Appendix O

Archaeological Assessment Report

Archaeological Assessment Survey of a 31.222-acre Parcel Located along Waiko Road Waikapū *Ahupua`a*, Wailuku District Maui Island TMK (2) 3-8-007:102

Prepared on behalf of:

Waiko Industrial Development, LLC
Wailuku, Maui

Prepared by

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Pukalani, Maui

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23 August 2011

ABSTRACT

Xamanek Researches, LLC conducted an Archaeological Assessment Survey for 31.222 acres of land on Tax Map Key [(2) 3-8-007:102]. The subject area is located in Waikapū *Ahupua`a*, Wailuku District, Maui Island.

Archaeological fieldwork took place during the months of May and June 2011. Fieldwork consisted of both surface and subsurface investigations throughout the subject area. Subsurface testing included twenty mechanical Backhoe test Trench (BT) excavations. Although significant archaeological sites are documented on immediately adjacent lands, no historic properties were identified within the boundaries during the archaeological assessment survey. Historic properties in the surrounding area consist of mainly of traditional Hawaiian grave sites as well as some plantation or historic ranch era and World War II military sites. The subject area is comprised of Aeolian sand dunes with meandering alluvial stream deposits.

This archaeological assessment survey report was prepared following the Department of Land and Natural Resources (DLNR), State Historic Preservation Division (SHPD) Hawai`i Administrative Rules (HAR 13-275-276); in compliance with Maui County guidelines, rules, and recommendations. This report records and synthesizes data gathered from a combination of background research and fieldwork results.

Because of the cultural sensitivity of the area, archaeological monitoring is warranted for any potential future clearing, grubbing, or grading activities on the subject parcel. An archaeological monitoring program is recommended; in order to mitigate potential inadvertent discoveries that could be uncovered in the future.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF PHOTOS

LIST OF TABLES

INTRODUCTION

Xamanek Researches, LLC conducted an Archaeological Assessment Survey for a 31.222 acre parcel in Waikapū *Ahupua`a*, Wailuku District, Maui Island on Tax Map Key (TMK) [2] 3-8-007:102 (Figure 1 and Figure 2). This report was prepared following the Department of Land and Natural Resources (DLNR), State Historic Preservation Division (SHPD) Hawai`i Administrative Rules (HAR 13-275-276-5); in compliance with Maui County guidelines, rules, and recommendations. Information was compiled through a combination of background research and archaeological investigative field results.

Archaeological fieldwork took place during the months of May and June 2011. Fieldwork consisted of both surface and subsurface investigations throughout the subject parcel. The survey covered accessible portions of the subject area. The project area has been utilized as pastureland for cattle and horses. Much of the land is currently heavily utilized as base-yards with various large stockpiles, as well as cattle feed lots and associated settling ponds. The bulk of the subject area has been previously disturbed through grubbing, grading, sand mining and agricultural or pastoral endeavors. An electrical easement in favor of Maui Electric Company, Ltd. connects the western and eastern portions of the parcel.

Surface survey investigations resulted in negative findings. There are a series of fence-lines spread throughout the area and access involved coordination with different leaseholders and avoidance of grazing horses. Cattle feedlots cover sections of the project area. Access was limited in these areas and mechanical backhoe work did not occur in the stockpile areas or the cattle feedlots. Subsurface testing included twenty, controlled mechanical Backhoe test Trench (BT) excavations. No historic properties were identified within the perimeters of the subject area during the archaeological fieldwork.

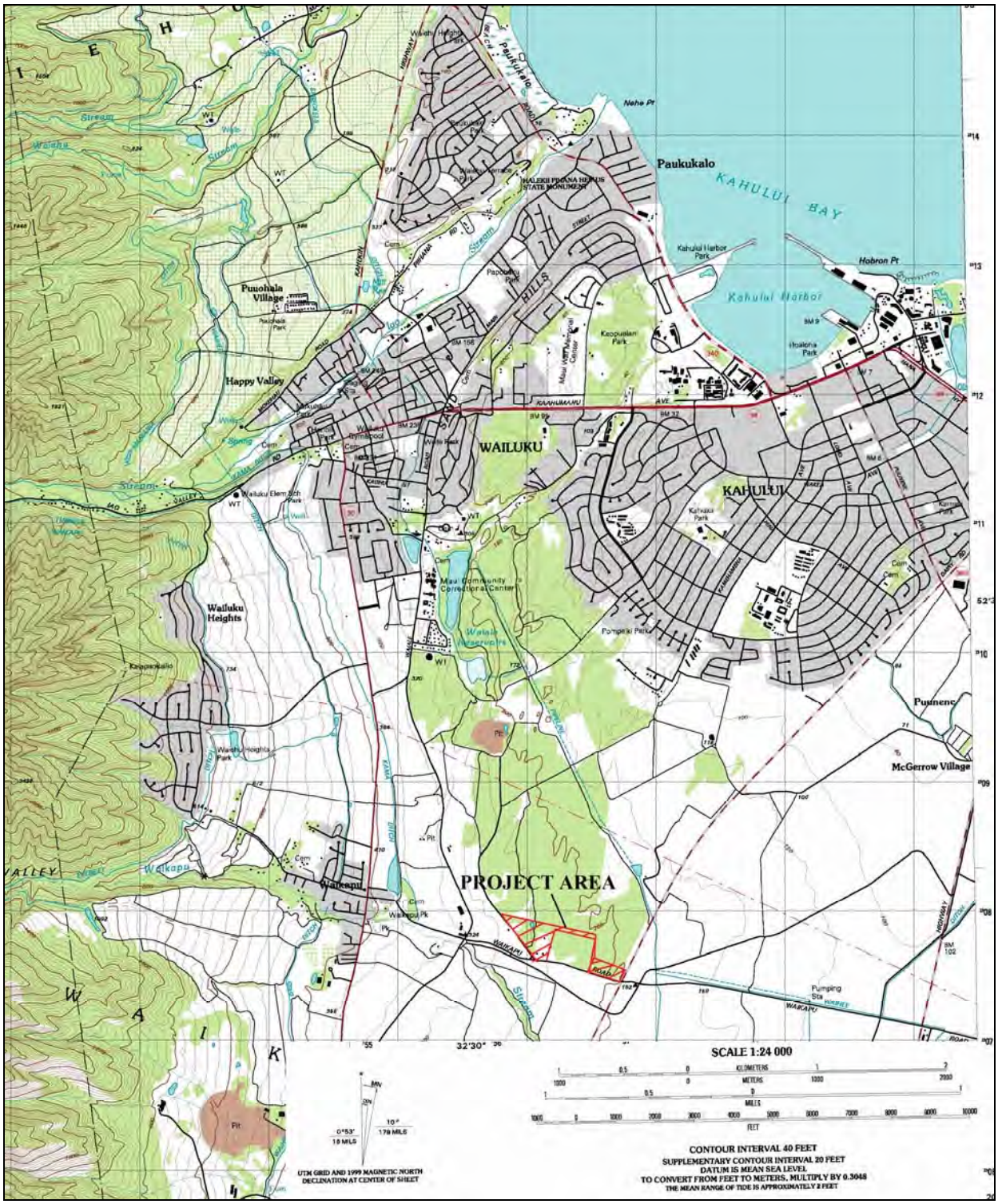

Figure 1: Portion of the Wailuku United States Geological Survey Topographic Map Depicting the Project Area Location (red).

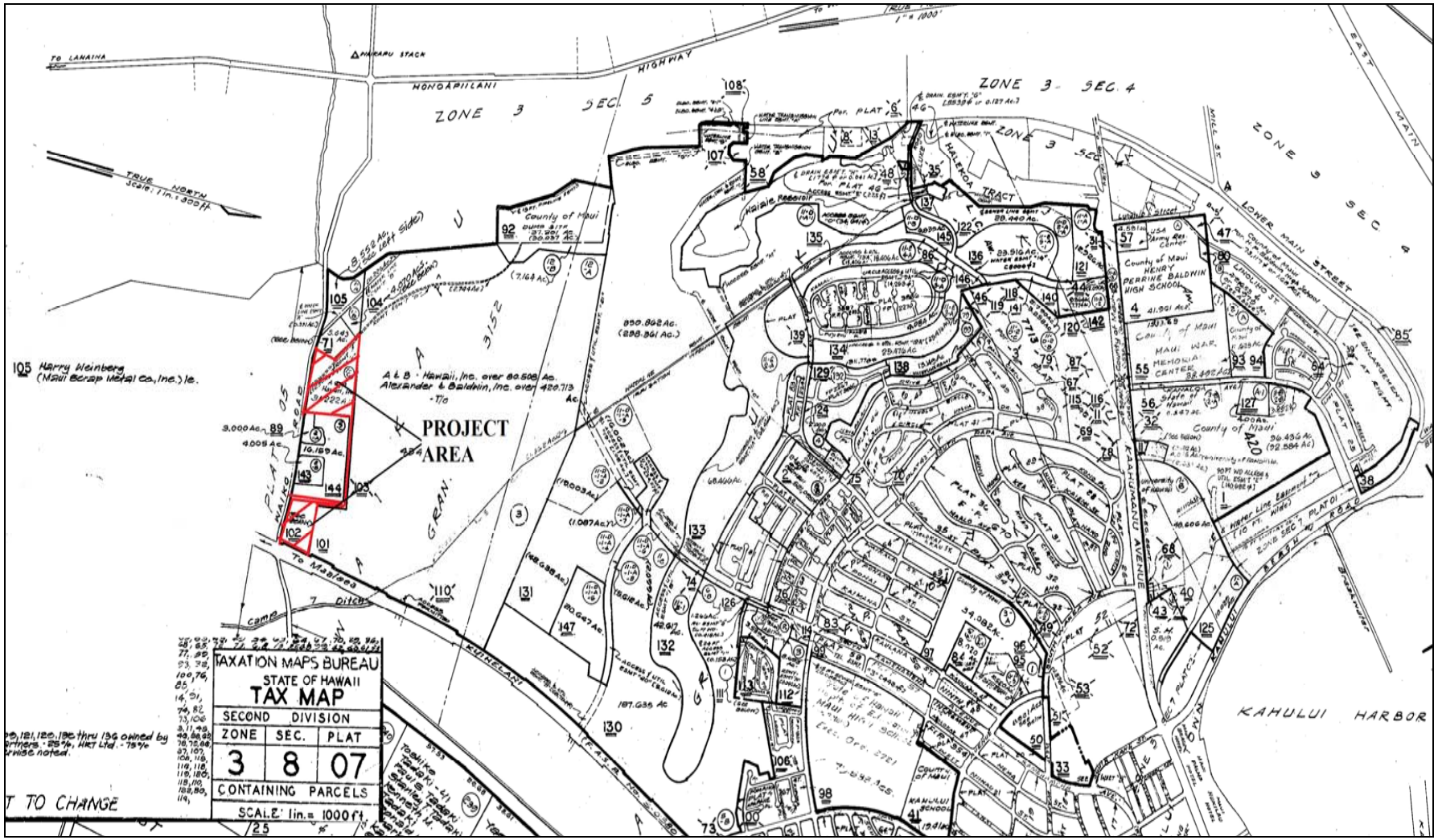

Figure 2: Tax Map Key (TMK) Depicting the Project Area Location at [2] 3-8-007:102.

STUDY AREA DESCRIPTION

The study area lies within Waikapū *Ahupua`a* in Wailuku District. The subject area includes 31.222 acres of undulating sand dunes (Photo 1). Generally, prior land use includes pastureland for horses and cows; construction or farming base-yard(s); sand-mined areas; stockpiles of sand, rock, dirt, gravel (etc); ponds; cattle feed lots; and a relatively narrow, enclosed easement behind the relatively recently developed Consolidated Base-yards development (Photo 2). The narrow easement and power lines delineate the northern boundary of the subject area.

Photo # 1: General Overview of Sand Dune (foreground) with Haleakalā (background), View to East.

Photo # 2: Overview of the Narrow Easement North Adjacent to the Consolidated Baseyards Development Project; View to West.

Various fence-lines and *jeep* access roadways meander throughout the parcel (Photo 3). The odd-shaped parcel is located south of the Maui Lani development and is bounded by Kuihelani Highway as well as Waiko Road. A wide and well-used access road bisects the west section of the project area (Photo 4). The dirt road is mainly utilized by the owners, lessees, and dump trucks for hauling mined sand or construction related material (no sand mining activities are actively occurring on the project area).

Photo # 3: Example of a *Jeep* Access Roadway within Project Area, View to South.

Photo # 4: Graded Access Road Bisecting the Western Portion of the Project Area, View to Northwest.

Natural History

The subject area ranges in elevation from approximately 45-75 meters (150-250 feet) above mean sea level. The area consists of an extensive Aeolian sand dune formation—a large geologic feature that extends at least eight miles from Waiehu through Waikapū. The sandy matrix is underlain by lava flows from Haleakalā and alluvial sediments from the West Maui Mountains (Stearns and Macdonald 1942: 54). The central isthmus comprised by sand is commonly referred to as *Pu`uone,* which loosely translates as sand dune.

Soil classification consists of *three* types: *Jaucas Sand* with 7-30% slopes commonly used for pasture and home sites, permeability is moderately rapid above the cemented (lithified) layers, runoff is slow and the wind erosion hazard is moderate to severe; *Pulehu Clay Loam* with 0-3% slopes commonly used for sugarcane cultivation, truck crops, and pasture land, permeability is moderate, runoff is slow, and the erosion hazard is no more than slight; and *Pulehu Cobbly Silt Loam* with 3-7% slopes –this type is similar to Pulehu Clay Loam except the texture is silt loam with a cobbly surface layer. This type is commonly used for used for sugarcane cultivation. Permeability is moderate, runoff is slow, and erosion hazard is slight (Foote, et.al 1972).

The color of the sand varies from grayish-brown to light brown and golden that generally forms layers of strongly alkaline cemented sand hard pan otherwise known as lithified sand that undulates above and below the surface. Old root molds, or root castings, filled with hard, white alkaline deposits are a common feature in the sand dunes. Pu`uone sands occur on slopes of 7 to 30 degrees, and develop in material derived from coral and seashells (Foote, et.al 1972).

Annual precipitation in this portion of Maui averages between 20 to 30 inches. The highest monthly rainfall occurs during the winter and spring months. Temperatures range from 60 to 80 degrees Fahrenheit in January to 68 to 90 degrees Fahrenheit in July. Winds are generally trade winds from the northeast, averaging 16 to 18 miles per hour (University of Hawaii, 1983:56).

The project area has been impacted by previous groundwork. Most of the sand dunes in the immediate area have been developed, or partially developed. Previous grubbing, grading, mining, agricultural and pastoral activities have affected the natural environment. Base-yard(s) with various equipment and stockpiles as well as active cattle feed lots with associated settling ponds prevented 100% coverage of surface and subsurface investigation (see *Field Methods* section).

Flora

Vegetation in the project area consists of drought tolerant native and alien plant species. The dry subject area is dominated by alien plant species such as *kiawe* trees (Prosopis pallida), *buffel grass* (Cenchrus ciliaris), *guinea grass*, *koa-haole*, and other introduced dry-land grasses and weeds.

Indigenous plant species in the project area include *`ilima* (Sida fallax), *`uhaloa* (Waltheria indica)*, kou*, and *pōpolo (*Solanum americanum). The Hawaiian Ethnobotany online database (www2.bishopmuseum.org) describes *`ilima* as a shrub traditionally used for making lei and was also utilized medicinally. *`Ilima* stems were used for building house frames and also used around taro planting mounds in swamplands. *`Ilima* vines were used for basketry, floor coverings under sleeping mats, and at Hula altars. *`Uhaloa* was also traditionally medicinally utilized.

The database further describes *kou* as a strong wood traditionally used for making *bowls (`umeke) & utensils, does not give off flavor (Krauss 1993:22), special `umeke mana`ai for first-born children made sometimes of kou that had been planted over afterbirths of grandparents (Krauss 1993:23); leaves for dye (Krauss 1993:65). Planted as shade trees near homes and the flowers used for lei (Handy et al. 1972:232), seeds eaten (Wagner et al 1990:394).*

Further, *pōpolo* is described by the website as an annual herb and *a very important medicinal plant. For problems in the respiratory system and skin eruptions the sap of the leaves and juice of the berries is used by itself or mixed with other ingredients. For treating cuts or wounds or as a general prophylactic, it is mixed with salt. To "tone up" the digestive tract the leaf buds are steaped with salt (Handy, Pukui, and Livermore 1934:18). For sore muscles, tendons, and joints, the juice from pōpolo leaves was sometimes applied to the affected area while it was sunned (Abbott 1992:98).* Pōpolo is described as *an ancillary ingredient in many other medicines.*

Fauna

Only non-native animals were noted on the project area. Observed animals included horses, cows, chickens, peacocks, cats, dogs, mongoose, rats, mice, birds, and axis deer (only droppings noted). Local informants report an influx in axis deer sightings in recent years. Non-native animal bones were noted throughout the surface areas of the parcel, and in some subsurface test locations.

Kealia Pond and Wildlife Refuge

Kealia Pond and Wildlife Refuge is a coastal salt marsh located c. 4.5 km south of the subject parcel across Kuihelani Highway towards the Kihei shoreline. It is contained within Waikapu *ahupua`a.* Public information (website and signs) describes this 691 acre (2.80 km^2) wetland area as a bird sanctuary; home to many native endangered species of waterfowl, shorebirds, and migratory ducks. Water levels vary drastically depending on the season. The pond consists of over 400 acres during the winter. Thick encrusted salt deposits cover the dried portions of the pond during the summer. Mudflats and shallow ponds are dispersed westward throughout the area north adjacent to Sugar Beach between Kīhei boat ramp and Ma`alaea. The federally supported boardwalk with informational signage was recently constructed along the pond- between Kīhei and Ma`alaea.

Kealia Pond is home to 30 species of waterfowl, shorebirds, and migratory ducks including the *`auku`u,* and the endangered Hawaiian Stilt and the Hawaiian Coot. Kealia Pond was selected as a wildlife refuge in 1953 that protected approximately 300 acres (1.2 km^2) of land. The refuge joined the National Wildlife Refuge System in 1992. The protected area consists of a coastal salt marsh between Kīhei and Ma`alaea, on both sides of North Kīhei Road. The wetland is now a 691-acre (2.80 km^2) bird sanctuary. During rainy season, high water levels increase the freshwater portion of the pond to over 400 acres (1.6 km^2). By spring, water levels decrease and by summer, the pond shrinks to half the size, leaving behind salty residue. *Kealia* can translate as "salt encrusted place" (ibid).

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BACKGROUND RESEARCH

Hawaiian Settlement

Wailuku District is a significant area and was referred to as such in early Hawaiian days. Waikapū *Ahupua`a* contained many *`ili*, or smaller land divisions. Waikapū was one of several *ahupua`a* within the traditional land division called Wailuku *Moku,* or "district" formerly known as Pū`ali Komohana *Moku* (Kame`eleihiwa 1992).

In ancient Hawaiian days, the prime environmental condition of lower `Īao Valley was ideal for agricultural endeavors necessary to support a large population. The area consisted of a wide valley floor, rich alluvial soils, and a constant water supply from `Īao Stream (AKA Wailuku Stream). These conditions combined with immediate access to the wetlands and Kahului Harbor; rich in marine resources, made an ideal setting for a communal political and cultural center. The lower portion of `Īao Valley provided a perfect climate for some of the most productive taro cultivation throughout the islands.

Īao Valley is noted as a place where chiefs were buried and wars were fought. *Wailuku* translated as "water of destruction" (Pukui, et. al., 1974: 225). Wailuku was once known as the political center of Maui that culminated during the time of Chief Pi`ilani (approximately 1600 AD). In the late pre-Contact period, warfare increased as the chiefs of Maui, O`ahu and the Big Island struggled for political and military dominance. High Chief Pi`ilani succeeded in unifying the districts (*Moku)* of Maui through warfare, but following his death, his sons fought amongst each another; each hoping to succeed their father as high chief. Eventually Kiha-a-Pi`ilani was victorious, but the following generation of chiefs struggled through warfare to secure their positions of political domination (Speakman 1978: 9-13).

During the reign of the last powerful paramount chief or king (*Mō`ī*) of Maui Kahekili (1765 to 1790), Wailuku again became the site of intense warfare. Allegedly, Chief Kehekili was Kamehameha I's father. Wailuku was considered to be the capital of Maui and Kahekili's royal residence, Kalanihale, was located in Wailuku, where he was surrounded by his retinue.[1] In the mid-1770s, the royal residence in Wailuku was marched upon by the Big Island chief named Kalani`ōpu`u and his *Alapa* (his warriors). News of Kalaniōpu`u's arrival preceded him, and Kahekili hid his warriors in the sand dunes above Haleki`i *Heiau* to surprise the invading troops. A fierce battle ensued, and

[1] The location is said to be located just north of the intersection of High Street and Main Street leading into Iao Valley in Wailuku town.

Kalani`ōpu`u's invading troops were pushed toward the sea and slaughtered (Speakman 1978: 9-13 and 16-17).

For four years Kahekili ruled Maui, Moloka`i, Lāna`i, and O`ahu. With the aid of foreign weapons such as guns and a canon, in 1790, Kamehameha I invaded Kahekili's territory—an action that ended with the notorious battle of Kepaniwai[2] and eventual political control over Maui Island. *Kahului* translates as "the winning", and the nearby town and Bay take the name because Kamehameha I gathered his warriors there before fighting the battle in `Īao Valley (Pukui, et. al. 1974).

The reign of Kamehameha I was intertwined with the increasing presence of foreign arrivals and commercialism. The arrival of Captain Cook offshore at Kahului Bay in 1778 began the steady flow of outside influences that would forever alter the population and environment of the Hawaiian Islands.

The Waikapū wetland field system is a complex system of *lo`i* extending over 700 acres, built around the central stream, with *`auwai* leaving the main stream in the upper reaches on both sides to provide water for the hundreds of taro fields. The upper reaches of the system may date back to the 1100s (Creed, v. I: 74-78).

According to the Supreme Court of the Hawaiian Kingdom (Journal 2006: 198-206), a big part of obtaining the territory divisions:

> …was that a land should run from the sea to the mountains, thus affording to the chief and his people a fishery residence at the warm seaside, together with the products of the high lands, such as fuel, canoe timber, mountain birds, and the right of way to the same, and all the varied products of the intermediate land as might be suitable to the soil and climate of the different altitudes from sea soil to mountainside or top. But this mode of allotment had numerous exceptions, because some of the lands were for some reasons not always understood, and perhaps arbitrary in the beginning, very wide at the top, cutting off a great number of other lands from the mountain; others in like manner wide in the lowlands, cut off land from the sea. With the Hawaiians, from prehistoric times, every portion of the land constituting these Islands was included in some division, larger or smaller, which had a name, and of which the boundaries were known to the people living thereon or in the neighborhood. Some persons were specially taught and made the repositories of this knowledge, and it was carefully delivered from father to son…

Ancient names have been passed from generation to generation. Native testimonies in the archives and in legal documents associated with land disputes indicate

[2]Kepaniwai means literally "water dam" in reference to Iao Stream, because the stream was choked with human bodies after the slaughter there (Pukui, et. al. 1974: 109).

that *Ka`ōpala* is the name of the place where the waters from the two great mountains of east and west Maui meet. *Ka`ōpala* is described by Pukui (1974) as a coastal area and gulch within the Honolua quad that literally translates as "the rubbish". The former name of the place now called Ka`ōpala, was *Kailinawai* because there the waters of the two mountains joined.

Original Hawaiian settlers may have utilized the area for permanent habitation, ceremony, or agriculture. Ceremonial, agricultural, habitation and human burial features have all been documented throughout the central Maui isthmus.

During initial human occupation, Waikapū was a relatively well populated area, rich with ancient traditional Hawaiian cultural practices. Significant *mo`olelo*, or stories of old, are associated with the area including the adjacent infamous `Īao Valley. The Kahului Isthmus was rich in natural resources. No doubt fishponds were abundant along the nearby fringing coral reefs and throughout the low-lying wetlands or mudflats.

Kealia was allegedly an ancient fishpond fed by water from the meandering Waikapū Stream from the West Maui Mountains through the general current project area, and from Kolaloa Gulch in the East Maui Mountains. The artful skill of fishpond construction involves a system of ditches and sluice gates to let fish into and out of the pond. Various types of fish may have been raised including *awa* (milkfish, *Chanos chanos*) and *ama`ama* (flathead mullet, *Mugil cephalus*). Ashdown (on file) says the pond was attributed to King Umi-a-Liloa after the death of Pi`ilani in Lāhaina .

The Plains of Kama`oma`o

Some areas in the Central Maui Isthmus have been referred to as Kama`oma`o or the Plains of Kama'oma'o. Fornander (1919b:572) describes *Kama`oma`o* as the region of the central plains of Maui known as a place where the souls of the common people were cast off with hopes of either finding a guiding *`aumakua* (family god) for companionship to the afterlife; or the soul may descend into the underworld realm known as *Milu,* which is also the name of the ruler of the underworld.

Pukui (1974) explains Kama`oma`o as a Plain near Pu`u-nēnē, Maui and that "ghosts are believed to have wandered here". Literally, Kama`oma`o translates to "the greenness." Fornander (1919:554) also refers to the "desolate plains" south of Pu`u-nēnē as a location where the souls of the dead are attracted to the "nether world" entrance.

In the book *Hawaiian Mythology*, Martha Beckwith describes a possible relation to the area of Kama`oma`o, but she refers to the area as *Oma`oma`o*:

> Among the peoples said to have appeared during the fifth period of the Kumulipo, when the hog-man was building up his family line, are the dog people… *(Born were the wagging tails; they had no fixed line of decent)*…This seems to mean that they intermarried without regard to

> class distinction and hence built up no inherited chief class. The reference is to the Ha`a people, according to David Malo Kupihea, the hairless olohe people first discovered on Maui on the plains in Kula called Oma`oma`o…they were still there in Kahekili's time. Some were in his army. They lived in the sand hills and they had mystical power of the demigods (kupua) in the form of big war dogs. These dog people still appear on Maui in the procession of spirits known as 'Marchers of the Night.' They look like other human beings but have tails like a dog...Olohe, or Ha`a people were hence a well recognized class in old days, skilled in wrestling and bone-breaking (lua) and with hairless bodies. It is said that they used to pull out their hair and smear their bodies with oil in order to give no hold to an antagonist (Beckwith 1970: 343).

The general area was known for massive battles that ensued across the land. There were many defeats of Big Island Mō`ī Kalaniopu`u's forces around 1776-1790, by the infamous Maui armies of Kahekili. The retreat took the Big Island army through Kama'oma'o (Fornander 1919:545). An area associated with Kama`oma`o was later referred to as Waikapū Common.

Waikapū Common

There are several accounts referring to a battle in the area that took place in 1776 (Fornander 1996:153-155). The Big Island King Kalaniopu`u gathered his forces and came ashore on Maui without resistance at Honua`ula, from Ke`one`oi`o to Makena. The Big Island regiment is known as *Alapa*, which consisted of several hundred highly skilled and trained men. Chaos and plunder marked the arrival of the *Alapa*. The Maui country people fled into the forest and mountain ravines for shelter. The Big Island forces were split so part of the army landed at Kīheipukoa, near the Kealia salt marsh between Kalepolepo and Ma`alaea. They were after the skilled warrior -King Kahekili in Wailuku.

With great courage the *Alapa* warriors crossed the isthmus of Kama`oma`o, also known as the Waikapū common. The warriors were determined "to drink the waters of Wailuku that day". The Big Island *Alapa* regiment was considered the bravest and best. The warriors were all of equal stature and their spears of equal length. The legend represents their appearance as a gorgeous and magnificent spectacle. The *brilliant feather cloaks reflected the sunshine and the plumes of their helmets tossed in the wind*. Kahekili offered no resistance while the *Alapa* crossed the common. Instead, he distributed his forces in various directions throughout the Wailuku side of the common. Kahekili's army fell upon the *Alapa* as they entered the sandhills -southeast of Kalua, near Wailuku…"the gallant and devoted *Alapa* were literally annihilated; only two out of the eight hundred escaped alive" (ibid).

Perhaps additional insight is portrayed by Kamakau who explains when Kaluli Heiau was completed, Kaleopu`upu told Kahekili, "This is the house of your god; open

the sluice gate that the fish may enter". Then, in 1776 Kalaniopu`u's army landed at Keoneo`o`i`o with their war canoes extending to Makena at Honua`ula and proceeded to ravage the countryside. Additional forces combined to 800 strong. War canoes landed from Kihepuko`a at Kealia to Kapa`ahu. The warrior's feather cloaks stood out along the plains of Pu`u`ainako (Can-trash-hill) and Kama`oma`o. King Kahekili was at Kalanihale just below Kihahale and above the plateau of Ka`ilipoe at Pohakuaokahi. It was then that Kaleopu'upu'u told Kahekili, "The fish have entered the sluice; draw in the net" (Kamakau 1992:85).

Kahekili had secretly spread his forces among the sand hills southeast of Kalua, near Wailuku. With the advantage of dune elevation providing a bird's eye view from the slopes combined with the element of surprise, Kahekili and his warriors annihilated the invading *Alapa* army. Two survivors were left alive to relay the news of the defeat to Kalaniopu1u's encampment (Fornander 1880:154). The day after the "Slaughter of the Pi`ipi`i at Kakanilua", the remaining forces of Kalaniopu`u were sent to battle Kahekili. Numerous attacks from the Big Island warriors ensued. Several years later, with aide from muskets and cannons, Kamehameha I claimed control, or unified the islands under one rule. Kahekili was said to be Kamehameha's father.

In 1790 Kamehameha I marched with his army across the central Maui isthmus with *Lopaka*—the cannon from the captured American trading vessel, the Fair American. Kamehameha the Greats' conquest of Maui concluded with the well known battle of *Kepaniwai*—a most devastating combat that eventually pushed into `Īao Valley and ended with many dreadful fatalities, allegedly jamming the stream with bodies.

Whaling

By the 1840s, the increased number of whaling ships anchoring off Maui shores created a substantial market for produce such as sweet and white, or Irish potatoes, which grew well in Kula along the slopes of Haleakalā. Because of the historic potato blight, Irish potatoes were more highly coveted, and became principal for trade. Potatoes were transported from the fields to the shore, where they were often sold directly to the ships that stopped at Kalepolepo in north Kīhei. The ships would then move to the Lāhaina for trade, where the bulk of the whaling fleet moored.

Kuykendall (1938:313) refers to a November 1849 article in the Polynesian:

> The call for [potatoes] is loud and pressing, as some vessels bound for California have taken as many as 1,000 barrels each. The price is high, and the probability is that the market cannot be supplied this autumn. Kula, however, is full of people…preparing the ground for planting, so that if the demand from California shall be urgent next spring as it is now the people will reap a rich harvest.

Aside from transport trading activities, Waikapū appear to have been relatively unaffected by the upland "potato boom", which lasted only a few years.

Gold Rush

The California Gold Rush began in 1848, which resulted in a potato boom on Maui that commenced in the fall of 1849. A man called Captain John Halstead established a trading post[3] in 1849 at Kalepolepo Village, in order to take advantage of the commercial venture. He built a large Pennsylvania Dutch-style, 3-story residence next to the south wall of Kalepolepo Fishpond. The trading station was located on the first floor of this structure, which was locally known as the *Koa* House. Halstead's large prominent house stood as a landmark for nearly one hundred years[4] —and was frequently visited by King Kamehamehas III, IV and V between 1850 and 1870.

Missionaries

An early outside influence that eventually changed every day life in the islands-came with the arrival of missionaries, who wanted to save "heathen" souls. The first missionaries arrived in Wailuku around the 1830s. The population of Wailuku was listed during an 1831-32 missionary census as 2,256; with most of it being in the northern portion, presumably in `Īao Valley (Cordy 1978: 59). In 1836, Reverend Jonathan Green established a girls' seminary known as the *Central Female Boarding School*, where young Hawaiian women were taught the foreign language, customs and religion. The school is still located in Wailuku.

Reverend Dwight and Charlotte Fowler Baldwin arrived as missionaries in 1831 as part of the fourth group from the Congregational Church. Mr. Henry Perrine Baldwin was born as their son. The early missionaries severely influenced Hawaiian communities including customs and culture. Reading and writing were among those social changes.

By as early as 1845 in Central Maui, on the southern and eastern side of the *Pu`uone* Dunes, cattle were roaming the Kahului Isthmus and a sizable area was utilized for pasturage. Cows were first introduced on the Big Island by Vancouver in 1793. At the time, cattle were under royal *kapu,* so they were not to be bothered. The cattle were destructive to the environment and Hawaiian landowners protested, but to no avail (Barrere 1975: 52). In addition to the commercial venture of cattle ranching, there were

[3] Captain Halstead arrived in Lāhaina from New York in 1838, and married the chiefess Kauwikikilani Davis, granddaughter of Isaac Davis, Kamehameha I's advisor.

[4] In 1946 it was abandoned and was leased by the Kīhei Yacht Club, the members of which tried to burn it down because it was so unsafe. Several attempts failed, but eventually the Maui Fire Department was called in and succeeded in reducing it to ashes in August of 1946 (Kolb, 1997, p. 70).

other efforts including a brief attempt at cotton production in the 1830s. The cotton endeavor met with little commercial success[5].

By the 1840s, the increased number of whaling ships anchoring off of Maui's shores created a substantial market for produce such as sweet and Irish potatoes. Irish potatoes were coveted and became important in the produce trade, particularly during the California Gold Rush. They were transported from the Kula fields to the shore, where they were often sold directly to ships then shipped to Lāhaina, where the bulk of the whaling fleet moored. The California Gold Rush began in 1848, which resulted in a potato boom on Maui that commenced in the fall of 1849.

The Māhele

The *Māhele*, or *Division*, defines the development of the mid-1800s land tenure system transformation, which essentially divided all Hawaiian lands into three categories: (1) Crown Land: designated for the occupant of the throne, (2) Government Land, and (3) Konohiki Land: set aside for 245 of the highest ranking *Ali`i*.

The Māhele of 1848-1851 marks a "period of significance" because it is the first extensive written record of how land was utilized (Creed v. I 1993: vii). The Hawaiian leaders had influential foreign powers advising that private ownership of land was desirable and necessary to move forward into the modern world. The Māhele awards books as well as the foreign and *kuleana* land claims help document the introduced land tenure system.

Not everyone, particularly older Hawaiians, fully understood the ramifications of the process of filing or not filing a claim for lands on which their families lived and worked for generations. Marion Kelly (Creed, v. I: 42) elaborates that "…many people who had use rights in the land did not register their claims…chiefs who participated in the division of lands with King Kamehameha III were not required to present claims to the Commissioners …not all testimonies and awards corresponded with registered claims, and there were often contentions. Many registered claims were rejected, and some lands listed in claims were not awarded…" The process was a complex one that presented a plethora of issues.

[5]The Anglican Church felt that "the Hawaiian people, freed from their service to and dependence on the chiefs should be self-supporting and thought that the encouragement of the manufacture of cloth from the superior cotton which grew luxuriantly in the islands would be a means to that end. They suggested that a manufacturer be sent with sufficient machinery to get the project started. They felt that the people would continue to work with the encouragement and cooperation of the chiefs." (Lemmon et. al 1973:2-B-3). To this end they sent Miss Lydia Brown in 1835 with " 'a quantity of domestic spinning apparatus' (presumably spinning wheels and a loom)" (Ibid.), and "charged with the responsibility of teaching the Hawaiian girls the arts of carding, spinning, weaving and knitting locally grown cotton and wool." (ibid.) As each class grew proficient enough to teach others, a new class was formed (ibid. 2.B.4).

The idea of *private property* was introduced to the islands. All of the lands were subject to the *rights of native tenants*. If the common people (*maka`āinana*), or "Native Tenants", met certain criteria and filed land claims under specific guidelines, a Land Commission Award (LCA) was issued. According to the Hawaiian Journal of Law & Politics (Volume 2: 2006):

> …After the surrender by Kamehameha III, in 1848, of the greater part of the land of the Kingdom to his chiefs and people, the necessity of a speedy distribution of it in accordance with what may be called the feudal rights of the chiefs, required that awards of lands be made by name only without survey. No body of surveyors could have been found in the country or practically could have been brought here, who might have surveyed these large estates within the lifetime of half the grantees, so that every award should have been issued as of a tract defined by metes and bounds, or with even an approximate statement of the acreage. The "Mahele" or division was, therefore, made without survey. Tracts of land known to Hawaiians as an ahupuaa or ili were awarded to those entitled by name of the ahupuaa or ili. By such grant was intended to be assigned whatever was included in such tract according to its boundaries as known and used from ancient times.

Further efforts for native tenant land rights required paying hefty commutation in addition to conducting expensive land surveys -with limited available land surveyors- then finally, a land grant may be awarded. The awarded lands are referred to as *kuleana*.

According to the on-line *Waihona `Āina* database: In 1848, much of Wailuku was designated Crown Land, to be used in support of the royal "state and dignity". In 1872, Kamehameha V died, and his sister Princess Ruth Ke`elikolani inherited the land. She was designated as the owner of the *Ka`a* lands of Wailuku, the southern portion of the *ahupua`a*. The *ili* of *Owa* comprised of 743.40 acres, (LCA 420) and was granted to Kuihelani. The study area is located within a section of LCA 420 to Kuihelani; being a portion of Royal Patent 1996.

The lower portion of `Īao Valley contained some of the most productive taro lands on the island, reported in historic testimonies and maps related to LCAs in the lower valley. There are 66 LCAs identified between the old Wailuku Mill site and Paukūkalo, on the southern side of `Īao stream, listed primarily as taro patch *kuleana*, and 39 *po`alima*. Additionally, thirteen awards were given to individual chiefs by Kamehameha IV.[6]

By 1876, a reciprocity treaty with the United States gave a boost to the sugar industry by increasing prices, and the dry eastern section of Wailuku *Ahupua`a* became more attractive for potential sugar land. Claus Spreckels developed a friendship with

[6] This is in contrast to the area south and east of Lower Iao Valley, in which the study parcel lies. Here there were 2 LCAs awarded—one to Victoria Kamamalu (7713), and one to Kuihelani (420). The largest land partition of Central Maui is Grant 3343 to Claus Spreckels.

King Kalākaua, and through him purchased or leased 40,000 acres of dry lands in 1878. The lease included 16,000 acres within Wailuku *Ahupua`a*. Later in 1882, one-half of the Crown Lands of Hawaii were deeded to sugar producer, Claus Spreckels, allegedly in order to settle debts.

Worried about what Spreckels might do with half of the Crown Lands, King Kalākaua deeded one of the aforementioned grants: Land Grant 3343 to Spreckels. The grant included a 24,000 acre portion of the southeastern section of Wailuku *Ahupua`a,* in return for the surrender of his claim (Adler 1966: 262-263). Much of the land shifted after the Māhele. According to Kame`eleihiwa (1992: 314-315), King Kalākaua's mother received fifty *ahupua`a* as a result of the Māhele and by the time she died, Kalākaua only received two *ahupua`a*…

> …which meant he was virtually a landless *Ali`i Nui*, equivalent to a mere *konohiki* of twenty years before. But if he were to live and rule as an *Ali`i Nui* in the new capitalist system, he needed money. His attempts to make money via his capitalist friend Spreckels, through shady land deals and auctioning of the sole opium license for the kingdom to various contending Chinese businessmen, gave the missionary faction an excuse to ferment a rebellion that culminated in 1887…The Bayonet Constitution stripped power from the Hawaiian *Mō`ī* [King] and gave it to foreign capitalists. Broken in spirit and disheartened by the betrayal of foreigners whom he thought could be his friends, Kalākaua's health deteriorated. In 1891 he died… Kalākaua had discovered that it was impossible to rule Hawai`i with *pono* for both Natives and foreigners-their worlds were too different.

Disputes were common. The Hawai`i Court Appeal addressed the topic of the Pūlehu-Nui and the Waikapū boundary issue. According to the Commissioner, Pūlehu-Nui includes an area of 16,687 78-100 acres. It extends from Kilohana Peak at the rim of Haleakalā Crater at an altitude of approximately 10,000 feet. Pūlehu-Nui continues westward, down about fifteen miles. The eastern or mountain section is *comparatively narrow, often less than half a mile wide.* The western section meets the low land and becomes wider –from three to four miles wide- until meeting at the west boundary with Waikapū Ahupua`a.

The west boundary was disputed. The claim states that Pūlehu-Nui boundary included ~5,000 acres that belong to Waikapū . The Commissioner's boundary includes ~2,000 feet along the shore from Kīhei sand spit to a point of rocks called Kalaepohaku. The proposed Waikapū border cut Pūlehu-Nui off from the sea. Pūlehu-Nui extends to a level place where the water ran down and stood still by the ancient name *Kaopala*. The boundary of Pūlehu-Nui ran through Kaopala with the stream-bed as the boundary. At Kaopala the water turned southward and ran down to the ocean towards Kealia Pond, which belonged to Waikapū . Pohakiikii is within Pūlehu-Nui (ibid).

Pūlehu-Nui borders Waikapū at Waikapū Common. *Waikapū Common* was granted to the Department of Education during the Māhele since there were no claimants

named. In 1879 the Supreme Court ruled on the disputed boundary indicating that because the 10 parcels for the Common were returned to the Department of Education, the patents on the Common "cannot be held to have an existence for any purpose" and further "if any inference is to be drawn it should be that the Government, or the Board of Education, did not have an assurance that Waikapū extended as they had sold it" (Judd 1883: 250).

All of Hawai`i, including Wailuku and Waikapū continued to transform under foreign influence. Because sugar cane cultivation requires an immense amount of water, the natural water flow in *Na Wai Eha* drastically shifted. In 1880, Spreckels began the construction of "Spreckels' Ditch", located *makai* of the aforementioned "Hāmākua" Ditch, which was built earlier by Alexander and Baldwin to water *Maui Agricultural Company's* fields in and around Pā`ia. The "Spreckels' Ditch" carried water from Haleakalā farther west onto the arid Kahului isthmus. The ditch was 30 miles long, delivered about 60 million gallons of water a day, and cost $500,000 to construct.

Spreckels spearheaded construction for the Waihe`e ditch in 1882, which tapped the water resources from the West Maui Mountains, thus bringing water to both sides of the *Wailuku Commons* isthmus area (Adler, 1966: 48-49). These endeavors enabled him, in 1882, to establish Hawaiian Commercial and Sugar Company (HC&S). He continued involvement in that company until 1898, when control was wrested from his hands. The parent company still bears the name *Alexander and Baldwin*, the principal participants in the transfer of corporate control. The production of sugar cane continues to be an activity in the isthmus area to this day, although some portions operated by C. Brewer and Company shifted to pineapple production. Most of the early historic agricultural endeavors have relatively recently ceased operations.

Railroad

During the sugar boom, a railroad network was established throughout Hawai`i. Kahului Railroad paralleled Lower Main Street, and was one of the earliest known commercial projects severely impacting the *natural* sand dune formation. The route of the railroad ran from Kahului Harbor to Wailuku Sugar Mill. Remains of the old railroad bed have been noted in a few places along Lower Main Street, along Kahului Beach Road, and Kā`ahumanu Avenue. Surface (and subsurface) architectural remnants from the railway system include berms and remains from the Makaweli Rock Crushing site.

Five concrete pillars and arches peek out of the shrubs makai of Kahului beach Road (1921). The feature was originally constructed so the train carrying rock from the quarry could off-load from the track-bed into the crusher. The concrete pilings elevated the crusher above ground so trucks could be driven in and filled with crushed rock. This series of pillars (footings for the Makaweli Rock Crusher Mill) still stands near the intersection of Kanaloa Avenue and Kahului Beach Road.

Railroad construction began in the late 1870s and continued for nearly 2 decades, as routes were added and service expanded. The railroad continued operations until after World War II. Then slowly, demands began to change, and segments of the system were phased out. An article in The Maui News of October 15, 1957 bore the headline "Iron Horses Bow Out as Wailuku Sugar Company Discontinues Use of Railroad". The railroad continued to serve other areas until 1966, when it ceased operation.

Military Occupation

In central Maui, modern development occurred later than in Wailuku town. During World War II areas all throughout Maui were utilized by the military. There was a large Marine Base located near the current Maui Community College campus and the Maui Arts and Cultural Center. After the war, several housing developments were built in Kahului (Dream City) and the Wailuku Sand Hills area for housing and modern development. The Army Reserve Maui location is located in Wailuku on the western slopes of the natural sand dune formation.

PREVIOUS ARCHAEOLOGICAL WORK

The earliest archaeological work in Wailuku was part of the island-wide survey of *heiau* (place of worship) compiled by Winslow Walker during 1928-1931. A number of *heiau* were listed for Wailuku. The infamous -*Pihana Heiau* and *Haleki'i Heiau*- lie on the northern side of `Īao Stream atop the large dune formation. Efforts in the 1970s led to the preservation and designation of a State Monument, under the supervision of the Division of State Parks (DLNR).

Walker reported a number of additional significant *heiau* in Wailuku, which were allegedly consecrated by Liholiho during his visit to Maui in 1801 (Walker 1931: 146-147). At the time of Walker's survey, none of the following Wailuku *heiau* could be located: Keahuku, Olokua, Olopio, Mālena, Pohakuokahi, Lelemākō, Kāwelowelo, Kaulupala, Palamaihiki, and Oloolokalani (ibid: 148).

In 2006, Cultural Surveys Hawai`i, Inc. completed an archaeological inventory survey for a 15.2 acre parcel. One historic archaeological feature was identified and listed as SIHP 50-50-10-4800. The site is an intact military structure that was previously investigated by IARII (2000). A buffer zone was recommended for placement around the feature for preservation.

Walker notes an unnamed *Heiau* and Petroglyphs located 0.25 mile from the village of Ma`alaea at the base of the foothills of the West Maui Mountains. An ancient village with house and shelter sites is also noted. During the Statewide inventory of historic sites project, the Sites were listed as SIHP -1441 (McGregor Point C-shapes) and SIHP -1287 (Ma`alaea Complex). At least 45 house and shelter sites were noted above (*mauka*) the highway during the survey.

At Ma`alaea Harbor, two large basalt boulders with cultural significance were re-located to the grounds of Buzz's Wharf Restaurant. One of the features is a large grindstone, referred to as the "King's Table". The grindstone was allegedly removed from the ocean during the expansion of the Harbor. The second feature was traditionally used to deposit newborn's umbilical cords into boulder, which has been referred to as a *Piko Stone* (SIHP -1286 and -1440]). The Piko Stone is most likely the one referred to in the Boundary Commission testimony (Creed v. I: 25). Prior to its' current location next to the grindstone, the Piko Stone was positioned at Kapoli Spring[7]

[7] The location of Kapoli Spring is offered by a local resident. It is a spring that has partially been sealed off -near Buzz's Wharf restaurant- at the public restroom facility.

