



1981 Tide Calendar • Dillingham Corporation

HAWAII'S HIDDEN ISLANDS

The Hawaiian chain of islands continues well beyond Kauai and Niihau, but few of us ever have the opportunity to travel along this hidden portion of the archipelago. Known as the Leeward or Northwestern Hawaiian Islands, this procession of islets and shoals — the eroded remnants of ancient underwater volcanoes — marches 1,100 nautical miles to the northwest of the eight main islands of our state.

The total exposed land area of the Leeward Islands amounts to just five square miles, representing less than .1 percent of the 6,425 square miles of the geologically younger main islands at the southeastern end of the Hawaiian chain. However, including the shoals and other submerged lands under ocean depths of less than 100 fathoms (600 feet), the total land areas of both segments of the archipelago are nearly equal.

For the most part, the Leeward Islands are uninhabited by man. Kure, the last island at the northwestern end of the chain, is the site of a U.S. Coast Guard Loran navigation station with a crew of 20. A similar facility located at French Frigate Shoals since 1944 was closed in 1979. Currently, biologists of the U.S. Fish and Wildlife Service use these quarters to facilitate research projects in the area. The remaining inhabited outpost is the U.S. territory

of Midway, the only site in the Hawaiian archipelago not part of the State of Hawaii. Midway is home for some 450 resident personnel under the jurisdiction of the U.S. Navy.

The sparse human habitation of the Leeward Islands is in sharp contrast to the abundance of wildlife that live and breed in the region. Numerous species of seabirds, the rare Hawaiian monk seal, the green sea turtle, and four types of land birds found nowhere else on earth depend on this isolated area for survival.

The importance of the Leeward Islands as breeding sites was recognized as early as 1909 when the Hawaiian Islands Bird Reservation was created by executive order of President Theodore Roosevelt. Today, the Hawaiian Islands National Wildlife Refuge includes Nihoa, Necker, French Frigate Shoals, Gardner Pinnacles, Maro Reef, Laysan, Lisianski, and Pearl and Hermes Reef. These islands and adjacent waters comprise about eight percent of the total area found within the 100-fathom curve of the Leeward chain.

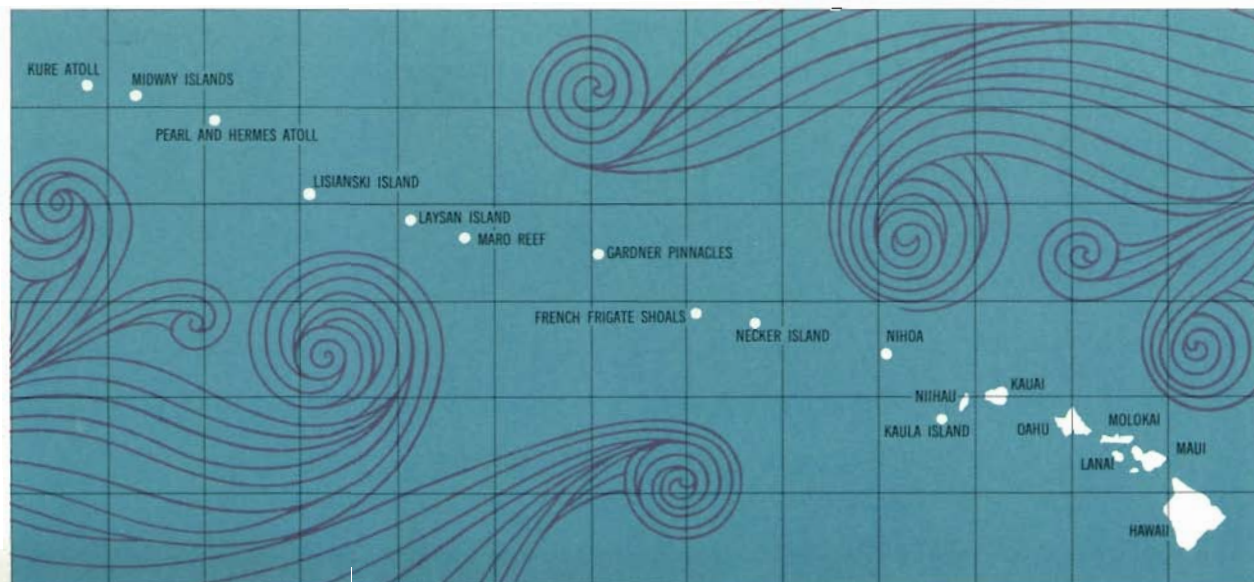
The precipitous volcanic islands of Nihoa, Necker and Kaula are the only sites in the Leeward chain with evidence of early Hawaiian visitation or colonization. The remains of house sites and agricultural terraces suggest that as many as 175 people may have lived on Nihoa at one time. On Necker the ruins of mysterious ceremonial stone structures line the island's narrow peaks. Human

images, expertly carved from stone, have been discovered at this location, but little is known about the people who fashioned them or their purposes for being there. Kaula, a crescent-shaped island within a day's sailing off Kauai, has a history of being regularly visited by early Hawaiians to gather seabirds for food and ornamental feathers.

Modern-day discovery of the various islands and shoals of the Leeward Islands dates from 1789 when French navigator Jean Francois de Galaup Comte de la Perouse sighted Necker and named the island in honor of France's minister of finance. Two days later, la Perouse "discovered" French Frigate Shoals by nearly running aground on the barrier reef.

Many other Leeward Island explorers were not as fortunate as la Perouse. During the 1800's, before accurate navigation charts were compiled, shipwrecks were common and sailors of many nations performed extraordinary feats of endurance and seamanship to survive and reach civilization. Today fishing boats and cargo vessels plying courses through the Leeward chain still fall victim to treacherous reefs and shoals.

A number of fishery surveys and assessments are in progress to explore fully and to detail the marine resources of the Leeward Islands. Early results suggest that quantities of certain food species including spiny lobsters, snappers, deep water shrimp and skipjack tuna could possibly support expansion of Hawaii's fishing industry.



About the photographer



GEORGE H. BALAZS

George H. Balazs, an avid photographer and researcher, presents his unique photographic collection of the remote segment of our island state known as the Leeward or Northwestern Hawaiian Islands.

As a marine biologist with the University's Hawaii Institute of Marine Biology, he is currently on loan to the National Marine Fisheries Service to further his research on Hawaiian sea turtles. Balazs has visited the Leeward Islands where he was able to photograph these "hidden" islands under a variety of conditions.

Balazs gratefully acknowledges the research assistance and support of the Office of the State Marine Affairs Coordinator, the University of Hawaii's Sea Grant College Program, the National Marine Fisheries Service, the State Division of Fish and Game, the U.S. Fish and Wildlife Service, the Bishop Museum, the Fourteenth Coast Guard District, Sea Life Park, the Waikiki Aquarium, and the U.S. Navy. He also expresses special appreciation to Captain Gary "Skip" Naftel of the Easy Rider Corporation.

Inquiries about his research in the Leeward Islands should be directed to: P.O. Box 1346, Kaneohe, HI 96744.

(Front cover)

SUNSET IN THE LEEWARD ISLANDS

The small rocky outcrops of Gardner Pinnacles located 600 miles to the northwest of Honolulu.

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The annexation of Necker Island to the Provisional Government of Hawaii. Minister James A. King read the official proclamation during this one day visit by the steamer **IWALANI** on May 27, 1894.

