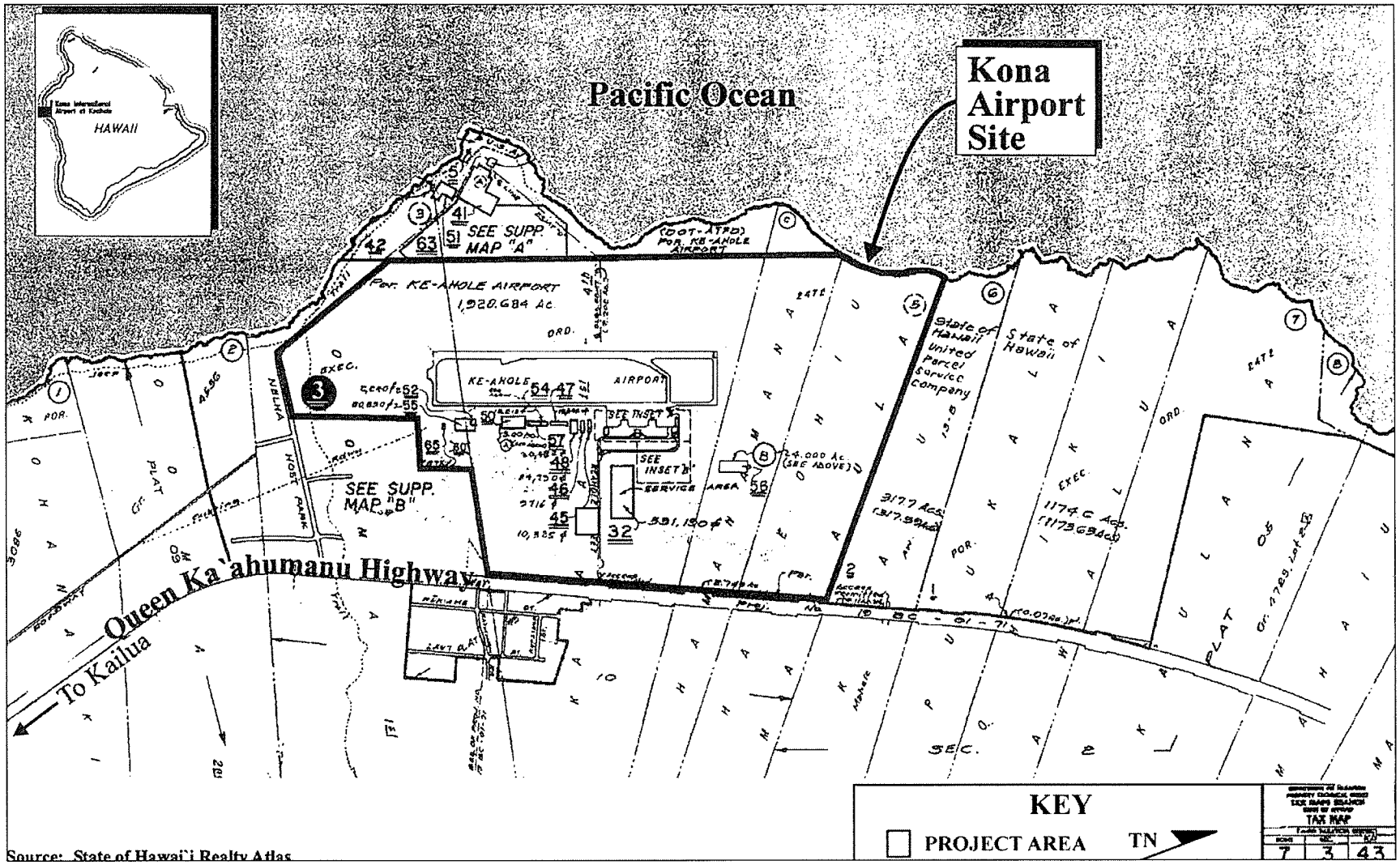

Figure 2: Onizuka Space Center Project Area on TMK Map.

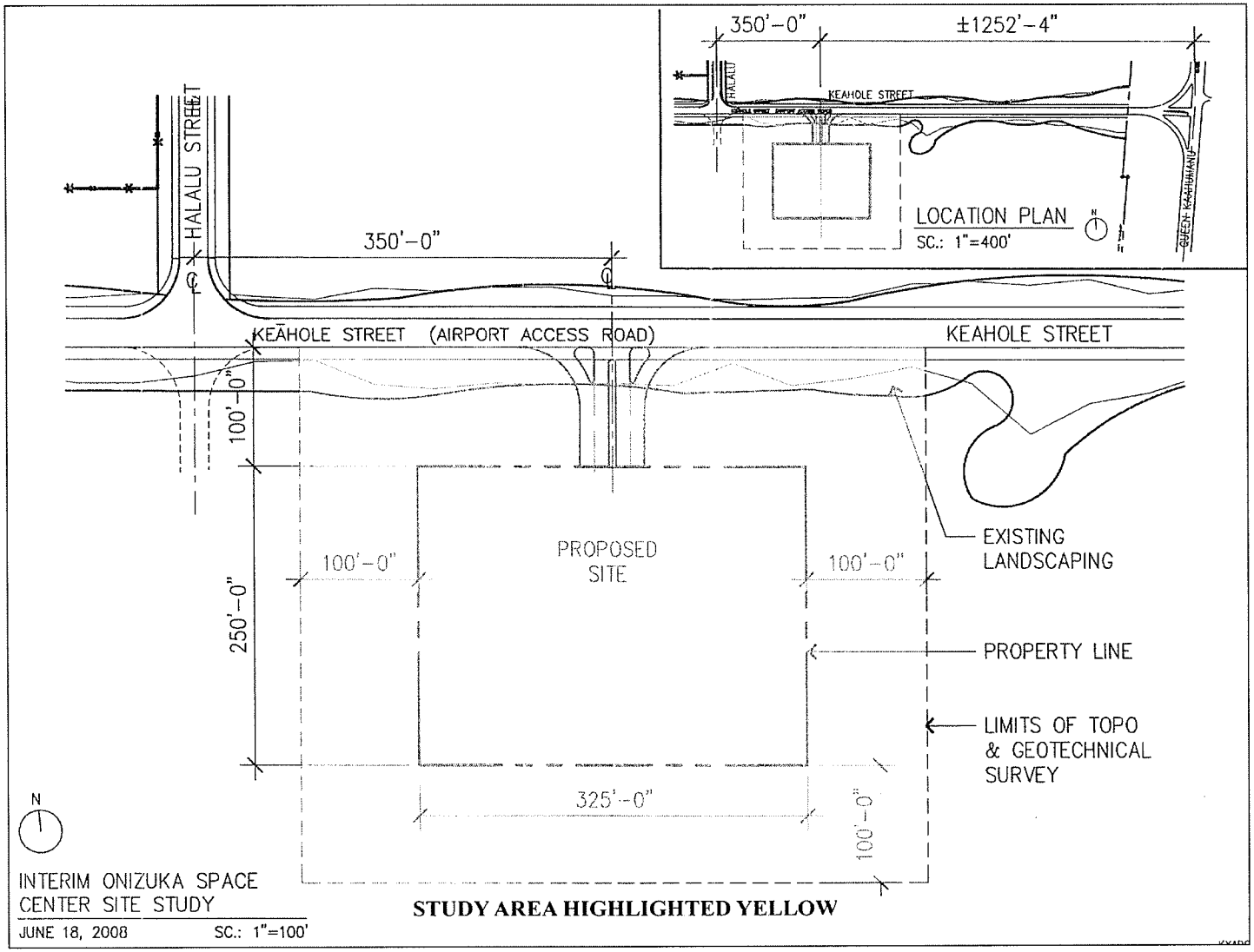

Figure 3: Onizuka Space Center Site and Study Area Map.

Its purpose has broadened, "to promote and protect cultural beliefs, practices and resources of native Hawaiians [and] other ethnic groups, and it also amends the definition of 'significant effect' to be re-defined as "the sum of effects on the quality of the environment including actions that are...contrary to the State's environmental policies...or adversely affect the economic welfare, social welfare, or cultural practices of the community and State" (H.B. 2895, Act 50, 2000).

Thus, Act 50 requires an assessment of cultural practices to be included in the Environmental Assessments and the Environmental Impact Statements, and to be taken into consideration during the planning process. The concept of geographical expansion is recognized by using, as an example, "the broad geographical area, e.g. district or *ahupua`a*" (OEQC 1997). It was decided that the process should identify 'anthropological' cultural practices, rather than 'social' cultural practices. For example, *limu* (edible seaweed) gathering would be considered an anthropological cultural practice, while a modern-day marathon would be considered a social cultural practice.

> According to the Guidelines for Assessing Cultural Impacts established by the Hawaii State Office of Environmental Quality Control (OEQC 1997): The types of cultural practices and beliefs subject to assessment may include subsistence, commercial, residential, agricultural, access-related, recreational, and religions and spiritual customs. The types of cultural resources subject to assessment may include traditional cultural properties or other types of historic sites, both manmade and natural, which support such cultural beliefs.

This Cultural Impact Assessment involves evaluating the probability of impacts on identified cultural resources, including values, rights, beliefs, objects, records, properties, and stories occurring within the project area and its vicinity cultural values and rights within the project area and its vicinity (H.B. 2895, Act 50, 2000).

METHODOLOGY

This Cultural Impact Assessment was prepared in accordance with the methodology and content protocol provided in the Guidelines for Assessing Cultural Impacts (OEQC 1997). In outlining the "Cultural Impact Assessment Methodology", the OEQC state: ...information may be obtained through scoping, community meetings, ethnographic interviews and oral histories... (1997).

The report contains archival and documentary research, as well as communication with organizations having knowledge of the project area, its cultural resources, and its practices and beliefs. This Cultural Impact Assessment was prepared in accordance with the methodology and content protocol provided in the Guidelines for Assessing Cultural Impacts (OEQC 1997). The assessment concerning cultural impacts should address, but not be limited to, the following matters:

(1) a discussion of the methods applied and results of consultation with individuals and organizations identified by the preparer as being familiar with cultural practices and features associated with the project area, including any constraints of limitations with might have affected the quality of the information obtained;

(2) a description of methods adopted by the preparer to identify, locate, and select the persons interviewed, including a discussion of the level of effort undertaken;

(3) ethnographic and oral history interview procedures, including the circumstances under which the interviews were conducted, and any constraints or limitations which might have affected the quality of the information obtained;

(4) biographical information concerning the individuals and organizations consulted, their particular expertise, and their historical and genealogical relationship to the project area, as well as information concerning the persons submitting information or interviewed, their particular knowledge and cultural expertise, if any, and their historical and genealogical relationship to the project area;

(5) a discussion concerning historical and cultural source materials consulted, the institutions and repositories searched, and the level of effort undertaken, as well as the particular perspective of the authors, if appropriate, any opposing views, and any other relevant constraints, limitations or biases;

(6) a discussion concerning the cultural resources, practices and beliefs identified, and for the resources and practices, their location within the broad geographical area in which the proposed action is located, as well as their direct or indirect significance or connection to the project site;

(7) a discussion concerning the nature of the cultural practices and beliefs, and the significance of the cultural resources within the project area, affected directly or indirectly by the proposed project;

(8) an explanation of confidential information that has been withheld from public disclosure in the assessment;

(9) a discussion concerning any conflicting information in regard to identified cultural resources, practices and beliefs;

(10) an analysis of the potential effect of any proposed physical alteration on cultural resources, practices or beliefs; the potential of the proposed action to isolate cultural resources, practices or beliefs from their setting; and the potential of the proposed action to introduce elements which may alter the setting in which cultural practices take place, and;

(11) the inclusion of bibliography of references, and attached records of interviews, which were allowed to be disclosed.

Based on the inclusion of the above information, assessments of the potential effects on cultural resources in the project area and recommendations for mitigation of these effects can be proposed.

ARCHIVAL RESEARCH

Archival research focused on a historical documentary study involving both published and unpublished sources. These included legendary accounts of native and early foreign writers; early historical journals and narratives; historic maps and land records such as Land Commission Awards, Royal Patent Grants, and Boundary Commission records; historic accounts, and previous archaeological project reports.

INTERVIEW METHODOLOGY

Interviews are conducted in accordance with Federal and State laws and guidelines. Individuals and/or groups who have knowledge of traditional practices and beliefs associated with a project area or who know of historical properties within a project area are sought for consultation. Individuals who have particular knowledge of traditions passed down from preceding generations and a personal familiarity with the project area are invited to share their relevant information. Often people are recommended for their expertise, and indeed, organizations, such as Hawaiian Civic Clubs, the Island Branch of Office of Hawaiian Affairs, historical societies, Island Trail clubs, and Planning Commissions are depended upon for their recommendations of suitable informants. These groups are invited to contribute their input, and suggest further avenues of inquiry, as well as specific individuals to interview.

