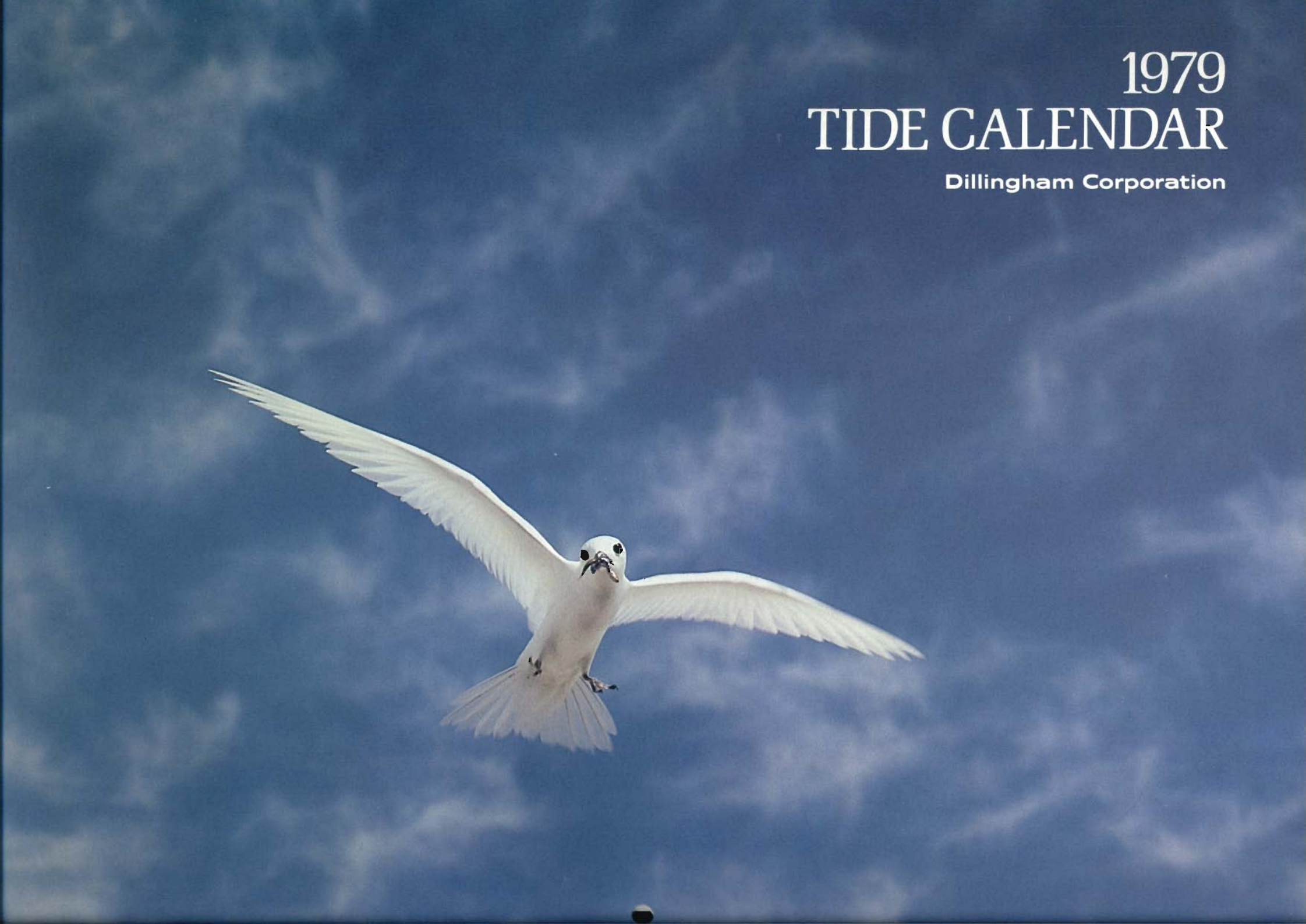
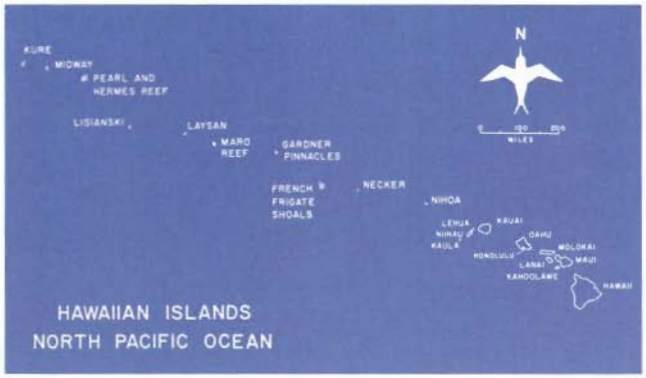


1979 TIDE CALENDAR

Dillingham Corporation

Seabirds of the Hawaiian Islands



Extending for 1400 nautical miles across the vast Pacific Ocean, our island chain serves as important breeding grounds and feeding areas for many of the world's seabirds. In addition to enriching the skies with their diverse forms and graceful flight, flocks of these marine avians frequently assist fishermen by their keen ability to locate schools of fish. To the early Hawaiians who were well acquainted with the birds of their environment, these creatures provided a valuable source of food as well as feathers for ornamentation.

Hawaii's native seabirds include a large number of species that share the ability to earn a living entirely from the ocean. Their food consists primarily of fish and squid. Special glands located above the eyes make it possible for them to drink sea water and shed the excess salt in tears. Some Hawaiian seabirds spend the greater portion of their lives wandering over the far reaches of the North Pacific. Others live and search for food close to our islands' shores. All, however, must return to land for breeding purposes. At the breeding sites some species form dense colonies, thereby necessitating efficient use of the land so that everyone can find room to nest. This is accomplished by staggered breeding seasons and by utilizing all the available space. Some species have adapted to nesting in underground burrows, others lay eggs right on the surface, and still others build nests off the ground in shrubs. Most seabirds lay only a single egg each season. Both sexes take

COVER PHOTOGRAPHS
WHITE TERN (Manu O Ku)
Gygis alba rothschildi

Returning from a succesful fishing trip, a White Tern hovers overhead momentarily (front cover) before descending to feed its downy chick who waits patiently on the ground (back cover). With remarkable skill, these snow-white seabirds are able to capture small fish and squid at the ocean's surface and hold several at a time crosswise in their bill until they are fed individually to the chick. White Terns lay their single egg out in the open on a rocky ledge or on the branch of a tree without constructing a nest. Consequently, the young chick must cling tightly to the hatching site to keep from being swept away by strong winds. Adults seem to have little fear of humans and frequently several will flutter within a very close distance chattering away in a pleasant manner.

JANUARY
RED-FOOTED BOOBY ('A)
Sula sula rubripes

In a nest constructed of twigs and vines, a vigilant Red-footed Booby stands careful watch over its half-grown young. During the hot daytime hours the parent provides shade to cool its offspring, while on cold nights warmth is supplied through close body contact. There are three species of boobies in the Hawaiian Islands. All are able to capture fish underwater by folding in their wings and diving down into the ocean from considerable heights. During the short period beneath the surface, the booby's wings and webbed feet aid in propelling it after the prey. Boobies are an important component of the mixed flocks of seabirds used by Hawaii's fishermen to locate schools of fish.

FEBRUARY
BROWN NODDY (Noio Koha)
Anous stolidus pileatus

Perched on an aging log, a Brown Noddy displays the characteristic "nodding" behavior from which its common name is derived. Numbered metal bands, like the one on this individual's right leg, have been placed on many Hawaiian seabirds in order to study their movements, growth and longevity. Newly hatched Brown Noddy chicks may have either a white or a sooty black coat of down which later develops into the same adult plumage. The importance of two different color phases during early life is not known. Noddies are often referred to as "aku-birds" by Hawaii's fishermen due to their ability to locate schools of this locally prized tuna fish.

