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6th ed.
(1953)

U. S. DEPARTMENT OF COMMERCE
SINCLAIR WEEKS, SECRETARY
COAST AND GEODETIC SURVEY
ROBERT F. A. STUDDS, *Director*

JUNE 6, 1953 SERIAL NO. 770

UNITED STATES COAST PILOT 3

Atlantic Coast

Sandy Hook to Cape Henry

SIXTH (1953) EDITION

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National Oceanic and Atmospheric Administration

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Important

Courses and bearings are in degrees (true) clockwise from 000° (north). Light sector bearings are from seaward. Courses in the Coast Pilot are the courses to be made good.

Current velocities are in knots, which are nautical miles per hour.

Depths are in feet or fathoms below mean low water unless otherwise noted.

Directions of winds are those from which they blow. Directions of currents are those toward which they set. Directions are true.

Distances are in nautical miles unless otherwise noted. A nautical mile is about 1.15 statute miles.

Heights and vertical clearances of bridges are in feet above high water. Clearances of drawbridges are for the closed position unless otherwise noted.

Lights, fog signals, radiobeacons, and other navigational aids are not fully described. See yearly Coast Guard Light List.

Mariners and other interested parties are requested to send to the Director, United States Coast and Geodetic Survey, Washington 25, D. C., any information affecting this Coast Pilot that may come to their attention.

MAR 18 1954

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Number in parentheses immediately following any item in these Contents is the number of the largest-scale U. S. Coast and Geodetic Survey Chart on which that feature appears.

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Conversion table, points to degrees ..... Back end paper

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Preface

THIS is the sixth edition of United States Coast Pilot 3, Atlantic Coast, Sandy Hook to Cape Henry. It is based on examinations by the United States Coast and Geodetic Survey and includes considerable material from the United States Coast Guard, the Corps of Engineers, and the Weather Bureau.

The Coast Pilot has been entirely rewritten. Chapter 2A is devoted to Navigation Regulations, and subsequent chapters describe the Atlantic coast from Sandy Hook to Cape Henry, the New Jersey Intracoastal Waterway, Delaware and Chesapeake Bays and their tributaries to the head of tidewater navigation.

This sixth edition of the Coast Pilot is corrected through Notice to Mariners 23 of June 6, 1953. It cancels the fifth edition published in 1947.

Supplements to this Coast Pilot, containing corrections and additions from various sources, are issued early each year. Each supplement is complete in itself and cancels all previous issues. The latest supplement, together with Notices to Mariners subsequent to it, will correct the book to date. Supplements may be obtained free upon application to the United States Coast and Geodetic Survey.

Mariners and other interested parties are requested to send to the Director, United States Coast and Geodetic Survey, Washington 25, D. C., any information affecting this Coast Pilot that may come to their attention.

ROBERT F. A. STUDDS, *Director*

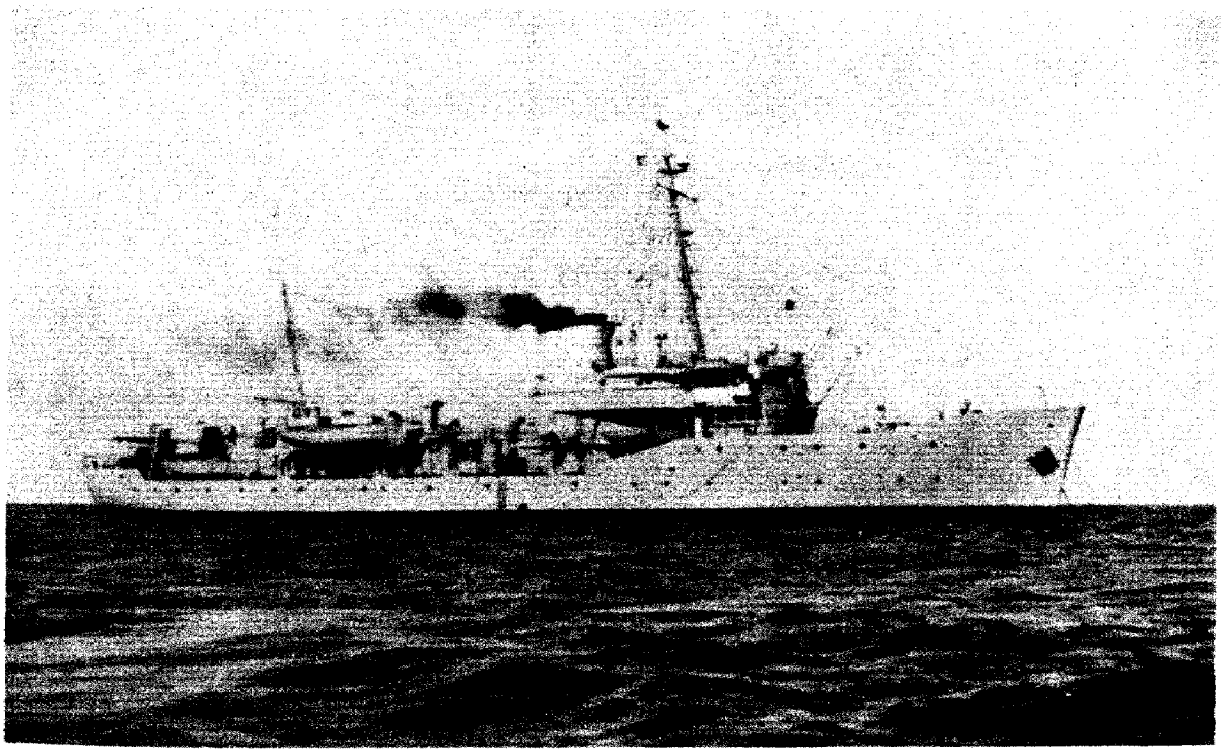
June 6, 1953

SERVICE FLAG
U. S. COAST AND GEODETIC SURVEY

United States Coast Pilot 3

Atlantic Coast, Sandy Hook to Cape Henry

Nautical Chart Indexes
Photographs



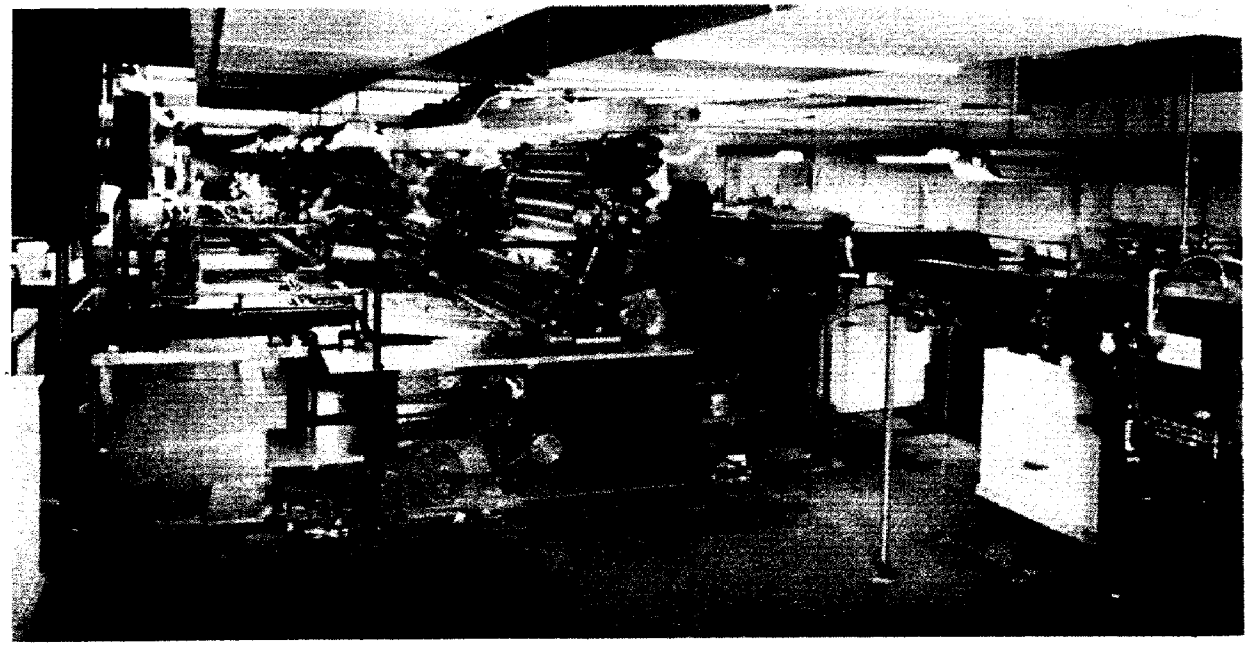
U. S. C. and G. Survey Ship *PATHFINDER;* length 229 feet, draft 15 feet, displacement 2000 tons. Equipped with the latest electronic devices, the *Pathfinder* is one of the main units of the Coast and Geodetic Survey fleet. — 1951 Photo.

NUMERICAL LIST OF NAUTICAL CHARTS

United States Coast Pilot 3

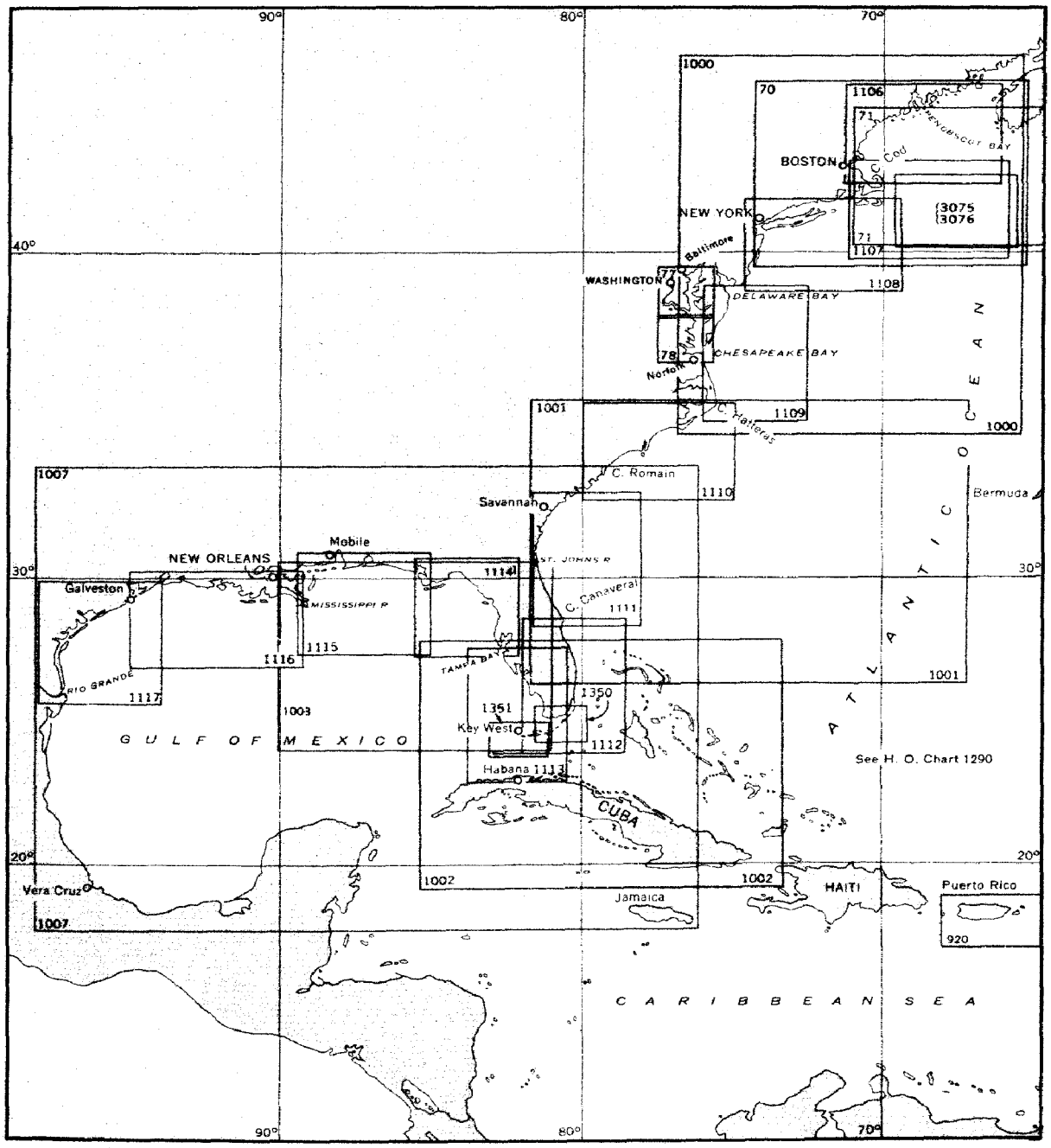
1953

No.	Price	Scale	No.	Price	Scale	No.	Price	Scale
70	$1.00	1:675,000	553	$1.00	1:40,000	1113	$1.00	1:470,940
71	1.00	1:500,000	555	1.00	1:40,000	1114	.75	1:456,394
77	.75	1:197,250	556	.50	1:20,000	1115	1.00	1:456,394
78	.75	1:200,000	557	1.00	1:40,000	1116	1.00	1:458,596
234	.25	1:10,000	558	1.00	1:40,000	1117	1.00	1:460,732
280	1.00	1:15,000	559	.75	1:40,000	1215	1.00	1:80,000
294	1.00	1:40,000	560	.75	1:40,000	1216	1.00	1:80,000
295	1.00	1:40,000	561	.75	1:10,000	1217	1.00	1:80,000
296	.75	1:40,000	566	.75	1:25,000	1218	1.00	1:80,000
375	.50	1:20,000	567	1.00	1:20,000	1219	1.00	1:80,000
400	1.00	1:20,000	570	.50	1:20,000	1220	1.00	1:80,000
411	.75	1:40,000	572	1.00	1:40,000	1221	1.00	1:80,000
452	1.00	1:20,000	795	.75	1:10,000	1222	1.00	1:80,000
481	.75	1:20,000	{ 824	.50	1:40,000	1223	1.00	1:80,000
492	1.00	1:20,000	{ 825		1:40,000	1224	1.00	1:80,000
494	1.00	1:40,000	{ 826	.50	1:40,000	1225	1.00	1:80,000
495	.75	1:40,000	{ 827		1:40,000	1226	1.00	1:80,000
504	1.00	1:40,000	920	.75	1:326,856	1350	.75	1:180,000
529	1.00	1:40,000	1000	1.00	1:1,200,000	1351	.75	1:180,000
530	.50	1:40,000	1001	1.00	1:1,207,256	{ 3075	1.00	1:220,000
						{ 3076		1:220,000
531	1.00	1:20,000	1002	1.00	1:1,210,765			
534	1.00	1:40,000	1003	1.00	1:868,399			
535	1.00	1:40,000	1007	1.00	1:2,161,530			
536	1.00	1:20,000	1106	1.00	1:378,838			
545	.75	1:15,000	1107	1.00	1:400,000			
548	1.00	1:40,000	1108	1.00	1:400,000			
549	1.00	1:40,000	1109	1.00	1:416,944			
550	1.00	1:40,000	1110	1.00	1:432,720			
551	1.00	1:40,000	1111	1.00	1:449,659			
552	.75	1:40,000	1112	1.00	1:466,940			

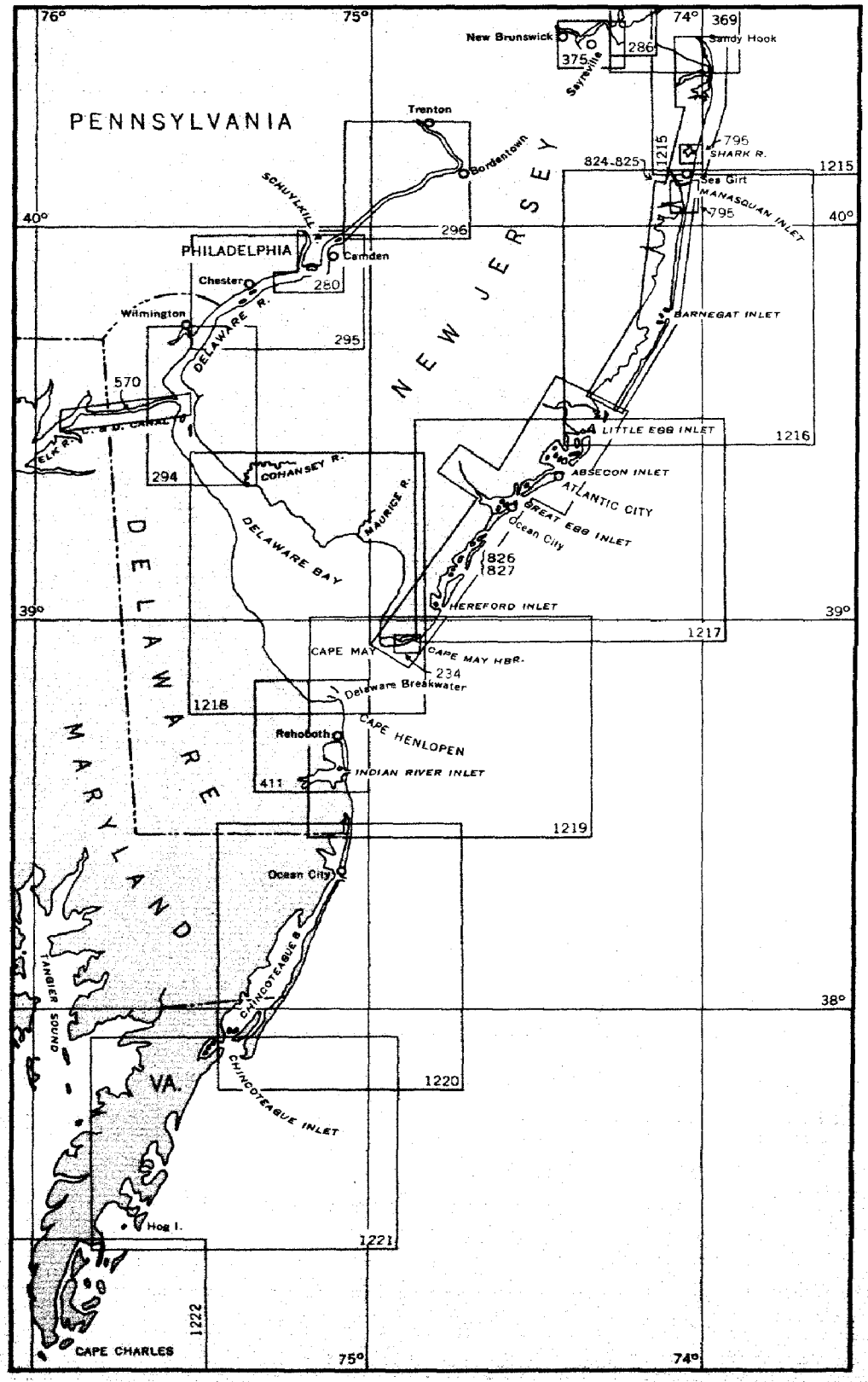


Pressroom of the Coast and Geodetic Survey, where charts are printed. — 1948 Photo.

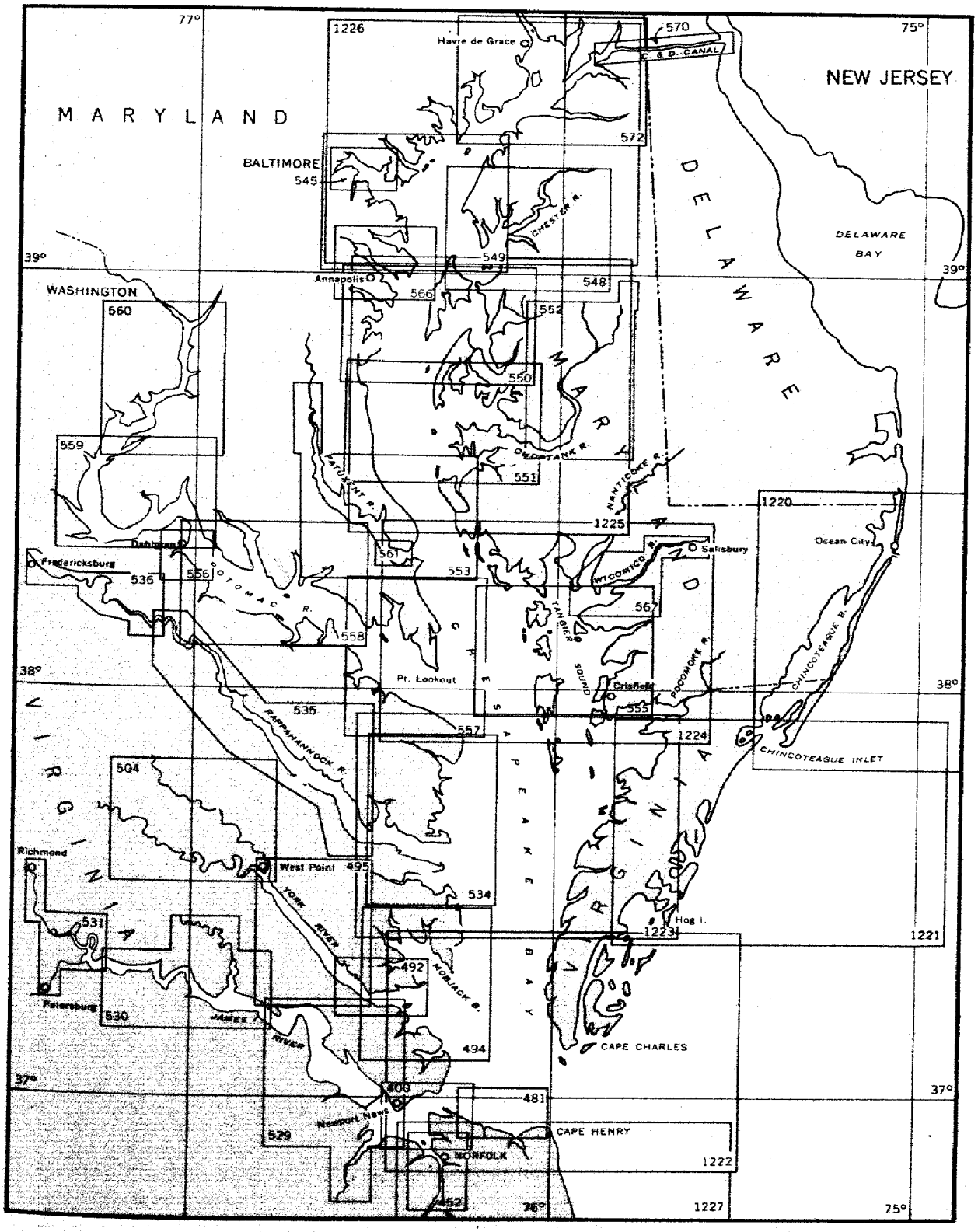
SAILING AND GENERAL CHARTS - ATLANTIC AND GULF COASTS

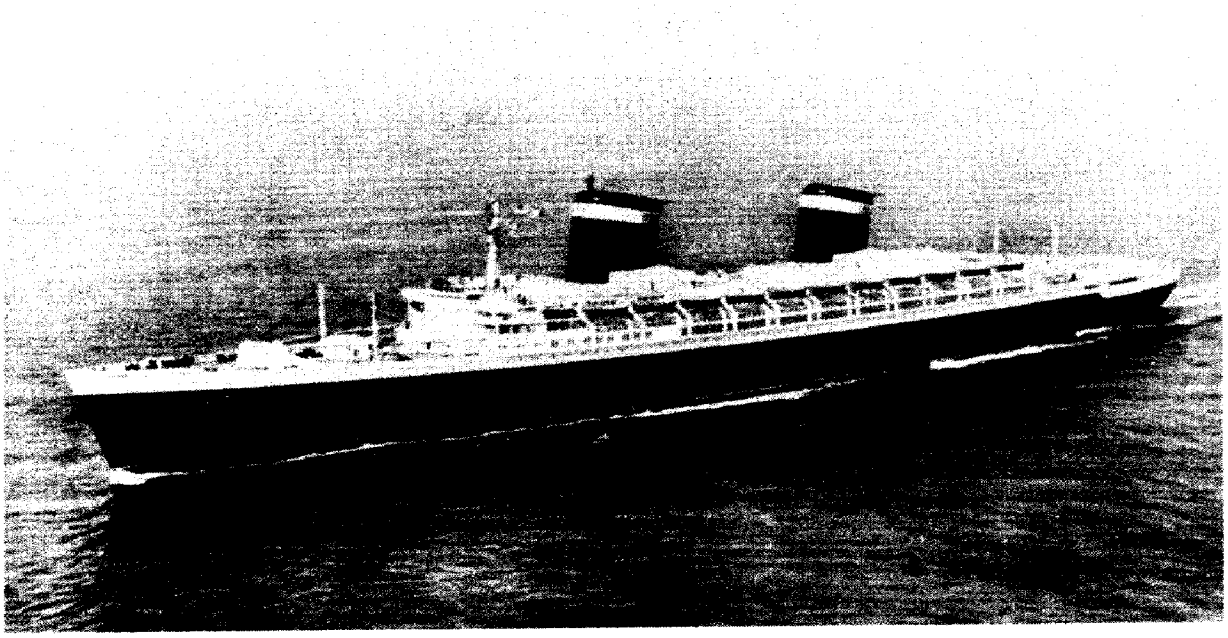


SANDY HOOK, N.J. TO CAPE CHARLES, VA. INCLUDING DELAWARE BAY

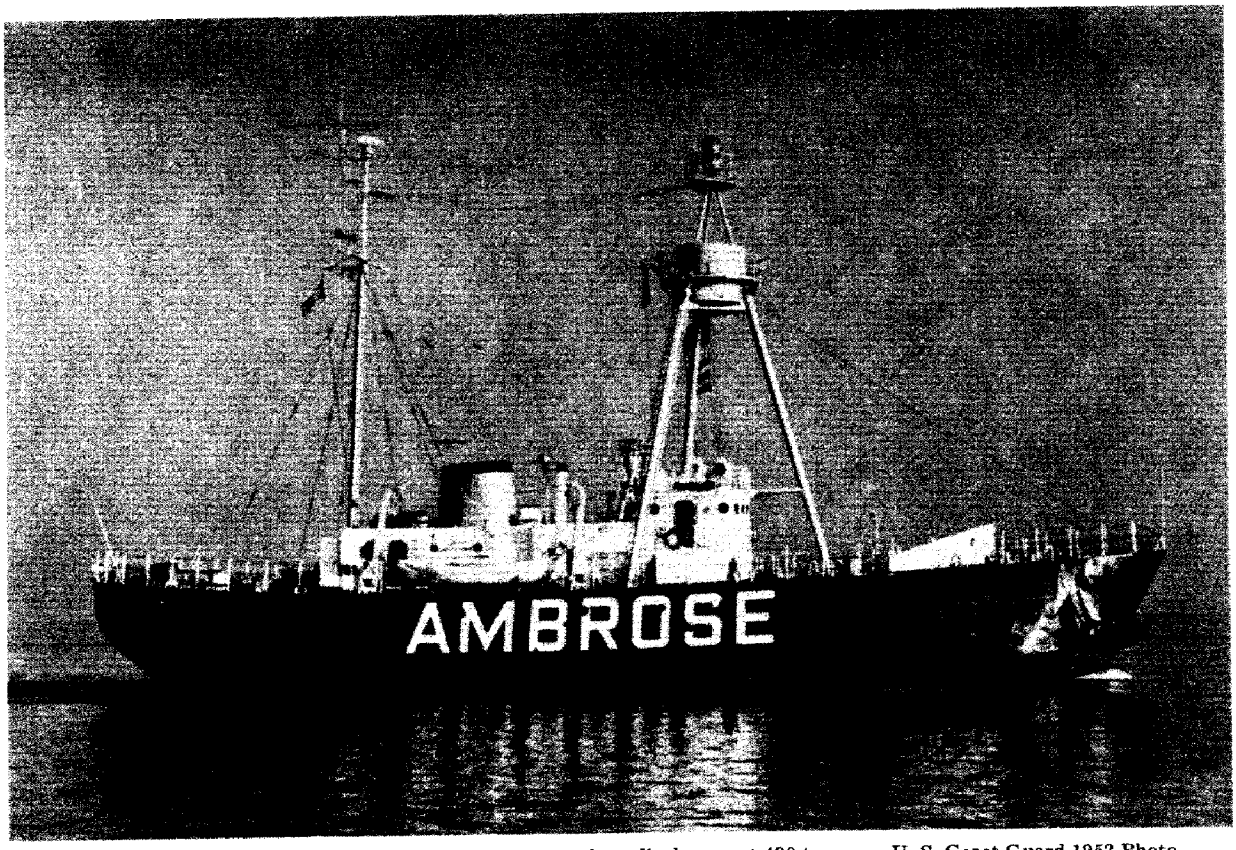


CHESAPEAKE BAY AND TRIBUTARIES

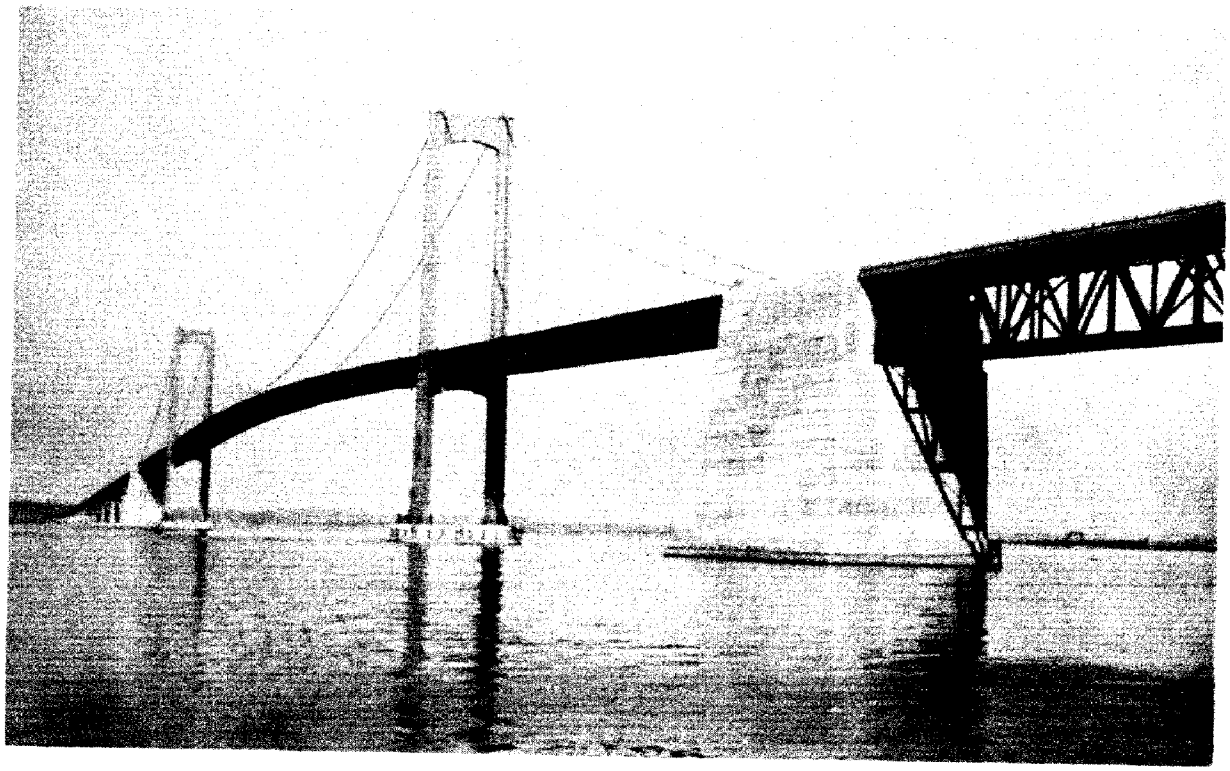




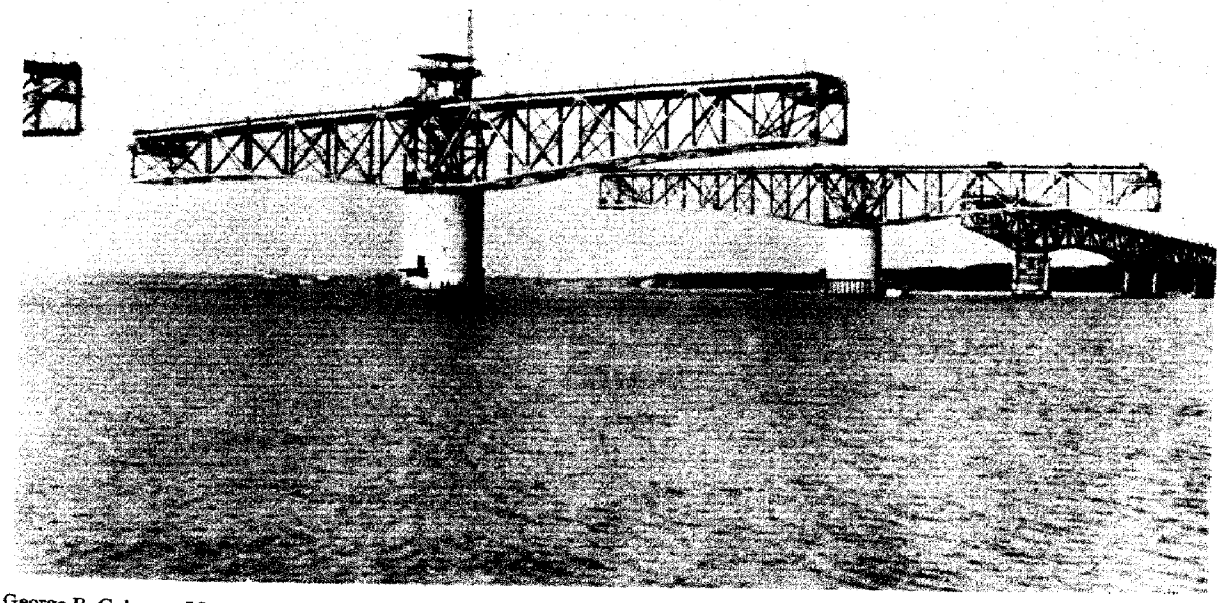
S. S. *UNITED STATES.* — U. S. Maritime Administration 1952 Photo.



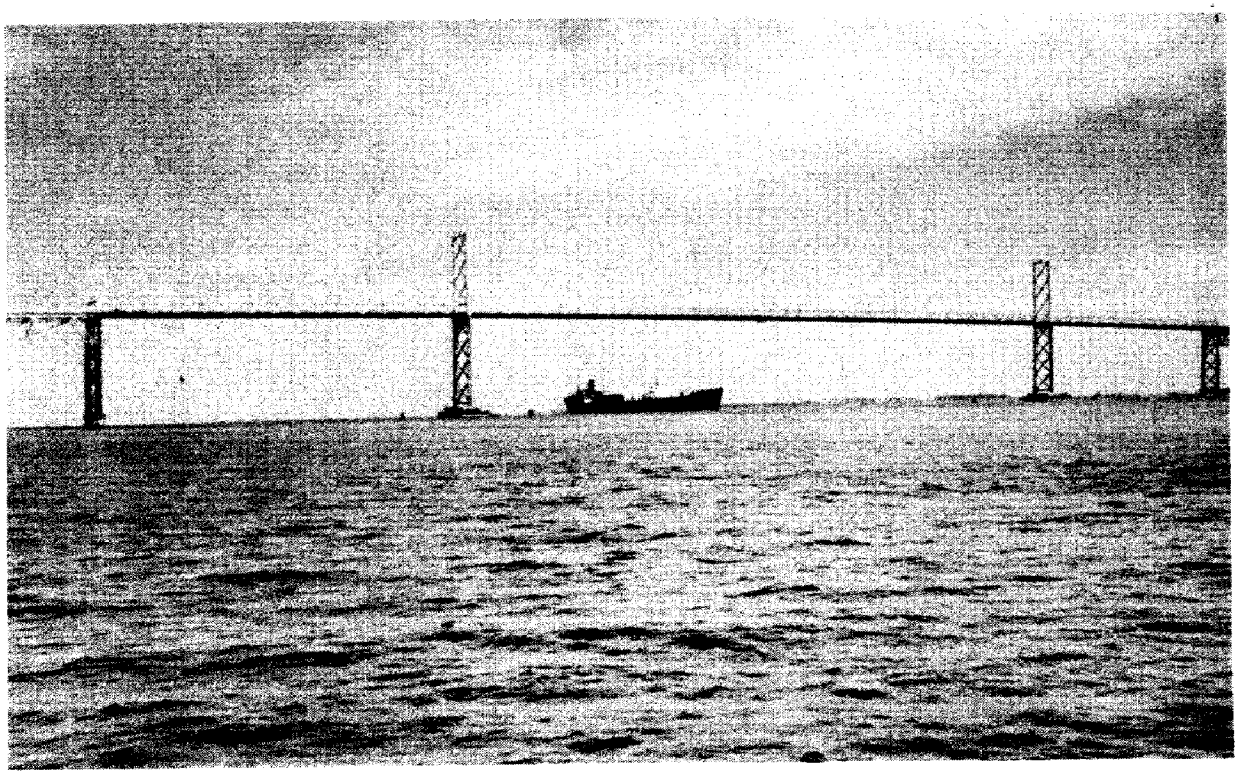
AMBROSE LIGHTSHIP; length 128 feet, draft 10 feet, displacement 490 tons. — U. S. Coast Guard 1952 Photo.



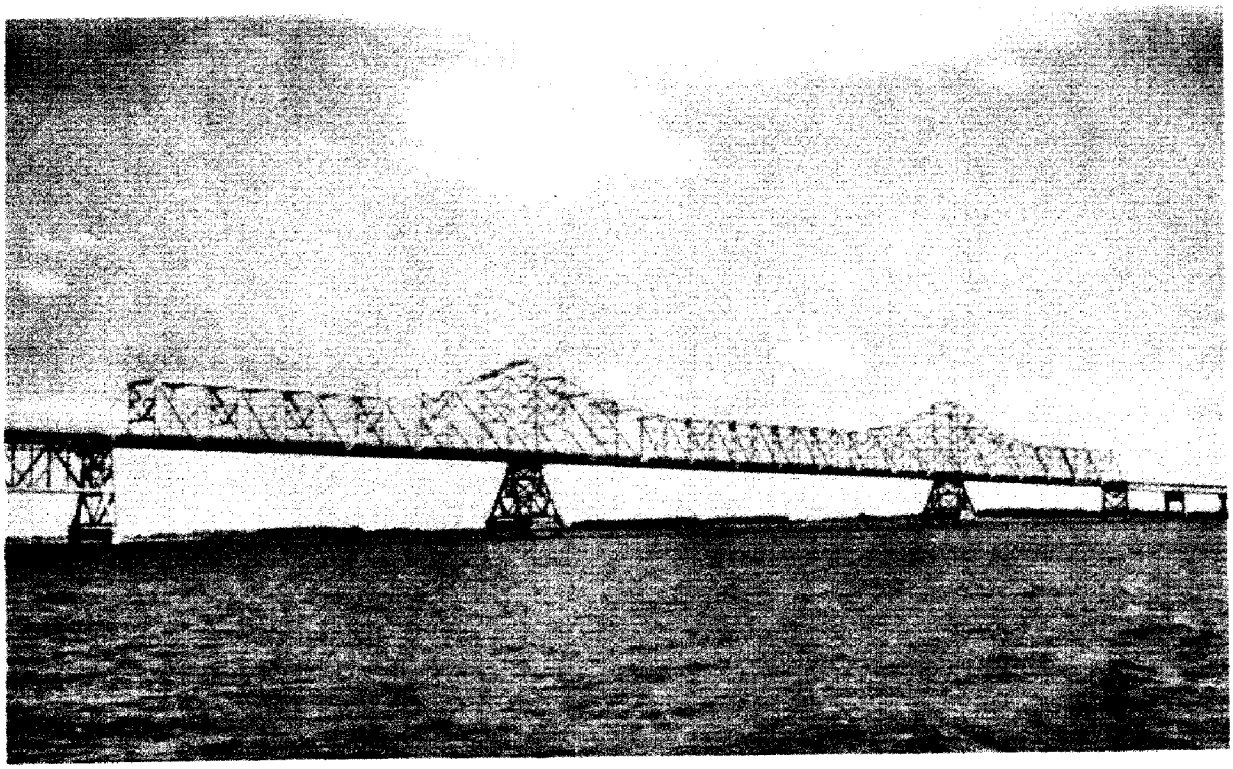
Delaware Memorial Bridge, 60 miles above the Delaware Capes; from the southeast. — U. S. Bureau of Public Roads 1952 Photo.



George P. Coleman Memorial Bridge, over York River at Yorktown, Virginia; from the southwest. — U. S. Bureau of Public Roads 1952 Photo.

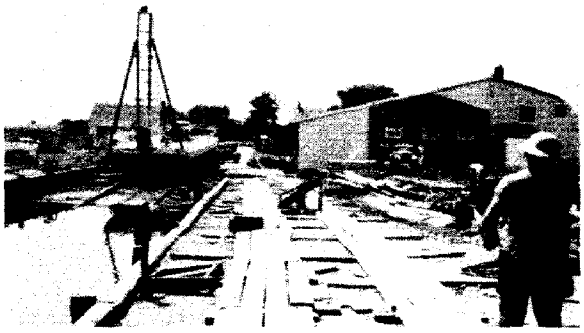


Chesapeake Bay Bridge, 127.5 miles above the Virginia Capes; main-channel span from the southwest. — U. S. Bureau of Public Roads 1952 Photo.

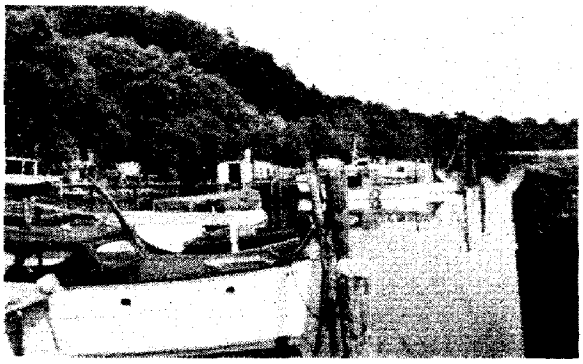


Chesapeake Bay Bridge; eastern channel span from the southwest. — U. S. Bureau of Public Roads 1952 Photo.

Boatyard in Pagan River



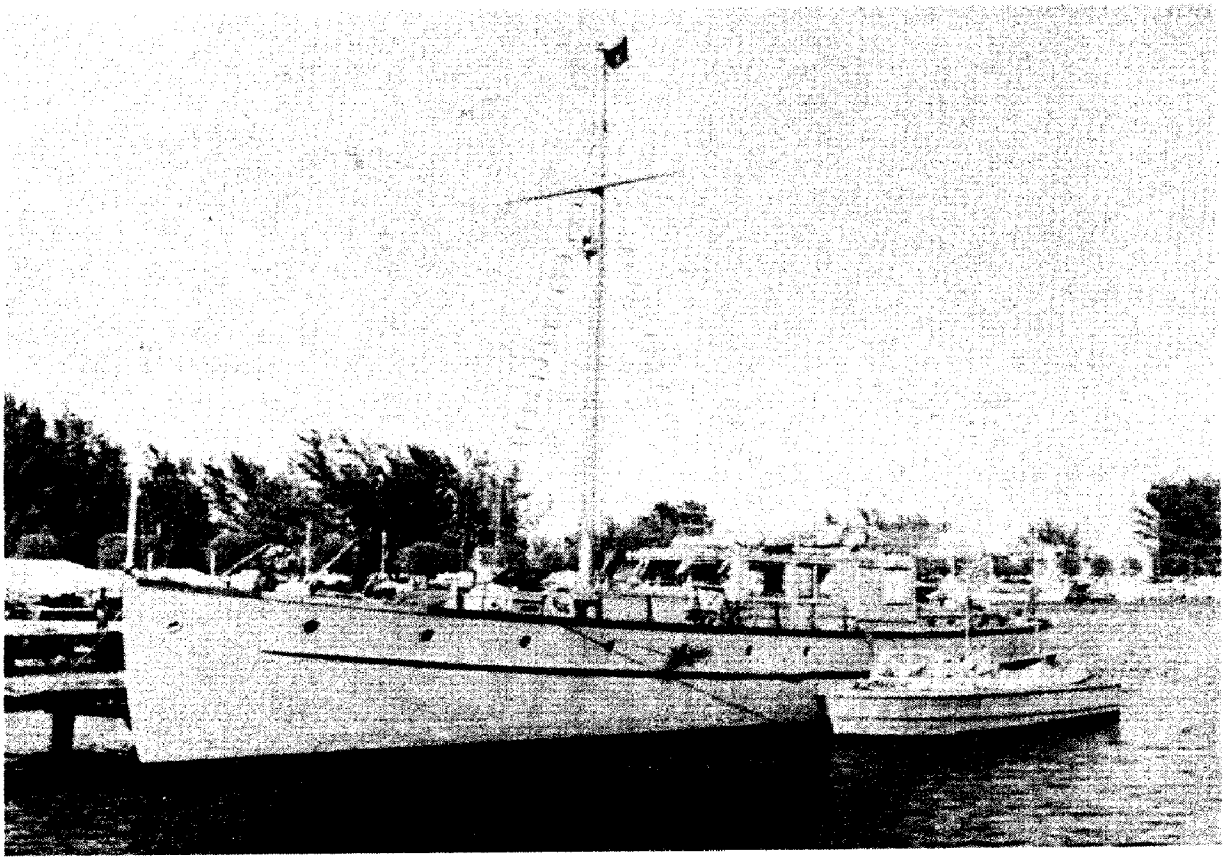
Boatyard in Knapps Narrows



Yacht basin in James River

Boatyard in Chisman Creek

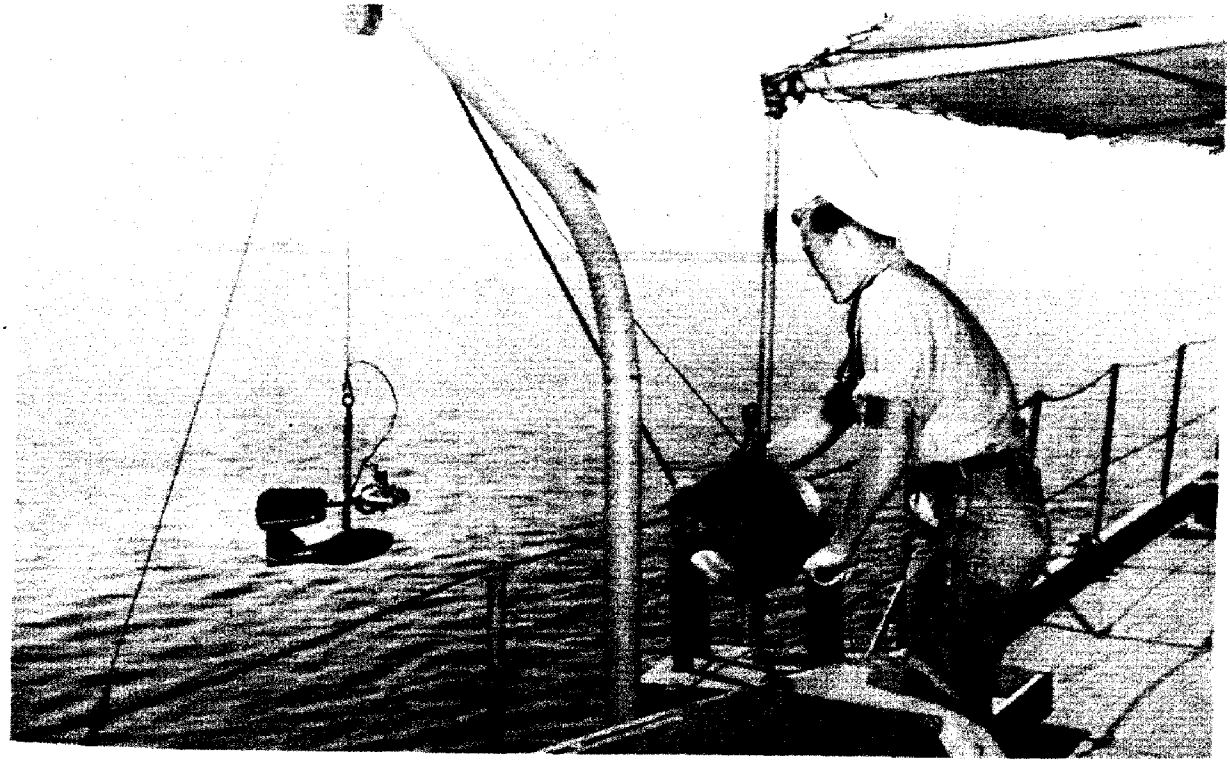
Boatyard at Oxford, Maryland



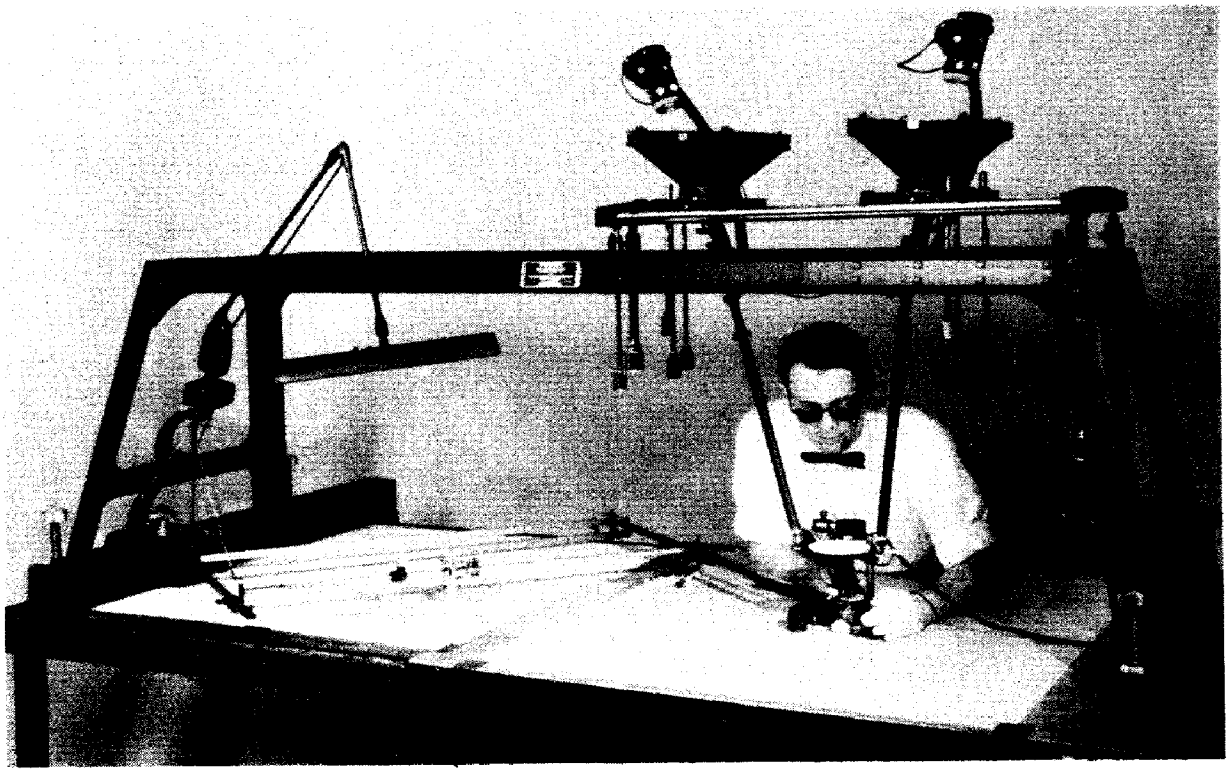
U.S.C. and G. Survey Ship *SOSBEE*; length 68 feet, draft 5½ feet, displacement 46 tons. The *Sosbee* makes inshore hydrographic surveys and is sometimes assigned to Coast Pilot field inspection.

Wheelhouse and Plotting room of a small survey ship.

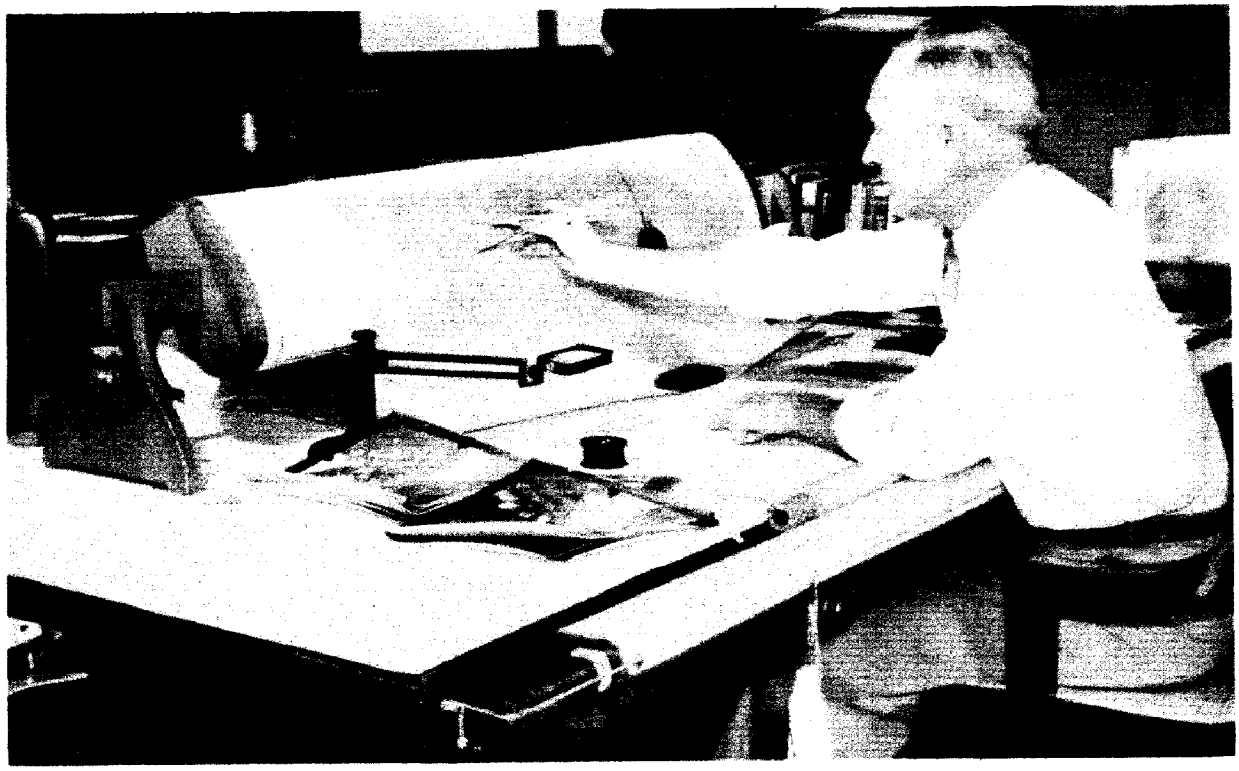
Echo sounder in survey launch.



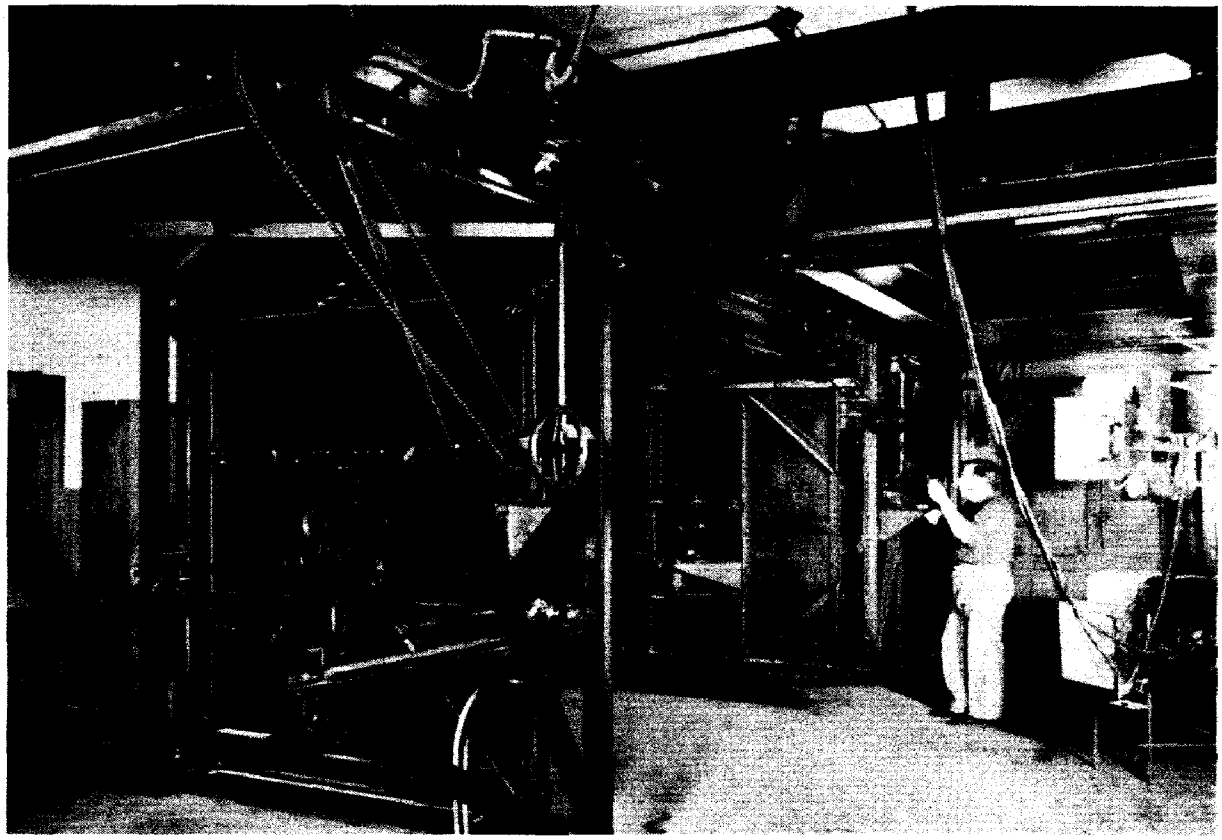
Current meter being lowered from survey ship.



This three-dimensional instrument, operated in semidarkness, is used to draw shoreline and contours from aerial photographs.



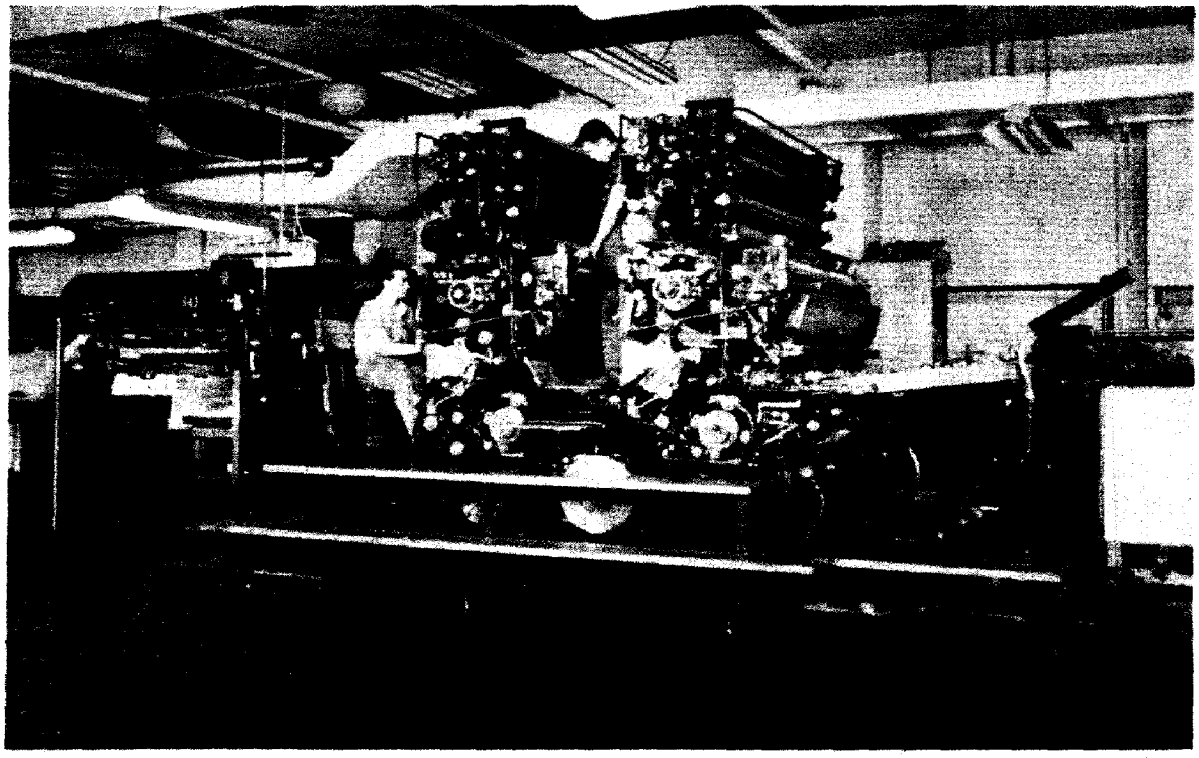
The drawing for the nautical chart is compiled from original hydrographic and topographic surveys and many other sources.



Large 50-inch precision camera designed and used by the Coast and Geodetic Survey for the reproduction of nautical charts. This wet-plate camera weighs 14¼ tons.

Artists and negative engravers.

Soundings are cut on the chart negative with a mechanical engraving machine.



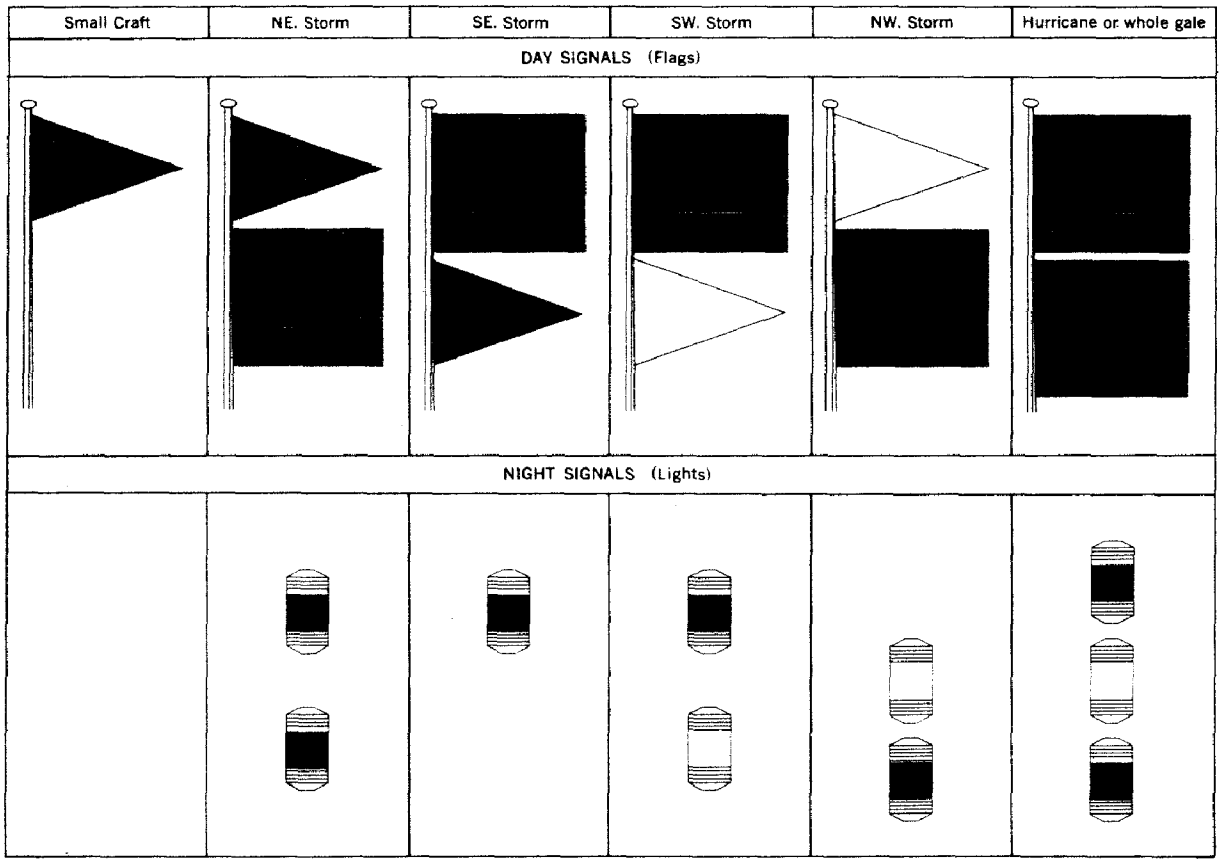
Two-color offset press on which nautical charts are printed.

Code Flags and Single Meanings

** General Signal*

Able (Affirm*) *Speed Trial*	King *Stop Instantly*	Uncle *Standing into danger*	1
Baker *Explosives*	Love *Stop, Something to communicate*	Victor *Require Assistance*	2
Charlie *Yes*	Mike *Doctor on Board*	William *Require Medical Assistance*	3
Dog *Keep Clear*	Nan (Negative*) *No*	Xray *Stop your Intentions*	4
Easy *Altering Course to Starboard*	Oboe (Option*) *Man Overboard*	Yoke *Carrying Mails*	5
Fox *Disabled*	Peter (Prep*) *About to Sail (Lights out)*	Zebra *Shore Stations*	6
George *Want a Pilot*	Queen *Request Pratique*	1st Repeat	7
How *A Pilot is on Board*	Roger *Way is off my ship*	2nd Repeat	8
Item (Interrogatory*) *Altering Course to Port*	Sugar *Going full speed astern*	3rd Repeat	9
Jig *Semaphore*	Tare *Do not pass ahead of me*	*(Decimal Point)* *Code and Answering Pennant:*	0

STORM WARNING SIGNALS



EXPLANATION OF SMALL CRAFT, STORM, AND HURRICANE WARNINGS

The small craft warning.—A red pennant indicates that moderately strong winds that will interfere with the safe operation of small craft are expected. No night display of small craft warnings is made.

The northeast storm warning.—A red pennant *above* a square red flag with black center displayed by day, or two red lanterns, one above the other, displayed by night, indicates the approach of a storm of marked violence with winds beginning from the *northeast.*

The southeast storm warning.—A red pennant *below* a square red flag with black center displayed by day, or one red lantern displayed by night, indicates the approach of a storm of marked violence with winds beginning from the *southeast.*

The southwest storm warning.—A white pennant *below* a square red flag with black center displayed by day, or a white lantern *below* a red lantern displayed by night, indicates the approach of a storm of marked violence with winds beginning from the *southwest.*

The northwest storm warning.—A white pennant *above* a square red flag with black center displayed by day, or a white lantern *above* a red lantern displayed by night, indicates the approach of a storm of marked violence with winds beginning from the *northwest.*

Hurricane, or whole gale warning.—Two square flags, red with black centers, one above the other, displayed by day, or two red lanterns, with a white lantern between, displayed by night, indicate the approach of a tropical hurricane or of one of the extremely severe and dangerous storms which occasionally move across the Great Lakes.

CHAPTER 1

General Information

Contents

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THE COAST AND GEODETIC SURVEY is charged with (1) the survey of the coasts of the United States and its possessions to insure the safe navigation of coastal and intracoastal waters; (2) the compilation and publication of **nautical charts, Coast Pilots, tables of predicted tides and currents, and tidal current charts** to meet the needs of the mariner; (3) the determination of geographical positions and elevations in the interior of the country to coordinate the coastal surveys and provide a framework for mapping and other engineering work; (4) the compilation and publication of aeronautical charts for use in air navigation; (5) observations of the earth's magnetism in all parts of the country to furnish magnetic information essential to the mariner, aviator, land surveyor, radio engineer, and others; and (6) seismological observations and investigations to supply earthquake data required in designing structures.

District Offices of the Coast and Geodetic Survey are located at some of the principal ports in the United States; see Appendix. Files of charts, Coast Pilots, and other publications are maintained at these offices for the use of mariners, who are invited to avail themselves of the facilities afforded.

Sales agents for Charts, Coast Pilots, Tide Tables, Current Tables, and Tidal Current Charts of the Coast and Geodetic Survey are located in many ports of the United

States and in some foreign ports; see Appendix for agents in the area covered by this Coast Pilot. The charts and publications can also be purchased from the Washington Office and from the District Offices. Orders mailed to Washington, D. C., should be accompanied by check or money order, made payable to the Treasurer of the United States; postage stamps or Superintendent of Documents coupons cannot be accepted. Indexes of nautical charts and related publications can be obtained free of charge from the Coast and Geodetic Survey or any of its agencies.

Important.—Mariners and other interested parties are requested to send to the Director, United States Coast and Geodetic Survey, Washington 25, D. C., any information affecting this Coast Pilot or the charts that may come to their attention, as well as any suggestions they may have for improving these publications. Reports of an urgent character should be sent by radio or telegraph.

Special signals for surveying vessels.—International Pilot Rules state that a vessel engaged in laying or in picking up a submarine cable or navigation mark, or a vessel engaged in surveying or underwater operations when from the nature of her work she is unable to get out of the way of approaching vessels, shall carry, in lieu of the usual white lights, three lights in a vertical line one over the other not less than 6 feet apart. The highest and lowest of these lights shall be red, and the middle light shall be white, and they shall be of such a character as to be visible all round the horizon at a distance of at least 2 miles. By day, she shall carry in a vertical line one over the other not less than 6 feet apart, where they can best be seen, three shapes each not less than 2 feet in diameter, of which the highest and lowest shall be globular in shape and red in color, and the middle one diamond in shape and white.

The **wire drags** used by the Coast and Geodetic Survey in sweeping for dangers to navigation may be crossed by vessels without danger of fouling at any point except between the towing launches and the large buoys near them, where the towline approaches the surface of the water. Vessels passing over the drag are requested to change course so as to cross it approximately at right angles, as a diagonal course may cause the propeller to foul the supporting buoys and attached wires. No attempt should be made to pass between the drag launches while the wire is being set out or taken in, unless it would endanger a vessel to do otherwise, because the bottom wire is slack and the floats at each 100-foot section may lift it nearly to the surface; at this time the launches usually are headed directly toward or away from each other and the operation may be clearly seen.

Nautical charts are published primarily for the use of the mariner but serve the public interest in many other ways. They are compiled principally from Coast and Geodetic Survey basic field surveys, supplemented by data from other Government organizations, and include all available information necessary for safe navigation.

The **scales of nautical charts** range from 1:2,500 to about 1:5,000,000. Graphic scales are generally shown on charts with scales of 1:80,000 or larger, and numerical scales are given in the upper right border for smaller-scale charts. For convenience of reference, Coast and Geodetic Survey charts are classified according to scale as follows:

Sailing charts, scales 1:600,000 and smaller, are for use in fixing the mariner's position as he approaches the coast from the open ocean, or for sailing between distant coastwise ports. On such charts the shoreline and topography are generalized and only

offshore soundings, the principal lights, outer buoys, and landmarks visible at considerable distances are shown.

General charts, scales 1:100,000 to 1:600,000, are for coastwise navigation outside of outlying reefs and shoals.

Coast charts, scales 1:50,000 to 1:100,000, are for inshore navigation leading to bays and harbors of considerable width, and for navigating large inland waterways.

Harbor charts, scales larger than 1:50,000, are for harbors, anchorage areas, and the smaller waterways.

Intracoastal Waterway (inside route) charts, scale 1:40,000, are a special series covering the inside route in New Jersey, the route from Norfolk, Virginia, to Key West, Florida, on the Atlantic coast, and from Key West, Florida, to the Mexican boundary on the Gulf coast.

Caution in using small-scale charts.—It is obvious that dangers to navigation cannot be shown with the same amount of detail on small-scale charts as on those of larger scale; therefore, in approaching the land or dangerous banks, the largest scale chart available should be used. A small error in laying down a position means only yards on a large-scale chart, but on a small scale the same amount of displacement means large fractions of a mile. For the same reason, near objects should be used for bearings in preference to objects farther off, although the latter may be more prominent, as a small error in a bearing or in laying it down on the chart has greater effect in misplacing the position, the longer the line to be drawn.

The **date of a chart** is of vital importance to the navigator. When charted information becomes obsolete, further use of the chart for navigation may be dangerous. Natural and artificial changes, many of them critical, are occurring constantly, and it is important that navigators obtain up-to-date charts at regular intervals, or hand-correct their copies for changes listed in the *Notice to Mariners.*

Nautical charts bear three dates which are important to persons using them. The **edition date** (month and year) of the publication note is **printed** centrally below the lower border. The **print date** (year, month, and day) is the latest date **printed** in the lower left-hand corner below the border and is the date of correction to the printing plate. The **date of issue** is **stamped** below the right lower border and just to the left of the subtitle. Charts are hand-corrected to show all essential changes for lights, buoys, daybeacons, recently reported dangers, and other critical information received to date of issue from the Washington, D. C., office. All important corrections subsequent to the date of issue are published in the *Notice to Mariners* and should be immediately applied by the mariner to charts on hand or purchased from agents.

The **Mercator projection** used on most nautical charts has straight-line meridians and parallels that intersect at right angles. On any particular chart the distances between meridians are equal throughout, but distances between parallels increase progressively from the equator toward the poles, so that a straight line between any two points is a rhumb line. This unique property of the Mercator projection is one of the main reasons why it is preferred by the mariner.

Accuracy of charts.—Each charted depth represents a survey location of an actual sounding. Important changes may have occurred in sand and mud areas since the last surveys, especially at bay and river entrances exposed to strong currents and heavy seas. Where changes are known to be frequent and radical, notes to that effect are printed on the charts.

In rocky areas, soundings, however detailed, may not find every small obstruction. The customary routes and channels should be followed when navigating such waters, and areas should be avoided where irregular and sudden changes in depth indicate conditions associated with pinnacle rocks, boulders, or coral heads.

Echo soundings.—Most of the various types of echo sounder, or **fathometer,** are calibrated for a velocity of sound in water of 800 fathoms per second, but the actual velocity may differ from the calibrated value by as much as 5 percent, depending upon the temperature and salinity of the waters in which the vessel is operating; the highest velocities are found in warm, highly saline water, and the lowest in icy, fresh water. Variation in line voltage can also cause errors of 10 percent or more in readings of the fathometer. Echoes can be obtained from schools of fish; in fact, trawlers are using the fathometer for that purpose. The most serious error in reading the fathometer commonly occurs where the depth is greater than the scale range of the instrument; a 400-fathom scale indicates 15 fathoms visually and graphically when the depth is 415 fathoms. Where possible, wide variations from charted depths should be checked by wire soundings.

Depth curves.—Since the installation of fathometers on most ships, the Coast and Geodetic Survey has been giving special prominence to depth curves on nautical charts of areas where modern hydrographic surveys have been made. Deep-water submarine relief has become important to the navigator, and the more faithfully the chart depicts this relief, the closer the navigator can relate his depth readings to the chart. The older charts showed many soundings and few depth curves; the newer charts show more depth curves and fewer soundings.

The **plane of reference** for charted depths is the mean of all low waters for the Atlantic coast of the United States, including the West Indies, and the mean of the lower low waters for the Pacific coast, including Alaska and the Hawaiian Islands. For foreign charts, the plane most frequently used is mean low water springs.

The effect of strong winds, in combination with the regular tidal action, may at times cause the water to fall considerably below the plane of reference of the chart. The level may also rise considerably above mean high water due to similar causes.

Dredged channels are shown on the charts by broken lines that represent the side limits of the improvement. Controlling depths in major channels are given in tabular form for the four quarters of the project width when the information is available. When the tabular form is not used, a note gives the controlling depth, the available width, and the date determined; if the width is not stated, the depth given is for the middle half. Revisions of tabulations and notes are published in the *Notice to Mariners*.

Compass roses on charts.—The annual change in variation gradually introduces an error in the magnetic compass roses on charts. The compass roses are replotted for every new edition of the chart if the error is appreciable; and the amount and date of the variation and the amount of annual change are stated for each compass rose. On some of the sailing and general charts the magnetic variation is shown by isogonic lines.

Magnetic disturbance of the compass.—The charts show areas where local magnetic disturbance of the compass, or **local attraction,** is caused by magnetic masses external to the ship. Such disturbances are fairly common in shallow waters but are never encountered over oceanic depths. Magnetic force diminishes so rapidly with distance that a magnetic center on land would have to be of unprecedented intensity to be capable of affecting the compass of a vessel 0.5 mile from shore.

It is unlikely that all the areas of magnetic disturbance have been located. When such an area is discovered, the position should be fixed and the facts reported as far as they can be ascertained. It is particularly important to note the time at which the disturbance was encountered, so as to rule out the possibility that the effects were caused by a magnetic storm rather than by local irregularity.

Deviation of the compass.—The magnetic effect of the ship itself combines with any instrumental error of the compass to cause the deviation, which varies with the heading of the ship and with the magnetic latitude. It is customary to counteract the deviation as far as possible with soft iron and permanent magnets, suitably placed in or on the binnacle. See U. S. Coast and Geodetic Survey Special Publication No. 96, *Instructions for compensation of the magnetic compass.*

Determination of compass error by the use of navigational ranges.—The azimuths of channel ranges which have been determined with sufficient accuracy for compass error determination are indicated in degrees and minutes in the *Light List* and in the *Notice to Mariners*. Azimuths given only in degrees should not be used for this purpose.

Use of electrical equipment affecting magnetic compasses.—Experiments with portable electric megaphones show that when such instruments are within 6 feet of a compass an error of 2° to 4° will result; closer proximity increases this greatly. Emergency lights and portable telephones have similar effects. Such electrical equipment should not be stowed within 10 feet of magnetic compasses nor used nearer the compasses for a time greater than necessary. Serious deflection of a ship's compass has been caused by the helmsman wearing an electric suit of the type used by airmen; masters are advised to prohibit the wearing of such garments in the vicinity of the compass.

Overhead cables are shown on the charts and described in the Coast Pilots; the clearances given are for the lowest wires at high water. Vessels with masts, stacks, booms, or aerials should allow for an additional clearance under power cables equal to the distance between adjacent cables.

The areas in which **submarine cables** are laid are shown on the charts by dashed lines. Because of the serious consequences resulting from damaged cables, vessels should take special care to avoid anchoring or fishing in cable areas.

If a vessel does foul a submarine cable, every effort should be made to clear the anchor or gear by normal methods: should these fail, the anchor or gear should be slipped and abandoned without attempting to cut the cable. High voltages are, or may be, fed into certain cables, and there is serious risk of severe burns or loss of life if any attempt is made to cut the cable. Damaging a submarine cable is a Federal offense.

The International Conference for the Protection of Submarine Cables, Paris, 1884, provided that the owners of vessels who are able to prove that they have sacrificed an anchor, a net, or other fishing gear, in order not to damage a submarine cable, may be compensated by the owner of the cable.

Tide Tables are issued annually by the Coast and Geodetic Survey in advance of the year for which they are prepared; see *Publications* at the end of this chapter. These tables include predicted times and heights of high and low waters for every day in the year for a number of reference stations and differences for obtaining similar predictions for numerous other places. They also include other useful information such as a

method for obtaining heights of tide at any time, local civil time of sunrise and sunset for various latitudes, reduction of local civil time to standard time, and time of moonrise and moonset for various ports.

Caution.—In using the Tide Tables, slack water should not be confused with high or low water. For ocean stations there is usually little difference between the time of high or low water and the beginning of ebb or flood currents; but for places in narrow channels, land-locked harbors, or on tidal rivers, the time of slack current may differ by several hours from the time of high or low water. The relation of the times of high or low water to the turning of the current depends upon a number of factors, so that no simple general rule can be given. To obtain the times of slack water, reference should be made to the Current Tables or to information given in the Coast Pilot.

Current Tables for the Atlantic coast and for the Pacific coast of the United States are issued annually by the Coast and Geodetic Survey in advance of the year for which they are prepared; see *Publications* at the end of this chapter. These tables include daily predictions of the times of slack water and the times and velocities of strength of flood and ebb currents for a number of waterways, together with differences for obtaining predictions for numerous other places. Also included is other useful information such as a method for obtaining the velocity of current at any time, duration of slack, coastal tidal currents, wind currents, combination of currents, and current diagrams. Some information on the Gulf Stream is included in the tables for the Atlantic coast.

Tidal Current Charts are published by the Coast and Geodetic Survey for various localities; see *Publications* at the end of this chapter. These charts depict the direction and velocity of the current for each hour of the tidal cycle. They present a comprehensive view of the tidal current movement in the respective waterways as a whole and when used with the proper current tables or tide tables supply a means for readily determining for any time the direction and velocity of the current at various localities throughout the areas covered.

THE COAST GUARD has among its duties (1) enforcement of the laws of the United States on the high seas, in harbors, bays, sounds, roadsteads, and other like bodies of water along the coasts of the United States, its territories and possessions; (2) enforcement of navigation laws, of neutrality laws and regulations, of rules and regulations in relation to anchorage grounds, and of the Oil Pollution Act; (3) inspection of all vessels to insure safety to passengers and crews; (4) aid to distressed mariners and saving of life and property from shipwreck; (5) issuance of marine licenses and certificates; (6) investigation of circumstances connected with shipwreck or collision at sea; (7) destruction of derelicts; (8) construction, operation, maintenance, and inspection of aids to navigation; and (9) publication of Light Lists.

Light Lists.—All aids to navigation, such as lights, radiobeacons, fog signals, buoys, and daymarks, are described in these publications which are for sale by the Superintendent of Documents, Government Printing Office, Washington 25, D. C., and by the various sales agencies. Mariners are referred to the above publications for detailed information regarding the characteristics, power, and visibility of lights, as well as descriptions of light structures and daymarks, buoys, and fog signals. Such detailed information is not given in this Coast Pilot; see *Publications* at the end of this chapter.

The Light List is corrected to the date of publication printed on the title page. The mariner is cautioned that the latest list must be used; he should keep his Light Lists as well as his charts corrected from changes announced in the weekly *Notice to Mariners*.

Aids to Navigation.—The distances at which **lights** may be seen in clear weather, given in Light Lists and on charts, are the geographic ranges computed in nautical miles for a height of the observer's eye of 15 feet above sea level; the luminous range is given when the light is not of sufficient power to be seen to the limit of its geographic range. These distances may at times be increased by abnormal atmospheric refraction and, of course, may be greatly lessened by unfavorable weather conditions, such as fog, rain, haze, or smoke. All except the most powerful lights are easily obscured by such conditions.

The navigator who expects to make a light of considerable power should find the geographic range corresponding to his own height of eye by reference to the Visibility Table in the *Light Lists*. For lights of small luminous power it is obvious that the increased geographic range is of no interest.

If, when first sighted, a light can be made to dip below the horizon by at once lowering the eye several feet, it is evident that the vessel is at the limit of the geographic range and that the light is of considerable luminous power. If, under the same circumstances, the light cannot be made to dip, it is evident that the vessel is well within the geographic range and may, in fact, be very close to the light, and that the light is of relatively small power. This same maneuver will also aid in distinguishing the lights of another vessel from the more powerful navigational lights, as a vessel's lights are usually so limited in intensity that they do not carry far enough to be intercepted by the horizon. The distance of a light cannot be estimated by its dimness or brilliance. See inside back cover for *Distance of Visibility of Objects at Sea table*.

Buoys.—Buoyage of the United States, with color, shape, numbering, and light characteristics, is described in the introductions to the *Light Lists*. Buoys are liable to be carried away, shifted, or capsized; lighted buoys may be extinguished; or audible buoys may not sound because of storm, ice, or collision. The navigator should, if possible, check his position by shore bearings, soundings, or other means.

Vessel operators are required by law to notify the nearest Coast Guard office of collisions with aids to navigation. Such collisions frequently are not reported as promptly as desirable, and repair or replacement of aids is thereby delayed.

Fog signals that depend upon the transmission of sound through the air have, as aids to navigation, certain inherent defects that should be considered. Sound travels through the air in a variable manner, even in the absence of wind, and its behavior cannot be predicted or guarded against. The distance at which a fog signal can be heard may vary with the bearing of the signal and may be different on different occasions. The intensity of the sound may be greater at a distance than close-to. There are sometimes areas, perhaps close to the signal, where the sound is entirely inaudible. Mariners must not judge their distance from a fog signal by the intensity of the sound and must not assume that a signal is not sounding because they do not hear it.

Echoes.—When a vessel is in the vicinity of a high rocky shore the navigator may find it advantageous to time the echo of his own signal and thus obtain a rough estimate of the distance offshore. The velocity of sound in air can be taken as 1,100 feet per second. In some localities **echo boards** have been erected to facilitate this operation. Two general types are in use. The first is specially constructed so that the echo will be

heard at a specified distance off. The second is a flat surface which will reflect any sound striking it. See the *Light List* for the construction details of each echo board before using it.

Radiobeacons are operated continuously during fog and low visibility and also at scheduled intervals during clear weather, night and day. The more powerful stations have an effective range far greater than is possible with light and fog signals, and bearings of them will furnish the navigator with a valuable indication of his position long before the land is in sight.

A list and descriptive details of all marine radiobeacons are given in the *Light List* and H. O. Publication No. 205, *Radio Navigational Aids*. Radio aircraft ranges and standard broadcast stations that may be received on marine radio compasses are listed in the Appendix. Conversion of radio bearings to Mercator bearings is discussed later.

A vessel steering a course for a radiobeacon should observe the same precautions as when steering for a light or any other mark. If the radiobeacon is aboard a lightship, particular care should be exercised to avoid the possibility of collision, and sole reliance should never be placed on sighting the lightship or hearing her fog signal. If there are no dependable means by which the vessel's position may be fixed and the course changed well before reaching the lightship, a course should be selected that will insure passing the lightship at a distance, rather than close aboard, and repeated bearings of the radiobeacon should show an increasing change in the same direction.

During a period of radio propagation disturbance, radiobeacon observations may be unreliable. See later discussion under *Time Signals*.

Special operation of radiobeacon stations for calibration of direction-finders.—Certain United States radiobeacons will broadcast for the purpose of enabling vessels to calibrate their radio direction-finders upon request. Special calibration operation will be made only upon request in advance to the district commander in whose district the calibration station is located, the address and district limits of which are listed in the Appendix. The day, time, and frequency on which special calibration service is desired must be stated. If service is desired on both frequencies listed, the time that transmission on each frequency is desired must be specified. Upon the arrival at the station on the date and hour specified, station personnel may be contacted by means of the usual whistle signal or flag hoist. At stations that also have radiobeacons, when previous arrangements have not been made, the regular radiobeacon transmitter will be operated for calibration purposes in answer to the usual whistle signal or flag hoist for calibration as given below. If it is not practicable to determine the time of calibration sufficiently in advance to contact the district commander, or if the calibration is desired from a remote station where communication is difficult, request may be made directly to the station by means of telephone, telegraph, or a whistle signal consisting of three long blasts followed by three short blasts, this whistle signal to be repeated until same is acknowledged by the station through the starting of the transmitter. The same group of signals will be sounded at the termination of calibration.

If attention of station or lightship is not attracted by the whistle signals, hoist the International Code signal, **J** over **K**, to indicate request for radio direction finder calibration.

The work of the station personnel is not confined to standing watch and there may be times when the whistle request for calibration is not immediately heard, due to the

noise of the operating station, etc. Usually, a repeated signal not too far from the station will attract attention.

Transmission for calibration purposes will be continuous without the 2-minute silent interval unless another station in the same frequency group is in operation at the time, in which case calibration operation will be "1 minute on, 2 minutes off." No continuous transmission for calibration will be undertaken during regular schedule periods of operation.

In addition to the special operation of regular radiobeacon transmitters for calibration of direction-finders, special radio direction-finder calibration transmitters of short range are also operated at certain localities to provide continuous service. These stations with information as to position, frequency, and characteristic are given in the *Light Lists*.

Radio bearings.—No exact data can be given as to the **accuracy** to be expected in radio bearings taken by a ship, since the accuracy depends to a large extent upon the skill of the ship's operator, the condition of the ship's equipment, and the accuracy of the ship's calibration curve. Mariners are urged to obtain this information for themselves by taking frequent radio bearings, when their ship's position is accurately known, and recording the results. United States radiobeacons are operated on hourly schedules regardless of weather conditions and at other times upon request (see special operation of radiobeacon stations given in *Light Lists*), giving mariners opportunity to make such frequent observations and often to check the results directly with visual bearings.

Skill in the operation of the radio direction-finder can be obtained only by practice and by observing the technical instructions for the set in question. For these reasons the operator should study carefully the instructions issued with the set and should practice taking bearings frequently so that when bearings are needed he can obtain them rapidly and accurately.

As the bearings are obtained by revolving the direction-finder coil until the signal disappears or becomes a minimum, the operator can tell by the size of the arc of silence or of minimum strength approximately how accurately he has taken the bearing. For instance, if the minimum is broad and the residual signal covers about 10° with equal strength, it is doubtful if the bearing can be accurately estimated within 3° or 4°. Where direction-finder bearings are not taken by the navigating officer, it will frequently be advantageous for the mariner to have his ship's operator report the probable operator's error of the bearing taken.

Radio bearings from other vessels.—Any vessel with a radio direction finder can give a bearing to a vessel equipped with a radio transmitter. Such service will generally be furnished when requested, particularly by Government vessels. These bearings, however, should be used only as a check, as comparatively large errors may be introduced by local conditions surrounding the radio direction-finder unless known and accounted for. Any radio station, for which the position of the transmitter is definitely known, may serve as a radiobeacon for vessels equipped with a radio direction-finder. However, mariners are cautioned that stations established especially for maritime service are more reliable.

Conversion of radio bearings to Mercator bearings.—The increasing use of radio directional bearings for locations of ships' positions at sea, especially during foggy weather, has made it particularly desirable to be able to apply these radio bearings directly to the nautical chart. These radio bearings are the bearings of the great circles

passing through the radio stations and the ship, and, unless in the plane of the Equator or of a meridian, would be represented on a Mercator chart as curved lines. Obviously it is impracticable for a navigator to plot such lines on a Mercator chart, so it is necessary to apply a correction to a radio bearing to convert it into a Mercator bearing, that is, the bearing of a straight line on a Mercator chart laid off from the sending station and passing through the receiving station.

A table of corrections is given in the Appendix for the conversion of a radio bearing into a Mercator bearing. It is sufficiently accurate for practical purposes for distances up to 1,000 miles.

The only data required are the latitudes and longitudes of the radiobeacons and of the ship by dead reckoning. The latter is scaled from the chart, and the former is either scaled from the chart or taken from the list of radiobeacons in the *Light List* or H. O. Publication No. 205, *Radio Navigational Aids*.

The table is entered with the differences of longitude in degrees between the ship and station (the nearest tabulated value being used), and opposite the middle latitude between the ship and station, the correction to be applied is read.

The sign of the correction (bearings read clockwise from the north) will be as follows: In north latitude, the minus sign is used when the ship is east of the radiobeacon and the plus sign used when the ship is west of the radiobeacon. In south latitude, the plus sign is used when the ship is east of the radiobeacon, and the minus sign is used when the ship is west of the radiobeacon.

To facilitate plotting, 180 degrees should be added to or subtracted from the corrected bearing, and the result plotted from the radiobeacon.

Should the position by dead reckoning differ greatly from the true position of the ship as determined by plotting the corrected bearings, a retrial should be made, using the new value as the position of the ship.

Numbering and recording of undocumented vessels.—Under the act of June 7, 1918, as amended, and the regulations issued thereunder, every undocumented vessel operated in whole or in part by machinery, owned in the United States and found on the navigable waters thereof, except public vessels and vessels not exceeding 16 feet in length, measured from end to end over the deck excluding sheer, temporarily equipped with detachable motors, shall be numbered. The requirements contemplate that machinery-propelled undocumented vessels of less than 5 net tons used for commercial purposes, which are owned in the United States and found on such waters, be numbered under the provisions of the act as such vessels, by reason of tonnage, are exempt from documentation. The Numbering Act, however, is for the purpose of identification only and the certificate of award of number which is issued to any such vessel is solely for such purpose. It is not an authorization, license, or permit for any such vessel to engage in trade.

Vessels of 16 gross tons and over used exclusively for pleasure purposes are entitled to be documented as yachts by the Bureau of Customs. The documentation of such vessels as yachts is not a mandatory requirement, however, and where such vessels are machinery-propelled and found on United States waters, if not documented, they must be numbered under the provisions of the act. There is no restriction as to length, tonnage, or size of such vessels and the provisions of the Numbering Act should not be confused with those of the Motorboat Act of 1940 providing for the equipment of motorboats not exceeding 65 feet in length and with other machinery-propelled vessels. The regulations issued by the Commandant of the Coast Guard under authority of the Numbering Act

clarify the language of the statute requiring the following undocumented vessels to be numbered:

(*a*) All boats equipped with permanently installed motors.

(*b*) All boats over 16 feet in length equipped with detachable motors.

The following undocumented vessels are not required to be numbered:

(*a*) Public vessels.

(*b*) All boats not exceeding 16 feet in length temporarily equipped with detachable motors.

(*c*) Motor lifeboats carried as lifesaving equipment on inspected vessels.

The words *temporarily equipped with detachable motors* shall be construed to mean outboard motors which are clamped or otherwise temporarily fastened as distinguished from outboard motors bolted or otherwise permanently secured. The controlling principle shall be whether or not the vessel has permanently installed motors rather than the design or construction of the vessel. A boat designed specifically for the use of an outboard motor as the ordinary means of propulsion, if not exceeding 16 feet in length, is nevertheless exempt for the requirements of the act if temporarily equipped with an outboard motor.

Applications and issuance of numbers.—Upon the purchase of an undocumented vessel which has been issued a certificate of award of number under the provisions of the act of June 7, 1918, as amended, and after completion of the bill of sale on the reverse side of the certificate by the vendor or the former owner, the purchaser should execute the application for number for undocumented motor vessel, which is incorporated on the reverse side of the certificate of award of number (CG 1513) and surrender the certificate, bill of sale, and application for a new number to the Officer in Charge, Marine Inspection, U. S. Coast Guard, having jurisdiction over the area in which the vessel is owned, within the statutory period of 10 days. That officer upon receipt of the certificate with the bill of sale and application properly executed, and upon being satisfied with the evidence of ownership, will assign a number to the vessel and forward the certificate and accompanying papers to the District Commander for processing. He will at the same time issue to the new owner a letter authorizing the operation of the vessel for a limited period, without the certificate of award of number on board, pending the issuance of such papers by the District Commander.

In the case of such vessels which are new or which have never been numbered under the provisions of the act of June 7, 1918, as amended, or which are operating under the old form of certificate of award of number, application should be made to the Officer in Charge, Marine Inspection, U. S. Coast Guard, having jurisdiction over the area in which the vessel is owned, for a certificate of award of number by presenting proper evidence of ownership such as a bill of sale, or builder's certificate, and by the execution of Form CG 1512, application for number for undocumented motor vessel. Upon the execution of these cards in duplicate and the presentation of evidence of ownership, the Officer in Charge, Marine Inspection, U. S. Coast Guard, will accept the application and accompanying papers, transmitting same to the District Commander for processing and will thereupon assign a number to the vessel, at the same time issuing a letter authorizing the operation of the vessel for a temporary period under the numbers assigned and pending the issuance of a certificate of award of number by the District Commander.

Number required on bows of vessels.—Upon assignment of a number by the Officer in Charge, Marine Inspection, U. S. Coast Guard, or upon receipt of the certificate of

award of number, the number awarded shall be painted or attached to each bow of the vessel and shall be in block characters of good proportion and not less than 3 inches in height, reading from left to right and parallel with the waterline, as near the forward end of the bow as legibility of the entire number for surface and aerial identification permits. The number shall also be of a color in contrast with the color of the hull so as to be distinctly visible and legible.

Carrying certificate of award of number.—The certificate of award of number must be kept on board at all times (unless in the custody of the Coast Guard), except in the case of vessels not exceeding 17 feet in length, or vessels whose design or fittings are such that the carrying of such certificate on board would render it imperfect, illegible, or would otherwise tend to destroy its usefulness as a means of ready identification.

Search and rescue operations for surface vessels or aircraft in distress or overdue are coordinated by the Coast Guard. Air-Sea Rescue planes have special markings of chrome yellow on the wing tips and wing-tip floats. The cooperation of vessel operators with the Air-Sea Rescue planes may mean the difference between life and death of some seaman or aviator.

Operators of disabled wooden craft that are, or may consider themselves to be, the object of a search should hoist on a halyard or otherwise place aloft any metallic object that would assist their detection by radar. All Coast Guard patrol vessels, planes, and some buoy tenders utilize this equipment and thus can continue searches in darkness and during other periods of low visibility if it can be assumed that the object of the search can be detected through the use of this aid.

Actual observations have shown that wooden hulls or other non-metallic objects are suited as radar targets according to the size, orientation, shape, and other radar-reflecting qualities of the object. Their value as radar targets may be enhanced by the use of special radar-reflecting devices properly oriented and placed as high above the waterline as possible. The largest metallic object available should be used.

Ships in distress.—Radio-equipped vessels requiring assistance may obtain the services of the Coast Guard by transmitting a request on the international distress and calling frequency 500 kc. to "Any Coast Guard Unit" (radio call NCU), or to any shore radio station addressed to "COGUARD." Shore radio stations will forward to the Coast Guard all information regarding vessels requiring assistance unless such information is contained in a message specifically addressed elsewhere.

If the following information is included in the original request for assistance it will place the responsible Coast Guard officer in a position to determine immediately the types and number of vessels required to render adequate aid, thus greatly facilitating the work of the Coast Guard and avoiding any unnecessary delay in the dispatching of assistance:

1. Name, type, and nationality of vessel: color, size, and shape.
2. Position, course, and speed (including drift).
3. Nature of trouble and condition of vessel, sea, and wind. Action taken, if any.
4. Number of persons on board.
5. State whether or not Coast Guard assistance is required.

Small craft in distress.—Under the provision of the international regulations, which permits the use of any means available to a vessel or aircraft in distress to draw attention

and obtain help, small commercial and private craft equipped with radiotelegraph or radiotelephone apparatus that cannot be operated on the international distress frequency of 500 kc. (600 m.) may usually obtain United States Coast Guard assistance by transmitting the distress signal or call and the message on the 2670 kc. (112 m.) frequency. Practically all Coast Guard units maintain a continuous watch on 2670 kc. and will answer emergency calls thereon, if heard.

Submarine emergency identification signals.—The following smoke-bomb or flare signals are made by submarines of the United States in cases of necessity:

Black or green indicates torpedo has been fired; will be used to simulate torpedo firing on special exercises such as convoy exercises.

Yellow indicates that submarine is about to come to periscope depth from below periscope depth. Surface craft terminate antisubmarine counterattacks and clear vicinity of submarine. Do not stop propellers!

Red indicates an emergency condition within the submarine and she will surface immediately if possible. Surface vessels clear the area and stand by to give assistance after the submarine has surfaced. In case of repeated red signals, or if the submarine fails to surface within a reasonable time, she may be assumed to be disabled. Buoy the location, look for submarine marker buoy, and attempt to establish sonar communications. Advise naval authorities.

The foregoing, all of which mark the submarine's position, are fired from a submerged signal ejector into the air to a height of about 300 feet, then float downward slowly, suspended from a small parachute, and give colored illumination for about 30 seconds.

Submarines are also equipped with marker buoys which are about 3 feet in diameter, painted yellow, and equipped with telephones for communication with the interior of the submarine. A submarine on the bottom in distress and unable to surface, will, if possible, release this buoy. An object of this description which is sighted on the surface of the water should be investigated and naval authorities advised.

Signals for aid of aircraft in distress.—The information below is quoted from Annex 12 to International Civil Aviation Organization (S. A. R.) (Annex), Search and rescue signals.

6.1—Signals with surface craft.

6.1.1—When it is necessary for an aircraft to direct a surface craft to the place where an aircraft or a surface craft is in distress, the aircraft shall do so by transmitting precise instructions by any means at its disposal. If such precise instructions cannot be transmitted or when necessary for any other reason, the instructions shall be given by using the procedure prescribed in 6.1.2.

NOTE.—Normally a change of heading will be made by a surface craft as an acknowledgement that the direction has been received and will be complied with. If the surface craft is unable to comply it will so indicate by hoisting the International flag N, or by other visual or radio means.

6.1.2.—The following procedures performed in sequence by an aircraft shall mean that an aircraft is directing a surface craft toward an aircraft or a surface craft in distress:

(a) Circling the surface craft at least once.

(b) Crossing the projected course of the vessel close ahead at a low altitude, opening and closing the throttle, or changing the propeller pitch.

(c) Heading in the direction in which the surface craft is to be directed. Repetition of such procedures shall have the same meaning.

6.1.3—The following procedure performed by an aircraft shall mean that the assistance of the surface craft to which the signal is directed is no longer required:

Crossing the wake of the vessel close astern at a low altitude, opening and closing the throttle, or changing the propeller pitch.

Mariners are advised that while U. S. Government vessels or planes in distress may exhibit the recognized International Distress signals, as set forth under the International Rules of the Road, they may be equipped with an additional distress signalling device intended to supplement the regular distress signals. This apparatus emits an orange smoke visible by day and red flames which can be seen at night.

Rescue operations for ditching and disabled aircraft.—Mariners may at any time be called upon to assist aircraft, which have become disabled, in the process of ditching these craft in the ocean and completing the rescue of personnel aboard.

The following procedure and suggestions are set forth by the Commander, Eastern Area, U. S. Coast Guard:

Establish good means of communication with aircraft if possible and attempt to get as close together as time permits before actual ditching takes place. Describe the force and direction of the surface wind and condition of the sea as accurately as possible. This factor will greatly affect the pilot's decision in how to ditch his plane and is often the deciding factor in a successful ditching operation. If the operation is to be attempted at night, use of the searchlight and all other ship's lighting has been found very beneficial, but care should be taken that the pilot of the aircraft is not blinded by the lights.

After the ditching has been completed, care must be taken not to maneuver the ship too close to the aircraft, as they might drift together.

Station several lookouts if possible in high places and assign each one a separate boat, life raft, or survivor so that if the survivors become separated they can be readily picked up.

In addition to the regular lifeboat equipment in the ship's boat, it has been proved that the following items are also useful:

Blankets, several flashlights, 2 pairs of heavy gloves, pliers, bolt cutters, metal shears, 2 fire axes, extra life jackets, an inflatable rubber or cork life raft, and several 10-fathom lengths of nine thread.

The rubber or cork life raft can be used to lay alongside the ditched aircraft in cases where the metal lifeboat might become damaged.

After rescue operations are completed, the mariner should make every effort to recover or destroy all equipment or wreckage to preclude future sightings and reporting.

Reports of accidents.—The licensed officer in command of any vessel shall report in writing and in person to the Coast Guard officer nearest the port of first arrival any accident to said vessel involving loss of life, or damage to property, and shall also report in like manner any casualty or loss of life from whatever cause of any person on board such vessel and any stranding or grounding, whether or not any damage has been sustained by the vessel.

THE CORPS OF ENGINEERS, United States Army, has charge of the improvement of the rivers and harbors of the United States and of miscellaneous other civil works which include the administration of the Federal laws enacted for the protection and preservation of navigable waters of the United States, the establishment of regulations for the use, administration, and navigation of navigable waters, the approval of plans of bridges, the alteration of obstructive bridges, the establishment of anchorage grounds and harbor lines, the removal of sunken vessels obstructing or endangering navigation, and the granting of permits for structures or operations in navigable waters.

Information concerning the various ports, improvements, channel depths, navigable waters, and the condition of the Intracoastal Waterways in the areas under their jurisdiction may be obtained direct from the District Engineer offices; see Appendix.

Anchorage areas and restricted areas in most places are defined and regulations governing them are established by the Corps of Engineers. The regulations are enforced by the United States Coast Guard, and the areas are shown on the large-scale charts of the Coast and Geodetic Survey. Copies of the regulations may be obtained at the offices of the Corps of Engineers. The regulations also are copied into the appropriate Coast Pilots.

The **Port Series,** prepared jointly by the Corps of Engineers and the Maritime Administration and sold by the Superintendent of Documents, are complete reports on the principal seaports of the United States and are primarily of interest to commercial and industrial concerns. They cover the subjects of particular interest to the shipping world, such as the physical features of each port, its organization and practices, regulations regarding the movement of ships and goods, port dues and charges, fuel and water, rail connections, and commerce.

Protection of navigable waters.—Given below are extracts from the laws of the United States for the protection and preservation of the navigable waters of the United States.