PHRI conducted an inventory survey of the Waikapū Mauka Partners Golf Resort, which was one of the largest areas surveyed in the vicinity –at the time. It lies at the foot of West Maui (400 to 800 feet elevation), south of Waikapū town. Continuous dry land Hawaiian agricultural and habitation features (~1585-1665 AD) were documented (Brisban, Haun and Jensen 1991).

Numerous significant archaeological sites were recorded, and some preserved. Joseph Kennedy conducted research at a Waikapū sand mining project that resulted in the identification and preservation of a human burial complex (Kennedy 1989). This site recommended for permanent preservation is located on the adjacent parcel.

Kennedy conducted an archaeological survey approximately 600-1000 feet above sea level. Several traditional Hawaiian dry-land agricultural features were documented during the survey (Kennedy, 1990). In Waikapū Valley traditional Hawaiian wet-land agricultural sites were documented by Theresa Donham (1991). The wetland features were identified approximately 750 feet above sea level-- downstream.

An archaeological survey was conducted for C. Brewer Homes' retention basin at TMK 3-5-002: 001. The parcel is located along the east side of Honoapi`ilani Highway and was under sugarcane cultivation for over a century. Thirteen backhoe test trenches were excavated in select areas. No significant remains were found (Tichenel 1996). Likewise, six backhoe test trenches were absent of cultural materials at TMK 3-5-002: 001, as reported by Kennedy in another nearby study (1989).

In 1994 and 1995, Xamanek Researches conducted a salvage recovery project in response to the inadvertent discovery of human skeletal remains in Waikapū. Human burials were destroyed by sand mining activities at Maui Scrap Metal Company. The transported sand contained human skeletal remains and the Maui/Lanai Islands Burial Council and the SHPD recommended mitigation measures including investigation, recovery, and reburial procedures. The skeletal remains represented more than 22 individuals. Ten pieces of a boar tusk anklet (*kupe`e hoaka*) and a hand drilled canine dogtooth pendant was also recovered. The artifacts were treated as burial associated items so the recovered artifacts and human skeletal remains were placed as close to the original burial site as possible (Fredericksen and Fredericksen 1996).

An archaeological assessment survey for the Kaikane Corporation's housing project in Waikapū listed no findings. Subsurface testing indicated the area was impacted by mechanical land altering activities -such as sugarcane and pineapple production (Fredericksen and Fredericksen, 2004). Precautionary monitoring was recommended because of the sand dune deposits and the chance of encountering skeletal remains.

Early archaeological reconnaissance surveys by Barrera (1976) of the approximate 1,000 acre neighboring Maui Lani Project, and of the Hale Laulea Subdivision (Barrera, 1983) in Kahului did not report any sites. However, since then many human burial features have been inadvertently discovered throughout the parcel.

Neller (1984) investigated the "sand borrow site" after sand from the dunes was transported to a construction site in Lāhaina, was discovered to contain human remains. Upon investigation, one *in situ* human burial, and skeletal fragments representing at least 3 other individuals were displaced throughout the vicinity.

In 1987, Xamanek Researches and the Maui Police Department investigated the discovery of human skeletal remains. The area was also referred to as the "sand borrow site". Archaeologists were sent to determine the nature of additional skeletal material reported by local informants. A well-utilized dirt bike trail had exposed the disturbed, flexed burial of a young female (18 to 25 years of age), and a 4 or 5 year old child nearby, partially exposed in the trail. Maui Police Department recommended the burials be removed. A shattered 4th thoracic rib and lower left scapula blade, suggests a frontal traumatic puncture wound may have caused the death of the young female. The burials were eventually turned over to the State Historic Preservation Division on Maui until permanent replacement.

Under contract to Maui Lani Partners, the Bernice Pauahi Bishop Museum Anthropology Department conducted test excavations at 4 sites identified during a reconnaissance survey (Rotunno and Cleghorn, February 1990). Three of the sites included 2 parallel alignments, 2 adjacent rock mounds, and a single rock mound. The surface features were all determined recent origin related to off-road vehicular traffic.

The fourth Bishop Museum site (Site 50-50-04-2797) is a human burial complex. The burials were identified across a *sand borrow pit* "near the eastern boundary of the Maui Lani Project area". No intact burials were recovered, but the scattered remains from at least 3 individuals were recovered near the surface (Rotunno-Hazuka et. al., May 1994a). Subsequent data recovery methods were employed. Results documented the identification of at least 12 individuals from 10 burial features. Six of the features were preserved *in situ* (Rotunno-Hazuka et. al., May 1994b). The site is nestled in the Maui Lani golf course and residential development.

Archaeological subsurface sampling of the Maui Lani Development Phases 1 and 1A was conducted by Aki Sinoto Consulting. The objective of the work was to implement a strategy for subsurface sampling to test for the predictability of burials based on topographic features within the unmodified dune areas, and to address the deficiencies in the reconnaissance or inventory survey (Pantaleo and Sinoto, January 1996).

A total of 90 backhoe trenches, 2 shovel scrapes and a manual trench were excavated in 58 areas (ibid: iii). Six previously unrecorded burials were identified – 4 associated with the sand borrow site (Site -2797); and one on top of a high dune (Site -4146). "No predictable pattern of traditional interment of the dead based on preference for topographic features was established during the current investigation. Rather, the resultant data indicates only one concentration or complex of multiple burials at Site -2797 and isolated individual burials at the top of dunes in the highest locations in the project area" (ibid.). Subsequent archaeological monitoring of Maui Lani residential and

commercial development resulted in the discovery of hundreds of additional human burial features throughout the sand dunes.

Xamanek Researches conducted an archaeological inventory survey along the Maui Lani Parkway, Lot 11-A in 1997. A human burial site was documented and assigned SIHP 50-50-04-4401. Several other burial features are documented along the Maui Lani Parkway Development such as Sites -4368 and -4435 (Xamanek Researches).

A pre-Contact human burial was discovered while road crews were excavating under the Ka`ahumanu Avenue bridge crossing along Wai`ale Road (Site -4126).

Also along Wai`ale Road, which forms the western border of the Wailuku Sand Hills residential neighborhood, human burial features have been documented. Archaeological monitoring occurred for a drainage project (C. Brewer) and archaeologists identified human remains formerly disturbed by an old pipe line trench running perpendicular to the road (Site -4005). Site -3502 contains human burial features including an historic coffin burial and a disturbed burial determined to be ancient Hawaiian. Site -4067 is a habitation site associated with Site -4005, which was identified during the drainage project. Site -4068 is another habitation site with an associated cluster of human burials (Dunn and Spear 1995).

During construction for the Maui Homeless Shelter in May of 1992, 3 human burials were inadvertently discovered (Site 50-50-04-2916). These skeletal remains were investigated by Theresa Donham. Skeletal remains representing an adult male were documented roughly 2 feet below the original surface (Burial 1), a cranium (Burial 2) was exposed during construction of a desilting basin located along the lower slope of the dune at the southeastern corner of the project area (Donham, 1992:3). A test unit measuring 5 by 3 meters was excavated to a depth of 0.50 to 0.75 meters below the surface. 280 identifiable elements or human skeletal fragments were recovered, along with 235 non-diagnostic fragments. Two adult individuals were represented in the collection.

In 1999, Archaeological Services Hawai‘i (ASH) conducted archaeological monitoring during the initial construction activities for the Cameron Center Expansion project. Human skeletal remains representing an adult and an infant were identified. The recovered skeletal remains were placed in a previously designated permanent burial preservation area (SIHP 50-50-04-4728).

Table 1: Selected Previous Archaeological Reports

AUTHORS	LOCATION	FINDINGS
Burgett and Spear, 1995	TMK: 3-8-37: 48, Lower Main St., Home Maid Bakery, Sites 3924 and 3925.	Habitation sites; human burials. Dated c. AD 1430 to 1671

Table 1: Previous Archaeology (cont.)

AUTHORS	LOCATION	FINDINGS
Burgett and Spear, 1996	Inventory Survey – TMK: 3-4-39: 77. Lower Main St., Oceanhouse, Inc., Site 4004	Habitation site remnant; human burials. Dated 1429-1640 AD.
Connolly, 1973	Statewide Inventory – TMK: 3-8-36: 94, Lower Main St., Site 1172	Habitation site; burials discovered in 1994 eroding from dune face.
Donham, 1994	TMK: 3-8-37: 49, Lower Main St., Home Maid Bakery, Site 3556	Inadvertent burial discovery, both historic and precontact burials.
Donham, 1992	Letter Report – TMK: 3-8-46: 21, Waiale Road, Maui Homeless Shelter, Site 2916	Human burials
Dunn and Spear, 1995	Monitoring – TMK: 3-4-02: 36, RR bed along Waiale Rd. Sites 4068, 4067; Site 3502 at Waiale Rd. and Kaohu Street	Habitation site and burials (Site 4068); Habitation (Site 4067)
Fredericksen, W. and Fredericksen, D. December 1992a	Inventory Survey – TMK: 3-8-07: 40 and 43; Maui Community College Parking Lot Extension	Historic sites from WWII. No precontact cultural materials
Ibid., September 1995	Inventory Survey – TMK: 3-8-07: por. 1; Keiki Zoo Maui.	No significant findings
Fredericksen, D. and Fredericksen, W. February 1996	Skeletal Recovery Project – TMK: 3-8-07: 104; Maui Scrap Metal Company, Waikapū , Borrow Site 3525	Remains of at least 22 individuals recovered from mined sand
Fredericksen E. and Fredericksen D. September 1996	Data Recovery – TMK: 3-4-39: por. 82	Habitation site (Site 4127); dated c. AD 1450 to 1675
Fredericksen, E. November 1998	Monitoring Report for Baldwin High School TMK: 3-8-07: 4	No significant findings
Fredericksen E. February 1998	Monitoring Report for Kuikahi Drive and Waiale Road, TMK: 3-5-01: por. 65	No significant findings
Fredericksen, E. and D. September 1998	Mitigation Report for Lower Main/Mill Streets Public Utilities Project – MECO TMK: 3-4-39: por. 81	*In Situ* precontact burial associated with Site 4127
Fredericksen, E. 1998	Na Leo Pulama O Maui Monitoring Project	Previously disturbed human remains located (Site 4493)
Fredericksen, E., D., and W. August 1994	Inventory Survey – TMK: 3-8-46: 30; Maui Memorial Park	No significant findings
Ibid., March 1997	Inventory Survey – TMK: 3-4-36: parcel A; Mokuhau Water Storage Tank	No significant findings
Fredericksen, E., W., and D., September 1994	Inventory Survey – TMK: 3-8-07: por. 125; Maui Central Park, 10 acres along Kahului Beach Road	No significant findings

Table 1: Previous Archaeology (cont.)

AUTHORS	LOCATION	FINDINGS
Fredericksen E., and Fredericksen D. June 1995	Inventory Survey – TMK: 3-8-46: 21, Waiale Road; Ka Hale A Ke Ola	No significant findings during inventory survey – monitoring recommended
Fredericksen D. February 1997	Skeletal Recovery Report – TMK: 3-8-46: 21, Waiale Road; Ka Hale Ke Ola	Human burials uncovered during grading – remains of at least four individuals recovered
Fredericksen E., and Fredericksen D., January 1997	Inventory Survey – TMK: 3-4-07: por. 121, Maui Lani Parkway corridor	No precontact finds in corridor – human remains (Site 4368) on Golf Course Hole #10 – monitoring recommended
Fredericksen E. November 1997	Maui Lani Parkway Corridor Monitoring report	*In Situ* burial (Site 4435) and previously disturbed remains (Site 4419) found during monitoring
Fredericksen D. and Fredericksen E. May 1997	Inventory Survey – TMK: 3-8-47: por. 1, 2, 3, 4, 17, 18, 30 and 32; 3-9-07: por. 121, Mahalani Street Extension	No significant findings – monitoring recommended
Fredericksen E., and D. June 1997	Inventory Survey – TMK: 3-4-07: por. 121, Lot 11-A, Maui Lani Project – 20.7 acres	One indigenous *in situ* burial (Site 4401). Monitoring recommended
Fredericksen E. December 1997	Monitoring Report for the Kaiser Permanente Parking Lot Extension Project TMK: 3-8-46: 08	No significant findings during monitoring
Fredericksen E. and D. February 1999	Monitoring Report for 12-inch sewer line along Waiale Road TMK: 3-4-10: 27 & 30	One indigenous cultural layer and *in situ* burial – Site 4683. Further monitoring recommended
Ibid., November 1998	Monitoring Report for Baldwin High School Gymnasium Project	No significant findings
Ibid., April 1999	Monitoring Report of Kahului Barge Terminal Improvements TMK: 3-7-08: por. 4 & 6	One subsurface site with coral and pebble pavement – site 4753
Fredericksen D. and E. April 2000 March 2001	Inventory Survey of TMK: 3-4-13: 96 and 100 – Phase 1 Main Street Promenade Phase 2 - TMK:3-4-13: 76	Adjacent property to the west. Identified 2 historic sites.
Fredericksen D. and Fredericksen, W. December 1992b Fredericksen, et al., October 1997	Inventory Survey: TMK: 3-8-07: 123, at Lower Main and Waiehu Road, Nisei Veterans Memorial Canter Data Recovery Report: TMK: 3-8-07: 123, at Lower Main and Waiehu Road, Nisei Veterans Memorial Center	Historic site, Kahului Railroad (Site 3112); large precontact habitation site, with continuous occupation from c. 1200 AD to c. 1740 (Site 3120); numerous burials to be preserved *in situ.*
Fredericksen D., and Fredericksen E., September 1997	Inventory Survey: TMK: 3-4-39: 82, proposed Maui Texaco Service Station project	Habitation site and burials (Site 4414) dated c. AD 1325 to 1670; data recovery and monitoring recommended.
Fredericksen, E., and D., December 1997	Inventory Survey – TMK: 3-8-07: 47 at Lunalilo and Liholiho Streets, Na Leo Pulama `O Maui Property, Site 4418	Habitation site (Site 4418), dated AD 1400s to 1600s; preservation of site recommended; monitoring of project recommended.

Table 1: Previous Archaeology (cont.)

AUTHORS	LOCATION	FINDINGS
Fredericksen, et al., July 1995	Inventory Survey – TMK: 3-4-39: por. 81, 82, 83 at Lower Main and Mill Streets, Site 4127 Data Recovery – TMK: 3-4-39: por. 82	Habitation site (Site 4127); data recovery recommended. Habitation site (Site 4127); dated c. AD 1450 to 1675.
Fredericksen, D. and E., December 1999	Inventory Survey of Site 1172 – TMK: 3-8-36: 94.	Infant burial; habitation site dated to AD 1400-1640.
Fredericksen, D. and Fredericksen E., September 2002	Inventory Survey- TMK: 3-4-039: 76, Site 4730	Habitation site, burial (Site 4730), monitoring recommended.
Fredericksen, E., and Fredericksen D., March 2002	AIS Puuohala Mauka TMK: 3-3-2: por 1	Site 5195 – plantation era wall/platform Site 5196 – surface scatter of coral and shell
Fredericksen, D., 2005	Kanaloa Avenue Project, TMK: 3-7-001: 02	Site 5495: four Native Hawaiian *in situ* burials; Site 5496: precontact coastal habitation site; Site 5471: Native Hawaiian burial; Site 5472: previously disturbed human remains, Site 5660, habitation site.
Heidel, Pyle and Hammatt, 1997	Inventory Survey – TMK: 3-8-07: 1 and 3-7-01: 2, Maui Central Park	Historic sites – Site 4232 – WW II military camp: Site 3112 – Kahului Railroad Berm; Site 4211 – scattered human remains
Kennedy, 1992	Inventory Survey TMK: 3-8-07; Maui Arts and Cultural Center	No findings
Pantaleo, J. and A. Sinoto, January 1996	TMK: 3-8-07: 2, 110; Phase I and Phase IA, Maui Lani Partners Development, Wailuku	No habitation sites. Human burials in several locations. Monitoring recommended. Additional burials during monitoring
Rotunno and Cleghorn, 1990 Rotunno-Hazuka, et. al. May 1994a	TMK: 3-8-07: 2, 110: Maui Lani Development Property	No precontact sites other than burials (Site 2797)
Spear, 1995	TMK: 3-8-37: 48; Lower Main Street	Human burials and habitation (Site 4066).

SETTLEMENT PATTERN AND EXPECTED FINDINGS

Settlement Pattern Summary

Lower Īao Valley within Wailuku *Ahupua'a* was a central political and religious area of West Maui, because of the fertile lands as well as the close proximity to wetlands and the ocean shoreline. A sizable and successful aboriginal Hawaiian settlement was most likely present for over the past eight hundred years. Wherever large population clusters are found, the social framework of chiefly importance and religious expression is also generally present. Aside from numerous examples from oral histories and traditions, concrete archaeological evidence supports the supposition: several habitation sites, agricultural complexes, and the presence of significant *heiau* including two preserved *heiau* (Haleki'i and Pihana) atop the northern dune system, and several others dispersed throughout the area.

Wailuku and upper `Īao Valley was traditionally known as a very significant sacred area in history. The middle and upper reaches of the region were once covered with actively cultivated pond fields (*lo'i)* and associated tributaries or complex integrated water transport systems (including *'auwai),* which produced food items to support a large population. No doubt the streams also provided food sources as well as the nearby ocean, which is teeming with aquatic resources.

Coastal habitation and ceremonial sites -such as Site -3120- were occupied since at least AD 1200s (possibly earlier). Although there has not been as many studies conducted in the upper region, patterns emerge from the lower region. In general, permanent habitation and ceremonial or political center sites seem closer to the ocean and yield earlier dates than inland. This suggests early Hawaiian settlement occurred along the shoreline and moved inland as population increased. This hypothetical theory matches many other researchers and scholars. An intensification of usage occurred during the 16th century and may have peaked around the time of Pi`ilani, approximately 1600 AD. .

Foreign influence brought change to the landscape and lifestyle. Cattle ranching occurred in the general area, which reshaped much of the landscape. Commercial agricultural endeavors brought several ethnic groups to work throughout the islands, including to the bustling area of Wailuku. Many plantation camps were scattered about. *Raw Fish Camp* was one of the camps located in central Maui. Remains from historic immigration camps and early historic homes as well as commercial buildings are located throughout the historic Wailuku corridor. World War II era sites have been documented in the region.

Expected Findings

Portions of the subject area have been previously altered through mechanical grubbing and grading activities but there are still many undisturbed sections of the natural Aeolian sand dunes. Based on the results of adjacent surveys and monitoring programs, it is very possible that previously unidentified subsurface cultural deposits may be encountered in the disturbed or undisturbed portions of the subject parcel.

Ancient traditional Hawaiian occupation, burial features, or ceremonial areas may still exist. Historic plantation, ranching, and military features may be encountered. Although subsurface testing occurred, it is possible hidden or subsurface features remain in the uninvestigated areas throughout the subject parcel. Isolated, clustered, and scattered human burial features have been noted at several locations throughout the sand dunes. World War II remains may be encountered.

FIELD METHODS

Xamanek Researches LLC, conducted an archaeological assessment survey for this 31.222 acre portion of land at TMK (2) 3-8-007:102. The subject area is located in Waikapū *Ahupua`a*, Wailuku District, Maui Island. Archaeological fieldwork occurred during late May early June 2011. Approximately five days were expended in the field for this project. Supervisory archaeologist Jenny Pickett, B.A., and Marco Molina, B.A., conducted the fieldwork. Erik Fredericksen (SHPD Permit No: 11-07) was the principle investigator and project director.

Subsurface testing included the excavation of a series of twenty mechanical Backhoe test Trench (BT) excavations across accessible areas throughout the subject area. 100% coverage was not possible because of two active cattle feed lots (including ponds), a graded access roadway, and selected areas where pipelines, high voltage, or other inaccessible locations.

All backfill material was visually inspected by the archaeologist- exposed sidewalls examined, and impacted portions consistently spot-checked. Following the mechanical test excavations, a representative wall from the subsurface test trenches was hand scraped with a trowel to aid in documentation. The wall profiles were mapped to scale and described by Munsell soil colors and U.S Soil Conservation Service terminology. The completed excavations were photographed and backfilled. Standard recordation methods were followed in the field and all mapping was performed utilizing a hand held compass and metric survey tape measures. Photographs were taken with a digital camera. All field records and associated research material are stored at the Xamanek Researches LLC laboratory located in Pukalani, Maui.

ARCHAEOLOGICAL FIELD RESULTS

The subsurface testing phase of this archaeological assessment survey consisted of the excavation of twenty backhoe test trench excavations within the accessible areas within the limits of the of the parcel. Maximum backhoe reach was ~4.2 meters. No evidence of significant cultural deposits was encountered. Visual observation of the mechanical excavation and inspection of the backfill did not reveal any significant cultural material.

Backhoe test trenches 1 through 10 were situated on the east half (Figure 3) and Backhoe test trenches 11 through 20 on the west section of the subject parcel, respectively (Figure 4). The subject area is comprised of Aeolian sand dunes with meandering alluvial streambed deposits from the ancient flows of Waikapū Stream. Nearly 100% of the subject area has been reshaped or heavily utilized in the relatively recent past. Note that two human burial features were inadvertently discovered during archaeological monitoring for the Consolidated Baseyards Development section between the east and west section of the subject area.

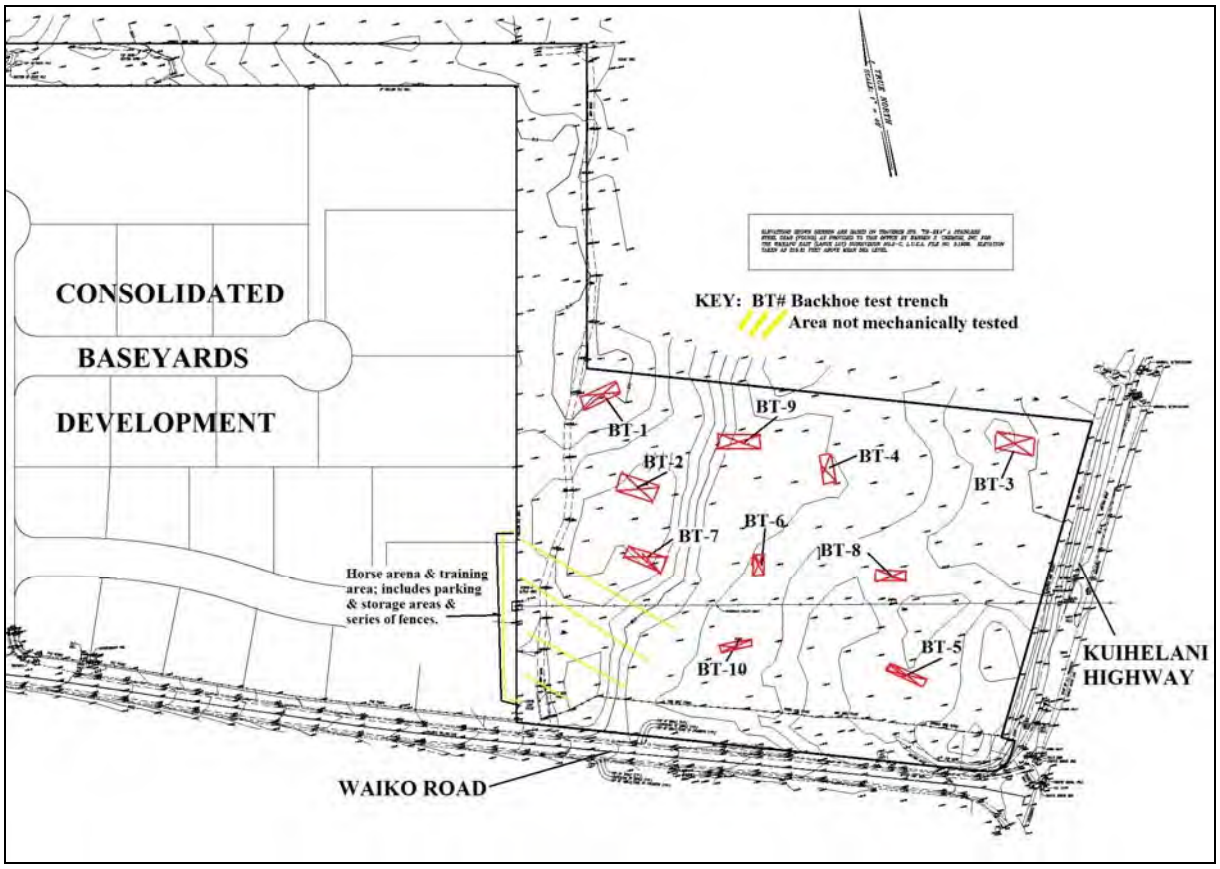

Figure 3: Backhoe Test Trenches 1-10 Location Map- East Section of Subject Area.

The east section of the subject area has been impacted by animal grazing as well as mechanical grubbing and grading. A bulldozed jeep access road bisects a long series of various push-piles mixed with modern trash (Photo 5). Fences delineate the boundaries along this recent development. Stockpiles, pushpiles, berms, and various construction remains were noted surrounding the Consolidated Baseyards Development area. Noted modern debris in the area consists of concrete chunks, plastic, and paper. Additionally, waterworn basalt boulders, cobbles, and pebbles are scattered about. A horse grazing, training, and activity area is located in the southern portion of the east section of the subject area.

Photo # 5: Overview of Access Road between berms or mechanical tailings, adjacent to the Consolidated Baseyards project boundary line, view to North.

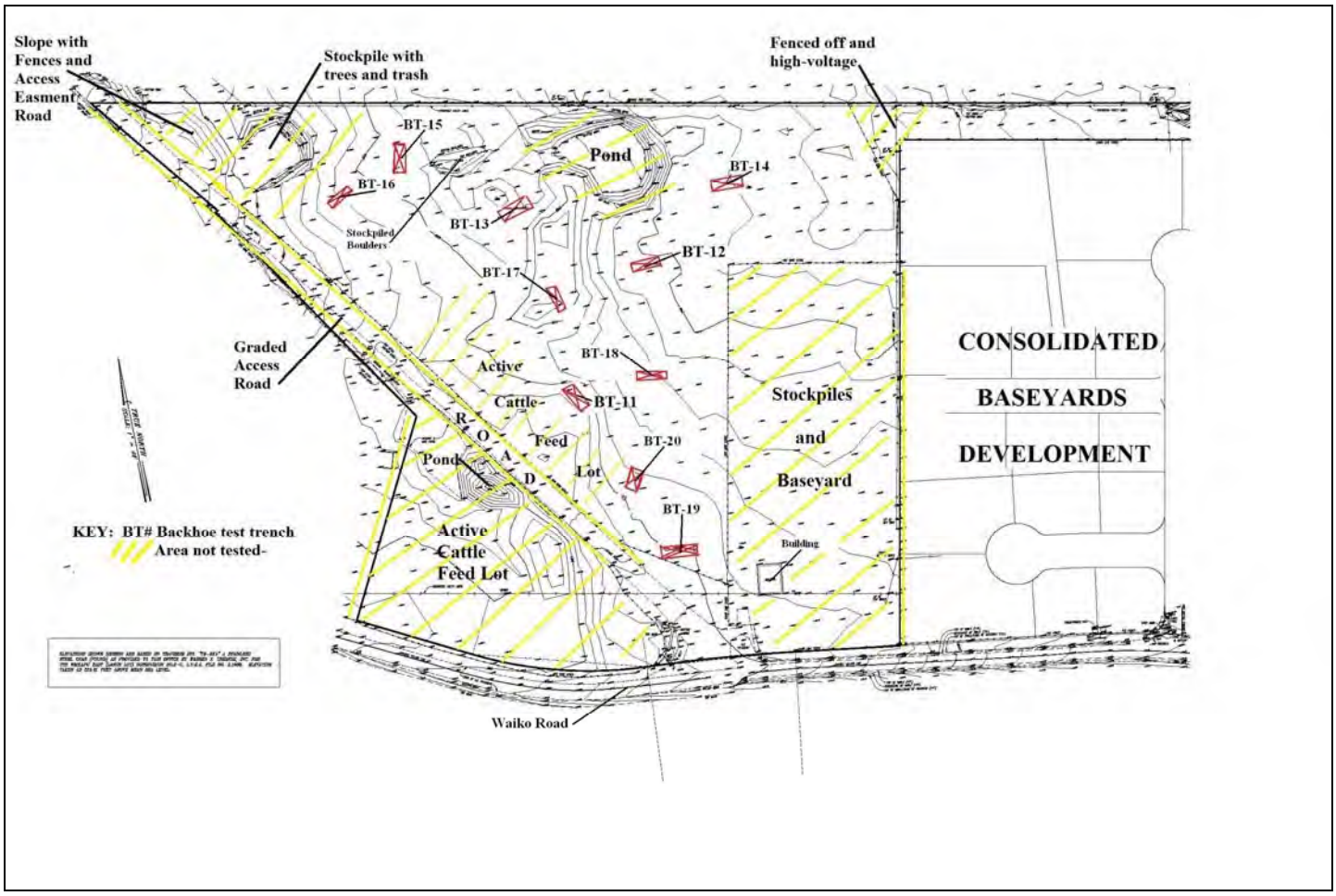

Figure 4: Backhoe Test Trenches 11-20 Location Map-West Section of Subject Area.

Backhoe Test Trench #1 (BT-1)

BT-1 was situated near the northwest property corner pin on the east section of the subject area- east of the recently developed light industrial area. BT-1 was placed adjacent to the recently developed Consolidated Baseyards Development project (see Fig's 3&4). BT-1 was oriented 120/300˚ and measured 5.8 meters long, 0.80 meters wide x 1.80 meters deep. BT-1 included both Aeolian (Layers I-III) and alluvial (Layer IV) deposits (Figure 5). Three distinct stratigraphic layers were recorded as follows:

Layer I 10YR4/3, brown; fine silty sand undulating with sandy silt texture; moderate, medium, single grain, structure; dry consistency, loose; moist consistency, friable; wet consistency, slightly sticky; plasticity, non-plastic; boundary, clear; topography, smooth; inclusions include heavy roots and rootlets with additional organic materials (*duff*), and 10% angular concreted sand gravels and/or pebbles; contains no significant cultural material.

Layer II 10YR4/3 brown mottled with 10YR 4/6 dark yellowish brown; fine, silty sand texture (more compact than Layer I); moderate, medium, single grain, structure; dry consistency, loose; moist consistency, friable; wet consistency, slightly sticky; plasticity, non-plastic; boundary, clear; topography, smooth; no roots and inclusions include little to no rootlets; contains no significant cultural material.

Layer III 7.5YR4/2 brown mottled peds of 7.5YR6/2 pinkish gray & 7.5YR4/1 dark gray; coarse loamy sand texture; (alluvial); strong, dry consistency, loose; moist consistency, friable; wet consistency, non-sticky; non-plastic; boundary, none; topography, none; inclusions includes white alluvial stream deposit indicating old stream bead; ~90% sub-angular porous & smooth basalt boulders/cobbles/pebbles (seem to be larger rocks at greater depth); contains no cultural material.

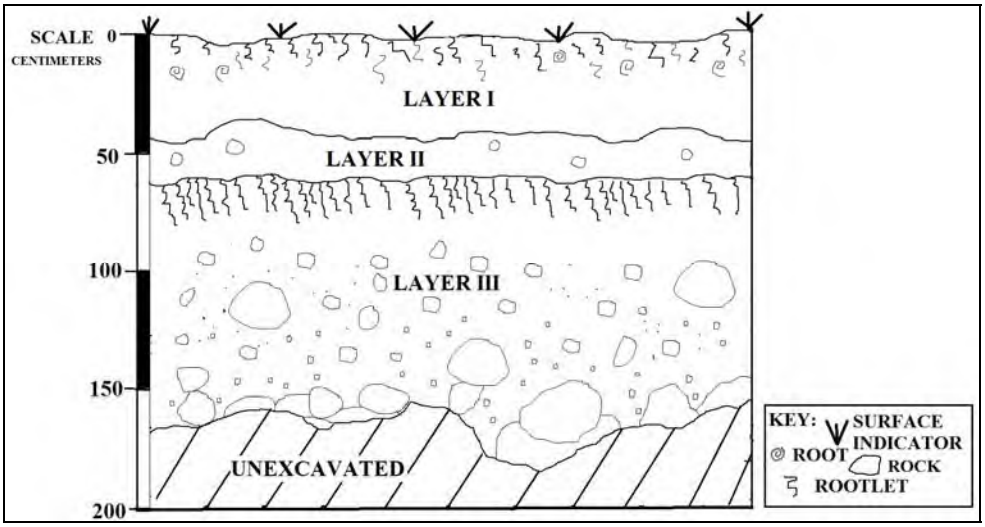

Figure 5: North Profile Drawing of BT-1.

Backhoe Test Trench #2 (BT-2)

BT-2 was also situated along the eastern section of the recently developed Consolidated Baseyards Development project (see Fig. 3). Modern trash was noted along the surface. BT-2 was oriented 114/294˚ measured 6.5 meters long, 0.80-0.85 meters wide (collapse) x ~3.6 meters maximum depth (Figure 6). Two layers of Aeolian sand dune deposits were documented as Layers I&II. Layer II became more compacted with depth.

Layer I 10YR4/3, brown; fine silty sand undulating with sandy silt texture; moderate, medium, single grain, structure; dry consistency, loose; moist consistency, friable; wet consistency, slightly sticky; plasticity, non-plastic; boundary, clear; topography, smooth; inclusions include few roots & rootlets; contains no significant cultural material.

Layer II 10YR5/3, brown; fine silty sand undulating with sandy silt texture; moderate, medium, single grain, structure; dry consistency, loose; moist consistency, friable; wet consistency, slightly sticky; plasticity, non-plastic; boundary, clear; topography, smooth; inclusions include few roots; few river cobbles and pebbles (white) contains no cultural material.

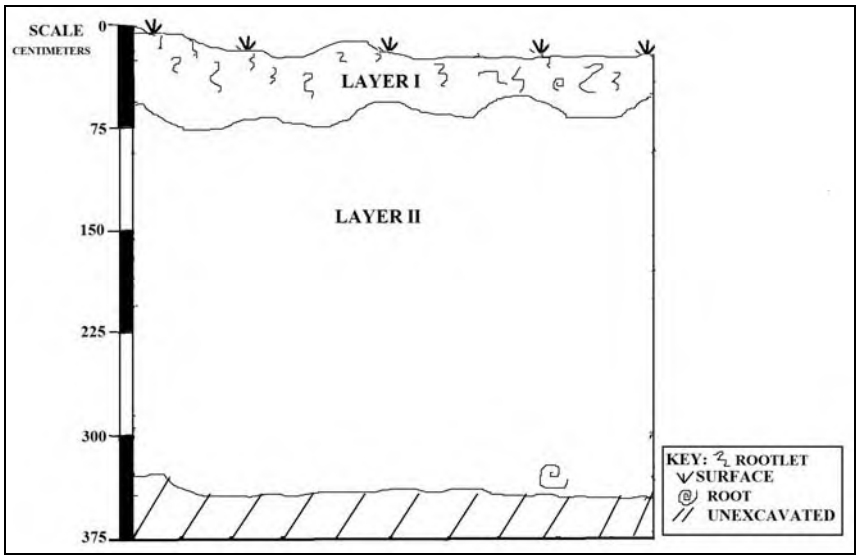

Figure 6: South Profile Drawing of BT-2.

Backhoe Test Trench #3 (BT-3)

BT-3 was placed in the corner of project area near the southeast corner of fenced area, adjacent to Kuihelani Highway along a small natural rise (Photo 6). This test trench resulted in all Aeolian sand deposits with no water worn rocks, and no alluvial or evidence of stream deposits.

Photo # 6: Pre-Excavation Overview of BT-3, View to Southwest.

Generally, small water-worn cobbles and pebbles were common. Few roots or rootlets within sandy silt that consists of fine soft small peds ("Grade B"). There were also small concreted sand pebbles noted. The intrusions of golden Aeolian forms semi-concreted peds, also concentrated at the base of trench Aeolian golden more coarse sand (less silt) soft Aeolian sand to base of excavation that terminated at the maximum reach of the hop-toe arm. The three stratigraphic layers were recorded as follows:

Layer I 10YR4/4, dark yellowish brown mottled with 10YR4/3 brown and 10YR6/4 light yellowish brown with intrusions of golden 7.5YR5/6 strong brown; fine silty sand undulating with sandy silt texture; moderate, medium, single grain, structure; dry consistency, loose; moist consistency, friable; wet consistency, slightly sticky; plasticity, non-plastic; boundary, clear; topography, smooth; inclusions include roots and rootlets; no significant cultural material.

Layer II 10YR5/3 and 10YR4/3 brown fine silty sand with sandy silt texture; moderate, medium, single grain, structure; dry consistency, loose; moist consistency, friable; wet consistency, slightly sticky; plasticity, non-plastic; boundary, clear; topography, smooth; inclusions include few roots and rootlets; common small water worn cobbles and pebbles; no significant cultural material. Intrusions of 7.5YR5/6 strong brown at base.

Layer III 10YR4/3 brown; fine, silty sand mottled with **7.5**YR 7/2 pinkish gray medium-coarse, sand and 10 R 4/3 weak red silty clay, texture; strong, fine, wet clump, structure; dry consistency, loose; moist consistency, friable; wet consistency, sticky; non-plastic; boundary, none; topography, none; inclusions include 45% of

sub-angular basalt boulders/cobbles and some sand stone cobbles; contains no cultural material.

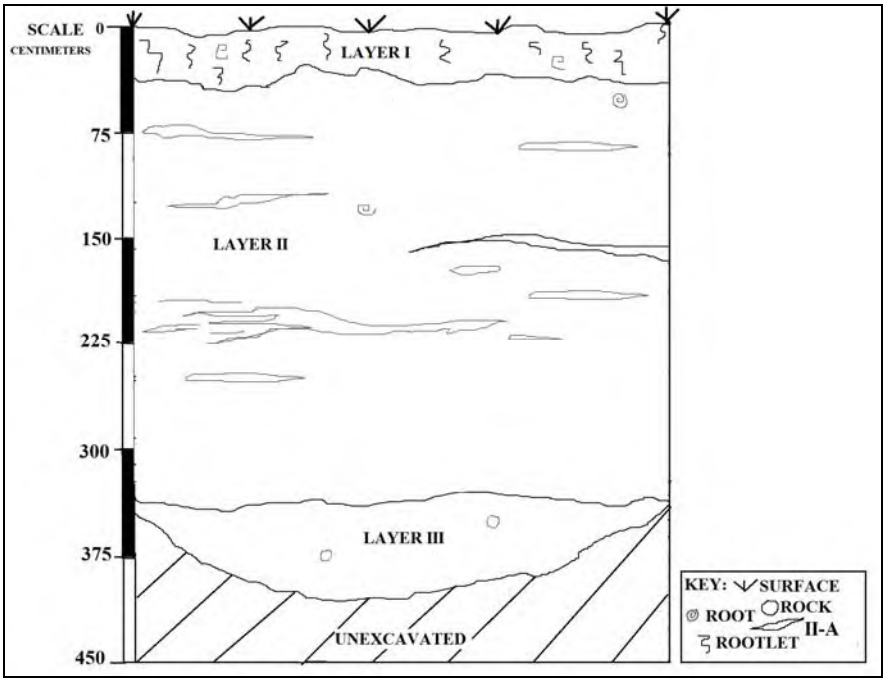

Figure 7: South Profile Drawing of BT-3.

Backhoe Test Trench #4 (BT-4)

BT-4 was placed near the crossing of 2 animal containment fence-lines (within corner area). In general, the trench was located on a gentle gradual eastern rise. There is a significant amount of bleached animal bones scatted along the surface. Matrix consists of soft golden Aeolian sand. There is a series of animal fences in this area and a small horse arena (Dixon). Alluvial deposits were noted at the base of excavation. Six stratigraphic layers were encountered as follows:

Layer I 10YR4/3, brown; fine silty sand undulating with sandy silt texture; moderate, medium, single grain, structure; dry consistency, loose; moist consistency, friable; wet consistency, slightly sticky; plasticity, non-plastic; boundary, clear; topography, smooth; inclusions include roots & rootlets; contains no significant cultural material.

Layer II 10YR5/3, brown; sand; moderate, medium-large, single grain, structure; dry consistency, loose; moist consistency, friable; wet consistency, slightly sticky; plasticity, non-plastic; boundary, clear; topography, smooth; no rock; inclusions are roots & rootlets; contains no significant cultural material.

Layer III 10YR6/2 light grayish brown; semi-compact silty sand and sandy loam peds; strong, fine, wet clump, structure; dry consistency,

loose; moist consistency, friable; wet consistency, sticky; non-plastic; boundary, none; topography, none; inclusions include sub-angular basalt and sand pebbles; contains no cultural material.

Layer IV 10YR4/3 brown sand; (fine) few white river cobbles and pebbles (random), texture; moderate, medium, single grain, structure; dry consistency, loose; moist consistency, friable; wet consistency, slightly sticky; plasticity, non-plastic; boundary, clear; topography, smooth; inclusions include few basalt river cobbles; contains no significant cultural material.

Layer V 7.5YR6/8 reddish yellow sand; compacted with semi-concreted platelets and few pebbles and cobbles (water-worn) within sandy silt, texture; strong, fine, wet clump, structure; dry consistency, loose; moist consistency, friable; wet consistency, sticky; non-plastic; boundary, none; topography, none; inclusions include sub-angular sand platelets and cobbles; contains no cultural material.

Layer VI 10YR4/3 brown (dominant color); sandy loam; alluvial deposit; (old stream bed); moderate, medium, single grain, structure; dry consistency, loose; moist consistency, friable; wet consistency, slightly sticky; plasticity, non-plastic; boundary, clear; topography, smooth; inclusions include few basalt river cobbles; contains no cultural material.

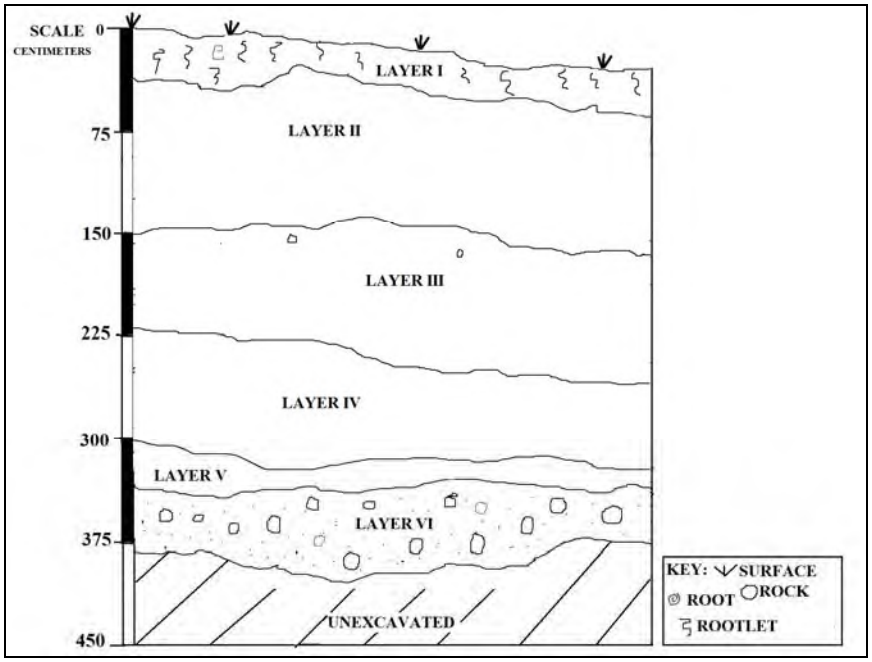

Figure 8: East Profile Drawing of BT-4.

Backhoe Test Trench #5 (BT-5)

BT-5 was placed near Kuihelani Highway on the east side of the subject area. The trench was placed in a relatively flat low lying area and contained very similar surface and subsurface deposition as BT-4 (Photo 7).

Photo # 7: Overview of BT-5 Excavation (sandy surface), view to northwest.

Both Aeolian and alluvial deposits were noted in the subsurface within the four distinctive layers, which were described as the following:

Layer I	10YR4/3, brown; fine silty sand undulating with sandy silt texture; moderate, medium, single grain, structure; dry consistency, loose; moist consistency, friable; wet consistency, slightly sticky; plasticity, non-plastic; boundary, clear; topography, smooth; inclusions include roots & rootlets; contains no significant cultural material.
Layer II	10YR5/3, brown; sand; moderate, medium-large, single grain, structure; dry consistency, loose; moist consistency, friable; wet consistency, slightly sticky; plasticity, non-plastic; boundary, clear; topography, smooth; no rock; inclusions are roots & rootlets; contains no significant cultural material (Note: Layer II-A contains whitish and black river pebbles).
Layer III	10YR4/3 brown sand; (fine) few white river cobbles and pebbles (random), texture; moderate, medium, single grain, structure; dry consistency, loose; moist consistency, friable; wet consistency, slightly sticky; plasticity, non-plastic; boundary, clear; topography, smooth; inclusions include few basalt river cobbles; contains no significant cultural material.

Layer IV 10YR4/3 brown (dominant color); mottled with 10YR4/6 dark yellowish brown; sandy clay loam (hard pan); moderate, medium, single grain, structure; dry consistency, loose; moist consistency, friable; wet consistency, slightly sticky; plasticity, non-plastic; boundary, clear; topography, smooth; inclusions include few basalt cobbles and pebbles; contains no cultural material.

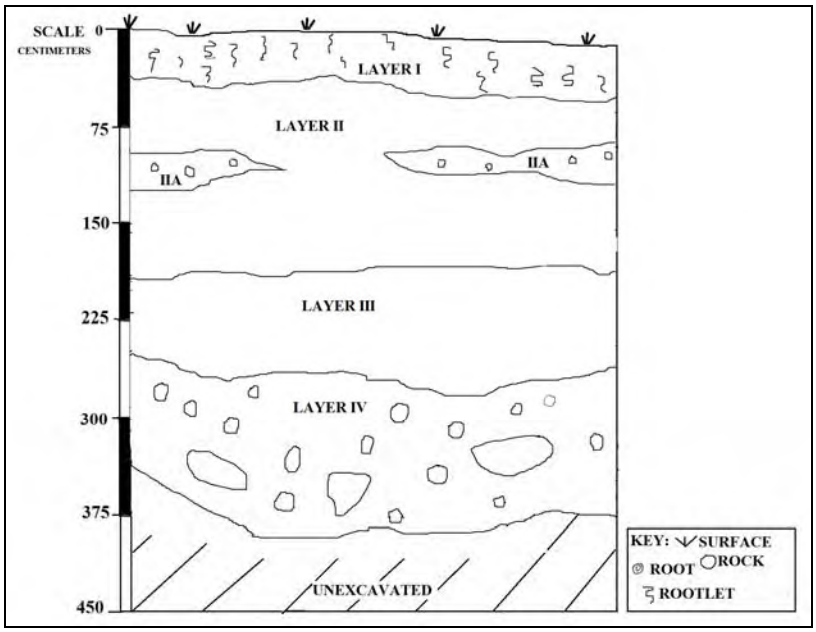

Figure 9: Southwest Profile Drawing of BT-5.