MARCH
MASKED BOOBY ('A)
Sula dactylatra personata

With adolescent wings stretched in anticipation of flight, a downy Masked Booby seems to dwarf its attendant parent. Masked Boobies lay a pair fish and squid. This industrious seabird nests in an underground burrow excavated with its hooked bill and webbed feet. Some of the small islands where nesting takes place are honey-combed with these tunnels and great care must be taken by humans not to cave them in. Shearwaters are often called "moaning birds" because of their vocal moaning and groaning which is common on land at night.

JULY
BLACK-FOOTED ALBATROSS
Diomedea nigripes

Albatrosses, or "gooney birds" as they are affectionately called, are large seabirds with wing spans of six to seven feet that permit effortless gliding flight for long periods over the ocean. During breeding, elaborate courtship dances are carried out with a lifetime mate. Following egg laying, both parents remain at the nesting site for a short period "talking" to the egg and inspecting it carefully. Later one parent departs to sea for food while the other attends to incubation. These duties are then rotated at regular intervals. The Black-footed Albatross chick requires about four months of parental care before being ready to set out on its own.

AUGUST
LAYSAN ALBATROSS (Moli)
Diomedea immutabilis

With nearly all of its feathers developed, a juvenile Laysan Albatross takes a short practice flight as a neighbor cheers him on. Nearby a young Hawaiian monk seal (Ilio Holo I Kauaua) resting on the beach seems to express boredom over the entire affair. Like its close relative, the Black-footed Albatross, the Laysan Albatross spends most of its non-breeding life away from land feeding on large squid at the ocean's surface. Laysan Albatrosses are the most abundant of the three species of gooneys in the North Pacific, with an estimated adult population in excess of a half million birds. Nearly all of these nest in the Leeward Hawaiian Islands.

part in the parental duties of caring for the egg and, later, feeding the chick. The young bird usually leaves the island of birth shortly after learning how to fly. Several years later when the bird has matured, it returns to the island. Some seabirds live for a long time, with ages of 30 to 40 years having been reported.

Due to the adverse effects of civilization, breeding sites for seabirds in the main Hawaiian Islands are now almost entirely confined to rocky offshore islets. The most important of these are Manana (Rabbit Island) and Moku Manu off Oahu, and Lehua and Kaula off the island of Niihau. The majority of our seabird nesting takes place in the Northwestern or Leeward Hawaiian Islands as they are often called. This isolated series of small islands and adjacent shoals extends for 1200 miles to the northwest of Kauai. In 1909, President Theodore Roosevelt declared most of these areas as the Hawaiian Islands Bird Reservation in response to poachers who were killing hundreds of thousands of seabirds for feathers used in making fashionable hats. Today the area is known as the Hawaiian Islands National Wildlife Refuge, with undisturbed breeding grounds also being provided for the Hawaiian green turtle and monk seal. The year 1979 marks the 70th anniversary of this internationally acclaimed wildlife preserve.

About the Photographer —
GEORGE H. BALAZS

George H. Balazs is an assistant marine biologist with the Hawaii Institute of Marine Biology, a division of the University of Hawaii located on Coconut Island in Kaneohe Bay. With the Hawaiian green sea turtle as his research specialty, Balazs has made many study visits to the Leeward Islands, particularly French Frigate Shoals where the turtles assemble each summer for nesting purposes. During lengthy periods of isolated field work he has been able to carefully observe and photograph the rich array of seabirds dependent on the areas. His beautiful photos are displayed in the 1979 Dillingham Tide Calendar.

Balazs gratefully acknowledges the support of his work by the Office of the State Marine Affairs Coordinator and the Sea Grant College Program of the University of Hawaii. He also expresses appreciation for multifaceted research assistance provided by the U.S. Fish and Wildlife Service (administrators of the Hawaiian Islands National Wildlife Refuge), the National Marine Fisheries Service, the State Division of Fish and Game, the Fourteenth Coast Guard District, and the Easy Rider Corporation of Honolulu.

Inquiries about his research activities should be directed to: Hawaii Institute of Marine Biology, P.O. Box 1346, Kaneohe, Hawaii 96744.

of chalky white eggs on the ground. Although both may hatch, usually only one chick is successfully raised. Like most Hawaiian seabirds, both sexes are nearly identical in appearance. However, the adult Masked Booby male can be easily recognized by its high pitched whistling voice. In contrast, the female emits a lower pitched loud squawk.

APRIL

GREAT FRIGATEBIRD ('Iwa)
Fregata minor palmerstoni

Inflating its bright red throat pouch like a balloon, a male Great Frigatebird exhibits courtship behavior intended to attract a female to his chosen nesting site. A Red-footed Booby incubating an egg in the same shrub seems indifferent to this flamboyant display. Although these two seabirds are able to exist as reasonably good neighbors on land, in the air frigatebirds regularly harass boobies for the purpose of stealing fish. With a seven-foot wing span, the 'Iwa ("thief") is able to use aerial acrobatics to outmaneuver a booby and force it to regurgitate a portion of the daily catch.

MAY

RED-TAILED TROPICBIRD (Koa'e 'Ula)
Phaethon rubricauda rothschildi

With short legs that are not well suited for roosting on land, Red-tailed Tropicbirds often prefer to rest on the ocean's surface in calm weather. During aerial courtship rituals, these seabirds drift with the wind and at times give the appearance of flying backwards. Tropicbirds like to lay their single egg under vegetation or in rock crevices. When approached too closely by humans, the parent will aggressively defend the nesting site with a series of loud screams. Early Hawaiians are known to have used the slender red tail feathers of this species for decorative purposes.

JUNE

WEDGE-TAILED SHEARWATER ('Ua'u Kani)
Puffinus pacificus chlororhynchus

Soaring gracefully along the shoreline on a brisk wind, a Wedge-tailed Shearwater departs from its nesting site on an expedition to catch

SEPTEMBER

BONIN PETREL
Pterodroma hypoleuca hypoleuca

Emerging from its deep underground nesting burrow during the dark of night, a Bonin Petrel makes itself momentarily available for a photographic impression. These small, exclusively nocturnal seabirds nest principally on Kure, Midway, Lisianski and Laysan in the Leeward Hawaiian Islands. Very little is known about their oceanic distribution or breeding characteristics while on land.

OCTOBER

BROWN BOOBY ('A)
Sula leucogaster plotus

Perched on a Naupaka shrub growing along the shore at Laysan Island, a juvenile Brown Booby twists its head in an almost complete circle to obtain a panoramic view of the surroundings. The Brown Booby is the smallest and least abundant of the three species of boobies in Hawaiian waters. Like its close relatives, a Brown Booby chick obtains food by placing its sharp pointed bill down into a parent's throat to retrieve fish.

NOVEMBER

SOOTY TERN ('Ewa 'Ewa)
Sterna fuscata oahuensis

After a short dip in the ocean to moisten its breast feathers, a watchful Sooty Tern presses against its speckled egg to provide cooling relief from the intense summer sun. Sooty Terns are the most abundant of Hawaiian seabirds, with some nesting colonies containing more than one million individuals. Along with noddies and boobies, Sooty Terns provide valuable assistance to fishermen in locating schools of fish. This species is sometimes called the Wideawake Tern due to its incessant screeching and squawking.

DECEMBER

GREAT FRIGATEBIRD ('Iwa)
Fregata minor palmerstoni

As a golden sun descends into the ocean, two juvenile frigatebirds rise to the sky for a brief flight above one of the sandy islets at French Frigate Shoals.