That it shall not be lawful to throw, discharge, or deposit, or cause, suffer, or procure to be thrown, discharged, or deposited either from or out of any ship, barge, or other floating craft of any kind, or from the shore, wharf, manufacturing establishment, or mill of any kind, any refuse matter of any kind or description whatever, other than that flowing from streets and sewers and passing therefrom in a liquid state, into any navigable water of the United States, or into any tributary of any navigable water from which the same shall float or be washed into such navigable waters; and it shall not be lawful to deposit, or cause, suffer or procure to be deposited material of any kind in any place on the bank of any navigable water, or on the bank of any tributary of any navigable water, where the same shall be liable to be washed into such navigable water, either by ordinary or high tides, or by storms or floods, or otherwise, whereby navigation shall or may be impeded or obstructed.

That it shall not be lawful to tie up or anchor vessels or other craft in navigable channels in such a manner as to prevent or obstruct the passage of other vessels or craft; or to voluntarily or carelessly sink, or permit or cause to be sunk, vessels or other craft in navigable channels; or to float loose timber and logs, or to float what is known as sack rafts of timber and logs in streams or channels actually navigated by steamboats in such a manner as to obstruct, impede, or endanger navigation. And whenever a vessel, raft, or other craft is wrecked and sunk in a navigable channel, accidentally or otherwise, it shall be the duty of the owner of such sunken craft to immediately mark it with a buoy or beacon during the day and a lighted lantern at night, and to maintain such marks until the sunken craft is removed or abandoned, and the neglect or failure of said owner so to do shall be unlawful; and it shall be the duty of the owner of such sunken craft to commence the immediate removal of the same and prosecute such removal diligently, and failure to do so shall be considered as an abandonment of such craft, and subject the same to removal by the United States as hereinafter provided for.

That, except in case of emergency imperiling life or property, or unavoidable accident, collision, or stranding, and except as otherwise permitted by regulations prescribed by the Secretary as hereinafter authorized, it shall be unlawful for any person to discharge, or suffer, or permit the discharge of oil by any method, means, or manner into or upon the coastal navigable waters of the United States from any vessel using oil as fuel for the generation of propulsion power, or any vessel carrying or having oil thereon in excess of that necessary for its lubricating requirements and such as may be required under the laws of the United States and the rules and regulations prescribed thereunder. The Secretary is authorized and empowered to prescribe regulations permitting the discharge of oil from vessels in such quantities, under such conditions, and at such times and places as in his opinion will not be deleterious to health or sea food, or a menace to navigation, or dangerous to persons or property engaged in commerce on such waters, and for the loading, handling, and unloading of oil.

WEATHER BUREAU.—Weather forecasts and warnings of the approach of storms over land and ocean areas are among services of the Weather Bureau to navigation, commerce, agriculture, and the general public. Other warnings cover cold waves, frost, forest-fire hazard, floods, and many types of weather conditions affecting the nation's economy.

Meteorological information is collected and transmitted at hourly, 3-hourly and 6-hourly intervals from land stations, ships at sea, and aircraft. These reports form a basis for the forecasting service, for summarization and publication of climatological data having general value and applicability, and for research basic to improvement of the national weather service.

Weather Bureau offices are located in many ports and other places throughout the continental United States and possessions. Stations in the area of concern to this Coast Pilot, at which the public may compare barometers against Weather Bureau barometers and discuss matters of weather service with Weather Bureau officials, are listed in the Appendix. By international agreement, the Weather Bureau also bears a share in the maintenance and operation of certain weather ships on the free oceans.

Marine meteorological service.—The collection of observations from ships at sea is conducted on a purely voluntary and cooperative basis. The Weather Bureau supplies shipmasters with blank forms, printed instructions, and such other material as is essential to the making and recording of observations. In the course of an average peace-time year, more than 100,000 observations are received from vessels representing every maritime nation and reaching every quarter of the globe. Among the publications that include reports based on this cooperative service are the *United States Coast Pilots*, which contain sections on weather and climate, storm charts, and meteorological tables. The *Pilot Charts* of the Hydrographic Office contain ocean meteorological data prepared in the Weather Bureau; *Sailing Directions* and *Naval Air Pilots* also contain summaries of weather information prepared by the Weather Bureau for various parts of the world from reports rendered chiefly by officers of merchant ships.

The **hurricane and storm warning service** was established primarily to aid marine interests. Storm warnings are prepared at regular district forecast centers and at special hurricane forecast centers. The warnings are distributed to the public through all neighboring Weather Bureau offices by radio, the press, and every other available means. During the West Indian hurricane season, June to November, inclusive, special teletype circuits expedite the exchange of special reports from the Atlantic and Gulf coasts. Special ship reports are described later under the heading of *Reports from Ships*.

Special aircraft reports are obtained during the hurricane season from weather reconnaissance planes which fly near the storms and sometimes into the storm centers.

Storm warning signals are displayed by the United States Weather Bureau from about 400 towers or flagstaffs on the Atlantic, Gulf, and Pacific coasts and on the shores of the Great Lakes. No displays are made in Alaska since distribution of the messages usually is effected by local rado broadcasts. Day and night displays are illustrated in the front of this Coast Pilot.

These storm signals are used to warn of the approach of a storm of marked violence with the wind beginning to blow from the indicated direction. The mariner must bear in mind that the storm signals do not necessarily mean that a storm will occur at the place where the signal is displayed, but that one is expected either there or within such a distance that vessels leaving port would be liable to be caught in it.

Other means by which weather information of public concern is circulated are described under the headings of *Weather Broadcasts* and *Reports from Ships* in this chapter. A table of commercial radio stations which broadcast directly from Weather Bureau microphones is contained in the Appendix. Additional information pertaining to weather radio or teletype services may be requested from the Weather Bureau, Washington 25, D. C.

Weather Bureau publications may be obtained from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., upon payment of list price. The current *Price List of Weather Bureau Publications* may be requested from the Weather Bureau, Washington 25, D. C. Certain publications, such as *Annual Meteorological Summaries,* may be obtained free of charge, ordinarily from the individual Weather Bureau offices which prepare them.

THE HYDROGRAPHIC OFFICE of the United States Navy exists for the improvement of the means of navigating safely the vessels of the United States Navy and the mercantile marine by providing accurate nautical charts, light lists, and sailing directions (pilots) of foreign navigable waters, navigator's tables and manuals of instruction for the use of all vessels of the United States, and for the benefit and use of navigators generally.

Publications issued by the Hydrographic Office include Charts of the high seas and all foreign waters, Sailing Directions and Light Lists for the same areas, Table of Distances Between Ports, Radio Navigational Aids, Radio Weather Aids to Navigation, International Code of Signals, and the American Practical Navigator (Bowditch). Periodic publications include the Daily Memorandum, the weekly Notice to Mariners, the weekly Hydrographic Bulletin, and the monthly or quarterly Pilot Charts for the various oceans; see *Publications* at the end of this chapter.

The weekly **Notice to Mariners,** published in two parts, contains corrections to Charts, Coast Pilots, Sailing Directions, Light Lists, and other publications. Part I, Western Hemisphere, covers North and South America, Greenland, and the Hawaiian Islands; Part II, Eastern Hemisphere, covers the rest of the world. Part I contains corrections to H. O. 205, *Radio Aids to Navigation,* and to the H. O. Chart Catalog and includes other items of world coverage; both parts include appropriate tables of corrections to charts and Light Lists.

THE BUREAU OF CUSTOMS enters and clears vessels; supervises the discharge of cargo; ascertains the quantities of imported merchandise, appraises and classifies such merchandise, and assesses and collects the duties thereon; controls the custom warehousing of imported merchandise; and enforces customs and other laws by inspecting international traffic by vessels.

The Bureau of Customs administers the navigation laws pertaining to registry, enrollment, and licensing of vessels, including the issuing of commissions to yachts and the assignment of signal letters; the measurement of vessels, administration of tonnage duties, and the collection of tolls; the regulation of vessels in the coasting and fishing trade and limitation of the use of foreigh vessels in waters under the jurisdiction of the United States; the recording of sales, conveyances, and mortgages of vessels; the protection of steerage passengers; and the remission of fines, penalties, and forfeitures incurred under the laws governing these matters. Collection districts and ports of entry located within the area covered by this Coast Pilot are tabulated in the Appendix.

Documents.—All vessels, owned and operated by citizens of the United States, of more than 5 net tons propelled by machinery and others of more than 20 net tons used for commercial purposes are required, with few exceptions, to be documented by the Bureau of Customs. These documents include a description of the vessel's characteristics, its measurements, and, in some cases, the name of the master; the type of document indicates the trade in which the vessel is engaged.

Seagoing vessels under **registry** are to engage only in trade with foreign countries and with the Islands of Guam, Tutuila, Wake, Midway, and Kingman Reef. Vessels of more than 20 net tons under **enrollment** or of less than 20 net tons under **license** are to engage only in coastal or Great Lakes trade or fishing.

Vessels used exclusively for pleasure and not for transporting merchandise or carrying passengers for pay may be documented as yachts. A **commission** may be issued to the owner of a documented yacht to identify the yacht and its owner during a foreign voyage.

THE IMMIGRATION AND NATURALIZATION SERVICE administers the laws relating to the admission, exclusion, and deportation of aliens, the registration and fingerprinting of aliens, and the naturalization of aliens lawfully resident in the United States.

The primary function of the Immigration Border Patrol is to detect and prevent the smuggling and surreptitious entry of aliens into the United States in violation of the immigration laws, and to apprehend smugglers of aliens and aliens who have effected unlawful entry.

The immigration laws provide that there shall be paid to the collector of the customs by the master, agent, owner, or consignee of a vessel arriving at a United States port from a foreign port a head tax of $8 for, with certain exceptions, every alien passenger entering the United States.

The designated ports of entry for aliens are divided into three classes. Class A is for all aliens. Class B is only for aliens who at the time of applying for admission are lawfully in possession of valid and unexpired resident aliens' border-crossing identification cards or valid nonresident aliens' border-crossing identification cards. Class C is only for aliens who are arriving in the United States as seamen as that term is defined

in the last sentence of section 1 of the Immigration Act of 1917 (39 Stat. 874; 8 U. S. C. 173) [That the term *seaman* as used in this Act shall include every person signed on the ship's articles and employed in any capacity on board any vessel arriving in the United States from any foreign port or place.] No alien may enter the United States until he has been inspected by an immigration officer. A list of the ports of entry for aliens is given in the Appendix.

THE PUBLIC HEALTH SERVICE, in addition to its other duties, administers hospitalization and outpatient treatment to legal beneficiaries of the Government; it also administers the foreign and domestic quarantine laws, supervising the medical examination of immigrants and enforcing interstate laws.

Radio report of disease aboard.—The master of the vessel shall report promptly by radio, to the medical officer in charge at the port of entry, the occurrence or suspected occurrence on board of any of the following communicable diseases: * anthrax, chancroid, * chickenpox, * cholera, * dengue, * diphtheria, favus, gonorrhea, granuloma, impetigo contagiosa, * infectious encephalitis, inguinale, leprosy, lymphogranuloma venereum, * measles, * meningococcus meningitis, * plague, * poliomyelitis, * psittacosis, ringworm of the scalp, * scarlet fever, * smallpox, * streptococcic sore throat, syphilis, trahoma, tuberculosis, * typhoid fever, * typhus, * yellow fever, or other diseases characterized by fever or skin rash.

Quarantine.—A vessel arriving at a port under the control of the United States shall undergo quarantine inspection prior to entry unless: (1) In the current voyage the vessel has not touched at any port other than those under the control of the United States, or in Canada, the Islands of St. Pierre and Miquelon, Iceland, Greenland, the West Coast of Lower California, Cuba, the Bahama Islands, the Canal Zone, the Bermuda Islands, and the Islands of Aruba and Curacao; or (2) in the current voyage the vessel has received pratique at a port under the control of the United States and since receiving same has not touched at a port other than those listed in (1); or (3) the vessel possesses a duplicate of a pratique issued at a port in Canada or the Canal Zone and since receiving same has not touched at ports other than those listed in (1).

A vessel otherwise exempt from quarantine inspection shall undergo such inspection prior to entering a port under the control of the United States if the vessel has aboard a person infected or suspected of being infected with any of the communicable diseases asterisked (*) in the radio report list above; or if the vessel arrives from a port where at the time of departure there was present or suspected of being present cholera, plague, or yellow fever, or there was a significant increase in the prevalence of smallpox or typhus.

Vessels subject to quarantine inspection shall upon arrival at ports under the control of the United States fly a yellow flag (International Code Flag Q—Queen), anchor in the quarantine anchorage, and await inspection. Only the quarantine officer, quarantine employees, or pilots shall be permitted to board any vessel subject to quarantine inspection until after it has been inspected by the quarantine officer and granted pratique, except with the permission of the quarantine officer. A person boarding such vessel shall be subject to the same restrictions as those imposed on the persons on the vessel.

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Sanitary inspection.—Vessels arriving at a port under the control of the United States from a foreign port shall be subject to sanitary inspection to ascertain whether there exists rodent, vermin, or insect infestation or other unsanitary condition requiring measures for the prevention of the introduction, transmission, or spread of communicable disease.

In general, where State quarantine is in force, the minimum requirements of quarantine are in accordance with the regulations of the Public Health Service. National quarantine regulations will be found at the stations of the service and at United States consulates, and will be furnished to vessels upon application to officers of the service or to the Bureau in Washington, D. C.

Medical service.—United States merchant seamen are entitled to medical relief obtainable through the Public Health Service. A United States seaman is one engaged on board in care, preservation, or navigation of any registered, enrolled, or licensed vessel of the United States, or in the service, on board, of those so engaged. **Hospitals, outpatient clinics,** and **outpatient offices** of the Public Health Service are located at the addresses given in the Appendix. Free medical advice is furnished to seamen by radio; see H. O. Publication 205, *Radio Navigational Aids*.

THE BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE prevents the entry or spread within the United States and its territories of injurious insects and plant diseases by enforcing quarantines and restrictive orders, issued under authority provided in various acts of Congress, which prohibit or regulate the importation or interstate movement of injurious insects and of plants and products that may introduce or spread insect pests or plant diseases new to or not widely prevalent within the United States or its territories. In compliance with plant-quarantine regulations the Bureau inspects at ports of entry plants and plant products that may be brought into the United States or its territories. A list of the ports within the area covered by this Coast Pilot at which inspectors of the Bureau are located is given in the Appendix.

The Bureau inspects plants and plant products offered for export and certifies such products to shippers and other interested parties in accordance with the sanitary requirements of the country to which they may be exported.

RADIO.—The radio communications in the United States and its possessions, except the Panama Canal Zone, are controlled by the **Federal Communications Commission,** Washington 25, D. C.

Responsibility of shipmasters.—Shipmasters have the responsibility of seeing that the general radio regulations are carried out by the radio operators.

Radio inspectors.—Inspectors of the Federal Communications Commission have authority to board ships at United States ports for the inspection of the radio station to determine whether it complies with international treaties, Federal laws, and such rules and regulations of the Federal Communications Commission which may apply. In general, these inspectors operate at the following ports where field offices of the Commission are located and where information concerning radio regulations and communications may be obtained:

Boston, Mass.	San Juan, P. R.	Los Angeles, Calif.
New York, N. Y.	Tampa, Fla.	San Francisco, Calif.
Philadelphia, Pa.	New Orleans, La.	Portland, Oreg.
Baltimore, Md.	Beaumont, Tex.	Seattle, Wash.
Norfolk, Va.	Galveston, Tex.	Juneau, Alaska
Savannah, Ga.	Houston, Tex.	Honolulu, T. H.
Miami, Fla.	San Diego, Calif.	

Service documents.—The rules and regulations of the International Telecommunication Convention require that when a radio-transmitting installation is compulsory equipment on board a ship, the latter must be provided with the following service documents:

1. The radio license.
2. The operators' certificates.
3. Register (radio service log) in which shall be noted, at the time they occur, service incidents of all kinds, as well as the communications exchanged with land stations or mobile stations and relating to reports of disaster. If the regulations on board permit, the position of the ship shall be indicated once a day in the said register.
4. Alphabetical list of call letters.
5. List of coast and ship stations.
6. List of stations performing special services.
7. The general radio regulations and the additional radio regulations as well as the provisions of the convention necessary for the operations of radio-communication service on board ships.
8. The telegraph rates of the countries for which the station (ship) most frequently accepts radio-telegrams.

The rules and regulations of the United States Federal Communications Commission require certain vessels to have additional service documents, a complete list of which may be obtained from the Federal Communications Commission, Washington 25, D. C., or from its suboffices. For further details concerning the above rules and regulations consult *Ship Radiotelegraph Safety Rules, The Communications Act of 1934*, with amendments, and H. O. 205, *Radio Navigational Aids*.

Weather Broadcasts.—Marine Weather Bulletins covering North Atlantic and North Pacific waters are issued by the Weather Bureau for broadcast by commercial and Government radio stations. Bulletins for Western North Atlantic waters are broadcast by U. S. Navy Radio Station NSS, Washington, D. C., while those applicable to Eastern North Pacific waters are transmitted by Stations KPH, Bolinas, Calif., and KTK, San Francisco, Calif. A separate Marine Bulletin for Central Pacific waters is broadcast by KHK, Kahuku, T. H. The marine bulletins contain Storm Advisories, Weather Summary, and Forecasts for the next 24 hours, beginning from the time of broadcast. A selection of ship and coast station reports in abbreviated codes is included in the NSS, KTK, and KHK transmissions for use in preparing shipboard weather maps.

For those ships desiring additional surface and upper air data for preparation of weather maps at sea, Synoptic Weather Bulletins are broadcast by the Civil Aeronautics Administration Stations WSY, New York, N. Y., and WEK, New Orleans, La. Similar transmissions which also include ocean area warnings and forecasts are made by U. S. Navy Stations NBA, Balboa, C. Z.; NPG, San Francisco, Calif., and NPM, Honolulu, T. H.

Areas covered by warnings and forecasts in the marine bulletins, together with time schedules of the broadcasts, are as follows:

NSS, Washington, D. C.: North Atlantic north of Latitude 3° N. and West of Longitude 35° W., including Gulf of Mexico and Caribbean Sea—0200, 0800, 1400, and 2000 G. M. T.

NBA, Balboa, C. Z.: North Atlantic south of Latitude 25° N. and west of Longitude 60° W.; Pacific waters between Latitudes 10° S. and 30° N. and east of Longitude 110° W.—0530, 1030, 1700, and 2230 G. M. T.

NPG, San Francisco, Calif.: North Pacific south of Latitude 60° N. and from Longitude 150° W. to 105° W.—0100, 0700, 1300, and 1900 G. M. T.

KTK, San Francisco, Calif.: North Pacific waters east of the 180th meridian—0420 and 1620 G. M. T.

KPH, Bolinas, Calif.: North Pacific waters east of the 180th meridian—0500 and 1700 G. M. T.

NPM, Honolulu, T. H.: North Pacific waters from the Equator to Latitude 45° N. and from Longitude 140° W. to 160° E.—0330, 0930, 1530, and 2130 G. M. T.

KHK, Kahuku, T. H.: North Pacific from the Equator to Latitude 50° N. and from Longitude 140° W. to 160° E.—0830 and 2030 G. M. T.

Emergency broadcasts by U. S. Naval Radio Stations.—Storm warnings and notices of an urgent nature concerning the safety of navigation at sea are broadcast by United States Naval Radio stations in accordance with the degree of urgency, as follows:

A. Notices of tidal waves, hurricanes, typhoons, cyclones, etc., so imminent as to warrant immediate broadcasting:

1. One transmission immediately on receipt.
2. One transmission at the end of the first ensuing silent period.
3. One transmission during the first ensuing on-watch period for ships with one operator, in case both previous transmissions were made during the off-watch period.

B. Storm warnings and notices of less urgency than those specified in (A) and other than those normally included in scheduled hydrographic broadcasts:

1. One transmission at the end of the first ensuing silent period.
2. One transmission during the on-watch period for ships with one operator in case the previous transmission was made during an off-watch period

These broadcasts are preceded by transmission of the Urgent Signal (XXX) or Safety Signal (TTT) and a preliminary announcement on 500 kcs. of the message to follow on the station working frequency.

Emergency broadcasts by U. S. Coast Guard radio stations.—Storm and hurricane warnings, advisories, and other urgent marine information are broadcast by Coast Guard radio stations:

A. By radiotelegraph on the station's medium frequency immediately following the first silent period after receipt of the message at the radio station (HH+18 or HH+48) preceded by an initial call on 500 kc. Whenever this transmission occurs outside the watch hours for single radio operator ships, the message will be repeated at the end of the next silent period falling within the radio watch hours for such vessels. If a station makes daily broadcasts of marine information, the message will also be included in its next scheduled transmission.

B. By radiotelephone on the District Voice Working frequency immediately following receipt of the message at the radio station preceded by an initial call on 2670 kc. and repeated at the station's next scheduled broadcast.

Radiotelephone broadcasts of weather information (United States).—Transmission

by voice of weather information from the Weather Bureau is made through certain radio stations of the Coast Guard and of the commercial coastal harbor radiotelephone service. These broadcasts are followed immediately by reports of dangerous obstructions and changes in aids to navigation.

This service gives to yachts, fishing craft, tugboats, and other vessels equipped with a radio receiving set having a band covering the frequency range of 2 to 3 megacycles, official weather information from the Weather Bureau in plain language and on regular schedules.

These radiotelephone broadcasts are made twice and, in some cases, four times daily at definite times and include marine forecasts, and storm warnings whenever they are issued, for coastal waters in or adjacent to the areas served by the radio stations.

Warnings of winds likely to interfere with the safe operation of small craft are included in the broadcasts.

Certain local radio stations in the standard broadcast band have microphones installed in nearby Weather Bureau offices. From these stations forecasts, weather summaries, and warnings are broadcast on regular schedule. For stations and schedules in the area covered by this volume, see the Appendix.

West Indies.—Coast Guard station NMR, San Juan, P. R. broadcasts twice daily by radiotelephone and radiotelegraph a weather bulletin consisting of marine forecasts and weather summary for the Caribbean Sea area and small-craft, storm, and hurricane warnings when applicable.

Mexico and Canada.—Scheduled broadcasts of weather information affecting the coasts of Mexico and Canada are made by designated stations of those countries on marine frequencies by both radiotelegraph and radiotelephone.

Alaska.—Weather broadcasts are made by radiotelegraph and radiotelephone by Naval station NHB, Kodiak, and Coast Guard station NMJ, Ketchikan. Radiotelephone broadcasts are made also by various stations of the Alaska Communication System operating in the 2-megacycle band.

Circulars giving complete details relating to the broadcasting of weather information, including times and frequencies, are available on request to the Weather Bureau. Similar information is also given in H. O. 206, *Radio Weather Aids*, including decoding tables and station index numbers.

Reports from ships.—The master of every ship of the United States equipped with radio transmitting apparatus, on meeting with a tropical storm, dangerous ice, derelict, or any other direct danger to navigation, is required to cause to be transmitted a report of these dangers to ships in the vicinity and to the appropriate Government agencies.

Weather reports (United States).—Weather reports should not be sent regularly except from ships with which specific arrangements have been made by the United States Weather Bureau, but masters of all ships encountering tropical or other severe storms should send special observations by radio.

These reports should be sent in the International Meteorological Code, unsigned and checked PREPAID, UNITED STATES GOVERNMENT. They should be given Safety Message priority and addressed OBSERVER WASHINGTON from Atlantic waters and OBSERVER SAN FRANCISCO from Pacific waters.

If a copy of the code is not available on shipboard, the message may be sent in plain language. Copies of the *International Meteorological Code for Ships* may be obtained

free on application to the United States Weather Bureau, Washington 25, D. C. It may also be found in H. O. 206, *Radio Weather Aids*.

During the West Indies hurricane season, June 1 to November 30, ships in the Gulf of Mexico, Caribbean Sea area, southern North Atlantic Ocean, and the Pacific waters west of Central America and Mexico are urged to cooperate with the Weather Bureau in furnishing these special reports in order that warnings to shipping and coastal areas may be issued.

Time Signals.—The **United States system** of broadcasting time signals begins at 55 minutes 0 seconds of some hour and continues for 5 minutes. Signals are transmitted on every second during that time, except that there is no signal on the twenty-ninth second of any minute, nor on certain seconds at the ends of the minutes, as shown in the following diagram:

Minute	Second										
	50	51	52	53	54	55	56	57	58	59	60
55	—		—	—	—	—					—
56	—	—		—	—	—					—
57	—	—	—		—	—					—
58	—	—	—	—	•	—					—
59	—										—

The dashes in the above diagram indicate seconds on which signals are transmitted. The seconds marked "60" are the zero seconds of the following minutes. All seconds from 0 to 50, inclusive, are transmitted except the twenty-ninth second. The dash on the beginning of the hour (shown as 59 minutes 60 seconds) is much longer than the others, i. e., 1.3 seconds. In all cases the beginnings of the dashes indicate the beginnings of the seconds, and the ends of the dashes are without significance. It will be noted that the number of dashes sounded in the group at the end of any minute indicates the number of minutes of the signal yet to be sent. In the event of a failure or an error occurring in any of the time signals another time signal will be transmitted 1 hour later on the same frequency.

The **National Bureau of Standards** broadcasts time signals from its radio station **WWV** near Washington, D. C., on radio frequencies of 2.5, 5, 10, 15, 20, and 25 megacycles, which are on the air at all times, day and night. This insures reliable coverage of the United States and extensive coverage of other parts of the world. The services include time announcements, standard time intervals, standard audio frequencies, and radio-propagation disturbance-warning notices.

Time announcements.—The audio frequencies are interrupted at precisely 1 minute before each hour and each 5 minutes thereafter. They are resumed precisely on the hour and each 5 minutes thereafter. The beginnings of the periods, when the audio frequencies are resumed, are in agreement with the basic service of the United States Naval Observatory, and accordingly they accurately mark the hour and successive 5-minute periods.

Greenwich Mean Time is announced in telegraphic code each 5 minutes. The zero- to 24-hour system is used. This announcement refers to the end of the announcement

interval. A voice announcement of eastern standard time is given following each telegraphic code announcement.

Standard time intervals.—On each carrier frequency is a pulse which occurs at intervals of precisely 1 second. The pulse is omitted at the beginning of the last second of every minute. The 1-minute, 4-minute, and 5-minute intervals, synchronized with the second pulses, are marked by the beginning or ending of the periods when the audio frequencies are off.

A **radio propagation disturbance warning** forecast is transmitted in Morse code twice each hour at 19½ and 49½ minutes past the hour. These warnings tell users of radio transmission paths over the North Atlantic the condition of the ionosphere at the time of the announcement and how good or bad communication conditions are expected to be for the next 12 hours. During a period of radio-propagation disturbance, direction-finder observations may be unreliable; the letters "N", "U", and "W" signify that radio propagation conditions are, respectively, normal, unsettled, or disturbed.

Radio station **WWVH** is on the island of Maui, Territory of Hawaii, and broadcasts on 5, 10, and 15 megacycles. The schedule of broadcasts is the same as that of station WWV for standard time intervals, time announcements in code, standard audio frequencies, and accuracy. Simultaneous reception of WWV and WWVH does not interfere with ordinary use of the standard frequency and time signals.

The WWVH broadcast is interrupted for 4 minutes following each hour and half hour and for periods of 34 minutes each day beginning at 1900 GMT.

Additional information on the operations of stations WWV and WWVH may be obtained from the Central Radio Propagation Laboratory, National Bureau of Standards, Washington 25, D. C.

LORAN is a system of position finding by reception of radio signals from specially designed transmitting stations of known position. The name is derived by combining the first two letters of **long,** the first two letters of **range,** and the first letter of **navigation.** It is designed to furnish reliable positions to navigators at greater distances from the transmitting stations than is possible by other methods of radio navigation.

The principle of the Loran system is the determination of the difference of the distances of two radio transmitting stations from the observer, though not the actual distance of either station. This is accomplished by determining how much more time a signal or pulse from one station takes to reach him than a signal or pulse from the other. Upon a chart a curve is drawn through all points whose distances from these stations differ by the amount found from the observation. The vessel must be somewhere on this curve, which is the Loran line of position with reference to these stations. Similarly, another line of position is obtained by comparing the signals received from another pair of stations. Since the vessel must be on both lines, the point of their intersection is its position.

Because of the velocity of propagation of radio waves, 162,000 nautical miles per second, the time differences are extremely small, being measured in millionths of a second. These small time intervals are determined visually by measuring on the luminous time scale of the receiver aboard ship or aircraft the separation between reference marks made by the reception of the pulses from the transmitting stations. This time scale is formed by the motion of a point of light, which is the tip of a ray of electrons,

controlled by electrical circuits in the receiver. The components of this motion take place in a few millionths of a second and are not visually perceptible, but the complete cycle in the formation of the time scale is repeated over and over at the rate of approximately 25 times per second. Due to persistence of vision, the eye sees a continuous pattern as in motion pictures. It is on this microsecond time scale that the time difference is measured.

The position of the vessel is found from the time difference by the use of Loran charts or tables. For the service area of each pair of transmitting stations the time differences which a vessel would observe are laid down in a pattern of lines. Each line is labeled with the time difference which is common to all points on it. The navigator has only to select the line of position indicated by the reading of the Loran receiver. Loran tables are used to determine positions of greater accuracy than is possible with the average small-scale Loran chart. The tables furnish the data necessary to plot, on any chart, the required segment of the line of position.

Caution.—Loran Position determinations on or near the base-line extensions are subject to considerable error and therefore should be avoided whenever possible. For accurate position determinations in the base-line extension area, the use of a radio bearing, or other means, along with Loran lines from another rate is recommended.

Loran charts and tables are compiled and distributed by the Hydrographic Office. They are available for all effective Loran service areas, which include the more frequented portions of the North Atlantic, North Pacific, South Pacific, and Indian Oceans.

The Coast and Geodetic Survey prints Loran lines of position on various sailing, general, and coast charts.

The Hydrographic Office distributes H. O. Misc. 15308, *Loran Accuracy Diagram*, which shows, for the regions of the world where Loran is available, the limits of areas within which Loran ground wave lines of position have average errors of 1 mile or less, and areas within which sky wave lines of position have average errors of 2 miles or less. In addition, there are outlined all areas where two or more Loran lines of position intersect at angles greater than 15 degrees.

Ships using Loran in areas of dependable ground wave reception occasionally experience apparent Loran errors of 10, 20, or more miles. When sufficient fix data accompany such reported errors, it usually can be determined that a skywave match has been made, or that a ground wave has been paired with a skywave. If the navigator in either case plots his reading as a ground wave match, a sizable position error will result.

The techniques for identifying Loran signals are explained in the introductory pages of all *Loran Tables*, H. O. 221 series, and in various equipment manuals. A familiarity with these techniques is necessary to avoid troubles and to make the most of the Loran system of potentialities. In general, it may be helpful for navigators who experience large apparent Loran errors to preset the Loran indicator to the expected reading when matching pulses. Then, if master or slave pulse fails to appear, adjustment of amplitude balance controls may bring the desired signal into view at the expected setting. Usually, a consideration of distance over land or sea from the Loran transmitter, plus time of day, receiver sensitivity, and local atmospheric interference, will enable the navigator to predict reception of ground waves or sky waves, and to anticipate which he must use.

Mariners and aviators are requested to notify the Commandant (OAN), Coast Guard Headquarters, Washington 25, D. C., or the nearest Coast Guard District Commander, of any defect observed in the operation of the Loran System (blinking is **not** a defect). The notification should include information as to the Loran rate involved, whether signals observed are ground waves or sky waves, the nature of the defect, the approximate position of the craft, and the date and time (GMT) of observation of the defective operation. Suggestions for improvement of Loran service are also requested.

RADAR (Radio Detection and Ranging) is an anticollision and piloting device that may be used during darkness and low visibility to detect most objects and to furnish an accurate measurement of range under all conditions. However, it has many limitations as well as advantages. Radar is merely a supplement and a highly valuable adjunct to other navigational methods.

Radar works on the principle of echoes. Instead of sound, a radar transmits a radio signal. The radar equipment is basically an instrument for measuring the distance from the transmitter of an object which will reflect electromagnetic energy of radio frequencies.

The accuracy of a position obtained by radar varies considerably with different types of radar and the skill of the operator. In general, the accuracy of radar fixes compares favorably with, and sometimes exceeds, those obtained by other methods.

Advantages.—1. Radar can be used at night and during periods of low visibility, when most other methods are not available.

2. Radar navigation is often more accurate than other methods of piloting. The limitations of accuracy of each set should be determined.

3. Radar fixes can be obtained rapidly. With the PPI (Plan Position Indicator) scope a continuous position is available.

4. A fix can be obtained from a single object, since both range and bearing are provided.

5. Radar may be available at greater distances from land than most methods of piloting.

6. Radar is a reliable anticollision device, permitting higher speeds, with relative safety, during periods of low visibility.

Failure on the part of a Government vessel to make use of radar while under way in low visibility has been held by a court to be directly contributory to a collision in which the vessel was involved. Article 29 of both International Rules of the Road and Inland Rules of the Road are applicable. This decision places an additional burden on vessels which are equipped and manned to use radar to do so while under way during periods of reduced visibility without in any way relieving commanding officers of the responsibility of carrying out normal precautionary measures.

7. Radar can be used to locate and track violent tropical storms.

8. Radar reception is not affected by the same factors that cause interference and poor reception in radio communication. Consequently, radar's use is insured when normal radio communication is impossible.

Limitations.—1. Radar is subject to mechanical failure. Also, as radar sets are sensitive instruments requiring accurate and precise adjustment, any error in the adjustment or synchronization will cause an error in the result.

2. There are both minimum and maximum range limitations. The minimum range is dependent on several factors. Inasmuch as the receiver is disconnected while a pulse is being sent out, any echo returning during transmission of the pulse will not be indicated. Excessive sea return, or echo from nearby water, and other obstructions nearby also affect the minimum effective range. Sea return becomes less with increased range because of the change in the angle of incidence, more of the signal is reflected away from the ship and less is returned in the form of echo. A good practical minimum range is 100 yards.

Maximum range is usually limited by the curvature of the earth to the line-of-sight, or slightly more (about 15 percent), because high frequency radio waves travel in a straight line and do not follow the earth's curvature except under the abnormal atmospheric conditions heretofore mentioned. The approximate maximum range at which any given target will return an echo can be determined by means of the table of *Distance of Visibility of Objects at Sea* in the same manner used for determining the distance at which a light can be expected to be seen at sea. This assumes, of course, that the radar is of sufficient power to extend to such a distance, that the scope is graduated for range to this distance, and that the target is of a nature that it will return a good echo.

3. Radar may be unreliable or unavailable during certain atmospheric conditions. Rain, snow, sleet and clouds generally have the same effect on the picture observed on the scope. If the ship is in the midst of a light rain, radar operation is usually near normal, but there might be a slight haze on the screen. In the case of heavy concentrations of precipitation, the scope will be blanked out to some degree. However, during this time, the radar will detect normally in the other areas of the scope if the heavy precipitation is local in nature. Also, targets may be seen on the same azimuth as the storm, but either closer to or beyond it.

The operation of radar in fog is usually good and usually can be relied upon, although there may be a reduction in the range at which targets are first detected.

Wind, though not a condition of poor visibility, is even more important a factor in the operation of radar. The effects of wind are more pronounced in open water. The wind by itself gives no trouble, but the attendant sea results in an obscuration of the radar known as **sea return,** which can obscure smaller targets. The waves resulting from the wind blowing over the surface present myriad targets for the radar signals to detect, with the most pronounced effect being in the direction of the sea. Depending on sea conditions, sea return may obscure the scope up to the 10-mile range ring.

Marine radar sets are equipped with devices to minimize the effect of sea return and permit more or less normal operation of the set. Although such devices are quite effective, they do not wholly remove the sea clutter in bad weather. It is usually possible to pick up large targets, such as ships, before they get close enough to get into the sea return. Also it is possible to manipulate the various controls of the set to detect ships inside the range of the sea return, because a ship normally gives a larger concentrated echo than do waves. This depends a great deal on the human element. A radar set in this condition will be operating at reduced sensitivity and will miss small targets obscured by sea return which may still be a source of potential danger to the ship.

4. Radar cannot distinguish the *nature* of a small target. One small object capable of returning an echo looks to radar just about the same as any other. When addi-

tional electronic devices (radar aids) are used in conjunction with the radar, identification can quite often be accomplished by implication, such as movement, relation to other objects, shape (coastlines), and sometimes initial range of detection. Small boats and buoys may not be detected if they are near the shore or lack sufficient elevation to produce an echo.

5. Radar chart presentation on the scope requires interpretation due to the line-of-sight characteristics which give shadow effects, that is to say, larger intervening objects may blank out objects behind them.

6. Certain types of objects, due to their characteristics or motion, may go undetected. For example, ice and some other things, because of their physical characteristics and reflecting properties, are relatively poor targets. So is a low-lying point of land. Most icebergs can be detected at distances equal to that at which a similar land mass can be seen, but *radar is not wholly reliable in the detection of growlers and floe ice large enough to damage or sink ships.* The motion of small objects, such as small buoys and boats bobbing up and down in a seaway, tends to reduce the echo returned to the radar. These considerations become particularly important when such things as sea return and rain are present to reduce the radar visibility.

7. Radar may be less accurate than other methods of piloting. A visual bearing, for instance, is usually more accurate than the radar bearing.

8. Radar requires transmission from the ship.

WAVES.—The most common type of wave is caused by the **wind.** The size of ocean waves depends on the strength of the wind, its duration, and the extent of open water over which it blows. As they travel across the ocean, their height continually decreases, their length increases, and several days later they roll toward the coast as a long, low **swell,** or **ground swell,** which may be all but hidden by short irregular wind waves until it enters shallow water.

Waves from deep water are modified when they get into shoal water. Where the swell approaches a shoreline at an angle it tends to parallel the shore and bends into bays and around outlying points. When the depth is reduced to less than half the wave length, the waves become higher and shorter, the crest arches forward and dashes downward, breaking into **surf.** An individual breaking wave, either on a beach, an isolated rock, or a shoal, is a **breaker.**

When viewed from a vessel, especially a small boat, the surf or breaker never appears as dangerous as it is, and often when comparatively smooth at sea a dangerous surf is running which is not perceptible 400 yards offshore. Many lives have been lost unnecessarily by the crews of stranded vessels being thus deceived and attempting to land in the ship's boats.

When large swells encounter the seaward margin of a submarine terrace they break and form smaller waves, or **rollers,** which differ from the usual waves found in deep water in that they are entirely above the normal mean level. They may cross the shallow water to the shore without change until they break as surf on the beach. Rollers often carry shingle and other material shoreward along the bottom. They do not break until the depth of the water is less than the height of the wave.

Seiche is a stationary vertical wave oscillation with a period varying from a few minutes to an hour or more, but somewhat less than the tidal periods. It is usually

attributed to external forces such as strong winds, changes in barometric pressure, swells, or seismic sea waves disturbing the equilibrium of the water surface. Seiche is found both in enclosed bodies of water and superimposed upon the tides of the open ocean. When the external forces cause a short-period horizontal oscillation of the water, it is called **surge.**

The combined effect of seiche and surge sometimes makes it difficult to maintain a ship in its position alongside a pier even though the water may appear to be completely undisturbed, and heavy mooring lines have been parted repeatedly under such conditions. Pilots advise taut lines to reduce the effect of the surge.

Destructive waves.—Unusual sudden changes in height of water level can be caused by seismic sea waves or violent storms. These two types of destructive waves have become commonly known as **tidal waves,** a name which is technically incorrect as they are not the result of tide-producing forces.

Seismic sea waves are set up by submarine earthquakes. Many such seismic disturbances do not produce sea waves and often those produced are small, but the occasional large waves can be very damaging to shore installations and dangerous to ships in harbors.

These waves travel great distances and can cause tremendous damage on coasts far from their source. The wave of April 1, 1946, that originated in the Aleutian Trench demolished nearby Scotch Cap lighthouse and also caused $25,000,000 damage in the Hawaiian Islands 2,200 miles away.

The speed of seismic sea waves varies with the depth of the water, reaching 300 to 500 knots in the deep water of the open ocean. In the open sea they cannot be detected from a ship or from the air because their length is so great, sometimes a hundred miles, as compared to their height, which is usually only a few feet. Only on certain types of shelving coasts do they build up into waves of disastrous proportions.

There is usually a series of waves with crests 10 to 40 minutes apart, and the highest may occur several hours after the first wave. Sometimes the first noticeable part of the wave is the trough which causes a recession of the water from shore, and people who have gone out to investigate this unusual exposure of the beach have been engulfed by the oncoming crest. Such an unexplained withdrawal of the sea should be considered as nature's warning of an approaching wave.

Improvements have been and are being made in the quick determination and reporting of earthquake epicenters, but no method has yet been perfected for determining whether a sea wave will result from a given earthquake. The problem of detecting and reporting the existence of seismic sea waves when they do occur is being studied. A reporting system has been organized in the Pacific with its center in the Hawaiian Islands.

When an advance warning is available, water-front areas should be vacated for higher ground and ships in the vicinity of land should head for the deep water of the open sea.

Storm waves.—A considerable rise or fall in the level of the sea along a particular coast may result from strong winds and a sharp change in barometric pressure. In cases where the water level is raised, higher waves can form with greater depth and the combination can be destructive to low regions, particularly at high stages of tide. Extreme low levels can result in depths which are considerably less than those shown

on nautical charts. This type of wave occurs especially in coastal regions bordering on shallow waters which are subject to tropical storms.

Use of oil on breaking waves.—Experience has proved the usefulness of oil in modifying the effect of breaking waves and has developed simple and effective methods of using it. The principal facts developed are:

1. The heaviest and thickest oils, notably animal and vegetable oils, are the most effective. Crude petroleum is serviceable and should be used when no better oil is available; it may be improved by mixing with other oils. Refined kerosene is of little value.
2. In cold weather oils thicken and do not spread freely. This tendency to thicken may be reduced by thinning a heavy, sticky oil with petroleum.
3. A small quantity of oil suffices if it can be made to spread to windward.
4. Oil spreads very slowly so a vessel with engines stopped or running slowly before a sea can make a slick to windward but not to leeward, except perhaps close alongside, for the vessel's drift or speed will exceed the rate of spread of the oil.
5. The effect of oil on free waves—that is, on waves in deep water—is greatest.
6. The effect of oil on a surf or waves breaking on a bar where a mass of shallow water is in actual motion is less than on free waves, but oil is of some service under these conditions.
7. A vessel at sea will get the best results by drifting or running slowly before the sea and distributing oil either from canvas bags filled with oakum saturated with oil and slung over the side into the sea or from the waste pipes.
8. In crossing a bar in heavy weather oil in considerable quantities is needed on both sides of the vessel for a short time. A convenient method in this situation is to trail a hose over the bow and pour oil freely through it.
9. In crossing a bar with flood current pour oil overboard and allow the oil to float in ahead of the vessel. To an entering vessel crossing a bar with an ebb current oil is of little use.
10. Oil is useful to vessels and boats when running, lying to, or wearing.
11. A vessel riding to a sea anchor can fasten an oil bag to an endless line rove through a block on the sea anchor. This method distributes the oil ahead and provides a means to haul the bag aboard for refilling.
12. Before boarding a wreck have the wreck use oil freely on both sides, if able to do so. If the wreck cannot use oil, the rescuing vessel should first pass to leeward of the wreck, using oil freely to form a slick into which the wreck will drift. If the wreck is aground, the attending circumstances will indicate the methods to be used.
13. In lowering or hoisting boats in heavy weather, in port or at sea, oil will greatly assist the operation.
14. In towing another vessel in a heavy sea, oil should be distributed from the towing vessel forward and on both sides; if it is only distributed from the after part of the towing vessel, only the tow is benefited.

HURRICANES.—Severe tropical cyclones of the North Atlantic Ocean are usually called West Indian Hurricanes, but actually many of these storms form, move and die far out from the mainland and hundreds of miles from the West Indies. The storm field advances in a straight or curved track, sometimes with considerable speed, at other times at a much slower rate. The areas of the individual storms vary from less than 100 to more than 500 miles in width, with a comparatively calm center. Centers ranging from 4 to 22 miles across have been observed. This center is a region of lowest atmospheric pressure around which winds blow in a more or less circular course, spiraling inward in a counterclockwise direction. The wind at the outer edge of the storm area is light to moderate and gusty, and it often increases toward the center to speeds too high for instrument recording. Although the air movement inside the center or *eye* of the hurricane is usually light and fitful, the seas in this area are in most

cases very heavy and confused, rendered so by the shifting violent winds which surround it. Furthermore, after the center has passed a vessel, she may expect a sharp renewal of the gales, but blowing now from a different and more or less opposite direction. The fully developed tropical cyclone, encompassing many tens of thousands of square miles, is perhaps the most destructive of all storms.

Tropical cyclones occur over all the tropical oceans except the South Atlantic. They form in or near the region of *doldrums*, or light to calm wind movements near the Equator. In the North Atlantic, hurricanes form over a wide range of ocean between the Cape Verde Islands and the Windward Islands, over the western part of the Caribbean Sea, and over the Gulf of Mexico. While some may move northward in the beginning, especially those that form southeast of Bermuda, the majority take a westerly to northwesterly course. Of these, some curve gradually northward, either east of or above the larger islands of the West Indies, then turn northeastward or eastward near to or at some distance from the Atlantic Coast of the United States. Others pass over or to the south of the greater islands and enter the Gulf of Mexico, then curve northward or northeastward and strike some part of the east Gulf Coast, or else continue westward and strike the west Gulf Coast. The most common path is curved, the young storms moving generally in a westward direction at first, turning later to the northwestward and then to the northeastward. A considerable number of hurricanes, however, remain in low latitudes and do not turn appreciably to the northward. Freak movements are not uncommon, and there have been storms describing loops, hairpin-curved paths, and other irregular patterns. Movement toward the southeast is rare in the West Indian region, and when it does occur it is of short duration. The entire Caribbean area, the Gulf of Mexico, the coastal regions bordering these bodies of water, and the Atlantic Coast are in danger of disturbances during the hurricane season.

The June hurricanes which form in the West Indian region usually move in a direction between west and north while they are south of 25° North Latitude. In late September, October, and November, hurricanes of this region are more likely to move in a direction between north and east, passing through the Yucatan Channel, or over Cuba, Florida, or the Bahamas. Of the hurricanes that come from the Atlantic into the West Indies, the majority occur in August and September, and move on a west-northwesterly course in low latitudes, reaching the coast before curving toward the north and northeast. Late in the season, October or November, the movement of hurricanes that form east of the West Indies is often toward the north in the open Atlantic. Paths of past hurricanes, selected as typical of the different months of the hurricane season, are to be found on the *Pilot Charts* of the *North Atlantic Ocean* and *Central American Waters*, published monthly by the United States Hydrographic Office.

The average speed of movement of West Indian Hurricanes is about 10 to 13 knots. This speed, however, varies considerably according to the location of the storm, its development and surrounding meteorological conditions. The highest rates of progression usually occur when the storm is moving northward or northeastward in the middle or higher latitudes.

Storm tides and the hurricane wave.—The winds on the right side of the center (looking forward along the hurricane's path) are blowing in the same direction as the hurricane is moving, and are felt with greater force at a point over which the hurricane moves than are winds in other parts of the hurricane. These winds drive the water

forward and flood the coast in advance of the hurricane. The highest tide occurs to the right of the point where the hurricane center crosses the coast. These high tides or storm waves are one of the great dangers from the hurricane. A hurricane of large diameter generally creates higher tides on the coast than one of smaller diameter, and a slow moving hurricane may produce higher tides than one of rapid progress. In each case, the higher water is caused by the greater duration of the drive of the wind in the same direction. A tidal rise in water level may begin when the hurricane center is 500 or more miles distant, and will continue until the hurricane center moves inland. This rise is called the *hurricane tide*, and is superimposed on the normal gravitational tide. The rise is most pronounced in a partially enclosed body of water, such as the Gulf of Mexico, where the concave coastline does not readily permit the escape of water, which is thus piled up on the coastline. The strongest winds and greatest fetch being in the right quadrant, the strongest current therefore is directed along and to the right of the storm attack. Heights of *hurricane tides* near the centers of storms vary from 3 to 10 feet above mean sea level. On the Atlantic Coast the average is less, and on small islands, around which the current may flow easily, there is little or no tidal effect.

The *hurricane wave* itself, sometimes erroneously called a tidal wave, is the concerted lifting up of the level of the sea at or near the center of an intense hurricane. It usually is not a series of individual waves, but one big uplift of water, and is most noticeable in the calm center. It has been noticed in all areas where tropical storms occur. Hurricane waves occur as readily on small islands as on continental coastlines. This wave has been responsible for heavy losses of life, and precautions should always be taken against it, especially at and to the right of the point where the center will cross the coastline. The hurricane wave is superimposed upon the hurricane and gravitational tides prevailing at the time, but it usually subsides quickly, although the tidal effects may remain for some time. This wave has been ascribed to the decrease in atmospheric pressure, but even in the most severe hurricanes this would only permit a rise of approximately 5 feet, and the rise would be gradual. It now is thought, rather, that the wave is caused by the draining effect of the wind on the forward side of the calm center following against the current set up by a strong wind from the opposite direction on the rear side of the calm center. Waves of 30 feet or more in height have been reported, and instances of waves of 20 feet can be credited.

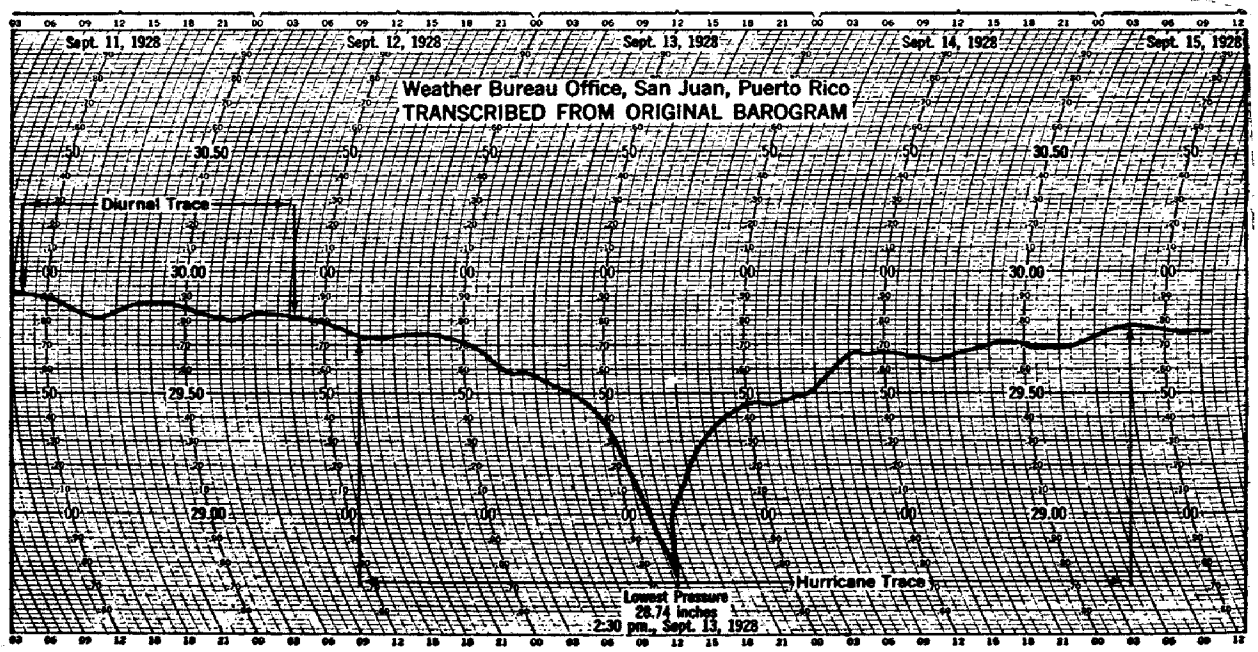
Showers have been commonly observed 300 to 500 miles in advance of a West Indian hurricane. As the storm moves somewhat nearer, there is likely to be a slight rise of the barometer as the weather clears. At the outer limits of the hurricane area itself, rainfall again is usually in the form of showers. As the center approaches further, the characteristic squalls of the hurricane begin; that is, the showers increase in frequency and intensity. Nearer the center, the rain is heavy to excessive, and continuous. Hurricane floods may do enormous damage in mountainous areas, and have resulted in high death tolls in such portions of some of the larger West Indian Islands.

Information regarding tropical cyclones by radio.—Modern developments in radio communication have made it possible for organized meteorological services to collect daily weather reports from island stations, from ships at sea, and from planes, and thus to locate tropical cyclones when they develop, and to issue warnings to shipping as to their intensities and probable movements. As a further aid, the mariner may secure weather reports direct by radio from other ships in the vicinity of the tropical cyclone. Although these radio weather reports and warnings have made it unnecessary in many

instances for the navigator to depend entirely upon his own observations and knowledge in avoiding dangerous positions with respect to the storm center, it is still an essential of good seamanship that he understand the rules for ascertaining from his own observations the existence of a tropical cyclone and for locating its center. *Attention is directed to the heading hurricane seamanship at the end of this section.*

Rules for establishing the existence of a storm and locating its center.—During the season of tropical storms, any interruption in the diurnal cycle of the barometer should be considered an indication of a change of weather. The barometer is by no means an infallible guide for warnings much in advance, but after the beginning of a storm it will, more or less, indicate the rapidity of approach and distance from the center, and its indications should in no case be disregarded.

One of the earliest indications of the approach of a tropical storm is the appearance of the sky and general clearness of the atmosphere. These storms are said to be preceded by a day of unusual clearness, when distant objects, not ordinarily visible, stand out with great distinctness. The atmosphere at such times is more than usually oppressive.



These conditions are frequently accompanied by a high barometer. The barogram shows pressure variations at San Juan during the passage of the hurricane of September 13, 1928. The changes in pressure differ in detail for individual storms. Later, there may follow a restless oscillation or pumping of the mercury, related to the disturbed condition of the atmosphere. Then the sky becomes overcast and remains so, at first with a delicate tufted cirrus, *mares' tails*, which shows no disposition to clear away at sunset, but which later becomes gradually more and more dense until the *bar*, or dark mass of the true hurricane cloud, appears upon the horizon. From the main body of this cloud, portions are detached from time to time and drift across the sky, their progress marked by squalls of rain and wind of increasing force.

Rain, in fact, forms one of the more prominent features of the storm. In the outer portions, it is fine and mistlike, with occasional showers. These later increase in frequency and in copiousness. In the neighborhood of the center, rain falls in torrents. Usually the rain area extends farther in advance of the storm than in the rear.

When the sky first becomes overcast with the characteristic veil of cirrus, the storm center most probably lies in the direction of greatest density of the cloud. It sometimes happens that the snow white fibrous mares' tails appear when the center is about 300 to 400 miles distant.

After the slight rise of the barometer as the storm first approaches, there follows a continuous fall. In front of the storm, if it is advancing from an easterly direction toward the observer, the winds blow from a northerly point (northeast, north, or northwest). If it is advancing from a southerly direction toward the observer, the winds blow from an easterly point (southeast, east, or northeast). In general, a high barometer (or restless pumping of the barometer), followed by an unusually long fall in pressure, when concurrent with other indications, warns of the approach of a hurricane.

Surrounding the actual storm area is a territory of large extent throughout which the barometer reads a tenth of an inch or more below the average, the pressure diminishing toward the central area, but with no such rapidity as is noted within the area itself. Throughout the outer ring unsettled weather prevails. The sky is ordinarily covered with a light haze, which increases in density as the center of the storm approaches. Showers are frequent. Throughout the northern portion of this ring (in the Northern Hemisphere at moderately low latitudes) the wind rises to force 6 or 8—the *reinforced trades*—and is accompanied by squalls.

Storm swells.—A further indication of the approach of a hurricane is an unusually rough, increasing sea. Another usual early indication is the occurrence of a long, heavy swell. Noticeable at a considerable distance, sometimes 2 or 3 days in advance of the storm (300 to 800 miles), the early swell will not usually match the winds or local waves observed at the vessel. The direction of the swell, and the time between crests, depend on the force and fetch of the winds at the place where the swell was formed. The normal frequency of swells in deep Atlantic waters is 8 per minute. Hurricanes set up swells with a greater wave length and period. Swell frequency is indicative of hurricane intensity. In severe storms the frequency decreases to 4 per minute. Swells will approach the observer from approximately the direction of the storm *at the time the swell was formed.*

The normal frequency of swells in the Gulf of Mexico is 12 to 15 crests per minute. Observations show storm swells in the Gulf to have 4 to 5 crests per minute; this corresponds to a period of 12 to 15 seconds between crests. An approximate rule for deep water is that groups of swells travel at a speed in knots equal to 1½ times their period. Using the rule, these storm swells travel about 20 knots. The average movement of the tropical storms is about 10 knots. Storm swells therefore are useful in detecting storms at some distance. In the case of a storm which entered the Gulf 800 miles from an observer, he might notice the swell at the vessel about 40 hours before the storm arrived, under the conditions described above. Occasionally the swell warning may not extend well ahead of the storm, however. For instance, a storm, upon arriving in the Gulf, might set up a swell whose period was 12 seconds, and which therefore would travel at about 18 knots. If the storm itself traveled at about 15 knots, the swell would reach a vessel 540 miles away only 6 hours before the storm. Hence with

a rapidly moving storm the swell may offer less of a warning, particularly in the Gulf of Mexico or at similar locations where land intervenes to prevent the arrival of the swell until the storm already is close to the vessel. In general, this warning is more effective in the case of large storms which advance slowly.

The height of the swells is also an indication of the storm's intensity, particularly when they have not encountered shallow water. Caution must be used in observing the direction of movement of swells from a coastal position, since the shallow water along the coast tends to turn the swell movement toward a direction at a right angle to the coastline (or at a right angle to the contour lines of a shoal portion of ocean floor).

Within the tropical cyclone, the winds turn to the left of the storm swell in the Northern Hemisphere. Waves do not deviate markedly from the wind in the absence of a cyclonic storm or other unusual weather condition.

If the swell comes always from the same direction, and increases, the hurricane may be following a direct path which will bring its center either toward the vessel, or near to her starboard side if she were to head into the swell. Should an observer facing the swell find that it comes in some time later from his left, the hurricane is likely to be following a path which will take its center to his left. Should an observer facing the swell find that it comes in some time later from his right, the hurricane is likely to be following a path which will take its center to his right.

The height of a swell decreases as the swell advances. An approximate rule for deep water is that swells lose one-third of their height each time they travel a distance in miles equal to their length (crest to crest) in feet. In terms of swell frequency, an approximate rule for deep water is that swells lose one-third of their height each time they travel a distance in miles equal to 5 times the square of their period (the number of seconds between successive crests).

A hurricane swell having 5 crests per minute would, then, lose one-third of its height each time it traveled about 700 miles (which travel would require only about a day for so long a swell—this point is discussed later under the heading *Compass bearing of the hurricane's center*). There is some indication that the period of the swell also increases as the swell advances, although at the present time this matter is controversial.

Should land intervene between the hurricane and the vessel, the early swell may be reduced, confused and unreliable as an indication of the hurricane's action.

As the storm center approaches, the barometer continues to fall. The wind increases in speed and blows in heavy squalls, and the changes in its direction become more rapid. The wind, in general, will back to the left during this time if the center is moving toward the observer's left, or veer to the right if toward his right as he faces into the wind. Rain in showers accompanies the squalls, and when the center comes closer the rain is usually continuous and is attended by furious gusts of wind. The air is thick with rain and spume drift. Objects at a short distance are often hardly visible. If a vessel is on the line of the hurricane's advance, the wind will remain from the same direction, or nearly so, until the center is close to the vessel, or upon her.

Distance of the hurricane's center.—The distance from the center of a hurricane can be estimated from a consideration of the height of the barometer and the rapidity of its fall, and the velocity of the wind and the rapidity of its changes in direction. If the barometer falls slowly and the wind increases gradually, it may reasonably be supposed that the center is distant. With a rapidly falling barometer and increasing winds, it

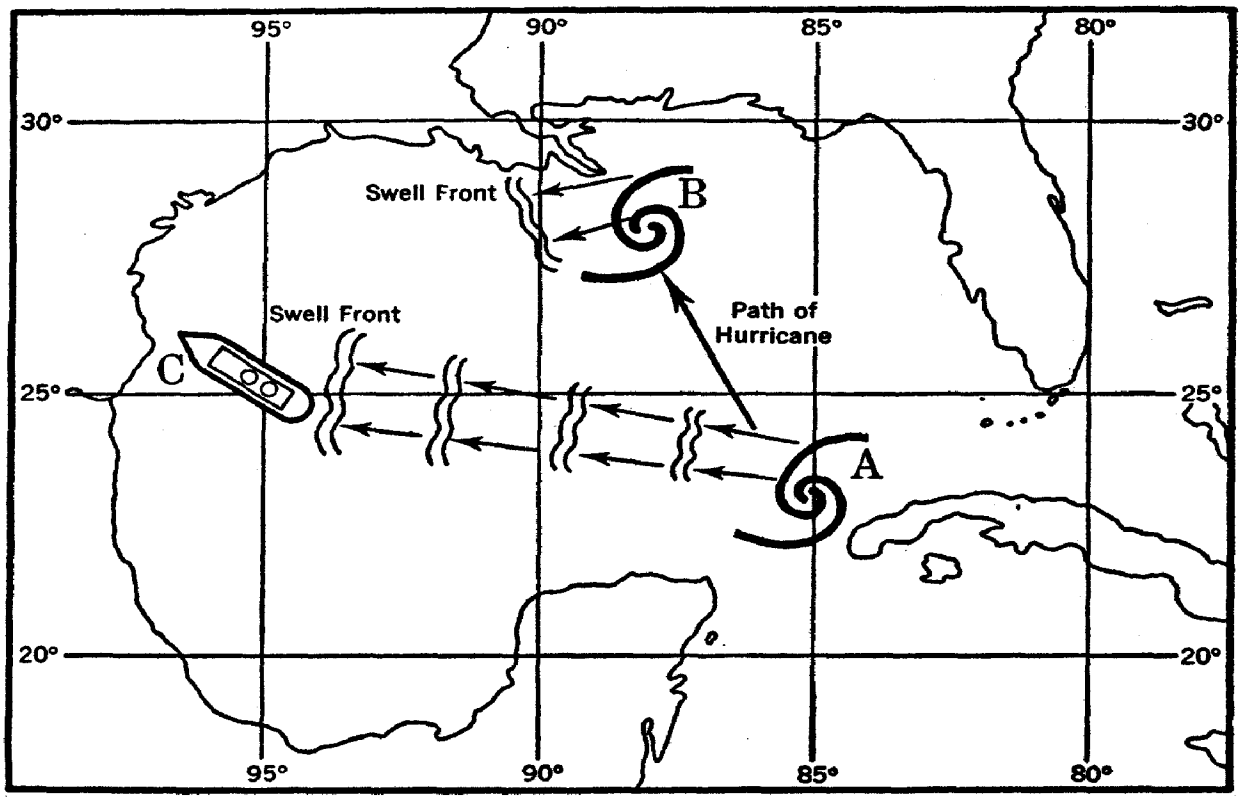
may reasonably be supposed that the center is approaching dangerously near, the more so if the winds blow closely from the direction of the increasing swell. When clearly observed, these signs will be valuable supplements to the radio reports of the storm's bearing and location. Moreover, a hurricane, however closely studied, may change its path with little apparent warning. The following old table from Piddington's *Horn Book* may serve as a guide, but it can give only an imperfect estimate of the distance and too much reliance must not be placed upon it.

Average fall of barometer per hour	Distance in miles from center
From 0.02 to 0.06 inch	From 150 to 250.
From 0.06 to 0.08 inch	From 100 to 150.
From 0.08 to 0.12 inch	From 80 to 100.
From 0.12 to 0.15 inch	From 50 to 80.

Compass bearing of the hurricane's center.—If an observer faces into the wind, the storm center is likely to be located 8 to 12 points to his right in the Northern Hemisphere. When the storm is distant, it may be 10 to 12 points, and when the barometer has fallen 5 or 6 tenths of an inch it may be nearer to 8 points. Two or more observations, apart in point of distance, would aid in estimating the location of the center, and two or more observations, apart in point of time, will aid in estimating the movement of the center.

In estimating the direction of the hurricane from a consideration of swell indications, the swell's travel time must be taken into account. The direction from which the swell comes can indicate only the position of the storm at the time when the swell was generated. The speed of movement of a group of deep water swells, in knots, is roughly 1½ times the number of seconds between successive crests. Thus a normal group of swells having 12 to 15 crests per minute in the Gulf of Mexico would advance about 7 knots. A group of hurricane swells having 4 to 5 crests per minute would advance at about 20 knots. The swell's travel time, in hours, is about two-thirds of the estimated distance of the storm, in nautical miles, divided by the number of seconds between successive crests. Actually, the individual wave is believed to travel with twice the speed of the group of swells but the group speed governs the speed of advance of the *swell front;* see diagram. The direction of the storm, and its distance, both are estimated for the time when the swell was formed. If a swell is believed to have left the storm 36 hours before arriving at the vessel, then the direction from which the swell arrives reveals only the probable direction of the hurricane 36 hours previously.

High cirrus clouds associated with a tropical cyclone move with the general air stream in which the storm is embedded. Since these clouds usually extend a considerable distance ahead of the storm center, especially in the direction of the front right quadrant, the direction of movement of the cirrus is often significant. This is especially so when a change is observed in the direction of movement of these very high clouds, indicating a corresponding change in the direction of movement of the storm. If the cirrus clouds move very slowly, however, the hurricane will tend to move at a small angle (generally less than 20°) to the right of the movement of the cirrus clouds. Moreover, very young storms may fail to follow the path of the cirrus clouds.



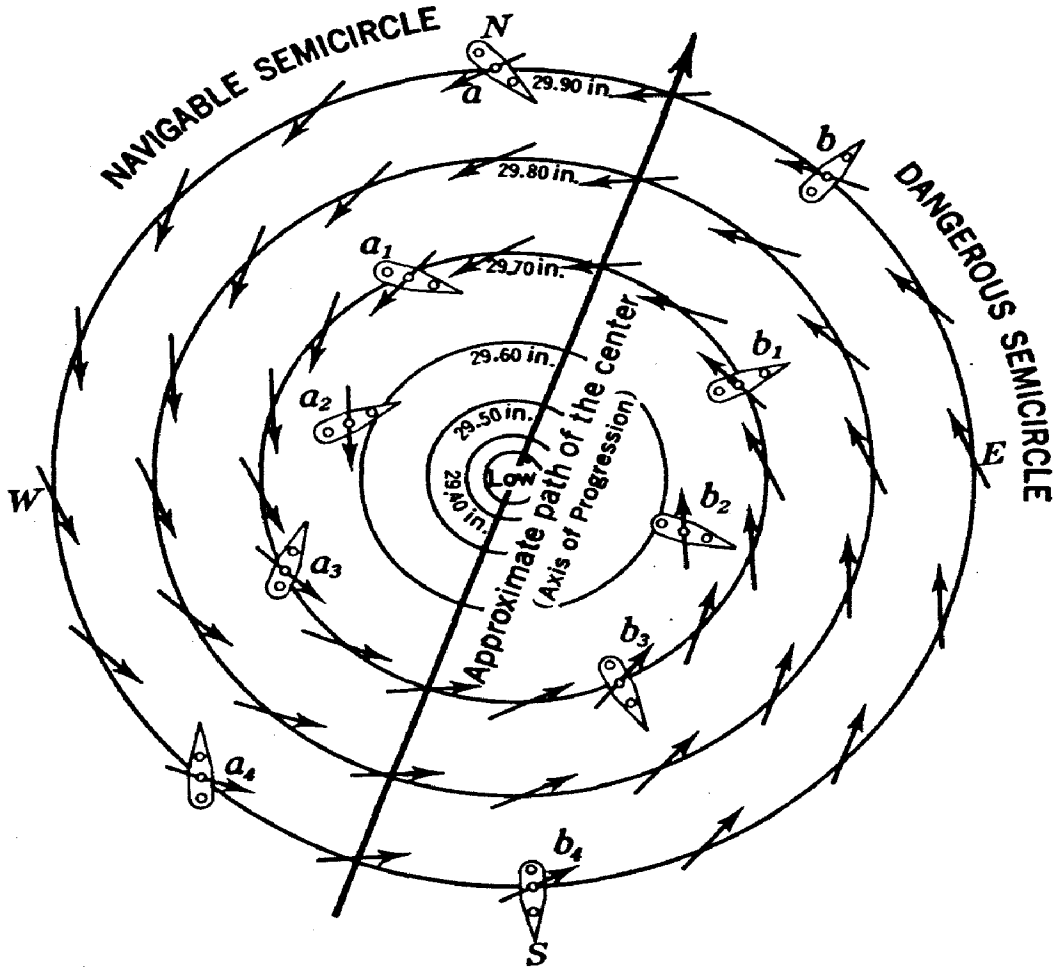
Prepared by U. S. Weather Bureau

Advance of Hurricane and Change in Swell Front; By the time swell front A reaches vessel at C, hurricane has traveled to B.

Practical rules.—When there are indications of a hurricane, vessels should remain in port or seek one if possible, taking every precaution to avert damage by striking light spars, strengthening moorings and, if a steamer, preparing steam to assist the moorings. In stormward ports, including the ports of the southern States, hurricanes are generally accompanied by very high tides, especially in the front right quadrant. Vessels may be endangered by overriding the wharf where moored, if the position is at all exposed. In a few other bays, especially facing from the storm on larger coasts, and larger bays on islands, the water level may be lowered dangerously. Vessels unable to reach a port and having sea room to maneuver usually observe the following rules:

When there are indications of the near approach of a hurricane, sailing vessels may heave to on the starboard tack. The safety of the vessel often depends on heaving to in time. Steamers may remain stationary. Both should carefully observe and record changes in wind, barometer and swell so as to find the bearing of the center, and to ascertain by the shift of the wind in which semicircle the vessel is situated.

To find in which semicircle the vessel is situated.—A line drawn through the center of a hurricane in the direction in which it is moving is called the storm track, or axis of progression. In the Northern Hemisphere, the semicircle on either side of the axis is called, respectively, the right-hand or dangerous semicircle and the left-hand or navigable semicircle. In the *Hurricane Diagram*, vessels marked *a* are in the navigable semicircle and vessels marked *b* are in the dangerous semicircle.



Hurricane Diagram [Northern Hemisphere]

If (while the vessel's position does not change) the wind veers to the right, the vessel will be in the dangerous semicircle; that is, in the right-hand semicircle with regard to the direction in which the storm is moving. If the wind backs to the left, the vessel will be in the left-hand or navigable semicircle. Should the wind not shift its direction, and the barometer continue to fall (assuming the vessel's position does not change between readings), the vessel is probably in the path of the storm. Should the ship be to the westward of the storm center in low latitudes, it may be assumed that the center will draw nearer more or less directly. It then becomes especially important to determine its path, and so learn whether the vessel is in the right or left semicircle of the storm area.

At this point it may be recalled that the winds in the dangerous semicircle are likely to be more severe than in the navigable semicircle. Furthermore, there is a distinct tendency for West Indian hurricanes to curve to the right. In the absence of good information, it would appear that the side of such a hurricane nearest the Equator would be the most likely to place a vessel within the navigable semicircle, especially in low latitudes (where young storms tend to move generally toward the west prior to

curving), in the Caribbean during earlier months of the season, or in more eastern Atlantic waters during the later months. In the absence of good information, general considerations might suggest that a somewhat more westerly location with respect to the storm center would be more likely to place the vessel within the navigable semicircle at certain other times and places, especially in middle or higher latitudes.

Handling the ship within the storm area.—If, from the weather indications given above and such others as his experience has taught him, the navigator is led to believe in the approach of a storm, he should at once—

First. Determine the bearing of the center.

Second. Estimate its distance.

Third. Plot its apparent path.

The first two of these determinations will locate the approximate position of the center, which should be marked on the chart. The relation between the position of the ship and the position and prospective track of the center will indicate the proper course to pursue (1) to enable the vessel to keep out of, or to escape from, the dangerous semicircle and to avoid the center of the storm; (2) to enable the vessel to ride out the storm with the least danger if unable to escape from it.

In order to determine the path of the storm, and consequently in which semicircle the ship finds herself, it is necessary to wait until the wind shifts. When this occurs, plot a new position of the center 10 points to the right of the new direction of the wind as before, and the line joining these two positions will be the *probable* path of the storm. If the ship has not been stationary during the time between the two sets of observations (as is likely unless at anchor), allowance must be made for the course and distance she has traveled in the interim.

Two bearings of the center, at an interval of 2 to 3 hours, will in general be sufficient to estimate the course of the storm, provided an account is kept of the ship's way, but if the storm be moving slowly a longer interval will be necessary.

Should the wind not shift, but continue to blow steadily with increasing force, and with a falling barometer, it may be assumed that the vessel is on or near the storm track. Owing to the slow advance of storms in the Tropics, a vessel in low latitudes might come within the disturbed area by overtaking the center. In such a case a slight decrease in speed would probably suffice, but it should be borne in mind that the storm path is by no means constant either in speed or direction, and that it is particularly likely to curve away from the Equator.

A vessel hove-to in advance of a tropical cyclonic storm will experience a long heavy swell, a falling barometer with torrents of rain, and winds of steadily increasing force. The shifts of wind will depend upon the position of the vessel with respect to the track followed by the storm center. Immediately upon the track, the wind will hold steady in direction until passage of the central calm, the *eye of the storm*, after which the gale will renew itself, but from a direction different from that which it previously had. To the right of the track, or in the *right-hand semicircle* of the storm (the observer being supposed to face along the track), the winds, as the center advances and passes the vessel, will constantly shift *to the right*. The rate at which the successive shifts follow each other increases with proximity to the center. In this semicircle, then, in order that the wind shall draw aft with each shift and the vessel not be taken aback, a sailing vessel must be hove-to on the starboard tack. Similarly, in the *left-hand semicircle*, the winds will constantly shift *to the left*. Here a sailing

vessel must be hove-to on the port tack so as not to be taken aback. These rules hold for all cyclonic storms north of about 5° or 8° North Latitude.

Since the wind circulates counterclockwise in the Northern Hemisphere, the rule in that hemisphere is to face into the wind and the storm center will be on the right hand. If the wind traveled in exact circles, the center would be 8 points to the right. However, the wind follows more or less a spiral path inward, which brings the center from 8 to 12 points to the right.

The number of points to the right may vary during the same storm. Since the wind usually shifts in squalls, its direction should be taken just after a squall.

The center will bear more nearly 8 points from the direction of the lower clouds than from that of the surface wind.

Ten points to the right (in north latitude) when facing into the wind is a good average allowance to make if in front of the storm, but a larger allowance should be made when in the rear. If very near the center the allowance should be reduced to 8 or 9 points in the front quadrants.

The direction of the storm center can be determined with fair accuracy if the vessel is definitely within the wind system of the cyclone. The direction of movement of the storm can be determined roughly from the change of the barometer and the shifts of the wind. It is helpful, in judging the probable course of West Indian hurricanes, to study the recorded paths of storms in different months as shown on the various *Pilot Charts*, since the places of origin and the area traversed vary with the season. For example, tropical storms originating in the western Caribbean Sea in June nearly always move northwestward into the Gulf of Mexico. In November storms originating in the same region usually move northeastward into the Atlantic.

With storms of varying area and different intensities, the lines of equal barometric pressure (isobars) lie much closer together in some cases than in others, so that it is quite impossible more than to guess at the distance of the center from the height of the mercury or its rate of fall.

At the same time, storms travel at varying rates of speed. In the Tropics this ranges from 5 to 15 knots, generally decreasing as the storm track turns northward and curves, but increasing again as it passes well into the mid-latitudes of the North Atlantic, where hurricanes may travel as fast as 40 to 45 knots. Within the Tropics, the storm area usually is small, the region of violent winds seldom extending more than 150 miles from the center. The barometer, however, falls rapidly as one progresses from the circumference toward the center, a difference of more than 3 inches having been observed in this distance.

The winds accordingly blow with greater violence and are more symmetrically disposed around the center in the Tropics than in higher latitudes. After the storm has curved it gradually widens out and becomes less severe, and its own speed of travel increases as the speed of its winds becomes more moderate. Its center no longer is a well defined area of small size, marked by a patch of clear sky and near which the winds blow with the greatest violence. Out of the Tropics, the strongest winds often are found at some distance from the center.

The central area of calm, and perhaps blue sky, characteristic of tropical cyclones, is not found in well-developed storms which form outside of the Tropics. Sometimes there is found, in LOW's where the cyclonic circulation is but imperfectly developed, a region of relative calm and clear sky lying between the easterly winds to the front of

the depression and the westerly winds in the rear. The phenomenon is not, however, analogous to the *eye* of the tropical cyclone. The *eye* appears to be caused by intensity of rotation, and to disappear when this has diminished sufficiently. Occasionally, a cyclone which formed in the Tropics will maintain its organization, including the calm center, until it reaches middle latitudes.

It must not be forgotten that the shifts of wind will occur in the order described above only when the vessel is stationary. When the course and speed are such as to maintain a constant relative bearing between the ship and storm center, there may be no shift of the wind. Should the vessel be outrunning the storm, the wind may shift in a direction opposite to that given, and a navigator in the right semicircle, for instance, should he judge only by the shifts of wind without taking his own run into account, might imagine himself on the opposite side. In such a case, the barometer must be the guide. If it falls, one is approaching the center. If it rises, one is receding.

An examination of the *Hurricane Diagram* shows how this is. A vessel hove-to at the position marked b, and being passed by the storm center, will occupy successive positions in regard to the center from b to b_4, and will experience shifts of wind, as shown by the arrows, from east through south to southwest. On the other hand, if the storm center be stationary or moving slowly, and a vessel be overtaking it along the line from b_4 to b, the wind will back from southwest to east, and is likely to convey an entirely wrong impression as to the location and movement of the center.

Hence it is recommended that a vessel suspecting the approach or proximity of a cyclonic storm should stop (if a sailing ship, heave-to on the starboard tack) for a while, until the path of the center is located by observing the shifts of the wind and the behavior of the barometer.

If the wind remains steady in direction and increases in force in heavy squalls while the barometer falls rapidly, say, at a rate greater than 3 hundredths of an inch per hour, the vessel is probably on or near the track of the storm and in advance of the center.

In this position, with plenty of sea room, the proper course is to run with the wind well on the starboard quarter, if north of the Equator. The vessel thus will make her way into the navigable semicircle, and be most likely to increase her distance from the center. The wind will draw more forward as she recedes from the center, but the compass course first set should be adhered to until well clear.

The procedure is the same if the observations place the ship anywhere within the navigable semicircle.

The most critical situation is that of a vessel finding herself in the forward quadrant of the dangerous semicircle, particularly if at some distance from the center, where the wind shifts but slowly and the barometer indications are indecisive, both causes combining to render the bearing of the center obscure.

The general objective, however, of putting as much distance as possible between oneself and the storm center should be kept in mind.

With steamers this may not be difficult, although, should the storm be curving, the course first set may have to be altered later in order to continue to draw away.

A *sailing vessel* will be set by the wind directly toward the path of the storm and may become involved with the center without being able to avoid it. If so caught in the dangerous semicircle, a *sailing vessel* should haul by the wind on the starboard tack when in north latitude, keep coming up as the wind draws aft, and carry sail as long

as the weather permits. If obliged to heave-to, do so on the starboard tack when in north latitude.

This maneuver, while it may not carry the vessel clear of the storm track, will make the best of a bad situation.

A vessel so hove-to will find the shifts of wind drawing aft, enabling her to come up to them instead of being headed off, as would be the case on the other tack.

Moreover, since the sea changes its direction less rapidly than the wind, the vessel will come up more nearly head-on to the old sea, instead of having it more abeam as on the opposite tack.

A general rule for *sailing vessels* is always to heave-to on whichever tack permits the shifts of wind to draw aft.

The *Hurricane Diagram* (representing a cyclonic storm in the Northern Hemisphere after curving) illustrates these rules for *sailing vessels* graphically.

For simplicity the area of low barometer is made perfectly circular and the center is assumed to be 10 points to the right of the direction of the wind at all points within the disturbed area. Let us assume that the center is advancing about north-northeast, in the direction of the long arrow, shown in heavy full line. The ship a has the wind at east-northeast; she is to the left of the track, or in the navigable semicircle. The ship b has the wind at east-southeast, and is in the dangerous semicircle. As the storm advances these ships, if lying-to, a upon the port tack, b upon the starboard tack, as shown, take with regard to the storm center the successive positions a to a_4, and b to b_4. The wind of ship a shifts to the left, of ship b to the right, and in both cases draws aft. This diminishes the probability that either ship will be struck aback with possible serious damage to spars and rigging, a danger to which a vessel lying-to on the opposite tack constantly would be exposed, since the wind in the latter case constantly would tend to draw forward. The ship b continually is beaten by the wind and sea toward the storm track. The ship a is drifted away from the track, and should she be able to carry sail would soon find better weather by running off to the westward.

Should *steamers* find it necessary to heave-to, the method of doing so must depend upon the position within the storm area.

A steamer is concerned more with the damage resulting from heavy seas than from wind. Furthermore, a steamer is not dependent for her course upon the direction of the wind, but is free to maneuver to keep away from the storm center, where the heaviest and most confused seas are found, unless other circumstances such as proximity to the land prevent this.

If unable to escape from the storm (and this can be done only in low latitudes or otherwise when the storm covers a comparatively limited area), the principal objective of a steamer is that of avoiding the center of the storm.

Referring to the *Hurricane Diagram*, it is obvious that in the Northern Hemisphere, if a steamer finding herself in the left-hand (*navigable*) semicircle at a or a_1 should obey the rule for sailing vessels and heave-to on the port tack, her head will lie toward the storm track and the greatest danger. On the other hand, under the same circumstances, if the steamer heaves-to on the starboard tack, her head will lie away from the storm track, and such headway as is made over the ground will all be in the direction of safety.

Following the same reasoning, a steamer in the Northern Hemisphere, caught in the right-hand (*dangerous*) semicircle at b or b_1 in the diagram and obliged to heave-to,

should do so head to sea. In this case both the wind and sea are constantly beating her toward the storm track, and less leeway will be made when lying-to head to sea than in any other position.

Many steamers behave better when hove-to with the sea astern, or on the quarter, but the adoption of this method must depend upon the position of the vessel within the storm area. Referring again to the diagram, it will be seen that, in the Northern Hemisphere, a steamer may heave-to safely with the sea astern or on the starboard quarter if in the forward quadrant of the left-hand semicircle at position a or a_1. This course, however, should never be preferred when in the forward quadrant of the right-hand semicircle (position b or b_1) for the reason that any headway made over the ground would be, in all probability, toward the storm center where the high and confused seas would be likely to inflict damage.

If, in spite of all endeavors, the storm center should pass directly over a vessel, she will experience a short period of calm, but the seas will be high, confused and dangerous, being swept in from all directions. After a short interval the wind will burst with hurricane force from a point different from, but not necessarily opposite to, that from which it was blowing before. The vessel must be prepared to meet this wind, and to avoid being caught aback.

Rules for maneuvering.—The rules for maneuvering in the Northern Hemisphere, insofar as they may be generalized, are:

Right or dangerous semicircle.—Steamers: Bring the wind on the starboard bow, make as much way as possible, and if obliged to heave-to, do so head to sea. Sailing vessels: Keep close-hauled on the starboard tack, make as much way as possible, and if obliged to heave-to, do so on the starboard tack.

Left or navigable semicircle.—Steam and sailing vessels: Bring the wind on the starboard quarter, note the course and hold it. If obliged to heave-to, steamers may do so stern to sea; sailing vessels on the port tack.

On the storm track in front of the center.—Steam and sailing vessels: Bring the wind 2 points on the starboard quarter, note the course and hold it, and run for the left semicircle. When in that semicircle, maneuver as above.

On the storm track in the rear of the center.—Avoid the center by the best practicable route, having due regard for the tendency of cyclones to curve to the northward and eastward.

In all cases, it is advisable to increase the vessel's distance from the center as soon as possible, keeping in mind that the whole storm field is advancing. If a vessel should find herself inside the relatively calm center, or *eye*, it should be realized that the gales will be renewed sharply from another quarter upon leaving the center, and that the new wind direction need not be directly opposite the old wind direction. When the storm center moves away, the barometer may be expected to rise, and the wind and sea to subside.

Importance of information by radio.—Since coastal vessels generally have radio facilities, the main value of the preceding discussion of hurricanes is that it may assist in understanding, and acting sensibly in the light of, radio reports, forecasts and advisory messages. Apparent lack of agreement between radio reports and local indications then becomes a signal for special caution and a close radio watch. Further information about radio reports will be found in this chapter under the heading *Weather Broadcasts*.

Destruction by hurricane of aids to navigation.—Caution should be observed when navigating over an area recently visited by a hurricane. Lights and beacons are damaged or swept away in the storm, and high tides and floods may make familiar landmarks unrecognizable. Temporary markers and devices are usually placed as quickly as possible after the storm has passed, but these guides are not necessarily the same as those destroyed. Thus a signal may be placed near but not exactly at the place of the original one. A small light may replace a larger one, a buoy may be used or other expedient substitutes placed.

Hurricane seamanship.—This item is based on Instructions to the Pacific Fleet by Admiral Nimitz, February 13, 1945. The West Indian hurricane, the counterpart of the Western Pacific typhoon, may well be encountered anywhere in the Caribbean, Gulf of Mexico, and in much of the Western Atlantic. The same principles of seamanship are applicable to the more frequent and extensive, though less violent, North Atlantic extra-tropical storms.

Many fine ships, crews, and cargoes have been needlessly lost as the result of taking too little heed of unmistakable weather symptoms in sufficient time to enable the master to take evasive or preventive action.

A hundred years ago, a ship's survival depended almost solely on the competence of her master and on his constant alertness to every hint of change in the weather. To be taken aback or caught with full sail on by even a passing squall might mean the loss of spars or canvas; and to come close to the center of a genuine hurricane or typhoon was synonymous with disaster. While to be taken by surprise was thus serious, the facilities for avoiding it were meager. Each master was dependent wholly on himself for detecting the first symptoms of bad weather, for predicting its seriousness and movement, and for taking the appropriate measures to evade it if possible and to battle through it if it passed near to him. There was no radio by which weather data could be collected from all over the oceans and the resulting forecast by expert meteorologists broadcasted to him while afloat on the high seas. There was no one to tell him that the time had now come to strike his light sails and spars, and snug her down under close reefs or storm trysails. His own barometer, the force and direction of the wind, and the appearance of sea and sky were all that he had for information. Ceaseless vigilance in watching and interpreting signs, plus a philosophy of taking no risk in which there was little to gain and much to be lost, was what enabled him to survive.

Seamen of the present day should be better at forecasting weather at sea, independently of the radio, than were their predecessors. The general laws of storms and the weather expectancy for all months of the year in all parts of the world are now more thoroughly understood, more completely cataloged, and more readily available in various publications. The Pilot Charts, available to all ships, give excellent information as to the probable incidence and movements of cyclonic storms.

A navigator is held culpable if he neglects "log, lead, and lookout" through placing blind faith in radio fixes. Likewise, a seaman is culpable if he regards personal weather estimates as obsolete and assumes that if no radio storm warning has been received then all is well, and no local weather signs need cause him concern.

Mariners are reminded to give full consideration to the adverse weather likely to be encountered in the West Indian hurricane area during the season. In this connection, masters should refresh themselves as to ship-handling in heavy weather. In order to

know what outside weather reports are broadcast and what he should be getting, the mariner should be familiar with *Radio Weather Aids to Navigation* (H. O. 206).

Masters should be fully aware of the stability characteristics of their ships, particularly the effect of free-liquid surfaces upon stability.

Any, and possibly all, of the following conditions can be expected if the vessel is so poorly handled that she finds herself within the destructive area of a severe cyclonic storm.

1. Visibility reduced to 1,000 yards or less and sea becoming mountainous and nearly indiscribable.

2. Ship not merely rolling, but heeled far over continually by the force of the wind, thus leaving very little margin for further rolling to leeward.

3. Ingress of water through ventilators and other topside openings.

4. Switchboards and electrical machinery shorted and drowned out and possible fires resulting from short circuits.

5. Free water over engineroom or fireroom floor plates and probably in other spaces.

6. Loss of steering control, failure of power and lighting, and stoppage of main engines. Loss of means of radio communication.

7. High winds and seas carrying away masts, funnels, boats, davits, and deck structures, and generally making it impossible for crew to secure gear adrift or to jettison deck cargo or top-side weights.

8. The storm "taking charge" and making impossible various evasive and security measures which might have been effective at an earlier stage.

An experience and prudent seaman, analyzing the foregoing, will readily appreciate that a vessel so situated is indeed in dire circumstances. He will also realize that it is now too late to prevent serious damage or actual foundering. At the same time, he will fail to understand why the vessel was allowed to continue until such dangerous conditions became unavoidable and the vessel placed in jeopardy.

It is emphasized that in bad weather, as in other situations, safety and fatal hazard are not separated by any sharp boundary line but shade gradually from one into the other. There is no "little red light" which is going to flash on and inform the master that from now on there is extreme danger from the weather and that measures for the ship's safety must now take precedence over further efforts to continue the voyage without delay or deviation. This time of decision will always be a matter of personal judgment. Naturally, no master is going to cut thin the margin between staying afloat and foundering, but he may nevertheless unwittingly pass the danger point even though his ship is not yet *in extremis*. A ship that keeps going as long as the severity of wind and sea has not yet come close to capsizing her or breaking her in two may nevertheless become helpless to avoid catastrophe later if things get worse. By then she may be unable to steer any heading but in the trough of the sea, or may have her steering gear, lighting, and main engines disabled, or may be helpless to secure or jettison deck cargo. The time for taking measures for a ship's safety is while still able to do so. Nothing is more dangerous than for a seaman to be grudging in taking precautions lest they turn out to have been unnecessary. Safety at sea for a thousand years has depended on exactly the opposite philosophy.

DANGER SIGNAL.—Many American masters and officers, when on the high seas and danger of collision appears imminent, use the danger signal of four or more short blasts of the whistle as provided by the Inland Pilot Rules. The revised International Rules for the Prevention of Collision, effective January 1, 1954, provide for a signal of at least five short and rapid blasts on the whistle or siren, which may be given by a power-driven vessel that is required under the Rules to keep course and speed if, when she is in sight of another vessel, she is in doubt whether that other vessel is taking sufficient action to avert collision. This signal gives the **stand-on vessel** the opportunity of calling the attention of the **give-way vessel** to its obligations under the Collision Regulations. In addition, the International Code of Signals provides a special signal, the letter **U,** which may be transmitted visually or by means of Morse Code (. . —), using a flashing light or a whistle or siren, which signifies *you are standing into danger*. The international Code Signal **D** which may be transmitted visually or by means of Morse Code (— . .), using a whistle or siren, signifies *keep clear of me—I am maneuvering with difficulty*, and can be used as a warning.

Ship fire signal.—In many ports a standard signal of five prolonged blasts of the whistle or siren has been adopted for use as an alarm in the event of a fire occurring on board the vessel, except vessels underway, or at the dock to which the vessel is moored. Such signal may be used in addition to other means of reporting a fire. The words **prolonged blast** shall mean a blast of from four to six seconds' duration. The signal is not to be used for other purposes. On hearing the 5-blast whistle signal persons on shore should pull a fire alarm box or turn in an alarm to the Fire Department by the most convenient means.

Mine sweeper signals.—United States vessels engaged in mine sweeping operations have their maneuvering powers considerably hampered. All other vessels, whether steamers or sailing craft, should keep out of the way of the sweepers, remembering especially that it is dangerous to pass between the vessels of a pair or group sweeping together.

All vessels towing sweeps are to show a black ball at the foremasthead and at each yardarm **by day** and green lights instead of the black balls **by night;** the lights may only be exhibited when necessary to warn approaching friendly vessels. Other vessels are not to approach the sweepers nearer than 500 yards on either beam or 1,000 yards astern; under no circumstances is a vessel to pass through a formation of mine sweepers. The sweepers should be prepared to warn other vessels who persist in approaching too close by means of any of the appropriate signals from the International Code of Signals.

Signals to be made by vessels inconvenienced by searchlights.—When navigation of a vessel is inconvenienced by the glare from searchlights near a port, she should make the International Code Signal **ZO** (— — . . — — —) by lamp and by whistle, siren, or foghorn. Both the light and sound signals should be employed, whenever possible, and should be repeated until the inconvenience is removed. Only real urgency should dictate the use of this signal, as it is not possible for the searchlight operator to know which projector is affected unless the vessel is actually in the rays. This signal is designed to assist mariners; no liability whatever will be admitted.

INLAND WATERWAYS.—The following data concerning the Intracoastal Waterway from Boston to the Rio Grande, the New York Canal System, the Mississippi River with its navigable tributaries are included for ready reference.

The **Intracoastal Waterway** affords a protected route, with the exception of various sections, for vessels between Boston, Mass., and the Rio Grande; a distance of approximately 2,900 miles. No toll is charged for passage as the waterway is under Federal jurisdiction. Navigation is restricted, however, by the limiting depths, and horizontal and vertical clearances in the various sections of the waterway.

Boston to New York Harbor.—Between Boston and Long Island Sound it is necessary to pass through comparatively exposed waters and no inland route exists except for the passage through the Cape Cod Canal and its approaches. The canal extends from Cape Cod Bay to Buzzards Bay and with its approach channels affords a sea-level waterway 12.6 miles in length. The project depth is 32 feet over a width of 450 to 500 feet. The minimum vertical clearance is 135 feet at high water. Cape Cod Bay and the canal are fully described in *United States Coast Pilot, Atlantic Coast, Section A.* Buzzards Bay to New York is fully described in *United States Coast Pilot, Atlantic Coast, Section B.*

New York Harbor to Norfolk.—Between New York and Manasquan Inlet the route follows the outside coast. From Manasquan Inlet to Delaware Bay the inside route follows the New Jersey Intracoastal Waterway. The State-maintained channels have a project depth of 6 feet. The Corps of Engineers have been authorized to maintain a waterway with a project depth of 12 feet over a width of generally 100 feet. The minimum horizontal clearance is 34 feet. Up to 1953 no work had been done on the project by the Corps of Engineers. The route then follows Delaware Bay and River to the Chesapeake and Delaware Canal, through the canal to Chesapeake Bay. The canal has a project depth of 27 feet over a width of 250 to 400 feet. The minimum vertical clearance is 135 feet at high water. The route between New York and Norfolk is fully described in *United States Coast Pilot 3, Atlantic Coast, Sandy Hook to Cape Henry.*

Norfolk to Key West.—This waterway consists of dredged channels and land cuts roughly parallel to the coast. The project depth is 12 feet from Norfolk to St. Johns River with minimum clearances of 47 feet horizontal and 80 feet vertical. From St. Johns River to Miami the project depth is 8 feet with minimum clearances of 52 feet horizontal and 79½ feet vertical. From Miami to Cross Bank the project depth is 7 feet with a minimum horizontal clearance of 40 feet. Between Cross Bank and Key West the waterway follows a natural channel 5 feet deep. *United States Coast Pilot, Atlantic Coast, Section D,* fully describes the route between Norfolk and Key West.

Key West to the Rio Grande.—Between Key West and Apalachicola, the waterway follows the outer coast. From Apalachicola to the Rio Grande, it consists of dredged channels and land cuts roughly parallel to the coast. The project depth is 12 feet over a width of 125 to 150 feet. The minimum clearances are 75 feet horizontal and 70 feet vertical. *United States Coast Pilot, Gulf Coast,* fully describes the route between Key West and the Rio Grande.

Note.—In the following discussion of the Mississippi River and its tributaries all mileages are given in statute miles. Distances on the Mississippi River are in statute miles from Head of Passes. Mileages on tributaries are in statute miles above the mouth of the tributary.

The **Mississippi River,** *Gulf of Mexico to Baton Rouge.*—This section of the river is a

deep-water channel and is described in the *United States Coast Pilot, Gulf Coast.* Navigation is safe and easy at all seasons. The bridge 2 miles above New Orleans has a vertical clearance of 135 feet above high water. Baton Rouge is 228.9 miles above Head of Passes, Gulf of Mexico.

Baton Rouge to Cairo, Mile 228.9 to Mile 964.0.—The project depth of the channel is 12 feet over a width of 300 feet. This dimension is greatly exceeded during medium and high stages. The minimum clearances are horizontal 600 feet and vertical 58 feet at extreme high water, 109 feet at low water.

Cairo to the mouth of the Missouri River, Mile 964.0 to Mile 1,159.3.—The project for this section of the Mississippi River is 9 feet deep and 300 feet wide from Cairo to the northern boundary of the city of St. Louis, thence 200 feet wide to the mouth of the Missouri River. The minimum clearances of the 10 fixed bridges crossing this section are horizontal 500 feet and vertical 47 feet at extreme high water, 88 feet at low water. Navigation is continuous throughout the year except when the river is blocked by ice.

Mouth of the Missouri River to St. Paul and Minneapolis, Mile 1,159.3 to Mile 1,821.0.—The project provides for a channel 9 feet deep. The minimum clearances of the 51 bridges and the 27 locks between the Missouri River and the Northern Pacific Railroad bridge in Minneapolis are horizontal 56 feet, vertical 59 feet at normal pool levels, and length of lock 320 feet. The navigation season is usually from April to December.

The **Red River** enters the Mississippi River 300.8 miles above Head of Passes. The project provides for a channel 9 feet deep and 100 feet wide from the Mississippi to Mile 31.0, thence a lateral canal with locks to Shreveport, La., Mile 325.0, thence continued improvement to Fulton, Ark., Mile 462.9. In 1949 preliminary engineering was underway for the lateral canal, however, the Red River has been improved by snagging, dredging shoals, and clearing of the banks to Fulton. A minimum depth of 6½ feet can be taken from the mouth to Mile 35.5, where the Black River enters, thence 3 feet to Alexandria, La., Mile 121.0, thence 1 to 2 feet to Shreveport, thence 1 foot or less to Fulton. From about January to July the minimum depth to Shreveport is 5 feet and to Fulton 4 feet. The minimum clearances on the river are horizontal 100 feet and vertical 37 feet at high water.

The *Black River* enters the Red River 35.5 miles above the mouth. At about Mile 57.0, above Jonesville, La., the Black River is joined by the Tensas and Little Rivers and the name changes to the *Ouachita River.* The project provides for a channel 6½ feet deep from the mouth to Camden, Ark., Mile 350.8, and a channel 7 feet deep from the mouth to Arkadelphia, Ark., Mile 417.0. The project has been completed to Camden, Ark., and project depths or greater are available for that distance. However, between Camden and Arkadelphia, navigation is restricted to small craft from January to June; the remainder of the year only a few inches may be expected. The minimum clearances of the 16 bridges and 6 locks are horizontal 55 feet, length of lock 268 feet, and vertical 57 feet at normal pool level. The project for the *Tensas River,* La., which enters the Black River above Jonesville and *Bayou Macon,* La., which enters Tensas River at Mile 42.7, provides for the removal of snags to Tendal, La., Mile 137.8 on the Tensas River and to Floyd, La., Mile 111.6 on Bayou Macon. In ordinary seasons navigation is possible between January and June, the remainder of the year depths reduce to 1 foot. The minimum clearances on the Tensas River are horizontal 55 feet

and vertical 8 feet at high water, 22 feet at low water; on Bayou Macon, horizontal 58 feet, and vertical 1 foot at high water, 30 feet at low water.

Boeuf River enters Ouachita River at Sicily Island Gorge about Mile 81.0. The river has been snagged to Wallace Landing, La., Mile 166.0. In ordinary seasons navigation is restricted to between January and June, the remainder of the year the depths usually reduce to 1 foot. The minimum clearances are horizontal 58 feet and vertical 8½ feet at high water, 28½ feet at low water. *Little Missouri River* enters Ouachita River about Mile 379.0. The river was snagged to Rawles Bluff, Ark., about Mile 23.0 but no work has been done in recent years and vessels attempting to navigate the stream encounter leaning trees, snags, and other similar obstructions. Minimum clearances of the bridges over the previously snagged portions are horizontal 12 feet and vertical 2½ feet at high water, 25 feet at low water.

The **Yazoo River** enters the Mississippi River at Vicksburg, Miss., through a dredged canal 431.7 miles above Head of Passes. The project provides for a depth of 6½ feet in the canal, a distance of 9 miles, and a depth of 4 feet over a width of 200 feet in the river to the junction of the *Tallahatchie* and *Yalobusha Rivers* at Mile 189.0. The minimum clearances are horizontal 83 feet and vertical 50 feet at high water.

The *Big Sunflower River* enters the Yazoo River about Mile 44.0. The project provides for a channel 4½ feet deep and 100 feet wide from the mouth to the mouth of the *Hushpuckena River* at Mile 171.4. Project depth is available to Pentecost, Miss., Mile 124.6, from January to June. The minimum clearances are horizontal 36 feet and vertical 12 feet at high water, 31 feet at low water.

The **Arkansas River** enters the Mississippi River at Mile 575.0 above Head of Passes. The project provides for clearing and snagging from the mouth to *Neosho (Grand) River* in Oklahoma, Mile 465. Under average conditions 4-foot draft vessels can be taken to Pine Bluff, Ark., Mile 117.0, from the first of February to the middle of July. From the middle of August to the middle of December the draft is generally limited to about 2 feet. The minimum clearances to Pine Bluff are horizontal 160 feet and vertical 56 feet at high water; to the head of the project, horizontal 130 feet and vertical 2 feet at high water, 42½ feet at low water.

The *Fourche La Fave River* enters the Arkansas River at Mile 192.2. The river is navigable to Perryville, Ark., Mile 22.2.

The *Petit Jean River* enters the Arkansas River at Mile 234.9. The river is navigable to Rocky Crossing, Ark., Mile 28.2.

The *Poteau River* enters the Arkansas River at Mile 362.0. The river is navigable to Branden, Okla., Mile 8.6.

The **White River** enters the Mississippi River 583.5 miles above Head of Passes. The river is considered navigable downstream from Branson, Mo., Mile 520.0, however, the project provides for channel maintenance only to Batesville, Ark., Mile 301.0, and for locks and dams to provide a 4-foot channel from Batesville to Guion, Ark., an additional 33 miles. Under ordinary conditions, boats of 6-foot draft may be taken from the mouth to Peach Orchard Bluff, Ark., Mile 169.0, from the first of February to the last of June. The rest of the season the controlling depth is generally 3 feet. A depth of 4 feet will be found between Batesville and Guion. The minimum clearances to Guion are horizontal 36 feet, length of lock 147 feet, and vertical 47 feet at high water.

The *Black River* enters the White River at Jacksonport, Ark., Mile 264.8. The project provides for channel maintenance to Poplar Bluff, Mo., Mile 211.0. A depth of

2 feet prevails from the mouth to the *Current River* in Arkansas, Mile 96.0, thence 1½ feet to Poplar Bluff. Vessels up to 7-foot draft may operate in the lower 15 miles of the river for about 6 months of the year. Minimum clearances are horizontal 32 feet and vertical ½ foot at high water, 18 feet at low water.

Buffalo River, Ark., enters the White River at about Mile 389.0. The river is considered navigable from its mouth to *Rush Creek*, Mile 22.0, however, at present there is no water-borne traffic.

The **St. Francis River** enters the Mississippi River 669.7 miles above Head of Passes. The project provides for channel maintenance to Marked Tree, Ark., Mile 148.2 During five months of the year a depth of 6 feet or more can be carried to Parkin, Ark., Mile 101.0 and for about 7 months a depth of 1 foot or more will be found. The minimum clearances to Marked Tree are horizontal 78 feet and vertical 7 feet at high water, 47½ feet at low water.

L'Anguille River enters the St. Francis River at Mile 11.8. The project provides for channel maintenance to Marianna, Ark., Mile 8.3. For five months depths of 3 feet are available and for seven months, less than 3 feet.

Blackfish Bayou, Ark., enters the St. Francis River at Mile 38.3. The project provides for channel maintenance to *Fifteen Mile Bayou*, Mile 6.0. For five months depths of 3 feet are available to *Frenchmans Bayou* and for seven months less than 3 feet.

The **Wolf River** enters the Mississippi River at Memphis, Tenn., 732.7 miles above Head of Passes. The lower 3 miles of the river has been developed to provide additional water front for the city of Memphis. A project provides for a channel 9 feet deep from the mouth to Hendman Ferry Road with widths varying from 125 feet in the upper end of the project to 250 feet at the mouth.

The **Hatchie River,** Tenn., enters the Mississippi River about 774 miles above Head of Passes. Snagging and clearing on the river and its tributaries has been completed a distance of 148.3 miles; however, only a small portion has been done in recent years.

The **Obion River,** Tenn., enters the Mississippi River 821.5 miles above Head of Passes. Snagging and clearing on the river and its tributaries has been completed a distance of 208.8 miles; however, only a small portion has been done in recent years.

Mayfield Creek, Ky., enters the Mississippi River 960.2 miles above Head of Passes. Snagging and clearing on the creek has been completed a distance of 5 miles.