(Photo: courtesy Bishop Museum)



Stone idols discovered on Necker by the annexation party in 1894. Thirteen of these images have been found on the island — eight are housed in the Bishop Museum, two rest in the British Museum, and the whereabouts of three is unknown. The largest image weighs 25 pounds and stands 18 inches high. (Photo: courtesy Bishop Museum)



Buildings ablaze at Midway during the decisive World War II naval engagement of June 1942. (Photo: courtesy U.S. Navy)



Personnel of the isolated U.S. Coast Guard Loran station at French Frigate Shoals show off their recreational shark fishing catch in 1945. (Photo: courtesy H. Emmett Finch)



Wreck of the Japanese fishing vessel **HOUEI MARU NO. 5**, grounded on the barrier reef at Kure during a violent storm in February 1976. None of the 17 crew members were found.

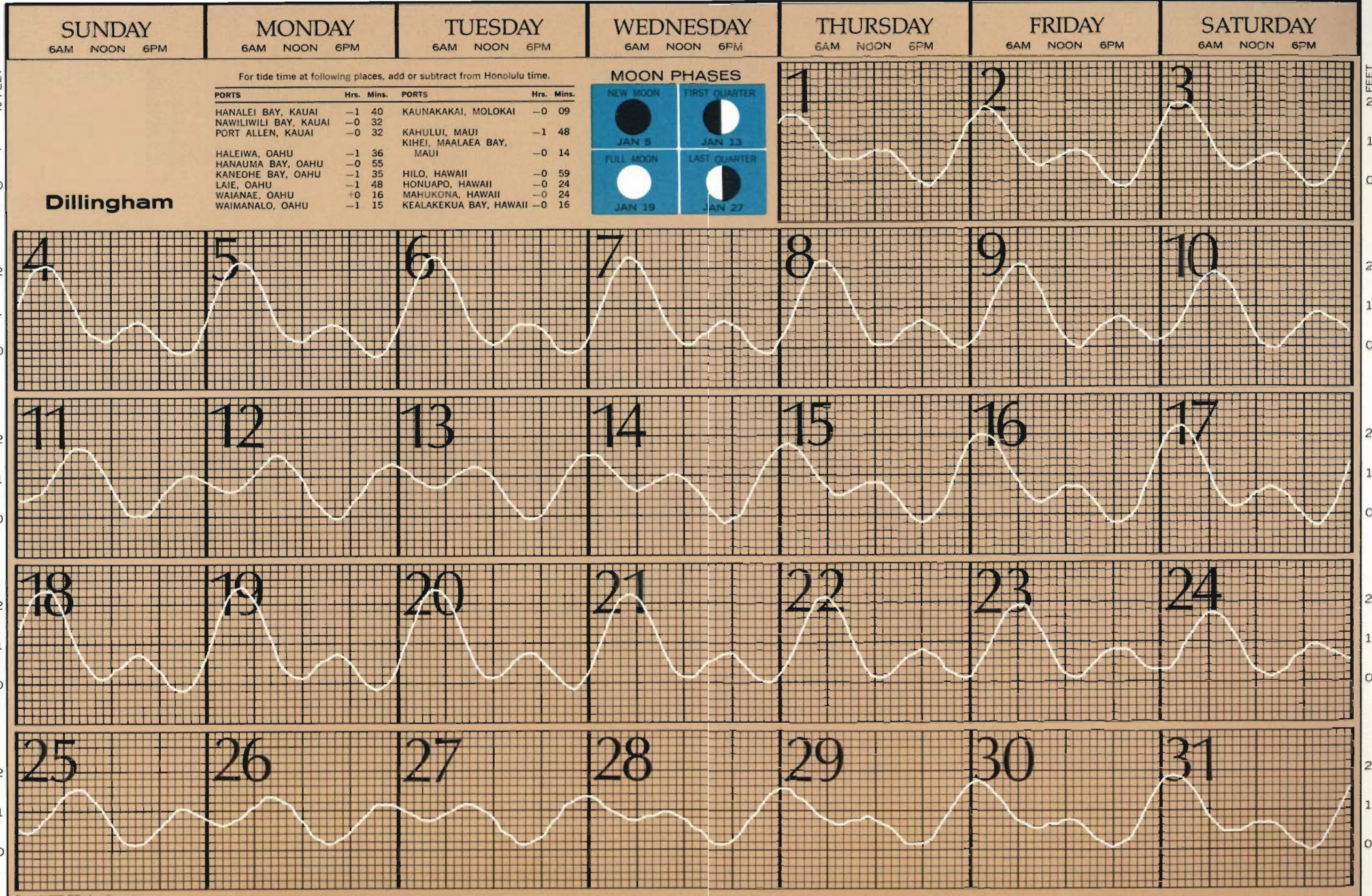


A Hawaiian monk seal and green sea turtle rest on one of the small islands in the Hawaiian Islands National Wildlife Refuge.



JANUARY 1981

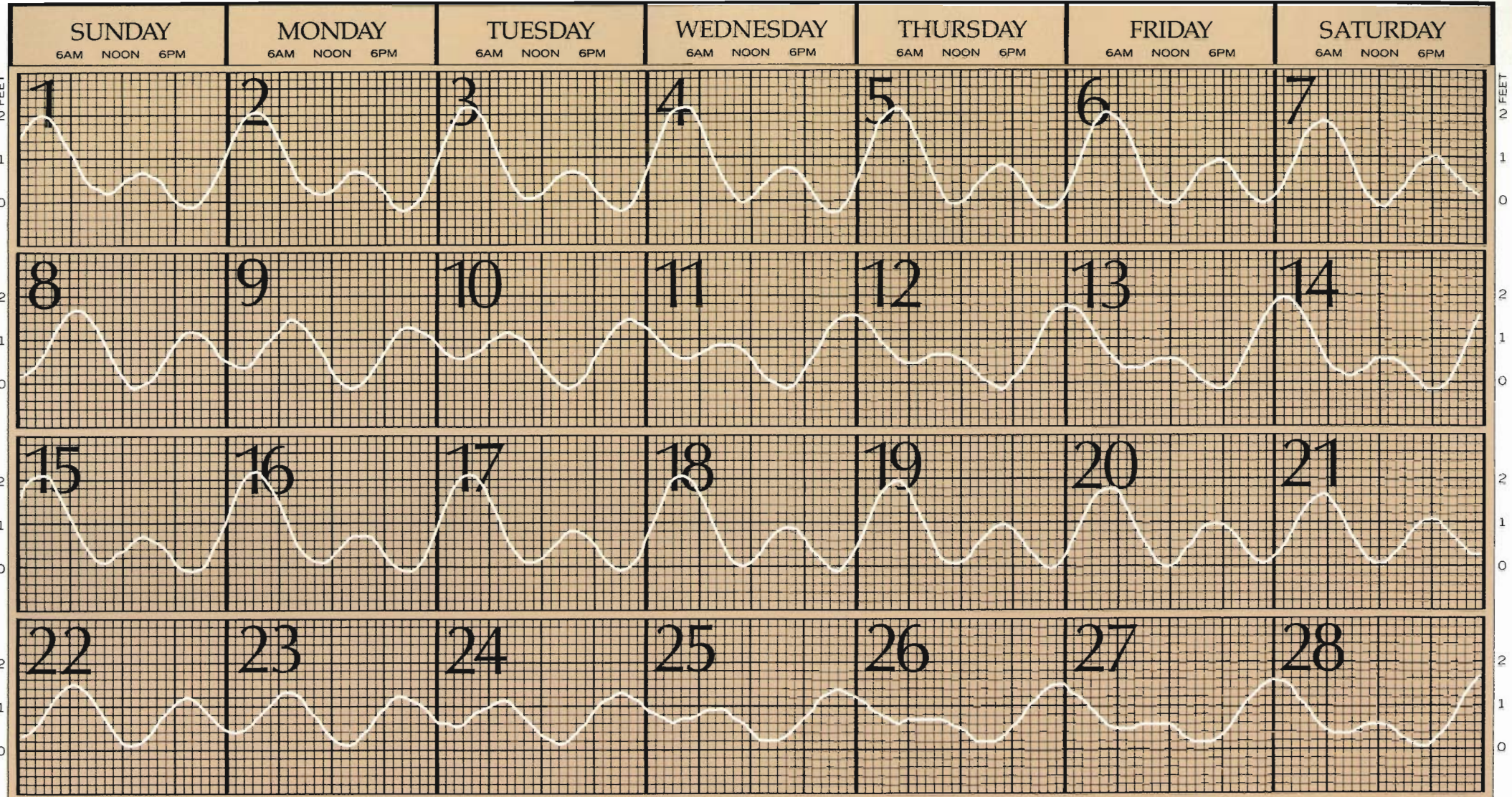
WHALE-SKATE ISLAND (23° 51' N 166° 13' W)
 One of 12 small islands located within the shallow waters of
 French Frigate Shoals, 480 miles to the northwest of Honolulu. Whale-Skate
 is a favorite breeding site for Hawaiian monk seals and green sea turtles.