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* Note: Bird names appear in English (capitals) and Hawaiian (in parentheses), with the scientific identification in italics. The Black-footed Albatross and Bonin Petrel have no known Hawaiian names.

LEATRICE H. HIGA
Production Coordinator

ALEC BAIRD
Designer

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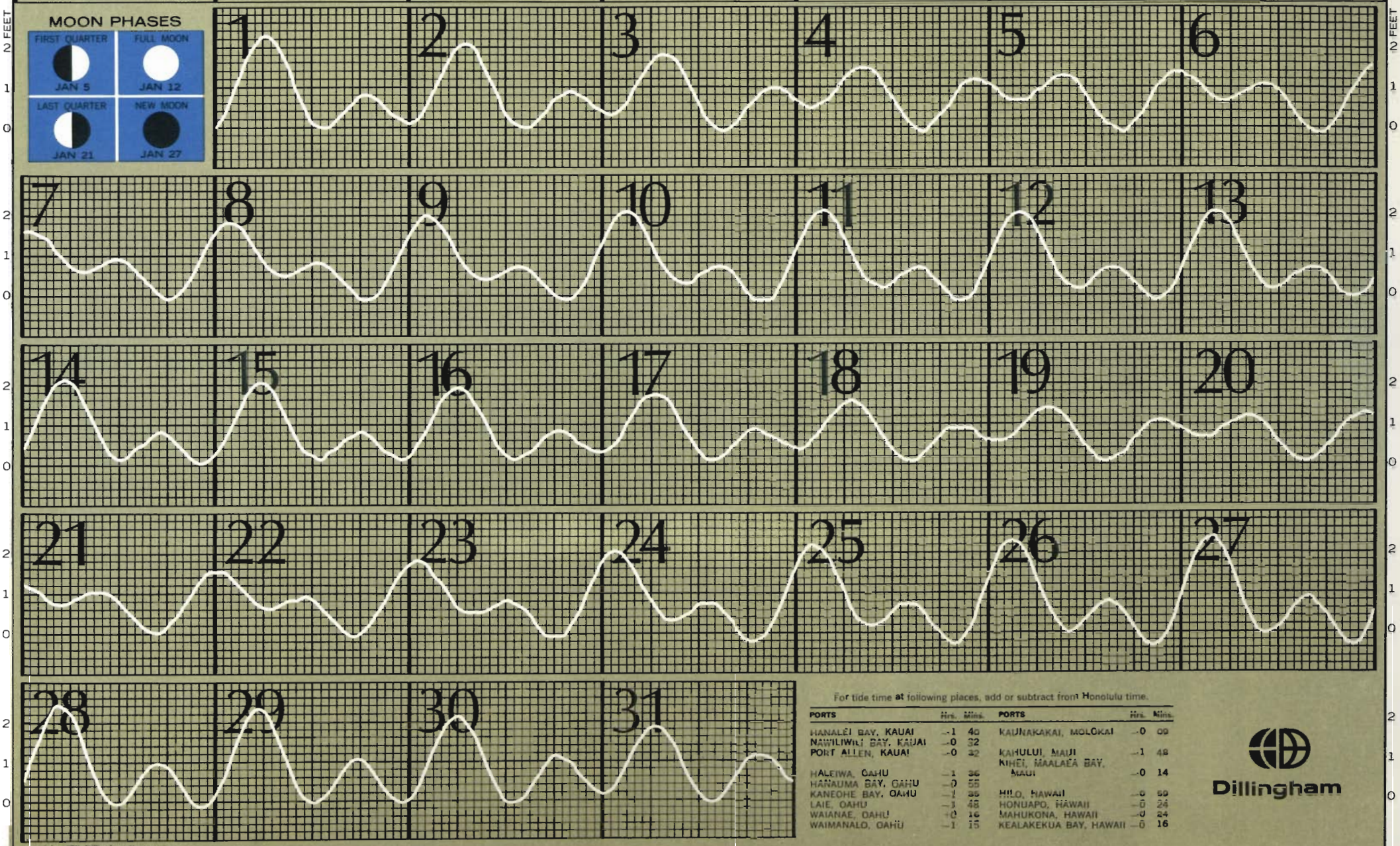
JANUARY 1979 TIDE CHART

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
6AM NOON 6PM	6AM NOON 6PM	6AM NOON 6PM	6AM NOON 6PM	6AM NOON 6PM	6AM NOON 6PM	6AM NOON 6PM

FEET 2 1 0

MOON PHASES

FIRST QUARTER JAN 5	FULL MOON JAN 12
LAST QUARTER JAN 21	NEW MOON JAN 27



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			
PORT ALLEN, KAUAI	–0	32	KAHULUI, MAUI	–1	48
			KIHEI, MAALAEA BAY, MAUI	–0	14
HALEIWA, OAHU	–1	36			
HANAUMA BAY, OAHU	–0	55			
KANEOHE BAY, OAHU	–1	35	HILO, HAWAII	–0	59
LAIE, OAHU	–1	48	HONUAPO, HAWAII	–0	24
WAIANAE, OAHU	+0	16	MAHUKONA, HAWAII	–0	24
WAIMANALO, OAHU	–1	15	KEALAKEKUA BAY, HAWAII	–0	16

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Brown Booby ('A)

FEBRUARY 1979 TIDE CHART

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
6AM NOON 6PM	6AM NOON 6PM	6AM NOON 6PM	6AM NOON 6PM	6AM NOON 6PM	6AM NOON 6PM	6AM NOON 6PM

FEET 2 1 0

MOON PHASES

FIRST QUARTER FEB 3	FULL MOON FEB 11
LAST QUARTER FEB 19	NEW MOON FEB 26

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			
PORT ALLEN, KAUAI	−0	32	KAHULUI, MAUI	−1	48
			KIHEI, MAALAEA BAY, MAUI	−0	14
HALEIWA, OAHU	−1	36			
HANAUMA BAY, OAHU	−0	55			
KANEOHE BAY, OAHU	−1	35	HILO, HAWAII	−0	59
LAIE, OAHU	−1	48	HONUAPO, HAWAII	−0	24
WAIANAE, OAHU	+0	16	MAHUKONA, HAWAII	−0	24
WAIMANALO, OAHU	−1	15	KEALAKEKUA BAY, HAWAII	−0	16

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1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28