The **Ohio River** enters the Mississippi River 964.0 miles above Head of Passes and 2 miles below Cairo, Ill. The project provides for the construction of dams and locks to provide a channel 9 feet deep for the entire river from the mouth to Pittsburgh, Pa., Mile 981.0. The minimum clearances in the 46 locks and 53 bridges are horizontal 110 feet, length of lock 600 feet, and vertical 63 feet at normal pool level. Running ice and ice gorges may occur during the months of December, January, or February, but seldom later.

The *Tennessee River* enters the Ohio River at Mile 48.4 The project provides for a channel 9 feet deep by the construction of locks and dams, from the mouth to the junction of the French Broad and Holston Rivers at Mile 652.1, 4.4 miles above Knoxville, Tenn. The minimum clearances in the 10 locks and 32 bridges are horizontal 60 feet, length of lock 265 feet, and vertical 50 feet at normal pool level. The *Hiwassee River* enters the Tennessee River at Mile 499.4. The river is navigable to Charleston, Tenn., Mile 18.8, with depths of 8½ feet. The minimum vertical clearance is 27 feet. The *Clinch River* enters the Tennessee River near Kingston, Tenn., at Mile 567.7. The

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river has a channel 9 feet deep to Mile 18.8. The *Little River* enters the Tennessee River at Mile 635.6. A channel 9 feet deep at minimum pool elevation leads to Singleton, Tenn., Mile 12.0. The *French Broad River*, one of the rivers forming the Tennessee River, is navigable to Douglas Dam, Tenn., Mile 24.1. The project for the river provides for a channel 2½ feet deep.

The *Cumberland River* enters the Ohio River at Mile 60.6. The project provides for a channel 6 feet deep to Waitsboro Shoals, Ky., Mile 513.0, thence 4 feet deep an additional 3 miles to Burnside, Ky., Mile 516.0. The minimum clearances of the 15 locks and 21 bridges are horizontal 52 feet, length of lock 280 feet, and vertical 74½ feet at normal pool level, 34 feet at extreme high water.

The *Tradewater River*, Ky., enters the Ohio River at Mile 107.0. The project depth is 9 feet to a coal tipple at Mile 3.0. A depth of 8 feet is usually available.

The *Wabash River*, forming part of the boundary between Illinois and Indiana, enters the Ohio River at Mile 132.8. Most of the Wabash River, the entire *White River*, an important tributary of the Wabash River, and short portions of the forks of the White River are classed as navigable streams. However, there has been no through navigation on these rivers for many years and there is no project at present for maintenance of a navigable channel.

The *Green River* enters the Ohio River at Mile 196.9. The project depth is 5½ feet to Mammoth Cave, Ky., Mile 197.8. The minimum clearances of the 6 locks and 8 bridges are horizontal 35½ feet, length of lock 137½ feet, and vertical 64½ feet at normal pool level, 26 feet at extreme high water. The *Rough River* enters the Green River at Mile 71.0. The project provides for a slack water channel of 4 feet to Hartford, Ky., Mile 29.5. Navigation is restricted to the lower 7 miles for boats not exceeding a 3-foot draft. The *Barren River* enters the Green River at Mile 149.5. The project provides for a channel 5½ feet deep to Bowling Green, Ky., Mile 30.1. The minimum clearance of the 1 lock is horizontal 56 feet and length of lock 360 feet. *Bear Creek*, Ky., enters the Green River at Mile 168.4. The project depth is 5½ feet to Mile 8.0. The *Nolin River* enters the Green River at Mile 183.5. The project depth is 5½ feet to Meredith Ferry, Ky., Mile 7.8.

The *Kentucky River* enters the Ohio River at Mile 435.2. The project provides for a channel 6 feet deep from the mouth to Mile 258.6 above Beattyville, Ky. The minimum clearances in the 14 locks and 23 bridges are horizontal 38 feet, length of lock 145 feet, and vertical 43½ feet at normal pool level, 2 feet at extreme high water.

The *Scioto River* enters the Ohio River near Portsmouth, Ohio, at Mile 624.5. The project provides for the construction of a harbor channel immediately above the mouth of the Scioto River.

Big Sandy River enters Ohio River at Mile 664.0, and divides at Louisa, Ky., Mile 27.2, forming *Levisa* and *Tug Forks*. The project provides for a depth of 6 feet from the mouth to Louisa, Mile 27.2 Navigation is restricted to the section below Mile 12.7. The minimum clearances of the fixed bridges over the navigable section are: horizontal 180 feet; vertical 54 feet at low water and 8 feet at extreme high water.

The *Kanawha River* enters the Ohio River at Point Pleasant, W. Va., Mile 715.4. The project provides for a channel 9 feet deep from the mouth to Mile 90.6. The minimum clearances of the 3 locks and 9 bridges are horizontal 56 feet, length of lock 360 feet, and vertical 51 feet at normal pool level, 27 feet at extreme high water.

The *Little Kanawha River* enters the Ohio River at Mile 796.4. The project depth is 4 feet from the mouth to Creston, W. Va., Mile 48.0. Navigation is restricted to the lower 14.9 miles of the river. The minimum clearances of the lock and 4 bridges are horizontal 23 feet, length of lock 125 feet, and vertical 50 feet at normal pool level, 1½ feet at extreme high water.

The *Muskingum River* enters the Ohio River at Marietta, Ohio, Mile 808.8. The project depth is 4½ feet from the lock near the mouth to Mile 93.1. The minimum clearances of the 11 locks and 24 bridges are horizontal 35½ feet, length of lock 156½ feet, and vertical 15½ feet at normal pool level, zero feet at extreme high water. Locks are only operated upon receipt of advance notice.

The *Beaver River* enters the Ohio River at Rochester, Pa., Mile 955.6. A project to provide a depth of 12 feet from the mouth of Beaver River to and up the *Mahoning River* to Struthers, Ohio, thence this depth to continue to Lake Erie at or near Ashtabula, Ohio, has been approved but no work has been done.

The *Allegheny River*, at the head of the Ohio River, has a project depth of 9 feet to Mile 72.0, 2 miles above East Brady, Pa. The minimum clearances of the 8 locks and 22 bridges in the improved section are horizontal 56 feet, length of lock 300 feet, and vertical 28¼ feet at normal pool level, 4 feet at extreme high water. Drafts of 2 to 5 feet operate in the river above the project.

The *Monongahela River*, at the head of the Ohio River, has a project providing for slack-water navigation its entire length, from Pittsburgh, Pa., to above Fairmont, W. Va., about Mile 128.0. A depth of 9 feet is available to Mile 100.3, thence 7 feet to above Fairmont. The minimum clearances of the 12 locks and 41 bridges are horizontal 56 feet, length of lock 182 feet, and vertical 42½ feet at normal pool level, 12 feet at extreme high water. The *Youghiogheny River* enters the Monongahela River at Mile 14.5. The project provides for a channel 9 feet deep to West Newton, Pa., Mile 19.3. The project has not been completed and at present navigation is possible to McKeesport, Pa., just inside the mouth.

The **Missouri River** enters the Mississippi River 1,159.0 miles above Head of Passes. The project depth is 9 feet from the mouth to Sioux City, Iowa, Mile 761.5. The minimum clearances of the 22 bridges from the mouth to Mile 386.2, above Kansas City, Kans., are horizontal 120 feet and vertical 71½ feet above the zero of the Weather Bureau gages. The Weather Bureau publishes the gage readings daily. The navigation season of this section of the river is generally from March 15 to November 30. A channel with a minimum depth of 6 feet and a minimum width of 200 feet is generally available during the navigation season. The minimum clearances of the 22 bridges on the Missouri River from Mile 386.2 to Sioux City, Mile 761.6, are horizontal 160 feet and vertical 63¼ feet above the zero of the Weather Bureau gage. The navigation season on this section of the river is generally from April 1 to November 15. A channel with a minimum depth of 5½ feet is generally available to Omaha, Nebr., Mile 632.0, thence 3½ feet to Sioux City.

The *Gasconade River* enters the Missouri River at Mile 103.5. A depth of 3 feet is available to Mile 3.0, thence less than a foot to Gascondy, Mo., Mile 61.4.

The *Osage River* enters the Missouri River at Mile 129.1. The project depth is 3 feet from the mouth to Bagnell Dam, Mo., Mile 75.4. The minimum clearances of the 1 lock and 4 bridges are horizontal 42 feet, length of lock 220 feet, and vertical 32 feet at high water, 59¼ feet at low water.

The *Big Sioux River* enters the Missouri River above Sioux City, Iowa. A project provides for the construction of a harbor in the mouth of the river. The project has not been completed.

The **Illinois River** enters the Mississippi River 1,181.9 miles above Head of Passes. The Illinois River, together with the *Des Plaines River*, the *Chicago Sanitary and Ship Canal*, and the south branch of the *Chicago River*, forms the **Illinois Waterway** connecting the Mississippi River and the Great Lakes. The project provides for a channel 9 feet deep and 300 feet wide from the mouth of the Illinois River, through the river and Des Plaines River to Lockport, Ill., Mile 291.1, thence 9 feet deep with present width to the controlling works, Mile 293.1, thence 9 feet deep with a width of 225 feet to the junction with the Calumet-Sag Channel, Mile 303.5. From Mile 303.5 the waterway divides, one portion continues up the Chicago Sanitary and Ship Canal and the south branch of the Chicago River to Lake Street, Chicago, Mile 325.6, with a least depth of 9 feet, thence through the Chicago River into Lake Michigan. The other branch follows the Calumet-Sag Channel to the lock at Blue Island, Ill., Mile 319.5, thence a channel 9 feet deep and 300 feet wide in the Calumet and Little Calumet Rivers to turning basin 5, Mile 327.3. From this point Lake Michigan may be entered by continuing up Calumet River to Calumet Harbor. The project provides further for a channel 9 feet deep and 225 feet wide along the Grand Calumet River to Indiana Harbor and to Gary, Ind. The minimum clearances from the Mississippi River to Lake Michigan are: Via the Chicago River, horizontal 72 feet and vertical 17 feet at ordinary water; via Calumet River, horizontal 70 feet and vertical 12½ feet at ordinary water. The minimum clearances from the Mississippi to the junction of the Chicago Sanitary and Ship Canal and the Calumet-Sag Channel are horizontal 110 feet and vertical 35 feet at high water.

The **Illinois and Mississippi Canal** enters the Mississippi River at the mouth of **Rock River,** 1,443.1 miles above Head of Passes. The locks on this canal are no longer operated and all aids to navigation have been removed.

The **Galena (Fever) River** enters the Mississippi River about 1,529 miles above Head of Passes. Navigation by small craft to the city of Galena, Ill., Mile 3.8 is possible. Above Galena navigation is restricted to small craft during periods of high water. Two drawbridges cross the river between the mouth and Galena with a minimum horizontal clearance of 93 feet and a minimum vertical clearance, closed, of 15¾ feet at normal pool, ¼ foot at extreme high water.

The **Black River** enters the Mississippi River 1,662.2 miles above Head of Passes. The project provides for a channel 9 feet deep from the mouth to Mile 1.4 at the La Crosse, Wisc. terminal. The minimum horizontal clearance is 127 feet.

The **St. Croix River** enters the Mississippi River 1,775.3 miles above Head of Passes. The project provides for a channel 9 feet deep to Stillwater, Minn., Mile 24.5, thence 3 feet to Taylors Fall, Minn., Mile 52.3. Minimum clearances to Stillwater are horizontal 103 feet and vertical 57 feet at normal pool level. Navigation season is usually from April to December.

The **Minnesota River** enters the Mississippi River 1,808.0 miles above Head of Passes. The project provides for a channel 4 feet deep from the mouth to Shakpee, Minn., Mile 25.6. Local interests have completed a channel 9 feet deep and 100 feet wide from the mouth to Port Cargill, Minn., Mile 13.1. The minimum clearances to Port Cargill are horizontal 100 feet and vertical 63 feet at normal pool level.

New York Canal System.—The New York canals, built by the State of New York, afford free waterway communication between the Hudson River and Lake Champlain on the east and Lakes Erie and Ontario on the west. The canal system comprises the following lines or branches: **Erie Canal,** Waterford to Tonawanda, 338 statute miles with 245 bridges and 35 locks; **Oswego Canal,** Three Rivers Point to Lake Ontario, 24 statute miles, with 14 bridges and 7 locks; **Cayuga-Seneca Canal,** from junction with the Erie Canal to Ithaca and Watkins including Cayuga and Seneca Lakes and spur to Montour Falls, 92 statute miles with 16 bridges and 4 locks; and **Champlain Canal,** Waterford to Whitehall, 60 statute miles with 34 bridges and 11 locks. The channel dimensions for the waterway are 12 feet deep at normal pool level; the minimum widths are 75 feet in earth, 44 feet in rock, and from 110 to 200 feet in river and lake sections. The inside dimensions of the lock chambers on the improved canal routes are approximately 310 feet long, 45 feet wide, with a depth on the mitre sills of 12 feet at normal pool level. For the most part the bridges are fixed structures except when local conditions as to grade render other types preferable. The maximum dimensions of a vessel or other watercraft which may enter the canals is 300 feet long, 43½ feet wide, and 15 feet overhead clearance above the water surface.

In the improved canal channels the speed of boats shall not exceed 6 statute miles per hour, except in canalized rivers and lakes on which the speed limits are posted when practicable. The limits are strictly enforced.

The United States Lake Survey, Detroit 26, Michigan, has prepared and placed on sale charts showing the natural navigable water embraced in the canal system. These charts do not include the Erie Canal from Lyons to the Niagara River, which is of artificial formation.

The Division of Operation and Maintenance, Department of Public Works, Albany 1, New York, issues the pamphlet *Rules and regulations governing navigation and use of the New York State Canal System*, which also contains descriptions of the routes, structures, and terminals.

In recent years the season of navigation has been from April 5th to 20th, as the time of opening and from November 15th to 30th, as the time of usual closing dates for the various types of vessels.

Lake Champlain connects with the New York canal system at its southern end and the Canadian Canal System at its northern end to form part of an international waterway between the United States and Canada. The limiting depth at low lake level is 10 feet over a width of 90 feet. The limiting vertical clearance at low lake level is 92 feet. Charts of Lake Champlain are published by the United States Lake Survey.

The **Richelieu River** and **Chambly Canal** connect Lake Champlain and the **St. Lawrence River.** The limiting dimensions of the smallest lock are 111½ feet in length, 23¼ feet in width, and 6½ feet in depth over the sills. The minimum overhead clearance is 120 feet. Navigation season is from about the middle of April to the middle of November. The *St. Lawrence River Pilot* (Canadian Edition) issued by the Department of Mines and Resources, Ottawa, Canada, fully describes the river and canal. Charts are published by the same agency.

The Canadian Government requires permits or let-passes from pleasure boats entering Canadian waterways, which may be obtained at their canal statistical offices at St. Johns and Prescott, or at the first lock in the St. Lawrence River below Prescott. American vessels when leaving Canada shall report at the customs office.

PUBLICATIONS.—The following résumé of the United States Government publications of navigational value is included for the ready reference of the mariner.

Certain libraries have been designated by the Congress of the United States to receive prints, as issued, of all publications printed by the Government for public distribution. These publications may be consulted by anyone during business hours.

Sales agencies have been established in various ports by the Coast and Geodetic Survey, Hydrographic Office, and Superintendent of Documents. District Offices of the Coast and Geodetic Survey sell all publications of that Bureau. Branch Hydrographic Offices do not sell any publications.

The mailing address of the Coast and Geodetic Survey, Hydrographic Office, Superintendent of Documents, Weather Bureau, Coast Guard, and Federal Communications Commission is Washington 25, D. C.

Indexes of U. S. Coast and Geodetic Survey Nautical Charts, Coast Pilots, Tide Tables, Current Tables, and Tidal Current Charts may be obtained free of charge from the Coast and Geodetic Survey and its agents.

Nautical Charts.—Coast of the United States, Territories, and Possessions:
Published by the U. S. Coast and Geodetic Survey.
For sale by C&GS and its sales agents.
Mississippi River from the Head of Passes to Cairo:
Published and for sale by the Mississippi River Commission, Vicksburg, Miss.
Illinois Waterway System:
Published and for sale by the Corps of Engineers, U. S. Army, Chicago, Ill.
Ohio River:
Published and for sale by the Corps of Engineers, U. S. Army, Cincinnato, Ohio.
Great Lakes, Lake Champlain, New York State Canals, and the St. Lawrence River, St. Regis to Cornwall, Canada:
Published and for sale by the U. S. Lake Survey, Detroit, Mich.
New York State Canal System:
Published and for sale by the Superintendent of Public Works, Albany, N. Y.
Foreign Countries:
Published by the U. S. Navy Hydrographic Office.
For sale by HO and its sales agents.

Coast Pilots.—Coasts of the United States, Territories, and Possessions:
Published by the U. S. Coast and Geodetic Survey.
For sale by C&GS and its sales agents.
Foreign Countries:
Published by the U. S. Navy Hydrographic Office.
For sale by HO and its sales agents.

Tide and Current Tables.—Tide Tables, East Coast, North and South America, including Greenland:
Tide Tables, West Coast, North and South America, including Hawaiian Islands:
Tide Tables, Europe and West Coast of Africa, including Mediterranean Sea:
Tide Tables, Central and Western Pacific Ocean and Indian Ocean:
Current Tables, Atlantic Coast, North America:
Current Tables, Pacific Coast, North America:
Tide and Current Tables, Philippine Islands:
Tide and Current Tables, Japan and China:
Published by the U. S. Coast and Geodetic Survey.
For sale by C&GS and its sales agents.

Tidal Current Charts.—Boston Harbor, Narragansett Bay to Nantucket Sound, Long Island and Block Island Sounds, New York Harbor, Delaware Bay and River, Tampa Bay, San Francisco Bay, Puget Sound Northern Part, Puget Sound Southern Part—Nine Volumes:
Published by the U. S. Coast and Geodetic Survey.
For sale by C&GS and its sales agents. 5

Notice to Mariners.—Notices to Mariners are published weekly and may be obtained free of charge from the U. S. Navy Hydrographic Office.

Light Lists.—Atlantic and Gulf Coasts, Pacific Coast:
Published by the U. S. Coast Guard.
For sale by the Superintendent of Documents and his sales agents. 10
Foreign Countries:
Published by the U. S. Navy Hydrographic Office.
For sale by HO and its sales agents.

Radio.—Radio Circulars giving schedules, frequencies, and data included in weather broadcasts.
Free on application to the Chief, U. S. Weather Bureau. 15
Radio Navigational Aids (H. O. Pub. No. 205).
Radio Weather Aids to Navigation (H. O. Pub. No. 206).
Published by the U. S. Navy Hydrographic Office.
For sale by HO and its sales agents.
International Code of Signals (American Edition) Vol. II—Radio (H. O. Pub. No. 88): 20
Published by the U. S. Navy Hydrographic Office.
For sale by HO and its sales agents.
International Convention for the Safety of Life at Sea, London, 1929 (affecting radio), Extracts from:
May be obtained from U. S. Federal Communications Commission.
Communications Act of 1934: 25
For sale by Superintendent of Documents.
Ship Radio Telegraph Safety Rules:
From the U. S. Federal Communications Commission or the Superintendent of Documents.
The International Bureau of Telecommunication Union, Berne, Switzerland, publishes and sells the following: 30
1. List of Frequencies.
2. List of Coast Stations and Ship Stations.
3. List of Aircraft and Aeronautical Stations.
4. List of Broadcasting Stations.
5. List of Stations Performing Special Services. 35
6. List of Call Letters of Fixed Land and Mobile Stations.
7. List of Fixed Stations.
8. The Telegraph Rates.

Radio Service Bulletin:
Issued by U. S. Federal Communications Commission. 40

Weather.—Manual of Marine Meteorological Observations (W. B. Circular M):
Preparation and Use of Weather Maps at Sea (W. B. Circular R):
Manual of Cloud Forms and Codes for States of the Sky (W. B. Circular S):
International Code for Radio Weather Reports from Ships (W. B. 1046, Revised):
Published by the U. S. Weather Bureau. 45
For sale by Superintendent of Documents. These publications will also be furnished free of charge on request of ships' officers cooperating with the Weather Bureau.
Weather Message for Shipping, IMO Publication No. 9, Volume IV:
Published and for sale by World Meteorological Organization, Geneva, Switzerland.

Miscellaneous.—American Ephemeris and Nautical Almanac:
American Nautical Almanac:
Published by the U. S. Naval Observatory.
For sale by the Superintendent of Documents and his sales agents.
American Practical Navigator (Bowditch) (H. O. Pub. No. 9):
Published by the U. S. Navy Hydrographic Office.
For sale by HO, the Superintendent of Documents, and their agents.
Annual Report of the Chief of Engineers, U. S. Army:
Part 1.—Report upon river and harbor improvement work, including flood-control operations.
Part 2.—Commercial Statistics, Water-borne Commerce of the United States.
For sale by Superintendent of Documents.
General Rules and Regulations Prescribed by the Board of Supervising Inspectors—four volumes.
Published by and free on application to the U. S. Coast Guard.
Laws Governing Steamboat Inspection:
Published by and free on application to the U. S. Coast Guard.
Hydrographic Bulletin:
Published weekly by the U. S. Navy Hydrographic Office.
International Code of Signals (American Edition) Vol. 1—Visual (H. O. Pub. No. 87):
Published by the U. S. Navy Hydrographic Office.
For sale by HO and its sales agents.
Pilot Rules for Certain Inland Waters of Atlantic and Pacific Coasts and Coast of Gulf of Mexico:
Published by and free on application to the U. S. Coast Guard
Pilot Rules for Great Lakes and Their Connecting and Tributary Waters:
Published by and free on application to the U. S. Coast Guard.
Pilot Rules for Rivers whose Waters Flow into the Gulf of Mexico and Their Tributaries and Red River of the North:
Published by and free on application to the U. S. Coast Guard.
Port Series—of the United States:
Prepared by the Corps of Engineers, U. S. Army, in cooperation with the Maritime Administration, U. S. Department of Commerce.
For sale by the Superintendent of Documents.

Water Temperatures and Densities.—Surface Water Temperatures, Atlantic Coast North and South American (Sp. Pub. 278).
Surface Water Temperatures, Pacific Ocean (Sp. Pub. 280).
Density of Sea Water, Atlantic and Gulf Coasts (Sp. Pub. 279).
Density of Sea Water, Pacific Ocean (Sp. Pub. 281).
Published by the U. S. Coast and Geodetic Survey.
For sale by Superintendent of Documents.

CHAPTER 2

Regional Information

BETWEEN New York Bay and Delaware Bay is the New Jersey coast with its numerous resorts, its inlets, and its Intracoastal Waterway. Delaware Bay and Delaware River are the approaches to Wilmington, Philadelphia, and Trenton; below Wilmington is the Delaware River entrance to the Chesapeake and Delaware Canal, deep inside link between the two great bays. Between Delaware Bay and Chesapeake Bay is the Delaware-Maryland-Virginia coast with its relatively few resorts, its inlets and the inner passages that connect them. The last seven chapters, nearly half the book, are required to describe Chesapeake Bay to Norfolk and Newport News, to Washington and Baltimore, to Susquehanna River 168 miles from the Virginia Capes.

A vessel approaching this coast from seaward will be made aware of its nearness by the number of vessels passing up and down in the coastal trade. The coast of New Jersey is studded with large hotels, prominent standpipes, and elevated tanks. South of Delaware Bay, the principal landmarks are the lighthouses and Coast Guard stations.

The general tendency along this mostly sandy coast is for the ocean beaches and the points on the north sides of the entrances to wash away and for the points on the south sides of the entrances to build out. Protective works have done much to stabilize the New Jersey coast, but several lighthouses have been abandoned between Delaware Bay and Chesapeake Bay because of erosion. Between 1903 and 1952, Wise Point, Cape Charles, on the north side of the entrance to Chesapeake Bay, was cut away about 350 yards; the outer shore of Smith Island, on which Cape Charles Light is located, was cut away about the same amount; and Cape Henry, on the south side of the entrance, remained relatively unchanged. During the same period, Cape Henlopen, on the south side of the entrance to Delaware Bay, built out 600 yards.

The shores of Delaware Bay and Delaware River are mostly low and have few conspicuous marks, other than lights, below the industrial centers along the river. The shores of Chesapeake Bay are low as far north as Patuxent River, then rise to considerable heights at the head of the bay.

Rules of the Road.—At all buoyed entrances from seaward to bays, sounds, rivers, or other estuaries for which specific lines are not described, **Inland Pilot Rules** apply shoreward of the outermost buoys or other aid to navigation of any system of aids; **International Pilot Rules** apply outside the aids. Specific lines have been established for Delaware and Chesapeake Bays and are described in Chapters 6 and 9.

The **channels** into Delaware and Chesapeake Bays are broad and deep. The entrances to the inlets are comparatively shallow and are more or less obstructed by shifting sand bars. Some of the inlets have been improved by dredging and by the construction of jetties; at such places more dependence can be placed on channel depths stated in this Coast Pilot and on the charts than at unimproved inlets. Where stated depths approximate the vessel's draft, information should be obtained as to drafts currently being taken over the bar. On many of the bars the buoys are moved from from time to time to mark the shifting channels. The best time to enter most of the inlets is on a rising tide with a smooth sea. The tidal currents have considerable velocity in all of the entrances, and their direction is affected by the force and direction of the wind.

Delaware Breakwater, with depths of 15 to 70 feet, is the only protected **anchorage** between New York Bay and Chesapeake Bay suitable for vessels of all classes. Absecon Inlet, Cape May Inlet, and some of the others can accommodate light-draft vessels such as trawlers and small yachts but not medium or deep drafts. Small local craft often seek shelter inside the shallower inlets, but entrance is difficult in heavy weather, and the unimproved inlets are often difficult even in good weather, particularly for strangers.

The principal **dangers** along this coast are the outlying sand shoals, the fogs, and the doubtful direction and velocity of the currents after heavy gales. Depths of 7 fathoms are found as far as 13 miles from shore. There are many **wrecks** along this coast, but most of them have been blasted off or cleared to safe navigational depths; the others are marked by obstruction buoys.

Gales from northeast to southeast cause heavy **breakers** on the beaches and outlying shoals; the sea breaks in 4 to 5 fathoms of water, and shoals of that depth or less usually are marked during easterly gales. The bars across the inlets are then impassable and are defined by breakers even in comparatively smooth water with a light swell. The heaviest surf on the beach is on a rising tide near high water springs; the least surf is encountered on a falling tide near low water. A very heavy surf makes on the beaches after a southeasterly gale followed by a sudden shift of wind to northwest.

Fish weirs are numerous along the outside coast and in Chesapeake Bay and tributaries. The stakes often become broken off and form a hazard to navigation, especially at night. Regulations limiting the areas within which fish weirs may be established have been prescribed by the Secretary of the Army, and the supervision of the fishing structures is controlled by the Chief of Engineers, United States Army. The areas within which fish weirs are permitted are shown on the 1200-series charts, and where no such chart covers the area, they are shown on the next larger scale. The exact locations of the weirs within the designated areas are not shown.

Along the outer coasts the limits of fish-weir areas are not marked. In Chesapeake Bay and tributaries, black and white horizontal-banded buoys mark the turns of the limits. Strangers should proceed with caution, when crossing areas of possible fish weirs, and should avoid crossing such areas at night, whenever possible.

Lighting fishing structures. (1) Fishing structures and appliances in navigable waters of the United States will be lighted for the safety of navigation as follows:

The lights will be displayed between sunset and sunrise. They will be placed at each end of the structure, excepting where the inner end terminates in such situation that there is no practicable navigation between it and the high-water line of the adjacent coast, in which case no inner light will be displayed. The outer light will be white, and the inner light will be red. The size, capacity, and manner of maintenance of the light will be such as may be specified in the Department of the Army

permit authorizing the erection of the structure or appliance. When several structures or appliances are placed on one line with no navigable passage between them, they will be considered for lighting purposes as one structure.

(2) By authority of the Secretary of the Army conditions in form as follows will be included in all permits for fishing structures and appliances in navigable waters of the United States, issued by the Chief of Engineers or by District Engineers specially authorized by him to issue such permits:

That the weir, trap, or pound will be lighted between sunset and sunrise, by and at the expense of the permittee, for the safety of navigation. The lights will be displayed at each end, the outer end of the structure, and at an elevation of not less than ---------- feet above high water. The outer light will be white, the inner light will be red, and both will be equal to ---------- with a capacity to burn ---------- days untended. They will be subject to the inspection of the aforesaid District Engineer before use. (Additions may be made to this condition and superfluous words deleted as may be necessary to provide for lighting the particular structure.)

That there will be installed and maintained on the weir, trap, or pound, by and at the expense of the permittee, such additional lights and signals, if any, as may be prescribed by the U. S. Coast Guard, and that provision will be made for proper attendance by watchman or otherwise of all lights and signals, so that they will at all times be in effective condition.

Aids to navigation are numerous and there are few places along the coast where a vessel is not in sight of one or more lights. Lightships are moored off New York Bay (two), Barnegat Inlet, Delaware Bay (two), Winter Quarter Shoal, and Chesapeake Bay. All lightships and some light stations, particularly in the approaches to the principal ports, are equipped with radiobeacons.

Bridge regulations for the area covered by this Coast Pilot are complete in Chapter 2A. The usual signal for the opening of a drawbridge is three distinct blasts of a whistle or horn or three calls through a megaphone but acknowledging signals from the bridge tenders vary. Chapters 4 to 15 refer the reader to specific sections in Chapter 2A for regulations governing operation of individual drawspans or groups of drawspans.

Sailing directions for navigation along this coast and into the principal ports are given in tabular form in Chapter 3. The routes along the coast vary with the vessel's draft and the weather. Traffic is heavy and a sharp lookout must be kept to avoid collisions.

Tides.—The mean range of tide along the coast varies from about 3½ to 4½ feet; in passages away from the inlets the range may be as little as ½ foot. In Delaware River, the mean range reaches 6 feet at Philadelphia, while in Chesapeake Bay the mean range is only 1 foot at Baltimore. The *Tide Tables, East Coast of North and South America*, give daily predictions for seven stations in the area covered by this Coast Pilot, along with differences for obtaining similar predictions for many other places.

Coastal currents.—Away from the immediate vicinity of the coast, the tidal currents are generally rotary. They shift direction, usually clockwise, at an average rate of about 30° an hour, and have velocities generally less than ¼ knot except in the vicinities of the entrances to the large bays where the velocities increase as the entrances are approached. For considerable distances off the entrances strengths of flood and ebb set respectively toward and away from those entrances, and minimums of velocity, corresponding to the slacks of reversing currents, set at right angles to the directions of flood and ebb strengths.

Offshore and away from the influence of the tidal flow into and out of the bays, the tidal current maintains a fairly uniform velocity. Shifting its direction continuously to the right, it sets in all directions of the compass during each tidal cycle of 12.4 hours.

The *Atlantic Coast Current Tables* give predicted times and velocities of the tidal currents at a number of locations in the coastal waters.

The inner edge of the **Gulf Stream** is about 85 miles southeast of Cape Henry, 120 miles southeast of Atlantic City, and 150 miles southeast of Sandy Hook; further information concerning this important current is given in the *Current Tables*. Between the coast and the Gulf Stream is a resultant **southward drift** with a velocity, generally less than ¼ knot, which decreases as the distance from the coast increases.

Except near the entrances to the bays where tidal currents are important, **wind currents** are of most interest to the navigator of the coastal waters between Sandy Hook and Cape Henry. The velocities and directions of wind currents depend upon the velocity, direction, and duration of the wind and the proximity and direction of the coast. In the Northern Hemisphere the wind-driven current usually sets somewhat to the right of the wind but in coastal waters it often sets to the left because of its tendency to follow the coast. The velocity of the wind current relative to that of the wind also varies with the locality.

Information based upon extensive current and wind observations at a number of lightships is given in the *Current Tables*, which also discuss the **combination** of wind current, tidal current, and other currents such as those due to drainage or oceanic circulation.

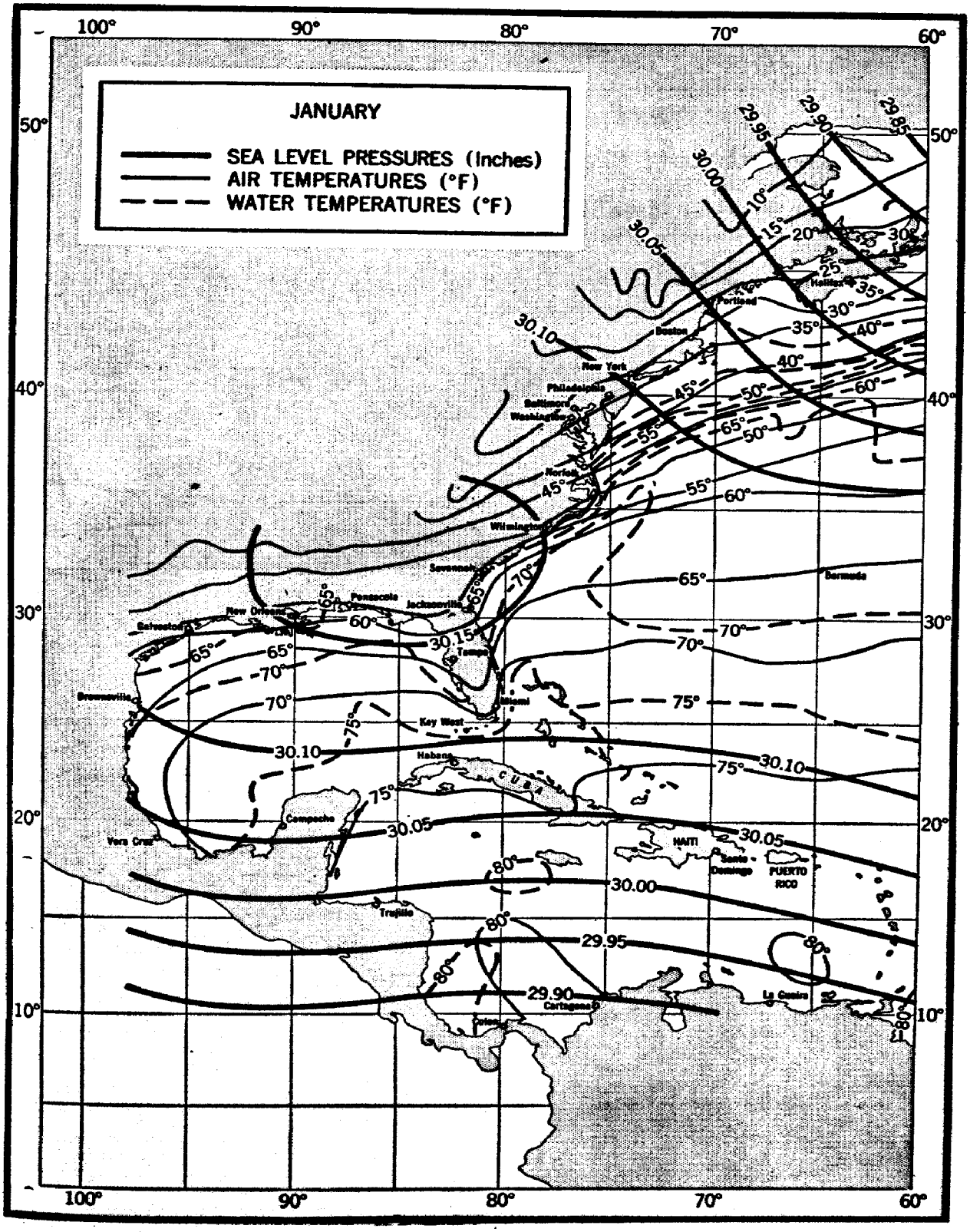
The largest current velocities likely to occur at offshore locations during storms are 2 knots at Ambrose Channel Lightship, 2½ knots at Scotland Lightship, 1 knot at Barnegat Lightship, 1½ knots at Five Fathom Bank Lightship, 3½ knots at Overfalls Lightship, 2½ knots at Winter Quarter Shoal Lightship, 1½ knots at Chesapeake Lightship, and 3 knots at the outer end of Tail of the Horseshoe.

Weather and climate.—The following description of climate and general weather conditions over the section of the Atlantic coast covered by this Coast Pilot was prepared by the Climatological Services Division of the United States Weather Bureau. The Appendix contains climatological tables for twelve land stations and three ocean areas.

The climate of the middle eastern seaboard is the result of the reaction of the general circulation upon the physiographic features in the area. A brief description of the most conspicuous surface features along the coast will be useful in understanding the weather.

The coast of New Jersey, extending from Sandy Hook to Cape May, is characterized by long stretches of sandy beaches and tidewater marshes. Most of the State south of a line connecting Jersey City and Trenton is low, flat, and in some places swampy, with few elevations higher than 100 feet.

The coastal plain region of Maryland and Delaware lies between the ocean on the east and a line, known as the fall line, running from Wilmington, Delaware, through Baltimore to Washington. The Eastern Shore of Chesapeake Bay, as well as most of Delaware, consists of flat, low, and almost featureless plains, while the Western Shore is a gently rolling upland. West of the fall line the streams are mostly turbulent while to the east they are quiet, with their courses largely dominated by the tides.


JANUARY
SEA LEVEL PRESSURES (Inches)
AIR TEMPERATURES (°F)
WATER TEMPERATURES (°F)
100°
90°
80°
70°
60°
50°
40°
30°
20°
10°
Halifax
Portland
Boston
New York
Philadelphia
Baltimore
Washington
Norfolk
Wilmington
Savannah
Jacksonville
Pensacola
New Orleans
Galveston
Tampa
Miami
Key West
Brownsville
Havana
CUBA
Campeche
Vera Cruz
HAITI
Santo Domingo
PUERTO RICO
Trujillo
Cartagena
Colon
La Guaira
Bermuda
29.85
29.90
29.95
30.00
30.05
30.10
30.15
10°
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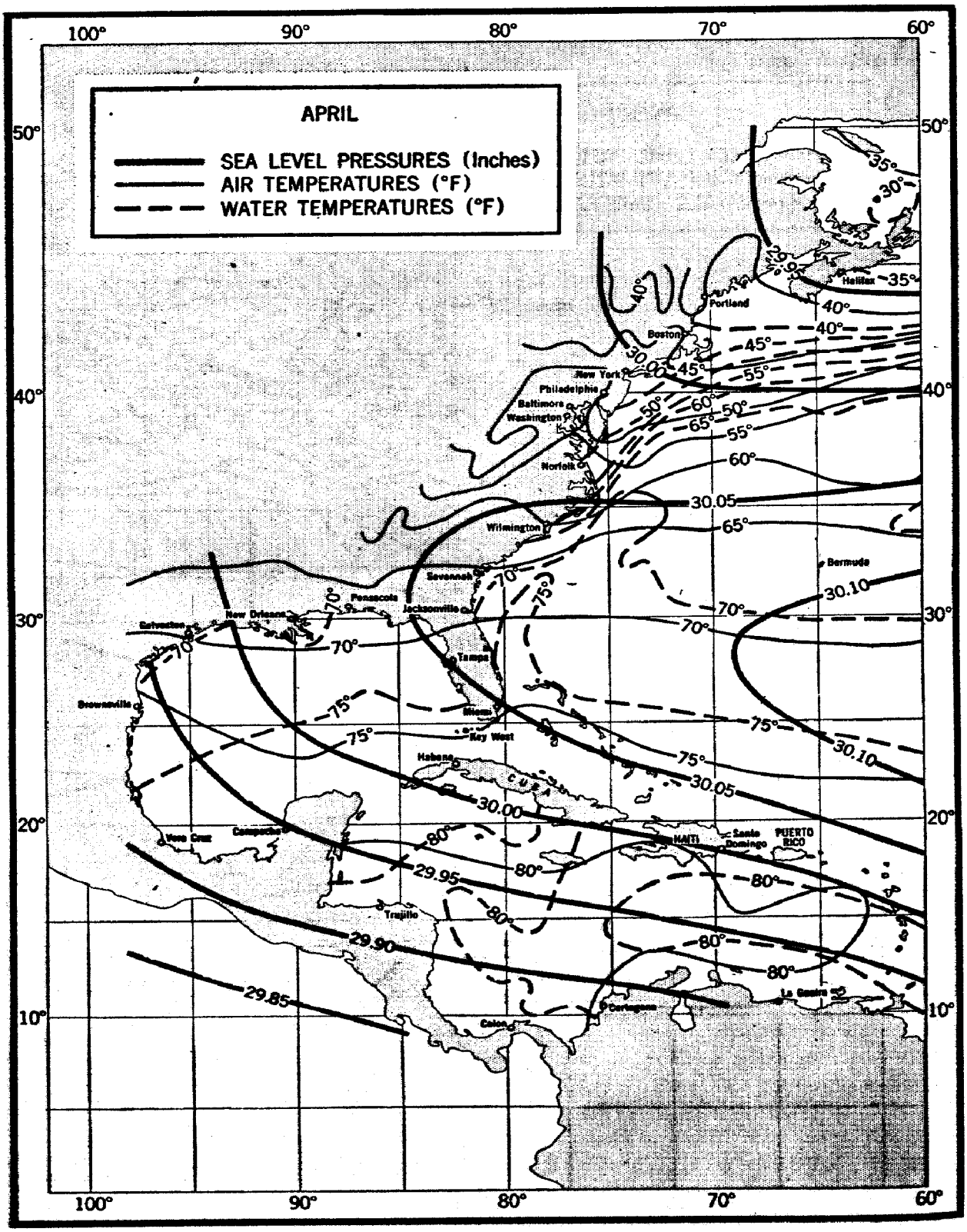
25°
30°
35°
40°
45°
50°
55°
60°
65°
70°
75°
80°


APRIL
SEA LEVEL PRESSURES (Inches)
AIR TEMPERATURES (°F)
WATER TEMPERATURES (°F)
100°
90°
80°
70°
60°
50°
40°
30°
20°
10°
Halifax
Portland
Boston
New York
Philadelphia
Baltimore
Washington
Norfolk
Wilmington
Savannah
Jacksonville
Pensacola
New Orleans
Galveston
Tampa
Miami
Key West
Brownsville
Habana
CUBA
Vera Cruz
Campeche
HAITI
Santo Domingo
PUERTO RICO
Trujillo
Cartagena
Colon
La Guaira
Bermuda
30.05
30.10
30.00
29.95
29.90
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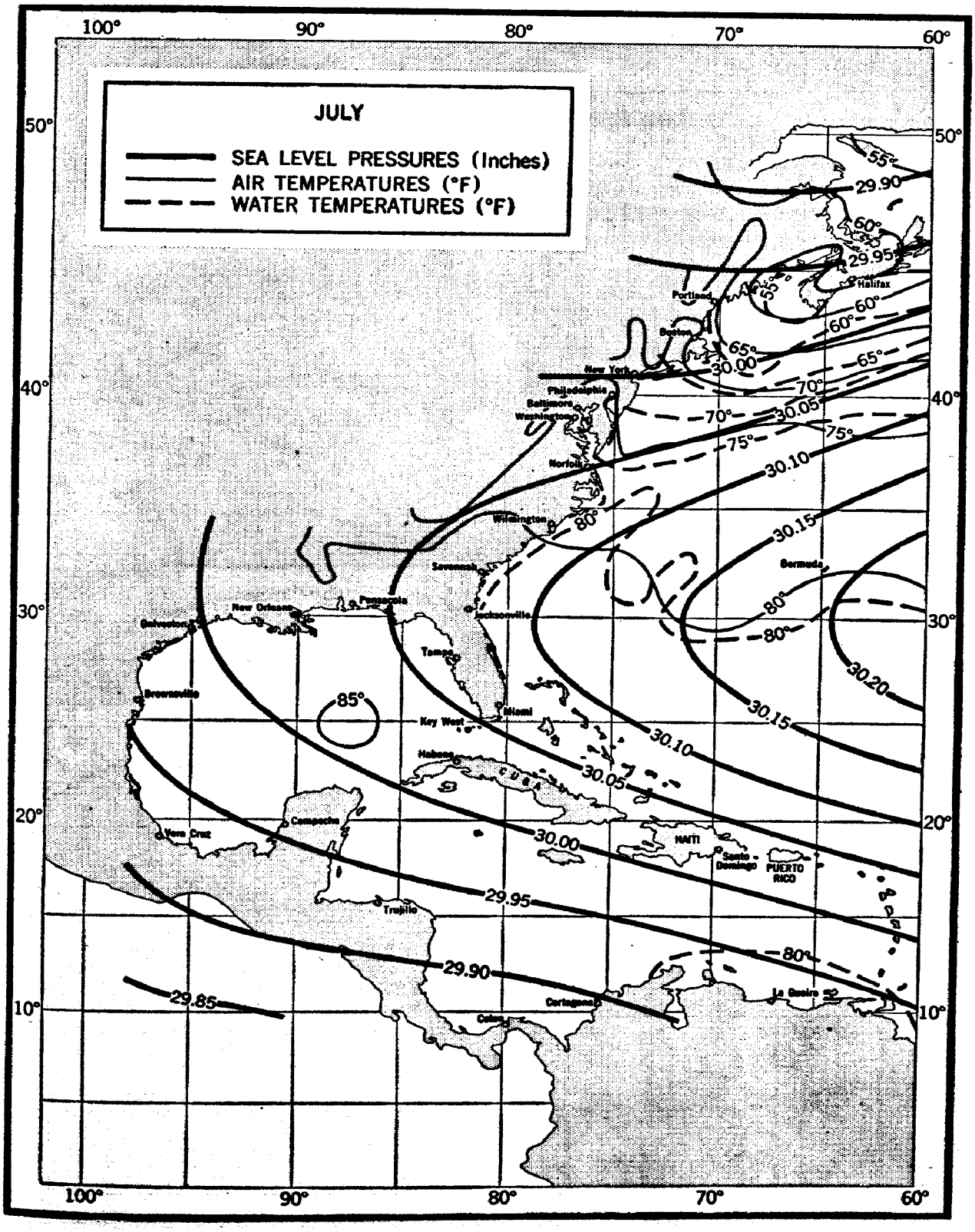
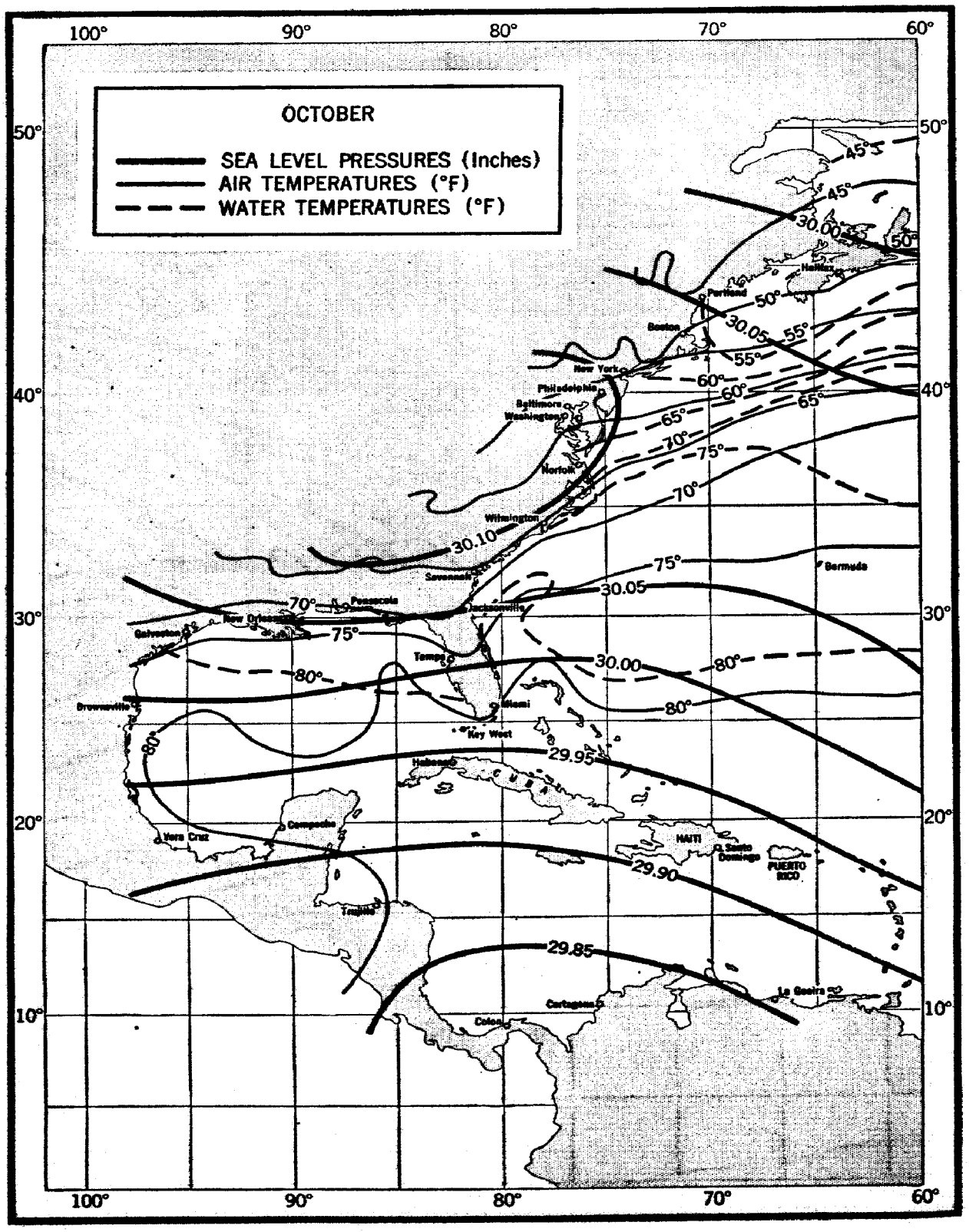
35°
30°
40°
45°
55°
50°
60°
65°
70°
75°
80°

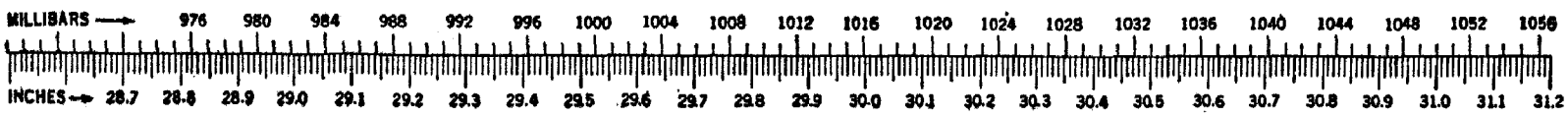

JULY
SEA LEVEL PRESSURES (Inches)
AIR TEMPERATURES (°F)
WATER TEMPERATURES (°F)
100°
90°
80°
70°
60°
50°
40°
30°
20°
10°
29.85
29.90
29.95
30.00
30.05
30.10
30.15
30.20
55°
60°
65°
70°
75°
80°
85°
Portland
Halifax
Boston
New York
Philadelphia
Baltimore
Washington
Norfolk
Wilmington
Savannah
Jacksonville
Pensacola
New Orleans
Galveston
Brownsville
Tampa
Miami
Key West
Havana
CUBA
Bermuda
Vera Cruz
Campeche
HAITI
Santo Domingo
PUERTO RICO
Trujillo
Cartagena
Colon
La Guaira


OCTOBER
SEA LEVEL PRESSURES (Inches)
AIR TEMPERATURES (°F)
WATER TEMPERATURES (°F)
100°
90°
80°
70°
60°
50°
40°
30°
20°
10°
30.00
30.05
30.10
29.95
29.90
29.85
45°
50°
55°
60°
65°
70°
75°
80°
Halifax
Portland
Boston
New York
Philadelphia
Baltimore
Washington
Norfolk
Wilmington
Savannah
Jacksonville
Pensacola
New Orleans
Galveston
Tampa
Miami
Key West
Brownsville
Havana
CUBA
Vera Cruz
Campeche
HAITI
Santo Domingo
PUERTO RICO
Tegucigalpa
Cartagena
Colon
La Guaira
Bermuda

Wind Force and State of Sea Surface with Specifications and Equivalents

Beaufort No.	Description of wind	Sea area: State of sea surface	Sea area: Description of sea	Sea area: Scale	Specifications for use on land	Nautical miles per hour	Terms used in U. S. Weather Bureau forecasts
0	Calm	Sea like a mirror—smooth	Glassy-calm	0	Calm; smoke rises vertically	Less than 1	Light.
1	Light air	Ripples with the appearance of scales are formed but without foam crests.	Rippled	1	Direction of wind shown by smoke drift, but not by wind vanes.	1 to 3	
2	Light breeze	Small wavelets, still short but more pronounced. Crests have a glassy appearance and do not break.	Smooth	2	Wind felt on face; leaves rustle; ordinary vane moved by wind.	4 to 6	
3	Gentle breeze	Large wavelets; crests begin to break; foam is not white but of glassy appearance, perhaps scattered whitecaps.		3	Leaves and small twigs in constant motion; wind extends light flag.	7 to 10	Gentle.
4	Moderate breeze	Small waves, becoming longer; fairly frequent whitecaps.	Slight	4	Raise dust and loose paper; small branches are moved.	11 to 16	Moderate.
5	Fresh breeze	Moderate waves, taking a more pronounced long form; many whitecaps are formed. (Chance of some spray.)	Moderate	5	Small trees in leaf begin to sway; crested wavelets form on inland waters.	17 to 21	Fresh.
6	Strong breeze	Large waves begin to form; white foam crests are more extensive everywhere. (Probably some spray.)	Rough	6	Large branches in motion; whistling heard in telegraph wires; umbrellas used with difficulty.	22 to 27	Strong.
7	Moderate gale (high wind)	Sea piles up and white foam from breaking waves begins to be blown in streaks along the direction of the wind.	Very rough	7	Whole trees in motion; inconvenience felt in walking against wind.	28 to 33	
8	Fresh gale	Moderately high waves of greater length; edges of crest begin to break into the spindrift. The foam is blown in well-marked streaks along the direction of the wind.	High	8	Breaks twigs off trees; generally impedes progress.	34 to 40	Gale.
9	Strong gale	High waves. Dense streaks of foam along the direction of the wind. Sea begins to "roll." Spray may affect visibility.		9	Slight structural damage occurs (chimney pots and slate removed).	41 to 47	
10	Whole gale (heavy gale).	Very high waves with long overhanging crests. The resulting foam, in great patches, is blown in dense white streaks along the direction of the wind. On the whole, the surface of the sea takes a white appearance. The rolling of the sea becomes heavy and shock-like. Visibility affected.	Very high	10	Seldom experienced inland; trees uprooted; considerable structural damage occurs.	48 to 55	Whole gale.
11	Storm	Exceptionally high waves (small and medium-sized ships might be for a time lost to view behind the waves). The sea is completely covered with long white patches of foam along the direction of the wind. Everywhere the edges of the wave crests are blown into froth. Visibility affected.	Phenomenal [1]	11	Very rarely experienced; accompanied by widespread damage.	55 to 65	
12	Hurricane	The air is filled with foam and spray. Sea completely white with driving spray; visibility very seriously affected.		12		Above 65	Hurricane.

[1] As might exist at the center of a hurricane.



258030°—54——6

Tidewater Virginia comprises the flat and near-sea-level sections east of a line from Quantico through Richmond to Emporia, Virginia. Its chief characteristics are numerous peninsulas, wide estuaries, and many swamps.

To the westward of the coastal regions lie the Appalachian Mountains and other lower mountain ranges. These physical features, though at some distance from the coast, have a pronounced effect upon the weather.

General circulation.—The circulation over the eastern seaboard is dominated largely by the position and intensity of the Bermuda HIGH. During the winter months a ridge of high pressure exists over the southeastern portion of the United States and the Bermuda HIGH is far out to sea. Major frontal systems developing over the interior of the country and the Gulf of Mexico sweep unhampered over the seaboard States in a general easterly or northeasterly direction. Since the contrast between continental and maritime polar air and maritime tropical air is great at this time, winter storms are generally intense, and changing air masses result in variable winter weather.

In spring the Bermuda HIGH, still far south, begins to exert its effect on the southeastern portion of the country. Normally the central seaboard region remains outside the rim of the high itself which obstructs but little the passage of the spring cyclonic storms.

In summer the entire eastern seaboard comes under the influence of the Bermuda HIGH which has now moved considerably northward. The intensity of the high pressure circulation is moderate but persistent, blocking the eastward movement of the continental pressure systems. A weak stationary front forms along the Appalachian Range and the synoptic situation on the coast may remain significantly unchanged for weeks at a time. The weather during this season, controlled by the infrequently interrupted warm, moist southerly air flow from the Gulf, is characterized by frequent instability, showers and thunderstorms, and uniformly high temperatures and humidity.

During the fall months the Bermuda HIGH retreats southward and eastward leaving the Atlantic Coast in a weak high pressure zone. The weakening of the pressure system indicates the gradual transition to the winter synoptic pattern accompanied by increased frontal activity and the more frequent passage of cyclones and anticyclones.

Pressure.—The mean sea level pressure on the coast ranges from 30.02 inches at New York to 30.07 inches at Norfolk. The highest mean pressure on the average occurs during the winter months and the lowest during late spring and early summer.

Exteme high pressures ranging from 30.96 to 31.02 inches were observed during January and February; lowest extreme high pressures (30.38 to 30.56 inches) in June, July, and August. Extreme low pressures, 28.35 to 28.67 inches were recorded in March, and highest extreme lows in the late spring and summer months. Thus it may be readily seen that winter and spring pressures are subject to wide variations accounted for by the moving cyclones and anticyclones, while summer pressures, dominated by the persistent Bermuda HIGH, though not as high on the average as winter, are less variable.

Winds.—Prevailing winds are from a northerly quadrant from October through March, from southerly to southeasterly from May through August, and about evenly divided from southerly to northerly in April and September. The shift in direction from summer to winter shows clearly the change in the general circulation.

The mean velocity of the wind averages from 6.1 knots at Washington to 13.0 knots at Atlantic City. Winds over the ocean are slightly stronger during the winter months

than at most land stations, and the yearly average is thus slightly greater. Highest mean velocities occur in February and March, and lowest during July and August.

Temperature and humidity.—Mean annual temperatures along the coast range from 52.3° F. at New York to 59.8° F. at Norfolk. January is the coldest month and July the hottest at most stations. The lowest mean monthly temperature is 30.5° F. at Trenton in January; the highest 78.5° F. at Richmond and Norfolk in July. Normally temperature decreases with increasing latitude. This is true in general for the middle eastern seaboard, but the isotherms are by no means oriented in a rigid east-west direction. Over the water area January mean air temperatures are 8° to 10° warmer than at coastal stations, and the minimum occurs in February. July mean air temperatures are 2° to 3° cooler, with the maximum in August. The least difference between air temperatures over the land and water occur in August due to the fact that air over land surfaces warms and cools readily and very much; over water areas, it warms and cools slowly and relatively little. Also land surfaces absorb heat to slight depths and give it up freely, while water absorbs heat to great depths and retains the heat longer. Coastal stations tend toward a continental temperature regime, but the proximity of the Atlantic Ocean modifies this to some extent.

The temperature of the sea surface itself is lower than the air temperature from April through August and higher during the remainder of the year. Sea-surface isotherms follow the warm Gulf current, while air temperatures are more dependent upon the air masses and the moving pressure pattern.

The diurnal variation in air temperature at coastal stations is about 12° to 20° throughout the year, and is likely to be much less over the water. Small craft operating close to shore and vessels in harbor activities will be concerned with this effect

Very little data on extremes in temperature are available for the ocean areas. Temperatures at the coastal stations rarely exceed 100° F. The highest mean daily maximum temperature is 88.3° F. recorded at Richmond in July. Freezing temperatures are usual from December through March at most stations, and below zero temperatures have been recorded from December through February.

Relative humidity is high throughout the year, averaging from about 63 to 75 percent. Highest humidities occur from July through September when air temperatures are also high. During these months the climate is depressing and enervating. Lowest average humidities occur during the spring.

Cloudiness and precipitation.—Mean cloudiness over the area is moderately high throughout the year averaging from 40 to 70 percent. As might be expected the least cloudiness occurs while the eastern seaboard is dominated by the persistent Bermuda HIGH circulation in summer and early fall, and greatest cloudiness accompanies the frequent winter storms. Of the possible hours of sunshine most stations experience 50 to 65 percent sunny. Since the air is comparatively moist most of the time, only a small drop in temperature may cause condensation and cloud formation.

Precipitation over the eastern seaboard is moderately heavy, averaging from 35 to 45 inches per year. Monthly departures from the average may be large in any individual year, but over a long period of record (50 to 75 years) a fairly uniform pattern appears. Since the region under consideration is not extensive, differences in station records may be explained by the exposure to the general circulation which may vary considerably in individual years.

Precipitation is heaviest, averaging 4 to 6 inches per month, during the months of

July and August, and most of the rainfall at this time is the showery type resulting from instability conditions in the air mass itself. Least precipitation occurs in October and November when 2 or 3 inches are average.

The intensity of storms and showers, magnified by the effect of convection and orography, is usually greater over land than over water. Heaviest precipitation occurs over land and near coastal waters in the afternoon; over open water, during the night. The mountain and hill country to the west of the coastal area is frequently the source of heavy cumulus and cumulonimbus cloud formations. These clouds drift eastward in the afternoon, frequently giving rain along the coast, or they drift to sea where the precipitation may be released at night.

Maximum thunderstorm activity occurs during the summer months. The average number of thunderstorms in July at most of the stations is from 7 to 10.

Snow along this coast may be expected from November through March. Maximum amounts averaging from 2.5 inches per month at Norfolk to 9.7 inches per month at New York are recorded in January and February. Most of the snow falls during intense winter storms but does not usually remain on the ground long. Over the water area falling snow is little more than a restriction to visibility.

Fog and visibility.—Visibility is generally good throughout the year. The frequency of days with visibility less than a mile on the coast is 3 to 10 percent annually. The principal restrictions are fog and precipitation over water, and smoke, haze, fog, and precipitation over land.

The occurrence of fog over the eastern seaboard is very irregular. Station data, indicating 10 to 22 days of heavy fog per year, is somewhat misleading because coastal exposures may be very different from place to place. In general, fog decreases from north to south. Along the coast the worst fog conditions occur during the winter months. Over the water the greatest frequency occurs during the spring and early summer months. Sea fogs frequently drift onshore on hot summer days where they burn off at the surface and lift. Over the water the process is reversed and clearing takes place from the top of the fog cloud.

Hurricanes.—The middle Atlantic coast is normally subject to hurricanes from June through November. From time to time, considerable damage has resulted to shore property from high tides and to surface vessels along and off the coast. Property damage was estimated to be in excess of one million dollars at Norfolk from September 18 to 20, 1936 and at Wilmington, Delaware, from July 30 to August 4, 1944.

The months of greatest hurricane frequency are August, September, and October, and the storms are most likely to be severe during those months. During all the months of the hurrican season, the chance of encountering an intense storm is great enough to warrant careful attention to Weather Bureau storm warnings, forecasts, and advisories. Hurricanes in general are discussed at some length in Chapter 1 of this Coast Pilot.

Ice.—The intracoastal passages of New Jersey, Delaware, and Maryland usually are closed by ice during ordinary winters; the Virginia passages are closed only during severe winters and then only for short periods. Local vessels use all the inlets and adjacent channels from Sandy Hook to Cape Charles all winter, even when through navigation is blocked.

In Delaware River, ice is present in sufficient amounts even in ordinary winters to be of some concern. The Chesapeake and Delaware Canal is kept open as long as possible but may be closed at times. In severe winters, navigation has been interrupted above Chester but ice breakers and large vessels keep the channels open to Philadelphia. Above Philadelphia, the river is closed for extended periods in January and February, and navigation is practically suspended during severe winters.

Ice seldom interferes with navigation of full-powered vessels in Hampton Roads even in severe winters. Large vessels can always pass up and down Chesapeake Bay, but ice jams are of frequent occurrence off Baltimore Harbor, and the harbor itself freezes over; Baltimore ice breakers attempt to keep the channels open but navigation is sometimes blocked for limited periods.

Conditions in other Chesapeake Bay tributaries are somewhat similar to those in the same latitudes along the coast. Ice is not much of a problem in the southerly tributaries, although Rappahannock River is said to freeze almost to the mouth in severe winters. The upper part of Potomac River is closed during severe winters, and Patuxent River is closed nearly to the mouth. Severn River, strangely enough, is said to remain open except for short periods in severe winters. Susquehanna River, at the head of the bay, usually is completely closed for about three months. Ice conditions in the Eastern Shore tributaries correspond roughly to those across the bay.

Pilotage is compulsory for certain vessels bound in and out of Delaware Bay and Chesapeake Bay. Pilot boats are stationed at the entrances to both bays. Details of pilotage regulations and rates are given in Chapters 6, 9, and 15.

Towboats operate out of Philadelphia, Norfolk, and Baltimore and can be ordered to other ports. Arrangements for towage should be made by radio.

Supplies of all kinds, including bunker coal, bunker oil, and ship chandlery, are available at the three big ports. Gasoline, Diesel oil, fresh water, ice, provisions, and some ship chandlery can be obtained at the smaller ports and at many of the towns and villages.

Repairs to hulls and machinery of medium to large vessels can be made at Chester, Philadelphia, Norfolk, Newport News, and Baltimore. Small vessels and motorboats can be hauled out and repaired at many other places. Wrecking and salvage facilities are available at Philadelphia, Norfolk, and Baltimore.

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CHAPTER 2A

Navigation Regulations

THIS chapter contains the parts of ***Code of Federal Regulations, Title 33, Navigation and Navigable Waters,*** that are of most importance in the area covered by this Coast Pilot. Complete for the area are § 202, Anchorage Regulations; § 203, Bridge Regulations; § 204, Danger Zone Regulations; and § 207, Navigation Regulations. Chapters 4 to 15 contain numerous references to specific sections in this chapter. The regulations have been corrected for amendments and cancellations to publication date of the Coast Pilot; subsequent changes will be written into the annual Coast Pilot supplements and the weekly *Notice to Mariners.*

§ 202.—ANCHORAGE REGULATIONS:

§ 202.1 General. (a) The areas described in Subpart A of this part are designated as special anchorage areas pursuant to the authority contained in an act amending laws for preventing collisions of vessels approved April 22, 1940 (54 Stat. 150). Section 1 of the act amended Article 11 of the Navigation Rules for Harbors, Rivers, and Inland Waters Generally (33 U. S. C. 180), section 2 amended Rule 9 of the Navigation Rules for Great Lakes and Their Connecting and Tributary Waters (33 U. S. C. 258), and section 3 amended Rule 10 of the Navigation Rules for Red River of the North and Rivers Emptying into Gulf of Mexico and Tributaries (33 U. S. C. 319). Vessels not more than 65 feet in length, when at anchor in any special anchorage area, shall not be required to carry or exhibit the white anchor lights required by the Navigation Rules.

(b) The anchorage grounds for vessels described in Subpart B of this part are established, and the rules and regulations in relation thereto adopted, pursuant to the authority contained in section 7 of the River and Harbor Act approved March 4, 1915 (38 Stat. 1053; 33 U. S. C. 471).

(c) All bearings in this part are referred to true meridian.

SUBPART A.—SPECIAL ANCHORAGE AREAS:

§ 202.65 Indian River Bay, Del. Beginning at a point bearing 174°, 300 feet, from a point on the southerly edge of the project channel 5,500 feet westerly from the State highway bridge across Indian River Inlet; thence 174°, 600 feet; thence 264°, 800 feet; thence 354°, 600 feet; and thence 84°, 800 feet, to the point of beginning.

§ 202.67 Delaware River, Essington, Pa. North of Little Tinicum Island, between the mouth of Darby Creek and Jansen Avenue, Essington, bounded as follows: Beginning at a point (approximately latitude 39°51′31″, longitude 75°17′43″) on a line in prolongation of the westerly line of Jansen Avenue 135 yards southerly from the mean high water line; thence 184°, 300 yards; thence 274° 30′, 1,700 yards; thence 04°, 425 yards; thence 100°, 1,225 yards; and thence 95°, 490 yards, to the point of beginning.

§ 202.70 Chesapeake and Delaware Canal, easterly of Courthouse Point, Md. Southerly of a line joining the northernmost extremity of Courthouse Point and the westernmost point of Herring Island; westerly of a line bearing 180° from the westernmost point of Herring Island; and northerly and easterly of the shore line.

§ 202.72 Blackhole Creek, Md. The waters on the west side of Blackhole Creek, a tributary of Magothy River, southwest of a line bearing 310°30′ from the most northerly tip of an unnamed island located 0.16 mile upstream from the mouth of the creek approximately 660 feet to the west shore of the creek; northwest of a line ranging from the southwesterly tip of the island toward the point of land on the west shore of the creek immediately southwest thereof; and north of a line 100 feet from and parallel to the shore of the creek to its intersection with the south property line extended of the Potapskut Sailing Association, Inc., thence northwesterly along the said property line extended to the shore.

SUBPART B.—ANCHORAGE GROUNDS:

§ 202.157 Delaware Bay and River—(a) *The anchorage grounds*—(1) *Anchorage 1 off Bombay Hook Point.* On the southwest side of the channel along Liston Range, bounded as follows: Beginning at a point (approximately latitude 39°17′59″, longitude 75°23′07″) bearing 228° from Ship John Shoal Light, 167 yards southwest of the southwest edge of the channel along Liston Range; thence 228°, 2,000 yards; thence 318°, 8,000 yards; thence 48°, 2,000 yards; and thence 138°, 8,000 yards, to the point of beginning.

(2) *Anchorage 2 (explosives) northwest of Artificial Island.* On the east side of the channel along Reedy Island Range, bounded as follows: Beginning at a point bearing 105° from the northernmost point of Reedy Island, 167 yards easterly of the east edge of the channel along Reedy Island Range; thence 105°, 800 yards; thence 195°, 4,500 yards; thence 285°, 800 yards, to a point (approximately latitude 39°28′58″, longitude 75°33′37″) opposite the intersection of Reedy Island and Baker Ranges; and thence 15°, 4,500 yards, to the point of beginning. This anchorage is intended for vessels engaged in the transportation and handling of explosives and other dangerous articles. No vessel not so engaged will be permitted to anchor in this anchorage except in case of emergency or by special permission of the District Commander. For special regulations relating to this anchorage, see paragraph (c) of this section.

NOTE: The term "District Commander" as used in this section means the Commander, Third Coast Guard District, or his authorized representative.

(3) *Anchorage 3 southeast of Reedy Point.* Southeast of the entrance to the Chesapeake and Delaware Canal at Reedy Point, bounded on the east by the west edge of the channel along Reedy Island and New Castle Ranges; on the west by a line beginning at a point on the west edge of the channel along Reedy Island Range at latitude 39°31′43″, thence to a point bearing 168° 30′, 3,150 yards, from Chesapeake and Delaware Canal 2 Light, and thence to a point bearing 131°, 1,160 yards, from Chesapeake and Delaware Canal 2 Light; and on the north by a line running from the last-described point 113° 30′, approximately 813 yards, to the west edge of the channel along New Castle Range.

(4) *Anchorage 4 north of Reedy Point.* North of the entrance to the Chesapeake and Delaware Canal at Reedy Point, on the west side of the river, bounded as follows: Beginning at a point (approximately latitude 39°33′52″, longitude 75°33′36″) 220 yards due north of Chesapeake and Delaware Canal 2 Light; thence 314°, 1,442 yards; thence 44° 30′, 377 yards; thence 134°, 1,442 yards; and thence 224° 30′, 377 yards, to the point of beginning.

(5) *Anchorage 5 southeast of Pea Patch Island.* On the northeast side of the channel along New Castle Range, bounded as follows: Beginning at latitude 39°34′28″, longitude 75°33′06″; thence 334°, 2,343 yards; thence 64°, 512 yards; thence 154°, 2,343 yards; and thence 244°, 512 yards, to the point of beginning.

(6) *Anchorage 6 off Deepwater Point.* Southeast of the entrance to Christina River, on the east side of the channel along Cherry Island Range, bounded as follows: Beginning at latitude 39°41′31″, longitude 75°30′55″; thence 17°, 2,747 yards; thence 112°, 847 yards; thence 215°, 1,340 yards; thence 204°, 893 yards; thence 186° 30′, 500 yards; and thence 286°, 377 yards, to the point of beginning. Vessels must not cast anchor in the cable area at the lower end of this anchorage except in case of emergency.

(7) *Anchorage 7 off Marcus Hook.* On the southeast side of the channel along Marcus Hook Range, bounded as follows: Beginning at a point on the southeast edge of the channel at longitude

75°25′50″; thence northeasterly along the edge of the channel to longitude 75°23′30″; thence 207°, 967 yards; thence 237°, 2,675 yards; and thence 267°, 967 yards, to the point of beginning. A preferential area in this anchorage is designated for the use of vessels awaiting quarantine inspection between lines projected from the northeast and southwest boundaries of the United States Quarantine Station at Marcus Hook. Should the remainder of the anchorage be in use the preferential area, when available, may be used by vessels not subject to quarantine inspection.

(8) *Anchorage 8 off Thompson Point.* On the south side of the channel along Tinicum Range, between Thompson Point and the east side of Crab Point, bounded as follows: Beginning at a point on the south edge of the channel along Tinicum Range at longitude 75°18′24″; thence easterly along the edge of the channel to longitude 75°17′42″; thence 179°, 203 yards; thence 260° 30′, 1,100 yards; and thence 358°, 425 yards, to the point of beginning.

(9) *Anchorage 9 near entrance to Mantua Creek.* On the southeast side of the channel along Mifflin Range, bounded as follows: Beginning at a point on the southeast edge of the channel at longitude 75°14′26″; thence northeasterly along the edge of the channel to longitude 75°12′01.5″; thence 203° 30′, 933 yards; thence 233° 30′, 3,058 yards; and thence 263° 30′, 933 yards, to the point of beginning. Vessels must not cast anchor in this anchorage in such manner as to interfere unreasonably with the passage of other vessels to and from Mantua Creek.

(10) *Anchorage 10 (naval) at Naval Base, Philadelphia.* On the north side of the channel along West Horseshoe Range, bounded as follows: Beginning at the southeasterly corner of Pier 7 (approximately latitude 39°53′11″, longitude 75°09′58.5″); thence 174°, 525 yards, to the north edge of the channel along West Horseshoe Range; thence 273°30′ along the edge of the channel, 880 yards; thence 354°, 433 yards, to the southeasterly corner of Pier 1; and thence 88° 30′, 875 yards, to the point of beginning. This is a restricted naval anchorage.

(11) *Anchorage 11 at Gloucester.* On the southeast side of the channel between Big Timber Creek and the Immigration Pier at Gloucester, bounded as follows: Beginning at a point on the southeast edge of the channel at latitude 39°54′07″; thence 165°, 350 yards, to latitude 39°53′57″, longitude 75°07′45.5″; thence 202°, 1,000 yards; thence 217° 30′, 1,142 yards, to the southeast edge of the channel; and thence northeasterly along the edge of the channel to the point of beginning.

(12) *Anchorage 12 between Gloucester and Camden.* On the east side of the channel between the Immigration Pier at Gloucester and the Public Service Electric and Gas Company pier, Camden, bounded as follows: Beginning at latitude 39°53′57″, longitude 75°07′45.5″; thence to a point on the east edge of the channel at latitude 39°54′07″; thence northerly along the edge of the channel to latitude 39°55′57.5″; thence 101°, 283 yards; and thence southerly along the line of 18-foot depth to the point of beginning. The area between New York Shipbuilding Corporation Pier No. 2 and the MacAndrews and Forbes Company pier, Camden, shall be restricted to facilitate the movement of carfloats to and from Bulson Street, Camden. The area in front of the Public Service Electric and Gas Company pier shall be restricted to facilitate the movement of vessels to and from the pier. Should the anchorage become so congested that vessels are compelled to anchor in these restricted areas, they must move immediately when another berth is available.

(13) *Anchorage 13 off Cooper Point.* On the southeast side of the channel, bounded as follows: Beginning at a point on the southeast edge of the channel at latitude 39°57′23.5″; thence northeasterly along the edge of the channel to latitude 39°57′35″; thence 131° 30′, 325 yards; thence 229° 358 yards; and thence 282°, 258 yards, to the point of beginning.

(14) *Anchorage 14 opposite Port Richmond.* On the southeast side of the channel, north of Petty Island, bounded as follows: Beginning at a point on the southeast edge of the channel at longitude 75°05′43″; thence 163°, 248 yards; thence 253°, 1,978 yards, to the southeast edge of the channel; and thence northeasterly along the edge of the channel to the point of beginning. Vessels having a draft of less than 20 feet must anchor southwest of Pier No. 11, Port Richmond. The area off the Cities Service Oil Company wharves, Petty Island, shall be restricted to facilitate the movement of vessels to and from the wharves. Vessels must not cast anchor in the cable area at the lower end of the anchorage except in case of emergency.

(15) *Anchorage 15 (restricted) off northeasterly end of Petty Island.* On the southeast side of the channel, bounded as follows: Beginning at a point on the southeast edge of the channel at longitude 75°05′34.7″; thence northeasterly along the southeast edge of the channel to longitude 75°05′09.5″; thence 171°, 198 yards; thence 260° 30′, 667 yards; and thence 351°, 198 yards, to the point of begin-

ning. This anchorage is reserved for vessels under the custody of the United States, and for vessels having a permit from the District Commander.

(16) *Anchorage 16 (restricted) between Port Richmond and Five Mile Point.* On the northwest side of the channel, bounded as follows: Beginning at a point on the northwest edge of the channel at longitude 75°05′35″; thence northeasterly along the edge of the channel to longitude 75°04′18.5″, thence 328°, 267 yards; thence 243°, 450 yards; thence 251°, 475 yards; thence 257°, 1,042 yards; and thence 174° 30′, 155 yards, to the point of beginning. This anchorage is reserved for vessels under the custody of the United States, and for vessels having a permit from the District Commander.

(b) *General regulations.* (1) Except in cases of great emergency, no vessel shall be anchored in Delaware Bay and River between Ship John Light and The Pennsylvania Railroad Company bridge at Delair, New Jersey, outside of the anchorage areas established in this section, or within a cable or pipe line area shown on a Government chart, or be moored, anchored, or tied up to any pier, wharf, or other vessel in such manner as to obstruct or endanger the passage of any vessel.

(2) No vessel shall occupy any anchorage for a longer period than 30 days without a permit from the District Commander. Vessels expecting to be at anchor for more than 30 days shall obtain a permit from the District Commander for that purpose in either Anchorage 15 or Anchorage 16. No vessel in such condition that it is likely to sink or otherwise become a menace or obstruction to navigation or anchorage of other vessels shall occupy an anchorage except in an emergency, and then only for such period as may be permitted by the District Commander.

(3) Whenever, in the opinion of the District Commander such action may be necessary, he may require any or all vessels in any designated anchorage area to moor with two or more anchors.

(4) Every vessel whose crew may be reduced to such number that it will not have sufficient men on board to weigh anchor at any time shall, before release or reduction of the crew, be anchored with two anchors with mooring swivel unless the District Commander shall waive the requirement of a mooring swivel.

(5) Anchors shall be placed well within the anchorage areas, so that no portion of the hull or rigging will at any time extend outside of the anchorage area.

(6). Light-draft barges using the anchorages shall be anchored away from the deeper portions of the anchorages, so as not to interfere with the anchoring of deep-draft vessels. Any barges towed in tandem to an anchorage area shall be bunched together when anchoring.

(7) Upon approval of the District Engineer, Corps of Engineers, the District Commander may permit wrecking plant or other vessels legally engaged in recovering sunken property, or in laying or repairing pipe lines or cables, or plant engaged in dredging operations, to anchor in channels. Such permission is not necessary for plant engaged upon works of river and harbor improvement under the supervision of the District Engineer, but the District Engineer will notify the District Commander in advance of all such proposed work.

(8) Whenever the maritime or commercial interests of the United States so require, the District Commander is hereby empowered to shift the position of any vessel anchored or moored within or outside an anchorage area, including any vessel which is so moored or anchored as to obstruct navigation or interfere with range lights.

(9) A vessel upon being notified to shift its position shall get under way at once or signal for a tug and shall change position as directed with reasonable promptness.

(10) Nothing in this section shall be construed as relieving any vessel or the owner or person in charge of any vessel from the penalties of law for obstructing navigation or for obstructing or interfering with range lights, or for not complying with the laws relating to lights and fog signals or other navigation laws and regulations.

(c) *Regulations for explosives anchorage.* (1) All vessels carrying explosives and other dangerous articles, or on which explosives and other dangerous articles are to be loaded, shall be within Anchorage 2 when anchored, except as provided in subparagraph (7) of this paragraph.

(2) A written permit shall be obtained from the District Commander before vessels carrying explosives and other dangerous articles, or on which explosives and other dangerous articles are to be loaded, may anchor in Anchorage 2, and no vessel shall anchor therein except by authority of such permit, which may be revoked at any time. This anchorage shall not be used by vessels which do not carry explosives and other dangerous articles as cargo, or on which explosives and other dangerous articles are not to be loaded, except in cases of great emergency or by special permit from the District Commander. All other vessels, including tugs and stevedore boats, used in connection with loading

or unloading explosives and other dangerous articles in this anchorage shall carry written permits from the District Commander and shall show such permits whenever required by him.

(3) Vessels shall be anchored in Anchorage 2 so as to be at least 1,000 feet apart, but the number of vessels which may anchor in the anchorage at any one time shall be at the discretion of the District Commander. This provision is not intended to prohibit barges or lighters from tying up alongside the vessels for the transfer of cargoes.

(4) Whenever any vessel or barge not mechanically self-propelled anchors in Anchorage 2 while carrying explosives and other dangerous articles, or on which explosives and other dangerous articles are to be loaded, the District Commander may require the attendance of a tug upon such vessel or barge when in his judgment such action is necessary.

(5) Every vessel transporting, stowing, storing, or handling explosives and other dangerous articles as cargo in the vicinity of Anchorage 2 shall display by day a red flag at least 16 square feet in area at its masthead, or at least ten feet above the upper deck if the vessel has no mast, and shall display by night a red light in the same position specified for the flag.

(6) Fishing and navigation are prohibited within Anchorage 2 at all times when vessels which are moored in the area display a red flag by day or a red light by night.

(7) The District Engineer, Corps of Engineers, may authorize, in writing, a vessel carrying explosives for use on river and harbor works or on other work under Department of the Army permit, to anchor in or near the vicinity of such work without a permit from the District Commander. The District Engineer will prescribe the quantity of explosives allowed and the conditions under which explosives shall be stored and handled in such cases, and will furnish the District Commander with a copy of such written authorization and instructions.

(8) Vessels carrying explosives and other dangerous articles, or on which explosives and other dangerous articles are to be loaded, shall comply with the general regulations in paragraph (b) of this section when applicable.

(9) Nothing in this section shall be construed as relieving any vessel or the owner or person in charge of any vessel, and all others concerned, of the duties and responsibilities imposed upon them to comply with the regulations governing the handling, loading, or discharging of explosives, and other dangerous articles, entitled "Explosives or Other Dangerous Articles or Substances and Combustible Liquids on Board Vessels."

§ 202.159 Annapolis Harbor, Md.—(a) *The anchorage grounds*—(1) *Naval anchorage for deep draft vessels.* In Chesapeake Bay, bounded on the north by latitude 38°58′; on the east by a line bearing 203°05′ from latitude 38°58′, longitude 76°24′; on the south by latitude 38°56′30″; and on the west by a line bearing 139° from Greenbury Point Shoal Light. This anchorage is reserved for deep-draft naval vessels. Berths in the area will be assigned on application to the Commandant, Severn River Naval Command.

(2) *Middle Ground anchorage.* In Severn River, beginning at a point bearing 126°, 800 yards, from the mast at the intersection of the northeast and southeast seawalls of the Naval Academy grounds; thence 79°20′, 485 yards, to Annapolis Harbor Buoy 13; thence 144°, 220 yards; thence 153°10′, 715 yards; thence 270°, 175 yards; and thence 313°30′, 1,060 yards, to the point of beginning.

(3) *South anchorage.* In Severn River, beginning at a point on the shoreline of Horn Point, Eastport, bearing 270° from Annapolis Harbor Buoy 5; thence 90° to Annapolis Harbor Buoy 5; thence 313°30′, 1,040 yards; thence 259°20′, 710 yards, to a point bearing 189°30′, 615 yards, from the mast at the intersection of the northeast and southeast seawalls of the Naval Academy grounds; and thence 180° to the shoreline at Eastport. No vessels shall anchor within 100 feet of any wharf, marine railway, or other structure without permission of the owner thereof.

(4) *Naval anchorage for small craft.* In Severn River, beginning at a point on the prolongation of the line of the northeast seawall of the Naval Academy grounds, 80 feet from the face of the southeast seawall of the Naval Academy grounds; thence 81°, 470 yards, to Annapolis Harbor Buoy 15; thence 125°45′, 580 yards; thence 259°20′, 1,035 yards; thence 310°, 230 yards; and thence 40°, parallel to the southeast seawall of the Naval Academy grounds, 400 yards, to the point of beginning. Except in case of emergency, no vessel shall be anchored in this area without permission of the Commandant, Severn River Naval Command. Anchorages will be assigned upon request to the station ship at the Naval Academy.

(5) *Anchorage A.* In Spa Creek, beginning at a point bearing 214°, 420 yards, from the mast at the intersection of the northeast and southeast seawalls of the Naval Academy grounds; thence

130°, 200 yards; thence 246°20′, 230 yards; thence 234°, 130 yards; thence 257°, 115 yards; thence 50°30′, 100 yards; thence 42°30′, 125 yards; and thence 34°, 200 yards, to the point of beginning.

(6) *Anchorage B.* In Spa Creek, beginning at a point bearing 204°, 660 yards, from the mast at the intersection of the northeast and southeast seawalls of the Naval Academy grounds; thence 144°, 22 yards; thence 204°45′, 140 yards; thence 214°, 195 yards; thence 331°, 160 yards; and thence 54°, 285 yards, to the point of beginning.

(b) *The regulattons.* (1) Except in case of emergency, no vessel shall be anchored in the area to the north and east of the Annapolis Channel bounded on the east by Greenbury Point; on the south by a line bearing 270° from the southern tip of Greenbury Point; on the west by the Annapolis channel; and on the north by the southern boundary of the cable area and the shoreline of the Government reservation and Carr Creek.

(2) Except in case of emergency, no vessel shall be anchored in Annapolis Harbor to the westward of the dredged channel and northward of Annapolis Harbor Buoy 5 (off Horn Point, Eastport) outside of the established anchorage areas, except in Spa Creek and the area to the southwestward of the Naval anchorage for small craft. No vessel shall be so anchored that any part of the vessel extends at any time within this area. Any vessel anchoring, under great emergency, within this area shall be placed as close to an anchorage area as practicable, and shall move away immediately after the emergency ceases.

(3) No vessel shall be anchored in the cable and pipe-line area, lying between the Naval Academy and the Naval Engineering Experiment Station and having the following limits: Eastern limit, from mast at the landward end of Reina Mercedes Pier approximately 67° to white "Cable Crossing" sign at the Experiment Station; western limit, from "Cable Crossing" sign on the point at Fort Severn Beach 233° to America Dock, Naval Academy.

(4) Except in case of emergency, no vessel shall be anchored, without permission of the Commandant, Severn River Naval Command, in the Naval Academy Drill area described as follows: That portion of the Severn River lying to the northeastward of the Naval Academy, bounded on the north by the State Highway Bridge and on the south by the northern limit of the cable and pipe-line area, excluding that area off the eastern shoreline inclosed by a line extending approximately 131° between the eastern abutment of the State Highway Bridge and the outboard end of the pier on Ferry Point. This drill area also includes the lower part of Dorseys Creek below the Naval Academy Drawbridge. Requests to anchor in this drill area shall be made to the station ship at the Naval Academy.

(5) The restrictions in this section do not apply to the anchoring or marking by buoys of apparatus used for the purpose of taking sea food, except within the cable and pipe-line area described in subparagraph (3) of this paragraph.

(6) The regulations in this section shall be enforced by the Commandant, Severn River Naval Command, and the Superintendent, United States Naval Academy, and such agencies as they may designate.

§ 202.165 Chesapeake Bay near Town of Cape Charles, Va.; naval explosives and ammunition-handling anchorage—(a) *The anchorage ground*—(1) *Explosives and ammunition-handling area.* That portion of Chesapeake Bay within a circle having a radius of 300 yards with its center at a point bearing 106°00′ true, 5.2 miles, from Wolf Trap Light, 66°30′ true, 10 miles, from New Point Comfort Light, and 347°30′ true, 8.5 miles, from Old Plantation Flats Light.

(2) *Restricted area.* A circle having a radius of 2,000 yards with the same center as the explosives and ammunition-handling area.

(b) *The regulations.* (1) When the explosives and ammunition-handling area is being used by vessels of the United States Navy engaged in ammunition-transfer operations, no other vessel shall enter or remain within the restricted area.

(2) When ammunition-transfer operations are in progress, a naval patrol will be maintained to warn vessels to leave or to remain outside the restricted area. Upon being so warned all vessels within the area shall leave promptly.

(3) This section shall be enforced by the Commandant, Fifth Naval District, and such agencies as he may designate.

§ 202.166 York River, Va.; naval anchorages—(a) *The anchorage grounds*—(1) *Anchorage 1.* Between Tue Marshes Lighthouse and Yorktown, beginning at latitude 37°14′57″, longitude 76°23′03.5″; thence to latitude 37°14′27″, longitude 76°23′03″; thence to latitude 37°13′54″, longitude 76°25′39″;

thence to latitude 37°13′42.5″, longitude 76°27′40.5″; thence to latitude 37°14′11″, longitude 76°29′11.5″; thence to latitude 37°14′23″, longitude 76°29′11.5″; thence to latitude 37°14′22.5″, longitude 76°25′43.5″; and thence to the point of beginning.

(2) *Anchorage 2.* Between Yorktown and the Naval Mine Depot, beginning at latitude 37°15′34″, longitude 76°31′25″; thence to latitude 37°15′25″, longitude 76°31′39.5″; thence to latitude 37°16′21.5″, longitude 76°32′46″; thence to latitude 37°17′07.5″, longitude 76°34′17″; thence to latitude 37°17′55″, longitude 76°35′14.5″; thence to latitude 37°18′05″, longitude 76°35′01″; thence to latitude 37°17′20″, longitude 76°34′07″; thence to latitude 37°16′33.5″, longitude 76°32′34″; and thence to the point of beginning.

(b) *The regulations.* These anchorages are reserved for the exclusive use of naval vessels and, except in cases of emergency, no other vessel shall anchor therein without permission from local naval authorities, obtained through the Captain of the Port, Norfolk, Virginia. Movement of vessels through the anchorages will not be restricted.

§ 202.168 Hampton Roads, Va., and adjacent waters—(a) *Hampton Roads*—(1) *Anchorage A, Hampton Bar (temporary).* South of a line running from latitude 37°00′45″, longitude 76°20′36″, across the mouth of Hampton Creek to latitude 37°00′47″, longitude 76°19′56″; southwest of the westernmost bridge across Mill Creek; and shoreward of a line described as follows: Beginning at latitude 37°00′04″; longitude 76°18′50.5″; thence to latitude 36°59′11″, longitude 76°19′00″; thence to latitude 36°59′08.5″, longitude 76°19′04.5″; and thence to latitude 37°00′00″, longitude 76°22′08″.

(i) No vessel shall be anchored in such manner as to swing within 200 feet of either of the dredged channels leading to Hampton and Phoebus.

(ii) This anchorage is reserved for the use of vessels while undergoing examination by quarantine, customs, or immigration authorities. Upon completion of these examinations vessels shall move promptly to a regular anchorage.

(iii) The master of every mechanically propelled vessel using this anchorage shall keep the vessel in condition to move promptly under its own power upon notification by the Captain of the Port, and when any such vessel is in charge of a pilot the pilot shall remain on board until the vessel is safely anchored in a regular anchorage. No sailing vessel using this anchorage shall be left unattended by a tugboat while undergoing examination by quarantine, customs, or immigration authorities, except when its stay is likely to be of several hours' duration when it shall be anchored in the western part of the anchorage out of the way of other vessels before the tug and pilot leave.

(iv) No master of a vessel awaiting or undergoing quarantine inspection shall release any part of the crew until the vessel has been passed by the proper quarantine officials and safely anchored or moored in a regular anchorage.

(2) *Anchorage B. Hampton Flats (naval).* Shoreward of a line described as follows: Beginning at latitude 37°00′00″, longitude 76°22′08″; thence to latitude 36°59′08.5″, longitude 76°19′04.5″; thence to latitude 36°57′57.5″, longitude 76°20′46.5″; and thence to latitude 36°58′56″, longitude 76°23′47″.

(i) Vessels shall not be anchored within 425 yards of Anchorage F–1 when that anchorage is occupied by a vessel carrying explosives.

(ii) This anchorage is reserved for the use of naval vessels, but in the absence of the fleet the Captain of the Port may, in his discretion, permit it to be used by merchant vessels. Upon receiving word that any part of the fleet is expected, the Captain of the Port may cause a sufficient area in this anchorage to be vacated to accommodate the number of vessels scheduled to arrive.

(3) *Anchorage C. Newport News Bar.* Shoreward of a line described as follows: Beginning at latitude 36°58′56″, longitude 76°23′47″; thence to latitude 36°57′57.5″, longitude 76°20′46.5″; thence to latitude 36°57′41″, longitude 76°21′12.5″; thence to latitude 36°57′35.5″, longitude 76°21′29″; thence along the north side of Newport News Channel to latitude 36°57′20″, longitude 76°24′38″; and thence to the radio tower at approximately latitude 36°57′47.5″, longitude 76°24′40.5″.

(i) Vessels shall be anchored so as to leave a clear fairway 200 yards wide across the southwest corner of the anchorage for the operation of the Norfolk-Newport News ferry, except that in an emergency this fairway may be used for the anchoring of naval vessels.

(ii) When Anchorage F–1, which lies within Anchorage C, is not occupied by vessels carrying explosives, it may be used as a general anchorage in the same manner as other portions of Anchorage C. It shall be vacated promptly upon notice from the Captain of the Port when a vessel carrying explosives, of a draft too great to permit it to use Anchorage F, desires to anchor therein. Vessels shall not be

anchored within 425 yards of Anchorage F–1 when that anchorage is occupied by a vessel carrying explosives.

(iii) This anchorage is a general anchorage for all vessels, but when fleet operations are scheduled the Captain of the Port may, in his discretion, permit it to be used by naval vessels. Upon receiving word that any part of the fleet is expected, the Captain of the Port may cause a sufficient area in this anchorage to be vacated to accommodate the number of vessels scheduled to arrive.

(4) *Anchorage D.* Beginning at a point on the west side of Norfolk Harbor Channel at latitude 36°57′34″, longitude 76°20′19.5″; thence to latitude 36°56′08″, longitude 76°22′23″; thence to latitude 36°56′00″, longitude 76°22′50″; thence to latitude 36°56′00″, longitude 76°23′34″; thence to latitude 36°56′09.5″, longitude 76°23′33.5″; thence to a point on the south side of Newport News Channel at latitude 36°57′27.5″, longitude 76°21′41″; and thence along the south side of Newport News Channel and a line in prolongation thereof to the point of beginning.

(i) Vessels shall be anchored so as to leave a clear fairway 200 yards wide through this anchorage for the operation of the Norfolk-Newport News ferry.

(ii) This anchorage shall be used by deep-draft vessels, wind-bound vessels from Lambert Point and Sewall Point, and vessels awaiting turn for docking. Other vessels may use this anchorage when permitted by the Captain of the Port.

(5) *Anchorage E, Newport News Middle Ground.* Beginning at a point on the south side of Newport News Channel at latitude 36°57′27.5″, longitude 76°21′41″; thence to latitude 36°56′09.5″, longitude 76°23′33.5″; thence to latitude 36°57′11″, longitude 76°25′02.5″; and thence to and along the south side of Newport News Channel to the point of beginning.

(i) Vessels shall be anchored so as to leave a clear fairway 200 yards wide through this anchorage for the operation of the Norfolk-Newport News ferry.

(6) *Anchorage H.* Beginning at a point on the west side of Norfolk Harbor Channel at latitude 36°57′34″, longitude 76°20′19.5″; thence along the west side of Norfolk Harbor Channel to latitude 36°56′00″, longitude 76°20′27″; thence to latitude 36°56′00″, longitude 76°22′50″; thence to latitude 36°56′08″, longitude 76°22′23″; thence to the point of beginning.

(i) Vessels shall be anchored so as to leave a clear fairway 200 yards wide through this anchorage for the operation of the Norfolk-Newport News ferry.

(7) *Anchorages for vessels carrying explosives*—(i) *Anchorage F (for shallow-draft vessels).* Beginning at latitude 36°56′03″, longitude 76°23′50″; thence to latitude 36°54′30″, longitude 76°23′55.5″; thence to latitude 36°54′30″, longitude 76°24′59″; thence to latitude 36°56′44″, longitude 76°24′50″; thence to the point of beginning.

(ii) *Anchorage F–1 (for deep-draft vessels).* Within Anchorage C and having a northeast boundary coincident with a portion of the northeast boundary of Anchorage C, beginning at latitude 36°58′06″, longitude 76°21′13″; thence to latitude 36°57′49.5″, longitude 76°21′36″; thence to latitude 36°57′47.5″, longitude 76°22′04″; thence to latitude 36°57′56″, longitude 76°22′30″; thence to latitude 36°58′19.5″, longitude 76°21′56″; thence to the point of beginning.

(iii) Vessels are forbidden to anchor within 425 yards of Anchorage F or between the northeast boundary of Anchorage F and the southwest boundary of Anchorage E.

(iv) When Anchorage F–1 is not occupied by vessels carrying explosives it may be used as a general anchorage in the same manner as other portions of Anchorage C, except that it shall be vacated promptly upon notice from the Captain of the Port when a vessel carrying explosives of a draft too great to permit it to use Anchorage F desires to anchor. When Anchorage F–1 is occupied by a vessel carrying explosives, vessels shall not anchor in Anchorages B and C within 425 yards of Anchorage F–1. No vessel carrying explosives shall be anchored in Anchorage F–1 so as to swing within 500 yards of the Newport News Channel.

(v) Vessels carrying explosives or other dangerous cargo, including inflammable liquids, inflammable solids, oxidizing materials, corrosive liquids, compressed gases, and poisonous substances, shall be within Anchorage F or F–1 when anchored, except as provided in subdivision (x) of this subparagraph. Anchorage F is reserved for this special purpose and shall not be used by vessels carrying other classes of cargo except in cases of great emergency or by special permit from the Captain of the Port.

(vi) A written permit shall be obtained from the Captain of the Port before a vessel carrying explosives, or on which explosives are to be loaded, may proceed to an explosives anchorage; and no

vessel shall occupy a berth in such an anchorage except by authority of such a permit which may be revoked at any time.

(vii) Vessels used in connection with loading or unloading explosives in anchorage areas, including tugs and stevedore boats, shall carry a written permit from the Captain of the Port. Such permits shall be shown whenever required by him or by his properly authorized agents.

(viii) Whenever any vessel not mechanically self-propelled anchors in an explosives anchorage while carrying explosives, the Captain of the Port may require the attendance of a tug upon such vessel when in his judgment such action is necessary.

(ix) Vessels carrying explosives shall comply with the general regulations in paragraph (h) of this section when applicable.

(x) The District Engineer, Corps of Engineers, may authorize a vessel carrying explosives for use on river and harbor works or on other work under permit issued by the District Engineer to anchor in or near the vicinity of such work without a permit from the Captain of the Port. The District Engineer will prescribe the quantities of such explosives allowed on such vessel and the conditions under which they are to be stored and handled, and will furnish the Captain of the Port with a copy of such instructions.

(b) *James River*—(1) *Anchorage G.* At the mouth of the river opposite Newport News; east of a line running from Barrel Point, latitude 36°54′53″, longitude 76°28′51″, across the mouth of Batten Bay to Candy Island, latitude 36°56′18″, longitude 76°29′05″; and shoreward of a line described as follows: Beginning at Fishing Point, latitude 36°57′50″, longitude 76°29′38″; thence to latitude 36°59′08″, longitude 76°27′56″; thence to latitude 36°58′37″, longitude 76°26′41″; thence to latitude 36°57′50″, longitude 76°26′04″; thence to latitude 36°57′08.5″, longitude 76°25′27″; thence to latitude 36°57′11″, longitude 76°25′04″; thence to latitude 36°55′52.5″, longitude 76°25′09.5″; and thence to latitude 36°54′00″, longitude 76°28′59″.

(2) *Anchorage G–1.* On the northeast side of the river downstream from the James River Bridge, and shoreward of a line described as follows: Beginning at latitude 36°59′41″, longitude 76°26′40″; thence to latitude 37°00′15″, longitude 76°27′52″; and thence to latitude 37°00′45″, longitude 76°27′17″.

(3) *Anchorage G–2.* On the northeast side of the river upstream from the James River Bridge, and shoreward of a line described as follows: Beginning at latitude 37°00′58″, longitude 76°27′23″; thence to latitude 37°00′24″, longitude 76°28′06″; thence to latitude 37°01′55″, longitude 76°31′19″; and thence to latitude 37°03′06″, longitude 76°30′29″.

(c) *East of Norfolk Harbor Channel*—(1) *Anchorage K–1.* Shoreward of a line described as follows: Beginning at the shoreward end of the jetty north of Army Base Pier No. 2, latitude 36°55′13″, longitude 76°19′42″; thence along the jetty to latitude 36°55′14″, longitude 76°19′46.5″; thence along the jetty to latitude 36°55′10″, longitude 76°19′49.5″; thence to a point on the east side of Norfolk Harbor Channel at latitude 36°55′06″, longitude 76°20′22″; thence northerly along the east side of Norfolk Harbor Channel to latitude 36°55′36.5″, longitude 76°20′20″; and thence to latitude 36°55′38″, longitude 76°19′47″.

(2) *Anchorage K–2.* South of a line running from Tanner Point latitude 36°54′13″, longitude 76°19′25″, across the mouth of Lafayette River to latitude 36°54′14″, longitude 76°18′43″; and shoreward of a line described as follows: Beginning at latitude 36°52′56″, longitude 76°19′08″; thence to a point on the east side of the dredged area alongside Norfolk Harbor Channel at latitude 36°53′04.5″, longitude 76°19′58.5″, thence northerly along the side of the dredged area to latitude 36°53′27″, longitude 76°20′02″; thence northwesterly along the side of the dredged area to latitude 36°53′31″, longitude 76°20′06″; thence northerly along the east side of Norfolk Harbor Channel to latitude 36°54′45.5″, longitude 76°20′19″; and thence to latitude 36°54′49″, longitude 76°19′40.5″.

(i) Anchorage is prohibited in the dredged channel to Lafayette River.

(3) *Anchorage K–3 (for yachts and pleasure craft).* That part of Lafayette River upstream from Anchorage K–2 and downstream from a line crossing the river below the Hampton Boulevard bridge from latitude 36°54′27.5″, longitude 76°18′22.5″, to latitude 36°54′11″, longitude 76°18′18″.

(i) Anchorage is prohibited in the dredged channel in Lafayette River.

(d) *Elizabeth River*—(1) *Anchorage H–1, West Norfolk (temporary).* On the west side of the river, south of Craney Island, and shoreward of a line described as follows: Beginning at latitude 36°52′59″, longitude 76°21′05.5″; thence along the southeast boundary of the pipeline area across the mouth of Craney Island Creek to latitude 36°53′05″, longitude 76°20′49″; thence to latitude

36°52′53″, longitude 76°20′30.5″; thence to latitude 36°52′53″, longitude 76°20′23.5″; thence to latitude 36°52′57.5″, longitude 76°20′24″; thence to a point on the west side of Norfolk Harbor Channel at latitude 36°52′59.5″, longitude 76°20′10″; thence southerly along the west side of the channel to latitude 36°52′15″, longitude 76°20′03″; thence southeasterly along the southwest side of the channel to latitude 36°52′03″, longitude 76°19′45.5″; thence to latitude 36°51′32.5″, longitude 76°20′15.5″; and thence to latitude 36°51′43″, longitude 76°20′32″.

(i) No vessel shall remain anchored in this anchorage awaiting loading for a period longer than 48 hours, except when non-availability of loading facilities, inclement weather, ice conditions, or other conditions reasonably require a longer period in awaiting turn for docking.

(ii) No vessel after receiving its load shall remain more than 12 daylight hours in this anchorage, i. e., vessels loaded during the afternoon or night shall clear the anchorage prior to the hour of darkness of the following day.

(2) *Anchorage L.* On the northeast side of Elizabeth River, south of Lambert Point, and shoreward of a line described as follows: Beginning at latitude 36°52′06.5″, longitude 76°19′04.5″; thence to latitude 36°51′56.5″, longitude 76°19′20″; thence to latitude 36°52′13″, longitude 76°19′44.5″; and thence to latitude 36°52′21″, longitude 76°19′34″.