If knowledgeable individuals are identified, personal interviews are sometimes taped and then transcribed. These draft transcripts are returned to each of the participants for their review and comments. After corrections are made, each individual signs a release form, making the information available for this study. When telephone interviews occur, a summary of the

information is often sent for correction and approval, or dictated by the informant and then incorporated into the document. Key topics discussed with the interviewees vary from project to project, but usually include: personal association to the *ahupua`a*, land use in the project's vicinity; knowledge of traditional trails, gathering areas, water sources, religious sites; place names and their meanings; stories that were handed down concerning special places or events in the vicinity of the project area; evidence of previous activities identified while in the project vicinity.

In this case, letters briefly outlining the development plans along with maps of the project area were sent to individuals and organizations whose jurisdiction includes knowledge of the area with an invitation for consultation. Consultation was sought from Kai Markell, the Director of Native Rights, Land and Culture, Office of Hawaiian Affairs on O'ahu; Ruby McDonald, Coordinator of the Hawai'i branch of the Office of Hawaiian Affairs; the Kuakini Civic Club; and the Kona Hawaiian Civic Club. If cultural resources are identified based on the information received from these organizations and/or additional informants, an assessment of the potential effects on the identified cultural resources in the project area and recommendations for mitigation of these effects can be proposed.

PROJECT AREA AND VICINITY

The project area is located at the Kona International Airport in the Ahupua`a of Kalaloa 3rd, North Kona District, Island of Hawai'i and consists of a roughly 5.423-acre parcel to be developed for the proposed Onizuka Space Center (see Figure 2). The project area for the proposed space center consists of previously undisturbed barren *pāhoehoe* with sparse fountain grass.

CULTURAL HISTORICAL CONTEXT

EARLY SETTLEMENT AND EXPANSION

Archaeological evidence suggests Hawai'i was first settled between A.D. 0 and 700 by people sailing from the Marquesas (Cordy 2000). Early settlements on the Island of Hawai'i were founded on the windward shores in likely places such as Waipi'o, Waimanu, and Hilo Bay. The windward, or *ko 'olau* shores receive abundant rainfall and have numerous streams that facilitated agricultural and fishpond production (Maly and Maly 2002). The windward shores also provide rich benthic and pelagic marine resources.

Historical accounts of residential patterns, land-use, and subsistence horticulture are believed to be indicative of traditional practices developed long before contact with Europeans

(McEldowney 1979). Early accounts of settlements along the windward shores describe the area as divided into several distinct environmental regions (Ellis 1963: 291-292). At Hilo Bay, from the coast to a distance of five or six miles scattered subsistence agriculture was evident, followed by a region of tall fern and bracken, flanked at higher elevations by a forest region between 10 and 20 miles wide, beyond which was an expanse of grass and lava (Ellis 1963:403).

The American Missionary C.S. Stewart wrote, "the first four miles of the country is open and uneven, and beautifully sprinkled with clumps, groves, and single trees of the bread-fruit, pandanus, and candle tree" (Stewart 1970:361-363). The majority of inhabitants (in 1825) lived within this coastal region (Ellis1969: 253). Taro, plantains, bananas, coconuts, sweet potatoes, and breadfruit were grown individually or in small garden plots. Fish, pig, dog, and birds were also raised and captured for consumption. Wood, such as *ʻōhiʻa* and *koa* for house construction, canoe building, and fires was obtained from the upland agricultural zone (McEldowney 1979:18-19), and from the dense forests above (Ellis 1963:236). Wood products and bird feathers were obtained from upland regions.

The dry leeward shores of Hawaiʻi Island presented a very different environment requiring a modified set of subsistence strategies. Archaeologists and historians are uncertain about the motives that lead to the establishment and spread of settlements on the leeward side of Hawaiʻi, but archaeological evidence suggests the process was underway between the A.D. 900s and 1100s (Cordy 2000). Coastal sites in Kona-
Kailua, South Kohala District, *makai* of Waikōloa, at Kalāhuipuaʻa and ʻAnaehoʻomalu and inland sites in the *ahupuaʻa* of Waimea have been dated to the A.D. 800s to 900s (Kirch 1979: 198, Cordy 2000: 130).

The early coastal settlements are located on, or adjacent to, the dry rocky shoreline and consist of temporary habitation caves containing midden, fishing tools, and fish remains; and two possibly permanent habitation sites (Barrera 1971, Jenson 1989a, 1989b, 1990a, and 1990b). The earlier phases of occupation were likely temporary habitations used when fishing, and later permanent habitations associated with fishpond production. Cordy suggests people who lived at inland Waimea occasionally frequented the Kalāhuipuaʻa and ʻAnaehoʻomalu area for its anchialine pond and marine resources (Cordy 2000:131). The implication is that, along the barren leeward coast, inland settlements and agriculture may have developed first, perhaps spreading from nearby Waimanu and Waipiʻo. Maly suggests that people living permanently along the dry shoreline shared extended family relations with people inland, allowing for an

exchange system that distributed marine resources to inland agriculturalists and brought inland agricultural products to people at the coastal settlements (Maly and Maly 2002).

The fertile plain of Waimea and the area of Kailua-Kona receive roughly 40 to 80 inches of rainfall annually and Waimea is watered by streams from the Kohala Mountains (the Waikōloa, Wai'aka, and Keanu'i'omanō streams). Inhabitants of these areas planted taro and sweet potato for subsistence. Sweet potato was the dominant crop at elevations that received from 30 to 60 inches (Cordy 2000: 135). Leeward expansion away from the coastline, at least on a permanent basis, is believed to have occurred only with the development or improvement of dry-land cultivation methods, possibly spurred by the introduction of sweet potato. Current evidence suggests that significant inland leeward settlement did not occur until 600 to 900 years after initial settlement, *i.e.*, between AD 1100 and 1400 (Green 1980; Hommon 1976; Cordy 2000). At lower elevations in North Kona and South Kohala Districts, especially along the coast, rainfall is less than thirty inches and soils are shallow or nonexistent. It is possible that mulching with rocks or cut plant materials allowed for a limited amount of root crop and arboreal agriculture in pockets of sandy soil.

In South Kona, Waimea, and Kohala, new settlements and agricultural field systems continued to spread and intensify during the A.D. 1200s to 1400s. Permanent communities were developing at Kona, Lapakahi, and along the coastal region from 'Upolu Point to Kawaihae (Cordy 2000: 140). Temporary residences and an agricultural field system were also established in the mid-elevations of Kona-Kailua and the uplands of the Waikōloa-Waimea area (Moffat and Fitzpatrick 1995, Maly and Maly 2002: 4). As communities grew and agriculture intensified during this period, polities began to form, along with competition between polities. Large polities influencing communities within modern district-size boundaries emerged in the 1300s (Cordy 2000: 142). Cordy notes that just north of the project area "two different settlement and political zones seem to have developed prior to the 1200s and to have lasted until late in prehistory—one focused on Waimea and Kawaihae in the south, and the other in north Kohala up to 'Upolu Point" (Cordy 2000:385, footnote 15). Kona-Kailua also became an important political center south of the current project area.

By the late 1700s extensive permanent field systems were well established in the Kona-Kailua area, North Kohala, Waimea, and Lālāmilo (Clark 1981, Clark and Kirch 1983, Cordy 2000). Lands of the current project area remained barren and unoccupied except for small fishing villages located at some distance along the coast.

TRADITIONAL SETTLEMENT PATTERNS

The Hawaiian economy was based on agricultural production and marine exploitation, as well as raising livestock and collecting wild plants and birds. Extended household groups settled in various *ahupua`a*. During pre-Contact times, there were primarily two types of agriculture, wetland and dry land, both of which were dependent upon geography and physiography. River valleys provided ideal conditions for wetland *kalo* (*Colocasia esculenta*) agriculture that incorporated pond fields and irrigation canals. Other cultigens, such as *kō* (sugar cane, *Saccharum officinaruma*) and *mai`a* (banana, *Musa* sp.), were also grown and, where appropriate, such crops as *`uala* (sweet potato, *Ipomoea batatas*) were produced. This was the typical agricultural pattern seen during traditional times on all the Hawaiian Islands (Kirch and Sahlins 1992, Vol. 1:5, 119; Kirch 1985). Between A.D. 600-1100, sometimes referred to as the Developmental Period, the major focus of permanent settlement continued to be the fertile and well-watered windward valleys.

Current archaeological, linguistic, and ethnological data suggest that Hawaiian social organization initially followed a Polynesian conical clan-pattern in which individual status was based upon genealogical ranking (Green 1980:72). Kinship formed the basis for regional and island-wide societal integration; however, the most important social subsistence unit was the localized, territorial community-based, corporate kin group. Leadership within this group fell to the "highest ranking individual of the locally dominant, socially ranked lineage" (*ibid*:73). This individual acted as the local chief, overseeing the social, political, and economic functioning of the community.

The subsequent development of a uniquely Hawaiian institution, the *ahupua`a*, resulted in a more complex level of social and political integration (Cordy 1978; Hommon 1976; Green 1980; Kirch 1985). The *ahupua`a* was the fundamental land division in late pre-contact Hawai`i. Ideally this land extended from the coast to the mountains–often corresponding with a valley drainage–and thus theoretically crosscut all primary resource zones, allowing each *ahupua`a* relative economic self-sufficiency. With the emergence of the *ahupua`a*, however, production shifted from the kinship-based relationship between chief and community to an incipient state-structured hierarchy. On his succession, the paramount chief chose the best lands for himself, and allocated the rest to his...

> warrior chiefs who had assisted in his conquests...[who], after retaining...land for themselves, reallotted the remaining lands to the inferior chiefs, who in turn reallotted portions of their lands to their own followers [and so on] down the scale

to the lowest tenants, the common farmers who actually tilled the soil [Chinen 1961:7].

The chief (*konohiki*) responsible for the *ahupua`a* was now a member of a non-localized ruling elite (*ali`i*) and extracted rents or tribute from the common people (*maka`ainana)* working the land. "All of these allotments to lands, from warrior chiefs down to the commoners, were on a revocable basis," and Chinen wryly notes that, "what the superior gave, he was able to take away at pleasure" (*ibid*).

WAHI PANA (LEGENDARY PLACES)

The most informative *mo'olelo* describing events that took place in the barren lands of North Kona District is The Heart Stirring Story of Ka-Miki (*Ka'ao Ho'oniua Pu'uwai no Ka-Maiki*) recorded and published between 1914 and 1917 in the weekly Hawaiian Newspaper *Ko Hōkū o Hawai'i* and translated by Maly (excerpts cited in Maly 1992). The *mo'olelo* is set in the 1300s, though it is an early 20th Century collection of narratives about local traditions, tales, and family histories. The tales do have some time depth as they have been handed down through generations. They contain a mixture of "ancient" and 20th Century descriptions of the areas through which Ka-Miki and his brother Maka-'iole traveled. Descriptions of tthree places directly related to the current project area, Hale'ohi'u, Kalaoa, and 'O'oma, are described in the story.

Hale-'ohi'u is translated as "house made with a thatching shuttle". Kalua'ōlapa was the priest of Hale'ohi'u and Kamāhoe, also referred to as Nā-Kalaoa-wai'ole, translated as "the waterless Kalaoa lands" (Maly 1992:220). Kalua'ōlapa dwelt along the *'ilima (Sidafallax)* covered upland plain of Māulukua. Ka'elehuluhulu is the name of the land, Hale'ohi'u is the sub-district, Kanāhāhā is the fishing ground, and Keawehala is the landing (ibid: 220). 'O'oma is also only mentioned for its famous fishermen (ibid: 386).

EARLY ACCOUNTS OF PREHISTORIC EVENTS IN NORTH KONA

There is a paucity of prehistoric information pertaining to the lands of the project area and surrounding lands. Cordy notes that the "oral traditions are silent" for the years of early settlement of and expansion along the leeward shores of Hawai'i (Cordy 2000: 130). The little information that does exist concerns the activities of *ali'i* and was collected and published by Fornander, I'i, and Kamakau.

Hale'ohi'u is the only area within the project area to be mentioned in these early accounts. Hale'ohi'u was a well-known fishing village at the time of 'Umi-a-liloa (Kamakau

1992:216) and is a well-known place to catch "sweet-tasting *aku* fish" up through the time of Kamehameha (*ibid*:185). During the fourth year of Kamehameha's reign, he was advised by a *kaula* (a seer devoted to Pele) to go to Kekaha to make sacrifices to Pele in order to stop the lava flow threatening his fishponds and the homes of the people in the area. The lava had already flowed through the adjacent lands of Mahai'ula, Ka'ūpūlehu, and Kīholo. It was believed that Pele desired *awa* from the fishponds of Ka'ūpūlehu, the *'ahi* of Kīholo, and the *aku* from Hale'ohi'u and Ka'elehuluhulu. The flow stopped soon after Kamehameha made sacrifices to Pele.