A small volcanic remnant at French Frigate Shoals that rises 135 feet above the ocean's surface. Large portions of this picturesque olivine basalt rock have been whitened by the droppings of nesting seabirds.

FEBRUARY 1981



MOON PHASES

 NEW MOON FEB 4	 FIRST QUARTER FEB 11
 FULL MOON FEB 18	 LAST QUARTER FEB 26

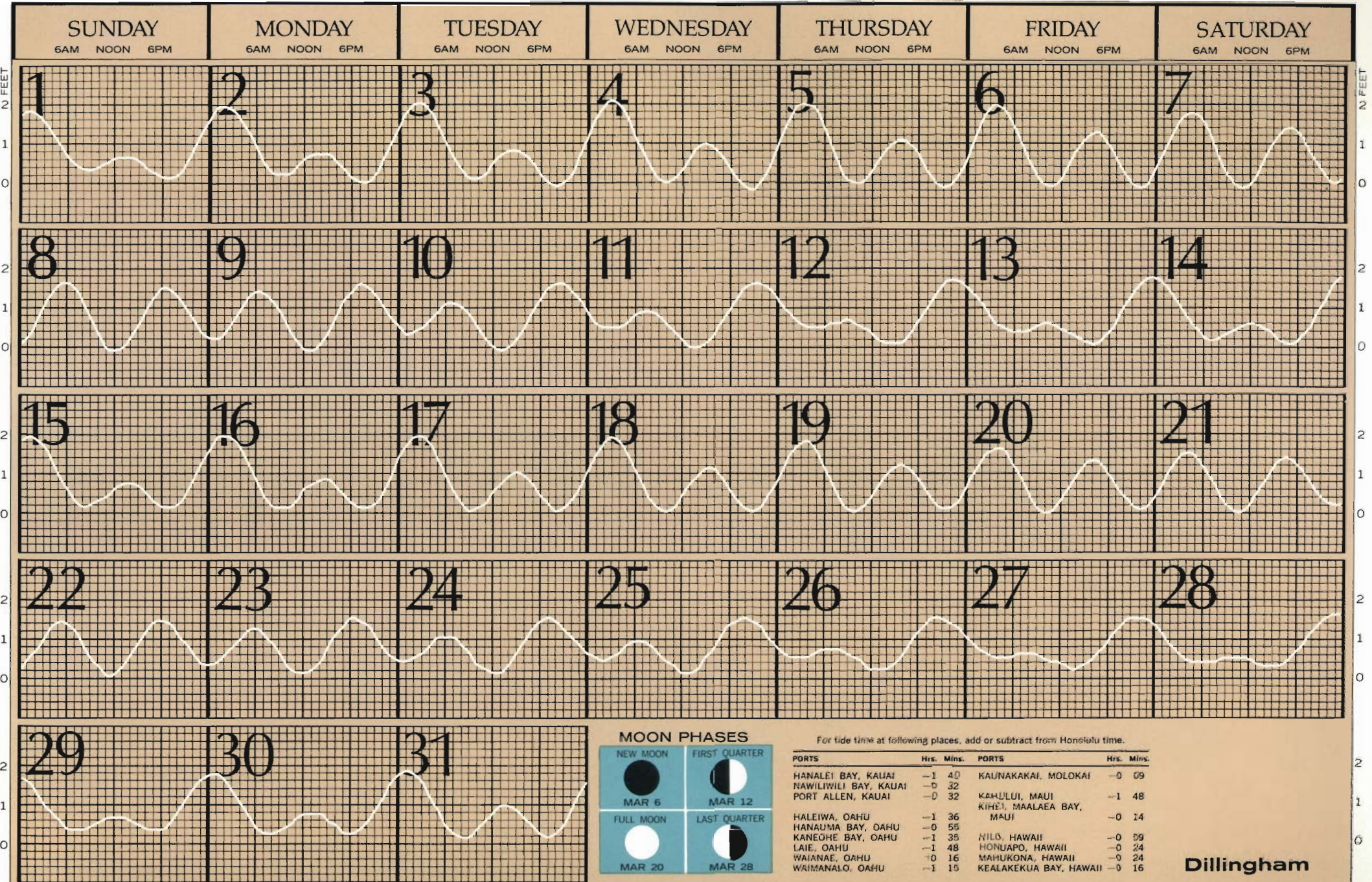
For tide time at following places, add or subtract from Honolulu time.

PORTS	Hrs.	Mins.	PORTS	Hrs.	Mins.
HANAIEI BAY, KAUAI	-7	40	KAUNAKAKAI, MOLOKAI	-0	09
NAWILIWILI BAY, KAUAI	-0	32			
PORT ALLEN, KAUAI	-0	32	KAHULUI, MAUI	-1	48
			KIHEI, MAUI		
HALEIWA, OAHU	-1	36	MAUI	-0	14
HANAUMA BAY, OAHU	-0	55			
KANEIHE BAY, OAHU	-1	35	HILO, HAWAII	-0	59
LAIE, OAHU	-1	48	HONOLULU, HAWAII	-0	24
WAIANAE, OAHU	+0	16	MAHUKONA, HAWAII	-0	24
WAIMANALO, OAHU	-1	15	KEALAKEKUA BAY, HAWAII	-0	16

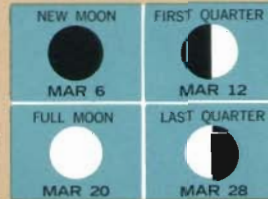
Dillingham



MARCH 1981



MOON PHASES



For tide time at following places, add or subtract from Honolulu time.