(3) *Anchorage M.* On the northeast side of Elizabeth River, opposite Pinner Point, and shoreward of a line described as follows: Beginning at latitude 36°51′29.5″, longitude 76°18′37″; thence to latitude 36°51′32″, longitude 76°18′45.5″; thence to latitude 36°51′42″, longitude 76°19′00″; and thence to latitude 36°51′52″, longitude 76°18′47.5″.

(4) *Anchorage N–1, Smith Creek (for yachts and pleasure craft)*—(i) *Mowbray Arch.* Between Mowbray Arch and a line described as follows: Beginning at Ghent Bridge 150 feet from Mowbray Arch and continuing westerly the same distance therefrom to the intersection of the prolongation of the east side of Colonial Avenue; thence in a straight line to a point on the south side of Mill Street prolonged and 70 feet from Mowbray Arch; thence parallel to and 70 feet from Mowbray Arch to the south side of Pembroke Avenue prolonged; thence along the prolongation of the south side of Pembroke Avenue to a point 50 feet from Mowbray Arch; and thence in a straight line to a point on the south side of Fairfax Avenue prolonged and 40 feet from Mowbray Arch.

(ii) *The Hague.* Between the wall on the west side of the Hague and a straight line joining a point 40 feet easterly thereof in the south side of Fairfax Avenue prolonged with a point 70 feet easterly from the wall in a line perpendicular to the wall at the south end thereof.

(iii) No floats, rafts, lighters, houseboats, or other craft laid up for any reason shall be permitted within these anchorages, except by permission of the Captain of the Port.

(iv) No vessel shall anchor or moor alongside any wharf or pier in Smith Creek so as to extend more than 40 feet beyond the pierhead line except in the authorized anchorages.

(5) *Anchorage O, Hospital Point.* On the southwest side of Elizabeth River, adjacent to the Portsmouth Naval Hospital, and shoreward of a line described as follows: Beginning at latitude 36°50′57″, longitude 76°18′43″; thence to a point on the southwest side of Norfolk Harbor Channel at latitude 36°51′05″, longitude 76°18′23″; thence southeasterly along the side of the channel to latitude 36°50′49.5″, longitude 76°18′00″; thence southeasterly along the side of the channel to latitude 36°50′33.5″, longitude 76°17′50.5″; and thence to latitude 36°50′27″, longitude 76°17′55″.

(6) *Anchorage P, Port Norfolk.* On the southwest side of Elizabeth River, between Pinner Point and Western Branch Channel, and shoreward of a line described as follows: Beginning at latitude 36°51′25″, longitude 76°19′59″; thence to latitude 36°51′44.5″, longitude 76°19′47″; thence to a point on the southwest side of Norfolk Harbor Channel at latitude 36°52′01″, longitude 76°19′42.5″; thence southeasterly along the side of the channel to latitude 36°51′32″, longitude 76°19′01″; and thence to latitude 36°51′18″, longitude 76°19′16″.

(e) *Eastern Branch of Elizabeth River*—(1) *Anchorage Q, Berkley.* South of the channel, shoreward of a line described as follows: Beginning at latitude 36°50′20″, longitude 76°17′12.5″; thence to latitude 36°50′24″, longitude 76°17′14.5″; thence to latitude 36°50′22.5″, longitude 76°16′58.5″; and thence to latitude 36°50′13″, longitude 76°16′59″.

(2) *Anchorage R*—(i) *Section 1.* South of the channel, shoreward of a line described as follows: Beginning at latitude 36°50′11″, longitude 76°16′17″; thence to latitude 36°50′18″, longitude 76°16′19″; thence to latitude 36°50′20″, longitude 76°16′05″; and thence to latitude 36°50′14.5″, longitude 76°16′03″.

(ii) *Section 2.* South of the channel shoreward of a line described as follows: Beginning at latitude 36°50′15″, longitude 76°15′48.5″; thence to latitude 36°50′21″, longitude 76°15′50.5″; thence to latitude 36°50′17″, longitude 76′15′18″; and thence to latitude 36°50′11″, longitude 76°15′20″.

(iii) *Section 3.* South of the channel, shoreward of a line described as follows: Beginning at latitude 36°50′10″, longitude 76°15′15″; thence to latitude 36°50′15.5″, longitude 76°15′12.5″; thence to latitude 36°50′10.5″, longitude 76°14′50″; and thence to latitude 36°50′08″, longitude 76°14′51″.

(iv) No vessel shall anchor within 200 feet of permanent improvements.

(3) *Anchorage S*—(i) *Section 1.* On the north side of the river, upstream from the Virginian Railway bridge, and shoreward of a line described as follows: Beginning at latitude 36°50′23″, longitude 76°14′18″; thence to latitude 36°50′18.5″, longitude 76°14′18″; thence to latitude 36°50′14″, longitude 76°14″35″; and thence to latitude 36°50′19.5″, longitude 76°14′33″.

(ii) *Section 2.* On the north side of the Eastern Branch, below the mouth of Broad Creek, and shoreward of a line described as follows: Beginning at latitude 36°50′22.5″, longitude 76°13′50″; thence to latitude 36°50′19.5″, longitude 76°14′12.5″; and thence to latitude 36°50′24″, longitude 76°14′13″.

(iii) Anchorage is prohibited within 200 feet of permanent improvements.

(f) *Willoughby Bay*—(1) *Anchorage J–1 (for yachts and pleasure craft).* East of the west end of Willoughby Spit, shoreward of a line running from latitude 36°57′54″, longitude 76°17′46″, to latitude 36°57′50.5″, longitude 76°17′49″.

(2) *Anchorage J–2 (for yachts and pleasure craft).* South of Willoughby Spit, shoreward of a line described as follows: Beginning at latitude 36°57′42″, longitude 76°16′21.5″; thence to latitude 36°57′44.5″, longitude 76°17′27″; thence to latitude 36°57′48″, longitude 76°17′43″; and thence to latitude 36°57′55.5″, longitude 76°17′44″.

(g) *Lower Chesapeake Bay south of Thimble Shoal Channel*—(1) *Anchorage L–A (naval).* Between Cape Henry and Little Creek, beginning at latitude 36°57′11.0″, longitude 76°03′03.0″; thence to latitude 36°55′41.0″, longitude 76°03′14.5″; thence to latitude 36°56′22.0″, longitude 76°05′53.5″; thence to latitude 36°57′01.5″, longitude 76°05′59.0″; thence to latitude 36°57′57.0″, longitude 76°09′35.0″; thence to latitude 36°58′47.0″, longitude 76°09′08.5″; thence to the point of beginning.

(i) This anchorage is reserved primarily for the use of naval vessels, but in the absence of the fleet the Captain of the Port may, in his descretion, permit it to be used by merchant vessels. Movement of vessels through the area will not be restricted.

(2) *Anchorage L–C.* Northwest of Anchorage L–A, beginning at latitude 36°59′14″, longitude 76°10′56.5″; thence to latitude 36°58′18.3″, longitude 76°10′54″; thence to latitude 36°58′59″, longitude 76°13′32.5″; thence to latitude 36°59′56″, longitude 76°13′36.3″; thence to the point of beginning.

(i) This anchorage is primarily for the use of merchant vessels but the Captain of the Port may, in his descretion, permit it to be used by naval vessels, the commercial conditions at the time being given due consideration. No vessels shall occupy any berth in this anchorage without first obtaining permission from the Captain of the Port.

(3) *Anchorage L–E (for naval amphibious craft).* Southwest of Anchorage L–A, east of the Little Creek thorofare, and shoreward of a line described as follows: Beginning at Little Creek Harbor Jetty 1 light (approximately latitude 36°55′57.0″, longitude 76°10′36.0″); thence to latitude 36°58′04.0″, longitude 76°10′02.0″; thence to latitude 36°57′31.5″, longitude 76°07′55.0″; thence to latitude 36°55′25.0″, longitude 76°08′28.5″.

(i) This anchorage is reserved for the exclusive use of naval vessels and, except in case of emergency, no other vessel shall anchor therein without permission from local naval authorities, obtained through the Captain of the Port, Norfolk, Virginia. Movement of vessels through the anchorage will not be restricted.

(h) *General regulations.* (1) Except in cases of great emergency, no vessel shall be anchored in Hampton Roads or adjacent waters outside of the anchorage areas established in this section or within a cable or pipe line area shown on a Government chart, nor be moored, anchored, or tied up to any pier, wharf, or other vessel in such manner as to obstruct or endanger the passage of any vessel.

(2) No vessel shall occupy for a longer period than 30 days, unless a permit is obtained from the Captain of the Port for that purpose, any anchorage for which the time of occupancy is not otherwise prescribed in this section. No vessel in a condition such that it is likely to sink or otherwise become a

menace or obstruction to navigation or anchorage of other vessels shall occupy an anchorage except in an emergency, and then only for such period as may be permitted by the Captain of the Port.

(3) Whenever, in the opinion of the Captain of the Port, such action may be necessary, that officer may require any or all vessels in any designated anchorage area to moor with two or more anchors.

(4) Every vessel whose crew may be reduced to such number that it will not have sufficient men on board to weigh anchor at any time shall, before release or reduction of the crew, be anchored with two anchors with mooring swivel unless the Captain of the Port shall waive the requirement of a mooring swivel.

(5) Anchors shall be placed well within the anchorage areas, so that no portion of the hull or rigging will at any time extend outside the boundaries of the anchorage area.

(6) Any vessel anchoring under circumstances of great emergency outside an anchorage area shall be placed near the edge of the channel and in such position as not to interfere with the free navigation of the channel nor obstruct the approach to any pier nor impede the movement of any other vessel, and shall move away immediately after the emergency ceases, or upon notification by the Captain of the Port.

(7) Upon application, a berth in an anchorage, if available, will be assigned to any vessel by the Captain of the Port. He may grant revocable permits for the habitual use of the same berth, and no vessel shall occupy a berth habitually except under authority of such a permit.

(8) Upon approval of the District Engineer, Corps of Engineers, the Captain of the Port may permit wrecking plant or other vessels legally engaged in recovering sunken property or in laying or repairing legally established pipe lines or cables, or plant engaged in dredging operations, to anchor in channels. Such permission is not necessary for plant engaged upon works of river and harbor improvement under the supervision of the District Engineer, but the District Engineer will notify the Captain of the Port in advance of all such proposed work.

(9) Whenever the maritime or commercial interests of the United States so require, the Captain of the Port is hereby empowered to shift the position of any vessel anchored or moored within or outside an anchorage area, including any vessel which is so moored or anchored as to obstruct navigation or interfere with range lights.

(10) A vessel upon being notified to shift its position shall get under way at once or signal for a tug and shall change position as directed with reasonable promptness.

(11) Nothing in this section shall be construed as relieving any vessel or the owner or person in charge of any vessel from the penalties of law for obstructing navigation or for obstructing or interfering with range lights, or for not complying with the laws relating to lights and fog signals or other navigation laws.

§ 203.—BRIDGE REGULATIONS:

§ 203.215 Navigable streams flowing into Raritan Bay (except Raritan River and Arthur Kill), the Shrewsbury River and its tributaries, and all inlets on the Atlantic Ocean including their tributaries and canals between Sandy Hook and Bay Head, N. J.; bridges. (a) The owners of or agencies controlling drawbridges shall provide the appliances and the personnel necessary for the safe, prompt and efficient operation of the draws.

(b) Drawbridges shall be opened promptly for the passage of any vessel or other watercraft unable to pass under the closed spans, except as hereinafter provided.

(c) *Signals*—(1) *Call signals for opening of draw.* (i) *Sound signal.* Three distinct blasts of a whistle, horn or megaphone, or three loud and distinct strokes of a bell, sounded within a reasonable hearing distance of the bridge.

(ii) *Visual signal.* To be used in conjunction with sound signals when conditions are such that sound signals cannot be heard. A white flag by day, a white light by night, swung in full circles at arm's length in full sight of the bridge and facing the draw.

(2) *Acknowledging signals by bridge operator*—(i) *Sound signals.* Draw to be opened immediately: Same as call signal. Draw cannot be opened immediately, or, if open, must be closed immediately: Two long distinct blasts of a whistle, horn or megaphone, or two loud and distinct strokes of a bell, to be repeated at regular intervals until acknowledged by the vessel.

(ii) *Visual signals.* To be used in conjunction with sound signals when conditions are such that sound signals cannot be heard. Draw to be opened immediately: A white flag by day or a green light

at night swung up and down vertically a number of times in full sight of the vessel. Draw cannot be opened immediately, or, if open, must be closed immediately: A red flag by day, a red light by night, swung to and fro horizontally in full sight of the vessel, to be repeated until acknowledged by the vessel.

(3) *Acknowledging signals by the vessel.* Vessels or other water craft having signaled for the opening of the draw and having received a signal that the draw cannot be opened immediately, or if open must be closed immediately, shall acknowlege said signal by one long blast followed by a short blast, or by swinging to and fro horizontally a red flag by day and a red light by night.

(d) Trains, automobiles, trucks, and other vehicles, vessels or other water craft shall not be stopped or manipulated in a manner hindering or delaying the operation of these drawbridges, but all passage over drawspans or through draw openings shall be so as to expedite both land and water traffic.

(e) The owners of or agencies controlling these bridges shall provide and keep in good legible condition two board gauges painted white, with black figures not less than 8 inches high, to indicate the headroom clearance under the closed drawspan at all stages of the tide. The gauges shall be so placed on the bridge that they will be plainly visible to the operator of the vessel approaching the bridge either up or downstream.

(f) These drawbridges shall not be required to open for craft carrying appurtenances unessential for navigation which extend above the normal superstructure. Military masts shall be considered as part of the normal superstructure. Upon request, the district engineer in charge of the locality will cause inspection to be made of the superstructure and appurtenances of any craft habitually frequenting those waterways, with a view to adjusting any differences of opinion in this matter between the vessel owner and the bridge owner.

(g) Copies of the regulations in this section shall be conspicuously posted on both the upstream and downstream sides of the bridges in such manner that it can be easily read at any time.

(h) This section shall take effect and be in force on and after June 11, 1937.

(i) The regulations to govern the operation of the Ocean Avenue bridge across the mouth of the Shark River between Belmar and Avon-by-the-Sea, and to govern the operation of drawbridges across Manasquan River, its navigable tributaries and the Bay Head-Manasquan Canal, New Jersey, prescribed under the dates of March 29, 1933, and January 18, 1937, respectively, are hereby revoked.

§ 203.220 New Jersey Intracoastal Waterway and tributaries; bridges. These regulations are given in the opening discussion of the waterway at the beginning of Chapter 5 of this Coast Pilot.

§ 203.225 Navigable waters in the State of New Jersey; bridges where constant attendance of draw tenders is not required. (a) The owners of or agencies controlling the bridges listed in paragraph (f) of this section will not be required to keep draw tenders in constant attendance.

(b) Whenever a vessel unable to pass under a closed bridge desires to pass through the draw, advance notice, as specified, of the time the opening is required shall be given to the authorized representative of the owner of or agency controlling the bridge.

(c) Upon receipt of such advance notice, the authorized representative of the owner of or agency controlling the bridge, in compliance therewith, shall arrange for the prompt opening of the draw at the time specified in the notice for the passage of the vessel.

(d) The owners of or agencies controlling the bridges shall keep conspicuously posted on both the upstream and downstream sides thereof, in such manner that it can easily be read at any time, a copy of the regulations in this section together with a notice stating exactly how the representative specified in paragraph (b) of this section may be reached.

(e) The operating machinery of the draws shall be maintained in a serviceable condition, and the draws shall be opened and closed at intervals frequent enough to make certain that the machinery is in proper order for satisfactory operation.

(f) The bridges to which this section applies, and the regulations applicable in each case, are as follows:

(1) Overpeck Creek; New York, Susquehanna and Western Railroad Company bridge and West Shore Railroad Company (New York Central System) bridge at Ridgefield Park. Between 10:00 p. m. and 6:00 a. m., at least two hours' advance notice required. At all other times and in all other respects the regulations contained in § 203.200 shall govern the operation of these bridges.

(2) Passaic River; Passaic and Bergen Counties highway bridge at West Eighth Street, Passaic. At least 24 hours' advance notice required.

(3) Elizabeth River; The Central Railroad Company of New Jersey bridge and Union County bridges at Baltic Street, Summer Street, South Street, and Bridge Street, in the City of Elizabeth. The draws need not be opened for the passage of vessels and the special regulations contained in paragraphs (b) to (e), inclusive, of this section shall not apply to these bridges.

(4) Woodbridge Creek; Middlesex County highway bridge and the Central Railroad of New Jersey bridge at Maurer. At least four hours' advance notice required.

(4-a) Shrewsbury River (South Branch) at junction of Parker Creek and Oceanport Creek; Monmouth County Gooseneck Highway Bridge. From November 1 to April 30, inclusive, at least four hours' advance notice required. At all other times and in all other respects the regulations contained in § 203.215 shall govern the operation of this bridge.

(5) Oceanport Creek; The New York and Long Branch Railroad Company bridge near Oceanport. At least four hours' advance notice required.

(6) Tuckahoe River; New Jersey State Highway Department bridge at Tuckahoe. At least 24 hours' advance notice required.

(7) Great Channel; Cape May County Bridge Commission bridge between Stone Harbor and Nummy Island. From November 1 to April 30, inclusive, at least 24 hours' advance notice required.

(8) Maurice River; New Jersey State Highway Department bridge at Main Street, Millville. At least 24 hours' advance notice required.

(9) Manantico Creek; New Jersey State Highway Department bridge near Millville. At least 12 hours' advance notice required.

(10) Cohansey River; New Jersey State Highway Department bridge at Broad Street, Bridgeton. At least 24 hours' advance notice required.

(11) Alloway Creek; Salem County highway bridges at Hancocks Bridge and at Upper Hancocks Bridge, and New Jersey State Highway Department bridge at Quinton. At least 24 hours' advance notice required.

(12) Oldmans Creek; New Jersey State Highway Department bridge near Nortonville, Pennsylvania-Reading Seashore Lines railroad bridge near Pedricktown, and Salem County highway bridge at Pedricktown. At least 24 hours' advance notice required.

(13) Delaware River (back channel); The Pennsylvania Railroad Company bridge between Petty Island and Camden. At least 24 hours' advance notice required.

§ 203.227 Delaware and Schuylkill Rivers, N. J. and Pa., in vicinity of Philadelphia and Bristol; bridges—(a) *Signals.* When at any time during the day or night any vessel, tug, or other watercraft unable to pass under a closed drawbridge approaches it with the intention of passing through the draw, the signal for the draw to be opened shall be three blasts of a whistle or horn blown on the vessel or craft. If the draw is ready to be opened immediately when the signal is given on the vessel or craft, the signal shall be answered by two blasts of a whistle or horn blown on the bridge; if the draw is not ready to be opened immediately, the signal shall be answered by one blast of a whistle or horn blown on the bridge.

(b) *Opening the draw.* Upon hearing or perceiving the prescribed signal, the bridge tender shall immediately clear the drawspan and open the draw to its full extent for the passage of the vessel or other craft: *Provided,* That the draw of a railroad bridge need not be opened when there is a train in the bridge block approaching the bridge with the intention of crossing, nor within 5 minutes of the known time of passage of a scheduled passenger, mail, or express train; but in no event, except in case of breakdown of the operating machinery, shall the opening of the draw be delayed more than 5 minutes in the case of a highway bridge nor more than 10 minutes in the case of a railroad bridge: *And provided further,* That the draw need not be opened for the passage of a tug or other craft equipped with a movable stack or mast which can readily be lowered so as to permit its passage under the closed draw, unless such craft has in tow a vessel which is unable to pass under the closed draw or by reason of stress of weather it is unsafe to lower such stack or mast.

(c) *Interference with operation.* Vehicles, streetcars, locomotives, and trains shall not be stopped on the drawspans, nor shall locomotives or trains be stopped in the bridge blocks of railroad bridges in such manner as to delay the operation of the draw, except in case of urgent necessity, nor shall vessels be moored to the bridge fenders or so maneuvered as to unnecessarily hinder or delay the clos-

ing of the draw, but all passages over, through, or under the bridges shall be prompt, to avoid delay to either land or water traffic.

(d) *Hinged stacks and masts.* Each tug, towboat, barge, and other small craft regularly and habitually navigating the Schuylkill River shall be subject to inspection and measurement by the District Engineer, Corps of Engineers, to determine the exact height above the water surface of its pilot or deckhouses when such vessel is in its ordinary trim; and the District Engineer is hereby empowered to decide in each case whether or not the vessel shall be equipped with hinged or removable stacks, masts, and flagpoles which can be lowered to enable the vessel to pass under the closed draw of any or all of the bridges. If the District Engineer decides that such action should be taken, he shall notify the vessel owner and the bridge owner of his decision, specifying a reasonable time for making the alterations; and after the expiration of the time specified the draw need not be opened for the passage of such vessel unless it has in tow a vessel unable to pass under the closed draw or by reason of stress of weather it is unsafe to lower such stack or mast.

(e) *Operating machinery.* All drawbridges shall be equipped with adequate, quick-operating power machinery for opening and closing the draw, and this machinery shall at all times be kept in good and effective working condition and manned by competent operators.

(f) *Clearance gages.* The owners of each bridge shall provide and keep in good legible condition two board gages, painted white with black figures not less than six inches high, to indicate the headroom clearance under the closed span at all stages of the tide. These gages shall be so placed on the ends of the drawspan fenders that they will be plainly visible to the navigator of a vessel approaching the bridge either upstream or downstream.

§ 203.228 Darby Creek, Pa., The Pennsylvania Railroad Company and Reading Company bridges near Essington. (a) The owners of or agencies controlling these bridges will not be required to keep draw tenders in constant attendance.

(b) Whenever a vessel unable to pass under the closed bridges desires to pass through the draws, 24 hours' advance notice of the time opening is required must be given to the authorized representative of the owner of or agency controlling each of the bridges to insure prompt opening thereof at the time required.

(c) On receipt of such advance notice the authorized representative, in compliance therewith, shall arrange for the prompt opening of the draw on proper signal at approximately the time specified in the notice.

(d) The owner of or agency controlling each bridge shall keep conspicuously posted on both the upstream and downstream sides thereof, in such manner that it can easily be read at any time, a copy of the regulations in this section together with information as to whom notice should be given when it is desired that the bridge be opened and directions for communicating with such person by telephone or otherwise.

(e) The operating machinery of the draws shall be maintained in a serviceable condition, and the draws shall be opened and closed at intervals frequent enough to make certain that the machinery is in proper order for satisfactory operation.

§ 203.230 Brandywine River at Wilmington, Del.—(a) *Highway bridge at Seventh Street, Wilmington, Del.* (1) The owner of or agency controlling the bridge shall provide the appliances and the personnel necessary for the safe, prompt and efficient opening of the draw at any time during the day or night for the passage of any vessel or other watercraft which cannot pass under the closed draw, when the following signal is received: Three blasts of a whistle or horn. When the draw of the bridge can be opened immediately, the draw tender shall reply by two blasts of a whistle or horn. When the draw of the bridge cannot be opened immediately, or when the bridge is open and is to be closed immediately, the draw tender shall reply by one blast of a whistle or horn.

(2) Vehicles shall not be stopped on the drawspan, in such manner as to delay the operation of the draw except in case of urgent necessity, nor shall vessels be moored to the bridge fenders or so maneuvered as to unnecessarily hinder or delay the closing of the draw, but all passage over, through, or under the bridge shall be prompt to avoid delay to either land or water traffic.

(3) The owner of or agency controlling the bridge shall provide and keep in good legible condition two board gauges painted white with black figures not less than 6 inches high, to indicate the headroom clearance under the closed span at all stages of the tide. These gauges shall be so placed on the ends of the drawspan fenders that they will be plainly visible to the navigators of a vessel approaching the bridge from either direction.

(b) *Highway bridge at Sixteenth Street, Wilmington, Del.* (1) The owner of or agency controlling this bridge will not be required to keep draw tenders in attendance at the bridge: *Provided*, That the said owner of or agency controlling the bridge shall keep conspicuously posted on both the upstream and downstream sides of the bridge, in such manner that it can be easily read at any time a copy of the regulations in this section together with a notice stating to whom requests for the opening of the draw shall be made and explaining exactly how such persons can be reached.

(2) Whenever a vessel, unable to pass under the closed draw approaches the bridge, notice of its desire to pass through the draw shall be given to the person or persons named in the notice posted on the bridge and in the manner stated therein.

(3) The draw of the bridge shall be opened as soon as practicable after receipt of notice, and in any case not later than 12 hours after receipt of notice.

(4) The operating machinery of the draw shall be maintained in a serviceable condition, and the draw shall be opened and closed at intervals frequent enough to make certain that the machinery is in proper order for satisfactory operation.

(c) *Pennsylvania Railroad bridge above Seventh Street and Highway bridge at Church Street, Wilmington, Del.* (1) The draws of these bridges need not be opened for the passage of vessels.

(2) The owners of or agencies controlling these bridges shall keep conspicuously posted on both the upstream and downstream sides thereof, in such manner that it can be easily read at any time, a copy of the regulations in this section.

§ 203.235 Christina River, Del.; bridge. (a) The owners of or agencies controlling the bridges shall provide the appliances and the personnel necessary for the safe, prompt and efficient opening of the draws at any time during the day or night for the passage of any vessel or other water craft which cannot pass under the closed draws, when the following signal is received: Three blasts of a whistle or horn.

(1) When the draw of the bridge can be opened immediately, the draw tenders shall reply by: Two blasts of a whistle or horn.

(2) When the draw of the bridge cannot be opened immediately, or when the bridge is open and is to be closed immediately, the draw tender shall reply by: One blast of a whistle or horn.

(b) Upon hearing or perceiving the prescribed signal, the bridge tender shall immediately clear the drawspan and open the draw to its full extent for the passage of the vessel or other craft: *Provided*, That the draw of a railroad bridge need not be opened when there is a train in the bridge block approaching the bridge with the intention of crossing, nor within 5 minutes of the known time of passage of a scheduled passenger, mail or express train; but in no event, except in case of breakdown of the operating machinery, shall the opening of the draw be delayed more than 5 minutes in the case of a highway bridge, nor more than 10 minutes in the case of a railroad bridge.

(c) Vehicles, street cars, locomotives, and trains shall not be stopped on the drawspans, nor shall locomotives or trains be stopped in the bridge blocks of railroad bridges in such manner as to delay the operation of the draws, except in case of urgent necessity, nor shall vessels be moored to the bridge fenders or so maneuvered as to unnecessarily hinder or delay the closing of the draw; but all passages over, through, or under the bridges shall be prompt, to avoid delay to either land or water traffic.

(d) The owners of or agencies controlling the bridge shall provide and keep in good legible condition two board gauges painted white with black figures not less than 6 inches high, to indicate the headroom clearance under the closed span at all stages of the tide. These gauges shall be so placed on the ends of the drawspan fenders that they will be plainly visible to the navigators approaching the bridges from either direction.

(e) This section shall take effect and be in force on and after May 15, 1938, and the regulations approved April 2, 1897 (E. D. 18023/12 and 13), and November 9, 1916 (E. D. 46046/19), heretofore prescribed to govern the operation of these drawbridges are hereby revoked to take effect on that date.

§ 203.237 St. Jones River, Del.; Delaware State Highway Department bridge at Lebanon. (a) The owner of or agency controlling this bridge will not be required to keep a draw tender in constant attendance

(b) Whenever a vessel unable to pass under the closed bridge desires to pass through the draw, 24 hours' advance notice of the time opening is required must be given to the authorized representative of the owner of or agency controlling the bridge to insure prompt opening thereof at the time required.

(c) On receipt of such advance notice the authorized representative, in compliance therewith, shall arrange for the prompt opening of the draw on signal at approximately the time specified in the notice.

(d) The owner of or agency controlling the bridge shall keep conspicuously posted on both the upstream and downstream sides thereof, in such manner that it can easily be read at any time, a copy of the regulations in this section together with a notice stating exactly how the representatives specified in paragraph (b) of this section may be reached.

(e) The operating machinery of the draw shall be maintained in a serviceable condition, and the draw shall be opened and closed at intervals frequent enough to make certain that the machinery is in proper order for satisfactory operation.

§ 203.240 Navigable waters discharging into the Atlantic Ocean south of and including Chesapeake Bay and into the Gulf of Mexico (including the Lower Atchafalaya River, La.), except the Mississippi River and its tributaries and outlets; bridges. (a) Corporations or persons owning or controlling a drawbridge shall provide the same with the necessary tenders and the proper mechanical appliances for the safe, prompt, and efficient opening of the draw for the passage of vessels.

(b) If the weather conditions are good and sound signals can be heard when a vessel approaches a drawbridge and desires to pass through the draw, three distinct blasts of a whistle or horn shall be sounded or three calls through a megaphone shall be made from the vessel when within reasonable hearing distance of the bridge.

(1) When the draw of the bridge can be opened immediately, the drawtender shall reply by three distinct blasts of a whistle or horn, by three calls through a megaphone, or by three loud and distinct strokes of a bell.

(2) When the draw of the bridge cannot be opened immediately or when the bridge is open and is to be closed immediately, the drawtender shall reply by four or more short, distinct blasts of a whistle or horn, by four or more calls through a megaphone, or by four or more loud and distinct strokes of a bell (danger signal).

(c) When weather conditions prevent hearing the sound signals when a vessel approaches a drawbridge and desires to pass through the draw, signals shall be made from the vessel by swinging in circles at arm's length a lighted lantern at night and a flag by day.

(1) When the draw of the bridge can be opened immediately, the drawtender shall reply by raising and lowering in vertical plane a number of times a lighted lantern at night and a flag by day.

(2) When the draw of the bridge cannot be opened immediately or when the bridge is open and is to be closed immediately, the drawtender shall reply by swinging to and fro horizontally a number of times a lighted lantern at night and a flag by day.

(d) When a vessel wishes to pass two or more bridges close together or crossing a section of the waterway less than 500 feet in length, signals as prescribed above shall be given from the vessel for opening the first bridge, followed at an interval of about five seconds by the same signals for the second bridge, and so on, thus giving, at intervals of about five seconds, separate signals for each bridge the vessel desires to pass.

(e) When two or more vessels are approaching a bridge at nearly the same time from the same or opposite directions with the draw opened or closed, each of these vessels shall signal independently for the opening of the draw, and the drawtender shall reply as prescribed and in turn to the signal of each vessel.

(f) Where bridges are less than 500 feet apart, the signals to govern the movements of the approaching vessel shall be given from the bridge nearest the vessel. If the bridge can be opened immediately, the bridgetender shall await the reply signals from the other bridges and then give the signal circumstances require. If the nearest bridge cannot be opened immediately, the prescribed signal shall be given the approaching vessel at once to be followed as soon as possible by the signal from that bridge that the draws are about to open.

(g) The draw shall be opened with the least possible delay upon receiving the prescribed signal: *Provided*, That the drawspan shall not be opened when a train is approaching so closely that it cannot safely be stopped before reaching the bridge, or when a passenger or mail train is approaching within sight or hearing of the operator of the drawspan.

(h) When a bridgetender is about to close a draw, he shall sound four or more short, distinct blasts of a whistle or horn, four or more calls through a megaphone, or four or more loud and distinct strokes of a bell (danger signal).

(i) Trains, wagons, and other vehicles shall not be stopped on a drawbridge for the purpose of delaying its opening, nor shall watercraft be so manipulated as to hinder or delay the operation of a drawspan, but all passage over, through, or under a drawbridge shall be prompt, to prevent delay to either land or water traffic.

§ 203.245 Navigable waters discharging into the Atlantic Ocean south of and including Chesapeake Bay and into the Gulf of Mexico, except the Mississippi River and its tributaries and outlets; bridges where constant attendance of draw tenders is not required. (a) The owners of or agencies controlling certain bridges will not be required to keep draw tenders in constant attendance. The bridges to which this section applies are listed, and the special regulations applicable in each case are set forth, in paragraph (f) of this section. At all times not covered by the regulations in this section, and in all other respects, the regulations contained in § 203.240 shall govern the operation of these bridges.

(b) Whenever a vessel unable to pass under a closed bridge desires to pass through the draw, advance notice, as specified, of the time the opening is required shall be given to the authorized representative of the owner of or agency controlling the bridge.

(c) Upon receipt of such advance notice, the authorized representative of the owner of or agency controlling the bridge, in compliance therewith, shall arrange for the prompt opening of the draw at the time specified in the notice for the passage of the vessel.

(d) The owners of or agencies controlling the bridges shall keep conspicuously posted on both the upstream and downstream sides thereof, in such manner that it can easily be read at any time, a copy of the regulations in this section together with a notice stating exactly how the representative specified in paragraph (b) of this section may be reached.

(e) The operating machinery of the draws shall be maintained in a serviceable condition, and the draws shall be opened and closed at intervals frequent enough to make certain the machinery is in proper order for satisfactory operation.

(f) Waterways discharging into Chesapeake Bay. (1) Susquehanna River, Md.; The Pennsylvania Railroad Company bridge at Perryville. At least 24 hours' advance notice required.

(2) Bush River, Md.; The Pennsylvania Railroad Company bridge at Bush River. From June 1 to September 30, inclusive, the draw will be required to be opened not more than two times each day on Saturdays and Sundays only between 10:00 a. m. and 5:00 p. m., on receipt of at least 24 hours' advance notice from the duly authorized representative of the Bush River Boat Club. At all other times the draw need not be opened for the passage of vessels. The notice posted in accordance with paragraph (d) of this section shall state exactly how the representative of the Bush River Boat Club may be reached.

(3) Dorseys Creek, Md.; Maryland State Roads Commission bridge and Baltimore and Annapolis Railroad Company bridge at Annapolis. At least five hours' advance notice required.

(4) Weems Creek, Md.; Anne Arundel County highway bridge at West Annapolis. From October 1 to April 30, inclusive, and between sunset and sunrise from May 1 to September 30, inclusive, at least five hours' advance notice required.

(5) South River, Md.; Anne Arundel County highway bridge at Riva. Between sunset and sunrise, at least five hours' advance notice required: *Provided*, That any notice is sufficient if given directly to the draw tender while on duty.

(6) Choptank River, Md.; Baltimore and Eastern Railroad Company bridge at Denton. At least thirty days' advance notice required. Paragraph (e) of this section shall not apply to this bridge.

(7) Marshyhope Creek, Md.; Maryland State Roads Commission bridge at Brookview. Between sunrise and sunset, at least six hours' advance notice required. Between sunset and sunrise the draw need not be opened for the passage of vessels.

(8) Broad Creek River, Del.; The Pennsylvania Railroad Company bridge at Laurel. Between 12:00 noon and 1:00 p. m., and between 4:00 p. m. and 7:00 a. m., and at all times on Saturdays and Sundays and on New Year's Day, Washington's Birthday, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, and Christmas Day, and the Monday following any of the foregoing holidays which may fall on a Sunday, at least four hours' advance notice required: *Provided*, That any notice is sufficient if given directly to the draw tender while on duty.

(8-a) Patuxent River, Md.; Maryland State Roads Commission bridge at Benedict. Between 6:00 p. m. and 6:00 a. m. (local time), advance notice required, to be given verbally or by tele-

phone to the Toll Captain at the Administration Building at the east end of the bridge before 6:00 p. m. The owner of or agency controlling the bridge shall keep a complete record of all openings of the draw in such form as may be prescribed by the District Engineer, Corps of Engineers, and shall report to him all cases where the draw has been required to be kept open for an unreasonable length of time.

(9) Neale Sound, Md.; Maryland State Roads Commission bridge between Cobb Island and Cobb Neck. Between sunset and sunrise the draw need not be opened for the passage of vessels.

(10) Pocomoke River, Md.; Maryland State Road Commission bridge at Snow Hill. At least five hours' advance notice required.

(11) Onancock River (Warrington Branch), Va.; highway bridge at Onancock. At least three hours' advance notice required.

(12) Urbanna Creek, Va.; Middlesex County highway bridge at Urbanna. On Sundays and between sunset and sunrise on all other days from September 16 to May 31, inclusive, and between 9:30 p. m. and sunrise daily from June 1 to September 15, inclusive, the draw need not be opened for the passage of vessels.

(13) Cat Point Creek, Va.; Virginia Department of Highways bridge near Warsaw. At least four hours' advance notice required.

(14) Elizabeth River, Eastern Branch, Va.; City of Norfolk highway bridge (Campostella Bridge) at Norfolk. Between 7:35 a. m. and 7:50 a.m., on week days only, the draw need not be opened except for the passage of tugs with tows.

(15) Elizabeth River, Western Branch, Va.; Virginia Department of Highways bridge at Hodges Ferry. At least eight hours' advance notice required.

(16) Baines Creek, Va.; Atlantic Coast Line Railroad Company bridge at Portsmouth. At least 24 hours' advance notice required.

(17) Nansemond River, Western Branch, Va.; Virginia Department of Highways bridge at Reids Ferry. At least eight hours' advance notice required.

(18) Appomattox River, Va.; Seaboard Air Line Railway Company bridge near Hopewell. Between 4:00 p. m. and 8:00 a. m., at least 30 minutes' advance notice required.

§ 203.250 Inlet from Little Annemessex River, Md.; bridge (highway) at Crisfield, Md. (a) The draw shall be promptly opened, during the hours specified in paragraph (b) of this section for the passage of any vessel whose masts permanently remain standing or which have masts that may be unstepped but which are 20 feet or more in height and 5 inches or more in diameter at the butt; or of any vessels whose hulls, deckhouses, or cargoes are of such height that they will not pass under the bridge safely when it is closed.

(b) During the period from March 20, to August 31, inclusive, the draw shall be opened upon signal for the passage of vessels at any hour of the day or night except between 11:30 a. m. and 12 noon. During the period from September 1 to March 19, inclusive, the draw shall be opened upon signal for the passage of vessels from 1 hour before sunrise to 11:30 a. m., and from 12 noon to 1 hour after sunset. During the hours above specified when the draw is to be opened upon signal an attendant shall be kept constantly on duty at the bridge for that purpose. At all other hours the operating machinery must be accessible to vessel captains who may desire to open the draw themselves for the passage of their vessels. In such cases it shall be the captain's duty to see that the draw is closed and properly secured after his vessel has passed through.

(c) Vessels have the right of way over vehicles or persons using the bridge except between the hours of 11:30 and 12 noon.

(d) Whenever a vessel of the kind described in paragraph (a) of this section approaches the bridge during the hours specified in paragraph (b) of this section, the signal of a desire for the draw to be opened shall be three blasts of a whistle or horn blown on the vessel. This signal shall be repeated at intervals until it is answered from the bridge. Upon receiving the signal from the vessel, the tender or operator of the bridge, in case the draw can be opened immediately, shall reply by three blasts of a whistle or horn. In case of accident to the machinery, or other contingency, necessitating delay in opening the draw, the signal from the vessel shall be answered by the tender or operator of the bridge by one blast of a whistle or horn.

(e) This section shall take effect and be in force on and after August 1, 1923, and all regulations or parts of regulations in conflict therewith are hereby revoked to take effect on that date.

§ 203.260 Wicomico River, Md.; bridges (highway) across south prong at Camden Avenue and Division Street and north prong at Main Street, Salisbury, Md. (a) A vessel desiring to pass through the bridge shall signal its intention by three long blasts of a whistle or horn. The signal shall be answered by three blasts of a whistle or horn from the bridge, and the draw shall be opened within 3 minutes from time of signal. In case, however, of accident to the machinery or other contingency involving unavoidable delay in opening the draw, the signal shall be answered by one blast of a whistle or horn.

(b) The draw shall be promptly opened for all vessels desiring to pass through it whose hulls, deckhouses, or cargoes are of such height that they will not pass under the bridge safely when it is closed.

(c) The bridge shall be promptly opened whenever signaled between the hours of 6 a. m. and 9:30 p. m., except between 6:30 and 7 a. m., 8:30 and 9 a. m., noon and 1 p. m., and 6 and 6:30 p. m., and during these times it shall remain closed for the purpose of accommodating street traffic. An attendant shall be kept on duty during those periods in which this section requires that the bridge shall be opened promptly upon signal.

(d) This section shall take effect April 1, 1920, and shall supersede those prescribed May 19, 1915.

§ 203.270 Cambridge Harbor, Md.; bridge. (a) The draw shall be promptly opened at any time for the passage of vessels unable to pass under the closed bridge, except during the following hours (eastern standard time) when it need not be opened: From 8 p. m. to 6 a. m.; from 12 noon to 12:10 p. m.; from 12:50 p. m. to 1 p. m.; and for 20 minutes before the scheduled time of departure from Cambridge of any regularly scheduled passenger train on the Pennsylvania Railroad.

(b) With the exceptions noted in paragraph (a) of this section, vessels have the right of way over vehicles or persons using the bridge.

(c) Whenever a vessel unable to pass under the closed bridge approaches it, the signal of a desire for the draw to be opened shall be three blasts of a whistle or horn blown on the vessel. This signal shall be repeated at intervals until it is answered from the bridge. Upon receiving the signal from the vessel, the tender or operator of the bridge, in case the draw can be operated immediately, shall reply by three blasts of a whistle or horn. In case of accident to the machinery or other contingency necessitating delay in opening the draw, the signal from the vessel shall be answered by the tender or operator of the bridge by one blast of a whistle or horn.

(d) The owner of the bridge shall post and maintain a copy of the regulations in this section in a conspicuous place at each end of said bridge.

(e) This section shall take effect and be in force on and after February 15, 1924.

§ 203.280 Miles River, Md.; bridge (highway) at Easton, Md. (a) Between sunrise and sunset the draw of the above-mentioned bridge shall be promptly opened for the passage of any vessel unable to pass under the closed bridge.

(b) Whenever a vessel unable to pass under the closed bridge approaches it, the signal of a desire for the draw to be opened shall be three blasts of a whistle or horn blown on the vessel. Upon receiving the signal from the vessel the tender or operator of the bridge, in case the bridge can be opened immediately, shall reply by three blasts of a whistle or horn. In case, however, of accident to the machinery or other contingency involving unavoidable delay in the opening of the draw, the signall shall be answered by one blast of a whistle or horn.

(c) A vessel wishing to pass the bridge between sunset and sunrise and unable to pass under the closed draw will request that the bridge be opened by notifying the draw tender of the time at which it is desired to pass and the draw of the bridge shall be opened as soon as practicable after the receipt of notice.

(d) A copy of the regulations in this section will be conspicuously posted on both the upstream and downstream sides of the bridge in such manner that it can be easily read at any time, together with a notice stating exactly how the draw tender, when not on duty at the bridge, may be reached.

(e) The operating machinery of the draw shall be kept in serviceable condition and the draw shall be opened and closed at intervals frequent enough to make certain that the machinery is kept in proper condition for satisfactory operation.

(f) This section shall take effect and be in force on and after September 15, 1930.

§ 203.285 Oak Creek, tributary of Miles River, Md.: bridges of the Maryland State Roads Commission and the Baltimore, Chesapeake and Atlantic Railroad Company at Royal Oak, Md. (a) During

the period from June 1 to September 30, inclusive, the draw shall be opened promptly at any time during the day or night for the passage of any vessel unable to pass under the closed bridge. During the period from October 1 to May 31, inclusive, the hours for opening the draw shall be from sunrise to sunset.

(b) Whenever a vessel unable to pass under the closed bridge approaches it, the signal of a desire for the draw to be opened shall be three blasts of a whistle or horn blown on the vessel. This signal shall be repeated at intervals until it is answered from the bridge. Upon receiving the signal from the vessel the tender or operator of the bridge, in case the draw can be opened immediately, shall reply by three blasts of a whistle or horn. In case of accident to the machinery or other contingency necessitating delay in opening the draw, the signal from the vessel shall be answered by the tender or operator of the bridge by one long blast of a whistle or horn.

(c) A copy of the regulations in this section shall be posted in a conspicuous place on each side of the bridge.

(d) This section shall take effect and be in force on and after July 1, 1924.

§ 203.290 Kent Island Narrows, Md.—(a) *Bridge (highway) of Maryland State Roads Commission.* (1) Between the hours of 1 hour before sunrise and 1 hour after sunset the draw shall be promptly opened for all vessels desiring to pass through it whose masts permanently remain standing or which have masts that may be unstepped but which are 20 feet or more in height and 5 inches or more in diameter at butt.

(2) Whenever a vessel of the kind described in subparagraph (1) of this paragraph shall approach the bridge and desire to pass through the draw, the signal therefor shall be three blasts of a whistle or horn blown on the craft, and when such signal is given the draw shall be opened forthwith if no person or vehicle is then in the way, and immediately upon the person or vehicle then on the bridge, if any, passing out of the way, and before any person or vehicle not then on the bridge shall be allowed to come upon it.

(3) If the draw is ready to be opened immediately when the signal is given on the craft, the signal shall be answered immediately by three blasts of a whistle or horn blown on the bridge, and if the draw is not ready to be opened immediately, by reason of persons or vehicles being on the bridge as aforesaid, or by reason of accident to the machinery or other contingency involving unavoidable delay in opening the draw, the signal for the craft shall be answered immediately by one blast of a whistle or horn blown on the bridge.

(4) This paragraph shall take effect and be in force on and after June 1, 1907.

(b) *Bridge of Baltimore and Eastern Railroad (Pennsylvania Railroad Co.).* (1) Between the hours of 1 hour before sunrise and 1 hour after sunset the draw shall be promptly opened for all vessels desiring to pass through it whose masts permanently remain standing or which have masts that may be unstepped but which are 20 feet or more in height and 5 inches or more in diameter at butt.

(2) Whenever a vessel of the kind described in subparagraph (1) of this paragraph shall approach the bridge and desire to pass through the draw, the signal therefor shall be three blasts of a whistle or horn blown on the craft, and when such signal is given the draw shall be opened forthwith, except when a train is passing or about to pass over the bridge.

(3) If the draw is ready to be opened immediately when the signal is given on the craft the signal shall be answered immediately by three blasts of a whistle or horn blown on the bridge, and if the draw is not ready to be opened immediately by reason of a train passing or about to pass over the bridge, or by reason of accident to the machinery or other contingency involving unavoidable delay in opening the draw, the signal for the craft shall be answered immediately by one blast of a whistle or horn blown on the bridge.

(4) When the call for opening the draw is given not 10 minutes before the hour at which a train is expected, the opening of the draw shall be delayed until immediately after the passage of that train, but in no case shall there be a delay longer than 15 minutes in opening the draw.

(5) This paragraph shall take effect and be in force on and after June 1, 1907.

§ 203.300 Colgate Creek, Md.; bridge (highway) of the City of Baltimore, Md. (a) The draw shall be promptly opened for all vessels desiring to pass through it whose hulls, deckhouses, or cargoes are of such height that they will not pass under the bridge safely when it is closed.

(b) The hours for opening the draw shall be from 6 a. m. to 6 p. m. during the months of December,

January, February, and March, and from 6 a. m. to 10 p. m. during the remaining months of the year, including Sundays.

(c) A vessel approaching the bridge and desiring to pass through the draw shall signal by three blasts of a whistle or horn. The signal shall be answered by three blasts of a whistle or horn from the bridge, and the draw shall be opened within 3 minutes from time of signal. In case, however, of accident to the machinery or other contingency involving unavoidable delay in opening the draw, the signal shall be answered by one blast of a whistle or horn.

(d) This section shall take effect July 1, 1913.

§ 203.305 Baltimore Harbor, Md.; bridge (highway) at Hanover Street across Middle Branch of Patapsco River. (a) When, at any time between the hours of 5 a. m. and 6:30 a. m., 9:30 a. m. and 4 p. m., and 6 p. m. and 9 p. m., a vessel, tug, or any watercraft unable to pass under the bridge approaches it, the signal of intention to pass through the draw and for the draw to be opened shall be three blasts of a whistle or horn blown on the craft. When such signal is given, the bridge shall be immediately cleared, no vehicle or person not then on the drawspan shall be allowed to come upon it, and the draw shall be opened forthwith.

If the draw is ready to be opened immediately, the draw operator shall answer immediately by three blasts of a whistle or horn blown on the bridge; and if the draw is not ready to be opened immediately, he shall answer by one short blast of a whistle or horn blown on the bridge.

(b) The draw shall not be required to open to vessels between 6:30 a. m. and 9:30 a. m. and between 4 p. m. and 6 p. m., except in cases involving the passage of fire boats, police boats, and craft similarly engaged in emergency operations. An attendant shall be kept on duty during these periods.

(c) When a vessel, tug, or any watercraft unable to pass under the bridge desires to pass through the draw at any time between the hours of 9 p. m. and 5 a. m., notice of such intention shall be given to the superintendent of the bridge by telephone or otherwise, either at the bridge before 9 p. m. or at his residence thereafter. If the notice is given between the hours of 5 a. m. and 9 p. m., or if at least one-half hour has elapsed since it was given, the draw shall be promptly opened at the time specified in the notice on signal given and answered as hereinbefore prescribed.

(d) The owner of the bridge shall keep conspicuously posted thereon, in such manner that it may be easily read at any time, a notice stating how the superintendent may be reached and shall arrange for ready telephonic communication with him at any time between 9 p. m. and 5 a. m., either from the bridge or from its immediate vicinity.

§ 203.310 Severn River, Md.; bridge (highway) near Annapolis, Md. (a) The leaves of the draw shall be promptly raised to their full height so as to provide full horizontal clearance through the bridge at any time during the day or night for all vessels desiring to pass through it whose masts are 15 feet or more in height or for any vessels whose hulls, deckhouses, or cargoes are of such height that they will not pass under the bridge when it is closed.

(b) Vessels have the right of way over vehicles or persons using the bridge.

(c) A vessel approaching the bridge and desiring to pass through the draw shall signal by three blasts of a whistle or horn. The signal shall be answered by three blasts of a whistle or horn that can be heard three-fourths of a mile from the bridge, and the draw shall be opened forthwith. In case, however, of accidents to the machinery or other contingency involving unavoidable delay in opening the draw, the signal shall be answered by one blast of a whistle or horn.

(d) This section shall take effect January 1, 1927, and will supersede the regulations approved January 3, 1901, and amended July 27, 1910.

§ 203.325 Potomac River at Washington, D. C.; drawbridges—(a) *Operation requirements.* The owners of or agencies controlling the bridge shall provide the appliances and the personnel necessary for the safe, prompt, and efficient operation of the draws.

(b) *Prompt opening required except when delayed by train.* Except as otherwise provided in this section, the draw shall be opened promptly when the call signal is given by an approaching vessel which cannot pass under the closed bridge: *Provided,* That when an approaching train is actually on the railroad bridge block, or a mail train is in motion toward the bridge in sight or hearing of the draw tender, the draw of the railroad bridge need not be opened until the train has passed and the drawspan is cleared.

(c) *Interference with operation of bridge prohibited.* Trains and vehicles shall not be stopped on a bridge for the purpose of delaying its opening, nor shall watercraft be navigated so as to hinder or

delay the operation of the draw, but all passage over or through a drawbridge shall be prompt to prevent delay to either land or water traffic.

(d) *Sound signals*—(1) *Call signal for opening of draw.* Three long blasts of a whistle, horn, or siren, or three loud and distinct strokes of a bell, sounded within reasonable hearing distance of the bridge and in time to give due notice to the draw tender.

(2) *Acknowledging signals.* (i) When draw can be opened immediately: One long blast of a whistle, horn, or siren, or one loud and distinct stroke of a bell.

(ii) When draw cannot be opened immediately, or when it is open and must be closed immediately: Four short, rapid blasts of a whistle, horn, or siren, or four rapid strokes of a bell. The vessel shall acknowledge by one long blast followed by one short blast or by two strokes of a bell. Thereafter, as soon as the draw can be opened, the draw tender shall sound one long blast or one stroke of a bell.

NOTE: As used in this paragraph, the term "long blast" means a distinct blast of three seconds' duration, and the term "short blast" means a distinct blast of one second's duration.

(e) *Visual signals.* To be used in conjunction with sound signals when conditions are such that sound signals may not be heard:

(1) *Call signal for opening of draw.* A white flag by day or a white light by night, swung in full circles at arm's length in full sight of the bridge and facing the draw.

(2) *Acknowledging signals.* (i) When draw can be opened immediately: A white flag by day or a green light by night, swung up and down vertically a number of times in full sight of the vessel.

(ii) When draw cannot be opened immediately, or when it is open and must be closed immediately: A red flag by day or a red light by night, swung to and fro horizontally in full sight of the vessel. The vessel shall acknowledge by swinging to and fro horizontally a red flag by day or a red light by night. Thereafter, as soon as the draw can be opened, the draw tender shall swing a white flag or a green light up and down vertically a number of times in full sight of the vessel.

(f) *Passing of railroad bridge and two highway bridges at Fourteenth Street.* A vessel desiring to pass these bridges shall give the call signal for the first bridge to be passed. A radio or other intercommunication system of a type approved by the District Engineer, Corps of Engineers, Washington, D. C., shall be provided and maintained by the owners in the control room of the drawspan of each bridge. When the call signal is given by an approaching vessel, the bridge nearest the vessel, if that bridge can be opened immediately, shall communicate with the other bridges to see if they can open immediately. The draw tender shall await the reply from the other bridges and then give the appropriate acknowledging signal. If any of the bridges cannot be opened immediately, the proper signal shall be given from the bridge nearest the vessel to be followed as soon as possible by the signal from that bridge that the draws are about to open.

(g) *Right of way*—(1) *Vessels approaching from opposite directions.* When vessels are approaching from opposite directions to pass a bridge, each vessel shall give the call signal for opening of the draw. The vessel running with the current shall have the right of way. At slack tide the vessel running in the direction of the ebb current shall have the right of way.

(2) *Vessels approaching from same direction.* When vessels are approaching a bridge from the same direction to pass a bridge, each vessel shall give the call signal for opening of the draw. They shall be navigated in accordance with the applicable pilot rule.

(h) *Closed periods.* Between 6:45 and 9:15 a. m., and between 3:45 and 6:30 p. m., daily, the bridges shall not be opened for the passage of any vessel: *Provided,* That any vessel passing one of the drawbridges before a closed period begins will be entitled to passage through all remaining bridges in the direction of travel without delay: *Provided further,* That vessels owned or controlled by the United States Government or the District of Columbia shall be passed without delay through any of the bridges at any time upon giving the call signal: *And provided further,* That in time of freshet or emergency the closed periods may be suspended or modified by the District Engineer.

(i) *Clearance gauges.* Clearance gauges of a type approved by the District Engineer shall be provided and maintained by the owners of the railroad bridge and the West Fourteenth Street highway bridge, as follows: One on the downstream end of the pivot-pier fender of the railroad bridge; one on the upstream end of the pivot-pier fender of the highway bridge; and an additional gauge on each bridge so placed that it can be distinctly read by the draw tender. These gauges shall be so set and maintained as to show accurately to an approaching vessel the actual vertical distance between the water surface and the lowest point of the lower chords of the drawspans.

(j) *Minimum vertical clearance to be observed.* No vessel shall pass under a closed drawspan at any time unless the vertical clearance between the lowest point of the span and the highest vertical projection of the vessel is at least 18 inches.

(k) *Habitual users.* Any vessel desiring to pass any of the bridges as often as once a day for 10 days in any 30-day period will be regarded as a habitual user of the waterway within the meaning of this paragraph. Such vessels should be so constructed that stacks, masts, and flagstaffs may be lowered to permit their passage under the closed bridges. The draws shall not be required to open to permit the passage of vessels habitually using the waterway which have stacks, masts, or flagstaffs exceeding a height of 16.8 feet above the water line and which, in the opinion of the District Engineer, can, through structural modifications, be made capable of clearing the closed bridges: *Provided,* That when the gauges described in paragraph (i) of this section read less than 16.8 feet the bridges shall be opened for such vessels at any time except during the closed periods prescribed in paragraph (h) of this section.

(l) *Records and reports.* The owners of or agencies controlling the bridges shall keep a complete record of all openings of the draws in such form as may be prescribed by the District Engineer, and shall report to him all cases where the draws have been required to be kept open for an unreasonable length of time.

§ 203.330 Anacostia River, D. C.; District of Columbia highway bridge at 11th Street SE.' Washington. (a) From 9:00 a. m. to 4:00 p. m. daily the draw of this bridge shall, upon proper signal, be opened promptly for the passage of any vessel or other watercraft not able to pass safely under the closed draw.

(b) Whenever a vessel unable to pass safely under the closed bridge desires to pass through the draw at any time between 4:00 p. m. and 4:00 a. m., notice of the time the opening is required shall be given to the draw tender at the bridge or other authorized representative of the owner of or agency controlling the bridge not later than 4:00 p. m.

(c) Whenever a vessel unable to pass safely under the closed bridge desires to pass through the draw at any time between 4:00 a. m. and 9:00 a. m., at least 12 hours' advance notice of the time the opening is required shall be given to the watchman at the bridge or other authorized representative of the owner of or agency controlling the bridge.

(d) Upon receipt of advance notice as specified in paragraphs (b) or (c) of this section the draw tender, watchman, or other authorized representative shall, in compliance therewith, arrange for the prompt opening of the draw upon proper signal at the time specified in the notice for the passage of the vessel or within a reasonable time thereafter: *Provided,* That from 6:45 a. m. to 9:00 a. m. and from 4:00 p. m. to 6:30 p. m. daily the draw shall not be required to open for the passage of vessels except vessels owned or controlled by the United States or the District of Columbia.

(e) The owner of or agency controlling the bridge shall keep conspicuously posted on both the upstream and downstream sides thereof, in such manner that it can be easily read at any time, a copy of the regulations in this section together with a notice stating exactly how the draw tender, watchman, or other authorized representative may be reached by telephone or otherwise.

§ 203.340 Rappahannock River, Va.; all bridges. (a) The corporations or persons owning or controlling a drawbridge shall provide the same with the necessary tenders and the proper mechanical appliances for the safe, prompt, and efficient opening of the draw and shall maintain the fender system in good condition for the passage of vessels.

(b) If the weather conditions are good and sound signals can be heard when a vessel approaches a drawbridge and desires to pass through the draw, three distinct blasts of a whistle, horn, or megaphone shall be sounded from the vessel when within reasonable hearing distance of the bridge.

(1) When the draw of the bridge can be opened immediately, the draw tender shall reply by three distinct blasts of a whistle, horn, or megaphone or by three loud and distinct strokes of a bell.

(2) When the draw of the bridge cannot be opened immediately or when the bridge is open and is to be closed immediately, the draw tender shall reply by two long distinct blasts of a whistle, horn or megaphone or by two loud and distinct strokes of a bell.

(c) When weather conditions prevent hearing the sound signals when a vessel approaches a drawbridge and desires to pass through the draw, signals shall be made from the vessel by swinging in circles at arm's length a lighted lantern at night and a flag by day.

(1) When the draw of the bridge can be opened immediately, the draw tender shall reply by raising and lowering in vertical plane a number of times a lighted lantern at night and a flag by day.

(2) When the draw of the bridge cannot be opened immediately or when the bridge is open and is to be closed immediately, the draw tender shall reply by swinging to and fro horizontally a number of times a lighted lantern at night and a flag by day.

(d) When a vessel wishes to pass two or more bridges close together signals as prescribed above shall be given from the vessel for opening the first bridge, followed at an interval of about 5 seconds by the same signals for the second bridge, and so on, thus giving at intervals of about 5 seconds, separate signals for each bridge the vessel desires to pass.

(e) When two or more vessels are approaching the bridge at nearly the same time from the same or opposite directions with the draw opened or closed, each of these vessels shall signal independently for the opening of the draw, and the draw tender shall reply as prescribed and in turn to the signal of each vessel.

(f) Where bridges are less than 500 feet apart, the signals to govern the movements of the approaching vessel shall be given from the bridge nearest the vessel. If that bridge can be opened immediately, the bridge tender shall await the reply signals from the other bridges and then give the signal circumstances require. If the nearest bridge cannot be opened immediately, the prescribed signal shall be given the approaching vessel at once, to be followed as soon as possible by the signal from that bridge that the draws are about to open.

(g) The draw shall be opened with the least possible delay, upon receiving the prescribed signal: *Provided*, That the drawspan shall not be opened when a train is approaching so closely that it cannot safely be stopped before reaching the bridge, or when a passenger or mail train is approaching within sight or hearing of the operator of the drawspan.

(h) When a bridge tender is about to close a draw, he shall sound two distinct blasts of a whistle, horn, or megaphone, or two loud and distinct strokes of a bell.

(i) Trains, vehicles, vessels or other water craft, shall not be stopped or manipulated in a manner hindering or delaying the operation of the draws, but all passage over the drawspans or through the draw openings shall be in a manner to expedite both land and water traffic.

(j) Any vessel with or without tows requiring the opening of the draw of a bridge on which only one draw opening is protected by a fender system, shall pass through the opening so protected.

(k) A copy of the regulations in this section will be conspicuously posted on both upstream and downstream sides of the bridges in such manner that it can be easily read at any time.

(l) This section shall take effect and be in force on and after August 22, 1934, and shall supersede all bridge regulations previously approved for the Rappahannock River.

§ 204.—DANGER ZONE REGULATIONS:

§ 204.20 Waters of Atlantic Ocean; Sea Girt Military Reservation, Sea Girt, N. J.—(a) *The danger zone.* (1) The firing range of Sea Girt Military Reservation includes the waters of the Atlantic Ocean within an area bounded on the north by a line extending east from the end of Sea Girt Avenue, on the east by a line 1 mile long 3 miles offshore, and on the south by a line extending southeast from the radio station.

(2) The above-described area will be marked by spar buoys at the two points 3 miles offshore, to be placed and maintained by the Commanding Officer, New Jersey State Arsenal, Sea Girt, New Jersey.

(b) *Regulations.* (1) Range firing will normally take place between the hours of 8:00 a. m. and 6:00 p. m. on all Saturdays and Sundays during the period April to November, inclusive, and on certain designated weekdays during the period July to September, inclusive.

(2) No vessel shall enter or remain in the danger zone during the operation of the firing range excepting vessels of the United States.

(3) When firing is scheduled or is in progress a large red flag will be displayed from the flag staffs on the beach located at both the northern and southern boundaries of the reservation, so as to be clearly visible for a distance of at least 3 miles offshore.

(4) No permits to erect and maintain fish pounds within the zone will hereafter be issued.

(5) This section shall be enforced by the Adjutant General, State of New Jersey, and such agencies as he may designate.

§ 204.25 Atlantic Ocean off Delaware coast; antiaircraft artillery firing areas, Second Army—(a) *The danger zones*—(1) *Automatic weapons area.* An area east and southeast of Rehoboth Beach described as follows: Beginning at a point on the shore at latitude 38°40′45″; thence to latitude 38°45′30″, longitude 75°01′24″; thence to latitude 38°43′00″, longitude 74°57′10″; thence to latitude 38°38′50″, longitude 74°55′33″; thence to latitude 38°36′15″, longitude 74°57′00″; thence to a point on the shore at latitude 38°37′54″; and thence northerly along the shore to the point of beginning.

(2) *90-mm. gun area.* An area east of Bethany Beach described as follows: Beginning at a point on the shore at latitude 38°31′15″; thence to latitude 38°38′27″, longitude 74°52′42″; thence to latitude 38°35′45″, longitude 74°49′12″; thence 180° true to latitude 38°25′00″; thence to latitude 38°22′26″, longitude 74°52′06″; thence to a point on the shore at latitude 38°29′03″; and thence northerly along the shore to the point of beginning.

(3) *120-mm. gun area.* An area which includes the 90-mm. gun area and extends that area about 7,800 yards on its northeast, east, and southeast sides, described as follows: Beginning at a point on the shore at latitude 38°31′15″; thence to latitude 38°40′26″, longitude 74°49′45″; thence to latitude 38°36′30″, longitude 74°44′18″; thence 180° true to latitude 38°24′32″; thence to latitude 38°20′30″; longitude 74°48′45″; thence to a point on the shore at latitude 38°29′03″; and thence northerly along the shore to the point of beginning.

NOTE: The danger zones will be marked by buoys.

(b) *The regulations.* (1) All firing during the months of November to April, inclusive, will be conducted between 8:00 a. m. and 6:30 p. m., e. s. t. All firing during the months May to October, inclusive, will be conducted between 12:00 m. and 6:00 p. m., e. s. t. Such firings as are conducted prior to 12:00 m. during this latter period will be occasional individual rounds fired at fixed points for testing purposes in accordance with established Department of the Army Safety Regulations, and will involve no restrictions on navigation. No firing will be conducted during hours of darkness.

(2) Firing in the various areas will take place on certain days other than Saturdays, Sundays, and national holidays, as listed in public notices to be issued about January 1 of each year by the District Engineer, Corps of Engineers, Philadelphia, Pennsylvania.

(3) When it is determined that no firing will take place on any of the days for which firing is scheduled, the public will be so advised by radio and other practicable means as far in advance as possible.

(4) Except as provided in subparagraph (6) of this paragraph, no vessel shall enter or remain in the danger zones during the time of firing unless specific permission is granted in each case by one of the representatives of the enforcing agency policing the area in patrol boats.

(5) Prior to the conducting of each firing practice, the danger zones will be adequately patrolled to insure that no watercraft are within the danger zones and to warn any watercraft in a danger zone that firing practice is to take place. Any such watercraft shall, upon being so warned, immediately leave the area designated and shall remain outside the area until the conclusion of the firing practice.

(6) The regulations in this section shall not deny traverse of portions of the danger zones by regular cargo-carrying vessels, or commercial fishing vessels based at Lewes, Delaware. In case of the presence of any such vessel in a danger zone, the officer in charge of firing operations will cause the cessation or postponement of fire until the vessel has cleared the area. The vessel shall proceed on its normal course and shall not delay its progress.

(7) This section shall be enforced by the Commanding General, Second Army, Fort George G. Meade, Maryland, and such agencies as he may designate.

§ 204.26 Atlantic Ocean in the vicinity of Wallops Island, Virginia; naval high altitude test bombing target area—(a) *The danger zone.* A circular area with a radius of one nautical mile having its center approximately two and one-fourth miles off Wallops Island at latitude 37°50′16″, longitude 75°25′00″.

(b) *The regulations.* (1) No vessels other than specifically authorized military and naval vessels shall enter or remain in the area during its use for test purposes. At all other times vessels may use the area without restrictions.

(2) The area will be in use intermittently during daylight hours, and this use will be signified by the presence of naval craft patrolling the area.

(3) Upon being warned by the naval patrol craft, vessels shall immediately vacate the area and remain outside the area during the period of use.

(4) Advance notice of the tests will be posted in the Fire House at Chincoteague, Virginia, every Friday and will cover operations for the ensuing week. Interested parties will be notified in the same manner in case of special tests not covered by weekly notice.

(5) The regulations in this section shall be enforced by the Commanding Officer, U. S. Naval Aviation Ordnance Test Station, Chincoteague, Virginia, and such agencies as he may designate.

§ 204.30 Chesapeake Bay; United States Army Proving Ground Reservation, Aberdeen, Md.—(a) *Restricted area defined.* The following indicates the limits of the waters of or adjacent to the Aberdeen Proving Ground, Maryland, and inside of which boundaries will lie the restricted area known as the Aberdeen Proving Ground, Maryland.

(1) Beginning at a point on the westerly side of Chesapeake Bay, at the south side of the mouth of Swan Creek, Harford County, Maryland, the most northerly point of the reservation known as Plum Point; thence southeasterly along the low water mark on the shore of Chesapeake Bay to and across the north entrance of Spesutie Narrows to and thence along the low water mark on the north shore of Spesutie Island to Locust Point; thence along straight line from Locust Point to Turkey Point for a distance of approximately 1,400 yards; thence following a line parallel with and 1,000 yards from the low water mark on the easterly shore of Spesutie Island to a point 1,000 yards due southeast of Sandy Point; thence approximately southwest in a straight line to a point approximately 1,250 yards S. 10°30′ W. from Bear Point; thence approximately 9,275 yards S. 51°04′ W. to a point in Chesapeake Bay about 1,700 yards due east from Taylor Island Point; thence southwesterly in a straight course, except such variations as may be necessary to include all of Pooles Island to the southwesterly point of Pooles Island, thence in a northwesterly direction to the most southwesterly point of Spry Island, including all of Spry Island; thence northwesterly in a straight line to extreme southerly island off Lower Island Point; thence northwesterly in a straight line through Brier Point to a point in Seneca Creek where this line intersects a straight line which passes through monuments No. 124 and No. 125 on westerly part of Carroll Island; thence northeasterly in a straight line passing through Marshy Point, at the junction of Dundee Creek and Saltpeter Creek, to the intersection of the center line of Reardon Inlet with Gunpowder River, except such variations as may be necessary to exclude any and all parts of the point of land on the westerly side of Gunpowder River about one mile south of Oliver Point; thence northerly along the center line of Reardon Inlet to its intersection with the southeasterly line of the right of way of the Pennsylvania Railroad; thence northeast along the Pennsylvania Railroad following the reservation boundary line to shore of Bush River, and along its western shore to Fairview Point; thence northeast in a straight line across Bush River to concrete monument No. 64, located on the eastern shore of Bush River, south of Chelsea; thence along the eastern shore of Bush River northerly to the mouth of Sod Run; thence by a broken line along the boundary of the reservation to Swan Creek; and thence in a straight line to Plum Point. (The above description may be traced on Coast and Geodetic Chart No. 1226).

(b) *Authority delegated Commanding Officer.* Under authority delegated by the Secretary of the Army to the Commanding Officer, Aberdeen Proving Ground, to designate from time to time, by suitably posted bulletins, the conditions under which the public, including food fishermen may enter the waters of the Restricted Area, Aberdeen Proving Ground, the following regulations are published.

(c) *Penalty.* All persons who enter the restricted waters, except as authorized in this section, without the authority of the Commanding Officer, Aberdeen Proving Ground, Md., are under the terms of the information given above, guilty of a misdemeanor and upon conviction thereon are punishable by a fine not exceeding $500.00 or by imprisonment not exceeding six months.

(d) *Entrance into restricted waters by the public over weekends and on National holidays.* Except as qualified in this paragraph, the waters included in Aberdeen Proving Ground Reservation are open throughout the year to the public for fishing and traffic but not for hunting from 6:00 p. m. Fridays to 7:00 a. m. Mondays and on National (not State) holidays from 6:00 p. m. on the day preceding the holiday to 7:00 a. m. on the day following the holiday. In addition those waters west of the east shore line of Bush River and the line Abbey Point to Pooles Island are further restricted to the public until 12:00 noon Saturdays.

(e) *Entrance at night into restricted waters by the public between the dates of February 1st and June 15th.* Between the dates of February 1st and June 15th, both dates inclusive, the waters included in Aberdeen Proving Ground Reservation are open to the public for fishing and other traffic but not hunting from 6:00 p. m. to 7:00 a. m., except on Tuesdays and Wednesdays, which are reserved for night firing over water. If, however, there is to be night firing over water on Tuesdays or Wednesdays,

a red flag will be hoisted at Howell Point Tower on the Eastern Shore, Maryland, at 4:30 p. m., and a siren located at Mulberry Point will be sounded at 4:35 p. m. as a signal to fishermen and others that entrance to the restricted waters of Aberdeen Proving Ground, on those evenings is prohibited.

(f) *Entrance at night into restricted waters by the public between dates of January 1st and January 31st and between dates of June 16th and December 31st provided night firing over water is not to be conducted.* Between the dates of January 1st and January 31st, both dates inclusive, and between the dates of June 16th and December 31st, both dates inclusive, firing may be conducted on any night except Saturday. However on dates in which night firing is not to be conducted, that portion of the waters of the Chesapeake Bay, Gunpowder River, and Bush River which are included in Aberdeen Proving Ground Reservation are open to the public for fishing and other traffic but not for hunting from 6:00 p. m. to 7:00 a. m. If firing is to be conducted on any night during these periods, a siren located at Mulberry Point will be sounded at 4:35 p. m. and in addition a red flag will be displayed from the staff at Howell Point Tower at 4:30 p. m. on the date the night firing is to be conducted as a signal to fishermen and others that entrance on this date in the waters included in Aberdeen Proving Ground Reservation is prohibited. In the event night firing is to be conducted over a considerable period between the dates specified herein a special notice of such firings and the dates and hours at which time the firing is to be conducted will be published by the Commanding Officer, Aberdeen Proving Ground, and circulated to the Post Offices in the surrounding localities for publication on the bulletin boards thereat. During such periods the provisions contained in these special notices must be complied with by fishermen and all others concerned.

(g) *No limitations on dates night firing may be conducted over land.* The foregoing provisions and limitations on night firing over water in no way restricts night firing over land which may be conducted on any night of a working day throughout the year.

(h) *Permits required from the Commanding Officer to set fixed nets in restricted waters.* Fishermen desiring to set fixed nets within the restricted waters of Aberdeen Proving Ground Reservation are required in every instance to have a written permit. A fixed net for the purpose of this paragraph is defined as a pound net, staked gill net, hedge fike net, hoop net, eel pot, and all other types of nets fastened by means of poles, stakes, weights, or anchors. Permits to fish within the restricted waters of Aberdeen Proving Ground may be obtained by written application to the Commanding Officer, Aberdeen Proving Ground, Md. Applicants for permits must state the location at which they desire to set fixed nets and state the period of time for which they desire the permit to cover.

Holders of permits for setting fixed nets must comply with the provisions of this part and also with § 206.50 (d).

(i) *Identification signs required at each location of fixed nets.* Fishermen who have been granted permits to fish within the restricted waters of Aberdeen Proving Ground Reservation with fixed nets must at each location have a stake securely driven at the outer end of the line of nets on which is mounted a sign board which contains their name and permit number.

(j) *Removal of pound net poles and/or stakes.* At the end of the fishing season or upon the expiration of the permit fishermen must remove and haul away from the location all pound nets, poles or stakes used in their operation. Pound net poles or stakes must not be cast adrift after removal.

(k) *Restrictions on fishermen.* It must be distinctly understood that holders of permits to fish are not authorized to enter the restricted waters of Aberdeen Proving Ground Reservation outside the hours aforementioned. In addition, the privileges granted in this paragraph include no right to land nor to cut or procure pound net poles or stakes on the Aberdeen Proving Ground Reservation.

(l) *Fishing with any type of net prohibited in all creeks.* Fishing with any type of net is prohibited in all creeks of the Aberdeen Proving Ground Reservation, including Romney Creek.

(m) *Compliance with Federal, State and county laws required.* The taking of fish in the waters of Aberdeen Proving Ground Reservation and the setting of and location of nets, in a manner not in compliance with Federal, State and county laws is prohibited.

§ 204.32 Chesapeake Bay in the vicinity of Chesapeake Beach, Md.; firing range, Naval Research Laboratory—(a) *The danger zone*—(1) *Area A.* A roughly rectangular area bounded on the north by latitude 38°39′55″; on the south by latitude 38°39′09″; on the east by longitude 76°31′03″; and on the west by the shore of Chesapeake Bay.

(2) *Area B.* The sector of a circle bounded by radii of 9,600 yards bearing 31° (to Bloody Bar Light) and 137° 30′ (to Buoy N "16 FF"), respectively, from the center at the southeast corner of building No. 3; excluding Area A.

(3) *Area C.* The segment of a circle inclosed by the arcs of two circles having radii of 9,600 yards and 13,200 yards, respectively, and bounded by the extended radii marking the north and south limits of Area B.

(4) *Area D.* A roughly rectangular area bounded on the north by an east-west line through Buoy C "1" at the entrance channel to Fishing Creek; on the south by an east-west line through Buoy C "23" northeast from Breezy Point; on the east by the established fishing structure limit line; and on the west by the shore of Chesapeake Bay.

NOTE: All bearings referred to true meridian.

(b) *The regulations.* (1) No vessel shall enter or remain in Area A at any time.

(2) No vessel shall enter or remain in Area B or Area C between the hours of 1:00 p. m. and 5:00 p. m. daily except Sundays, except that through navigation of commercial craft will be permitted in Area C at all times, but such vessels shall proceed on their normal course and shall not delay their progress.

(3) No fishing structures, other than those presently in established locations, which may be maintained, will be permitted to be established in Area D without specific permission from the Director, Naval Research Laboratory.

(4) The areas will be in use throughout the year, and no further notice is contemplated that firing is continuing.

(5) Prior to the conduct of each firing practice a patrol vessel will patrol the range to warn navigation. "Baker" will be flown from a conspicuous point on the patrol vessel and from a prominent position on shore.

(6) The regulations in this section shall be enforced by the Commandant, Fifth Naval District, and such agencies as he may designate.

§ 204.34 Chesapeake Bay, south of Sharps Island, Md.; restricted area, U. S. Navy—(a) *The danger zone.* The waters within a circle having a radius of 200 yards with its center approximately 300 yards south of Sharps Island at latitude 38°36′53″, longitude 76°21′56″.

(b) *The regulations.* (1) No vessel shall enter or remain in the restricted area at any time except as authorized by the enforcing agency.

(2) This section shall be enforced by the Commanding Officer, U. S. Naval Air Station, Patuxent River, Maryland, and such agencies as he may designate.

§ 204.36 Chesapeake Bay, in vicinity of Bloodsworth Island, Md.; shore bombardment, air bombing, air strafing, and rocket firing area, U. S. Navy—(a) *The danger zone.* All waters of Chesapeake Bay and Tangier Sound within an area bounded as follows: Beginning at latitude 38°08′15″, longitude 76°10′00″; thence to latitude 38°12′00″, longitude 76°10′00″; thence to latitude 38°12′00″, longitude 76°07′00″; thence to latitude 38°13′00″, longitude 76°06′00″; thence to latitude 38°13′00″, longitude 76°04′00″; thence to latitude 38°12′00″, longitude 76°02′00″; thence to latitude 38°12′00″, longitude 76°00′00″; thence to latitude 38°08°15″, longitude 76′00′00″; thence to the point of beginning.

(b) *The regulations.* (1) No vessel or other craft shall enter or remain in the restricted area when notified by an enforcing authority to keep clear or when firing is or will soon be in progress, except as provided in subparagraph (5) of this paragraph.

(2) Advance notice will be given of the dates and times of all firings and such notice will be published in the local "Notice to Mariners". The area will be in use intermittently throughout the year. On days when firing is conducted, firing will take place normally between sunrise and sunset, except that occasional night firing may be conducted between sunset and 12:00 midnight.

(3) Prior to the commencement of firing each day, surface or air search of the entire area will be made for the purpose of locating and warning all craft and persons not connected with the firing, and a patrol will be maintained throughout the duration of firing.

(4) Warning that firing is or soon will be in progress will be indicated during daylight by a red flag prominently displayed from a tower off Okahanikan Point at latitude 38°11′45″, longitude 76°05′35″, and at night by a searchlight beam pointed into the sky. All persons, vessels, and other craft shall clear the area when these signals are displayed or when warned by patrol vessels or by aircraft employing the method of warning known as "buzzing" which consists of low flight by the airplane and repeated opening and closing of the throttle.

(5) During hours when firing is in progress and warning signals are displayed, no fishing or oystering vessels or other craft not directly connected with the firing shall navigate within the restricted area, except that deep-draft vessels proceeding in established navigation lanes and propelled by mechanical power at a speed greater than five knots normally will be permitted to traverse the area. Permission for such deep-draft vessels to enter and traverse the area will be indicated during daylight by dipping the red warning flag to halfmast, and at night by flashing the warning searchlight.

(6) When firing is not in progress and warning signals are not displayed, oystering and fishing boats and other craft may operate within the restricted area.

(7) All projectiles, bombs, and rockets will be fired to land on Bloodsworth Island or Pone Island, but Naval authorities will not be responsible for damage by such projectiles, bombs, or rockets, or by Navy or Coast Guard vessels, to nets, traps, buoys, pots, fish pounds, stakes, or other equipment which may be located within the restricted area.

(8) This section shall be enforced by the Commandant, Fifth Naval District, and such agencies as he may designate.

§ 204.40 Potomac River—(a) *United States Naval Torpedo Testing Range, Piney Point, Md.*—(1) *The danger zone*—(i) *The prohibited area.* That portion of the Lower Potomac River bounded as follows: Beginning at latitude 38°00′51″, longitude 76°20′40″, which point is marked by Torpedo Testing Range Lighted Bell Buoy A; thence northeasterly to Point Lookout Shoal Bell Buoy 2; thence northerly to Point Lookout Light; thence northerly and westerly along the shores of Cornfield Harbor past Cornfield Point to the mouth of Potter Creek; thence northwesterly to Grays Point Buoy "2GP"; thence northwesterly to a point at the mouth of a creek on St. Georges Island, the position of said point being latitude 38°06′20″, longitude 76°28′08″; thence southerly, westerly, and northerly along the shores of St. Georges Island to latitude 38°06′37″, longitude 76°28′45″; thence northwesterly to Piney Point Light; thence southwesterly to latitude 38°07′08″, longitude 76°32′44″, which point bears 303°16′41″ true, 1,000 yards, from Torpedo Testing Range Lighted Bell Buoy D; thence 123°16′41″ true to the point of beginning.

The prohibited area is crossed by three passages as follows:

Passage No. 1: A passage 600 yards wide between a line running from latitude 38°02′36″, longitude 76°24′04″, to latitude 38°05′27″, longitude 76°24′21″, and a line running from latitude 38°02′50″, longitude 76°24′30″, to latitude 38°05′32″, longitude 76°24′43″.

Passage No. 2: A passage 800 yards wide between a line running from latitude 38°03′08″, longitude 76°25′04″, to latitude 38°05′48″, longitude 76°25′56″, and a line running from latitude 38°03′28″, longitude 76°25′42″, to latitude 38°05′56″, longitude 76°26′30″.

Passage No. 3: Beginning at Piney Point (latitude 38°08′01″, longitude 70°31′45″); thence 221°, 700 yards; thence 90°, 1,250 yards; thence 301° to the point of beginning.

(ii) *The restricted area.* An area adjacent to the prohibited area, bounded as follows: Beginning at Piney Point Light, Piney Point, Maryland; thence northwesterly to spar buoy "19DW"; thence southerly to Spar Buoy "19W"; thence southeasterly to Potomac River Lighted Buoy "5A"; thence southeasterly along a line through spar buoy "18AW" to spar buoy "18W"; thence southeasterly along a line through Spar buoys "17W", "16AW" to spar buoy "16W"; thence northerly to Point Lookout Shoal Bell Buoy 2; thence southwesterly to Torpedo Testing Range Lighted Bell Buoy A; thence northwesterly along a line through Torpedo Testing Range Lighted Bell Buoys B, C, and D to latitude 38°07′08″, longitude 76°32′44″, which point bears 303°16′41″ true, 1,000 yards, from Torpedo Testing Range Lighted Bell Buoy D; and thence northeasterly to Piney Point Light, the point of beginning.

(2) *The regulations.* (i) The presence of any vessel in the prohibited area is prohibited unless prior permission has been granted by the enforcing officer, except that Passages No. 1, No. 2, and No. 3 may be used to traverse the area when firing is not in progress. Vessels shall keep under way at all times while operating in Passages No. 1, No. 2, and No. 3.

(ii) Between the hours of 7:00 a. m. and 4:00 p. m. daily except Sundays and legal holidays, and at other times and on other days when the Torepdo Testing Range is being operated, no vessel shall enter or remain in the restricted area if specifically forbidden to do so by the officer in charge of the Range or his duly accredited representative. Passage of traffic in this area will not be unreasonably interfered with or restricted.

(iii) Between the hours of 7:00 a. m. and 4:00 p. m. daily except Sundays and legal holidays and at other times and on other days when the range is being operated, all vessels are forbidden to

anchor within the restricted area except in cases of great emergency. Any vessel anchoring under circumstances of great emergency shall move away as soon as the emergency permits.

(iv) Any vessel upon being notified by proper authority to shift its position or course shall change position or course as directed with reasonable promptness.

(v) During periods when the range is in operation any vessels in danger or any vessels interfering with operations will be met by representatives of the officer in charge, suitably warned, and given necessary instructions and orders relative to navigating the restricted area. The torpedo testing barge will fly "International B" at a yard arm when testing operations are in progress. Government vessels, seaplanes, or other craft patrolling the zone will fly or expose a red flag.

(vi) Vessels in passage up or down the Potomac River in the restricted area shall keep to the south part of the channel insofar as practicable.

(vii) The speed of vessels passing within 1,000 yards of the torpedo testing barge during testing operations shall not exceed 10 knots.

(viii) Nothing in this section shall prevent the setting of fish traps within the restricted area, under permits granted by the Department of the Army, nor shall the passage of fishing vessels to and from authorized traps be unreasonably interfered with or restricted.

(ix) This paragraph shall be enforced by the Commanding Officer, Piney Point Torpedo Testing Range, Piney Point, Maryland.

(b) *United States Naval Proving Ground, Dahlgren, Va.*—(1) *The danger zones*—(i) *Lower zone.* The entire portion of the lower Potomac River between a line from Point Lookout, Maryland, to Smith Point, Virginia, and a line from Blakiston Island Shoal Buoy 4A (off Blakiston Island) to Hollis Marsh. This zone, in which long-range and aerial machine gun firing is normally conducted at infrequent intervals, embrances the Naval Torpedo Testing Range at Piney Point, Maryland, which is subject to special additional restrictions (see paragraph (a) of this section).

(ii) *Middle zone.* Beginning at the intersection of the Potomac River Bridge with the Virginia shore; thence to Lower Cedar Point Light; thence to latitude 38°19′06″, longitude 76°57′07″, which point is about 3,300 yards east-southeast of Lower Cedar Point Dredge Channel Range Front Light; thence to line of Fire Buoy O, about 1,150 yards southwest by west of Swan Point; thence to line of Fire Buoy M, about 1,700 yards south of Potomac View; thence to Line of Fire Buoy K, about 1,300 yards south by west of the lower end of Cobb Island; thence to Blakiston Island Shoal Buoy 4A, abreast of Blakiston Island abandoned lighthouse; thence southwesterly to a point on the northeast shore of Hollis Marsh at latitude 38°10′; thence northwesterly to Line of Fire Buoy J, about 3,000 yards off Popes Creek, Virginia; thence to Line of Fire Buoy L, about 3,500 yards off Church Point; thence to Line of Fire Buoy N, about 800 yards off Colonial Beach; thence to Line of Fire Buoy P, about 1,000 yards off Bluff Point; thence to the Main Dock at the Naval Proving Ground. Firing is normally conducted in this zone daily except Saturdays, Sundays, and national holidays.

(iii) *Upper zone.* Beginning at Mathias Point, Virginia; thence north to Mathias Point Shoal Light; thence north by east to Port Tobacco River Flats Light; then east-southeast to Popes Creek Flats Lighted Buoy 26; thence east-southeast to Stone Pile Buoy 24 SP abreast of Popes Creek, Maryland; thence to the Maryland shore on an extension of the line connecting Buoys 26 and 24; thence southerly with the Maryland shore to a line passing through Persimmon Point Shoal Light to the Virginia shore, parallel to the Potomac River Bridge; thence northerly with the Virginia shore to the point of beginning. Aerial bombing and strafing is normally conducted in this zone at infrequent intervals.

(2) *The regulations.* (i) Firing normally takes place between the hours of 8:00 a. m. and 4:00 p. m. daily except Saturdays, Sundays, and national holidays, with infrequent night firing between 4:00 p. m. and 10:30 p. m. During a national emergency, firing will take place between the hours of 6:00 a. m. and 10:30 p. m. daily except Sundays.

(ii) When firing is in progress, no fishing or oystering vessels shall operate within the danger zone affected unless so authorized by the Naval Proving Ground's patrol boats. Oystering and fishing boats or other craft may cross the river in the danger zone only after they have reported to the patrol boats and received instructions as to when and where to cross. Deep-draft vessels using dredged channels and propelled by mechanical power at a speed greater than five miles per hour, may proceed directly through the danger zones without restriction except when especially notified to the contrary.

(iii) This paragraph shall be enforced by the Captain of the Port and the Commanding Officer of the United States Naval Proving Ground and such agencies as they may designate. Patrol boats and planes will fly or expose a square red flag in clearing a danger zone.

(c) *Accotink Bay, Accotink Creek, and Pohick Bay; United States Military Reservation, Fort Belvoir, Va.*—(1) *The danger zone.* The waters of Accotink Bay, Accotink Creek, and Pohick Bay, Virginia, within and adjacent to the target ranges of the United States Military Reservation, Fort Belvoir, as follows: All of Accotink Bay; all of Accotink Creek below the bridge which crosses Accotink Creek approximately 400 yards south of U. S. Highway No. 1; and that portion of Pohick Bay bordering its north shore. The mouth of Accotink Bay and that portion of Pohick Bay within the danger zone will be marked by the Post Commander with suitable warning buoys.

(2) *The regulations.* (i) When firing affecting the area is in progress, the Post Commander will post guards at such locations that the waters in the danger zone may be observed and arrange signals whereby these guards may stop the firing should any person be seen in the danger zone. When firing is in progress, the Post Commander will cause to be displayed both on the east shore of Accotink Bay at its mouth and near the danger zone boundary on Accotink Creek a red streamer which shall be visible to a person in a boat near those points.

(ii) Persons desiring to cross the waters in the danger zone shall first determine whether a red streamer is displayed on the east shore of Accotink Bay at its mouth or near the danger zone boundary on Accotink Creek. If the red streamer is displayed, it will indicate that firing is in progress and that the waters in the danger zone are covered by rifle fire, and the area shall not be entered until the streamer is lowered.

(iii) The Post Commander is hereby authorized by using such agencies and equipment necessary to stop all boats at the boundary of the danger zone and prohibit their crossing the area until convenient to the firing schedule to do so.

§ 204.42 Chesapeake Bay, Point Lookout to Cedar Point; aerial gunnery range and target areas, U. S. Naval Air Station, Patuxent River, Md.—(a) *The danger zone*—(1) *Aerial gunnery range (restricted area).* The waters of Chesapeake Bay within an area described as follows: Beginning at the easternmost extremity of Cedar Point; thence easterly to the southern tip of Barren Island; thence southeasterly to latitude 38°01′15″, longitude 76°05′33″; thence southwesterly to Kedges Straits Middle Ground Buoy 14 (approximately latitude 37°59′36″, longitude 76°10′30″); thence northwesterly to Fish Net Stake Buoy 20 W. (approximately latitude 38°02′20″, longitude 76°17′26″); thence northerly to Point No Point Light; thence northwesterly to the shore line at latitude 38°15′45″; thence northeasterly along the shore line to the point of beginning. Aerial machine gun practice will be conducted in this area throughout the year.

(2) *Aerial target areas (prohibited areas).* Nonexplosive aerial projectiles will be dropped at infrequent intervals in the following areas:

(i) A circular area with a radius of 400 yards having its center at latitude 38°16′54″, longitude 76°22′00″ (bearing approximately 176° true, 1,870 yards, from Cedar Point Light).

(ii) A circular area with a radius of 600 yards having its center at latitude 38°13′00″, longitude 76°19′00″ (bearing approximately 153° true, 11,130 yards, from Cedar Point Light).

(b) *The regulations.* (1) Through navigation of surface craft will be permitted at all times in the aerial gunnery range outside the prohibited areas. Such vessels shall proceed on their normal course and shall not delay their progress. No vessels or other craft, except military and naval vessels, shall enter the prohibited areas at any time.

(2) Advance notice will be given of the date on which firing practice is to begin in the aerial gunnery range, and such notice will be published in "Notice to Mariners." The range will be used throughout the year, and no further notice that firing is continuing will be given.

(3) Prior to firing in the aerial gunnery range or in an aerial target area, the area will be patrolled by surface craft or naval aircraft to warn any watercraft likely to be endangered by such firing by means of signals that firing practice is to take place. Surface craft so used will display a square red flag. Naval aircraft will employ a method of warning consisting of repeated shallow dives to a low altitude in the area in which firing is to be conducted, following each dive with a sharp pull-up.

(4) Any watercraft under way or at anchor, upon being so warned, shall immediately vacate the area or areas designated and shall remain outside the areas until the conclusion of firing practice.

(5) Military and naval vessels will conduct gunnery and training exercises in the aerial gunnery range. When there is apparent conflict between surface craft with attendant planes and planes operating under the control of the Naval Air Test Center, Patuxent River, planes from the Naval Air Test Center are expected to keep clear.

(6) Nothing in this section shall prevent oystering or the setting of fishing structures within the

aerial gunnery range outside the prohibited areas in accordance with approved Federal and State regulations: *Provided*, That no permanent or semi-permanent fishing structure or oyster ground markers shall be placed on the western side of Chesapeake Bay between Point No Point and Cedar Point without prior written approval of the Commanding Officer, Patuxent River Naval Air Station.

(7) All projectiles, bombs, and other missiles will be released to fall within the aerial target areas, but naval authorities will not be responsible for damage by such missiles or by naval or Coast Guard vessels to fishing structures or fishing equipment which may be located adjacent to the prohibited areas.

(8) The regulations in this section shall be enforced by the Commandant, Fifth Naval District, and such agencies as he may designate.

§ 204.44 Chesapeake Bay, in vicinity of Tangier Island; Naval guided missiles test operations area.—(a) *The danger zone*—(1) *Prohibited area.* A circle 1,000 yards in radius with its center at latitude 37°47′54″, longitude 76°03′48″.

(2) *Restricted area.* A circle three nautical miles in radius with its center at latitude 37°47′54″, longitude 76°03′48″, excluding the prohibited area.

(b) *The regulations.* (1) Vessels or other craft shall not enter or remain in the prohibited area at any time unless authorized to do so by the enforcing agency.

(2) Except as otherwise provided in subparagraph (6) of this paragraph, vessels or other craft shall not enter or remain in the restricted area when firing is or will soon be in progress unless authorized to do so by the enforcing agency.

(3) Advance notice will be given of the date on which the first firing is to be conducted and such notice will be published in "Notice to Mariners." Thereafter, the danger zone will be in use intermittently throughout the year and no further notice is contemplated that firing is continuing.

(4) Warning that firing is or will soon be in progress will be indicated by a red flag displayed from one of six dolphin platforms on the perimeter of the prohibited area, and by patrol vessels within the danger zone or by aircraft employing the method of warning known as "buzzing" which consists of low flight by the airplane and repeated opening and closing of the throttle. Surface or air search of the entire area will be made prior to the commencement of firing on each scheduled day. During periods of firing a patrol vessel will remain in the approaches to the restricted area and maintain continuous contact with the firing planes to warn when the area is not clear.

(5) Upon observing the warning flag or upon receiving a warning by any of the patrol vessels or aircraft, vessels or other craft shall immediately vacate the restricted area and remain outside the area until the conclusion of firing for the day.

(6) This section shall not deny traverse of portions of the restricted area by commercial craft proceeding in established steamer lanes, but when firing is or will soon be in progress all such craft shall proceed on their normal course through the area with all practicable speed.

(7) All projectiles, bombs, and rockets will be fired to land within the prohibited area, but the Department of the Navy will not be responsible for damage by such projectiles, bombs, or rockets to nets, traps, buoys, pots, fishpounds, stakes, or other equipment which may be located within the restricted area.

(8) This section shall be enforced by the Commanding Officer, Naval Aviation Ordnance Test Station, Chincoteague, Virginia, and such agencies as he may designate.

§ 204.46 Chesapeake Bay, south of Tangier Island; naval firing range—(a) *The danger zone.* Beginning at latitude 37°47′00″, longitude 75°58′00′; thence to latitude 37°43′42″, longitude 75°55′30″; thence to latitude 37°27′00″, longitude 76°02′48″; thence to latitude 37°27′00″, longitude 76°10′00″; thence to latitude 37°47′00″, longitude 76°10′00″; thence to latitude 37°44′30″, longitude 76°00′30″; and thence to the point of beginning.

(b) *The regulations.* (1) Any vessel propelled by mechanical means or by sail at a speed greater than five knots may proceed through the danger zone to and from points without, but not from one point to another point within, the area, except when especially notified to the contrary.

(2) All vessels, other than naval craft, are forbidden to anchor within the danger zone except in cases of great emergency. All vessels anchoring under circumstances of great emergency within the area shall leave the area immediately after the emergency ceases or upon notification by the enforcing agency.

(3) Fishing, oystering, clamming, crabbing, and other aquatic activities are forbidden within the limits of the danger zone, except that existing fishing structures licensed by the State of Virginia may

be maintained and operated; *Provided*, The owners thereof obtain written permits from the enforcing agency designated in subparagraph (5) of this paragraph.

(4) Day and night firing over the range will be conducted intermittently by one or more vessels, depending on weather and operating schedules. When firing is in progress, adequate patrol by naval craft will be conducted to prevent vessels from entering or remaining within the danger zone.

(5) This section shall be enforced by the Commandant, Fifth Naval District, Norfolk Naval Station, Norfolk, Virginia, and such agencies as he may designate.

§ 204.48 Atlantic Ocean and connecting waters in vicinity of Myrtle Island, Va.; Air Force practice bombing, rocket firing, and gunnery range—(a) *The danger zone.* The waters of the Atlantic Ocean and connecting waters within an area described as follows: Beginning at latitude 37°12′18″, longitude 75°46′00″; thence southwesterly to latitude 37°08′21″, longitude 75°50′00″; thence northwesterly along the arc of a circle having a radius of three nautical miles and centered at latitude 37°11′16″, longitude 75°49′29″, to latitude 37°10′14″, longitude 75°52′57″; thence northeasterly to latitude 37°14′12″, longitude 75°48′55″; and thence southeasterly along the arc of a cricle having a radius of three nautical miles and centered at latitude 37°11′16″, longitude 75°49′29″, to the point of beginning.

(b) *The regulations.* (1) No vessel shall enter or remain in the danger zone except during intervals specified and publicized from time to time in local newspapers or by radio announcement.

(2) This section shall be enforced by the Commanding General, Tactical Air Command, Langley Air Force Base, Virginia, and such agencies as he may designate.

§ 204.50 Chesapeake Bay off Fort Monroe, Va.; restricted area, U. S. Naval Base and Naval Ordnance Laboratory—(a) *The danger zone.* Beginning at latitude 37°00′30″, longitude 76°18′05″; thence to latitude 37°00′38″, longitude 76°17′42″; thence to latitude 37°01′00″, longitude 76°17′15″; thence to latitude 37°01′00″, longitude 76°16′11″; thence to latitude 36°59′43″, longitude 76°16′11″; thence to latitude 36°59′18″, longitude 76°17′52″; thence along a curve approximately 300 yards off the north shore of Fort Wool to latitude 37°59′09″, longitude 76°18′21″; thence to latitude 36°59′02″, longitude 76°18′39.5″; thence to latitude 37°00′00″, longitude 76°18′54″; thence to latitude 36°59′57″, longitude 76°18′42.5″; thence to latitude 36°59′58.5″, longitude 76°18′27″; thence to latitude 37°00′03″, longitude 76°18′26″; thence to the Fort Monroe seawall and northward along the seawall to the point of beginning.

(b) *The regulations.* (1) Anchoring, trawling, fishing, and dragging are prohibited in the danger zone, and no object, either attached to a vessel or otherwise, shall be placed on or near the bottom.

(2) This section shall be enforced by the Commander, Naval Base, Norfolk, Virginia, and such agencies as he may designate.

§ 204.51 Chesapeake Bay, Lynnhaven Roads; Navy amphibious training area—(a) *The danger zone.* A portion of the restricted area for Navy amphibious training operations described in § 207.157, along the south shore of Chesapeake Bay, bounded as follows: Beginning at a point on the mean low-water line at longitude 76°08′59″; thence 200 yards to latitude 36°55′36″, longitude 76°08′57″; thence 400 yards to latitude 36°55′34″, longitude 76°08′43″; thence 200 yards to a point on the mean low-water line at longitude 76°08′45″; and thence approximately 400 yards along the mean low-water line to the point of beginning. The danger zone will be marked by range poles set on shore on the prolongation of the lines forming its eastern and western boundaries.

(b) *The regulations.* (1) Vessels other than those owned and operated by the United States shall not enter the danger zone at any time unless authorized to do so by the enforcing agency.

(2) This section shall be enforced by the Commanding Officer, Naval Amphibious Base, Little Creek, Virginia, and such agencies as he may designate.

§ 207.—NAVIGATION REGULATIONS:

§ 207.65 Atlantic Ocean off Sandy Hook, N. J.; naval restricted area—(a) *The area.* A circular area having a radius of 400 yards with its center at latitude 40°26′38″, longitude 73°56′29″, approximately 2,000 yards west of Scotland Lightship.

(b) *The regulations.* (1) No vessel shall anchor, troll, drag, or fish in the restricted area.

(2) No vessel shall pass between the buoys placed diametrically opposite each other on the perimeter of the restricted area.

(3) The regulations in this section shall be enforced by the Commandant, Third Naval District, and such agencies as he may designate.

§ 207.70 Channel of Tuckerton Creek, N. J.; navigation. (a) Power boats or other vessels propelled by machinery shall not proceed at any time within the limits of these waters at a greater speed than 8 statute miles per hour.

(b) This section shall take effect June 15, 1920, and shall superseded those prescribed August 1, 1917, for this waterway.

§ 207.80 Channel of Christina River, Del.; navigation. (a) That vessels of over 20 tons capacity, propelled by machinery, shall not proceed at any time within the limits of these waters at a greater speed than 8 statute miles per hour.

(b) That the regulations of this paragraph shall take effect June 15, 1920, and shall supersede those prescribed July 10, 1909, for this waterway.

§ 207.90 Delaware River, Pa.; use of Government landing pier at Marcus Hook. (a) This wharf must not be used for storage of material. A clear, unobstructed passageway not less than 14 feet wide must be left at the wharf approach.

(b) The dragging of any heavy articles over or along the wharf is not allowed, nor the dragging of one end of a log or timber the other end of which is carried on trucks.

(c) No load exceeding 1½ tons, exclusive of wagon and team, is allowed to cross the bridge without permission of the officer in charge.

(d) Anyone violating paragraphs (a) to (c) of this section or committing any other acts of carelessness or violence which results in injuring the wharf will be reported to the United States district attorney for prosecution as provided by law.

§ 207.100 Inland waterway from Delaware River to Chesapeake Bay, Delaware and Maryland (Chesapeake and Delaware Canal); use, administration, and navigation. These regulations are given in the discussion of the canal in Chapter 7 of this Coast Pilot.

§ 207.110 Magothy River, Md.; speed. No boat shall at any time proceed at a greater speed than eight statute miles per hour in that portion of the Magothy River between Gibson Island Beach and a line extending due north from the most northerly part of Holland Point and crossing the Magothy Narrows.

§ 207.115 Chesapeake Bay near Annapolis, Md.; seaplane restricted areas—(a) *The areas*—(1) *North area.* The waters of Chesapeake Bay bounded as follows: Beginning at the southernmost tip of Greenbury Point; thence southerly to Greenbury Point Shoal Light; thence 90° true to longitude 76°25′; thence due north to an east-west line tangent to Hackett Point; thence 270° true along said east-west line to the shore at the Naval Radio Station; and thence southerly along the shore to the point of beginning.

(2) *South area.* The waters of Chesapeake Bay bounded as follows: Beginning at the easternmost tip of Tolly Point; thence southeasterly to Tolly Point Shoal Lighted Bell Buoy 33; thence 180° true to an east-west line passing through the southeasternmost tip of Thomas Point; thence 270° true along said east-west line to Thomas Point; and thence northeasterly to the point of beginning.

(b) *The regulations.* (1) Only one of the areas will be used for practice landings during any period. The north area will normally be used except when firing practice is being conducted at the Naval Academy Rifle Range. Such firing practice is generally conducted during the summer months, and at such times the south area will be used for practice landings.

(2) Within the area selected for practice landings, such operations will be confined during any period to a landing strip one mile long and one-fourth mile wide. This landing strip will be laid out, so far as the wind direction will permit, in such manner as to cause the least possible interference with commercial fishing and navigation, and will be patrolled during practice landings.

(3) Vessels will be permitted to pass through either area, including the landing strip, at any time, but they shall give seaplanes using the landing strip the right-of-way. Vessels shall not moor or anchor or otherwise delay their progress within the landing strip when informed by naval personnel assigned to patrol the landing strip that it is in use.

(4) Fixed fishing nets supported on stakes in accordance with Department of the Army regulations governing such structures may be placed in the areas without restriction. Unattended an-

chored or buoyed nets or other apparatus used for the purpose of taking sea food, except fixed fishing nets supported on stakes, may be placed in or permitted to enter the areas but only at the owners' risk, and the United States shall not be liable for any accidental damage thereto resulting from seaplane operations.

(5) The regulations in this section shall be enforced by the Commandant, Severn River Naval Command, United States Naval Academy, Annapolis, Maryland, and such agencies as he may designate.

§ 207.116 Severn River at Annapolis, Md.; experimental test area, U. S. Naval Engineering Experiment Station—(a) *The restricted area.* The water of Severn River shoreward of a line beginning at the southeasternmost corner of the U. S. Naval Engineering Experiment Station sea wall and running thence southwesterly perpendicular to the main Severn River channel, approximately 560 feet, thence northwesterly parallel to and 50 feet shoreward of the edge of the channel, 1,035 feet, and thence northeasterly perpendicular to the channel, approximately 600 feet, to the shore. Spar buoys will mark the corners of the area adjacent to the channel.