Backhoe Test Trench #6 (BT-6)

BT-6 was located in an area with old overgrown mechanical push-piles across the surface. There are also broken dead kiawe tree clearing piles in the grassy area. BT-6 is adjacent to the parking access area-next to the horse arena and training area (Photo 8).

Photo # 8: Overview of Adjacent Parking Area and Horse Arena/Training Area, view to northwest.

Root castings and partially lithified sand stone with whitish pebbles were noted in the trench. Evidence of an old meandering alluvial stream waterway or drainage deposits are located in the area. There were intrusions of small gravel river sand noted at approximately 1.2 meters below the existing surface. The silty sand is mottled with concreted sand intrusions and the four indistinctive layers were described as follows:

Layer I	10YR4/3, brown; fine silty sand undulating with sandy silt texture; moderate, medium, single grain, structure; dry consistency, loose; moist consistency, friable; wet consistency, slightly sticky; plasticity, non-plastic; boundary, clear; topography, smooth; inclusions include few roots & rootlets; contains no significant cultural material.
Layer II	10YR5/3 and 10YR4/3 brown sand with sand platelets; moderate, medium, single grain, structure; dry consistency, loose; moist consistency, friable; wet consistency, slightly sticky; plasticity, non-plastic; boundary, clear; topography, smooth; inclusions include concreted and partially concreted sand and root castings; no significant cultural material. (Note Layer II-A is 10YR6/2 light grayish brown and also includes partially plated/concreted sand.
Layer III	10YR4/3 brown mottled with 10YR 4/6 dark yellowish brown; fine, silty sand texture (more compact than Layer I); moderate, medium, single grain, structure; dry consistency, loose; moist consistency, friable; wet consistency, slightly sticky; plasticity, non-plastic; boundary, clear; topography, smooth; no roots and

inclusions include little to no rootlets; contains no significant cultural material.

Layer IV 10YR4/3 brown (dominant color); mottled with 10YR4/6 dark yellowish brown; sandy clay loam (hard pan); moderate, medium, single grain, structure; dry consistency, loose; moist consistency, friable; wet consistency, slightly sticky; plasticity, non-plastic; boundary, clear; topography, smooth; inclusions include sandstones, basalt cobbles and pebbles; ~75-80% rock within loam clay silt; no river sand; contains no cultural material.

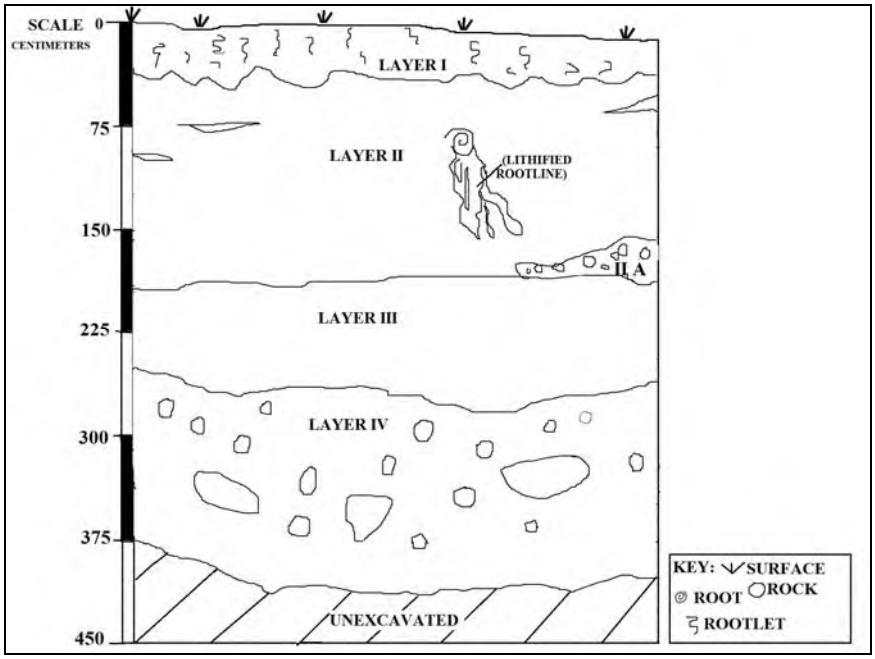

Figure 10: Southeast Profile Drawing of BT-6.

Backhoe Test Trench #7 (BT-7)

BT-7 was placed in the east section of the project area within a vegetated area. BT-7 was located inside a series of fences near overhead power lines (Photo 9 and Figure 11). Both Aeolian and alluvial deposits were noted as described by the following six soil descriptions:

Layer I 10YR4/3, brown; fine silty sand undulating with sandy silt texture; moderate, medium, single grain, structure; dry consistency, loose; moist consistency, friable; wet consistency, slightly sticky; plasticity, non-plastic; boundary, clear; topography, smooth; inclusions include roots & rootlets; contains no significant cultural material.

Layer II 10YR5/3, brown; sand; moderate, medium-large, single grain, structure; dry consistency, loose; moist consistency, friable; wet consistency, slightly sticky; plasticity, non-plastic; boundary,

clear; topography, smooth; no rock; inclusions are roots & rootlets; contains no significant cultural material.

Layer III 10YR4/3 brown sand; (fine) few white river cobbles and pebbles (random), texture; moderate, medium, single grain, structure; dry consistency, loose; moist consistency, friable; wet consistency, slightly sticky; plasticity, non-plastic; boundary, clear; topography, smooth; inclusions include few basalt river cobbles; contains no significant cultural material.

Layer IV 7.5YR6/8 reddish yellow sand; compacted with semi-concreted platelets and few pebbles and cobbles (water-worn) within sandy silt, texture; strong, fine, wet clump, structure; dry consistency, loose; moist consistency, friable; wet consistency, sticky; non-plastic; boundary, none; topography, none; inclusions include sub-angular sand platelets and cobbles; contains no cultural material.

Layer V 10YR4/3 brown (dominant color); sandy loam; transition layer; moderate, medium, single grain, structure; dry consistency, loose; moist consistency, friable; wet consistency, slightly sticky; plasticity, non-plastic; boundary, clear; topography, smooth; inclusions include few basalt river cobbles; contains no cultural material.

Layer VI 7.5YR4/2 brown mottled peds of 7.5YR6/2 pinkish gray & 7.5YR4/1 dark gray; coarse loamy sand texture; (alluvial); strong, dry consistency, loose; moist consistency, friable; wet consistency, non-sticky; non-plastic; boundary, none; topography, none; inclusions includes evidence of old alluvial stream deposit; angular porous & smooth basalt boulders/cobbles/pebbles; contains no cultural material

Photo # 9: BT-7 Area (background post-ex) and BT-8 (foreground pre-ex) Overview to northwest.

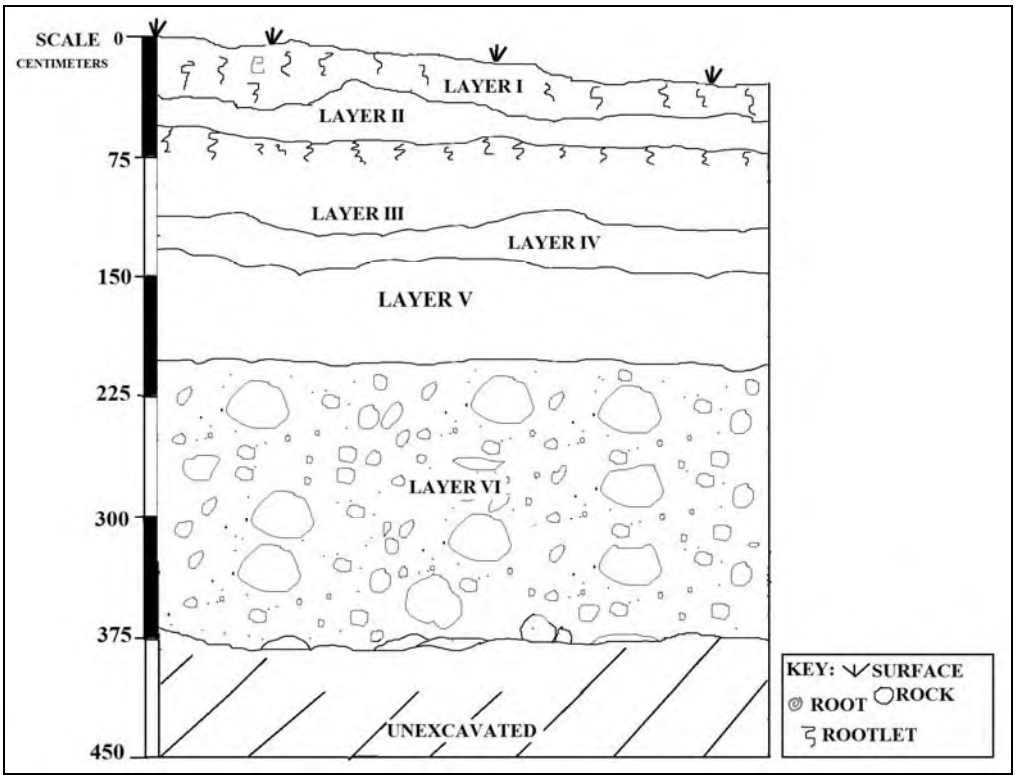

Figure 11: Southeast Profile Drawing of BT-7.

Backhoe Test Trench #8 (BT-8)

BT-8 was placed approximately 15 meters east of BT-7 (see Photo 9). There were sandstone boulders located at the surface and small berm (Photo 10 and Figure 12). Testing proved the surface anomalie was the result of previously mechanical disturbance. Broken branches were noted approximately 0-50/60 centimeters below the surface. Hard sand was atop a sandstone platelet layer with sandstone cobbles. All of the deposits in BT-8 consisted of Aeolian sand (loose and concreted). No alluvial was noted as reported in the following soil descriptions:

Layer I 10YR4/3, brown; fine silty sand undulating with sandy silt texture; moderate, medium, single grain, structure; dry consistency, loose; moist consistency, friable; wet consistency, slightly sticky; plasticity, non-plastic; boundary, clear; topography, smooth; inclusions include roots & rootlets; contains no significant cultural material.

Layer II 10YR5/3, brown; sand; moderate, medium-large, single grain, structure; dry consistency, loose; moist consistency, friable; wet consistency, slightly sticky; plasticity, non-plastic; boundary, clear; topography, smooth; no rock; inclusions are roots & rootlets; contains no significant cultural material.

Layer III 10YR4/3 brown sand; texture; moderate, medium-large, single grain, structure; dry consistency, loose; moist consistency, friable; wet consistency, slightly sticky; plasticity, non-plastic; boundary, clear; topography, smooth; inclusions include few basalt river cobbles; contains no cultural material (very soft- collapsing).

Photo # 10: BT-8 Area Overview to northeast.

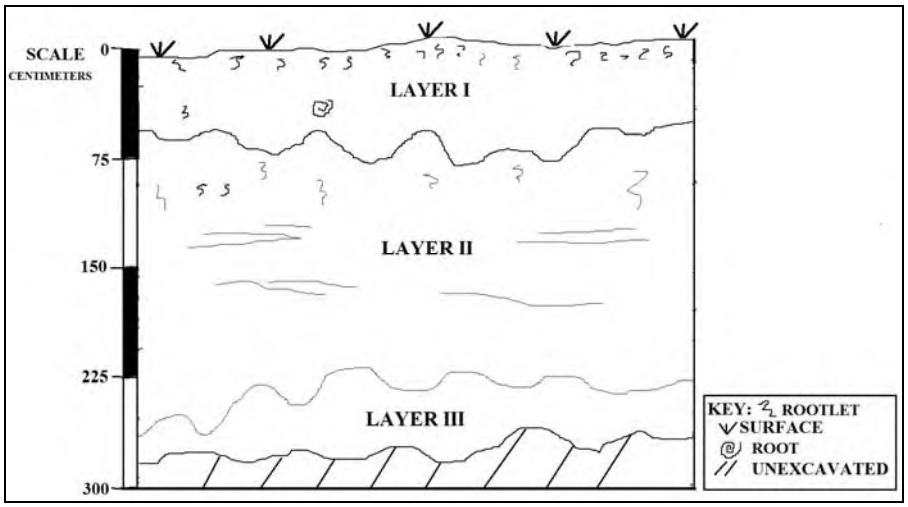

Figure 12: Northwest Profile Drawing of BT-8.

Backhoe Test Trench # (BT-9)

BT-9 was situated inside a fenced area adjacent with and parallel to overhead power lines at the top of a small dune rise. The trench contained very heavy hairy rootlets, very

silty soft sand with no clear color variation. The long rootlets hang down approximately 1meter below the existing surface. There were small roots, no rocks, and no alluvial deposits. There was some diagonal striation of concreted sand banding in the lower section. Extremely soft sand and the trench collapsed incessantly. Only a single layer was identified in this trench described as the following:

Layer I 10YR4/3, brown; fine silty sand and sandy silt texture; moderate, medium, single grain, structure; dry consistency, loose; moist consistency, friable; wet consistency, slightly sticky; plasticity, non-plastic; boundary, clear; topography, smooth; inclusions include heavy hairy rootlets and few roots; contains no significant cultural material.

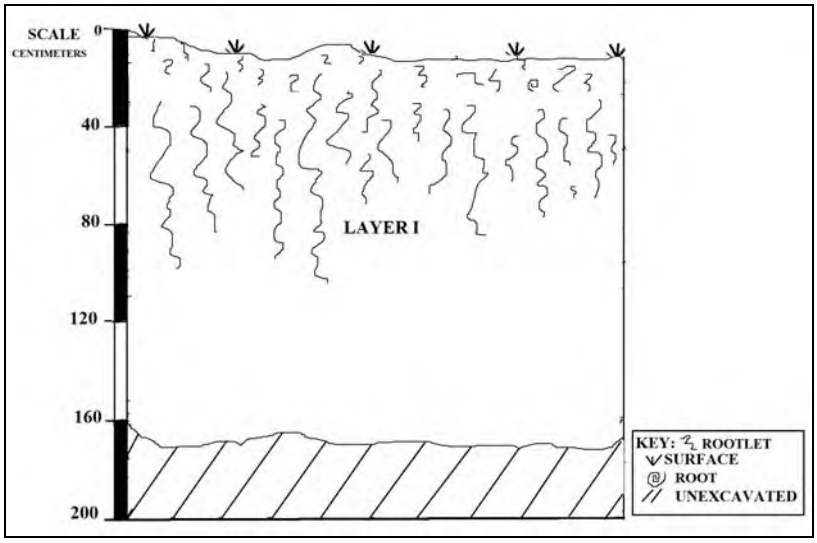

Figure 13: North Wall Profile Drawing of BT- 9.

Backhoe Test Trench #10 (BT-10)

BT-10 was situated in the lower area near the horse arena and paddock area at the access parking area (Photo 11). This trench contained both Aeolian and alluvial deposits. The area is also currently actively used for storage (Photo 12).

Photo # 11: Overview of BT-10, view to east.

Photo # 12: Overview of Storage Area west of BT-10, View to southeast.

The trench was extended to trace the expanding alluvial deposit that got thicker eastward. The loose surface sand (10/12 cmbs) had no roots but few rootlet clumps. The four stratigraphic layers were described as the following:

Layer I 10YR4/3, brown; fine silty sand undulating with sandy silt texture; moderate, medium, single grain, structure; dry consistency, loose; moist consistency, friable; wet consistency,

slightly sticky; plasticity, non-plastic; boundary, clear; topography, smooth; inclusions include roots & rootlets; contains no significant cultural material.

Layer II 10YR5/3, brown; sand; moderate, medium-large, single grain, structure; dry consistency, loose; moist consistency, friable; wet consistency, slightly sticky; plasticity, non-plastic; boundary, clear; topography, smooth; no rock; inclusions are roots & rootlets; some partially lithified, or concreted sections; contains no cultural material.

Layer III 10YR4/3 brown; fine, silty sand mottled with **7.5**YR 7/2 pinkish gray medium-coarse, sand and 10 R 4/3 weak red silty clay, semi-compact; texture; strong, fine, wet clump, structure; dry consistency, loose; moist consistency, friable; wet consistency, sticky; non-plastic; boundary, none; topography, none; inclusions include 45% of sub-angular basalt boulders/cobbles and some sand stone cobbles; contains no cultural material.

Layer IV 10YR5/3, brown; sand; moderate, medium-large, single grain, structure; dry consistency, loose; moist consistency, friable; wet consistency, slightly sticky; plasticity, non-plastic; boundary, clear; topography, smooth; no rock; inclusions are roots & rootlets; contains no significant cultural material.

Layer V 10YR4/3 brown sand; texture; moderate, medium-large, single grain, structure; dry consistency, loose; moist consistency, friable; wet consistency, slightly sticky; plasticity, non-plastic; boundary, clear; topography, smooth; inclusions include few basalt river cobbles; contains no cultural material (very soft- collapsing- some alluvial).

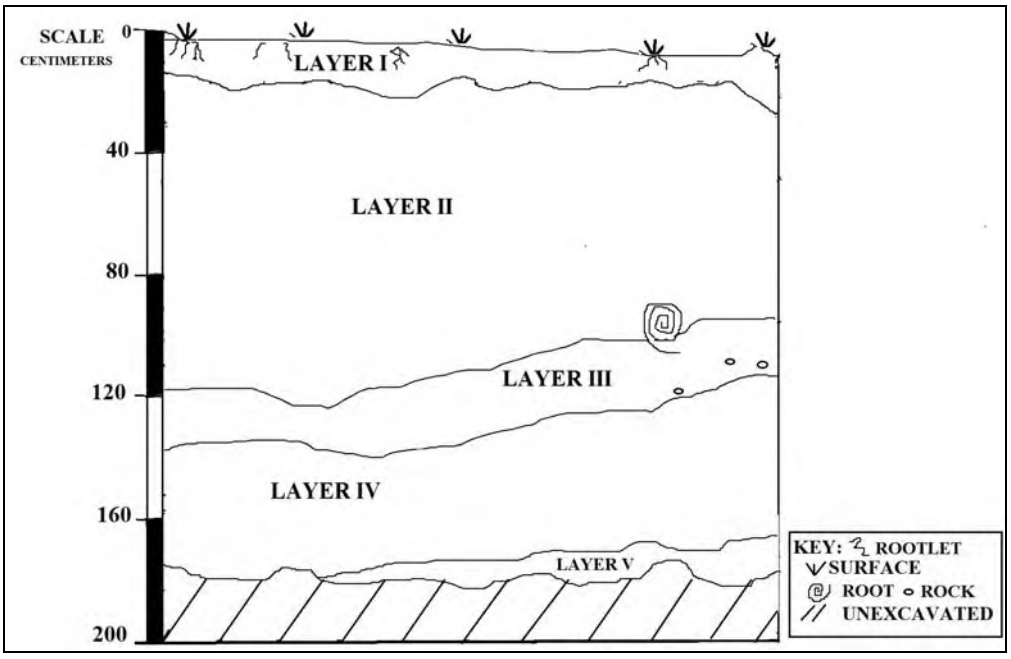

Figure 14: BT-10 Drawing of North Wall Profile.

Backhoe Test Trench #11 (BT-11)

BT-11 was located just inside the cattle feed lot atop a remnant sand dune ridgeline. The trench was placed along a gentle southern slope, with very soft sand (see Fig. 4). There are peacocks in the area. Cattle bones and scattered stones as well as a drainage ditch are across the area, generally. The length of BT-11 was extended because of the soft sandy collapsing walls (Photo 13). Disturbed surface Layer I contained a large amount of cow bones and also a buried cow skeleton with skin attached. Rootlets are undulating (0-20/30) and there was no alluvial deposit noted.

Layer I 10YR4/3 brown sand; (fine) few white river cobbles and pebbles (random), texture; moderate, medium, single grain, structure; dry consistency, loose; moist consistency, friable; wet consistency, slightly sticky; plasticity, non-plastic; boundary, clear; topography, smooth; inclusions include few basalt river cobbles; contains no significant cultural material.

Layer II 10YR4/4 dark yellowish brown; fine, silty sand, mottled with 10YR6/4 light yellowish brown; moderate, medium, single grain, structure; dry consistency, loose; moist consistency, friable; wet consistency, slightly sticky; plasticity, non-plastic; boundary, clear; topography, smooth; inclusions include few basalt river cobbles; contains no cultural material.

Photo # 13: BT-11 Post Excavation Overview to Northeast.

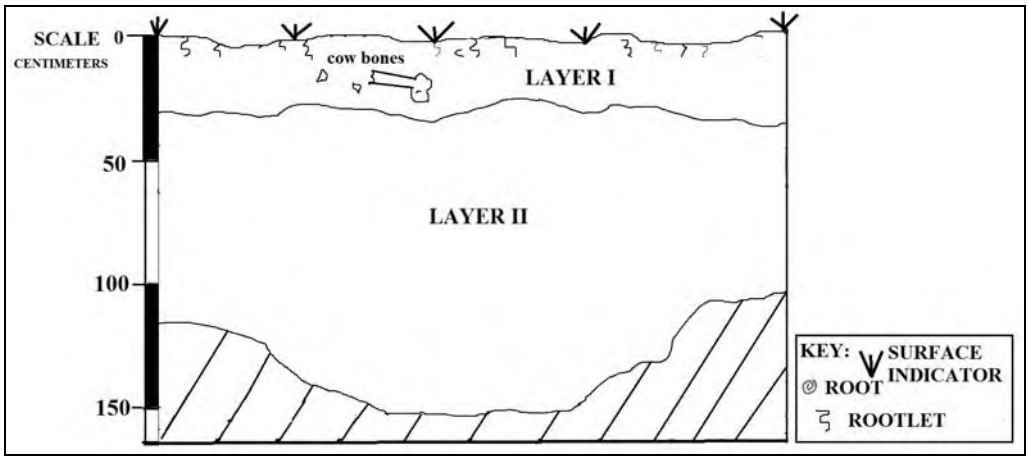

Figure 15: Southeast Profile Drawing of BT-11.

Backhoe Test Trench #12 (BT-12)

BT-12 was positioned along the east base of remnant sand dune ridgeline along the surface where water worn cobbles and small boulders were scattered. The trench was placed south of a recently constructed barbed wire fence. Push piles and dead kiawe trees are piled in the area and a significant amount of cow bones noted across the surface. The sand is very silty in this area that also contains scattered water worn cobbles and boulders (some black some white some smooth some porous). There are sand stone cobbles in the area (white). Four layers were recorded as follows:

Layer I 10YR4/3, brown; fine silty sand undulating with sandy silt texture; moderate, medium, single grain, structure; dry consistency, loose; moist consistency, friable; wet consistency, slightly sticky; plasticity, non-plastic; boundary, clear; topography, smooth; inclusions include few roots & rootlets; contains no significant cultural material. Note water worn boulders scattered at surface.

Layer II 5YR6/3 light reddish brown; semi-compact very fine silty sand; moderate, medium, single grain, structure; dry consistency, loose; moist consistency, friable; wet consistency, slightly sticky; plasticity, non-plastic; boundary, clear; topography, smooth; inclusions include concreted and partially concreted sand and root castings; no significant cultural material.

Layer III 10YR4/3 7.5YR6/6 & 6/8 reddish yellow; fine but more coarse than Layer II; whitish hue 5YR6/3 light reddish brown and 5YR7/3 pink banding with root casting intrusions and thin gold sand platelet formations; moderate, medium, single grain, structure; dry consistency, loose; moist consistency, friable; wet consistency, slightly sticky; plasticity, non-plastic; boundary, clear; topography, smooth; no roots and inclusions include little to no rootlets; contains no cultural material.

Layer IV 10YR4/3 brown (dominant color); mottled with 10YR4/4 dark yellowish brown sandy clay loam (hard pan); moderate, medium,

single grain, structure; dry consistency, loose; moist consistency, friable; wet consistency, slightly sticky; plasticity, non-plastic; boundary, clear; topography, smooth; inclusions include sandstones, basalt cobbles and pebbles; no cultural material (Note Layer IV-A is 7.5YR6/2 pinkish gray. 2.5Y2.1/1 black and 2.5Y8/1 white alluvial pebbles); base of trench contains river sand and rock; blackish silty sand. white sand stone banding approximately 2 cm thick 7.5YR8/1 white and 7.5YR8/2 pinkish white.

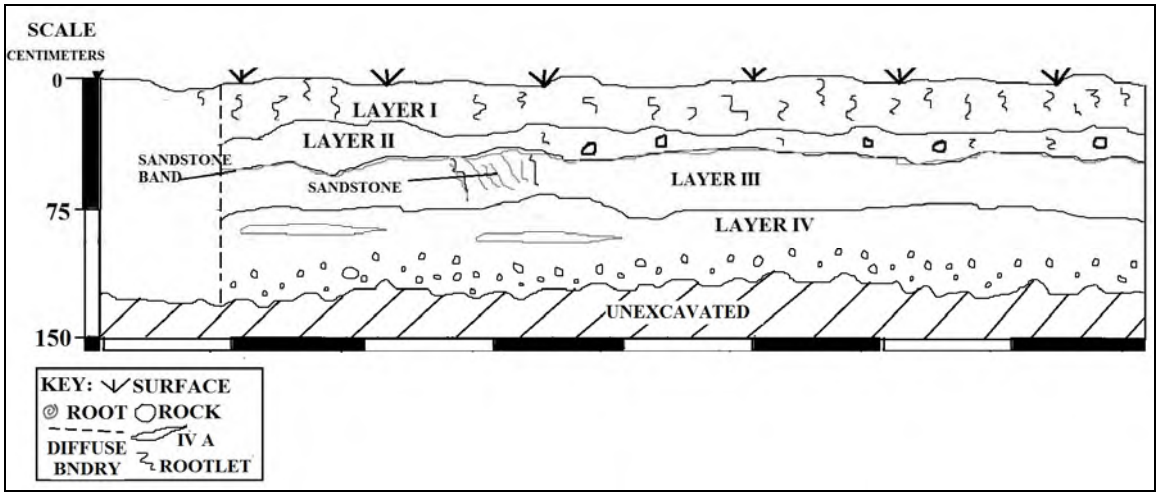

Figure 16: North Profile Drawing of BT-12.

Backhoe Test Trench #13 (BT-13)

Bt-13 was located in a small natural rise between the access road-way within a clump of kiawe trees. The trench is near a large boulder stockpile area (Photo 14). Modern rubbish is located across the surface and water-worn rocks, plastic irrigation pipe, old concrete lined waterway, concrete chunks and slabs at the surface, cow bones, water troughs, and associated farm items.

Photo # 14: BT 13 Area Overview (foreground) with boulder stockpile (background), View to west.

Basalt boulders were located at the surface at the southeast end of the trench (1.10 meters deep). Four stratigraphic layers were recorded as the following:

Layer I 10YR4/3 brown (0-23/25); silty sand roots & rootlets loose overburden brown; fine silty sand, texture; moderate, medium, single grain, structure; dry consistency, loose; moist consistency, friable; wet consistency, slightly sticky; plasticity, non-plastic; boundary, clear; topography, smooth; inclusions include rootlets and other organic materials, contains no significant cultural material.

Layer II 10YR4/4 (23/25-1-1.15) dark yellowish brown; moderate, fine, single grain, structure; dry consistency, slightly hard/ compacted; moist consistency, friable; wet consistency, non-sticky; non-plastic; clear boundary, smooth, no inclusions; contains no cultural material.

Layer III 10YR3/4 dark yellowish brown fine, silty sand texture; strong, fine, wet clump, structure; dry consistency, loose; moist consistency, friable; wet consistency, sticky; non-plastic; boundary, none; topography, none; inclusions include 45% of sub-angular basalt boulders/cobbles and ~30 cm thick roots; contains no cultural material.

Layer IV 10YR6/4 light yellowish brown; concreted sandstone (cobbles at base); fine, silty sand texture; strong, fine, wet clump, structure; dry consistency, loose; moist consistency, friable; wet consistency, sticky; non-plastic; boundary, none; topography, none; inclusions some cobbles; contains no cultural material.

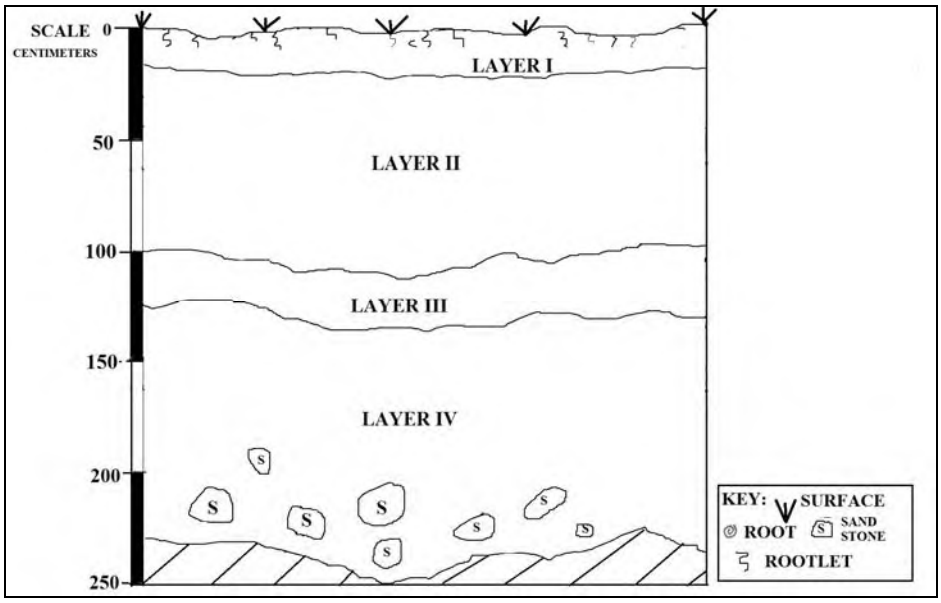

Figure 17: South Profile Drawing of BT-13.

Backhoe Test Trench #14 (BT-14)

BT-14 was excavated along the gentle southwestern slope of a remnant sand dune ridge. The test trench was placed within a fence -adjacent to the large pond. Subsurface matrix consists of very soft collapsing sand intrusions of reddish clay loam. No alluvial deposit all Aeolian (Photo 14 and Figure 18).

Photo # 15: BT-14 Post Ex Overview to northeast.

Layer I 10YR4/3, brown; fine silty sand undulating with sandy silt texture; moderate, medium, single grain, structure; dry consistency, loose; moist consistency, friable; wet consistency, slightly sticky; plasticity, non-plastic; boundary, clear; topography, smooth; inclusions include roots & rootlets; contains no significant cultural material.

Layer II 10YR5/3, brown; sand; moderate, medium-large, single grain, structure; dry consistency, loose; moist consistency, friable; wet consistency, slightly sticky; plasticity, non-plastic; boundary, clear; topography, smooth; no rock; inclusions are roots & rootlets; some partially lithified, or concreted sections; contains no cultural material.

Layer III 10YR3/3 dark brown semi-compacted silty loam; strong, fine, wet clump, structure; dry consistency, loose; moist consistency, friable; wet consistency, sticky; non-plastic; boundary, none; topography, none; inclusions include basalt boulders/cobbles and roots; contains no cultural material.

Layer IV 7.5YR 5/4 brown fine, silty sand mottled with **7.5**YR 7/2 medium-coarse, sand and 10 R 4/3 weak red silty clay, texture; strong, fine, wet clump, structure; dry consistency, loose; moist consistency, friable; wet consistency, sticky; non-plastic; boundary, none; topography, none; inclusions include sub-angular basalt and sand cobbles; contains no cultural material. Note: hardpan encountered at north end of trench.

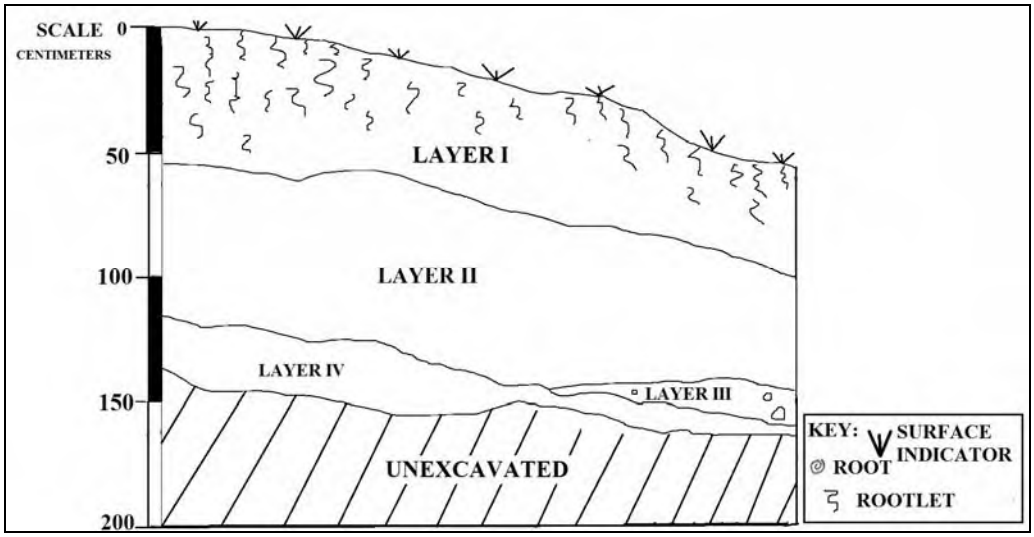

Figure 18: West Profile Drawing of BT-14.

Backhoe Test Trench #15 (BT-15)

BT-15 was placed in the area next to the pond and stockpiles. This area has been heavily impacted by cattle care and mechanically placed imported stockpiles. Sand pushpiles are also in the area and a lot of former land alterations occurred around the pond.

Stockpiles and clean our piles are in the area as well as several old sand stock piles covered by thick grass and stockpiled dead kiawe trees. Two layers were described as follows:

Layer I 10YR4/3, brown; fine silty sand undulating with sandy silt texture; moderate, medium, single grain, structure; dry consistency, loose; moist consistency, friable; wet consistency, slightly sticky; plasticity, non-plastic; boundary, clear; topography, smooth; inclusions include roots & rootlets; contains no significant cultural material.

Layer II 10YR5/3, brown; sand; moderate, medium-large, single grain, structure; dry consistency, loose; moist consistency, friable; wet consistency, slightly sticky; plasticity, non-plastic; boundary, clear; topography, smooth; no rock; inclusions are roots & rootlets; some partially lithified, or concreted sections; contains no cultural material.

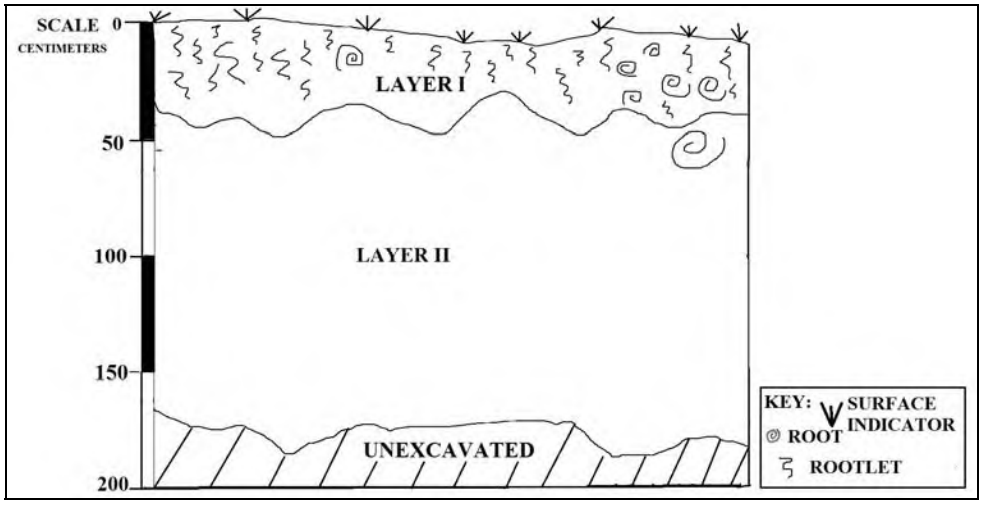

Figure 19: East Profile Drawing of BT-15.

Backhoe Test Trench #16 (BT-16)

BT-16 was located in a relatively flat area with scattered boulders across the surface. The area was in the general area of BT-15. The placement of the existing cattle feedlot has heavily impacted this area (Photo 16). Four layers were recorded (Figure 20) as follows:

Layer I 10YR4/3, brown; fine silty sand undulating with sandy silt texture; moderate, medium, single grain, structure; dry consistency, loose; moist consistency, friable; wet consistency, slightly sticky; plasticity, non-plastic; boundary, clear; topography, smooth; inclusions include roots & rootlets; contains no significant cultural material.

Layer II 7.5YR3/4 dark brown; silty loam (little sand); moderate, medium-large, single grain, structure; dry consistency, loose; moist consistency, friable; wet consistency, slightly sticky; plasticity,

non-plastic; boundary, clear; topography, smooth; Note: II-A 10YR3/2 very dark grayish brown; sandy silt blackish staining only observed in south half of trench (both profiles); possibly the remains of old dump or stockpile.

Layer III 10YR4/3 dark brown semi-compacted silty loam; 10YR very dark grayish brown coarse sand loose strong, fine, wet clump, structure; dry consistency, loose; moist consistency, friable; wet consistency, sticky; non-plastic; boundary, none; topography, none; inclusions include basalt boulders/cobbles and roots; contains no cultural material.

Layer IV 10YR3/4 & 10YR3/2 dark yellowish brown; silty loam; texture; strong, fine, wet clump, structure; dry consistency, loose; moist consistency, friable; wet consistency, sticky; non-plastic; boundary, none; topography, none; inclusions include sub-angular basalt and sand cobbles; contains no cultural material.

Photo # 16: Pond Overview (near the cattle feed lot) to northeast.

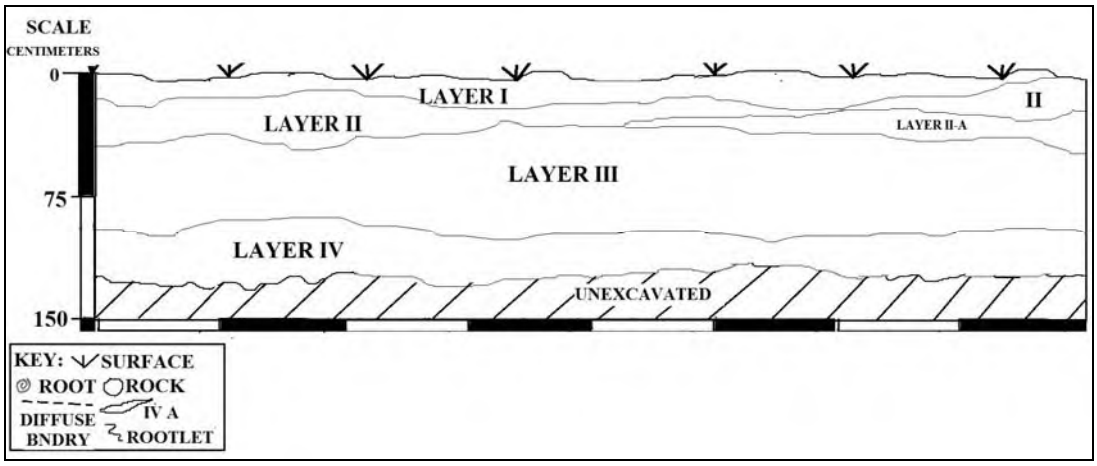

Figure 20: East Profile Drawing of BT-16.

Backhoe Test Trench #17 (BT-17)

BT-17 was situated near a surface boulder rock scatter across an access roadway-adjacent to the feedlot. Subsurface matrix consisted of Aeolian sand on top of alluvial stream deposits. Two layers were encountered and recorded as follows:

Layer V 10YR4/3 brown (dominant color); sandy loam; transition layer; moderate, medium, single grain, structure; dry consistency, loose; moist consistency, friable; wet consistency, slightly sticky; plasticity, non-plastic; boundary, clear; topography, smooth; inclusions include few basalt river cobbles; contains no cultural material.

Layer VI 7.5YR4/2 brown mottled peds of 7.5YR6/2 pinkish gray & 7.5YR4/1 dark gray; coarse loamy sand texture; (alluvial); strong, dry consistency, loose; moist consistency, friable; wet consistency, non-sticky; non-plastic; boundary, none; topography, none; inclusions includes evidence of old alluvial stream deposit; angular porous & smooth basalt boulders/cobbles/pebbles; contains no cultural material

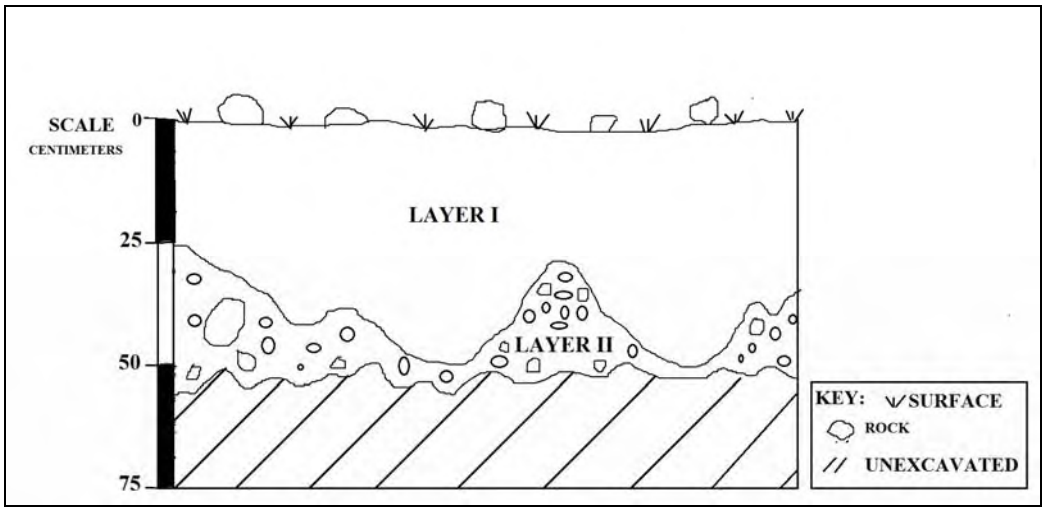

Figure 21: East Profile Drawing of BT- 17.

Backhoe Test Trench #18 (BT-18)

BT-18 was in a low-lying area near the cattle feed lot. This area appears to have previously been utilized as a *sand borrow* site. There is a small indentation in the soft Aeolian sand. The soft sand is overlying rocky dirt as well as small-large water-worn boulders cobbles and pebbles. This was a very shallow trench and the two layers were described as the following:

Layer I 10YR4/3 brown mottled with 10YR 4/6 dark yellowish brown; fine, silty sand texture; moderate, medium, single grain, structure; dry consistency, loose; moist consistency, friable; wet consistency, slightly sticky; plasticity, non-plastic; boundary, clear; topography, smooth; no roots and inclusions include little to no rootlets; contains no significant cultural material.

Layer II 10YR4/3 brown (dominant color); mottled with 10YR4/6 dark yellowish brown; sandy clay loam (hard pan); moderate, medium, single grain, structure; dry consistency, loose; moist consistency, friable; wet consistency, slightly sticky; plasticity, non-plastic; boundary, clear; topography, smooth; inclusions include sandstones, basalt cobbles and pebbles; no cultural remains.

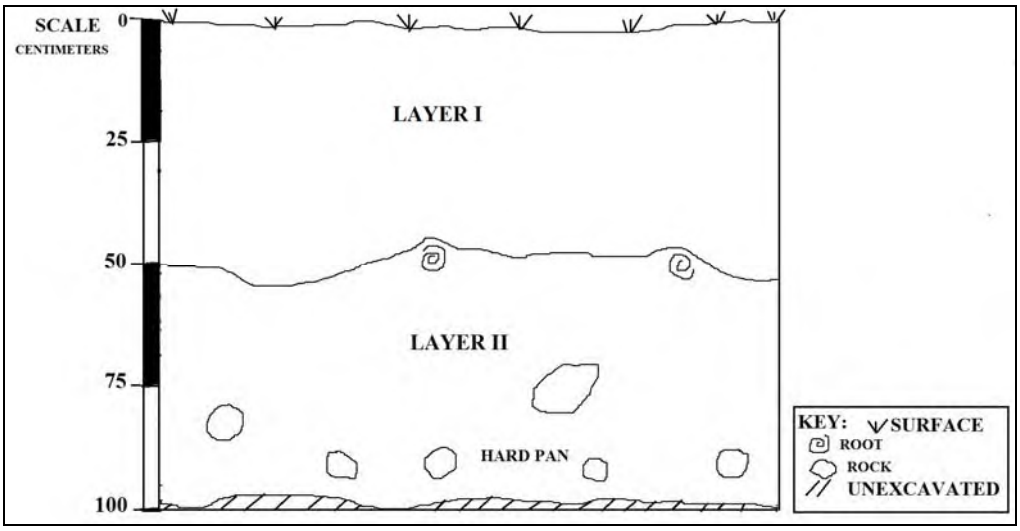

Figure 22: South Profile Drawing of BT-18.

Backhoe Test Trench # (BT-19)

BT-19 was placed along the gentle slope of a small Aeolian dune; adjacent to the graded gravel access road across from tall pu`u (feed lot). A large cow was buried in the area and we shifted the trench slightly to avoid digging up the partially buried and decayed animal lying approximately ~0-75cmbs (roughly N/S). Cow bones were spread throughout the upper two layers (Figure 23). Layers I & II have common random white pebbles. Both Aeolian and alluvial deposits were recorded in the four layers as follows:

Layer I 10YR4/3, brown; fine silty sand undulating with sandy silt texture; moderate, medium, single grain, structure; dry consistency, loose; moist consistency, friable; wet consistency, slightly sticky; plasticity, non-plastic; boundary, clear; topography, smooth; inclusions include few roots & rootlets; contains no significant cultural material.