Descriptions of lands both north and south of the project area are brief. 'Ōhiki is a stretch of sand and Kaloko has a large walled fishpond (*ibid*:56). 'O'oma is also mentioned by Kamamkau, but only as an out of way place, where the prince Ke-aweawe'ula was raised until he was five years old. (*ibid*:264).

HISTORIC ERA LAND USE

William Ellis described two trips he made between Kawaihae and Kailua. He traveled by boat during the first trip and only remarked on the coast to say it was "a rugged and barren shore of lava" (Ellis 2004:83). During his second trip, Ellis traveled by canoe from Kawaihae to Kailua. He left the former at six in the morning, stopped at Kapalaoa around 9:00am, and arrived in Kīholo around 4:00pm. He described Kīholo as "a straggling village, inhabited principally by fishermen" (Ellis 2004:418). He also described the large fishpond created by order of Kamehameha at that village. He left Kīholo just before sunset and arrived at Ka'ūpūlehu between 7:00 and 8:00pm. He records little about the village except that everyone was asleep. When the moon had risen, by 11:00pm, he continued his journey by moonlight, arriving in Kailua an hour before sunrise. In all Ellis makes little description of the coastal area of North Kona Disctrict, perhaps because he was traveling at night.

Isabella Bird, who traveled from Kailua to Kawaihae some fifty years later described the coastal region by writing, "We sailed for some hours along a lava coast, streamless, rainless, verdureless, blazing under the fierce light of a tropical sun and some time after noon anchored in the scorching bay of Kawaihae" (Bird 2007:144).

There were no Land Commission awards granted in the project area or surrounding lands. The area of the project area remained unusable for homesteading, ranching, or farming during the Contact and Historic eras. A review of early historic maps showed no man-made features within the project area. The only known cultural resources within the Kona International Airport

facilities are a pre-Contact era cave habitation site (carbon-dated between A.D.1430-1650), a pre-Contact era temporary habitation feature with several low, circular stone alignments, a short segment of the Mamalahoa trail, and an area with several petroglyphs (Dye and Prasad 2000) (Figure 4). Both habitation areas have been fully documented and are not significant for inclusion on the National Register of Historic Places (NRHP). The Mamalahoa trail segment and the petroglyphs are significant for inclusion for the NRHP. The Mamalahoa trail segment is located in a restricted (fenced-off) area between Alpha and Delta runways, and the collection of petroglyphs is protected by a three foot high rock wall constructed around them. None of the sites are within, or in close proximity to, the three areas of proposed improvements detailed in this report. No cultural resources were encountered during a March 2008 pedestrian reconnaissance survey of all three areas of proposed improvements.

MODERN LAND USE

The lands of the current project area had limited use from settlement of the leeward side of the Island of Hawai'i until the construction of the Kona International Airport in 1969 and 1970. Land use was restricted to small coastal settlements focused on fishing, and trail systems situated between these coastal villages and larger, socio-politically important populations centered in Kawaihae to the north and Kailua-Kona to the south. The Mamalaho trail and associated features (*ahu* and two habitation sites) are the only major cultural resources located near the current project area, and none of these will be impacted by the proposed improvements documented in this report. A single site (SIHP 50-10-27-26868) consisting of three small *pāhoehoe* excavations was recorded during an archaeological inventory survey for this project (Escott and Keris 2009). The site is just outside the southeast edge of the study area, has been fully recorded, and no further work is recommended.

The following interview conducted February 12, 2009 with Aunty Josephine Palacat Barney of Kailua-Kona documents her knowledge of the coastal area from Kohanaiki to Kailua-Kona during the period from 1925 to 1935. Josephine is the daughter of Palacat Catalino (father) and Pararat Philipa (mother) of the Philippines. Palacat Catalino arrived in Hawaii in 1912 at the age of 15. Pararat Philipa was brought to Hawaii by her adoptive father. Palacat Catalino and Pararat Philipa met in Onomea when she was 14. He was a field supervisor for Hamakua Sugar. They later married and moved to Kona.

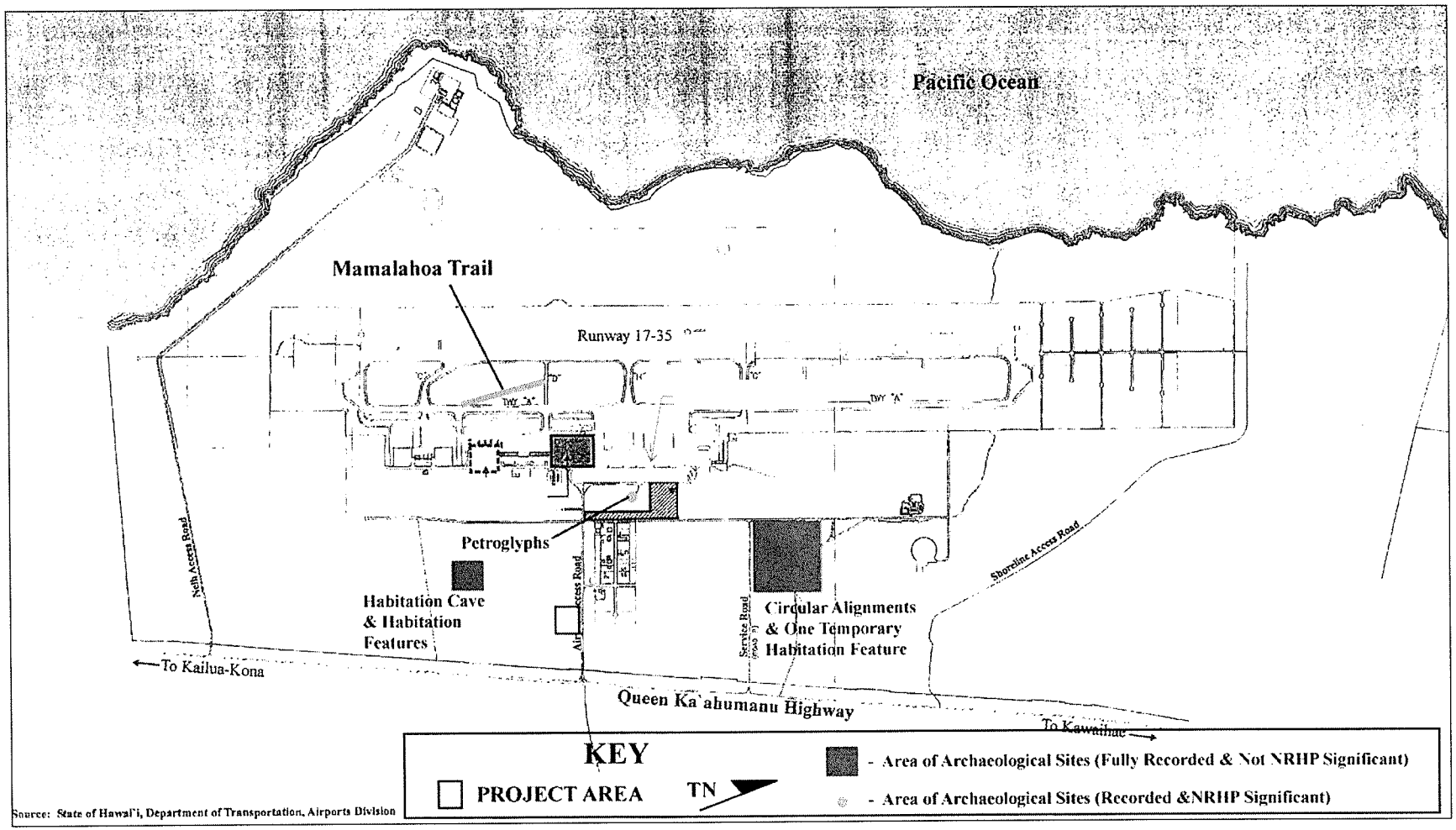

Figure 4: Map of Known Archaeological Sites and their Relationship to Project Area.

Josephine is one of fifteen children. She is fifth born and the oldest girl. They lived in Kaloko, Honokohau, and Kohanaiki between 1925 and 1935 during which time her father was the supervisor of the *opai* ponds. He was hired to care for and maintain the ponds and was responsible for keeping them in pristine condition, for all people had the privilege of using the shrimp without permission. The fish in those ponds such as *awa* and mullet were the property of the person leasing the ponds, and only they had access to them. Most land in the area belonged to Greenwell's HueHue Ranch, so the ponds were probably leased through them. Other individuals would help clean the ponds, removing algae and debris. The algae was burned so it didn't make its way back into the pond.

The Palacats first beach house was just south of the Kaloko fish pond. They also lived in homes along the beach in Honokohau and Kohanaiki. They used the tax trail (Mamalahoa Trail) and traveled by donkey up and down the coast. By that time the trail was no longer used for collecting taxes. That ended after Kamehamehas death. They traveled north on the trail to Kalaoa to gather taro and breadfruit, and south to Kailua.

The house they lived in at Kohanaiki was already standing when they arrived (Figure5). It was a ranch house that Josephine's father proceeded to repair and enlarge. They began their stay there in 1930 and continued on there until 1935. The house belonged to the Greenwell's, and was probably obtained through payment of unpaid taxes. The Keanaaina family claimed that land. At one time they lived there because they have two family members buried there. This was before the Palacats lived there.

There was once a village near there prior to the 1801 lava flow. The flow stopped before it got to the ocean. The legend is that Kamehameha was concerned about the village taken by Pele, and feared that she was headed for Kailua. Kamehameha went to Hualalai but forgot *ho'okupu* (gifts). All the Kahuna were with him, and he asked them to make peace with Pele. As he had forgotten the gifts, he grasped his hair and cut it off as he was chanting and the lava stopped flowing.

During the Palacats stay at Kohanaiki, only one other family lived in the area. Pedro Espigata was from the same province in the Philippines as Josephine's father, so they were good friends, and he and his family moved wherever the Palacats happened to be.

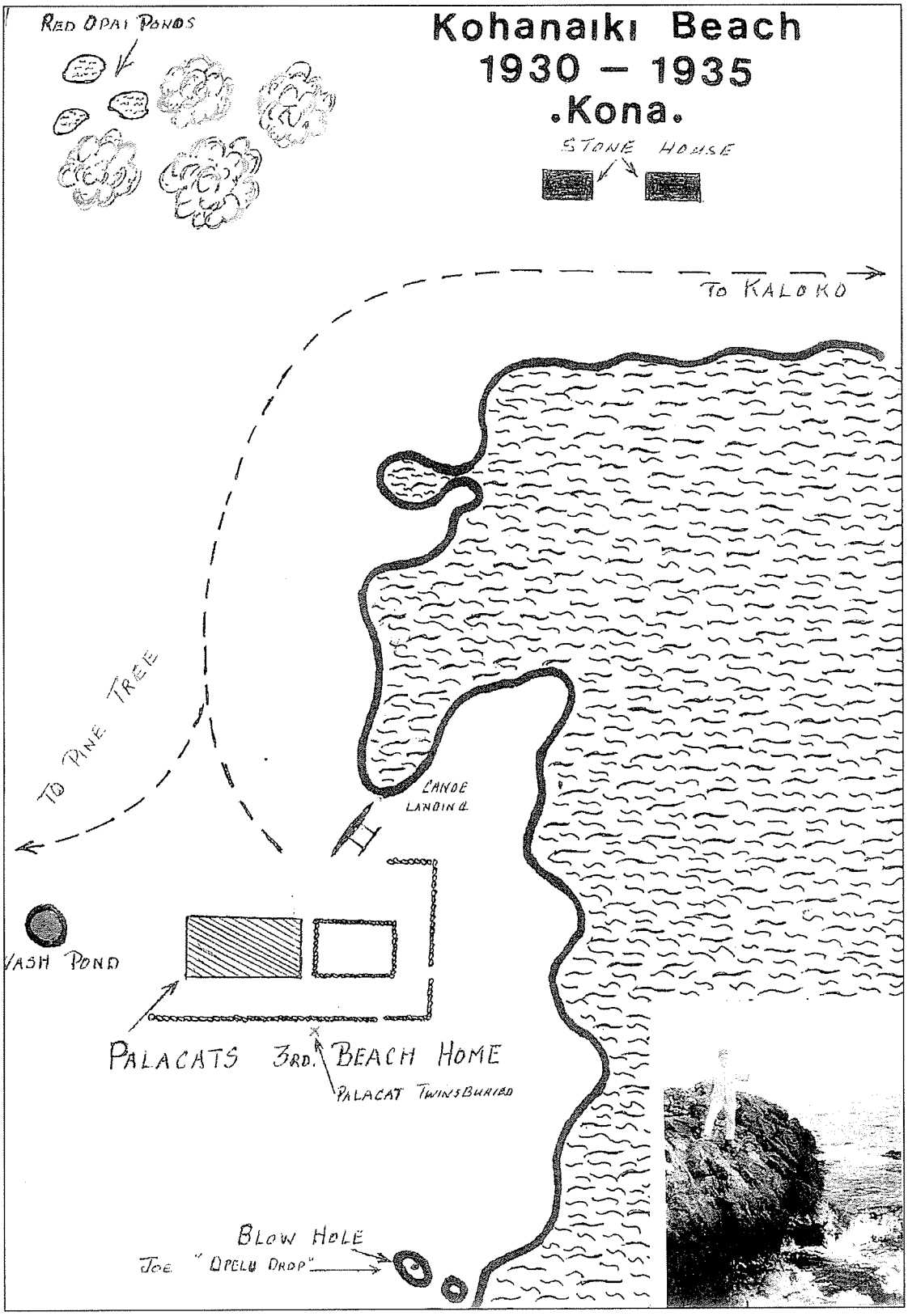

Figure 5: Palacat House at Kohanaiki Drawn by Mr. Joseph Palacat (in photo).