(b) *The regulations.* (1) No vessel other than specifically authorized military and naval vessels shall enter or remain in the area during its use for experimental purposes. At all other times vessels may use the area without restriction.

(2) The area will be in use intermittently, and this use will be signified by the presence of white-painted boats or floats, which will be lighted at night.

(3) Upon observing the boats or floats referred to in subparagraph (2) of this paragraph, or upon being warned, vessels shall immediately vacate the area and remain outside the area during the period of use.

(4) The regulations in this section shall be enforced by the Commandant, Severn River Naval Command, and such agencies as he may designate.

§ 207.120 South River, Md., and its tributaries; speed. No boat shall at any time between May 1 and September 15, inclusive, proceed at a greater speed than eight statute miles per hour in that portion of the South River above the Maryland State Roads Commission bridge at Edgewater, Maryland, or in the tributaries emptying therein, including Warehouse, Gingerville, Beards, and Broad Creeks.

§ 207.125 Patuxent River, Md.; restricted areas, Naval Air Test Center, Patuxent River, Md. (a) Except in the gut off the tip of Point Patience, no craft shall approach closer than 75 yards to the beaches, shoreline, or piers of the area formerly occupied by the United States Naval Mine Warfare Test Station, or of Naval Air Station property. Civilian craft shall not approach rafts, barges, and platforms closer than 100 yards.

(b) Diving tenders will exhibit two red conical shapes, arranged vertically, base to base, when underwater diving takes place from naval small craft. At such times civilian craft shall stay at least 200 yards clear of these vessels and proceed at a speed not greater than five knots when within 1,000 yards thereof.

(c) On occasions, seaplane landings and take-offs will be practiced in the seadrome area north of the Naval Air Station, Patuxent River. This area includes those waters of the Patuxent River between Town Point and Hog Point shoreward of a line described as follows: Beginning at a point on the shore just west of Lewis Creek, bearing 161°30′ true, 2,000 yards, from Point Patience Light; thence to a point bearing 130° true, 1,850 yards, from Point Patience Light; thence to a point bearing 247°30′ true, 3,650 yards from Drum Point Light; thence to a point bearing 235° true, 2,060 yards, from Drum Point Light; thence to a point bearing 129° true, 700 yards, from Drum Point Light; thence to a point bearing 137° true, 1,060 yards, from Drum Point Light; and thence to a point on the shore west of Harper Creek entrance, bearing 158°30′ true, 1,900 yards, from Drum Point Light. Operations will be indicated by day by a square white flag with square blue center, and by night by one green light for operations in an easterly direction, or by two vertical green lights for operations in a westerly direction, all signals to be exhibited from Patuxent River Boathouse seawall at the Naval Air Test Center. In addition, crash boats will patrol the landing lanes during the operations, and by night float lights will mark the landing lanes. At such times as the above signals are exhibited the following restriction will apply to boating in the waters adjacent to the Naval Air Station in the area westward of Fishing Point: Boating will be confined to areas not less than 75 yards nor more than 500

yards from the beaches of the Air Center; will proceed across the seaplane operating area only in accordance with instructions from crash boats; will not enter the seaplane basins; and will not use the areas adjacent to seaplane basins (boats may cross entrances when no signal is exhibited).

(d) The regulations in this section shall be enforced by the Commanding Officer, Naval Air Station, Patuxent River, Maryland, and such agencies as he may designate.

§ 207.128 York River, Va.; mine service testing area at Naval Mine Depot near Yorktown—(a) *The restricted areas.* (1) A square area having 300-foot sides with its westerly corner coinciding with the easterly offshore corner of Pier 1, Naval Mine Depot, at approximately latitude 37°15′06″, longitude 76°31′38″, and its northwesterly side being an extension of the southeasterly side of the pier.

(2) An area off Stony Point, partially overlapping the area described in subparagraph (1) of this paragraph, bounded as follows: Beginning at latitude 37°15′16″, longitude 76°31′47″; thence to latitude 37°15′36″, longitude 76°31′18″; thence to latitude 37°15′14″, longitude 76°30′54″; thence to latitude 37°14′56″, longitude 76°31′22″; and thence to the point of beginning.

(b) *The regulations.* (1) All vessels other than naval craft are forbidden to enter the restricted area described in paragraph (a) (1) of this section.

(2) Anchoring, trawling, dragging, and net fishing are prohibited in the restricted area described in paragraph (a) (2) of this section.

(3) The regulations in this section shall be enforced by the Commandant, Fifth Naval District, and such agencies as he may designate.

§ 207.129 York River, Va.; U. S. Navy antitorpedo net areas—(a) *York River entrance*—(1) *The prohibited area.* The area is bounded as follows: Beginning at latitude 37°15′52.6″, longitude 76°23′33″; thence to latitude 37°13′42.2″, longitude 76°23′20.8″; thence easterly along the shore to Tue Point at latitude 37°13′45.1″, longitude 76°23′06″; thence to latitude 37°15′46.2″, longitude 76°23′18″; thence westerly along the shore of Jenkins Neck to the point of beginning.

(2) *The restricted area.* The area is bounded as follows: Beginning at latitude 37°14′57.2″, longitude 76°23′13″; thence to latitude 37°14′58.6″, longitude 76°22′53.2″; thence to latitude 37°14′-16.2″, longitude 76°22′48″; thence to latitude 37°14′15.5″; longitude 76°23′08.6″; thence to the point of beginning.

(3) *The regulations.* (i) No vessel shall enter the prohibited area at any time without the permission of the Commandant, Fifth Naval District, or his authorized representative, except that when the gate in the net is open, vessels may pass through the prohibited area adjacent thereto, and in so doing shall be governed by the regulations in subdivision (ii) of this subparagraph.

(ii) Vessels may pass through but shall not remain in the restricted area. Anchoring, trawling, fishing, crabbing, and dragging are prohibited within the area, and no object attached to a vessel or otherwise shall be placed on or near the bottom.

(b) *York River, Thorofare entrance*—(1) *The restricted area.* The area is bounded as follows: Beginning at latitude 37°13′25″, longitude 76°25′14″; thence to latitude 37°13′25″, longitude 76°24′58″; thence southerly to and along the shore of Goodwin Island to latitude 37°13′15.2″, longitude 76°24′53″; thence westerly to latitude 37°13′15.2″, longitude 76°25′21″; thence along the shore of Goodwin Neck to the point of beginning.

(2) *The regulations.* (i) Vessels may pass through the restricted area in order to effect passage of the net, but shall not stop in the area.

(ii) Anchoring, trawling, fishing, crabbing, and dragging are prohibited within the area, and no object attached to a vessel or otherwise shall be placed on or near the bottom.

(c) *Enforcement.* This section shall be enforced by the Commandant, Fifth Naval District, Norfolk, Virginia, and such agencies as he may designate.

NOTE: Aids to navigation and other related data are shown on U. S. Coast Survey Charts 492, 494, 1222 and listed in detail in "Notice to Mariners" (N. M. 35, Aug. 30, 1952 (4317)). Mariners are referred to local "Notice to Mariners", C. G., Norfolk for any later changes.

§ 207.130 York Spit Channel, Chesapeake Bay; navigation. The use of this channel shall be restricted to vessels and other watercraft passing up or down the bay, and no vessel or other watercraft shall cross the channel or enter it at any point other than at its ends and in the direction of its axis. Any vessel having entered the channel shall follow the course thereof for its entire length.

§ 207.140 Thimble Shoal Channel, Chesapeake Bay; navigation. (a) The use of this channel shall be restricted to vessels, tows, and other watercraft drawing 20 feet or more at the time of navigating the channel: *Provided*, That this restriction shall not apply to passenger-carrying vessels.

(b) Watercraft permitted to use the channel under paragraph (a) of this section shall proceed through at a reasonable speed so as not to endanger other vessels or interfere with any work in connection with maintaining, surveying, or buoying the channel. Vessels shall not anchor in the channel except in cases of emergency, such as fog or accident, which would render progress unsafe or impossible.

(c) This section shall not be construed as prohibiting necessary use of the channel by Government boats while on Government duty, or its use in emergencies by pilot boats, whether steam or sail, or by police boats.

§ 207.141 Chesapeake Bay, Hampton Roads; U. S. Navy antitorpedo net areas—(a) *The prohibited areas.* (1) Area "A" is bounded as follows: Beginning at latitude 37°01′10.5″, longitude 76°17′40″; thence to latitude 37°01′20.5″, longitude 76°17′35.3″; thence to latitude 37°00′58″, longitude 76°16′07.3″; thence to latitude 37°00′27.5″, longitude 76°15′58″; thence to latitude 37°00′-24.5″, longitude 76°16′12.5″; thence to latitude 37°00′49″, longitude 76°16′19.5″; thence to the point of beginning.

(2) *Area "B".* Area "B" is bounded as follows: Beginning at latitude 37°00′13″, longitude 76°16′09.6″; thence to latitude 37°00′16″, longitude 76°15′54.7″; thence to latitude 37°00′00″, longitude 76°15′49.8″; thence to latitude 36°58′14.2″, longitude 76°16′23.2″; thence to latitude 36°58′17.3″, longitude 76°16′37.5″; thence to latitude 37°00′00″, longitude 76°16′05.2″; thence to the point of beginning.

(b) *The restricted area.* The restricted area is bounded as follows: Beginning at latitude 37°00′-42.2″, longitude 76°16′02.5″; thence to latitude 37°00′45.8″, longitude 76°15′45.5″; thence to latitude 37°00′03.3″, longitude 76°15′33″; thence to latitude 37°00′00″, longitude 76°15′49.8″; thence to latitude 37°00′16″, longitude 76°15′54.7″; thence to latitude 37°00′13″, longitude 76°16′09.6″; thence to latitude 37°00′24.5, longitude 76°16′12.5″; thence to latitude 37°00′27.5″, longitude 76°-15′58″; thence to the point of beginning.

(c) *The regulations.* (1) No vessel shall enter either of the two prohibited areas at any time without the permission of of the Commandant, Fifth Naval District, or his authorized representative.

(2) Vessels may pass through, but shall not remain in, the restricted area. Anchoring, trawling, fishing, crabbing, and dragging are prohibited within the restricted area, and no object attached to a vessel or otherwise shall be placed on or near the bottom.

(3) This section shall be enforced by the Commandant, Fifth Naval District, Norfolk, Virginia, and such agencies as he may designate.

NOTE: Aids to navigation and other related data are shown on U. S. Coast Survey Charts 400, 1222 and listed in detail in "Notice to Mariners" (N. M. 35, Aug. 30, 1952 (4315)). Mariners are referred to local "Notice to Mariners", C. G., Norfolk, for any later changes.

§ 207.152 James River off the entrance to Skiffes Creek, Va.; Army smallcraft testing area—(a) *The restricted area.* Beginning at latitude 37°10′00″, longitude 76°37′28″; thence to latitude 37°09′13″, longitude 76°37′48″; thence to latitude 37°09′13″, longitude 76°38′08″; thence to latitude 37°10′00″, longitude 76°37′55″; and thence to the point of beginning.

(b) *The regulations.* (1) No vessels other than Department of the Army vessels shall enter the restricted area except as provided in subparagraph (2) of this paragraph.

(2) Nothing in this section shall prevent the setting of fish traps within the restricted area under regulations of the Department of the Army, nor will the passage of fishing vessels to and from authorized traps be unreasonably interfered with or restricted.

(3) Vessels anchored in the area shall be so anchored as not to obstruct the arc of visibility of Deep Water Shoals Light.

(4) This section shall be enforced by the Commanding General, Fort Eustis, Virginia, and such agencies as he may designate.

§ 207.154 Southern Branch of Elizabeth River; speed. In that part of the Southern Branch of Elizabeth River between the junction of the Southern and Eastern Branches of the Elizabeth River and the Norfolk and Portsmouth Belt Line Railroad Bridge, no vessel shall move at a speed exceeding six knots.

§ 207.155 Hampton Roads off Norfolk Naval Station; Navy restricted area—(a) *The restricted area.* Beginning at latitude 36°56′41.5″, longitude 76°19′44″; thence to latitude 36°56′45.5″, longitude 76°20′14″; thence to latitude 36°57′21″, longitude 76°20′11″; thence to latitude 36°57′17″, longitude 76°19′35″; and thence to the point of beginning.

(b) *The regulations.* (1) No commercial vessels other than those moving to and from piers at the Norfolk Naval Station shall enter the restricted area.

(2) This section shall be enforced by the Commandant, Fifth Naval District, and such agencies as he may designate.

§ 207.156 Hampton Roads and Willoughby Bay, Norfolk, Va.; seaplane restricted area—(a) *The area.* Beginning at latitude 36°57′22″, longitude 76°18′02.5″; thence to latitude 36°57′29″, longitude 76°19′01″; thence to latitude 36°58′41.5″, longitude 76°18′42″; thence to latitude 36°58′37.5″, longitude 76°18′16″; thence to latitude 36°58′01″, longitude 76°18′23″; thence to latitude 36°57′48″, longitude 76°18′07.5″; thence to latitude 36°57′45.5″, longitude 76°17′58.5″; thence to latitude 36°57′42″, longitude 76°16′21.5″; and thence southerly, easterly, and northerly along the shore of Willoughby Bay to the point of beginning.

(b) *The regulations.* (1) Vessels shall not moor or anchor within the area. Fishing, oystering, clamming, crabbing, and other aquatic activities are prohibited within the area.

(2) All vessels moving through that portion of the area in Willoughby Bay shall navigate as near the shore of Willoughby Spit as practicable, and shall pass through as quickly as parcticable.

(3) All vessels moving in the area shall immediately proceed to leave the area when warned by aircraft employing the "buzzing" method, which consists of low flight by an airplane and repeated opening and closing of its throttle.

(4) This section shall be enforced by the Commandant, Fifth Naval District, and such agencies as he may designate.

§ 207.157 Chesapeake Bay, Lynnhaven Roads; Navy amphibious training area—(a) *The restricted area.* Beginning at latitude 36°55′47″, longitude 76°11′04.5″; thence to latitude 36°59′15″, longitude 76°10′08″; thence to latitude 36°58′39.5″, longitude 76°07′51″; thence to latitude 36°55′-27.5″, longitude 76°08′42″; thence westerly along the shore and across the mouth of Little Creek to the point of beginning.

(b) *The regulations.* (1) No fish-pound stakes or structures shall be allowed in the restricted area.

(2) No vessel shall approach within 300 yards of any naval vessel or within 600 yards of any vessel displaying the red "baker" burgee.

(3) This section shall be enforced by the Commandant, Fifth Naval District, and such agencies as he may designate.

§ 207.158 Chesapeake Bay entrance; naval restricted area—(a) *The area.* Beginning at a point on the south shore of Chesapeake Bay at longitude 76°03′06″; thence to latitude 37°01′24″, longitude 76°02′06″; thence to latitude 37°06′15″, longitude 76°00′42″; thence 90° true to longitude 75°58′50″; thence to a point on the east shore of Chesapeake Bay at latitude 37°07′18″; thence southerly and northeasterly along the shore at Wise Point to longitude 75°57′30″; thence 180° true to latitude 37°05′36″; thence to latitude 37°01′12″, longitude 75°50′00″; thence 180° true to latitude 36°48′00″; thence 270° true to longitude 75°55′00″; thence to latitude 36°52′24″, longitude 75°55′54″; thence 270° true to the shore; and thence northwesterly and southwesterly along the shore at Cape Henry to the point of beginning.

(b) *The regulations.* (1) Anchoring, trawling, crabbing, fishing, and dragging in the area are prohibited, and no object attached to a vessel or otherwise shall be placed on or near the bottom.

(2) This section shall be enforced by the Commandant, Fifth Naval District, and such agencies as he may designate.

§ 207.900 Restricted areas in vicinity of Maritime Administration Reserve Fleets. (a) The regulations in this section shall govern the use and navigation of waters in the vicinity of the following National Defense Reserve Fleets of the Maritime Administration, Department of Commerce:

(1) Hudson River Reserve Fleet, Jones Point, New York.

(2) James River Reserve Fleet, Fort Eustis, Virginia.

(3) Wilmington Reserve Fleet, Brunswick River near Wilmington, North Carolina.
(4) Mobile Reserve Fleet, Tensaw River near Bay Minette, Alabama.
(5) Beaumont Reserve Fleet, Neches River near Beaumont, Texas.
(6) Suisun Bay Reserve Fleet near Benicia, California.
(7) Astoria Reserve Fleet, Cathlamet Bay near John Day Point, Oregon.
(8) Olympia Reserve Fleet, Budd Inlet at Olympia, Washington.

(b) No vessels or other watercraft, except those owned or controlled by the United States Government, shall cruise or anchor between Reserve Fleet units, within 500 feet of the end vessels in each Reserve Fleet unit, or within 500 feet of the extreme units of the fleets, unless specific permission to do so has first been granted in each case by the enforcing agency.

(c) The regulations in this section shall be enforced by the respective Fleet Superintendents and such agencies as they may designate.

CHAPTER 3

Sailing Directions

THE tables that follow give courses and distances for the usually travelled routes along the coast from New York Bay to Chesapeake Bay and into the principal ports. Unless otherwise noted, depths along the tabular courses are as great or greater than depths at the ports to which the courses lead. The navigator must make his own allowances for wind and current. Chapter 2 discusses generally the tides, currents, winds, and obstructions of the region, and Chapters 4 to 15 discuss them in some detail.

The geographic positions given are those of the turning points and not of the reference objects. Where a course extends across two or more charts the position of a junction point also is given. Courses and bearings are in degrees, true, clockwise from 000° at north to 359°. Bearings are from seaward, and distances are in nautical miles.

Table 1.—New York Bay to Chesapeake Bay.—This table represents approximately a mean of the courses followed by coasting vessels and the largest tows. The courses are varied but little on account of weather conditions except northward of Five Fathom Bank where vessels sometimes head farther offshore during easterly weather and closer inshore during westerly weather. Except when entering or leaving New York Bay, Delaware Bay, or Chesapeake Bay, vessels of the deepest draft should stay outside the lightships where depths along the tabular courses are 8½ fathoms or more; the critical depth is between Ambrose Channel Lightship and Barnegat Lightship. Traffic is heavy along this coast and a sharp lookout must be kept to avoid collisions.

Position (Reverse directions in *italics*—read upwards)	Course	Distance	Distance from origin
1. **Gedney Channel lighted whistle buoy** close aboard; 40°28′.8 N., 73°53′.6 W. International Rules apply seaward of a line drawn from Ambrose Channel Lightship to Navesink Lighthouse south tower. Chart 1215:			0.0
Direct	181	42.9	
Scotland Lightship 1.1 miles 270°.			2.1
Shrewsbury Rocks lighted bell buoy 1, 1.4 miles 270°			8.3
Change to Chart 1216 (*1215*) at 40°09′.0 N., 73°54′.1 W.			
Sea Girt Light 5.8 miles 270°.			20.6
Reverse	*001*	*42.9*	
2. **Barnegat Lightship** 1.0 mile 270°; 39°45′.9 N., 73°54′.7 W.			42.9

Table 1.—New York Bay to Chesapeake Bay—Continued

Position (Reverse directions in *italics*—read upwards)	Course	Distance	Distance from origin
1. Gedney Channel lighted whistle buoy close aboard; 40°28′.8 N., 73°53′.6 W. Chart 1215:			0.0
Direct	129	4.2	
Reverse	*309*	*4.2*	
2A. Ambrose Channel Lightship 1.0 mile 000°; 40°26′.1 N., 73°49′.4 W.			4.2
Direct	186	40.4	
Change to Chart 1216 (*1215*) at 40°09′.0 N., 73°51′.7 W.			
Reverse	*006*	*40.4*	
2. Barnegat Lightship 1.0 mile 270°; 39°45′.9 N., 73°54′.7 W.			44.6
2. Barnegat Lightship 1.0 mile 270°; 39°45′.9 N., 73°54′.7 W.:			42.9
Direct	206½	66.8	
Change to Chart 1217 (*1216*) at 39°30′.0 N., 74°05′.0 W.			
Change to Chart 1219 (*1217*) at 39°00′.0 N., 74°24′.4 W.			
Reverse	*026½*	*66.8*	
3. Five Fathom Bank Lightship 1.5 miles 315°; 38°46′.2 N., 74°33′.3 W.			109.7
3. Five Fathom Bank Lightship 1.5 miles 315°; 38°46′.2 N., 74°33′.3 W.:			109.7
Direct	274	22.4	
Reverse	*094*	*22.4*	
4A. Overfalls Lightship 0.4 mile 045°; 38°47′.6 N., 75°01′.8 W. Same as Position 1 Table 3, and Position 8A Table 2.			132.1
4A. Overfalls Lightship 0.4 mile 045°; 38°47′.6 N., 75°01′.8 W. Same as Position 1 Table 3, and Position 8A Table 2. Chart 1219. **International Rules apply seaward of Overfalls** Lightship.			
Direct	145	27.2	
Change to Chart 1109 (*1219*) at 38°28′.0 N., 74°44′.6 W.			
Reverse	*325*	*27.2*	
4. Fenwick Shoal lighted whistle buoy 2, 2.9 miles 270°; 38°25′.2 N., 74°42′.2 W.			
3. Five Fathom Bank Lightship 1.5 miles 315°; 38°46′.2 N., 74°33′.3 W. Chart 1219:			109.7
Direct	198	22.1	
Change to Chart 1109 (*1219*) at 38°30′.0 N., 74°40′.1 W.			
Reverse	*018*	*22.1*	
4. Fenwick Shoal lighted whistle buoy 2, 2.9 miles 270°; 38°25′.2 N., 74°42′.2 W.			131.8
Direct	198	32.4	
Change to Chart 1220 (*1109*) at 38°20′.0 N., 74°44′.4 W.			
Reverse	*018*	*32.4*	
5. Winter Quarter Shoal Lightship 1.5 miles 315°; 37°54′.4 N., 74°55′.0 W. Chart 1221 (*1220*):			164.2
Direct	213	67.4	
Change to Chart 1109 (*1221*) at 37°25′.0 N., 75°19′.0 W.			
Change to Chart 1222 (*1109*) at 37°11′.4 N., 75°30′.0 W.			
Reverse	*033*	*67.4*	
6. Chesapeake Lightship 1.3 miles 315°; 36°57′.8 N., 75°41′.0 W.:			231.6
Direct	233	10.0	
Reverse	*053*	*10.0*	

Table 1.—New York Bay to Chesapeake Bay—Continued

Position (Reverse directions in *italics*—read upwards)	Course	Distance	Distance from origin
7. **Chesapeake Entrance lighted whistle buoy 2CB** close aboard; 36°51′.8 N., 75°51′.0 W.:			241. 6
Direct	306	7. 6	
Reverse	*126*	*7. 6*	
8. **Cape Henry Light** 1.7 miles 244°; 36°56′.3 N., 75°58′.6 W. Same as Position 16 Table 2, Position 1 Table 5, and Position 1 Table 6.			249. 2
New York to Cape Hatteras			
2. **Barnegat Lightship** 1.0 mile 270°; 39°45′.9 N., 73°54′.7 W. Chart 1216:			42. 9
Direct	193	285. 3	
Change to Chart 1217 (*1216*) at 39°30′.0 N., 73°59′.4 W. Change to Chart 1109 (*1217*) at 39°00′.0 N., 74°08′.2 W.			
Reverse	*013*	*285. 3*	
9. **Diamond Shoal Lightship** 5.0 miles 240°; 35°07′.8 N., 75°14′.5 W.			328. 2
Overfalls Lightship to Cape Hatteras			
5. **Winter Quarter Shoal Lightship** 1.5 miles 315°; 37°54′.4 N., 74°55′.0 W. Chart 1109:			
Direct	185½	167. 3	
Reverse	*005½*	*167. 3*	
9. **Diamond Shoal Lightship** 5.0 miles 240°; 35°07′.8 N., 75°14′.5 W.			

Table 2.—New York Bay to Chesapeake Bay.—The following courses are suggested for light-draft vessels and tows in good weather. The courses are laid to avoid dangers along the coast and to pass outside the authorized fish-trap areas. In bad weather, directions in Table 1 should be followed.

Position (Reverse directions in *italics*—read upwards)	Course	Distance	Distance from origin
1. **Scotland Lightship** 0.5 mile 311½°; 40°26′.3 N., 73°54′.7 W. Chart 1215:			0. 0
Direct	185	5. 8	
Reverse	*005*	*5. 8*	
2. **Shrewsbury Rocks lighted buoy 1,** 0.2 mile 270°; 40°20′.5 N., 73°55′.3 W.			5. 8
Direct	194	14. 8	
Change to Chart 1216 (*1215*) at 40°09′.0 N., 73°58′.9 W.			
Reverse	*014*	*14. 8*	
3. **Manasquan Inlet North Breakwater Light** 1.5 miles 270°; 40°06′.1 N., 73°59′.9 W.:			20. 6
Direct	185	20. 4	
Reverse	*005*	*20. 4*	
4. **Barnegat Lightship** 5.0 miles 090°; **Barnegat Old Lighthouse** 3.0 miles 270°; 39°45′.8 N., 74°02′.5 W.:			41. 0
Direct	201	23. 9	
Change to Chart 1217 (*1216*) at 39°30′.0 N., 74°10′.3 W.			
Reverse	*021*	*23. 9*	

258030°—54——9

Table 2.—New York Bay to Chesapeake Bay—Continued

Position (Reverse directions in *italics*—read upwards)	Course	Distance	Distance from origin
5. Brigantine Shoal lighted whistle buoy 2BS 1.0 mile 270°; 39°23′.5 N., 74°13′.5 W.:			64.9
Direct	225	21.8	
Reverse	*045*	*21.8*	
6. Ludlam Beach lighted bell buoy 2LB 1.0 mile 270°; 39°08′.1 N., 74°33′.3 W.:			86.7
Direct	215	21.4	
Change to Chart 1219 (*1217*) at 39°00′.0 N., 74°40′.5 W.			
Reverse	*035*	*21.4*	
7. McCrie Shoal lighted whistle buoy 2, 1.0 mile 270°; 38°50′.5 N., 74°49′.0 W.			108.1
7. McCrie Shoal lighted whistle buoy 2, 1.0 mile 270°; 38°50′.5 N., 74°49′.0 W.:			
Direct	254	10.4	
Reverse	*074*	*10.4*	
8A. Overfalls Lightship 0.4 mile 045°; 38°47′.6 N., 75°01′.8 W. Same as Position 4A Table 1 and Position 1 Table 3.			
8A. Overfalls Lightship 0.4 mile 045°; 38°47′.6 N., 75°01′.8 W. Same as Position 4A Table 1 and Position 1 Table 3.			
Direct	160	5.5	
Reverse	*340*	*5.5*	
9A. Hen and Chickens Shoal lighted whistle buoy 1HC 0.5 mile 270°; 38°42′.4 N., 74°59′.3 W.:			
Direct	176	15.6	
Reverse	*356*	*15.6*	
8. Fenwick Shoal lighted whistle buoy 1FIS, 0.5 mile 090°; 38°26′.9 N., 74°57′.9 W. Change to Chart 1220 (*1219*).			
7. McCrie Shoal lighted whistle buoy 2, 1.0 mile 270°; 38°50′.5 N., 74°49′.0 W.:			108.1
Direct	196	24.6	
Reverse	*016*	*24.6*	
8. Fenwick Shoal lighted whistle buoy 1FIS, 0.5 mile 090°; 38°26′.9 N., 74°57′.9 W. Change to Chart 1220 (*1219*):			132.7
Direct	190	10.6	
Reverse	*010*	*10.6*	
9. Great Gull Bank lighted whistle buoy 4, 0.1 mile 270°; 38°16′.4 N., 75°00′.2 W.:			143.3
Direct	192	19.8	
Sugar Point lighted bell buoy 3, 0.1 mile 090°.			156.6
Reverse	*012*	*19.8*	
10. Winter Quarter Shoal lighted whistle buoy 6WQS 0.1 mile 270°; 37°57′.0 N., 75°05′.4 W.:			163.1
Direct	219	8.3	
Reverse	*039*	*8.3*	
11. Blackfish Bank lighted whistle buoy 8, 0.2 mile 270°; 37°50′.6 N., 75°11′.9 W. Change to Chart 1221 (*1220*):			171.4
Direct	210	21.6	
Reverse	*030*	*21.6*	
12. Parramore Banks lighted whistle buoy 10P, 0.2 mile 270°; 37°32′.0 N., 75°25′.6 W.:			193.0
Direct	206	16.0	
Change to Chart 1222 (*1221*) at 37°24′.0 N., 75°30′.5 W.			
Reverse	*026*	*16.0*	

Table 2.—New York Bay to Chesapeake Bay—Continued

Position (Reverse directions in *italics*—read upwards)	Course	Distance	Distance from origin
13. **Hog Island lighted bell buoy 12,** 0.2 mile 270°; 37°17′.6 N., 75°34′.4 W.:			209. 0
Direct	207	11. 4	
Reverse	*027*	*11. 4*	
14. **Cape Charles lighted whistle buoy 14,** 0.2 mile 270°; 37°07′.4 N., 75°40′.8 W.:			220. 4
Direct	212	11. 2	
Reverse	*032*	*11. 2*	
15. **Cape Henry Approach lighted whistle buoy 2,** 0.1 mile 315°; 36°57′.9 N., 75°48′.3 W.:			231. 6
Direct	259	8. 3	
Reverse	*079*	*8. 3*	
16. **Cape Henry Light** 1.7 miles 244°; 36°56′.3 N., 75°58′.6 W. Same as Position 8 Table 1, Position 1 Table 5, and Position 1 Table 6.			239. 9

Table 3.—Delaware Bay Entrance to Philadelphia

1. **Overfalls Lightship** 0.4 mile 045°; 38°47′.6 N., 75°01′.8 W. Chart 1218. Same as Position 4A Table 1 and Position 8A Table 2:			0. 0
Direct (Miah Maull Shoal Light ahead)	337	18. 9	
Brandywine Shoal Light 0.9 mile 067°.			12. 1
Fourteen Foot Bank Light 0.7 mile 247°.			16. 8
Reverse (Miah Maull Shoal Light astern)	*157*	*18. 9*	
2. **Delaware Bay Main Channel lighted bell buoy 19,** 200 yards 240°; 39°05′.1 N., 75°11′.2 W.:			18. 9
Direct	325	7. 1	
Miah Maull Shoal Light 0.6 mile 055°.			21. 6
Reverse	*145*	*7. 1*	
3. **Elbow of Cross Ledge Light** 400 yards 075°; 39°10′.9 N., 75°16′.4 W.:			26. 0
Direct	336	3. 4	
Reverse	*156*	*3. 4*	
4. **Delaware Bay Main Channel lighted bell buoy 32,** 250 yards 057°; 39°14′.0 N., 75°18′.2 W.:			29. 4
Direct (Liston Range ahead)	317°57′	18. 0	
Ship John Shoal Light 650 yards 048°.			34. 9
Change to Chart 294 (*1218*) at 39°24′.2 N., 75°30′.0 W.			
Reverse (Liston Range astern)	*137°57′*	*18. 0*	
5. **Junction of Baker and Liston Ranges, Baker Range lighted bell buoy 2B,** 0.2 mile 061°; 39°27′.3 N., 75°33′.7 W.:			47. 4
Direct (Baker Range ahead)	355°04′	1. 6	
Reverse (Baker Range astern)	*175°04′*	*1. 6*	
6. **Junction of Baker and Reedy Island Ranges;** 39°29′.0 N., 75°33′.8 W.:			49. 0
Direct (Reedy Island Range astern)	015°10′	4. 3	
Reverse (Reedy Island Range ahead)	*195°10′*	*4. 3*	
7. **Junction of Reedy Island and New Castle Ranges;** 39°33′.1 N., 75°32′.4 W.:			53. 3
Direct (New Castle Range ahead)	334	0. 8	
Reverse (New Castle Range astern)	*154*	*0. 8*	
8. **Junction of Chesapeake and Delaware Canal Range and New Castle Range;** 39°33′.8 N., 75°32′.8 W. Same as Position 1 of Table 4:			54. 1
Direct (New Castle Range ahead)	334	3. 6	
Fort Delaware Light 0.1 mile 270°			55. 9
Reverse (New Castle Range astern)	*154*	*3. 6*	
9. **Junction of New Castle and Bulkhead Bar Ranges;** 39°37′.0 N., 75°34′.8 W.:			57. 7
Direct (Bulkhead Bar Range ahead)	008	0. 6	
Reverse (Bulkhead Bar Range astern)	*188*	*0. 6*	

Table 3.—Delaware Bay Entrance to Philadelphia—Continued

Position (Reverse directions in *italics*—read upwards)	Course	Distance	Distance from origin
10. Junction of Bulkhead Bar and Deepwater Point Ranges; 39°37′.6 N., 75°34′.7 W.:			58. 3
Direct (Deepwater Point Range ahead)	042	3. 7	
Deepwater Point Range lighted bell buoy 5D.			60. 7
Reverse (Deepwater Point Range astern)	*222*	*3. 7*	
11. Junction of Deepwater Point and Cherry Island Ranges; 39°40′.4 N., 75°31′.5 W.:			62. 0
Direct (Cherry Island Range ahead)	017	2. 6	
Delaware Memorial Bridge.			62. 9
Reverse (Cherry Island Range astern)	*197*	*2. 6*	
12. Junction of Cherry Island and Christina River Ranges; 39°42′.9 N., 75°30′.5 W.			64. 6
12. Junction of Cherry Island and Christina River Ranges; 39°42′.9 N., 75°30′.5 W.:			64. 6
Direct (Christina River Range ahead)	293	0. 9	
Reverse (Christina River Range astern)	*113*	*0. 9*	
13A. Wilmington Marine Terminal; 39°43′.2 N., 75°31′.5 W.			65. 5
12. Junction of Cherry Island and Christina River Ranges; 39°42′.9 N., 75°30′.5 W.:			64. 6
Direct (Cherry Island Range ahead)	017	1. 8	
Reverse (Cherry Island Range astern)	*197*	*1. 8*	
13. Junction of Bellevue and Cherry Island Ranges; 39°44′.6 N., 75°29′.8 W. Change to Chart 295 (*294*):			66. 4
Direct (Bellevue Range astern)	035°30′	3. 0	
Reverse (Bellevue Range ahead)	*215°30′*	*3. 0*	
14. Junction of Bellevue and Marcus Hook Ranges; 39°47′.0 N., 75°27′.6 W.:			69. 4
Direct (Marcus Hook Range astern)	058	4. 3	
U. S. Quarantine wharf at Marcus Hook 0.2 mile 328°			71. 7
Reverse (Marcus Hook Range ahead)	*238*	*4. 3*	
15. Junction of Marcus Hook and Chester Ranges; 39°49′.3 N., 75°22′.9 W.:			73. 7
Direct (Chester Range ahead)	051	1. 9	
Reverse (Chester Range astern)	*231*	*1. 9*	
16. Chester Range lighted buoy 6C, 200 yards 145°; 39°50′.6 N., 75°21′.0 W.:			75. 6
Direct	065	1. 0	
Reverse	*245*	*1. 0*	
17. Tinicum Island Range lighted buoy 2T, 200 yards 180°; 39°51′.0 N., 75°19′.9 W.:			76. 6
Direct (Tinicum Range ahead)	092	3. 0	
Crab Point wharves 0.2 mile 180°			78. 2
Reverse (Tinicum Range astern)	*272*	*3. 0*	
18. Junction of Tinicum and Billingsport Ranges; 39°50′.9 N., 75°15′.9 W.:			79. 6
Direct (Billingsport Range astern)	070	1. 2	
Reverse (Billingsport Range ahead)	*250*	*1. 2*	
19. Junction of Billingsport and Mifflin Bar Ranges; 39°51′.3 N., 75°14′.5 W.:			80. 8
Direct (Mifflin Bar Range astern)	053½	2. 8	
Reverse (Mifflin Bar Range ahead)	*233½*	*2. 8*	
20. Junction of Mifflin Bar and West Horseshoe Ranges; 39°52′.9 N., 75°11′.5 W. Change to Chart 280 (*294*):			83. 6
Direct (West Horseshoe Range astern)	093°56′	1. 8	
Reverse (West Horseshoe Range ahead)	*273°56′*	*1. 8*	

Table 3.—Delaware Bay Entrance to Philadelphia—Continued

Position (Reverse directions in *italics*—read upwards)	Course	Distance	Distance from origin
21. Horseshoe Lower lighted buoy 35, 150 yards 000°; 39°52′.8 N., 75°09′.2 W.:			85. 4
Direct	Turn left	0. 6	
Reverse	*Turn right*	*0. 6*	
22. Horseshoe lighted buoy 37, 400 yards 260°; 39°53′.1 N., 75°08′.5 W.:			86. 0
Direct	Various	3. 9	
Reverse	*Various*	*3. 9*	
23. Foot of Chestnut Street, mid-channel; 39°56′.8 N., 75°08′.3 W.			89. 9

Table 4.—Delaware River to Sandy Point, Chesapeake Bay

1. Junction of New Castle and Chesapeake and Delaware Canal Ranges; 39°33′.8 N., 75°32′.8 W. Chart 570. Same as Position 8 Table 3:			0. 0
Direct (C. & D. Canal Range ahead)	258½	3. 4	
Reverse (C. & D. Canal Range astern)	*078½*	*3. 4*	
2. Chesapeake and Delaware Canal Light 12 close aboard; 39°33′.2 N., 75°37′.2 W.:			3. 4
Direct	Various	12. 4	
Passage through Canal is made by following the aids and proceeding in accordance with regulations.			
Reverse	*Various*	*12. 4*	
3. Back Creek Light 2 close aboard; 39°31′.5 N., 75°52′.3 W.:			15. 8
Direct (Courthouse Point Channel Range astern)	229	1. 1	
Reverse (Courthouse Point Channel Range ahead)	*049*	*1. 1*	
4. Courthouse Point Channel Buoy 3C, 100 yards 000°; 39°30′.8 N., 75°53′.4 W.:			16. 9
Direct	242	0. 5	
Reverse	*062*	*0. 5*	
5. Town Point Channel buoy 3, 100 yards 000°; 39°30′.5 N., 75°54′.0 W.:			17. 4
Direct (Town Point Channel West Range ahead)	254½	0. 9	
Reverse (Town Point Channel East Range ahead)	*074½*	*0. 9*	
6. Junction of Arnold Point Channel and Town Point Channel Ranges; 39°30′.3 N., 75°55′.2 W. Change to Chart 572 (*570*):			18. 3
Direct (Arnold Point Channel Range astern)	226	3. 0	
Reverse (Arnold Point Channel Range ahead)	*046*	*3. 0*	
7. Junction of Grove Neck Channel South and Arnold Point Channel Ranges; 39°28′.2 N., 75°58′.0 W.:			21. 3
Direct (Grove Neck Channel South Range ahead)	222½	5. 8	
Turkey Point Light, 0.7 mile 312½°			23. 6
Reverse (Grove Neck Channel North Range ahead)	*042½*	*5. 8*	
8. Junction of Howell Point Channel and Grove Neck Channel South Ranges; 39°23′.9 N., 76°03′.0 W.:			27. 1
Direct (Howell Point Channel Range astern)	246	3. 4	
Reverse (Howell Point Channel Range ahead)	*066*	*3. 4*	
9. Howell Point Light 0.3 mile 124°; 39°22′.5 N., 76°07′.0 W.:			30. 5
Direct	238	3. 0	
Reverse	*058*	*3. 0*	
10. Midway between Shad Battery Channel lighted bell buoy 1 and Shad Battery Channel buoy 2; 39°20′.9 N., 76°10′.3 W.:			33. 5
Direct	228	2. 9	
Reverse	*048*	*2. 9*	
11. Midway between Upper Chesapeake Channel lighted bell buoy 5 and Upper Chesapeake Channel lighted buoy 6; 39°18′.9 N., 76°13′.1 W. Change to Chart 549 (*572*):			36. 4
Direct (Upper Chesapeake Channel Range astern)	196	3. 3	
Pooles Island South Range 1.8 miles 264°.			38. 5
Reverse (Upper Chesapeake Channel Range ahead)	*016*	*3. 3*	

Table 4.—Delaware River to Sandy Point, Chesapeake Bay—Continued

Position (Reverse directions in *italics*—read upwards)	Course	Distance	Distance from origin
12. Midway between Upper Chesapeake Channel lighted bell buoy 1 and Upper Chesapeake Channel buoy 2; 39°15′.7 N., 76°14′.2 W.:			39.7
Direct	182	1.5	
Reverse	*002*	*1.5*	
13. Upper Chesapeake Middle Ground lighted bell buoy 9, 400 yards 270°; 39°14′.3 N., 76°14′.3 W.:			41.2
Direct	202	1.4	
Reverse	*022*	*1.4*	
14. Tolchester Beach Light 400 yards 090°; 39°13′.0 N., 76°15′.0 W.:			42.6
Direct	197	0.8	
Reverse	*017*	*0.8*	
15. Upper Chesapeake Middle Ground lighted bell buoy 7, 400 yards 270°; 39°12′.2 N., 76°15′.3 W.:			43.4
Direct	228	1.7	
Reverse	*048*	*1.7*	
16. Upper Chesapeake lighted bell buoy 6, 300 yards 090°; 39°11′.0 N., 76°17′.0 W.:			45.1
Direct	219	3.0	
Reverse	*039*	*3.0*	
17. Brewerton Channel East Range Front Light 2.6 miles 111°; 39°08′.7 N., 76°19′.4 W.			48.1
To Baltimore			
17. Brewerton Channel East Range Front Light 2.6 miles 111°; 39°08′.7 N., 76°19′.4 W.:			48.1
Direct	291°09′	9.4	
Reverse	*111°09′*	*9.4*	
18A. Junction Brewerton Channel and Fort McHenry Channel Ranges; 39°12′.1 N., 76°30′.8W.; Same as Position 17 Table 5:			57.5
Direct	321	4.4	
Reverse	*141*	*4.4*	
19A. Lazaretto Point Light 0.3 mile 000°; 39°15′.5 N., 76°34′.3 W. Same as Position 18 Table 5.			61.9
17. Brewerton Channel East Range Front Light 2.6 miles 111°; 39°08′.7 N., 76°19′.4 W.:			48.1
Direct	180	4.1	
Reverse	*000*	*4.1*	
18. Upper Chesapeake Bay lighted bell buoy 1, 500 yards 270°; 39°04′.6 N., 76°19′.4 W.:			52.2
Direct	214	4.3	
Reverse	*034*	*4.3*	
19. Sandy Point Light 0.5 mile 270°; 39°01′.0 N., 76°22′.5 W. Same as Position 13 Table 5.			56.6

Table 5.—Chesapeake Bay Entrance to Baltimore

Position (Reverse directions in *italics*—read upwards)	Course	Distance	Distance from origin
1. **Cape Henry Light** 1.7 miles 244°; 36°56′.3 N., 75°58′.6 W. Same as Position 8 Table 1, Position 16 Table 2, and Position 1 Table 6. Chart 1222:			0.0
Direct	333	2.7	
Reverse	*153*	*2.7*	
2. **Tail of the Horseshoe lighted bell buoy 3TH** 0.1 mile 243°; 36°58′.7 N., 76°00′.1 W.:			2.7
Direct	320	10.6	
Reverse	*140*	*10.6*	
3. **Middle Ground lighted whistle buoy 10,** 0.9 mile 067°; 37°06′.8 N., 76°08′.6 W. Same as Position 1 Table 8:			13.3
Direct	353	4.3	
Part of this course is through York Spit Channel; for regulations, see § 207.130, Chapter 2A.			
Reverse	*173*	*4.3*	
4. **York Spit Channel lighted buoy 8,** 300 yards 130°; 37°11′.0 N., 76°09′.3 W.:			17.6
Direct	017	4.1	
Reverse	*197*	*4.1*	
5. **York Spit Channel lighted bell buoy 17,** 300 yards 287°; 37°15′.0 N., 76°07′.8 W. Chart 1222:			21.7
Direct	001	8.4	
Reverse	*181*	*8.4*	
6. **Wolf Trap Light** 3.0 miles 270°; 37°23′.4 N., 76°07′.6 W. Change to Chart 1223 (*1222*):			30.1
Direct	354	9.9	
Reverse	*174*	*9.9*	
7. **Windmill Point Light** 4.9 miles 301°; 37°33′.3 N., 76°08′.9 W. Same as Position 1 Table 9:			40.0
Direct	354	13.3	
Reverse	*174*	*13.3*	
8. **Tangier Island Shoal Lump lighted bell buoy 12TL** 0.3 mile 090°; 37°46′.5 N., 76°10′.4 W.:			53.3
Direct	005	7.2	
Great Wicomico River Light 4.6 miles 270°:			55.1
Reverse	*185*	*7.2*	
9. **Smith Point Light** 1.4 miles 232°; 37°53′.6 N., 76°09′.6 W. Same as Position 1 Table 10. Change to Chart 1224 (*1223*):			60.5
Direct	342	41.7	
Point Lookout Light 4.9 miles 270°.			69.7
Holland Island Bar Light 6.4 miles 090°.			71.6
Point No Point Light 1.6 miles 270°.			75.3
Hooper Island Light 2.8 miles 090°.			83.4
Drum Point Light 4.2 miles 270°.			87.4
Cove Point Light 1.0 mile 270°.			91.7
Change to Chart 1225 (*1224*) at 38°23′.0 N., 76°21′.6 W.:			
Reverse	*162*	*41.7*	
10. **Sharps Island lighted bell buoy 18A,** 0.1 mile 090°; 38°33′.3 N., 76°25′.8 W.:			102.2
Direct	356	11.9	
Sharps Island Light 2.9 miles 090°:			107.2
Reverse	*176*	*11.9*	
11. **Poplar Island Shoal lighted bell buoy 20A,** 0.2 mile 090°; 38°45′.1 N., 76°26′.9 W.:			114.1
Direct	010	8.9	
Bloody Point Bar Light 1.8 miles 090°:			119.0
Reverse	*190*	*8.9*	
12. **Thomas Point Shoal Light** 0.9 mile 270°; 38°53′.9 N., 76°25′.0 W.:			123.0
Direct	016	7.3	
Chesapeake Bay Bridge, main channel:			128.9
Reverse	*196*	*7.3*	

Table 5.—Chesapeake Bay Entrance to Baltimore—Continued

Position (Reverse directions in *italics*—read upwards)	Course	Distance	Distance from origin
13. Sandy Point Light 0.5 mile 270°; 39°01′.0 N., 76°22′.5 W. Change to Chart 549 (*1225*). Same as Position 19 Table 4:			130.3
Direct	343	3.3	
Pass between Craighill Channel Entrance buoys. **Baltimore Light** 0.4 mile 270°:			133.1
Reverse	*163*	*3.3*	
14. Midway between lighted buoy 5C and lighted bell buoy 6C; 39°04′.1 N., 76°23′.6 W.:			133.6
Direct (Craighill Channel Range ahead)	000	3.4	
Reverse (Craighill Channel Range astern)	*180*	*3.4*	
15. Junction of Craighill and Cutoff Channel Ranges; 39°07′.5 N., 76°23′.7 W.:			137.0
Direct (Cutoff Channel Range ahead)	329°30′	3.6	
Reverse (Cutoff Channel Range astern)	*149°30′*	*3.6*	
16. Junction of Cutoff Channel and Brewerton Channel Ranges; 39°10′.7 N., 76°26′.1 W.:			140.6
Direct (Brewerton Channel Range ahead)	291°09′	3.9	
Reverse (Brewerton Channel East Range ahead)	*111°09′*	*3.9*	
17. Junction of Brewerton Channel and Fort McHenry Channel Ranges; 39°12′.1 N., 76°30′.8 W.:			144.5
Direct (Fort McHenry Channel Range ahead)	321	4.4	
Reverse (Fort McHenry Channel Range astern)	*141*	*4.4*	
18. Lazaretto Point Light 0.3 mile 000°; 39°15′.5 N., 76°34′.3 W.			148.9

Table 6.—Chesapeake Bay Entrance to Newport News and Norfolk

1. Cape Henry Light 1.7 miles 244°; 36°56′.3 N., 75°58′.6 W. Same as Position 8 Table 1, Position 16 Table 2, and Position 1 Table 5. Chart 1222:			0.0
Direct	288	14.5	
This course passes through Thimble Shoal Channel; for regulations, see § 207.140, Chapter 2A.			
Reverse	*108*	*14.5*	
2. Thimble Shoal Light 0.45 mile 045°; 37°00′.6 N., 76°14′.8 W. Change to Chart 400 (*1222*):			14.5
Direct	261	1.3	
Reverse	*081*	*1.3*	
3. Old Point Comfort Light 1.6 miles 263°; 37°00′.4 N., 76°16′.4 W.:			15.8
Direct	245	1.8	
Reverse	*065*	*1.8*	
4. Old Point Comfort Light 0.5 mile 000°; 36°59′.6 N., 76°18′.4 W.:			17.6
Direct	230	1.7	
Reverse	*050*	*1.7*	
5. Elizabeth River lighted bell buoy 1A, 275 yards 140°; 36°58′.5 N., 76°20′.0 W.			19.3
To Newport News			
5. Elizabeth River lighted bell buoy 1A, 275 yards 140°; 36°58′.5 N., 76°20′.0 W.:			19.3
Direct	230	1.5	
Reverse	*050*	*1.5*	
6A. Newport News North Channel lighted buoy 2, 400 yards 045°; 36°57′.5 N., 76°21′.4 W.:			20.8
Direct	264	2.8	
Reverse	*084*	*2.8*	

Table 6.—Chesapeake Bay Entrance to Newport News and Norfolk—Continued

Position (Reverse directions in *italics*—read upwards)	Course	Distance	Distance from origin
To Newport News—Continued			
7A. **Newport News North Channel lighted bell buoy 8,** 400 yards 066°; 36°57′.2 N., 76°24′.9 W.:			23.6
Direct	308	1.1	
Reverse	*128*	*1.1*	
8A. **Newport News, C & O Railway Pier** 250 yards 070°; 36°58′.0 N., 76°26′.0 W. Same as Position 1 Table 7.			24.7
To Norfolk			
5. **Elizabeth River lighted bell buoy 1A,** 275 yards 140°; 36°58′.5 N., 76°20′.0 W.:			19.3
Direct	196	0.4	
Reverse	*016*	*0.4*	
6. **Elizabeth River lighted gong buoy 3,** 100 yards 090°; 36°58′.1 N., 76°20′.2 W.:			19.7
Direct	184	3.0	
Reverse	*004*	*3.0*	
7. **Elizabeth River lighted buoy 12,** 150 yards 270°; 36°55′.1 N., 76°20′.4 W.:			22.7
Direct	172	2.9	
Craney Island Light 200 yards 262°, change to Chart 452 (*400*).			24.3
Reverse	*352*	*2.9*	
8. **Elizabeth River lighted buoy 23,** 380 yards 110°; 36°52′.3 N., 76°20′.0 W.:			25.6
Direct	131	2.2	
Reverse	*311*	*2.2*	
9. **Channel buoy 30,** 150 yards 235°; 36°50′.9 N., 76°17′.9 W.:			27.8
Direct	155	0.5	
Reverse	*335*	*0.5*	
10. **Railway wharves, north end of Portsmouth water front,** 180 yards 270°; 36°50′.4 N., 76°17′.7 W.			28.3

Table 7.—James River to Richmond

1. **Newport News, C & O Railway Pier** 250 yards 070°; 36°58′.0 N., 76°26′.0 W. Same as Position 8A Table 6. Chart 529:			0.0
Direct	322	2.8	
Reverse	*142*	*2.8*	
2. **Center of lift span James River highway bridge;** 37°00′.2 N., 76°28′.2 W.:			2.8
Direct	299	1.9	
Reverse	*119*	*1.9*	
3. **James River lighted bell buoy 6,** 250 yards 000°; 37°01′.1 N., 76°30′.3 W.:			4.7
Direct	307	3.4	
White Shoal Tower 0.5 mile, 227°.			5.7
Reverse	*127*	*3.4*	
4. **Between James River lighted buoys 9 and 10;** 37°03′.2 N., 76°33′.7 W.:			8.1
Direct	271	1.3	
Reverse	*091*	*1.3*	
5. **James River lighted bell buoy 14,** 350 yards 345°; 37°03′.2 N., 76°35′.4 W.:			9.4
Direct	330	5.0	
Reverse	*150*	*5.0*	

Table 7.—James River to Richmond—Continued

Position (Reverse directions in *italics*—read upwards)	Course	Distance	Distance from origin
6. James River lighted bell buoy 24, 0.4 mile 145°; 37°07′.5 N., 76°38′.5 W.:			14. 4
Direct	003	1. 5	
Reverse	*183*	*1. 5*	
7. Deep Water Shoals Light 300 yards 093°; 37°08′.9 N. 76°38′.5 W.:			15. 9
Direct	017	1. 2	
Reverse	*197*	*1. 2*	
8. Between James River lighted buoy 27 and buoy 28; 37°10′.1 N., 76°38′.0 W.:			17. 1
Direct	Swinging left	3. 7	
Reverse	*Swinging right*	*3. 7*	
9. Between James River lighted buoy 39 and buoy 40; 37°12′.8 N., 76°40′.3 W.:			20. 8
Direct	247	2. 4	
Reverse	*067*	*2. 4*	
10. Between James River lighted buoy 46 and buoy 45; 37°11′.9 N., 76°43′.0 W.:			23. 2
Direct (Goose Hill Channel Range ahead)	228	1. 7	
Reverse (Goose Hill Channel Range astern)	*048*	*1. 7*	
11. James River lighted bell buoy 52, 525 yards 287°; 37°10′.8 N., 76°44′.6 W.:			24. 9
Direct	296	0. 7	
Reverse	*116*	*0. 7*	
12. Midway between James River lighted buoy 54 and buoy 53; 37°10′.9 N., 76°45′.3 W. Change to Chart 530 (*529*):			25. 6
Direct	317	3. 1	
Church Point Light 300 yards 047°.			27. 4
Reverse	*137*	*3. 1*	
13. Swann Point Junction lighted bell buoy 0.2 mile 272°; 37°13′.3 N., 76°48′.0 W.:			28. 7
Direct (Dancing Point Shoal Channel Range ahead)	264	5. 0	
Reverse (Swann Point Shoal Channel Range ahead)	*084*	*5. 0*	
14. Between James River lighted buoy 68 and buoy 67; 37°12′.8 N., 76°54′.2 W.:			33. 7
Direct	302	2. 8	
Reverse	*122*	*2. 8*	
15. Claremont Wharf 900 yards 150°; 37°14′.2 N., 76°57′.2 W.:			36. 5
Direct	Various	1. 7	
Lighted wreck off Chippokes Point, 200 yards 215°.			37. 8
Reverse	*Various*	*1. 7*	
16. Brandon Wharf Light 0.3 mile 308°; 37°15′.2 N., 76°59′.0 W.:			38. 2
Direct	335	0. 6	
Reverse	*155*	*0. 6*	
17. Brandon Wharf Light 0.4 mile 178°; 37°15′.8 N., 76°59′.3 W.:			38. 8
Direct (Bachelor Point Light ahead)	358	1. 9	
Ritchie Wharf Light 350 yards 270°.			39. 3
Reverse (Brandon Wharf Light ahead)	*178*	*1. 9*	
18. Bachelor Point Light 530 yards 358°; 37°17′.7 N., 76°59′.4 W.:			40. 7
Direct	Swinging left	1. 8	
Round Kennon Marsh in mid-channel. Pass Bachelor Point Light 175 yards off and Sturgeon Point Light 175 yards off.			
Reverse	*Swinging right*	*1. 8*	
19. Milton Point Light 300 yards 315°; 37°18′.2 N., 77°01′.4 W.:			42. 5
Direct (James River lighted buoy 75 ahead)	219	2. 1	
Reverse	*039*	*2. 1*	

Table 7.—James River to Richmond—Continued

Position (Reverse directions in *italics*—read upwards)	Course	Distance	Distance from origin
20. James River buoy 73, 50 yards 135°; 37°16′.5 N., 77°03′.0 W.:			44. 6
Direct	Various	0. 6	
Reverse	*Various*	*0. 6*	
21. James River buoy 77, 50 yards 180°; 37°16′.2 N., 77°03′.6 W.:			45. 2
Direct (Fort Powhatan Light ahead)	269	0. 6	
Reverse (Fort Powhatan Light astern)	*089*	*0. 6*	
22. Fort Powhatan Light 450 yards 269°; 37°16′.2 N., 77°04′.3 W.:			45. 8
Direct	Various	2. 3	
Round Weyanoke Point in mid-channel.			
Flowerdew Hundred Creek Light 250 yards 270°.			46. 4
Reverse	*Various*	*2. 3*	
23. Between James River lighted buoy 81 and buoy 82; 37°18′.3 N., 77°04′.9 W.:			48. 1
Direct	Swinging left	0. 4	
Reverse	*Swinging right*	*0. 4*	
24. Between James River lighted buoy 83 and buoy 84; 37°18′.6 N., 77°05′.2 W.:			48. 5
Direct	Various	0. 4	
Reverse	*Various*	*0. 4*	
25. Between James River lighted buoy 86 and buoy 85; 37°18′.7 N., 77°05′.6 W.:			48. 9
Direct	249	1. 9	
Reverse	*069*	*1. 9*	
26. Between James River lighted buoy 91 and buoy 92; 37°18′.1 N., 77°07′.9 W.:			50. 8
Direct (Jordan Point Range ahead)	279	2. 4	
Reverse (Jordan Point Range astern)	*099*	*2. 4*	
27. Between James River lighted buoy 97 and buoy 98; 37°18′.4 N., 77°10′.8 W.:			53. 2
Direct	Various	2. 0	
Reverse	*Various*	*2. 0*	
28. Between James River lighted buoy 106 and buoy 105; 37°19′.1 N., 77°13′.1 W. Change to Chart 531 (*530*):			55. 2
Direct	246	0. 8	
Jordan Point 400 yards 180°.			55. 5
Reverse	*066*	*0. 8*	
29. James River lighted buoy 107, 80 yards 180°; 37°18′.8 N., 77°14′.0 W.:			56. 0
Direct	237	0. 6	
Reverse	*057*	*0. 6*	
30. James River Light 109, 125 yards 147°; 37°18′.5 N., 77°14′.6 W.:			56. 6
Direct	Various	1. 7	
Reverse	*Various*	*1. 7*	
31. Hopewell (City Point) Wharf abeam; 37°19′.0 N., 77°16′.4 W.:			58. 3
Direct	Various	18. 7	
James River Light 129 (Turkey Island Cutoff) 100 yards 270°.			60. 3
James River Light 144 (Jones Neck Cutoff) 75 yards 090°.			63. 2
James River Light 152 (Aiken Swamp-Dutch Gap Cutoff) 75 yards 000°.			65. 8
Richmond Deepwater Terminal, southern end, 175 yards 270°.			72. 8
Reverse	*Various*	*18. 7*	
32. Richmond wharves; 37°31′.4 N., 77°25′.2 W.			77. 0

Table 8.—York River from Eastward (Main Ship Channel)

Position (Reverse directions in *italics*—read upwards)	Course	Distance	Distance from origin
1. Middle Ground lighted whistle buoy 10, 0.9 mile 067°; 37°06′.8 N., 76°08′.6 W. Same as Position 3 Table 5. Chart 1222:			0.0
Direct	310	10.6	
Reverse	*130*	*10.6*	
2. Tue Marshes Light 3.6 miles 278°, **York River Entrance bell buoy 20,** 0.3 mile 000°; 37°13′.6 N., 76°18′.7 W. Change to Chart 494 (*1222*):			10.6
Direct	286	3.6	
Reverse	*106*	*3.6*	
3. Tue Marshes Light 0.5 mile 195°; 37°14′.7 N., 76°23′.0 W. Change to Chart 492 (*494*):			14.2
Direct	258	4.1	
Reverse	*078*	*4.1*	
4. Lower Yorktown Light on Naval Fuel Depot Wharf 0.6 mile 245°; 37°13′.8 N., 76°28′.0 W.:			18.3
Direct	291	2.1	
Reverse	*111*	*2.1*	
5. Center span Yorktown Bridge; 37°14′.6 N., 76°30′.4 W.:			20.4
Direct	313	5.2	
York River Light 31, 250 yards 223°.			22.9
Reverse	*133*	*5.2*	
6. Pages Rock Light 0.5 mile 000°; 37°18′.1 N., 76°35′.2 W. Change to Chart 495 (*494*):			25.6
Direct	335	2.3	
Reverse	*155*	*2.3*	
7. Clay Bank Wharf End 0.6 mile 335°; 37°20′.3 N., 76°36′.4 W.:			27.9
Direct	321	4.0	
Clay Bank Wharf End 300 yards 051°			28.5
Reverse	*141*	*4.0*	
8. York River Light 42, 175 yards 045°:			31.9
Direct	317	4.9	
Reverse	*137*	*4.9*	
9. Roane Flat Light 475 yards 090°:			36.8
Direct	332	2.4	
Reverse	*152*	*2.4*	
10. Bells Rock Light 100 yards 090°:			39.2
Direct	299	1.7	
Reverse	*119*	*1.7*	
11. York River Light 51, 250 yards 180°:			40.9
Direct	332	1.8	
Reverse	*152*	*1.8*	
12. Abreast southeast end of West Point; 37°31′.5 N., 76°48′.0 W.			42.7

Table 9.—Rappahannock River Entrance to Fredericksburg.

1. Windmill Point Light 4.9 miles 301°; 37°33′.3 N., 76°08′.9 W. Same as Position 7 Table 5. Chart 1223:			0.0
Direct	284	10.3	
Reverse	*104*	*10.3*	
2. Rappahannock River buoy 2, 0.4 mile 000°; 37°35′.7 N., 76°21′.4 W. Change to Chart 534 (*1223*):			10.3
Direct	299	4.8	
Reverse	*119*	*4.8*	
3. Spinhouse Point Shoal Light 1.0 mile 000°; 37°38′.0 N., 76°26′.6 W.:			15.1
Direct	265	3.0	
Reverse	*085*	*3.0*	

Table 9.—Rappahannock River Entrance to Fredericksburg—Continued

Position (Reverse directions in *italics*—read upwards)	Course	Distance	Distance from origin
4. **Rappahannock River lighted bell buoy 6,** 0.3 mile 000°; 37°37′.7 N., 76°30′.3 W. Change to Chart 535 (*534*):			18. 1
Direct	300	2. 4	
Reverse	*120*	*2. 4*	
5. **Urbanna Creek Outer Light** 0.9 mile 242°, in range with **Urbanna Creek Inner Light;** 37°39′.0 N., 76°32′.9 W.:			20. 5
Direct	346	4. 4	
Reverse	*166*	*4. 4*	
6. **Smoky Point Lighted Buoy 9,** 0.5 mile 270°; 37°43′.2 N., 76°34′.2 W.:			24. 9
Direct	318	3. 2	
Reverse	*138*	*3. 2*	
7. **Rappahannock River lighted buoy 11,** 200 yards 225°; 37°45′.6 N., 76°36′.9 W.:			28. 1
Direct	291	2. 4	
Reverse	*111*	*2. 4*	
8. **Rappahannock River buoy 12,** 300 yards 045°; 37°46′.4 N., 76°39′.7 W.:			30. 5
Direct	325	1. 2	
Reverse	*145*	*1. 2*	
9. **Rappahannock River lighted buoy 13,** 250 yards 225°; 37°47′.4 N., 76°40′.5 W.:			31. 7
Direct	307	3. 1	
Reverse	*127*	*3. 1*	
10. **Bowlers Rock Light** 0.4 mile 310°; 37°49′.2 N., 76 43′.6 W.:			34. 8
Direct	326	2. 6	
Reverse	*146*	*2. 6*	
11. **Rappahannock River buoy 19,** 150 yards 180°; 37°51′.4 N., 76°45′.4 W.:			37. 4
Direct	321	0. 8	
Reverse	*141*	*0. 8*	
12. **Waverly Point Light 20,** 300 yards 065°; 37°52′.0 N., 76°46′.0 W.:			38. 2
Direct	337	1. 8	
Reverse	*157*	*1. 8*	
13. **Rappahannock River buoy 23,** 0.1 mile 270°; 37°53′.6 N., 76°46′.9 W.:			40. 0
Direct	308	2. 4	
Reverse	*128*	*2. 4*	
14. **Rappahannock River Light 29,** 150 yards 200°; 37°55′.1 N., 76°49′.3 W.:			42. 4
Direct	300	1. 7	
Reverse	*120*	*1. 7*	
15. **Tappahannock wharf** 300 yards 235°; 37°56′.0 N., 76°51′.2 W.:			44. 1
Direct	Various	56. 3	
Change to Chart 536 (*535*) abreast west end of Marsh Point.			69. 2
Reverse	*Various*	*56. 3*	
16. **Fredericksburg;** 38°17′.8 N., 77°27′.2 W.			100. 4

Table 10.—Potomac River to Washington

1. **Smith Point Light** 1.4 miles 232°; 37°53′.6 N., 76°09′.6 W. Same as Position 9 Table 5. Chart 1224:			0. 0
Direct	306	22. 9	
Change to Chart 557 (*1224*) at 38°00′.3 N., 76°21′.2 W.			
Reverse	*126*	*22. 9*	
2. **Piney Point Light,** 1.4 miles 045°; 38°07′.1 N., 76°33′.0 W. Change to Chart 558 (*557*):			22. 9
Direct	324	3. 3	
Reverse	*144*	*3. 3*	

Table 10.—Potomac River to Washington—Continued

Position (Reverse directions in *italics*—read upwards)	Course	Distance	Distance from origin
3. Ragged Point Light 0.7 mile 225°; 38°09′.7 N., 76°35′.5 W.:			26. 2
Direct	286	7. 5	
Reverse	*106*	*7. 5*	
4. Potomac River Mid-channel lighted bell buoy F close aboard; 38°11′.8 N., 76°44′.7 W.:			33. 7
Direct	295	8. 5	
Pass between Potomac River lighted buoy 17 and bell buoy 18.			
Reverse	*115*	*8. 5*	
5. Between Potomac River lighted buoy 25 and buoy 26; 38°15′.4 N., 76°54′.4 W.:			42. 2
Direct	296	3. 1	
Pass south of Potomac River buoy 28.			
Reverse	*116*	*3. 1*	
6. Potomac River Mid-channel lighted bell buoy H close aboard; 38°16′.8 N., 76°58′.0 W.:			45. 3
Direct	328	2. 0	
Reverse	*148*	*2. 0*	
7. Potomac River lighted bell buoy 29, 500 yards 270°; 38°18′.5 N., 76°59′.3 W.:			47. 3
Direct	358	3. 3	
Reverse	*178*	*3. 3*	
8. Center of Channel Span Potomac River Bridge; 38°21′.7 N., 76°59′.4 W. Change to Chart 559 (*558*):			50. 6
Direct	340	2. 3	
Persimmon Point Shoal Light 500 yards 270°.			51. 2
Reverse	*160*	*2. 3*	
9. Upper Potomac River lighted buoy 4, 550 yards 340°; **Mathias Point Obstruction Light** 0.5 mile 248°; 38°23′.9 N., 77°00′.5 W.:			52. 9
Direct	299	1. 3	
Reverse	*119*	*1. 3*	
10. Upper Potomac River Light 6, 0.4 mile 299°; 38°24′.6 N., 77°01′.9 W.:			54. 2
Direct (Riverside Wharf Light ahead)	255	5. 1	
Mathias Point Shoal Light 200 yards 180°.			54. 8
Upper Cedar Point Light 500 yards 000°.			56. 7
Reverse (Riverside Wharf Light astern)	*075*	*5. 1*	
11. Riverside Wharf Light 14, 0.5 mile 255°; 38°23′.3 N., 77°08′.1 W.:			59. 3
Direct	230	2. 9	
Reverse	*050*	*2. 9*	
12. Maryland Point Light 0.85 mile 243°; 38°21′.4 N., 77°10′.9 W.:			62. 2
Direct	261	1. 3	
Maryland Point Light 540 yards 180°.			62. 9
Reverse	*081*	*1. 3*	
13. Maryland Point Light 0.5 mile 113°; 38°21′.2 N., 77°12′.5 W.:			63. 5
Direct	282	1. 0	
Reverse	*102*	*1. 0*	
14. Upper Potomac River lighted buoy 22, 50 yards 000°; 38°21′.4 N., 77°13′.8 W.:			64. 5
Direct	303	0. 9	
Reverse	*123*	*0. 9*	
15. Upper Potomac River lighted buoy 23, 50 yards 270°; 38°21′.9 N., 77°14′.7 W.:			65. 4
Direct	335	2. 5	
Reverse	*155*	*2. 5*	
16. Upper Potomac River lighted buoy 27, 50 yards 270°; 38°24′.2 N., 77°16′.1 W.:			67. 9
Direct	356	5. 6	
Mallows Bay Light 150 yards 090°.			72. 5
Reverse	*176*	*5. 6*	

Table 10.—Potomac River to Washington—Continued

Position (Reverse directions in *italics*—read upwards)	Course	Distance	Distance from origin
17. **Upper Potomac River buoy 41,** 200 yards 270°; 38°29′.7 N., 77°16′.6 W.:			73. 5
Direct	007	2. 1	
Upper Potomac River buoy 43, 350 yards 270°.			74. 9
Reverse	*187*	*2. 1*	
18. **Upper Potomac River lighted buoy 44,** 500 yards 090°; 38°31′.8 N., 77°16′.3 W.:			75. 6
Direct	044	2. 4	
Reverse	*224*	*2. 4*	
19. **Between Upper Potomac River lighted bell buoy 45 and buoy 46;** 38°33′.6 N., 77°14′.1 W. Change to Chart 560 (*559*):			78. 0
Direct	038	2. 7	
Reverse	*218*	*2. 7*	
20. **Between Upper Potomac River lighted buoy 51 and buoy 52;** 38°35′.7 N., 77°12′.0 W.:			80. 7
Direct	053	1. 3	
Reverse	*233*	*1. 3*	
21. **Upper Potomac River buoy 54,** 350 yards 115°; 38°36′.5 N., 77°10′.7 W.:			82. 0
Direct (Glymont Light 56 ahead)	084	1. 4	
Reverse (Glymont Light 56 astern)	*264*	*1. 4*	
22. **Glymont Light 56,** 0.4 mile 084°; 38°36′.6 N., 77°08′.8 W.:			83. 4
Direct	061	0. 6	
Reverse	*241*	*0. 6*	
23. **Glymont Light 56,** 0.3 mile 211°; 38°36′.9 N., 77°08′.1 W.:			84. 0
Direct (Glymont Light 56 astern)	031	0. 9	
Reverse (Glymont Light 56 ahead)	*211*	*0. 9*	
24. **Midway between Upper Potomac River lighted buoy 59 and buoy 60;** 38°37′.7 N., 77°07′.5 W.:			84. 9
Direct	349	2. 2	
Reverse	*169*	*2. 2*	
25. **Upper Potomac River lighted buoy 64 on range with Whitestone Point Light** 575 yards; 38°39′.9 N., 77°08′.0 W.:			87. 1
Direct	012	0. 3	
Reverse	*192*	*0. 3*	
26. **Upper Potomac River lighted buoy 64,** 100 yards 135°; 38°40′.1 N., 77°07′.9 W.:			87. 4
Direct	033	1. 0	
Reverse	*213*	*1. 0*	
27. **Between Whitestone Point Light and Upper Potomac River buoy 66;** 38°41′.0 N., 77°07′.2 W.:			88. 4
Direct	051	0. 6	
Reverse	*231*	*0. 6*	
28. **Upper Potomac River lighted buoy 67,** 100 yards 045°; 38°41′.3 N., 77°06′.7 W.:			89. 0
Direct	073	2. 8	
Reverse	*253*	*2. 8*	
29. **Upper Potomac River buoy 75,** 200 yards 000°; 38°42′.2 N., 77°03′.2 W.:			91. 8
Direct	Turning	0. 8	
Reverse	*Turning*	*0. 8*	
30. **Fort Washington Light** 300 yards 053°; 38°42′.7 N., 77°02′.4 W.:			92. 6
Direct	023	0. 7	
Reverse	*203*	*0. 7*	
31. **Midway between Riverview Wharf Light and Upper Potomac River buoy 83;** 38°43′.3 N., 77°02′.0 W.:			93. 3
Direct	349	1. 0	
Reverse	*169*	*1. 0*	

Table 10.—Potomac River to Washington—Continued

Position (Reverse directions in *italics*—read upwards)	Course	Distance	Distance from origin
32. Upper Potomac River lighted buoy 84, 150 yards 090°; 38°44′.3 N., 77°02′.3 W.:			94. 3
Direct	007	1. 9	
Reverse	*187*	*1. 9*	
33. Upper Potomac River Light 88, 200 yards 090°; 38°46′.2 N., 77°02′.0 W.:			96. 2
Direct	351	1. 6	
Reverse	*171*	*1. 6*	
34. Jones Point Light 750 yards 191°; 38°47′.8 N., 77°02′.3 W.:			97. 8
Direct	011	1. 8	
Reverse	*191*	*1. 8*	
35. Bellevue Magazine Pier Light 180 yards 090°; 38°49′.6 N., 77°01′.8 W.:			99. 6
Direct	016	1. 4	
Reverse	*196*	*1. 4*	
36. Hains Point Junction lighted bell buoy 300 yards 000°; 38°51′.0 N., 77°01′.3 W.:			101. 0
Direct	Various	1. 4	
Reverse	*Various*	*1. 4*	
37. Municipal Pier 4; 38°52′.4 N., 77°01′.4 W.			102. 4

CHAPTER 4

Atlantic Coast

New York Bay to Delaware Bay

Charts 1215 to 1219

THE coast of New Jersey extends in a general southerly direction for 44 miles from Sandy Hook to Barnegat Inlet, then southwesterly for 66 miles to Cape May Point. From Sandy Hook to Atlantic City natural depths of less than 7 fathoms are not found more than 5 miles from shore; south of Atlantic City this distance increases to a maximum of 13 miles. There are many wrecks along this coast; those outside the general 7-fathom limit have been blasted off and/or cleared to safe navigational depths, or marked by obstruction buoys.

Courses recommended for vessels of various drafts are given in Chapter 3. Shallow-draft vessels can follow the shore more closely if they pay strict attention to the charts for fish-weir areas, shoals, wrecks, and other obstructions. Small boats should wait for favorable weather before attempting an outside run along this coast.

The principal entrances are Shark River Inlet, Manasquan Inlet, Barnegat Inlet, Absecon Inlet, and Cape May Inlet. There are several others that are unimproved. The inlets are, or may be, obstructed by shifting bars, and most require local knowledge to carry the best water. The best time to enter is on a rising tide with a smooth sea; passage is hazardous during easterly gales and heavy seas.

The greater part of the New Jersey coast is built up in summer resorts, and the numerous standpipes and elevated tanks are prominent from seaward. The New Jersey Intracoastal Waterway, a continuous inside passage from Manasquan Inlet to Delaware Bay, is described in Chapter 5.

Chart 1215.—Sandy Hook, on the south side of the entrance to **New York Bay,** is low and is the most northerly part of the New Jersey coast. **Sandy Hook Light,** 88 feet above the water and visible 15 miles, is shown from a white stone tower a mile from the north end of the point. The light was established in 1764 and is the oldest in continuous use in the United States.

Sandy Hook Coast Guard Station is 0.7 mile northwest of Sandy Hook Light and near the inner side of the point. **Storm warnings** are displayed day and night from the Coast Guard tower. A light is shown from a skeleton tower on the inner shore 0.3 mile west of the Coast Guard station; a special fog horn is mounted in a building near the outer beach 0.4 mile east of the station. A tall observation tower and a large standpipe near the station are the most prominent objects on the northern end of Sandy Hook.

258030°—54——10

Sandy Hook is a Government reservation, and landing is prohibited as far south, approximately, as the bridge over the mouth of Shrewsbury River. Vessels awaiting favorable weather for an outside run can find suitable anchorage in Sandy Hook Bay south of a line bearing due west from Sandy Hook Light. The Coast Guard station will furnish weather reports, directly or by telephone, to small boats planning a run to Manasquan Inlet and will request the other stations to the southward to watch for any particular boat and report it from station to station.

Sandy Hook Bay, Navesink River, and **Shrewsbury River** are described in the *United States Coast Pilot, Atlantic Coast, Cape Cod to Sandy Hook.*

The **Highlands of Navesink,** on the northwest side of the approach to Navesink River, are the highest ground along the open Atlantic coast between Maine and Florida. The prominent wooded ridge is 276 feet high, is 4 miles south of Sandy Hook Light and 0.5 mile back of the outer beach. Abandoned **Navesink Lighthouse** is in a cleared space on the easternmost spur at a ground elevation of 180 feet; the two brownstone towers, the north octagonal and the south square, are connected by a dwelling and stand 73 feet above the ground.

There are several summer resorts between Sandy Hook and Shark River Inlet. **Seabright** is 6 miles south of Sandy Hook Light.

Shrewsbury Rocks, 7.3 miles south of Sandy Hook Light, extend 1.3 miles from shore and have a depth of 14 feet; the outer limits are marked by buoys. **Monmouth Beach Coast Guard Station** is at the shore end of the rocks; **storm warnings** are displayed, daytime only, from the tower. South of Shrewsbury Rocks the 5-fathom curve is only 0.2 to 0.3 mile off the beach for a considerable distance.

Long Branch, 10 miles from Sandy Hook Light, is conspicuous because of its large buildings. **Storm warnings** are displayed day and night 200 yards from the ocean a mile east of the business district.

Asbury Park, 14.5 miles south of Sandy Hook Light, is the largest summer resort along the northern New Jersey coast. **Ocean Grove** adjoins the southern side of Asbury Park, and **Bradley Beach** is 16 miles from Sandy Hook Light.

Chart 795.—Shark River, a small stream that enters the Atlantic Ocean 17 miles south of Sandy Hook Light, is the only harbor between Sandy Hook and Manasquan Inlet. The river is used by small yachts and fishing boats. The town of **Avon** fronts the ocean on the north side of the river and **Belmar** is on the south side.

Shark River Inlet is protected by jetties, each marked at its outer end by a light. **Shark River Coast Guard Station** is near the beach 0.5 mile north of the inlet. **Storm warnings** are displayed, daytime only, at the station. A rock jetty extends 200 yards from shore abreast of the station; between this jetty and the inlet are two rock groins that are awash at high water.

A Federal project provides for a **channel** 18 feet deep and 150 feet wide across the bar at the entrance to Shark River Inlet; thence 12 feet deep and generally 100 feet wide through Main Channel and South Channel to the highway bridge 0.8 mile above the jetties; thence 8 feet deep and 100 feet wide to the upper limit of the Belmar Municipal Yacht Basin, an additional distance of 0.4 mile; and an anchorage 12 feet deep east of the highway bridge 0.7 mile above the jetties. The controlling depth was 5½ feet in the entrance in February 1953.

The mean range of **tide** is 4 feet in Shark River Inlet, and the mean range of spring tides is 4¾ feet; irregular fluctuations due to wind and barometric pressure vary from 2½ feet below mean low water up to 8½ feet above mean high water.

Breakers form along the bar off Shark River Inlet in stormy weather, but the entrance can be made in moderately rough weather with some local knowledge. At the highway bridge just above the jetties, a cross-current, strongest on the ebb, may be encountered. Strong **currents** sweep through the inlet, and vessels for which the closed bridge clearance is insufficient should not attempt entrance until the drawspan is completely open.

The highway **bridge** over Shark River Inlet just above the jetties has a bascule span with a horizontal clearance of 90 feet and a vertical clearance of 12 feet. The highway bridge 0.7 mile above the jetties has a bascule span over **South Channel** with a horizontal clearance of 50 feet and a vertical clearance of 13 feet; the fixed span over **North Channel** has a horizontal clearance of 80 feet and a vertical clearance of 8 feet.

A railroad bridge and a highway bridge, close together, cross South Channel, then **Shark River Island,** thence unimproved North Channel 0.8 mile above the jetties. The railroad bridge has a bascule span over South Channel with a horizontal clearance of 50 feet and a vertical clearance of 8 feet; the fixed span over North Channel has a horizontal clearance of 20 feet and a vertical clearance of 8 feet. The highway bridge has a bascule span over South Channel with a horizontal clearance of 50 feet and a vertical clearance of 10 feet; the fixed span over North Channel has a horizontal clearance of 69 feet and a vertical clearance of 10 feet. **General regulations** governing operation of these bridges are given in § **203.215,** Chapter 2A.

The entrance to **Belmar Basin** is 0.4 mile above the jetties. The **Belmar Municipal Boat Basin** is at the head of the improved channel. Several boatyards, boathouses, and landings for commercial and pleasure craft are located along the lower part of Shark River. Gasoline, Diesel oil, water, ice, provisions, and some ship chandlery are available in Avon and Belmar.

Chart 1215.—Sea Girt Inlet, 3 miles southward of Shark River Inlet, bares at low water; it is used occasionally at high water and with a smooth sea by fishing boats of 2-foot draft. On the north side of the entrance is a short wooden jetty. The mean range of **tide** at the inlet is about 4 feet.

Spring Lake, on the north side of Sea Girt Inlet, has two large hotels with cupolas. On the south side of the inlet is the town of **Sea Girt. Sea Girt Light,** 60 feet above the water and visible 13 miles, is shown from a square red-brick tower, in front of dwelling on the beach on the south side of the inlet and 20 miles southward from Sandy Hook Light.

The **danger zone** of a military firing range extends from the beach at Sea Girt. Limits of the area and regulations governing it are given in § **204.20,** Chapter 2A.

Chart 795.—Manasquan River is a small stream that rises near Freehold and flows easterly to the Atlantic Ocean, which it enters about 22 miles southward of Sandy Hook Light. **Manasquan Inlet** is protected by two stone jetties, each marked at its outer end by a light. A fog signal and a low-power radiobeacon operate at the south light. **Storm warnings** are displayed day and night at **Manasquan Coast Guard Station,** on the south side of the inlet.

Manasquan, on the north side of the inlet, has a large summer colony. Back of Manasquan is the town of **Brielle.** **Point Pleasant Beach,** on the south side of the inlet, is marked by an elevated tank and a nearby standpipe.

The Federal project for the improvement of Manasquan River provides for a **channel** 14 feet deep and 250 feet wide, protected by jetties, from the Atlantic Ocean to the inner end of the north jetty, thence 12 feet deep and 300 to 100 feet wide to the railroad bridge 0.9 mile from the outer ends of the jetties. The controlling depth to the bridge was 7 feet in June 1950.

The mean range of **tide** is 3¾ feet at the inner end of Manasquan Inlet and 4 feet at the ocean end; the mean range of spring tides is 4½ feet at the inner end and 4¾ feet at the ocean end. Irregular fluctuations due to wind and barometric pressure vary from 2¾ feet below to 7½ feet above mean low water at the inner end of the inlet. The **current** in Manasquan Inlet has a velocity of about 2 knots at strength; see the *Current Tables* for further information.

Cooks Creek, which is the outlet for **Lake Louise,** empties into Manasquan River from southward about halfway between the jetties and the railroad bridge. A fixed bridge 0.2 mile above the entrance to Cooks Creek has a horizontal clearance of 20 feet and a vertical clearance of 8½ feet. Gasoline, Diesel oil, water, and ice can be obtained north of the bridge.

Crabtown (Debbies) Creek, which empties into the river from northward just east of the railroad bridge, has depths of about 5 feet. The highway bridge 0.4 mile above the river has a bascule span with a horizontal clearance of 30 feet and a vertical clearance of 8 feet.

Manasquan Inlet is the northern terminus of the **New Jersey Intracoastal Waterway.** Manasquan, Brielle, the railroad and highway drawbridges 0.9 and 1.1 miles above the jetties, and the channel that continues southwestward in Manasquan River from the bridges for 1.2 miles to Bay Head-Manasquan Canal are described in more detail in Chapter 5. A New Jersey project provides for a side channel 6 feet deep and 100 feet wide northwestward in Manasquan River from the canal for 1 mile to a highway bridge and beyond the bridge for an additional 1.5 miles; dredging was to be completed in May 1953; the highway bridge has a bascule span with a horizontal clearance of 50 feet and a vertical clearance of 15 feet.

Chart 1216.—Bay Head, about 2 miles south of Manasquan Inlet, is marked by a prominent elevated water tank. From Bay Head south, the resorts are more widely separated on the low, narrow barrier beach which separates the inside waters from the ocean.

Other settlements along the beach and their distances from Manasquan Inlet are **Mantoloking,** 4 miles; **Normandy Beach,** with a water tank, 6 miles; **Chadwick,** 7 miles; **Lavallette,** with a standpipe, 8 miles; **Ortley Beach,** 9 miles; **Seaside Heights,** with a standpipe at the north end, 10 miles; and **Seaside Park,** with a water tank near the south end, 11 miles. **Toms River Coast Guard Station** is near the beach at Seaside Heights.

Barnegat Inlet, 21 miles southward of Manasquan Inlet and 43 miles from Sandy Hook Light, is protected by jetties, each with a light at its outer end. Abandoned **Barnegat Lighthouse,** the most prominent landmark in this area, is a conical red-brick tower that stands 161 feet above the ground on the south side of the inlet; the tower is

no longer lighted but is maintained by the State of New Jersey as a historical monument. **Barnegat Coast Guard Station** is 0.4 mile south of the old lighthouse; **storm warnings** are displayed, daytime only, at the station. Also on the south side of the inlet is **Barnegat Light,** a summer resort with a permanent settlement of oystermen and fishermen.

Barnegat Lightship is moored in 78 feet of water 7 miles eastward of the Barnegat Inlet jetties. The vessel has a red hull, with the name BARNEGAT on both sides, and two masts with lantern galleries. The light is 65 feet above the water and visible 14 miles; the radiobeacon and the fog signal are synchronized for distance finding. Call letters for radio and code flag are NNBB. **Storm warnings** are displayed, daytime only.

The Federal project for the improvement of Barnegat Inlet provides for a **channel** 10 feet deep through the outer bar and 8 feet deep through the inlet, the channel to be protected by two converging stone jetties extending to the 12-foot contour in the ocean and spaced 1,000 feet apart at the outer ends; a channel of suitable hydraulic characteristics extending in a northwesterly direction from the gorge in the inlet to **Oyster Creek Channel,** about 3 miles above the jetties, thence by way of Oyster Creek Channel to deep water in Barnegat Bay; and maintenance of a channel 8 feet deep and 200 feet wide to connect Barnegat Light harbor with the main inlet channel. Controlling depths were 7½ feet from the ocean to the inlet gorge, thence 3 feet to the inner end of the inlet channel in October 1950; and thence 7 feet through Oyster Creek Channel to Barnegat Bay in August 1946.

No recent information is available on the condition of the channel southward from the inlet to the landings on the inner side of the point at the town of Barnegat Light, but it appears navigable for any craft that can use the inlet. A marine railway at the fish-company wharf at the head of the channel can haul out boats up to 45 feet in length for hull repairs; there is no machine shop in the immediate vicinity. Gasoline, Diesel oil, water, ice, and some marine supplies are available at the wharf.

The inlet and the inner channels are well marked but are shifting and the buoys are moved to conform. Any vessel that is not familiar with this inlet should lay to outside and attempt to obtain a pilot.

The mean range of **tide** is 2¾ feet at Barnegat Inlet and ½ foot at Oyster Creek Channel. The extreme tidal range at the inlet is from about 2 feet below mean low water to about 3 feet above mean high water. The average velocity of the **current** in the inlet is 2¼ knots; see the *Current Tables* for further information.

Four miles south-southwestward of Barnegat Lighthouse is a standpipe, and **Harvey Cedars** is a mile farther south. Seven miles from the lighthouse is **Surf City,** which has a prominent standpipe. South-southwestward of Surf City is an almost continuous line of beach settlements with standpipes or elevated tanks. **Shipbottom** 8.4 miles from Barnegat Lighthouse, has a prominent standpipe.

Beach Haven, a large town 13 miles from Barnegat Lighthouse, has a standpipe, a stack, and an elevated water tank. **Holgate** is a group of houses around **Bonds Coast Guard Station,** 16 miles from Barnegat Lighthouse. **Storm warnings** are displayed, daytime only, at the station.

Beachhaven Inlet, 3 miles south-southwestward of Beach Haven, is a natural break through the barrier beach and should not be mistaken for Little Egg Inlet, from which it is separated by small **Tucker Island.** A narrow, winding channel through the

inlet is said to have a controlling depth of about 4 feet. The Coast Guard sounds the channel and shifts the buoys to mark the best water. The buoys are not charted. The mean range of **tide** at the inlet is 3¾ feet.

Chart 1217.—Little Egg Inlet, about 19 miles south-southwestward of Barnegat Lighthouse, is used considerably by local pleasure and fishing boats. The depth over the bar is ample for any vessel able to use the inside waters. In very heavy weather breakers form all the way across the bar. The shoreline and channels at the inlet are constantly changing. The entrance is well marked but the buoys are not charted because they are frequently shifted in position. **Little Egg Coast Guard Station** is on the north side of the entrance to the inlet.

The United States Navy Hydrographic Office **warns** vessels against fishing, dragging, or anchoring in an area within a radius of 1 mile of latitude 39°26′.7 N., longitude 73°56′.6 W. This position is about 17 miles eastward of Little Egg Inlet.

Brigantine Inlet is about 22 miles south-southwestward of Barnegat Lighthouse. The only boats using the inlet are small oyster and fishing craft, and those only with a smooth sea and on a rising tide. The depth over the bar is not more than 4 feet. The entrance buoys are not charted because they are frequently shifted in position.

Brigantine Shoal, about 3 miles south of the inlet, is one of the outermost spots with depths of less than 30 feet along this part of the coast. The shoal is 17 feet deep and is marked by a buoy; there are depths of 7 feet between it and Absecon Inlet.

Brigantine is a large beach resort between Brigantine Inlet and Absecon Inlet. The city has two prominent elevated tanks and a large conspicuous hotel. Once inside the bar across Brigantine Inlet, fairly deep water is found in the main part of **Brigantine Channel** and in the thoroughfares along the inner side of Brigantine.

Absecon Inlet, 28 miles southwest by south from Barnegat Lighthouse, is on the northeast side of **Atlantic City,** the largest resort on the New Jersey coast. Abandoned **Absecon Lighthouse,** standing 170 feet above the ground, is a conical brick tower on the southwest side of the inlet; the lower 100 feet of the tower is painted white, and upper 70 feet is divided into three horizontal bands of blue, white, and blue. **Atlantic City Light,** 70 feet above the water and visible 14 miles, is shown from a white skeleton tower on a concrete block about 0.3 mile southeast of the old lighthouse.

The Federal project for the improvement of Absecon Inlet provides for an entrance **channel** 20 feet deep and 400 feet wide, for a channel 15 feet deep and 200 feet wide to Clam Creek, and for a turning basin 15 feet deep in Clam Creek. The controlling depth was 12 feet in the entrance channel in April 1953.

The **buoys** at Absecon Inlet are not all charted because they are moved frequently to mark the shifting entrance channel, which should be used only with local knowledge. The shore on the south side of the inlet has been stabilized by the construction of protective works, and a long jetty was being constructed on the north side in 1953.

The mean range of **tide** is 4 feet in the ocean and 3½ feet at the inlet gorge; the extreme range due to ocean storms is about 11 feet. Strong **currents** are experienced in the channel.

Atlantic City is a base, or a point of call, for many boats, both from outside and from points along the inside waters. Supplies of all kinds are obtainable and ordinary repairs can be made to hulls and motors of boats using these passages. The city has rail and highway connections with the mainland and highway connections with Brig-

antine on the northeast and Ocean City on the southwest. Many of the piers and wharves along Absecon Inlet and Clam Creek are open to public use either free or on payment of moderate charges. There are several places where boats can obtain fuel and other supplies.

Yachtsman's Dock, on the southwest side of the inlet and 0.65 mile north of the old lighthouse, has ample depth along its outer and inner faces for boats using the inlet. Back of the dock is a small basin which shoals gradually to 0 feet at the shore bulkhead; this basin is used only by for-hire fishing boats.

Clam Creek is an extensive basin on the southwest side of the inlet and just above Yachtsman's Dock. On the north side of the entrance is **Atlantic City Coast Guard Station.** Southwestward of the Coast Guard bulkhead wharf is a State-owned basin.

Extending southeastward from the main part of Clam Creek are **Gardner Basin, Snug Harbor,** and **Delta Basin.** Gardner Basin, 60 yards wide and about 700 yards long, has a depth of 8 feet in mid-channel to the head and is used by many motorboats, which make fast to the bulkheads. All kinds of supplies are obtainable. Marine railways and machine shops are available; the largest marine railway can haul out vessels up to 130 feet in length and 7 feet in draft. Snug Harbor and Delta Basin have depths of 6 feet or more in their entrances; the Corps of Engineers wharf is in Delta Basin.

Storm warnings are displayed day and night at the Coast Guard station; daytime displays also are made at the Atlantic City Tuna Club in Gardner Basin and at the Kentucky Avenue Lifeguard Station a mile southwest of the old lighthouse.

The highway bridge over Absecon Inlet 1.2 miles above the old lighthouse has a double-leaf bascule span with a horizontal clearance of 75 feet and a vertical clearance of 11 feet. Care must be exercised when making the passage through this bridge because of the strong **currents;** velocities of 2½ knots have been reported.

Absecon Island extends southwestward from Absecon Inlet to Great Egg Harbor Inlet. Southwest of Atlantic City are **Ventnor City, Margate City,** and **Longport.** This beach is one of the most intensively developed resort areas in the United States.

Great Egg Harbor Inlet, 7 miles southwest of Absecon Inlet, has a controlling depth of about 6 feet over the bar. The buoys marking the inlet are not charted because they are shifted frequently to mark the best water. The inlet is used by many local fishing and pleasure boats with drafts up to 5 feet. Breakers extend along the bar even in moderate weather and are hazardous to small boats. The mean range of **tide** at the inlet is about 4 feet. The bridges just inside Great Egg Harbor Inlet are described in Chapter 5 in connection with the New Jersey Intracoastal Waterway.

Ocean City, a large summer resort on the southwest side of Great Egg Harbor Inlet, has rail and highway connections with the mainland. Standpipes, gas tanks, and a stack are prominent. Supplies and facilities are described in connection with the New Jersey Intracoastal Waterway. **Ocean City Coast Guard Station** is in a basin on the inner side of the city and near Great Egg Harbor Inlet; **storm warnings** are displayed, daytime only, at the station.

Corson Inlet, 14 miles southwest of Absecon Inlet, is subject to wide changes in position and depth. The buoys marking the inlet are not charted because they are shifted frequently to mark the best water. The inlet is used by fishing boats and pleasure craft up to 5 feet in draft. The mean range of **tide** at the inlet is about 4 feet.

The fixed bridge over the channel northward from Corson Inlet to **Middle Thorofare** has a horizontal clearance of 10 feet and a vertical clearance of 6 feet; this channel is

seldom used. The highway bridge over **Main Channel,** which leads southward from Corson Inlet to the Intracoastal Waterway, has a bascule span with a horizontal clearance of 50 feet and a vertical clearance of 15 feet.

Strathmere is a settlement on the southwest side of Corson Inlet. **Corson Inlet Coast Guard Station** is on the inner side of the barrier beach at Strathmere and about 0.8 mile from the inlet. A standpipe in Strathmere is prominent.

Sea Isle City, a summer resort 4 miles southwest of Corson Inlet, has a standpipe and two church spires. **Ludlam Beach Light,** 45 feet above the water and visible 12 miles, is shown from a red skeleton tower on a white tankhouse near the northeast end of the town. A shoal, with a depth of 16 feet and marked by an obstruction buoy, is 3 miles southeast of Ludlam Beach Light. **Avalon Shoal,** 7 miles southeast of the light, has a depth of 26 feet and is marked by a lighted gong buoy.

Townsend Inlet, about 20 miles southwest of Absecon Inlet, was said to have a a controlling depth of about 3½ feet in 1951. The inlet is used by small fishing and pleasure boats and by an occasional cruising yacht. The channel and shoreline are subject to considerable change. The channel buoys are not charted because they are shifted frequently to mark the best water. The mean range of **tide** at the inlet is about 4 feet.

Townsends Inlet is a small resort on the northeast side of the inlet. **Townsend Inlet Coast Guard Station** is on the northeast side of the town; **storm warnings** are displayed, daytime only, at the station.

The highway bridge over Townsend Inlet has a bascule span with a horizontal clearance of 50 feet and a vertical clearance of 23 feet. The route of the New Jersey Intracoastal Waterway is just west of the bridge.

Avalon, a resort on the southwest side of Townsend Inlet, is marked by a standpipe. **Stone Harbor,** with an elevated water tank, is 3.5 miles farther to the southwest.

Hereford Inlet, 27 miles southwest of Absecon Inlet, was said to have a controlling depth of 3 feet in 1951. The inlet is subject to rapid change and the buoys cannot always be depended upon to indicate the best water. The buoys are not charted because they are shifted frequently. Large areas bare at low water. Breakers form along the bar in heavy weather and on the shoals at all times. The mean range of **tide** at the inlet is about 4 feet.

The inlet is used by many fishing boats and by some yachts. **Hereford Inlet Light,** 53 feet above the water and visible 13 miles, is shown from a gray shingle tower on a white dwelling on the south side of the inlet. **Hereford Inlet Coast Guard Station** is at the light.

Nummy Island is just inside Hereford Inlet; the Intracoastal Waterway passes west of the island. The highway that traverses Nummy Island has bascule spans over **Great Channel,** which leads northward from the inlet, and **Grassy Sound Channel,** which leads westward; horizontal clearances are 50 feet and vertical clearances are 15 feet. **Regulations** governing operation of the Great Channel bridge are given in **§ 203.225,** Chapter 2A.

North Wildwood, a summer resort on the south side of Hereford Inlet, is a base for many fishing boats. The Coast Guard wharf and several other wharves are at the northeast end of the town; a long sandspit separates the channel to these wharves from Hereford Inlet. A standpipe about 0.3 mile west-southwest of Hereford Inlet is prominent

A marine railway along **Beach Creek,** on the west side of the town, can handle boats up to 35 feet in length for hull and engine repairs; gasoline, water, ice, and some supplies are available. **Wildwood** and **Wildwood Crest** are southwest of North Wildwood; standpipes in both resorts are prominent.

Chart 234.—Cape May Inlet is 33 miles southwest of Absecon Inlet and about 4 miles eastward of **Cape May Point,** the southern extremity of the New Jersey coast. The inlet is protected by jetties, each with a light at its outer end. The light on the west jetty has a marker radiobeacon and a fog signal; this jetty should not be rounded too close because the outer end is submerged. A direction light is shown from a skeleton tower at the head of the inlet channel; the beam is white for a width of about 125 feet between the jetties, red to the eastward, and green to the westward. The red light atop a high slim radio tower about 0.5 mile northeast of the inner ends of the jetties has been seen many miles at sea.

Cape May Harbor is used considerably by fishing vessels and large yachts. Some of these vessels anchor in the west end of the harbor; others go to the wharves on the south side of the harbor or to Schellenger Landing. Many fishing vessels go to the fish wharf on Lower Thorofare.

The town of **Cape May,** southwest of the harbor and 2 miles westward of Cape May Inlet, is a summer resort that fronts the ocean and has several large and prominent hotels. The Public Health Service has an **outpatient office** in the town.

The Federal project for the improvement of Cape May Harbor provides for a channel 25 feet deep and 400 feet wide in Cape May Inlet, protected by two parallel jetties and extending from the 25-foot depth curve in the Atlantic Ocean to a line 500 feet harborward of the inner ends of the jetties, thence 20 feet deep and 300 feet wide to deep water in the harbor. The controlling depth was 16 feet from the ocean to the inner end of the project in 1949–50. The mean range of **tide** in the harbor is 4½ feet, and the extreme range due to ocean storms is about 11 feet.

A water tank on **Sewell Point,** on the west side of the inlet, is prominent. A possible **danger area** due to rifle fire during May to October, inclusive, extends about a mile along the beach from the west jetty and about a mile from shore; vessels are warned to avoid the area during those months.

The highway bridge over the channel that leads northeastward from the inlet is described in Chapter 5 in connection with the Intracoastal Waterway. Above the bridge the channel divides into **Lower Thorofare,** leading eastward, and **Middle Thorofare,** the route of the Intracoastal Waterway northward. A long marginal fish wharf with rail connections is on the east side of Lower Thorofare; gasoline, Diesel oil, water, ice, and some marine supplies can be obtained on the wharf.

Upper Thorofare and **Skunk Sound,** entering the harbor from the north, are crossed by fixed bridges with horizontal clearances of 23 feet and vertical clearances of 6 feet. On the harbor shore between these two bodies of water is a yacht basin with depths of 9 to 5 feet; gasoline, Diesel oil, water, ice, and some marine supplies are available. A marine railway in the basin can handle boats up to 55 feet in length and 20 tons in weight.

The largest wharves in Cape May Harbor are on the inner side of Sewell Point and have depths of 12 to 24 feet alongside. The channel in the harbor is marked by buoys, some of which are lighted.

Cape Island Creek, which empties into the west end of Cape May Harbor, is known as **Schellenger Creek** at its mouth; **Schellenger Landing** is on the north side of the mouth. On both sides of the mouth are boatyards with marine railways, the largest of which can haul out vessels up to 175 feet in length and 11 feet in draft. Gasoline, Diesel oil, water, provisions, and some ship chandlery are available. The bridge 0.3 mile above the entrance to Schellenger Creek has a bascule span with a horizontal clearance of 38 feet and a vertical clearance of 5 feet.

Cape May Canal, leading northwestward from Cape May Harbor, is part of the Intracoastal Waterway and is described in Chapter 5. **Cape May Light** and the shoals and channels to the south and southwest are described in Chapter 6.

CHAPTER 5

New Jersey Intracoastal Waterway

Charts 824 to 827

THE **New Jersey Intracoastal Waterway,** a sea-level inland water route that approximately parallels the New Jersey coast, extends from the Atlantic Ocean at Manasquan Inlet to Delaware Bay at a point 2 miles north of Cape May Light. The waterway passes through a series of bays, lagoons, thorofares, and land cuts. The Federal project for the waterway provides for a channel 12 feet deep and generally 100 feet wide from Manasquan Inlet to Delaware Bay.

Note.—***Miles*** in the following text are distances along the waterway from the outer ends of the Manasquan Inlet jetties, which are 40 miles by outside run from the Battery, New York.

Through 1952, the only improvement work done in the waterway by the Corps of Engineers was in Manasquan River and in the Cape May Canal. The controlling depth through Manasquan Inlet and into the lower part of Manasquan River as far as the railroad bridge at *Mile 0.9* is given in Chapter 4; the controlling depth from Cape May Inlet, *Mile 97.7*, through Cape May Canal to Delaware Bay, *Mile 102.1*, was 7½ feet in March 1953.

In May 1946, surveys by the Corps of Engineers showed controlling depths of 9 feet from the New York and Long Branch Railroad bridge, *Mile 0.9*, to Bay Head, *Mile 4.0;* thence 5 feet to a point opposite Waretown, *Mile 22.9*, in Barnegat Bay; thence 3 feet to Little Egg Inlet, *Mile 43.5;* thence 3 feet to Albany Avenue bridge, *Mile 59.2*, Atlantic City; thence 5½ feet to Ninth Street bridge, *Mile 68.6*, Ocean City; thence 4½ feet to Townsend Inlet, *Mile 82.2;* thence 3½ feet to Rio Grande Avenue bridge, *Mile 94.4*, Wildwood; and thence 9 feet to Cape May Inlet, *Mile 97.7*.

The Bureau of Navigation, State of New Jersey, does considerable maintenance work along the waterway. Information on channel conditions can be obtained from the Bureau office at 1060 Broad Street, Newark 2, New Jersey.

Aids to navigation.—The Coast Guard maintains the aids to navigation that mark the inlets, and the State of New Jersey maintains those that mark the Intracoastal Waterway and the side channels. The New Jersey Intracoastal Waterway aids are similar to those used by the Coast Guard to mark the Intracoastal Waterway southward from Norfolk. The New Jersey aids are numbered from Manasquan Inlet south to

Absecon Inlet, where a new series begins and continues south to Cape May Harbor; the aids that mark the side channels are numbered proceeding from the main channel. The channels through the wider bays are marked by barrel buoys from April through October and by spar buoys the rest of the year. The channels in narrow waterways are marked by cedar stakes, which are renewed, when necessary, in March or April; north of Atlantic City the stakes are subject to ice damage during severe winters. The State lights between Manasquan Inlet and Hereford Inlet operate from April through October; the lights south of Hereford Inlet operate the year around.