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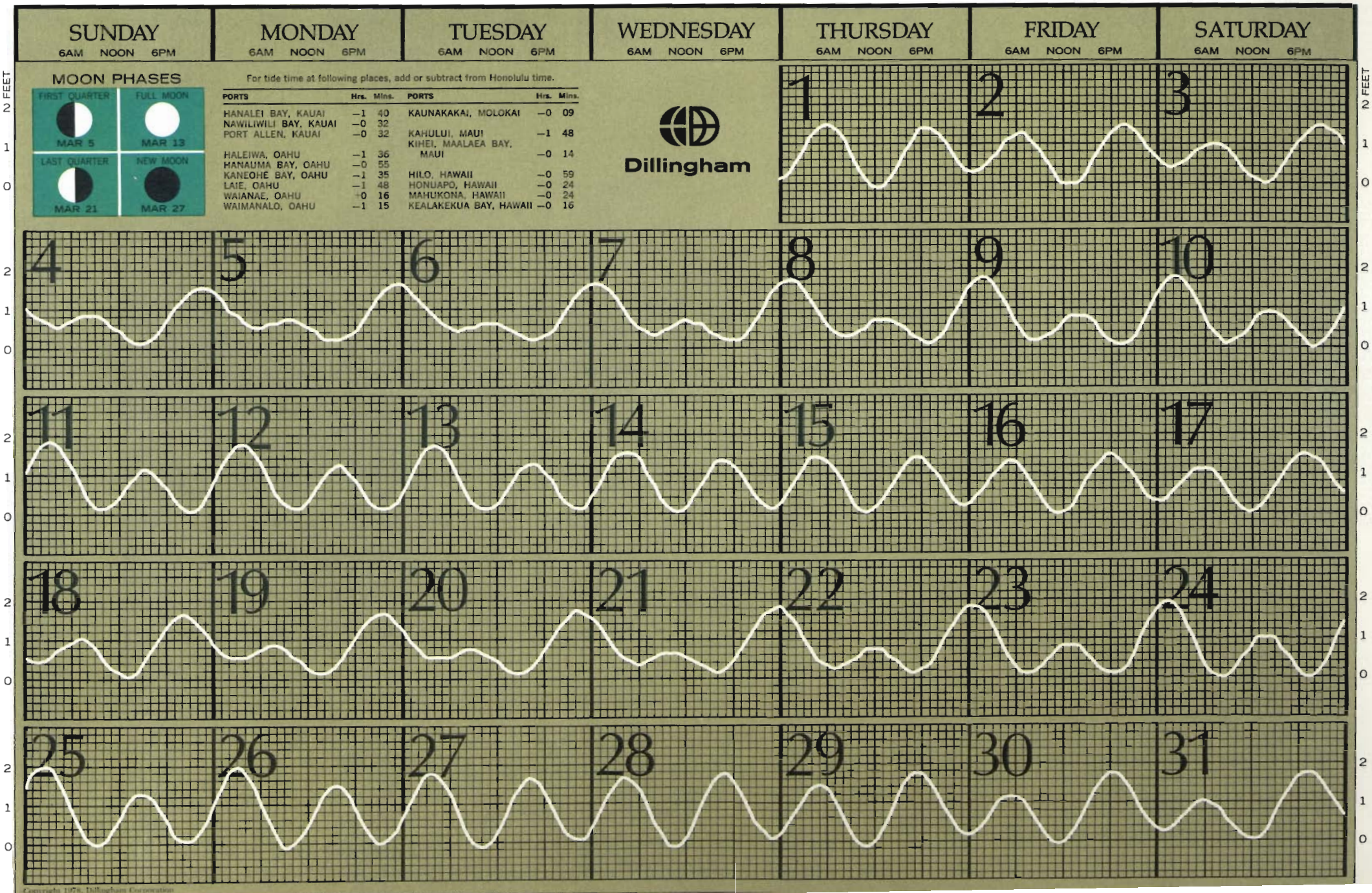
MARCH 1979 TIDE CHART



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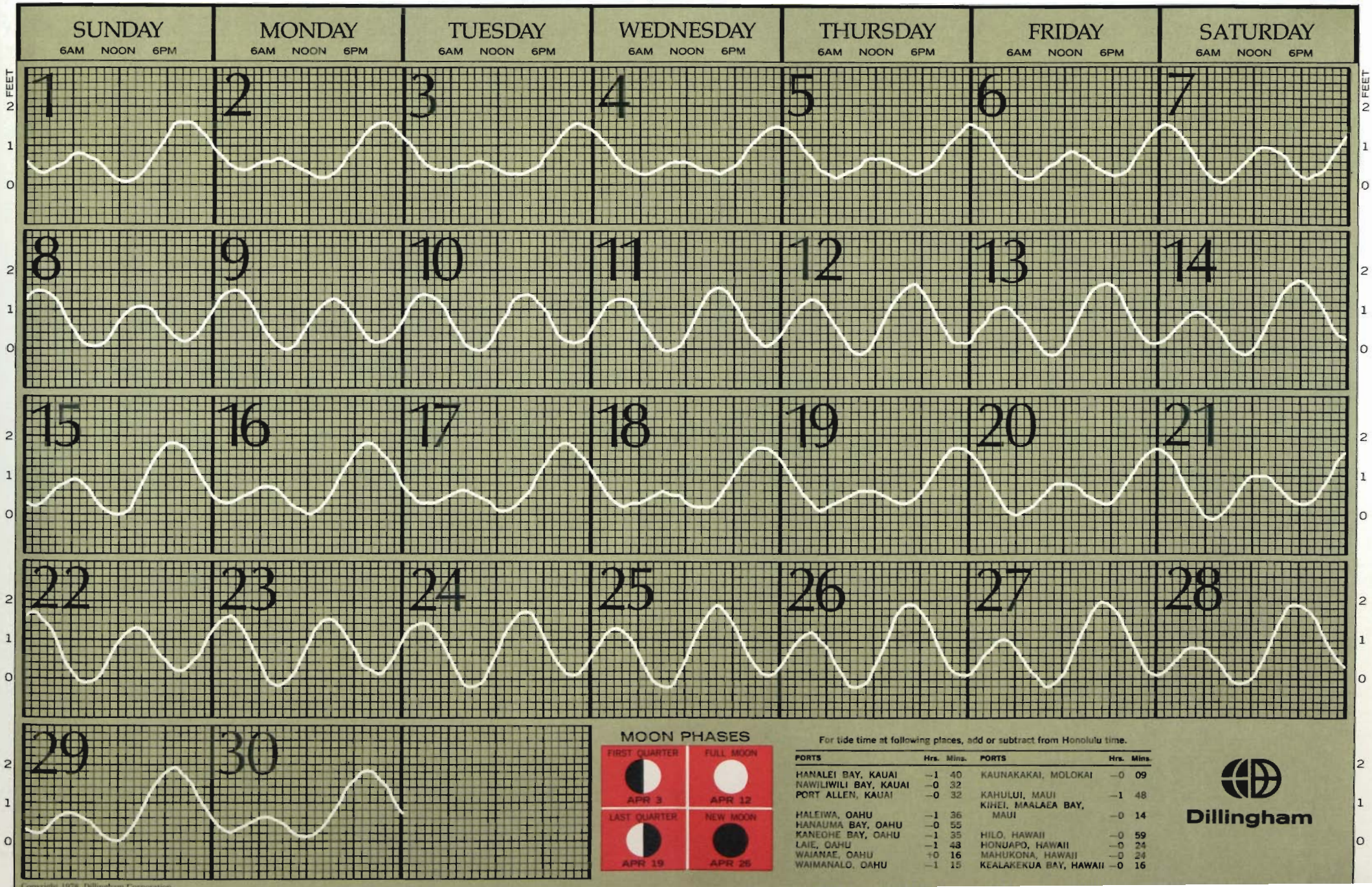
Laysan Albatross (Moli)

APRIL 1979 TIDE CHART



MOON PHASES

FIRST QUARTER APR 3	FULL MOON APR 12
LAST QUARTER APR 19	NEW MOON APR 26

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			
PORT ALLEN, KAUAI	−0	32	KAHULUI, MAUI	−1	48
			KIHEI, MAALAEA BAY, MAUI	−0	14
HALEIWA, OAHU	−1	36			
HANAUMA BAY, OAHU	−0	55			
KANEOHE BAY, OAHU	−1	35	HILO, HAWAII	−0	59
LAIE, OAHU	−1	48	HONUAPO, HAWAII	−0	24
WAIANAE, OAHU	+0	16	MAHUKONA, HAWAII	−0	24
WAIMANALO, OAHU	−1	15	KEALAKEKUA BAY, HAWAII	−0	16