Layer II 5YR6/3 light reddish brown; semi-compact very fine silty sand; moderate, medium, single grain, structure; dry consistency, loose; moist consistency, friable; wet consistency, slightly sticky; plasticity, non-plastic; boundary, clear; topography, smooth; inclusions include concreted and partially concreted sand and root castings; no significant cultural material.

Layer III 10YR4/3 7.5YR6/6 reddish yellow; whitish hue 5YR6/3 light reddish brown and 5YR7/3 pink banding with root casting intrusions and thin gold sand platelet formations; moderate, medium, single grain, structure; dry consistency, loose; moist consistency, friable; wet consistency, slightly sticky; plasticity, non-plastic; boundary, clear; topography, smooth; no roots and inclusions include little to no rootlets; contains no cultural material.

Layer IV 10YR4/3 brown (dominant color); mottled with 10YR4/4 dark yellowish brown sandy clay loam (hard pan); moderate, medium, single grain, structure; dry consistency, loose; moist consistency, friable; wet consistency, slightly sticky; plasticity, non-plastic; boundary, clear; topography, smooth; inclusions include sandstones, basalt cobbles and pebbles; no cultural material

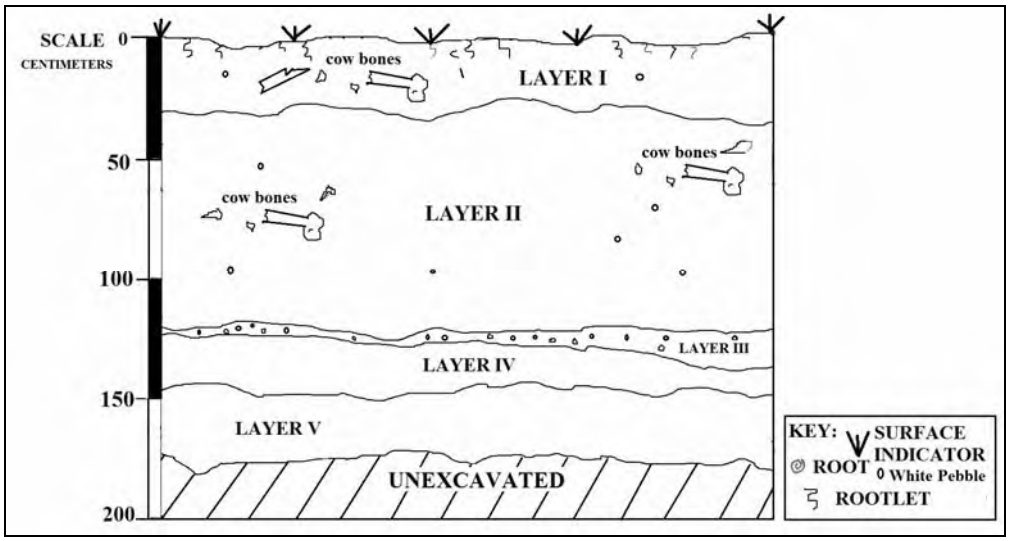

Figure 23: Southwest Profile Drawing of BT-19.

Backhoe Test Trench #20 (BT-20)

BT-20 was located southeast adjacent to the cattle feed lot pen with several grazing cattle. The runoff drains through this area forming a small ditch that is partially concreted more toward the pond (Photo 17).

Photo # 17: Runoff draining through a small ditch (sections partially concreted), view to northeast.

Layer I 5YR 4/3 reddish brown silty loam (loose topsoil); diffuse distinctness, irregular top of boundary; fine, medium, and large prominent contrast clay loam; structureless to strong peds, very fine to very coarse granular and crumb structure; loose, non-coherent when dry and moist; non-sticky; non-plastic; few fine to coarse vesicular roots and pores; contains no cultural material.

Layer II 2.5YR 3/4 dark reddish brown; diffuse distinctness, irregular top of boundary; fine, medium, and large prominent contrast clay loam; structureless to strong peds, very fine to very coarse granular and crumb structure; loose, non-coherent when dry and moist; non-sticky; non-plastic; many fine to coarse vesicular roots and pores; contains no cultural material.

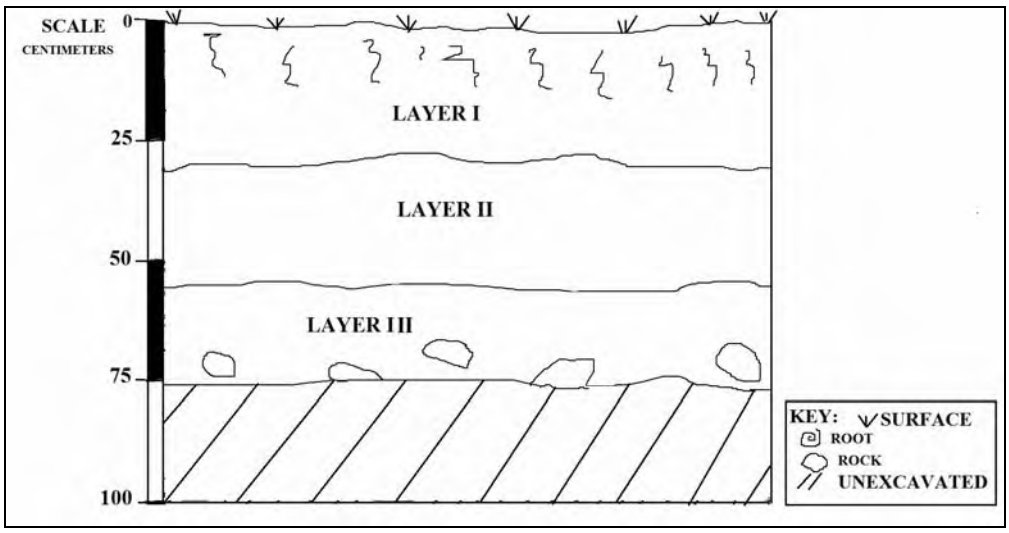

Figure 24: East Profile Drawing of BT-20.

Table 2: Backhoe Test Trench (BT) Summary (note: m=meters).

BT#	Orientation	Length	Width	Depth	Additional Comments
1	120˚/300˚	5.80 m	0.80 m	1.80 m	Aeolian and alluvial deposits; 4 layers
2	114˚/294˚	6.50 m	0.80-0.85 m	3.60 m	Aeolian sand; 2 layers
3	120˚/300˚	5.85 m	0.85-0.95 m	4.2 m	Aeolian sand with pebbles; 3 layers
4	20˚/200˚	6.1 m	0.90 m	4.12 m	Aeolian and alluvial deposits; 6 layers
5	164˚/344˚	6.0 m	0.85 m	3.95 m	Aeolian and alluvial deposits; 4 layers
6	40˚/220˚	6.11 m	0.85 m	4.25 m	Aeolian sand and silt; 4 layers
7	190˚/370˚	5.75 m	0.85 m	3.85 m	Aeolian sand and alluvial deposits; 6 layers
8	20˚/200˚	5.5 m	0.83-0.87 m	2.6 m	Aeolian sand; 3 layers
9	38˚/218˚	6.3 m	0.95 m	1.8 m	Aeolian sand; 1 layer
10	100˚/280˚	7.5 m	0.85 m	1.8 m	Aeolian and alluvial deposits; 5 layers
11	33˚/213˚	7.0 m	1.70 m	1.5 m	Aeolian sand; 2 layers
12	90˚/270˚	6.5 m	0.90 m	1.35 m	Aeolian sand; 4 layers
13	145˚/325˚	5.8 m	0.92 m	2.5 m	Aeolian sand with sandstone cobbles at base; 4 layers
14	170˚/350˚	6.2 m	2 m	1.6 m	Aeolian sand with silt loam intrusions; 4 layers
15	70˚/250˚	5.75 m	1.2 m	2.2 m	Aeolian sand; 2 layers
16	25˚/205˚	8.02 m	0.85 m	1.35 m	Aeolian sand and silt; 4 layers
17	˚165/345˚	5.5 m	0.90-1.5 m	1.75 m	Aeolian and alluvial deposits 5 layers
18	100˚280/˚	5.4 m	1.5 m	1 m	Layer I Sand- overlying hard pan- (Layer II silt with rock); 2 layers
19	140˚/320˚	5.8 m	1.2 m	0.60 m	Aeolian and alluvial deposits; 2 layers
20	45˚/235˚	5.8 m	0.85-1 m	0.75 m	Aeolian and alluvial deposits; 2 layers

SUMMARY AND CONCLUSIONS

No significant surface or subsurface cultural remains were identified during the archaeological assessment survey. Complete surface inspection of accessible areas occurred and twenty mechanical backhoe test trenches were excavated in order to help assess the surface and subsurface conditions throughout the subject parcel. Efforts were made to identify the presence or absence of significant cultural deposits. Portions of the project area were previously heavily impacted by mechanical grading or sand-mining activities. Cattle grazing with associated feedlots and large drainage ponds reshaped sections of the subject area.

In general, the subject area is located within an area that contains human burials – the Pu`uone Dune system. Surface and subsurface historic properties have been documented on some of the adjacent parcels. Although no surface or subsurface historic properties were identified during this archaeological assessment survey, there is a possibility of the inadvertent discovery of undocumented subsurface cultural properties during any potential future land alteration activities. Sand dune deposits were located in all test instances.

PROJECT MITIGATION AND RECOMMENDATIONS

Given the results of this archaeological survey, no further archaeological work beyond the assessment level is recommended for the 31.222 acre subject area. However, given the general location of the project area, the occurrence of Aeolian sand dune deposits, and the presence of historic properties on immediately adjacent properties, precautionary archaeological monitoring is recommended for any development or future earthmoving activities on the subject parcel.

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Appendix P

Traffic Impact Analysis Report

TRAFFIC IMPACT ANALYSIS REPORT FOR

WAIKO ROAD LIGHT INDUSTRIAL PARK

IN WAIKAPU, MAUI, HAWAII

Prepared For

WAIKO INDUSTRIAL INVESTMENT
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May 17, 2011

TABLE OF CONTENTS

APPENDICES

LIST OF FIGURES

LIST OF TABLES

1. INTRODUCTION

Phillip Rowell and Associates has been retained to prepare a traffic impact analysis for a proposed light industrial park along Waiko Road in the Waikapu area of Maui. The approximate location of the project on the Island of Maui is shown in Figure 1.

This introductory chapter discusses the location of the project, the proposed development, and the study methodology.

Purpose and Objectives of Study

1. Determine and describe the traffic characteristics of the proposed project.

2. Quantify and document the traffic related impacts of the proposed project.

3. If required, identify and evaluate traffic related improvements required to provide adequate access to and egress from the proposed project and to mitigate the project's traffic impacts.

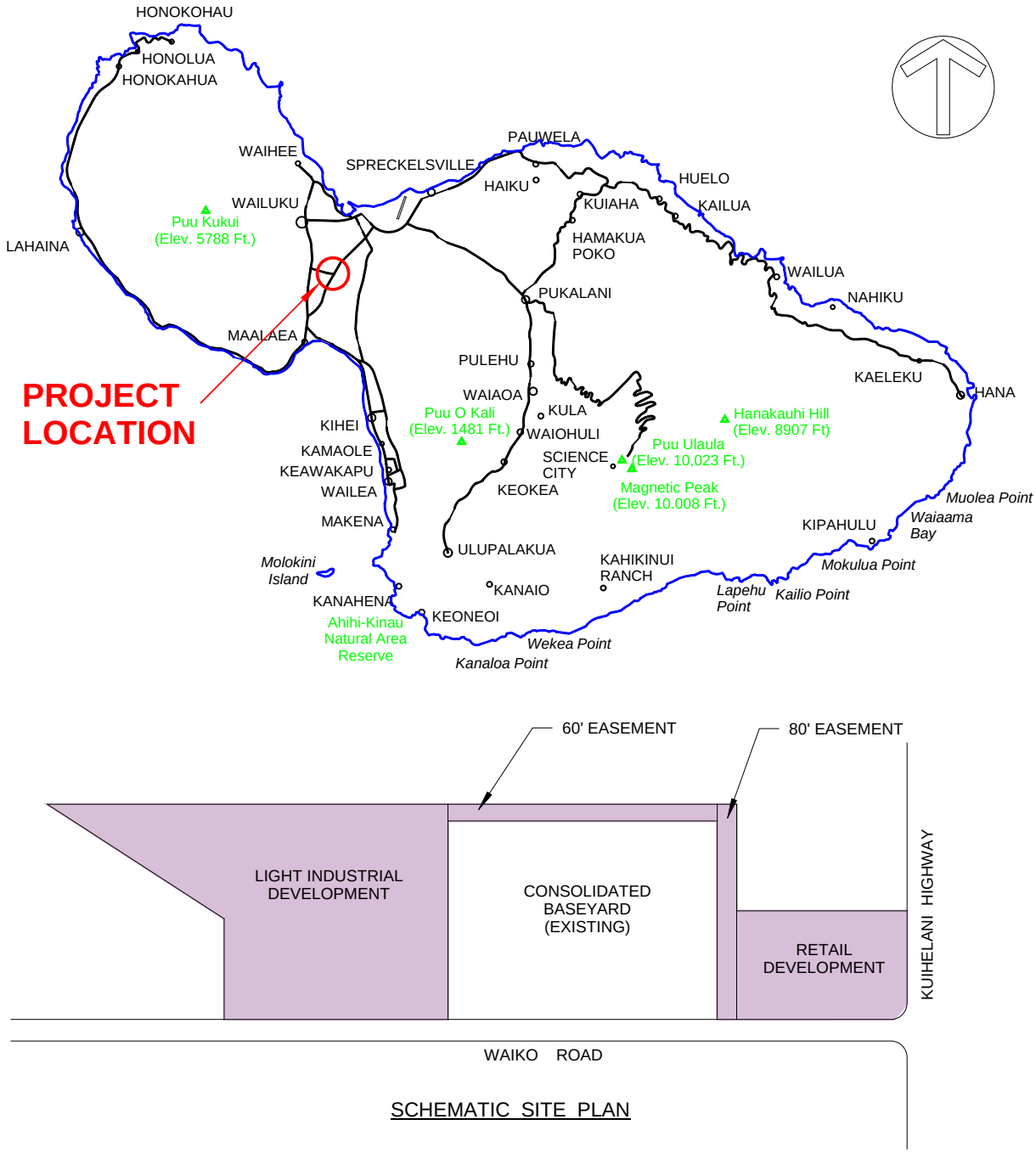


Figure 1
PROJECT LOCATION ON MAUI

Project Location and Description

A preliminary site plan of the project is shown as Appendix A. The total area of the project is 32 acres. The current site plan for the proposed industrial park indicates two separate parcels. The first parcel is located along the north side of Waiko Road between Kuihelani Highway and the east property line of the Consolidated Baseyard. There is an 80 foot wide roadway easement between the parcel and the Consolidated Baseyard. This area of this parcel is 8.4 acres and could accommodate approximately 100,000 square feet of retail and commercial floor space. Access to and egress from this parcel will be provided by a driveway using the 80 foot easement described.

The second parcel is located west of the Consolidated Baseyard and will consist of 19.7 acres of light industrial uses. Access to and egress from this parcel will be provided a one driveway, Drive B. This driveway will be unsignalized and all approaches in be one lane only. following is a summary of the traffic related.

Lastly, there is an 60 foot wide easement along the north boundary of the Consolidated Baseyard connecting the two parcels.

A schematic project site plan is also shown on Figure 1.

Horizon Year

The design horizon year represents a date for which future background traffic projections were estimated. These projections include traffic generated by other planned projects within and adjacent to the study area and background traffic growth.

The year 2015 was used as the horizon year, even though scheduled completion could be earlier. This year was selected to be consistent with the traffic studies for the related projects in the area.

Study Methodology

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

2. Existing peak-hour traffic volumes for the study intersections were obtained and summarized.

3. Existing levels-of-service of the study intersections was determined using the methodology described in the *Highway Capacity Manual*.

4. A list of related development projects within and adjacent to the study area that will impact traffic conditions at the study intersections was compiled.

5. Future background traffic volumes at the study intersections without traffic generated by the study project were estimated.

6. Peak hour traffic that the proposed project will generate was estimated using trip generation analysis procedures recommended by the Institute of Transportation Engineers.

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

8. The impacts of traffic generated by the proposed project at the study intersections was quantified and summarized.

9. Locations that project generated traffic significantly impacts traffic operating conditions were identified.

10. Recommendations, improvements or modifications necessary to mitigate the traffic impacts of the project and to provide adequate access to and egress from the site were formulated.

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

Order of Presentation

Chapter 2 describes existing traffic conditions, the Level-of-Service (LOS) concept and the results of the Level-of-Service analysis of existing conditions.

Chapter 3 describes the process used to estimate 2015 background traffic volumes and the resulting background traffic projections. Background conditions are defined as future background traffic conditions without traffic generation by the study project.

Chapter 4 describes the methodology used to estimate the traffic characteristics of the proposed project, including 2015 background plus project traffic projections.

Chapter 5 describes the traffic impacts of the proposed project, identifies potential mitigation measures and summarizes the traffic impact study.

2. ANALYSIS OF EXISTING CONDITIONS

This chapter presents the existing traffic conditions on the roadways adjacent to the proposed project. The level-of-service (LOS) concept and the results of the Level-of-Service analysis for existing conditions are also presented. The purpose of this analysis is to establish the base conditions for the determination of the impacts of the project which are described in a subsequent chapter.

Description of Existing Streets and Intersection Controls

The following is summary of the major roadways in the study area:

Honoapiilani Highway

Honoapiilani Highway is a State highway connecting Wailuku and Maalaea. In the vicinity of the proposed project, the highway is a two-lane, two-way facility with separate left turn lanes. In the vicinity of Waiko Road, the posted speed limit is 35 miles per hour (mph). The intersection with Waiko Road is signalized. The northbound and southbound left turns from Honoapiilani Highway are protected-permissive.

Kuihelani Highway

Kuihelani Highway is a four-lane divided State highway connecting Kahului and Maalaea. The posted speed limit in the study area is 55 miles per hour. The intersection with Waiko Road is a signalized T-intersection with a separate left turn lanes for northbound to westbound left turns onto Waiko Road. The left turns are protected. There is also a separate right turn deceleration lane for southbound to westbound right turns.

Waiko Road

Waiko Road is a two-lane, two-way roadway intersecting Honoapiilani Highway and Kuihelani Highway. The intersection of Waiko Road at Waiale Road is a STOP sign controlled T-intersection with the STOP sign along the southbound approach of Waiale Road.

Figure 2 is a schematic indicating the lane configurations and right-of-way controls of the study intersections.

Existing Peak Hour Traffic Volumes

The existing peak hour traffic volumes are also shown on Figure 2. The peak hour volumes were determined from traffic counts of the study intersections.

1. The traffic counts were performed during January, 2011.

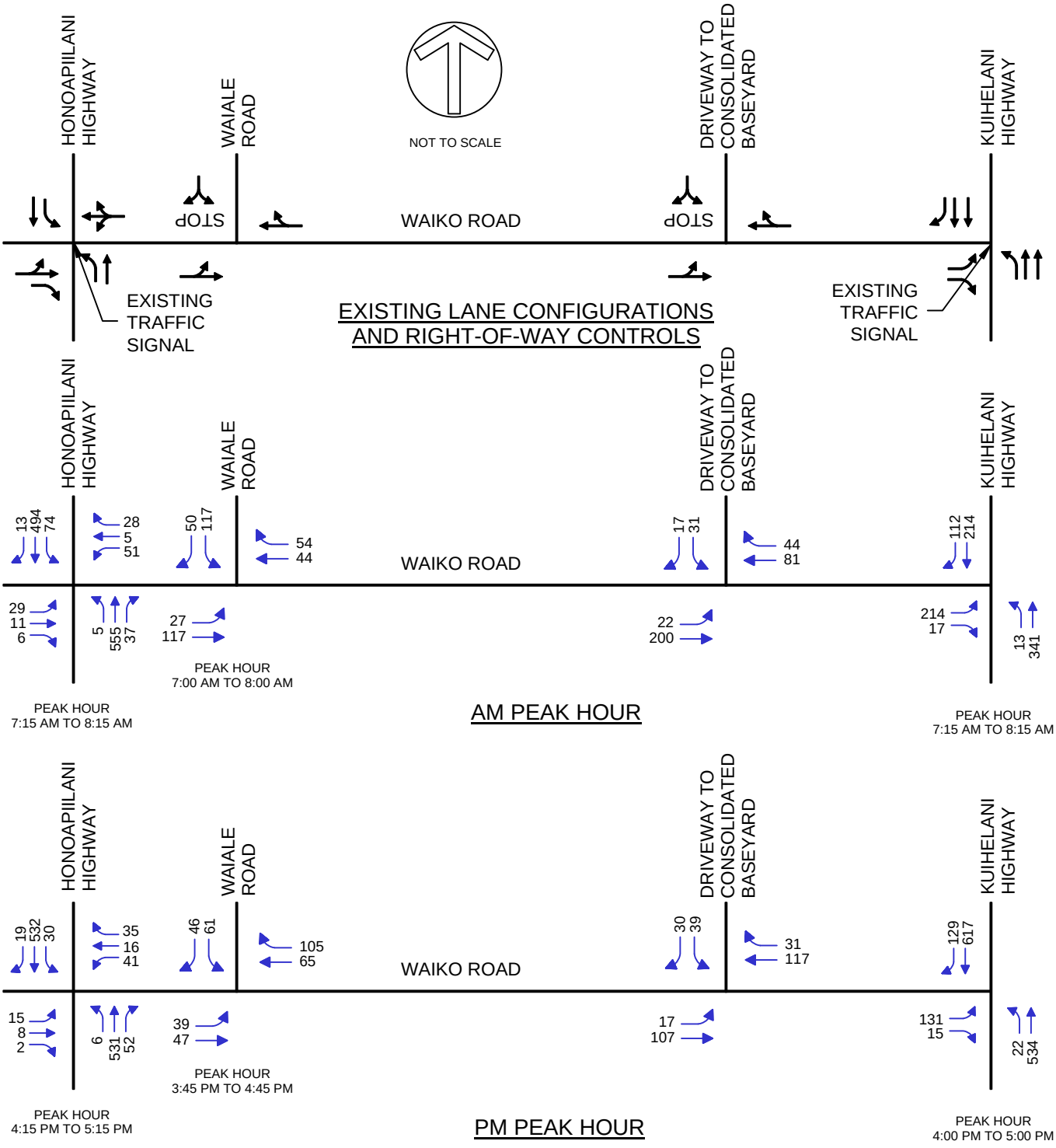
2. The morning counts were performed between 6:30 AM and 9:00 AM. The afternoon counts were performed between 3:30 PM and 6:00 PM.

3. The traffic counts include buses, trucks and other large vehicles. Mopeds and Bicycles were not counted.

4. The traffic volumes of adjacent intersections may not match the volumes shown for an adjacent intersection because the peak hours of the adjacent intersections may not coincide and there are driveways between the intersections.

5. Pedestrian activity was negligible.

The Traffic Count Worksheets are provided as Appendix B.



NOTES:
1. TRAFFIC COUNTS WERE PERFORMED DURING JANUARY 2011.

Figure 2
EXISTING INTERSECTION LANE CONFIGURATIONS, RIGHT-OF-WAY CONTROLS AND 2011 PEAK HOUR TRAFFIC VOLUMES

Level-of-Service Concept

Signalized Intersections

"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 (Level-of-Service) 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, Level-of-Service A represents free-flow conditions with no congestion. Level-of-Service F, on the other hand, represents severe congestion with stop-and-go conditions. Level-of-service D is typically considered acceptable for peak hour conditions in urban areas.

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	Uncongested operations; all vehicles clear in a single cycle.	0.00-0.700	≤10.0
B			10.1 - 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.

Unsignalized Intersections

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.

Level-of-Service Analysis of Existing Conditions

The results of the level-of-service analysis of the signalized study intersections are summarized in Table 3. Shown in the table are the volume-to-capacity ratios, delays and levels-of-service of the overall intersection and all the controlled movements. The level-of-service worksheets for existing conditions are provided as Appendix C.

Table 3 Existing (2011) Levels-of-Service - Signalized Intersections

Intersection and Movement	AM Peak Hour V/C[1]	AM Peak Hour Delay[2]	AM Peak Hour LOS[3]	PM Peak Hour V/C[1]	PM Peak Hour Delay[2]	PM Peak Hour LOS[3]
Honoapiilani Hwy at Waiko Road	***0.70***	***11.8***	***B***	***0.53***	***9.5***	***A***
Eastbound Left & Thru	0.25	26.2	C	0.21	26.3	C
Eastbound Right	0.01	24.7	C	0.00	25.1	C
Westbound Left, Thru & Right	0.55	30.1	C	0.38	27.6	C
Northbound Left	0.02	4.7	A	0.03	4.2	A
Northbound Thru & Right	0.67	11.7	B	0.54	7.9	A
Southbound Left	0.29	6.3	A	0.10	4.0	A
Southbound Thru & Right	0.45	6.7	A	0.52	7.2	A
Kuihelani Highway at Waiko Road	***0.55***	***11.8***	***B***	***0.37***	***7.8***	***A***
Eastbound Left	0.70	29.2	C	0.50	25.5	C
Eastbound Right	0.03	20.3	C	0.02	22.3	C
Northbound Left	0.60	54.1	D	0.51	35.2	D
Northbound Thru	0.19	4.6	A	0.26	3.5	A
Southbound Thru	0.12	6.6	A	0.33	6.6	A
Southbound Right	0.28	7.9	A	0.11	5.5	A

NOTES:
1. V/C denotes ratio of volume to capacity.
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.

Unsignalized Intersections

The results of the Level-of-Service analysis of the unsignalized intersections are summarized in Table 4. Shown are the control delays and Levels-of-Service of each controlled movement. Delays and levels-of-service are not calculated for uncontrolled, or free flow, movements.

Table 4 Existing (2011) Levels-of-Service Analysis for Unsignalized Intersections[1]

Intersection and Movement	AM Peak Hour Delay [1]	AM Peak Hour LOS [2]	PM Peak Hour Delay [1]	PM Peak Hour LOS [2]
Waiko Road at Waiale Road				
Eastbound Left & Thru	2.0	A	4.6	A
Southbound Left & Right	12.4	B	11.7	B

NOTES:
(1) Delay in seconds per vehicle.
(2) LOS denotes Level-of-Service calculated using the operations method described in Highway Capacity Manual. Level-of-Service is based on delay.

Conclusions of the Level-of-Service Analysis

1. The intersection of Honoapiilani Highway at Waiko Road operates at Level-of-Service B during the morning peak hour and Level-of-Service A during the afternoon peak hour. All lane groups operate at Level-of-Service C, or better, during both peak periods.

2. The intersection of Kuihelani Highway at Waiko Road operates at Level-of-Service B during the morning peak hour and Level-of-Service A during the afternoon peak hour. The northbound left turn operates at Level-of-Service D during the afternoon peak hour. All other lane groups operate at Level-of-Service C, or better, during both peak periods.

3. All controlled movements operate at Level-of-Service A or B during the peak periods.

Existing Deficiencies

We have used the Institute of Transportation Engineers standard that Level-of-Service D is the minimum acceptable Level-of-Service. For signalized intersections, this criteria is applicable to the overall intersection rather than each controlled lane group. Minor movements, such as left turns, and minor side street approaches may operate at Level-of-Service E for short periods of time during the peak hours so that the overall intersection and major movements along the major highway will operate at Level-of-Service D, or better. All volume-to-capacity ratios should also be less than 1.00. A volume-to-capacity ratio equal to or greater than 1.00 implies that the intersection or lane group operates at or over capacity.

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

Using this standard, all the intersections operate at an acceptable level-of-service.

3. PROJECTED BACKGROUND TRAFFIC CONDITIONS

The purpose of this chapter is to discuss the assumptions and data used to estimate 2010 background traffic conditions. Background traffic conditions are defined as future traffic volumes without the proposed project.

Future traffic growth consists of two components. The first is ambient background growth that is a result of regional growth and cannot be attributed to a specific project. The second component is estimated traffic that will be generated by other development projects in the vicinity of the proposed project.

Background Traffic Growth

The *Maui Long Range Transportation Plan*[1] concluded that traffic in Maui would increase an average of 1.6% per year from 1990 to 2020. This growth rate was used to estimate the background growth between 2011 and 2015, which is the design year for this project. The growth factor was calculated using the following formula:

$$F = (1 + i)^n$$

where F = Growth Factor
i = Average annual growth rate, or 0.016
n = Growth period, or 4 years

It should be noted that some traffic studies for project in Kihei have used a growth factor of 2.0% rather that 1.6% used in the study. We have checked with the other consultants and verified that this is the result of rounding.

[1] Kaku Associates, *Maui Long Range Land Transportation Plan*, October 1996

This growth factor was applied to the northbound and southbound through traffic movements along Honoapiilani Highway and Kuihelani Highway. All increases of turning movement traffic volumes and side street approach volumes will be the result of traffic generated by related projects, not the result of regional traffic growth.

Related Projects

The second component in estimating future background traffic volumes is traffic resulting from other proposed projects in the vicinity. Related projects are defined as those projects that are likely to be constructed within or adjacent to the study project and would significantly impact traffic in the study area. Related projects may be development projects or roadway improvements. The following related projects were identified and the assumptions used to estimated the amount of traffic that each will generate:

Emmanuel Lutheran Church & School

The proposed Emmauel Lutheran Church and School will be located between Honoapiilani Highway and Waiale Road and south of Kuikahi Drive. The project will consist of a 4,000 square foot sanctuary and a K thru 8 school of approximately 400 students. The estimated peak hour traffic and the trip assignments were obtained from the project's TIAR. Access and egress will be via a proposed driveway along Waiale Road.

Waiolani Mauka

Waiolani Mauka is a 108 single-family residential development located in the northeast quadrant of the intersection of Honoapiilani Highway at Pilikana Street. Access and egress is via intersections along Pilikana Street. A field reconnaissance of the project determined that 47 units were constructed and occupied at the time of the traffic counts. Trip generation estimates and trip assignments were obtained from the TIAR for the project and adjusted to reflect the number of future units to be constricted.

Kehalani Phase 2

Kehalani Phase 2 is residential development located in the northeast quadrant of the intersection of Honoapiilani Highway at Kuikahi Drive. Based on a field reconnaissance of the project, it is estimated that approximately 50% of the project was occupied at the time of the traffic counts. Trip generation estimates and trip assignments were obtained from the TIAR for the project and adjusted to reflect the number of future units to be constricted.

Puunani

Puunani is a residential development located along the west side of Honoapiilani Highway and south of Kuikahi Drive. The project will consist of 278 single-family and 476 multi-family units. Access and egress will be via driveways along the south side of Kuikahi Drive and a new driveway along the west side of Honoapiilani Highway south of Kuikahi Drive. Traffic movements at this new driveway will be restricted to right turns in and right turns out only. Traffic assignments were obtained from the project's TIAR.

Valley Isle Fellowship Church

The proposed Valley Isle Fellowship Church will be located along the east side of Honoapiilani Highway between Emmanuel Lutheran Church described above and the Waikapu Affordable Housing project. The Church will not have a school and therefore will generate negligible traffic during the weekday peak hours. Access and egress will be via Waiale Road.

Maui Lani

Maui Lani is a large multi-use development project between Waiale Road, Kuihelani Highway and Kaahumanu Avenue. Traffic assignments were obtained from the project's TIAR.

Maalaea Mauka Subdivision

Maalaea Mauka is a proposed subdivision along the west side of Honoapiilani Highway in the vicinity of Kuihelani Highway and North Kihei Road. Traffic assignments were obtained from the project's TIAR.

Kehalani Commercial Center

Kehalani Commercail Center will be located between Honoapiilani Highway and Waiale Road north of Kuikahi Drive and will consist of approximately 148,300 square feet of commercial uses. Access and egress will be via a driveway along the north side of Kuikahi Drive and a driveway along the west side of Waiale Road. A TIAR could not be obtained. Therefore, the amount of traffic that project will generate was estimated using Institute of Transportation Engineers trip generation data and distributed to the study intersections using the distribution data of the adjacent related projects.

Consolidated Baseyard

The consolidated baseyard is located along the north side of Waiko Road between Kuihelani Highway and the proposed Waiko Road Light Industrial Park. Based on a field reconnaissance of the baseyard, it is estimated that approximately 50% of the project was occupied at the time of the traffic counts. Access and egress is via an intersection along the north side of Waiko Road. Traffic counts were performed at this intersection and used to estimate additional traffic that the undeveloped portion baseyard will generate.

The projects that were identified as related projects and the estimated number of peak hour trips generated by each are summarized in Table 5.

Table 5 Trip Generation Summary of Related Projects

		AM Peak Hour			PM Peak Hour		
	Related Project	In	Out	Total	In	Out	Total
A	Emmanuel Lutheran Church & School	255	215	470	150	165	315
B	Waiolani Mauka	30	85	115	90	55	145
C	Kehalani Phase 2	210	635	845	720	405	1,125
D	Pu'unani	105	265	370	290	165	455
E	Valley Isle fellowship Church	0	0	0	0	0	0
F	Maui Lani	1,225	1,410	2,635	1,880	1,785	3,665
G	Maalaea Mauka Subdivision	255	215	470	150	165	315
H	Kehalani Commercial Center	115	75	190	205	260	465
I	Consolidated Baseyard	132	96	228	102	138	240
TOTALS		**2,327**	**2,996**	**5,323**	**3,587**	**3,138**	**6,725**

Notes:
(1) All numbers are rounded to nearest five (5).

The approximate locations of the development projects and the approximate alignment of Waiale Road is shown in Figure 3. The peak hour trip assignments are shown as Figure 4.

2015 Background Traffic Projections

2015 background traffic projections were calculated by expanding existing traffic volumes by the appropriate growth rates and then superimposing traffic generated by related projects. The resulting 2015 background peak hour traffic volumes are shown in Figures 5.

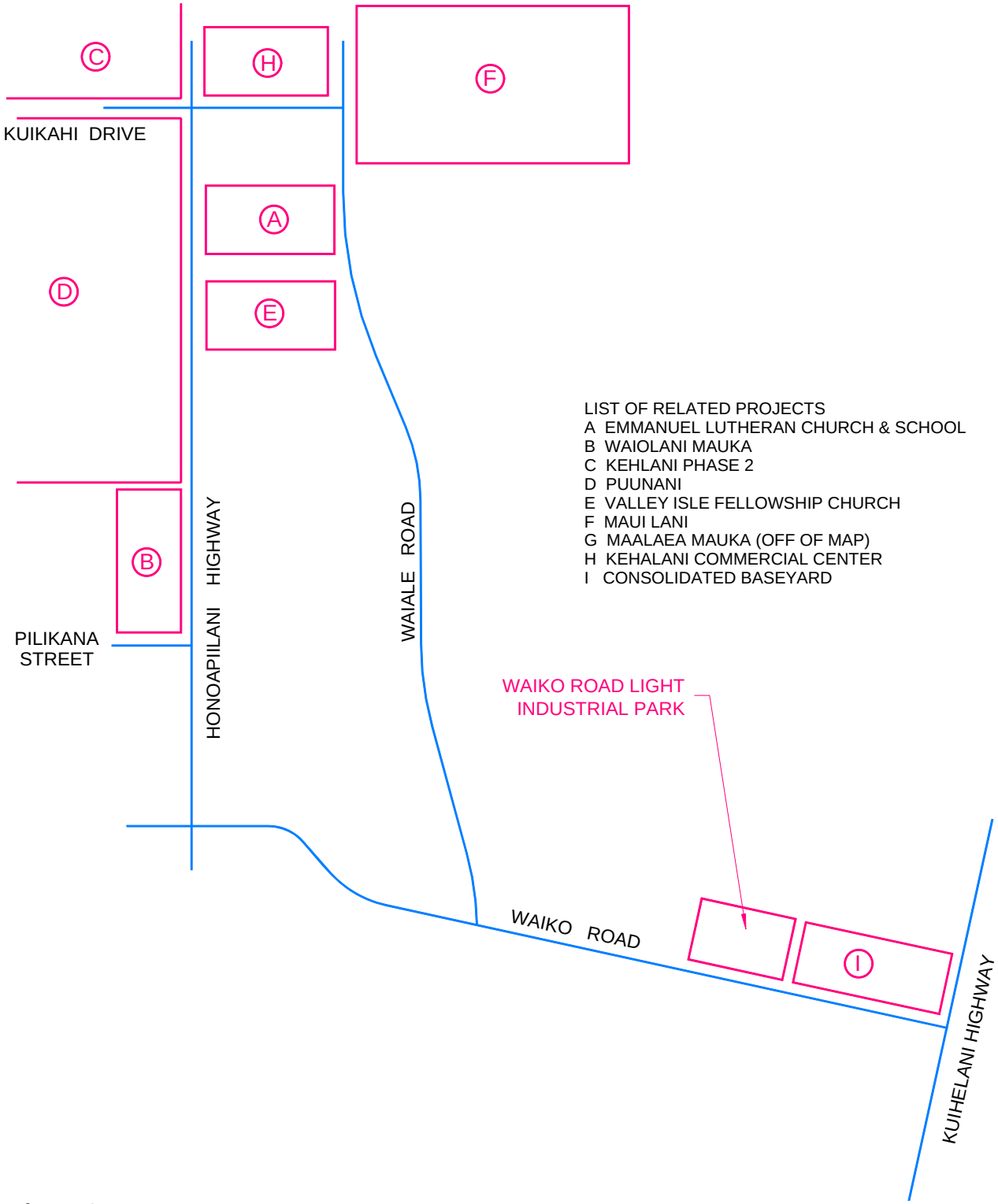
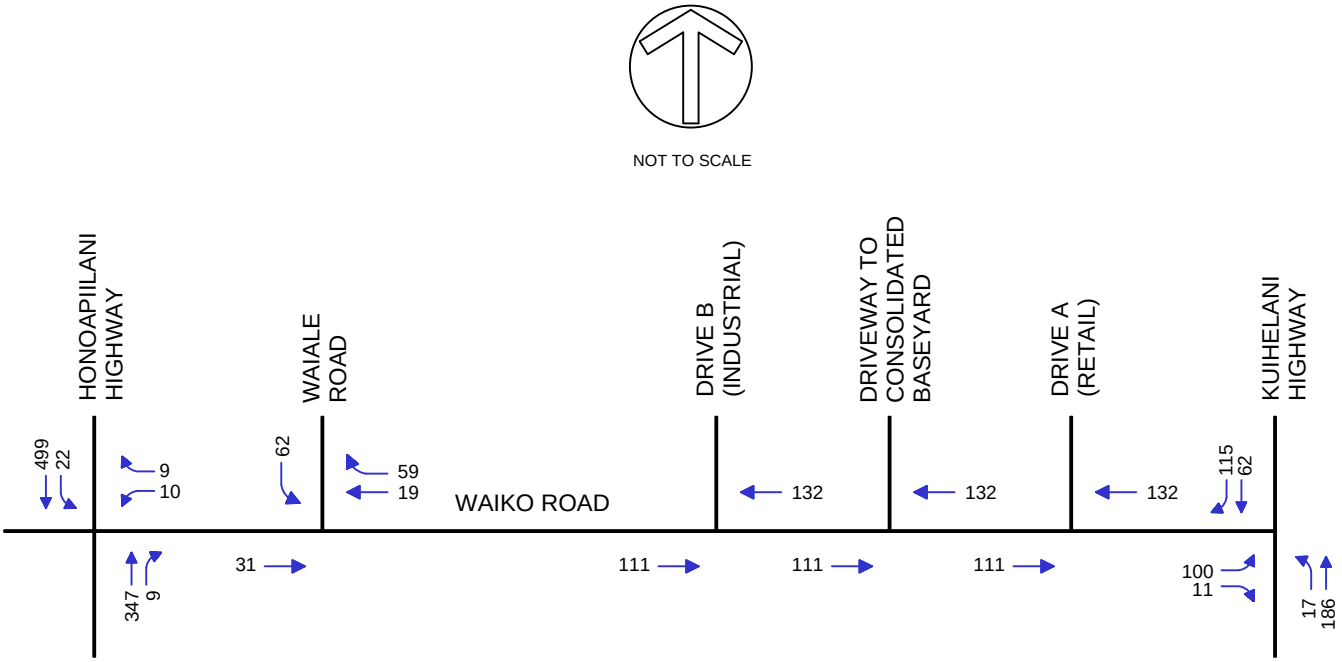
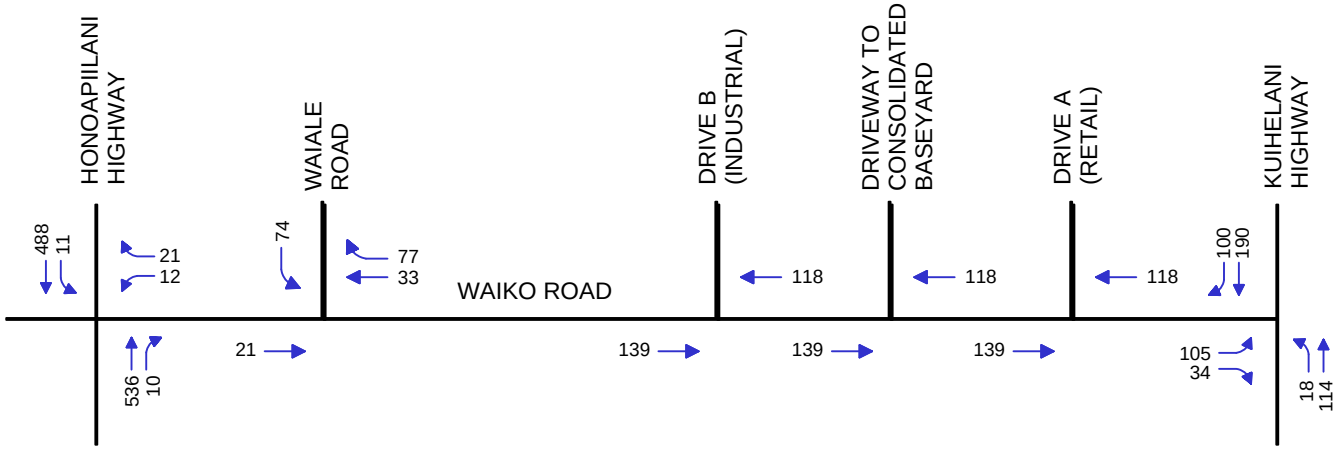


Figure 3
LOCATIONS OF RELATED PROJECTS



AM PEAK HOUR



PM PEAK HOUR

Figure 4
RELATED PROJECTS' TRIP ASSIGNMENTS

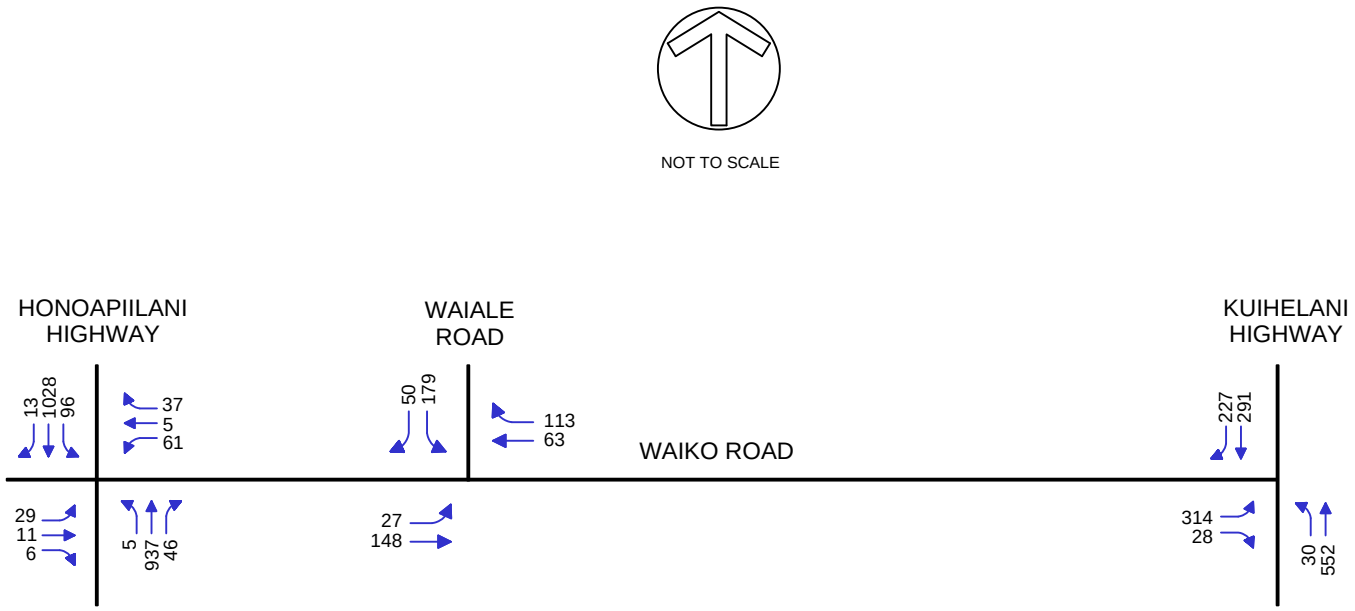


Figure 5
2015 BACKGROUND PEAK HOUR TRAFFIC PROJECTIONS

4. PROJECT-RELATED TRAFFIC CONDITIONS

This chapter presents the generation, distribution and assignment of project generated traffic and the background plus project traffic projections. The result of the level-of-service analysis of background plus project conditions is presented in the following chapter.

Project Trip Generation Calculations

Future traffic volumes generated by a project were typically estimated using the procedures described in the *Trip Generation Handbook,*[2] published by the Institute of Transportation Engineers. This method uses trip generation rates to estimate the number of trips that a proposed project will generate during peak hours. The standard reference for trip generation data is *Trip Generation.*[3]

The total project area is 32 acres. The current site plan for the proposed industrial park indicates two separate parcels. The first parcel is located along the north side of Waiko Road between Kuihelani Highway and the east property line of the Consolidated Baseyard. There is an 80 foot wide roadway easement between the parcel and the Consolidated Baseyard. This area of this parcel is 8.4 acres. Approximately 100,000 leasable square feet of retail and commercial floor space will be provided on this site. Access to and egress from this parcel will be provided by a driveway using the 80 foot easement described.

The second parcel is located west of th Consolidated Baseyard and will consist of 19.7 acres of light industrial uses. Access to and egress from this parcel will be provided a one driveway, Drive B. This driveway will be unsignalized and all approaches in be one lane only.

[2] Institute of Transportation Engineers, *Trip Generation Handbook*, Washington, D.C., 1998, p. 7-12

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

Lastly, there is an 60 foot wide easement along the north boundary of the Consolidated Baseyard connecting the two parcels.

See Table 6 for a breakdown of the areas and proposed uses.