Bridges.—All bridges crossing the New Jersey Intracoastal Waterway have draw openings. The minimum horizontal clearance of 34 feet is at the three railroad bridges that cross to Atlantic City at *Mile 58.3*. Staff gages at each bridge indicate the vertical clearances under the closed drawspan at all stages of the tide. Vertical clearances given in this Coast Pilot and on the charts are for closed positions at high water. Bridge regulations follow.

§ 203.220 New Jersey Intracoastal Waterway and tributaries; bridges. (a) The New Jersey Intracoastal Waterway referred to in this section is defined as that waterway extending through the bays and thoroughfares on the eastern coast of New Jersey from Manasquan Inlet on the north to Cape May on the south, including Cape May Canal to Delaware Bay.

(b) When drawbridges are less than 1,000 feet apart they shall, for the purposes of this section, be considered and operated as a unit. The owners thereof shall provide and install, for uninterrupted service, systems of electric signals on their respective bridges, so connected that the operator of any bridge of the group may thereby simultaneously notify, by signal, the operators of all the other drawbridges of that group of the desire of the master of any vessel or other watercraft to pass through the draws. The operator of the bridge first in any group of bridges to be passed by an approaching vessel or other watercraft shall be responsible for observing the approach of such vessel or other watercraft toward that bridge, also for receiving the signal or notice for passing and for communicating, by means of the electric signals prescribed above, to the operators of the other bridges composing such group the purpose of such vessel or other watercraft to pass.

(c) Whenever any vessel or watercraft approaches a bridge affected by this section, and under which it cannot pass, the lawful signal of the desire of the master of the vessel or craft to pass through the draw opening shall be three blasts of a whistle or horn blown on the vessel or craft. These drawbridges shall not be required to open for craft carrying appurtenances unessential for navigation which extend above the normal superstructure. Upon request, the district engineer in charge of the locality will cause inspection to be made of the superstructure and appurtenances of any craft habitually frequenting those waterways, with a view to adjusting any differences of opinion in this matter between the vessel owner and the bridge owner.

(d) The draws in each and every bridge or group of bridges shall, upon the signal prescribed in paragraph (c) of this section, be promptly opened at any and all hours of the day or night, except as provided in paragraph (m) of this section for the passage of any vessel, vessels, or other watercraft unable to pass safely underneath the draw when closed. For bridges crossing the New Jersey Intracoastal Waterway, failure of the draws to be fully opened within 4 minutes from the signal to open shall be considered a violation of the requirement for prompt opening.

(e) If a car, train of cars, or other vehicle is, at the time of receiving the signal prescribed in paragraph (c) of this section, approaching any draw so closely that it cannot be safely stopped before reaching such draw, two blasts of a whistle or horn shall be blown on the bridge. As soon thereafter as such draw shall be cleared, such draw or all draws comprised in any group of bridges concerned shall be promptly opened, and three blasts of a whistle or horn blown on the bridge to indicate such clearance.

(f) After the draw or draws of any bridge or group of bridges shall have remained open for a period of 10 minutes or for such shorter period as may be necessary for the passage of vessels or other watercraft waiting to pass, the draw or draws may be closed for the crossing of cars, trains, vehicles, or individuals, if any be waiting to cross. After being so closed for a period of 10 minutes or for for such shorter times as may be necessary, the draw or draws shall be again promptly opened for the passage of vessels or other watercraft, if there be any desiring to pass.

(g) No vehicle, car, locomotive, or train shall be stopped on the drawspan of any bridge subject to this section; nor shall any such bridges carrying railway or tramway tracks be used for switching purposes, except those bridges for which special regulations are prescribed in paragraph (m) of this section; nor shall locomotives or trains be stopped in bridge blocks of railroad bridges in such manner as to hinder or delay the operation of any draw, except in cases of urgent necessity. Vessels shall not be so moored nor maneuvered as to delay or hinder unnecessarily closing the draw of any bridge. All passages of vessels and other watercraft through or under the drawbridges and all passage of cars, locomotives, trains, and other vehicles over drawbridges shall be prompt and as rapid as practicable in order to avoid unnecessary delay to either land or water traffic.

(h) The owner or owners of each and every drawbridge covered by this section shall maintain in good and serviceable order the drawspan, together with the machinery and appliances required for operating the same, and the electric signal system prescribed in paragraph (b) of this section; shall provide such number of draw operators or tenders as may be found necessary to open and close the draws promptly; and shall also provide and maintain in good order on the bridge piers or fenders such fixtures as may be necessary for vessels to moor or make fast while waiting for the drawspan to be opened.

(i) The length of time that a draw has been opened shall be computed from the time that the drawspan begins to move in opening, and the length of time that a draw has been closed shall be computed from the time that the drawspan ceases to move in closing.

(j) At each opening of a draw full horizontal and vertical clearances shall be provided, regardless of the size or requirements of the passing vessel or other watercraft.

(k) The owner or owners of each and every bridge covered by this section shall provide and maintain in good legible condition two board gauges, with figures not less than 6 inches high, the figures painted black on a white background, or vice versa, to indicate the vertical clearance under the closed drawspan at all stages of the tide. The gauges shall be so placed on the ends of the drawspan fender that they shall be plainly visible to the master of a vessel or other watercraft approaching such bridge either up-stream or down-stream.

(l) The owner or owners of each and every bridge covered by this section shall cause to be kept a complete record of all openings of the draw and shall promptly report to the district engineer of the United States in charge of the river and harbor improvements in that vicinity all cases in which the drawspan has been required to remain open for an unreasonable length of time or to remain closed for more than 10 minutes after the prescribed signal to open the draw has been given.

(m) The provisions of paragraph (d) of this section shall be applicable to the bridges of the Pennsylvania-Reading Seashore Lines, over Beach Thorofare at Atlantic City, N. J., only between the hours of 11 p. m. and 6 a. m. daily. Between the hours of 6 a. m. and 11 p. m. these bridges shall be opened upon signal from any vessel or craft desiring to pass at any time during the periods from 20 to 30 minutes past each hour, but may remain closed during such periods if no vessel or craft give such signal: *Provided*, That when once opened for the passage of any vessel or craft said bridges shall remain opened sufficiently long to permit the passage of all vessels or craft which may be engaged in passing or which may be presenting itself for passage. Between such hours (6 a. m. and 11 p. m.) these bridges shall not be opened except as provided for in this paragraph.

Tides.—In the inland waters, the tides are greatly affected by the winds both in time and height, westerly winds producing low water and easterly winds high water. In Barnegat Bay, northerly and southerly winds drive the water to the ends of the bay. While the normal range of tide is only about ½ foot in sections of the waterway removed from the inlets, strong winds of long duration may cause variations in level of as much as 3 feet below mean low water or 3 feet above mean high water. Near the inlets the wind has less effect and the normal range of tide is 3 to 4 feet. Tidal differences, by means of which daily predicted times and heights of high and low waters may be obtained for numerous places in the Intracoastal Waterway, are included in the *Tide Tables* published annually by the Coast and Geodetic Survey.

Currents.—Current velocities may reach 3 knots in the inlets and in the narrow channels that connect the inlets with the inside waters. The *Current Tables* give information for a number of locations in the area where current observations have been made.

Ice.—The inside waters are completely closed to navigation by ice during extreme winters. In ordinary winters, some of the channels, especially near the inlets where the currents are strong, remain open most of the time, though ice always forms on the flats. The inlets themselves are rarely closed, but passage is often difficult because of running ice. All the principal inlets and adjacent channels are used in winter by local fishing boats, but through navigation is usually blocked.

Facilities.—At communities along or adjacent to the waterway are numerous piers, wharves, and docks, many of which are open to general public use, and fuel, water, and other supplies are readily available. Public and privately owned boat basins are located in a number of streams entering the bays and thorofares through which the waterway passes. Boat repair and storage yards with marine railways are also scattered along the waterway. Facilities for icing, storing, and shipping food fish are available at most of the larger communities.

Chart 824; New York Bay to Manasquan Inlet.—This addition to the Intracoastal Waterway series of charts covers the outside run along the coast in the approach to the waterway from the north. All features along this part of the coast have been described in Chapter 4 in connection with the standard coastal charts.

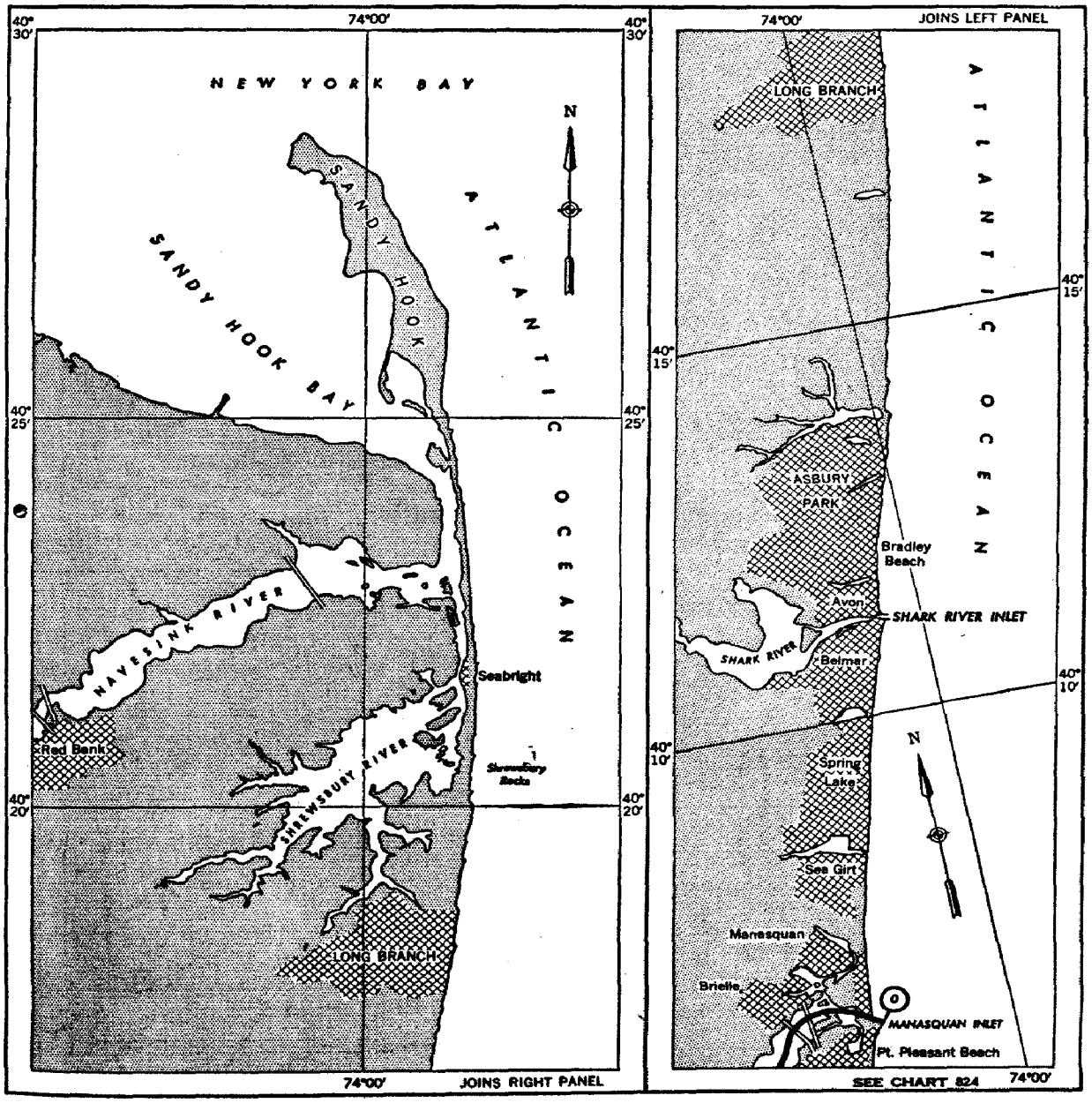
Chart 825; Manasquan Inlet to Little Egg Harbor.—**Manasquan Inlet,** 22 miles southward of Sandy Hook Light, is the northern terminus of the New Jersey Intracoastal Waterway. **Manasquan,** on the north side of the inlet, and **Point Pleasant Beach,** on the south side, have large summer colonies. The inlet and Manasquan River as far as the railroad bridge at Brielle have been described in Chapter 4.

Manasquan River has a very large traffic of pleasure and commercial fishing craft, and considerable berthage space is available. In hurricane weather, boats usually go south to Bay Head for better protection.

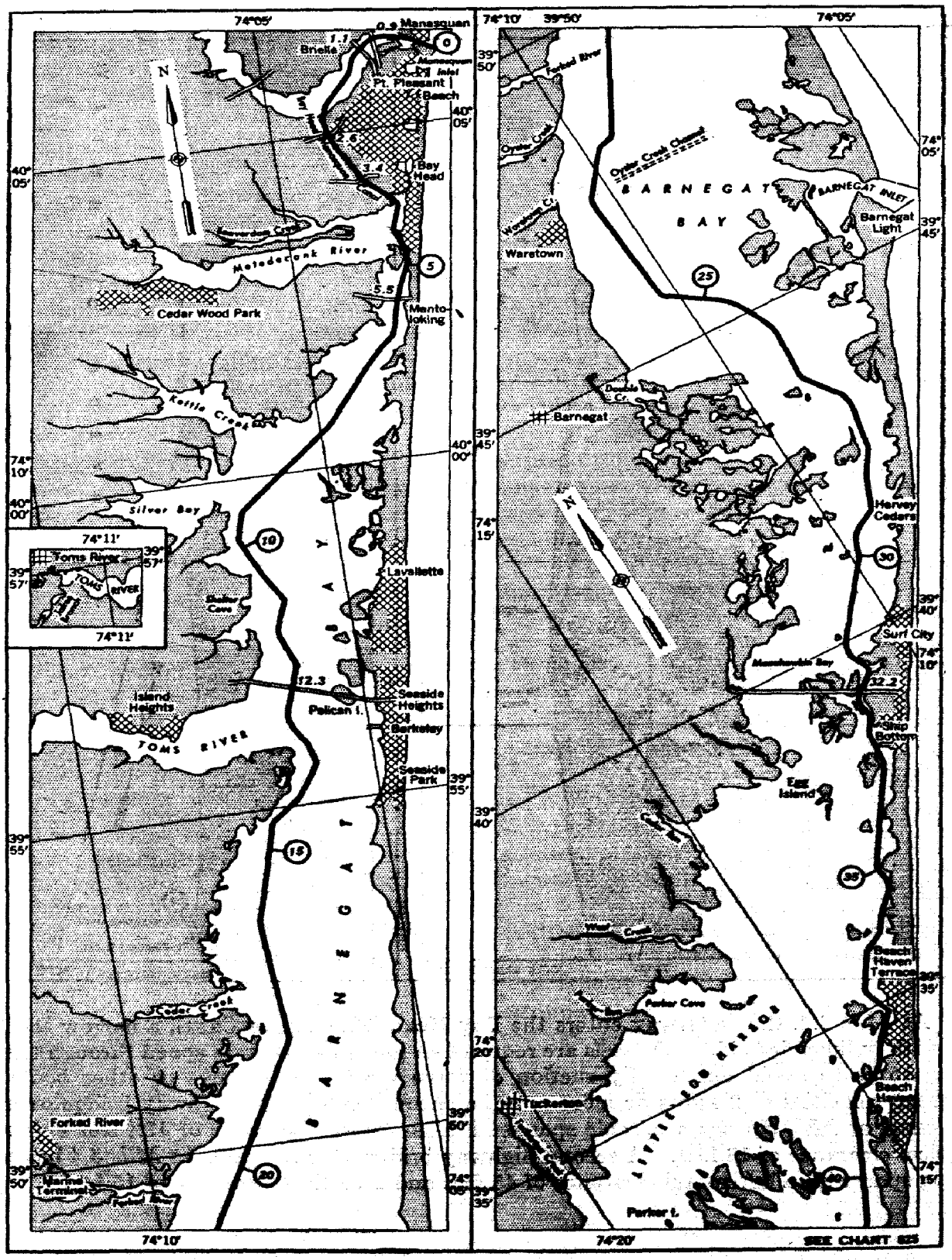
The New York and Long Branch Railroad bridge over Manasquan River at *Mile 0.9* has a bascule span with a horizontal clearance of 47½ feet and a vertical clearance of 3 feet. The highway bridge at *Mile 1.1* has a bascule span with a horizontal clearance of 90 feet and a vertical clearance of 36 feet; the overhead cable on the southwest side of the bridge has a vertical clearance of 107 feet

Brielle is a town at *Mile 1.0* on the north side of Manasquan River. Gasoline, Diesel oil, water, ice, provisions, and some ship chandlery can be obtained at the Brielle basin on the west side of the railroad bridge. A marine railway at the basin can haul out boats up to 60 feet in length and has a machine shop equipped to repair gasoline and Diesel engines. Other railways along the river handle smaller craft and have limited quantities of supplies available. A yacht club is just east of the railroad bridge.

The waterway follows a dredged channel southwestward in Manasquan River from the railroad bridge to the north end of the Bay Head-Manasquan Canal. The dredged channel that extends northwestward in the river from the canal has been discussed in Chapter 4.



At *Mile 2.3*, the waterway enters the **Bay Head-Manasquan Canal,** a narrow land cut with bulkheaded sides. Vessels are required to navigate at a safe **speed** through the canal so as to avoid damage by suction or wave wash to structures or other boats. **Current** velocities of 2 knots or more may be encountered. The highway bridge over the canal at *Mile 2.6* has a bascule span with a horizontal clearance of 47½ feet and a vertical clearance of 13 feet. A second highway bridge over the canal at *Mile 3.4* has a swing span with a horizontal clearance of 45 feet and a vertical clearance of 15 feet.


74°05'
Manasquan
Brielle
Manasquan Inlet
Pt. Pleasant Beach
Bay Head
Metedecunk River
Cedar Wood Park
Mantoloking
Kettle Creek
Silver Bay
Toms River
TOMS RIVER
Lavallette
Island Heights
Pelican I.
Seaside Heights
Berkeley
Seaside Park
BARNEGAT BAY
Cedar Creek
Forked River
Marine Terminal
74°10'
74°11'
39°50'
74°05'
Forked River
Oyster Creek
Oyster Creek Channel
BARNEGAT BAY
BARNEGAT INLET
Barnegat Light
Waretown
Barnegat
Double Cr.
Hervey Cedars
Surf City
Manahawkin Bay
Ship Bottom
Egg Island
West Creek
Beach Haven Terrace
Parker Cove
Beach Haven
Tuckerton
Parker I.
74°20'
SEE CHART 825

From *Mile 3.9* at the south end of the canal the route of the waterway is through **Barnegat Bay,** which has a north-south length of about 25 miles. The western half of the bay has general depths of 5 to 10 feet; the eastern half is mostly extensive flats. The usual draft of boats seen in the bay is 2 to 5 feet.

Bay Head, at the north end of Barnegat Bay and at *Mile 4.0* on the east side of the waterway, is a summer resort with a large year-round settlement. Many boats use the well-sheltered harbor. The public dock has berthing space for more than 100 boats, and other large berthing areas are available for transients. A yacht club is on the north side of the harbor.

Gasoline, Diesel oil, water, ice, provisions, and ship chandlery can be obtained at Bay Head. The harbor has several boatyards where repairs of all kinds can be made. The largest marine railway can haul out boats up to 90 feet in length, 7 feet in draft, and 100 tons in weight. The mean range of **tide** at Bay Head is about ½ foot. **Storm warnings** are displayed, daytime only, at the Dale Yacht Basin.

Beaverdam Creek empties into the west side of Barnegat Bay at *Mile 4.2*. The controlling depth into the creek is about 4 feet. A highway bridge about 0.4 mile above the mouth of the creek has a swing span with a horizontal clearance of 40 feet and a vertical clearance of 14 feet. A marine railway on the south side just west of the bridge can haul out boats up to 50 feet in length and 15 tons in weight. Gasoline, water, ice, and ship chandlery can be obtained at the railway. The machine shop at the railway is equipped to make repairs on Diesel and gasoline engines.

Metedeconk River, separated from Beaverdam Creek by **Wardells Neck,** flows eastward into Barnegat Bay opposite *Mile 4.5*. The best approach to the river from the waterway appears to be from *Mile 4.2*, the same as for Beaverdam Creek. The controlling depth into the river is the same as for the creek; depths above the mouth of the river are 5 to 8 feet.

The highway bridge over Barnegat Bay at *Mile 5.5* has a bascule span with a horizontal clearance of 51 feet and a vertical clearance of 14 feet. Just south of the bridge is **Mantoloking,** a summer resort on the barrier beach east of *Mile 5.7*.

A public pier at Mantoloking has depths of about 4 feet at the outer end. Supplies are available in the town. A yacht club is just south of the bridge. A marine railway at the resort can haul out boats up to 30 feet in length and 3 feet in draft. At the west end of the highway bridge is a marine railway that can handle boats up to 65 feet in length and 35 tons in weight for hull and engine repairs; gasoline, water, ice, and marine supplies are available.

Kettle Creek flows southeastward into Barnegat Bay opposite *Mile 8.7*. The creek has depths of about 4 feet as far as the forks 1.4 miles above the mouth. A marine railway on **South Kettle Creek,** the southerly of the two forks, can haul out boats up to 40 feet in length.

Shelter Cove, on the west side of Barnegat Bay opposite *Mile 10.7*, has a landlocked yacht basin with boat slips, a gasoline pier, and a restaurant. The channel into the basin has a depth of about 5 feet.

Lavallette is a small summer resort on the barrier beach east of *Mile 10.7*. A channel, dredged to 6 feet, extends along the bay shore from Lavallette to Seaside Heights. A yacht club is at the north end of Lavallette, and a marine basin is at the south end. The marine railway in the basin can handle boats up to 45 feet in length;

gasoline and water are available in the basin, and ice, provisions, and other supplies can be obtained from nearby stores.

The highway bridge over Barnegat Bay at *Mile 12.3* has a bascule span with a horizontal clearance of 80 feet and a vertical clearance of 32 feet. **Pelican Island,** crossed by the eastern part of the bridge, has a thickly populated permanent settlement. A marine railway on the island can haul out boats up to 35 feet in length and 4 feet in draft. Gasoline, water, ice, and some marine supplies are available. **Seaside Heights** is a summer resort on the beach at the east end of the bridge; the public pier at the resort has depths of about 7 feet at its face.

Toms River, the most important tributary of Barnegat Bay, empties into the bay from westward at *Mile 12.7*. A Federal project provides for a channel 12 feet deep and 100 feet wide from the Intracoastal Waterway to the fixed highway bridge over **Jakes Branch,** which extends southward at the town of Toms River, including a turning basin, and a channel 5 feet deep the full width of the river to the fixed highway bridge over it at the town. The controlling depth to the town is about 3 feet. The mean range of **tide** is about ½ foot in the river and the extreme range is about 1¾ feet.

Island Heights is a town on the high wooded point on the north side of Toms River 1.7 miles above the mouth. A public pier at the town has depths of about 5 feet at its face. Gasoline is available at the pier, and some supplies can be obtained in the town. The largest marine railway at Island Heights can haul out boats up to 45 feet in length and 3 feet in draft. Marine supplies and water are available at the boatyards. Depths at the yards are 2 to 3 feet.

The town of **Toms River,** 4 miles above Barnegat Bay, is at the head of navigation in the river. The town bulkheads along the river and Jakes Branch provide public berthage. A yacht club at Toms River also provides berthage the year around. There are three boatyards with facilities for overhauling boats up to 50 feet in length. Gasoline, Diesel oil, and marine supplies are available at the yards.

Seaside Park, on the beach east of *Mile 13.9*, has a public wharf and a yacht-club wharf with depths of about 4 feet at their outer ends. A marine railway at the town can accommodate boats up to 48 feet in length; the machine shop is equipped to make repairs on gasoline and Diesel engines. Gasoline, water, ice, and some marine supplies are available.

Cedar Creek, which empties into Barnegat Bay west of *Mile 17.2*, has depths of 2 to 3 feet. There is a public pier on the south side of the creek but the water at the face is very shallow. A marine railway on the north side of the creek can haul out boats up to 30 feet in length. Gasoline, water, and some marine supplies are obtainable at **Lanoka Harbor,** a town at the head of navigation 1.4 miles above the mouth of the creek.

On the west side of Barnegat Bay opposite *Mile 18.6* is the north end of a **measured statute mile.** The rear ranges are on shore. The front ranges are black and yellow piles in depths of about 7 feet with square white signs that read, "State of New Jersey, Bureau of Navigation, North (South) end of Measured Mile."

Forked River, on the west side of Barnegat Bay opposite *Mile 20.4*, has a controlling depth of about 6 feet from the bay to the head of navigation at the town of **Forked River,** 1.7 miles above the mouth. The river forks into three branches about halfway between the mouth and the town, which is on the north side of **North Branch.**

On the opposite side of North Branch from Forked River is **Marine Terminal,** which is maintained by the State of New Jersey. The terminal has considerable berth-

age space and can accommodate about 100 boats. Depths in the basin are 6 to 10 feet. Boats up to 100 feet in length lie alongside the wharf. The water in the basin is brackish. Gasoline, water, ice, and some marine supplies are available at the terminal and in the town of Forked River.

There is also a public dock on the Forked River side of North Branch, but the slips usually are all leased to permanent residents. When slips are vacant, transient vessels may tie up overnight without charge. Depths at the outer ends of the slips are 3 to 4 feet.

The several boatyards along Forked River all have marine railways. The largest railway can handle boats up to 60 feet in length and 30 tons in weight.

Oyster Creek is on the west side of Barnegat Bay opposite *Mile 21.5*. A New Jersey project provides for a channel 5 feet deep and 80 feet wide between similar depths in Barnegat Bay and the upper part of Oyster Creek; dredging was to be completed in July 1953. Two boatyards near the head of navigation a mile above the mouth of the creek have railways that can haul out boats up to 40 feet in length and 4 feet in draft. Gasoline is obtainable.

At *Mile 22.6*, **Oyster Creek Channel** leads eastward from the waterway to **Barnegat Inlet.** The channel, the inlet, and the town of **Barnegat Light** have been described in Chapter 4.

Waretown Creek, west of *Mile 22.6*, is a sheltered basin which is said to have a controlling depth of about 6 feet. Gasoline and water are available at the public wharf, which has a face about 200 feet long.

Waretown, just south of Waretown Creek, is opposite *Mile 22.9*. Gasoline, water, ice, and some marine supplies are available at the town. A marine railway at Waretown can haul out boats up to 42 feet in length and 15 tons in weight; machine shops at the railway and in the vicinity are equipped to make repairs on gasoline engines. On the south side of Waretown is a dredged slip about 0.3 mile long that is said to have a controlling depth of 4 feet in the entrance.

Double Creek, southwest of *Mile 24.5*, is protected on the north side of its entrance by a jetty which has a light on its outer end. The controlling depth in the channel from the bay to the fixed highway bridge 0.7 mile above the entrance is about 4 feet. The bridge has a horizontal clearance of 18½ feet and a vertical clearance of 6 feet. The creek is shallow above the bridge. Gasoline and fresh water are available at the public wharf, and provisions can be obtained in limited quantities.

Harvey Cedars is a summer resort on the barrier beach opposite *Mile 29.3*. The public wharf has a depth of about 2 feet at its face. Gasoline and some supplies can be obtained at the resort.

The highway bridge over **Manahawkin Bay** and the large group of marshy islands on its eastern side crosses the waterway at *Mile 32.2;* the bridge has a single-leaf bascule span with a horizontal clearance of 51 feet and a vertical clearance of 8 feet at the waterway. The waterway passes between the barrier beach and the islands. Westward of the islands Manahawkin Bay has general depths of 1 to 2 feet, but a depth of 5 feet can be carried from southward nearly to the bridge through a narrow unmarked channel.

Shipbottom, south of the highway bridge, is on the barrier beach opposite *Mile 33.1*. About 0.7 mile south of the bridge a marked dredged channel, with a controlling depth of about 5 feet, leads eastward to a yacht basin where berthage is available. Gasoline, water, ice, and marine supplies can be obtained in the basin. Diesel oil may be ordered,

and provisions are available in the town. The marine railway in the basin can handle boats up to 40 feet in length and 5 feet in draft. Just south of the basin is another marine railway that can haul out boats up to 50 feet in length and 5 feet in draft.

The waters between Manahawkin Bay and Little Egg Harbor are mostly shallow. The route of the Intracoastal Waterway is along the inner side of the barrier beach. **Cedar Run,** 2.4 miles northwest of *Mile 35.0*, has a controlling depth of about 2 feet for about a mile from the mouth. The controlling depth from Cedar Run to the natural channel leading southward probably does not exceed 1½ feet.

West Creek, 2.1 miles northwest of *Mile 36.2*, has depths ranging from about 2 feet at the mouth to 1 foot at the public landing and oyster wharves 2.4 miles upstream. A marine railway at the yacht club on the southwest side of the mouth can haul out boats up to 35 feet in length.

Beach Haven Terrace is on the barrier beach opposite *Mile 36.7*. Gasoline, water, ice, and some marine supplies are available at the fuel dock, which has a depth of about 4½ feet at the face. A marine railway at the dock can haul out boats up to 32 feet in length.

Little Egg Harbor has general depths of 4 to 6 feet in its northwestern part and is thick with oyster stakes. In the southern part of the harbor is a large group of marshy islands surrounded by a shoal area with depths of 1 to 3 feet. Between some of these islands are narrow unmarked channels which begin and end abruptly in the shoal area. The Intracoastal Waterway continues southward along the southeast side of the harbor.

Parker Cove is at the northern end of Little Egg Harbor and about 3 miles northwest of *Mile 37.0*. **Parker Run,** which empties into the northwest corner of the cove, has a public dock on the north side about 0.3 mile above the mouth. The controlling depth to the dock is about 4 feet. Improved berthage space is available at the dock, and gasoline and lubricating oil can be obtained.

Beach Haven, a town on the southeasterly side of Little Egg Harbor, is on the barrier beach opposite *Mile 38.8*. The town has a public dock and two yacht clubs. Controlling depths from the waterway to the principal docks are 5 to 6 feet. Fuel, water, ice, provisions, and other supplies are available.

A dredged basin just south of the stack in the northeastern part of Beach Haven has a marine railway that can haul out boats up to 50 feet in length and 40 tons in weight; the machine shop on the premises can make repairs to gasoline and Diesel engines. There is 3 feet of water at the ways at low tide. The fuel dock in the basin has considerable berthage space in depths up to 8 feet. Gasoline, Diesel oil, water, ice, and some ship chandlery are available on the dock.

Tuckerton Creek empties into the west side of Little Egg Harbor about 4 miles northwest of *Mile 40.0*. The creek is very narrow and crooked, and the bottom is soft. In 1950, the creek had depths of 3½ feet to **Scow Landing,** 1.6 miles above the mouth, and thence 2 feet to the mill dam at **Tuckerton,** 1.8 miles above the mouth.

A New Jersey project provides for an approach channel 6 feet deep and 80 feet wide from **Story Island Channel** near the north end of the island to the mouth of Tuckerton Creek, a distance of about 1.6 miles. Dredging was to be completed and new aids established by July 1953.

The mean range of **tide** is about 2½ feet throughout the Tuckerton Creek channel; the extreme range is from about 1 foot below mean low water to 1 foot above mean high water. Cross **currents** may be experienced in the approach channel. A **speed limit**

of 8 statute miles per hour is prescribed for Tuckerton Creek channel by § **207.70,** Chapter 2A.

Gasoline, water, ice, provisions, and marine supplies are available along Tuckerton Creek. Boats up to 40 feet in length can be hauled out locally and machine repairs can be made. The yacht club near the mouth of the creek provides mooring space and has gasoline, water, and ice.

Chart 826; Little Egg Harbor to Longport.—Tucker Island, just east of *Mile 42.5*, separates **Beachhaven Inlet** from **Little Egg Inlet,** whose channel centers at *Mile 43.5;* all three have been discussed in Chapter 4. **Marshelder Channel** trends northwestward from the vicinity of Tucker Island, passes around the southwest side of **Story Island,** and connects with Story Island Channel and the dredged channel to Tuckerton Creek.

Several thoroughfares lead from Little Egg Harbor to Great Bay, on the southwest. **Big Thorofare,** at the southwest corner of Little Egg Harbor, is used by small local boats but has a controlling depth of only about 1 foot and should not be used by strangers. **Big Sheepshead Creek,** leaving Marshelder Channel about 0.7 mile north of Tucker Island and extending westward to the bay, is shallow and little used. **Little Sheepshead Creek,** extending westward from opposite Tucker Island, has a controlling depth of about 4 feet and is used extensively. The fixed highway bridge over Little Sheepshead Creek has a horizontal clearance of 18 feet and a vertical clearance of 14 feet.

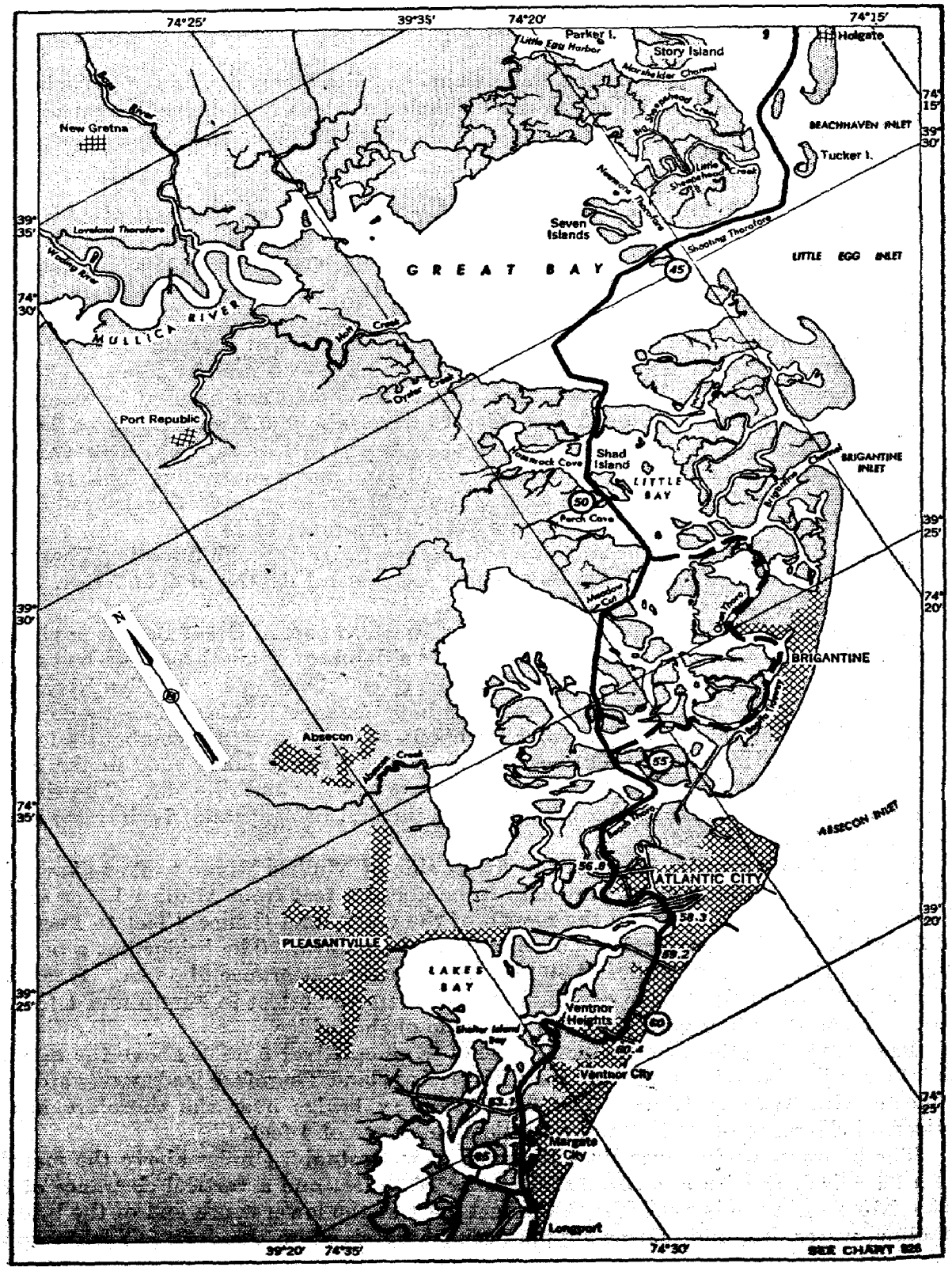
From Little Egg Inlet, the waterway passes westward through **Shooting Thorofare** and along the south side of **Great Bay,** which has general depths of 4 to 7 feet. The middle of the bay is about opposite *Mile 46.0.*

Mullica River, which empties into the northwestern part of Great Bay, is navigable for about 20 miles to a mill dam. At low water a depth of about 4 feet can be carried across the flats of Great Bay to the mouth of the river. Once inside Mullica River, the water is deep and the mid-channel is clear for a long distance. It is said that a depth of about 9 feet can be taken at high water for about 16 miles, and thence about 4 feet at high water to the mill dam. The navigation of the river is fairly easy in the lower reaches, but the last few miles to the mill dam are shallow and difficult. The river is marked by lights and stake daybeacons as far as the first bridge; stake daybeacons mark the reaches above the bridge.

Nacote Creek empties into the southwest side of Mullica River 4 miles above the mouth. The controlling depths are said to be about 4 feet from Mullica River to the highway bridge 1.6 miles above the mouth of the creek, and thence 3 feet to **Port Republic,** at the head of navigation 3.6 miles from the mouth. The bridge has a bascule span with a horizontal clearance of 30 feet and a vertical clearance of 5 feet. A marine railway just east of the bridge can haul out boats up to 36 feet in length and 4 feet in draft. A boat-building yard is on the west side of the bridge.

Bass River empties into the north side of Mullica River 5 miles above the mouth. About 0.5 mile above the mouth of Bass River, **Loveland Thorofare** leads westward and connects with Wading River. The fixed highway bridge over the thorofare has a horizontal clearance of 16 feet and a vertical clearance of 4 feet.

The highway bridge over Bass River at **New Gretna,** 2.4 miles above the mouth has a bascule span with a horizontal clearance of 30 feet and a vertical clearance of 9½ feet. Mooring space is available at the fuel dock at the lower south end of the bridge. Gasoline, water, ice, and marine supplies can be obtained on the dock. Yachts up to


74°25'
39°35'
74°20'
74°15'
Parker I.
Little Egg Harbor
Story Island
Holgate
Marshelder Channel
New Gretna
BEACHHAVEN INLET
Tucker I.
Little Sheepshead Creek
Seven Islands
Shooting Thorofare
GREAT BAY
LITTLE EGG INLET
Loveland Thorofare
Wading River
MULLICA RIVER
Port Republic
Shad Island
LITTLE BAY
BRIGANTINE INLET
Perch Cove
BRIGANTINE
Absecon
ABSECON INLET
ATLANTIC CITY
PLEASANTVILLE
LAKES BAY
Ventnor Heights
Ventnor City
Margate City
Longport
39°20'
74°35'
74°30'
SEE CHART 826

60 feet in length and 4 feet in draft can be hauled out for repairs locally, and a fully-equipped machine shop is available.

The highway bridge 6.5 miles above the mouth of Mullica River has a bascule span with a horizontal clearance of 50 feet and a vertical clearance of 4 feet; the 66,000-volt overhead transmission line about 400 feet above the bridge has a minimum vertical clearance of 67 feet. On the west side about 0.5 mile below the bridge are the piers and railways of a boatyard.

Wading River, which empties into the north side of Mullica River 7.5 miles above the mouth, is said to have deep water for several miles. The highway bridge 4 miles above the mouth of Wading River has a bascule span with a horizontal clearance of 30 feet and a vertical clearance of 5 feet.

The highway bridge 13 miles above the mouth of Mullica River has a bascule span with a horizontal clearance of 30 feet and a vertical clearance of 6½ feet. The highway bridge 16 miles above the mouth has a bascule span with a horizontal clearance of 30 feet and vertical clearance of 5½ feet.

Mott Creek, on the west side of Great Bay, is reported to have depths of about 3 feet to a bulkhead landing 1.5 miles above the mouth. Gasoline, water, ice, and provisions are available at the landing.

Oyster Creek empties into the west side of Great Bay about 0.7 mile south of Mott Creek. Depths are about 4 feet from the bay to the small fishing village of **Oyster Creek,** 0.3 mile above the mouth, and 0.2 mile beyond to a public landing where gasoline, water, and ice are available. A marine railway at the landing can haul out boats up to 10 tons in weight.

The Intracoastal Waterway leaves Great Bay at *Mile 48.3* and follows **Main Marsh Thorofare** to **Little Bay,** which is entered at *Mile 49.0.* The route follows the western side of Little Bay across the mouths of **Hammock Cove** and **Perch Cove** and westward of **Shad Island.**

At *Mile 51.1* an alternate route swings eastward in **Brigantine Channel,** which leads to **Brigantine Inlet,** discussed in Chapter 4. About 1.3 miles along the channel, the alternate route turns southward and follows **Obes Thorofare** along the inner side of the city of **Brigantine** for 2.3 miles to a cove where good berthage is available. The cove is a good harbor of refuge during a storm, and gasoline, water, and ice can be obtained in the vicinity.

From the cove at Brigantine the alternate route follows **Bonita Tideway** along the city water front, then swings westward through **Golden Hammock Thorofare** and rejoins the main route at *Mile 54.3.* The total length of the alternate route is 7 miles. Fairly deep water is found in the main part of Brigantine Channel and in the thorofares along the inner side of Brigantine, but the channels shoal as they near the main route and can be navigated only by very shallow drafts.

Returning to the main route, the waterway leaves Little Bay at *Mile 51.1* and continues along the northwestern side of **Grassy Bay,** a shoal area mostly bare at low water, to **Meadow Cut.** From this short land cut the route follows the southeastern side of **Reed Bay** to and through **Gull Island Thorofare,** across the mouth of **Broad Creek,** through **Middle Thorofare,** where it is rejoined by the alternate route from Brigantine, and into Absecon Chnanel at *Mile 54.7.*

Absecon Channel extends southeastward to **Absecon Inlet** and northwestward to Absecon Bay. The inlet and the lower part of the channel have been described in Chapter 4. The route of the waterway follows Absecon Channel southeastward to *Mile 55.3*, then turns sharply westward into **Beach Thorofare.**

From the chart, it appears that passage can be made northwestward in Absecon Channel from *Mile 54.7*, but a better approach would seem to be from *Mile 55.5* in Beach Thorofare, northward through **Point Bar Thorofare,** thence along Absecon Channel to the beginning of the dredged cut across Absecon Bay, a total distance of 2 miles.

Absecon Bay is shallow and bares in some places at low water. **Absecon Creek** empties into the northwest side of the bay. A Federal project provides for a channel 5 feet deep and 80 feet wide across the flats in Absecon Bay from deep water at the head of Absecon Channel to the mouth of the creek, a distance of about 1 mile; and thence 5 feet deep and 50 feet wide in the creek to the highway bridge at **Absecon,** a farther distance of 1.8 miles. The controlling depth to Absecon is about 2 feet.

The mean range of **tide** at the mouth of Absecon Creek is 3½ feet; the extreme range is from 1 foot below mean low water to 1 foot above mean high water. There are several wharves and landings along Absecon Creek. A marine railway at Absecon can haul out boats up to 45 feet in length and 4 feet in draft. Marine supplies are available in the town.

The Intracoastal Waterway follows Beach Thorofare along the northwest side of **Atlantic City.** The highway bridge over Beach Thorofare at *Mile 56.8* has a bascule span with a horizontal clearance of 60 feet and a vertical clearance of 20 feet.

The three railway bridges over Beach Thorofare at *Mile 58.3* have swing spans with minimum clearances of 34 feet horizontally and 2 feet vertically. **Particular attention** is called to regulations for opening these and other bridges over the Intracoastal Waterway; see **§ 203.220** at the beginning of this chapter. The bridges open simultaneously on signal and it is advisable to wait until all are open before beginning passage. Boat operators have reported that these bridges are hazards to navigation.

The route of the waterway leaves Beach Thorofare at *Mile 58.7* and continues along the inner side of Atlantic City by way of **Inside Thorofare.** There are numerous wharves and boathouses along Beach and Inside Thorofares; many of them are in poor condition and mariners should use caution when in their immediate vicinity.

The Albany Avenue, Atlantic City, bridge over Inside Thorofare at *Mile 59.2* has a double-leaf bascule span with a horizontal clearance of 50 feet and a vertical clearance of 10 feet. On the southwest side of the bridge is a fuel dock where gasoline, water, and ice can be obtained.

The highway bridge over the waterway at *Mile 60.4* connects **Ventnor Heights,** on the northwest side, with **Ventnor City,** on the beach; the bridge has a double-leaf bascule span with a horizontal clearance of 50 feet and a vertical clearance of 9 feet. A boatyard just south of the bridge has a marine railway that can haul out boats up to 40 feet in length; all kinds of engine and hull repairs can be made. Gasoline and Diesel oil can be delivered by truck, and marine supplies can be obtained ashore.

The waterway turns sharply northwestward southwest of the bridge and follows **West Canal** along the southwest side of Ventnor Heights to *Mile 61.5*, where it rejoins Beach Thorofare and continues southwestward.

At *Mile 62.5*, southwest of **Shelter Island,** a marked channel with a controlling depth of about 5 feet leads northward along the eastern shores of **Shelter Island Bay** and **Lakes Bay** to **West Atlantic City,** 2.2 miles from the waterway; thence along the north shore of Lakes Bay to the yacht basin and municipal docks at **Pleasantville,** 3.4 miles from the waterway. Gasoline, water, and ice are available at the Pleasantville basin.

The highway bridge over Beach Thorofare at *Mile 63.1* has a bascule span with a horizontal clearance of 61 feet and a vertical clearance of 14 feet. The bridge connects the mainland with the northeastern end of **Margate City,** on the beach. In Margate City, the first of two basins south of the highway bridge has a boatyard with a crane capable of handling boats up to 38 feet in length and 15 tons in weight. Berthage is available in both basins, and gasoline, water, ice, and marine supplies can be obtained.

At ***Mile 63.5,*** an ***alternate route*** makes off to southward and follows the water fronts of Margate City and Longport. The highway bridge over the alternate route 1.2 miles from the junction has a bascule span with a horizontal clearance of 45 feet and a vertical clearance of 9 feet.

Longport is a city on the beach at the eastern end of the highway bridge. Just south of the bridge is a yard with a marine railway that can handle boats up to 48 feet in length and 15 tons in weight; repairs can be made to gasoline and Diesel engines. Gasoline, water, ice, and some marine supplies can be obtained at the yard; provisions are available in the city.

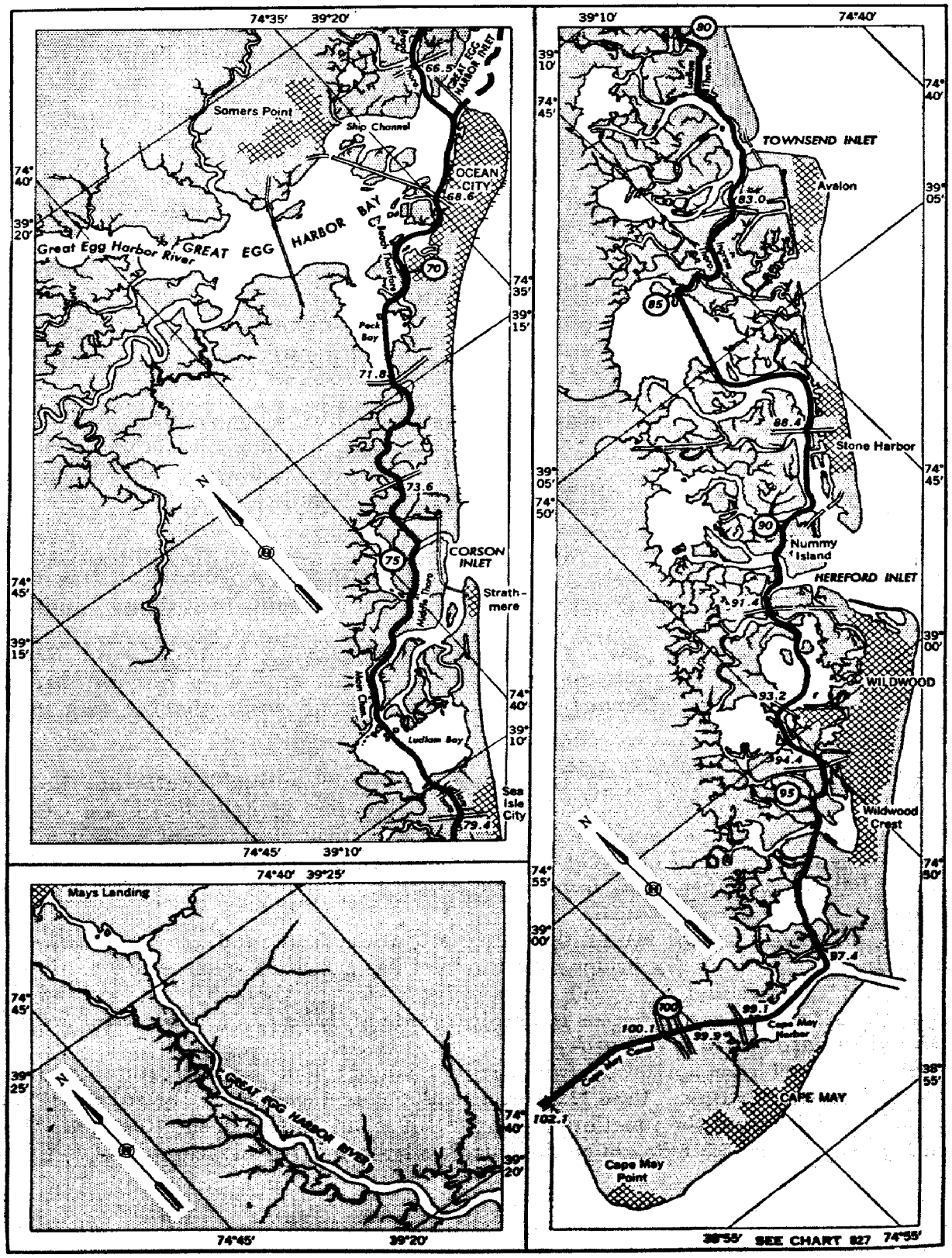
The project route of the waterway follows Beach Thorofare cuts southwestward from ***Mile 63.5*** and swings sharply northwestward into **Risley Channel** at *Mile 64.4*. At *Mile 65.1*, the route turns sharply out of Risley Channel and follows **Broad Thorofare** southwestward.

Note.—In 1953, the project route through Risley Channel and Broad Thorofare had filled to such an extent that it was closed to navigation; all vessels were using the alternate route, which is 0.8 mile shorter but more exposed.

Chart 827; Longport to Cape May.—The project route continues southward through Broad Thorofare. The highway bridge over the thorofare at *Mile 66.5* has a bascule span with a horizontal clearance of 49½ feet and a vertical clearance of 9½ feet. The route crosses the inner end of **Great Egg Harbor Inlet,** described in Chapter 4, at *Mile 67.3* and follows the inner water front of Ocean City. **Currents** are strong at the inlet crossing.

The ***alternate route*** leaves the Longport water front and crosses Great Egg Harbor Inlet. The highway bridge over the inlet has a bascule span with a horizontal clearance of 102 feet and a vertical clearance of 23 feet. About 0.3 mile beyond the bridge, the ***alternate route*** rejoins the project route at ***Mile 67.5. The total length of the alternate route is 3.2 miles.***

Ship Channel leads northward from the junction of the project and alternate routes to Great Egg Harbor Bay. **Bass Harbor,** a small channel leading northward from Ship Channel 1.5 miles from the junction, has depths of about 10 feet in the entrance. The fixed highway bridge 0.3 mile above the entrance has a horizontal clearance of 13½ feet


74°35′ 39°20′
Somers Point
Ship Channel
OCEAN CITY
66.5
68.6
GREAT EGG HARBOR INLET
Great Egg Harbor River
GREAT EGG HARBOR BAY
Peck Bay
71.8
73.6
CORSON INLET
Strathmere
Ludlam Bay
Sea Isle City
79.4
74°45′ 39°10′
Mays Landing
74°40′ 39°25′
GREAT EGG HARBOR RIVER
74°45′ 39°20′
39°10′ 74°40′
TOWNSEND INLET
Avalon
83.0
88.4
Stone Harbor
Nummy Island
HEREFORD INLET
91.4
WILDWOOD
93.2
94.4
Wildwood Crest
97.4
99.1
100.1
Cape May Harbor
CAPE MAY
102.1
Cape May Point
38°55′ SEE CHART 827 74°55′

and a vertical clearance of 5 feet. A marine railway on the west side of Bass Harbor can haul out boats up to 40 feet in length; engine and hull repairs can be made. Gasoline, water, ice, and marine supplies are available; provisions can be obtained in Somers Point.

Two miles from the route junction, Ship Channel enters **Great Egg Harbor Bay.** The highway bridge over Ship Channel at this point has a bascule span with a horizontal clearance of 50 feet and a vertical clearance of 14 feet. **Somers Point,** at the northwest end of the bridge, is a summer resort with wharves that have depths of about 6 feet at their ends.

Peck Bay empties into the south side of Great Egg Harbor Bay about 1.4 miles above the Somers Point bridge. The bridge has a fixed span over the direct approach to Peck Bay; the horizontal clearance is 17 feet and the vertical clearance is 4½ feet.

About 1.7 miles above the Somers Point bridge, Great Egg Harbor Bay is crossed by a second highway bridge. The bascule span near the south end of the bridge has a horizontal clearance of 60 feet and a vertical clearance of 14 feet. **Beesleys Point,** a small summer resort at the south end of the bridge, has landings with depths of about 3 feet at their outer ends.

Patcong Creek empties into the north side of Great Egg Harbor Bay about 0.4 mile west of the Beesleys Point bridge. The depth over the bar at the entrance to the creek is only about 2 feet. The highway bridge 0.5 mile above the mouth of the creek has a swing span with a horizontal clearance of 34½ feet and a vertical clearance of 6 feet; the east passage should be used because the channel veers sharply to the eastward and passes close to the inside of the first bend.

The Ocean Heights Avenue bridge 3.1 miles above the mouth of Patcong Creek has a fixed span with a horizontal clearance of 30 feet and a vertical clearance of 7 feet. About 120 yards below the bridge, the submerged piling of an old dam extends past midstream from the eastern shore; the western shore should be followed at a distance of about 20 yards in order to clear the piling.

Tuckahoe River, which empties into the south side of Great Egg Harbor Bay about 0.7 mile above the Beesleys Point bridge, is said to have depths of about 3 feet to the town of **Tuckahoe,** 7 miles above the mouth. The overhead cable 3 miles above the mouth of the river has a vertical clearance of about 100 feet. The highway bridge over the river at Tuckahoe has a bascule span with a horizontal clearance of 30 feet and a vertical clearance of 9 feet; see § **203.225,** Chapter 2A, for operating **regulations.** The fixed railroad bridge 0.9 mile above the highway bridge has a horizontal clearance of 30 feet and a vertical clearance of 7 feet.

Cedar Swamp Creek empties into the south side of Tuckahoe River 4.3 miles above the river's mouth. The creek has depths of about 4 feet to the highway culvert 2.5 miles above the mouth.

Great Egg Harbor River enters the western end of Great Egg Harbor Bay about a mile above the Beesleys Point bridge. The controlling depth to Mays Landing, the head of navigation, is about 4 feet. The overhead cables that cross the river between the mouth and Mays Landing have vertical clearances of about 100 feet. The mean range of **tide** in the river is about 4 feet.

Middle River empties into the southwest side of Great Egg Harbor River about 1 mile above the latter's mouth. The overhead power cable about 1 mile above the mouth of Middle River has a vertical clearance of 54 feet.

Powell Creek empties into the east side of Great Egg Harbor River 5.5 miles above the mouth. The channel in the creek is narrow and crooked and has a depth of about 3 feet in the entrance. A marine railway along the creek can haul out boats up to 42 feet in length; the yard builds boats and makes all kinds of repairs. Gasoline, motor oil, and water are available at the yard.

Scull Landing is on the east side 6.4 miles above the mouth of Great Egg Harbor River. A marine railway just above the landing can haul out boats up to 45 feet in length; hull and engine repairs can be made. Gasoline is delivered by tank truck.

Mays Landing is at the head of navigation 12.4 miles above the mouth of Great Egg Harbor River. The river water is nearly fresh at the town. Fresh water can be obtained at the town bulkhead; gasoline and supplies are available in the town. A marine railway at the town can handle boats up to 75 feet in length.

The Intracoastal Waterway continues southward along the water front of **Ocean City.** The highway bridge from Somers Point crosses the waterway to Ninth Street, Ocean City, at *Mile 68.6;* the bascule span has a horizontal clearance of 70 feet and a vertical clearance of 15 feet.

The lagoons at Ocean City can accommodate boats up to 5 feet in draft. Gasoline, Diesel oil, water, ice, provisions, and marine hardware are available at several places along the water front. Local yards can haul out boats up to 60 feet in length and can make all kinds of engine and hull repairs.

The waterway follows **Beach Thorofare** to Peck Bay, previously described. The mud flats bordering the channel through the bay are visible in some places at low water. The highway bridge over the head of the bay at *Mile 71.8* has a swing span with a horizontal clearance of 48 feet and a vertical clearance of 6 feet; the east opening should be used.

From Peck Bay, the route follows **Crook Horn Creek.** The railroad bridge over the creek at *Mile 73.6* has a swing span with a horizontal clearance of 59 feet and a vertical clearance of 2½ feet. The west opening should be used; the other is obstructed. The swing span moves slowly.

The waterway enters **Middle Thorofare** at *Mile 74.7.* From this point a channel leads eastward for 0.6 mile to **Corson Inlet,** described in Chapter 4. The route is then by way of **Ben Hands Thorofare** to *Mile 76.4* in **Main Channel,** which leads eastward and northward for 2.3 miles to Corson Inlet. This channel, the principal one to the inlet, also has been described in Chapter 4.

The waterway follows Main Channel southwestward and enters **Ludlam Bay** at *Mile 77.5.* The bay is mostly shallow and the channel thorugh it is marked by bush stakes. At *Mile 78.8* the route leaves Ludlam Bay and enters **Ludlam Thorofare.** The highway bridge over Ludlam Thorofare at *Mile 79.4* has a bascule span with a horizontal clearance of 48½ feet and a vertical clearance of 10 feet.

Sea Isle City, at the eastern end of the Ludlam Thorofare bridge, has several basins with depths of about 3 feet in the entrances and slightly more water inside. Just south of the bridge is a marine railway that can handle boats up to 50 feet in length for hull and engine repairs. Gasoline, motor oil, water, ice, groceries, and marine supplies are available during the summer months.

The route enters **Townsend Channel** at *Mile 81.0* and follows the inner water front of the town of **Townsends Inlet.** Berthage is available at the town. Gasoline, water, and some marine supplies can be obtained.

At *Mile 82.2*, the route of the waterway is 300 yards west of the highway bridge over **Townsend Inlet,** described in Chapter 4. **Avalon,** a resort on the southwest side of the inlet, is separated from **Ingram Thorofare,** the route of the waterway, by a marsh area.

Cornell Harbor, a privately dredged channel, leads southeastward through the marsh from *Mile 82.5* to the northeastern end of Avalon and thence along the inner side of the town; the controlling depth is about 2 feet. There is a yacht club at the entrance to Cornell Harbor, and a marine railway at the Avalon end can handle hull and engine repairs on boats up to 40 feet in length. Gasoline, water, and ice are available at the boatyard.

The highway bridge crossing Ingram Thorofare to Avalon at *Mile 83.0* has a swing span with a horizontal clearance of 49 feet and a vertical clearance of 6½ feet. The span is hand-operated and should be approached with caution as it takes about 10 minutes to open.

Pennsylvania Harbor is an outlet from the Avalon water front to Ingram Thorofare just north of the highway bridge. **Princeton Harbor** is a parallel outlet just south of the same bridge. The two outlets have controlling depths of about 2 feet. Fixed bridges over the Avalon channel at the inner ends of the two harbors restrict passage between them and to the southwest to a vertical clearance of about 4 feet. Two public wharves with depths of about 3 feet at the outer ends are at the Avalon end of Princeton Harbor.

From the highway bridge, the waterway follows Ingram Thorofare westward to **Paddy Thorofare,** thence into **Great Sound** at *Mile 85.0.* The channel through the mostly shallow sound is marked by stake daybeacons. The route leaves Great Sound at *Mile 86.1* and follows **Gull Island Thorofare** southward to the Stone Harbor waterfront.

Stone Harbor is a resort on the northeast side of Hereford Inlet. The highway bridge crossing the waterway to Stone Harbor at *Mile 88.4* has a bascule span with a horizontal clearance of 51 feet and a vertical clearance of 11 feet.

There are several privately-dredged basins along the Stone Harbor waterfront. Northeast of the highway bridge are **North Basin, South Basin,** and **Snug Harbor;** southwest of the bridge are **Shelter Haven, Stone Harbor,** and **Carnival Bay.** North Basin has a marine railway that can handle boats up to 40 feet in length for hull and engine repairs; gasoline and marine supplies are available. Gasoline, water, ice, and marine supplies also can be obtained in Shelter Haven.

The waterway follows **Great Channel** southwestward along the Stone Harbor waterfront, then turns sharply westward at *Mile 89.4,* and follows the northern and northwestern shores of **Nummy Island.** Just 300 yards south of the turning point is the bridge over the channel that leads along the east side of Nummy Island to **Hereford Inlet,** described in Chapter 4.

At *Mile 90.9*, the main channel to Hereford Inlet leads southeastward from the route of the waterway in **Grassy Sound Channel.** The bridge over the inlet channel 0.2 mile from the waterway has been described in Chapter 4.

The highway bridge over the waterway at *Mile 91.4* has a bascule span with a horizontal clearance of 50 feet and a vertical clearance of 8½ feet. The route enters **Grassy Sound** at *Mile 91.9* and follows a well-marked channel. The railroad bridge over the waterway at *Mile 93.2*, at the southwestern end of the sound, has a hand-operated bascule span with a horizontal clearance of 50 feet and a vertical clearance of 6½ feet.

Just east of the railroad bridge, a channel leads along the northeast side of **West Wildwood** for 0.8 mile to the waterfront of **Wildwood.** The channel continues completely around West Wildwood and has a controlling depth of about 5 feet, but passage is limited by the 5-foot vertical clearances of the fixed bridges that connect the two communities.

At *Mile 94.2*, **Post Creek** extends northeastward from the waterway and widens into a small bay between Wildwood and West Wildwood. The creek and the bay are part of the encircling channel described in the preceding paragraph.

Ottens Harbor, a dredged slip that extends 0.5 mile southeastward from the mouth of Post Creek, will accommodate fishing vessels and yachts up to 150 feet in length. Local marine railways can handle boats up to 40 feet in length. Gasoline, water, ice, and marine supplies are available in the harbor.

The highway bridge over the waterway at *Mile 94.4* has a bascule span with a horizontal clearance of 57 feet and a vertical clearance of 25 feet. Gasoline, water, and ice can be obtained at a marine service station just southwest of the bridge.

Sunset Lake, at **Wildwood Crest,** can be entered either from *Mile 94.8* or *Mile 95.4* along the waterway route. Gasoline, water, ice, and marine supplies can be obtained along the water front of Wildwood Crest.

The waterway continues southwestward through **Jarvis Sound** and **Middle Thorofare.** The highway bridge over Middle Thorofare at *Mile 97.4* has a bascule span with a horizontal clearance of 50 feet and a vertical clearance of 23 feet. The route crosses the inner end of **Cape May Inlet** at *Mile 97.7* and proceeds westward in **Cape May Harbor;** the inlet and the harbor have been described in Chapter 4.

The waterway enters **Cape May Canal** at *Mile 98.9*. On the southwest side of the entrance is a **traffic light;** vessels shall enter only when the light is green. Vessels transiting the canal should limit their speed to 5 knots and should proceed with special care in the vicinity of the bridges; passage of barge tows may be delayed because of tide and current conditions. The mean range of **tide** in the canal is 4 feet. The maximum velocity of the normal tidal **current** is 2¼ knots; see the *Current Tables* for predicted times and velocities. The controlling depth in the canal was given at the beginning of this chapter.

The highway bridge over Cape May Canal at *Mile 99.1* has a swing span with a horizontal clearance of 40 feet and a vertical clearance of 20 feet. The railroad bridge at *Mile 99.9* has a swing span with a horizontal clearance of 50 feet and a vertical clearance of 4 feet. The highway bridge at *Mile 100.1* has a swing span with a horizontal clearance of 40 feet and a vertical clearance of 10 feet.

The Intracoastal Waterway enters Delaware Bay 2 miles northward of Cape May Light between stone jetties, the outer ends of which are at *Mile 102.1* and are marked by lights; the south light station has a fog signal. A 50-foot skeleton tower, with white lookout house on top, is at the inner end of the north jetty; **storm warnings** are displayed day and night at the tower. 5

A lighted bell buoy marks the bay approach to the canal. Farther westward, an approach channel was dredged through **Crow Shoal,** 2 miles from the jetties, approximately to waterway project depth, but the channel is unmarked and undoubtedly has shoaled to depths of 8 feet or less.

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CHAPTER 6

Delaware Bay and River

Charts 1219, 1218, 294 to 296

DELAWARE BAY and Delaware River form the boundary between the State of New Jersey on the east and the States of Delaware and Pennsylvania on the west. The bay is only an expansion of the lower part of the river; the arbitrary dividing line, 42 miles above the Delaware Capes, extends from Liston Point, Delaware, to Hope Creek, New Jersey. The Atlantic entrance to Delaware Bay is used by deep-draft vessels; medium-draft vessels can enter Delaware River from Chesapeake Bay by way of the Chesapeake and Delaware Canal, described in Chapter 7. Along the river are Wilmington, Chester, Marcus Hook, Philadelphia, Camden, Trenton, and many other smaller cities and towns.

Note.—Many of the distances in this chapter are stated in miles above the **Delaware Capes,** or the **Capes,** which is a short way of referring to the line from Cape May Light to the tip of Cape Henlopen. Distances above Overfalls Lightship, which is a reference point for Sailing Directions in Chapter 3 and for Corps of Engineers publications, can be obtained by adding 3.0 miles to distances from the Capes.

The Atlantic entrance to Delaware Bay is 10 miles wide between Cape May on the northeast and Cape Henlopen on the southwest. Shoals extend a considerable distance from Cape May in the general direction of Cape Henlopen, but there is a clear width of about 3 miles off Cape Henlopen that can be used by deep-draft vessels. Cape May Light and the structures on Cape Henlopen are discussed later in this chapter.

Rules of the Road.—Inland Pilot Rules shall be followed inside a line from Cape May East Jetty Light to Cape May Entrance lighted bell buoy 2CM; thence to Overfalls Lightship; thence to the northernmost extremity of Cape Henlopen.

Channels.—Delaware Bay is shoal along its northeastern and southwestern sides, and there are extensive shoal areas close to the main channel through the middle of the bay. The bay has natural depths in excess of navigational needs for a distance of 5 miles above the entrance capes; thence a channel has been dredged up the bay and river and is well marked by lights, ranges, and buoys. A Federal project provides, in part, for a channel 800 to 1,000 feet wide and 40 feet deep from that depth in the lower bay to the Philadelphia Naval Shipyard; the channel is maintained at or near project dimensions and its condition is given at frequent intervals in the *Notice to Mariners.* The channel at and above Philadelphia is discussed later in the chapter.

Anchorages.—Breakwater Harbor and Harbor of Refuge, west and northwest of Cape Henlopen, are among the important anchorages along the Atlantic coast and are used extensively by vessels of various drafts; the harbors are described later in this chapter. Deep-draft vessels can anchor in various places in the vicinity of the dredged channel through the bay, but usually will continue to the more sheltered anchorages in the upper bay and in the river.

Defined anchorage areas in Delaware Bay and Delaware River are shown on the charts; limits of the areas and regulations governing them are given in **§ 202.157,** Chapter 2A. The first of these areas begins 32 miles above the Capes.

Sailing directions for Delaware Bay and Delaware River are given in tabular form in Chapter 3.

Tides.—The mean range of tide is about 4 feet at Breakwater Harbor, 5 feet at Brandywine Shoal Light, 5½ feet at Ship John Shoal Light, Reedy Point, and Marcus Hook, and 6 feet from Philadelphia to Trenton. Tidal information for the tributaries is given in their individual descriptions. Full tidal information, including daily predictions for Breakwater Harbor, Reedy Point, and Philadelphia, is given in the *Tide Tables*.

Currents.—The predicted times of slack water and of velocities of strength of flood and ebb in Delaware Bay Entrance (Overfalls Lightship) are given for every day in the year in the *Current Tables*. Similar predictions for about 50 other locations in Delaware Bay and River may be readily obtained from those for the entrance through the use of time differences and velocity ratios given in Table 2 of the *Current Tables*, which also include a current diagram for the bay and river.

A comprehensive view of the tidal current movement in the area is presented by the Tidal Current Charts, Delaware Bay and River. These charts also afford a means of readily determining the direction and velocity of the tidal current for any hour of the current cycle for various locations throughout the area. They are good for any year and are designed for use with the annual current predictions for Delaware Bay Entrance in the *Current Tables*.

Weather.—Fogs are most frequent along this part of the Atlantic coast during the months of December, January, and February, but may be encountered at other times during the year. The fogs come in with easterly winds and are cleared away by westerly and northerly winds. In the late fall, dense fogs are liable to occur and may last through the forenoons for two or three days in succession. Autumn fogs nearly always clear away before noon.

Ice.—In ordinary winters there is usually sufficient ice in Delaware Bay and River to be of some concern to navigation. Thin ice has been known to form early in December between Chester and Philadelphia, but the heavier ice usually does not begin to run before January. The tidal currents keep the ice in motion, except where it packs in the narrower parts of the river; ice breakers from Philadelphia keep these parts of the river open. The ice usually packs heavier than elsewhere at Ship John Shoal, at Pea Patch Island, at Deepwater Point, and below Gloucester City. Ice is rarely encountered after the early part of March.

In severe winters, navigation has occasionally been interrupted above Chester, but the powerful vessels employed in the foreign and coasting trade to Philadelphia keep the channel fairly open. The greatest danger is to wooden vessels, which are liable to be cut through on the waterline if they encounter thin ice.

Freshets.—Freshets are of rare occurrence, except in the vicinity of Trenton, and do not interfere with navigation unless accompanied by ice. Freshets and ice above Philadelphia are discussed further in the latter part of this chapter.

Storm warnings.—See discussion of Cape Henlopen and Bivalve, later in this chapter, and the west end of Cape May Canal in Chapter 5.

Pilotage.—*Vessels subject to pilotage.*—Every ship or vessel arriving from or bound to any foreign port or place is obliged to receive a pilot, except American vessels solely laden with coal mined in the United States; provided that a ship or vessel inward bound to any port or place on the Delaware River, which is not spoken or offered the service of a pilot outside a straight line drawn from Cape May light to Cape Henlopen, is exempt from the duty of taking a pilot, as well as from the duty of paying pilotage, or any penalty whatsoever.

Vessels exempt from pilotage.—All ships or vessels employed in or licensed for the coasting trade, except such as are under register, bound to or from States or Territories of the United States on the Pacific Ocean, are exempt from the duty of employing a pilot or paying pilotage, or any penalty whatsoever, in case of their neglect or refusal to do so; but any ship or vessel voluntarily taking a pilot shall pay the same fees for pilotage as are prescribed in case of a vessel bound to or from a foreign port.

Delaware Breakwater pilotage.—Every ship or vessel bound to the Delaware Breakwater for orders is obliged to receive a pilot, provided she is spoken or a pilot offers his services outside of a straight line drawn from Cape Henlopen to Cape May Light, and every ship or vessel bound to the Delaware Breakwater for orders is required to pay a pilotage fee equal to half the pilotage fee to the port of Philadelphia and is obliged to receive a pilot and pay the same pilotage fee when outward bound from the breakwater, and if such ship or vessel, without discharging her pilot, proceeds to the port of Philadelphia, or any other port or place on Delaware Bay or River, only one full pilotage fee shall be paid, in addition to the fee for detention; provided, however, that the pilot bringing such ship or vessel to the breakwater be there discharged. If the ship or vessel afterward proceeds to Philadelphia or any other port or place on Delaware Bay or River, she shall make the usual signal for a pilot and continue to make such signal until reaching Brandywine Light, and if spoken by or offered the services of a duly licensed Pennsylvania pilot before reaching Brandywine Light shall be obliged to employ such pilot and pay him the regular rate in addition to the fee paid for bringing her into the breakwater, and for detention, if any.

Official pilot boats, carrying both Pennsylvania and Delaware pilots, are stationed off the entrance to Delaware Bay. Either Pennsylvania or Delaware pilots may be taken to or from any point of Delaware Bay or River, the charges being the same in either case.

The fees for pilotage are based on a charge of $2 per half foot for vessels drawing over 12 feet. An increase of 10 percent over these fees is charged when a vessel is spoken east of Five Fathom Bank Lightship or north of Hereford Inlet Light, or south of Fenwick Island Light, and a deduction of 10 percent is made when a vessel is spoken inside of a line joining Cape May Light and Cape Henlopen. Vessels entering the Capes for anchorage in the Breakwater pay one-half pilotage in and one-half pilotage out.

In addition to regular pilotage charges for Delaware Bay and River, a charge of $40 is made for pilotage in the Chesapeake and Delaware Canal. Pilotage work within

Philadelphia Harbor is done by tugboats and charges are governed by conditions. If a State pilot is taken, the charge on movements to points below Marcus Hook is $40 and to points above Marcus Hook $30.

All foreign vessels and vessels under register are required to take a pilot for movements on the Delaware River outside Philadelphia Harbor and for movements to Trenton, New Jersey. From Philadelphia Harbor to Trenton, the rate is $75.

Reporting stations.—Vessels are reported to the Philadelphia Maritime Exchange either day or night from a tower on Cape Henlopen and by day only from a station at Marcus Hook. Messages can be exchanged by International Code with either station during the day and by flashing lamp and Morse Code with the Cape Henlopen station at night.

Towage.—A large fleet of tugs, operating from the Port of Philadelphia, is available at any time of the day or night for any type service required. Although several operators limit their activities to ports within the Philadelphia port area, most of the companies include the entire Delaware River and Bay and tributary waters in their zone of operations. Some companies also have tugs available for deep-sea towing.

Quarantine.—All inbound vessels subject to quarantine inspection and destined to points above Marcus Hook, Pennsylvania, are required to stop at the boarding station at Marcus Hook and may not proceed until granted pratique. Vessels will be inspected at any time between sunrise and sunset. The quarantine station at Marcus Hook is equipped to handle detention cases.

Customs and Immigration.—District headquarters of the Bureau of Customs and of the Immigration and Naturalization Service are in Philadelphia.

Supplies.—Bunker coal is available at the large coal terminals in Philadelphia Harbor. Bunker oil can be obtained in Philadelphia Harbor, at Paulsboro, New Jersey, and at Marcus Hook, Pennsylvania. Many vessels receive their bunker oil from barges alongside. Fresh water is available in unlimited quantities at the larger ports. Small boats can obtain gasoline, Diesel oil, water, ice, provisions, and marine supplies not only in the larger ports but at many smaller cities and towns along the river and bay.

Repairs.—The largest shipyards along Delaware River are at Chester, Pennsylvania, but repairs can be made to the hulls and machinery of medium-size vessels at Philadelphia and Camden. Many of the smaller cities and towns have marine railways that will accommodate motorboats and other small vessels.

Chart 1219.—The **approaches to Delaware Bay** have few off-lying dangers. An **obstruction,** unproved as to position and depth, is shown on Chart 1109 in approximately latitude 38°40′ N., longitude 73°52′ W., 54 miles east-southeastward of Cape May Light; the obstruction is said to be only 5 fathoms deep, and the area should be avoided.

Five Fathom Bank has a least charted depth of 17 feet 15 miles east by south of Cape May Light. The area inclosed by the 5-fathom curve is about 9 miles long in a north-south direction and 2 miles wide. A 22-foot spot at the south end of the bank is 3.5 miles from the critical 17-foot depth. The greater part of Five Fathom Bank is within authorized **fish-trap** limits. Several buoys are moored around the bank.

Five Fathom Bank Lightship (lat. 38°47′.3, long. 74°34′.6) is moored in 91 feet of water 20 miles east-southeast of Cape May Light and about 4 miles southeast of the

south end of the bank. The vessel has a red hull, with the name FIVE FATHOM on both sides, and a circular gallery on the foremast. The light is 65 feet above the water and visible 14 miles; the radiobeacon and the fog signal are synchronized for diatance finding. Call letters for radio and code flag are NNBL. **Storm warnings** are displayed daytime only.

McCrie Shoal, 7 miles southeast of Cape May Light, has a least charted depth of 18 feet. A buoy is moored on the southeast side of the shoal.

Overfalls, or **South Shoal,** has a depth of 6 feet 4.7 miles southwest by south of Cape May Light. The 5-fathom curve extends 3 miles farther in the general direction of Cape Henlopen and has a depth of 19 feet just within its outermost limit. The area between Overfalls and Cape May is very broken. Several of the shoaler spots have depths as shallow as 2 to 6 feet, but there are buoyed channels between them that are used by light-draft vessels.

Overfalls Lightship (lat. 38°48′.0, long. 75°01′.4) is moored in 66 feet of water 3 miles east of the northern tip of Cape Henlopen and 1.3 miles south of the extremity of Overfalls. The vessel has a red hull, with the name OVERFALLS on both sides, and a tubular mast with lantern and gallery. The light is 57 feet above the water and visible 13 miles; the radiobeacon and the fog signal are synchronized for distance finding. Call letters for radio and code flag are NNBQ. **Storm warnings** are displayed daytime only.

Hen and Chickens Shoal has depths of 5 feet within a mile of the northern tip of Cape Henlopen and a depth of 9 feet about 3 miles to the southeast. The outer end of the 5-fathom curve is 7 miles southeast by south of the cape, is 3.4 miles offshore, and is marked by a buoy.

Fenwick Shoal, 22 miles south-southeast of Cape Henlopen and 5.5 miles offshore, is in the southern approach to Delaware Bay. See Chapter 8 for a detailed description of the shoal.

The 100-fathom curve is 50 to 75 miles off the entrance to Delaware Bay and the 20-fathom curve is about 25 miles off. Depths inside the 20-fathom curve are irregular, and in thick weather a vessel should not approach the coast closer than depths of 12 fathoms until sure of its position. Coastwise courses from both northward and southward are given in Chapter 3.

The passage inside Five Fathom Bank, and eastward and westward of McCrie Shoal, is used by most coasting vessels of medium to light draft. In heavy weather, such vessels should pass eastward of Five Fathom Bank, and this is the safest course at all times for strangers. Coasting vessels of the deepest draft stay outside the lighted whistle buoy several miles eastward of Fenwick Shoal; light-draft vessels usually pass inside of Fenwick Shoal in good weather, but strangers should use this passage with caution.

Chart 411.—Cape Henlopen, on the southwest side of the entrance to Delaware Bay, is marked by a number of towers and buildings. About 0.4 mile southward from the tip of the cape is an observation tower from which vessels are reported to the Philadelphia Maritime Exchange. **Storm warnings** are displayed day and night from a mast at the **reporting station.** A group of sand hills about 70 feet high is near the beach 1.5 miles from the end of the cape.

Delaware Breakwater is the name in common use for the combined anchorage areas behind the inner and outer breakwaters west and north of Cape Henlopen. **Breakwater Harbor,** between the inner breakwater and the shore, is easy of access both day and night. The harbor is excellent for light-draft vessels in all but heavy northwesterly gales and even then affords considerable protection.

The inner breakwater has a total length of 0.8 mile in a general east-west direction and its eastern end is about 0.3 mile southwestward from the tip of Cape Henlopen. **Delaware Breakwater Light (lat. 38°47′.8, long. 75°06′.0)**, 61 feet above the water and visible 13 miles, is shown from a brown conical tower on the east end of the breakwater; the light has a fog signal. A low-power light, 56 feet above the water, is shown from a black skeleton tower on the west end of the breakwater.

A Federal project provides for a channel 15 feet deep and 300 feet wide into Breakwater Harbor from deep water in Delaware Bay to a large fish pier east of Lewes, Delaware, with a turning basin 600 feet square at the inner end, which is a mile southwest of Delaware Breakwater Light. The channel and basin are maintained at or near project dimensions and are marked by several buoys.

Breakwater Harbor has general depths of 7 to 12 feet between the inner breakwater and the dredged channel. Westward and northwestward of the breakwater is an extensive area with depths of 16 to 25 feet, mud bottom, where anchored vessels are sheltered from southeasterly and northeasterly winds. In heavy weather, Breakwater Harbor is usually crowded and vessels with drafts greater than 9 feet should use the anchorage just described.

The easternmost pier along the shore in Breakwater Harbor is maintained by the United States Army. Westward of the Army pier are three fish piers, the westernmost already mentioned in connection with the dredging project, and the remains of two or three others. Channel depths can be carried to the Army pier and to the two longer fish piers. About 300 yards beyond the head of the turning basin a pier with a depth of about 9 feet at the outer end extends out from the **Lewes Coast Guard Station.**

The mean range of **tide** in Breakwater Harbor is 4¼ feet; daily predictions are given in the *Tide Tables*. The flood **current** sets westward and the ebb eastward with velocities at strengths of about 1 knot in the inner harbor; velocities are greater at the eastern end of the harbor. Outside the outer breakwater the velocity of the current at strength is about 2 knots, and the general direction of set is parallel with the breakwaters. See the *Current Tables* for predictions.

Harbor of Refuge is behind a breakwater that begins 0.8 mile north of Cape Henlopen and extends 1.3 miles in a general north-northwestward direction. A line of ice breakers extends 0.4 mile farther northwestward, then turns and extends a like distance west by south onto **The Shears. Harbor of Refuge Light (lat. 38°48.′9, long. 75°05.′6)**, 72 feet above the water and visible 14 miles, is shown from a white conical tower on a brown cylindrical substructure near the south end of the breakwater; the light has a fog signal. A low-power light marks the north end of the breakwater.

The harbor has depths of 15 to 70 feet between the breakwater and a shoal ridge 8 to 12 feet deep, a mile to the southwestward. The deepest water will be found behind the south end of the breakwater. The entrance from southward is deep and clear, while that from northward across The Shears has depths of 8 to 12 feet. During the winter season, drifting ice often is a hazard. Harbor of Refuge affords good protection for deep-draft vessels during easterly gales.

Fixed ranges mark a **measured course,** 6,123 feet long on azimuth **141° 30′,** off the outer breakwater. The front range markers on the breakwater and the northwesterly rear range marker on the shore west of Roosevelt Inlet are lighted on request. The southeasterly rear range marker is the light on the west end of the inner breakwater.

Roosevelt Inlet, 3 miles west of Cape Henlopen, is the entrance to the **Lewes and Rehoboth Canal** from Delaware Bay. The inlet is protected by jetties, each marked at its outer end by a light; a fog signal operates at the southeast light, and a lighted range marks the centerline of the entrance channel. A Federal project provides, in part, for an entrance channel 10 feet deep and 200 feet wide protected by two parallel jetties 500 feet apart; and thence a channel 10 feet deep and 100 feet wide to South Street Bridge at Lewes, with a basin of the same depth 1,200 feet long and up to 375 feet in width at the latter point. The controlling depth was 4 feet from Roosevelt Inlet to the bridge in 1950.

The mean range of **tide** at Roosevelt Inlet is about 4½ feet. Between the jetties the **current** has a velocity of about ¾ knot at strength of flood and about 1¼ knots at strength of ebb.

The Coast Guard has a buoy depot at the head of Roosevelt Inlet. Just inside the inlet is a small oil wharf where gasoline, fuel oil, and fresh water can be obtained; the depth at the wharf is reported to be 6 feet.

Lewes is a town with rail communication 1.7 miles along the waterway from the outer ends of the Roosevelt Inlet jetties. The Public Health Service has an **outpatient office** in Lewes.

Gasoline, water, ice, provisions, and marine supplies are available at Lewes. A marine railway at the town can haul out boats up to 70 feet in length and 30 tons in weight; the machine ship repairs gasoline and Diesel engines and does hull work.

The highway bridge over the waterway at Lewes has a bascule span with a horizontal clearance of 46 feet and a vertical clearance of 7 feet. The part of the Lewes and Rehoboth Canal between the bridge and Rehoboth Bay is described in Chapter 8. Owners and operators of vessels using the canal are requested to travel at safe and reasonable **speeds** in order to avoid excessive wave action and resulting damage to other vessels and property along the waterway; failure to comply with this request will result in disciplinary action against the offending parties.

Broadkill Inlet, about 5 miles westward of Cape Henlopen, formerly was the entrance to **Broadkill River,** but the inlet was impassable in 1952 and the river was being entered by way of an inside channel from Roosevelt Inlet, 2 miles to the southeastward. No recent information is available on the condition of the channels, but in 1946 controlling depths were said to be 4 feet from Roosevelt Inlet to the old mouth of the river and thence up river for 5 miles to a highway bridge, thence 2 feet to **Milton,** 4 miles above the bridge. Broadkill River has very little traffic. The highway bridge has a bascule span with a horizontal clearance of 43 feet and a vertical clearance of 3½ feet.

Chart 1218.—The southwestern shore of Delaware Bay is low and marshy and has few prominent marks above Delaware Breakwater. The principal marks are a few scattered groups of houses, the lights and ranges of the tributaries, and a few steel observation towers.

The tributaries are narrow and crooked and vessels have considerable difficulty in making some of the turns. The streams are little used except by vessels carrying gaso-

line to the towns along their banks and by local fishing vessels, which also often seek sheltered anchorage in the mouths. Strangers seldom attempt to enter. When entering or leaving the streams allowance should be made for currents in the bay which set across the tributary channels and have considerable velocity at times.

There are many shoal spots with depths as shallow as 2 to 6 feet between Delaware Breakwater and Bombay Hook Point. Most of the spots are unmarked and they are subject to some change both in depth and position. Strangers should proceed with caution in any of the passages southwest of the ship channel.

A line of fairway buoys marks a passage along the southwestern side of Delaware Bay from a point about 8 miles northwest of Cape Henlopen and 3 miles offshore to the lighted bell buoy 1.5 miles off the entrance to Murderkill River. The passage is used by most of the vessels entering or leaving the tributaries and is said to lead clear of dangers if the buoys are followed closely, but it is close to the shoal spots in some places. The large numbers of fish and oyster stakes in the area also are to be avoided. The passage should not be attempted at night.

Vessels entering the southwestern passage from northward usually leave the main ship channel about 2.5 miles below Ship John Shoal Light, pass close eastward of the buoy 2 miles off the entrance to Leipsic River, and steer approximately due south for the vicinity of the lighted bell buoy off Murderkill River. A 4-foot spot is about midway along a direct course between the two buoys, but a depth of about 7 feet can be carried by shifting course westward toward Little River when nearing the shoal.

Mispillion River empties into Delaware Bay from westward 13 miles northwest of Cape Henlopen. The river is used by pleasure and fishing craft and by oil barges bound for Milford. A Federal project provides for a channel 6 feet deep and 80 feet wide from that depth in Delaware Bay to the mouth of the river, and thence 6 feet deep and 60 feet wide to **Milford**, about 10 miles above the mouth. The controlling depth to Milford was 5½ feet in December 1950.

The entrance to Mispillion River is protected by two parallel jetties, about 200 feet apart and extending about 1 mile southeastward from the shore. A light is near the outer end of the southwest jetty and another light is on the west side of the river's mouth. From the inner end of the jetties, the channel follows the south and west sides of the river until above the light, passes southward of the island a mile above the mouth, and then follows mid-river to Milford.

The mean range of **tide** is 5 feet at the entrance to the river and about 4 feet at Milford; high and low waters at Milford are reported to occur 1 hour later than at the entrance. At the mouth of the river the velocity of the **current** at strength of flood or ebb is about 1½ knots; the flood is particularly strong on the south and west sides.

Gasoline and fresh water can be obtained at a small landing just inside the mouth of Mispillion River during the summer season. The oil wharves, fertilizer-plant wharf, and power-plant wharf at Milford have depths of 6 to 7 feet, mud bottom, alongside.

The highway bridge about 0.5 mile below Milford has a bascule span with a horizontal clearance of 45 feet and a vertical clearance of 5½ feet. Just below the Milford fixed highway bridge, which is the head of navigation, is a marine railway that can haul out boats up to 60 feet in length and 5 feet in draft; the depth at the landing is about 6 feet.

Murderkill River empties into Delaware Bay 21 miles northwestward of Cape Henlopen. A Federal project provides for a channel 7 feet deep and 150 feet wide in

Delaware Bay to the mouth of the river, and thence 80 feet wide to **Frederica,** 6.5 miles above the mouth. Controlling depths were 7 feet to the mouth in 1949, and thence 5 feet to Frederica in 1945. The mean range of **tide** is 5½ feet at the entrance and about 3 feet at Frederica.

A lighted range marks the entrance to Murderkill River, and a lighted bell buoy about 1.5 miles offshore is near the intersection of this range and the range for entering St. Jones River, to the northward.

Bowers (*P. O.*), a village and summer resort on the north side of the entrance to Murderkill River, is fairly prominent from offshore. Gasoline, water, ice, and provisions are available. A marine railway across the river from Bowers can haul out boats up to 50 feet in length and 20 tons in weight; a machine shop in the neighborhood can repair gasoline and Diesel engines and does hull work. The wharves along the Murderkill River are used extensively by fishing and oyster boats.

St. Jones River, 0.5 mile north of Murderkill River, leads to the city of Dover, the capital of the State of Delaware. The river is used mostly by shell fishermen. The Federal project provides for a channel 7 feet deep and 60 feet wide from that depth in the bay to the mouth of the river; thence a channel within the river 7 feet deep from the mouth to Dover, 50 feet wide from the mouth to Lebanon, thence 40 feet wide to Dover. Controlling depths were 3 feet in the entrance channel, thence 5 feet to Barkers Landing in 1949; and thence 3½ feet to Dover in 1945. A lighted range marks the approach to St. Jones River from the buoy previously mentioned in the discussion of the approach to Murderkill River. The mean range of **tide** is 5½ feet at the entrance, about 3 feet at Lebanon, and about 1 foot at Dover.

A highway bridge over St. Jones River at **Barkers Landing,** 3 miles above the mouth, has a bascule span with a horizontal clearance of 50 feet and a vertical clearance of 5 feet. The cannery wharf at the landing is in ruins. One mile inland southwestward of the bridge is the village of **Magnolia.**

A highway bridge over the river at **Lebanon,** 6 miles above the mouth, has a swing span with a horizontal clearance of 30 feet and a vertical clearance of 6 feet; **regulations** governing operation of the drawspan are given in § **203.237,** Chapter 2A. The fixed highway bridge 9 miles above the mouth has a horizontal clearance of 70 feet and a vertical clearance of 13 feet. Navigation ends below the lower bridge at **Dover,** which is 10 miles above the mouth of the river. There are no landings at Dover.

Little River, 6 miles northward of Murderkill River, is navigable to the highway bridge at the village of **Little Creek,** 2 miles above the mouth. The controlling depth from Delaware Bay to Little Creek was 2 feet in 1949. A lighted range marks the entrance to the river. The mean range of **tide** is 5½ feet at the entrance to Little River and about 4½ feet at Little Creek; high and low waters at Little Creek are reported to occur about ¾ hour later than at the entrance. Gasoline and some provisions can be obtained at the Little Creek landing.

Mahon River, 7.5 miles northward of Murderkill River, is marked by a light, which is on the south side of the river and 0.2 mile above the mouth. The river has depths of 5 feet across the bar at the mouth and considerably deeper water inside, and it is used extensively by shell fishermen. Gasoline, water, and some provisions can be obtained at the lighthouse landing, which is in poor condition.

Simons River, 10 miles northward of Murderkill River, has depths of 3 or 4 feet

over the bar at the mouth and deeper water inside. The river is used to some extent as an anchorage but is unmarked.

Leipsic River, 11 miles northward of Murderkill River, is used considerably by shell fishermen. Controlling depths are about 5 feet from Delaware Bay to the town of **Leipsic,** 7 miles above the mouth, and thence 4 feet to the dam at **Garrison Mill,** 4 miles farther up the river.

The entrance to Leipsic River is marked by a lighted range. The mean range of **tide** is 5½ feet at the entrance, 3½ feet at Leipsic, and about 2½ feet at the head of navigation. The wharves at Leipsic have depths of 5 to 8 feet alongside; gasoline, fresh water, and provisions are available. The fixed highway bridge at Leipsic has a horizontal clearance of 70 feet and a vertical clearance of 13 feet.

Smyrna River, 9 miles northwestward of Leipsic River and 3 miles southeastward of Liston Point, is navigable to **Smyrna Landing,** about 8 miles above the mouth and 1 mile from the town of **Smyrna.** The controlling depth from Delaware Bay to Smyrna Landing was 7 feet in 1948.

The entrance to Smyrna River is protected by jetties, the southeasterly of which extends about 0.5 mile from shore and is marked at its outer end by a light. The entrance also is marked by a lighted range. The prolongation of the range line leads across a shoal, with depths of 5 feet, about 1 mile offshore. Local vessels usually enter near high water when the shoal can be crossed on the range. If entering at low water, they pass well southward of the shoal and then steer northwestward behind it until on the range, but some local knowledge is required to carry the best water. Within the river the best water generally follows a mid-channel course or favors the ebb-tide bends.

The mean range of **tide** in Smyrna River is 6 feet at the entrance and about 3½ feet at Smynra Landing; high and low waters at the landing are reported to occur about 2 hours later than at the entrance. The **current** at the entrance has a velocity of about 1½ knots at strength of flood or ebb.

The highway bridge at **Fleming Landing,** 3 miles above the mouth of Smyrna River, has a swing span with a horizontal clearance of 36 feet and a vertical clearance of 5½ feet; the north opening is generally used. The river is little used except by an occasional fertilizer boat bound to or from Smyrna Landing; the wharves at the landing are in poor condition.

The New Jersey side of Delaware Bay is low and has few prominent marks. The principal tributaries are Maurice and Cohansey Rivers, which have considerable trade; there are also many small creeks which are used mostly by fishing boats. General depths along this side of the bay are 7 to 15 feet but there are many spots with depths of less than 6 feet. The shoals generally are not marked and some local knowledge is needed to avoid them. Most of the creeks have bars across their mouths.

Cape May is the extensive peninsula on the northeast side of the entrance to Delaware Bay. **Cape May Inlet** and the town of **Cape May,** both on the south side of the cape, have been described in Chapter 4. At the southwest end of Cape May and 4 miles from Cape May Inlet is the village of **Cape May Point. Cape May Light (lat. 38°56.'0, long. 74°57.'6),** 165 feet above the water and visible 19 miles, is shown from a white tower with red lantern at Cape May Point; the light station has two white dellings. A tall brick stack is about 0.7 mile north of the light.

The shoals on the northeastern side of the entrance to Delaware Bay are mixed clay and sand and have the consistency of hardpan; the ridges run in approximately the same direction as that of the currents. **Cape May Channel** is the principal buoyed passage between the shoals; least depths are 13 to 17 feet through this channel and thence between **North Shoal** and **Crow Shoal.** Some tugs pass just northeastward of **Overfalls,** which was discussed earlier in the chapter. Small boats can follow the south side of Cape May and cross **Prissy Wicks Shoal** in depths of 9 feet or more 0.5 mile southwest of Cape May Light; the shoal has depths as shallow as 2 feet 2 miles south of Cape May Light, and depths of 12 feet are found 3.5 miles south-southeastward of the light.

The channels have strong tidal **currents,** and many tide rips occur near Prissy Wicks Shoal. In Cape May Channel the current has an average velocity at strength of flood of about 1½ knots and at strength of ebb of about 2½ knots. In the channel just to the northeast of Overfalls the current has an average velocity at strength of flood of about 1 knot and at strength of ebb of about 1½ knots.

Cape May Canal, 2 miles northward of Cape May Light, is described in Chapter 5 in connection with the New Jersey Intracoastal Waterway. Farther north are several creeks, the first of any importance to navigation being **Bidwell Ditch,** a drainage canal 12 miles north-northeastward of Cape May Light. The ditch has depths of about 3 feet at the jettied entrance and deeper water inside to the fixed highway bridge 1.5 miles above the jetties.

Deadman Shoal, 6 miles west-southwestward of Bidwell Ditch and 10 miles north-northwestward of Cape May Light, has a minimum depth of 3 feet and is marked by buoys on the north and east sides. A ridge with depths of 5 to 7 feet begins a mile westward of Deadman Shoal and extends southward about 3 miles.

Goshen Creek, 13 miles north-northeastward of Cape May Light, has a depth of about 1 foot over the flats at the mouth and for about 2 miles upstream to within a mile of the village of **Goshen.** The creek is entered only by small local boats.

Dennis Creek, 14 miles north-northeastward of Cape May Light, has depths of about 2 feet over the flats at the mouth and much deeper water inside to **Jakes Landing,** about 3 miles upstream. The creek is navigable for a considerable distance, but has no commerce and is little used. A fixed highway bridge over the creek at **Dennisville,** the head of navigation 5 miles above the mouth, has a horizontal clearance of 39½ feet and a vertical clearance of 3 feet.

Maurice River empties into the northeast corner of **Maurice River Cove** 7 miles west-northwestward of Dennis Creek and 17 miles north-northwestward of Cape May Light. The dome of a white dwelling which is an abandoned lighthouse, is prominent on **East Point,** on the east side of the entrance to the cove. The landings near the mouth of Maurice River are the center of a large shellfish industry, and a considerable tonnage of logs is handled on the upper river.

The controlling depth over the bar and up Maurice River to Millville is about 4 feet. The main channel is west of an island in mid-entrance and is marked by lighted and unlighted buoys and a lighted range; an unmarked channel on the opposite side of the island has depths of 2½ feet and is much used by local boats.

For about 15 miles above the mouth the channel in Maurice River has ample width and is easily followed; without local knowledge it is safer to navigate this part of the river on a rising tide and to proceed with caution. The upper part of the river is nar-

row but is marked by buoys which are not charted; towboats bound to or from this part of the river usually run with the current.

The mean range of **tide** is 5½ feet at the mouth of Maurice River and 6 feet at Millville; high and low waters at the latter place occur about 2 hours later than at the mouth. At the entrance to the river the **current** has an average velocity at strength of flood or ebb of about 1 knot. At Mauricetown the average velocity of strengths is about 2½ knots. At Millville the flood is very weak; at strength of ebb the average velocity is less than ½ knot.

Bivalve is an important oyster-shipping point on the west bank of Maurice River 3 miles above the mouth. Gasoline and provisions are obtainable and water is available on the wharves. **Storm warnings** are displayed day and night at Bivalve.

The town of **Maurice River,** on the opposite side of the stream from Bivalve, has rail connections for shipping seafood. **South Port Norris,** on the west bank 3.5 miles above the mouth, has several oyster-packing plants; the wharves have deep water alongside.

Leesburg, on the east bank of Maurice River 7 miles above the mouth, has a boatyard that can haul out and make hull and engine repairs to vessels up to 115 feet in length and 8 feet in draft. Gasoline, fresh water, and marine supplies are available. The wharf has deep water alongside. Leesburg has rail connections.

Dorchester, on the east bank of Maurice River 9 miles above the mouth, has a boatyard that can haul out and make repairs to vessels up to 115 feet in length, 8 feet in draft, and 100 tons in weight; marine supplies are available at the yard. The wharves at Dorchester have relatively deep water alongside.

Mauricetown, on the west bank of Maurice River 10 miles above the mouth, has a yard that can haul out boats up to 65 feet in length and 6 feet in draft. The highway bridge over the river at Mauricetown has a swing span with a minimum horizontal clearance of 58 feet and a vertical clearance of 3½ feet; both openings are clear but the slightly wider eastern opening is generally used because the **current** has a westerly set on both ebb and flood.

Bricksboro and **Port Elizabeth,** on the east bank 11 and 12 miles, respectively, above the mouth of the river, have rail communication. Port Elizabeth has a yard that can haul out boats up to 35 feet in length.

Millville, on the east bank of Maurice River 20 miles above the mouth, has rail communication and several factories. Gasoline and provisions can be obtained at the town. The highway bridge over the river at Millville has a swing span with a horizontal clearance of 36 feet and a vertical clearance of 5 feet; **regulations** governing operation of the drawspan are given in **§203.225,** Chapter 2A. A yard below the bridge can haul out and make hull repairs on boats up to 40 feet in length and 3 feet in draft. The head of navigation on the river is a mill dam a mile above the bridge.

Dividing Creek empties into the northwest corner of Maurice River Cove 3 miles west of Maurice River. The creek has depths of about 2½ feet across the flats at the mouth and deeper water inside. Above the mouth, the creek twists and turns for 8 miles through the marsh to the town of **Dividing Creek,** which is only 4 miles from the mouth by air line. The channel to the town can be navigated by small boats at high water but it is seldom used except by a few oyster boats.

Egg Island Point, 11 miles westward of Dennis Creek and 17 miles northwest by north of Cape May Light, is marked by a light. Southward of the point are Egg

Island Flats, which have depths as little as 3 feet; the shallowest part is marked by buoys at the southeast and northwest ends. The flats are thick with oyster-bed stakes. Between Egg Island Point and the inner end of the flats is a slough, with depths of 7 feet, that is used by local boats.

Fortescue Creek, 4 miles northwest by north of Egg Island Point, has a light on the south side of the entrance. The creek is said to have depths of 4 feet to the highway bridge at **Fortescue** (*P. O.*), a small village and summer settlement on the south side 0.4 mile above the entrance. Gasoline, water, and ice can be obtained at a Fortescue dock, and food stores are within 0.5 mile. Across the creek is a basin with a marine railway that can haul out boats up to 50 feet in length and 20 tons in weight; a nearby machine shop can make hull and gasoline-engine repairs.

Nantuxent Point, 8 miles northwestward of Egg Island Point, is on the southeast side of the entrance to **Nantuxent Cove.** A light marks the point and a buoy marks the outer limit of the 5- and 6-foot spots that extend a mile off.

Nantuxent Creek empties into Nantuxent Cove along the northwest side of Nantuxent Point. The creek has depths of about 5 feet in the mouth and is navigated at high water by local oyster boats for about 5 miles to within a mile of the village of **Newport.**

Cedar Creek, which empties into Nantuxent Cove a mile north-northwestward of Nantuxent Point, has depths of about 4 feet in the entrance and upstream for 3 miles; at high water the creek can be navigated by small boats for an additional 2 miles to the village of **Cedarville.** Small boats anchor in the mouth of the creek but there is little traffic above.

Back Creek, which empties into the northwest corner of Nantuxent Cove 2 miles northwestward of Nantuxent Point, is used by local boats only as an anchorage. The creek has depths of about 5 feet over the flats at the entrance and good depths for about 3 miles above.

Ben Davis Point, 2 miles west-northwestward of Nantuxent Point and 10 miles northwestward of Egg Island Point, is on the northwest side of the entrance to Nantuxent Cove. Shoals to be avoided are the 1-foot spot a mile southwest of the point and 5-foot **Ben Davis Point Shoal,** which is 2.5 miles south by west of the point and within 0.7 mile of the main channel through the bay.

Cohansey River empties into the northeast side of Delaware Bay 14 miles northwestward of Egg Island Point. The water-borne commerce is mostly in petroleum products, but sizable tonnages of shellfish, shells, and fertilizer also are transported on the river.

Cohansey Light (lat. 39°20′.5, long. 75°21′.7), 42 feet above the water and visible 12 miles, is shown from a skeleton tower on a concrete foundation on the south side of Cohansey River near the natural entrance. A dredged cut through the narrow neck of land on which the light stands gives a more direct approach to the river; the cut is 0.3 mile northwest of Cohansey Light and is marked on its west side by lights at the inner and outer ends. Controlling depths were 11 feet in the entrance in 1945; thence, in 1948, 12 feet to Glass Street in Bridgeton; thence, in 1947, 4½ feet to Broad Street bridge; and thence, in 1945, 2½ feet to Commerce Street bridge.

The usual approach to Cohansey River is along the axis of the dredged cut, but the natural channel eastward of Cohansey Light is sometimes used; the latter has a controlling depth of about 7 feet, and unmarked shoals with depths of 4 to 6 feet must

be avoided on either side. Within the river, the natural channel has ample width and depth to within a mile of Bridgeton; thence to Bridgeton is a dredged channel which requires some local knowledge to follow.

The mean range of **tide** is 6 feet at the entrance to Cohansey River and 6½ feet at Bridgeton; high water at Bridgeton occurs about 1½ hours later than at the entrance. The average velocity of the **current** at strength of flood or ebb is 1 to 1½ knots at the entrance and less than ½ knot at Bridgeton.