PORTS	Hrs.	Mins.	PORTS	Hrs.	Mins.
HANALEI BAY, KAUAI	-1	40	KAUNAKAKAI, MOLOKAI	-0	09
NAWILIWILI BAY, KAUAI	-0	32	KAHULUI, MAUI	-1	48
PORT ALLEN, KAUAI	-0	32	KIHEI, MAALAEA BAY, MAUI	-0	14
HALEIWA, OAHU	-1	36	HILO, HAWAII	-0	59
HANAUMA BAY, OAHU	-0	55	HONUAPO, HAWAII	-0	24
KANEOHE BAY, OAHU	-1	35	MAHUKONA, HAWAII	-0	24
LAIE, OAHU	-1	48	KEALAKEKUA BAY, HAWAII	-0	16
WAIANAE, OAHU	-0	16			
WAIMANALO, OAHU	-1	15			

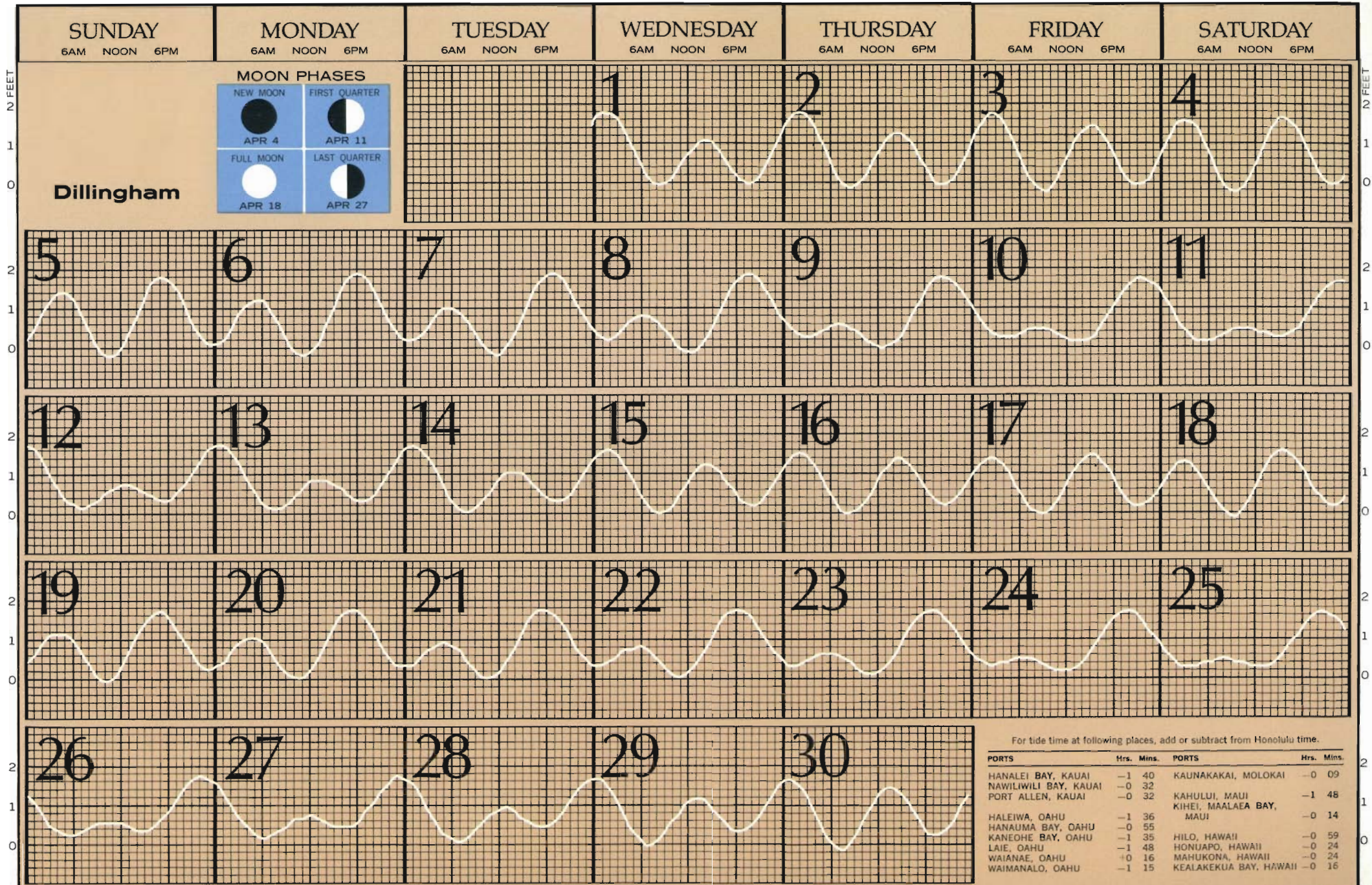
Dillingham



APRIL 1981

NECKER ISLAND (23°35'N 164°42'W)

A 41-acre volcanic island with several narrow peaks, the highest of which rises to 276 feet. Archaeological remains suggest that humans may have first used this lonely island sometime before 1300 A.D.





TERN ISLAND (23° 52' N 166° 17' W)
A 57-acre island at French Frigate Shoals that was enlarged from 11 acres in 1942 in a joint wartime effort by the U.S. Navy and Hawaiian Dredging, a subsidiary of Dillingham Corporation. Considered one of the leading construction feats of World War II, this 3000-foot runway served as a refueling and emergency landing site.

