

# Historic Context

## USAG-HI Cultural Resources

### USAG-HI Subinstallations

There are 27 USAG-HI subinstallations in Hawaii. Twenty-two are located on the island of Oahu (see Appendix A, Map 1). They cover large areas of all parts of the island except the windward coast. Mākua Military Reservation and Waianae-Kai Military Reservation are located on the leeward coast. Schofield Barracks Military Reservation, Wheeler Army Airfield, Kunia Field Station, Helemano Military Reservation, Pupukea-Paalaa Uka Military Road, the Waikakalaua Ammunition Storage Tunnels Site, and Kipapa Ammunition Storage Site occupy most of central Oahu. Kawailoa Training Area and Kahuku Training Area are both situated in the northern Koolau Range. The Mauna Kapu Communication Station is on the crest of the southern Waianae Range. Dillingham Military Reservation and Mokuleia Army Beach are on the north shore. Fort DeRussy Military Reservation is located in Waikiki. Fort Shafter Military Reservation, Tripler Army Medical Center, and Aliamanu Military Reservation are located on the south shore between Kalihi and Pearl Harbor. Finally, the Signal Cable Trunking System is located in various locations throughout the island.

Five installations are located on the island of Hawaii (see Appendix A, Map 2). The largest is Pōhakuloa Training Area, which covers 108,792 acres on the high-elevation saddle between Mauna Kea, Hualalai, and Mauna Loa Volcanoes. Kilauea Military Camp is a recreational facility on the north rim of Halemaumau Crater at Kilauea Volcano; it falls within the boundaries of the Hawaii Volcanoes National Park. The SFC Minoru Kuneida U.S. Army Reserve Center is adjacent to Hilo Airport on the windward east side of the island. Kawaihae Military Reservation is on the leeward west coast of the island. Finally, the Kawaihae Tank Trail is a 24-mile long dirt track extending from the docks at Kawaihae Harbor up to the Pōhakuloa Training Area in the northeastern sector of Hawaii Island.

Cultural resources on USAG-HI subinstallations fall into three general categories: traditional Hawaiian, U.S. military, and non-military historical sites.

Traditional Hawaiian sites consist of two partially overlapping types of sites: archaeological remains and cultural places. Archaeological remains represent Native Hawaiian settlement and land use dating from earliest pre-contact settlement of the islands to well into the 19<sup>th</sup> century. They include a wide range of functional site types that, at the broadest level, are divided into residential, subsistence, non-subsistence resource collection, ceremonial, and miscellaneous categories. The miscellaneous category includes sites such as trails, burials, and boundary markers. Cultural places represent lifestyles, cultural practices, and beliefs for which there are ancient traditional associations. They are also places for which there are traditional associations based on knowledge of older people today or for which there are family or community traditions. Continuity of the traditional association is provided by *knowledge* of the place, not necessarily *use* of the place. Traditional Hawaiian sites constitute the majority of cultural resources in training areas and other non-urbanized lands of the garrison.

U.S. military sites are buildings, structures, archaeological remains, and objects related to the development of the U.S. Army in Hawaii. They date from the first decade of the 20<sup>th</sup> century to the present. U.S. military sites make up the bulk of the cultural resources on developed urban lands of the garrison.

Nineteenth century historical sites are the archaeological remains and standing buildings and structures related to historical (i.e., post-western contact) use of garrison installation areas. This category of sites

overlaps the time frames of the other two categories. It differs from the traditional Hawaiian sites in representing the westernization of island land use and settlement, primarily through the introduction of new economies, such as ranching and commercial agriculture, and western technology, such as the railroad. The category overlaps with the U.S. military sites in reflecting non-military historic use of garrison lands.

## **Traditional Hawaiian Context**

The traditional Hawaiian context is presented in three major sections. The background section summarizes information related to Hawaii in general, including mythological beginnings, island colonization, and general patterns of development. Subsequent sections deal with the pre-contact history of Oahu and Hawaii Islands, with specific emphasis on the areas in which USAG-HI installations are located. The chapter concludes with sections on themes and property types related to the traditional Hawaiian context.

### **Background**

The history of the islands before European contact is based on a vast body of traditional Hawaiian material recorded in the 19<sup>th</sup> and early 20<sup>th</sup> centuries, and on archaeological research that has been particularly intensive over the past 25 years. Hawaiian chronology derives from these two types of data. Traditional Hawaiian histories and royal genealogies are used for one framework, employing a specific numbers of years (varying from 20 to 30) per genealogical generation (see Fornander 1969:I-166; Stokes 1930; Hommon 1976; Johnson 1994; Cordy 1996b; Masse and Tuggle 1998). The archaeological chronology is based on radiocarbon dating. Where possible, research on pre-contact Hawaiian history has integrated these two sources of dating (see e.g., Emory 1959; Hommon 1976; Tuggle 1979; Cordy 1996b, 2000).

### **Mythological Beginnings**

There is no single origin myth in Hawaiian traditions. Instead, there are numerous traditions concerning creation, island origins, the coming of the gods, and migrations. The most famous creation chant is the Kumulipo (Beckwith 1951; Johnson 2000).

Traditions concerning island origins are found in the works of such Hawaiian writers as Malo (1951, 1996) and Kamakau (1991), as well as numerous authors in the Fornander collection (1969). Analyses of origin and migration traditions are found in 19<sup>th</sup> century writings such as Fornander's 1878 and 1880 work (1969) and continue to be carried out (e.g., Barrère 1969; Cachola-Abad 1993; Tuggle 2000; Cordy 2000). It is clear that the traditional literature is a rich body of metaphorical and historical complexities.

From the Song of Pakui (Fornander 1916:IV-12, 18):

Wakea Kahiko Luamea  
Papa that gives rise to islands was the wife,  
Tahiti of the rising and Tahiti of the setting sun was born,  
Was born the foundation stones,  
Was born the heavenly stones,  
Was born Hawaii;  
Their first-born child  
of Wakea together with Kane  
And Papa of Walinuu the wife...  
Papa came from within Tahiti...  
Was wild and bad-tempered toward her husband Wakea,

And slept with Lua for a new husband.  
Oahu-a-Lua was born,  
Oahu-a-Lua, an island child...

### **Initial Colonization of the Hawaiian Islands**

The date of initial island colonization is perhaps the point of greatest disagreement among archaeologists working in Hawaii today. The two main positions on this issue have been labeled the “long count” and the “short count” (Graves and Addison 1995). Those favoring the long count argue for settlement as early as A.D. 100-300 (e.g., Hunt and Holsen 1991; Kirch 2000; Cordy 2000), with those in the short count school arguing for colonization no earlier than A.D. 700-800 (e.g., Spriggs and Anderson 1993; Athens and Ward 1993; Masse and Tuggle 1998; Tuggle and Spriggs 2001). The arguments are not repeated here, but it is obvious from the extent of disagreement that there is a great deal of ambiguity and uncertainty in the data. The importance of the date of colonization lies in the implications for rate of population growth, patterns of settlement expansion, and single versus multiple voyages to Hawaii. On this last point, some favor only one voyage of colonization (e.g., Cordy 2000), while others suggest many (e.g., Cachola-Abad 1993), depending largely on the way in which Hawaiian voyaging traditions are interpreted.

Questions can be also raised about the interpretation of radiocarbon dating series subsequent to initial dates (see Tuggle and Tomonari-Tuggle 1997:73 for a proposed protocol), but the date ranges employed in the following discussions are presented without this consideration.

A less contentious point is the question of the place of Hawaiian origin, generally believed to have been the Marquesas (Cordy 2000; Kirch 2000). However, like the date of initial colonization, this conclusion rests on very limited data.

### **General Patterns of Cultural Development**

The generally accepted model of Hawaiian cultural development (e.g., Tuggle 1979; Kirch 1985; Cordy 2000) emphasizes early settlement in the rich windward environments and later expansion into the drier leeward regions. Linked to expansion was associated population growth and increasing political complexity.

Of the colonization period, Kirch (1992:7) writes:

To colonizing Polynesians with a horticultural economy augmented by fishing, the key environmental factors affecting settlement were the distribution of arable alluvial and colluvial soils, rainfall, streamflow (for irrigation), and coral reefs.

Radiocarbon data clearly show that the period of major population growth and settlement expansion was from about A.D. 1150 to 1400 (Dye and Komori 1992; Dye 1994). The evidence from archaeology and Hawaiian traditions (employing genealogical generations for dating) suggests that political complexity and large polities developed in the later portion of that era. As indicated by traditions (Table B.3), this was the time of the founding of the powerful lineages of the kings of Oahu (the Maweke line) and Hawaii (the Pili line). Archaeologically, this was the initial period of large temple construction, development of royal centers, and agricultural expansion and intensification (Kolb 1991; Dye 1994; Cordy 1995, 1996a, 1996b, 2000). Alternative hypotheses pose that (a) environmental change or (b) the introduction of sweet potato (*Ipomoea batatas*) was a critical factor in the development or intensification of the large dryland field systems of leeward Hawaii (cf. Rosendahl and Yen 1971; Yen 1974).

Agricultural expansion and population growth continued over the next centuries, until at least A.D. 1700. The extent to which population and agricultural development had stabilized, or perhaps even declined, during the century before contact is still being investigated (Tuggle 1979; Kirch 1984; Dye and Komori 1992; Dye 1994; Ladefoged et al. 1996; Cordy 2000). In any case, the settlement pattern of the islands that was described at the time of contact had been clearly established by A.D. 1700, including population centers, royal centers, temples, and expansive dryland and irrigation agricultural field systems (see Armstrong 1973:87; Tuggle 1979:Figure 7-12; Juvik and Juvik 1998:166).

Traditions and archaeology indicate periods of intensive warfare and political expansion in the final century of Hawaiian cultural development before European contact in 1778, at which time there were four competing kingdoms. The kingdom of Hawaii (Hawaii Island and a section of Maui) was ruled by Kalaniopuu. The kingdom of Maui (Maui, Lanai, and Kahoolawe) was under Kahekili. The kingdom of Oahu (Oahu and Molokai) was under the rule of Peleioholani. Kauai and Niihau were the realm of Kaneoneo.

### **Hawaiian Cultural Context: Oahu**

Undoubtedly, the earliest permanent habitation site excavated on Oahu is the Bellows Dune site (Pearson et al. 1971). The question is whether it was occupied as early as A.D. 300-600 (Kirch 1985) or as late as A.D. 800-900 (Tuggle 1997; Tuggle and Spriggs 2001). There are other places on Oahu that have yielded dates in the early range, but like the Bellows dates, these are by no means generally accepted (see Cordy 1996b for a positive summary and Tuggle 1997 for a negative summary). At the same time, none of these other sites have been excavated in the detail of Bellows work. Whatever the date of earliest settlement proves to be, there is no doubt that Hawaiian colonization had occurred by at least A.D. 750-800.

The earliest settlers probably made their homes on the windward shore of the island where fertile valleys, permanent water, high rainfall, and rich natural resources facilitated settlement in a new land. In early years, they probably ventured to the drier southern and western areas only for selected resources like fish and birds. But from A.D. 1000 on, Hawaiians moved outward from their original settlements, spreading into leeward areas along Oahu's southern shores (Cordy 1996b). Coastal Waikiki was almost certainly settled during this period, offering easy access to rich ocean resources, a ready freshwater supply from springs and streams, level and easily developed lands for cultivation and aquaculture, and a bounty of game foods like ducks and other wildfowl. Some cultivation probably followed the stream courses into valleys like Manoa and Nuuanu, which were also sources for items like hardwood (for tools, weapons, and building materials) and birds (for feathers).

By the A.D. 1200s, three major competing districts developed out of earlier small and independent political units. These districts were Kona, Koolau (later divided into Koolauloa and Koolaupoko), and Greater Ewa (the later districts of Ewa, Waianae, and Waialua) (Cordy 1996b). The dominant chiefly line of Ewa was that of the Maweke-Kumuhonua genealogy (see Table B.3). Maweke is one of the main figures in the voyaging era of Hawaiian traditions, which occurred 16 generations from the founder of the Oahu line, Nanaulu. In turn, Nanaulu and his brother Ulu were 13 generations from Wakea and Papa, the sacred and deified ancestors of Hawaiians (Kamakau 1991; Fornander 1969). With Maweke, the lineage of ancient Polynesia was transformed into a distinctly Hawaiian lineage (Fornander 1919), and Maweke's offspring came to rule various parts of Oahu.

The A.D. 1150-1400 period of rapid growth saw development of new settlements and expansion of both wet and dry agricultural complexes, notably in the Kaneohe region, along the outlets of the streams feeding Puuloa (Pearl Harbor), and in the Waianae valleys. Kukaniloko, the sacred place of birth on the central plateau, and Ulu-Po *heiau* on the windward side of the island may have been constructed by the late A.D. 1300s.

Although there is disagreement about when island unification occurred (see Tuggle and Tomonari-Tuggle 1997:29), some degree of pan-district consolidation was taking place in the early A.D. 1400s under the king Laakona, “the great progenitor of the Ewa chiefs” (Fornander 1969:II-48-49). During this time, the center of power on Oahu was in Ewa, and the ruling center of the Oahu Kingdom was in Lihue on the central plateau (Cordy 1996b). The lords of this place (as well as Wahiawa and Halemano, also spelled Helemanu or Helemano) also became known as the Lo Alii (Kamakau 1991:40): “the chiefs of these places lived there and guarded their kapu ... they were like gods, unseen, resembling men.” Kukaniloko and the associated temple of Hoolonopahu are also in this upland area and are related to the Lo Alii.

Subsequent generations saw periods of unification and peace alternating with periods of conflict. When Mailikukahi became high chief of the island about a century later, chosen by a council of chiefs to succeed Haka, a “bad chief and a stingy one” (Kamakau 1991:53), he moved the royal center to Waikiki. The times were said to have been prosperous and peaceful. One of the significant acts attributed to Mailikukahi is the division of the island into districts and smaller socio-economic units called *ahupua‘a*.

The 15<sup>th</sup> and 16<sup>th</sup> centuries saw the Hawaiian political system change, as political power gradually replaced kinship as the means of legitimizing rule (Kolb 1991; Hommon 1986). One way that chiefs expressed their power was through construction of monumental architecture including temples, irrigation systems, and fishponds (Cordy 1996b), all requiring the ability to mobilize enormous expenditures of labor. Traditions say the taro fields (and presumably the fishponds) of the Waikiki Plain were built by the chief Kalamakua at this time. It is probable that many of the large temples of Oahu were also constructed during this period, although there is no direct evidence for this.

The unified Oahu kingdom disintegrated in 17<sup>th</sup> century and was replaced by warring factions among district chiefs. However, in the early A.D. 1700s, the chief Kualii re-established the primacy of the island ruler (Kanahale 1995). When Kualii came to power, he had numerous struggles with the chiefs of various districts, including at least two rebellions from the chiefs of Ewa (Fornander 1969), who were defeated in battles in the southern central plateau.

Kualii’s successors, however, had less success in maintaining a unified domain. At the time of contact in 1778, Peleioholani, a son of Kualii, was ruling chief of the island. When he died a year later, the king of Maui, Kahekili “the warrior-chief of the black tattoo” (Kanahale 1995:76), immediately attacked Oahu and defeated his successor Kahahana, who was eventually captured and killed in about 1785. Later, in revenge for a plot against him by the remaining Oahu chiefs, Kahekili initiated a “war of extermination” and the “native Oahu aristocracy were [sic] almost entirely extirpated” (Fornander 1969:II-226).

Maui claims to Oahu ended shortly after Kahekili’s death, when the Hawaii island chief Kamehameha attacked. He landed his forces at Waikiki and encamped along the sandy beaches from Waialae around Diamond Head to Kalia (Kanahale 1995). The invasion ended at the battle of Nuuanu when Oahu warriors, finding themselves trapped at the precipice of the Koolau cliffs by the overwhelming and superior armed forces of Kamehameha, chose to leap to their deaths.

The successive conquests of Oahu, first by Kahekili and then by Kamehameha, severely damaged the chiefly families of the island, and resulted in new land distributions and an influx of population from other islands.

The disruption and turmoil were compounded by the effects of European contact. In 1778, British captain James Cook made the first western landfall in the Hawaiian Islands. This landing was followed by other ships, which left a slew of sailors and adventurers behind in the islands. At Kamehameha’s death in 1819, his widows and heir brought about the formal end of the *kapu* system; shortly thereafter, the first Christian missionaries arrived and found a religious vacuum. Other foreigners settled in the island

frontier, bringing with them new diseases that resulted in massive population decline, and a new economic basis in cash. Introduced cattle that had gone feral destroyed garden plots and agricultural fields. Hawaiians moved en masse to developing ports. Drastic labor re-allocations came from pursuits such as the collection of sandalwood and commercial development of sugarcane and rice. The ultimate disruption in Hawaiian settlement was the mid-19<sup>th</sup> century redistribution and privatization of land.

## **The South Coast of Oahu**

The south coast of Oahu encompasses two traditional districts, Kona and Ewa (see Figure B.1). USAG-HI installations within the Kona district include Fort DeRussy in the *ahupua'a* of Waikiki, Fort Shafter in the *ahupua'a* of Kahauiki, and Aliamanu Military Reservation and Tripler Army Medical Center in the *ahupua'a* of Moanalua. There are no Army installations in the Ewa portion of the south coast.

Kona occupies the southeastern coast of the island of Oahu, a broad plain fronted by sandy beaches and coral reefs. Behind the plain is a range of valleys that vary from relatively arid (like Maunalua in the east and Kahauiki and Moanalua in the west) to lush (the central valleys of Manoa, Nuuanu, and Kalihi). Handy and Handy (1972:474) describe the district:

There were abundant rain, ever flowing streams, springs, pools, verdant interior valleys, broad slopes and well-watered lowlands, fishpond areas, harbors, beaches, and lagoons. Altogether Kona was, for Oahu, the area richest in natural resources and most pleasant for abundant and comfortable living.

At the time of western contact, the center of island power was in Waikiki (now the location of Fort DeRussy), where the Oahu chief Peleioholani had his primary court and major temples. Local chiefs also had centers of power, primarily the area around the Pearl Harbor lagoon in the district of Ewa and around Kaneohe Bay on the windward side of the island. The entire southern coastline, including the coastal plain and the inland valleys, was developed in irrigation pondfields, which may have been the primary zone of cultivation on the island at the time (Kirch 1992). Kotzebue's 1817 map of the south coast of Oahu (in Fitzpatrick 1986:48-49), which is considered the earliest map of this coastline, shows agricultural fields (presumably for taro cultivation) extending from Honolulu to Pearl Harbor. The southern coast was also an intricate network of fishponds and fishtraps. Every embayment from Pearl Harbor to Waikiki was lined with elaborately constructed ponds for cultivation of fish.