When the Palacats moved to Kaloko, the Espigatas moved to Kaloko. When the Palacats moved to Kohanaiki, the Espigatas moved to Kohanaiki. And when the Palacats moved to Kailua, the Espigatas moved there, too. He was married to Sarah Pai. She was very dedicated to her name because she was a descendent of an old Hawaiian Chief named Pai from ancient times. She was part Hawaiian, but also had ancestors from the Philippines, China and Portugal. She and Pedro had several children. There were no other individuals living near there during that time.

People at that time had respect for one another and for the *'aina*, and fishermen had respect for the ocean, as well. If a person used something, they were compelled to give something back in return. There were fishing traditions like the *Opelu Koa*. There were several on the west side of the island. The tradition was to fish one, then skip one. Then fish the next, and skip the one after that. Later, on there way back down the coast, they would feed the ones that they skipped. The next time they went fishing they would fish the ones that were skipped the last time.

There was a tradition that was practiced so that the shrimp were not depleted. *kanaoa* flower, which is also called the flower of Lanai is orange in color. It used to be plentiful along the coast, but the only place that it still exists is Makalawena. To chum the fish, it was customary to use a piece of cloth the size of a men's handkerchief. Josephine used soil from the base of the *keawe* tree made into mud, a pinch of shrimp and the orange *kanaoa* flower. The handkerchief was closed up and thrown out into the water. The handkerchief opens, the dirt forms a cloud, then the fish feed on the *kanaoa* because it's the same color as the shrimp. There was no need to deplete the shrimp population. This is not practiced by fishermen today, because there's not a fisherman alive today that has learned or even knows about this technique. Josephine and her brother remember this. Her sister doesn't because she wasn't involved.

Fish *imu* at Honokohau. Depending on the currents, Josephine's brother would go out and make fish *imu*. He would take rocks and depending on the way the waves were breaking, he would construct a mound, setting the rocks in such a way so that the waves wouldn't disturb them. Once the fish made a home there, inhabiting the rocks, a net could be thrown over it to catch the fish. In those days, those who fished using this method were free to use any *imu*, but were obligated to rebuild it for the next person to use. People at that time were respectful of others and of their efforts. There were strong notions concerning keeping things the way they were and putting things back, and not being disruptive.

Modern use of the lands associated with the airport facility and the Natural Energy Laboratories Hawaii (NELH) continues to be primarily focused on fishing, and coastal access and activities. A study conducted to address Public Access Shoreline Hawaii (PASH) Rights (Dye and Prasad 2000:23-30) concluded that the primary use and concern for continued use of the area were:

1. Limited access to shoreline within the vicinity of existing airport properties;
2. Compromising of archaeological and historical sites;
3. Access to prime fishing grounds;
4. Loss of native (traditional) plants'
5. Observation of traditional boundaries (need to treat an *ahupua'a* as one unit);
6. Impacts to aquifers and seabeds; and
7. Boundaries compromised and/or seen as inseparable from NELH.

Eight long-time Kona residents with specific knowledge of the lands of the Kona International Airport were interviewed (December 1999 to February 2000) for the PASH study. Concerns were that, while the airport did not appreciably limit vehicle access to camping and fishing areas, the construction of the NELH facility did (Dye and Prasad 2000:25, 26-17). Moreover, those interviewed voiced concern that the NELH operations might have resulted in a reduction in the area fish supply. There was a sense that pollutants from the airport and the NELH could degrade the local aquifers and seabeds. Cultural informants also voiced concern over the possible alteration of ancestral burials, archaeological sites, and native plant habitat.

SUMMARY

The "level of effort undertaken" to identify potential effect by a project to cultural resources, places or beliefs (OEQC 1997) has not been officially defined and is left up to the investigator. A good faith effort can mean contacting agencies by letter, interviewing people who may be affected by the project or who know its history, research identifying sensitive areas and previous land use, holding meetings in which the public is invited to testify, notifying the community through the media, and other appropriate strategies based on the type of project being proposed and its impact potential. Sending inquiring letters to organizations concerning development of a piece of property that has already been totally impacted by previous activity and is located in an already developed industrial area may be a "good faith effort". However, when many factors need to be considered, such as in coastal or mountain development, a good faith effort might mean an entirely different level of research activity.

In the case of the present parcel, letters of inquiry were sent to organizations whose expertise would include the project area. Consultation was sought from Kai Markell, the Director of Native Rights, Land and Culture, Office of Hawaiian Affairs on O`ahu; Ruby McDonald, Coordinator of the Hawai'i branch of the Office of Hawaiian Affairs; the Kuakini Civic Club; and the Kona Hawaiian Civic Club.

Historical and cultural source materials were extensively used and can be found listed in the References Cited portion of the report. Such scholars as I`i, Kamakau, Beckwith, Chinen, Kame`eleihiwa, Fornander, Kuykendall, Kelly, Handy and Handy, Puku`i and Elbert, Thrum, Sterling, and Cordy have contributed, and continue to contribute to our knowledge and understanding of Hawai`i, past and present. The works of these and other authors were consulted and incorporated in the report where appropriate. Land use document research was supplied by the Waihona `Aina 2007 Data Base.

CIA INQUIRY RESPONSE

As suggested in the "Guidelines for Accessing Cultural Impacts" (OEQC 1997), CIAs incorporating personal interviews should include ethnographic and oral history interview procedures, circumstances attending the interviews, as well as the results of this consultation. It is also permissible to include organizations with individuals familiar with cultural practices and features associated with the project area.

As stated above, consultation was sought from the Director of Native Rights, Land and Culture, Office of Hawaiian Affairs on O`ahu; the Hawai'i branch of the Office of Hawaiian Affairs; the Kuakini Civic Club; and the Kona Hawaiian Civic Club. Except for OHA acknowledging the receipt of our letter, none of the organizations responded with information concerning the potential for cultural resources to occur in the project area, or with additional suggestions for further contacts.

Analysis of the potential effect of the project on cultural resources, practices or beliefs, its potential to isolate cultural resources, practices or beliefs from their setting, and the potential of the project to introduce elements which may alter the setting in which cultural practices take place is a requirement of the OEQC (No. 10, 1997). To our knowledge, the project area has not been used for traditional cultural purposes within recent times. Based on historical research and no response from the above listed contacts, it is reasonable to conclude that Hawaiian rights related to gathering, access or other customary activities within the project area will not be affected and there will be no direct adverse effect upon cultural practices or beliefs. The visual impact of the project from surrounding vantage points, e.g. the highway, mountains, and coast would appear to be minimal.

CULTURAL ASSESSMEMNT

Based on organizational response as well as archival research, it is reasonable to conclude that, pursuant to Act 50, the exercise of native Hawaiian rights, or any ethnic group, related to gathering, access or other customary activities will not be affected by development activities on this parcel. Because there were no cultural activities identified within the project area, there are no adverse effects.

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APPENDIX D.

Traffic Impact Assessment Report

Phillip Rowell and Associates
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June 15, 2009

Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Maui, HI 96793

Attn: Mr. Mich Hirano

Re: **Traffic Impact Assessment Report**
Onizuki Space Center Kono International Airport

Dear Mich:

Phillip Rowell and Associates have completed the following Traffic Impact Assessment Report (TIAR) for the proposed relocation of the Onizuka Space Center at Kona International Airport on the Island of Hawaii. The following report is presented in the following format:

A. Project Location and Description
B. Purpose and Objective of Study
C. Methodology
D. Description of Existing Streets and Intersection Controls
E. Existing Peak Hour Traffic Volumes
F. Level-of-Service Concept
G. Existing Levels-of-Service
H. Background Traffic Projections
I. Project Trip Generation
J. Background Plus Project Traffic Projections
K. Traffic Impact Analysis
L. Mitigation
M. Other Traffic Related Issues
N. Summary and Conclusions

A. Project Location and Description

The existing Onizuka Space Center is located in the terminal area of Kona International Airport. The proposed action is the relocation of the center. The proposed location is located along the south side of Keahole Street. Access to and egress from the site will be provided via a new driveway approximately 1,250 west of Queen Kaahumanu Highway and 350 feet east of Halau Street. See Attachment A.

Based on information provided by the Program Coordinator of the Center, the Center had approximately 16,250 visitors between October 2007 and September 2008. However, this traffic study is based on the higher number of visitors, or 16,500 per year. Approximately 8,000 of the annual visitors are students on organized school trips.

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. Methodology

1. *Define the Study Area*

The first step in defining the study area was to estimate the number of peak hour trips that the proposed project will generate. Because the project involves the relocation of the existing space center to another site within the Kona International Airport property, any changes in traffic volumes or circulation patterns will be between the existing and new locations. Thus, the traffic analysis is limited to the intersection of the project driveway at Keahole Street, aka Airport Access Road.

2. *Analyze Existing Traffic Conditions*

The traffic analysis was performed using traffic counts performed by State of Hawaii Department of Transportation along Keahole Street. The roadway configuration, right-of-way controls and surrounding land use conditions were verified during a field reconnaissance of the study area. As the study intersection (Keahole Street at the project driveway) does not currently exist, an assessment existing traffic operating conditions could not be performed.

3. *Estimate Project-Related Traffic Characteristics*

The number of peak-hour trips that the proposed project will generate was estimated using standard trip generation procedures outlined in the *Trip Generation Handbook*[1] and data provided in *Trip Generation*[2]. These trips were distributed and assigned, based on the available approach and departure routes.

4. *Analyze Project Related Traffic Impacts*

The project-related traffic was then superimposed on background traffic volumes. The traffic impacts of the project were assessed by analyzing the changes in peak hour traffic volumes and changes in the levels-of-service at the study intersections using the methodology described in the 2000 *Highway Capacity Manual* (HCM)[3]. The purpose of this analysis was to identify potential operational deficiencies in the vicinity of the proposed project.

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[1] *Trip Generation Handbook*, Institute of Transportation Engineers, Washington, D.C., 1998

[2] *Trip Generation*, Institute of Transportation Engineers, Washington, D.C., 2003

[3] *Highway Capacity Manual*, Institute of Transportation Engineers, Washington, D.C., 2000

D. Description of Existing Streets and Intersection Controls

Keahole Street (aka Airport Access Road) is a two-lane, two-way roadway with an east-west orientation, connecting Queen Kaahumanu Highway with the Kona International Airport terminal. The roadway is used by traffic to and from the airport as well as rental cars.

E. Existing Peak Hour Traffic Volumes

The existing morning and afternoon peak hour traffic volumes along Keahole Street are summarized in Attachment B.

F. 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. LOS D is typically considered acceptable for peak hour conditions in urban areas.

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 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.

G. Existing Levels-of-Service

As the study intersection does not currently exist, existing levels-of-service could not be calculated.

H. Background Traffic Projections

As the proposed action is the relocation of an existing activity to another location on the airport property and the time between the completion of the EA and actual relocation of the space center, the growth of background traffic along Keahole Street will be negligible. Therefore, it was assumed that existing traffic volumes would be used from background traffic volumes. See Attachment B.

I. Project Trip Generation

Traffic generated by the space center consists of three components: school students, other non-organized visitors and employees. Separate trip generation analysis were performed for each. The trip generation analysis is based on a total of 16,600 visitors with occurred between October 2006 and September 2007. This is the peak number of annual visitors recorded. Since then, the annual number of visitors has decreased to approximately 11,600.

School Students

Based on information provided by the Program Coordinator, approximately 8,000 school students per year visit the space center as part of an organized school trip. The number of peak hour trip associated with these trips was estimated using the following assumptions:

1. The total number of students visiting the space center is 8,000 students per year.

2. The trips to the space center are over a 30 week period as all schools do not operate year round.

3. School trips to the space center occur two days per week. This means that the average number of students visiting the space center is 8,000/60 = 135 students per day.