SUNDAY
6AM NOON 6PM

MONDAY
6AM NOON 6PM

TUESDAY
6AM NOON 6PM

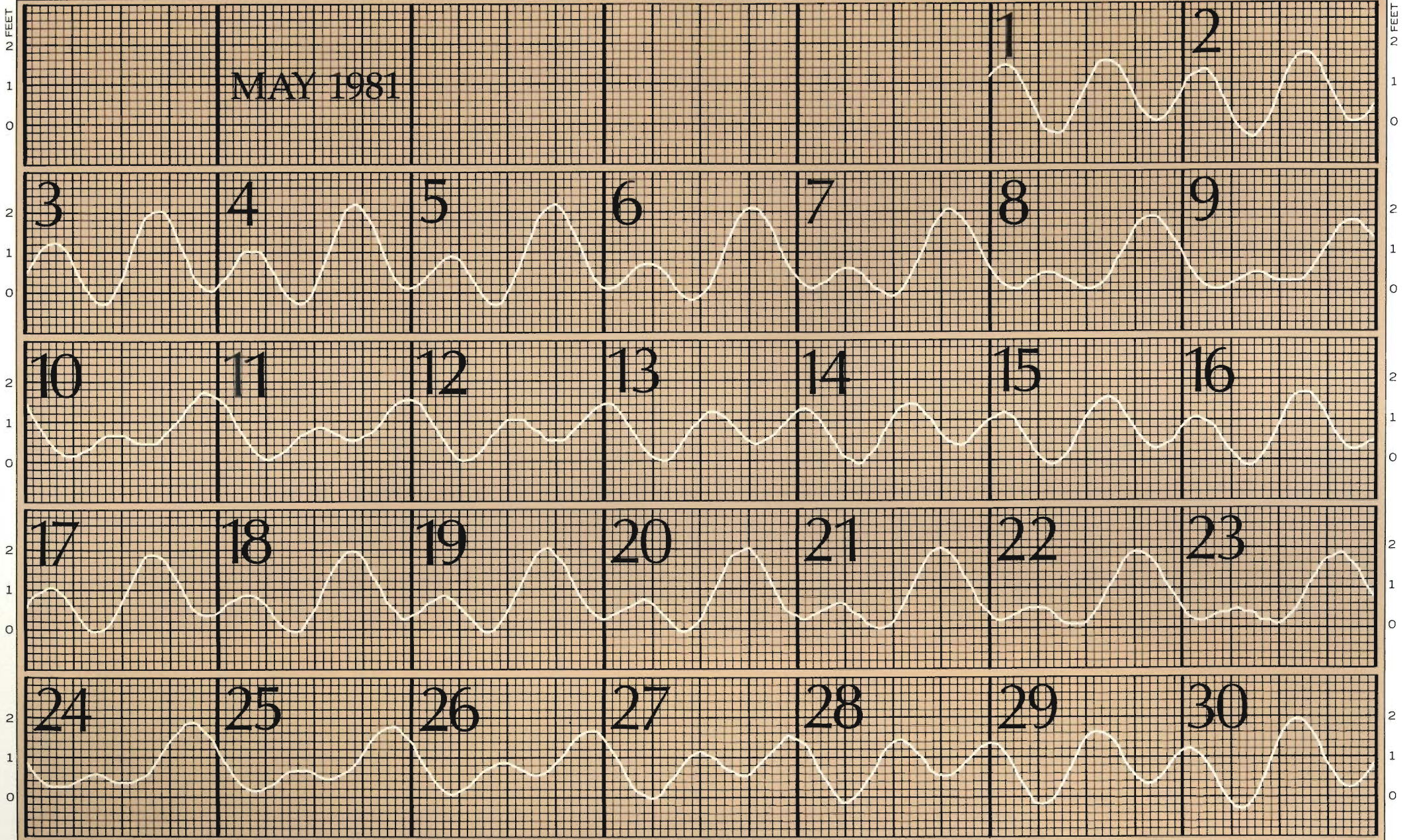
WEDNESDAY
6AM NOON 6PM

THURSDAY
6AM NOON 6PM

FRIDAY
6AM NOON 6PM

SATURDAY
6AM NOON 6PM

MAY 1981



MOON PHASES



For tide time at following places, add or subtract from Honolulu time.

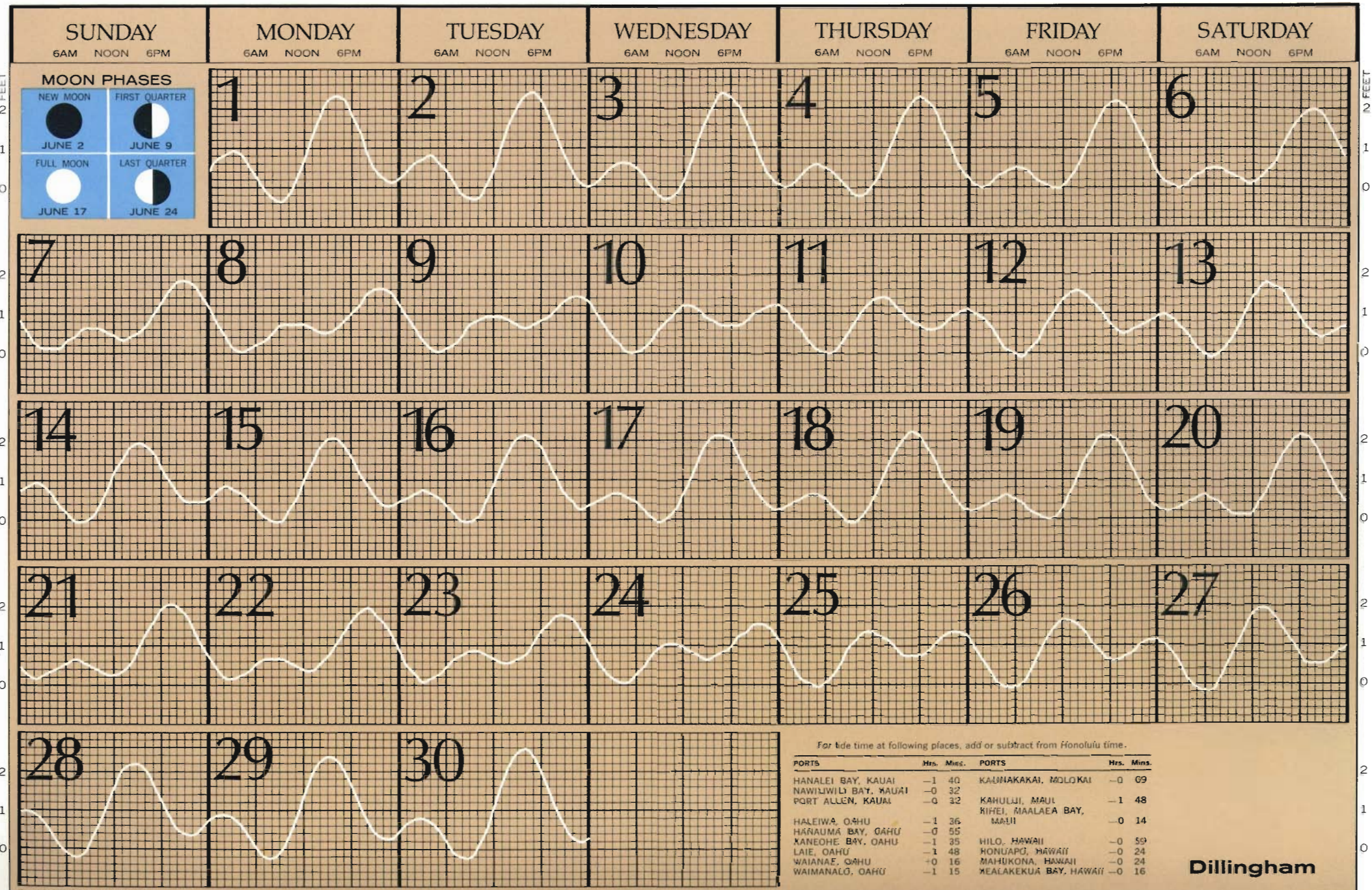
PORTS	Hrs.	Mins.	PORTS	Hrs.	Mins.
HANAIE BAY, KAUAI	-1	40	KAUNAKAKAI, MOLOKAI	-0	09
NAWILIWILI BAY, KAUAI	-0	32	KAHULUI, MAUI	-1	48
PORT ALLEN, KAUAI	-0	32	KIHEI, MAALAEA BAY, MAUI	-0	14
HALEIWA, OAHU	-1	36	HILO, HAWAII	-0	59
HANAUMA BAY, OAHU	-0	55	HONUAPO, HAWAII	-0	24
KANEHOE BAY, OAHU	-1	35	MAHUKONA, HAWAII	-0	24
LAIE, OAHU	-1	48	KEALAKEKUA BAY, HAWAII	-0	16
WAIANAЕ, OAHU	+0	16			
WAIMANALO, OAHU	-1	15			

Dillingham



Sheer cliffs of up to 850 feet occur along the north, east and west shores of this 156-acre island. The south shore has several steep valleys containing prehistoric Hawaiian house sites and agricultural terraces.