## **The Leeward Coast of Oahu**

The leeward coast of the island falls entirely within Waianae district. The USAG-HI installations, Waianae Army Recreation Center and Mākua Military Reservation, are within the traditional land areas of Waianae and Mākua, respectively.

Waianae district consists of seven traditional land units that, except for the *ahupua'a* of Waianae, encompass an area that is naturally defined by the cliffs or crest of the Waianae Range and by spur ridges that extend to the ocean. The *ahupua'a* of Waianae includes three valleys (Waianae, Lualualei, and Nanakuli) and a narrow extension across the central island plateau (Waianae Uka).

Handy and Handy (1972:275-276, brackets added) describe the Waianae area as an area "subject to drought:"

The third dry area on Oahu was the coast along the leeward flank of the Wai'anae range, from Mākua to Nanakuli. Only Wai'anae Valley supported a number of areas where wet taro was planted, watered by streams from the Wai'anae range, streams whose flows were probably constant owing to the high bogs on top of the mountains. Here in Wai'anae Valley was the only village to be seen along this coast when the area was visited by Vancouver [in 1793]. Along the

rest of the coast he reported seeing only “a few straggling fishermen’s huts” and “a small grove of shabby cocoanut trees.”

Based on the arid conditions of the leeward coast, Cordy (1998) suggests that early occupation of this part of the island began near sources of permanent fresh water, probably in Waianae Valley. Keaupuni Stream at Pokai Bay (the present Waianae Army Recreation Center) and Kekoo Spring at Kamaile made these “the two best watered coastal lands” in the district (Cordy 1998:7). Early dates from Waianae indicate settlement by A.D. 1100-1200 (Cordy 1998).

Primary settlements were probably along the coast, with the main subsistence activity being fishing in the rich leeward waters. Back dune marsh areas may also have been used intermittently as fishponds. Handy and Handy (1972:467) describe the fishing potential of this coast:

... the exceptionally rich deep-sea fishing available off and beyond Ka‘ena Point, where the great current pressed by the northeast trade winds flows in a westerly direction along these shores. It was here that the ancient chief Kawelo distinguished himself as a fisherman; and there are also many stories of the culture hero Maui as a great fisherman identified with this area.

The middle valleys were an intermediate zone, with only temporary shelters and scattered dryland gardens except possibly along permanent streams. Pili grass was a valued resource of these dry plains.

The upper valleys were developed in dryland and irrigated agricultural complexes fed by higher rainfall, springs, and permanent streams. Nineteenth century land records for Lualualei Valley also refer specifically to *wauke* (*Broussonetia papyrifera*; used for making *kapa* cloth) collection in forest areas. Haun (1991:238) describes an area at the back of Lualualei Valley as “an area with many walled pits presumed to be for cultivation of certain low tree/shrub corps, possible *wauke* or bananas.” The upper reaches of the valleys were also sites for habitation.

The Waianae valleys were also transit points for travelers crossing between the leeward coast and central Oahu. The two main passes across the Waianae Range are in Lualualei Valley. Kolekole Pass, the higher of the two passes, is located at the northern corner of the valley and connects the Waianae coast with Waianae Uka (the present Schofield Barracks), the inland extension of Waianae district onto the central Oahu plateau. Pohakea Pass is at the southeastern corner of the valley and connects the leeward coast with the area called Lihue in the district of Ewa (Covington 1881).

Travelers across the Waianae Range may have used other trails as well as these two main passes. In his tour of Oahu in 1828, Levi Chamberlain (1957:37-38, in Kelly and Quintal 1976:18) described entering Mākua Valley from Kawaihapai on the north shore, stopping on the ridge overlooking the valley:

... [we] reached a prominence just before the commencement of the descent of the mountain; from which we had a full view of the valley of Makua, into which we were about to descend. At about half past one o’clock we directed our steps downward by a steep and rugged path. Having descended the steepest part of the mountain, we came to a deep gutter worn out by the rains. Here we found cool, pure water ... we pursued our way along the declivity, which was now a gentle slope clothed with grass & shrubs, and at half past 3 o’clock arrived at the settlement of Makua upon the sea shore.

## **The North Shore of Oahu**

The north shore of the island extends from Kaena Point on the west to Kahuku Point on the east. At the center of the north shore is Waialua Bay, into which flow some of the longest streams on the island. Most

of the north shore falls within the traditional district of Waialua; the stretch of coastline from Waimea Bay to Kahuku Point lies within Koolaupoko district.

Dillingham Military Reservation and Mokuleia Army Beach are adjacent USAG-HI installations at the western end of the north shore, at the base of the Waianae Range. They lie in Waialua district in the *ahupua'a* of Kaena, Kawaihapai, Kealia, and Mokuleia.

The western end of the north shore is a generally dry area with no permanent streams. Streck (1986), however, notes the presence of “sacred springs situated along the base of the mountains in Kawaihapai (and perhaps Kealia).” Small areas of irrigated taro fields were probably fed by the mountain springs, but it is clear that most of this coastal plain was cultivated in dryland crops such as sweet potato. In his 1826 tour of Oahu schools, Chamberlain (1957:36-37) described the general area, probably Kealia or Kawaihapai, where a trail crossed the mountain into Mākua Valley on the leeward coast:

We ascended by a rough and difficult path, shrubs, long grass, wild plants and bushes sprung up and grew luxuriantly among the rocks, being plentifully moistened by little streams which trickled down the steep sides of the mountains.

After ascending several hundred feet we came to a small stream of clear water conducted by spouts and gutters to the plain below affording sufficient moisture for a number of taro patches. I was told that the water never fails; -- and the district into which it passes is called Kawaihapai (Water Lifted Up) on account of the water's being conducted from such an elevation. The prospect from the acclivity is very fine, the whole district of Waialua is spread out before the eye with its clustering settlements, straggling houses, scattering trees, cultivated plants and growing vegetation.

## **The Central Plateau of Oahu**

The central plateau of the island falls primarily within the Waianae district, with the northern area in Waialua district and the southern area in Ewa district. A significant portion of the central plateau is under USAG-HI jurisdiction: Schofield Barracks (cantonments and training areas), Wheeler Army Airfield, Helemano Military Reservation, Kipapa and Waikakalaua Ammunition Storage sites, Kunia Field Station, and the Pupukea-Paalaa Uka Road.

In ancient times, the central plateau, particularly the area called Lihue on the southwestern part of the plateau, was a center of island political power. Even after the royal center had shifted to Waikiki during the time of chief Mailikukahi, this central area continued to play a role in chiefly activities, especially related to Kukaniloko, the site where chiefs came for the birth of their royal children. The birthstones were said to have been established by Nanakaoko and his wife, Kahihiokalani, who gave birth to Kapawa, the first of the important high chiefs born at this place (Fornander 1969; McAllister 1933). As late as 1797, Kamehameha is said to have “made every arrangement to have the accouchement [birth of his successor] take place at Kukaniloko; but the illness of Queen Keopuolani frustrated the design” (Fornander 1969:II-21).

The central plateau was also a sanctuary for refugee chiefs. In 1783, the Maui chief Kahekili invaded and conquered Oahu, chasing the Oahu chief Kahahana and his wife into hiding in “the thickets of Wahiawa” (Kamakau 1961:136). The chiefly refugees undoubtedly sought cover in the dense mountain forests of the central plateau.

The larger gulches of the central plateau and the gulches on the higher slopes of the Waianae and Koolau Ranges were probably cultivated with irrigated taro. Handy (1940:81) writes “there are terraced areas watered by Kioea and Waikoloa [the north boundary of the Schofield Barracks cantonment] Streams. Kalena Gulch [in the Schofield West Range] had some terraces; I have no information about Mohiakea.”

There were also terraces on the level land between the junction of Poamoha and Helemano Streams, in Kaukonahua Gulch, and in Helemano Stream, and there were numerous irrigated pondfields northwest of present Wahiawa town (Handy and Handy 1972).

Residences were probably on the tablelands and along the edges of ridges. Nineteenth century records document several villages in the area: Kalakoa was a large village and others included Oahunui, Lihue, and Waikakalaua (as listed in 1855 tax assessment books, State of Hawaii Archives). Kamakau (1961:424) writes that during the reign of Kamehameha III (1825-1854), “schools were built in the mountains and in the crowded settlements...At Kahalepo‘ai, Hauone, Kalakoa, Wahiawa, Halemano, and Kanewai, there were large villages with teachers and schoolhouses; so at Lihu‘e, Kalena, Maunauna, Kake, and Pu‘uku‘u.” This probably occurred sometime after 1840 when a law establishing government schools was passed.

A network of trails connected the central plateau with other parts of the island. The northern leg of the Waialua trail extended to the north shore; the southern leg reached to the rich estuaries of Puuloa (Pearl Harbor) on the south shore. The Kolekole trail pointed west to the crest of the Waianae Range and across to the leeward coast.

The central plateau was also certainly a collection area for forest resources like *koa* and *ohia* wood, wild vegetable foods, and animals, especially birds that were trapped for food as well as for their feathers.

A legendary account of the central plateau describes the cannibal chiefs of Helemano. Nakuina (1897:90, brackets added) writes:

Lo-Aikanaka is the name given to a family of South Sea chiefs who are driven from the plains of Mokuleia [near the present Dillingham MR] into the hills to a place called Hele-mano [the present Helemano MR], where they are received by the chief Oahu-nui east of that locality and the two chiefs exchange courtesies. Oahu-nui develops a passion for human flesh and finally the two chubby sons of his sister Kilikiliula, wife of Lehua-nui, are sacrificed to his appetite during the absence of their father. Warned by a vision, the father returns, puts to death the chief and his sister, and abandons the place with his men. A curse hangs over the place...None has ever dared to live there since (T. Thrum, quoted in Beckwith 1970:342).

Aikanaka, the cannibal chief, resided at Helemano, “a narrow ridge of land forming a curving pathway between two steep gulches along which men used to travel to reach the mountain timber” (Beckwith 1970:340). Jarves (1844:72), on the other hand, describes Aikanaka as “a beautiful and retired rural spot...[lying] between two deep ravines...its area embraces several hundred acres, verdant and picturesque, but now regarded with superstitious dread, from once having been the rendezvous of a clan of cannibals.”

## **The Mountain Ranges of Oahu**

The Koolau and Waianae mountain ranges roughly form the divides between traditional Hawaiian districts: Koolauloa and Koolaupoko on the windward side of the Koolau Range, Waianae on the leeward side of the Waianae Range and across the crest of the central plateau, Waialua to the north of the central crest, and Ewa to the south of the crest. These were the hinterlands of Hawaiian settlement, providing places for resource collection but little that was useable for cultivation except in some of the larger gulch areas. USAG-HI installations that fall within the mountains include the Kawailoa and Kahuku Training Areas in the Koolau Range and the Mauna Kapu Communication Station in the Waianae Range. The western boundary of Schofield Barracks falls at the crest of the Waianae Mountains, with Kolekole Pass at the center. The eastern boundary of the installation falls at the crest of the Koolau Range.

While the mountains themselves were a collection area for natural resources such as timber and birds, it was probably the gulches and valleys that were used intensively. Research in the middle and upper reaches of Anahulu Valley, which flows out of the Koolau Range through the Kawailoa Training Area and into Waialua Bay (Kirch 1992; Dega and McGerty 1998; Dega and Kirch 2000), found archaeological evidence of settlement and cultivation. From the A.D. 1300s, the inland valley was probably visited by people from the Waialua coast who came on seasonal forays for resource collection and some shifting cultivation, and sometimes took shelter in shallow caves along the base of the valley walls. Between A.D. 1400 and 1600, localized households occupied the valley, with some household-based agriculture and continued natural resource collection. In the last century before western contact, residences were in open-air sites as well as in some of the rock shelters.

At the time of contact and for a short period after, Kamehameha was waging his wars of conquest. In 1804, he occupied Oahu, and Kirch (1992) argues that this led to a rapid transformation of settlement and land use in the middle reaches of Anahulu Valley: the development of open house sites (as opposed to rockshelters) and permanent irrigation agricultural systems. This transformation was almost equally nullified within a decade when most of the area was abandoned. The intensification of agriculture did not extend into the upper portions of the valley within Kawailoa Training Area.

Opportunity for human settlement in the Waianae Mountains differs from that for the Koolau Range. Unlike the narrow gulches and rugged terrain of the latter range, the valleys and tablelands of the eastern slope of the Waianae Mountains (within the Schofield Barracks West and South Ranges) offered more useable lands for cultivation and habitation, as well as proximity to a major transportation route, the Kolekole Pass. Irrigation complexes, dryland fields, and temporary and permanent habitation localities follow permanent streams to within 2,800 feet of the crest of the mountain (Carson and Yeomans 2000).

### **Hawaiian Cultural Context: Hawaii Island**

No site considered an early permanent settlement has ever been identified on Hawaii Island (for reviews of early dates (see Kirch 1985:68; Hunt and Holsen 1991; Spriggs and Anderson 1993; Cordy 2000:100-127). The only site to be seriously considered as having a pre-A.D. 600 occupation is the temporary occupation locale of Puu Alii at South Point; like the Bellows Site on Oahu, however, the dating of this site is debated (Dye 1992; Cordy 2000).

The model of early windward settlement of the island remains largely untested, with very little work conducted in predicted locations of early occupations. A 1991 summary of pre-A.D. 1000 dates from the island (see Hunt and Holsen 1991:Figure 1) identifies no dated sites from the windward area. The earliest dates available at the time of that review are in the A.D. 1000-1400 range and come from sites in Honopue Valley on the windward Kohala coast (Tuggle 1979; Cordy 1994:Table 11). As far as is known, more recent work has produced only one date with an earlier range (A.D. 784-1187), this from Waimanu Valley, which is also on the windward Kohala coast (Shun and Schilz 1991; Cordy 1994: Table 11).

Although a few radiocarbon dates from the island fall between A.D. 600-900, most of them (calibrated at two sigma) also overlap the A.D. 900-1100 range (see e.g., Hunt and Holsen 1991:Table 1). This is also true if sequences in individual regions are considered (e.g., Burtchard 1996:Figure 3-1 for Kona). It is thus during the A.D. 900-1100 era that there is clear evidence for scattered settlement over various parts of the island, including the beginnings of cultivation in the leeward regions (Cordy 2000).

As for all of the islands (as shown in the radiocarbon-based population curve of Dye and Komori 1992; also see Dye 1994), Hawaii Island population, settlements, and cultivated areas expanded rapidly in the A.D. 1150-1400 era. Radiocarbon dates from the upland saddle and montane regions (Cordy 1994:Tables 29 and 32) indicate some activity as early as about A.D. 1000-1100, including initial use of the massive

basalt quarry complex on Mauna Kea (McCoy 1978). However, it is during the A.D. 1150-1400 period that there is evidence for relatively frequent visits to this region for the exploitation of natural resources. This resource collection was related to subsistence and daily life, such as birds for food and timber and vine for construction. Some may also have been associated with collection of materials destined for use by and for the chiefs, such as bird feathers for helmets and cloaks and large logs for temple images and canoes. There is no direct evidence concerning the time when such items became chiefly needs, but the association of upland activity and traditional evidence for increasing political authority is suggestive. Fornander (1969:II-110) notes, for example, that feathered helmets are “mentioned in legends older than the time of *Umi*.”

Traditions (e.g., Fornander 1969:II-49) suggest that the A.D. 1150-1400 period was one of competing district-sized chiefdoms or kingdoms. In general, there were three centers of power during this period: Waipio Valley in the windward region, Kona in the leeward area, and Kohala on the northern end of the island. Toward the end of this time period, traditions identify a new social order created through the actions of the priest Paoa and the empowerment of the Pili lineage (see Table B.3; also see summary of discussions of Paoa and Pili traditions in Hommon 1976; Cachola-Abad 1993; Cordy 2000:Table 6-2).

There is evidence that some form of island political consolidation occurred under Pili and his successors (Fornander 1969:II-22; see summary in Cordy 2000:186ff), although this appears to have varied in strength and cohesiveness. By the time of Liloa in the late A.D. 1500s, the island was clearly a strongly centralized kingdom. Also at this time, it appears that the massive dryland agricultural field systems of Kona and Kohala had been extensively developed, matching the growth of large population centers along the leeward coast of the island. The importance of the leeward region was emphasized during the time of Umi in the early A.D. 1600s, when this king moved the royal center to leeward Kona from its ancient location in windward Waipio Valley (Fornander 1969).

As indicated above, the trajectory of Hawaii’s population and subsistence in the A.D. 1700s remains uncertain. However, under the power of centralized authority, large construction projects, including possibly fishpond construction and certainly the rededication and expansion of major temples (Kamakau 1961), continued during this period. The temple construction was primarily related to the intensive warfare of the period, which involved some internal conflict, but was mainly between island kingdoms. At the time of European contact in 1778, the two powerful kings of Hawaii and Maui were involved in a protracted war.

## **The Saddle Region of Hawaii Island**

Pōhakuloa Training Area (PTA), the main Army facility on Hawaii Island, lies primarily in the upland Saddle Region of the island. It falls within the *ahupua‘a* (land area) of Kaohe in the traditional district of Hamakua; a small portion falls in Hilo district (Figure B.2). A detailed archaeological and historical summary of this district is presented in Cordy (1994), with summaries of the specific PTA region described in numerous archaeological reports for the facility (summarized in Williams [ed.] 2000). Eidsness et al. (1998) is an historic preservation plan (HPP) that describes the historic context of PTA in detail.

Kaohe stretches from the windward coast of the island to the area that is identified physiographically as the Interior Plateau (Cordy 1994), commonly called the Saddle Region. It also incorporates much of Mauna Kea. Like all of the other land areas of Hamakua, the main settlement and agricultural region of Kaohe was near the coastline. Within the boundaries of what is now PTA, Hawaiians came periodically to collect upland resources like birds, other forest products, and volcanic glass and basalt for tools. Birds played a role in subsistence, as well as in the production of elite goods. The young of Hawaiian dark-rumped petrel, which nested in the Saddle Region, was considered a delicacy reserved for the chiefs. The feathers of other mountain birds were collected for chiefly capes and headdresses. Volcanic glass, which

occurs as surface chills on pahoehoe flows in the Saddle area, and basalt were quarried and worked in the PTA area (Athens and Kaschko 1989; Eidsness et al. 1998).