Table 6 Proposed Land Uses

Proposed Use	Description	Acres
Retail	Northeast Quadrant of Kuihelani Highway at Waiko Road	8.4
Light Industrial	West of Consolidated Baseyard	19.7
Roadway Right-of-Way	80 Foot Easement between Retail and Consolidated Baseyard	3.9
	60 Foot Easement Along North Boundary of Consolidated Baseyard	
Total		32.0

The assumptions used for the trip generation analysis are:

1. Trip generation equations for light industrial uses provided in *Trip Generation* were used to estimate the number of peak hour trips that will be generated by the light industrial portion of the project. Light industrial uses are defined by the Institute of Transportation Engineers as follows:

   Light industrial facilities usually employee fewer than 500 persons, they have an emphasis on activities other than manufacturing and typically have minimal office space. [4]

   These rates are based on acres. The trip generation equations for general light industrial uses are summarized in Table 7.

Table 7 Trip Generation Formulas Used for the Industrial Uses

	Weekday AM Peak Hour	Weekday PM Peal Hour
Total	T = 7.51(A)	T = 3.68(A) + 116.82
Inbound	83%	22%
Outbound	17%	78%

Notes:
(1) Source: Institute of Transportation Engineers, *Trip Generation, 7th Edition*
(2) T = Trips, A = 1,000 gross square feet
(3) Formulas shown are for the peak hour of the adjacent street.

2. Trip generation equations for shopping centers were used to estimate the number of peak hour trips generated by the retail uses of the project. These rates are based on the leasable floor area. The trip generation equations for shopping centers are summarized in Table 8. The retail portion of the project will consist of 100,000 square feet of leasable floor space.

Table 8 Trip Generation Formulas Used for the Retail Uses

	Weekday AM Peak Hour	Weekday PM Peal Hour
Total	Ln (T) = 0.60Ln(A)+2.29	Ln (T) = 0.66Ln(A)+3.40
Inbound	61%	48%
Outbound	39%	52%

Notes:
(1) Source: Institute of Transportation Engineers, *Trip Generation, 7th Edition*
(2) T = Trips, A = 1,000 gross leasable square feet
(3) Formulas shown are for the peak hour of the adjacent street.

[4] Institute of Transportation Engineers, *Trip Generation*, Washington, D.C., 2003, page 89

3. The percentage of pass by trips generated by the retail uses were estimated using the data provided in the *Trip Generation Handbook*.[5] The equations for estimating the number of pass by trips are summarized in Table 9. The number of pass by trips diverted from Honoapiilani Highway, Kuihelani Highway and Waiko Road was estimated to be proportional to the peak hour traffic volumes along each roadway. Using this assumption, it was estimated that 45% would be diverted from Honoapiilani Highway, 45% from Kuihelani Highway and 10% from Waiko Road.

Table 9 Formulas For Pass By Trips of Retail Uses

	Weekday AM Peak Hour	Weekday PM Peal Hour
Total	No Formula Provided	Ln (T) = - 0.29 Ln(A)+5.00
Inbound		50%
Outbound		50%

Notes: (1) Source: Institute of Transportation Engineers, *Trip Generation Handbook*, Washington, D.C., June 2004, p 47 and 50
(2) T = Percent Pass By Trips, A = 1,000 gross leasable square feet
(3) Formulas shown are for the peak hour of the adjacent street.

The trip generation calculations are summarized in Table 10. The trips shown are the peak hourly trips generated by the project, which typically coincide with the peak hour of the adjacent street. As shown, the project will generate 560 trips during the morning peak hour, 2,375 during the afternoon peak hour and 3,253 during the Saturday peak hour. It should be noted that the Saturday peak hour is significantly higher than the weekday peak hours.

Table 10 Summary of Trip Generation Analysis

		Industrial	Retail			Total Project		
Time Period	Direction	Total Trips	Total Trips	Pass By Trips	Net New Trips	Total Trips	Pass By Trips	New Trips
AM Peak Hour	Total	148	157	0	157	305	0	305
	In	123	96	0	96	219	0	219
	Out	25	61	0	61	86	0	86
PM Peak Hour	Total	189	626	244	382	815	244	571
	In	42	300	122	178	342	122	220
	Out	147	326	122	204	473	122	351

[5] Institute of Transportation Engineers, *Trip Generation Handbook*, Washington, D.C., June 2004

Trip Distribution and Assignments

Since the proposed project is comparable to the existing Consolidated Baseyard located immediately east of the project, the trip distribution patterns should also be comparable. A manual count of traffic entering and exiting the intersection of Waiko Road at the Consolidated Baseyard was performed to determine the trip distribution patterns. The results were used to distribute the study project's trips. Separate distributions were estimated for the morning and afternoon peak periods. The resulting peak hour trip assignments are shown in Figure 6.

Heavy Vehicles

Based on the previously noted traffic count at the driveway serving the Consolidated Baseyard, it was estimated that 25% of the vehicles into and out of the industrial area will be heavy vehicles. Heavy vehicles are defined in the *Highway Capacity Manual* as vehicles with more than four tires and may be trucks or buses[6]. The percentage of heavy vehicles is input into the capacity calculations to consider the adverse impact of these heavy vehicles on roadway and intersection capacity.

2015 Background Plus Project Projections

Background plus project traffic conditions are defined as 2015 background traffic conditions plus project related traffic. These projections were estimated by superimposing the peak hourly traffic generated by the proposed project on the 2015 background peak hour traffic volumes presented in Chapter 3. The traffic projections for 2015 background plus project conditions are shown on Figure 7.

[6] Transportation Research Board, *Highway Capacity Manual*, 2000, Washington, D.C., page 16-4.

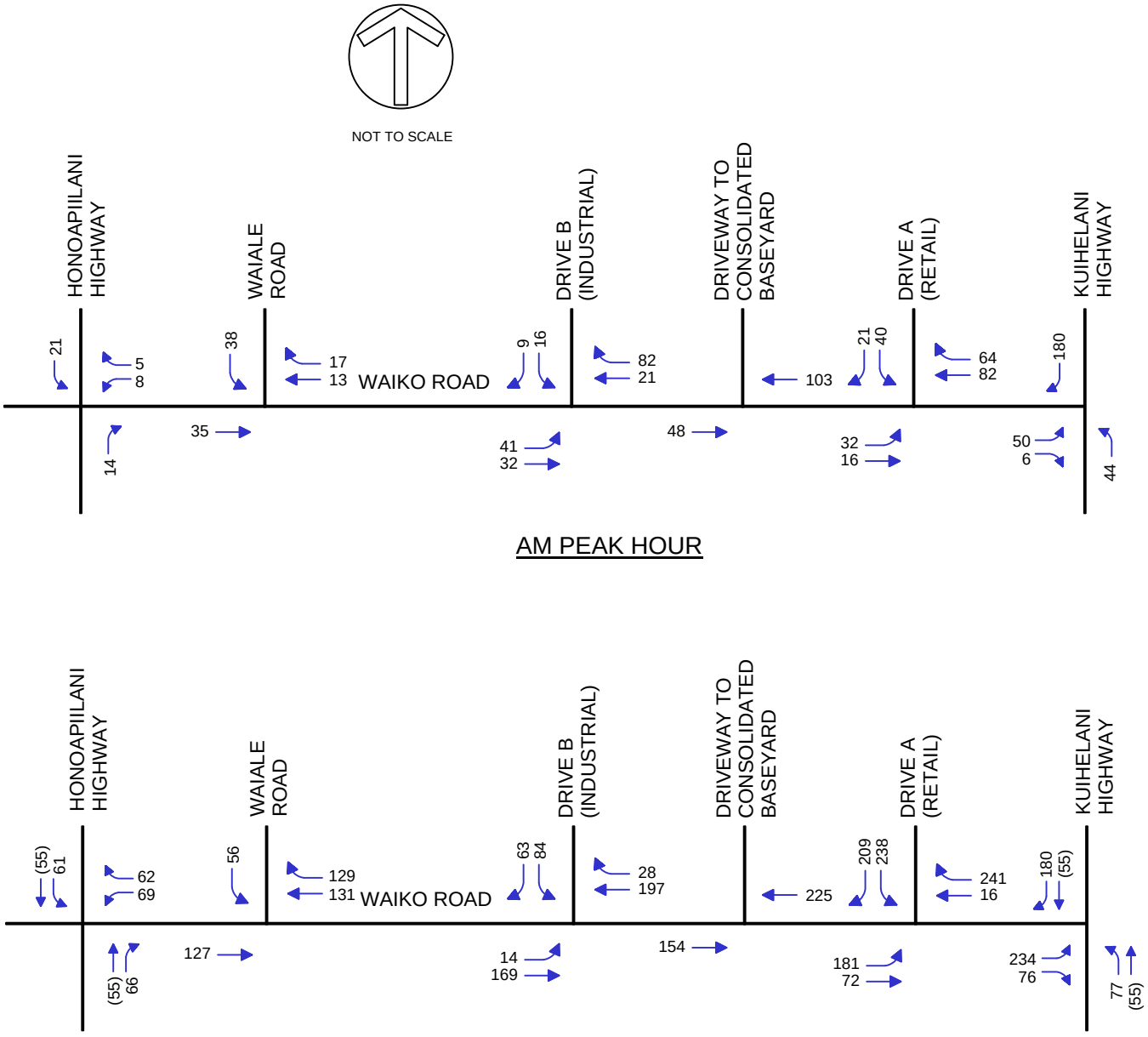
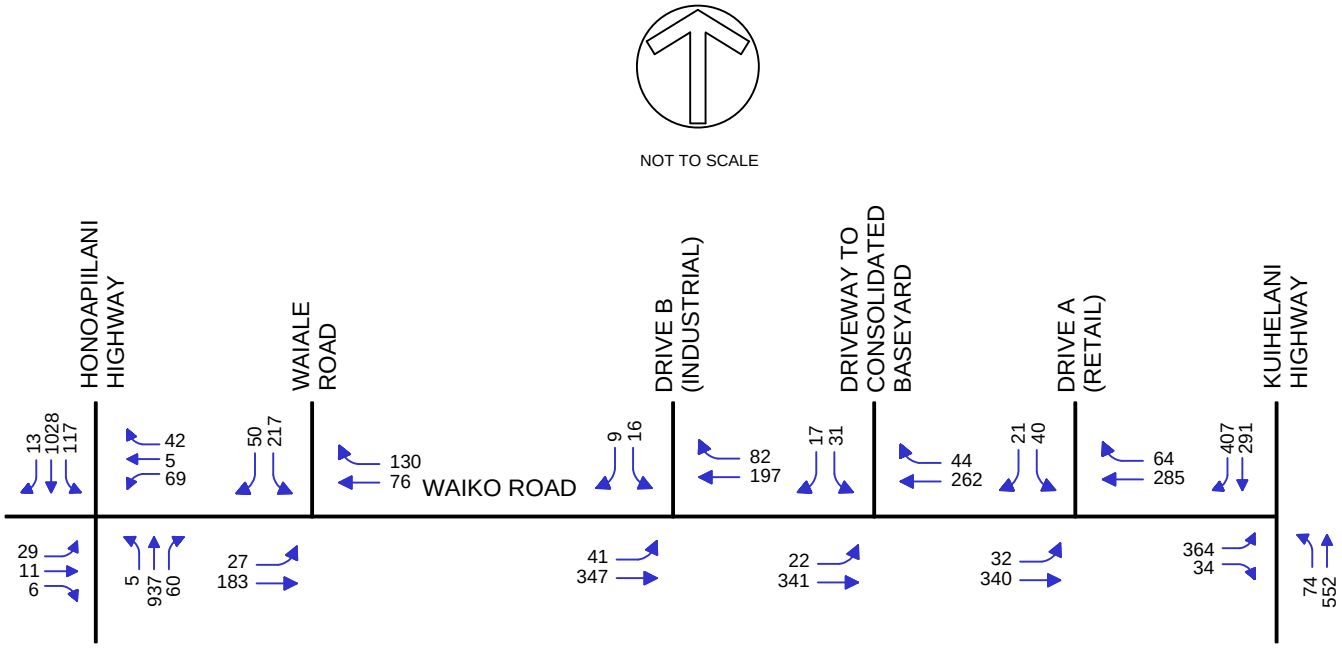
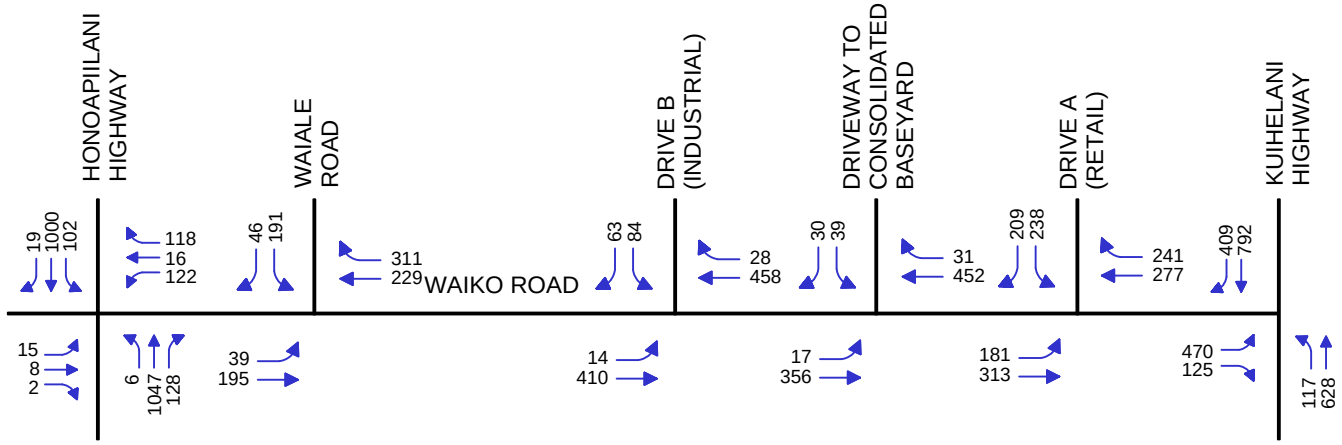


Figure 6
PROJECT TRIP ASSIGNMENTS



AM PEAK HOUR



PM PEAK HOUR

Figure 7
2015 BACKGROUND PLUS PROJECT PEAK HOUR TRAFFIC PROJECTIONS

5. TRAFFIC IMPACT ANALYSIS

The purpose of this chapter is to summarize the results of the level-of-service analysis, which identifies the project-related impacts and any mitigation required as a result of project generated traffic. The impact of the project was assessed by analyzing the changes in levels-of-service at the study intersections.

Level-of-Service Analysis

The level-of-service analysis of the study intersections was performed for background and background plus project conditions. The incremental difference of the volume-to-capacity ratios between the two conditions is the impact of the project. It was assumed that the existing intersection configurations will be maintained.

Signalized Intersections

The results of the level-of-service analysis of the signalized intersections are summarized in Table 11. Shown are the volume-to-capacity ratios, average vehicle delays and levels-of-service. The results indicate that the overall intersections and major northbound and southbound through movements operate at Level-of-Service D, or better, and all the volume-to-capacity ratios are less than 1.00.

Table 11 2015 Levels-of-Service - Signalized Intersections

Intersection, Approach and Movement	AM Peak Hour						PM Peak Hour					
	Without Project			With Project			Without Project			With Project		
	V/C[1]	Delay[2]	LOS[3]	V/C	Delay	LOS	V/C[1]	Delay[2]	LOS[3]	V/C	Delay	LOS
Honoapiilani Hwy at Waiko Rd	0.85	23.6	C	0.89	28.3	C	0.88	18.4	B	0.96	41.3	D
Eastbound Left & Thru	0.27	55.1	E	0.25	55.4	E	0.18	54.3	D	0.11	60.6	E
Eastbound Right	0.01	52.4	D	0.01	52.7	D	0.00	52.6	D	0.00	59.2	E
Westbound Left, Thru & Right	0.86	90.0	F	0.91	101.1	F	0.70	70.2	E	0.95	113.3	F
Northbound Left	0.04	12.3	B	0.04	13.5	B	0.02	9.6	A	0.03	15.8	B
Northbound Thru & Right	0.82	21.2	C	0.87	26.8	C	0.87	18.4	B	0.95	41.5	D
Southbound Left	0.50	22.3	C	0.64	34.7	C	0.26	21.1	C	0.81	91.3	F
Southbound Thru & Right	0.78	14.2	B	0.79	15.3	B	0.77	11.4	B	0.76	17.7	B
Kuihelani Hwy at Waiko Road	0.52	19.8	B	0.70	22.0	C	0.54	13.1	B	0.87	26.7	C
Eastbound Left	0.85	50.8	D	0.86	49.6	D	0.75	38.3	D	0.87	41.6	D
Eastbound Right	0.02	27.5	C	0.03	26.5	C	0.04	25.2	C	0.10	19.8	B
Northbound Left	0.44	51.9	D	0.58	52.5	D	0.46	40.1	D	0.74	55.5	E
Northbound Thru	0.30	8.3	A	0.31	9.3	A	0.31	5.6	A	0.36	13.3	B
Southbound Thru	0.16	11.3	B	0.18	14.4	B	0.47	11.3	B	0.65	27.3	C
Southbound Right	0.20	12.0	B	0.31	16.5	B	0.20	9.2	A	0.34	23.2	C

NOTES:
1. V/C denotes ratio of volume to capacity.
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.

Unsignalized Intersections

The intersection of Waiko Road at Waiale Road is the only unsignalized study intersection. The results of the level-of-service analysis of this intersection are summarized in Table 12. Shown are the average vehicle delays and levels-of-service of the controlled lane groups. Delays and levels-of-service are not calculated for the overall intersection or the uncontrolled movements of an unsignalized intersection.

The results of the level-of-service analysis indicate that all the controlled movements will operate at Level-of-Service C during the morning peak hour and Level-of-Service F during the afternoon peak hour with project generated traffic. The level-of-service of the southbound left and right turns will decrease from Level-of-Service C to Level-of-Service F, with the addition of project related traffic, during the afternoon peak hour. The average vehicle delay increases from 18.5 seconds per vehicle to 151.0 seconds per vehicle. Since the delay increases to over 3.5 minutes, this implies that project generated traffic will have a significant impact on the level-of-service of the overall intersection.

Table 12 2015 Levels-of-Service - Unsignalized Intersections[1]

Intersection and Movement	AM Peak Hour				PM Peak Hour			
	Without Project		With Project		Without Project		With Project	
	Delay [1]	LOS [2]	Delay	LOS	Delay	LOS	Delay	LOS
Waiale Road at Waiko Rd								
Eastbound Left & Thru	1.9	A	1.7	A	4.3	A	3.1	A
Southbound Left & Right	16.0	C	20.6	C	18.5	C	151.0	F

NOTES:
(1) Delay in seconds per vehicle.
(2) LOS denotes Level-of-Service calculated using the operations method described in Highway Capacity Manual. Level-of-Service is based on delay.

Mitigation

As noted in the Chapter 2, the Institute of Transportation Engineers standard is that Level-of-Service D is the minimum acceptable Level-of-Service. For signalized intersections, this criteria is applicable to the overall intersection rather than each controlled lane group. Minor movements, such as left turns, and minor side street approaches may operate at Level-of-Service E for short periods of time during the peak hours so that the overall intersection and major movements along the major highway will operate at Level-of-Service D, or better. All volume-to-capacity ratios should also be less than 1.00. A volume-to-capacity ratio equal to or greater than 1.00 implies that the intersection or lane group operates at or over capacity.

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

Based on the above criteria, the signalized intersections will operate at Level-of-Service D, or better, and volume-to-capacity ratios are less than 1.00. No mitigation will be required.

The results of the level-of-service analysis implies that project generated traffic will have a significant impact at the intersection of Waiko Road at Waiale Road during the afternoon peak hour. The average vehicle delay increases from 18.5 seconds per vehicle without project related traffic to 151.0 seconds per vehicle with project related traffic. Since the delay increases to over 3.5 minutes, this implies that project generated traffic will have a significant impact of this intersection and mitigation measures should be assessed.

Typically, a left turn refuge lane is an effective mitigation measure in comparable cases. The effectiveness of a left turn refuge lane for left turns from southbound Waiale Road to eastbound Waiko Road was assessed and the results are summarized in Table 13. This will improve the level-of-service of the southbound to eastbound left turn from Level-of-Service F to Level-of-Service D during the afternoon peak hour.

Table 13 Mitigation Analysis - Intersection of Waiko Road at Waiale Road

	With Project Without Mitigation				With Mitigation Left Turn Refuge Lane			
	AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
Intersection, Approach and Movement	Delay [1]	LOS [2]	Delay	LOS	Delay	LOS	Delay	LOS
Eastbound Left & Thru	1.7	A	3.1	A	1.7	A	3.1	A
Southbound Left & Right	20.6	C	**151.0**	**F**	15.2	C	29.4	D

NOTES:
(1) Delay in seconds per vehicle.
(2) LOS denotes Level-of-Service calculated using the operations method described in *Highway Capacity Manual*. Level-of-Service is based on delay.

Driveway Analysis

A separate level-of-service analysis of anticipated traffic conditions at the project's driveways along Waiko Road was performed to determine the required lane configuration. There will be two driveways. Drive A will serve the retail portion of the development, which is located in along the north side of Waiko Road between Kuihelani Highway and the Consolidated Baseyard. The driveway will be along the west boundary of the parcel adjacent to the Baseyard, which is approximately 580 feet from the right-of-way along Kuihelani Highway. It was assumed that the driveway will not be signalized and the exit from the proposed project will have one left and one right turn lane. It was also assumed that a separate left turn lane would be provided for eastbound to northbound left turns into the project.

The second driveway, Drive B, will serve the industrial portion of the project, which is located west of the Consolidated Baseyard. It was assumed that the driveway is unsignalized and that all intersection approaches are one lane each.

The results of level-of-service analysis of the driveways are summarized in Table14. During the morning peak hour, all movements will operate at acceptable levels-of-service. During the afternoon peak hour, the southbound left turn from Drive A, which serves the retail portion of the project, will have an estimated delay of 301.4 seconds per vehicle, which equates to Level-of-Service F. This also implies that there will be a long queue for left turns from the retail area. Accordingly, additional capacity is required for the driveway to operate acceptably.

After an assessment of various improvements, it was determined that the following improvements will be required for Drive A to operate acceptably:

a. Provide a separate right turn lane along the westbound approach of Waiko Road to Drive A.

b. Provide a left turn refuge lane for left turns from Drive A to eastbound Waiko Road. The refuge lane should provide capacity for three vehicles.

Also shown in the Table 14 are the results of an level-of-service analysis of with these improvements installed. Left turns from Drive A will operate at Level-of-Service D. The average vehicle delay is reduced from 301.4 seconds per vehicle to 33.2 seconds per vehicle. This driveway should be monitored as the retail portion of the project is developed in order to determine if additional improvements should be implemented.

No improvements are required at Drive B.

Figure 8 is a schematic drawing of the recommended driveway configurations.

Table 14 2015 Levels-of-Service at Project Driveway along Waiko Road

	Without Mitigation				With Mitigation (Separate Westbound Right turn Lane & Left Turn Refuge Lane)			
	AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
Intersection and Movement	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
Waiko Road at Drive A								
Eastbound Left	8.1	A	9.4	A	8.1	A	9.4	A
Southbound Left	16.7	C	**301.4**	**F**	11.6	B	33.2	D
Southbound Right	10.3	B	14.0	B	10.1	B	12.0	B
Waiko Road at Drive B								
Eastbound Left & Thru	1.2	A	0.4	A	NO MITIGATION REQUIRED		NO MITIGATION REQUIRED	
Southbound Left & Right	14.0	B	23.9	C				

NOTES:
(1) Delay in seconds per vehicle.
(2) LOS denotes Level-of-Service calculated using the operations method described in Highway Capacity Manual. Level-of-Service is based on delay.

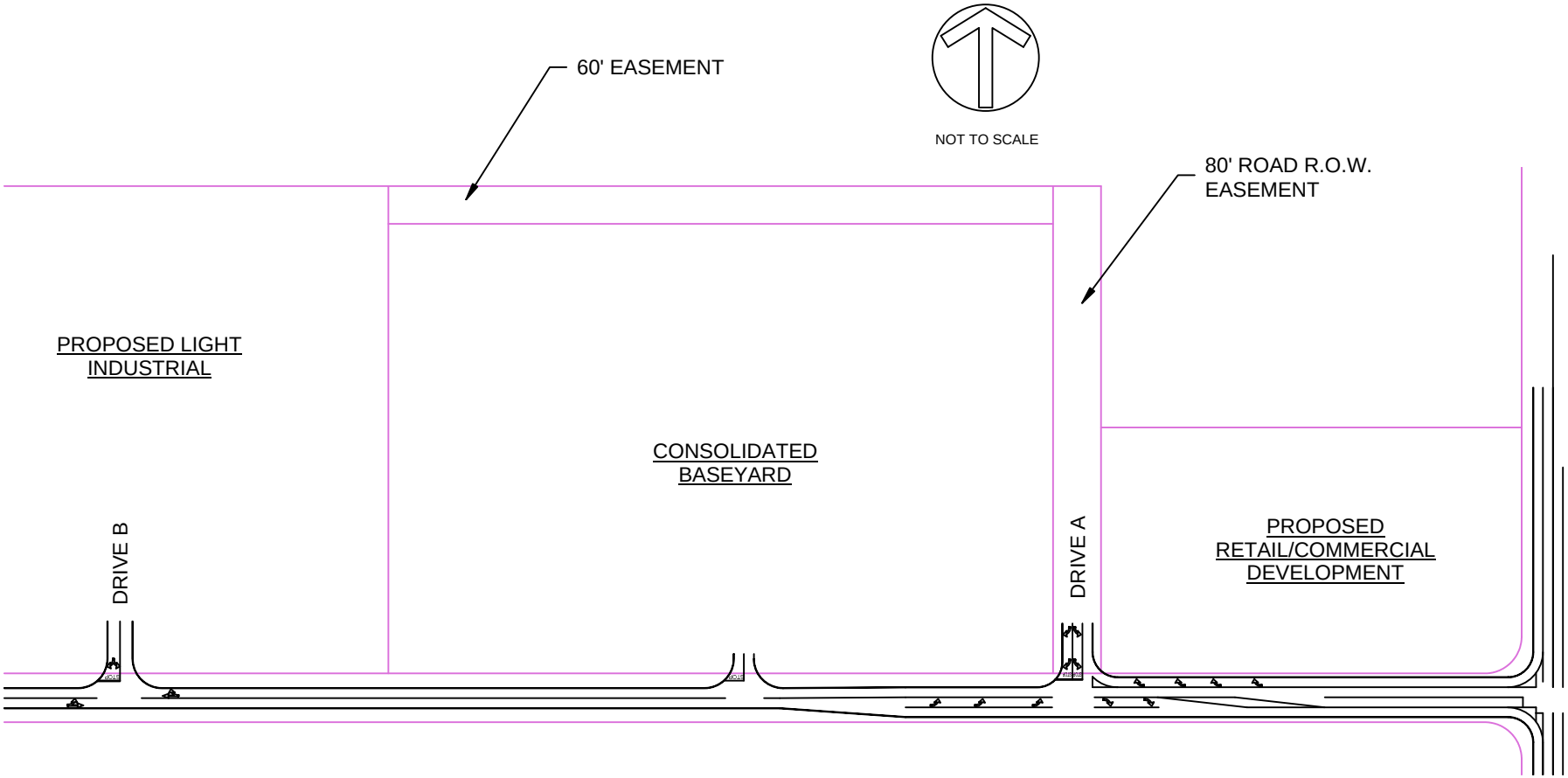


Figure 8
SCHEMATIC DRAWING OF RECOMMENDED DRIVEWAY CONFIGURATIONS

Summary and Recommendations

1. The level-of-service analysis concluded that the signalized intersections (Honoapiilani Highway at Waiko Road and Kuihelani Highway at Waiko Road) will operate at acceptable levels-of-service without additional improvements.

2. The southbound approach of Waiale Road at Waiko Road will operate at Level-of-Service C during the morning peak hour and Level-of-Service F during the afternoon peak hour. An assessment of potential improvements concluded that installation of a left turn refuge lane for left turns from southbound Waiale Road to eastbound Waiko Road would result is Level-of-Service D and is therefore recommended. However, since the projected traffic volumes that result in the unacceptable level-of-service reflect full build out of the project, it would be prudent to defer the improvement until the left turn refuge lane is required. It is possible that the traffic projections, which are based on Institute of Transportation Engineers trip generation data, may not be realized. The intersection should be monitored and re-assessed when the proposed industrial park is approximately 50% occupied.

3. The current site plan for the proposed industrial park indicates two separate parcels. The parcel is located along the north side of Waiko Road between Kuihelani Highway and the east property line of the Consolidated Baseyard. Approximately 100,000 square feet of retail and commercial floor space can be constructed on this parcel. The level-of-service analysis determined that access to and egress from the project should be provided by a major driveway (unsignalized) along Waiko Road along the west boundary of the project. The main driveway, Drive A, should have separate turn lanes along each approach and a left turn refuge lane along Waiko Road for left turns from the project. It is recommended that this driveway be monitored as the parcel is developed to determine if additional improvements are required. As with the previous intersection, the reassessment should be performed when the retail portion of the project is approximately 50% occupied.

4. The second parcel is located west of th Consolidated Baseyard and will consist of 19.7 acres of light industrial uses. Access to and egress from this parcel will be provided a one driveway, Drive B. This driveway will be unsignalized and all approaches in be one lane only.

APPENDIX A
SITE PLAN

LOT 12-A
TMK: (2) 3-8-07: 101

TRUE NORTH
SCALE: 1 IN. = 100 FT.

21 78,082 sq.ft.
20 73,464 sq.ft.
19 32,100 sq.ft.
18 27,283 sq.ft.
17 25,300 sq.ft.
16 34,901 sq.ft.
15 17,490 sq.ft.
14 12,042 sq.ft.
13 12,021 sq.ft.
12 11,465 sq.ft.
11 12,881 sq.ft.
10 14,285 sq.ft.
9 14,716 sq.ft.
8 11,673 sq.ft.
7 11,249 sq.ft.
6 10,220 sq.ft.
5 9,533 sq.ft.
4 13,533 sq.ft.
3 14,343 sq.ft.
2 10,114 sq.ft.
1 10,455 sq.ft.
22 58,640 sq.ft.
23 10,745 sq.ft.
24 11,204 sq.ft.
25 12,419 sq.ft.
26 10,033 sq.ft.
27 10,488 sq.ft.
28 10,612 sq.ft.
29 9,536 sq.ft.
30 15,339 sq.ft.
31 12,882 sq.ft.
32 13,282 sq.ft.
33 10,579 sq.ft.
34 9,745 sq.ft.
35 13,093 sq.ft.
36 14,590 sq.ft.
37 16,007 sq.ft.
38 71,993 sq.ft.
39 54,915 sq.ft.
40 7,564 sq.ft.
41 367,360 sq.ft.

CONSOLIDATED BASEYARD

WAIKO ROAD

TO HONOAPIILANI HWY.

TO KAHULUI

KUIHELANI HIGHWAY

WAIKO INDUSTRIAL PARK
CONCEPTUAL PLAN

SCALE: 1 IN. = 100 FT.

FEBRUARY 25, 2011

OTOMO
ENGINEERING, INC.
CONSULTING CIVIL ENGINEERS
305 S. HIGH STREET, STE. 102
WAILUKU, MAUI, HAWAII 96793
PHONE: (808) 242-0032
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2010-51/DWG/EXHIBITS/CONCEPT-PLAN.DWG

APPENDIX B
TRAFFIC PROJECTION WORKSHEETS

TRAFFIC COUNT SUMMARY WORKSHEET

PROJECT: Waiko Light Industrial Park
INTERSECTION: Waiko Road at Kuihelani Highway
DAY & DATE: Tuesday, January 18, 2011
START TIME: 6:30 am
END TIME: 9:00 am

15-Minute Volumes Beginning at:

		North Approach			East Approach			South Approach			West Approach			
Interval	Start Time	1	2	3	4	5	6	7	8	9	10	11	12	Totals
1	6:30 am	16	122						39	4	4		21	206
2	6:45 am	21	114						48	6	10		34	233
3	7:00 am	26	114						61	3	4		30	238
4	7:15 am	18	114						58	4	8		56	258
5	7:30 am	33	86						83	5	3		69	279
6	7:45 am	25	127						101	3	3		56	315
7	8:00 am	36	107						99	1	3		33	279
8	8:15 am	30	111						74	5	11		19	250
9	8:30 am	24	93						82	2	6		19	226
10	8:45 am	21	111						110	0	2		25	269
11	9:00 am													0
12	9:15 am													0
13	9:30 am													0
14	9:45 am													0
	Maximum:	36	127						110	6	11		69	315

Hourly Volume of Each Movement

6:30 am	7:30 am	81	464	0	0	0	0	0	206	17	26	0	141	935
6:45 am	7:45 am	98	428	0	0	0	0	0	250	18	25	0	189	1008
7:00 am	8:00 am	102	441	0	0	0	0	0	303	15	18	0	211	1090
7:15 am	**8:15 am**	**112**	**434**	**0**	**0**	**0**	**0**	**0**	**341**	**13**	**17**	**0**	**214**	**1131**
7:30 am	8:30 am	124	431	0	0	0	0	0	357	14	20	0	177	1123
7:45 am	8:45 am	115	438	0	0	0	0	0	356	11	23	0	127	1070
8:00 am	9:00 am	111	422	0	0	0	0	0	365	8	22	0	96	1024
8:15 am	9:15 am													
8:30 am	9:30 am													
8:45 am	9:45 am													
9:00 am	10:00 am													
Peak Hour Volume		112	434	0	0	0	0	0	341	13	17	0	214	1131
Per Cent of Approach		21%	79%	0%	0%	0%	0%	0%	96%	4%	7%	0%	93%	
Peak Hour Factor:		0.78	0.85	0	0	0	0	0	0.78	0.54	0.39	0	0.78	0.9

Total Arrivals	546	0	354	231
Total Departures	555	0	451	125
Total	1101	0	805	356

TRAFFIC COUNT SUMMARY WORKSHEET

PROJECT: Waiko Light Industrial Park
INTERSECTION: Waiko Road at Kuihelani Highway
DAY & DATE: Tuesday, January 18, 2011
START TIME: 3:00 pm
END TIME: 6:00 pm

15-Minute Volumes Beginning at:

		North Approach			East Approach			South Approach			West Approach			
Interval	Start Time	1	2	3	4	5	6	7	8	9	10	11	12	Totals
1	3:00 pm	21	165						103	6	2		26	323
2	3:15 pm	17	160						110	3	0		19	309
3	3:30 pm	30	175						127	10	3		28	373
4	3:45 pm	37	150						134	2	5		25	353
5	4:00 pm	29	157						125	7	3		36	357
6	4:15 pm	27	160						125	5	6		31	354
7	4:30 pm	37	135						123	3	5		33	336
8	4:45 pm	36	165						161	7	1		31	401
9	5:00 pm	27	138						125	2	4		23	319
10	5:15 pm	42	124						133	5	2		28	334
11	5:30 pm	26	114						115	1	3		35	294
12	5:45 pm	30	115						113	2	3		25	288
13	6:00 pm													0
14	6:15 pm													0
	Maximum:	42	175						161	10	6		36	401

Hourly Volume of Each Movement

3:00 pm	4:00 pm	105	650	0	0	0	0	0	474	21	10	0	98	1358
3:15 pm	4:15 pm	113	642	0	0	0	0	0	496	22	11	0	108	1392
3:30 pm	4:30 pm	123	642	0	0	0	0	0	511	24	17	0	120	1437
3:45 pm	4:45 pm	130	602	0	0	0	0	0	507	17	19	0	125	1400
4:00 pm	**5:00 pm**	**129**	**617**	**0**	**0**	**0**	**0**	**0**	**534**	**22**	**15**	**0**	**131**	**1448**
4:15 pm	5:15 pm	127	598	0	0	0	0	0	534	17	16	0	118	1410
4:30 pm	5:30 pm	142	562	0	0	0	0	0	542	17	12	0	115	1390
4:45 pm	5:45 pm	131	541	0	0	0	0	0	534	15	10	0	117	1348
5:00 pm	6:00 pm	125	491	0	0	0	0	0	486	10	12	0	111	1235
5:15 pm	6:15 pm													
5:30 pm	6:30 pm													
Peak Hour Volume		129	617						534	22	15		131	1448
Per Cent of Approach		17%	83%	0%	0%	0%	0%	0%	96%	4%	10%	0%	90%	
Peak Hour Factor:		0.77	0.88	0	0	0	0	0	0.83	0.55	0.63	0	0.91	0.9

Total Arrivals	746	0	556	146
Total Departures	665	0	632	151
Total	1411	0	1188	297

TRAFFIC COUNT SUMMARY WORKSHEET

PROJECT: Waiko Light Industrial Park
INTERSECTION: Waiko Road at Waiale Road
DAY & DATE: Tuesday, January 11, 2011
START TIME: 6:30 am
END TIME: 9:00 am

15-Minute Volumes Beginning at:

		North Approach			East Approach			South Approach			West Approach			
Interval	Start Time	1	2	3	4	5	6	7	8	9	10	11	12	Totals
1	6:30 am	21		23	3	3						19	2	71
2	6:45 am	8		28	6	6						16	2	66
3	7:00 am	15		26	9	10						21	6	87
4	7:15 am	15		35	13	3						28	5	99
5	7:30 am	10		27	18	18						28	12	113
6	7:45 am	10		29	14	13						40	4	110
7	8:00 am	12		21	4	7						12	4	60
8	8:15 am	11		18	13	12						8	6	68
9	8:30 am	4		7	11	9						11	5	47
10	8:45 am	5		22	10	10						10	4	61
11														0
12														0
13														0
14														0
15														0
16														0
	Maximum:	21		35	18	18						40	12	113

Hourly Volume of Each Movement

6:30 am	7:30 am	59	0	112	31	22	0	0	0	0	0	84	15	323
6:45 am	7:45 am	48	0	116	46	37	0	0	0	0	0	93	25	365
7:00 am	**8:00 am**	**50**	**0**	**117**	**54**	**44**	**0**	**0**	**0**	**0**	**0**	**117**	**27**	**409**
7:15 am	8:15 am	47	0	112	49	41	0	0	0	0	0	108	25	382
7:30 am	8:30 am	43	0	95	49	50	0	0	0	0	0	88	26	351
7:45 am	8:45 am	37	0	75	42	41	0	0	0	0	0	71	19	285
8:00 am	9:00 am	32	0	68	38	38	0	0	0	0	0	41	19	236

Peak Hour Volume		50		117	54	44						117	27	409
Per Cent of Approach		30%	0%	70%	55%	45%	0%	0%	0%	0%	0%	81%	19%	
Peak Hour Factor:		0.6	0	0.84	0.75	0.61	0	0	0	0	0	0.73	0.56	
Total Arrivals			167			98			0			144		
Total Departures			81			234			0			94		
Total			248			332			0			238		

TRAFFIC COUNT SUMMARY WORKSHEET

PROJECT: Waiko Light Industrial Park
INTERSECTION: Waiko Road at Waiale Road
DAY & DATE: Tuesday, January 11, 2011
START TIME: 3:00 pm
END TIME: 6:00 pm

15-Minute Volumes Beginning at:

		North Approach			East Approach			South Approach			West Approach			
Interval	Start Time	1	2	3	4	5	6	7	8	9	10	11	12	Totals
1	3:00 pm	9		14	14	11						13	11	72
2	3:15 pm	0		14	11	11						10	4	50
3	3:30 pm	5		16	31	14						6	8	80
4	3:45 pm	6		23	29	20						10	11	99
5	4:00 pm	13		17	21	14						13	7	85
6	4:15 pm	14		11	19	11						15	8	78
7	4:30 pm	13		10	36	20						9	13	101
8	4:45 pm	3		12	12	17						11	13	68
9	5:00 pm	13		12	23	20						12	12	92
10	5:15 pm	7		16	25	19						10	9	86
11	5:30 pm	6		12	25	10						13	11	77
12	5:45 pm	6		9	12	13						14	19	73
13	6:00 pm													0
14	6:15 pm													0
	Maximum:	14		23	36	20						15	19	101

Hourly Volume of Each Movement

3:00 pm	4:00 pm	20	0	67	85	56	0	0	0	0	0	39	34	301
3:15 pm	4:15 pm	24	0	70	92	59	0	0	0	0	0	39	30	314
3:30 pm	4:30 pm	38	0	67	100	59	0	0	0	0	0	44	34	342
3:45 pm	**4:45 pm**	**46**	**0**	**61**	**105**	**65**	**0**	**0**	**0**	**0**	**0**	**47**	**39**	**363**
4:00 pm	5:00 pm	43	0	50	88	62	0	0	0	0	0	48	41	332
4:15 pm	5:15 pm	43	0	45	90	68	0	0	0	0	0	47	46	339
4:30 pm	5:30 pm	36	0	50	96	76	0	0	0	0	0	42	47	347
4:45 pm	5:45 pm	29	0	52	85	66	0	0	0	0	0	46	45	323
5:00 pm	6:00 pm	32	0	49	85	62	0	0	0	0	0	49	51	328
5:15 pm	6:15 pm													
5:30 pm	6:30 pm													
Peak Hour Volume		46		61	105	65						47	39	363
Per Cent of Approach		43%	0%	57%	62%	38%	0%	0%	0%	0%	0%	55%	45%	
Peak Hour Factor:		0.82	0	0.66	0.73	0.81	0	0	0	0	0	0.78	0.51	0.9

Total Arrivals	107	170	0	86
Total Departures	144	108	0	111
Total	251	278	0	197

TRAFFIC COUNT SUMMARY WORKSHEET

PROJECT: Waiko Light Industrial Park
INTERSECTION: Waiko Road at Honoapiilani Highway
DAY & DATE: Thursday, January 6, 2011
START TIME: 6:30 am
END TIME: 9:00 am

15-Minute Volumes Beginning at:

		North Approach			East Approach			South Approach			West Approach			
Interval	Start Time	1	2	3	4	5	6	7	8	9	10	11	12	Totals
1	6:30 am	1	109	13	2	0	12	5	75	0	2	1	6	226
2	6:45 am	0	122	9	4	2	10	3	91	0	2	2	5	250
3	7:00 am	3	121	10	5	1	14	5	91	1	3	5	4	263
4	7:15 am	0	131	22	3	1	15	13	134	1	1	3	9	333
5	7:30 am	2	103	27	3	4	11	8	181	1	4	3	9	356
6	7:45 am	4	132	17	10	0	13	11	144	2	0	2	8	343
7	8:00 am	7	128	8	12	0	12	5	96	1	1	3	3	276
8	8:15 am	2	128	6	3	2	5	8	106	1	0	3	1	265
9	8:30 am	1	83	5	7	1	10	13	121	0	1	0	2	244
10	8:45 am	6	104	9	3	0	7	7	110	1	1	3	4	255
11	9:00 am													0
12	9:15 am													0
13	9:30 am													0
14	9:45 am													0
	Maximum:	7	132	27	12	4	15	13	181	2	4	5	9	356

Hourly Volume of Each Movement

6:30 am	7:30 am	4	483	54	14	4	51	26	391	2	8	11	24	1072
6:45 am	7:45 am	5	477	68	15	8	50	29	497	3	10	13	27	1202
7:00 am	8:00 am	9	487	76	21	6	53	37	550	5	8	13	30	1295
7:15 am	**8:15 am**	**13**	**494**	**74**	**28**	**5**	**51**	**37**	**555**	**5**	**6**	**11**	**29**	**1308**
7:30 am	8:30 am	15	491	58	28	6	41	32	527	5	5	11	21	1240
7:45 am	8:45 am	14	471	36	32	3	40	37	467	4	2	8	14	1128
8:00 am	9:00 am	16	443	28	25	3	34	33	433	3	3	9	10	1040
8:15 am	9:15 am													
8:30 am	9:30 am													
8:45 am	9:45 am													
9:00 am	10:00 am													
Peak Hour Volume		13	494	74	28	5	51	37	555	5	6	11	29	1308
Per Cent of Approach		2%	85%	13%	33%	6%	61%	6%	93%	1%	13%	24%	63%	
Peak Hour Factor:		0.46	0.94	0.69	0.58	0.31	0.85	0.71	0.77	0.63	0.38	0.55	0.81	0.92

Total Arrivals	581	84	597	46
Total Departures	612	122	551	23
Total	1193	206	1148	69

TRAFFIC COUNT SUMMARY WORKSHEET

PROJECT: Waiko Light Industrial Park
INTERSECTION: Waiko Road at Waiale Road
DAY & DATE: Tuesday, January 11, 2011
START TIME: 3:00 pm
END TIME: 6:00 pm

15-Minute Volumes Beginning at:

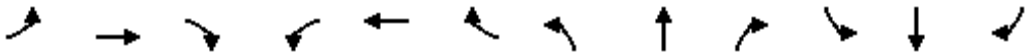
		North Approach			East Approach			South Approach			West Approach			
Interval	Start Time	1	2	3	4	5	6	7	8	9	10	11	12	Totals
1	3:00 pm	4	116	4	7	2	8	7	119	1	1	1	2	272
2	3:15 pm	5	106	4	4	3	9	11	105	1	1	0	1	250
3	3:30 pm	2	130	3	10	4	10	12	104	3	0	1	4	283
4	3:45 pm	2	117	2	3	3	8	21	128	1	1	1	5	292
5	4:00 pm	6	101	6	8	0	11	11	127	2	1	3	4	280
6	4:15 pm	8	131	7	11	6	10	16	133	2	0	2	5	331
7	4:30 pm	1	123	7	10	3	9	13	131	1	0	4	2	304
8	4:45 pm	7	155	11	6	4	12	10	126	0	1	1	7	340
9	5:00 pm	3	123	5	8	3	10	13	141	3	1	1	1	312
10	5:15 pm	3	116	7	7	2	11	8	126	0	0	3	5	288
11	5:30 pm	2	84	4	10	6	7	18	135	3	0	4	4	277
12	5:45 pm	5	75	5	7	4	10	9	106	1	0	0	2	224
13														
14														
15														
16														
	Maximum:	8	155	11	11	6	12	21	141	3	1	4	7	340