4. All school students are brought to the space center by bus and the average occupancy is 30 students. Therefore, there are five (5) bus trips required to accommodate 135 students.

5. Buses drop off the students at the space center. As a worse-case scenario, buses do not park on-site, but part at another location, then return to pick up the students.

6. All bus trips occur during the morning peak hour. There are no school student trips during the afternoon.

Using these assumptions, there will be a total of 10 trips during the morning peak hour, 5 inbound and 5 outbound.

Other Visitors

1. There are 8,600 non-student visitors annually.

2. The space center is open approximately 350 days per year, which means that the average number of daily visitors is 25.

3. For the traffic analysis, it was assumed that the number of visitors used for the design day is two times the average daily visitors, or 50 persons.

4. The number of persons per vehicle is 2.0. Therefore the number of design day trips os 25.

5. 50% of the visitor trips, or 12 trips, occur during the peak hour and all visits are less than one hour. This means that there are 12 inbound and 12 outbound trips during the peak hour. It was assumed that these visitor trip may occur during with the morning or afternoon peak hour.

6. 10% of the visitor trips as pass by trips. This means that 10% of the trips are on their way to or from the airport. The remainder are trips to and from the space center only.

Employees

1. There will be one full-time employees. This employee will during the morning peak hour and leave during the afternoon peak hour.

2. There will be five part-time employees. Two part-time employees will arrive during the morning peak hour and two will leave during the afternoon peak hour.

Total Trips Generated

The trip generation analysis is summarized in Table 3. The proposed project will generate 20 inbound and 17 outbound trips during the morning peak hour. During the afternoon peak hour, the project will generate 12 inbound and 15 outbound trips.

Table 3 Trip Generation Analysis

Period & Direction		School Student Trips	Other Visitor Trips			Employee Trips	Total Trips		
			Total	Pass By	New		Total	Pass By	New
AM Peak Hour	Total	10	24	4	20	3	37	4	38
	Inbound	5	12	2	10	3	20	2	18
	Outbound	5	12	2	10	0	17	2	20
PM Peak Hour	Total	0	24	4	20	3	27	4	23
	Inbound	0	12	2	10	0	12	2	11
	Outbound	0	12	2	10	3	15	2	12

The project generated traffic was and assigned to the allowable traffic movements at the project driveway along Keahole Street. The project trip assignments are shown in Attachment B.

J. 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. The resulting background plus project peak hour traffic projections are shown in Attachment B.

K. Results of Level-of-Service Analysis

1. The *Highway Capacity Software* (HCS) package was used to perform the level-of-service analysis. This package uses the *Highway Capacity Manual* methodology.

2. As the *Highway Capacity Manual* defines level-of-service by delay, we have used the same definitions.

3. The project driveway is one lane inbound and one lane outbound. There is no separate left or right turn lane for inbound traffic.

The results of the level-of-service analysis are summarized in Table 4. Shown are the average vehicle delays and levels-of-service of all controlled lane groups. The results of the level-of-service analysis indicate that all the controlled movements at the project driveway along Keahole Street will operate at Level-of-Service A or B, or better. This indicates that the driveway will operate well and that the new driveway will have a minimal impact on non-project related traffic along Keahole Street.

Table 4 Results of Levels-of-Service at Project Driveway along Keahole Street

	AM Peak Hour		PM Peak Hour	
Intersection, Approach and Movement	Delay	LOS	Delay	LOS
Keahole Street at Project Driveway				
Westbound Left & Thru	7.7	A	8.5	A
Northbound Left & Right	9.9	A	12.4	B

NOTES:
1. V/C ratio is not calculated for unsignalized intersections.
2. Delay is in seconds per vehicle.
3. LOS denotes Level-of-Service calculated using the operations method described in *Highway Capacity Manual*. LOS is based on delay.
4. See Attachment C for level-of-service worksheets.

L. Mitigation

Level-of-Service D is generally considered to be the minimum acceptable peak hour level-of-service for urban intersections [4]. It is generally accepted that side street approaches and minor movements, such as left turn lanes may operate at Level-of-Service E or F for short periods, especially if the volume-to-capacity ratio indicates a higher level-of-service, as this implies that the long delay, and therefore, the low level-of-service is a result of the traffic signal cycle length rather than a lane deficiency [5].

Based on this criteria, no mitigation is required at the study intersection as a result of project generated traffic because all movements will operate at Level-of-Service A or B.

M. Other Traffic Related Issues

Pedestrian Traffic and Safety

No pedestrian traffic was observed along Keahole Street and there are no sidewalks. The terminal to too far away for pedestrians to walk between the terminal and space center. Queen Kaahumanu Highway is also too far from the proposed space center. As there are no sidewalks, pedestrian should not be encourage to walk between the space center and other locations within the airport property. All drop offs and pick ups of pedestrians by other vehicles, including any public transportation vehicles, should be within the space center's on-site parking lot.

N. Summary and Conclusions

The conclusions of the traffic impact assessment are:

1. The proposed project will generate 20 inbound and 17 outbound trips during the morning peak hour. During the afternoon peak hour, the project will generate 12 inbound and 15 outbound trips.

2. The Institute of Transportation Engineers recommends that a traffic impact study should be performed if, in lieu of another locally preferred criterion, development generates an additional 100 vehicle trips in the peak direction (inbound or outbound) during the site's peak hour.[6] Based on the criterion, a traffic impact study is not warranted. .

3. Based on the findings of the level-of-service analysis, all movements at the project driveway along Keahole Street will operate at Level-of-Service A or B. This indicates that the driveway will operate well and that the new driveway will have a minimal impact on non-project related traffic along Keahole Street.

Respectfully submitted,

---

[4] Institute of Traffic Engineers *Transportation Impact Analyses for Site Development, A Recommended Practice,* Washington, D.C., 2006, p 60.

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

[6] Institute of Transportation, *Traffic Access and Impact Studies for Site Development, A Recommended Practice*, 1991, page 5.

PHILLIP ROWELL AND ASSOCIATES

Phillip J. Rowell, P.E.
Principal

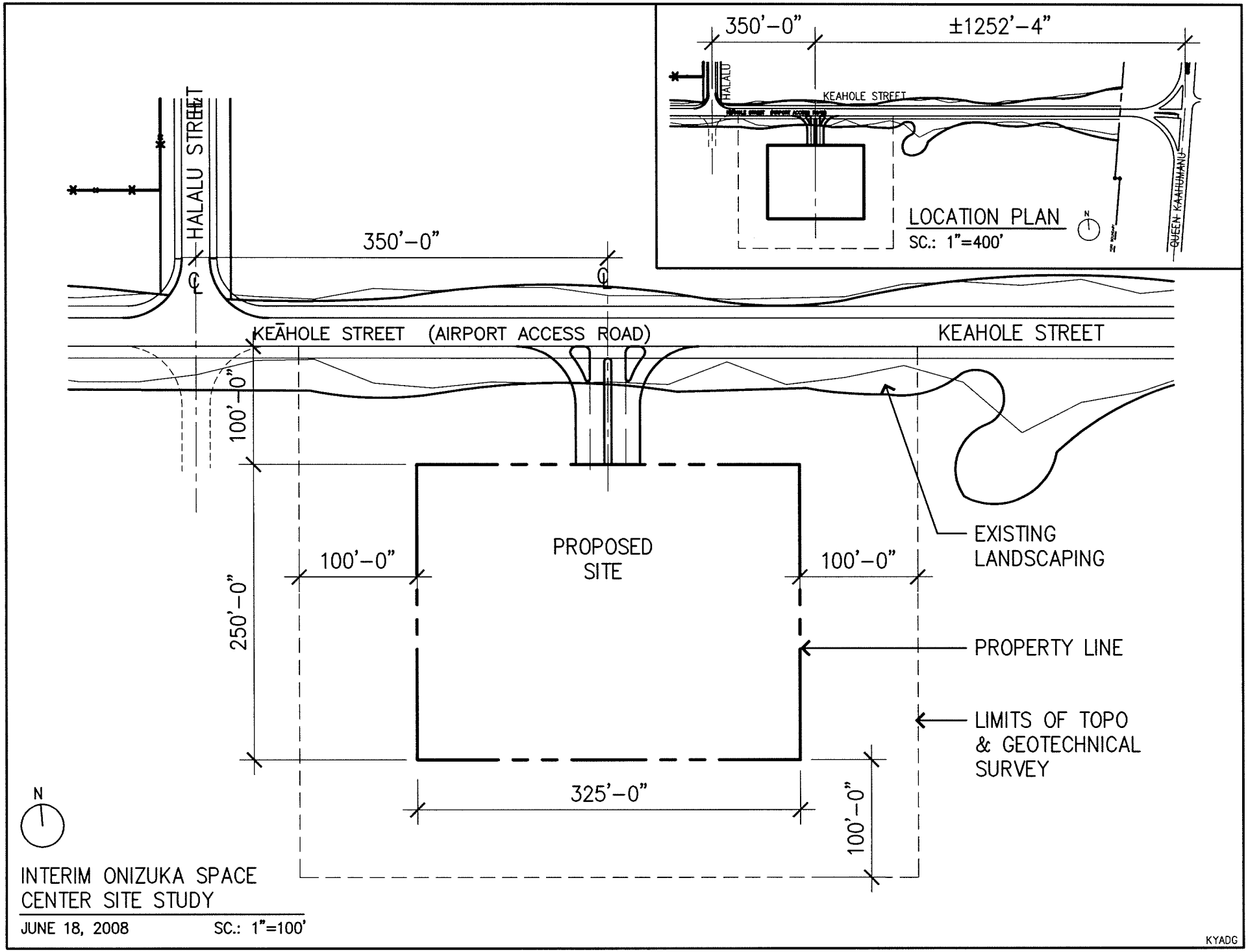
List of Attachments

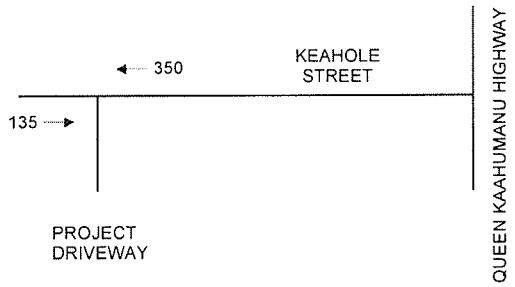
A. Project Location Map

B. Background Peak Hour Traffic Projections, Project Trip Assignments and Background Plus Project Peak Hour Traffic Projections

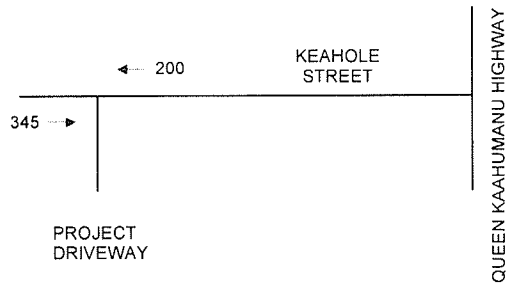
C. Level-of-Service Worksheets

Attachment A
PROJECT LOCATION MAP
(BY OTHERS)

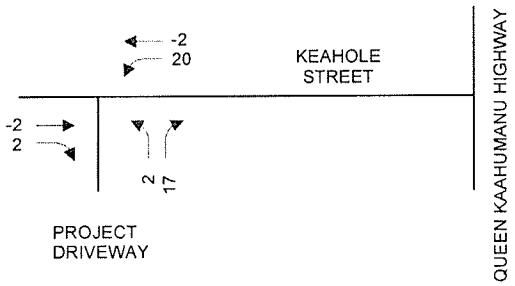

350'-0"
±1252'-4"
HALALU
KEAHOLE STREET
QUEEN KAAHUMANU
LOCATION PLAN
SC.: 1"=400'
HALALU STREET
350'-0"
KEĀHOLE STREET (AIRPORT ACCESS ROAD)
KEAHOLE STREET
100'-0"
PROPOSED SITE
100'-0"
100'-0"
250'-0"
EXISTING LANDSCAPING
PROPERTY LINE
LIMITS OF TOPO & GEOTECHNICAL SURVEY
325'-0"
100'-0"
N
INTERIM ONIZUKA SPACE CENTER SITE STUDY
JUNE 18, 2008
SC.: 1"=100'
KYADG