Hawaiians who came in search of mountain resources took shelter in lava tubes that provided protection from the high elevation conditions (Eidsness et al. 1998). They left behind evidence of their presence in the form of firepits, pavings, cupboards, and other household improvements. A variety of artifacts attest to their residence: groundstone tools, charred wooden torches, gourd containers, cordage and matting, woven leaf sandals, and the remains of meals of fish, shellfish, and bird.

Although resource collection probably began in the A.D. 1000-1100 period in the upland region as a whole, the most intensive period of use in the PTA area was in the A.D. 1400-1600 period (Streck 1992; Reinman 1999; Shapiro and Cleghorn 1998). There was a possible decline in the A.D. 1700s, possibly due to over-exploitation.

Trails in the area were used in pre-contact and early post-contact eras for the movement of armies (Kamakau 1961), and certainly for access to the resources of the PTA region and adjacent areas, including the basalt quarries on Mauna Kea. Another trail is associated with the temple known as Ahu a Umi, which is west of the training area. Radiocarbon dates from shelters near trails indicate that some were in use as early as the A.D. 800-1100 period (Cordy 1994).

### **The Kilauea Summit Region of Hawaii Island**

Kilauea Military Camp sits on the north rim of Halemaumau crater in the summit region of Kilauea Volcano. It falls within the *ahupua'a* of Keauhou, which marks the eastern border of the traditional district of Kau. Just east of the KMC area is the district of Puna. The district of Kau encompasses the southern quarter of the island of Hawaii and is dominated both geologically and visually by the looming and still active Mauna Loa and to a lesser extent by Kilauea. A detailed archaeological and historical summary of this area is presented in Tomonari-Tuggle and Slocumb (2000b).

The seaward half of Keauhou is arid, a series of volcanic terraces descending steeply from Kilauea crater to the sea. The inland half of the land area above the volatile crater is an *ohia-koa* forest on a base of volcanic lavas from Mauna Loa. Agricultural potential for ancient Hawaiians was limited. A small, wide bay at the coast offered a base for good fishing; springs provided fresh water (Handy and Handy 1972). Trails extended inland to the crater, and along the coast in both directions.

Similar to the Saddle Region, the Kilauea summit area falls in a relatively remote and high-elevation zone that was used by ancient Hawaiians primarily for the collection of natural resources such as bird feathers for chiefly adornment and hardwoods for canoes, houses, and tools. Although higher than the interpreted elevation range of primary *koa* exploitation for canoes (McEldowney 1979), the Kilauea summit area may have seen some canoe-making activity. On his trip to the volcano in 1825, the botanist Macrae (1972:75) described “some sheds used by the natives when cutting trees for canoes” on the north rim of the crater near the steam vents. Similarly, the missionary William P. Alexander (1934:129), in his traverse of the Hawaii mountains in 1833, noted “passing many large trunks of the *koa*, partly hewn into canoes, beside which were erected little huts, the temporary abode of the carpenters.”

From a cultural perspective, Kilauea Volcano is intimately tied to the goddess Pele, who made Kilauea her principal home when she emigrated from Tahiti. Wherever she traveled, she announced her coming “by the convulsive trembling of earth, the illuminating fire in their houses [i.e., craters], ... the flashes of lightning, and the roar of awful thunder” (Ellis 1963:173, brackets added).

The traditions of Pele are a significant aspect of the Kilauea region and undoubtedly played a role in Hawaiian use of the area. Byron (1826:186) notes that nothing of the crater region was eaten or disturbed

or carried out without first propitiating Pele “by locks of hair, and often more precious things. Frequently the hog and the dog were sacrificed to procure her favour.” Ellis (1963:185) notes that apprehension about Pele and her anger prevented frequent visits by Hawaiians to the crater summit, and that when “they had occasion to approach Kirauea, they were scrupulously attentive to every injunction of her priests.” One of the most noted historical events attributed to Pele occurred in the late 1700s. Keoua, the ruling chief of Kau and part of Puna, was passing Kilauea enroute to Puna following a stale-mated battle with his rival Kamehameha. A violent explosive eruption engulfed a portion of his army, expressing Pele’s displeasure with this chief.

Less than three decades later, however, Pele’s primacy was challenged by a convert to the new Christianity. In 1824, the high chiefess Kapiolani, a recently avowed Christian, defied the volcano goddess in an effort to convince the people of their false gods. Byron (1826:187) describes her action:

... she resolved to climb the mountain, descend into the crater, and, by thus braving the volcanic deities in their very homes, convince the inhabitants of the Islands that God is God alone, and that the false subordinate deities existed only in the fancies of their weak adorers.

The fact that Kapiolani returned to the rim of the crater totally unscathed after stirring the liquid lava and ashes of the lake at the crater bottom was sufficiently convincing to Hawaiians to become less fearful.

### **The Hilo Bay Region of Hawaii Island**

The U.S. Army Reserve Center at Hilo is located near Hilo Bay, on what is physiographically known as the Hilo Lava Plain. It falls within the large *ahupua’a* known as Waiakea in the traditional district of Hilo.

The area around Hilo Bay was a rich environment for Hawaiian settlement, with the fertility of recent lava flows, numerous streams and natural ponds, and high rainfall. Early visitors saw a dense population within a well-exploited, lush agricultural landscape (Ellis 1963), an impression that lasted into the latter part of the 19<sup>th</sup> century (Bird 1974). This area was well-known for its breadfruit, for its many varieties of taro grown under conditions ranging from dryland to swamp to irrigation, and for its fishponds (Handy and Handy 1972; Kelly et al. 1981). It was probably an area of early Hawaiian settlement, although there are no radiocarbon dates from this time span (Hunt and Holsen 1991).

At contact, habitation and communal activities were centered around Hilo Bay, although houses were also scattered among the agricultural fields throughout the region (Kelly et al. 1981). Hilo was also one of the centers of power throughout much of the history of pre-contact Hawaii, and was clearly a royal center in the A.D. 1700s and during the time of Kamehameha (Cordy 2000).

### **The Kawaihae Region of Hawaii Island**

Kawaihae Military Reservation is located on the leeward west coast of the island of Hawaii. It falls in the land units of Kawaihae and Waimea in the traditional district of Kohala. Waimea extended from the coast south of Kawaihae to the highest point of the Waimea Plain in the modern town of Waimea, and southward to the district boundary with Kona. Kawaihae was a smaller area within the extensive Waimea region, centering on Kawaihae Bay.

This is a rocky and arid zone, but one that was nonetheless developed for limited Hawaiian agriculture and habitation, as indicated by archaeological research and early post-contact accounts (Clark and Kirch 1983). Undoubtedly, however, the main attraction of this coastline was its rich marine resources, and throughout its history, settlement at Kawaihae was concentrated close to the shore, with an emphasis on fishing and shellfish collection. It is possible that there was early temporary use for fishing camps, but none have been identified in the area. Based on radiocarbon dates from sites on the north coast of

leeward Kohala and from sites south of Kawaihae (e.g., at Waikoloa, Kalahuipuaa, and Anaehoomalu; summarized in Kirch 1985 and Cordy 2000), it is possible that there was occupation of the region in the early A.D. 1000 era. However, settlements of any significance probably did not begin until the A.D. 1200-1300s. Radiocarbon dates from the Kawaihae area are in the A.D. 1400-1800 range (Clark and Kirch 1983).

At the time of western contact, Kawaihae was described as a treeless shore with few houses or signs of culture, and with little to offer in the way of provisions for western ships (Beaglehole 1967; Portlock 1794). Shortly after, however, Kamehameha was moving to secure his position as supreme ruler of the islands, and the small settlement at Kawaihae was greatly expanded as a result of his undertakings. In 1790, he began construction of the massive temple at Puukohola at Kawaihae, which involved amassing a labor force said to be in the thousands (Kuykendall 1938). From around 1793, the former British sailor John Young resided at Kawaihae in the service of Kamehameha. Young's task was to supervise a large work force of blacksmiths and carpenters in the construction of Kamehameha's war fleet in preparation for the invasion of Kauai (Sahlins 1992). Young stayed on at Kawaihae after Kamehameha's departure in 1802, serving as governor of the island and managing trade and resources on behalf of the high chief until 1812. An 1819 map of Kawaihae shows 111 houses comprising the village, including Young's residence and structures associated with Kamehameha's temple (Duperrey 1819; Rosendahl and Carter 1988:Figure 11).

## **19<sup>th</sup> Century Historic Context**

The 19<sup>th</sup> century historic context presents a framework for understanding the cultural resources of the period in Hawaiian history following the time of western contact. This section summarizes the 19<sup>th</sup> century history of the islands, focusing on some of the critical factors that resulted in a transformation of the Hawaiian landscape. These factors include: the early inter-island wars that culminated in Kamehameha's unification of the islands, the effects of westernization on settlement and land use (primarily through the introduction of new economies, such as ranching, commercial agriculture, and new technologies), and especially by the drastic change in the concept of land ownership brought about by the mid-19<sup>th</sup> century Mahele.

The chapter concludes with a discussion of themes and property types of the 19<sup>th</sup> century historic context.

### **Background**

The physical, social, and political landscape of the islands was transformed during the 19<sup>th</sup> century. Within 30 years of western contact in 1778, the geographic focus of political power shifted from island-based chiefdoms to centralized government at the protected harbor of Honolulu. Kamehameha's conquest of the islands (except for Kauai) brought him to Oahu, where he first settled at Waikiki and then moved to Honolulu, the best anchorage in the islands for foreign ships.

The 19<sup>th</sup> century saw a transformation in population. From the time of first contact, foreigners began staying in the islands, in some cases integrating themselves into traditional lifeways and in other cases imposing western concepts of society. They also brought new diseases that raged as epidemics, decimating Hawaiian communities; the population on Oahu was particularly vulnerable, already weakened by the havoc wreaked by the inter-island wars of the late 1700s. In the aftermath of Kamehameha's death in 1819 and the subsequent abandonment of the traditional *kapu* system, American missionaries arrived with a new set of religious order. In the second half of the century, the development of commercial agriculture resulted in new waves of immigrants.

The physical landscape of the islands was inexorably transformed. The introduction of cattle to Hawaii in the late 1700s had a horrific effect. With a *kapu* in place, cattle were allowed to range free, and

subsequently ran amok in native gardens and across the native forests. The sandalwood trade of the first three decades of the 19<sup>th</sup> century had an equally devastating effect on the landscape; the need for firewood in urban areas and as part of the whaling industry had similar impacts (see discussion below). Frequent forest burning and cutting in the relentless quest for sandalwood and firewood, combined with the effects of free-ranging cattle, resulted in massive deforestation and erosion. Commercial agriculture in the second half of the century spread sugarcane, pineapple, and other cash crops across the landscape.

In the first half of 19<sup>th</sup> century, the Hawaiian government moved from a highly stratified political order led by island chiefs to a formalization of a Hawaiian monarchy within a western framework. In between occurred Kamehameha's unification of the islands, the collapse of the *kapu* system, and the premiership of Kaahumanu, Kamehameha's favorite wife who was greatly influenced by the American missionaries. At mid-century, one of the key events of political change in terms of settlement and land use occurred; this was the introduction of a western-based concept of land tenure based on fee simple ownership. The century ended with the overthrow of the monarchy and eventual annexation by the U.S. government.

### **Inter-Island Wars of Conquest**

In his quest for island unification in the late 18<sup>th</sup> century, Kamehameha amassed and moved huge armies through staging points, battles, and battle aftermaths. After his victories, he rewarded his chiefs with new lands, particularly after the conquest of Oahu.

Several of the USAG-HI installations fall in areas that felt the tread of Kamehameha's army. Over a period of 12 years, Kawaihae on the leeward coast of the island of Hawaii experienced a massive influx of population related to Kamehameha's ascendancy to power. In 1790, the high chief began construction of Puukohola, the *heiau* that was the site of his ultimate conquest of the island (in which his adversary Keoua was deceived and then sacrificed at the temple dedication). He amassed a construction force said to be in the thousands (Kuykendall 1938). From around 1793, John Young resided at Kawaihae with the task of supervising the construction of Kamehameha's war fleet in preparation for the invasion of Kauai (Sahlins 1992). By the time Kamehameha embarked on the invasion in 1802, he had 7,000 to 8,000 warriors under his command. Such numbers suggest that use of the Kawaihae coast as a staging area increased pressure on local resources.

In the mid-1790s, Kamehameha invaded Oahu, which was ruled by Kalanikupule, the successor to the powerful Maui chief Kahekili. Kamehameha landed his forces at Waikiki, where as many as 10,000 warriors may have encamped along the sandy beaches from Waialae to Kalia (just west of Fort DeRussy) (Kanahele 1995). The invasion ended at the battle of Nuuanu when Kalanikupule's warriors leaped to their deaths off the sheer *pali*.

In the period immediately following this conquest, Kamehameha's massive army, including dependents, overwhelmed the resources of the island and it is said that Oahu was reduced to famine (Sahlins 1992). Kamehameha was forced back to Hawaii to put down a minor rebellion but returned in 1804 with another army set on the conquest of the still independent Kauai. Having learned his lesson from his earlier stay on Oahu, Kamehameha had a new policy of dispersing the lesser chiefs in hinterland areas and encouraging them to intensify agricultural production (see Sahlins 1992 and Kirch 1992 for their Anahulu example, a small portion of which extends into the Kawaihoa Training Area).

### **Economic Changes**

Following western contact, foreigners introduced new economies to the islands, based on commerce and trade within a global sphere. Early economic changes focused on using natural resources for commercial purposes. There were early attempts at starting western-style commercial industries such as agriculture and ranching, but it was not until mid-century changes in the way that land was held that the investment for commercialization became feasible.

### ***Commercialization of Natural Resources***

Natural resources of the islands were sometimes commercialized with devastating effect on both the resource and the Hawaiian population. Some of the most notable examples are sandalwood, timber for firewood, *pulu*, and native birds.

**Sandalwood.** In the first three decades of the 19<sup>th</sup> century, the aromatic sandalwood was a valuable commodity in the China trade. Initially controlled by Kamehameha, the trade exploded in the 1820s, after the high chief's death, when other chiefs were allowed to become involved. The sandalwood population was nearly devastated, bringing the active trade to an abrupt end by the close of the decade. Commoners were often pressured into sandalwood collection by the local chiefs. The trade was rampant and affected populations throughout the islands by forcing people away from their subsistence activities. Even at a relatively remote place such as the crest of the northern Waianae mountains were "the ruins of a hut built apparently not long since for the accommodation of sandal wood cutters" (Chamberlain 1957:37).

The sandalwood trade had a double effect in rural areas with useable anchorages, such as Kawaihae on the leeward coast of the island of Hawaii. In addition to taking Hawaiians away from farming and fishing, the trade also created an industry related to shipments. In 1823, the Reverend Ellis (1963:286) reported seeing approximately 2,000 to 3,000 men transporting loads of sandalwood to the landing at Kawaihae.

**Firewood.** Firewood was also a commodity, with demand from both the growing population in urban areas as well as the local whaling industry that operated from the 1820s to 1870s. From about 1850, it became common practice to transship oil and whale bone from whaling ships to merchant ships sailing for New England. Firewood was needed to render the blubber into oil, and there were significant quantities of oil to be rendered: one ship "took into her hold 8,000 barrels of oil in January and February, 1853" (Kuykendall 1938:309). The combined firewood and sandalwood collection probably decimated the native forests of Hawaii, particularly on Oahu because of its central importance to foreign trade through the port of Honolulu. Cuddihy and Stone (1990:38, referencing Kuykendall 1938) report that more than 20,000 cubic feet (representing possibly several hundred trees) were supplied to ships laying up in Hilo in a one year period.

**Pulu.** In the mid-1800s, a new industry based on *pulu* developed in the mountain regions of the islands. *Pulu* is the soft downy material that grows around the fronds and fiddleheads of the *hapuu* fern (*Cibotium glaucum*). The first commercial sale of *pulu* was made in 1847, when a businessman found that it made an excellent stuffing for pillows and mattresses (Glidden 1998). Demand for *pulu* came from as far away as Paris, and by 1862, over 788,000 pounds of *pulu* were exported from the islands. In the volcano region of Hawaii, families were hired to collect the *pulu* as well as to work at the processing centers, where the *pulu* was dried and compacted into 100 pound bales for shipment through Keauhou to Honolulu. *Pulu* collection was a labor intensive operation, which Glidden (1998) describes:

The actual harvesting of *pulu* was usually completed by first cutting the stalk of the *hapu'u* with a stone tool thus exposing the fronds and fiddleheads. The *pulu* was then removed with a bone scraper and placed in burlap bags (Hilo Tribune-Herald: July 10, 1932). It probably took a while to fill one bag as each tree fern supplied a mere 5 ounces. This is a trivial amount considering the 30 pounds required to fill just one mattress.

In 1851, two *pulu* processing centers were developed in the volcano region, including one just north of the present Kilauea Military Camp (Olson 1941).

**Bird Catching.** The profession of bird catching in the upland areas continued into the 19<sup>th</sup> century, practiced much as it had been in traditional times since bird hunters “were able to find a market for feathers even after the disappearance of traditional Hawaiian feather crafts” (McEldowney 1979:42). However, toward the end of the 19<sup>th</sup> century, bird hunters began using guns, with disastrous effect on the population of several species (McEldowney 1979). Berger (1972:121) notes that at the turn-of-the-century, bird hunters killed more than 1,000 ‘ō‘ō (*Moho nobilis*) in the heavily wooded area north of the Wailuku river in Hilo. Emerson (1894:111) laments:

The days of the bird-catchers of ancient Hawaii are over. Their place has been taken by those who know not Ku-huluhulumanu and the other gods of the craft. In their hands, instead of the snare and the pole, with its gum, its flowers and decoys, there is the deadly shot-gun.

### ***Changing Agriculture***

In the early 19<sup>th</sup> century, foreign vessels laying over in Hawaiian waters likely reoriented cultivation from subsistence production to commercial crops such as Irish potatoes and fresh vegetables (as well as fresh and salted beef). At mid-century, the Gold Rush boom in California prompted increased commercial agriculture for export, but even so, cultivation remained at a relatively small scale. The major change in the agricultural landscape came in the second half of the century with the development of the sugar industry.

The impetus for the sugar industry was the Reciprocity Treaty of 1876 in which the Hawaiian government granted the United States permission to develop Pearl Harbor in exchange for allowing the duty-free import of Hawaiian sugar to U.S. markets. Sugar fields, mills, and rail lines sprang up throughout the islands. An intricate combination of groundwater pumping, fluming, and tunneling brought valuable water from source to fields, sometimes across far distances. Even on the arid leeward coast of Oahu where permanent streams are almost non-existent, sugar fields spread across valley floors, with water piped and flumed from one valley to the next. Labor was also a requirement, and to meet this need, foreign workers were imported, primarily from Asia.