Hourly Volume of Each Movement

3:00 pm	4:00 pm	13	469	13	24	12	35	51	456	6	3	3	12	1097
3:15 pm	4:15 pm	15	454	15	25	10	38	55	464	7	3	5	14	1105
3:30 pm	4:30 pm	18	479	18	32	13	39	60	492	8	2	7	18	1186
3:45 pm	4:45 pm	17	472	22	32	12	38	61	519	6	2	10	16	1207
4:00 pm	5:00 pm	22	510	31	35	13	42	50	517	5	2	10	18	1255
4:15 pm	**5:15 pm**	**19**	**532**	**30**	**35**	**16**	**41**	**52**	**531**	**6**	**2**	**8**	**15**	**1287**
4:30 pm	5:30 pm	14	517	30	31	12	42	44	524	4	2	9	15	1244
4:45 pm	5:45 pm	15	478	27	31	15	40	49	528	6	2	9	17	1217
5:00 pm	6:00 pm	13	398	21	32	15	38	48	508	7	1	8	12	1101
5:15 pm	6:15 pm													
5:30 pm	6:30 pm													
5:45 pm	6:45 pm													
6:00 pm	7:00 pm													
Peak Hour Volume		19	532	30	35	16	41	52	531	6	2	8	15	1287
Per Cent of Approach		3%	92%	5%	38%	17%	45%	9%	90%	1%	8%	32%	60%	
Peak Hour Factor:		0.59	0.86	0.68	0.8	0.67	0.85	0.62	0.94	0.5	0.5	0.5	0.54	0.95

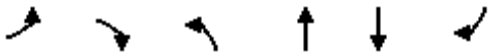
Total Arrivals	581	92	589	25
Total Departures	581	90	575	41
Total	1162	182	1164	66

APPENDIX C
LEVEL-OF-SERVICE WORKSHEETS FOR EXISTING CONDITIONS



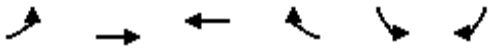
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		0.97		1.00	0.99		1.00	0.99	
Flt Protected		0.97	1.00		0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1805	1583		1746		1770	1844		1770	1849	
Flt Permitted		0.80	1.00		0.77		0.42	1.00		0.22	1.00	
Satd. Flow (perm)		1482	1583		1391		784	1844		410	1849	
Volume (vph)	29	11	6	51	5	28	5	555	37	74	494	13
Peak-hour factor, PHF	0.81	0.55	0.38	0.58	0.31	0.85	0.63	0.77	0.71	0.69	0.94	0.46
Adj. Flow (vph)	36	20	16	88	16	33	8	721	52	107	526	28
RTOR Reduction (vph)	0	0	14	0	22	0	0	3	0	0	2	0
Lane Group Flow (vph)	0	56	2	0	115	0	8	770	0	107	552	0
Turn Type	Perm		Perm	Perm			pm+pt			pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)		10.1	10.1		10.1		43.0	42.1		48.8	45.0	
Effective Green, g (s)		10.1	10.1		10.1		43.0	42.1		48.8	45.0	
Actuated g/C Ratio		0.15	0.15		0.15		0.63	0.62		0.72	0.66	
Clearance Time (s)		4.0	4.0		4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		220	235		207		509	1142		370	1224	
v/s Ratio Prot							0.00	c0.42		c0.02	0.30	
v/s Ratio Perm		0.04	0.01		c0.10		0.01			0.19		
v/c Ratio		0.25	0.01		0.55		0.02	0.67		0.29	0.45	
Uniform Delay, d1		25.6	24.7		26.9		4.7	8.5		5.8	5.5	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.6	0.0		3.2		0.0	3.2		0.4	1.2	
Delay (s)		26.2	24.7		30.1		4.7	11.7		6.3	6.7	
Level of Service		C	C		C		A	B		A	A	
Approach Delay (s)		25.9			30.1			11.6			6.7	
Approach LOS		C			C			B			A	

Intersection Summary			
HCM Average Control Delay	11.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	68.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	57.0%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	3539	3539	1583
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	1770	3539	3539	1583
Volume (vph)	214	17	13	341	214	112
Peak-hour factor, PHF	0.78	0.39	0.54	0.78	0.85	0.25
Adj. Flow (vph)	274	44	24	437	252	448
RTOR Reduction (vph)	0	34	0	0	0	190
Lane Group Flow (vph)	274	10	24	437	252	258
Turn Type		Perm	Prot			Perm
Protected Phases	4		5	2	6	
Permitted Phases		4				6
Actuated Green, G (s)	14.7	14.7	1.5	43.7	38.2	38.2
Effective Green, g (s)	14.7	14.7	1.5	43.7	38.2	38.2
Actuated g/C Ratio	0.22	0.22	0.02	0.66	0.58	0.58
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	392	350	40	2329	2036	911
v/s Ratio Prot	c0.15		c0.01	0.12	0.07	
v/s Ratio Perm		0.03				0.28
v/c Ratio	0.70	0.03	0.60	0.19	0.12	0.28
Uniform Delay, d1	23.8	20.3	32.2	4.4	6.4	7.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	5.4	0.0	21.9	0.2	0.1	0.8
Delay (s)	29.2	20.3	54.1	4.6	6.6	7.9
Level of Service	C	C	D	A	A	A
Approach Delay (s)	28.0			7.2	7.4	
Approach LOS	C			A	A	

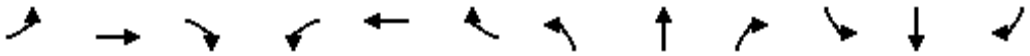
Intersection Summary			
HCM Average Control Delay	11.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	66.4	Sum of lost time (s)	12.0
Intersection Capacity Utilization	29.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	27	117	44	54	117	50
Peak Hour Factor	0.56	0.73	0.61	0.75	0.84	0.60
Hourly flow rate (vph)	48	160	72	72	139	83
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	144				365	108
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	144				365	108
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	97				77	91
cM capacity (veh/h)	1438				613	946

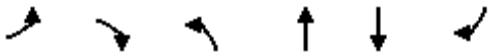
Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	208	144	223
Volume Left	48	0	139
Volume Right	0	72	83
cSH	1438	1700	706
Volume to Capacity	0.03	0.08	0.32
Queue Length 95th (ft)	3	0	34
Control Delay (s)	2.0	0.0	12.4
Lane LOS	A		B
Approach Delay (s)	2.0	0.0	12.4
Approach LOS			B

Intersection Summary			
Average Delay		5.5	
Intersection Capacity Utilization		30.5%	ICU Level of Service A
Analysis Period (min)		15	



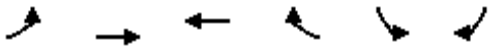
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		0.95		1.00	0.98		1.00	0.99	
Flt Protected		0.97	1.00		0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1805	1583		1732		1770	1827		1770	1849	
Flt Permitted		0.82	1.00		0.85		0.35	1.00		0.32	1.00	
Satd. Flow (perm)		1528	1583		1499		644	1827		605	1849	
Volume (vph)	15	8	2	41	16	35	6	531	52	30	532	19
Peak-hour factor, PHF	0.54	0.50	0.50	0.85	0.67	0.80	0.50	0.94	0.62	0.68	0.86	0.59
Adj. Flow (vph)	28	16	4	48	24	44	12	565	84	44	619	32
RTOR Reduction (vph)	0	0	3	0	38	0	0	6	0	0	2	0
Lane Group Flow (vph)	0	44	1	0	78	0	12	643	0	44	649	0
Turn Type	Perm		Perm	Perm			pm+pt			pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)		9.3	9.3		9.3		45.1	44.2		47.1	45.2	
Effective Green, g (s)		9.3	9.3		9.3		45.1	44.2		47.1	45.2	
Actuated g/C Ratio		0.14	0.14		0.14		0.67	0.66		0.70	0.67	
Clearance Time (s)		4.0	4.0		4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		211	218		207		446	1198		456	1240	
v/s Ratio Prot							0.00	c0.36		c0.00	0.35	
v/s Ratio Perm		0.03	0.00		c0.08		0.02			0.06		
v/c Ratio		0.21	0.00		0.38		0.03	0.54		0.10	0.52	
Uniform Delay, d1		25.8	25.1		26.4		4.1	6.2		3.9	5.6	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.5	0.0		1.2		0.0	1.7		0.1	1.6	
Delay (s)		26.3	25.1		27.6		4.2	7.9		4.0	7.2	
Level of Service		C	C		C		A	A		A	A	
Approach Delay (s)		26.2			27.6			7.8			7.0	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM Average Control Delay	9.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	67.4	Sum of lost time (s)	12.0
Intersection Capacity Utilization	49.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	3539	3539	1583
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	1770	3539	3539	1583
Volume (vph)	131	15	22	534	617	129
Peak-hour factor, PHF	0.91	0.63	0.55	0.83	0.88	0.77
Adj. Flow (vph)	144	24	40	643	701	168
RTOR Reduction (vph)	0	20	0	0	0	67
Lane Group Flow (vph)	144	4	40	643	701	101
Turn Type		Perm	Prot			Perm
Protected Phases	4		5	2	6	
Permitted Phases		4				6
Actuated Green, G (s)	10.3	10.3	2.8	45.0	38.2	38.2
Effective Green, g (s)	10.3	10.3	2.8	45.0	38.2	38.2
Actuated g/C Ratio	0.16	0.16	0.04	0.71	0.60	0.60
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	288	258	78	2516	2136	955
v/s Ratio Prot	c0.08		c0.02	0.18	c0.20	
v/s Ratio Perm		0.02				0.11
v/c Ratio	0.50	0.02	0.51	0.26	0.33	0.11
Uniform Delay, d1	24.2	22.2	29.6	3.2	6.2	5.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.4	0.0	5.6	0.2	0.4	0.2
Delay (s)	25.5	22.3	35.2	3.5	6.6	5.5
Level of Service	C	C	D	A	A	A
Approach Delay (s)	25.1			5.3	6.4	
Approach LOS	C			A	A	

Intersection Summary			
HCM Average Control Delay	7.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	63.3	Sum of lost time (s)	12.0
Intersection Capacity Utilization	32.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	39	47	65	105	61	46
Peak Hour Factor	0.51	0.78	0.81	0.73	0.66	0.82
Hourly flow rate (vph)	76	60	80	144	92	56
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	224				365	152
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	224				365	152
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	94				85	94
cM capacity (veh/h)	1345				598	894

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	137	224	149
Volume Left	76	0	92
Volume Right	0	144	56
cSH	1345	1700	684
Volume to Capacity	0.06	0.13	0.22
Queue Length 95th (ft)	5	0	21
Control Delay (s)	4.6	0.0	11.7
Lane LOS	A		B
Approach Delay (s)	4.6	0.0	11.7
Approach LOS			B

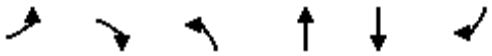
Intersection Summary			
Average Delay	4.6		
Intersection Capacity Utilization	30.7%	ICU Level of Service	A
Analysis Period (min)	15		

APPENDIX D
LEVEL-OF-SERVICE WORKSHEETS FOR 2015 BACKGROUND CONDITIONS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		0.96		1.00	0.99		1.00	1.00	
Flt Protected		0.97	1.00		0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1805	1583		1561		1770	1831		1570	1856	
Flt Permitted		0.77	1.00		0.77		0.16	1.00		0.12	1.00	
Satd. Flow (perm)		1425	1583		1246		300	1831		199	1856	
Volume (vph)	29	11	6	61	5	37	5	937	46	96	1028	13
Peak-hour factor, PHF	0.81	0.55	0.38	0.58	0.31	0.85	0.63	0.95	0.71	0.75	0.95	0.46
Adj. Flow (vph)	36	20	16	105	16	44	8	986	65	128	1082	28
RTOR Reduction (vph)	0	0	14	0	9	0	0	1	0	0	0	0
Lane Group Flow (vph)	0	56	2	0	156	0	8	1050	0	128	1110	0
Heavy Vehicles (%)	2%	2%	2%	15%	2%	15%	2%	2%	15%	15%	2%	2%
Turn Type	Perm		Perm	Perm			pm+pt			pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)		21.1	21.1		21.1		101.2	100.5		114.6	109.9	
Effective Green, g (s)		21.1	21.1		21.1		101.2	100.5		114.6	109.9	
Actuated g/C Ratio		0.15	0.15		0.15		0.70	0.70		0.80	0.76	
Clearance Time (s)		4.0	4.0		4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		209	232		183		218	1281		255	1419	
v/s Ratio Prot							0.00	c0.57		c0.04	c0.60	
v/s Ratio Perm		0.04	0.01		c0.13		0.03			0.36		
v/c Ratio		0.27	0.01		0.86		0.04	0.82		0.50	0.78	
Uniform Delay, d1		54.4	52.4		59.8		12.2	15.2		20.7	9.9	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.7	0.0		30.2		0.1	5.9		1.6	4.4	
Delay (s)		55.1	52.4		90.0		12.3	21.2		22.3	14.2	
Level of Service		E	D		F		B	C		C	B	
Approach Delay (s)		54.5			90.0			21.1			15.1	
Approach LOS		D			F			C			B	

Intersection Summary			
HCM Average Control Delay	23.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	143.7	Sum of lost time (s)	16.0
Intersection Capacity Utilization	80.8%	ICU Level of Service	D
Analysis Period (min)	15		

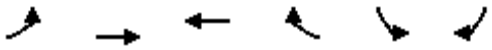
c Critical Lane Group



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1570	1404	1570	3539	3539	1404
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	1570	1404	1570	3539	3539	1404
Volume (vph)	314	28	30	552	291	227
Peak-hour factor, PHF	0.85	0.80	0.85	0.80	0.90	0.80
Adj. Flow (vph)	369	35	35	690	323	284
RTOR Reduction (vph)	0	25	0	0	0	125
Lane Group Flow (vph)	369	10	35	690	323	159
Heavy Vehicles (%)	15%	15%	15%	2%	2%	15%
Turn Type		Perm	Prot			Perm
Protected Phases	4		5	2	6	
Permitted Phases		4				6
Actuated Green, G (s)	28.6	28.6	5.2	67.4	58.2	58.2
Effective Green, g (s)	28.6	28.6	5.2	67.4	58.2	58.2
Actuated g/C Ratio	0.28	0.28	0.05	0.65	0.56	0.56
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	432	386	79	2294	1980	786
v/s Ratio Prot	c0.24		c0.02	0.19	0.09	
v/s Ratio Perm		0.02				0.20
v/c Ratio	0.85	0.02	0.44	0.30	0.16	0.20
Uniform Delay, d1	35.7	27.5	48.0	8.0	11.1	11.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	15.1	0.0	3.9	0.3	0.2	0.6
Delay (s)	50.8	27.5	51.9	8.3	11.3	12.0
Level of Service	D	C	D	A	B	B
Approach Delay (s)	48.8			10.4	11.6	
Approach LOS	D			B	B	

Intersection Summary			
HCM Average Control Delay	19.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	104.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	39.3%	ICU Level of Service	A
Analysis Period (min)	15		

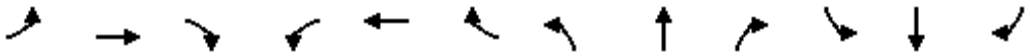
c Critical Lane Group



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	27	148	63	113	179	50
Peak Hour Factor	0.56	0.80	0.80	0.85	0.90	0.60
Hourly flow rate (vph)	48	185	79	133	199	83
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	212				427	145
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	212				427	145
tC, single (s)	4.2				6.5	6.4
tC, 2 stage (s)						
tF (s)	2.3				3.6	3.4
p0 queue free %	96				63	90
cM capacity (veh/h)	1285				540	869

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	233	212	282
Volume Left	48	0	199
Volume Right	0	133	83
cSH	1285	1700	608
Volume to Capacity	0.04	0.12	0.46
Queue Length 95th (ft)	3	0	61
Control Delay (s)	1.9	0.0	16.0
Lane LOS	A		C
Approach Delay (s)	1.9	0.0	16.0
Approach LOS			C

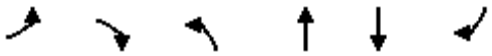
Intersection Summary			
Average Delay	6.8		
Intersection Capacity Utilization	42.5%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		0.94		1.00	0.99		1.00	1.00	
Flt Protected		0.97	1.00		0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1804	1583		1541		1770	1836		1570	1858	
Flt Permitted		0.74	1.00		0.85		0.16	1.00		0.09	1.00	
Satd. Flow (perm)		1378	1583		1336		302	1836		153	1858	
Volume (vph)	15	8	2	53	16	56	6	1102	62	41	1055	19
Peak-hour factor, PHF	0.80	0.80	0.80	0.97	0.97	0.97	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	19	10	2	55	16	58	6	1160	65	43	1111	20
RTOR Reduction (vph)	0	0	2	0	22	0	0	1	0	0	0	0
Lane Group Flow (vph)	0	29	0	0	107	0	6	1224	0	43	1131	0
Heavy Vehicles (%)	2%	2%	2%	15%	2%	15%	2%	2%	15%	15%	2%	2%
Turn Type	Perm		Perm	Perm			pm+pt			pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)		15.3	15.3		15.3		103.5	102.8		109.9	106.0	
Effective Green, g (s)		15.3	15.3		15.3		103.5	102.8		109.9	106.0	
Actuated g/C Ratio		0.11	0.11		0.11		0.77	0.77		0.82	0.79	
Clearance Time (s)		4.0	4.0		4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		157	181		153		241	1409		167	1470	
v/s Ratio Prot							0.00	c0.67		c0.01	c0.61	
v/s Ratio Perm		0.02	0.00		c0.10		0.02			0.20		
v/c Ratio		0.18	0.00		0.70		0.02	0.87		0.26	0.77	
Uniform Delay, d1		53.7	52.6		57.1		9.6	10.9		20.2	7.5	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.6	0.0		13.0		0.0	7.5		0.8	3.9	
Delay (s)		54.3	52.6		70.2		9.6	18.4		21.1	11.4	
Level of Service		D	D		E		A	B		C	B	
Approach Delay (s)		54.2			70.2			18.3			11.8	
Approach LOS		D			E			B			B	

Intersection Summary			
HCM Average Control Delay	18.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	134.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	82.3%	ICU Level of Service	E
Analysis Period (min)	15		

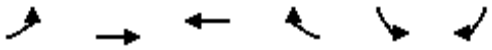
c Critical Lane Group



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1570	1404	1570	3539	3539	1404
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	1570	1404	1570	3539	3539	1404
Volume (vph)	236	49	40	683	847	229
Peak-hour factor, PHF	0.91	0.85	0.85	0.90	0.90	0.85
Adj. Flow (vph)	259	58	47	759	941	269
RTOR Reduction (vph)	0	45	0	0	0	111
Lane Group Flow (vph)	259	13	47	759	941	158
Heavy Vehicles (%)	15%	15%	15%	2%	2%	15%
Turn Type		Perm	Prot			Perm
Protected Phases	4		5	2	6	
Permitted Phases		4				6
Actuated Green, G (s)	18.1	18.1	5.4	55.9	46.5	46.5
Effective Green, g (s)	18.1	18.1	5.4	55.9	46.5	46.5
Actuated g/C Ratio	0.22	0.22	0.07	0.68	0.57	0.57
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	347	310	103	2413	2007	796
v/s Ratio Prot	c0.17		c0.03	0.21	c0.27	
v/s Ratio Perm		0.04				0.19
v/c Ratio	0.75	0.04	0.46	0.31	0.47	0.20
Uniform Delay, d1	29.8	25.1	36.9	5.3	10.5	8.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	8.5	0.1	3.2	0.3	0.8	0.6
Delay (s)	38.3	25.2	40.1	5.6	11.3	9.2
Level of Service	D	C	D	A	B	A
Approach Delay (s)	35.9			7.6	10.8	
Approach LOS	D			A	B	

Intersection Summary			
HCM Average Control Delay	13.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	82.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	49.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

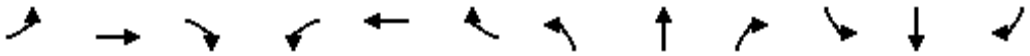


Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	39	68	98	182	135	46
Peak Hour Factor	0.51	0.78	0.81	0.73	0.66	0.82
Hourly flow rate (vph)	76	87	121	249	205	56
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	370				486	246
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	370				486	246
tC, single (s)	4.2				6.5	6.4
tC, 2 stage (s)						
tF (s)	2.3				3.6	3.4
p0 queue free %	93				58	93
cM capacity (veh/h)	1120				482	762

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	164	370	261
Volume Left	76	0	205
Volume Right	0	249	56
cSH	1120	1700	524
Volume to Capacity	0.07	0.22	0.50
Queue Length 95th (ft)	5	0	69
Control Delay (s)	4.3	0.0	18.5
Lane LOS	A		C
Approach Delay (s)	4.3	0.0	18.5
Approach LOS			C

Intersection Summary			
Average Delay	6.9		
Intersection Capacity Utilization	42.4%	ICU Level of Service	A
Analysis Period (min)	15		

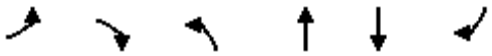
APPENDIX E
LEVEL-OF-SERVICE WORKSHEETS FOR 2015 BACKGROUND PLUS PROJECT CONDITIONS



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		0.96		1.00	0.99		1.00	1.00	
Flt Protected		0.97	1.00		0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1805	1583		1558		1770	1822		1570	1856	
Flt Permitted		0.77	1.00		0.77		0.16	1.00		0.09	1.00	
Satd. Flow (perm)		1431	1583		1240		295	1822		153	1856	
Volume (vph)	29	11	6	69	5	42	5	937	60	117	1028	13
Peak-hour factor, PHF	0.81	0.55	0.38	0.58	0.31	0.85	0.63	0.95	0.71	0.75	0.95	0.46
Adj. Flow (vph)	36	20	16	119	16	49	8	986	85	156	1082	28
RTOR Reduction (vph)	0	0	14	0	8	0	0	2	0	0	0	0
Lane Group Flow (vph)	0	56	2	0	176	0	8	1069	0	156	1110	0
Heavy Vehicles (%)	2%	2%	2%	15%	2%	15%	2%	2%	15%	15%	2%	2%
Turn Type	Perm		Perm	Perm			pm+pt			pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)		22.9	22.9		22.9		100.8	100.0		116.6	111.8	
Effective Green, g (s)		22.9	22.9		22.9		100.8	100.0		116.6	111.8	
Actuated g/C Ratio		0.16	0.16		0.16		0.68	0.68		0.79	0.76	
Clearance Time (s)		4.0	4.0		4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		222	246		193		210	1235		242	1407	
v/s Ratio Prot							0.00	c0.59		c0.06	c0.60	
v/s Ratio Perm		0.04	0.01		c0.15		0.03			0.45		
v/c Ratio		0.25	0.01		0.91		0.04	0.87		0.64	0.79	
Uniform Delay, d1		54.8	52.7		61.3		13.4	18.5		28.9	10.7	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.6	0.0		39.8		0.1	8.3		5.8	4.6	
Delay (s)		55.4	52.7		101.1		13.5	26.8		34.7	15.3	
Level of Service		E	D		F		B	C		C	B	
Approach Delay (s)		54.8			101.1			26.7			17.7	
Approach LOS		D			F			C			B	

Intersection Summary			
HCM Average Control Delay	28.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	147.5	Sum of lost time (s)	16.0
Intersection Capacity Utilization	82.8%	ICU Level of Service	E
Analysis Period (min)	15		

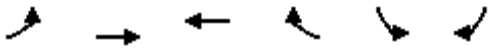
c Critical Lane Group



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1570	1404	1570	3539	3539	1404
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	1570	1404	1570	3539	3539	1404
Volume (vph)	364	34	74	552	291	407
Peak-hour factor, PHF	0.92	0.92	0.92	0.80	0.90	0.92
Adj. Flow (vph)	396	37	80	690	323	442
RTOR Reduction (vph)	0	26	0	0	0	219
Lane Group Flow (vph)	396	11	80	690	323	223
Heavy Vehicles (%)	15%	15%	15%	2%	2%	15%
Turn Type		Perm	Prot			Perm
Protected Phases	4		5	2	6	
Permitted Phases		4				6
Actuated Green, G (s)	31.0	31.0	9.2	66.4	53.2	53.2
Effective Green, g (s)	31.0	31.0	9.2	66.4	53.2	53.2
Actuated g/C Ratio	0.29	0.29	0.09	0.63	0.50	0.50
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	462	413	137	2230	1786	709
v/s Ratio Prot	c0.25		c0.05	0.19	0.09	
v/s Ratio Perm		0.03				0.31
v/c Ratio	0.86	0.03	0.58	0.31	0.18	0.31
Uniform Delay, d1	35.1	26.5	46.3	9.0	14.2	15.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	14.5	0.0	6.2	0.4	0.2	1.2
Delay (s)	49.6	26.5	52.5	9.3	14.4	16.5
Level of Service	D	C	D	A	B	B
Approach Delay (s)	47.6			13.8	15.6	
Approach LOS	D			B	B	

Intersection Summary			
HCM Average Control Delay	22.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	105.4	Sum of lost time (s)	12.0
Intersection Capacity Utilization	42.3%	ICU Level of Service	A
Analysis Period (min)	15		

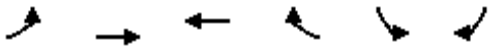
c Critical Lane Group



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	27	183	76	130	217	50
Peak Hour Factor	0.56	0.80	0.80	0.85	0.90	0.60
Hourly flow rate (vph)	48	229	95	153	241	83
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					TWLTL	
Median storage veh)					2	
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	248				497	171
vC1, stage 1 conf vol					171	
vC2, stage 2 conf vol					325	
vCu, unblocked vol	248				497	171
tC, single (s)	4.2				6.5	6.4
tC, 2 stage (s)					5.5	
tF (s)	2.3				3.6	3.4
p0 queue free %	96				62	90
cM capacity (veh/h)	1246				631	840

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	277	248	324
Volume Left	48	0	241
Volume Right	0	153	83
cSH	1246	1700	674
Volume to Capacity	0.04	0.15	0.48
Queue Length 95th (ft)	3	0	66
Control Delay (s)	1.7	0.0	15.2
Lane LOS	A		C
Approach Delay (s)	1.7	0.0	15.2
Approach LOS			C

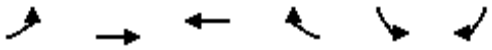
Intersection Summary			
Average Delay		6.4	
Intersection Capacity Utilization		48.2%	ICU Level of Service A
Analysis Period (min)		15	



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	32	340	285	64	40	21
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	35	370	310	70	43	23
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					TWLTL	
Median storage veh)					3	
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	379				749	310
vC1, stage 1 conf vol					310	
vC2, stage 2 conf vol					439	
vCu, unblocked vol	379				749	310
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)	2.2				3.5	3.3
p0 queue free %	97				93	97
cM capacity (veh/h)	1179				591	730

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	SB 2
Volume Total	35	370	310	70	43	23
Volume Left	35	0	0	0	43	0
Volume Right	0	0	0	70	0	23
cSH	1179	1700	1700	1700	591	730
Volume to Capacity	0.03	0.22	0.18	0.04	0.07	0.03
Queue Length 95th (ft)	2	0	0	0	6	2
Control Delay (s)	8.1	0.0	0.0	0.0	11.6	10.1
Lane LOS	A				B	B
Approach Delay (s)	0.7		0.0		11.1	
Approach LOS					B	

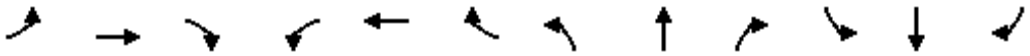
Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	31.7%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	41	347	197	82	16	9
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	45	377	214	89	17	10
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	303				725	259
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	303				725	259
tC, single (s)	4.3				6.6	6.5
tC, 2 stage (s)						
tF (s)	2.4				3.7	3.5
p0 queue free %	96				95	99
cM capacity (veh/h)	1138				346	727

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	422	303	27
Volume Left	45	0	17
Volume Right	0	89	10
cSH	1138	1700	426
Volume to Capacity	0.04	0.18	0.06
Queue Length 95th (ft)	3	0	5
Control Delay (s)	1.2	0.0	14.0
Lane LOS	A		B
Approach Delay (s)	1.2	0.0	14.0
Approach LOS			B

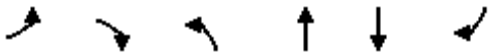
Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	49.2%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		0.94		1.00	0.98		1.00	1.00	
Flt Protected		0.97	1.00		0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1804	1583		1589		1770	1817		1641	1858	
Flt Permitted		0.74	1.00		0.83		0.17	1.00		0.03	1.00	
Satd. Flow (perm)		1376	1583		1356		318	1817		59	1858	
Volume (vph)	15	8	2	122	16	118	6	1047	128	102	1000	19
Peak-hour factor, PHF	0.80	0.80	0.80	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	19	10	2	124	16	120	6	1068	131	104	1020	19
RTOR Reduction (vph)	0	0	2	0	18	0	0	2	0	0	0	0
Lane Group Flow (vph)	0	29	0	0	242	0	6	1197	0	104	1039	0
Heavy Vehicles (%)	2%	2%	2%	10%	2%	10%	2%	2%	10%	10%	2%	2%
Turn Type	Perm		Perm	Perm			pm+pt			pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)		34.0	34.0		34.0		125.2	124.4		137.9	133.1	
Effective Green, g (s)		34.0	34.0		34.0		125.2	124.4		137.9	133.1	
Actuated g/C Ratio		0.19	0.19		0.19		0.70	0.69		0.77	0.74	
Clearance Time (s)		4.0	4.0		4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		260	299		256		228	1256		129	1375	
v/s Ratio Prot							0.00	c0.66		c0.04	0.56	
v/s Ratio Perm		0.02	0.00		c0.19		0.02			0.57		
v/c Ratio		0.11	0.00		0.95		0.03	0.95		0.81	0.76	
Uniform Delay, d1		60.4	59.2		72.0		15.7	25.1		61.8	13.8	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.2	0.0		41.3		0.0	16.4		29.5	3.9	
Delay (s)		60.6	59.2		113.3		15.8	41.5		91.3	17.7	
Level of Service		E	E		F		B	D		F	B	
Approach Delay (s)		60.5			113.3			41.3			24.4	
Approach LOS		E			F			D			C	

Intersection Summary			
HCM Average Control Delay	41.3	HCM Level of Service	D
HCM Volume to Capacity ratio	0.96		
Actuated Cycle Length (s)	179.9	Sum of lost time (s)	12.0
Intersection Capacity Utilization	100.0%	ICU Level of Service	G
Analysis Period (min)	15		

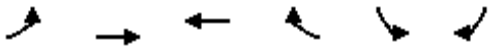
c Critical Lane Group



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1570	1404	1570	3539	3539	1404
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	1570	1404	1570	3539	3539	1404
Volume (vph)	470	125	117	628	792	409
Peak-hour factor, PHF	0.91	0.85	0.85	0.90	0.90	0.85
Adj. Flow (vph)	516	147	138	698	880	481
RTOR Reduction (vph)	0	92	0	0	0	298
Lane Group Flow (vph)	516	55	138	698	880	183
Heavy Vehicles (%)	15%	15%	15%	2%	2%	15%
Turn Type		Perm	Prot			Perm
Protected Phases	4		5	2	6	
Permitted Phases		4				6
Actuated Green, G (s)	36.6	36.6	11.6	52.7	37.1	37.1
Effective Green, g (s)	36.6	36.6	11.6	52.7	37.1	37.1
Actuated g/C Ratio	0.38	0.38	0.12	0.54	0.38	0.38
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	591	528	187	1917	1349	535
v/s Ratio Prot	c0.33		c0.09	0.20	0.25	
v/s Ratio Perm		0.10				0.34
v/c Ratio	0.87	0.10	0.74	0.36	0.65	0.34
Uniform Delay, d1	28.2	19.7	41.4	12.7	24.8	21.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	13.4	0.1	14.1	0.5	2.5	1.7
Delay (s)	41.6	19.8	55.5	13.3	27.3	23.2
Level of Service	D	B	E	B	C	C
Approach Delay (s)	36.8			20.2	25.8	
Approach LOS	D			C	C	

Intersection Summary			
HCM Average Control Delay	26.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	97.3	Sum of lost time (s)	12.0
Intersection Capacity Utilization	64.4%	ICU Level of Service	C
Analysis Period (min)	15		

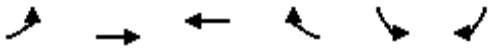
c Critical Lane Group



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	39	195	229	311	191	46
Peak Hour Factor	0.51	0.78	0.81	0.73	0.66	0.82
Hourly flow rate (vph)	76	250	283	426	289	56
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					TWLTL	
Median storage veh)					2	
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	709				899	496
vC1, stage 1 conf vol					496	
vC2, stage 2 conf vol					403	
vCu, unblocked vol	709				899	496
tC, single (s)	4.2				6.5	6.4
tC, 2 stage (s)					5.5	
tF (s)	2.3				3.6	3.4
p0 queue free %	91				38	90
cM capacity (veh/h)	833				469	549

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	326	709	345
Volume Left	76	0	289
Volume Right	0	426	56
cSH	833	1700	480
Volume to Capacity	0.09	0.42	0.72
Queue Length 95th (ft)	8	0	143
Control Delay (s)	3.1	0.0	29.4
Lane LOS	A		D
Approach Delay (s)	3.1	0.0	29.4
Approach LOS			D

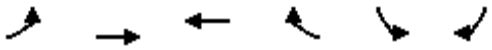
Intersection Summary			
Average Delay	8.1		
Intersection Capacity Utilization	63.7%	ICU Level of Service	B
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	181	313	277	241	238	209
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	197	340	301	262	259	227
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					TWLTL	
Median storage veh)					3	
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	563				1035	301
vC1, stage 1 conf vol					301	
vC2, stage 2 conf vol					734	
vCu, unblocked vol	563				1035	301
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)	2.2				3.5	3.3
p0 queue free %	80				31	69
cM capacity (veh/h)	1008				376	739

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	SB 2
Volume Total	197	340	301	262	259	227
Volume Left	197	0	0	0	259	0
Volume Right	0	0	0	262	0	227
cSH	1008	1700	1700	1700	376	739
Volume to Capacity	0.20	0.20	0.18	0.15	0.69	0.31
Queue Length 95th (ft)	18	0	0	0	124	33
Control Delay (s)	9.4	0.0	0.0	0.0	33.2	12.0
Lane LOS	A				D	B
Approach Delay (s)	3.5		0.0		23.3	
Approach LOS					C	

Intersection Summary			
Average Delay	8.3		
Intersection Capacity Utilization	47.8%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	14	410	458	28	84	63
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	15	446	498	30	91	68
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	528				989	513
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	528				989	513
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				66	88
cM capacity (veh/h)	1039				270	561

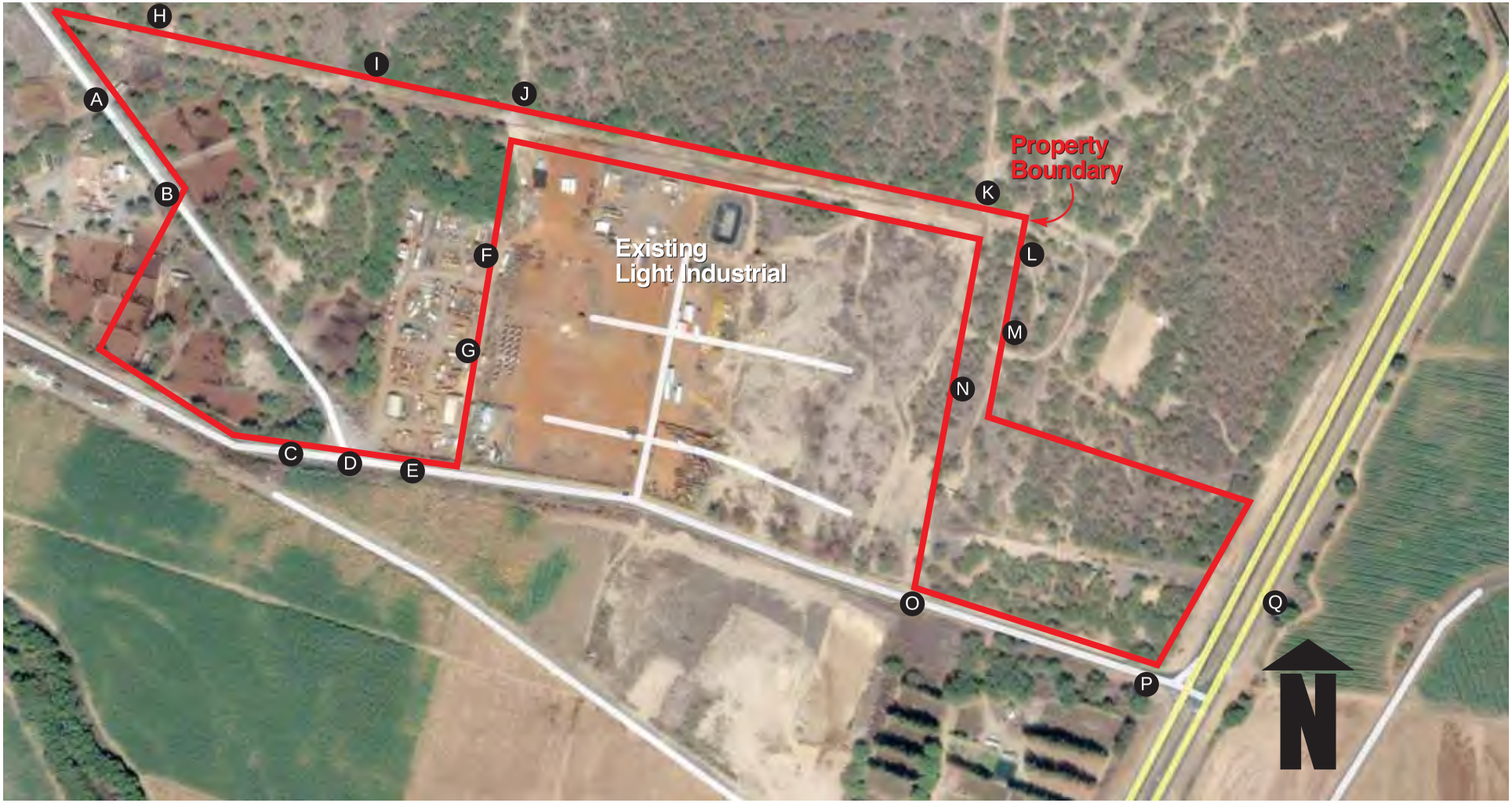
Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	461	528	160
Volume Left	15	0	91
Volume Right	0	30	68
cSH	1039	1700	347
Volume to Capacity	0.01	0.31	0.46
Queue Length 95th (ft)	1	0	58
Control Delay (s)	0.4	0.0	23.9
Lane LOS	A		C
Approach Delay (s)	0.4	0.0	23.9
Approach LOS			C

Intersection Summary			
Average Delay	3.5		
Intersection Capacity Utilization	48.1%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix Q

Aerial Photo of Project Site

Aerial Photo of Project Site



Appendix R

View Photos of Project Site

O View facing North from Southern Adjoining Property East Boundary of Project Site (Fronting Waikō Road)

P View facing North from Southern Adjoining Property East End at Corner of Waikō Road and Kūihelani Highway (East Boundary of Project Site)

Q View facing West from Across Kūihelani Highway

Ⓐ View facing Northeast from Western Adjoining Property

Ⓑ View facing Northeast from Western Adjoining Property

Ⓒ View facing North from Southern Adjoining Property Fronting Waikō Road (Western Boundary of Project Site)

Ⓓ View facing Northwest from Southern Adjoining Property (Fronting Waikō Road) (Western Boundary of Project Site)

Ⓔ View facing North from Southern Adjoining Property (Fronting Waikō Road)

Ⓕ View facing West from Fong Construction Baseyard

Ⓖ View facing West from Fong Construction Baseyard

Ⓗ View facing South from Northern Adjoining Property

Ⓘ View facing South from Northern Adjoining Property

J View facing South from Northern Adjoining Property (View behind Existing Light Industrial Consolidated Baseyard Lots)

K View facing South from Northern Adjoining Property (View behind Existing Light Industrial Consolidated Baseyard Lots)

Ⓛ View facing West from Eastern Adjoining Property

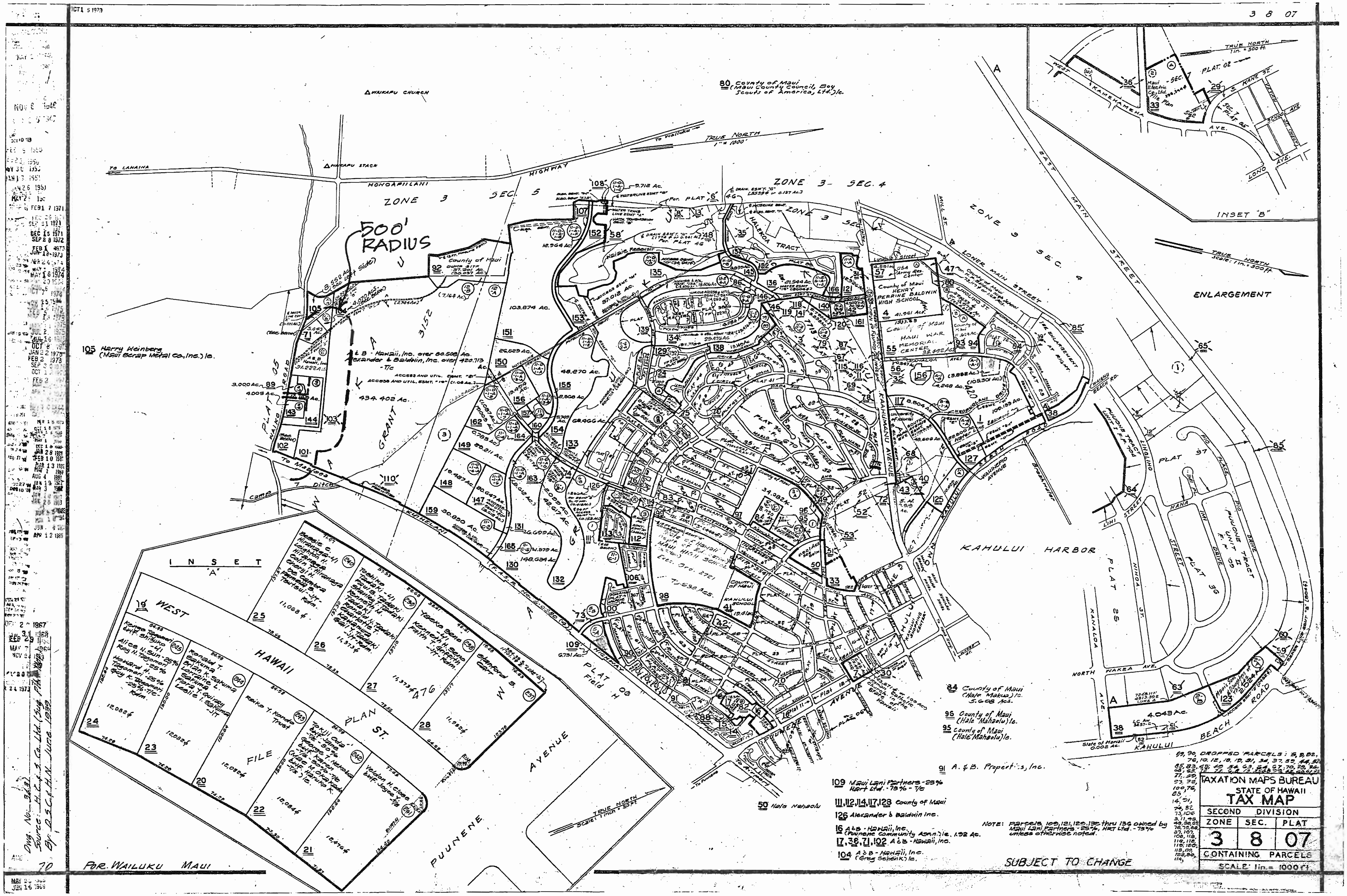
Ⓜ View facing West from Eastern Adjoining Property