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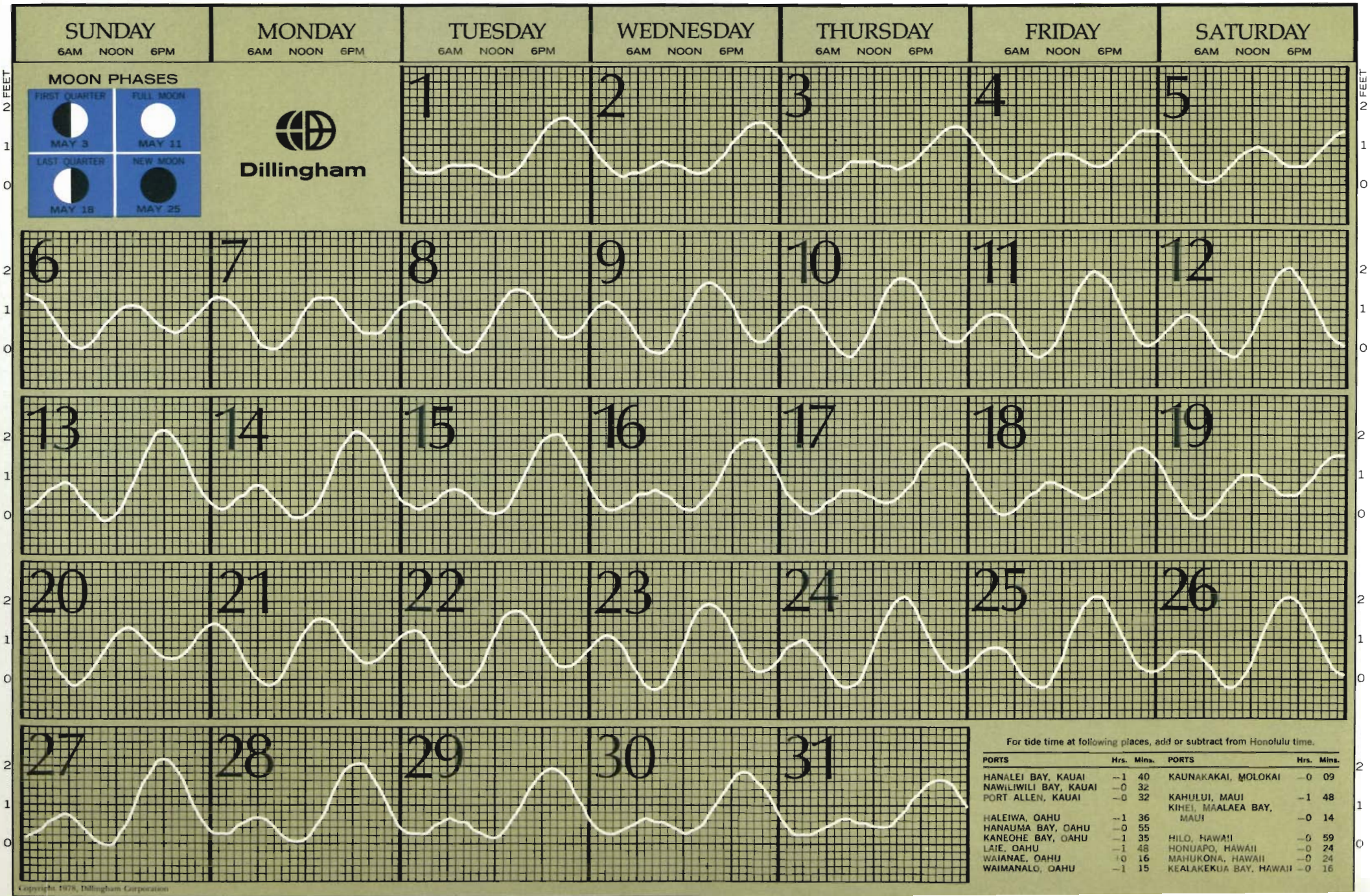
MAY 1979 TIDE CHART



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			
PORT ALLEN, KAUAI	−0	32	KAHULUI, MAUI	−1	48
			KIHEI, MAALAEA BAY, MAUI	−0	14
HALEIWA, OAHU	−1	36			
HANAUMA BAY, OAHU	−0	55			
KANEOHE BAY, OAHU	−1	35	HILO, HAWAII	−0	59
LAIE, OAHU	−1	48	HONUAPO, HAWAII	−0	24
WAIANAE, OAHU	+0	16	MAHUKONA, HAWAII	−0	24
WAIMANALO, OAHU	−1	15	KEALAKEKUA BAY, HAWAII	−0	16