Sugar was grown in the Dillingham Military Reservation area. Kahuku Training Area was part of the Kahuku Sugar Plantation. Even the gulch areas now occupied by Kipapa and Waikakalaua Ammunition Storage facilities were part of sugar operations. The town of Hilo on Hawaii Island (site of the U.S. Army Reserve Center) developed into the islands’ second largest city as a result of the sugar industry on the Hilo-Hamakua coast.

In 1900, James B. Dole came to Wahiawa with ideas for growing pineapple for a canning operation (Nedbalek 1984). By 1910, there was pineapple growing on thousands of acres both north and south of Wahiawa. The industry flourished through the first half of the 20<sup>th</sup> century. Infrastructure and labor requirements were similar to, and had similar effects as, the sugar industry. A portion of Wheeler Army Airfield and Helemano Military Reservation were once part of the extensive central plateau pineapple fields.

### ***Ranching***

In 1793, Captain George Vancouver introduced cattle to Hawaii. Kamehameha immediately instituted a *kapu* on the animals for a period of ten years. The animals became a serious problem as they survived and reproduced handsomely in the wild. Ellis (1963:291) writes that the cattle “resorted to the mountains and became so wild and ferocious that the natives are afraid to go near them.” The trade of bullock hunting began in the early 1800s, and by the 1820s, it was an industry, with commodities of hides and tallow for local use and export, and salted and barreled beef for the growing provisioning trade related to Pacific whaling. On the island of Hawaii, the processing of cattle took place mostly in the Waimea region, but Hilo also saw substantial trade in hides, jerked meat, and tallow (McEldowney 1979).

Cattle hunting gradually evolved into cattle ranching, with much of the initial ranch stock coming from wild cattle herds. By mid-century, however, there was a movement to improve the stock by importing purebred cattle.

Like cattle, sheep were introduced to Hawaii in the closing years of the 18<sup>th</sup> century and became a serious threat to the health of the island environment. In 1856, an informal sheep station was established near Humuula in the Saddle Region of the island of Hawaii to take advantage of the feral sheep population (McEldowney 1979). In the 1930s, there was an estimated 40,000 sheep around the summit of Mauna Kea (Judd 1935). A major project of the Depression-era Civilian Conservation Corps (CCC) was the construction of a stock-proof fence encircling the entire mountain, combined with systematic hunting to reduce the population of sheep, as well as wild cattle.

Ranching took place on almost all areas now covered by USAG-HI installations. In the late 1800s, James I. Dowsett had ranching interests on lands now occupied by Fort Shafter, Schofield Barracks, and Wheeler Army Airfield; portions of the latter two were part of his extensive Leilehua Ranch. Cattle from George Galbraith's Mikilua Ranch in Lualualei Valley on the Waianae coast may have been herded across Kolekole Pass to pasture on Leilehua Ranch plateau lands.

The Dillingham area was once the Dillingham Ranch. Kilauea Military Camp was used as pasture for Shipman's Keauhou Ranch; *pulu* was boiled as pig feed, using steam from the natural steam cracks for heating. Cattle and sheep also ran across the lands of Pōhakuloa Training Area.

### ***Volcano Tourism***

A 19<sup>th</sup> century activity that was unique to the Kilauea summit region was tourism related to the volcano. On his circuit of the island in 1822, the missionary William Ellis (1963) was one of the first westerners to view the bleak splendor of the volcano region. Other westerners like the missionary Elisha Loomis in 1824, the officers and crew of the HMS *Blonde* in 1825, and the officers of the USS *Vincennes* in 1829, followed (Olson 1941). The volcano became a destination as sightseers, explorers, and scientists came to stand on the brink of fiery volcanic lakes, melt coins into red-hot lava globules, and singe the bottoms of their shoes on barely hardened day-old lava.

Initially, visitors stayed in rude shelters of branches and ferns. Even after the development of a house to greet guests around mid-century, overnight accommodations in the cold, often wet, very untropical environment were still rugged. The wife of the missionary physician at Hilo described her night sleeping with "merely some ferns' leaves with a thin mat spread over them for our bed." Although her second night at the crater was spent at the Volcano House, it entailed "23 persons ... in the house which I should judge to be about fourteen feet by eighteen or twenty. Don't you think that pretty close packing" (Olson 1941:27).

As tourism developed in the region, the old Hawaiian trail from Kau to Hilo was transformed from a well-worn path to a well-worn road. By 1894, an improved road from Hilo to the volcano was completed and the trip could be done "in 6-1/2 hours going up and 5-1/2 hours coming down" (Bishop 1895:68). In the early years of the 20<sup>th</sup> century, prison labor was used for road construction.

The idea of Kilauea as a national park was casually proposed as early as 1903, but it was not until 1910 that official interest from the territorial governor was transmitted to the Secretary of the Interior (Apple 1954). This was followed by a succession of bills to Congress in 1911, 1915, and 1916, to actually create the park. The 1916 bill was passed, defining the boundaries of the park but allowing only for acquisition of territorial lands. In 1920, Congress authorized the acquisition of the private lands.

## **Land Changes**

Changes in economic life went hand in hand with changes in settlement and in the way that people held their lands.

### ***Urbanization***

After his wars of conquest, Kamehameha made Waikiki his capital, continuing its place as the chiefly center of the southern Oahu coast (Cordy 1996b; Napoka 1986). In 1809, however, Kamehameha moved his court to Honolulu to be more accessible to the increasingly important western visitors, and the time of Waikiki as a center of power came to an end. Honolulu became the center of the Hawaiian political and economic realms. In the 19<sup>th</sup> century, it was transformed from a small village to a major urban hub.

Throughout the century, the edges of urban Honolulu crept outward, moving faster toward Waikiki, slower toward Pearl Harbor. The rest of Oahu remained largely rural.

Early in the century, Waikiki remained a retreat for the chiefs, who maintained residences on the beach where entertainment was in a casual Hawaiian style that contrasted with the formality of Honolulu. Waikiki also became a place where elaborate mansions were built along the Diamond Head shore and more modest bungalows inland. Hawaiians who retained their homesteads continued farming and tending fishponds, although over the century, Chinese farmers took over much of this activity. Toward the end of the 1800s, Waikiki began to develop as a tourist destination.

Hilo, on the island of Hawaii, became a similar but smaller urban hub. Like Honolulu, it had a protected harbor in which foreign vessels could safely anchor. During the height of the whaling period, it was the third most frequented port-of-call (after Honolulu and Lahaina) for food resupply and firewood. After the sugar industry developed, the town grew to be the second largest in the islands, acting as a business hub for the numerous plantations along the Hilo-Hamakua coast as well as a transport center for incoming supplies and equipment and outgoing crops.

Although Kawaihae was a major shipping point on the leeward coast, it never reached any degree of urban intensity (although an 1819 map of Kawaihae shows 111 houses in the village, a not insignificant number; see Duperrey 1819).

USAG-HI installations in these urban areas include Forts DeRussy in Waikiki, the U.S. Army Reserve Center in Hilo, and Kawaihae Military Reservation at Kawaihae.

### ***The Mahele and Fee Simple Ownership***

In 1845, the Hawaiian government began a process of change in land tenure that eventually instituted private, fee simple ownership of land. The Mahele of 1848 divided all lands in the islands among the King (Crown Lands), the government (Government Lands), and 245 chiefs (Mahele Lands). Each relinquished their rights to the others' lands. A government resolution in 1849 allowed commoners to make claims to lands that they used. In 1850, foreigners were given the right to own land.

By the mid-1800s, when this process took place, the Hawaiian population was greatly diminished by disease, low birth rates, and outmigration. Individuals, particularly commoners, who were awarded their family lands still faced a daunting task of holding on to a lifeway as well as a piece of property. Throughout the second half of the 19<sup>th</sup> century, lands were bought, sold, and lost to debts.

The physical manifestation of this change is represented by house lots (often walled), agricultural fields and house gardens, and boundary markers that are directly linked to claims and testimonies of the Land Commission and the Boundary Commission, the two primary governmental bodies that administered

claims, awards, and boundary certifications. The government records, combined with the physical remains, are the artifacts of the most significant transformation of the 19<sup>th</sup> century.

## **MILITARY HISTORIC CONTEXT: THE U.S. ARMY IN HAWAII**

The military historic context presents a framework for understanding the cultural resources of 20<sup>th</sup> century Hawaii, emphasizing the presence of the U.S. Army in the islands. The chapter opens with a history of the Army in Hawaii and concludes with a discussion of themes and property types for this historic context. A primary model for the context is Goodwin et al. (1995).

### **Background**

This section presents a summary history of the U.S. Army in Hawaii. It is intended as an historical framework for the subsequent section on the themes related to the Army in the islands. The history is divided into four major periods. The first three periods are the Progressive Era from 1890 to 1918, the inter-war years from 1918 to 1941, and the World War II period from 1941 to 1945; these are based on Goodwin et al. (1995). The fourth period encompasses the era of the Cold War, which began essentially following World War II in 1946 and ended in 1989 with the collapse of the Berlin Wall (see United States Army Environmental Center (USAEC) n.d.b).

Table B.4 depicts the four major periods along with overall trends in military history, general missions, installation types, and construction, design, and location characteristics of the built environment that occurred during each time period. The table can be used as a general reference while reading the historic military context of the U.S. Army in Hawaii. It can also be used as a tool in helping determine if a historic site is eligible for listing on the National Register of Historic Places (NRHP) based on Criteria A; sites that are associated with events that have made a significant contribution to the broad patterns of our history.

The primary source of chronological information in this section is Addleman (n.d.), which is a year-by-year chronicle of the U.S. Army in Hawaii to 1939. He lists information such as changes in command and command structure, incoming and outgoing units, construction projects, and notable events; an entire section is devoted to recreation. Thompson (n.d.) and Dod (1966) are histories of the Army Corps of Engineers and provide detailed descriptions of Engineer construction throughout the Army's tenure in Hawaii. Dorrance (1993, 1995, 1997) writes specifically about Oahu's coastal defenses. Arakaki and Kuborn (1991) describe the events leading up to and including the Japanese attack on Pearl Harbor. Allen (1950) describes World War II events in the islands. Linn (1997) is an analysis of the U.S. Army in Hawaii and the Philippines between the turn-of-the-century and World War II.

Alvarez (1982) and Meeken (1974) are histories of Schofield Barracks and Fort Shafter, respectively. Kelly and Quintal (1976) is a history of Mākua Valley (Mākua Military Reservation). There are also numerous recent installation histories that have been prepared as part of compliance with Army cultural resources management regulations and the National Historic Preservation Act.

### **Prelude to the Army in Hawaii**

In 1872, Major General John M. Schofield, Commander of the Army Division of the Pacific, came to Hawaii on a mission to evaluate the defense possibilities of various Hawaiian ports (Alvarez 1982). Recognizing the potential importance of Puuloa Lagoon as a harbor that could be inexpensively and effectively defended, he recommended that it be developed as a military base. In the Reciprocity Treaty of 1876, the Hawaiian government granted the United States permission to develop the harbor in exchange for allowing the duty-free import of Hawaiian sugar to United States markets. In 1887, the United States was given exclusive use of what became known as Pearl Harbor.

## **Hawaii in the Progressive Era**

At the turn of the century, American vision was redirected to the far reaches of the world. As a result of the Spanish-American War, the United States gained properties in the western Pacific, as well as Cuba and Puerto Rico. It embarked on a major project to connect the Atlantic and Pacific Oceans across the Panama Isthmus. At the same time, other countries were testing their strength. Japan's victory in its 1905 war with Russia established the Asian country as a perceived threat to western nations. Germany was also expanding into the Pacific. With its new, far-flung overseas possessions, the United States found itself with a new stake in international politics.

In the same decade that saw Spain lose its possessions to the United States, the monarchy of Hawaii was overthrown, and the subsequent republican government appealed to the United States for annexation, eventually succeeding in August 1898. The U.S. military viewed this new territory, strategically located in the central Pacific "as the Gibraltar of the Pacific Ocean, the forward bastion, which, along with the Panama Canal Zone and Alaska, would form a cordon to protect the American west coast. Pearl Harbor ... stood as the centerpiece of the work" (Alvarez 1982:18).

### ***The Early Years***

Four days after annexation in 1898, the 1<sup>st</sup> New York Volunteer Infantry Regiment, the 3<sup>rd</sup> Battalion, and the 2<sup>nd</sup> U.S. Volunteer Engineers arrived in Hawaii and set up a temporary camp called Camp McKinley at the foot of Diamond Head (Addleman n.d.). The following year, regular Army troops encamped at Camp McKinley, and support elements established offices in nearby Honolulu. By the end of the century, U.S. forces in Hawaii were bolstered by a Depot Quartermaster Office and two batteries of the 6<sup>th</sup> Artillery Regiment (Addleman n.d.).

The principal mission of the U.S. Army in Hawaii was the defense of the naval base at Pearl Harbor, which was established in 1901. Over the first five years of the new century, three different Army boards were dispatched to Hawaii to recommend military development options. In 1901, a board consisting of engineer and artillery officers traveled across southern Oahu investigating sites for both coastal and land defenses (Thompson n.d.). The board recommended fortifications along the southern coastline to protect against attack from the sea and a system of field works and entrenchments across the central plateau to guard against a land attack from the north; small mobile detachments would protect against land attack from the windward coast.

In 1903, an Army board convened to determine a site for the principal military post on Oahu. The likely options were two parcels of former Crown Lands that had been set aside by presidential order for use as military reservations: Kahauiki on the southern coast of Oahu and Waianae Uka on the central plateau of the island. Kahauiki was closer to Honolulu and Pearl Harbor and had a reliable water source; it offered an advantageous site for a principal infantry post in its "capability of close-in support of Honolulu and Pearl Harbor, as well as a possible site for heavy artillery" (Meeken 1974:2). Waianae Uka, on the other hand, was an ideal location for deployed troops to protect from a northern attack, but the lack of fresh water on the central plateau was its main drawback. In the end, Kahauiki on the south coast of the island was selected for the military post.

In 1905, a third board, led by Secretary of War William H. Taft, reviewed the status of coastal defenses. Its recommendations were generally similar to the 1901 board, although the specifics of coastal fort locations varied.

Thus, in the first years of the 20<sup>th</sup> century, plans were made for the development of Pearl Harbor as a primary Pacific naval base, for coastal and land defenses to protect Pearl Harbor, and for construction of Hawaii's first U.S. military post at Kahauiki. Construction at Kahauiki began in 1905, and the first area, a battalion cantonment at Palm Circle, was completed in 1907-1908; the new post was named Fort Shafter after Major General William R. Shafter. In spite of the evaluation of the 1903 board that water at Waianae Uka would be a major problem, the Army proceeded with developing an installation on the central plateau in 1908; the post was eventually named Schofield Barracks after Major General John Schofield. During this same period, a system of coastal defenses was built along the southern shore of Oahu; these included Forts DeRussy and Ruger in Waikiki, Fort Armstrong at the mouth of Honolulu Harbor, and Fort Kamehameha at the entrance to Pearl Harbor.

Army forces in Hawaii originally fell under the authority of the Military Department of California, which maintained headquarters in San Francisco. In 1913, Hawaii became an independent command reporting directly to the War Department. The creation of the Hawaiian Department was a reflection of the increasing importance of Hawaii's role in American defense strategy.

### ***World War I***

The United States entered World War I in April 1917. This European war, which had been going on for two years, changed the way nations' armies confronted each other. They faced each other across desolate battlefields, wreaking havoc with large-scale use of poison gas and indirect artillery, as well as with new weapons such as machine guns, airplanes, and tanks.

The U.S. Army changed profoundly during this time. In the early years of the century, it was made up largely of small units scattered across the western United States, a relic of the frontier period. By the close of World War I, it consisted of 62 well-trained and equipped divisions that were equal to any army in Europe. Professionally trained and educated officers headed a greatly improved command structure.

The technical services developed during this period. The Ordnance Department, which maintained a system of armories, proving grounds, and multiple arsenals, expanded its network of depots in 1917; this included the formation of the Hawaiian Ordnance Depot at Fort Shafter. The Signal Corps was expanded in 1914 to include the Aviation Service. The Quartermaster Department and the Medical Service underwent important changes following major logistical and structural problems encountered in the Spanish-American War.

In Hawaii, participation in the Great War meant that most of the regular Army departed for Europe by the end of 1917, leaving empty posts in need of caretakers. The Hawaiian National Guard took on the role, entering Federal service at Schofield Barracks and Fort Shafter as the 1<sup>st</sup> and 2<sup>nd</sup> Hawaiian Infantry Regiments. Addleman (n.d.:19) writes: "The selective service draft filled these organizations to war strength. Many of these draftees were aliens, principally Japanese and Filipinos." These regiments were garrisoned at Schofield Barracks and Fort Shafter from October 1918 to April 1919.

With the Armistice signed in 1918, the National Guard remained at Schofield Barracks until replaced by the returning regular Army. The Guard spent the post-Armistice period at maintenance and beautification projects, "planting trees and shrubs, seeding lawns, building roads, and working on general landscape improvement. A double line of eucalyptus trees was planted around the post" (Addleman n.d.:19). In 1919, the Guard vacated Fort Shafter when the 9<sup>th</sup> Signal Service Company arrived.

## **The Inter-War Period**

With the end of World War I, military appropriations were drastically curtailed. The war had created an enormous debt that was not relieved by the national prosperity of the 1920s. Post-war disarmament conferences and pacts among world powers also emphasized peace and military curtailment. International politics looked to a peaceful future founded on the League of Nations. In this environment of limited funding and lack of public and political interest, the Army worked at administrative reforms, technological experimentation, and facility consolidation.

### ***The 1920s***

In the 1920s, the Army experimented with new technologies and re-evaluated old ones, with significant effects on posts in Hawaii. This decade saw the birth of the Army Air Corps and the passing of land defenses in the islands.

Army aviation did not exist before 1908. But within ten years, it had developed into an important component of the Army. Within a year of the creation of the Aviation Section within the Signal Corps in 1914, the Army had organized aero companies in the overseas possessions; in Hawaii, flying fields were graded at Schofield Barracks and on Ford Island in Pearl Harbor. In 1922, the Army's air service left the jointly operated Army-Navy field at Pearl Harbor and moved to an improved all-Army Wheeler Field on the central plateau. Here, it was host to a number of notable aviation feats throughout the decade.