Ⓝ View facing East from Boundary Opposite Eastern Adjoining Property

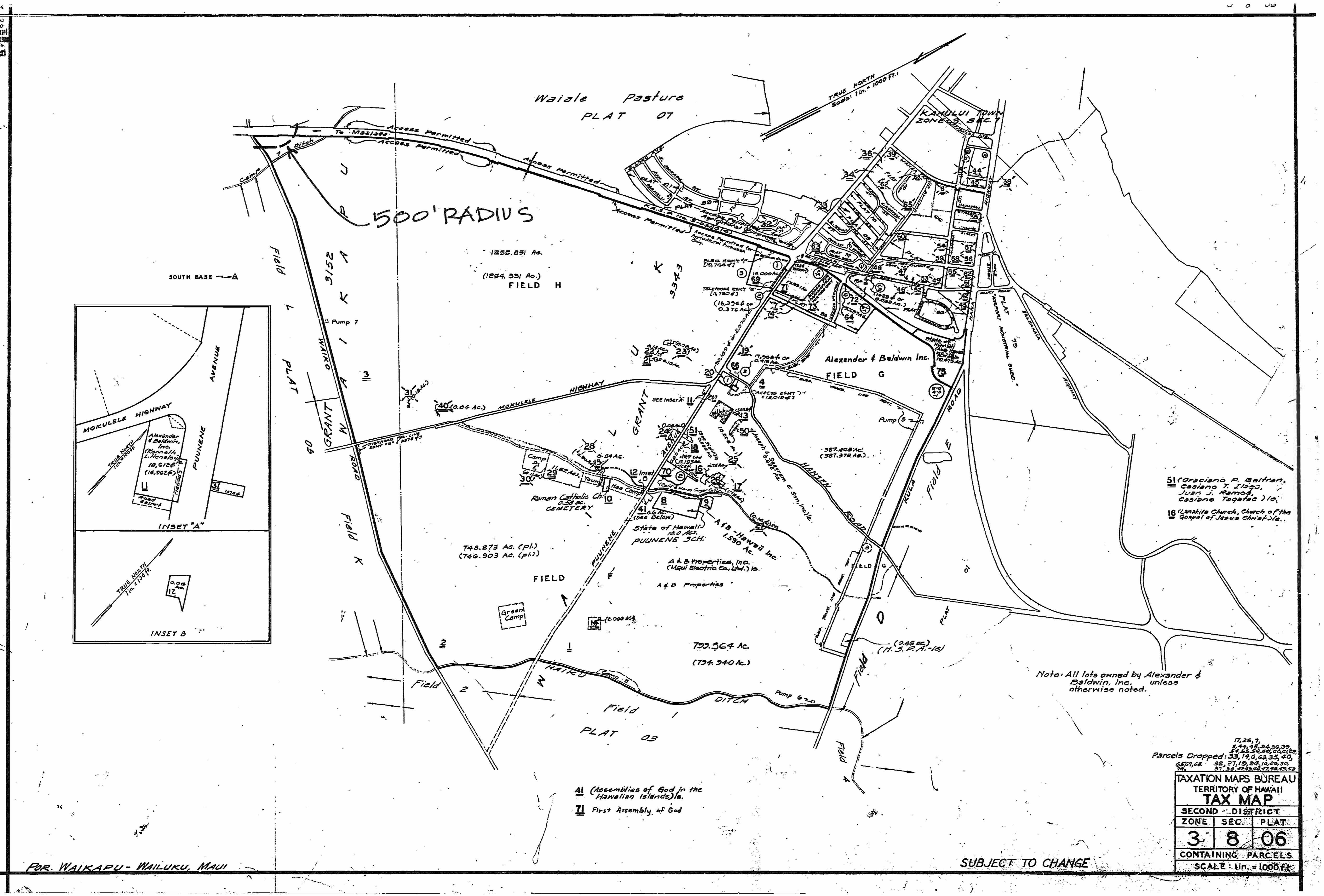
Appendix S

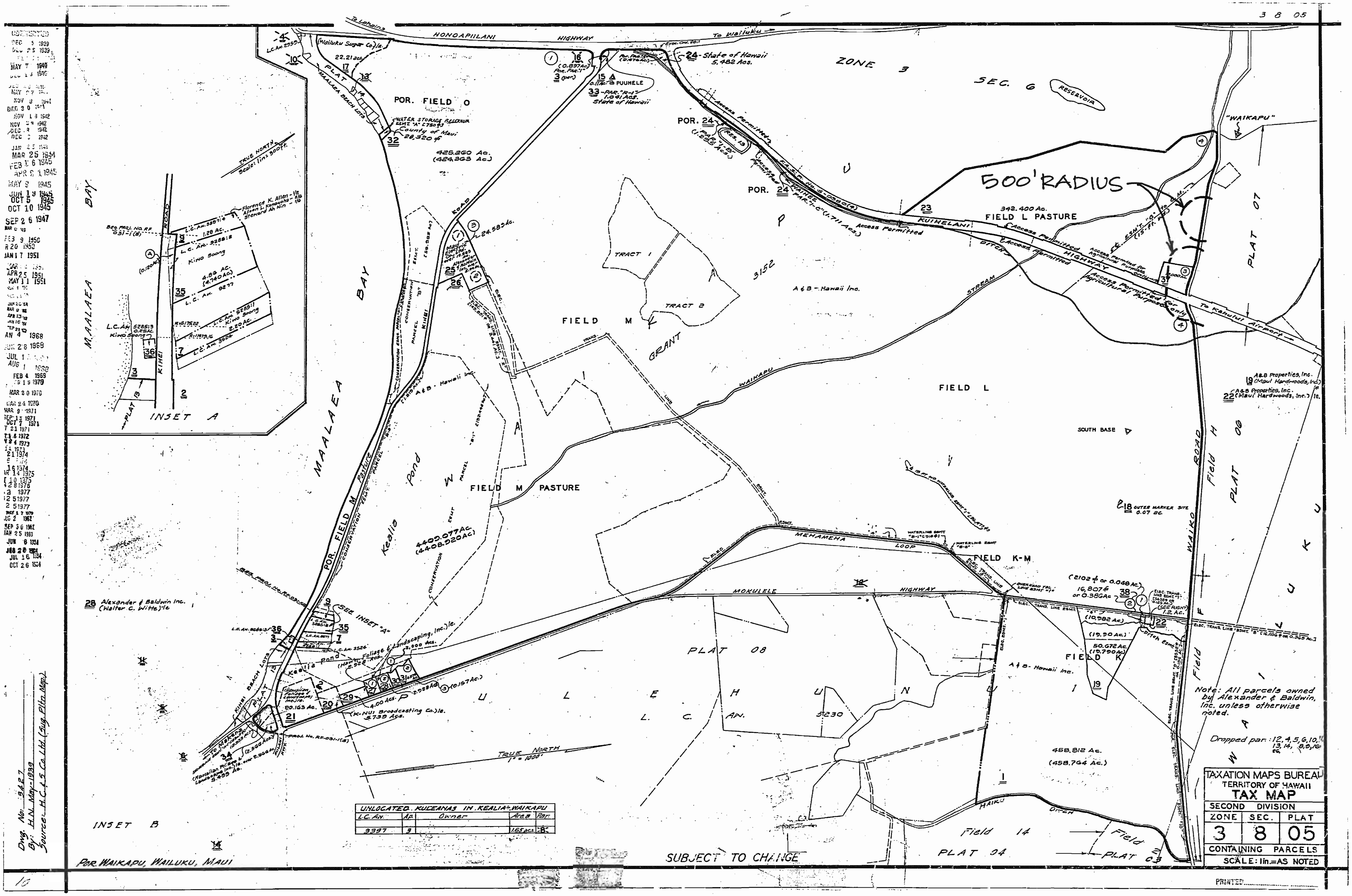
TMK Map Identifying Owners Within 500-Foot Radius

Property Owners Within the 500-Foot Radius of TMK: (2) 3-8-007:102



Dwg. No: 3231
Source: H.C.&S. Co. Ltd. (Sug. Plt. Map)
By: D.S.C.&H.N. June 1939
Por. WAILUKU MAUI
ZONE 3 SEC. 5
ZONE 3- SEC. 4
ZONE 3 SEC. 6
ZONE 3 SEC. 4
500' RADIUS
HONOAPIILANI HIGHWAY
TO LAHAINA
To Wailuku
TRUE NORTH 1" = 1000'
KAAHUMANU AVENUE
LOWER MAIN STREET
EAST MAIN STREET
KAHULUI HARBOR
KAHULUI BEACH ROAD
PUUNENE AVENUE
GRANT
HALEKOA TRACT
PUUONE TRACT UNIT II F.P. 60
INSET "A"
WEST HAWAII PLAN ST. FILE 476
INSET "B"
ENLARGEMENT
TRUE NORTH Scale: 1 in. = 500 ft.
TRUE NORTH Scale: 1 inch = 50 ft.
80 County of Maui (Maui County Council, Boy Scouts of America, Ltd.)/e.
105 Harry Weinberg (Maui Scrap Metal Co., Inc.)/e.
A & B - Hawaii, Inc. over 80.508 Ac. Alexander & Baldwin, Inc. over 420.713 Ac. -T/c
434.402 Ac.
92 County of Maui
4 County of Maui HENRY PERRINE BALDWIN HIGH SCHOOL 41.961 Acs.
55 MAUI WAR MEMORIAL CENTER
84 County of Maui (Hale Makua)/c. 5.608 Acs.
96 County of Maui (Hale Mahaolu)/e.
95 County of Maui (Hale Mahaolu)/e.
91 A. & B. Properties, Inc.
109 Maui Lani Partners - 25% Hart Ltd. - 75% - T/c
111, 112, 114, 117, 128 County of Maui
126 Alexander & Baldwin Inc.
16 A & B - Hawaii, Inc. (Puunene Community Assn.)/e. 1.92 Ac.
17, 38, 71, 102 A & B - Hawaii, Inc.
104 A & B - Hawaii, Inc. (Greg Schenk)/e.
50 Hale Nehaolu
NOTE: Parcels 109, 121, 129, 130 thru 136 owned by Maui Lani Partners - 25%, Hart Ltd. - 75% unless otherwise noted.
SUBJECT TO CHANGE
TAXATION MAPS BUREAU
STATE OF HAWAII
TAX MAP
SECOND DIVISION
ZONE SEC. PLAT
3 8 07
CONTAINING PARCELS
SCALE: 1 in. = 1000 ft.
3 8 07


Waiale Pasture
PLAT 07
500' RADIUS
KAHULUI TOWN ZONE 3 SEC. 7
TRUE NORTH Scale: 1 in. = 1000 Ft.
Access Permitted
To Maalaea
1255.251 Ac.
(1254.331 Ac.)
FIELD H
Alexander & Baldwin Inc.
FIELD G
HIGHWAY
MOKULELE HIGHWAY
GRANT
WAIKO ROAD
KULA ROAD
HANSEN ROAD
PUUNENE AVENUE
Field L
PLAT 05
Field K
Field E
Field D
Field 2
Field 1
Field 4
PLAT 03
WAIKO DITCH
FIELD F
387.405 Ac.
(387.372 Ac.)
748.273 Ac. (pl.)
(746.903 Ac. (pl.))
793.564 Ac.
(794.940 Ac.)
Roman Catholic Ch.
CEMETERY
State of Hawaii
PUUNENE SCH.
A & B Hawaii Inc.
A & B Properties, Inc.
(Maui Electric Co., Ltd.) le.
A & B Properties
Green Camp
Pump 7
Pump 5
Pump 6
SOUTH BASE
51 (Graciano P. Beltran, Casiano T. Ilagan, Juan J. Ramos, Casiano Tagatac) le.
16 (Lanakila Church, Church of the Gospel of Jesus Christ) le.
Note: All lots owned by Alexander & Baldwin, Inc. unless otherwise noted.
41 (Assemblies of God in the Hawaiian Islands) le.
71 First Assembly of God
INSET "A"
INSET B
Parcels Dropped: 17,25,7, 5,44,45,34,36,39, 54,55,56,57,60,61,62, 33,14,6,63,35,40, 32,27,19,24,10,29,30, 31,38,42,43,46,47,48,49,53
TAXATION MAPS BUREAU
TERRITORY OF HAWAII
TAX MAP
SECOND DISTRICT
ZONE 3 SEC. 8 PLAT 06
CONTAINING PARCELS
SCALE: 1 in. = 1000 Ft.
SUBJECT TO CHANGE
POR. WAIKAPU - WAILUKU, MAUI
Dwg. No. 3436
Source: H.C. & S. Co. (Sugar Pltn. Map)
By: D.S.C. & H.N. May 1939



3 8 05
HONOAPIILANI HIGHWAY
To Lahaina
To Wailuku
ZONE 3
SEC. 6
RESERVOIR
"WAIKAPU"
POR. FIELD O
MAALAEA BAY
INSET A
INSET B
KIHEI ROAD
500'RADIUS
342.400 Ac.
FIELD L PASTURE
KUIHELANI HIGHWAY
To Kahului Airport
FIELD L
FIELD M
FIELD M PASTURE
FIELD K-M
FIELD K
Kealia Pond
TRACT 1
TRACT 2
GRANT 3152
A & B - Hawaii Inc.
MEHAMEHA LOOP
MOKULELE HIGHWAY
WAIKO ROAD
PLAT 07
PLAT 06
PLAT 08
PLAT 04
PLAT 03
Field 14
Field H
HAIKU DITCH
STREAM
WAIKAPU
SOUTH BASE
18 OUTER MARKER SITE 0.07 Ac.
458.812 Ac. (458.764 Ac.)
4400.077 Ac. (4408.920 Ac.)
425.260 Ac. (424.863 Ac.)
28 Alexander & Baldwin Inc. (Walter C. Witte) le.
19 A&B Properties, Inc. (Maui Hardwoods, Inc.)
22 A&B Properties, Inc. (Maui Hardwoods, Inc.) le.
24 - State of Hawaii 5.482 Acs.
33 - PAR. "R-1" 1.041 Acs. State of Hawaii
15 PUUHELE
32 WATER STORAGE RESERVOIR ESMT. "A" County of Maui 28,320 sf
Note: All parcels owned by Alexander & Baldwin, Inc. unless otherwise noted.
Dropped par.: 12, 4, 5, 6, 10, 13, 14, 8, 9, 16
UNLOCATED KULEANAS IN KEALIA-WAIKAPU
L.C.Aw. | Ap. | Owner | Area | Par.
3397 | 3 | | 1.65 Acs. | 8
TRUE NORTH 1" = 1000'
SUBJECT TO CHANGE
Por. WAIKAPU, WAILUKU, MAUI
Dwg. No: 9427
By: H.N. May-1939
Source: H.C.&S. Co. Ltd. (Sug. Pltn. Map)
TAXATION MAPS BUREAU
TERRITORY OF HAWAII
TAX MAP
SECOND DIVISION
ZONE 3 SEC. 8 PLAT 05
CONTAINING PARCELS
SCALE: 1 in. = AS NOTED
PRINTED

Property Owners Within 500 Feet Radius
of Waiko Industrial Investment LLC Parcel
TMK: (2) 3-8-007:102

TMK	Owner	Mailing Address
(2) 3-8-005:002	A & B Hawaii Inc.	P.O. Box 156, Kahului, HI 96732
(2) 3-8-005:023	A & B Hawaii Inc.	P.O. Box 156, Kahului, HI 96732
(2) 3-8-005:037	A & B Hawaii Inc.	P.O. Box 156, Kahului, HI 96732
(2) 3-8-006:003	A & B Hawaii Inc.	P.O. Box 156, Kahului, HI 96732
(2) 3-8-007:071	A & B Hawaii Inc.	P.O. Box 156, Kahului, HI 96732
(2) 3-8-007:104	A & B Hawaii Inc.	P.O. Box 156, Kahului, HI 96732
(2) 3-8-007:101	A & B Hawaii Inc.	P.O. Box 156, Kahului, HI 96732
(2) 3-8-094:030	Lane's Development LLC	530 E. Uahi Way, Wailuku, HI 96793
(2) 3-8-007:105	ABC Development Co., LLC	815 Waikamilo Rd., Honolulu, HI 96817
(2) 3-8-094:031	Steven D. Allen	2734 Kalialani St., Pukalani, HI 96868
(2) 3-8-094:032	PFI Realty V LP	30318 Longhorn Dr., Canyon Lake, CA 92587
(2) 3-8-094:033	La'a Kea Properties LLC	4641 Little Uvas Rd., Morgan Hill, CA 95037
(2) 3-8-094:034	HD Maui LLC	2308 Pahounui Dr., Honolulu, HI 96819
(2) 3-8-094:035	KC Commercial LLC	300 E. Uahi Way, Wailuku, HI 96793
(2) 3-8-094:001	Phillip Anthony Feliciano	58 Amala Pl., Kahului, HI 96732
(2) 3-8-094:002	A & D Properties LLC	P.O. Box 880687, Pukalani, HI 96788
(2) 3-8-094:028	Pacific Source Properties Maui LLC	20321 Broadway Ave., Snohomish, WA 98296
(2) 3-8-094:027	Aina Maui Holding Co., LLC	10 Kamalei Circle, Kahului, HI 96732
(2) 3-8-094:036	Consolidated Baseyards LLC	2073 Wells St., Suite 101, Wailuku, HI 96793
(2) 3-8-094:026	Dennis C. Franco	P.O. Box 532, Puunene, HI 96784
(2) 3-8-094:003	Michael Robertson	110 W. Uahi Way, Wailuku, HI 96793
(2) 3-8-094:025	KCG Waiko LLC	1258 Kilou Lp., Wailuku, HI 96793
(2) 3-8-094:006	Waikapu Center I - Condo Master	P.O. Box 3124, Kahului, HI 96732
(2) 3-8-094:005	Bert S. Shiroma Trust	77 Waiale Dr., Suite 102, Wailuku, HI 96793
(2) 3-8-094:020	Valley Isle Excursions Inc.	390 Papa Pl., Unit B, kahului, Hi 96732
(2) 3-8-094:021	Maui Petroleum Inc.	385 Hukilike St., Suite 102, Kahului, HI 96732
(2) 3-8-094:004	CALROD LLC	495 Hukilike St., Bay #4, Kahului, HI 96732

(2) 3-8-094:022	Pinnacle Consolidated LLC	57 E. Mahi Pua Pl., Lahaina, Hi 96761
(2) 3-8-094:023	Waikapu Center II - Condo Master	P.O. Box 3124, Kahului, HI 96732
(2) 3-8-094:008	Waiko Elua Baseyard LLC	77 Waiale Dr., Suite 102, Wailuku, HI 96793
(2) 3-8-094:009	Alpha Par Partners	951 Kailiu Pl., Honolulu, HI 96825
(2) 3-8-094:017	Commercial Plumbing Properties LLC	1820 Colburn St., Honolulu, HI 96819
(2) 3-8-094:016	CYMK Development LLC	P.O. Box 1181, Haiku, HI 96708
(2) 3-8-094:015	CBY-15 LLC	P.O. Box L, Libertyville, IL 60048
(2) 3-8-094:011	Lite Electric Inc.	50 Kaniela St., Wailuku, Hi 96793
(2) 3-8-094:010	Reef Development Of Hawaii Inc.	99-930 Iwaena St., #106, Aiea, HI 96701
(2) 3-8-094:018	Massdec LLC	19201 Susana Rd., Rancho Dominquesz, CA 90221
(2) 3-8-094:014	Richard N Barreras Trust	860 Eha St., Wailuku, Hi 96793
(2) 3-8-094:013	Baseyards 13 LLC	1132 Bishop St., Suite 1600, Honolulu, HI 96813
(2) 3-8-094:012	Maui Storage Space - Condo Master	12 Kaimau St., Paia, HI 96779

Appendix T

Department of Planning Zoning and Flood Confirmation Form

COUNTY OF MAUI
DEPARTMENT OF PLANNING
Kalana Pakui Building
250 South High Street
Wailuku, Hawaii 96793

Zoning Administration and
Enforcement Division (ZAED)
Telephone: (808) 270-7253
Facsimile: (808) 270-7634
E-mail: planning@mauicounty.gov

ZONING AND FLOOD CONFIRMATION FORM

APPLICANT INFORMATION *(To be completed by Applicant)*

APPLICANT NAME Vince G. Bagoyo TELEPHONE (808) 357-3842

PROJECT NAME Waiko Industrial Development E-MAIL Vbagoyo-devgroup@hawaii.rr.com

ADDRESS/LOCATION Waiko Road, Wailuku, Maui, Hawaii TAX MAP KEY (2) 3-8-007:102

☐ Yes ☒ No Will this Zoning and Flood Confirmation Form be used with a Subdivision Application, including four (4) or more dwelling units on a parcel, but NOT including subdivisions listed and processed under the exceptions in Section 18.04.030(B), Maui County Code? **IF YES, LIST THE PROPOSED LAND USES BELOW:**

NOTE: 1) **Use a separate Zoning and Flood Confirmation Form for each Tax Map Key (TMK) number.**
2) **If the above "Yes" box is checked AND if the zoning information for the subject property contains multiple State Land Use Districts, Community Plan Designations, or County Zoning, a signed and dated Land Use Designations (LUD) Map, prepared by a licensed surveyor showing all the various districts, designations, zonings, and any subdistricts, shall be submitted for review and approval.**
3) **If the above "Yes" box is checked AND if there are multiple State Land Use District designations, the applicant shall procure a District Boundary Interpretation from the State Land Use Commission.**

FOR COUNTY USE ONLY *(To be completed by ZAED)*

ZONING INFORMATION

STATE LAND USE DISTRICT(S) Agricultural

COMMUNITY PLAN DESIGNATION(S) Agricultural

COUNTY ZONING(S) Agricultural

OTHER DESIGNATION(S) N.A.

☐ Yes ☒ No See Additional Comments On Page Two

☐ Yes ☒ No See The Attached Land Use Designation Map

☐ Yes ☒ No SPECIAL MANAGEMENT AREA (SMA)

☐ Yes ☒ No PLANNED DEVELOPMENT

☐ Yes ☒ No PROJECT DISTRICT

FLOOD INFORMATION

FLOOD HAZARD AREA ZONE(S) X For Flood Zone AO, FLOOD DEPTH N.A.

BASE FLOOD ELEVATION(S) N.A. feet mean sea level, Local Tidal Datum.

*FLOODWAY ☐ Yes ☒ No *FLOOD DEVELOPMENT PERMIT REQUIRED ☐ Yes ☒ No

*For flood hazard area zones X or XS, a flood development permit would be required if any work is done in any drainage facility or stream area that would reduce the capacity of the drainage facility, river, or stream, or adversely affect downstream property.

*For subdivisions in ALL FLOOD HAZARD AREA ZONES (including zones X or XS) that involve streams, gulches, low areas, or any type of drainageway, a designation of the 100 year flood inundation limits or a drainage reserve may be required.

SUBDIVISION CONSISTENCY [*Section 18.04.030(D), Maui County Code*]

☒ N/A (Not Applicable) ☐ **The proposed land uses appear to be consistent _____ a unilateral agreement.

Except as permitted in Section 18.04.030(B) MCC, property containing any Interim Zoning shall NOT be subdivided.

Comments: _____

☐ **The proposed land uses appear to NOT be consistent.

Comments: _____

** All proposed subdivisions will be further reviewed during the subdivision application process to verify subdivision consistency, unilateral agreement requirements, and the conditions associated with a unilateral agreement.

REVIEWED & CONFIRMED BY:

Russell T. Tsuji 1/20/11

(Signature) (Date)

For: AARON SHINMOTO, Planning Program Administrator, Zoning Administration and Enforcement Division

Appendix U

Water Resources Report by Tom Nance Water Resources Engineering

Tom Nance Water
Resource Engineering

No. of pages: 11
Email: devgroup@hawaii.rr.com

Original ☑ will ☐ will not be mailed to you.

March 1, 2011
11-062 | 11-08

MEMORANDUM

To: Vince Bagoyo - Waiko Industrial Developments

From: Tom Nance

Subject: Capability of the Two Consolidated Baseyard Wells to Supply the Proposed Waiko Industrial Park

Introduction

This memo and its attachments evaluate the capability of the two Consolidated Baseyard wells (State Nos. 5129-02 and 03) to supply the proposed Waiko Industrial Park in addition to their service of the 35-lot Consolidated Baseyard Subdivision. Waiko Industrial Park would be located on the 31.22-acre parcel identified as TMK 3-8-07:102. Its lots would be adjacent to and on the west and east sides of the Consolidated Baseyard Subdivision (Figure 1).

Required Well Supply for Both Industrial Subdivisions

The "Preliminary Engineering Report for New Potable Water Sources at Consolidated Baseyard Subdivision" prepared in February 2006 by Austin Tsutsumi & Associates, Inc. (ATA) presents design amounts for the subdivision's required supply. ATA's computed average demand consisted of 76,400 gallons per day (GPD) for the 35 lots and 6,600 GPD for common area irrigation, amounting to a total of 83,000 GPD. It should be noted that this design rate is less than Maui County Department of Water Supply (DWS) standards. DWS' standards require 6000 GPD/acre. As a private system, ATA used different design criteria which amounted to an average of 3860 GPD per acre for the lots. This is relatively close to the 4000 GPD/acre standard used by all other municipal water systems in the state.

Assuming 85 percent of the gross area of Waiko Industrial Park is lots (the remainder being roadways), applying 4000 GPD/acre for this net lot area, and adding an allowance of 15,000 GPD for roadway landscape irrigation results in a total average demand of 139,890 GPD:

31.2224 Ac. x 4000 GPD/acre + 15,000 GPD = 139,890 GPD

With 139,890 GPD for Waiko Industrial Park, the total average demand for both subdivisions would be 222,890 GPD. The maximum day supply requirement, defined as 1.5 times the average demand (DWS' standard, also used by ATA), amounts to 334,335 GPD. Several different design criteria to size well pumping capacity could be used to meet this maximum day amount. These criteria are:

1. Provide the maximum day demand in a 16-hour pumping day with the largest well out of service. This is a criterion of Maui DWS which was used, in part, by ATA.

2. Provide the maximum day demand in a 24-hour pumping day with the largest well out of service. This criteria is used by the Hawaii and Kauai County municipal systems, as well as by most private water systems in the state.

3. Provide the maximum day demand in a 19-hour pumping day. This is a pragmatically adopted criterion of several private water systems that have very deep wells (pumping lifts of more than 1000 feet). This criterion limits pumping to off-peak hours in order to get a lower rate schedule from the power utility.

For Consolidated Baseyard, ATA applied Criterion 1 to the largest of its two wells (resulting in a required 130 GPM), but not to the smaller well as the standard would require. In other words, the ATA design does not provide full standby capacity. For both subdivisions combined, the three sizing criteria result in the following required well pumping capacities for each of the Consolidated Baseyard wells:

Criterion	Required Pumping Capacity (GPM)
1	348
2	232
3	293

In my opinion, Criterion 1 is overly conservative and Criterion 3 is not necessary as pumping costs are very modest for this system. Criterion 2, requiring 232 GPM from each of the wells to provide full back up capacity, is more than acceptable. For the balance of the assessment herein, a requirement of 235 GPM from each well is used.

Hydraulic Capacities of the Consolidated Baseyard Wells

Figures 2 and 3 are reproductions of the well sections prepared by ATA from the information in the drilling contractor's Well Completion Reports. Their respective performances, based on their original step-drawdown tests, are depicted on Figure 4. Although the hydraulic performance of each well was very good, neither was tested at the 235 GPM pumping rate required to accommodate the addition of Waiko Industrial Park. Well 1, the smaller of the two wells with 8-inch casing, was pumped at just 60 GPM. Well 2, with larger 10-inch casing, was tested at 150 GPM. Figure 5 depicts extrapolations of the step test curves to (and slightly beyond) the 235 GPM pumping requirement. At this required rate, the drawdown in Well 1 would be about 2.0 feet. In Well 2, it would be about 2.3 feet. Both of these drawdowns would primarily be turbulent loss rather than an actual aquifer response. The wells do have adequate hydraulic capacity to supply both subdivisions.

Long-Term Salinity of the Consolidated Baseyard Wells at Increased Pumping Rates

The constant rate pump test of Well 1 in 2001 was at 60 GPM for 12 hours. Its salinity was stable throughout. Well 2 was tested in 2005 at 100 GPM for 24 hours. Its salinity steadily decreased throughout the test. Samples collected from both wells on February 17, 2011 had lower salinities than the original testing of each well. Pump tests of the nearby A&B Waiale Wells 1 and 2 were run at 550 GPM, producing relatively stable salinities. All of these results suggest that a pumping rate of 235 GPM should be sustainable at a stable and acceptable salinity level.

Present (Year 2010) Use of the Consolidated Baseyard Wells

Figure 6 presents the combined well pumpage of the two Consolidated Baseyard wells through 2010. More than 98 percent of the pumpage was from Well 2, as Well 1 is considered a back up and is run only often enough to keep it functional. The subdivision is now more than half occupied, but the water use is far less than half the design use rate. It is obvious that the design use amount on which the well capacities are based is very conservative. It is unlikely that the actual use at full build out will approach the design capacity.

Conclusions, Recommendations, and Other Observations

1. The addition of water service to the Waiko Industrial Park from the Consolidated Baseyard system would require both of its well pumps to be replaced with new pumps capable of delivering 235 GPM to the system's 0.35 MG, 250-foot (spillway elevation) tank. Both well pumps would be driven by 25-horsepower motors. The pumps presently in Wells 1 and 2 are driven by 7.5- and 15-horsepower motors, respectively.

2. Both wells have adequate hydraulic capacity to deliver 235 GPM to the 250-foot storage tank with only modest drawdowns. The 4-inch pipeline from Well 2 to the tank, of about 500-foot length, could accommodate the higher pumping rate.

3. Based on available data, it appears that long-term salinity will be stable at the increased pumping rate. However, neither well has been used to a significant extent or pumped at the required higher rate. As an assurance that both parties need to have, it would be appropriate to install a 235 GPM pump in one of the wells and run a pump test of a minimum of 72 hours duration to monitor the salinity response.

4. Consolidated Baseyard has a 0.35 MG storage tank. Two sizing criteria were applied by ATA to determine the tank's size. As indicated below, applying these two criteria with the addition of Waiko Industrial Park will not require additional storage.

   Criterion 1. Provide the maximum day demand would no credit for well inflow.

	Max. Day Amount (MG)
Consolidated Baseyard	0.1245
Waiko Industrial Park	0.2083
Combined Total	0.3328 (less than 0.35 MG)

Criterion 2. Provide a 2000 GPM fire flowrate for two-hour duration with coincident maximum day demand, the largest well out of service, and the reservoir 3/4 full at the start of the fire.

Consolidated Baseyard:

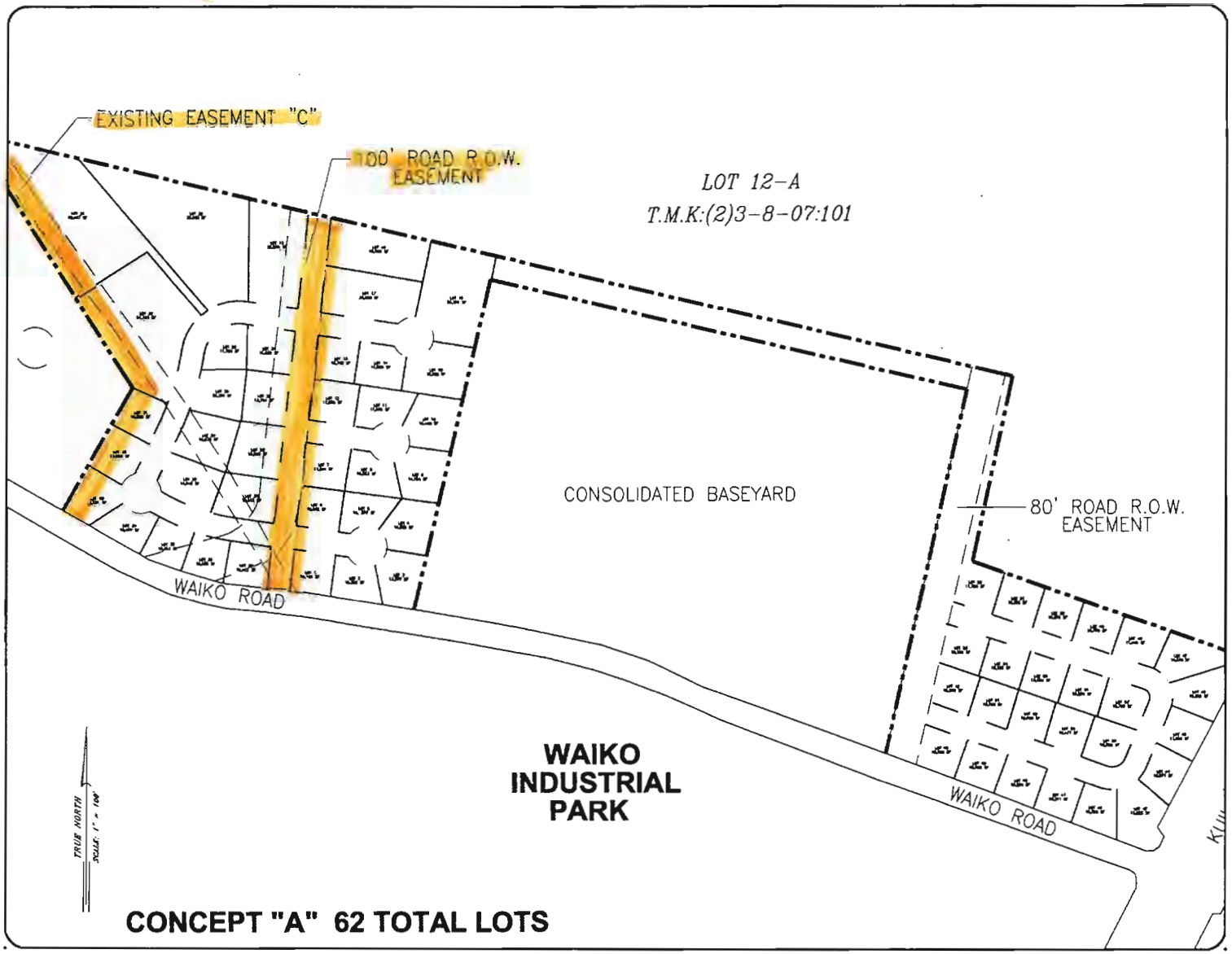
$$\left[\frac{124{,}500(2)}{24} + (2000)(120) - (60)(120)\right] x \frac{4}{3} = 324{,}233 \text{ Gallons (less than 0.35 MG)}$$

Addition of Waiko Industrial Park:

$$\left[\frac{332{,}800(2)}{24} + (2000)(120) - (235)(120)\right] x \frac{4}{3} = 319{,}378 \text{ Gallons (also less than 0.35 MG)}$$

5. DOH will not allow individual wastewater disposal systems (cesspools or leach fields) within 1000 feet of either of the Consolidated Baseyard drinking water wells. Many of the Waiko Industrial Park lots are inside these 1000-foot set back distances (Figure 7). Consolidated Baseyard dealt with this issue by requiring advanced septic systems for each lot and delivery of the effluent from these septic systems to a common leachfield in the southeast corner of the subdivision. A similar accommodation will be required of the Waiko Industrial Park.

Attachments



KENNETH L. FENCKS
PLANNING & DESIGN LLC
705 Pogue Street
Wailuku, Maui, Hawaii 96793
Office: 808-268-0442
Email: kenfencks@gmail.com

WAIKO INDUSTRIAL PARK

PREPARED FOR:
PACIFIC RIM LAND
PO-BOX-220
1300-NORTH-HOLOPONO-ST.
KIHEI-MAUI-HAWAII
96753

SHEET TITLE
CONCEPT"A"

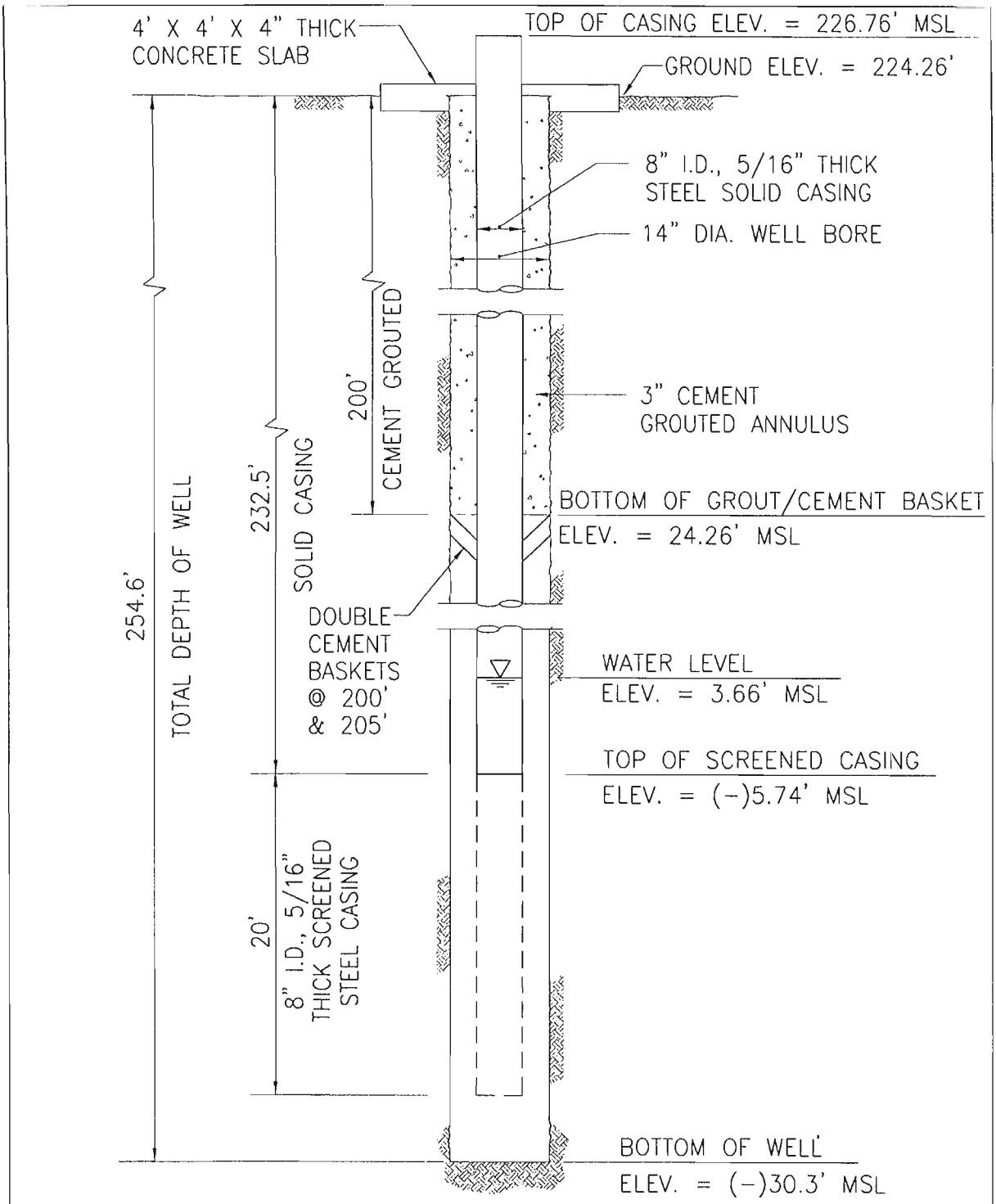
NO	DESCRIPTION	DATE	BY

JOB NUMBER 438-083 | DATE APRIL-28-2010
DESIGNED BY KLF | CHECKED BY KLF

SHEET SCALE 1"=100'
SHT-1
SHT of SHT

m_11-062 | 11-08

Figure 1
Proximity of Waiko Industrial Park to the Consolidated Baseyard Subdivision



CONSOLIDATED BASEYARDS, LLC
ENGINEERING REPORT FOR
NEW POTABLE WATER SOURCES
CONSOLIDATED BASEYARD SUBDIVISION
WAIKAPU, MAUI, HAWAII

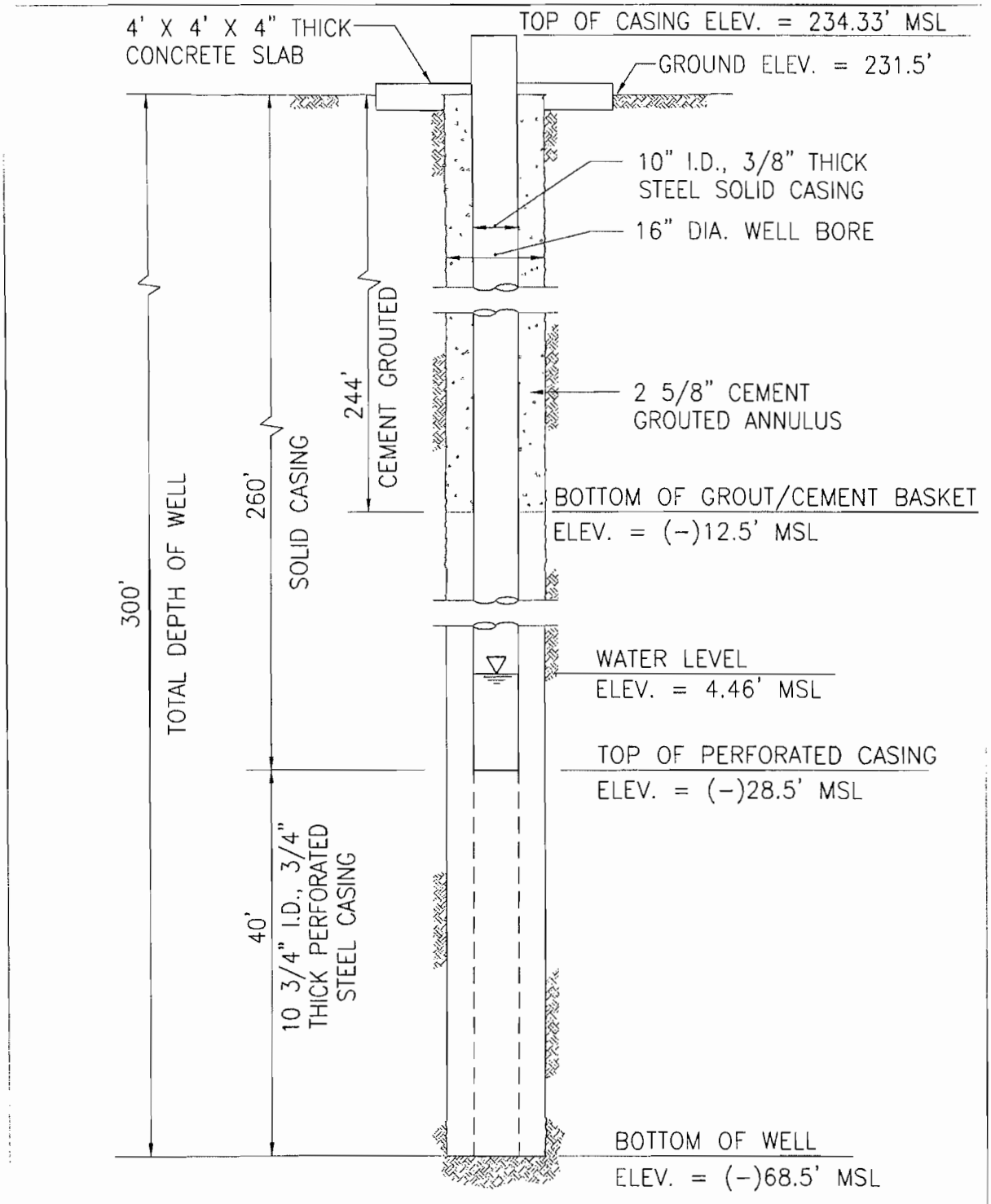
AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS, SURVEYORS • HONOLULU, HAWAII

WELL NO. 1 SECTION

EXHIBIT 8

m_11-062 | 11-08

Figure 2



CONSOLIDATED BASEYARDS, LLC

ENGINEERING REPORT FOR
NEW POTABLE WATER SOURCES
CONSOLIDATED BASEYARD SUBDIVISION
WAIKAPU, MAUI, HAWAII

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS, SURVEYORS • HONOLULU, HAWAII