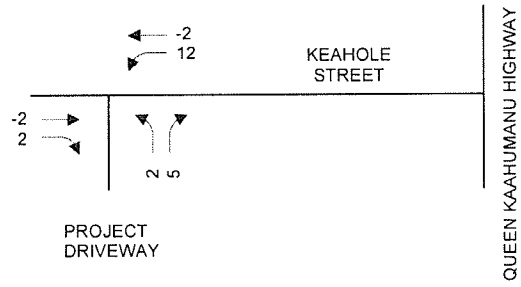
BACKGROUND AM PEAK HOUR



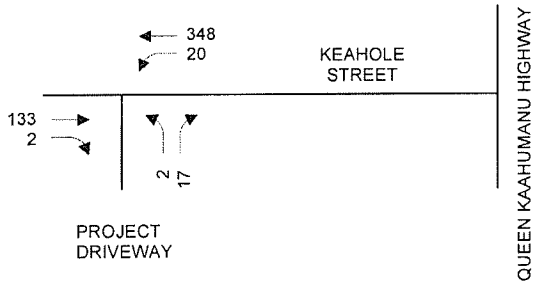
BACKGROUND PM PEAK HOUR



AM PEAK HOUR PROJECT TRIP ASSIGNMENTS

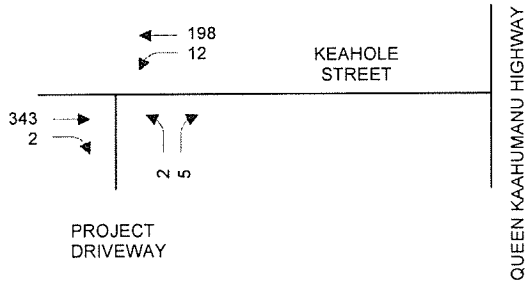


PM PEAK HOUR PROJECT TRIP ASSIGNMENTS



Approach	Delay	LOS
WB LT	7.7	A
NB LR	9.9	A

BACKGROUND PLUS PROJECT AM PEAK HOUR



Approach	Delay	LOS
WB LT	8.5	A
NB LR	12.4	B

BACKGROUND PLUS PROJECT PM PEAK HOUR

Attachment B
BACKGROUND PEAK HOUR PROJECTIONS,
PROJECT TRIP ASSIGNMENTS AND
BACKGROUND PLUS PROJECT PEAK HOUR PROJECTIONS

Attachment C
LEVEL-OF-SERVICE WORKSHEETS

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	PJR	Intersection	Case3am
Agency/Co.	PRA	Jurisdiction	
Date Performed	6/8/2009	Analysis Year	
Analysis Time Period	AM Peak Hour		

Project Description: Onizuka Space Center

East/West Street: Airport Access Road | North/South Street: Project Driveway

Intersection Orientation: East-West | Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		133	2	20	348	
Peak-Hour Factor, PHF	0.70	0.70	0.70	0.70	0.70	0.70
Hourly Flow Rate, HFR (veh/h)	0	190	2	28	497	0
Percent Heavy Vehicles	0	--	--	5	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	0	1	0	0	1	0
Configuration			TR	LT		
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	2		17			
Peak-Hour Factor, PHF	0.70	0.70	0.70	0.70	0.70	0.70
Hourly Flow Rate, HFR (veh/h)	2	0	24	0	0	0
Percent Heavy Vehicles	5	0	5	0	0	0
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	0	0	0	0	0
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		LT		LR				
v (veh/h)		28		26				
C (m) (veh/h)		1364		768				
v/c		0.02		0.03				
95% queue length		0.06		0.11				
Control Delay (s/veh)		7.7		9.9				
LOS		A		A				
Approach Delay (s/veh)	--	--	9.9					
Approach LOS	--	--	A					

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TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*PJR*
Agency/Co.	*PRA*
Date Performed	*6/8/2009*
Analysis Time Period	*AM Peak Hour*

Site Information

Intersection	*Case3pm*
Jurisdiction	
Analysis Year	

Project Description *Onizuka Space Center*

East/West Street: *Airport Access Road* | North/South Street: *Project Driveway*

Intersection Orientation: *East-West* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		*343*	*2*	*12*	*198*	
Peak-Hour Factor, PHF	*0.70*	*0.70*	*0.70*	*0.70*	*0.70*	*0.70*
Hourly Flow Rate, HFR (veh/h)	*0*	*490*	*2*	*17*	*282*	*0*
Percent Heavy Vehicles	*0*	--	--	*5*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration			*TR*	*LT*		
Upstream Signal		*0*			*0*	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*2*		*5*			
Peak-Hour Factor, PHF	*0.70*	*0.70*	*0.70*	*0.70*	*0.70*	*0.70*
Hourly Flow Rate, HFR (veh/h)	*2*	*0*	*7*	*0*	*0*	*0*
Percent Heavy Vehicles	*5*	*0*	*5*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration		*LR*				

Delay, Queue Length, and Level of Service

Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*LT*		*LR*				
v (veh/h)		*17*		*9*				
C (m) (veh/h)		*1056*		*497*				
v/c		*0.02*		*0.02*				
95% queue length		*0.05*		*0.06*				
Control Delay (s/veh)		*8.5*		*12.4*				
LOS		*A*		*B*				
Approach Delay (s/veh)	--	--	*12.4*					
Approach LOS	--	--	*B*					

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APPENDIX E.

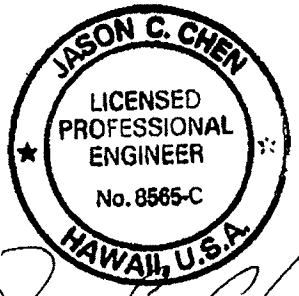
Engineering Design Report

ENGINEERING DESIGN REPORT

Water and Wastewater Systems
for
Astronaut Ellison S. Onizuka Space Center Project
Kona International Airport

June, 2009

Prepared by



JC Engineering, LLC

Table of Contents

Engineering Design Report

Figures

1.0 POTABLE WATER AND FIREWATER SUPPLY

1.1 Existing Condition

Potable and fire water supply to the Kona International Airport area is from two water reservoirs that are adjacent to each other, have a storage capacity of 500,000-gallon each, have a storage elevation range of 262.00 feet at its lowest point and 280.00 feet above the mean sea level (MSL) at its highest point, is approximately 1,850 feet east of Queen Kaahumanu Highway, and have water mains installed along the north side of Keahole Street (airport access road) that are through two parallel 12 inch and 16 inch pipes. These water mains are joined at the intersection area of Keahole Street and Pao'o Street (Road "N"). Invert elevation is 83.30 feet MSL, approximately 2,650 feet west of Queen Kaahumanu Highway, and then connect to the airport water distribution system. The grade elevations for airport building areas vary from 50.00 feet to 65.00 feet MSL. The average gage water pressure for the airport water distribution system is 92.50 pounds per square inch (psi) for static pressure, and 82.50 psi for residual pressure tested at fire hydrants.

1.2 Proposed Astronaut Ellison S. Onizuka Space Center

The proposed Astronaut Ellison S. Onizuka Space Center site is located at approximately 1,250 feet west of Queen Kaahumanu Highway and 100 feet south of Keahole Street, or 130 feet south of the existing 12-inch water mains. The proposed invert elevation for the tie-in point of the existing 12-inch water main is approximately 108.50 feet MSL. The estimated gage water pressure for the proposed tie-in point is 70.40 pounds per square inch (psi) for static pressure, and 60.40 psi for estimated residual pressure with fire flow.

1.2.1 Water Demand for Proposed Astronaut Ellison S. Onizuka Space Center

The estimated water demands for the proposed Astronaut Ellison S. Onizuka Space Center are as follows:

- Potable water demand = 60 gallons per minute (gpm) = 0.13 cubic feet per second (cfs)
- Firewater demand = 300 gpm = 0.67 cfs

1.3 Determine Pipe Size

To minimize the head loss and suspended solid deposit, the pipe flow velocity should be maintained at a range from 2.00 to 7.50 feet per second (fps).

A. For 8-inch Lateral Line (combined flow line, ductile iron Class 52 pipe):

$$A = \pi D^2/4$$
$$= 3.1416 \times (0.6992)^2/4$$

$= 0.38$ sf

$Q = 360$ gpm
$= 0.80$ cfs

$V = Q/A$
$= 2.11$ fps

B. For 6-inch Firewater Line (ductile iron Class 52 pipe):

$A = \pi D^2/4$
$= 3.1416 \times (0.5233)^2/4$
$= 0.22$ sf

$Q = 300$ gpm
$= 0.67$ cfs

$V = Q/A$
$= 3.05$ fps

C. For 2-inch Potable Water Line (soft copper pipe):

$A = \pi D^2/4$
$= 3.1416 \times (0.1667)^2/4$
$= 0.02$ sf

$Q = 60$ gpm
$= 0.13$ cfs

$V = Q/A$
$= 6.50$ fps

1.4 Estimated System Pressure

The configuration of proposed new water lateral and branch line is shown on **Figure 1** and criteria to estimate head losses are as follows:

- The existing 12-inch pipe invert elevation at the proposed tie-in point is approximately 108.50 feet MSL and estimated residual pressure with fire flow is 60.40 psi.
- The proposed finished grade elevation for the proposed Astronaut Ellison S. Onizuka Space Center is 116.75 feet MSL.
- The length of combined flow line, 8-inch-diameter, is approximately 141.00 linear feet.
- The length of potable water supply line, 2-inch-diameter, is approximately 39.00 linear feet.

- The longest firewater supply line, 6-inch in diameter, is approximately 216.60 linear feet.
- The firewater supply line for building sprinkler system, 6-inch in diameter, is 27.58 60 linear feet.

1.4.1 Estimated System Pressure for Potable Water Supply

A. Minor losses elements:

- One 2-inch meter with valves is to be installed.
- One 2-inch gate valve is to be installed.
- Two 90-degree elbows are to be installed.
- One pipe entrance connection is to be installed in the lateral line.
- Flow velocity, $V_1 = 2.11$ fps for the combined flow line.
- Flow velocity, $V_2 = 6.50$ fps for the potable water supply line.

B. Static Head (H_s):

Combined flow line invert elevation at inlet location = 108.50 ft

Combined flow line invert elevation at outlet location = 110.75 ft

Finished grade elevation for the space center= 116.70 ft

H_s = 116.70 ft – 108.50 ft
= 8.20 ft

C. Pipe Friction Head Loss (H_f):

- Combined Flow Line (8-inch)

Reynolds Number, $R_e = (DV/\nu) = (0.6992 \times 2.11/0.0000107639) = 1.37 \times 10^5$

Relative Roughness, $\varepsilon/D = 0.000005/0.6992 = 0.00001$

Resistance Coefficient, $f = 0.0180$ (read from Moody Graph base on above data)

$H_f = f \times (L / D) \times (V^2 / 2g)$
$= 0.0180 \times (141.0000 / 0.6992) \times (2.11^2 / 64.4)$
$= 0.0180 \times 200.2288 \times 0.0691$
= 0.25 ft

- Potable Water Line (2-inch)

Reynolds Number, $R_e = (DV/\nu) = (0.1667 \times 6.50/0.0000107639) = 1.00 \times 10^5$

Relative Roughness, $\varepsilon/D = 0.000005/0.1667 = 0.00003$

Resistance Coefficient, f = 0.0180 (obtained from the Moody Graph based on the data above)

$$\begin{aligned} H_f &= f \times (L / D) \times (V^2 / 2g) \\ &= 0.0180 \times (39.0000 / 0.1667) \times (6.50^2 / 64.4) \\ &= 0.0180 \times 233.9532 \times 0.6561 \\ &= \underline{2.76 \text{ ft}} \end{aligned}$$

- Other Cross Losses (H_L):

  Pipe Entrance Loss, K = 1.0

$$\begin{aligned} H_E &= K \times (V^2 / 2g) \\ &= 1.0 \times (6.50^2 / 64.4) \\ &= \underline{0.66 \text{ ft}} \end{aligned}$$

  Water meter, K = 35

$$\begin{aligned} H_M &= K \times (V^2 / 2g) \\ &= 35 \times (6.50^2 / 64.4) \\ &= \underline{22.96 \text{ ft}} \end{aligned}$$

  Gate Valve = 1 ea

$$\begin{aligned} H_{GV} &= 1 \times 0.14 \times (6.50^2 / 64.4) \\ &= \underline{0.09 \text{ ft}} \end{aligned}$$

  90° Bent = 2 ea

$$\begin{aligned} H_B &= K \times (V^2 / 2g) \\ &= 2 \times 0.51 \times (6.50^2 / 64.4) \\ &= \underline{0.67 \text{ ft}} \end{aligned}$$

$$\begin{aligned} \text{Total Head Loss} &= 8.20 + 0.25 + 2.76 + 0.66 + 22.96 + 0.09 + 0.67 \\ &= 35.59 \text{ feet} \\ &= 15.42 \text{ psi} \end{aligned}$$

Therefore, the potable water discharge pressure at the proposed Astronaut Ellison S. Onizuka Space Center finished floor level is approximately 60.40 – 15.42 = 44.98 psi. The discharge pressure is higher than a normal discharge pressure of 25 psi or less. It may be required to release the additional pressure through a regulator valve inside the water meter. The adjustment can be done when the system pressure test is completed.