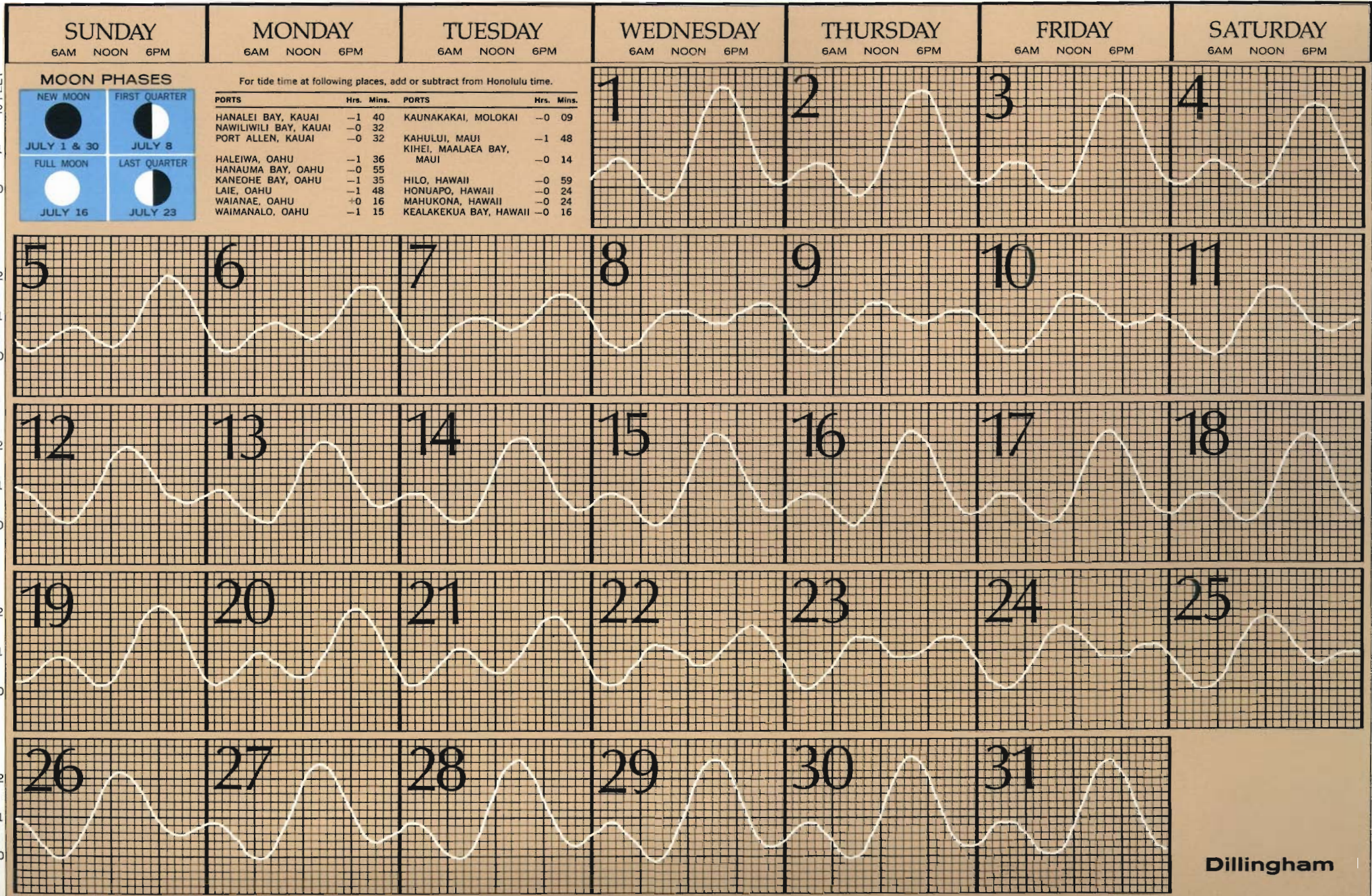
JUNE 1981





A low sand and coral island consisting of 450 acres (0.7 square miles).
 Neva Shoal, named for the Russian exploring vessel that ran aground
 on it in 1805, extends for 65 square miles around the island.

JULY 1981



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KAULA (21°39'N 160°33'W)

The U.S. Lighthouse Service formerly maintained an automatic beacon at the island's 550-foot crest; however, the island is now used as a bombing target by the military. The sea cave at the base of the northwest cliff is reputed to be the home of the legendary Hawaiian shark god, Kahaimoana.

SUNDAY

6AM NOON 6PM

MONDAY

6AM NOON 6PM

TUESDAY

6AM NOON 6PM

WEDNESDAY

6AM NOON 6PM

THURSDAY

6AM NOON 6PM

FRIDAY

6AM NOON 6PM

SATURDAY

6AM NOON 6PM

AUGUST 1981

2 FEET

1

0

2 FEET

1

0

2

3

4

5

6

7

8

2

1

0

2

1

0

9

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MOON PHASES



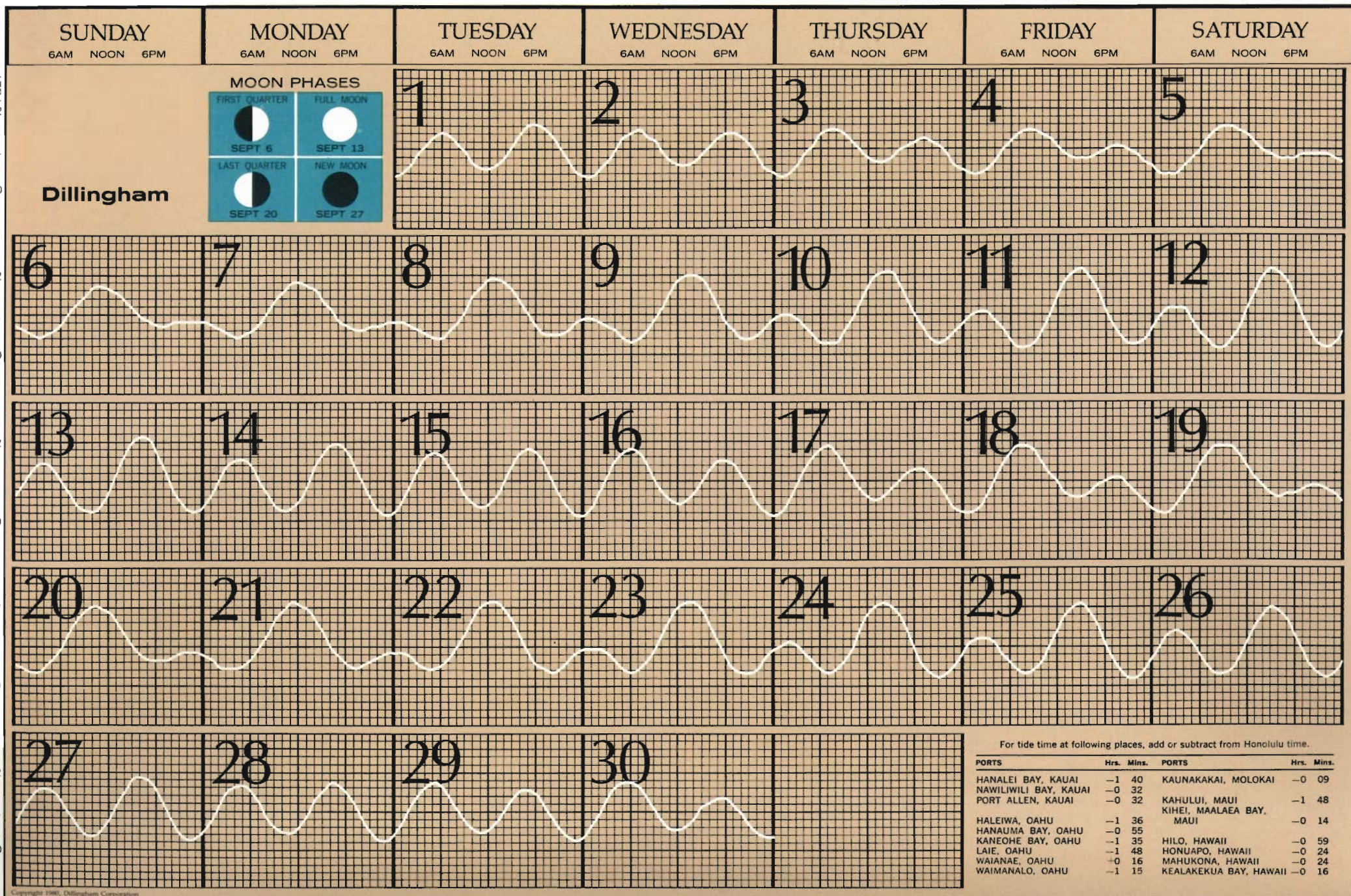
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HANAIEI BAY, KAUAI	-1	40	KAUNAKAKAI, MOLOKAI	-0	09
NAWILIWILI BAY, KAUAI	-0	32	KAHULUI, MAUI	-1	48
PORT ALLEN, KAUAI	-0	32	KIHEI, MAALAEA BAY, MAUI	-0	14
HALEIWA, OAHU	-1	36	HILO, HAWAII	-0	59
HANAUMA BAY, OAHU	-0	55	HONOLULU, HAWAII	-0	24
KANEHOE BAY, OAHU	-1	48	MAHUKOHA, HAWAII	-0	24
LAIE, OAHU	-0	16	KEALAKEKUA BAY, HAWAII	-0	36
WAIANAE, OAHU	-1	15			