Greenwich Pier, a shipping point for seafood, is on the northwest bank of Cohansey River 4 miles above the entrance. Gasoline, water, and provisions can be obtained at the oyster pier. The larger of two marine railways at Greenwich Pier can haul out boats up to 115 feet in length and 8 feet in draft; hull and engine repairs can be made.

Fairton is a village on the southeast bank of Cohansey River 14 miles above the entrance. The largest of several marine railways at the village can haul out boats up to 40 feet in length and 3 feet in draft.

Bridgeton is an important manufacturing town and rail center 17 miles above the entrance to Cohansey River. Depths at the principal wharves are 8 to 12 feet. Gasoline, water, marine hardware, and provisions are obtainable at the town. The Broad Street bridge has a bascule span with a horizontal clearance of 40 feet and a vertical clearance of 6½ feet; **regulations** governing operation of the drawspan are given in **§ 203.225,** Chapter 2A. The Commerce Street bridge, 0.2 mile above Broad Street, has a fixed span with a horizontal clearance of 23 feet and a vertical clearance of 7 feet. The Washington Street fixed trestle, 0.7 mile above Broad Street, has a horizontal clearance of 14 feet and a vertical clearance of 5½ feet.

Stow Creek, 3 miles northwestward of Cohansey Light, has depths of 3 feet or more in the entrance and deeper water inside. The creek is said to be navigable at high water for about 9 miles to within a mile of the village of **Canton.** The best water in the approach to Stow Creek is eastward and northward of the island in the mouth but local knowledge is needed to follow it.

Bay Side is a fishing resort on the east side of the entrance to Stow Creek. The small landings at the village have depths of about 3 feet at their outer ends. Gasoline, water, and ice can be obtained at Bay Side.

Chart 294.—The dividing line between **Delaware River** and Delaware Bay is 42 miles above the Delaware Capes. The line was defined arbitrarily by the legislatures of Delaware and New Jersey and extends from a monument on **Liston Point,** Delaware, to a similar monument on the south side of the entrance to **Hope Creek,** New Jersey. Hope Creek has depths of about 2 feet at the mouth and is navigable for several miles but is little used; the breakwater that extends 0.5 mile southwestward from the northwest side of the entrance has a light on the outer end.

From **Stony Point,** 1 mile northwest of Hope Creek, a large filled area extends, behind dikes and bulkheads, a mile westward, thence 2.5 miles northward inclosing the shallowest part of **Baker Shoal,** and thence southward and eastward to the original shore. The fill is referred to by the Corps of Engineers as **Artificial Island.**

Alloway Creek empties into Delaware River from eastward 3.5 miles above Hope Creek and behind the north end of the Baker Shoal fill. The controlling depth is reported to be about 5 feet to Quinton. The approach to Alloway Creek is unmarked and the shoals on either side of the mouth must be avoided. Above the mouth the

best water is not always in midstream, and some local knowledge is needed to follow it. The mean range of **tide** is about 5½ feet at the entrance and 4 feet at Quinton. The average velocity at strength of flood or ebb **current** is about 2 knots at the entrance and 1¼ knots at New Bridge.

Hancocks Bridge, 4 miles above the mouth of Alloway Creek, has a swing span with a horizontal clearance of 48 feet and a vertical clearance of 2½ feet; the best water is in the north opening. Gasoline can be obtained at small bulkhead landings at Hancocks Bridge and provisions are available in the settlement. **New Bridge,** 5.5 miles above the mouth, has a swing span with a horizontal clearance of 35 feet and a vertical clearance of 3½ feet. The highway bridge at **Quinton,** 8 miles above the mouth of the creek, has a swing span with a horizontal clearance of 30 feet and a vertical clearance of 3 feet. **Regulations** governing operation of all three drawspans are given in § **203.225,** Chapter 2A.

Salem River empties into **Salem Cove** from eastward 51 miles above the Delaware Capes and on the opposite side of Delaware River from the entrance to the Chesapeake and Delaware Canal. Commerce on Salem River is almost entirely in petroleum products. The approach channel follows the southeast side of Salem Cove for about 2 miles to the mouth of the river and is marked by buoys and a lighted range. Within the river the channel enters a land cut 0.8 mile above the mouth and returns to the river 1.3 miles from the mouth; the river channel is marked by buoys as far as the cut. Controlling depths were 10 feet across Salem Cove to the cut-off, thence 12 feet to the first highway bridge in 1949; and thence 11½ feet to the fixed highway bridge over Fenwick Creek at Salem in 1946.

The mean range of **tide** is 5½ feet at the entrance and at Salem; the tides occur at Salem about 20 minutes later than at the entrance. The average velocity at strength of flood or ebb **current** is about 1½ knots at the entrance.

The highway bridge 1.8 miles above the mouth of Salem River has a bascule span with a horizontal clearance of 60 feet and a vertical clearance of 5 feet. On the south shore just below the bridge is a marine railway that can haul out boats up to 48 feet in length and 3 feet in draft for repairs and storage; gasoline and provisions are available.

Fenwick Creek empties into Salem River 2 miles above the mouth. The river turns northward from the junction and is not used above that point. The creek extends eastward along the water front of **Salem.** The fixed highway bridge over Fenwick Creek 2.4 miles above the mouth of Salem River has a horizontal clearance of 33 feet and a vertical clearance of 2 feet.

Appoquinimink River empties into the west side of Delaware River 3 miles above Liston Point. The river has no commerce and is little used except by pleasure boats and a few local fishing boats. Controlling depths were 2 feet over the bar, and thence 4 feet to Odessa in 1945. The mean range of **tide** is 6 feet at the mouth and about 3 feet at Odessa; high and low waters are reported to occur at Odessa about one hour later than at the mouth. The average velocity at strength of flood or ebb **current** is about 1 knot at the mouth.

The highway bridge 3 miles above the mouth of Appoquinimink River has a swing span with a horizontal clearance of 39½ feet and a vertical clearance of 7 feet. The highway bridge at **Odessa,** 5.5 miles above the mouth, has a swing span with a single clear opening that has a horizontal clearance of 40 feet and a vertical clearance of 5 feet; the bridge has not been opened for many years. The wharves at Odessa are in ruins.

Reedy Island, 6 miles northward along Delaware River main channel from Liston Point and midway between the channel and the western shore, is the site of a former Federal quarantine and detention station. The pier on the channel side of the island has a depth of 10 feet at the outer end. A dike extends southward for 3 miles from Reedy Island and roughly parallels the western shore. The dike is marked by lights, and a buoy is moored off the submerged southern end.

Port Penn is a village on the western shore opposite Reedy Island. The best approach to the village is through an opening in the Reedy Island dike; the opening is 0.2 mile south of the island, is 5 feet deep and 150 feet wide, and is marked on the south side by a daybeacon. Approaches to the village from north of Reedy Island or from south of the dike are over flats with depths of 2 feet. Anchorage depths off Port Penn are 15 feet or more but depths at the piers are relatively shallow.

The **Chesapeake and Delaware Canal** extends westward from a point on the main channel of Delaware River 51 miles above the Delaware Capes. The canal is described in Chapter 7.

Delaware City is 1.6 miles northwestward along the west bank of the river from the entrance to the Chesapeake and Delaware Canal. **Delaware City Branch Channel,** which extends southward from the river front of the town to the Chesapeake and Delaware Canal, is described in Chapter 7. The bulkhead wharf at Delaware City has several hundred feet of berthing space for tugs, fishing boats, and pleasure craft; depths at the wharf range from 6 feet to 2 feet.

Pea Patch Island is on the southwest side of the Delaware River main channel and 2 miles northwestward of the Chesapeake and Delaware Canal. The low island is the site of old **Fort Delaware.** The Fort Delaware wharf is marked by a light, and there is a wharf directly opposite on the northeast shore of the river. A dike, mostly submerged at high water, extends northward along **Bulkhead Shoal** for about 3 miles from Pea Patch Island. The dike is marked by lights, one of which is on the south side of a shallow opening a mile from the island.

Bulkhead Shoal Channel, westward of Pea Patch Island and Bulkhead Shoal, has depths of 15 feet or more and is sometimes used by small vessels bound for the Chesapeake and Delaware Canal. The average velocity of the **current** at strength of flood or ebb is about 1¾ knots in the channel.

New Castle, on the west bank of Delaware River 57 miles above the Delaware Capes, has little water-borne commerce. The principal public wharf has depths of 15 feet alongside. The yacht basin is reported to go dry at low water and with adverse winds. Several stone fenders that stand about 5 feet above high water protect the wharves from drifting ice.

Pennsville is on the east bank of Delaware River 58 miles above the Delaware Capes. The principal pier has a depth of 10 feet at the outer end and is used by excursion boats from Wilmington and Philadelphia during the summer. A mile northeast of the Pennsville docks, a dike extends out from shore and parallels it at a distance of 0.3 mile for about 0.7 mile toward the docks.

Delaware Memorial Bridge, which crosses the river 60 miles above the Delaware Capes, has a suspension channel span, 2,000 feet between piers, with a minimum vertical clearance of 166 feet and a maximum of 193 feet.

About 0.3 mile south of the New Jersey end of the Memorial Bridge are two buoyed channels, each marked by a lighted range, that lead to a power-company wharf

which accommodates coal barges in depths of 26 feet. The channels meet just south of the wharf; depths are about 25 feet in the upper channel and 18 feet in the lower channel.

Salem Canal extends eastward just north of the eastern end of the bridge. The canal once gave access to the upper part of Salem River, described earlier, and navigation was possible for 12 miles to the now-navigable part of Salem River at the town of Salem. The route is now blocked in several places, the first being at a dam about 300 yards above the mouth of the canal.

Deepwater Point, 0.6 mile above the New Jersey end of the Memorial Bridge, is the site of a large chemical plant and has a long main wharf and a railroad car-float bridge. The main wharf has depths of 30 feet at the face.

Pigeon Point, 0.6 mile above the Delaware end of the Memorial Bridge, has a railroad car-float bridge and a coal pier for bunkering light-draft vessels. The coal pier has depths of 12 feet at the face.

Christina River empties into the west side of Delaware River 61.7 miles above the Delaware Capes. The river is the approach to the city of Wilmington and to the towns of Newport and Christiana.

A steel sheet-pile jetty 0.4 mile long is on the south side of the entrance to Christina River. The outer end of the jetty and the point on the opposite side of the entrance are marked by lights. A lighted range marks the first reach of the river channel.

Wilmington Marine Terminal, on the south side of Christina River 0.7 mile above the mouth, has a bulkheaded water front that can accommodate at one time several vessels of any draft that can negotiate the entrance channel. The terminal has rail and highway connections, modern storage facilities, and mechanical freight-handling equipment.

Lobdell Canal, on the south side of Christina River 0.9 mile above the mouth, is used by towboats and barges and has depths of about 8 feet alongside the bulkheads.

Brandywine River, which empties into the northeast side of Christina River 1.6 miles above the mouth, has depths of about 4 feet to the railroad bridge 1 mile above the mouth. The channel is rocky above the railroad bridge but depths of 1 to 2 feet can be carried 0.7 mile to Market Street bridge, above which there are rapids. The river is used mostly for anchorage and storage of pleasure boats.

Wilmington, on the north side of Christina River 2.5 miles above the mouth, has large manufacturing interests and considerable water-borne commerce. At the city, both sides of the river are lined with wharves which will accommodate the drafts using the channels.

Newport, on the north side of Christina River 8 miles above the mouth, is at the head of the improvement project described below. There is little traffic above Newport but depths of 2 to 3 feet can be taken to **Christiana,** on the north side 13 miles above the mouth of the river.

Channels.—A Federal project provides for a channel 30 feet deep and 400 feet wide in Delaware River for 0.2 mile to the mouth of Christina River and within the river to Lobdell Canal; thence 21 feet deep and 250 feet wide to the mouth of Brandywine River; thence 21 feet deep and 200 feet wide to the former pulp works, 3.7 miles above the mouth; thence decreasing to a depth of 10 feet at Pennsylvania Railroad bridge No. 4, 3.8 miles above the mouth; and thence 7 feet deep and 100 feet wide to

Newport. Controlling depths were, in February 1953, 22 feet in the middle half and 24 feet in the south outside quarter to the west end of the Marine Terminal, thence 11 feet to Lobdell Canal; thence, in July 1949, 14 feet to Pennsylvania Railroad bridge No. 4, and thence 6 feet to Newport.

Anchorages.—Vessels must not anchor in Christina River channel within the city limits of Wilmington or tie up at any wharf more than two abreast without permission of the harbor commissioners. Limits of a designated anchorage area off Deepwater Point, south of the entrance to the river, and **regulations** governing its use are given in **§ 202.157,** Chapter 2A.

Bridges.—The bridges over Christina River are listed below with name, type of drawspan, distance above mouth of river, minimum horizontal clearance, and closed vertical clearance at high water in that order. **Regulations** governing operation of the drawspans are given in **§ 203.235,** Chapter 2A. In October 1949, the Corps of Engineers requested navigation interests to arrange their schedules so that the Third Street and Market Street drawspans will not be required to open from 8:00 a. m. to 9:00 a. m. and from 4:30 p. m. to 5:30 p. m. in order to prevent traffic congestion during the rush hours.

Pennsylvania Railroad, swing, 1.4 miles. 90 feet, 7 feet.
Third Street, highway bascule, 2.2 miles, 143 feet, 16 feet.
Market Street, highway bascule, 2.8 miles, 183 feet, 10 feet.
Pennsylvania Railroad, swing, 3.8 miles, 69 feet, 6 feet.
Reading Railway, swing, 3.8 miles, 63 feet, 3 feet.
Pennsylvania Railroad, swing, 5 miles, 37 feet, 2½ feet.
Newport, highway bascule, 8 miles, 49 feet, 5 feet.
Churchmans, highway fixed, 10 miles, 61 feet, 8 feet.
Christiana, highway fixed, 13 miles, 60 feet, 6½ feet.

The bridges over Brandywine River are listed below, with information in the same order as for Christina River. **Regulations** governing operation of the drawspans are given in **§ 203.230,** Chapter 2A.

Seventh Street, highway swing, 0.1 mile, 48 feet, 10½ feet.
Pennsylvania Railroad, swing, 1.0 mile, 50 feet, 21 feet.
Church Street, highway bascule, 1.2 miles, 40 feet, 15 feet.
Sixteenth Street, highway vertical-lift, 1.5 miles, 40½ feet, 10 feet down and 54 feet up.
Market Street, highway fixed, 1.7 miles, 149 feet, 13 feet.

Tides and currents.—The mean range of tide is about 5½ feet at Wilmington and 4 feet at Newport. At the entrance to the harbor the strength of the current normally has a velocity of about ¾ knot. Unless influenced by strong winds, the inner harbor currents rarely impede navigation and generally follow the direction of the channel.

Local magnetic attraction.—In the vicinity of Wilmington the direction of the compass needle has been observed on shore to differ as much as 4° from the charted value.

Pilotage.—The rates for pilotage into or out of Delaware River ports are given at the beginning of this chapter.

Quarantine.—The Federal quarantine station is at Marcus Hook, 7 miles up Delaware River from Wilmington. The Public Health Service has an outpatient office in Wilmington.

Customs.—Wilmington is a port of entry at which marine documents are issued. A deputy collector is in charge of the Wilmington customs office.

Immigration and naturalization.—At the port of Wilmington inbound vessels carrying aliens are boarded, either at Delaware Breakwater or at their docks, by immigration inspectors who will, after examining passengers, either grant them entry or direct the vessel to hold them for further examination.

Harbor regulations.—§ **207.80,** Chapter 2A, limits the **speed** of vessels in Christina River to 8 statute miles per hour.

Supplies.—There is an unlimited supply of pure water; at the Wilmington Marine Terminal vessels can be furnished water from pipe connections with the city mains. The nearest coal-bunkering facilities for large vessels are at Philadelphia; the Wilmington Marine Terminal offers its wharf and cranes for bunkering purposes but, as it maintains no stocks of coal, special orders must be placed for delivery at shipside. Towboats and other light-draft vessels can secure bunker coal at Pigeon Point, described earlier. The nearest facilities for supplying deep-draft vessels with bunker oil are at Marcus Hook. Light-draft vessels can obtain bunker oil at a wharf on the south side of Christina River just above the second bridge; the depth at the wharf is about 8 feet.

Repairs.—Wilmington has several marine railways but none capable of handling large vessels. The railway on the south side of Christina River just below the second bridge can haul out vessels up to 100 feet in length and 60 tons in weight. There are several machine and hull repair shops in the port.

Communications.—Wilmington is served by three railroads. The principal airport serving the area is the New Castle County Delaware Airport, 5 miles southwest of Wilmington; regular scheduled passenger service is maintained.

Chart 295.—Carney Point, on the south side of **Helms Cove** and across Delaware River from Christina River, is the site of a powder factory. A tank and a stack are prominent.

Penns Grove is a railroad terminus on the east side of Delaware River 63 miles above the Delaware Capes. The wharf at the town has a depth of about 12 feet at the outer end and is used by excursion boats from Wilmington and Philadelphia during the summer.

Edgemoor is directly across Delaware River from Penns Grove. The two Government piers at Edgemoor have depths of 17 feet at their outer ends and 15 feet in the basin between them. The **Corps of Engineers** has a suboffice at the basin. About 400 yards to the southwestward is a wharf with depths of 16 feet alongside.

In September 1950, the Corps of Engineers requested masters to limit the **speed** of their vessels to 6 knots when passing the piers at Edgemoor, as well as when passing other piers and wharves along Delaware River, in order to avoid damage caused by excessive wave action.

A dike, with its outer end submerged, extends 0.3 mile offshore from **Oldmans Point,** which is on the eastern shore of Delaware River 2 miles above Penns Grove. About 0.3 mile southward of the dike are the ruins of a long pier. The Government pier 0.3 mile northeast of the dike is protected by ice fenders and has depths of 15 feet at the outer end.

Oldmans Creek, which empties into the southeast side of Delaware River 67 miles above the Delaware Capes, is the approach to the villages of **Nortonville, Pedricktown,** and **Auburn,** 1.7, 3.4, and 7.8 miles, respectively, above the mouth. The creek has very little traffic of any kind. Controlling depths were 3½ feet in the entrance channel

in 1945; thence, in 1942, 6½ feet to Pedricktown, and thence 1½ feet to Auburn. The approach to the creek is marked by buoys. The mean range of **tide** in Oldmans Creek is about 5½ feet at the entrance, 2½ feet at Pedricktown, and 1 foot at Auburn; the tides at Pedricktown and Auburn are reported to occur about ½ hour and 2¾ hours later, respectively, than at the entrance.

Bridges over Oldmans Creek, with type, distance above mouth, horizontal clearance, and closed vertical clearance at high water in that order, are: Nortonville, highway vertical-lift, 1.7 miles, 75 feet, 5 feet down and 64 feet up; Pennsylvania Railroad, swing, 2.4 miles, 36 feet, 2 feet; Pedricktown, highway swing, 3.4 miles, 36 feet, 8 feet; and Auburn, 7.8 miles, highway fixed, 29½ feet, 1 foot. **Regulations** governing operation of the drawspans are given in § **203.225,** Chapter 2A. An overhead cable 0.8 mile below Auburn has a vertical clearance of 64 feet.

Claymont, Delaware, on the northwest bank of Delaware River 68 miles above the Capes, is the site of petroleum and chemical works. The wharves have depths of 27 to 30 feet at their faces.

Marcus Hook, Pennsylvania, on the northwest bank of Delaware River 69 miles above the Delaware Capes, is an important center at which large quantities of crude oil are received and refined. The oil companies at Marcus Hook have wharves, with depths of 30 to 34 feet at the faces, at which vessels can be bunkered at the rate of 2,000 to 3,000 barrels per hour. The companies also operate barges for bunkering in the stream or alongside other wharves.

A Federal **quarantine and detention station** for Delaware River ports is maintained at Marcus Hook by the U. S. Public Health Service. The station wharf is at the lower end of the city waterfront and has depths of 10 feet at the outer end. **Regulations** governing use of the wharf are given in § **207.90,** Chapter 2A. A daytime **reporting station** of the Philadelphia Maritime Exchange is on the wharf.

On the southeast side of the main ship channel opposite Marcus Hook is an **anchorage** ground in which a preferential area is designated for vessels awaiting quarantine inspection. Limits of the area and regulations governing it are given in § **202.157,** Chapter 2A. The **current** in this area averages about 1¾ knots at strength of flood or ebb.

Raccoon Creek, on the southeast side of Delaware River 70 miles above the Capes, is the approach to the towns of Bridgeport and Swedesboro. The creek carries some traffic in fertilizers and fertilizer materials. The approach to Raccoon Creek is a channel that extends west-southwestward through the shallow flats for 1.1 miles from the mouth. Controlling depths were 7½ feet in the entrance channel in May 1948, thence 7 feet to Bridgeport in June 1945, and thence 7½ feet to Swedesboro in September 1948.

The approach channel is marked by buoys, and a light marks the outer end of the rock jetty on the south side of the mouth. The mean range of **tide** in Raccoon Creek is about 5½ feet at the entrance and 5 feet at Swedesboro; high and low waters at Swedesboro are reported to occur about 1½ hours later than at the entrance.

The highway bridge over Raccoon Creek at **Bridgeport,** 1.5 miles above the mouth, has a vertical-lift span with a horizontal clearance of 65 feet and vertical clearances of 6 feet down and 64 feet up. The railroad bridge 0.3 mile above the highway bridge has a swing span with a horizontal clearance of 38 feet and a vertical clearance of 7 feet. The wharves on the east side between the bridges are in poor condition. A boatyard on the east side just south of the highway bridge can make minor repairs.

The landings between Bridegeport and Swedesboro are in ruins. The highway bridge 6.7 miles above the mouth of Raccoon Creek has a swing span with horizontal clearances of 50 feet in the north opening and 60 feet in the south opening and a vertical clearance of 6 feet.

The fixed railroad bridge over Raccoon Creek at **Swedesboro,** 7.1 miles above the mouth, has a horizontal clearance of 33 feet and a vertical clearance of 21 feet. The fixed highway bridge 0.3 mile above the railroad bridge has a horizontal clearance of 50 feet and a vertical clearance of 8 feet. There is little traffic above Swedesboro.

A passenger and vehicular **ferry** landing is on the southeast side of Delaware River 0.7 mile above Raccoon Creek. Cross-river service is maintained to Chester. The ferry landing is connected with the town of Bridgeport by a highway.

Chester is on the northwest side of Delaware River 72 miles above the Delaware Capes. The city is an important manufacturing center and many of its industries use the wharf facilities along the 3-mile water front. The nearest designated **anchorage** is off Marcus Hook. Chester is a **customs** port of entry. A passenger and vehicular **ferry** operates across the river to the Bridgeport landing.

The majority of the wharves at Chester have depths of 15 to 20 feet at their faces; some have as little as 5 feet, and the **Chester Tidewater Terminal,** near the lower end of the water front has 35 feet. The water front has storage facilities, mechanical transfer equipment, and rail and highway connections.

Water is piped to the principal wharves. None of the wharves have facilities for coal or oil bunkering. One of the largest shipyards and ship-repair plants along the Atlantic seaboard is at Chester; each of the two floating drydocks has a capacity of 10,000 tons.

Chester Creek empties into Delaware River about 0.4 mile above the mid-point of the Chester water front. The railroad bridge 200 yards above the mouth of the creek has a swing span with a horizontal clearance of 59 feet and a vertical clearance of 1½ feet. Second Street highway bridge, 150 yards above the railroad bridge, has a fixed span with a horizontal clearance of 84 feet and a vertical clearance of 8 feet. Six more fixed bridged cross the creek between Second Street and the dam 0.8 mile above the mouth; minimum clearances are 79 feet horizontally and 6 feet vertically.

There is very little traffic in Chester Creek, and commerce goes only as far as the Second Street bridge. In 1946, controlling depths were 5 feet to the Second Street bridge, thence about 3 feet to the railroad bridge 0.5 mile above the mouth, and thence 1½ feet to the dam. The mean range of **tide** is about 5½ feet at the entrance.

Ridley Creek, 0.8 mile above Chester Creek, bares in places at low water and is crossed by nine fixed bridges in the first mile; minimum clearances are 40 feet horizontally and 6 feet vertically. **Chester Island,** on the southeast side of the main channel opposite Ridley Creek, is marshy and has no prominent marks.

Eddystone, on the northwest side of Delaware River 74 miles above the Delaware Capes, has about 1.5 miles of water front. Most of the wharves have depths of about 8 feet at their faces. The average velocity of the **current** off Eddystone is about 1¾ knots at strength of flood and 2¼ knots at strength of ebb.

Crum Creek, near the upper end of the Eddystone water front, bares in places at low water and is crossed by several fixed bridges with very little vertical clearance.

Darby Creek, 0.3 mile above Crum Creek, has depths of about 9 feet to the railroad bridges just above the mouth, thence about 7 feet to a point 4 miles above the

mouth, and thence 3 feet to the forks 6 miles above the mouth. Oil barges and small tankers go to a wharf, with depths of 9 feet alongside, on the east side just below the railroad bridges. Above the wharf, the creek is used only by small pleasure boats.

The railroad bridges 0.3 mile above the mouth of Darby Creek have bascule spans with horizontal clearances of 50 feet and vertical clearances of 5 feet; **regulations** governing operation of the drawspans are given in **§ 203.228,** Chapter 2A. The fixed highwaybridge just above the railroad bridges has a horizontal clearance of 73 feet and a vertical clearance of 22 feet. Fixed highway bridges 1.1 and 4.1 miles above the mouth have horizontal clearances of 50 feet and vertical clearances of 8 feet and 10 feet, respectively. The mean range of **tide** is about 5½ feet at the mouth of Darby Creek.

Essington, on the north side of Delaware River 75 miles above the Capes, is the center and fitting-out point for the majority of the yachts in the Philadelphia area. Between Essington and Delaware River main channel is marshy **Little Tinicum Island,** which is about 2 miles long in a direction paralleling the channel. As the controlling depth in the passage east of the island is only 2 feet, vessels bound for Essington, unless of very light draft, usually pass around the west end of the island where the controlling depth is about 9 feet.

A special small-vessel **anchorage** area is between the Essington water front and Little Tinicum Island; limits of the area and regulations governing it are given in **§ 202.67,** Chapter 2A. Depths in the anchorage are 9 to 16 feet. The average velocity of the **current** is about 1 to 1½ knots at strength of flood or ebb.

Gasoline, Diesel oil, fresh water, ice, provisions, and marine supplies can be obtained at Essington. One shipyard on the water front has four railways, the largest of which can haul out vessels up to 125 feet in length, 11 feet in draft, and 250 tons in weight; the yard has a well-equipped machine shop.

A railroad car-float bridge is on **Thompson Point** on the New Jersey side of Delaware River opposite the west end of Little Tinicum Island. Between Thompson Point and **Crab Point,** 0.5 mile to the eastward, are the large buildings of a chemical plant. The principal wharves on Crab Point have depths of 26 feet at their faces. A general **anchorage** is between the two points and the south side of the main channel; limits of the area and regulations governing it are given in **§ 202.157,** Chapter 2A. The average velocity of the **current** is about 2 knots at strength of flood or ebb.

Bramell Point, on the south side of Delaware River 76.5 miles above the Capes, is the site of a large oil refinery. The bulkhead wharf is 2,500 feet long and has depths of 33 feet at the face. Vessels can be bunkered at the rate of 1,400 barrels per hour.

Billingsport, 1.2 miles eastward of Bramell Point and 0.3 mile westward of the entrance to Mantura Creek, has an oil pier with depths of 32 feet alongside. Vessels can be bunkered at the rate of 1,800 barrels per hour.

Mantua Creek, on the southeast side of Delaware River 78 miles above the Delaware Capes, is the approach to the town of **Paulsboro** and to the villages of **Mount Royal** and **Mantua,** 1.3, 3.8, and 6.4 miles, respectively, above the mouth. The creek has considerable traffic in chemicals and fertilizers as far as the Paulsboro bridges, above which it is little used except by small boats.

A Federal project provides for a channel, protected by twin jetties at the mouth of the creek, 20 feet deep and 110 feet wide from that depth in Delaware River to the chemical plant 0.7 mile above the mouth; thence 12 feet deep and 100 feet wide to a wharf 1.7 miles above the mouth; thence 10 feet deep and 60 feet wide for 0.3 mile;

and thence 7 feet deep and 60 feet wide to **Parkers Landing** at Mount Royal. Controlling depths were 20 feet to the fertilizer wharf 0.3 mile above the mouth in December 1950; thence 10 feet to the chemical plant in December 1948; thence 11 feet to the wharf 1.7 miles above the mouth in 1945; thence, in 1942, 10 feet for 0.3 mile, thence 6½ feet to Parkers Landing, and thence ½ foot to Mantua.

The outer ends of the jetties are marked by lights and the channel within Mantua Creek is marked by buoys to the fertilizer wharf 0.3 mile up. The mean range of **tide** is about 5½ feet at the entrance, 5 feet at Paulsboro, 4½ feet at Mount Royal, and 3½ feet at Mantua. High and low waters are reported to occur 20 minutes, 50 minutes, and 2 hours later at Paulsboro, Mount Royal, and Mantua, respectively, than at the entrance.

The Pennsylvania Railroad bridge over Mantua Creek at Paulsboro, 1.3 miles above the mouth, has a swing span with a horizontal clearance of 37 feet and a vertical clearance of 0 feet. The highway bridge 0.2 mile above the railroad bridge has a vertical-lift span with a horizontal clearance of 75 feet and vertical clearances of 6 feet down and 65 feet up. The aerial cable just above the highway bridge has a vertical clearance of 69 feet.

The fixed highway bridge 2.4 miles above the mouth of Mantua Creek has a horizontal clearance of 65 feet and a vertical clearance of 25 feet.

The Mount Royal fixed highway bridge 4.3 miles above the mouth has a horizontal clearance of 67 feet and a vertical clearance of 10 feet. The fixed railroad bridge 0.2 mile above the highway bridge has a horizontal clearance of 42 feet and a vertical clearance of 13 feet.

The fixed highway bridge over Mantua Creek 5.4 miles above the mouth has a horizontal clearance of 60 feet and a vertical clearance of 13 feet. The Mantua fixed highway bridge, 6.4 miles above the mouth, has a horizontal clearance of 66 feet and a vertical clearance of 13 feet.

The fertilizer wharf 0.3 mile above the mouth of Mantua Creek has a depth of about 20 feet at the face. One of the wharves at the chemical plant, 0.7 mile above the mouth, has a depth of 14 feet at the face. The wharves between the Paulsboro bridges have depths of 5 to 7 feet, and the wharves above the highway bridge have depths of 10 to 12 feet at their faces. The oil terminals facing on Delaware River at Billingsport and Bramell Point were discussed earlier.

The **Hog Island** wharf, on the northwest side of Delaware River 78 miles above the Capes, is about 0.6 mile long and has depths of 23 to 33 feet off the face. A general **anchorage** is on the southeast side of the main channel opposite Hog Island; limits of the **area** and **regulations** governing it are given in § **202.157,** Chapter 2A. The average velocity of the **current** at strength is about 2 knots.

Old **Fort Mifflin** is on the northwest side of Delaware River 79.5 miles above the Delaware Capes. The **Corps of Engineers** wharves at Fort Mifflin have depths of 28 feet at the outer ends. The oil wharf 0.5 mile below the Engineers wharves has a 300-yard face with depths of 30 feet or more alongside.

Woodbury Creek, on the southeast side of Delaware River 79.5 miles above the Capes, has no commercial traffic. In 1944, controlling depths were 3 feet in the entrance, thence 6 feet to the first highway bridge, thence 5½ feet to the second highway bridge, and thence ½ foot to Broad Street bridge at Woodbury. The entrance to the creek is marked by buoys, but some local knowledge is needed to carry the best water.

The approach must be made from the northeast or west-southwest because of the 2-foot shoal directly off the creek. At low water the channel within the creek is well defined.

The highway bridge 0.8 mile above the mouth of Woodbury Creek has a swing span with a horizontal clearance of 39 feet and a vertical clearance of 5½ feet. The fixed highway bridge 1.5 miles above the mouth has a horizontal clearance of 55 feet and a vertical clearance of 15 feet. The Broad Street bridge at **Woodbury,** 2.7 miles above the mouth, has a fixed span with a vertical clearance of about 10 feet.

The mean range of **tide** in Woodbury Creek is 5½ feet at the entrance and 4 feet at Woodbury; high and low waters at Woodbury are reported to occur about 45 minutes later than at the mouth.

Chart 280.—Philadelphia, Pennsylvania, one of the chief ports of the United States, is at the junction of Delaware and Schuylkill Rivers. The mid-harbor point along Delaware River is at Chestnut Street, 86.5 miles above the Delaware Capes.

The Port of Philadelphia, as defined for Customs purposes, comprises such waters of the Delaware and Schuylkill Rivers bordering on the Municipality as are navigable; the municipal limits on Delaware River extend from Fort Mifflin on the south to Poquessing Creek on the north, a distance of about 20 miles.

Principal imports are crude petroleum, raw sugar, molasses, chrome ore, and manganese ore. Exports are chiefly bituminous and anthracite coal, wheat and wheat flour, and refined petroleum products. Coastwise receipts are mostly crude petroleum, and shipments are mostly refined petroleum products.

Channels.—The main channel in Delaware River as far as the Philadelphia Naval Shipyard was covered at the beginning of the chapter. A Federal project provides for a channel 37 feet deep and 800 feet wide from the Naval Shipyard to **Allegheny Avenue,** 89 miles above the Delaware Capes. The channel is maintained at or near project dimensions as far as Cumberland Street, 1 mile below Allegheny Avenue, thence the controlling depth to Allegheny Avenue was 26 feet in December 1952. The channel from Allegheny Avenue to Trenton is discussed later.

Anchorages.—Limits of defined anchorage areas in Delaware River and **regulations** governing them are given in **§ 202.157,** Chapter 2A.

Bridges.—The **Philadelphia-Camden highway bridge** over Delaware River 0.3 mile above Chestnut Street and 86.8 miles above the Capes has a suspension span, 1,686 feet long between piers, with a vertical clearance of 135 feet.

Sailing directions for Delaware River are given in tabular form in Chapter 3.

Tides.—The mean range of tide at Philadelphia is about 6 feet. Daily predictions are given in the *Tide Tables*.

Pilotage.—The rates for pilotage into or out of Philadelphia and other Delaware River ports are given at the beginning of the chapter.

Towage.—A large fleet of tugs is available at Philadelphia any time of the day or night for any type service required. As a general rule, tugs are not required by vessels moving between Philadelphia and the sea; most vessels traverse this distance under their own power.

Quarantine.—The national quarantine station at Marcus Hook is maintained by

the U. S. Public Health Service primarily as a boarding station. The detention quarters are at Marcus Hook and the administrative offices and an outpatient clinic for merchant seamen are in Philadelphia.

Customs.—Philadelphia is headquarters of a customs district that includes eastern Pennsylvania, all of Delaware, and the southern part of New Jersey. Marine documents are issued.

Immigration.—The Immigration and Naturalization Service maintains a district office and an entry and departure office in Philadelphia.

Other Federal offices in Philadelphia include U. S. Coast Guard examiner and marine inspection offices, a U. S. Navy Branch Hydrographic Office, and a Corps of Engineers district office.

Harbor regulations.—Local rules and regulations are enforced by the Navigation Commission for the Delaware River (Pennsylvania). The authority of the Commission extends from the Pennsylvania-Delaware boundary line on the south to the head of the navigable water of Delaware River on the north.

Terminal facilities.—Philadelphia has more than 125 piers, wharves, and docks along its Delaware River front. Practically all of the piers between **Greenwich Point,** 3 miles below Chestnut Street, and **Port Richmond,** 2.5 miles above, have direct connections with the railroads. Cranes and derricks with lift capacities ranging up to 100 tons are available for public use at several piers. The port has two modern grain elevators, each with a storage capacity of more than two million bushels, one along Schuylkill River and the other at Port Richmond. Facilities for the public storage of goods received or to be shipped by water include numerous warehouses in various parts of the city.

Supplies.—An unlimited supply of water is available for drinking and for use in boilers; boiler water may also be pumped from the river anywhere in the harbor but, because of pollution, this is not advisable except near the upper limits.

Bunker and cargo coal are handled at the Greenwich Point and Port Richmond tipples; the rate of delivery is 1,000 to 1,200 tons per hour at Greenwich Point and 600 to 700 tons per hour at Port Richmond.

Bunker oil can be obtained at terminals along Schuylkill River and at Petty Island, New Jersey; one of the terminals along Schuylkill River has a pumping rate of 5,500 barrels per hour. Many vessels receive their bunker oil from barges alongside. Other oil terminals are at Marcus Hook, Pennsylvania, and at Bramell Point and Billingsport, Paulsboro, New Jersey.

Repairs.—A shipyard 1.3 miles above Chestnut Street has a complete plant, including various types of shops, for repairing vessels. The graving dock can handle vessels up to 412 feet in length and 17 feet in draft. The larger of the two railways at the yard has a hauling power of 1,500 tons and can handle vessels up to 300 feet in length. Other repair facilities are available at Chester and Camden.

Communications.—Philadelphia is served by the Pennsylvania Railroad, the Baltimore and Ohio Railroad, and the Reading Railway. More than 50 steamship lines operate to and from the port. Several major airlines provide frequent scheduled services between **Philadelphia International Airport,** 5.5 miles southwest of City Hall, and domestic and overseas points.

Schuylkill River, which empties into the north side of Delaware River 80.5 miles above the Delaware Capes and 6 miles below Chestnut Street, is navigable for 7.3 miles to **Fairmount Dam** and is an important outlet for a part of the commerce of Philadelphia.

A Federal project provides for a channel 33 feet deep and 400 feet wide in Delaware River to the mouth of Schuylkill River and within the river to Twenty-ninth Street, 0.8 mile above the mouth; thence 33 feet deep and 300 feet wide to Passyunk Avenue bridge, 3.1 miles above the mouth; thence 26 feet deep and 300 feet wide to Gibson Point, 4 miles above the mouth; and thence 22 feet deep and 200 feet wide to University Avenue bridge, 5.3 miles above the mouth.

Controlling depths reported by the Corps of Engineers for entire channel width are published in tabular form in the *Notice to Mariners* and on the chart. Above the head of the improvement project at University Avenue bridge, most of the wharves have depths of about 12 feet at their faces and it is probable that a pilot can carry that depth to them.

A light marks the outer end of a sunken jetty on the east side of the entrance to Schuykill River and a fog signal is on the west side. Lights, ranges, and buoys mark the channel within the river as far as the railroad bridge 4.5 miles above the mouth.

The **bridges** over Schuylkill River are listed below with name, type of drawspan, distance above mouth, minimum horizontal clearance, and closed vertical clearance at high water in that order. **Regulations** governing operation of the drawspans are given in § **203.227,** Chapter 2A.

Pensrose Avenue, highway fixed, 1.3 miles, 680 feet, 136 feet.
Passyunk Avenue, highway bascule, 3.1 miles, 199 feet, 32 feet.
Baltimore and Ohio Railroad, swing, 4.5 miles, 58 feet, 14 feet.
Pennsylvania Railroad, swing, 4.8 miles, 75 feet west and 65 feet east, 22 feet.
Grays Ferry Avenue, highway swing, 4.8 miles, 75 feet, 22 feet.
University Avenue, highway bascule, 5.3 miles, 100 feet, 32 feet.
Pennsylvania Railroad, swing, 5.6 miles, 70 feet east and 68 feet west, 25 feet.
South Street, highway bascule, 5.9 miles, 100 feet, 38 feet.
Walnut Street, highway fixed, 6.2 miles, 112 feet, 23 feet.
Chestnut Street, highway fixed, 6.3 miles, 160 feet, 31 feet.
Market Street, highway and railroad fixed, 6.4 miles, 165 feet, 30 feet.
Arch Street, railroad fixed, 6.6 miles, 172 feet, 40 feet.
Fairmount Bridge (Spring Garden Street), highway fixed, 7.1 miles, 275 feet, 18 feet.

The mean range of **tide** in Schuylkill River is about 5½ feet. The average velocity of the **current** in the entrance is about ½ knot at strength.

The shores of the Schuylkill River have become the center of the petroleum industry at the port of Philadelphia. About 20 piers and wharves along the river are controlled by the oil companies. Vessels can secure bunker oil at terminals on the north bank 1 mile above the mouth of the river, on the west bank 1.8 miles above the mouth, and at **Point Breeze,** 3 miles above the mouth. The **Girard Point** grain elevator on the north bank 0.7 mile above the mouth has a storage capacity of more than two million bushels. Depths at the faces of the bunkering and grain-elevator terminals are about 30 feet. Most of the other wharves along the river have depths of 9 to 12 feet at their faces.

League Island, now a part of the mainland at the junction of Delaware and Schuylkill Rivers, is the site of the **Philadelphia Naval Shipyard.** The reservation has a frontage of 0.6 mile on the east side of Schuylkill River and 2 miles on the north side of Delaware River. **Reserve Basin,** in the northwest part of the reservation, has depths

of about 20 feet in the entrance and as much as 30 feet inside; the vertical-lift bridge 0.2 mile above the entrance has a horizontal clearance of 200 feet and vertical clearances of 7 feet down and 127 feet up. The wharves in Reserve Basin and along Delaware River will accommodate any draft navigating the channels. A **ferry** operates across Delaware River from midway along the League Island water front to **National Park,** New Jersey.

Big Timber Creek, on the southeast side of Delaware River 83 miles above the Capes, has a controlling depth of about 7 feet to **Clements Bridge,** 4 miles above the mouth. The channel through the flats at the entrance is marked by buoys.

The three fixed bridges over Big Timber Creek at **Westville,** a mile above the mouth, have minimum clearances of 32 feet horizontally and 14 feet vertically. The fixed highway bridge 3 miles above the mouth has a horizontal clearance of 60 feet and a vertical clearance of 12 feet. Clements Bridge has two fixed spans with horizontal clearances of 60 feet and vertical clearances of 9 feet. The mean range of **tide** is about 5 feet at Westville and 4 feet at Clements Bridge.

The oil and chemical wharves on the northeast side of the entrance to Big Timber Creek have depths of about 12 feet at their faces. Above these wharves the creek is little used except by pleasure boats. A marine railway just above the Westville bridges can haul out boats up to 50 feet in length and 30 tons in wieght; repair service is available for gasoline and Diesel engines and hull work is done. Gasoline, fresh water, and ice can be obtained at the railway.

Gloucester City, on the east side of Delaware River 83.5 miles above the Delaware Capes, is the site of large manufacturing plants. The water front is 1.3 miles long and the depths at most of the wharves range from 5 to 15 feet, but there are wharves with depths of 30 feet or more at the faces. A **Coast Guard buoy depot** is about midway along the water front. The average velocity of the **current** at strength of flood or ebb is about 2 knots off Gloucester City.

Newton Creek, on the east side of Delaware River 84 miles above the Capes, forms the boundary betwen Gloucester City and Camden. Navigation is blocked 500 yards above the mouth by low-clearance fixed bridges. The creek has depths of 30 feet or more between the wharves of a shipbuilding plant on either side.

Camden, New Jersey, on the east bank of Delaware River 86.5 miles above the Delaware Capes, is an important manufacturing and shipbuilding center directly opposite Philadelphia, with which its industrial and shipping activities are closely allied. The South Jersey Port Commission, with headquarters at Camden, has jurisdiction over the New Jersey ports bordering Delaware River from Trenton to the ocean. **Quarantine, customs,** and **immigration** are handled from the Philadelphia offices.

The water front of Camden extends from Newton Creek to the northeast end of Petty Island, a distance of 5.5 miles. A Federal project provides for dredging in front of Camden to depths of 18 feet from that depth north of **Cooper Point,** 3.3 miles above Newton Creek, to Berkley Street, 2 miles above the creek, and 30 feet from Berkley Street to Newton Creek, with the depth increased to 37 feet in front of the Camden marine terminals, these depths extending from the ship channel in Delaware River to a line parallel with and 50 feet distant from the established pierhead line. In May 1951, the 18- and 30-foot areas were at or near those depths except near Cooper Point, and the minimum depth in front of the terminals was 26 feet.

A few of the wharves below Berkley Street have depths of 30 feet or more at their

faces; most of the others have depths ranging from 14 to 25 feet. From Berkley Street to Cooper Point, the maximum depth at any of the wharf faces is about 15 feet; most have depths between 6 and 10 feet, and some of the bulkheads are dry, or nearly dry, at low water.

Fresh water is piped to the principal Camden wharves. Bunker oil can be obtained at Petty Island. Two floating drydocks, one at Cooper Point and one back of Petty Island, have lift capacities of 1,000 tons. The largest of several marine railways available for general use is at Cooper Point and has a hauling power of 1,400 tons and a cradle length of 240 feet; the shipyard makes all kinds of repairs to hulls of wood and steel vessels and to engines and boilers. Camden is served by the Pennsylvania Railroad and the Reading Railway.

The lower end of **Petty Island,** Camden, is on the southeast side of Delaware River 88 miles above the Capes. The island is 1.5 miles long and is the site of a coal-storage yard and an oil refinery. Bunker oil can be obtained at a marginal wharf, with depths of about 30 feet at the face, on the main-channel side of the island.

The channel between Petty Island and the New Jersey mainland has a controlling depth of about 12 feet from end to end and is used principally by vessels bound to or from Cooper River; both entrances are marked by buoys. The railroad bridge over the northeastern end of the channel has a bascule span with a horizontal clearance of 80 feet and a vertical clearance of 12 feet; **regulations** governing operation of the drawspan are given in § **203.225,** Chapter 2A.

Cooper River empties into the south side of the channel back of Petty Island 0.6 mile above the southwest entrance. The lower part of the river carries a substantial traffic in petroleum products and sand, gravel, and crushed rock. A Federal project provides for a channel 12 feet deep and 70 feet wide for 1.4 miles above the mouth of the river. The controlling depth was 12 feet to the head of the project in November 1950. Shallow depths can be carried 1.1 miles farther to the dam at the head of navigation. The channel through the flats at the mouth is marked by buoys.

Bridges over Cooper River, with type, distance above mouth, horizontal clearance, and closed vertical clearance at high water in that order, are: State Street, highway swing, 0.3 mile, 47 feet west and 20 feet east, 7½ feet; Pennsylvania Railroad, swing, 0.9 mile, 37 feet east and 34 feet west, 4 feet; Federal Street, highway bascule, 1.0 mile, 60 feet, 4 feet; Admiral Wilson Boulevard, highway bascule, 1.0 mile, 68 feet, 3½ feet; Baird Avenue, highway fixed, 1.8 miles, 42 feet, 12 feet; and Kaighn Avenue, highway fixed, 2.3 miles, 60 feet, 6 feet.

The mean range of **tide** is about 6 feet at Cooper Point just outside the entrance. The principal wharves along Cooper River, including the Civic Center Wharf on the west side 1.1 miles above the mouth, have depths of about 10 feet at their faces. Two marine railways are just inside the mouth of the river. The railway on the east bank can haul out boats up to 50 feet in length; storage can be arranged and gasoline and fresh water are available. The railway on the west bank can handle boats up to 60 feet in length; gasoline, Diesel oil, and fresh water are available.

The **Cramer Hill** shipyard wharves on the mainland side midway along the channel back of Petty Island have depths of about 15 feet alongside. The larger of the two floating drydocks at the yard has a lifting capacity of 1,000 tons; repairs can be made to hulls of wood and steel vessels and to engines, boilers, and dynamos.

Chart 296.—A Federal project provides for a channel 28 feet deep and 300 feet wide from Allegheny Avenue, Philadelphia, to the Pennsylvania Railroad bridge at Delair; thence 25 feet deep and 300 feet wide to the upper end of the Trenton Marine Terminal, including a turning basin 500 feet wide and 1,700 feet long at the terminal, and the maintenance of a channel 12 feet deep and 200 feet wide from the upper end of the 25-foot channel to the Pennsylvania Railroad bridge at Trenton. In February 1951 to January 1953, controlling depths were 25 feet from Allegheny Avenue to the upper end of Newbold Island, thence 17 feet to the Trenton Marine Terminal, and thence 10½ feet to the railroad bridge at Trenton. The channel reaches are well marked by lighted ranges and buoys all the way to Trenton.

The mean range of **tide** is about 6 feet from Bridesburg to Trenton. Above Philadelphia the river is generally closed by **ice** for extended periods during January and February, and in severe winters navigation is practically suspended during these months; ice seldom forms before January.

During March and April **freshets** 10 to 20 feet in height above mean low water may be expected at Trenton. The highest level is reached during the ice break-up in the spring; heavy rains do not ordinarily raise the level to more than 9 feet above mean low water. Freshets usually are not dangerous to shipping unless accompanied by ice. The 1903 freshet, highest on record, reached heights above low water of 21½ feet at Trenton, 19½ feet at Bordentown, and 13 feet at Bristol.

The rates for **pilotage** to or from Trenton and other Delaware River ports are given at the beginning of the chapter.

The **Pennsylvania Railroad bridge** over Delaware River from **Bridesburg,** Philadelphia, to **Delair,** New Jersey, 90.5 miles above the Delaware Capes, has a swing span with a horizontal clearance of 122 feet and a vertical clearance of 51 feet; **regulations** governing operation of the drawspan are given in § **203.227,** Chapter 2A. The average velocity of the **current** at the bridge is about 1½ knots at strength of flood and 1¾ knots at strength of ebb. The wharves at Bridesburg and Delair have depths of 8 to 15 feet at their outer ends.

Pennsauken Creek, on the New Jersey side of the river a mile above the railroad bridge, is very shallow at the mouth and navigation is limited by fixed bridges. **Frankford Creek,** on the Philadelphia side 1.5 miles above the bridge, is very shallow and has practically no traffic; several fixed bridges cross the creek.

The **Tacony-Palmyra highway bridge,** 93 miles above the Capes, has a bascule span with a horizontal clearance of 240 feet and a vertical clearance of 53 feet; the main fixed span has a horizontal clearance of 520 feet and a vertical clearance of 64 feet. **Regulations** governing operation of the drawspan are given in § **203.227,** Chapter 2A.

The wharves at **Tacony,** at the Philadelphia end of the highway bridge, have general depths of 9 to 12 feet at their outer ends. A marine railway just below the bridge has a hauling power of 10 tons and can handle boats up to 38 feet in length; gasoline and water are available. A wharf on **Ten Mile Point,** 1.2 miles above the bridge, has depths of about 25 feet alongside.

Pennypack Creek, on the Philadelphia side of Delaware River 95 miles above the Capes, is very shallow and can be navigated only at high water. The Philadelphia House of Correction is on the lower side of the creek and the city filter plant is on the upper side.

Delran Harbor, on the New Jersey side of Delaware River 95.5 miles above the

Capes, is a base for sand and gravel dredges, tugs, and barges. The harbor has depths of about 9 feet in the entrance and 7 to 15 feet inside; the entrance channel is marked by private ranges, and the shallow spots inside, some bare at low water, are marked by private buoys. The sand and gravel wharves on the northeast side of the harbor have depths of 8 to 10 feet at their outer ends.

The yacht basin on the south side just inside the entrance to Delran Harbor has floats with depths of 7 to 9 feet alongside. The boatyard can haul out and make hull and engine repairs to vessels up to 50 feet in length. Gasoline, fresh water, and marine supplies can be obtained at the yard.

A marine railway at the eastern end of Delran Harbor has a hauling power of 30 tons and can handle boats up to 55 feet in length; a machine shop nearby can make repairs to hulls and to gasoline and Diesel engines. Gasoline, water, and ice can be obtained at the railway.

Rancocas Creek, on the New Jersey side of Delaware River 96.5 miles above the Delaware Capes, has some tug and barge traffic as far as the first bridge; above the bridge the creek is used only by pleasure boats. The creek has depths of about 6 feet for 3 miles and thence 5 feet for 4 miles to South Branch; from South Branch to **Mount Holly,** 11 miles above the mouth, the creek is very shallow and bares in places at low water. The channel is narrow and crooked, especially above Bridgeboro, and in general follows the ebb-tide bends back and forth between shoals; navigation is difficult without local knowledge. The entrance to Rancocas Creek is marked by buoys. The average velocity of the **current** in the entrance is about 1 knot at strength of flood or ebb.

Riverside, on the south side of Rancocas Creek 1 mile above the mouth, has several factories. The coal wharf just below the highway bridge has depths of about 10 feet at the face.

Delanco, directly across Rancocas Creek from Riverside, has wharves on both the creek and Delaware River water fronts but they are in poor condition and little used. A marine railway at Delanco can haul out boats up to 50 feet in length.

The highway bridge from Riverside to Delanco has a swing span with a horizontal clearance of 50 feet and a vertical clearance of 4 feet. The railroad bridge 0.2 mile above the highway bridge has a swing span with a horizontal clearance of 42 feet and a vertical clearance of 3 feet.

The highway bridge over Rancocas Creek at **Bridgeboro,** on the south side 2.6 miles above the mouth, has a bascule span with a horizontal clearance of 60 feet and a vertical clearance of 12 feet; the overhead cable just below the bridge has a vertical clearance of 160 feet. The cable 4 miles above the mouth has a vertical clearance of 80 feet. **Centerton Bridge,** 6 miles above the mouth, has a swing span with a horizontal clearance of 49 feet in the south opening and a vertical clearance of 4 feet; the north opening is shallow.

South Branch of Rancocas Creek, 6.5 miles above the mouth, has depths of about 3 feet for 2.2 miles to a highway bridge at **Hainesport.** The bridge has a swing span with a horizontal clearance of 45 feet in the one navigable opening and a vertical clearance of 3 feet; overhead cables on both sides of the bridge have vertical clearances of 25 feet. Above the drawbridge, South Branch is navigable at high water for 2 miles to **Lumberton;** two fixed bridges within a mile of the drawbridge have minimum clearances of 48 feet horizontally and 15 feet vertically.

Poquessing Creek, on the Pennsylvania side of Delaware River 97 miles above the Capes, forms the upper boundary of the city of Philadelphia. The yacht club at

Torresdale, a part of the city on the lower side of the creek, has a float landing where gasoline, Diesel oil, and water can be obtained; depths at the float are 10 to 14 feet.

Mud Island, just above Poquessing Creek, is a flat that is partly submerged at high water and is covered with marsh grass in the summer. The channel between Mud Island and the Pennsylvania mainland has a controlling depth of about 9 feet. The lower part of the channel is used considerably as a small-boat anchorage.

Andalusia, on the Pennsylvania side of Delaware River 98 miles above the Capes, is a suburban residential community with a few industries along the water front. The yacht club at **Cornwells Heights,** on the upper side of Andalusia, has a float landing with depths of about 10 feet alongside; gasoline, Diesel oil, and water are available.

Beverly is a town on the New Jersey side of Delaware River 99.5 miles above the Capes. **Edgewater Park** is a settlement of summer residences along the high bank a mile above Beverly; there are no wharves except for small motorboats.

Neshaminy Creek, on the Pennsylvania side of Delaware River 100 miles above the Capes, has depths of about 7 feet to the fixed highway bridge 0.7 mile above the mouth, thence 3 feet to the fixed railroad bridge 1.2 miles above the mouth. The fixed highway bridge has a horizontal clearance of 100 feet and a vertical clearance of 9½ feet. The boatyard on the east side 300 yards below the highway bridge has a marine railway that can haul out boats up to 60 feet in length; gasoline, fresh water, ice, and provisions are available. A railway above the bridge can handle boats up to 30 feet in length.

A highway bridge over Delaware River 102 miles above the Capes has a vertical-lift span with a horizontal clearance of 515 feet and vertical clearances of 62 feet down and and 134 feet up; **regulations** governing operation of the drawspan are given in § **203.227,** Chapter 2A.

Burlington is on the New Jersey side of Delaware River 102.5 miles above the Capes. Part of the city fronts on the main channel of Delaware River and part on the auxiliary channel southeast of Burlington Island. Several industries are located at Burlington and its suburb, **East Burlington,** centered a mile along the auxiliary channel.

The lower end of **Burlington Island** is 103 miles above the Delaware Capes. The island is a mile long and 0.5 mile in greatest width, is high and partly wooded.

The main channel of Delaware River is along the northwest side of Burlington Island. A Federal project provides for an auxiliary channel 20 feet deep and 200 feet wide southeast of Burlington Island extending 1.2 miles from the main channel to a turning basin 450 feet wide at the upper end of the United States Pipe and Foundry Company property at East Burlington. The controlling depth was 17 feet in April 1951. Above the turning basin, the back channel has natural depths of about 12 feet for 0.5 mile, then shoals to 7 feet in the northern entrance.

The average velocity of the **current** in the back channel is about ¾ knot at strength of flood and 1¾ knots at strength of ebb. In the main channel opposite Burlington Island the average velocity is about 1¼ knots at strength of flood and 1½ knots at strength of ebb.

The fuel-receipt wharf at the lower end of Burlington has depths of about 20 feet at the face; other wharves have depths ranging from 7 to 12 feet. The foundry wharf at East Burlington has depths of about 20 feet at the face and the oil wharf above the turning basin has depths of about 17 feet at the outer end.

Bristol is on the Pennsylvania side of Delaware River 103.5 miles above the Capes. The town was the terminus of the **Delaware and Lehigh Canal,** which was abandoned

in 1931; the former Bristol entrance from the river is filled in. The public wharf at the lower end of the town has depths of about 6 feet at the face, and an industrial wharf near the upper end has face depths of about 15 feet. The yacht club near the upper end of Bristol has a float landing, with face depths of about 12 feet, where gasoline and water can be obtained; the club railway can haul out boats up to 40 feet in length, but members or guests must make their own repairs.

Florence, on the New Jersey side of Delaware River 107 miles above the Capes, is the site of a pipe foundry. The foundry wharf at the lower end of the town has depths of about 12 feet at the face, and an oil wharf at the upper end has face depths of about 10 feet.

Money Island, on the opposite side of the main channel from Florence, is wooded. The flats between the island and the Pennsylvania mainland bare at low water.

Roebling, on the New Jersey side of Delaware River 108.5 miles above the Capes, is a privately owned port of the John A. Roebling Sons Company, which operates an extensive wire-cable plant. The main wharf has depths of about 12 feet at the face.

The lower end of **Newbold Island** is about 150 yards off the New Jersey mainland just above the Roebling main wharf. The island is 1.5 miles long and has a greatest width of 0.7 mile. The main channel of Delaware River is along the north side of Newbold Island.

The back channel between Newbold Island and the New Jersey mainland has a controlling depth of 3 feet or less but depths of about 7 feet can be carried a short distance above either entrance. The boatyard on the mainland just inside the northeastern entrance has a marine railway that can haul out vessels up to 100 feet in length, 9 feet in draft, and 100 tons in weight; the yard has a machine shop that can make general repairs, and gasoline and marine supplies are available. The salvage wharf on the mainland 0.3 mile along the back channel from the boatyard has depths of about 12 feet at the face.

On the Pennsylvania side of Delaware River across from Newbold Island, and 109 miles above the Capes, is a **basin** where sand and gravel are handled. The wharves have depths of about 8 feet at their faces.

An unloading slip of the **Fairless Works, U. S. Steel Company,** extends northward into the Pennsylvania shore opposite Newbold Island and 109.5 miles above the Capes. The slip can accommodate the deepest draft navigating the river channel.

Fieldsboro, on the high bank on the New Jersey side of Delaware River 110.5 miles above the Capes, is chiefly a residential community, but there are some industrial activities along the water front at the foot of the bank. The flood **current** off Fieldsboro is weak and of short duration; at strength of ebb the average velocity is about 1¼ knots.

Crosswicks Creek, on the New Jersey side of Delaware River 111.5 miles above the Capes, has depths of about 4 feet to the fixed railroad bridge 0.4 mile above the mouth. The creek is said to have depths of 3 feet for about 2.5 miles farther in a narrow, crooked channel and is crossed by several more fixed bridges with minimum clearances of 20 feet horizontally and 6 feet vertically.

Bordentown, on the high bank on the southeast side of the entrance to Crosswicks Creek, was the terminus of the **Delaware and Raritan Canal,** which was abandoned in 1933.

Two **oil piers** on the New Jersey side of Delaware River 113 miles above the Capes have depths of about 12 feet at their outer ends but are behind an extensive shoal that bares in places at low water. A depth of about 4½ feet can be carried over the shoal at low water on course **343°** to the lower pier from a point in mid-channel 0.5 mile from the pier. The overhead **cable** 114 miles above the Capes has a vertical clearance of 167 feet.

Trenton, the capital of New Jersey, is on the east bank of Delaware River. The railroad bridge, which is the head of powerboat navigation on the river, is 116 miles above the Delaware Capes. The city is an important manufacturing center.

Trenton Marine Terminal is a mile below the railroad bridge. Controlling depths in the 25-foot project channel to the upper end of the terminal and the 12-foot channel thence to the railroad bridge were given earlier. Depths at the terminal wharf range from 25 feet to 6 feet. The public wharf and the oil wharf just below the railroad bridge have depths of about 12 feet at their faces.

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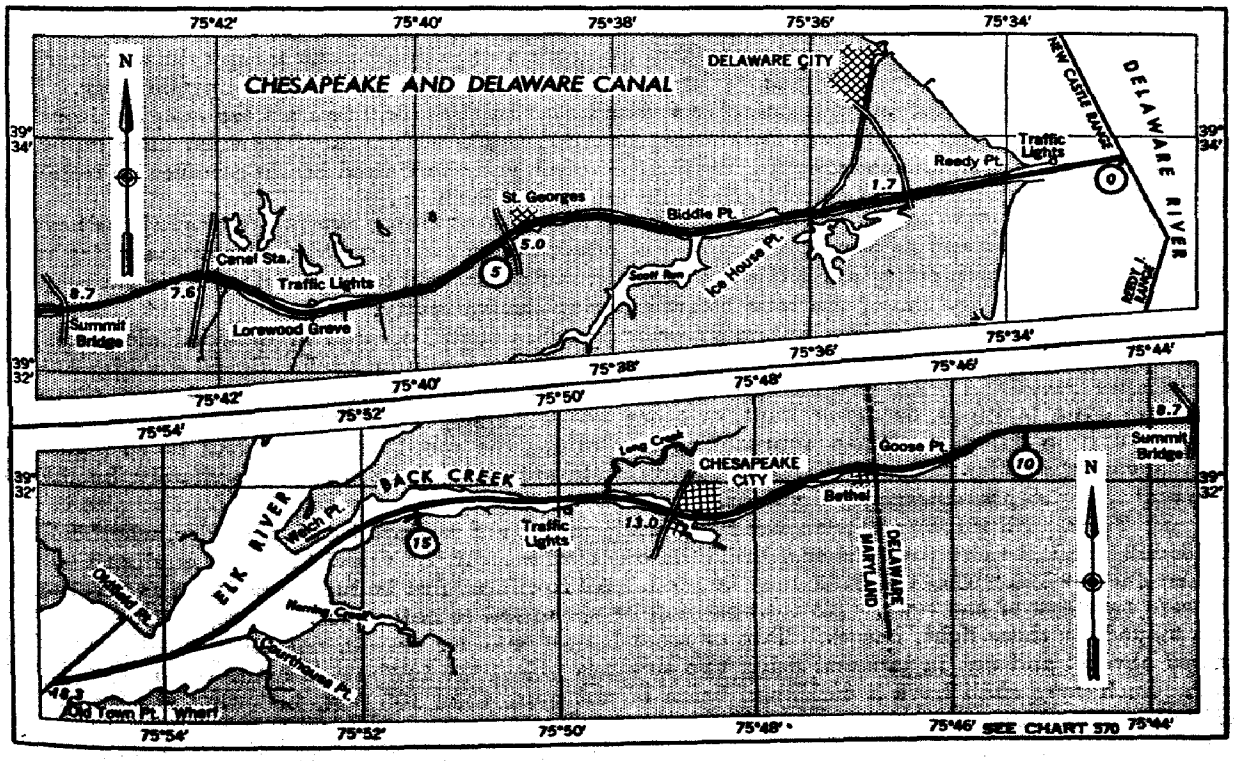
CHAPTER 7

Chesapeake and Delaware Canal

Chart 570

THE **Chesapeake and Delaware Canal** is a toll-free sea-level waterway that extends from Delaware River at Reedy Point, Delaware, to **Back Creek** at Chesapeake City, Maryland, thence down Back Creek to Elk River and Chesapeake Bay. The intersection of New Castle Range and Chesapeake and Delaware Canal Range in Delaware River main channel is 51 miles above the Delaware Capes, 35.5 miles below Philadelphia, 62 miles from Baltimore, and 185 miles from the Virginia Capes; ***Miles*** in the following text are distances along the canal from the range intersection. **Reedy Point,** at Mile ***0.7,*** is on the north side of the Delaware River entrance to the Chesapeake and Delaware Canal; the jetties are marked by lights. 5



Information concerning the conditions existing in the canal at any particular time may be obtained from the Resident Engineer, Chesapeake City Suboffice, Philadelphia District, Corps of Engineers, Chesapeake City, Maryland.

§ 207.100 Inland waterway from Delaware River to Chesapeake Bay, Delaware and Maryland (Chesapeake and Delaware Canal); use, administration and navigation—(a) *Applicability.* This section is applicable to that part of the Inland Waterway from Delaware River to Cheapeake Bay, Delaware and Maryland, between the Delaware River and Elk River, including the Cheapeake and Delaware Canal and the Delaware City Branch Channel which extends from the Delaware River at Delaware City to its junction with the Canal about 1.5 miles west of Reedy Point.

(b) *Supervision.* The District Engineer, Corps of Engineers, Philadelphia, Pennsylvania, has administrative supervision over the waterway and is charged with the enforcement of this section. The District Engineer from time to time will prescribe the dimensions of vessels which may transit the waterway, and the special conditions which shall govern the movements of vessels using the waterway. The District Engineer's representative is the Canal Superintendent. All orders in aiding and directing traffic and in enforcing this section will be issued by the Superintendent through the dispatcher and the patrolmen on duty.

(c) *Safe navigation required.* Permission for any vessel to enter or pass through any part of the waterway will be contingent on the vessel's being properly equipped in personnel, machinery, and operative devices for safe navigation. In the event of question as to the ability of any vessel to navigate the waterway in safety, a ruling thereon will be made by the dispatcher. An appeal from the dispatcher's ruling may be taken by the owner, agent, master, or other person in charge of the vessel concerned to the District Engineer whose decision shall be final. The granting of permission for any vessel to proceed through the waterway shall not relieve the owners, agents, and operators of the vessel of full responsibility for its safe passage.

(d) *Anchorage, mooring, and wharfage facilities.* The anchorage basin on the south side of the waterway at Chesapeake City, mooring basins and tie-up dolphins on the north side of the waterway at Reedy Point and in Back Creek about one mile west of Cheapeake City, and free wharfage facilities on the west side of the anchorage basin at Chesapeake City and on the north side of the Branch Channel at Delaware City, are of limited capacity, and permission to occupy them for periods exceeding 24 hours must be obtained in advance from the dispatcher at Chesapeake City. The mooring dolphins provided on each side of the vertical lift bridges shall be used for mooring in emergencies only. Any craft using these anchorage, mooring, and wharfage facilities must have on board at all times a crew adequate to care properly for the vessel, and the United States assumes no responsibility for damages which may be sustained while using such facilities.

(e) *Projections from vessels.* No vessel carrying a deck load which overhangs or projects beyond the sides of the vessel will be permitted to enter or pass through the waterway. Vessels carrying rods, poles, or other gear extending above the top of the vessel's mast will be required to lower such equipment to a level with the top of the mast before entering the waterway.

(f) *Speed.* No vessel in the waterway or approaches shall be raced or crowded alongside another vessel, or be moved at such speed as will cause excessive swells or wash. Speed shall be kept at a minimum consistent with safe navigation. All vessels, when passing other vessels, mooring dolphins, wharves, landings, dredging plant, or other working craft, shall proceed with caution to avoid wave or suction damage. When approaching any bridge the speed of vessels shall be so regulated that they will be under full control and, in the event the span cannot be raised immediately, be able to stop and tie up at the emergency dolphins.

(g) *Tows.* All ships or tugs engaged in towing vessels not equipped with a rudder, whether light or loaded, shall use two towlines or a bridle on one towline. If the vessel in tow is equipped with a rudder one towline without a bridle may be used. All towlines must be hauled as short as practicable for safe handling of the tows. No towboat will be permitted to enter the waterway with more than two loaded, or three light, barges. Two or more barges or other vessels, not self-propelled, shall be towed abreast and not in tandem, using two towlines unless the towboat is made fast alongside the tow. Such tows shall have a combined beam of not more than 105 feet, including the towboat if made fast alongside.

(h) *Right of way.* All vessels proceeding with the current shall have the right of way over those proceeding against the current. Vessels up to 150 feet in length shall be operated so as not to inter-

fere with the operation of vessels of greater length at bridges and bends. Large vessels or tows must not overtake and attempt to pass other large vessels or tows in the waterway.

(i) *Traffic lights.* (1) Navigation in and through the waterway shall be governed by the following system of traffic control lights. These lights, which are of fixed type, are located on the outer end of the north jetty at the eastern entrance to the waterway, at Lorewood Grove about one mile east of the Pennsylvania Railroad bridge, and on the south bank of the waterway about one mile west of Chesapeake City.

(i) *Green light.* Waterway open to navigation. Vessel may proceed.

(ii) *Amber light.* Caution. Traffic restricted.

(iii) *Red light.* Waterway closed to traffic. Vessel must stop.

(2) In addition to the above system of lights, navigation shall be governed by the lights installed at the drawbridges crossing the waterway as described in paragraph (j) of this section. Traffic lights controlling the approach of eastbound or westbound ships to the Chesapeake City ferry route are located at the Chesapeake City Suboffice. Normally the green light will be showing. Flashing amber and flashing red lights mean the same as those at the drawbridges.

(j) *Drawbridges.* (1) The signal for the opening of a drawbridge shall be three blasts of a whistle or horn blown by the vessel or craft desiring to pass. If the drawspan is to be opened immediately the bridge tender will reply with one blast of a whistle or horn. If the drawspan is not to be opened immediately the bridge tender will reply with two blasts of a whistle or horn; thereafter four blasts of a whistle or horn will be blown by the bridge tender to indicate that the bridge is open to navigation and that the vessel may proceed.

(2) The foregoing horn or whistle signals by the bridge tender will be supplemented by the following lights shown at the center of the drawspan in addition to and above the navigation lights referred to in subparagraph (3) of this paragraph:

(i) *Flashing red light.* Vessel must stop and tie up before reaching bridge.

(ii) *Flashing amber light.* Delay approach until vessel coming from opposite direction clears bridge.

(3) The following navigation lights prescribed by the Coast Guard will be shown at the center of the drawspan below the lights referred to in subparagraph (2) of this paragraph:

(i) *Fixed red light.* Bridge closed to navigation. Vessel unable to pass under closed drawspan must be kept under control so it can be stopped if necessary.

(ii) *Fixed green light.* Bridge open to navigation. Vessel may proceed.

(4) The drawbridge crossing the Branch Channel at Delaware City will be opened for the passage of vessels only between 8:00 a. m. and 4:00 p. m. Whenever a vessel, unable to pass under the closed bridge, desires to pass through the draw, at least two hours' advance notice of the time the opening is required shall be given to the dispatcher at Chesapeake City.

(k) *Stopping in waterway.* Whenever a vessel stops in the land cut elsewhere than at the mooring dolphins, it shall be fastened securely to one bank and only at such place and under such conditions as will not obstruct the passage of other vessels or craft. When thus tied up all vessels must be moored by not less than two lines each, and no vessel shall be tied up abreast of another. Sufficient crew to care properly for such vessels shall remain on board at all times. Vessels that have been tied up or anchored in or at the entrance to the waterway shall not proceed until given clearance by the dispatcher. Stoppages in the improved portions of the waterway shall be only for such periods as may be necessary, and no vessel or craft will be allowed to use such portions of the waterway as a permanent or semipermanent place of mooring without the permission of the District Engineer. Vessels may anchor in Elk River, but they shall not anchor in the channel, and during the night they shall display lights as required by the Federal Pilot Rules.

(l) *Refuse.* The placing of any ashes, refuse, or other material likely to cause an obstruction in the waterway or upon the banks or rights of way thereof is prohibited.

(m) *Trespass upon or injury to waterway property.* Trespass upon the waterway property or injury to the waterway, lands, banks, bridges, jetties, piers, fences, houses, trees, telephone lines, or any other property of the United States pertaining to the waterway is prohibited.

(n) *Fish and game.* The fish and game laws of the United States and of the States of Delaware and Maryland, within their respective bounds, will be enforced upon the waters and lands pertaining to the waterway owned by the United States. The use of traps and nets upon the property is forbidden except on written permission from the District Engineer.

(o) *Grounded, wrecked, or damaged vessels.* In the event a vessel is grounded or wrecked in the waterway or is so damaged by accident as to render it likely to become an obstruction in the waterway, the District Engineer shall supervise and direct all operations that may be necessary to float the vessel, clear the wreckage, or move the damaged vessel to a safe locality.

(p) *Commercial statistics.* Masters or pursers of vessels shall furnish the District Engineer or his authorized representative, on each passage through the waterway, such written statement of passengers, freight, and vessel data as may be indicated by blank forms furnished for this purpose. Failure to furnish this statement will result in denial to the offending vessel of the privilege of using the waterway. Blank forms may be obtained from the following:

(1) District Engineer, Philadelphia District, Corps of Engineers, City Centre Building, 121 North Broad Street, Philadelphia 1, Pa.

(2) District Engineer, Baltimore District, Corps of Engineers, 24th Street and Maryland Avenue, Baltimore 18, Md.

(3) Resident Engineer, Chesapeake City Suboffice, Philadelphia District, Corps of Engineers, Chesapeake City, Maryland.

(4) Patrol boats in the waterway.

(5) Pilots.

The following **general instructions** governing traffic in the canal were issued on August 28, 1952 to supplement the Rules and Regulations in **§ 207.100,** preceding, governing the use, administration, and navigation of the waterway.

1. Ships and large tows intending to transit the canal, whether under way or anchored, shall not enter the canal until they have been given clearance by the Patrol Boat stationed at the entrance.

2. Vessels of 25-foot draft or less may transit the canal at any time under the following conditions:

(a) Vessels under 250 feet between perpendiculars may transit the canal without prior arrangements.

(b) Vessels 250 feet between perpendiculars and over must make prior arrangements with the Dispatcher for specific trips. Vessels over 600 feet between perpendiculars must have at least one tug of not less than 600 horsepower in attendance through the bridges, unless a particular tug of less power is approved by the Dispatcher.

(c) Vessels 325 feet between perpendiculars or over will not pass each other in the canal between Reedy Point and the tie-up dolphins west of Chesapeake City.

(d) No vessel having a greater draft forward than aft will be allowed to enter the canal.

(e) All vessels observed by the pilot to be difficult to handle, or known to have handled badly on previous trips must transit the canal during daylight hours and must have tug assistance. Such vessels must obtain permission from the Dispatcher to enter the canal and must be provided with the number of tugs specified by the Canal Superintendent. Agents must make their own arrangements for tug assistance. Such eastbound vessels must clear Reedy Point Bridge and such westbound vessels the Chesapeake City Bridge before dark.

3. The granting of permission for any vessel to proceed through the canal, either by day or night, with or without tug, shall not relieve the owners, agents, and operators of said vessel of full responsibility for its safe passage.

4. Vessels requiring a pilot under existing State laws or Coast Guard regulations may be handled through the canal by any pilot duly licensed for this waterway by the Office of Marine Inspection, U. S. Coast Guard, and approved for the District Engineer by the Canal Superintendent. Pilots will be approved upon satisfactory completion of at least three trips through the canal during the preceding 12 months.

5. The Master of every vessel 200 feet or more in length between perpendiculars shall report to the Dispatcher the name of the pilot handling the vessel through the canal.

6. Vessels of all types, including pleasure craft, are required to navigate at all times at a safe speed throughout the canal and approaches, so as to avoid damage by suction or wave wash to wharves, landings, or other boats, or injury to persons. Pilots are warned that violation of this rule may result in suspension for 30 days of their status as approved canal pilots, and flagrant or repeated offenses will be followed by citation of the offending pilot to the Coast Guard for reckless navigation.

7. Owners of yachts, motorboats, rowboats, and other craft moored or anchored in the canal or approaches are cautioned to secure their vessels in such manner as will avoid damage from the passage of ships at reasonable speed.

8. The north bank of the canal is lighted at night between Reedy Point Bridge and Chesapeake City, Maryland, by a system of mercury vapor luminaires supported 25 feet above high water and spaced 500 feet apart. These lights are designed to illuminate the bank at the water's edge as an aid to navigation.

Channels.—The Federal project provides for a channel 27 feet deep and 250 feet wide from Delaware River to Elk River at ***Mile 16.4,*** off Courthouse Point, thence 400 feet wide down Elk River to deep water in Chesapeake Bay. The channel is maintained at or near project dimensions and is well marked by lights.

The project also provides for a depth of 8 feet and a width of 50 feet in **Delaware City Branch Channel** from ***Mile 2.5*** northward for 1.5 miles to Delaware River at **Delaware City;** the controlling depth is about 2 feet. Delaware City has been described in Chapter 6.

Anchorages.—An anchorage basin 400 feet wide and 1,000 feet long is provided on the south side of the canal at ***Mile 12.8,*** opposite Chesapeake City; the controlling depth was 5½ feet in 1947. Free wharfage is available at the Government wharf on the west side of the basin.

A special **small-vessel anchorage,** with depths of 3 to 4 feet, is on the southeast side of the canal at ***Mile 16.4,*** northeastward of Courthouse Point; limits of the area and regulations governing it are given in § **202.70,** Chapter 2A.

Mooring basins are provided on the north side of the channel at ***Mile 1.4,*** west of Reedy Point, and at ***Mile 13.7,*** west of Chesapeake City; each basin is 1,500 feet long and is provided with tie-up dolphins spaced 50 feet on centers. Controlling depths were 14 feet in the Reedy Point basin in February 1953 and 27 feet in the Chesapeake City basin in March 1953.

Bridges.—The canal is crossed by three vertical-lift bridges and two high-level fixed bridges. The Reedy Point highway bridge at ***Mile 1.7*** has a vertical-lift span with a horizontal clearance of 168 feet and vertical clearances of 6 feet down and 132 feet up. The **St. Georges** fixed highway bridge at ***Mile 5.0*** has a horizontal clearance of 399 feet and a vertical clearance of 135 feet.

The Pennsylvania Railroad bridge at **Canal Station,** ***Mile 7.6,*** has a vertical-lift span with a horizontal clearance of 164 feet and vertical clearances of 48 feet down and 137 feet up. **Summit Bridge,** at ***Mile 8.7,*** has a vertical-lift span with a horizontal clearance of 162 feet and vertical clearances of 71 feet down and 139 feet up; an overhead power **cable** 150 feet east of the bridge has a vertical clearance of 142 feet.

The overhead power **cable** at ***Mile 10.0*** has a vertical clearance of 142 feet. The **Chesapeake City** fixed highway bridge at ***Mile 13.0*** has a horizontal clearance of 523 feet and a vertical clearance of 140 feet.

The highway bridge over Delaware City Branch Channel a mile from the canal has a bascule span with a horizontal clearance of 60 feet and a vertical clearance of 6 feet; **regulations** governing operation of the drawspan are given in § **207.100,** this chapter.

Tides.—The normal range of tide is about 5 feet at the Delaware River end of the canal and about 2½ feet at the Chesapeake City end. High water is about 2 hours later in Delaware River than in Elk River. At times, the heights of high and low waters are greatly affected by the winds. Northeast storms raise the level and westerly storms

lower it. Daily tide predictions for Reedy Point, together with differences for other places in the canal, are given in the *Tide Tables*.

Staff gages, with zeros set at **canal datum,** have been installed at numerous places along the canal, including the bridges and both ends. The datum is 2 feet below local mean low water at the mouth of Back Creek and about 1 foot below at Delaware River.

Currents.—The daily predicted times of slack water and the times and velocities of eastward and westward strengths are given in the *Current Tables*. The velocities at strength of current usually are between 1½ and 2½ knots; storms may increase these velocities to 3 knots or more. Under such conditions, tows usually have difficulty in making headway against the current. At times there is considerable current across the Reedy Point entrance, and it must be guarded against, especially when passing other vessels.

Ice sufficient to interfere with the navigation of small craft may be expected at any time between December and April and is worst during January and February. The canal is kept open as long as possible. During mild winters, local vessels use the canal throughout most of the season, but strangers should make inquiries before attempting passage. Wooden vessels passing through thin ice are liable to be cut through at the waterline.

Pilotage through the Chesapeake and Delaware Canal from Delaware River to Chesapeake City is handled by the Philadelphia pilots, who charge $40 in addition to the regular rates for Delaware Bay and River; see Chapter 6. Pilotage from Chesapeake City to points along Chesapeake Bay is handled by the Maryland pilots, who charge the same rates as from the Virginia Capes to Baltimore; see Chapter 15.

Supplies and repairs.—Small vessels can obtain gasoline, Diesel oil, water, ice, provisions, and marine supplies at Chesapeake City. The principal wharves have depths of 12 to 18 feet at their faces.

The largest marine railway in the area is on the north side of the canal at ***Mile 13.5,*** 0.5 mile west of the Chesapeake City bridge. The railway can handle vessels up to 125 feet in length, 12 feet in draft, and 500 tons in weight; repairs are made on shafts, wheels, and all kinds of gasoline and Diesel engines. Fuel and other supplies are available on the dock, which has depths of 18 feet at the face.

A marine railway on **Courthouse Point,** at ***Mile 16.7*** on the south side of the mouth of Back Creek, can haul out boats up to 35 feet in length; gasoline, water, and some marine supplies are available.

CHAPTER 8

Atlantic Coast

Delaware Bay to Chesapeake Bay

Charts 1219 to 1222

THE coast extends southward for 21 miles from Cape Henlopen to the Delaware-Maryland boundary line, then south-southwestward for 90 miles to Cape Charles. The chain of low sand beaches is backed by bays, rivers, and creeks which are bordered by marsh and woodland. Broken ground fringes the coast and depths of 6 fathoms or less are found as far as 12 miles from shore.

Visible from seaward are the summer resorts of Rehoboth Beach, Bethany Beach, and Ocean City, all within 30 miles of Cape Henlopen. South of Ocean City the light structures and Coast Guard stations are the most prominent marks.

The bays and connecting channels behind the barrier beaches form a continuous inland passage from Delaware Bay to Chesapeake Bay, but Assawoman Canal and Little Assawoman Bay are now navigable only for rowboats.

There are no harbors of refuge along this coast for deep-draft vessels. The inlets are subject to frequent change and their use requires local knowledge.

Fish traps along the coast from Cape Henlopen to Cape Charles are limited by Federal regulations to certain areas which are shown on Charts 1219 to 1222. Numerous pile remains of old traps are said to menace navigation.

Navigational aids.—The more important of the navigable inlets are marked by buoys, but the channels shift and the buoys cannot always be depended upon. Breakers form on the shoal areas even in ordinary weather and are good marks. Some of the interior channels are marked by daybeacons and lights, but others are marked only by bush stakes. The channels through the flats can be followed best at low water when the flats are visible.

Tides.—The mean range of tide along the outside coast varies from about 3½ to 4½ feet, and high and low waters occur at about the same time as at Sandy Hook.

Levels in the inside waters are greatly affected by winds, westerly winds producing low water and easterly winds high water. In Assawoman, Isle of Wight, Sinepuxent, and Chincoteague Bays northerly and southerly winds drive the water to the ends of the bays. With strong winds of long duration, depths may be as much as 3 feet above or below the normal level.

Currents.—The currents have considerable velocity in the inlets and in the narrow channels connecting the inlets with the adjacent bays and sounds. It is estimated that

velocities of as much as 3 knots may be experienced at times in localities where the currents are strongest.

Ice.—The inside waters north of Chincoteague Bay are usually closed to navigation by ice during ordinary winters. From Chincoteague Bay south the waters tributary to the inlets are closed by ice during severe winters but remain so only for short periods. The principal inlets are rarely closed and are used by local boats throughout the winter.

Chart 411.—Cape Henlopen, on the southwest side of the entrance to Delaware Bay, has been described in Chapter 6. **Rehoboth Beach,** a summer resort 5 miles south of the cape, has bus communication with Lewes and the interior. A highway follows the beach south to Ocean City, Maryland. A standpipe, a nearby water tank, and a large hotel are prominent marks. **Dewey Beach** is a small summer resort just south of Rehoboth Beach.

The **danger zone** of an antiaircraft artillery firing area extends offshore from a point about 9 miles south of Cape Henlopen; limits of the area and regulations governing it are given in § **204.25,** Chapter 2A.

The **Lewes and Rehoboth Canal** is a tidal waterway that links Rehoboth Bay with Delaware Bay; the part between Delaware Bay and Lewes has been described in Chapter 6. The Federal project provides for a channel 6 feet deep and 50 feet wide (40 feet wide through Deep Cut near Rehoboth Beach) from the turning basin at Lewes to Rehoboth Bay, a distance of 6.5 miles; the controlling depth was 2½ feet in August 1950. The canal passes behind Rehoboth Beach and enters Rehoboth Bay between stone jetties.

The mean range of **tide** in the waterway is 3¾ feet at Lewes and ½ foot at Rehoboth Beach; the extreme range is from about 1 foot below mean low water to about 3 feet above mean high water.

The northerly of two highway bridges over the canal at Rehoboth Beach has a bascule span with a horizontal clearance of 49 feet and a vertical clearance of 17 feet. The southerly bridge, 0.4 mile away, has a bascule span with a horizontal clearance of 50 feet and a vertical clearance of 14 feet; the overhead power cable just south of the bridge has a vertical clearance of 80 feet. Gasoline, water, and provisions can be obtained at Rehoboth Beach.

Rehoboth Bay has depths of 3 to 7 feet and is frequented by boats drawing 3 to 4 feet. From the jetties at the south end of the Lewes and Rehoboth Canal, the best water in Rehoboth Bay passes about 0.5 mile east of **Piney Island,** then about 300 yards northeast of marshy **Bluff Point.** About 4 feet of water can be carried to this point.

Close southeastward of Bluff Point is a large marshy island with a cedar thicket on its east end. The best passage is around the east and south sides of the island. The channel then passes through **Big Ditch,** which is between **Middle Islet** and **Long Neck,** and into Indian River Bay. Middle Islet, marked by a lone tree and a shanty, is between **Burton Island** on the east and Long Neck on the west.

Love Creek, at the northwest corner of Rehoboth Bay, is navigable for small boats to a mill dam near the village of **Robinsonville,** 3.5 miles above the mouth. A fixed highway bridge 2 miles above the mouth has a horizontal clearance of 18 feet and a vertical clearance of 7 feet. The controlling depth to the bridge is about 3 feet.

Herring Creek, which empties into the southwest corner of Rehoboth Bay, has depths of 3 to 5 feet to the forks 2 miles above the mouth, thence 1 to 3 feet for 0.5 mile up either fork. The creek is little used. **Angola** is a village near the head of navigation.

Indian River Bay is a shallow lagoon 5 miles long east to west and 1 to 2 miles wide north to south about midway along the Delaware coast between Cape Henlopen and the Delaware-Maryland boundary line. The bay has general depths of 1 to 6 feet. A channel has been dredged east to west from Indian River Inlet into and up Indian River.

Indian River flows easterly into Indian River Bay. **Indian River Inlet,** about 12 miles south of Cape Henlopen, is an opening through the barrier beach separating Indian River Bay and the Atlantic Ocean. Prominent at the inlet are two high transmission towers, one on either side, and a Coast Guard lookout tower on the north side. **Indian River Inlet Coast Guard Station** is near the beach 1.5 miles north of the inlet.

A Federal project provides for fixation of Indian River Inlet by the construction of two parallel jetties extending to about the 14-foot depth curve in the ocean, and for dredging an entrance channel 15 feet deep and 200 feet wide for a distance of 7,000 feet inshore from the jetties; thence a channel 9 feet deep, 100 feet wide in the bay and 80 feet wide in the river, to and including a turning basin 9 feet deep, 175 feet wide, and 300 feet long at Old Landing; thence a channel 4 feet deep and 60 feet wide to the causeway at Millsboro. Controlling depths were 10½ feet to Burton Island in 1950; thence, in 1951, 9 feet to Old Landing, and thence 4 feet to Millsboro.

The outer ends of the jetties are marked by lights; the channel through Indian River Bay is marked by buoys, and the Indian River channel is marked by daybeacons. The mean range of **tide** is 3¾ feet at the ocean end of the inlet and 2½ feet at the highway bridge over the inlet; the extreme range at the bridge is about 6 feet.

The highway bridge 0.2 mile from the outer ends of the jetties has a swing span with a horizontal clearance of 54 feet and a vertical clearance of 14 feet in the south opening; no maintenance work is done in the north opening. A Coast Guard wharf is on the north side of the inlet 0.8 mile above the jetties.

About 0.9 mile above the jetties, a dredged cut extends 0.2 mile northeastward to a privately owned yacht basin, 400 yards in diameter, between Burton Island and the outer beach; depths in the channel and basin are about 6 feet. Berthing facilities are available for boats up to 65 feet in length, and gasoline, Diesel oil, water, and ice can be obtained on the long fuel wharf. A marine railway in the basin can haul out boats up to 65 feet in length for hull repairs. There is bus service to and from the basin during the summer.

A special small-vessel **anchorage area** is on the south side of Indian River inlet 1.2 miles from the jetties; limits of the area and regulations governing it are given in § **202.65,** Chapter 2A.

Oak Orchard, on the north side of the entrance to Indian River 5.5 miles above the inlet jetties, has numerous small piers; gasoline and provisions are available. **Old Landing** and **Millsboro** are on the south side of Indian River 11 and 12 miles from the jetties; Millsboro has rail connections.

Pepper Creek, on the south side of Indian River Bay near the western end, has depths of 5 to 3 feet for 1 mile to **Vines Creek;** thence both creeks have depths of 1 to 2 feet for about a mile.

White Creek, on the south side of Indian River Bay 1.5 miles back of the outer beach, has depths of 1 to 3 feet for 1.8 miles to **Ocean View,** where gasoline, water, and provisions are available.

Chart 1219.—Assawoman Canal is a cut 2.3 miles long that connects White Creek with the north end of Little Assawoman Bay. The canal has a controlling depth of only about ½ foot and is rarely used except by rowboats. Three fixed highway bridges over the canal have minimum clearances of 12 feet horizontally and 4½ feet vertically.

Bethany Beach is a summer resort 4 miles south of Indian River Inlet. A privately dredged channel with a depth of about 1 foot leads eastward from Assawoman Canal through the south side of **Salt Pond** to a point near the outer beach.

The **danger zone** of an antiaircraft artillery firing area extends offshore from a point about 6 miles south of Indian River Inlet; limits of the area and regulations governing it are given in § **204.25,** Chapter 2A.

Little Assawoman Bay, behind the barrier beach of **Fenwick Island,** is about 3 miles long north to south, averages 0.5 mile wide east to west, and extends southward almost to Fenwick Island Light. The bay has depths of 2 to 4 feet in some places but is bare in others and is little used. **Miller Creek** and **Dirickson Creek,** which empty into the west side of the bay, have depths of about 1½ feet.

Chart 1220.—Fenwick Island Light (lat. 38°27′.1, long. 75°03′.3), 83 feet above the water and visible 15 miles, is shown from a white tower 0.25 mile back of the beach. The tower, just north of the Delaware-Maryland boundary line, is 9 miles south of Indian River Inlet and 21 miles south of Cape Henlopen. **Maryland Beach** is a small summer resort just south of the light.

Fenwick Shoal, 6 miles eastward from the light, has a least natural depth of 14 feet but the westerly of two wrecks near the crest of the shoal is covered only 6 feet. A lighted whistle buoy marks the southwest end of the shoal and another is moored 8 miles east by south of the shoal. Deep-draft vessels normally pass to eastward of the outer buoy.

Isle of Wight Shoal, 7 miles southeast by east of Fenwick Island Light, has a depth of 21 feet and is marked on its west side by an obstruction buoy. A 24-foot shoal is about midway between Isle of Wight Shoal and Fenwick Shoal.

The narrow thorofare 0.4 mile west of Fenwick Island Light that links Little Assawoman Bay with Assawoman Bay is navigable only for small boats with local knowledge. The fixed highway bridge over the thorofare has a horizontal clearance of 32 feet and a vertical clearance of 12 feet. The highway leads to **Bayville,** a village about 2 miles northwest of the light.

Assawoman Bay and **Isle of Wight Bay** form a continuous lagoon that extends from the vicinity of Fenwick Island Light to Ocean City. The bays have depths of 4 to 6 feet along their western sides and are frequented by boats from Ocean City. The dredged channel in Isle of Wight Bay is discussed later in connection with Ocean City Inlet.

Roy Creek and **Greys Creek,** on the west side of Assawoman Bay, have depths of 3 feet nearly to their heads but are little used.

St. Martin River, on the northwest side of Isle of Wight Bay, has depths of 3 feet to the fork 3.5 miles above the mouth and 1½ feet for 2.5 miles farther to **Bishopville**

(*P. O.*), a village at the head of navigation on the north branch. The west branch is said to be navigable for small boats for 1.5 miles.

Ocean City Inlet, between Fenwick Island and Assateague Island, is 29 miles south of Cape Henlopen and is the only break in the barrier beach between Indian River Inlet and Chincoteague Inlet. The entrance is between stone jetties but the north jetty and the outer end of the south jetty are covered at high water. About 400 yards from the north jetty is a high pier that extends about 300 yards into the ocean; the pier has a depth of 8 feet at the outer end but there are no landing facilities. **Ocean City Coast Guard Station** is on the beach 0.5 mile north of the inlet.

Little Gull Bank, 3 miles southeastward of Ocean City Inlet, has a depth of 15 feet and is marked at its southwest end by an obstruction buoy. **Great Gull Bank,** 5 miles southeastward of the inlet, has a depth of 17 feet at its southwest end and is marked at its northern end by a lighted whistle buoy. Midway between the two banks is a wreck covered 26 feet.

Ocean City is a summer resort on the north side of Ocean City Inlet. Two elevated tanks and several hotels are prominent landmarks. The resort is frequented by many small boats during the summer and is the shipping point for a large amount of seafood and produce.

A Federal project provides for the construction of an inlet, protected by jetties, between the Atlantic Ocean and Sinepuxent Bay, with a depth of 10 feet and a width of 200 feet; a channel 6 feet deep and 150 feet wide from Ocean City Inlet to Green Point, Sinepuxent Bay, 7.5 miles from the shore ends of the jetties, and thence 100 feet wide into Chincoteague Bay, a farther distance of 5 miles; a channel 10 feet deep, 100 feet wide, and 3,000 feet long into the **Commercial Fish Harbor** on the mainland directly back of the inlet, with two turning basins of the same depth; and for a channel 6 feet deep and 125 feet wide into Isle of Wight Bay from the inlet channel to North Ninth Street, Ocean City, 1.2 miles from the jetties, thence 75 feet wide for a farther distance of 1.5 miles.

Controlling depths were greater than project in the inlet channel and into the Commercial Fish Harbor in 1948; 5 feet in the channel through Sinepuxent Bay to Chincoteague Bay in 1947; greater than project in Isle of Wight Bay to North Ninth Street in 1944, thence project for 0.8 mile and 4½ feet to the end of the dredged channel in 1947.

Ocean City Inlet is marked by a light and a lighted buoy; the inner channels are well marked by lights and daybeacons. The mean range of ocean **tide** is 3½ feet.

The highway bridge over Isle of Wight Bay from the mainland to Ocean City about 0.4 mile north of the inlet has a bascule span with a horizontal clearance of 70 feet and a vertical clearance of 18 feet. South of this bridge are the pile remains of an abandoned highway bridge from which the spans have been removed.

There are numerous privately owned pile and timber piers and bulkhead wharves on the inner side of Ocean City. The Commercial Fish Harbor has a public bulkhead landing about 1,000 feet long and several private bulkhead wharves open to the public for transaction of business with the owners.

On the east side about a mile northward of the highway bridge is a small-boat basin; the northerly of the two elevated tanks in Ocean City is just to the northeastward. A depth of about 5 feet can be carried into the basin from the channel in Isle of Wight Bay.

Gasoline, Diesel oil, water, ice, provisions, and marine supplies are available at Ocean City. The largest boatyard in the area is in the Commercial Fish Harbor and has a marine railway capable of handling boats up to about 150 tons; gasoline and marine supplies are available at the yard.

Buses operate to and from Ocean City along the highways west and north. The Baltimore and Eastern Railroad has a freight siding parallel to and 200 feet north of the Commercial Fish Harbor.

Sinepuxent Bay, which extends southward behind Assateague Island for about 9 miles from Ocean City Inlet to Chincoteague Bay, is mostly shoal but has a well marked, improved channel, already described in connection with Ocean City Inlet, running its entire length. The bay is frequented by fishing and pleasure boats and by boats bound north or south along the inside passage.

Chincoteague Bay is about 20 miles long north to south and has general depths of 4 to 7 feet along its western side but is shoal along its eastern side. A large number of boats up to 4 feet in draft engage in oystering, clamming, and fishing in the bay.

Newport Creek, at the north end of Chincoteague Bay, is said to be navigable for a draft of 2 feet to within 1.5 miles of the town of **Berlin.**

Snow Hill Landing, on the mainland side of Chincoteague Bay and about 15 miles from Ocean City Inlet, has a public wharf with a depth of 3 feet alongside. Depths at the private landings and fish docks are the same or less. A skeleton steel tower about 60 feet high is about 0.5 mile northeastward of the public wharf. A highway leads westward from the landing to **Snow Hill** on Pocomoke River. Gasoline is available near the landing.

Franklin City (*P. O.*) is a village on the mainland side of Chincoteague Bay just south of the Maryland-Virginia boundary line and about 4 miles north of Chincoteague. A draft of 4 feet can be carried to the wharves from southward. Franklin City is a freight terminus of the Pennsylvania Railroad and a shipping point for seafood and produce of the vicinity. A marine railway at the village can haul out boats up to 50 feet in length and 4 feet in draft for minor repairs.

Greenbackville (*P. O.*), a village on the west side of Franklin City, has a substantial trade in shell fish. Gasoline and provisions are available in the harbor. The channel into the harbor has a controlling depth of about 5 feet and is marked by two lights. The mean range of **tide** is about 2 feet.

The controlling depth to the south end of Chincoteague Bay from the dredged channel out of Sinepuxent Bay is about 4 feet but local knowledge is needed in order to carry the best water. The channel in the vicinity of **Killick Shoal,** just north of Chincoteague, is said to shift frequently. Several of the critical points along the route through the bay are marked by lights.

Pope Island Coast Guard Station, just south of the Maryland-Virginia boundary line, is 19.5 miles southward along the barrier beach of **Assateague Island** from Ocean City Inlet and 11.5 miles from the south end of the island.

Assateague Light (lat. 37°54′.7, long. 75°21′.4), 154 feet above the water and visible 19 miles, is shown from a red tower 3 miles from the south end of the island. The light stands well above the surrounding trees and is the most prominent mark in the vicinity of Chincoteague Inlet. An aviation light, 5.5 miles 292° from Assateague Light, is more brilliant but is not visible as far and may not always be lighted.

Blackfish Bank, about 6 miles eastward of the south end of Assateague Island, has several depths of 13 to 16 feet along its 5-mile length, and near its southwest end is a depth of 11 feet over a wreck. A bell buoy is moored 0.6 mile south of the wreck. A 25-foot shoal 2.5 miles east of the wreck is marked on its east side by a lighted whistle buoy. Coasting vessels seeking protection from westerly weather pass westward of Blackfish Bank.

Winter Quarter Shoal, 11 miles east-northeast of Assateague Light, has natural depths of 10 to 17 feet but a wreck just west of the highest part is covered only 5 feet. A buoy is moored on the west side of the wreck. About 2 miles east-southeast of the shoal is a wreck covered 40 feet; a lighted whistle buoy is eastward of the wreck.

Winter Quarter Shoal Lightship (**lat. 37°55′.5, long. 74°56′.4**) is moored in 78 feet of water 9.5 miles east-southeast of the shoal. The vessel has a red hull, with the name WINTER QUARTER on both sides, and two masts with a lantern gallery on each masthead. The light is 66 feet above the water and visible 14 miles; the radiobeacon and the fog signal are synchronized for distance finding. Call letters for radio and code flag are NNBZ. **Storm warnings** are displayed, daytime only.

Chincoteague Shoals are just off the south end of Assateague Island. A lighted bell buoy is moored near the southernmost part of the 5-fathom depth curve.

Chincoteague Inlet, between Assateague Island and Wallops Island, is 30 miles south-southwestward from Ocean City Inlet. The inlet is well marked but should not be entered without local knowledge because the channels shift. The narrow entering channel usually is along and close to **Fishing Point,** the hook-shaped sandspit at the south end of Assateague Island; the point is marked by a light. The controlling depth from the ocean to Chincoteague was said to be about 8 feet in October 1951.

Assateague Cove, behind the Fishing Point spit, is about 1.5 miles in diameter and has depths of 7 to 15 feet. The narrow entrance channel is close to the point and has a controlling depth of about 7 feet. The channel is dangerous in heavy weather. The wharf and boathouse of **Assateague Beach Coast Guard Station** are on the south side of the cove. The Coast Guard tower and a light on the barrier beach south of the wharf are visible from seaward. Oyster boats operate in the cove.

Chincoteague is a town on the west side of **Chincoteague Island,** which is about 7 miles long and is between the mainland and the south end of Assateague Island. The most prominent mark is an elevated tank near the highway bridge over **Chincoteague Channel.** The bridge has a swing span with a horizontal clearance of 52 feet and a vertical clearance of 16 feet.

Chincoteague is an oystering and fishing center and is headquarters for Coast Guard activities in the area. Several wharves along Chincoteague Channel have depths of 5 to 10 feet alongside. Fuel, supplies, and ship chandlery are available in the town. The marine railways at Chincoteague can haul out vessels up to 45 feet in length.

Assateague Channel, between Chincoteague and Assateague Islands, has a shifting entrance 2½ feet deep which leads north to deeper water. The north end of the passage between the islands is known as **Assateague Bay;** it has a shallow entrance from Chincoteague Bay and is little used.

Wire Narrows, Queen Sound, and **Cockle Creek** are passages from Chincoteague Inlet to Chincoteague Bay between the marshy islands west of Chincoteague Island. The passages have good depths into them from southward but are shallow at their out-

lets into the bay and are used only by small oyster boats. The five fixed bridges over the passages have horizontal clearances of 33 to 40 feet and vertical clearances of 4½ to 12 feet.

Chart 1221.—The 35-mile stretch of coast between Chincoteague Inlet and Great Machipongo Inlet is formed by six islands of about equal length. The islands are separated from each other by narrow inlets and from the mainland by marsh and flats through which are numerous sloughs and channels.

The **Waterway on the Coast of Virginia** lies between the barrier beach along the Atlantic Ocean on the east and the Virginia portion of the mainland peninsula on the west. It extends from the south end of Chincoteague Bay for 72 miles through creeks, thorofares, and bays to enter Chesapeake Bay in the vicinity of Fisherman Inlet, just south of Cape Charles. The Federal project for the waterway provides for a channel 6 feet deep and 60 feet wide from Chincoteague Bay to Chesapeake Bay; work has been done between Bogues Bay and Gargathy Bay, 6 and 16 miles south of Chincoteague. The mean range of **tide** is about 3 feet; greater fluctuations in water level are caused by high winds and storms.

Wallops Island is on the southwest side of Chincoteague Inlet. The **danger zone** of a bombing target area is centered about 2 miles off the island; limits of the area and regulations governing it are given in § **204.26**, Chapter 2A.

North and west of Wallops Island are **Watts Bay, Powells Bay,** and **Bogues Bay** which have general depths of 1 to 2 feet and are used by oyster boats. The dredged section of inland waterway in the east end of Bogues Bay was said to have a controlling depth of 2½ feet in October 1951.

Wishart is a town on the mainland back of Bogues Bay. A draft of about 2 feet can be carried through **Ballast Narrows** to the wharf at Wishart.

Assawaman Inlet, between Wallops Island and **Assawaman Island,** is very shallow and is little used. The changing entrance is usually marked by breakers.

Kegotank Bay, back of Assawaman Island, has general depths of about 1 foot. The dredged section of inland waterway through the bay was said to have a controlling depth of about 4 feet in October 1951.

Gargathy Inlet, between Assawaman Island and **Metomkin Island,** is unmarked and changeable but is used occasionally by small local boats. Back of the inlet and parallel to the coast is a dredged cut through the marsh that is a link in the inland waterway. The controlling depth in the cut was 6 feet in 1947 but it probably has shoaled since to 4 or 5 feet.