1.4.2 Estimated System Pressure for Firewater Supply – Fire Hydrant

A. Minor losses elements:

- Three 90-degree elbows are to be installed.
- One 6-inch gate valve is to be installed.
- One water exist is to be installed.
- Flow velocity, $V_1 = 2.11$ fps for the combined flow line.
- Flow velocity, $V_2 = 3.05$ fps for the firewater supply line.

B. Static Head (H_s):

Combined flow line invert elevation at inlet location = 108.50 ft

Combined flow line invert elevation at outlet location = 110.75 ft

Fire hydrant outlet elevation for the space center= 114.75 ft

H_s = 114.75 ft – 108.50 ft
= 6.25 ft

C. Pipe Friction Head Loss (H_f):

- Combined Flow Line (8-inch)

Reynolds Number, $R_e = (DV/\nu) = (0.6992 \times 2.11/0.0000107639) = 1.37 \times 10^5$

Relative Roughness, $\varepsilon/D = 0.000005/0.6992 = 0.00001$

Resistance Coefficient, f = 0.0180 (obtained from the Moody Graph based on the data above)

$H_f = f \times (L / D) \times (V^2 / 2g)$
$= 0.0180 \times (141.0000 / 0.6992) \times (2.11^2 / 64.4)$
$= 0.0180 \times 200.2288 \times 0.0691$
= 0.25 ft

- Firewater Line (6-inch)

Reynolds Number, $R_e = (DV/\nu) = (0.5233 \times 3.05/0.0000107639) = 1.48 \times 10^5$

Relative Roughness, $\varepsilon/D = 0.000005/0.5233 = 0.00001$

Resistance Coefficient, f = 0.0180 (obtained from the Moody Graph based on the data above)

$H_f = f \times (L / D) \times (V^2 / 2g)$
$= 0.0180 \times (216.50 / 0.5233) \times (3.05^2 / 64.4)$

$= 0.0180 \times 413.7206 \times 0.1444$

$= \underline{1.08 \text{ ft}}$

- Other Cross Losses (H_L):

  Entrance Loss, K = 1.0

  $H_E = K \times (V^2 / 2g)$

  $= 1.0 \times (3.05^2 / 64.4)$

  $= \underline{0.14 \text{ ft}}$

  Hydrant Exit Loss, K = 10.0

  $H_E = K \times (V^2 / 2g)$

  $= 10.0 \times (3.05^2 / 64.4)$

  $= \underline{1.44 \text{ ft}}$

  Gate Valve = 1 ea

  $H_{GV} = 1 \times 0.14 \times (3.05^2 / 64.4)$

  $= \underline{0.02 \text{ ft}}$

  90° Bent = 3 ea

  $H_B = K \times (V^2 / 2g)$

  $= 3 \times 0.51 \times (3.05^2 / 64.4)$

  $= \underline{0.21 \text{ ft}}$

Total Head Loss $= 6.25 + 0.25 + 0.18 + 0.14 + 1.44 + 0.02 + 0.21$

$= 8.49$ feet

$= 3.68$ psi

Therefore, the fire water discharge pressure at the proposed farthest fire hydrant within the Astronaut Ellison S. Onizuka Space Center is approximately 60.40 – 3.68 = 56.72 psi. The estimated discharge pressure is high enough for fire hydrant operation.

1.4.3 Estimated System Pressure for Firewater Supply – Building Sprinkler

A. Minor losses elements:

- One 90-degree elbow is to be installed.
- One 6-inch gate valve is to be installed.
- One 6-inch check valve is to be installed.
- One water exist is to be installed.
- Flow velocity, $V_1 = 2.11$ fps for the combined flow line.
- Flow velocity, $V_2 = 3.05$ fps for the firewater supply line.

B. Static Head (H_s):

Combined flow line invert elevation at inlet location = 108.50 ft

Combined flow line invert elevation at outlet location = 110.75 ft

Space center finished floor elevation= 116.75 ft

H_s = 116.75 ft – 108.50 ft
= 8.25 ft

C. Pipe Friction Head Loss (H_f):

- Combined Flow Line (8-inch)

  Reynolds Number, $R_e = (DV/\nu) = (0.6992 \times 2.11/0.0000107639) = 1.37 \times 10^5$

  Relative Roughness, $\varepsilon/D = 0.000005/0.6992 = 0.00001$

  Resistance Coefficient, f = 0.0180 (obtained from the Moody Graph based on the data above)

  $H_f = f \times (L / D) \times (V^2 / 2g)$
  $= 0.0180 \times (141.0000 / 0.6992) \times (2.11^2 / 64.4)$
  $= 0.0180 \times 200.2288 \times 0.0691$
  = 0.25 ft

- Fire Sprinkler Line (6-inch)

  Reynolds Number, $R_e = (DV/\nu) = (0.5233 \times 3.05/0.0000107639) = 1.48 \times 10^5$

  Relative Roughness, $\varepsilon/D = 0.000005/0.5233 = 0.00001$

  Resistance Coefficient, f = 0.0180 (obtained from the Moody Graph based on the data above)

  $H_f = f \times (L / D) \times (V^2 / 2g)$
  $= 0.0180 \times (34.00 / 0.5233) \times (3.05^2 / 64.4)$
  $= 0.0180 \times 64.9723 \times 0.1444$
  = 0.17 ft

- Other Cross Losses (H_L):

  Entrance Loss, K = 1.0

  $H_E = K \times (V^2 / 2g)$
  $= 1.0 \times (3.05^2 / 64.4)$
  = 0.14 ft

Gate Valve = 1 ea

$H_{GV} = 1 \times 0.14 \times (3.05^2 / 64.4)$
$= \underline{0.02 \text{ ft}}$

Check Valve = 1 ea

$H_{CV} = 1 \times 6.00 \times (3.05^2 / 64.4)$
$= \underline{0.87 \text{ ft}}$

90° Bent = 1 ea

$H_B = K \times (V^2 / 2g)$
$= 1 \times 0.51 \times (3.05^2 / 64.4)$
$= \underline{0.07 \text{ ft}}$

Total Head Loss = 8.25 + 0.25 + 0.17 + 0.14+ 0.02 + 0.87 + 0.07
= 9.77 feet
= 4.23 psi

Therefore, the fire water discharge pressure at the proposed fire sprinkler connection point at the Astronaut Ellison S. Onizuka Space Center is approximately 60.40 – 4.23 = 56.17 psi. The estimated discharge pressure is high enough for building sprinkler system operation.

2.0 WASTEWATER SYSTEM

2.1 Existing Condition

Kona International Airport owns and operates a private wastewater treatment plant to handle the entire domestic wastewater generated within the airport boundaries and discharged from aircrafts. The maximum treatment capacity of the plant is 0.13 million gallons per day (MGD) and current daily treatment capacity peaks at 0.06 MGD, approximately 46% of design maximum treatment capacity.

The wastewater discharged from the Ground Transportation Facility and lease parcels through a gravity sewage collection system (8-inches, 10-inches, and 12-inches), discharges into the existing lift station located at north side of the terminal area, and then pumps to an existing 12-inch gravity sewer installed along the existing service road to the wastewater treatment plant. Design capacity for the existing10-inch gravity sewage collection system is 2.14 cubic feet per second (cfs) with a normal depth of 0.63 feet (7.56 inches).

2.2 Estimated Sewage Flow Rate

The estimated potable water supply for the project is 60 gpm (0.13 cfs), thus, the maximum domestic sewage should be 60 gpm (0.13 cfs).

As indicated in Paragraph 2.1, the flow depth for existing 10-inch gravity sewerage is designed at 76% of pipe diameter for flow rate of 2.14 cfs. Check the impact for additional flow rate of 0.13 cfs to the existing 10-inch gravity sewerage as follows:

Analysis:

Assume that the flow depth (h) in 10-inch pipe is 0.665 ft, or 7.98 in, based on flow rate (Q) of 2.27 cfs.

Result from pipe hydraulic computer software is as,

- Wet Perimeter, P = 1.840 ft.
- Flow Area, A = 0.466 sf.
- Hydraulic Radius, R = A/P = 0.253 ft.

Check Flow Velocity and Flow Rate

$$
\begin{aligned}
V &= (1.486/n) \times R^{2/3} \times S^{1/2} \\
&= (1.486/0.013) \times 0.253^{2/3} \times 0.0113^{1/2} \\
&= 114.3077 \times 0.4000 \times 0.1063 \\
&= \underline{4.86 \text{ fps}} \qquad \text{O.K.}
\end{aligned}
$$

$$
\begin{aligned}
Q &= A \times V \\
&= 0.466 \times 4.86 \\
&= \underline{2.27 \text{ fps}} \qquad \text{O.K.}
\end{aligned}
$$

From the analysis above, there will be no impact to the existing 10-inch gravity sewerage when an additional flow rate of 0.13 cfs discharges into the system.

2.3 Proposed Sewerage and Sewerage Tie-In

The closest possible discharge point to the existing wastewater collection system for the proposed Astronaut Ellison S. Onizuka Space Center is located at the Ground Transportation Facility, intersection of Halalu Street (Road "A") and A'u Lepe Street (Road "B"), approximately 1,100 feet northwest from the proposed Astronaut Ellison S. Onizuka Space Center. The existing invert elevation at the proposed tie-in manhole is 93.42 feet and grate elevation is 97.45, the existing pipe cover thickness is less than 4.00 feet. See **Figure 1**.

Based on the estimate, a 10-inch sewer line will require a slope of 0.0200 in order to have a velocity of 2.80 fps and the distance between the intersection of A'U Lepe Street (Road "B") and Halalu Street (Road "A") and the intersection of Keahole Street and Halalu Street is approximately 545.50 feet. Therefore, the estimated invert elevation for a 10-inch gravity sewer at the intersection Keahole Street and Halalu Street will require approximately 104.33 feet (93.42 + 545.50 × 0.0200). From the topographic survey data, the existing finished grade elevation at the intersection Keahole Street and Halalu Street is 105.00 feet. Therefore, a gravity sewerage system cannot be installed along Halalu Street. The proposed sewerage will be exposed in the air with no cover layer.

The final proposed sewerage system will be a combination of gravity and force main sewerage system, see **Figure 1**. The gravity sewerage system includes a ductile iron (Class 52) pipe approximately 504.50 feet 6-inch in diameter with a slope of 0.0200 and 2 manholes (4-feet in diameter). The force main system, approximately 4-foot cover, includes a lift station and a ductile iron (Class 52) pipe 693.00 feet 3-inch in diameter with a slope of 0.0120.

2.4 Gravity Flow Sewerage

Criteria:

- Pipe = 6-inch in diameter ductile iron Class 52 pipe.
- Flow Rate = 60 gpm = 0.13 cfs
- Manning Coefficient, n = 0.013.
- Pipe Slope, S = 0.0200.
- Minimum Velocity, V = 2.50 fps minimum.

Analysis:

Assume flow depth in 6-inch pipe, h = 0.135 ft = 1.62 in

Result from pipe hydraulic computer software is as,

- Wet Perimeter, P = 0.557 ft.
- Flow Area, A = 0.044 sf.
- Hydraulic Radius, R = A/P = 0.079 ft.

Check Flow Velocity and Flow Rate

$$
\begin{aligned}
V &= (1.486/n) \times R^{2/3} \times S^{1/2} \\
&= (1.486/0.013) \times 0.079^{2/3} \times 0.0200^{1/2} \\
&= 114.3077 \times 0.1841 \times 0.1414 \\
&= \underline{2.98 \text{ fps}} \qquad \text{O.K.}
\end{aligned}
$$

$Q = A \times V$
$= 0.044 \times 2.98$
$= \underline{0.13 \text{ cfs}}$ O.K.

Control Elevation:

Given Data:

- Finish grade elevation for Space Center = 116.75 ft
- Invert elevation for the proposed sewerage at south end = 112.75 ft (4 feet below the finished grade

Highest invert elevation	=	112.75 ft
Subtract slope head = 168.50 × 0.0200	=	3.37 ft
Invert outlet elevation at east MH	=	109.38 ft
Subtract slope head across the MH	=	0.17 ft
Invert inlet elevation at east MH	=	109.21 ft
Subtract slope head = 191.00 × 0.0200	=	3.82 ft
Invert outlet elevation at middle MH	=	105.39 ft
Subtract slope head across the MH	=	0.17 ft
Invert inlet elevation at east MH	=	105.22 ft
Subtract slope head = 145.00 × 0.0200	=	2.90 ft
Invert outlet elevation at wet well	=	102.32 ft

2.5 Force Main Sewerage

The detail configuration for proposed lift station is shown on **Figure 2**.