The circular fringing reef of Kure shelters a shallow lagoon and Green Island, the site of a U.S. Coast Guard Loran station. The island has a 4000-foot coral runway and a 625-foot high transmitting antenna.

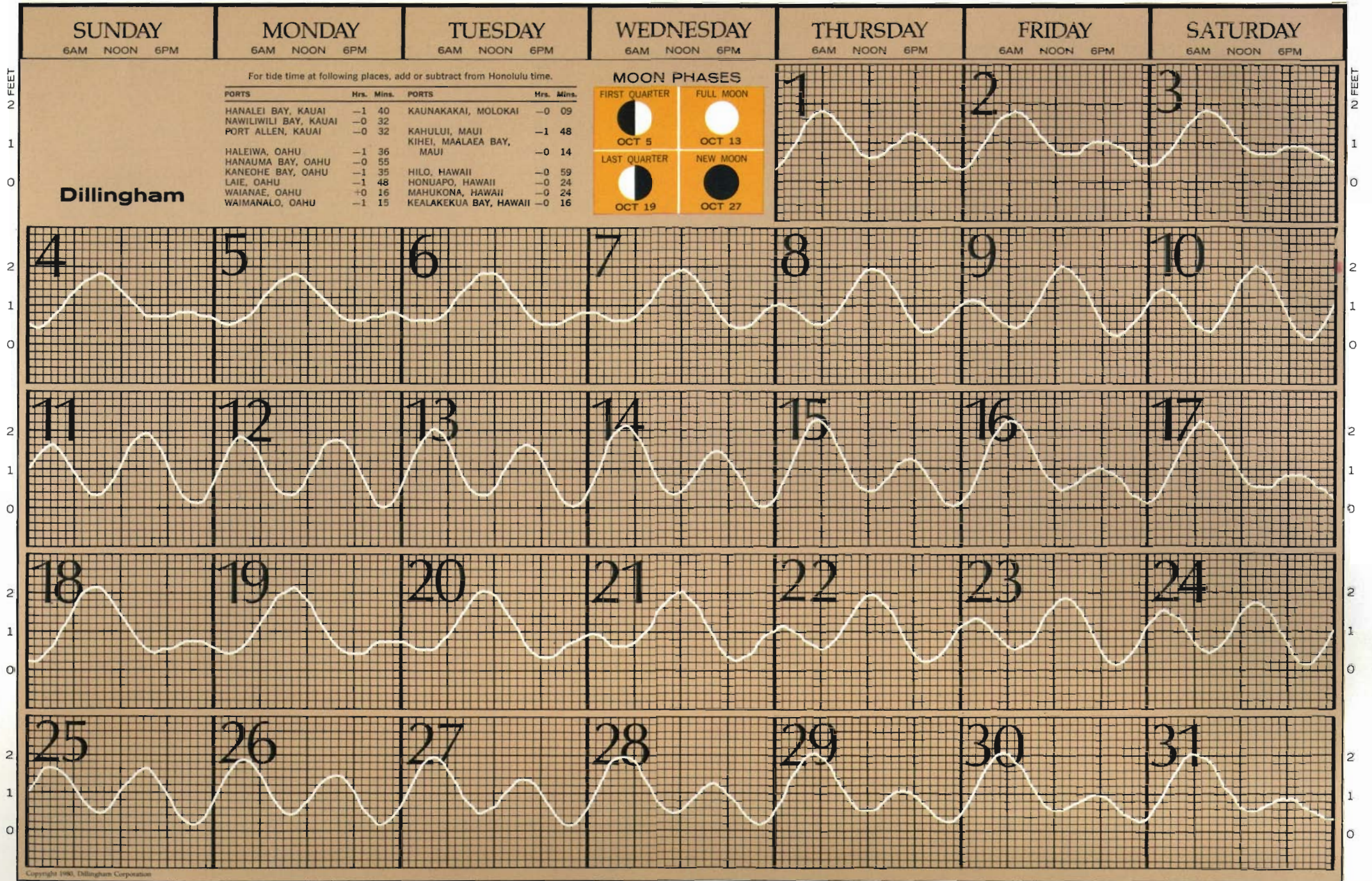
SEPTEMBER 1981





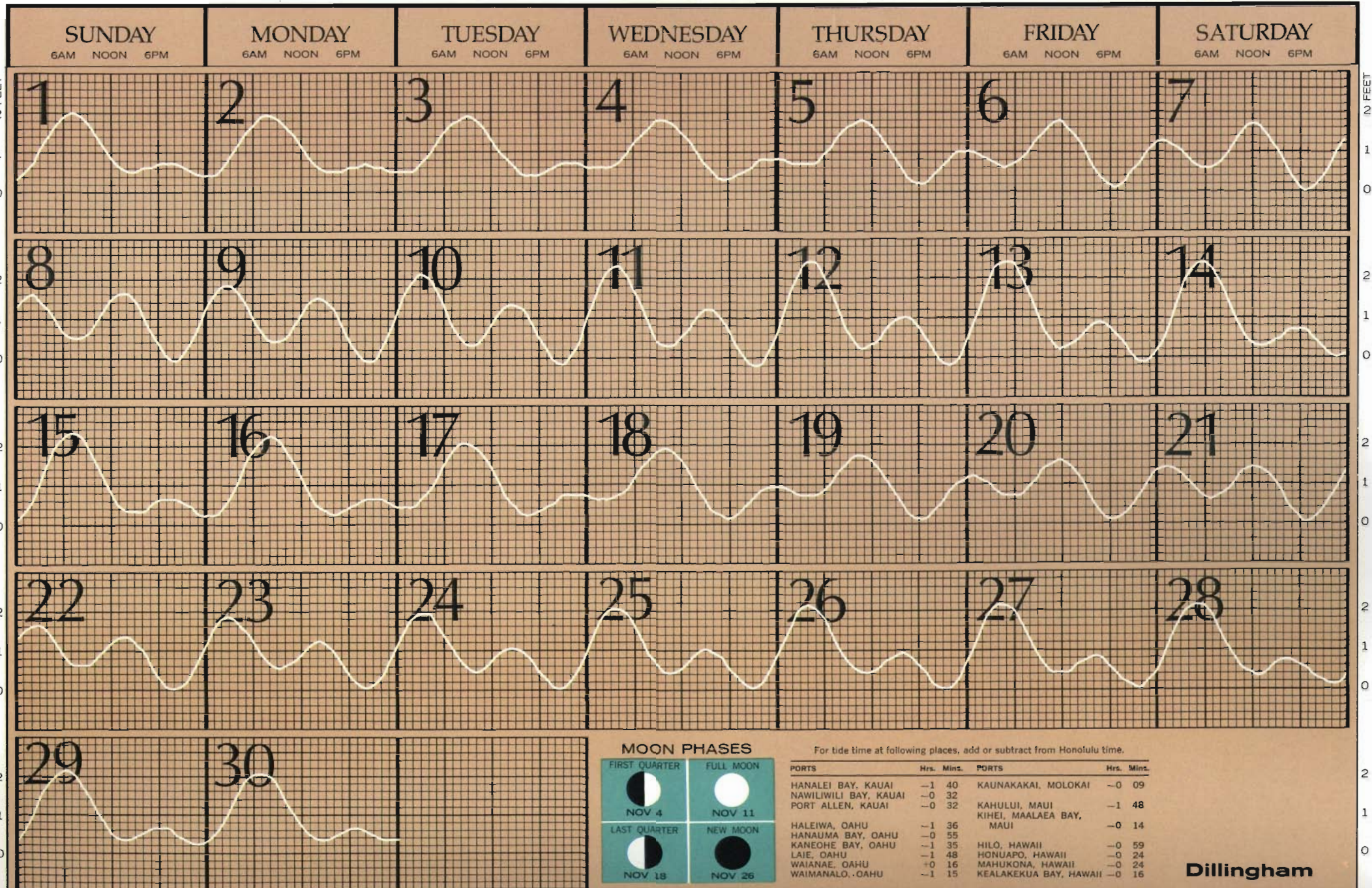
OCTOBER 1981

GARDNER PINNACLES (25°00'N 168°00'W)
 Two small volcanic rocks with a maximum elevation of 170 feet. Frigate birds at times roost on these pinnacles in great numbers. An unnamed 20- by 50-mile bank with depths of less than 40 fathoms extends to the south.





NOVEMBER 1981



MOON PHASES



For tide time at following places, add or subtract from Honolulu time.

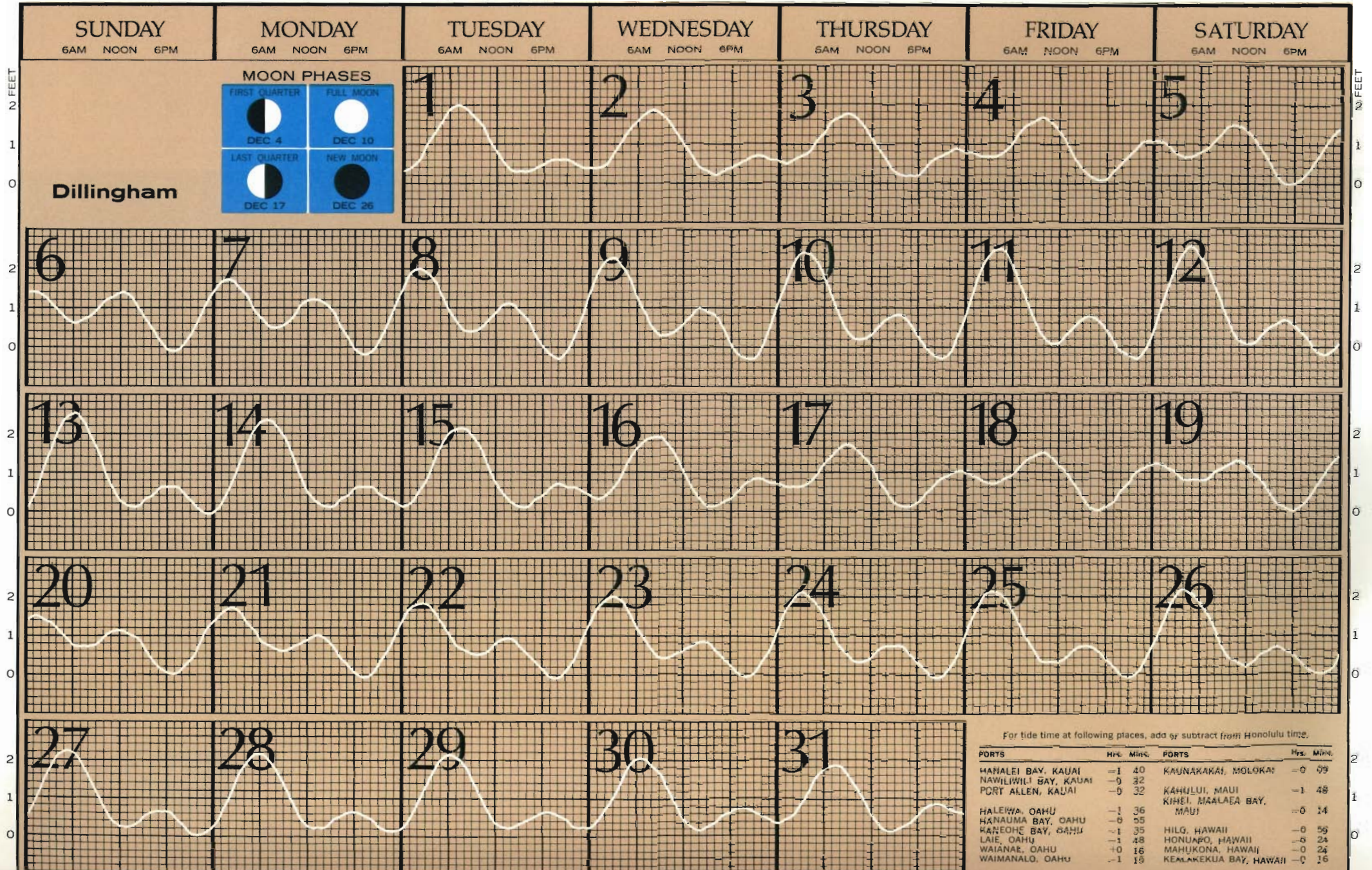
PORTS	Hrs. Mins.	PORTS	Hrs. Mins.
HANAIEI BAY, KAUAI	-1 40	KAUNAKAKAI, MOLOKAI	-0 09
NAWILIWILI BAY, KAUAI	-0 32	KAHULUI, MAUI	-1 48
PORT ALLEN, KAUAI	-0 32	KIHEI, MAALAEA BAY, MAUI	-0 14
HALEIWA, OAHU	-1 36	HILO, HAWAII	-0 59
HANAUMA BAY, OAHU	-0 55	HONUAPO, HAWAII	-0 24
KANEOHE BAY, OAHU	-1 35	MAHUKONA, HAWAII	-0 24
LAIE, OAHU	-1 48	KEALAKEKUA BAY, HAWAII	-0 16
WAIANAЕ, OAHU	+0 16		
WAIMANALO, OAHU	-1 15		

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The largest island in the Leeward chain, with an area of 913 acres (1.4 square miles). Guano was mined at this site from 1891 until 1910. Introduced in 1903, domestic rabbits completely stripped the island of vegetation before they were eradicated in 1923.

DECEMBER 1981





LISIANSKI, a low grass-covered island situated
325 miles beyond Gardner Pinnacles.



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