Army aviation received an additional boost from the Air Corps Act of 1926. Among other provisions, the law changed the name of the Air Service to the Air Corps, authorized additional men and aircraft, and directed the Chief of the Air Corps to develop a five-year plan for implementing the legislation. The years from 1926 to 1932 marked some of the major improvements to aviation facilities on Army posts throughout the country. Wheeler Field was greatly improved and expanded during this period.

During this decade, the Army also re-evaluated old technology. By the mid-1920s, the fixed land defense batteries that had been emplaced along Oahu's southern shore only a decade earlier were determined to be obsolete and were disarmed or assigned other functions (Dorrance 1995), largely based on experiences from World War I. At the same time, coastal defenses in Hawaii, the U.S. west coast, and the Philippines were improved.

In the early 1920s, changes to the Army's organizational structure were made. The National Defense Act of 1920 replaced the Army's geographically based departments with nine corps areas, as well as comparable departments in the overseas possessions of Panama, Hawaii, and the Philippines. In Hawaii, changes included a shift of headquarters from the Alexander Young Hotel in Honolulu (which had been headquarters since 1911) to Fort Shafter in 1921. An infantry post until that time, Fort Shafter now became home of the senior Army headquarters in the islands (Meeken 1974). Also in 1921, a new unit, the Hawaiian Division, was established at Schofield Barracks. At the time, it was the only complete division in the Army. It was composed of four infantry regiments (thus its designation as a "square division") and associated components, as well as division headquarters and special troops (e.g., engineers and medical and staff regiments). Of the four regiments, three were designated for line duty and one was held in reserve.

The year 1921 also saw a change in the Artillery District of Hawaii. The district was redesignated Hawaiian Coast Artillery District, and its headquarters was moved from Fort Ruger to first, the Alexander Young Hotel in Honolulu, and then shortly after to Fort Shafter. Fort Ruger was named a subordinate command, Coast Defenses of Honolulu (Meeken 1974).

Although budgetary restraints were placed on military services in general during this period, the importance of Hawaii for national defense, particularly against Japan, gave it a funding edge. One of the treaties signed after World War I was the Limitations of Armament Treaty of 1921, which prohibited the building of new U.S. military defenses west of Hawaii. Because of this, Pearl Harbor and the associated Army facilities took on ever-increasing importance in terms of Pacific strategy and national defense (Conn et al. 1964). Alvarez (1982:53) writes that “while obsolete World War I equipment continued to be used throughout the Army, Schofield Barracks received much of the new equipment that was developed” and was one of the Army’s best equipped garrisons.

Although Army interests on the island of Hawaii had begun before World War I, the European war and local politics interfered with permanent moves away from the island of Oahu. However, in October 1921, the Army took control of Kilauea Military Camp on the north edge of Kilauea Crater and it became the first U.S. Army installation on the island, with the primary purpose of providing rest and recreation facilities for Army personnel.

### ***The 1930s***

In the 1930s, Germany and Japan had become sufficiently serious threats to demand the attention of Army leaders. Military strategists viewed Hawaii with a major role in the defense of the U.S. mainland from possible Japanese attack. Early in the decade, the military acquired large areas of Oahu as part of a general build-up of facilities to alleviate overcrowding at Pearl Harbor. For the Army, this included acquisition of lands on the southern central plateau (at Kipapa and Waikakalaua) for eventual construction of ammunition tunnels, and at Mākua Valley and in the northern Koolau Range (what became Kawaiiloa Training Area) for training.

The development of effective aircraft carriers, with the increased potential for air attacks, prompted the Army to strengthen its anti-aircraft defenses. Both fixed and mobile anti-aircraft stations were set up throughout the islands (Alvarez 1982).

By the end of the decade, there was heightened anticipation of impending war. The Sino-Japanese War, which began in 1937, was a tangible sign of Japan’s intent to militarily extend its hegemony (Conn et al. 1964). Defense mobilization throughout the islands increased. Schofield Barracks was the Army’s largest single garrison and the second largest city in the territory with a population of 20,000 people. On the island of Hawaii, a new Army command, the District of Hawaii, was created with authority over the entire island, except for Kilauea Military Camp, which was considered a separate post command. Headquarters for the new district was in the Hilo Armory.

In October 1941, the Hawaiian Division was reorganized. The square division established after World War I was replaced by a three-sided configuration of two infantry regiments on the line and one in reserve, with each regiment making up a complete infantry-artillery team (Alvarez 1982).

### **World War II**

Beginning with Austria in 1938, Hitler systematically annexed neighboring countries with impunity, until the invasion of Poland in September 1939 caused Great Britain and France to declare war on Germany. In the far east, Japan’s invasion of China developed into full-scale war, with French Indochina as Japan’s next objective. As Americans observed the instability in Europe and Asia, the Nation was divided between a desire to remain out of foreign conflicts and a recognition of the importance of military preparedness. In 1940, President Franklin D. Roosevelt approved the transfer of 50 destroyers to Great Britain, in return for a lease on British bases in the Caribbean. A Selective Service was initiated, and the National Guard was partially mobilized. Greatly increased military funding flowed into Hawaii.

### ***The Pearl Harbor Attack***

On the morning of December 7, 1941, Japanese planes swept over the islands in a surprise attack. Major damage occurred at Pearl Harbor, Hickam Field, and Wheeler Field, with incidental damage to other installations. Considerable damage to sites in Honolulu was initially thought to be from the attack, but was eventually attributed to defective navy ammunition (Allen 1950:8, quoting the commander of the coast artillery; brackets original):

A great deal of it [the ammunition] was defective, and “duds.” Unfortunately, the “duds” detonated on contact with the ground. ... they did not burst in the air. They burst all over town. They burst all over De Russy, where I was. I saw them burst, two of them, up in the crater on Diamond Head, knocking out one of my mortars.

In the aftermath of the attack, Hawaii shifted to a state of continuous emergency. For a year and a half, the threat of invasion weighed heavily on everyone’s minds, with troops remaining on defensive alert. The Army declared martial law and used this authority to expand military control into all parts of the islands. Beach positions were strengthened with trenches, gun positions, pillboxes, and rolls of barbed wire.

### ***Mobilization***

During the war, Hawaii played a crucial role as the advanced base for the Pacific war. It was a base of operations for military staging and supply, as well as headquarters for numerous Federal agencies and construction firms doing government work in forward areas (Allen 1950).

Following the Japanese attack, the military rushed reinforcements to the islands. Within a month of the attack, two military convoys of 16 ships arrived from the west coast of the U.S. mainland, carrying 15,000 troops in two infantry regiments, one regiment each of field and coast artillery, and light tank, signal, and railway battalions.

Construction during the initial phase of the war focused on defensive facilities, including a build-up of coastal defenses. Four new permanent batteries for 8-inch guns were constructed on Oahu. Ammunition storage facilities were expanded, with construction of new storage tunnels in Waikakalaua Gulch and in two areas of Kipapa Gulch (the present Waikakalaua and Kipapa facilities). A major, top secret project was called the “Hole” (the present Kunia Field Station), a three-story structure intended for aircraft repair and assembly, with the capability to handle B-17 heavy bombers. Access to the air-conditioned complex was through a quarter-mile long tunnel. A runway in the nearby Waieli Gulch (on the present Wheeler Army Airfield) was constructed to service the planes coming out of this plant.

Another critical component in logistical planning was dealing with the large numbers of civilian workers who came to Hawaii during the war. Military construction projects required more workers than were locally available. Contractors’ camps were built all over the islands, including a major camp in Waikakalaua Gulch, just south of Wheeler Field.

In 1942, U.S. victory at the battle of Midway altered the role of Hawaii from a defense position to “a springboard for the Pacific offensive” (Allen 1950:185). Troops poured into the islands en route to the western Pacific, and were housed in barracks and makeshift camps throughout the islands. Allen (1950:219) writes that:

There were 43,000 soldiers on Oahu on December 7, 1941, plus a handful on the other islands. In the first six months of the war, the total swelled to 135,000. By June of 1945,

when plans were mounting for an offensive against the homeland of Japan, troops on Oahu alone numbered 253,000.

Jungle training and coordinated Army-Navy amphibious landings were practiced in anticipation of the island-hopping battle strategy of the western Pacific. Areas on Oahu that had been taken over by the military at the onset of war were developed as training areas. Allen (1950:190) summarizes Hawaii's role in Pacific training:

Hawaii served as an invaluable training ground for the amphibious and jungle warfare which characterized the Pacific fighting. Well removed from the combat zone, yet 2,000 miles nearer the battlefield than the Mainland, there was sufficient area and enough equipment in the Islands to handle many thousands of troops and to embark them for large-scale operations. More important, some of the varied climates and terrains in Hawaii were like those of the target areas.

The year 1943 saw preparations for the first full-scale offensive in the Central Pacific, the attack on Tarawa in the Gilbert Islands. Training for the Tarawa assault took place in all areas on Oahu, including Mākua and Pokai in Waianae Bay (the present Mākua and Waianae Kai Military Reservations respectively) where troops practiced amphibious assault techniques. On the island of Hawaii, training camps at the north end of the island were connected to Hilo by the Army-built Saddle Road (then known as Kaumana Road). Older residents of the Waimea area recall a small training camp of tents and Quonset huts at Camp Pōhakuloa, and tanks maneuvers and artillery practice in the Saddle Region (Langlas et al. 1997).

In late 1944 and early 1945, as American forces moved closer to Japan, military headquarters shifted west as well (Allen 1950). In November 1944, the Army's 7th Air Force moved to Saipan, leaving only a wing to defend Hawaii. Two months later, the Navy's Commander-in-Chief, Pacific Ocean Areas (CINCPOA), moved his headquarters from Pearl Harbor to Guam.

Even as late as 1944, however, military construction was still actively underway and being carried out under extremely tight schedules. A prime example is the Pineapple Pentagon (Buildings T-100, T-101, and T-103) at Fort Shafter; these buildings were the nerve center of logistical planning for Pacific operations. Char (1984) notes that "the buildings were completed in the unbelievable construction time of 49 days" from May 10 to June 27, 1944.

Wartime development at Hawaii installations saw construction wherever space was available. Buildings were expanded and remodeled to meet intensified wartime needs. Development also focused on infrastructure. Using Federal funds, Nimitz Highway was built to relieve the traffic load on the old road to Pearl Harbor.

### **The Post-War Years**

World War II ended with the Japanese surrender on September 2, 1945. As had occurred following World War I, the Army went quickly from full wartime mobilization to demobilization and severe cutbacks in funding. Changes in military technology, particularly related to the development of nuclear weapons, required a re-thinking of military strategies and organizations. Much of the lands that the Army had acquired in 1941 were no longer needed, and several posts were considered for closure. In 1948, seacoast artillery was declared obsolete and all guns in the United States, including those at coastal defenses in Hawaii, were scrapped. Wheeler Field was also declared obsolete, and its runways too short to handle new jet-powered aircraft. In 1949, funding restrictions placed many Army installations on stand-by status, with Army activities in Hawaii limited primarily to the major posts on Oahu (Allen 1950).

Immediately after the war, the Territorial government made a concerted effort to regain lands that had been taken over for the war effort, as well as lands that it felt no longer met Army needs. An example of the former was Mākua Valley (Kelly and Quintal 1976:41-42), where the Territorial government argued that there was a public need for the lands; the valley had been “valuable area for grazing, and a beach park. The Territory was also faced with the gradual Federal takeover of Hawaiian lands; with Mākua added, this would amount to one-third of the coastline of Oahu.” Fort DeRussy was an example of lands that the Territory felt the Army no longer needed; Allen (1950:367) writes:

A special effort was made by civilians for the release of the Army’s long-held Fort DeRussy, and possibly other areas within the Honolulu city limits, on the grounds that modern warfare made them antiquated and that the land was badly needed for the growth of the city.

The policies that would frame the Cold War formed during this immediate post-war period. The United States Army Environmental Center (USAEC) (n.d.b: 19) writes:

... the traditional American hesitancy about foreign involvements changed into a commitment to contain communism abroad. Events in Europe led the United States to join with other western European nations to prevent further communist expansion and resulted in a divided continent. ... the United States also expanded its military commitments in Asia in response to the growing perception of a communist threat, due to the communist revolution in China and the Soviet involvement in Korea.

The Army’s role in containing communism was to deter or defeat communist advances short of strategic nuclear war (USAEC n.d.b). To this end, the Army maintained a combat readiness that was unlike the demobilization years following World War I. It also encouraged technological innovations, the most notable examples of which were tactical nuclear weapons, missiles, and helicopters (USAEC n.d.b).

### ***The Korean War and the Cold War***

On July 25, 1950, the United States became officially involved in the Korean Conflict. All military resources in the islands, including those like Wheeler Field that had been put in caretaker status, were placed on full alert. As in World War II, posts in Hawaii were used for training replacement troops. At Schofield Barracks, the Hawaiian Infantry Training Center was established in 1951 (Belt Collins Hawaii 2000a). In 1953, the Conflict came to an end with the signing of an armistice that restored pre-war conditions on the Korean peninsula.

When the 25th Infantry Division returned to Schofield Barracks from Korea in 1954, the installation once again became an active post. The influx of troops and their families, however, put a strain on housing. The Army dramatically increased family housing by transforming virtually the entire western portion of the Schofield Barracks cantonment from athletic fields, open space, and training areas into new housing. Wheeler Field was brought back into active duty to accommodate the 25th Division air operations (helicopters and fixed wing aircraft) that had become essential in support of ground combat troops.

An immediate side effect of the housing development at Schofield Barracks was the loss of training areas, which the Army addressed by acquiring lands elsewhere in the islands. In 1956, 240 acres of former Kahuku Plantation lands were acquired for the Kahuku Training Area; subsequent leases expanded the original training area to over 9,600 acres (Williams and Patolo 1998). Also in 1956, a large parcel on the saddle between Mauna Kea and Mauna Loa on the island of Hawaii was acquired and became the Pōhakuloa Training Area; the training area, which was accessed by the Army-built Saddle Road, also

included the World War II cantonment. Bradshaw Army Airfield was built at the same time (Langlas et al. 1997).

Cold War-related developments on Oahu included construction of Nike Hercules batteries and a satellite tracking station (Thompson n.d.). The Hercules, which was a surface-to-air missile developed for defense against airplanes, had just become operational in 1959 and was being installed in a nationwide defense system. Four batteries were constructed on Oahu including: a single battery in the vicinity of Dillingham Field and a single battery at the northern end of the Koolau Range in the Kahuku Training Area; two sets of dual batteries were built at Bellows Air Force Station and above Fort Barrette on the Ewa Plain. In 1958, a satellite tracking station was built for the Air Force on the ridge above Kaena Point. Development of the tracking station coincided with the Soviet launching of the Sputnik satellite on October 4, 1957, identified as the beginning of the "Space Race." Less than four months later, the United States launched its first satellite into orbit, the Army-developed Explorer 1.

In the mid-1960s, the U.S. became embroiled in a regional conflict in Southeast Asia. American participation in the Vietnam War continued until 1975, with a peak in 1969 when over 543,000 troops were in Vietnam. A major role that Hawaii played in this war was as a rest and recreation retreat for soldiers on the line. August 1966 was the beginning of the Army's program, and by 1970, 75 flights a month brought 12,500 personnel from Southeast Asia to Hawaii, where soldiers and their families were reunited at the Fort DeRussy R&R center before dispersing on leave.

A Vietnam War-related activity took place near Kilauea Military Camp on the island of Hawaii (Tomonari-Tuggle and Slocumb 2000b:III-57). In June 1964, the U.S. Army was granted a permit from the State Department of Land and Natural Resources to conduct certain "meteorological and tracer tests" in the Olaa Forest Reserve near KMC. In January 1966, another 1,144 acres in the upland region was leased for additional experiments, including a "Jungle and Environmental Test Site" which was said to be used to test clothing, equipment, and munitions for possible use in Vietnam. The facility was built under tight security and included two 300 foot towers; it was enclosed with barbed wire and was patrolled by armed guards with police dogs. In actuality, the area was utilized for the testing of various substances such as anti-personnel stimulants (code named "Yellow Leaf"), nerve gas substances such as Sarin, and defoliant compounds (code named "Agent White"). Building 82 at KMC was converted into a laboratory to analyze the results of the field tests.

Opposition by the public to the use of nerve gas and biological tests compelled the Army to terminate the activities. A special team from the Desert Biological Warfare Test Center in Utah was required to clean up the test site and the KMC laboratory facilities.

### ***Army Reorganization***

The Army reorganized several times following World War II. In 1947, the Department of Defense was created as a unifying umbrella organization for the armed forces. At the same time, the U.S. Air Force was established and was seen as the primary service that would be capable of delivering nuclear weapons; the Army was assigned responsibilities for "conducting land warfare, providing troops for occupation duty, and providing for air defense units" (United States Army Environmental Center (USAEC) n.d.b:20). The Air Force incorporated the Army Air Corps and its facilities; many of the Army airfields, including Wheeler and Dillingham, were transferred to Air Force control.

In 1952, the Armed Forces Reserve Act placed the Army Reserve as a distinct entity within the Army structure.

In 1955, the Army activated the Continental Army Command (CONARC). Commands were divided among subordinate numbered armies that were organized geographically. Most of the CONARC installations focused on manning or training Army forces for ready deployment anywhere in the world.

In 1962, the Army underwent a significant reorganization. The technical services were abolished and their functions assigned to new agencies (USAEC n.d.b). The most important of these agencies was the Army Materiel Command, which reorganized the logistical functions of the technical services along functional lines. Other commands included the Army Air Defense Command, Strategic Communications Command, and Military Traffic and Terminal Service.

In 1973, the Army carried out another reorganization. CONARC and the Combat Developments Command was replaced by Forces Command (FORSCOM) and Training and Doctrine Command (TRADOC), both commanded by four-star generals (USAEC n.d.b). The Army placed a renewed emphasis on training in creating TRADOC, which assumed responsibility for all Army branch schools, as well as all training organizations. FORSCOM was responsible for fighting units and the supporting structure that function within a theater of operations; U.S. Army Pacific (USARPAC) was formed as a comparable command with authority in Alaska, Hawaii, and the Pacific islands. The USAEC (n.d.b:83) writes:

The typical FORSCOM post is designed as a garrison for line units. As such, it contains large numbers of barracks, family quarters, motor pools, administrative buildings, and other property that can be described as base operations. The remaining property consists primarily of training facilities. These facilities were constructed to improve individual proficiency and, more importantly, to enable operational units to train as a team in the tasks that they are expected to perform in a theater of operations. The major function of an Army unit during peacetime is to maintain its operational proficiency.