Criteria:

- Existing manhole grate elevation = 97.45 ft.
- Existing 10-inch sewerage invert in the manhole = 93.42 ft.
- Forced main pipe = 3-inch in diameter ductile-iron Class 52 pipe (ID = 3.40 in = 0.2833 ft, A = 0.0630 sf)
- Length of forced main, L = 723 ft (including 5% contingency).
- Design flow velocity, V = 5.00 fps (maximum).
- Design flow rate, Q = V A = 5.00 × 0.0630 = 0.3150 cfs (141.37gpm, say 140 gpm).
- Water kinematic viscosity at 70°, $\nu = 0.0000107639$ ft^2/sec.
- Equivalent sand roughness, $\varepsilon = 0.00085$ ft (ductile-iron pipe).
- Pump efficiency > 40%.

Determine Total Dynamic Head (TDH):

Static Head (H_s):

Lowest water surface elevation in the lift station = 99.00 ft

System highest elevation = 101.86 ft

H_s = 101.86 ft – 99.00 ft
= 2.86 ft

Pipe Friction Head Loss (H_f):

Reynolds Number, Re = (DV/ν) = (0.2833 × 5.00/0.0000107639) = 1.32×10^5

Relative Roughness, ε /D = 0.00085/0.2833 = 0.0030

Resistance Coefficient, f = 0.0275 (obtained from the Moody Graph based on the data above)

$H_f = f \times (L / D) \times (V^2 / 2g)$
$= 0.0275 \times (723 / 0.2833) \times (5.00^2 / 64.4)$
$= 0.0275 \times 2{,}552.0649 \times 0.3882$
= 27.24 ft

Other Head Losses (H_l):

90° Bent = 4 ea

$H_{B1} = K \times (V^2 / 2g)$
$= 4 \times 0.51 \times (5.00^2 / 64.4)$
= 0.79 ft

45° Bent = 3 ea

$H_{B12} = K \times (V^2 / 2g)$
$= 3 \times 0.27 \times (5.00^2 / 64.4)$
= 0.31 ft

Check Valve = 1

$H_{CV} = 1 \times 1.70 \times (5.00^2 / 64.4)$
= 0.66 ft

Gate Valve = 1

$H_{GV} = 1 \times 0.14 \times (5.00^2 / 64.4)$
= 0.05 ft

Pipe Exit Loss = 1

$H_E = 1 \times 1.00 \times (5.00^2 / 64.4)$
$= \underline{0.39 \text{ ft}}$

TDH = 2.86 + 27.24 + 0.79 + 0.31 + 0.66 + 0.05 + 0.39
= 32.30 ft (say 33.00 ft)

Determine Break Horsepower:

$HP_B = (gpm \times TDH) / (3{,}960 \times 0.40)$
$= (140 \times 33) / (3{,}960 \times 0.40)$
= 2.92 (use 3.00 hp)

Typical Motor Characteristics (from Cameron Hydraulic Data):

When horsepower = 3.00 and Single-Phase 60 Hertz

- Approximately Full-Load, rpm = 1,730.
- Typical full load, amperes (208 volt) = 17.0.
- NEMA Locked Rotor (max) = 90.
- NEMA Code = H.
- Approximately Torque, Full-Load = 9.10 lb-ft.
- Approximately Torque, Locked Rotor (min) = 22 lb-ft.
- Approximately Torque, Breakdown Full-Load (min) = 19.0 lb-ft.

Control Elevations for Lift Station Sump (48" diameter and 72" deep):

- 107.00 ft Top of Lift Station.
- 102.32 ft Invert Outlet Elevation for Gravity Sewer Line.
- 101.86 ft Forced Main Invert Elevation at Sump Exit Point.
- 101.50 ft Lag Pump On and High Level Alarm On.
- 101.00 ft Discharge Invert Elevation for Sewer Line #1 at Sump and Lead Pump On.
- 99.50 ft Pump(s) Off.
- 99.00 ft Pump(s) Off and Low Level Alarm On.
- 98.50 ft Bottom of Sump.

System Performance Data:

Forced Main

Size = 3-inches in diameter, Ductile-Iron

Length = 723 ft

Wet Well (4-feet in diameter and 8.50-feet deep) Storage Volume

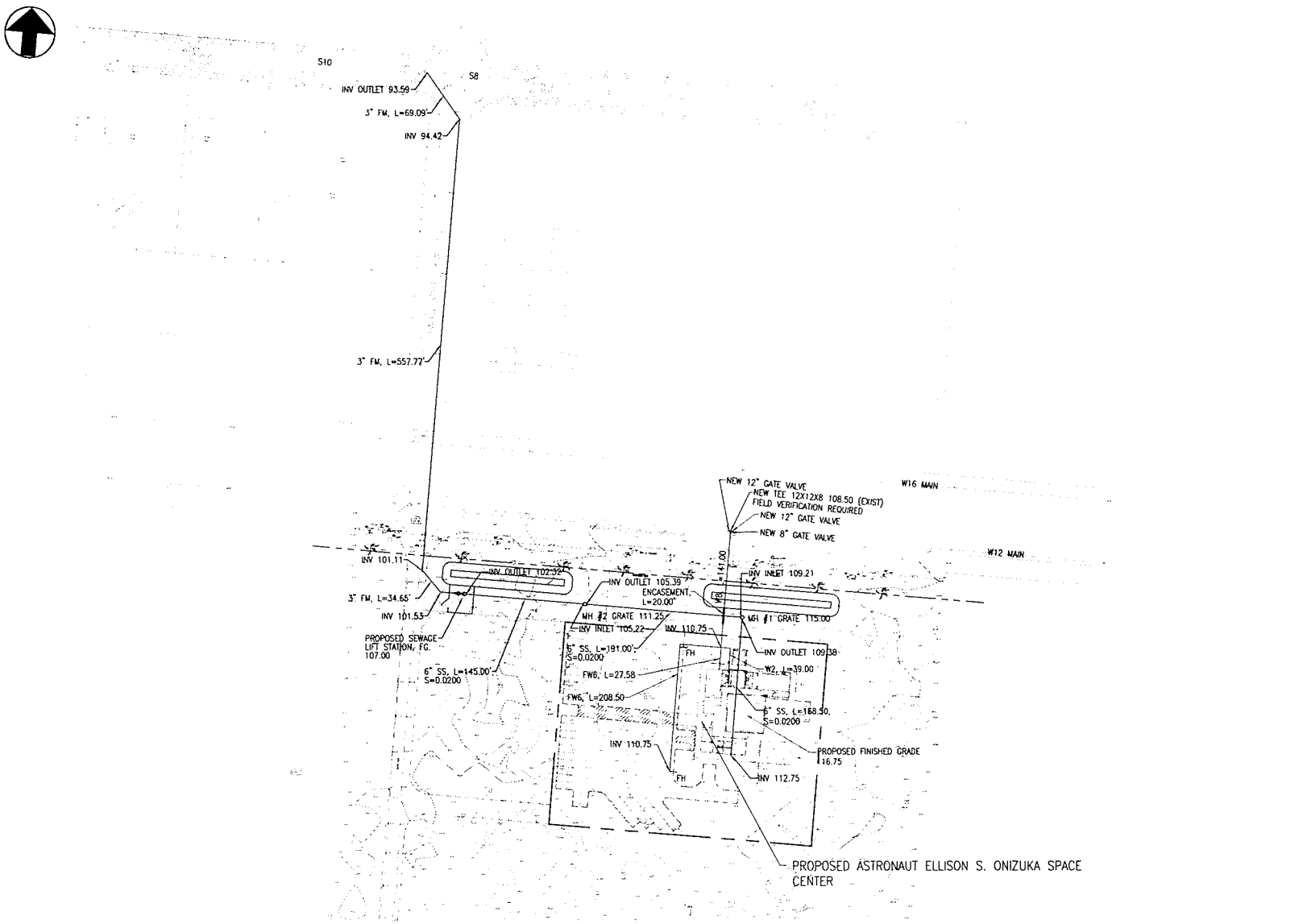
Between HWL and LWL	=	$(4.00^2 \times 3.1416) \times (102.32 - 99.00) / 4$
	=	41.72 cf
	=	312 gal
Below LWL	=	$(4.00^2 \times 3.1416) \times (99.00 - 98.50) / 4$
	=	6.28 cf
	=	47 gal
Total Storage Volume	=	312 + 47
	=	359 gal

Total Dynamic Head

TDH = 33.00 ft

Pump(s)

- Rating = 140 gpm @ 33.00 ft.
- Motor Rating = 3.00 HP @ 1,730 RPM.
- Minimum Efficiency = 40%.
- Minimum Pump Circle = 15 minutes.
- Electrical Characteristics = 208 volt, 60 Hertz, and Single Phase.
- Sphere = 2 inch.
- Discharge Size = 3 inch.



GRAPHIC SCALE

0 60 120 180 240 300

SCALE IN FEET

Airports Division
DEPARTMENT OF TRANSPORTATION
STATE OF HAWAII

JASON C. CHEN
LICENSED PROFESSIONAL ENGINEER
No. 8565-C
HAWAII, U.S.A.

This work was prepared by me or under my supervision and construction of this project will be under my observation.

signature 4/30/10 expiration date of the license

DSGN.	DRWN.	CHKD.	APPD.
H.S.	D.C.	A.Y.	J.C.

KEY PLAN / NOTES:

NO.	DATE	REVISIONS

PROJECT TITLE:

ASTRONAUT ELLISON S. ONIZUKA SPACE CENTER
SITE PREPARATION PHASE I
AT
KONA INTERNATIONAL AIRPORT

PROJECT NO.:

STATE PROJECT NO. AH2081-12
TMK 7-3-43:3

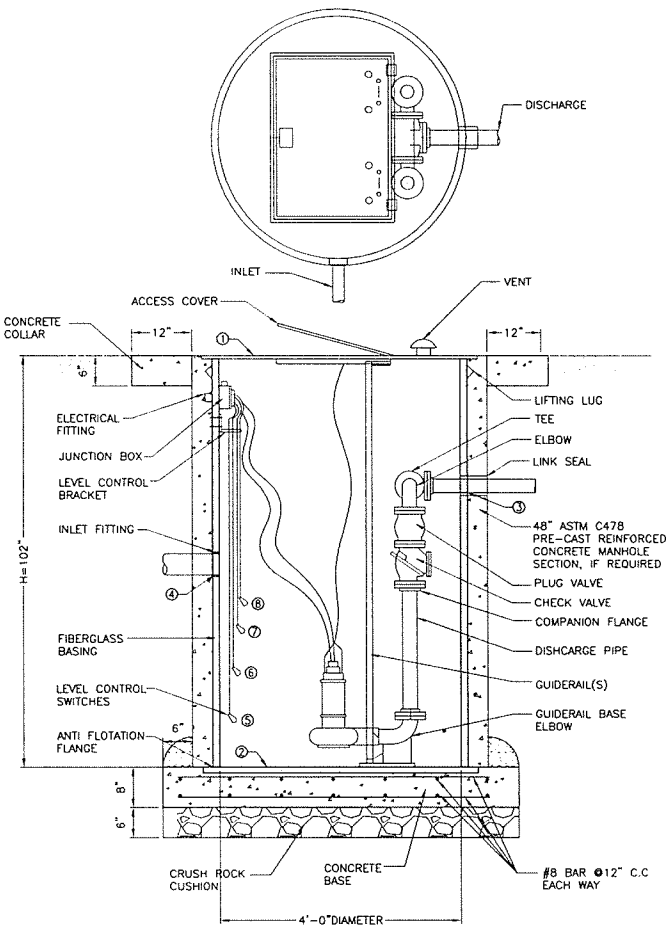
SHEET TITLE:

SITE UTILITY PLAN

DATE:
JUNE 2009

DWG. NO.:

FIGURE 1



#	ELEV	DESCRIPTION
①	107.00'	TOP OF SUMP
②	98.50'	BOTTOM OF SUMP
③	101.86'	FORCE MAIN INV ELEV @ EXIT POINT
④	102.32'	INVERT ELEV FOR SEWER OUTLET
⑤	99.00'	PUMPS OFF AND LOW LEVEL ALARM ON
⑥	99.50'	PUMPS OFF
⑦	101.00'	LEAD PUMP ON
⑧	101.50'	LAG PUMP ON & HIGH LEVEL ALARM ON

PACKAGE SEWERAGE LIFT STATION

NOT TO SCALE

Airports Division
DEPARTMENT OF TRANSPORTATION
STATE OF HAWAII

JASON C. CHOW
LICENSED PROFESSIONAL ENGINEER
No. 8565-C
HAWAII, U.S.A.

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MISCELLANEOUS DETAILS

DATE:
JUNE 2009
DWG. NO.:

FIGURE 2