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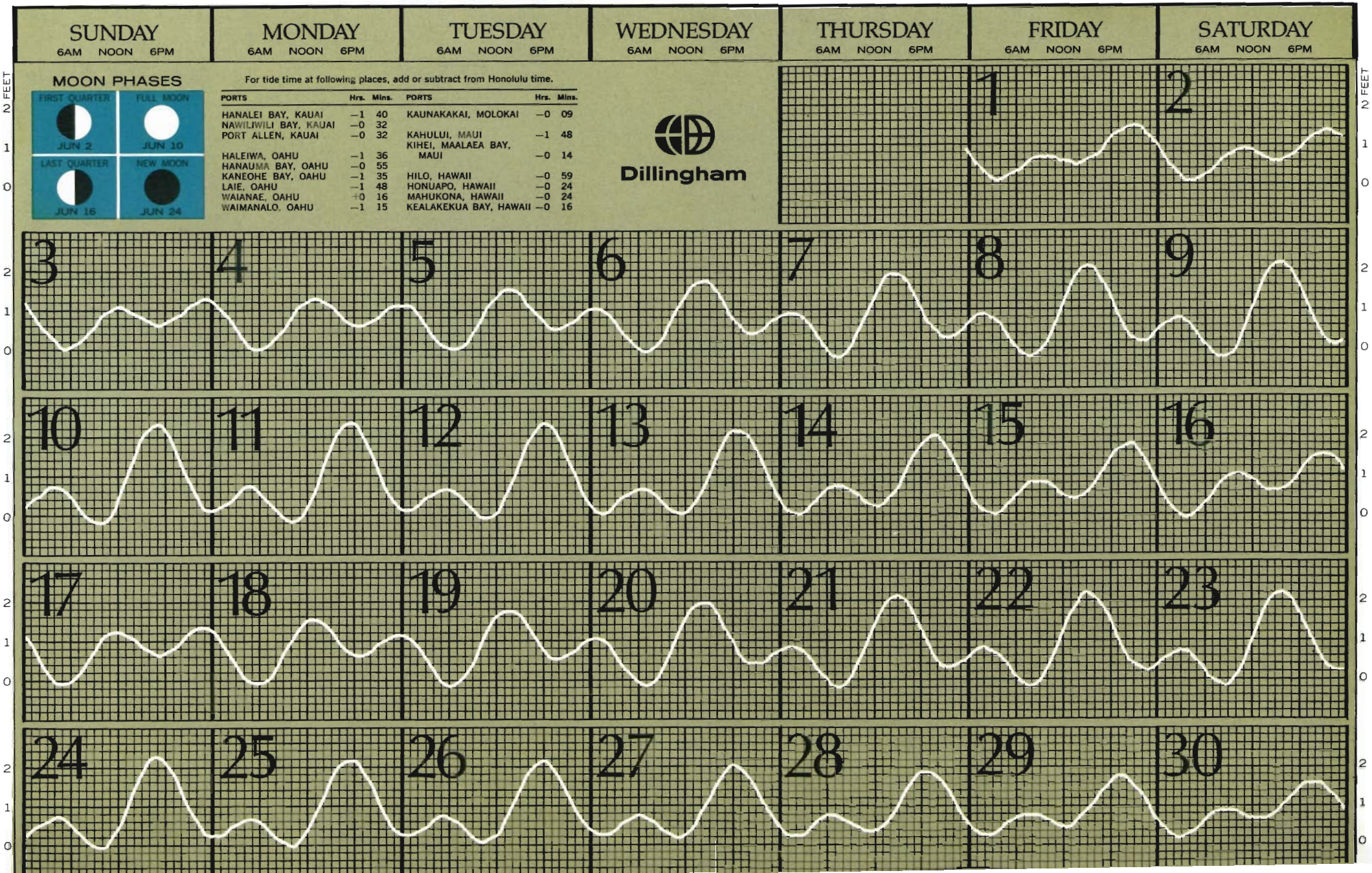
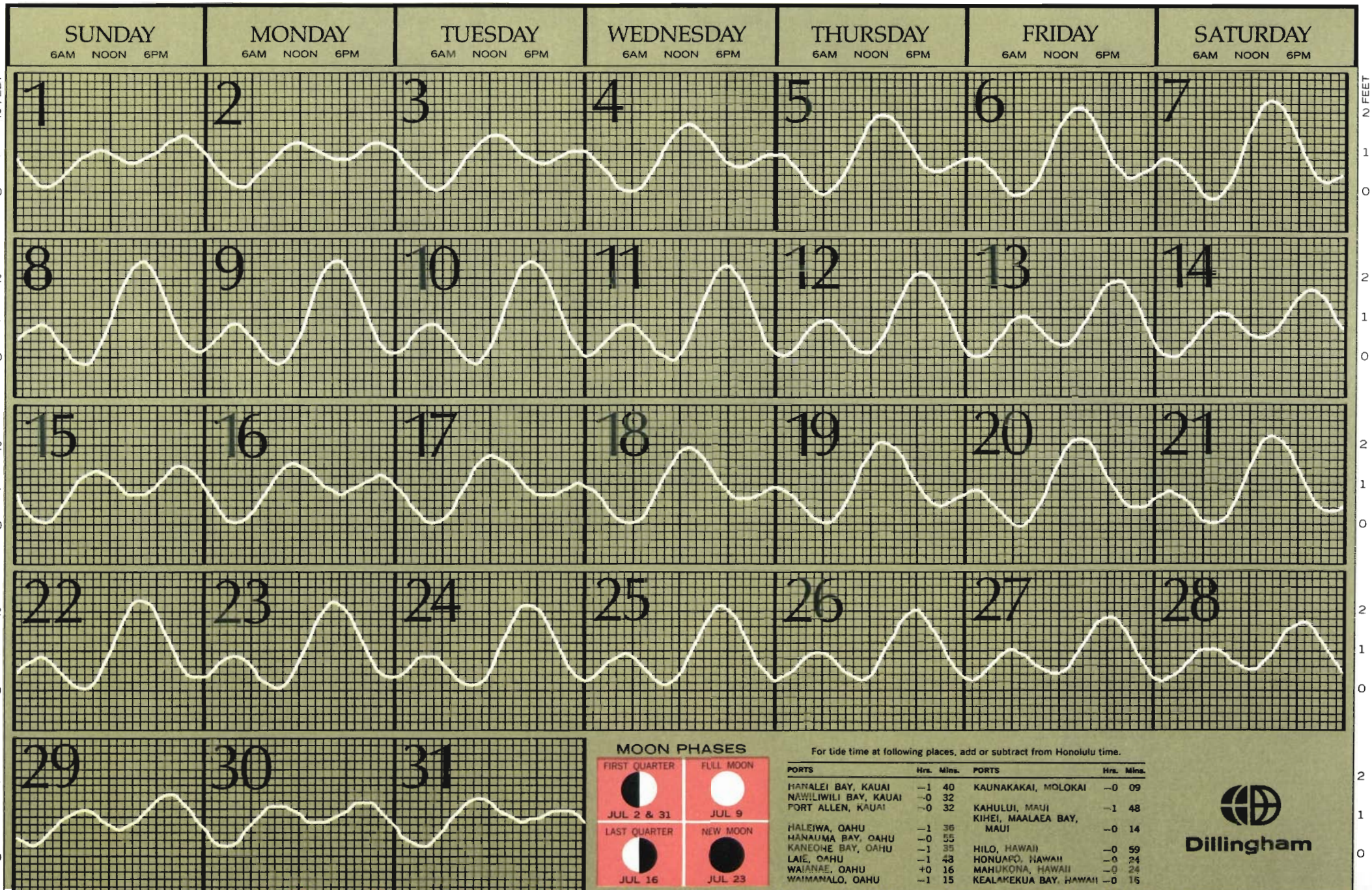
Wedge-Tailed Shearwater ('Ua'u Kani)

JUNE 1979 TIDE CHART



JULY 1979 TIDE CHART



MOON PHASES

FIRST QUARTER	FULL MOON
JUL 2 & 31	JUL 9
LAST QUARTER	NEW MOON
JUL 16	JUL 23

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			
PORT ALLEN, KAUAI	−0	32	KAHULUI, MAUI	−1	48
			KIHEI, MAALAEA BAY, MAUI	−0	14
HALEIWA, OAHU	−1	36			
HANAUMA BAY, OAHU	−0	55			
KANEOHE BAY, OAHU	−1	35	HILO, HAWAII	−0	59
LAIE, OAHU	−1	48	HONUAPO, HAWAII	−0	24
WAIANAE, OAHU	+0	16	MAHUKONA, HAWAII	−0	24
WAIMANALO, OAHU	−1	15	KEALAKEKUA BAY, HAWAII	−0	15