### **Historic Military Themes**

This section describes the historic themes that characterize the development of U.S. Army installations in Hawaii. They represent patterns of Army development and generally relate to functional categories of Army use. Table B.5 identifies the themes that are pertinent to specific USAG-HI installations; the relevance of a particular installation to a theme is related to its overall history. The themes are adapted from Goodwin et al. (1995) and the United States Army Environmental Center (n.d.b), with the addition of themes (e.g., recreation and defense) that are applicable to Hawaii.

In addition to being visual aids for the historic military context of USAG-HI, Tables B.4 and B.5 can also be used as tools in helping determine if a historic site is eligible for listing on the National Register of Historic Places (NRHP) with respect to Criteria A; sites that are associated with events that have made a significant contribution to the broad patterns of our history.

### **Planning and Architecture**

As in civilian communities, the landscapes of military installations evolved over time through a combination of intentional design and organic growth. These landscapes are the cumulative result of changing military philosophy, goals, and objectives, and are the spatial representation of the Army “community” organization. As Goodwin et al. (1995:119) note:

... military construction reflected simpler versions of contemporary architectural design, built and designed by talented military and civilian engineers and architects. Military installations were self-contained communities, thus their site designs frequently were the result of large-scale planning efforts that illustrate contemporary planning theories. Installations that developed over a comparatively short period often display unified

overall planning and architecture. However, many military installations grew over time, and reflect the more diverse influences that would affect any community that evolved over an extended period of time.

In Hawaii, the landscapes of military posts developed from standardized Army planning concepts that were often based on regimental structure. For example, at Schofield Barracks, plans for the original permanent post were designed around the proposed infantry, artillery, and cavalry complement: five regiments of infantry and one each of cavalry and field artillery. Alvarez (1982:32) notes that the 1912 planning map of the post shows that the permanent buildings were to be:

... organized in seven contiguous sections, each one shaped in a rectangle headed by a loop. The rectangles were to contain barracks in quadrangular formation while officers' quarters would line the loop, with the main sewer and water lines down the center for economy.

As new missions were added and new units arrived, installations expanded by adding new facilities. And as long as land was available, the layouts of these facilities were designed independent of the existing post structures. For example, the landscape of Fort Shafter as it existed just prior to World War II is typical of this additive design. There are five clearly defined areas. Palm Circle is the original complex of buildings dating to 1905. The hospital area (now demolished), started in 1907, was immediately south of Palm Circle. The cantonment area (also demolished) represents 1914 construction to accommodate the arrival of the 2<sup>nd</sup> Infantry to the post. The ordnance area was developed in 1917 for the Hawaiian Ordnance Depot, and finally, the Signal Corps area at Shafter Flats was used during World War II. Each of these areas had a distinctly different layout (as well as architectural style) that reflects the period of its development and its primary function.

Kilauea Military Camp has a similar pattern of sequential and distinctive construction areas. Buildings in the original camp are aligned in a T-shape behind the half-circle entry drive. Cabins in the Navy camp, built in the 1930s, curve around a tennis court and rotary to the east of the original camp. Stone cabins, which were built for the permanent camp staff in 1933, are aligned to the west of the main camp buildings. World War II temporary buildings (no longer on-site) were built to the west of the stone cabins.

Once land was taken up, however, new facilities were squeezed in wherever possible. This occurred primarily during the massive build-up of World War II. Again, using Fort Shafter as an example, the cohesive design and architecture of Palm Circle was modified by the construction of new structures such as the Pineapple Pentagon. Temporary buildings for administration, civilian cafeteria, and post exchange were also added to the Palm Circle area (Slocumb 2000). In the hospital area, 15 ward buildings, four quarters buildings, four 50-man barracks, a mess, a receiving and evacuation building, and a water heating plant were added to the 1907 complex.

In addition to overall layout, the landscapes of Army installations are also defined by the character of individual buildings. Individual building designs were based on standardized plans, but with modifications made to accommodate Hawaii's tropical environment.

### ***A Brief History of Army Construction in Hawaii***

Fort Shafter, Schofield Barracks, Fort Ruger, and Fort DeRussy were the first Army posts in Hawaii. Construction at Fort Shafter started in 1905, with portions of Palm Circle completed and occupied by 1907. Initial construction at Schofield Barracks began in 1908, and even with the arrival in mid-January 1909 of officers' families, it still consisted mainly of temporary cantonments (Addleman n.d.). A burst of construction activity from around 1910 until World War I saw work underway on most of the early permanent buildings at the posts, including the coastal defense facilities at Forts Ruger and DeRussy.

World War I forced a brief hiatus in Army construction. But construction renewed with vigor in the 1920s, when consolidation and improvement programs instituted for Army installations saw direct effects on posts in Hawaii. In this decade, Army growth was affected by severe budget constraints, public and political disinterest in things military, and low troop strengths. One result was a focus on improvements to existing facilities. Goodwin et al. (1995:73) write:

One of the most conspicuous achievements of the Army during these years was the physical improvement of its installations. With congressional authorization, the Army disposed of its unnecessary installations and constructed some of its most comfortable posts during this time.

Funding for installation improvements was facilitated in 1926 by congressional directive to dispose of 43 installations or portions of installations, with the proceeds to be deposited into a special “Military Post Construction Fund” for construction at remaining posts (Goodwin et al. 1995:133). In the years following this directive, the Quartermaster Corps changed its emphasis from improving single buildings to overall landscaping of installations. Employing distinguished military and civilian landscape architects, it applied contemporary approaches to city planning, such as the “garden city” and “city beautiful” movements, to Army posts.

Posts in Hawaii benefited from the inflow of construction monies. For example, between 1926 and 1934, numerous buildings were erected at Schofield Barracks and an extensive road system throughout the post was developed. As part of the newly created Army Air Corps, Wheeler Field was greatly expanded and improved during this same time.

Construction funding was supplemented in the 1930s by Depression era government employment programs like the Emergency Conservation Work Project and Federal Emergency Relief Act. At Kilauea Military Camp, for example, grounds and other camp improvements were carried out by program workers including conversion of a barracks building into a theater, construction of enlisted men’s steam baths (using the natural resources of the volcano), and the building of nine lava rock buildings for housing of permanent camp staff (Tomonari-Tuggle and Slocumb 2000b). In 1938, the Civilian Conservation Corps constructed large lava rock portals at the entrance to the camp; these remain at present as impressive entry statements to the camp.

The 1930s also saw land acquisitions for a major build-up of military facilities such as ammunition storage magazines, gun emplacements, new coastal defense batteries, and auxiliary flying fields.

Major construction activity characterized World War II in Hawaii. Immediately following the Japanese attack on Pearl Harbor, the military instituted marshal law and began a rapid acquisition of lands. The islands became the primary advance base for all services, and were overwhelmed by a massive influx of military personnel en route to the Pacific theater of operations. In addition to the military, civilian construction workers from the U.S. mainland also came to Hawaii to build housing, training camps, administration and support structures, and combat-related facilities; Allen (1950:233) writes that “at one time they numbered 82,000, a quarter of all the employed persons in the islands.”

New buildings, mostly of a temporary nature, were squeezed into every available space. Allen (1950:235) describes the wartime construction milieu:

During 1941, the most important undertakings were airfields in Hawaii ..., and air raid warning stations and underground installations on Oahu. With the coming of the war, the work centered on repair of damage, lengthening Island fields to accommodate larger

planes ... Then followed new defenses, military posts, pillboxes, roads, bridges, trails, pier facilities, recreation centers, hospitals, and all the multitudinous installations needed to support the offensive. Just to provide materials, the Engineers had to set up eight mills for fabricating lumber, furniture, sheet metal, cement products, and other goods.

A major organizational change in the Army occurred just prior to the war. Up until early 1941, the Quartermaster General was responsible for Air Corps and cantonment construction, while the Chief of Engineers was responsible for fortifications and waterway projects (Kuranda et al. 1997). This system was tolerable in the relatively slow pace of peacetime construction, but the frantic pace of wartime building overwhelmed the centralized Quartermaster Corps. The Corps of Engineers, on the other hand, was organized around district offices, which were better suited for the accelerated level of construction. In December 1941, President Roosevelt signed legislation that transferred all Army construction to the Corps of Engineers.

Even when the focus of war shifted westward in 1944, construction was still underway; for example, in 1944, the Pineapple Pentagon at Fort Shafter was completed and the new Tripler Army Hospital was just underway.

As had occurred following World War I, the immediate post-war years were characterized by demobilization, military cut-backs in funding, and re-evaluations of old technology in light of innovations made during wartime. In keeping with this general trend, installation landscapes at this time were altered more by demolition than by construction.

A major emphasis of military construction in the decades following World War II was housing. Thompson (n.d.:280) reports that “in the mid-1950s ... the scarcity of housing became a severe problem for the Armed Forces, especially concerning the retention on active duty of experienced noncommissioned officers as well as young married commissioned officers considering a military career.”

In 1957, the U.S. Congress mandated a nationwide construction program for military housing, which became known as Capehart housing after the Indiana senator who introduced the bill in Congress (Thompson n.d.). The first Capehart project in Hawaii involved construction of 1,326 units at Schofield Barracks. However, using construction criteria developed at the national level, the new housing had structural problems related to the Hawaiian environment. Once the structural problems were resolved, new housing projects at Fort Shafter, Tripler, and Schofield were successfully completed by 1967.

To alleviate continued housing shortages in the early 1970s, the Army, Navy, and Marines developed a joint project at Aliamanu Military Reservation, once a World War II era Navy-Army command post and important ammunition storage facility. The ammunition was removed to the Lualualei storage depot and the crater was transformed into a 2,600-unit housing development. A new 640-unit family housing project was also developed at Schofield Barracks, where the historic barrack quadrangles were also remodeled and upgraded to accommodate the requirements of the Modern Volunteer Army Barracks Modernization Program (Thompson n.d.).

Other projects during this period included construction of Nike Hercules batteries at Dillingham Military Reservation and Kahuku Training Area in 1959 and the Army Reserve Training Center at Hilo in the early 1960s, as well as support facilities at Schofield Barracks, Fort Shafter, and Wheeler Army Airfield.

### ***Planning Landscapes***

The landscapes of Army installations reflect military structure. A common design at Army cantonments is the linear base design. At Schofield Barracks, for example, the original layout had housing on one side

of a central line and technical buildings on the other (Alvarez 1982). Permanent housing was organized by contiguous sections, each shaped in a rectangle headed by a loop. The rectangles contained barracks in quadrangular formation; officers' quarters lined the loops. Development of Wheeler Field in the 1930s continued this linear design. Officer and NCO quarters, barracks, hangars, headquarters, fire station, and other support buildings were aligned along a central thoroughfare, with hangars and technical buildings on the south side of the road and housing and administration built along loops to the north of the road.

The linear pattern, with wing extensions, was used at Kilauea Military Camp. The original camp consisted of three main wooden buildings (Tomonari-Tuggle and Slocumb 2000b). Tents for officers and their families extended in wings to either side of the officers' building; similarly, tents for incoming enlisted men extended in a neat line of 20 tents to the west of the enlisted men's barracks. The central building was a recreation hall. As permanent structures replaced tents, they also followed the linear wing pattern.

Another common design was a focus around a central parade ground. This is reflected at Palm Circle at Fort Shafter, where most buildings were constructed for officers and enlisted housing between 1905 and 1909. They are of the same architectural style, and the cohesive landscape is emphasized by the stately rows of royal palms (*Palmea roystonea regia*) that line the circular drive around the parade ground. Although no longer extant, the cantonment area of Fort Shafter (largely demolished by 1961) and the original buildings at Fort Ruger (also demolished) were also designed around parade grounds.

Functionality took precedence in the design of technical service areas. For example, the Hawaiian Ordnance Depot Military Reservation (on the grounds of the present Fort Shafter) was largely designed for access by rail cars. Warehouses were aligned along parallel rows of rail lines, with housing and support buildings to one side of the warehouses and storage sheds on the other. Magazines were set apart to the southwest of the main ordnance complex.

The post hospital at Fort Shafter (no longer present) is another example of function determining layout. Common to Army hospital design of the early 20<sup>th</sup> century, the hospital area at the post followed a dispersed pavilion plan that "reflected contemporary medical philosophies of medical care" (Goodwin et al. 1995:27), namely, a continuing belief that stale air or "vapors" caused disease:

Nineteenth-century military hospitals generally had a central block with ward wings and two-story verandas around the building. Early twentieth-century military hospitals followed the same design, but with Colonial Revival or Classical stylistic references.

Modern medical advances, particularly a better understanding of epidemiology, bacterial causes of disease transmission, and the importance of antiseptics, resulted in changes to Army hospital design. Hospitals such as the new Tripler Hospital (now the Tripler Army Medical Center), built in the late 1940s, were designed as consolidated buildings with massive multi-storied towers that minimized distances between wards, resulting in savings of staff time and infrastructure (Goodwin et al. 1995). By the 1970s, however, the improved design of the post-war years was antiquated (Thompson n.d.:390):

The rapid evolution of medical sciences demanded new facilities and more space. Changing methods of patient care resulted in fewer bed-patients ... and more outpatients ... . Wards became offices, laboratories, and diagnostic center to take care of this changing workload. Further, the type of patient had shifted from young males in the 1940s to senior retirees, veterans, and more females, as well as people from the Trust Territory and Samoa. In 1974, a medical survey team concluded that Tripler was 'no longer functionally organized to economically deliver quality health care.' Criticisms of

the hospital included its low ceiling, narrow wings, close column spacing, and the long distances in the sprawling wings that caused poor circulation and extra work for the staff.

An unusual example of functionality and efficient reuse is the cantonment at Pōhakuloa Training Area, which consists largely of Quonset huts (Figure B.3). The original World War II camp consisted of Quonsets and tents. More Quonsets were added during the Korean War when the area was used by both the National Guard and the Army. In February 1956, there were already 120 Quonset huts at the Pōhakuloa Training Area cantonment, with Marines planning to add 110 more in the following month (Langlas et al. 1997).

### *Island Architecture*

Early construction of military facilities in Hawaii largely followed standard Army plans, except for adaptations required by island conditions. For example, houses at Palm Circle at Fort Shafter are similar to other standardized plans used by the Quartermaster Corps between 1901 and 1908, but modifications were made, particularly to increase ventilation; the plans are marked by a special number in the index of standard drawings (Slocumb 2000). At Schofield Barracks, the standard Army design for barracks was a substantial building of Second Renaissance Revival style, but the tar and gravel roofs were slightly sloped to account for island rains (Alvarez 1982).

Similar problems with adapting standardized plans to an island environment continued even into the 1950s. As noted above, the original Capehart housing at Schofield Barracks used construction criteria developed at the national level that resulted in structural flaws. The criteria required modification that was then successfully applied to other Capehart projects in the islands.

A more suitable architectural style that was used in Hawaii was the Craftsman style, which was well-adapted to the local climate. Between 1918 and 1922, Craftsman-style houses were built at several Army posts, including Schofield Barracks and Fort Shafter, as well as Fort Kamehameha and Ford Island at Pearl Harbor. This board-and-batten, single-wall style was common to island plantation housing at the turn-of-the-century. The single-wall construction, in which the board-and-batten serves exterior, interior, and structural functions, was unusual outside of Hawaii (Belt Collins Hawaii 2000a). The use of this wall type, along with screened porches, pitched roofs, and open courtyards, were adaptations to tropical living.

The 1920s and 1930s was a period in military design and construction in which planners attempted to incorporate regional styles and materials into post design. Spanish Mission architecture was “deemed most appropriate for the southern region” (Goodwin et al. 1995:75). At Schofield Barracks, officers’ quarters associated with the last infantry quad to be completed (finished in 1932) used plans that were originally authorized for Fort Huachuca in Arizona. These quarters had flat roofs that were later replaced with peaked design to accommodate Hawaii’s tropical rain (Alvarez 1982). Houses of similarly modified design were built at Wheeler Field.

In the 1930s, new construction reflected the artistic style of the period, called art deco or art moderne (Alvarez 1982). At Schofield Barracks, this is represented by the Macomb and Funston Gates (built in 1932) and the post theater (built in 1933).

There was also an attempt to incorporate local materials into building construction. Local lava rock was a common material and is reflected in numerous structures dating to the 1930s. At Fort Shafter, the former Golf Clubhouse (called the Roundhouse Restaurant, now demolished) was built in a distinctive circular design using local lava rock. At Kilauea Military Camp, nine stone cabins were built in 1933 for use by the permanent camp staff; the rock came from a nearby quarry.

In the early years of World War II mobilization, temporary buildings had to be erected quickly in the effort to develop the islands as a staging area for the Pacific theater. Dod (1966:366) gives examples of adaptations to standardized theater of operations drawings “to improve and strengthen buildings and at the same time make as much use as possible of local materials:”

Standard drawings prescribed earth floors for barracks and latrines; in Hawaii, the engineers installed floors of wood or concrete. The drawings prescribed waterborne sewage for hospitals only; in the Islands it was a feature of other buildings as well. Officers’ quarters had interior plumbing and lounge space not called for in the original designs.

## **Defense**

Historically, one of the primary missions of the U.S. Army in Hawaii has been defense. At the local level, the role of the Army prior to World War II was the defense of Pearl Harbor. At the international level, the role of the military in the islands was the defense of the U.S. mainland. Coastal armament, aviation, and radar were some of the major means by which the U.S. Army implemented its mission.

At the turn of the century, the U.S. military undertook a general program to modernize its coastal defenses. Thompson (n.d.:31) writes that “the huge construction program resulted in all the major harbors being fortified with newly designed steel guns ranging in size from 3 to 12 inches in diameter of bore and 12-inch, breech-loading mortars.” By 1907, Army artillery was divided into the Coast Artillery and Field Artillery Corps. The purpose of the Coast Artillery was harbor defenses, including plotting and preparing underwater mines and manning heavy guns at coastal batteries; Field Artillery remained with the field army with the mission to support infantry in battle.

Military aviation was formalized in 1914 with the creation of the Air Service within the Signal Corps. With the development of military aviation, defense took on a two-pronged meaning. Coastal defense was expanded to include an anti-aircraft mission, which meant the development of defensive facilities in areas away from the coastline. At the same time, Army aviation itself was seen as a means of defense, particularly after 1927 when Japan completed its first fleet carrier and it became apparent that Hawaii’s place in the middle of the Pacific Ocean no longer afforded it automatic protection from enemy aircraft (Linn 1997). As Linn (1997:248) succinctly states: “Aviation promised to extend Hawaii’s defensive perimeter hundreds of miles out to sea, but enemy carriers presented a potential threat that was still unresolved when the Japanese struck [on December 7, 1941].”