WELL NO. 2 SECTION

EXHIBIT **9**

m_11-062 | 11-08

Figure 3

FIGURE 4. HYDRAULIC PERFORMANCE OF CONSOLIDATED BASEYARD WELLS 1 AND 2 BASED ON THEIR STEP-DRAWDOWN PUMP TESTS

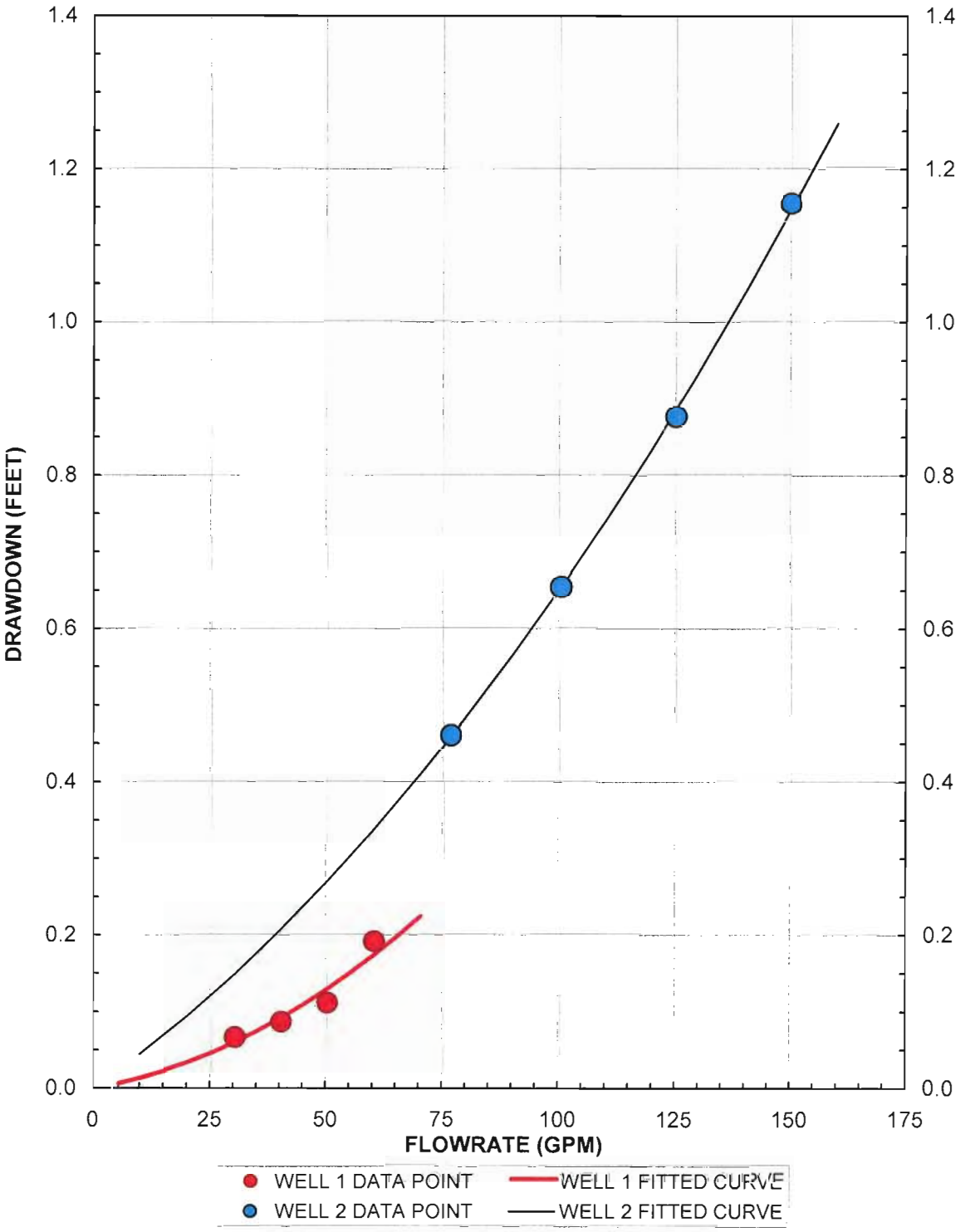


FIGURE 5. EXTRAPOLATED HYDRAULIC PERFORMANCE OF THE CONSOLIDATED BASEYARD WELLS 1 AND 2

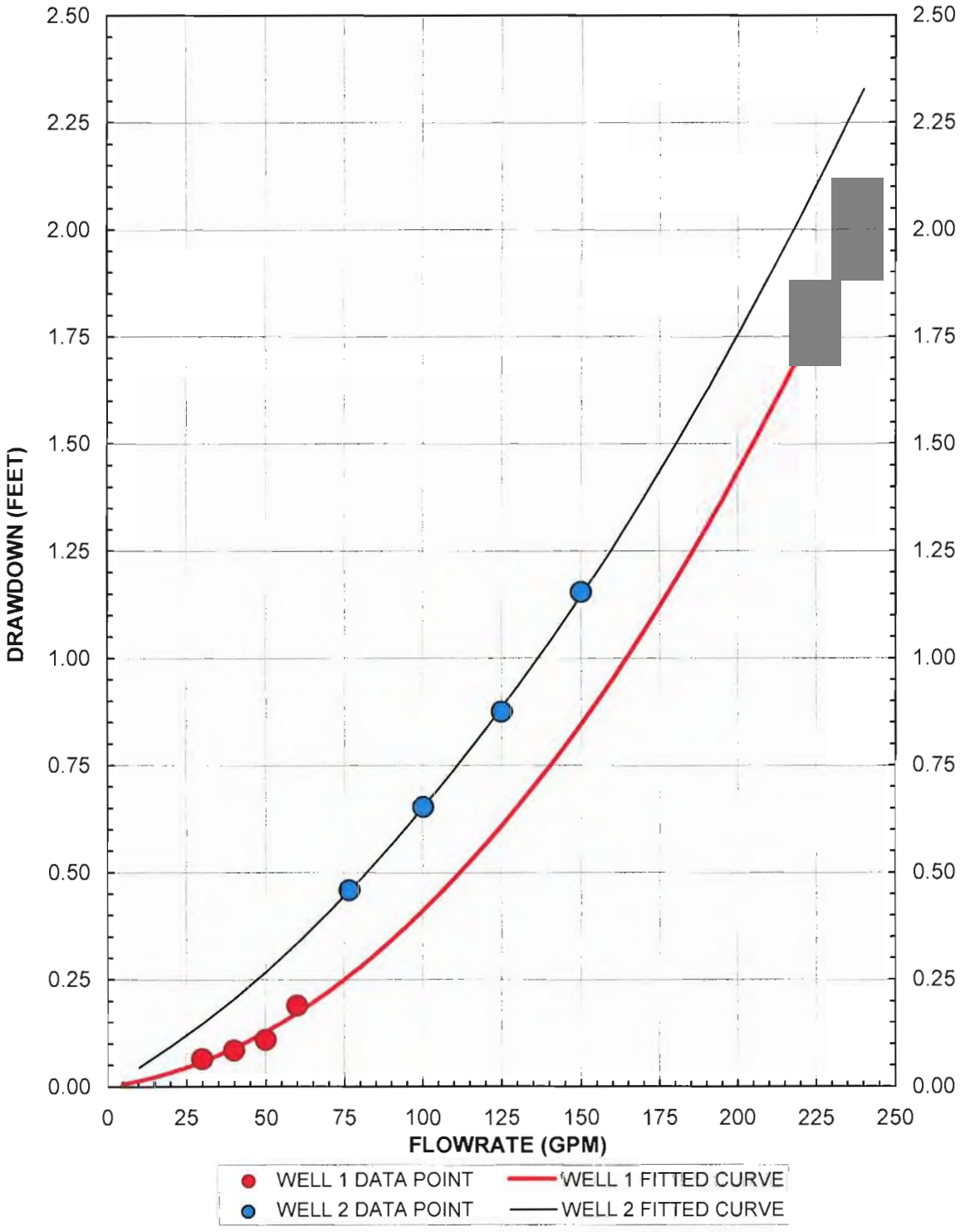
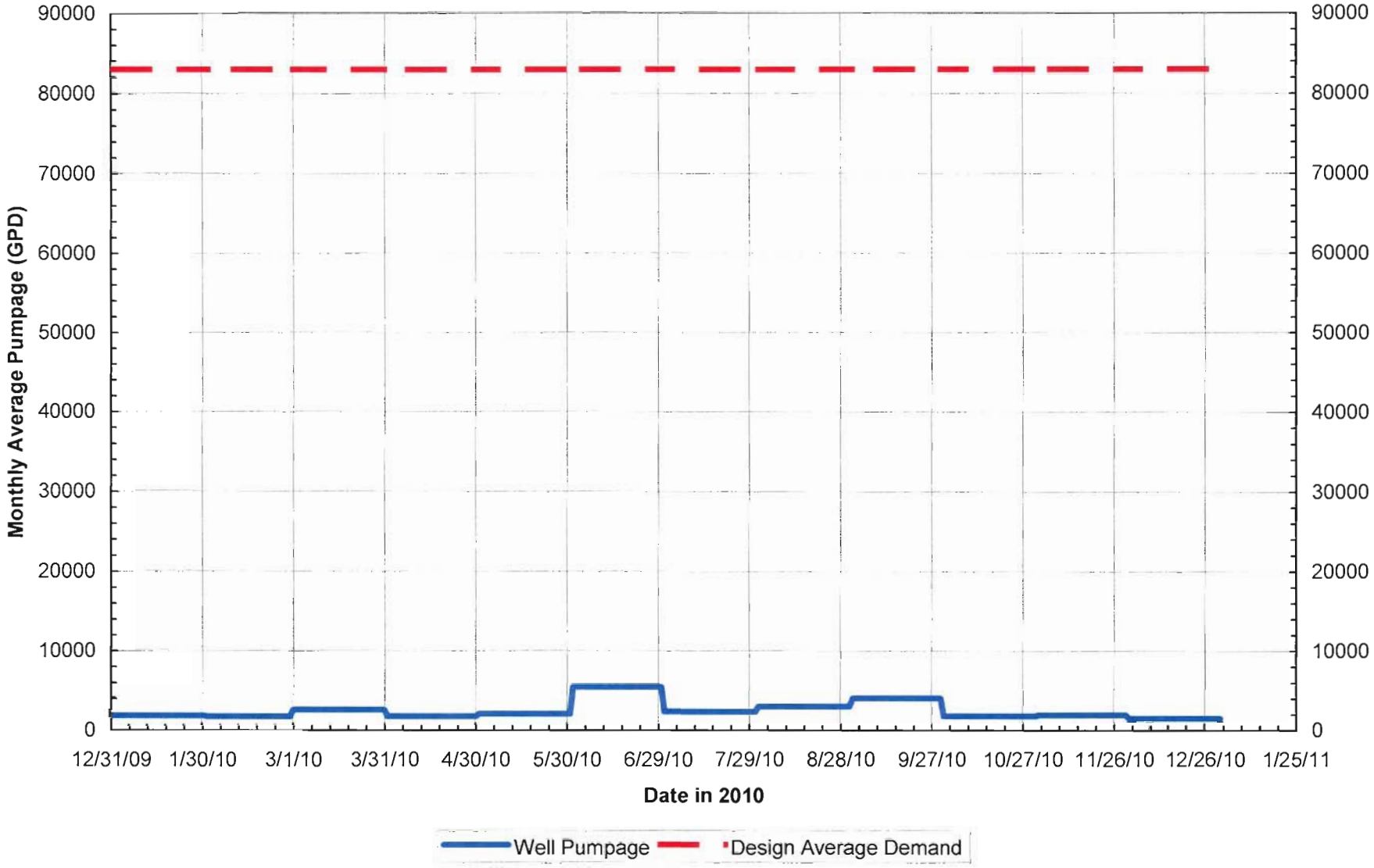
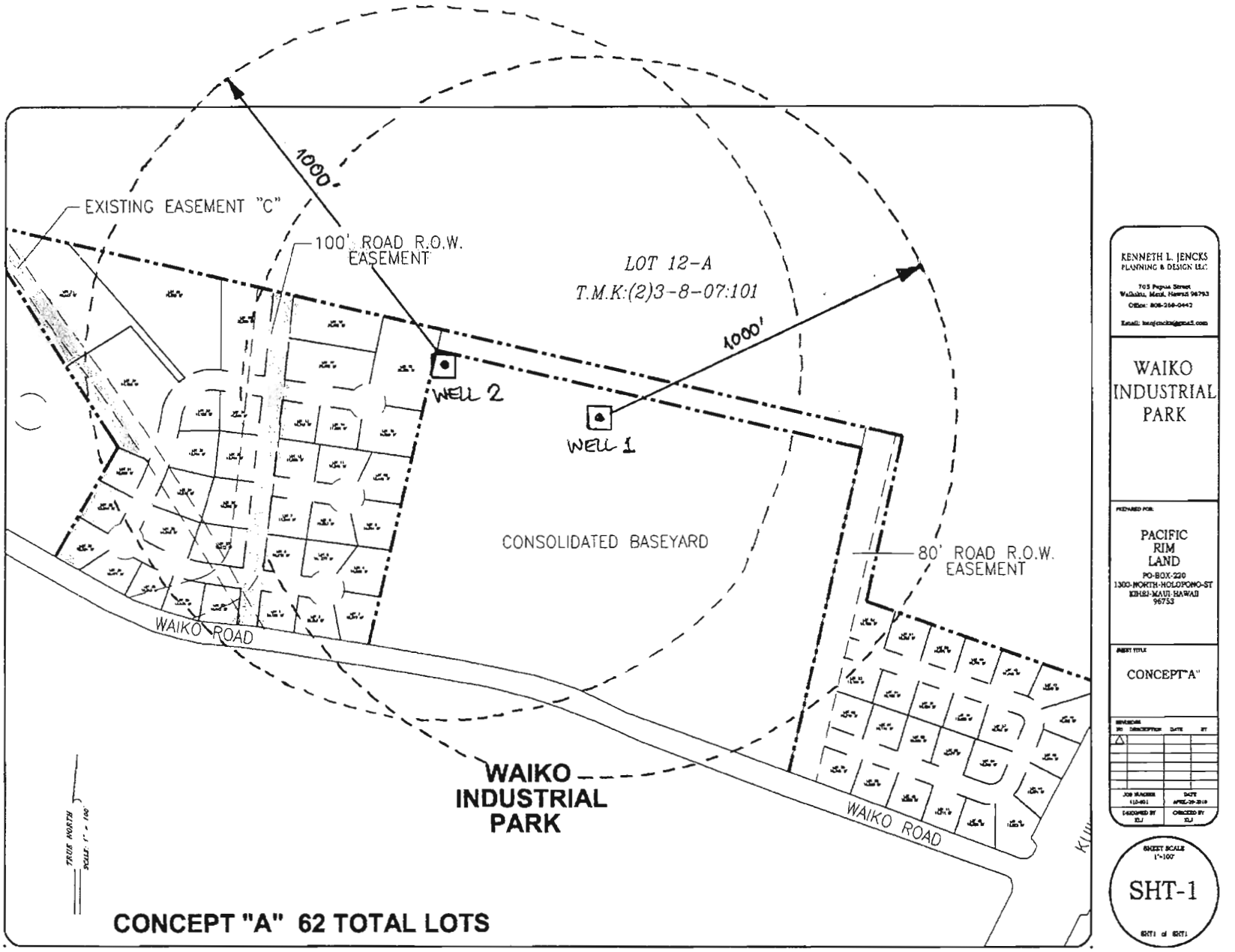


Figure 6. Monthly Average Pumpage of the Consolidated Baseyard Wells in 2010





KENNETH L. JENCKS
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705 Pepua Street
Wailuku, Maui, Hawaii 96793
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WAIKO INDUSTRIAL PARK

PREPARED FOR:
PACIFIC RIM LAND
PO-BOX-220
1300-NORTH-HOLOPONO-ST
KIHEI-MAUI-HAWAII
96753

SHEET TITLE
CONCEPT"A"

NO	DESCRIPTION	DATE	BY
1			

JOB NUMBER 11-001
DATE APRIL-29-2011
DESIGNED BY KJ
DRAWN BY KJ

SHEET SCALE 1"=100'

SHT-1

SHT1 of SHT1

m_11-062 | 11-08

Figure 7
1000-Foot Setbacks From
Consolidated Baseyard Wells 1 and 2

Appendix V

Proposal Letter to Consolidated Baseyard to Use Its Private Water System

Letter from Consilidated Baseyards Association Supporting Connection and Use of Existing Source and Storage Systems for Waikō Baseyard

PACIFIC RIM LAND, INC.

July 5, 2011

Mr. David Ward
Consolidated Baseyards
Frampton & Ward
2073 Wells Street, Room 101
Wailuku, HI 96793

Subject: Waiko Baseyard ("WB") Light Industrial Project proposed connection and use of the Existing Consolidated Baseyard ("CB") Water Source & Storage System

Dear Mr. Ward:

I am writing to you on behalf of Waiko Industrial Investments, LLC, the owner of a 31.22 acre parcel located immediately adjacent to the Consolidated Baseyard Subdivision 35 lot Subdivision. On behalf of the owners of WB, we are presently in the process of preparing the land use entitlement applications to develop the WB property as a light industrial/commercial subdivision consisting of approximately 38 developable lots. Please see the attached conceptual site plan of proposed project.

The purpose of this letter is to explore with you the possibility of utilizing the private water source developed for the Consolidated Baseyard as a water source and storage system for the WB project. We believe this proposed arrangement will benefit both parties by allowing the use of an existing system to serve additional light industrial activity and assist the current owners of the CB system by reducing long term maintenance costs and providing improvements to the existing system that will improve its efficiency and utility. Based upon the projection of demand for the CB system, the projected use of water for the WB facility is projected to be 139,000 gpd. Based upon the results of the water source study provide by Mr. Tom Nance discussed below this incremental increase in use is expected to be easily handled by the existing CB water system.

In support of our proposed joint use of the CB water system the WB ownership commissioned Mr. Tom Nance of Tom Nance Water Resource Engineering to conduct a preliminary engineering evaluation of the existing water system with particular attention paid to the ability of the system to adequately and safely provide the water source needed for both the CB and WB projects. The initial findings by Mr. Nance indicate that there is more than adequate capacity to provide water services to both projects subject to the following recommendations:

- As an assurance to ensure long-term stability/quality of the existing wells at the increased pumping rate necessary to serve both projects, it is recommended in Mr. Nance's preliminary engineering analysis to install a temporary 235 GPM pump in one of the wells and run a pump test of a minimum of 72 hours duration to monitor the water quality response to that pumping regimen. Factors to be reviewed will be drawdown, temperature, salinity, etc. and all results will be shared with you. It is

P.O. Box 220 • Kihei, HI • 96753 • 808.874.5263 • Fax 808.879.2557

expected this test will prove the capacity of the resource and assure CB of the ability of the system to serve both projects.

- The addition of water service to the proposed WB subdivision from the CB system would require both of the existing well pumps be replaced with new pumps capable of delivering 235 GPM to the system's 0.35 MG, 250-foot (spillway elevation) tank. Both well pumps will be driven by 25-horsepower motors. The pumps presently in wells 1 and 2 are driven by 7.5- and 15-horsepower motors, respectively. These improvements will be permitted and installed at no cost to the CB owners.

All of the costs associated with the above recommendations and any other improvements necessary to the existing water system that may be required to satisfy the current users or governmental requirements will be borne by the WB ownership and at no expense to the current system ownership.

As part of our analysis of the existing CB system, we have reviewed the system's budget as reported to the CB owners association and find that the current CB owners' water reserve infrastructure replacement and service maintenance fees will be substantially reduced through the additional WB users and after improvements are made to the existing system to accommodate such use. One way to quickly improve the long term financial protection for the system would be to directly contribute funds to the CB water reserve collection as part of the approval to use the system. The actual amount of the contribution and timing of the contribution would need to be discussed and agreed upon.

As noted above, having WB connect to and use CB's existing water source and storage systems will we believe result in a long-term benefit for both parties. We appreciate your consideration of this proposal and look forward to discussing your thoughts and ideas on how WB can assist you in making a decision on this joint use in the near term. Please feel free to contact me as soon as you have had a chance to review this letter and proposed actions provided for herein.

Sincerely,

Charles Jencks
Manager

CONSOLIDATED BASEYARDS ASSOCIATION

August 30, 2011

Mr. Charles Jencks
Pacific Rim Land, Inc.
PO Box 220
Kihei, HI 96753

Re: Waiko Baseyard ("WB") Light Industrial Project proposed connection and use of the Existing Consolidated Baseyard ("CB") Water Source and Storage Systems

Dear Charlie,

Thank you for your letter dated July 5, 2011 outlining the proposed expansion of the Consolidated Baseyards water system. In our meeting of July 14th we met to further discuss your proposed Waiko Light Industrial project and to discuss your proposed joint use of the CB water system. In general, it is appropriate to state that CB supports your proposal for joint use based upon the concept that spreading the overall operational cost over a broader number of users will help all of the users manage their water use fees and the long term support of the private system. With that said, however, there are concerns with regard to the system that must be addressed before any formal agreement can be finalized between CB and the Waiko ownership. The following summarizes those general issues that we discussed and addressed in your letter:

- In our discussion we both agreed that a contribution to the current water system ownership on an agreed to pro-rata basis would be necessary for CB to support use of the system and we also agreed that the basis for the contribution would be the cost to develop the current system. We would appreciate your providing to CB a proposal for such a capital contribution and how and when that contribution would be provided.
- In order to assure CB that the existing system is capable of the proposed joint use, Waiko will initiate testing of the system to include installation of a larger pump with an extended pumping regimen to establish the system's capability in terms of quantity and quality. All of this testing will of course be at Waiko's cost with the results provided to CB for review once completed. Before CB can authorize such testing you will need to provide supporting information on how the current system will be repaired if damaged, when the testing will occur, how any loss of service will be addressed, etc.
- Based upon the test results, a proposal for capital improvements (CIP) to the system at Waiko's sole cost will be provided to CB. The CIP will address all of the improvements

necessary to achieve a successful joint use approval by all relevant government agencies and include a description of the improvements, cost, permitting necessary and timing.

- If indeed the system has the capability to provide for the proposed joint service, a joint service agreement will be drafted by Waiko for review by CB providing for all of the essential terms and conditions for joint use including authorizations, permit processing, entitlement support, capital improvement costs and budget analysis identifying the costs and benefits to CB.

The Board of Directors of Consolidated Baseyards Association has reviewed and approved this letter. As stated in our meeting, we think there are benefits to CB for this proposed joint use as well as the opportunity to assist Waiko in its efforts to add to the inventory of light industrial properties here in central Maui. We look forward to your response to this letter and should you require any assistance in the processing of your entitlement documents as they relate to water system use please do not hesitate to contact CB for support.

Sincerely,
Consolidated Baseyards Association

David Ward
President

Cc: Commercial Properties of Maui Management

Appendix W

Conditional Permit

ORDINANCE NO. 3735

BILL NO. 23 (2010)

A BILL FOR AN ORDINANCE AMENDING ORDINANCE NO. 3001 (2001), TO GRANT A CONDITIONAL PERMIT TO FONG CONSTRUCTION COMPANY, LIMITED, IN ORDER TO OPERATE A COMMERCIAL BASEYARD PRIMARILY FOR BUSINESS WITHIN THE CONSTRUCTION INDUSTRY WITHIN THE COUNTY AGRICULTURAL DISTRICT FOR PROPERTY SITUATED AT WAIKAPU, MAUI, HAWAII

BE IT ORDAINED BY THE PEOPLE OF THE COUNTY OF MAUI:

SECTION 1. Pursuant to Chapter 19.40, Maui County Code, the Conditional Permit granted by Ordinance No. 3001 (2001), is amended by amending Section 1 to read as follows:

"SECTION 1. Pursuant to Chapter 19.40 , [of the] Maui County Code, a Conditional Permit is hereby granted to [Consolidated Baseyards, LLC,] Fong Construction Company, Limited, subject to the conditions imposed in Section 2 of this ordinance, for the operation of a commercial baseyard within the County Agricultural District. The site is identified for real property tax purposes by TMK: (2) 3-8-007:por. 102, and is comprised of approximately 11.836 acres of land, situated at Waikapu, Maui, Hawaii. The subject property sits astride property identified for real property tax purposes as TMK: (2)3-8-007:089 ("parcel 89") on the north side of Waiko Road, with 7.836 acres of the subject property located at the corner of Waiko Road and Kuihelani Highway and 4.000 acres of the subject property located on the opposite side of parcel 89."

SECTION 2. Ordinance No. 3001 (2001) is amended by amending Section 2 to read as follows:

"SECTION 2. The granting of this Conditional Permit is subject to the following conditions:

1. That full compliance with all applicable governmental requirements shall be rendered.

2. That the Conditional Permit shall be valid [until September 30, 2004] until March 1, 2019; provided, that[,] an extension of this period may be granted pursuant to Section 19.40.090, [of the] Maui County Code.

3. That the Conditional Permit shall be nontransferable[.] unless the Council approves the transfer by ordinance.

4. That [Consolidated Baseyards, LLC,] Fong Construction Company, Limited, its successors and permitted assigns shall exercise reasonable due care as to third parties with respect to all areas affected by subject Conditional Permit and shall procure at its own cost and expense, and shall maintain during the entire period of this Conditional Permit, a policy or policies of comprehensive liability insurance in the minimum amount of ONE MILLION AND NO/100 DOLLARS ($1,000,000) naming the County of Maui as an additional [named] insured, insuring and defending [Consolidated Baseyards, LLC] Fong Construction Company, Limited and County of Maui against any and all claims or demands for property damage, personal injury and/or death arising out of this [permit] Conditional Permit, including but not limited to: (1) claims from any accident in connection with the permitted use, or occasioned by any act or nuisance made or suffered in connection with the permitted use in the exercise by [Consolidated Baseyards, LLC] Fong Construction Company, Limited of said rights; and (2) all actions, suits, damages and claims by whomsoever brought or made by reason of the non-observance or non-performance of any of the terms and conditions of this [permit] Conditional Permit. A copy of [a policy] the certificate of insurance naming County of Maui as an additional [named] insured shall be submitted to the [department] Department of Planning within ninety (90) calendar days from the effective date of this ordinance.

5. That this Conditional Permit shall be limited to the storage of equipment and materials, minor services of said equipment, and offices appurtenant to such uses. No retailing or other sales activities shall be permitted except for limited sales accessory to the principal permitted use. Structures shall be allowed to protect material and equipment as appropriate.

6. That [the permit holder] Fong Construction Company, Limited fully comply with the conditions established under the State Land Use Commission Special Use Permit No. SP94-387.

7. That [the permit holder] Fong Construction Company, Limited shall submit to the [Planning Department] Department of Planning annual reports addressing its compliance with the conditions established with the subject Conditional Permit.

8. That Fong Construction Company, Limited shall develop the property in substantial compliance with the representations made to the Maui County Council in obtaining the Conditional Permit. Failure to so develop the property may result in the revocation of the Conditional Permit pursuant to Section 19.40.080 of the Maui County Code."

SECTION 3. Material to be repealed is bracketed. New material is underscored.

SECTION 4. This ordinance shall take effect upon its approval.

APPROVED AS TO FORM
AND LEGALITY:

JAMES A. GIROUX
Deputy Corporation Counsel
County of Maui
S:\CLERICAL\SE\ORDS\CP\fongconstructionlu23.wpd

WE HEREBY CERTIFY that the foregoing BILL NO. 23 (2010)

1. Passed FINAL READING at the meeting of the Council of the County of Maui, State of Hawaii, held on the 19th day of March, 2010, by the following vote:

Dennis A. MATEO Chair	Michael J. MOLINA Vice-Chair	Gladys C. BAISA	Jo Anne JOHNSON	Solomon P. KAHO'OHALAHALA	William J. MEDEIROS	Wayne K. NISHIKI	Joseph PONTANILLA	Michael P VICTORINO
Excused	Aye	Aye	Aye	Aye	Aye	Aye	Aye	Aye

2. Was transmitted to the Mayor of the County of Maui, State of Hawaii, on the 22nd day of March, 2010.

DATED AT WAILUKU, MAUI, HAWAII, this 22nd day of March, 2010.

RECEIVED
2010 MAR 22 AM 8:41
OFFICE OF THE MAYOR

MICHAEL J. MOLINA, VICE-CHAIR
Council of the County of Maui

JEFFREY T. KUWADA, COUNTY CLERK
County of Maui

THE FOREGOING BILL IS HEREBY APPROVED THIS 24th DAY OF March, 2010.

CHARMAINE TAVARES, MAYOR
County of Maui

I HEREBY CERTIFY that upon approval of the foregoing BILL by the Mayor of the County of Maui, the said BILL was designated as ORDINANCE NO. 3735 of the County of Maui, State of Hawaii.

JEFFREY T. KUWADA, COUNTY CLERK
County of Maui

Passed First Reading on March 5, 2010.
Effective date of Ordinance March 24, 2010.

RECEIVED
2010 MAR 25 AM 9:31
OFFICE OF THE COUNTY CLERK

I HEREBY CERTIFY that the foregoing is a true and correct copy of Ordinance No. 3735, the original of which is on file in the Office of the County Clerk, County of Maui, State of Hawaii.

Dated at Wailuku, Hawaii, on

County Clerk, County of Maui

Appendix X

Draft Maui General Plan

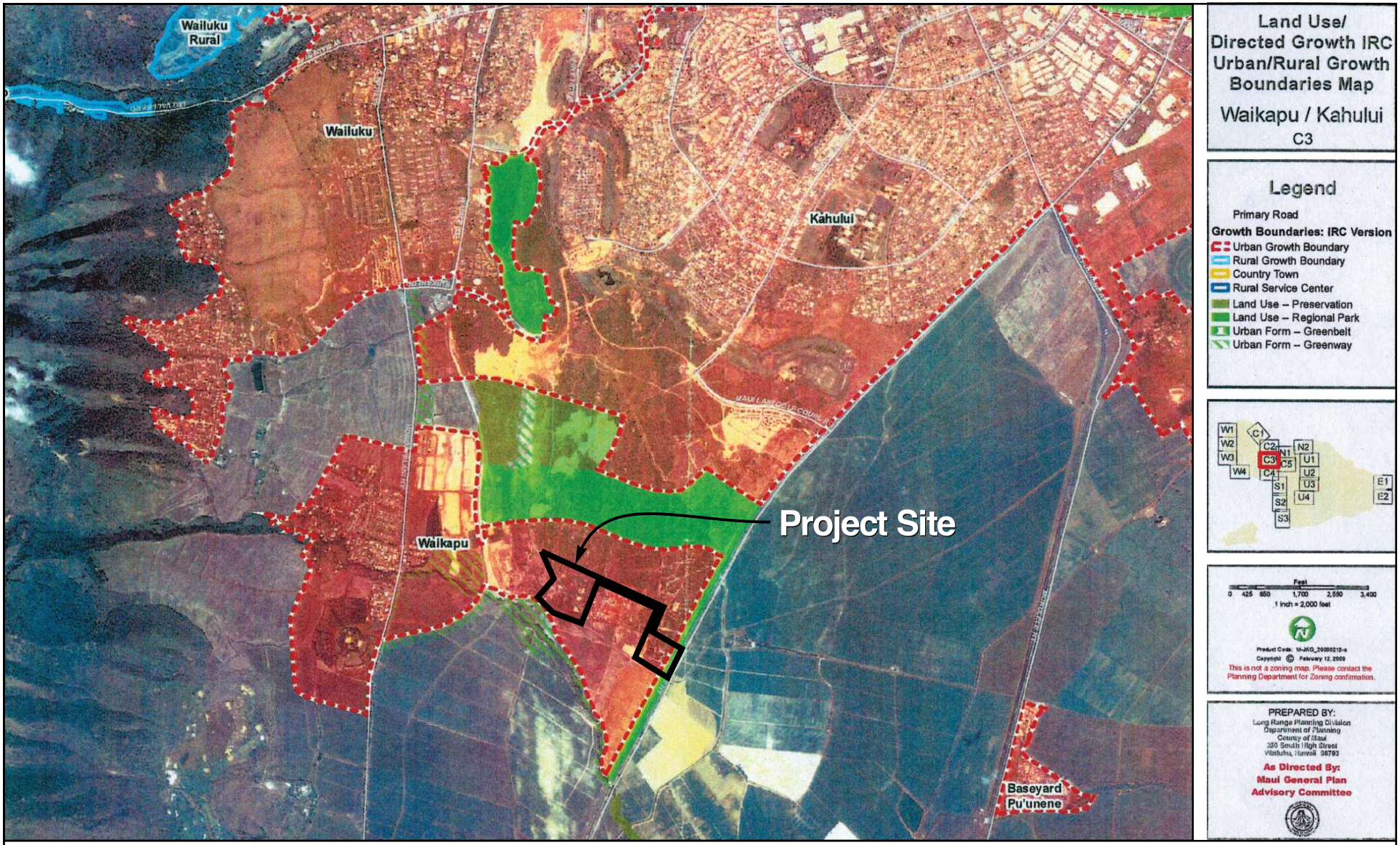


Figure I

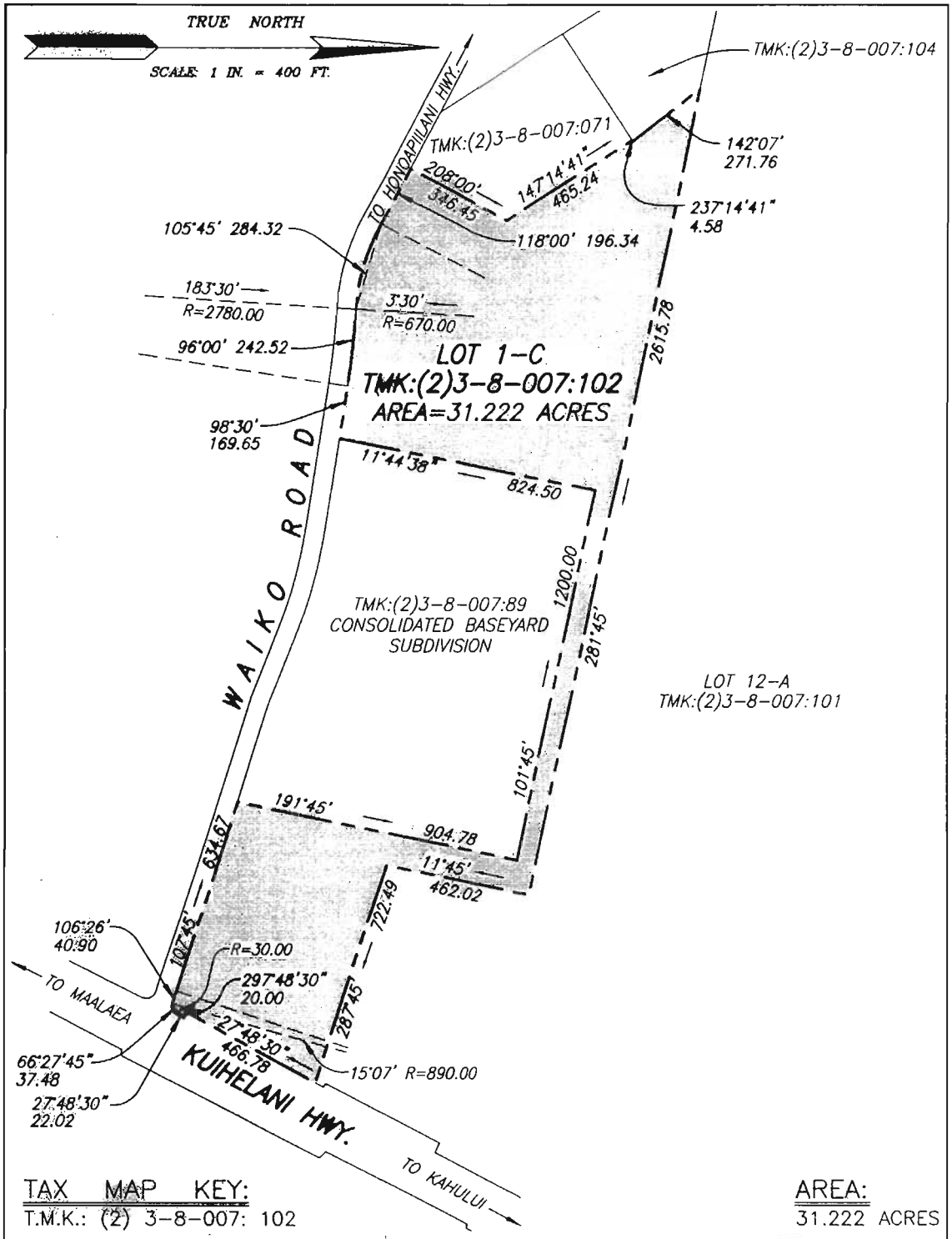
Prepared for:
Waikō Industrial Investment, LLC

Waikō Baseyard Light Industrial Subdivision
TMK (2) 3-8-007-102
Proposed General Plan

BAGOYO
DEVELOPMENT
CONSULTING GROUP

Appendix Y

Mylar Map



TAX MAP KEY:
T.M.K.: (2) 3-8-007: 102

AREA:
31.222 ACRES

LAND ZONING MAP NO.

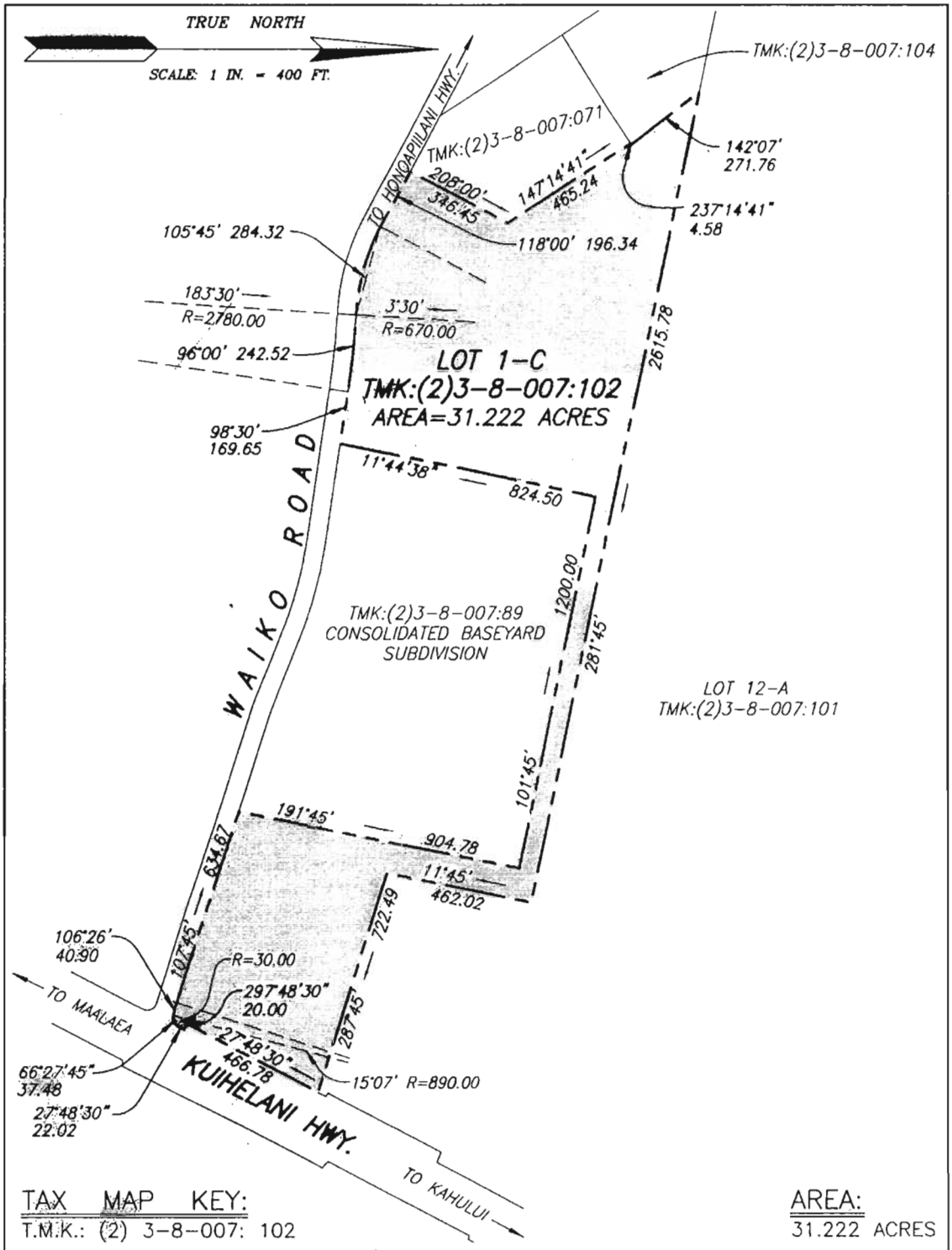
CHANGE IN ZONING – WAILUKU, MAUI, HAWAII

FROM AGRICULTURE TO M-1 LIGHT INDUSTRIAL

APPROVED: _____ COUNTY CLERK	PUBLIC HEARING: ADOPTED – COUNCIL: ADOPTED – MAYOR: ORDINANCE NO.:
APPROVED: _____ PLANNING DIRECTOR	DATE: / SCALE: 1"=400'

OFFICE OF THE COUNTY CLERK

200 S. HIGH STREET, WAILUKU, MAUI, HAWAII 96793



TAX MAP KEY:
T.M.K.: (2) 3-8-007: 102

AREA:
31.222 ACRES

COMMUNITY PLAN MAP NO.

COMMUNITY PLAN AMENDMENT – WAILUKU, MAUI, HAWAII

FROM AGRICULTURE TO LIGHT INDUSTRIAL

APPROVED: _____ COUNTY CLERK	PUBLIC HEARING: ADOPTED – COUNCIL: ADOPTED – MAYOR: ORDINANCE NO.:
APPROVED: _____ PLANNING DIRECTOR	DATE: / SCALE: 1"=400'

OFFICE OF THE COUNTY CLERK

200 S. HIGH STREET, WAILUKU, MAUI, HAWAII 96793 CP–

Appendix Z

Topographic Map

Appendix ZZ

Government Agencies and Community Organizations Contacted for this Proposed Project

Government Agencies and Community Organizations Contacted for this Proposed Project

1. Maui Planning Department
2. Maui Department of Water supply
3. Maui Department of Public Works
4. State Historic Preservation Division—
   State Department of Land and Natural Resources
5. State Department of Business,
   Economic Development & Tourism
6. State Department of Health
7. State Department of Transportation,
   Highways Division
8. Waikapū Community Association
9. Office of Hawaiian Affairs (OHA)
10. Human Concerns and Housing Department

Appendix ZZZ

Notice of Applications and Notarized Affidavit of Mailing of Notice of Applications

NOTARIZED AFFIDAVIT OF MAILING OF NOTICE OF APPLICATION

Vince G. Bagoyo, being first duly sworn on oath, deposes and says that:

a. Affiant is the Applicant for a Community Plan Amendment for land situated at: Waiko Road, Wailuku, Hawaii, TMK: (2) 3-8-007:102.

b. Affiant did on April 28, 2011, deposit in the United States mail, post paid, a copy of a *Notice of Application* with the *location map*, a copy of which is attached hereto as "Exhibit A" and made a part hereof, addressed to each of the persons identified in the list of recorded owners and lessees identified as "Exhibit B", attached hereto and made a part hereof.

Further Affiant sayeth naught:

Vince G. Bagoyo

subscribed and sworn to before me this 28th day of Sept, 2011.

KIM MACADANGDANG NOTARY PUBLIC No. 03-189 STATE OF HAWAII

Kim Macadangdang

Notary Public, State of Hawaii KIM MACADANGDANG

My commission expires: My Commission expires 3/30/2015

Document Date: 9/28/11 # Pages: 1

Notary Name: KIM MACADANGDANG Second Circuit

Doc. Description: Notarized Affidavit of Mailing of notice of Appl.

Kim Macadangdang 9/28/11

Notary Signature Date

KIM MACADANGDANG NOTARY PUBLIC No. 03-189 STATE OF HAWAII

ATTACHMENT E

NOTARIZED AFFIDAVIT OF MAILING OF
NOTICE OF PUBLIC HEARING

Vince G. Bagoyo, being first duly sworn, on oath, deposes and says:

1. Affiant is the applicant for a CHANGE-IN-ZONING for land situate at WAILUKU, HAWAII, TMK No.: (2) 3-8-007:102

2. Affiant did on APRIL 28, 2011, deposit in the United States mail, postage prepaid, by certified or registered mail, return receipt requested, a copy of a Notice of Hearing with location map, a copy of which is attached hereto as "Exhibit A" and made a part hereof, addressed to each of the persons identified in the list of recorded owners and lessees identified as "Exhibit B," attached hereto and made a part hereof.

3. Thereafter, there was returned to the office of Affiant, the United States Post Office certified or registered mail receipts and return receipts which are attached hereto as "Exhibit C" and made a part hereof.

Further, Affiant sayeth naught.

Subscribed and sworn to before me
this 28 day of Sept, 2011.

KIM MACADANGDANG
NOTARY PUBLIC
No. 03-189
STATE OF HAWAII

KIM MACADANGDANG
My Commission expires 3/30/2015

Notary Public, State of Hawaii
My commission expires: _____

NOTICE OF APPLICATION

Date: 9-28-11

TO: OWNERS/LESSEES

Please be advised that the undersigned has filed an application for a **Community Plan Amendment** with the County of Maui, Department of Planning to change the Community Plan land use designation(s) for the following parcel(s):

1. Tax Map Key Number: (2) 3-8-007:102 (see attached *location map*)
2. Location (street address): Waiko Road, Wailuku, Hawaii
3. Existing Land Use Designations:
   - State Land Use District: Agriculture
   - Community Plan: Agriculture
   - County Zoning: Agriculture
   - Other: None
4. Proposed Community Plan Designation: Light Industrial (M-1)
5. Description of the existing uses on the Property: Agriculture (horse pasture) and approx. 4-acre Conditional and SUP Permits Industrial Use
6. Description of the proposed uses on the Property: 41-Lot Light Industrial Subdivision and commercial Use

The Applicant is responsible for ensuring accuracy of the information.

Waiko Industrial Investment, LLC	V. Bagoyo Development Group
Owner/Applicant	Applicant (if not also Owner)
Signature	Signature
P.O. Box 220	1500 Kilinoe Place
Mailing Address, No. & Street or PO Box	Mailing Address, No. & Street or PO Box
Kihei, Hawaii 96753	Wailuku, Hawaii 96793
City, State, Zip Code	City, State, Zip Code
(808) 874-5263	(808) 357-3842
Telephone	Telephone

ATTACHMENT A

TO: DATE: 9-28-11

NOTICE OF FILING OF APPLICATION

Check appropriate Line:

x CHANGE IN ZONING (From Ag to M-1 Light Ind.)
___ COUNTY SPECIAL USE
___ PROJECT MASTER PLAN

Please be advised that the undersigned will be applying to the Department of Planning of the County of Maui for the above-referenced application(s) for the following parcel(s):

1. Tax map Key No.: (2) 3-8-007:102
(NOTE: Please attach an 8 ½" x 14" location map)

2. Location (Street Address): Waiko Road, Wailuku, Hawaii

3. Existing Land Use Designations:

a. State Land Use District: Ag
b. Community Plan Designation: Ag
c. County Zoning: Ag

4. Description of the Existing Uses on Property: Ag (horse pasture and approx. 4 acs. on Conditional and SUP permits industrial

5. Description of the Proposed Uses on Property: 41-Lots Light Industrial Subdivision

****

By: Waiko Industrial Investment LLC (Owner/Applicant)

(Signature)

P.O. Box 220
Kihei, HI 96753
(Address)

(808)874-5263
(Telephone)

Vince G. Bagoyo (Agent)

(Signature)

1500 Kilinoe Place
Wailuku, HI 96793
(Address)

(808)357-3842
(Telephone)

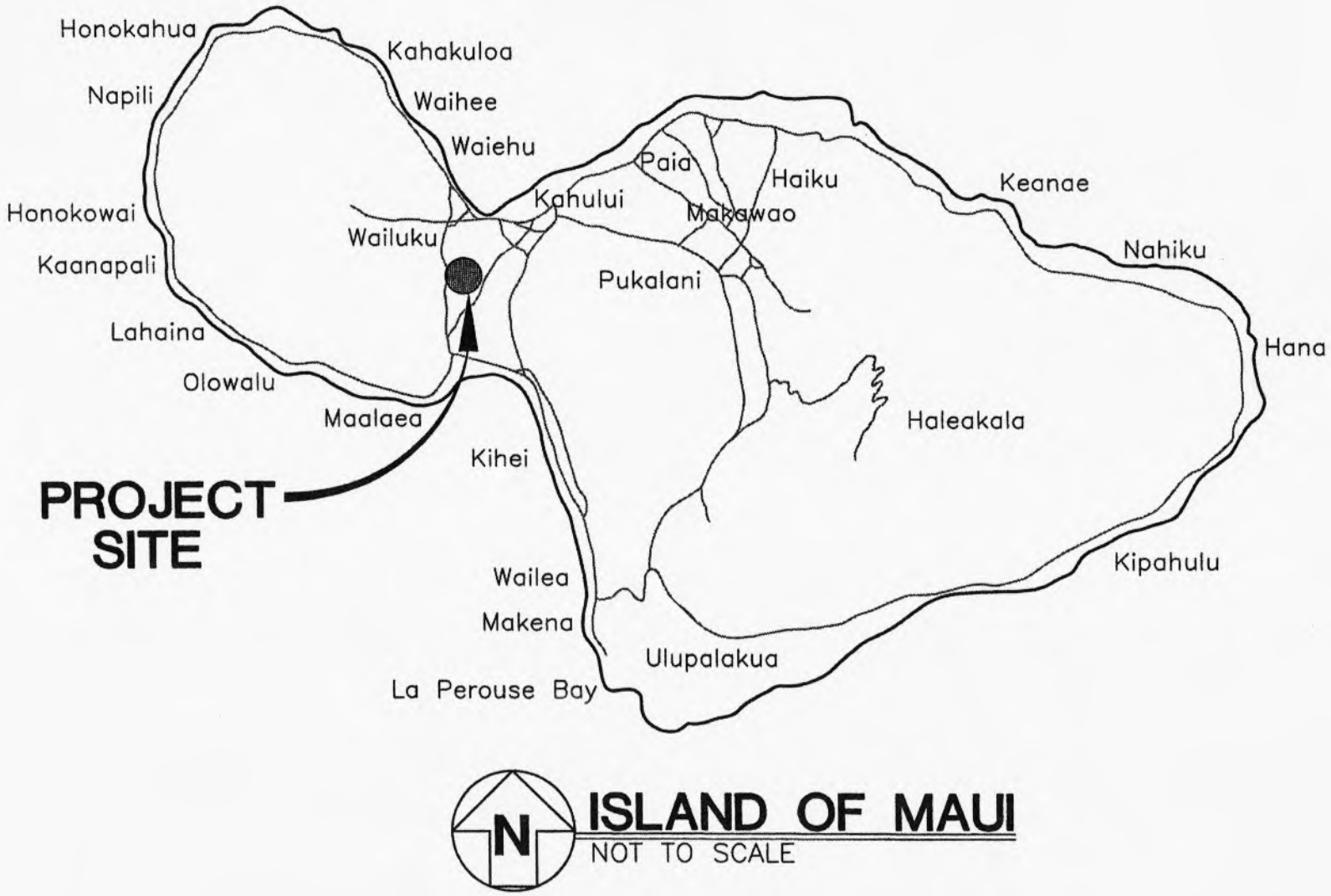


Figure C

Prepared for:
Waikō Industrial Investment, LLC

Waikō Baseyard Light Industrial Subdivision
TMK (2) 3-8-007-102
Location Map

BAGOYO
DEVELOPMENT
CONSULTING GROUP