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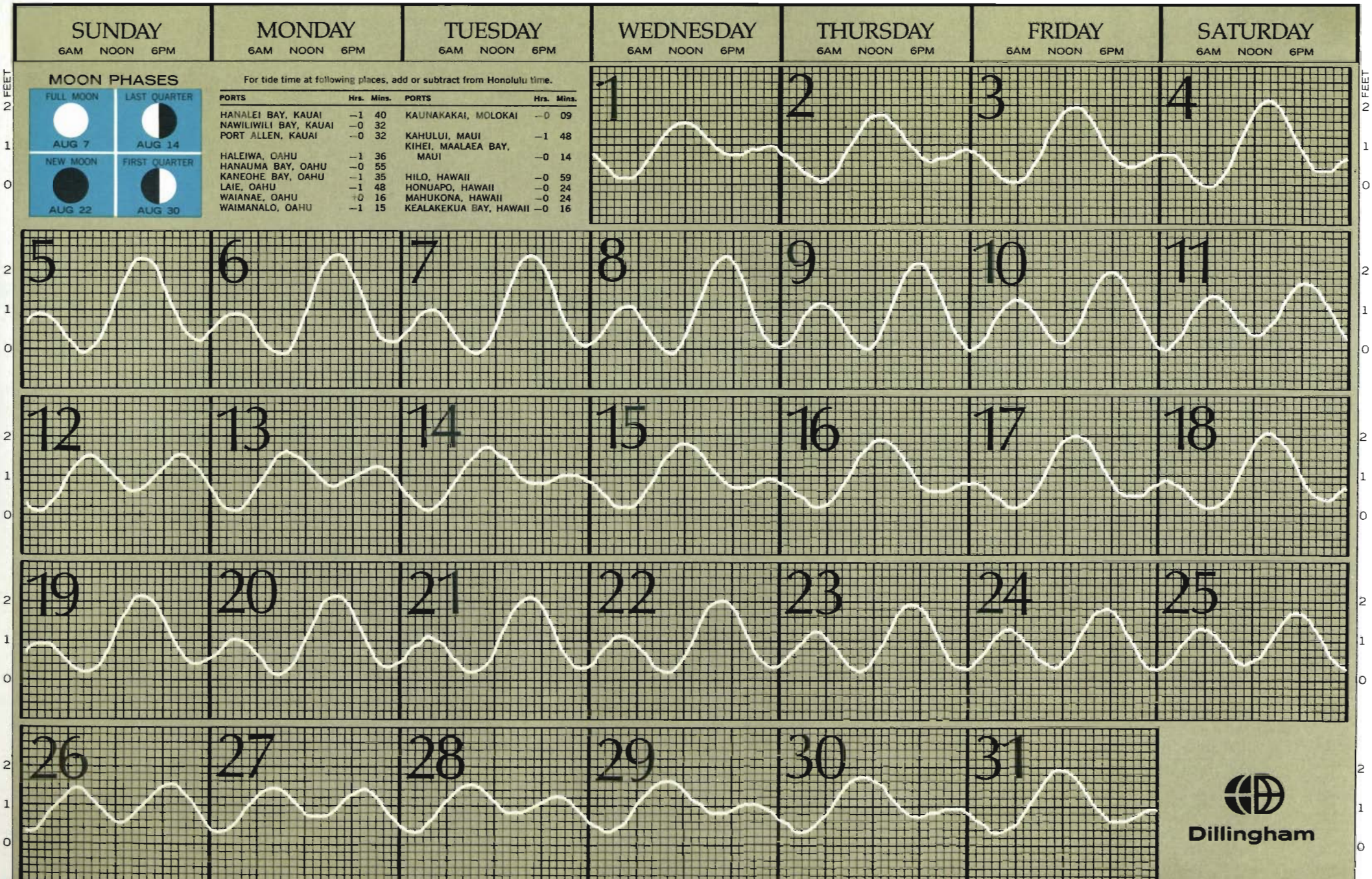
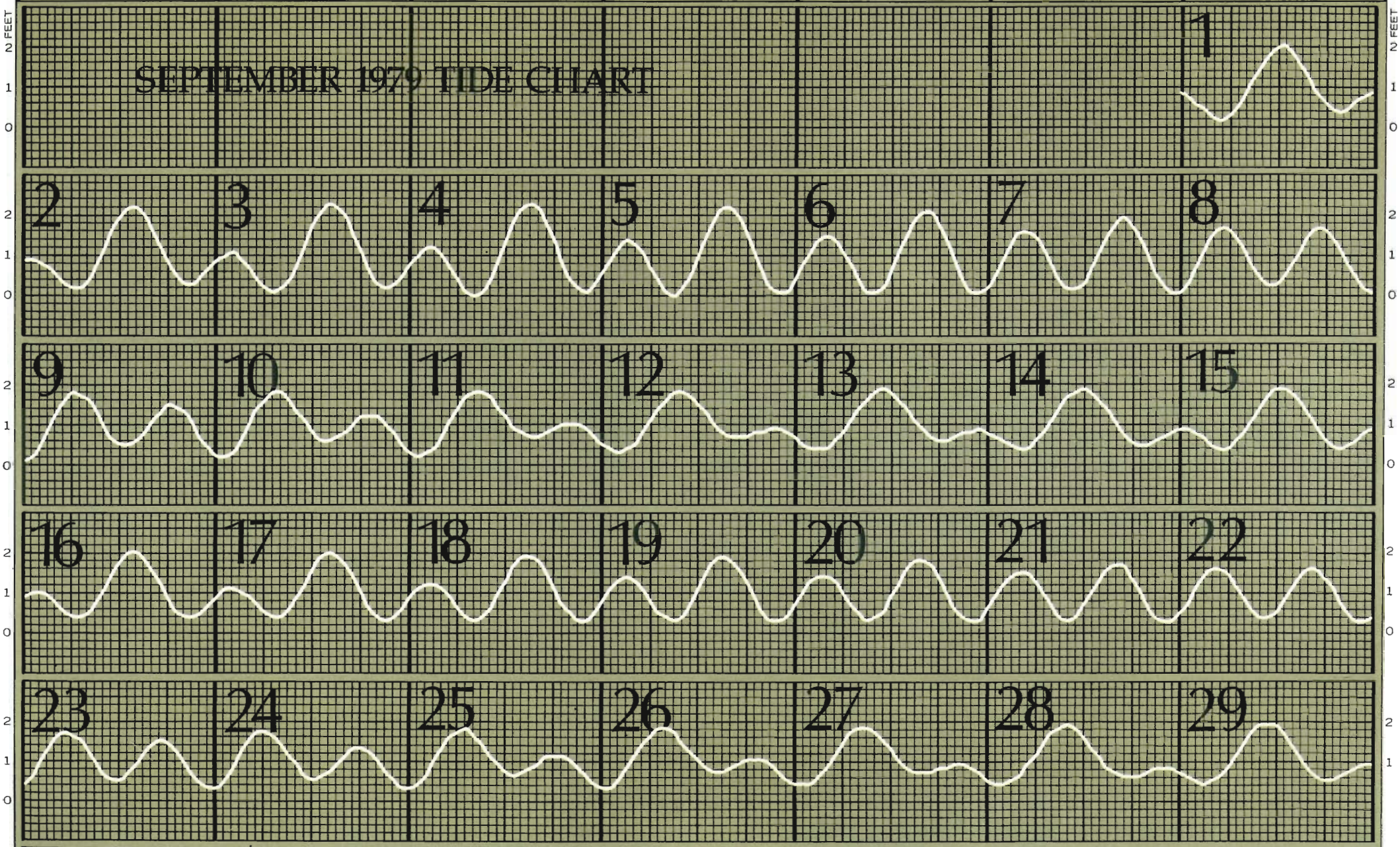
Laysan Albatross (Moli)

AUGUST 1979 TIDE CHART



SEPTEMBER 1979 TIDE CHART



MOON PHASES

FULL MOON SEP 6	LAST QUARTER SEP 12
NEW MOON	FIRST QUARTER

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			
PORT ALLEN, KAUAI	−0	32	KAHULUI, MAUI	−1	48
			KIHEI, MAALAEA BAY, MAUI	−0	14
HALEIWA, OAHU	−1	36			
HANAUMA BAY, OAHU	−0	55			
KANEOHE BAY, OAHU	−1	35	HILO, HAWAII	−0	59
LAIE, OAHU	−1	48	HONUAPO, HAWAII	−0	24
WAIANAE, OAHU	+0	16	MAHUKONA, HAWAII	−0	24