In the Cold War era, Army aviation expanded to include helicopters as an effective means to move troops across battlefields, as well as for reconnaissance, artillery observation, and medical evacuations. The Army experimented with air mobile units that were transported by helicopters and with helicopter gunships in support of ground forces (United States Army Environmental Center (USAEC) n.d.b).

The Cold War also saw the development of air defense for military bases in the continental United States and overseas as a major Army mission. In July 1950, the Anti-aircraft Command was formed “to coordinate the defense against Soviet bombers” (USAEC n.d.b:27). The Army became a leader in development of surface-to-surface and surface-to-air missiles.

## ***Coastal Defense in Hawaii***

Of the Army services, the Coast Artillery has one of the longest histories of the Army in Hawaii. The 6th Artillery Regiment arrived in the islands less than a year after the first Army troops set up Camp McKinley at the foot of Diamond Head. In the early years of the 20<sup>th</sup> century, the Taft Board recommended that coastal forts be established to defend Honolulu Harbor and Pearl Harbor, the only significant deep water ports in Hawaii (Dorrance 1995). This recommendation was in line with an overall

national strategy in which Hawaii served as the first line of defense against an enemy invasion of the west coast of the U.S. mainland.

On April 24, 1909, the War Department established the Artillery District of Honolulu, which was headquartered at Fort Ruger. The district consisted of batteries and gun emplacements at Fort Kamehameha at Pearl Harbor, Forts DeRussy and Ruger at Waikiki, and Fort Armstrong at Honolulu Harbor (Meeken 1974; Dorrance 1993) (Figure B.4). Dorrance (1997:3, brackets added) describes the strategy of the coastal defenses:

The mortars [at Fort Ruger] covered the approaches to Honolulu Harbor and could reach as far as the approaches to the entrance to Pearl Harbor. They complemented the 6-inch and 14-inch guns emplaced at the closer approaches to Honolulu Harbor at Fort DeRussy and the harbor entrance submarine mining facilities at Fort Armstrong located at the Honolulu Harbor entrance. Any enemy vessel attempting to enter Honolulu Harbor would encounter, first, the deck piercing projectiles of the mortars, next, the side armor piercing projectiles of the Fort DeRussy guns, and, if they survived those weapons, last, the hull-threatening submarine mines planted in the harbor entrance by the soldiers at Fort Armstrong.

It was soon apparent, however, that the harbor defense fortifications were vulnerable to an attack from land; once taken, the harbors could be used by the enemy with impunity (Dorrance 1995). In 1908, the National Land Defense Board looked at the question of protecting seacoast fortifications from land attack. The board recommended that a garrison of infantry protect against hostile landings on the north shore, and that any landings on the east or west coasts be stopped at pinch points at Makapuu Point on the east or Kahe Point on the west. A second board in 1912 reiterated the 1908 recommendations.

Between 1914 and 1920, massive land defense batteries were emplaced at Fort Ruger, Ford Island, and at the entrance to Pearl Harbor, providing a “protected citadel encompassing the anchorage and naval base at Pearl Harbor, metropolitan Honolulu and all coastal defense forts” (Dorrance 1995:156).

By the mid-1920s, however, the fixed land defense batteries of only a decade earlier were determined to be obsolete and were disarmed or assigned other functions (Dorrance 1995:158, brackets added):

The 4.7 inch guns were removed from Batteries Barri [at Pearl Harbor], Hulings, and Dodge [at Fort Ruger]. Battery Birkhimer (four 12-inch mortars) [at Fort Ruger] was found to be too cramped and poorly designed. The battery was extensively rebuilt and subsequently listed as a harbor-defense battery.

With the development of the airplane as a military tactical weapon, protection against air attacks was added to the Coast Artillery mission. In 1922, the 64<sup>th</sup> Coast Artillery based at Fort Shafter became the first anti-aircraft regiment in the Army (Meeken 1974). Although the regiment was reorganized several times, it remained intact until 1942 when it was reformed as separate anti-aircraft battalions.

Development of coastal defenses continued throughout the 1920s and 1930s, with a trend toward greater dispersion of guns. Larger guns, including 16-inch guns that were removed from battleships following the 1922 Washington Naval Limitations Treaty, were also used. In Hawaii, a traditional battery fort mounting two 16-inch guns was established on the Ewa Plain (Fort Barrette) in 1934; the battery included a railroad that connected the two guns, barracks, and machine gun pillboxes. During this period, the large gun emplacements were augmented with mobile 8-inch railroad guns and 155mm guns that were deployed through Oahu. Panama mounts, which were standardized circular concrete gun mounts for 155mm guns, were built in numerous locations to be ready as needed for installation of the mobile guns.

A network of artillery fire-control stations that would allow “observers to call down heavy artillery on any beach in the island” (Linn 1997:224) were also built. Other facilities included machine gun pillboxes, ammunition storage, and coastal and anti-aircraft searchlights.

New lands were acquired for expanding defense needs. For example, in 1929, the Army took control of two parcels in the back of Mākua Valley in Waianae for gun emplacements (Kelly and Quintal 1976). In the 1930s, land within the Kawailoa Forest Reserve in the northern Koolau mountains was acquired, primarily for troop training, although gun emplacements and batteries were constructed; these included Panama mounts for 155mm guns built on top of two-story high concrete towers. Each battery included a splinter-proof magazine and a battery commander’s station (Paliwoda 1990).

Coastal defense remained a priority after the Japanese attack on Pearl Harbor, particularly in the early years of the war when additional attacks were still considered a possibility. The Hawaiian Seacoast Artillery Command was established at Fort Ruger, and controlled operations at Forts DeRussy, Kamehameha, Weaver (on the west side of the Pearl Harbor entrance), Barrette (on the Ewa Plain), Hase (at Kaneohe Bay), and battery positions on the north shore of the island (Meeken 1974; Dorrance 1993). Five new batteries were developed at Fort Ruger, Fort Hase, and in Waianae, before the tides of war changed and the need for fortifications lessened (Thompson n.d.).

After World War II, seacoast artillery was declared obsolete and all guns in the United States, including those in Hawaii, were scrapped (Meeken 1974). In 1950, the Coast Artillery Corps was disbanded.

### ***Army Aviation in Hawaii***

In the second decade of the 20<sup>th</sup> century, the U.S. Army in Hawaii was “at the forefront of the developing science of flight” (Alvarez 1982:47). The 6<sup>th</sup> Aero Squadron arrived in Hawaii on March 13, 1917 and was stationed at Fort Kamehameha at the entrance to Pearl Harbor (Addleman n.d.). The first air service, a joint operation of the Army and Navy, was established in 1918 at Luke Field on Ford Island in Pearl Harbor. The same year, the Army and the Territory of Hawaii entered an agreement to move the Waialua-Honolulu Road so that an airfield could be developed on the central plateau. The central plateau lands were cleared and leveled. In 1922, the Army left Luke Field to the Navy and moved to a permanent base at what had become Wheeler Field, the home base for the Divisional Air Service.

By 1940, the “developing science of flight” had evolved into the Hawaiian Air Force, whose principal mission was to defend the “Hawaiian Islands and the Navy’s Pacific facilities from air attack” (Arakaki and Kuborn 1991:3). The Pursuit Wing based at Wheeler Field was the interceptor arm of the Air Warning System that was being instituted just prior to the Japanese attack on Pearl Harbor.

Throughout its history, Wheeler Field has been the Army’s primary air facility in Hawaii. At its origin, the field was planned to meet the increasing needs for facilities to support land planes used by the Army’s Hawaiian Department. Early permanent construction included storage tanks and hangars, but even until the late 1920s, the field was a simple cleared strip of land described as “grass and dirt and lots of dust when a plane took off” (Earley 1968). Army aviators assisted Army engineers in mapping the island, practiced bomb drops during maneuvers, sowed tree seeds for the Department of Agriculture, and took countless aerial photographs of all the islands (Tomonari-Tuggle and Bouthillier 1994).

In 1926, the Air Service was formally designated the Army Air Corps. Nationwide, the decade of the 1930s was characterized by improved facilities, particularly to support on-going development of heavy bombers. Facilities included hard surface runways, landing lights, larger aircraft hangars, and larger maintenance facilities. Wheeler Field was part of this construction boom. All of the original wooden buildings were demolished and new construction focused on the north edge of the post. Housing,

hangars, headquarters, a fire station, and other support buildings were aligned along a central thoroughfare, with hangars and technical buildings on the south side of the road and housing and administration built along loops to the north of the road. A new dirt runway was graded along the south side of the hangars.

In 1935, the General Headquarters (GHQ) Air Force was created, still under the umbrella of the Army, but one step closer to becoming an independent and equivalent service to the Army and Navy. In 1939, Wheeler Field officially became a permanent post separate from Schofield Barracks. With impending war, construction in 1940 and 1941 included a new control tower and aircraft revetments. By late 1941, more than 100 front-line P-40 interceptors had replaced older aircraft, and troop strength had risen to 5,000 airmen.

The Pearl Harbor attack brought this development to an abrupt end, although it soon instigated a new round of construction. At Wheeler, two new runways were added, which, with the newly paved original runway, formed a triangle that allowed all three to be used at the same time. The grass landing strip at Dillingham Field was quickly expanded to an 8,000-foot long asphalt runway, complemented by roadways, bunkers, revetments, ammunition storage, and gun emplacements.

In the 1930s and during World War II, numerous airfields were established throughout the islands as major installations or subsidiaries to Wheeler. On Oahu, these included the major fields at Hickam and Bellows, as well as subsidiary fields at Haleiwa, Kahuku, Kipapa, Kualoa, and Dillingham (Figure B.5). John Rodgers Field (the present Honolulu International Airport) was also developed at this time.

At war's end, there was rapid demobilization and a re-evaluation of facilities. The runway at Wheeler was determined to be too short for new jet-powered aircraft, making the post obsolete. In

1947, the U.S. Air Force was founded and Wheeler Field became Wheeler Air Force Base. It remained under Air Force authority until 1991 when it was returned to the Army as Wheeler Army Airfield.

During the Cold War, Army aviation was revived in the form of troop tactical support, particularly using helicopters (USAEC n.d.b). Coordinated training with ground troops and support helicopters was carried out at USAG-HI training areas, especially at Pōhakuloa Training Area on Hawaii.

### ***Radar in Hawaii***

This section is taken largely from Tomonari-Tuggle and Yoklavich (2000). It is based on historic research concerning the Mount Kaala Air Force Station conducted by Ann Yoklavich of Mason Architects.

Arakaki and Kuborn (1991:11) write: “the key to the Hawaiian Islands air defense was the Air Warning System (AWS), consisting of the radar units, an air warning center, and the 14<sup>th</sup> Pursuit Wing at Wheeler.” In theory, the AWS operated in the following manner. The radar units, along with long-range reconnaissance flights, surface ship contacts, and units on the outer islands, provided data to the air warning center, which interpreted the data in terms of the paths of incoming aircraft and whether it was friendly or unknown. If unknown, the center ordered the launch of interceptor aircraft to investigate.

Radar was a revolutionary innovation of the late 1930s. Although the basic principle of radar, that metal objects reflect radio waves, was discovered in 1885, the use of radar for military purposes, primarily to detect aircraft at long range, did not occur until the 1930s. Late in that decade, research and development had progressed, but in the immediate pre-war period of defense development, it “was less than four years old and a heavy secret” (Terrett 1956:121).

Planning for aircraft warning systems for Hawaii started in 1939 at the Signal Corps office in Washington, D.C. One fixed and seven mobile radar stations, later revised to three fixed and five mobile stations, were proposed for Oahu, Kauai, Maui, and Hawaii (Terrett 1956; Thompson n.d.). The three fixed stations were to be built at Kaala in the Waianae Mountains of Oahu, Kokee on Kauai, and Haleakala on Maui. Mobile SCR-270 and fixed SCR-271 radars, the “first generation of descent from the parent equipment” (Terrett 1956:121), were to be used. The SCR-271 radars were a very new and highly secret technology; Hawaii got the third, fourth, and fifth off the production line (Terrett 1956).

The first radars to arrive in Hawaii were five mobile sets that came in July 1941 and were set up in temporary locations on Oahu. The sixth mobile set and the three fixed sets arrived in late November 1941. The mobile radar was erected at Opana near the north shore of Oahu; the fixed sets could not be installed because their mountain top sites were not yet ready (Conn et al. 1964).

Organizational problems were numerous. This was a revolutionary system that was “so new to the Army that no one was sure how to make it work or who should control it” (Arakaki and Kuborn 1991:13, brackets added):

Everyone wanted to get into the act. Even the simplest job took months of coordination and frustration before it could be completed. Oahu abounded with US Government-owned locations suitable for the mobile radar units; but before a site could be used, approval had to be obtained from the National Park Service and the Department of Interior. More than once, General Short [Commander, Hawaiian Department] had to intervene to get the approval process moving. Cooperation within the Army was no better. Captain Bergquist [14<sup>th</sup> Pursuit Wing liaison with the Hawaiian Signal Corps which had control of the new technology] placed a requisition for headsets to be used by personnel operating the control center, only to have it disapproved by the Quartermaster Corps because the latter thought the Signal Corps was the organization in charge.

The mobile radar systems on Oahu in late 1941 were intended for training purposes only. The various Army organizations (Signal Corps, the air warning command, and the Pursuit Command) had not yet established a structure to effectively operate the Air Warning System (Conn et al. 1964). Moreover, the military on Oahu had been instructed to be on guard for acts of sabotage and was not expecting an attack by Japanese planes. Effective radar operations were also hampered by a shortage of spare parts and an unreliable power supply that made it impractical to operate the systems for more than three or four hours a day (Conn et al. 1964).

The radar station at Opana on the north shore was scheduled to operate only briefly in the predawn and early dawn morning of December 7, 1941. The two men on duty were awaiting their ride down from the hilltop station, and were practicing when they saw an unusual mark on their oscilloscope, which they calculated as a large formation of planes to the north. They called the information center at Fort Shafter, where they found only two people, a private who was shortly going off-duty and an Air Corps lieutenant who was there only because he wanted to become acquainted with the routine at the center. The private deferred to the visiting lieutenant, who reassured the radar men that the marks were probably “a flight of Army bombers [that] was coming in from the mainland that morning” (Thompson et al. 1957:5). Less than an hour later came the devastating Japanese attack on Oahu’s military installations (Thompson et al. 1957).

Immediately after the Japanese attack, there was a tremendous amount of work on military defenses. A priority system was established, and “at the head of the list was the protection of existing aircraft warning stations and the building of additional ones” (Dod 1966:346). In pre-war designs, all radar installations were above ground, with adaptations only to weather conditions at the sites (R. Richardson 1946). After

the attack, buildings at permanent aircraft warning stations were modified to be “splinterproof” (resistant to bomb fragments), and shortly thereafter, to be bombproof (Dod 1966:347).

This meant that each site would have to have a number of sub-terranean rooms with a cover of at least forty feet of rock for vital equipment and living quarters. At some of the stations, the 100-foot high steel tower with its revolving antenna would have to be moved so that it would be directly over the chambers, and at all the stations a vertical shaft would have to be drilled through the rock or earth between the tower and the rooms. The district office hurriedly redesigned the stations while continuing to work on them.

By June 1943, there were over 70 radar sets in Hawaii. On that date, the responsibility for all air warning stations, “except for the maintenance of seacoast radar,” was transferred to the Army Air Forces (Thompson and Harris 1957:236). From 1943, the practice of bombproofing was discontinued (Thompson n.d.).

The largest underground project for the aircraft warning system was the Air Defense Command Post (Building 1292) at Fort Shafter (Thompson n.d.). Here, information from all fixed and mobile radars in the island was received and then relayed to all concerned command posts and required parties.

### *Underground Storage*

In the period of heightened military construction of the mid-1930s, as well as during the war years, “both the Army and the Navy burrowed far underground to build some of their most important installations” (Allen 1950:228). Figure B.6 shows the locations of major underground facilities on Oahu dating from this period.

A major defense project of the mid-1930s was the construction of ammunition tunnels into the sides of Aliamanu Crater. Called Aliamanu Ammunition Storage Depot (now Aliamanu Military Reservation), this facility was located halfway between Fort Shafter and the East Loch of Pearl Harbor and was intended for centralized storage of Army ammunition (Thompson n.d.). Eight tunnels were dug in 1934 and additional 35 magazines were completed in 1937.

Army construction during this period also included “The Hole” (now the Kunia Field Station), a facility originally intended for plane assembly (with a runway connection to Wheeler Field to the east). Allen (1950:229) describes the installation:

The entrance appeared to lead only to a small dugout in a rolling hill, but at the end of a quarter-mile tunnel two elevators – one big enough for 20 passengers and the other able to carry four ½-ton trucks – gave access to a three-floor structure, self-sufficient even to a cafeteria that could serve 6,000 meals a day.

“The Hole” was intended for plane assembly, but since it was not needed for such use, it proved ideal for the reproduction of maps and charts. Its huge air conditioning and ventilating systems provided easy control of temperature and humidity, and its fluorescent lighting furnished a flood of shadowless illumination.

At the onset of World War II, the Army was importing ammunition in huge quantities, requiring construction of ammunition storage facilities. Small facilities were built above ground, but the bulk of the ammunition was stored in massive underground storage facilities. The first to be developed was in Waikakalaua Gulch just south of Wheeler Field. Two other locations in Kipapa Gulch were also developed. Dod (1966:368) writes:

Tunnels driven into the almost vertical walls of the two gorges would have entrances invisible from the air. To keep out bomb fragments, passageways to the storage chambers would be dog-legged or provided with baffles. The only drawbacks to these sites were lava formations and cinder pockets which would necessitate timbering or concreting considerable portions of the chambers.

In October 1941, work was started to convert the storage facility in the rim of Aliamanu Crater into a joint Army-Navy command post; although not completed at the time of the Japanese attack on Pearl Harbor, the post was shortly after put into service by the island command.

Other tunnel complexes were built at Schofield Barracks, Wheeler Field, Fort Shafter, and Fort Ruger. The tunnels at Wheeler Field and Fort Ruger were for ammunition storage. The tunnels at Fort Shafter included a bombproof radio station, an underground cold storage facility, an anti-aircraft command radio transmitter tunnel, and the Air Defense Command Post (Tomonari-Tuggle and Slocumb 2000a).

### *Air Defense*

In the early 1950s, guided missiles were the crux of the Army arsenal of air defense. The first guided missile was the Nike Ajax, which was deployed in 1953. Within a year's time, 224 Nike Ajax batteries had been developed throughout the United States. In 1958, the Nike Hercules improved the Ajax range of 25 miles to a 100-mile radius, and had the advantage of carrying a nuclear warhead. As part of a nationwide deployment, four batteries were constructed on Oahu: a single battery in the vicinity of Dillingham Field, a single battery at the northern end of the Koolau Range in the Kahuku Training Area, and dual batteries at Bellows Air Force Station and above Fort Barrette on the Ewa Plain.

#### **6.1.1.1 Education and Training**

Professional military education had its origins in the post-Civil War era. Before then, training was generally limited to initial entry level education that was often haphazard and idiosyncratic (Goodwin et al. 1995). After the Civil War, a more sophisticated system developed in response to growing technical requirements, technological innovations, and the increasing perception of the military as a profession. By the time the Army established itself in Hawaii at the turn-of-the-century, it had already initiated formal graduate programs for senior officers, a post-based system for junior officer training, and branch schools for the artillery, cavalry, engineer, and medical services.

As the United States entered World War I, the need for trained soldiers resulted in the creation of large cantonments for the regular Army, the National Guard, and technical branches.

#### *Military Education in Hawaii*

In Hawaii, early schools included one for bakers and cooks that was established at Schofield Barracks and Fort Shafter in 1914, and a "school of fire" at Schofield Barracks in 1916 (Addleman n.d.). The extensive use of gas warfare in the European war prompted the addition of instruction in gas defense to the Schofield fire school in 1918. In August 1917, just before the onset of American participation in World War I, an officer training school was established at Schofield Barracks (Alvarez 1982). The initial class of 100 students included 68 men of Hawaiian, Chinese, and Japanese backgrounds from Oahu and 32 men from the other islands or from the Army. Graduates were commissioned and sent to the mainland. Three other training classes were held in 1918.

Following the war, a variety of schools were established on Army posts in Hawaii: a school for warrant officers to learn typewriting and stenography, a school for farriers and horseshoers, and even a school for instruction in shoe measuring and shoe and sock fitting (Addleman n.d.).

In 1922, education was formalized by War Department orders that required that six percent of infantry and field artillery personnel on an installation were to be enrolled in post schools (Addleman n.d.). By 1924, a wide range of courses was offered at Schofield Barracks, ranging from elementary reading and writing to preparatory classes for West Point admission (Addleman n.d.). Vocational trades included automotive, electrical, cooking, and clerical schools. Military education included ordnance, blacksmithing, tentage, gas defense, and signal communications.

For the year 1939, Addleman (n.d.) lists schools for bakers and cooks, medical laboratory technicians, and clerks (for stenography, company administration, typewriting, and English). Military education included instruction for West Point preparation, signal communications, chemical warfare, and radio. In spite of the declining use of horses and mules for military transport, there were schools for farriers and horseshoers, and instruction in stable management and care of animals.

An example of an informal school that offered direct benefit to personnel was an aircraft sheet metal school at Wheeler Field. Arakaki and Kuborn (1991:45) write that the school was conducted by the staff sergeant in charge of the sheet metal shop:

Sergeant Snodgrass ... conducted a school for those interested in learning about aircraft sheet metal. This was not compulsory, but those who attended qualified as aircraft mechanics; and the "AM rating" entitled them to the same pay as a staff sergeant, regardless of whether they wore private, private first class, corporal, or sergeant stripes.

### ***Troop Training in Hawaii***

In the 1930s, Japanese aggression in the western Pacific and in China brought about heightened anticipation of war. The Navy and Army held annual joint maneuvers. The Army moved to acquire lands for troop training, including the lease of the Kawaihoa Forest Reserve (Dega and McGerty 1998) and lands at Mākua Valley.

The onset of World War II brought a new meaning to education and training for the Army in Hawaii. In 1941, Schofield Barracks had the only major training facilities in the islands; these included artillery ranges, small arms firing ranges, bayonet and obstacle courses, and bivouac and maneuver areas (Alvarez 1982) that were largely designed for a square division, the post-World War I regimental organization. As the war progressed, thousands of troops bound for the Pacific theater transited through the islands, forcing the expansion of Army training facilities.

Further, the nature of island warfare against a Japanese enemy called for a different approach to combat, requiring training for beach landings and fighting and survival in tropical and semi-tropical conditions. Before the Tarawa invasion, troops practiced assault maneuvers at Mākua on the Waianae coast where replicas of the Japanese beach defenses had been constructed (Allen 1950). One of the few permanent structures built at Schofield Barracks during the war was an Olympic-sized swimming pool that was intended for combat training under the commanding general's directive that "every man should be a swimmer" (Alvarez 1982:71).

In late 1942, the Jungle Training Center (later called the Ranger Combat Training School) was established at Schofield Barracks to provide troop training in techniques of unarmed defense to combat Japanese infiltration tactics. By 1943, the mission of the school was expanded to provide qualified instructors in ranger or commando methods of combat. Jungle warfare training was also held on the windward side of the island. Amphibious landing techniques were practiced at Mākua, as well as at the amphibious training center at Waianae, which was the largest on the island. These areas were used for coordinated maneuvers involving Navy landing operations combined with ground troop invasion training. Anti-aircraft and

machine-gun training was provided at Camp Malakole at Barbers Point. Fort DeRussy was used for a camouflage school and for the U.S. Armed Forces Institute (Allen 1950; Meeken 1974).

Even recreation facilities were transformed into training camps. From March to October 1942, Kilauea Military Camp served as headquarters for the 27th Division and was used exclusively for its quarters and training (Tomonari-Tuggle and Slocumb 2000b).

An adjunct of the training exercises was the need for training camps. For example, at Mākua, a large training camp housing several thousand troops was set up. The camp included housing, kitchens, a post exchange, beer parlor, and an outdoor theater.

When the war came to an end, the need for combat training diminished. Most of the training centers were closed, although in some cases, like the Waianae Kai Military Reservation, the land was retained for other uses.

The Korean War reestablished a need for troop training that continued as a major Army activity during the Cold War. During the Korean War, Schofield Barracks played an important role in training. But as troops returned to Hawaii from Korea, housing needs at Schofield Barracks took precedence, and training areas on the installation were transformed into family housing developments. Other training areas were required. In 1956, lands at Pōhakuloa, on the saddle between Mauna Kea and Mauna Loa on Hawaii, were acquired for troop training. The World War II training cantonment, which had continued in use by the Hawaii National Guard after the war, was refurbished and expanded, and Bradshaw Army Airfield was developed (Langlas et al. 1997). Also in 1956, the Army developed 240 acres of former Kahuku Plantation lands for the Kahuku Training Area; subsequent leases expanded the original training area to over 9,600 acres (Williams and Patolo 1998).

### **Recreation**

Addleman (n.d.:65) writes in his history of the U.S. Army in Hawaii:

The lack of opportunities for social contacts for the enlisted soldier has been ameliorated by providing an extensive and varied program of sports, education, and entertainment. This program ... is second in importance only to military training.

Physical, social, and cultural conditions in Hawaii made it an unusual stationing for most Army personnel. Hawaii is an archipelago of small tropical islands that was a long and remote distance from the United States mainland. There was clearly a different cultural and social climate that often provoked misunderstanding and sometimes violence for soldiers on leave in Honolulu. This situation made recreation a more important aspect of Army life in Hawaii than at posts on the mainland. Therefore, while recreation is not a theme of the national military context (Goodwin et al. 1995), it is certainly appropriate for Hawaii installations.

### ***Recreation Posts***

One of the earliest attempts at developing Army rest and recreation facilities was the plan to use the cool and un-tropical upland plateau at Waianae Uka “as a place for the recuperation of soldiers who had become run down by service in the Philippines” (letter from Governor of Hawaii to the Secretary of War, dated December 21, 1907, quoted in Addleman n.d.:5). Similarly, the high altitude at Kilauea Volcano was seen as a likely location for Army recreation facilities. The commanding officer of the Hawaiian Department made a visit to Kilauea in 1916 and came away with the impression that “the bracing climate [afforded] a splendid tonic for men who have been for some time stationed near sea level” (Warshauer, in Tomonari-Tuggle and Slocumb 2000b:III-28).

Kilauea Military Camp (KMC) is a unique post in that its mission throughout its history has been as a recreation facility. Except for a brief period in which National Guard training was planned for the facility and also during the early years of World War II when martial law was instituted, the camp has always served a primary recreation function. Addleman (n.d.:15) writes that in 1916, “a vacation of at least two weeks each year at the camp is permitted all soldiers of the Hawaiian Department who desire to avail themselves of the privilege.” Although World War I saw the camp virtually abandoned, the Army renewed its interest in the recreation facility by 1921. Almost 5,000 enlisted men visited the camp in its first year of operation. By 1923, visitors had access to a library and pool table, with three movies shown each week and a monthly dance to which the women of the nearby town of Volcano were invited (Tomonari-Tuggle and Slocumb 2000b).

By the end of the last major construction period at the camp in 1937, recreation facilities included a 250-seat theater, recreation room, tennis court, three handball courts, golf course, and a baseball diamond; motor trips to various points of interest on the island and horseback riding were other recreational amenities (Tomonari-Tuggle and Slocumb 2000b). In October 1943, after being used as quarters and training for the 27<sup>th</sup> Division in the early years of World War II, KMC was returned to a rest and recreation facility, with a priority mission of serving personnel who had seen combat (Tomonari-Tuggle and Slocumb 2000b).

In the post-World War II demobilization period, KMC was joined by Fort DeRussy and Waianae Kai Military Reservation as recreational facilities. While the original mission of Fort DeRussy was to provide coastal defense for Honolulu and Pearl Harbor, its location on the beach at Waikiki did not go unnoticed when the Coast Artillery Corps was disbanded in 1950 and a new mission was needed. As early as 1949, the Army prepared plans for using the installation as a recreation area for the Armed Forces (Thompson n.d.) and redesignated the post as an Armed Forces Recreation Area (Meeken 1974). These plans progressed in 1957 with an Army Corps of Engineers master plan for a multi-story hotel adjacent to Battery Randolph and a proposed seven-story building that would serve as the offices of the Corps’ Pacific Ocean Division and Honolulu District. In 1965, the Corps prepared a revised plan for a low-rise hotel surrounded by an open park, with supplementary use by the Army Reserve and a post garrison. Plans remained on hold until 1969, when Hawaii became a rest and recreation destination for troops serving in Southeast Asia. Military personnel came first to the center at Fort DeRussy before disbanding on leave, often reuniting with family for a brief respite from the war. This use spurred final planning and construction of what became the Hale Koa Hotel, which opened in 1975.

Both Fort DeRussy and Waianae Kai Military Reservation, however, had been used periodically for recreational purposes long before World War II. As with modern tourism, the beaches of Hawaii were always an attraction to soldiers. As early as 1922, bath houses were built by the Army at the coastal defense facility at Fort DeRussy (Addleman n.d.:37):

... the present bath houses for officers and enlisted men and their families were built at a cost of about \$750 each. The dredging that was necessary to make the deep channel for the barges that brought the big guns to batteries [Randolph and Dudley] resulted in what amounts to a tremendous bathing tank that is free from coral formations and is deep enough for all kinds of diving.

In the 1930s, the Army at Schofield Barracks sponsored beach convoys to the north shore of Oahu three times a week, but the “water at Haleiwa beach is so frequently muddy that swimming at Waianae is becoming increasingly popular for those who have transportation” (Addleman n.d.:64).

### ***Organized Recreation and Athletics***

Organized athletics and recreation on the military posts was the primary means of offering an off-duty distraction for personnel.

In a 1939 review of athletic and recreational opportunities, Addleman (n.d.:69) describes each of the Army posts and their facilities, and states that “Schofield Barracks has an athletic set-up that is not equaled at any other post in the Army,” including a complete athletic plant for each regiment that consisted of a “baseball field, football field, boxing rings, gymnasium and training quarters, basketball courts, tennis courts, handball courts, running tracks and volleyball courts.”

At the time, baseball was clearly the most popular organized sport in Hawaii’s Army. Schofield Barracks alone had a 10-team league playing on nine baseball fields. In a 3-1/2 month long season, games were played against teams from other Army posts, as well as against Navy and Marine teams, while crowds of up to 10,000 spectators looked on (Addleman n.d.). Basketball was almost as popular, as was bowling, which Addleman (n.d.:70) describes as having the largest player attendance in the Hawaiian Department in 1939.

Boxing was also a major sport at all posts in the Hawaiian Department (Addleman n.d.). At Schofield Barracks, about 30 smokers (consisting of an average of 11 bouts each) were held each year during a season that lasted from December through March. The octagonal boxing arena, called Conroy Bowl, seated 10,000 people. Originally built in 1923 as an outdoor boxing amphitheater, the arena was covered with a roof in 1932 with exterior walls added later. In 1935, a group of 17 boxers from the Hawaiian Division went on a “barnstorming tour of the Orient” (Addleman n.d.:55).

Golf was also a popular sport. The course at Schofield Barracks was the first built on an Army post in Hawaii and was opened to enlisted men in 1917. In 1926, golf arrived at Kilauea Military Camp in the form of a five-hole miniature/practice course on the front lawn of the camp; the course was quickly expanded to nine holes (Tomonari-Tuggle and Slocumb 2000b). The Fort Shafter course was built in the late 1920s; the Golf Clubhouse (the Roundhouse Restaurant, now demolished) was a distinctive circular structure constructed of local lava rock.

### **Communications**

Communications is a critical function of military organizations (Figure B.8). Prior to the 20<sup>th</sup> century, military communications was based on the simple mechanisms of messengers or written reports (Goodwin et al. 1995). The development and use of the military telegraph in the Civil War was a major improvement that allowed commanders to coordinate actions of dispersed units as well as communicate between different headquarters. The beginning of the 20<sup>th</sup> century saw the introduction of wireless telegraph and radio that further revolutionized military communications.

#### ***Brief History of Army Communications***

Although the Signal Corps began to experiment with wireless telegraph and radio in 1906, most of the innovations in the early years of the 20<sup>th</sup> century came from Europe. When the United States entered World War I, Army radio equipment was too heavy or too delicate for use in tactical situations. The backbone of Army signal work remained wire, both telephone and telegraph.

During the inter-war years, radio technology was greatly improved, largely because it had proven to be a commercial success. One of the challenges facing the Signal Corps during this period was the need for aircraft radio communications. Aircraft radios needed to be light enough to be carried aboard a small plane, yet rugged enough to withstand the sudden movements of an airplane; aircraft needed suitable antennae and their ignition systems created electronic “noise” that interfered with radio transmission. It

was not until 1931 that the Army finally developed a radio that weighed only 43 pounds and met the Air Corps performance requirements.

During World War II, the Signal Corps was involved in both communications and intelligence activities. However, like the rest of the Army, it underwent significant reductions at the close of the war, and its strategic communications and intelligence functions were transferred to other agencies (United States Army Environmental Center (USAEC) n.d.b).

In 1962, the Army underwent a major reorganization in which the technical services were abolished and their functions assigned to new agencies (USAEC n.d.b). The functions of the Signal Corps were replaced by “the Army Materiel Command for logistics, Continental Army Command for schools, and the Army Strategic Communications Command ... for operating communications systems (USAEC n.d.b:79).

### ***Communications in Hawaii***

The Army’s presence in Hawaii began at a time when the United States was first seeing itself as an international power and at a revolutionary time in communications technology.

The first Army Signal Corps company, consisting of two officers and 60 enlisted men, arrived in Hawaii in May 1913. Addleman (n.d.:10) writes that “prior to this time there appears to have been no regular Signal Corps officers or troops stationed here. Signal Corps activities were handled by officers from some other service.” In August of the same year, a telegraph and telephone platoon arrived in the islands.

Just after World War I, the Signal Corps established pigeon lofts, first at Schofield Barracks and Luke Field in 1919, and at Fort Shafter in 1922 (The Signal Corps acquired its first homing pigeons in 1878). However, in 1925, experimental work in the use of high frequency radio was begun in the islands (Addleman n.d.) and apparently replaced the pigeons as a more reliable method of communication. The pigeon lofts were discontinued between 1929 and 1934 (although night-flying pigeons were still being trained at Schofield Barracks in 1934).

During World War II, communications within Hawaii and between the U.S. mainland and the Pacific theater of operations was a vital function of the Army. One of the important construction projects in the early years of the war was the transformation of an ordnance storage tunnel at Aliamanu Ammunition Storage Depot into an Army-Navy command post. Started in October 1941, the project was rushed to completion after the Japanese attack. Top Army and Navy officials of the island defense forces operated out of this headquarters for several months. Allen (1950:229) notes: “opening off a main tunnel big enough for a truck to pass through were 20 rooms, including a large communications room 115 feet long.”

In 1943, Helemano Military Reservation was developed as a communications station (it was formally designated the Helemano Radio Receiver Station in 1946). During the Cold War, it served as a major relay station in the STARCOM network (United States Army Environmental Center (USAEC) n.d.b).

### **Medicine**

The Post Hospital at Fort Shafter was established in 1907. The first building was ready for occupancy in 1907, and the entire complex of medical buildings was completed by 1919 (Tomonari-Tuggle and Slocumb 2000a).

During World War II, Hawaii served as a casualty evacuation center for wounded coming back from Pacific battles. Army hospitals at the onset of war were limited to Tripler General Hospital at Fort Shafter and the post hospital at Schofield Barracks. Immediately after the December 7 attack, civilian

buildings across Oahu were taken over and some developed into major facilities that functioned throughout the war (Allen 1950). Hospitals were set up at Farrington High School and Kamehameha School for Boys in Kalihi, Saint Louis College in Kaimuki, the Japanese Hospital in Honolulu, and the territorial hospital for the mentally ill on the windward side of the island. The Army also built annex hospitals at Waipio and Ekahanui, as well as small hospitals on the numerous new posts that sprang up across the island.

In the fall of 1944, work was started on the new 14-story Tripler General Hospital located on a ridge above Moanalua valley to the west of Fort Shafter. The first patient was admitted in August 1948 (Thompson n.d.). Thompson (n.d.:155) writes that “two years after it opened its doors, Tripler’s strategic location was dramatically illustrated by the outbreak of war in Korea. During the three years of fighting, over 65,000 wounded were flown from the Far East to Honolulu for rest and medical treatment at Tripler.” The facility was redesignated the Tripler Army Medical Center in 1959.