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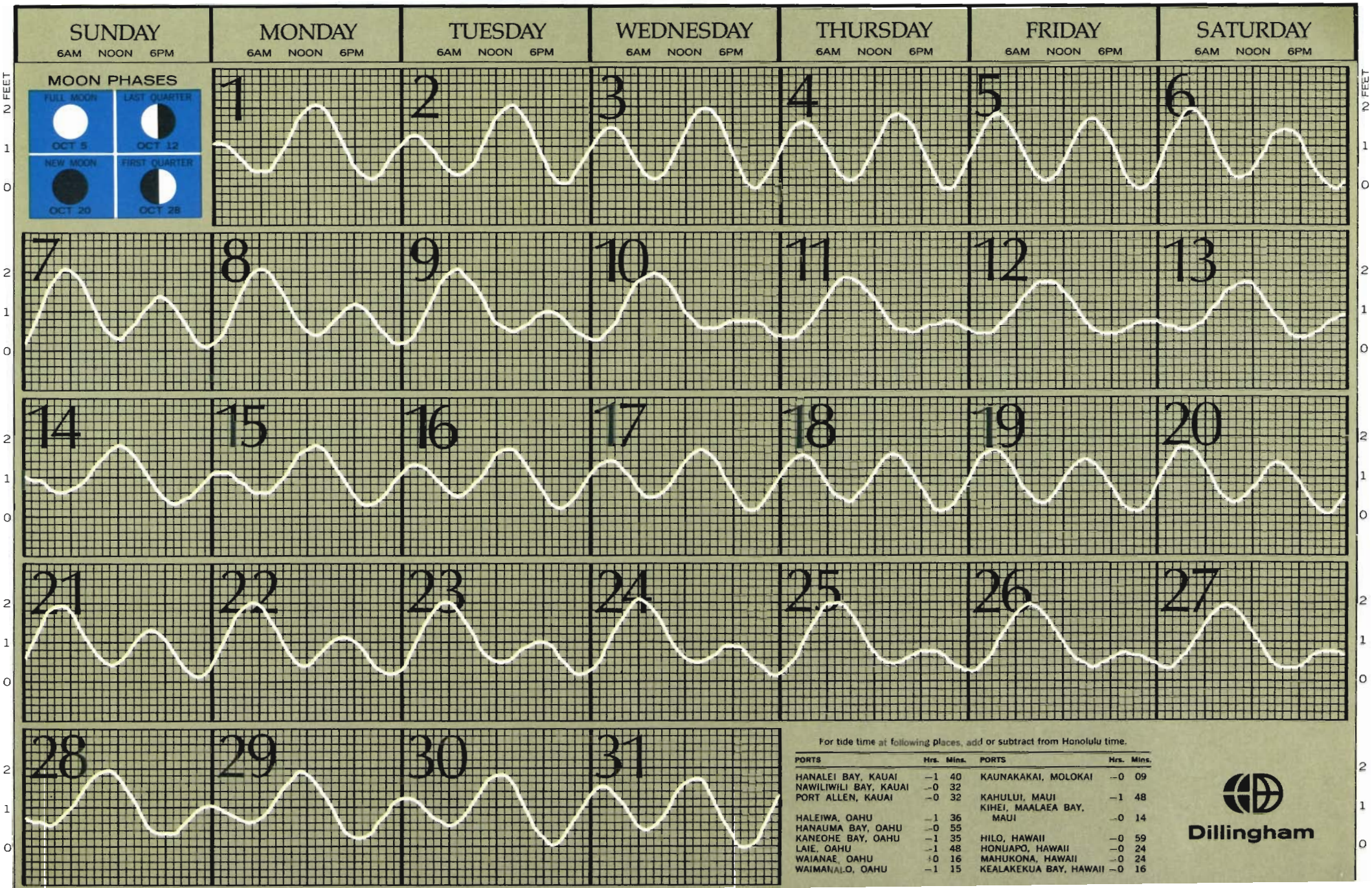
OCTOBER 1979 TIDE CHART



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			
PORT ALLEN, KAUAI	−0	32	KAHULUI, MAUI	−1	48
			KIHEI, MAALAEA BAY, MAUI	−0	14
HALEIWA, OAHU	−1	36			
HANAUMA BAY, OAHU	−0	55			
KANEOHE BAY, OAHU	−1	35	HILO, HAWAII	−0	59
LAIE, OAHU	−1	48	HONUAPO, HAWAII	−0	24
WAIANAE, OAHU	+0	16	MAHUKONA, HAWAII	−0	24
WAIMANALO, OAHU	−1	15	KEALAKEKUA BAY, HAWAII	−0	16

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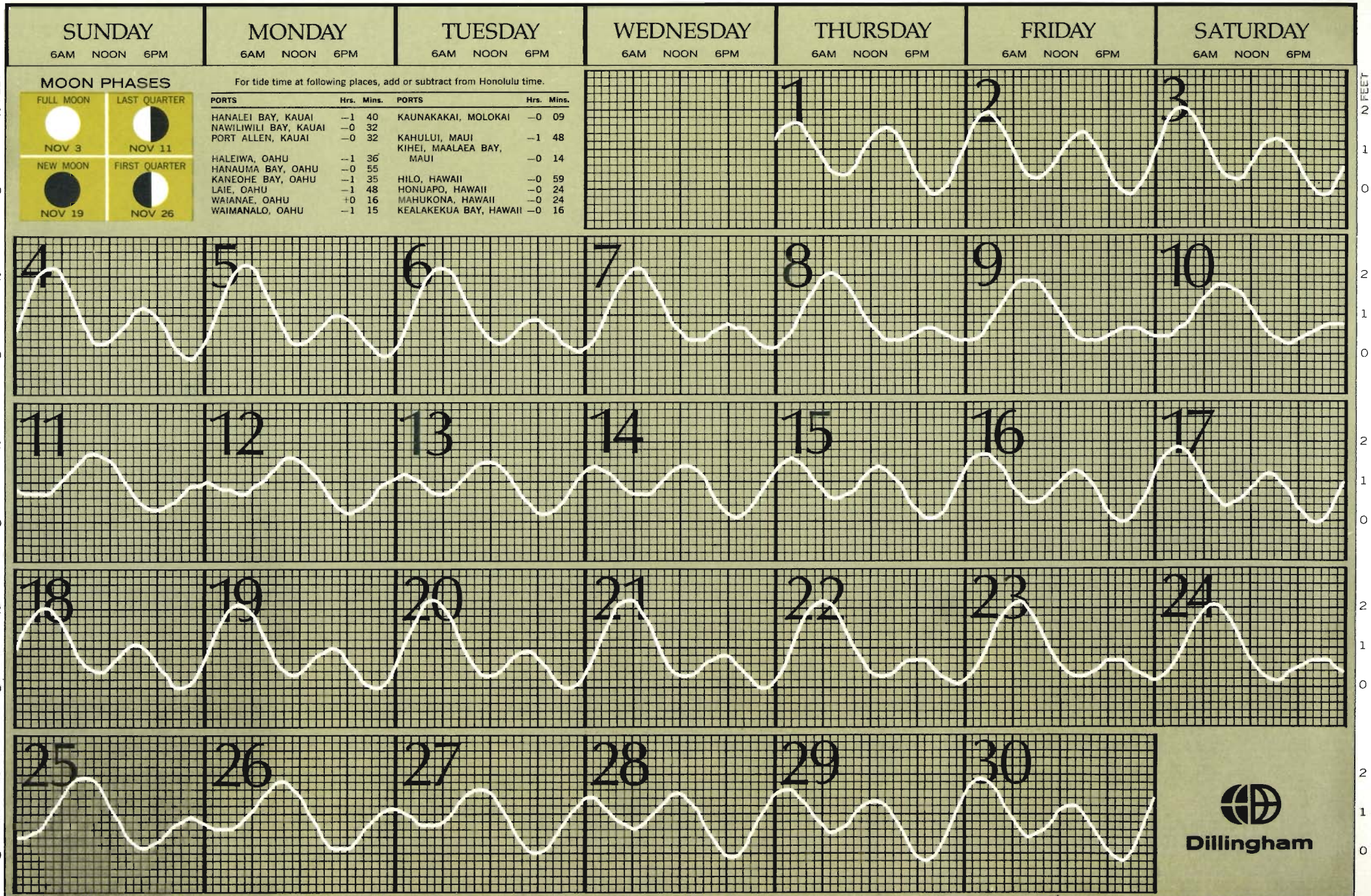
NOVEMBER 1979 TIDE CHART



Great Frigatebird ('Iwa)

DECEMBER 1979 TIDE CHART

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
6AM NOON 6PM	6AM NOON 6PM	6AM NOON 6PM	6AM NOON 6PM	6AM NOON 6PM	6AM NOON 6PM	6AM NOON 6PM
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

FEET 2 1 0

MOON PHASES

FULL MOON DEC 3	LAST QUARTER DEC 11
NEW MOON	FIRST QUARTER

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			
PORT ALLEN, KAUAI	−0	32	KAHULUI, MAUI	−1	48
			KIHEI, MAALAEA BAY, MAUI	−0	14
HALEIWA, OAHU	−1	36			
HANAUMA BAY, OAHU	−0	55			
KANEOHE BAY, OAHU	−1	35	HILO, HAWAII	−0	59
LAIE, OAHU	−1	48	HONUAPO, HAWAII	−0	24
WAIANAE, OAHU	−0	16	MAHUKONA, HAWAII	−0	24

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1979 TIDE CALENDAR