Gargathy Creek, which leads west from Gargathy Inlet to **Gargathy Bay** and then north, is navigable at high water for small boats for about 4 miles to within a mile of the village of **Modest Town.**

Metomkin Inlet, between Metomkin Island and **Cedar Island,** is used by some local fishing and oyster boats up to 3½ feet in draft. The channel is marked but is changeable and should not be entered without local knowledge. **Metomkin Inlet Coast Guard Station** is on the north end of Cedar Island.

Porpoise Banks, about 10 miles offshore from Metomkin Inlet, have irregular bottom with depths of 34 to 40 feet.

Metomkin Bay, back of Metomkin Island, has several sloughs leading northward from Metomkin Inlet. Most of the bay is shallow. The section of inland waterway that extends the length of the bay was said to have a controlling depth of 1½ feet in October 1951.

Folly Creek, which leads westward from the south end of Metomkin Bay, is said to have a depth of 1 foot at low water to the landing at its head, 3 miles above the mouth and a mile from the village of **Accomac.** A private marine railway at the head of the creek can haul out boats up to 35 feet in length for minor repairs.

Longboat Creek, which extends westward from Metomkin Inlet to **Cedar Island Bay,** is fairly deep throughout. The passage across the bay has a controlling depth of about 3 feet and is connected with the north end of Burtons Bay by **Teagles Ditch,** which has a controlling depth of about 9 feet.

Burtons Bay, which extends northward from Wachapreague Inlet, is an area of mud flats cut by north-south sloughs. The slough that leads from Teagles Ditch to deep water in **Hummock Channel** has a controlling depth of about 2 feet at its northern end.

Wachapreague Inlet, between Cedar Island and **Parramore Island,** had a controlling depth of 9 feet over the bar and through the channel along the north end of Parramore Island in 1953. A lighted bell buoy marks the approach to the inlet, and lights on shore mark the channels to Wachapreague. **Parramore Beach Coast Guard Station** is on the inner side of Parramore Island 0.5 mile south of the inlet.

The inlet is used by many fishing boats and by some boats seeking shelter. It should be entered only with local knowledge because the channel shifts. The best anchorage is in **Horseshoe Lead,** southwest of the entrance, where there are depths of 20 to 30 feet west of the middle ground.

Parramore Banks extend about 8 miles offshore from Wachapreague Inlet. The area is lumpy and has numerous depths of 18 to 30 feet. A lighted whistle buoy is moored east of the banks.

Wachapreague (*P. O.*), a town on the mainland about 4 miles west-northwest of Wachapreague Inlet, is an oystering and fishing center and is a base for some pleasure boats during the summer. Excellent fishing makes the town popular. With local knowledge a draft of 7 feet can be carried to the wharves from Wachapreague Inlet through Hummock Channel and **Wachapreague Channel.** A marine railway at Wachapreague can haul out boats up to 45 feet in length. Gasoline, Diesel oil, water, and provisions are available at the village.

Little Machipongo Inlet, between Parramore Island and **Hog Island,** has a fan of breakers across the entrance. The channels shift but can be followed by the appearance of the water. Local boats with drafts of 5 to 6 feet use the inlet. The best channel is along the shore on the northeast side. The inlet is marked but should not be used without local knowledge. **Little Machipongo Light (lat. 37°27.'2, long. 75°40.'5),** 55 feet above the water and visible 13 miles, is shown from the cupola of **Little Machipongo Inlet Coast Guard Station** on the inner side of the north end of Hog Island.

Quinby (*P. O.*) is a village on the mainland about 6 miles northwest of Little Machipongo Inlet. The channel to Quinby leads from the inlet through the deep water of **Sandy Island Channel** and into a slough through the mud flats in **Upshur Bay.**

A Federal project provides for a channel 8 feet deep and 80 feet wide from that depth in Upshur Bay to a point 600 feet bayward from Quinby Landing, thence 60

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feet wide to the landing, a total distance of about 1.3 miles, and a turning and mooring basin of the same depth, 200 feet wide and 400 feet long opposite the public terminal and landing. A depth of 4 feet was available over a width of 35 feet in the channel and the lower 50 feet of the turning basin in July 1952. The mean range of **tide** is 4½ feet, with variations caused by storms of from 2 feet below to 12 feet above mean low water.

Back of Hog Island is **Hog Island Bay,** mostly mud flats but intersected by several deep sloughs. The principal slough is **Great Machipongo Channel** which extends northward through the bay from Great Machipongo Inlet to the mainland where it continues as **Machipongo River.** The channel is deep throughout and is well marked. From inside the bar across Great Machipongo Inlet depths are greater than 15 feet to Machipongo River and into **Parting Creek,** 12 miles above the inlet.

Willis Wharf (*P. O.*) is a town on the west bank of Parting Creek about a mile above its junction with Machipongo River. The high-water width of the creek varies from about 450 feet at the mouth to 350 feet at Willis Wharf.

A Federal project provides for a channel 8 feet deep and 80 feet wide from the town of Willis Wharf to deep water below; the controlling depth was 8 feet in September 1948. The mean range of **tide** is about 4½ feet; the extreme range is from about ¾ foot below mean low water to about 2 feet above mean high water.

Willis Wharf has several privately owned wharves and bulkheads which are used for packing seafoods and servicing fishing vessels. The town is a shipping point for seafood; the railroad station is at **Exmore,** 2 miles distant. A marine railway at Willis Wharf can haul out vessels up to 50 feet in length. Gasoline, Diesel oil, and some supplies are available.

About 7 miles above Great Machipongo Inlet a well marked passage leads eastward from Great Machipongo Channel through **North Channel** and **North Inlet** to Little Machipongo Inlet. The controlling depth of about 1½ feet is at the west end of North Channel.

General.—Boats making the passage south from Chincoteague can carry the best water by leaving on the last of the falling tide. From the wharves at Chincoteague the route follows Chincoteague Channel to Chincoteague Inlet, thence across the inlet toward the tower on Wallops Island, thence along the shore between sand bars and over a bar with a controlling depth of about 2 feet to **Walker Point,** thence westward into Ballast Narrows. An alternate route follows Queen Sound to its northern end, thence southwestward in Cockle Creek and close along the marsh to Walker Point.

From Walker Point the route is through **Ballast Narrows, Island Hole Narrows,** and the dredged channel in Bogues Bay; thence through **Cat Creek** into the easterly narrow slough to **Hog Creek** and down the latter to Assawaman Inlet. The controlling depth in this section is in Bogues Bay, previously described.

From Assawaman Inlet the route follows **Assawaman Creek** northwestward for 0.8 mile, then turns west and follows **Northam Narrows** to Kegotank Bay. The dredged channel through Kegotank Bay, previously described, is the controlling part of this section. From Kegotank Bay the route is south through **Kegotank Creek,** the easterly of the two sloughs, to the dredged cut, previously described, back of Gargathy Inlet.

From the cutoff the route is south and west through Gargathy Creek and **Wire**

Passage to Metomkin Bay. The channel through the bay to Metomkin Inlet and Longboat Creek has been described.

The route is then through Longboat Creek, Cedar Island Bay, Teagles Ditch, and Burtons Bay into Hummock Channel and Wachapreague Inlet. The controlling depth along this section is in Burtons Bay.

From Wachapreague Inlet the route continues south through Horseshoe Lead into **Drawing Channel,** through the flats into **Little Sloop Channel,** and southward through flats to Sandy Island Channel. From here the route generally used is southeastward in Sandy Island Channel to Little Machipongo Inlet, then westward through North Inlet and North Channel to Great Machipongo Channel. The route turns south along Great Machipongo Channel and swings westward about 4 miles from Great Machipongo Inlet. The controlling depth in this section is at the western end of North Channel.

Chart 1222.—Great Machipongo Inlet, between Hog Island and **Cobb Island,** has depths of 6 to 14 feet over the bar. The north channel, along Hog Island, is the deepest and is marked by buoys; as the channel changes the buoys are shifted. Breakers form on the bar only in heavy weather, but form on the shoals on either side at all times. The inlet is the ocean approach to Great Machipongo Channel, a large and deep waterway which has already been described. Local boats with drafts up to 8 feet use the inlet.

From Great Machipongo Channel the inside passage leads westward through **The Deeps** and **The Outlet** into **Ramshorn Channel,** which traverses the northern part of The Thorofare. The controlling depth of 2½ feet in this section is between The Outlet and Ramshorn Channel. An alternate route is northwestward through the marsh from The Deeps, then northward and finally southwestward into Ramshorn Channel. It is said that the latter route is deeper and more used.

The Thorofare extends south between the mainland and the marsh to Sand Shoal Channel and beyond to the north end of Magothy Bay.

Sand Shoal Inlet, between Cobb Island and **Wreck Island,** has depths of about 9 feet over the bar across **Southeast Channel** about 3 miles seaward of the south end of Cobb Island. The channel is straight but the bar breaks in heavy weather.

Northeast Channel, which leads along the south end of Cobb Island, is marked by buoys and it is said to have a controlling depth of about 13 feet. **South Channel,** which has a controlling depth of about 10 feet, and Southeast Channel are used to some extent by local boats but are unmarked and should not be used by strangers. The inlet has been used by local boats with drafts of 5 to 6 feet.

Prominent in the approach to Sand Shoal Inlet are a light on the south end of Cobb Island and **Cobb Island Coast Guard Station** on the inner side of the island near the south end. **Loon Channel,** between Cobb Island and **Little Cobb Island,** leads from the inlet to the Coast Guard station and can be used by drafts up to about 8 feet. The channel has depths of about 20 feet off the station and is a good fair-weather anchorage.

Sand Shoal Channel leads westward from Sand Shoal Inlet and has a controlling depth of about 30 feet in the 5 miles between the inlet and The Thorofare. The channel is well marked and is easily followed.

Oyster (*P. O.*) is on the mainland 10 miles north of Cape Charles and 47 miles southwestward of Chincoteague. The village can be reached by way of **Lipscombes Channel,** which extends southwestward from Ramshorn Channel at a point 0.5 mile northwest of the latter's junction with Sand Shoal Channel.

A Federal project provides for a channel about 0.8 mile long, 60 feet wide, and 6 feet deep from deep water in Lipscombes Channel to and including a turning basin of the same depth 200 feet long and 125 feet wide along the water front at Oyster; controlling depths were 5 feet from Oyster to the Atlantic Ocean and 4½ feet in the turning basin in May 1950. The head of navigation for boat traffic is about 200 feet above the turning basin. Navigation is practicable throughout the year. The mean range of **tide** is about 4½ feet; greater fluctuations in water level are caused by prolonged high winds along this section of the Atlantic coast.

Oyster has several privately owned wharves and a public bulkhead. The village is the shipping point for a large amount of seafood; the railroad station is at **Cheriton,** 2 miles distant. A marine railway at Oyster can haul out boats up to 45 feet in length for general repairs. Gasoline, Diesel oil, water, and provisions can be obtained at the oil-company docks at the easterly end of the village.

Mockhorn Channel, which leads south through The Thorofare from Sand Shoal Channel to the north end of Magothy Bay, has a controlling depth of about 9 feet. A bare rock in mid-channel about halfway along the passage is marked by a buoy.

New Inlet, between Wreck Island and **Ship Shoal Island** and 9 miles northeast of Cape Charles Light, is shallow and unmarked, is very changeable, and is seldom used even by local boats.

Ship Shoal Inlet, between Ship Shoal Island and **Myrtle Island,** is shallow and unmarked and is used only by local oyster boats. There is deep water back of the inlet but the channels to the inland waterways are shallow and tortuous.

The **danger zone** of a bombing and gunnery range is centered on Myrtle Island; limits of the area and regulations governing it are given in **§204.48,** Chapter 2A.

Little Inlet, between Myrtle Island and Smith Island, is shallow and is little used. Small boats could connect with the inside passages at high water.

Cape Charles is on the north side of the entrance to Chesapeake Bay; **Wise Point** is the most southerly mainland tip of the cape. The southwest end of **Smith Island,** site of **Cape Charles Light,** is 2 miles eastward of Wise Point. **Fisherman Island** is a mile south of Wise Point. The cape and the islands are described in more detail in Chapter 9.

Smith Island Inlet, between Smith Island and Fisherman Island, is fairly wide but the narrow, changeable channel is between sandbars and breakers. The inlet is used by many local boats with drafts of 3 to 4 feet, but it is unmarked and should not be used by strangers. The controlling depth over the bar is said to be about 1½ feet.

Magothy Bay, which extends northward from Smith Island Inlet to The Thorofare, already described, is shallow except in the channel, which has a controlling depth of about 9 feet. **Magotha** is a village on the west side of Magothy Bay about 3.5 miles northwestward of Cape Charles Light. Oysters are handled at the Magotha wharves, which can be reached at high water.

Fisherman Inlet, between Fisherman Island and Wise Point, has a depth of 1 foot at low water. The inlet is used by boats with drafts of 2 to 3 feet and is preferred over Smith Island Inlet, when depths are sufficient, because it has ample width and is protected from heavy seas. A power cable over Fisherman Inlet from the island to the mainland is supported by poles at regular intervals and has a vertical clearance of 19 feet.

A naval **restricted area** extends across the entrance to Chesapeake Bay; limits of the area and regulations governing it are given in **§207.158,** Chapter 2A.

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CHAPTER 9

Chesapeake Bay Entrance

Virginia Capes to Norfolk

Charts 1222, 400, 452

CHESAPEAKE BAY, the largest inland body of water along the Atlantic coast of the United States, is 168 miles long from the Virginia Capes to the mouth of Susquehanna River. The bay is the approach to the major ports of Norfolk, Newport News, and Baltimore and to many other cities and towns. Deep-draft vessels use the Atlantic entrance, which is about 10 miles wide between Cape Charles on the north and Cape Henry on the south. Medium-draft vessels can enter from Delaware River on the north by way of the Chesapeake and Delaware Canal, and light-draft vessels can enter from Albemarle Sound on the south by way of the Dismal Swamp Canal or the Albemarle and Chesapeake Canal.

Note.—Many of the distances in this and later chapters are stated in miles above the **Virginia Capes,** or the **Capes,** which is a short way of referring to a line from Cape Henry Light to Cape Charles Light. As the turning point used in Sailing Directions, Chapter 3, is outside the Capes, cumulative distances in that chapter are 1.1 miles greater to points in Hampton Roads and 1.5 miles greater to points up the bay than distances above the Capes.

Chesapeake Lightship (lat. 36°58′.7, long 75°42′.2) is moored in 63 feet of water 15 miles 078° from Cape Henry Light. The vessel has a red hull, with the name CHESAPEAKE on both sides, and a tubular mast with lantern and gallery. The light is 66 feet above the water and visible 14 miles; the radiobeacon and the fog signal are synchronized for distance finding. Call letters for radio and code flag are NNBF. **Storm warnings** are displayed, daytime only.

Cape Charles, on the north side of the entrance to Chesapeake Bay, is low and bare but the land back of it is high and wooded. **Wise Point** is the most southerly mainland tip of the cape; the observation towers about a mile northeast of the point are conspicuous.

The southwest end of **Smith Island** is 2 miles eastward of Wise Point; the island is 6.5 miles long, is low and sparsely wooded, and is awash at half tide midway along its length. **Cape Charles Light (lat. 37°07′.3, long. 75°54′.4),** 180 feet above the water and visible 20 miles, is shown from an octagonal, pyramidal skeleton structure, upper part black and lower part white, a mile from the southwest end of the island. The ruins of the old lighthouse are in the water 0.7 mile eastward of the light.

Smith Island Shoal has a depth of 21 feet 7.5 miles east by south of Cape Charles Light. The shoal breaks in heavy weather. Depths of less than 36 feet extend 4.5

miles northeastward of the shoal and are marked at their outer limit by a lighted whistle buoy.

Nautilus Shoal, which covers an extensive area, has a depth of 10 feet 5 miles southward of Cape Charles Light. The channel south of the shoal, and thence between **Inner Middle Ground** and Fisherman Island, has a controlling depth of about 24 feet; it is marked by buoys and is used by local vessels drawing up to 12 feet but is not recommended for strangers.

Low **Fisherman Island** is a mile south of Wise Point. There are several small tanks and towers on the northwest end of the island. A wharf extends out from the northwest side of the island and another wharf is at the northwest end.

Cape Henry, on the south side of the entrance to Chesapeake Bay, has a prominent range of sand hills about 80 feet high. **Cape Henry Light (lat. 36°55′.6, long. 76°00′.4),** 157 feet above the water and visible 19 miles, is shown from an octagonal, pyramidal tower, upper and lower half of each face alternately black and white, on the beach near the point of the cape; the radiobeacon and the fog signal are synchronized for distance finding. The radiobeacon will broadcast upon special request to enable vessels to **calibrate** their radio direction finders; see *Light List* for alerting whistle signals and operational information. A light, 100 feet above the water, will be shown from the north face of the tower when the calibration service is in operation.

The old lighthouse, built in 1791, is 340 feet southwestward of Cape Henry Light. At the signal tower 0.3 mile northwest of the light, the Hampton Roads Maritime Exchange maintains a **reporting station** from which vessels are reported to Norfolk and Baltimore; vessels can communicate with the station by flag hoist in International Code, and messages from or to vessels can be relayed by the station. **Storm warnings** are displayed day and night at the tower.

About 4.5 miles southward of Cape Henry Light is the conspicuous summer resort of **Virginia Beach.** The most prominent building is the Cavalier Hotel, which is distinguished by its size and its cupola. **Virginia Beach Coast Guard Station** is near the ocean, and an elevated tank is about 0.8 mile inland.

Rules of the Road.—Inland Pilot Rules shall be followed inside a line from Cape Henry Light to Cape Henry Junction lighted whistle buoy, thence to Cape Charles Light.

A naval **restricted area** extends from Cape Henry to Cape Charles; limits of the area and regulations governing it are given in **§ 207.158,** Chapter 2A.

Pilotage.—Virginia and Maryland **pilot boats** are stationed in the entrance to Chesapeake Bay, Virginia pilots are taken to any port in Virginia and Maryland pilots to any port in Maryland, but vessels bound up Potomac River may take either. The night signal for a Virginia pilot is one long and one short blast of the whistle, and for a Maryland pilot is three longs and one short. Virginia pilot rates are given a little later in this chapter in connection with Hampton Roads, Maryland rates are given in Chapter 15 in connection with Baltimore, and Potomac River pilotage, not compulsory, is discussed in Chapter 12.

The deep **channel** into Chesapeake Bay is close to Cape Henry. From eastward the entrance may be approached boldly as there are no outlying dangers. Depths of 20 fathoms are found 45 miles eastward of Cape Henry; inshore of that depth the water

shoals irregularly. In clear weather Chesapeake Lightship can be picked up and the buoys can be followed into the bay.

A direct course from Chesapeake Lightship to abeam of Cape Henry has a controlling depth of about 34 feet. Deep-draft vessels should approach the entrance through the natural channel, with depths greater than 50 feet, that extends southeastward from Cape Henry. The 60-foot curve should be followed when rounding the cape to insure passing at a safe distance of 1 mile; depths near 100 feet should be avoided as these are found dangerously close to the shoal northeast of the cape. **Sailing directions** are given in tabular form in Chapter 3.

A Federal project provides for a uniform main-channel depth of 39 feet from the Virginia Capes to Baltimore. The well marked channel, which extends northwestward from off Cape Henry, is discussed further in Chapters 11 to 15.

Chart 481.—Thimble Shoal Channel, the improved approach to Hampton Roads, begins about 2 miles northwest of Cape Henry Light and extends about 10 miles west-northwestward. The Federal project provides for a channel 40 feet deep and 750 feet wide; the channel is maintained at or near project dimensions and is well marked by lighted buoys. **Regulations** governing the navigation of Thimble Shoal Channel are given in **§ 207.140,** Chapter 2A.

Naval and merchant-vessel **anchorages** have been established south of Thimble Shoal Channel; limits of the areas and regulations governing them are given in **§ 202.168,** Chapter 2A.

Lynnhaven Roads, an open bight just westward from Cape Henry, is protected from southerly winds and is sometimes used as an anchorage. The former dumping-ground area in the western part of the bight has shoals and obstructions with depths as little as 12 feet; elsewhere, general depths are 20 to 28 feet. Westward of Lynnhaven Inlet the shoaling is gradual and depths of 18 feet can be found 0.8 mile from shore; eastward of the inlet the 18-foot curve is no more than 0.3 mile from shore.

Lynnhaven Inlet, 4 miles westward of Cape Henry Light, has depths of 2½ to 3 feet over the bar and is marked by several buoys. The highway bridge over the inlet has a bascule span with a horizontal clearance of 31 feet and a vertical clearance of 5 feet. The railroad bridge immediately south of the highway bridge has a hand-operated swing span with a horizontal clearance of 28 feet and a vertical clearance of 3½ feet. **Lynnhaven Bay,** south of the inlet, has depths of 2 to 10 feet.

Long Creek, which leads eastward from Lynnhaven Inlet to **Broad Bay,** has depths as little as 1 foot. The highway bridge 1.2 miles from the inlet bridges has a hand-operated swing span with a horizontal clearance of 19½ feet and a vertical clearance of 5½ feet.

A **land cut** makes off to starboard from Long Creek about a mile from the inlet bridges. A private project provides for a depth of 5 feet through the cut; the controlling depth was 3 feet in July 1951. The fixed highway bridge 1.2 miles from the inlet bridges has a horizontal clearance of 38 feet and a vertical clearance of 12 feet. The Long Creek approach to the cut is marked by daybeacons.

The Cavalier Yacht and Country Club (*see Chart 1222*) back of Virginia Beach, is about 5 miles from Lynnhaven Inlet by way of Long Creek, the land cut, Broad Bay, **The Narrows, and Linkhorn Bay.** Depths are about 7 feet in Broad Bay, 4 feet in The Narrows, and 10 feet in Linkhorn Bay. The club is on the south side of the entrance

to **Little Neck Creek,** the southeast arm of Linkhorn Bay; the pier has depths of about 11 feet at the face. Gasoline, water, and ice are available at the pier, and groceries can be delivered. A marine railway within a mile of the pier can handle boats up to 40 feet in length and 15 tons in weight.

Little Creek is entered between jetties 8 miles westward of Cape Henry Light. A Federal project provides for a channel 20 feet deep and 400 feet wide to the Pennsylvania Railroad terminals, 1.2 miles south of the jetties, and a basin of the same depth at the terminals; the controlling depth was 20 feet in May 1951. Lights mark the outer ends of the jetties, and a polychrome directional light is shown from a skeleton tower at the head of the channel.

The town of **Little Creek** has rail and highway connections with Norfolk. The Pennsylvania Railroad operates car floats to the town of Cape Charles, on the Delmarva Peninsula. Automobile and passenger **ferries** operate to Kiptopeke Beach, also on the peninsula. There are several Government installations in Little Creek; **Little Creek Coast Guard Station** is about 200 yards eastward of the railroad pier. There are no public landings.

A Navy **restricted area** for amphibious training extends from the beach just westward of Little Creek to the edge of Thimble Shoal Channel, east-southeastward along the channel, then back to the beach at a point about 2 miles eastward of Little Creek; limits of the area and regulations governing it are given in **§ 207.157,** Chapter 2A. A small **danger zone** within the restricted area is close to the beach near the eastern end; limits of the area and regulations governing it are given in **§ 204.51,** Chapter 2A.

Chart 400.—Hampton Roads, at the southwest corner of Chesapeake Bay 16.5 miles westward of the Virginia Capes, is the approach to Newport News and James River and to Elizabeth River and the cities of Norfolk and Portsmouth. The harbor is one of the most important along the eastern seaboard. Bituminous coal, petroleum products, sand and gravel, and fertilizers constitute more than 90 percent of the heavy traffic movement by water.

Channels.—The approach to Hampton Roads through 40-foot-project Thimble Shoal Channel was discussed earlier. There are natural depths of 20 to 80 feet in the harbor, but it has been necessary to dredge deep channels to the big ports.

A Federal project provides for a channel 40 feet deep and 750 feet wide from Hampton Roads to the junction of Eastern and Southern Branches of Elizabeth River. The improved section begins 18 miles from the Virginia Capes and extends southward for about 9 miles along the water fronts of Norfolk and Portsmouth. The channel is maintained at or near project dimensions. Project channels in Eastern, Southern, and Western Branches are discussed later.

A Federal project also provides for a channel 40 feet deep and 600 feet wide from deep water in Hampton Roads to deep water in James River. The improved section begins 19.5 miles from the Virginia Capes and extends westward for about 3 miles to the waterfront of Newport News. The channel is maintained at or near project dimensions.

Anchorages.—Numerous anchorages, general, temporary, naval, explosives, quarantine, deep-draft, and yacht, have been established in Hampton Roads and Elizabeth River; limits of the areas and regulations governing them are given in **§ 202.168,** Chapter 2A. The areas are shown on Charts 400 and 452.

Aids to navigation.—The channels are well marked by lights and by lighted and unlighted buoys.

Sailing directions for Hampton Roads and Elizabeth River are given in tabular form in Chapter 3.

Tides and currents.—The mean range of tide is 2½ feet in Hampton Roads; daily predictions for Sewall Point are given in the *Tide Tables*. Current information for several places in Hampton Roads and Elizabeth River is given in the *Current Tables*. The currents are influenced considerably by the wind and at times attain velocities in excess of the current-table values. In Elizabeth River and each of its three branches the average velocity of the current at strength is about ¾ knot.

Storm warnings are displayed day and night at Old Point Comfort and at the Royster Building in Norfolk; warnings are displayed, daytime only, at the Norfolk Naval Base.

Ice.—Hampton Roads generally is free of ice, and navigation is never obstructed for full-powered vessels. In severe winters, the upper part of Southern Branch, Elizabeth River, is sometimes closed for short periods.

Pilotage at Hampton Roads ports is performed exclusively by the Virginia Pilot Association and is compulsory for all vessels excepting those engaged in coastwise trade and those exempted by United States statute. The master of any inbound coastwise vessel that arrives within the line of Cape Henry bearing west of south without having taken a pilot may proceed to Hampton Roads or York Spit Light and there employ any other vessel to tow his vessel to its destination.

Rates of pilotage from sea to Smith Point, Newport News, or Norfolk are $3.60 per foot of draft for cargo vessels under 501 net registered tons, $4.20 per foot from 501 to 1,000 tons, $4.80 per foot from 1,001 to 1,500 tons, $5.40 per foot for 1,501 to 2,000 tons, and $6.00 per foot for over 2,000 tons; rates for bunkers or orders are approximately 80 percent of cargo rates.

Pilotage from Newport News to Richmond, or from Smith Point to Washington, is $4.00 per foot of draft when no sea pilotage is paid and $1.50 per foot when sea pilotage is paid; sum total of sea and river pilotage is not to exceed $6.50 per foot.

Towage.—Vessels usually proceed from Cape Henry to points in the Hampton Roads port area under their own power and without assistance. A large fleet of tugs is available at Norfolk to assist in docking or undocking and in shifting within the harbor.

Quarantine.—The quarantine station is at Old Point Comfort. Arriving vessels which are subject to quarantine regulation and bound for Hampton Roads ports or Richmond must remain at the Old Point Comfort quarantine anchorage until granted pratique. The United States Public Health Service Hospital is on Hampton Boulevard, Norfolk, and the United States Naval Hospital is in Portsmouth. There are numerous private hospitals.

Customs.—The customhouse for Norfolk and Portsmouth is at the corner of Main and Granby Streets, Norfolk. The customhouse at Newport News, which is under the supervision of the collector of customs at Norfolk, is at the corner of Twenty-fifth Street and West Avenue.

Immigration.—Vessels are boarded by immigration officers upon arrival at Norfolk and Newport News, and all members of crews are subject to inspection before landing, except that masters may be permitted to go ashore on ship's business. All passengers, stowaways, and workaways must be entered on alien passenger manifests

and safely detained aboard until instructions are issued by the immigration officer for their disposal. Vessels from foreign ports bound direct for Richmond are required to stop at Newport News for immigration inspection.

Other **Federal offices** in the area include a U. S. Coast and Geodetic Survey district office, the U. S. Coast Guard Fifth District office, a Corps of Engineers district office, and a U. S. Navy Branch Hydrographic Office; all are in Norfolk.

Terminal facilities in Hampton Roads include coal piers, storage and bunkering facilities for fuel oil, general cargo piers, marine railways, drydocks, and shipyards. More coal is transshipped at Norfolk than at any other seaport in the United States, and the large coal loading docks supply proportionate amounts of bunker coal to vessels of all classes.

Supplies.—The principal coal handling and bunkering piers are those of the Virginian Railway at Sewall Point and of the Norfolk and Western Railway at Lambert Point, both in Norfolk, and of the Chesapeake and Ohio Railway in Newport News. Bunker oil is available at Sewall Point and in Southern Branch, Elizabeth River. Water is available on the principal piers and can be delivered by barge.

Repairs.—The Hampton Roads area has extensive facilities for drydocking and hauling out. The largest floating drydock at Norfolk has a capacity of 15,000 tons, and the largest marine railway has a capacity of 5,500 tons. The shipyard at Newport News is one of the largest and best equipped shipbuilding and ship repair plants in the United States; the principal repair facilities are the graving docks, the largest of which has a length of 745 feet on the bottom. Smaller railways in the area cater to the yachtsman and small-boat operator.

No firms in the area specialize in wrecking and salvage work, but there is adequate equipment for such service. Equipment also can be brought from New York as the need arises.

Communications.—The Hampton Roads ports are served by nine trunk line railroads and a terminal line; most of the trunk lines operate water-front terminals which are reached direct over their own rails. More than 60 steamship lines connect Hampton Roads with principal United States and foreign ports; regular sailings are maintained by the majority of the lines and frequent but irregular service by the remainder. **Norfolk Municipal Airport** is about 5 miles northeast of Main and Granby streets.

Thimble Shoal Light (lat. 37°00′.9, long. 76°14′.4), 55 feet above the water and visible 13 miles, is shown from a red conical tower on brown cylinder pier, in depths of 10 feet on the shoal, on the north side of Hampton Roads approach 13 miles from the Virginia Capes; the light has a fog signal. The shoal is the southern edge of the **Horseshoe,** described in Chapter 11.

An **antitorpedo net area** extends across the approach to Hampton Roads about halfway between Thimble Shoal Light and Old Point Comfort; limits of the area and regulations governing it are given in § **207.141,** Chapter 2A.

A Naval Ordnance Laboratory **restricted area** extends eastward and southward of Old Point Comfort; limits of the area and regulations governing it are given in § **204.50,** Chapter 2A.

The **entrance** to Hampton Roads is between Willoughby Spit and Old Point Comfort, 2 miles to the northward; the mid-channel point is 0.5 mile from Old Point Comfort and 16.5 miles from the Virginia Capes.

Old Point Comfort is the site of **Fort Monroe** and the **quarantine station** for Hampton Roads ports; the Chamberlin Hotel is an excellent landmark. **Old Point Comfort Light (lat. 37°00′.1, long. 76°18′.4),** 54 feet above the water and visible 13 miles, is shown from a white tower; the fog signal is 180 yards east-southeastward. **Storm warnings** are displayed day and night on the south waterfront. Gasoline, water, and provisions are available in limited quantities. Passenger and automobile **ferries** operate across Hampton Roads to Willoughby Spit.

The main wharf at Old Point Comfort has depths of about 25 feet at the face and has a fog signal. Most of the vessels operating between Norfolk and points along Chesapeake Bay and its tributaries stop at the wharf.

Caution.—Landing at the Old Point Comfort wharf is often rendered difficult by the strong tidal **currents.** The first of the ebb sets southeastward from the wharf and the last of the ebb sets directly on the wharf and northward through the opening eastward of Hampton Bar. The direction of the flood currents is approximately west-southwestward. The current turns about 1 hour earlier than in mid-channel to the southward; consequently, there is about an hour preceding each mid-channel slack when the currents near the wharves and in the channel set in opposite directions.

Hampton Bar begins about 200 yards southwest of Old Point Comfort and extends 2 miles southwestward; depths on the bar are 1 to 5 feet. The buoyed **channel** between Old Point Comfort and Hampton Bar has depths of 20 to 10 feet to the Old Point Comfort **ferry slip,** 0.4 mile north of the main wharf. The channel continues northward, with a controlling depth of about 10 feet, to **Phoebus,** a mile from the Old Point Comfort main wharf. The wharves at Phoebus have depths of 8 to 12 feet at their outer ends. Small boats anchor in depths of 8 to 20 feet along the sides of the channel.

Mill Creek, back of Old Point Comfort and just eastward of the Phoebus wharves, has several narrow channels through extensive areas that bare at low water. The three fixed bridges over the entrance have minimum clearances of 10 feet horizontally and 4½ feet vertically. The creek is little used.

Hampton Creek is on the north side of Hampton Roads 1.5 miles northwest of Old Point Comfort and 17.5 miles from the Virginia Capes. A Federal project provides for a channel 12 feet deep from the vicinity of Old Point Comfort across Hampton Flats and up the creek to the highway bridge at Hampton, with widths of 200 feet in the approach and 150 feet in the creek; the controlling depth was 10 feet in 1949. The channel is well marked and easy to follow. The creek may be approached from either end of Hampton Bar, but the larger craft use the dredged channel.

The residential and commercial areas of **Hampton** are on the west side of Hampton Creek; Hampton Institute and a Veterans Hospital are on the east side. The town is headquarters for numerous oyster and fish boats. The fixed highway bridge 0.7 mile above the mouth of the creek has a horizontal clearance of 26 feet and a vertical clearance of 10 feet; only very small boats navigate above the bridge. The principal commercial wharves are just below the bridge and have depths of 10 to 12 feet at their faces. The public landing 500 yards below the bridge has depths of 8 feet at the face; small boats anchor between the public landing and the bridge. The Hampton Yacht Club pier halfway between the mouth and the bridge has depths of 7 feet at the outer end. Gasoline, Diesel oil, water, ice, provisions, and some marine supplies are available at Hampton, and there are several marine railways along the creek and its tributaries.

Jones Creek, on the east side of Hampton Creek 300 yards above the mouth, has

depths of about 9 feet. The bulkheads have depths of 3 to 7 feet alongside and are controlled by the Veterans Hospital on the south and Hampton Institute on the north.

Sunset Creek is on the west side of Hampton Creek 400 yards above the mouth. A Federal project provides for a channel 12 feet deep and 80 to 100 feet wide to the fill 0.5 mile above the entrance; the controlling depth was 12 feet in 1949. The lower part of the channel is marked by lights. The wharves along the creek have depths of 6 to 9 feet at their outer ends. The boatyard on the south side can haul out vessels up to 85 feet in length and 200 tons in weight; the machine shop repairs gasoline and Diesel engines and does hull work.

The 40-foot-project **channel** to Newport News was discussed earlier. Depths along the edges of the dredged section are 19 to 25 feet. The **currents** do not always set fair with the channel, especially with strong winds, and deep-draft vessels sometimes find it difficult to stay in the channel.

Newport News Middle Ground Light (lat. 36°56′.7, long. 76°23′.5), 52 feet above the water and visible 13 miles, is shown from a brown conical tower on a black cylinder pier in depths of 15 feet on the western part of the shoal. The light has a fog signal and is equipped for **radio direction finder calibration service;** see *Light List* for alerting whistle signals and operational information. The light is 0.6 mile south of the Newport News channel and 21.5 miles from the Virginia Capes.

Newport News Point, on the north side of the entrance to **James River,** is 22.5 miles from the Virginia Capes. The city of **Newport News** extends several miles along the northeast bank of the river. Passenger and automobile **ferries** operate from Newport News Point to the Norfolk slips south of Sewall Point.

Newport News Creek, just west of Newport News Point, is a city-improved small-boat harbor. A Federal project provides for a channel 12 feet deep and 200 to 60 feet wide to the head of the harbor, 0.6 mile above the mouth; the controlling depth was 12 feet in April 1950. A light marks the west side of the entrance. The bulkheads in the harbor have depths of 7 to 12 feet alongside. Gasoline, Diesel oil, water, ice, and yacht supplies are available. The marine railways on the west side of the harbor can haul out vessels up to 90 feet in length and 75 tons in weight for general repairs.

The Chesapeake and Ohio Railway **coal piers** 0.3 mile westward of Newport News Point have depths of 35 feet alongside; vessels can be loaded at the rate of 7,500 tons per hour. The general-cargo piers 1.1 miles northwest of the point also have depths of 35 feet alongside.

The facilities of the Newport News Shipbuilding and Drydock Company begin 1.7 miles northwest of Newport News Point and extend up river about a mile. Depths at the piers are about 35 feet. The largest graving dock has a length of 745 feet on the bottom and a depth of 30 feet over the sill. The largest submerged shipway is 1,000 feet long, 140 feet wide, and has a depth of 35 feet over the sill.

Willoughby Spit, on the south side of the entrance to Hampton Roads, is a narrow barrier beach 1.3 miles long in an east-west direction. About midway between the spit and Old Point Comfort, on the opposite side of the entrance, is **Fort Wool,** which is on the south edge of the deep channel; a light, 25 feet above the water, is shown from the north searchlight tower on the fort.

Willoughby Bank, with depths of 3 to 7 feet, extends east-northeastward along the edge of the main channel for about 2.5 miles from Fort Wool. Westward and south-

ward of the fort is a narrow channel with depths of 13 feet that leads southward of the bank; the channel is little used except by local boats.

Willoughby Bay, on the inner side of Willoughby Spit, has general depths of 7 to 12 feet. On the south side of the bay are the prominent buildings of the Norfolk Naval Base and the Naval Air Station. A Federal project provides for a channel 10 feet deep and 300 feet wide from deep water 0.4 mile westward of Fort Wool to the **ferry slip** behind the hooked outer end of Willoughby Spit; the controlling depth is about 9 feet. The channel is well marked.

Most of Willoughby Bay and approaches are a seaplane **restricted area;** limits of the area and regulations governing it are given in § **207.156,** Chapter 2A. The northern part of the bay has been designated as a yacht **anchorage;** limits of the area and regulations governing it are given in § **202.168,** Chapter 2A.

The Willoughby Spit passenger and automobile **ferries** operate across Hampton Roads to Old Point Comfort. The wharf immediately west of the ferry slip has depths of 12 feet at the face; gasoline, Diesel oil, water, and ice are available.

Charts 400, 452.—Norfolk Harbor comprises a portion of the southern and eastern shores of Hampton Roads and both shores of Elizabeth River and its Eastern, Southern, and Western Branches, on which the cities of Norfolk, Portsmouth, South Norfolk, and West Norfolk are located. The harbor extends from the 40-foot depth contour off Sewall Point, at the entrance to Elizabeth River, to a point 0.4 mile south of the Norfolk and Western Railway bridge over Southern Branch, a total distance of 14 miles; it extends 1.5 miles up Western Branch to a point 0.5 mile above the West Norfolk highway bridge, and up Eastern Branch for 2.5 miles to the Virginian Railway bridge.

The main part of Norfolk is on the east side of Elizabeth River north of Eastern Branch, with Berkley, a subdivision, to the southward between Eastern and Southern Branches. South of Berkley is the city of South Norfolk. Portsmouth, the seat of Norfolk County, is opposite Norfolk and its water frontage extends along the west shore of Southern Branch and the south shore of Western Branch. West Norfolk is on the north shore of Western Branch. These cities form practically a single community as they have the same commercial interests and are served by the same ship channel.

Chart 400.—Sewall Point, on the east side of the entrance to **Elizabeth River,** is 19.4 miles from the Virginia Capes. The piers of the Norfolk Naval Base extend southward along the river for 0.6 mile. Depths alongside the Naval piers are 27 to 40 feet; the inclosed basin at the north end affords protection to small Naval vessels in depths of 24 to 30 feet. The approach to the Naval piers is a **restricted area;** limits of the area and regulations governing it are given in § **207.155,** Chapter 2A.

Sewall Point Spit, with depths of 3 to 6 feet, extends north-northeastward from the point for about 2 miles to the outer end of the Willoughby Spit Channel. A channel has been dredged through Sewall Point Spit along the Naval Base bulkhead to an inclosed basin 0.9 mile eastward of the point; controlling depths are about 7 feet in the buoyed channel and 5 to 7 feet in the basin, which is used only by small Naval boats.

Immediately south of the Naval Base are the slips of the automobile and passenger ferries that operate across Hampton Roads to Newport News.

The Virginian Railway **coal piers** 0.8 mile south of Sewall Point have depths of 35 feet alongside; vessels can be loaded at the rate of 5,000 tons per hour. About 1.4

miles south of Sewall Point is the Norfolk and Western Railway pier that serves a 750,000-bushel grain elevator; depths alongside are about 32 feet. South of the grain elevator is an **oil wharf** with depths of 30 to 35 feet alongside; the delivery rates per hour are 1,500 barrels of Diesel oil and 6,000 barrels of bunker oil. The general-cargo terminals 2.4 miles south of Sewall Point have depths of 35 feet alongside.

Lafayette River, which empties into the east side of Elizabeth River 3.6 miles south of Sewall Point and 23 miles from the Virginia Capes, is much travelled by small pleasure boats. The entrance is between **Tanner Point** and Lambert Point, 1.5 miles to the southward. The river has natural depths of 4 to 6 feet in the entrance, thence 6 to 20 feet for 3.5 miles to the forks, thence 2 to 4 feet up either fork. The dredged section in the entrance has a controlling depth of about 7 feet and is marked by lights and buoys. The channel turns sharply at the light off **Lawless Point,** on the north side a mile above the entrance, and vessels must be on the alert to avoid grounding. Above Lawless Point, the channel is marked by an occasional buoy.

Defined **anchorage areas** extend up Lafayette River to the first bridge; limits of the areas and regulations governing them are given in § **202.168,** Chapter 2A.

Hampton Boulevard bridge, 1.5 miles above the entrance to Lafayette River, has a fixed concrete arch with a horizontal clearance of 61 feet and a vertical clearance of 29 feet. The wharf of the Norfolk Yacht and Country Club just below the north end of the bridge has depths of about 20 feet at the face; gasoline, Diesel oil, fresh water, and ice are available.

Granby Street bridge, 3.4 miles above the entrance to Lafayette River, has a bascule span with a horizontal clearance of 40 feet and a vertical clearance of 20 feet. The yacht basin 200 yards below the south end of the bridge has slips for more than a hundred boats; the finger pier extends out to the channel. Gasoline, water, and ice are available at the pier, and the machine shop repairs gasoline and Diesel engines and does hull work.

Chart 452.—Craney Island, now a part of the mainland, is on the west side of Elizabeth River 3.6 miles south of Sewall Point. The low and thinly wooded area is the site of a Navy fuel depot, and the docks and piers, all on the eastern side, are used only by Government vessels. A light, 34 feet above the water, is shown from a white skeleton structure on piles off the northeast corner of the point and has a fog signal. The wharves have depths of 30 to 38 feet alongside. A **submerged water main** crosses from Craney Island to the north side of Lambert Point; vessels are cautioned not to anchor in the vicinity of the lighted range that marks the crossing.

Lambert Point is on the east side of Elizabeth River 5 miles south of Sewall Point. The Norfolk and Western Railway **coal piers** have depths of 30 to 32 feet alongside; vessels can be loaded at the rate of 5,000 tons per hour. A mile farther along the river are the general-cargo piers of the same railway; depths alongside are 32 to 35 feet.

Western Branch empties into the southwest side of Elizabeth River 5.4 miles south of Sewall Point and 24.8 miles from the Virginia Capes. A Federal project provides for a channel 24 feet deep and 300 to 400 feet wide from Elizabeth River to the highway bridge a mile above the mouth, thence 18 feet deep and 150 feet wide to a point 0.5 mile above the bridge; controlling depths were, in January 1949, 15½ feet to the bridge, thence 18 feet to the head of the project. Buoys mark the channel as far as the bridge. Above the project channel, Western Branch has depths of 18 to 13 feet in a narrow un-

marked channel for a mile, thence 7 to 20 feet to **Drum Point,** 4.3 miles above the entrance. Small boats can navigate about 3 miles farther.

The highway bridge 1 mile above the entrance to Western Branch has a swing span with a horizontal clearance of 140 feet and a vertical clearance of 4½ feet; the channel is through the north opening. **West Norfolk** is at the north end of the bridge.

The West Norfolk shipyard just above the bridge can haul out vessels up to 220 feet in length and 750 tons in weight; the yard makes all kinds of engine and hull repairs. The yacht-service pier about 400 yards above the bridge has depths of about 8 feet at the face; gasoline, Diesel oil, water, ice, and some other supplies are available.

Churchland Bridge, 2.3 miles above the entrance to Western Branch, has a fixed span with a horizontal clearance of 107 feet and a vertical clearance of 38 feet. The Atlantic Coast Line Railroad bridge 4 miles above the entrance has a swing span with a horizontal clearance of 49½ feet and a vertical clearance of 4 feet. **Hodges Ferry** bridge, 4.7 miles above the entrance, has a bascule span with a horizontal clearance of 32 feet and a vertical clearance of 5½ feet; **regulations** governing operation of the draw-span are given in § **203.245,** Chapter 2A. The overhead power cable just above the Hodges Ferry bridge has a vertical clearance of 37½ feet.

Pinner Point is on the southwest side of Elizabeth River 6.3 miles from Sewall Point. The northwesternmost pier has depths of 28 feet alongside; the others have depths ranging from 15 to 20 feet. Most of the piers are controlled by the Southern Railway or the Atlantic Coast Line Railroad and are used for transfer of general cargo.

Scott Creek is on the southwest side of Elizabeth River 6.8 miles from Sewall Point. A Federal project provides for a channel 12 feet deep and 100 feet wide to a point 100 feet above the railroad bridge; the controlling depth is about 7 feet. Day-beacons mark the improved channel. The Atlantic Coast Line Railroad bridge 0.5 mile above the entrance has a hand-operated swing span with a horizontal clearance of 34½ feet and a vertical clearance of 3 feet; the channel is through the northwest opening. The fish wharves in the cove just above the south end of the bridge have depths of 9 to 12 feet at their faces.

Hospital Point, on the southwest side of Elizabeth River 7.1 miles from Sewall Point, is the site of a U. S. Naval Hospital. An elevated tank and the dome of the main building are visible above the trees. The hospital landing has depths of about 18 feet at the face.

Norfolk, or parts of it, has been discussed at some length in the preceding text. The mid-point of the downtown section can be taken as the City Wharf, at the foot of West Main Street, which is on the northeast side of Elizabeth River 7.3 miles from Sewall Point and 26.7 miles from the Virginia Capes. The City Wharf has depths of 15 feet at the face. Other wharves northwest and southeast of West Main Street have depths mostly ranging from 14 to 20 feet and are used for a variety of purposes.

Smith Creek; 0.3 mile north-northwestward of West Main Street, has depths of 7 to 10 feet. The creek is used by motorboats, oyster and fish boats, and sand and gravel barges; motorboats anchor in the northwest arm. **Anchorage areas** have been defined in Smith Creek; limits of the areas and regulations governing them are given in § **202.168,** Chapter 2A. The highway bridge over the entrance to the creek has a swing span with a horizontal clearance of 49 feet and a vertical clearance of 5½ feet; the northwest opening is used.

A marine service pier below the northwest end of the Smith Creek bridge has depths

of 10 feet at the face; gasoline, Diesel oil, freshwater, and ice are available. A Naval small-boat landing is on the opposite side of the entrance. A fuel barge moored off the entrance to the creek has depths of 9 to 12 feet alongside; gasoline, Diesel oil, and fresh water are available.

The wharves in Smith Creek have depths of 8 to 12 feet at their faces. A boatyard in the northwest arm can haul out vessels up to 80 feet in length and 100 tons in weight; the machine shop repairs gasoline and Diesel engines and does hull work.

Eastern Branch empties into the east side of Elizabeth River 7.7 miles southward of Sewall Point and 27 miles from the Virginia Capes. A Federal project provides for a channel 25 feet deep and 500 to 200 feet wide to the Virginian Railway bridge, 2.5 miles above the entrance. The channel is maintained at or near project dimensions and is marked at the critical points. Above the Virginian Railway bridge, the natural channel has depths of 10 to 18 feet to the forks 3.3 miles from the entrance and usually is marked by bush stakes. Limits of **anchorage areas** in Eastern Branch and regulations governing them are given in § **202.168,** Chapter 2A.

Downtown Norfolk is on the north side of Eastern Branch and **Berkley,** a subdivision, is on the south side. Traffic is fairly heavy to just above the fourth bridge, thence there is some traffic to the plant just below the south end of the Virginian Railway bridge. Depths at most of the piers on both sides of the branch range from 14 to 25 feet.

The highway **bridge** 0.4 mile above the entrance to Eastern Branch has a bascule span with a horizontal clearance of 150 feet and a vertical clearance of 48 feet. The highway bridge 0.7 mile above the entrance has a horizontal clearance of 128 feet and a vertical clearance of 35 feet. The Norfolk and Western Railway bridge 1.0 mile above the entrance has a bascule span with a horizontal clearance of 140 feet and a vertical clearance of 5 feet; the overhead power cable 200 yards above the bridge has a vertical clearance of 150 feet.

Campostella Bridge, 1.4 miles above the entrance to Eastern Branch, has a bascule span with a horizontal clearance of 142 feet and a vertical clearance of 16 feet; **regulations** governing operation of the drawspan are given in § **203.245,** Chapter 2A. The Virginian Railway bridge 2.5 miles above the entrance has a swing span with a horizontal clearance of 60 feet and a vertical clearance of 6 feet; the ebb **current** through this bridge has a southerly set.

There are several **shipyards** along Eastern Branch. The yard on the Berkley side of the entrance has a railway that handles vessels up to 250 feet in length and 3,000 tons in weight. The yard just below the Berkley end of the Norfolk and Western Railway bridge has a railway that handles vessels up to 420 feet in length and 5,000 tons in weight. The yard just below the Norfolk end of Campostella Bridge has a railway that handles vessels up to 420 feet in length and 5,500 tons in weight and a floating drydock with a capacity of 5,000 tons.

Southern Branch, which is merely a continuation of Elizabeth River south of the junction with Eastern Branch, is the approach to the **Dismal Swamp Canal** and the **Albemarle and Chesapeake Canal,** the **Intracoastal Waterway** routes southward to Albemarle Sound. The canals and the waterway are described at length in the *United States Coast Pilot, Atlantic Coast, Cape Henry to Key West.*

The Federal project for Southern Branch provides for a channel 40 feet deep and 450 feet wide to the Belt Line Railroad bridge, thence 35 feet deep and 375 feet wide to

the Virginian Railway bridge, thence 35 feet deep and 250 feet wide to a point 0.4 mile south of the Norfolk and Western Railway bridge. The channel is maintained at or near project dimensions and is well marked.

A **speed** limit of 6 knots is prescribed by § **207.154,** Chapter 2A, for the part of a Southern Branch between Eastern Branch and the Belt Line Railroad bridge.

Portsmouth, on the west side of the entrance to Southern Branch, has been partly described in some of the preceding paragraphs. The commercial wharves of the city extend about 0.5 mile up the branch and have depths of 15 to 30 feet at their faces. Beyond the commercial wharves is the Norfolk Naval Shipyard, which occupies about 2 miles of the Portsmouth water front.

Depths at the Berkley wharves, on the east side of the entrance to Southern Branch, range from 20 to 40 feet, the latter being at the **shipyard** 0.7 mile above the entrance. The yard has a floating drydock, with a capacity of 15,000 tons, that has handled vessels up to 500 feet in length.

Bunker **oil** is available at **South Norfolk,** on the east side of Southern Branch 2 miles from the entrance and 29 miles from the Virginia Capes. Depths at the wharves are about 30 feet, and oil can be loaded at the rate of 2,000 barrels per hour.

The Belt Line Railroad **bridge** 1.8 miles above the entrance to Southern Branch is at *Mile 2.2* from the foot of West Main Street, Norfolk, which is ***Mile 0.0*** of Intracoastal Waterway distances south. The bridge has a swing span with a horizontal clearance of 109 feet and a vertical clearance of 12 feet.

The highway bridge at *Mile 2.5* has a vertical-lift span with a horizontal clearance of 220 feet and vertical clearances of 15 feet down and 145 feet up. The Virginian Railway bridge at *Mile 3.2* has a swing span with a horizontal clearance of 110 feet and a vertical clearance of 9 feet.

The highway bridge and the Norfolk and Western Railway bridge at *Mile 5.5* have bascule spans with a horizontal clearance of 125 feet and a vertical clearance of 7 feet; large vessels must exercise caution when making the turns to these bridges because of the **current.** The overhead power cable at *Mile 6.1* has a vertical clearance of 145 feet.

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CHAPTER 10

Chesapeake Bay

James River

Charts 529 to 531

JAMES RIVER empties into the west side of Hampton Roads 22.5 miles by main channel from the Virginia Capes. Richmond, 78 miles above the mouth, is the head of practical navigation. Traffic on James River consists chiefly of petroleum products, sand and gravel, some chemicals and shellfish. Drafts of vessels using the river above Newport News generally do not exceed 15 feet, but vessels drawing 24 feet or more navigate it occasionally.

The Federal project for the improvement of James River provides for a **channel** 25 feet deep, 300 feet wide to Hopewell and thence 200 feet wide to Richmond Deepwater Terminal. The dredged cuts are maintained at or near project dimensions and are well marked. The 18-foot-project channel above Richmond Deepwater Terminal is discussed later.

Limits of established **anchorage areas** at the mouth of James River and regulations governing them are given in § **202.168,** Chapter 2A. **Sailing directions** for the river are given in tabular form in Chapter 3.

The mean range of **tide** is 2½ feet at Newport News and Hopewell, and 3½ feet at Richmond. The **currents** follow the general direction of the channel except between Hog Island and Jamestown Island, where they set across Goose Hill Flats. Their velocities are variable; in the lower reaches the flood current approximately equals the ebb in velocity. In mid-channel, average velocities at strength of flood or ebb vary from about 1½ knots near Newport News to 1 knot at Dutch Gap. Near Richmond the drainage flow predominates and the current seldom if ever sets upstream. The foregoing normal conditions are, of course, subject to modification by wind and freshet effects. The *Current Tables* give detailed information for several places.

During severe winters some drift **ice** appears, and at times the river freezes over, but navigation to Richmond hardly ever is suspended more than two days at a time because of ice.

Freshets occur irregularly in the fall, winter, and spring; their height at Richmond ranges from 6 to 32 feet, though the latter is exceptional. The maximum freshet heights usually occur between the middle of March and the middle of April; the freshets occurring at other times usually reach heights not greater than about 6 feet above the normal high water. The number of freshets that cause the water to rise above the level of the wharves along the main channel at Richmond averages about one per year; the water seldom rises above the level of the city wharf. The flood heights diminish

rapidly below Richmond; the extreme is about 11 feet less at Dutch Gap, and the rise is not felt at Hopewell. The cutoffs have reduced the freshet heights at Richmond about one foot.

Rates and regulations governing **pilotage** at Hampton Roads ports are given at the beginning of Chapter 9. Pilotage of vessels from Newport News to Richmond and intermediate points is $4.00 per foot of draft when no sea pilotage is paid and $1.50 per foot when sea pilotage is paid; sum total of sea and river pilotage is not to exceed $6.50 per foot.

Above Newport News, the principal places along James River for **supplies** are Suffolk, Hopewell, Petersburg, and Richmond. **Repair facilities** are extremely limited; small railways operate in Chuckatuck Creek, Pagan River, and in the Dutch Gap bend

Chart 529.—The entrance to James River is between Pig Point and **Newport News Point,** 3.6 miles to the north-northeastward; the mid-channel point is 22.5 miles from the Virginia Capes and is close to the Newport News wharves, described in Chapter 9.

Anchorage areas extend up James River for about 7 miles from the mouth; limits of the areas and regulations governing them are given in § **202.168,** Chapter 2A.

Nansemond River empties into the mouth of James River between Pig Point and **Barrel Point,** 2 miles west by north. **Traffic** on Nansemond River consists chiefly of clays and earths, sand and gravel, concrete and clay products, and petroleum products. The river is used considerably by vessels with drafts of 9 feet and has been navigated with drafts of as much as 11 feet.

A Federal project for the improvement of Nansemond River provides for a **channel** 12 feet deep and 100 feet wide from the mouth to a point 0.4 mile above the highway bridge at Suffolk, with a turning basin 200 feet square at Suffolk. The channel and basin were at project depth in July 1951. Small boats can go several miles above Suffolk.

The mean range of **tide** in Nansemond River is about 3 feet at the entrance and 4 feet at Suffolk. For information on **currents,** see the *Current Tables.*

Pig Point, on the south side of the entrance to James River and the east side of the entrance to Nansemond River, is the site of an ordnance depot. The dredged channel to the wharf has a controlling depth of about 9 feet. The entrance to the channel is marked by buoys. The twin tanks 0.4 mile east of the wharf are prominent. The remains of an old wharf extend northward 0.7 mile from the vicinity of the tanks and are marked at their outer end by a light.

From Pig Point to Hollidays Point, 6.5 miles upstream, Nansemond River is wide but the channel is crooked and leads between extensive shoals that are almost bare at low water in some places. There are many fish stakes on the shoals near the mouth. Above Hollidays Point, the river is narrow and crooked, but the mid-channel is clear to Suffolk. The channel is marked by buoys and several lights as far as Western Branch.

The highway toll bridge over Nansemond River at **Town Point,** on the south side 2.4 miles above the mouth, has a bascule span with a horizontal clearance of 90 feet and a vertical clearance of 20 feet. Just east of the bridge, a buoyed channel leads southward into **Bennett Creek,** which has a depth of only about 1 foot over the bar at the entrance. **Great Shoal,** on the northwest side of the channel a mile up river from the bridge, has an oyster bar that bares ½ foot at low water.

The highway toll bridge over the river at **Hollidays Point,** on the north side 6.5

miles above the mouth, has a swing span with a horizontal clearance of 80 feet and a vertical clearance of 8½ feet. The dredged basin 0.2 mile west of Hollidays Point has depths of about 6 feet.

Western Branch empties into the west side of Nansemond River 10 miles above the mouth. The branch has depths of about 10 feet to the village of **Reids Ferry,** 1.6 miles above the mouth, but, in 1951, was considerably obstructed by snags and logs. The highway bridge over Western Branch at Reids Ferry has a swing span with a horizontal clearance of 35 feet and a vertical clearance of 9 feet; the channel is through the south opening. **Regulations** governing operation of the drawspan are given in § **203.245,** Chapter 2A.

Suffolk is an important rail center on the south side of Nansemond River 15 miles above the mouth. Fuel and other supplies are available at the city. The highway bridge over the river at Suffolk has a bascule span with a horizontal clearance of 40 feet and a vertical clearance of 4½ feet. The oil wharves just above and below the bridge have main-channel depths at their faces.

Batten Bay, on the west side of James River just north of Nansemond River, has general depths of 2 to 6 feet. **Ragged Island Creek,** which empties into the north side of the bay, is shallow and little used.

Chuckatuck Creek, which empties into Batten Bay from southwestward, has depths of about 4 feet in the approach through the bay and deeper water inside for about 1.7 miles. The channel through the bay is marked by lights and buoys which must be followed closely to carry the best water; the channel edges usually are marked by bush stakes.

The highway bridge over Chuckatuck Creek 0.8 mile above the mouth has a bascule span with a horizontal clearance of 80 feet and a vertical clearance of 21 feet. One of the two boatyards at **Crittenden,** the village at the south end of the bridge, has a marine railway with a hauling capacity of 22 tons. The oyster-house wharf at Crittenden has depths of 6 to 9 feet at the face; the smaller landings have depths of 3 to 5 feet at the outer ends. The gasoline wharf between Crittenden and the mouth of the creek has depths of 6 feet alongside.

James River Bridge is 4 miles above the mouth and extends 4 miles from shore to shore in a northeast-southwest direction. The main-channel vertical-lift span, 1 mile from the northeast, or Newport News, end, has a horizontal clearance of 250 feet and vertical clearances of 50 feet down and 145 feet up; at night, red lights show when the lift span is down and green lights show when it is up. A fixed span midway between the two shores has a horizontal clearance of 82 feet and a vertical clearance of 25 feet.

On the east side of James River 5 miles above the mouth is **Hilton Village.** Six miles above the mouth are **Lake Maury** and the **Mariners' Museum.** A prominent monument is at the end of the dam between the lake and the river.

White Shoal, on the southwest side of James River main channel 7 miles above the mouth, is marked near its southeast end by the tower of an abandoned lighthouse. The secondary channel on the opposite side of the shoal from the main channel also is marked.

Pagan River empties into the southwest side of James River 8 miles above the mouth. Traffic on the river consists chiefly of shellfish, pulpwood, and some petroleum

products, sand and gravel. Drafts of vessels using the river are mostly 6 feet or less, but drafts of 7 feet are common, and it has been navigated with drafts up to 12 feet.

A Federal project for the improvement of Pagan River provides for a **channel** 10 feet deep and 80 feet wide from the 10-foot contour in James River to Smithfield, 4.5 miles above the entrance. The channel was at project depth in January 1950, but it was reported, in July 1951, to have shoaled to 8 feet.

The approach to Pagan River is from southeast of White Shoal and is well marked by buoys and lights. The channel in the river also is marked by buoys and lights to within a mile of Smithfield. The mean range of **tide** is about 2½ feet at the entrance.

Jones Creek, on the south side of Pagan River 0.7 mile above the mouth, has dredged depths of 6 feet or more across the flats at the entrance and upstream as far as the first bridge, thence 2 feet to 13 feet or more to the second bridge.

The fixed highway bridge 0.6 mile above the mouth of Jones Creek has a horizontal clearance of 33 feet and a vertical clearance of 8 feet. A marine railway just below the bridge can haul out boats up to 30 feet in length, 3 feet in draft, and 10 tons in weight for the usual small-boat repairs. The fixed highway bridge 2.5 miles above the mouth has a horizontal clearance of 30 feet and a vertical clearance of 8 feet.

Battery Park (*P. O.*), on the south side of Pagan River a mile above the mouth, has a boatyard that can haul out vessels up to 60 feet in length, 5 feet in draft, and 30 tons in weight for ordinary repairs. The easterly wharf at the village has a depth of 10 feet at the outer end; gasoline and limited quantities of supplies are available on the wharf.

Cypress Creek, on the south side of Pagan River 4 miles above the mouth, has depths of 4 feet or more for 2 miles. The landing on the east side of the entrance has depths of 6 feet at the outer end. The highway bridge over the entrance has a bascule span with a horizontal clearance of 39 feet and a vertical clearance of 1 foot.

Smithfield, on the southwest side of Pagan River 4.5 miles above the mouth, is famous for its hams. The principal wharves have depths of 6 to 8 feet at their faces. Gasoline, provisions, and fresh water are available. The fixed highway bridge just above the wharves has a horizontal clearance of 29½ feet and a vertical clearance of 12 feet.

Deep Creek empties into the northeast side of James River 9 miles above the mouth. Traffic on the creek consists of some shellfish, sand and gravel. The creek is used as an overnight anchorage by large numbers of oyster boats with drafts up to 6 feet.

The Federal project for the improvement of Deep Creek provides for an approach **channel** 8 feet deep and 100 feet wide from the 8-foot contour in James River to a point where the natural creek entrance is constricted, a distance of about 1.5 miles; thence 8 feet deep and 60 feet wide to the harbor opposite Menchville. The controlling depth was 7 feet to the harbor in May 1950. The channel is well marked by a lighted range, other lights, and buoys. The mean range of **tide** is about 2½ feet.

Menchville is on the northwest side of the entrance to Deep Creek. The landings at the town have depths of about 5 feet alongside. Gasoline and other supplies are available.

Warwick River, which empties into the northeast side of James River just above Deep Creek, has depths of 3 feet or more for 7 miles in a narrow unmarked channel. The mouth of the river is sometimes used as an anchorage by small oyster boats.

Point of Shoals is an extensive shallow area in **Burwell Bay,** on the southwest side

of James River main channel 12 miles above the mouth. There are also wide areas of unmarked shoals between the channel and the northeastern shore. The main channel formerly passed southward and westward of Point of Shoals, but is now through the dredged cut known as **Rocklanding Shoal Channel.** The old channel has shoaled but is still buoyed. The several small landings along the shore of Burwell Bay have depths of about 4 feet at their outer ends.

The channel in Burwell Bay is used as an anchorage for a Maritime Administration Reserve Fleet. **Regulations** restricting navigation in the vicinity of the decommissioned ships are given in **§ 207.900,** Chapter 2A.

The long wharf on the east side of James River 16 miles above the mouth is the landing for **Fort Eustis** and has depths of 14 feet at the outer end. A dredged channel leads along the south side of the wharf to a boat basin at the inner end. Controlling depths were 10 feet in the channel and 9 feet in the basin in November 1948. The channel is marked by two lights and a daybeacon. Decommissioned ships are moored on either side of the main channel off the Fort Eustis wharf.

Lawnes Creek, on the west side of James River 16.5 miles above the mouth, has depths of 2 feet over the bar, thence 3 feet or more for 4 miles.

Deep Water Shoals Light (lat. 37°08.'9, long. 76°38.'2), 34 feet above the water and visible 10 miles, is shown from a white hexagonal house on brown piles, in depths of 2 feet, on the east side of James River main channel 17 miles above the mouth; the light has a fog signal.

Skiffes Creek empties into the east side of James River 18 miles above the mouth. A dredged channel leads from deep water in the river to a pier and boat basin on the south side of the entrance to the creek. Controlling depths, in July 1951, were 18 feet to the pier, 16 feet in the outer part of the basin, and 8 feet in the inner part of the basin. The channel is marked by a lighted range. **Storm warnings** are displayed, daytime only, on the west side of the entrance to the creek.

An Army small-craft **testing area** is at the entrance to the Skiffes Creek channel; limits of the area and regulations governing it are given in **§ 207.152;** Chapter 2A.

Hog Point, on the south side of James River 23 miles above the mouth, is low and has scattered clumps of trees. The pile remains of a wharf at **Homewood,** on the east side of the point, are marked by a light.

College Creek, across the river from Hog Point, has depths of 1 foot across the flats at the mouth, 6 feet inside for 2 miles, thence 2½ feet for 0.5 mile to **Williamsburg Landing,** a mile from the town of Williamsburg. The creek is difficult to navigate without local knowledge.

Cobham Bay, a wide bight on the south side of James River 26 miles above the mouth, has general depths of 5 to 7 feet. **Lower Chippokes Creek,** which empties into the head of the bay, has depths of about 1 foot at the entrance, thence 2 feet to a landing 2.6 miles up; the creek is used occasionally by trappers and fishermen. The remains of **Cobham Wharf,** and another wharf 0.2 mile to the eastward, are on the northwest side of the entrance to the bay.

Jamestown Island is on the north side of James River across from Cobham Bay. Historic **Jamestown** is on **Church Point,** at the northwest end of the island, 28.5 miles above the mouth of the river. The Jamestown wharves and a white monument are prominent; the ruins of the old church are hidden by the trees.

An automobile and passenger ferry operates from Jamestown to Scotland, across the river; the ferry slip has a depth of 14 feet. The Government wharf, with depths of 22 feet at the face, is in poor condition and is unsafe for large vessels; artesian water is piped to the wharf, but the pressure is low. No supplies are available.

The Thorofare, between the northeast side of Jamestown Island and the mainland, is a shallow bay with depths of 2 to 4 feet in the eastern part and extensive mud flats in the western part.

Mill Creek, which empties into the north side of The Thorofare, has a controlling depth of 1 foot to a landing 1.5 miles above the mouth. Above the landing the creek is foul with snags and obstructions. There are several duck blinds in the creek and near its entrance from The Thorofare.

Back River is a passage from the head of The Thorofare northward of Jamestown Island to James River northwest of the island. Through navigation is limited by a fixed bridge near the northwest end of the island; the bridge has a horizontal clearance of 10 feet and a vertical clearance of 1 foot. West of the bridge the controlling depth is about 3 feet.

Powhatan Creek, which empties into the north side of James River just westward of Back River, is used by fishermen and trappers. The creek has depths of 1 foot at the mouth, thence 2 feet or more to a landing 1.7 miles upstream. The numerous snags along the banks can be avoided by staying in midstream, and the island 0.3 mile above the mouth should be left to northward. An overhead cable at the mouth has a vertical clearance of 31 feet. The best approach to the creek is from a point about 15 yards off the shore at the entrance to Back River.

Chart 530.—Scotland, on the southwest side of James River 27.5 miles above the mouth, is the mainland terminus of the Jamestown ferry. The two ferry slips have depths of about 8 feet. The remains of the old Scotland wharf are about 100 yards southward of the slips.

Grays Creek, on the southwest side of James River 28.5 miles above the mouth, is entered through a shallow bay. On the north side of the entrance to the creek is a small private landing. The creek has depths of 2 feet in the approach and for 3 miles above the mouth; it has many snags and obstructions and is little used.

Chickahominy River empties into the north side of James River 33 miles above the mouth. Controlling depths into the river are 7 feet, on a direct **330°** course from James River main channel, and 9 feet on an indirect approach from a point 3 miles down James River channel.

Above the mouth, Chickahominy River has depths of 14 feet, and as much as 70 feet, for 11 miles, thence 10 feet to the head of tidewater navigation at **Rock-a-Hock Dam,** 19 miles from the mouth. The lock in the dam has a length of 60 feet, a width of 15 feet, and a depth of 4 feet over the sill. The lock gates are hand operated; there is no tender.

Buoys mark the entrance to Chickahominy River and the critical points along the channel inside. The river is used only by a few local fishermen and pleasure boats. The mean range of **tide** is about 2 feet at the entrance.

Wharf ruins extend out about 200 yards from shore 0.5 mile above **Barretts Point,** on the east side of the entrance to Chickahominy River. A sunken barge lies awash at low water on the eastern edge of the channel 0.8 mile above the entrance.

Barretts Ferry bridge, 1.3 miles above the mouth of Chickahominy River, has a swing span with a horizontal clearance of 80 feet in the west opening and a vertical clearance of 13 feet; the east opening is not used.

Gordon Creek, on the east side of Chickahominy River 1.7 miles above the mouth, has depths of 7 feet in the entrance and 5 feet or more for 3.5 miles upstream. **Morris Creek,** on the west side of the river 2.1 miles above the mouth, has depths of 6 feet at the entrance and for 3 miles upstream. **Yarmouth Creek,** on the east side 5 miles above the mouth of the river, has depths of 4 feet in the entrance and for 2.5 miles upstream. These are the tributaries most often entered.

Shipyard Landing, on the east side of Chickahominy River 6.5 miles above the mouth, has a fish wharf with deep water at the face; the buildings at the wharf are prominent from downstream. **Lanexa** (*P. O.*), on the east side 15 miles above the mouth, has a landing with depths of about 5 feet alongside; gasoline, fresh water, and some other supplies are available.

A **wreck** on the northeast side of James River main channel 36.5 miles above the mouth showed part of its stem above high water in 1951 and was very conspicuous by daylight.

Claremont (*P. O.*) is a village on the southwest side of James River 37.5 miles above the mouth. The Claremont wharf on **Sloop Point** is in ruins; the bottom in the vicinity is said to be foul with wire rope. Gasoline, ice, and some provisions can be obtained at Claremont. Water is not available at the wharf. The landing about 0.6 mile southeastward of Sloop Point is in fair condition but has a depth of only 1 foot at the outer end.

The old ferry landing 0.2 mile westward of Sloop Point is in poor condition; this was formerly a terminus of the vehicular ferry that operated to **Sandy Point** wharf across the river. There is a depth of about 5 feet at the head of the old ferry slip.

A fish-packing plant at Sandy Point has a wharf with a depth of about 7 feet at its face. Just eastward of the wharf are the rotting remains of the abandoned ferry slip. A wrecked barge bares at all stages of the tide about 200 yards northwest of the wharf.

Upper Chippokes Creek empties into the southwest side of James River 39 miles above the mouth. The little-used creek has depths of 6 feet for 1.4 miles above the mouth, thence 4 feet for 1.5 miles, and thence 2 feet for 0.8 mile to the head of navigation. The channel into the creek is close along the south bank. A wreck off the entrance to Upper Chippokes Creek is close to the southwest side of James River main channel and is marked by a light; the top of the boiler is about 15 feet above high water.

Brandon wharf, on the west side of James River 39.5 miles above the mouth, has depths of about 20 feet at the face and is marked by a light. The wharf on **Brandon Point,** about 1 mile farther north, has depths of about 12 feet at the face; some gasoline and a few supplies can be obtained at a nearby store, which also is the post office for Brandon. Brandon Point is marked by a light.

Sturgeon Point, on the north side of James River 42.5 miles above the mouth, is the site of an abandoned brickyard. The point is marked by a light.

Kittewan Creek, which empties into the northwest side of James River 44 miles above the mouth, has depths of 2 feet over the mud flats at the entrance, thence 5 feet for 0.7 mile, and thence 2 feet for 0.5 mile. **Mapsico Creek** flows southwestward into

Kittewan Creek 0.2 mile above the latter's mouth and has depths of 3 to 11 feet for 0.6 mile to a large snag that completely blocks the channel.

Upper Brandon Farms wharf, on the southeast side of James River 44.5 miles above the mouth, has depths of about 19 feet at the face. The ruins of **Upper Brandon** wharf are 0.4 mile northeastward, and a few rotten piles are all that remain of a wharf 0.3 mile to the southwestward.

Wards Creek empties into the south side of James River 46 miles above the mouth. A depth of 2 feet can be carried across the mud flats at the entrance by following the east bank at a distance of about 75 yards. Above the mouth depths in the creek are 4 to 10 feet for 1.7 miles. The creek is an excellent storm anchorage for any boat that is able to enter.

Fort Powhatan, on the southwest side of James River 47 miles above the mouth, is marked by a light. **Flowerdew Hundred Creek,** which flows eastward into James River about 600 yards upstream from Fort Powhatan, has depths of 1 foot across the flats at the entrance, thence 2 to 3 feet for 1.3 miles. The best approach to the entrance is along the south bank at a distance of 50 yards; there is a light on the north side of the entrance.

Ruffins Wharf, on the east side of James River 48.5 miles above the mouth, has depths of about 13 feet at the face but is in poor condition. A light is shown from the house on the wharf.

Queens Creek empties into the north side of James River 49.5 miles above the mouth. A depth of 2 feet can be taken across the flats as far as the first point on the west bank, thence 1 foot into the creek proper, and 3 feet for a farther distance of 1 mile. The best approach to the creek is along the west bank at a distance of 30 yards to the first point, thence in midstream.

Willcox Wharf, on the north side of James River 50 miles above the mouth, has depths of 4 to 5 feet at the face, but deeper water close off, and can be used by boats drawing up to 8 feet. Artesian water is available. Exposed piling are just below the wharf, and the pile remains of two wharves are awash at high water 0.2 and 0.5 mile above.

Herring Creek empties into the north side of James River 52 miles above the mouth. Depths of 3 feet can be taken across the flats at the entrance, thence 5 to 16 feet for 1.3 miles, thence 2 to 4 feet for 2 miles to a point where fallen trees block the channel. There are numerous duck blinds and several hunting camps in the bordering marshes. The **Westover** landing 0.6 mile west of Herring Creek has depths of 9 feet at the face.

Powell Creek, on the south side of James River 53 miles above the mouth, has depths of 7 feet through a narrow channel across the mud flats at the entrance and for 2 miles upstream. The creek is a good storm anchorage.

Chart 531.—Jordan Point is on the south side of James River 56.5 miles above the mouth. The rear light of Jordan Point Range is on the outer end of the point. The privately marked channel for the vehicular ferry that operates between Jordan Point and the north side of the river has a controlling depth of about 6 feet; depths in the ferry slips are about 10 feet at the point and 7 feet on the other side of the river. Several wrecks lie in the shoal water north of James River main channel about 1 mile west of Jordan Point.

Hopewell, on the southwest side of James River 59 miles above the mouth, has several industries and is the terminus of a branch railroad to Petersburg. The principal wharves along James River south of **City Point** can accommodate any vessel able to negotiate the river channel. Gasoline, fuel oil, fresh water, ice, and other supplies are available at Hopewell.

Appomattox River, which empties into the west side of James River 59.5 miles above the mouth, is navigable to Petersburg, 10 miles above the entrance. There are no landings of any importance along the river, and it is now little used except by pleasure craft. The Federal project for the improvement of Appomattox River provides for a channel 80 feet wide and 12 feet deep to Petersburg. The controlling depth is about 7 feet.

The difficult part of the channel through the flats at the mouth of Appomattox River has a least depth of about 11 feet and is marked by lights and buoys. The part of the channel at **Point of Rocks,** 3.3 miles above the mouth, also is marked by lights and buoys. At other places along the river, a general mid-channel course is best.

The highway bridge 1.2 miles above the mouth of Appomattox River has a swing span with a horizontal clearance of 80 feet and a vertical clearance of 8 feet. The Hopewell Yacht Club, on the south side just above the bridge, has a small-boat basin; depths off the T-pier are about 6 feet. Gasoline, water, and some other supplies are available at the club, which welcomes visiting yachtsmen.

The railroad bridge 2.4 miles above the mouth of Appomattox River has a swing span with a horizontal clearance of 80 feet and a vertical clearance of 9 feet; **regulations** governing operation of the drawspan are given in § **203.245,** Chapter 2A.

Petersburg, at the head of tidewater navigation 10 miles above the mouth of Appomattox River, is an important rail center. The bulkheads at the city are in poor condition. The mean range of **tide** is about 3 feet; **ice** and **freshets** do not interfere with navigation. Petersburg is a **customs** port of entry. Supplies are not available at the water front, but all kinds may be obtained in the city.

Above its junction with Appomattox River, James River becomes narrow and winding. The bends are often referred to as the **Curles of the River,** and the 14-mile section from Hopewell to Wilton has been called **The Corkscrew.**

Bermuda Hundred (*P. O.*) is on the west side of James River 61 miles above the mouth. A light is shown at the outer end of the wharf ruins.

Turkey Island Bend, just north of Bermuda Hundred, has depths of 10 to 30 feet around its 6-mile length, but is seldom used except by pleasure boats because the main channel is now northwestward through Turkey Island Cutoff; most of the landings along the bend are in ruins. The north and west sections of the bend are excellent anchorages because the river current has been greatly diminished by the cutoff and winds from any direction have little effect; the bottom is mostly soft mud.

Turkey Island Cutoff is about a mile long and is well marked by lights and buoys. A cable **ferry** crosses the lower part of the cutoff 61.5 miles above the mouth of James River; vessels must proceed with caution when the ferry is under way, as the cable comes to the surface.

Jones Neck Cutoff begins about 64 miles above the river mouth and extends about a mile northward and westward; the cutoff is well marked by lights. The old river bend that extends northward around **Jones Neck** and back to the main channel has depths of

13 to 44 feet along its 4.5-mile length but is now little used; most of the landings are in ruins.

Dutch Gap is 66.5 miles above the mouth of James River. The main channel extends west-northwestward through **Aiken Swamp-Dutch Gap Cutoff,** which is about a mile long and is marked by lights at both ends. There is a gravel basin in **Hatcher Island,** on the north side of the cutoff.

The old river bend, that extends northward from Dutch Gap, around Hatcher Island, and back to the main channel at the west end of the cutoff, has depths of 7 to 25 feet along its 2-mile length. **Richmond Yacht Basin,** north of Hatcher Island, has piers with depths of about 12 feet at their outer ends; the small marine railway has a hauling capacity of 10 tons and can handle boats up to 40 feet in length and 4 feet in draft for ordinary repairs. A fixed bridge over the western entrance to the bend has a horizontal clearance of 41 feet and a vertical clearance of 24 feet.

The old channel that extends southward from Dutch Gap has depths of 10 feet or more for over a mile to the gravel basin in **Farrar Island.**

A concrete and steel wharf of the Virginia Electric and Power Company is on the south side of James River at the western end of Aiken Swamp-Dutch Gap Cutoff; the wharf is 67.5 miles above the mouth of the river and has main-channel depths at the face. A privately maintained light is shown from the end of the wharf. The overhead cable that crosses James River, just above the wharf, has a vertical clearance of 166 feet.

The oil wharf at **Drewrys Bluff,** on the southwest side of James River 72 miles above the mouth, is of concrete construction and has main-channel depths at the face. The wharf is marked by lights and has mooring dolphins.

Richmond Deepwater Terminal at **Warwick,** on the west side of James River 74 miles above the mouth, has 1,200 feet of berthing space with main-channel depths. The terminal has transit sheds and warehouses, good rail and highway connections, and is used for receipt and shipment of general cargo. An electric gantry crane on the wharf has a 10-ton capacity. Fresh water is available in quantity. There is a small-boat landing at the north end of the wharf.

Richmond, the capital of Virginia, is on the east side of James River 78 miles above the mouth. Traffic to and from the city consists chiefly of petroleum products, sand and gravel, sulfur, sugar, and newsprint. Commercial navigation in the river proper ends at the city wharves, but small boats can go a mile farther to the first bridge at **Mayos Island.**

The Federal project provides for a channel 18 feet deep and 200 feet wide from the head of the 25-foot project at Richmond Deepwater Terminal to the Richmond lock. The channel is maintained at or near project dimensions. The mean range of **tide** is about 3½ feet.

General cargo for Richmond is handled at the wharves on the east side of the river; several oil wharves are on the west side. Some of the wharves have rail connections, and most have main-channel depths at their faces. Fresh water is available on the wharves, and supples can be delivered from the city.

Richmond is a **customs** port of entry, and the U. S. Public Health Service has an **outpatient office** in the city. The **harbor master** at Richmond assigns berths and anchorages; the city has a tugboat.

The **Kanawha Ship Canal,** at the north end of the Richmond water front, is reached through a masonry lock with a length of 168 feet, a width of 35 feet, and a vertical lift of 15 feet; the lock is operated, by hand, from 8 a. m. to 5 p. m., Mondays through Fridays. The canal is said to have depths of about 12 feet but is now little used except by small private boats. The railroad bridge about 150 yards above the lock has a bascule span with a horizontal clearance of about 30 feet and a vertical clearance of about 2 feet.

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CHAPTER 11

Chesapeake Bay Western Shore

York and Rappahannock Rivers

Charts 1222, 1223

FROM Old Point Comfort to Potomac River, the western shore of Chesapeake Bay is mostly low. The principal tributaries are Back River, Poquoson River, York River, Mobjack Bay, Piankatank River, Rappahannock River, and Great Wicomico River. York River and Rappahannock River are broad and deep at their entrances and are navigable for long distances. **Fish traps** are thicker in this area than in any other part of the bay. **Ice** is seldom encountered this far south in the bay, but may be found in the upper parts of some of the tributaries.

Chart 1222.—A Federal project provides for a uniform main-channel depth of 39 feet between the Virginia Capes and Fort McHenry, Baltimore. Dredging has been necessary off Cape Henry and off York Spit. The section off Cape Henry begins 0.5 mile above the line joining the Capes and extends northward 0.7 mile. **York Spit Channel,** with a project width of 1,000 feet, begins 14.5 miles above the Capes and extends northward 5.5 miles; **regulations** governing navigation of the channel are given in § **207.130,** Chapter 2A. Both dredged sections are maintained at or near project dimensions and are well marked. **Sailing directions** for the main channel are given in tabular form in Chapter 3.

The **Horseshoe** is a shoal that extends several miles out from the shore between Old Point Comfort and the abandoned lighthouse 5.5 miles to the northward. The southern edge of the shoal lies along the north side of the main channel into Hampton Roads; the eastern half has depths of 13 to 18 feet, and the western half has 6 to 11 feet. Local vessels drawing 7 feet or less use the lanes through the fish traps on the Horseshoe when navigating between Hampton Roads and York River or Mobjack Bay. The tidal **current** over the Horseshoe is rotary, turning clockwise, and has an average velocity at strength of about ½ knot.

Buckroe Beach is a summer resort 2.5 miles north-northeastward of Old Point Comfort. The lights of the resort are conspicuous during the summer.

Chart 494.—Back River empties into the west side of Chesapeake Bay 7 miles northward of Old Point Comfort. The entrance is between **Northend Point** and **Plumtree Point,** 1 mile to the northward. The approach to Back River is from southeastward through a lane in the fish traps and is well marked by lights and buoys. The

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white tower of the abandoned lighthouse 1.5 miles south-southeastward of Northend Point is prominent.

About 2 miles above the mouth, Back River divides into **Northwest Branch** and **Southwest Branch,** which have general depths of 2 to 5 feet. The **Langley Field** hangars, water tanks, and wind tunnel back of **Willoughby Point,** between the branches, can be seen for many miles. The dredged channel that extends 3 miles from the mouth of the river to the Langley Field fuel pier on the west side of Southwest Branch had a controlling depth of 12 feet in 1952. A side channel to the Langley Field boathouse, on the south side of Northwest Branch 3 miles above the mouth of the river, had a controlling depth of 6 feet in 1952. Both channels are well marked by lights and buoys. The mean range of **tide** is about 2½ feet at the mouth of Back River.

Gasoline is available at the fish wharf on **Messick Point,** on the north side of Back River 1.5 miles above the mouth. **Amorys Wharf,** on the same side 2.4 miles above the mouth, has depths of 3 feet at the outer end; gasoline is available on the wharf, and general supplies can be obtained 0.5 mile up the road.

Harris Creek, on the south side of Back River across from Messick Point, has depths of 3 feet to a marine railway on the east side 0.6 mile above the mouth; the railway has a small machine shop. **Fox Hill** is a village on the east side a mile above the mouth.

The fixed highway bridge over Southwest Branch 1.5 miles above Willoughby Point has a horizontal clearance of 39 feet and a vertical clearance of 6 feet; the fixed railroad bridge just above the highway bridge has a horizontal clearance of 14 feet and a vertical clearance of 6 feet.

Between Back River and Poquoson River are shoals that extend 1 to 3 miles from shore; on the shoals are scattered oyster rocks that bare, or nearly bare, at low water. Strangers should stay outside the 6-foot curve.

Poquoson River, which empties into Chesapeake Bay 5 miles northwest of Back River and about 4 miles south of York River, has depths of 7 feet to the village of **Yorkville,** on the west side 2.5 miles above the mouth. The approach to the river is from northeastward and is clear of fish traps for a width of 400 yards. There is a light on either side of the entrance. The mean range of **tide** is about 2½ feet.

Bennett Creek, which empties into the southeast side of Poquoson River mouth, has depths of 6 feet or more for 1.3 miles to **Easton Cove,** which makes off to the eastward. A marine railway in Easton Cove has a hauling capacity of 50 tons and can handle boats up to 75 feet in length and 6 feet in draft; the usual small-boat repairs are made. Depths off the boatyard piers are about 4 feet. Gasoline and ice can be obtained at a small fish wharf opposite the railway; provisions can be delivered from **Messick** (*P. O.*), a village about a mile from the wharf. Another small wharf is on the west side of Bennett Creek across from Easton Cove; from here a highway leads to **Jeffs.**

Chisman Creek, which empties into the north side of Poquoson River mouth, has depths of 6 feet or more in a narrow channel for 1.7 miles. A marine railway on the north side a mile above the mouth has a hauling capacity of 80 tons and can handle vessels up to 75 feet in length and 5 feet in draft for hull and engine repairs; gasoline can be obtained at the railway. Another railway on the opposite side of the creek can haul out small craft for hull repairs.

Back Creek, which flows eastward into Chesapeake Bay about 1.5 miles south of York River, has depths of 8 feet or more to the State-owned wharf on the south side

1.4 miles above the mouth, thence 5 to 6 feet for an additional 0.7 mile. The entrance is marked by lights and buoys. Back Creek is used by oystering and fishing boats drawing up to 9 feet. Gasoline, Diesel oil, and some provisions can be obtained on the wharves.

Passage northward from Back River to York River can be made by way of the **Thorofare,** which is about 0.8 mile above the mouth of Back River. A Federal project provides for a channel 7 feet deep and 60 to 80 feet wide through the Thorofare. The controlling depth was 7 feet in May 1950. The channel is marked by lights and daybeacons.

Charts 494, 492, 495, 504.—York River, formed by the junction of Mattaponi and Pamunkey Rivers 29 miles above the mouth, empties into Chesapeake Bay 15 miles northward of Old Point Comfort and 26 miles by channel from the Virginia Capes. **Traffic** on York River consists chiefly of pulpwood, petroleum products, and shellfish. Drafts of vessels using the river are mostly 12 feet or less, but deep-draft vessels navigate the lower reaches.

York River has a broad and fairly straight **channel,** is well marked and easily followed. Depths are as much as 80 feet off Yorktown, and the controlling depth to West Point is about 18 feet. Vessels can **anchor** in the wider parts of York River channel aside from the Naval areas discussed later. **Sailing directions** for the river are given in tabular form in Chapter 3.

The mean range of **tide** is 2½ feet at the entrance to York River and at Yorktown, 3 feet at West Point. The **currents** follow the general direction of the channel except in the narrowest parts where there is a tendency to set a vessel onto the shoals. The velocity of the current and the times of slack water vary somewhat in the river proper and to a considerable extent in Mattaponi and Pamunkey Rivers, due mainly to freshets but somewhat to winds. The *Current Tables* give detailed information for several places.

Ice sometimes interferes with navigation of York River for short periods during severe winters, but in ordinary winters there is no interruption below West Point.

Pilotage is compulsory in Chesapeake Bay proper but not in York River. Rates and regulations governing pilotage at Hampton Roads ports are given at the beginning of Chapter 9.

Supplies are available and **repairs** can be made to small vessels in Perrin River and Sarah Creek; supplies also can be obtained at Yorktown and West Point.

Chart 494.—The entrance to York River is between **Tue Point** and **Guinea Marshes,** 2.5 miles to the northeastward; the mid-channel point is 6 miles west-northwest of York Spit Light and 26 miles (*14 miles northwest of the 12-mile point in the bay channel*) from the Virginia Capes.

Tue Marshes Light (lat. 37°14′.1, long. 76°23′.2), 41 feet above the water and visible 12 miles, is shown from a white square house on brown piles, in depths of 4 feet, 0.3 mile north of Tue Point; the light has a fog signal.

York Spit extends outward along the northeast side of the York River approach channel for about 7 miles from Guinea Marshes; the inner half of the spit has depths of 1 to 6 feet, and the outer half has 10 to 20 feet. **York Spit Light (lat. 37°12′.6, long. 76°15′.5),** 37 feet above the water and visible 11 miles, is shown from a white hexagonal

house on brown piles, in depths of 12 feet, near the outer end of the spit; the light has a fog signal. *York Spit Light is 5 miles due west of a point 17.5 miles along Chesapeake Bay main channel from the Virginia Capes.*

In 1952, York River approach channel was dredged to a depth of 39 feet over a width of 750 feet. The dredged section, which begins about 7 miles southeast of York Spit Light and ends about 3 miles northwest of the light, is well marked by lighted and unlighted buoys. There are natural depths in excess of 39 feet from the upper end of the dredged section to a point about 11 miles above the river mouth.

About 1.5 miles northwest of York Spit Light, a buoyed lane extends northeastward through the fish traps. The lane has depths of 15 feet or more and can be used by medium-draft vessels approaching York River from northward.

The swash channel that crosses York Spit about 5 miles northwest of the light has a controlling depth of about 8 feet and is marked by a light and buoys. The channel shows up well on a bright day.

An **antitorpedo net area** extends across the mouth of York River from Tue Point to the north side; limits of the area and regulations governing it are given in § **207.129**, Chapter 2A.

A **naval anchorage area** begins at the mouth of York River and extends upstream about 5 miles; limits of the area and regulations governing it are given in § **202.166**, Chapter 2A. Naval authorities have reported the loss of buoy anchors in the blue mud bottom of this area, and fishermen have lost their anchors in this same type of bottom for lack of retrieving power.

Perrin River, on the north side of York River 2 miles above the mouth, has depths of 8 feet in the approach, thence 6 feet through a narrow channel to the wharf at **Perrin,** on the north side 0.3 mile above the entrance. Gasoline, Diesel oil, provisions, and other supplies are available on the wharf, which has a depth of about 10 feet at the outer end. A marine railway at the wharf has a hauling capacity of 100 tons and can handle vessels up to 90 feet in length and 7 feet in draft; the railway has a machine shop. The oysterhouse wharf on the east side of the entrance to Perrin River has depths of 5 feet alongside; gasoline is available on the wharf.

The **Thorofare,** on the south side of York River 2.3 miles above the mouth, is a small-boat passage that leads southward to Back Creek and has been described earlier.

Wormley Creek and **West Branch** have a common entrance, with a depth of about 3 feet over the bar, on the south side of York River 4.5 miles above the mouth. The two creeks have depths of about 2 feet nearly to their heads, but are little used except by oyster boats.

The naval fuel-oil T-pier on the south side of York River 5 miles above the mouth has depths of 30 feet or more at the outer end and is marked by a light.

Sarah Creek, on the north side of York River 6 miles above the mouth, has depths of 7 feet in the entrance and for about 0.5 mile up the westerly branch; the entrance is marked by two lights and a buoy. A boatyard, on the west side 0.3 mile above the entrance, has a hauling capacity of 75 tons and can handle vessels up to 70 feet in length and 5 feet in draft for all general repairs; the yard has a well-equipped machine shop. Gasoline, Diesel oil, water, ice, and other supplies can be obtained at the yard. There are many finger piers to accommodate yachts and smaller craft, and covered wet storage is available for as many as 60 yachts or fishing craft of average size.

Chart 495.—Yorktown is on the southwest side of York River 6.7 miles above the mouth. High on the bluff in the southerly part of the town is the **Yorktown Monument,** and a group of buildings is prominent on the shore back of the wharves. The main part of the town is not visible from the river. **George P. Coleman Memorial Bridge,** which crosses the river from Yorktown to Gloucester Point, has twin swing spans with a middle horizontal clearance of 454 feet and a vertical clearance of 60 feet; the two spans open clockwise simultaneously. The wharves at the Yorktown end of the bridge have depths of 9 to 20 feet at their faces. Gasoline, Diesel oil, fresh water, ice, and some provisions can be obtained at Yorktown.

Gloucester Point is a village at the northeast end of Coleman Bridge. There are several wharves and buildings and some conspicuous oil tanks on the low point, and the red brick building of the Virginia Commission of Fisheries is about 500 yards northeastward. The oil wharf has depths of about 10 feet at the outer end, and another wharf, in poor condition, has about 16 feet at the face.

Local captains report that, with average weather conditions, **slack water** occurs on the Gloucester Point side of York River about 2 hours earlier than on the Yorktown side.

The **Naval Mine Depot** piers on the southwest side of York River 8 miles above the mouth have depths of about 39 feet at their outer ends. Off the piers is a **restricted area** for mine service testing; limits of the area and regulations governing it are given in § **207.128,** Chapter 2A.

A **naval anchorage area** begins off the Naval Mine Depot piers and extends up river about 4 miles; limits of the area and regulations governing it are given in § **202.166,** Chapter 2A.

The wharf ruins off **Carmines Island,** on the northeast side of York River 9.5 miles above the mouth, were not visible in 1951; a buoy marks the former location of the outer end. **Timberneck Creek, Cedarbush Creek,** and **Carter Creek,** on the northeast side 10, 11.5, and 12 miles above the mouth, are shallow and are used only by small local boats.

Felgates Creek and **King Creek** have a common entrance, with depths of about 3 feet over the flats, on the southwest side of York River 10.5 miles above the mouth. The fixed highway bridge over the mouth of Felgates Creek has a horizontal clearance of 45 feet and a vertical clearance of 8 feet.

The **Naval Supply Depot** wharves at **Cheatham Annex,** on the southwest side of York River 11.5 miles above the mouth, have depths of about 39 feet at their faces.

Queen Creek, on the southwest side of York River 12.5 miles above the mouth, has depths of 2½ feet across the flats at the entrance, 4 feet inside for 2 miles, and 1½ feet for 2 miles farther to a fixed highway bridge 1.5 miles from the town of **Williamsburg.** Stakes on either side of the entrance mark the limits of Virginia Commission of Fisheries experimental oyster beds. The channel is difficult to navigate in some places.

Aberdeen Creek, on the northeast side of York River 14 miles above the mouth, has depths of about 2 feet across the flats at the entrance. A marine railway on the east side of the creek near the entrance has a hauling capacity of 35 tons and can handle boats up to 55 feet in length and 5 feet in draft; the yard makes some general repairs.

Clay Bank (*P. O.*) is on the northeast side of York River 15 miles above the mouth.

The wharf is in poor condition but is used by local fishermen; depths at the face are 10 to 14 feet.

Allmondsville is on the northeast side of York River 18 miles above the mouth. A light marks the outer end of the pile remains of the former wharf.

Poropotank Bay, on the northeast side of York River 22 miles above the mouth, has depths of about 3 feet across the flats at the entrance; the best water favors the eastern side. From the entrance, depths of about 5 feet can be carried about 4 miles through **Morris Bay** and **Poropotank River** to **Miller Landing.** There are several other landings along the river. The channel is usually marked by bush stakes, but it is crooked and narrow in some places and is difficult to navigate without local knowledge.

Chart 504.—West Point, at the junction of Mattaponi and Pamunkey Rivers 29 miles above the mouth of York River, has little water-borne trade other than the pulpwood brought down the two tributaries. The town is a terminus of a Southern Railway branch line. The pulp-mill wharves just above the Pamunkey River bridge have depths of 12 to 14 feet alongside. The southerly wharf on the Mattaponi River side has depths of 13 to 21 feet at the face; the oil wharves have 8 and 9 feet. Only burned piling remain of the former railroad wharf at the southwest end of the town. Gasoline, Diesel oil, fresh water, and provisions are available at West Point.

Mattaponi River is the easterly of the two tributaries that combine to form York River. Traffic on Mattaponi River consists chiefly of pulpwood. Drafts of vessels navigating the river above West Point usually do not exceed 8 feet.

The Federal project for the improvement of Mattaponi River provides for a channel 9 feet deep and 150 feet wide to **Locust Grove,** 23.5 miles above the mouth; thence 7 feet deep and 150 feet wide to **Rosespout,** 28.5 miles above the mouth. Controlling depths, in 1948, were 9 feet to Locust Grove, thence 5½ feet to Rosespout. Above Rosespout, the river has depths of about 4 feet for 3.5 miles to Aylett, thence 1 to 2 feet for 2 miles to Dunkirk.

The channel in Mattaponi River is unmarked and is difficult to navigate without local knowledge. The mean range of **tide** is about 3 feet at West Point and 4 feet at Walkerton. **Freshets** occur at irregular intervals, being more severe in March and April, and have reached a height of 17 feet above low water at Aylett, though this is exceptional; the freshet rise is negligible at and below West Point. Supplies are available at West Point, and gasoline and provisions can be obtained at some of the landings up the river.

The highway bridge over Mattaponi River at West Point has a swing span with a horizontal clearance of 80 feet and a vertical clearance of 12 feet; the eastern opening is used. The **Walkerton** highway bridge, 24.5 miles above the mouth, has a swing span with a horizontal clearance of 54 feet and a vertical clearance of 6½ feet. The **Aylett** fixed highway bridge, 32 miles above the mouth, has a horizontal clearance of 119 feet and a vertical clearance of 20 feet. The **Dunkirk** fixed highway bridge, 34 miles above the mouth, has a horizontal clearance of 37 feet and a vertical clearance of 9 feet.

Pamunkey River has many landings along its banks. Traffic on the river consists chiefly of pulpwood. The deepest draft now using the river above West Point is reported to be 5 feet. A Federal project for the improvement of Pamunkey River

provides for a channel 7 feet deep and 100 feet wide to **Bassett Ferry,** 41 miles above the mouth, and thence 5 feet deep and 50 feet wide to **Manquin Bridge,** 46 miles above the mouth. Controlling depths were 4½ feet from the mouth to Bassett Ferry in 1949, and thence 4 feet to Manquin Bridge in 1947.

The mean range of **tide** is about 3 feet from West Point to Northbury, 35 miles above the mouth. **Freshets** occur at irregular intervals, being more severe in March and April.

The highway bridge over Pamunkey River at West Point has a swing span with a horizontal clearance of 89 feet and a vertical clearance of 5 feet; the northeast opening is obstructed by piling. A small-boat opening just west of the swing span has a horizontal clearance of 18½ feet and a vertical clearance of 6½ feet.

The river is easy to navigate as far as **Sweet Hall Landing,** 14.5 miles above the mouth; farther up, navigation is difficult without local knowledge. Fresh water is available at some of the landings, and the river water is **fresh** above **Cumberland Landing,** 19 miles above the mouth. Several narrow cutoffs have depth enough for small boats, but their use requires local knowledge.

The railroad bridge at **White House,** 28 miles above the mouth of Pamunkey River, has a swing span with a horizontal clearance of 53 feet and a vertical clearance of 4½ feet; the easterly opening is used.

Chart 494.—Mobjack Bay, which is entered between Guinea Marshes, at the shore end of York Spit, and New Point Comfort, 4 miles east-northeastward, has several tributaries, the most important being East, North, Ware, and Severn Rivers. The bay is obstructed by extensive shoals but has depths of 22 feet in the entrance and 15 feet for considerable distances into the tributaries. Many of the shoals are marked by lights and buoys.

The only prominent marks in the approach to Mobjack Bay are York Spit Light on the south and New Point Comfort Light on the north. York Spit Light, York Spit, and Guinea Marshes were discussed earlier. **Monday Creek,** a bush-staked thorofare that leads from Mobjack Bay to York River back of Guinea Marshes, has depths of about 2 feet and is used extensively by small local craft.

New Point Comfort is the south end of a low partly wooded island which is separated from the mainland by **Deep Creek,** a crooked and unmarked natural channel with depths of about 2 feet.

New Point Comfort Light (lat. 37°18′. 0, long. 76°16′.7), 58 feet above the water and visible 13 miles, is shown from a white tower at the southerly tip of the point. *New Point Comfort Light is 7 miles due west of a point 23 miles along Chesapeake Bay main channel from the Virginia Capes.*

Good **anchorage,** sheltered from all but southerly and southeasterly winds, can be found in Mobjack Bay. Small craft find safe anchorage in the bight westward of New Point Comfort and in the rivers and creeks. The mean range of **tide** is about 2½ feet.

Bayside wharf is on the northeast side of Mobjack Bay 1.5 miles northwestward of New Point Comfort Light. The wharf is about 700 yards long and has depths of about 8 feet at the outer end, but is in poor condition. An ice plant operates at the shore end of the wharf. Some provisions are available on shore.

Pepper Creek, about 3 miles northwest of New Point Comfort, has depths of

5 feet for about 0.3 mile above the entrance and 3 feet for another 0.3 mile. The approach is marked by two lights. Along the shores of the creek are gasoline tanks, on high piles, which are used by fishermen to refuel their boats.

East River, which empties into Mobjack Bay from northward about 5 miles northwest of New Point Comfort, has a narrow channel with depths of 13 feet for 4 miles above the entrance and thence 4 feet for another 2 miles to the head. The entrance is marked by lights and buoys. Shoals, sometimes marked by bush stakes, extend for some distance off many of the points above the entrance, but the mid-channel is clear.

Diggs Wharf, on the east side of East River just inside the entrance, has depths of 9 feet off the face but is in poor condition. Across the river at the village of **Mobjack** is **Philpots Wharf,** which has a depth of 8 feet at the outer face. Gasoline, Diesel oil, water, provisions, and some other supplies are available. Two oil companies have extensive receiving docks at Mobjack.

Williams Wharf, on the northeast side of East River about 2.5 miles above the entrance, has depths of 9 to 7 feet alongside the oyster-house bulkhead; gasoline, water, and some other supplies are obtainable. The oil wharf has a depth of 10 feet at the outer end. The landing about 0.3 mile above has depths of 5 feet at the face. An oyster house and landing are on the western shore opposite Williams Wharf.

North River, which empties into the head of Mobjack Bay from northward, is wide but has long shoals making off from many of the points. The channel has depths of 12 feet for 4 miles and is marked by lights and buoys; depths of 7 feet can be carried 2 miles farther.

A small boatyard just inside the entrance to **Back Creek,** which empties into the west side of North River 4.5 miles above the mouth, has a marine railway with a hauling capacity of 5 tons that can handle boats up to 35 feet in length and 3 feet in draft for topside repairs; gasoline is available.

Ware River, which empties into the head of Mobjack Bay from northwestward, has depths of 15 feet to the mouth of **Wilson Creek,** on the west side 3 miles above the entrance, and 7 feet for another 2 miles. Long shoals, some of which are marked by buoys, extend off many of the points. The only commercial landing is the Texas Oil Company wharf, on the east side about 4 miles above the entrance, which has a depth of about 8 feet at the end; gasoline, Diesel oil, and lubricants are available, but there is no fresh water. **Schley,** 0.5 mile inland from the wharf, has a post office and store.

Severn River, which flows into Mobjack Bay from westward, has depths of 15 feet to the junction of **Northwest** and **Southwest Branches,** 8 feet for 1.3 miles in Southwest Branch, and 8 feet for 1.8 miles in Northwest Branch. The most prominent shoals are marked by buoys.

Greenway Wharf, at **Glass** on the north side of Southwest Branch 1.1 miles above the fork, has depths of about 9 feet at the outer end. Gasoline is pumped at the wharf, and Diesel oil is trucked in. Fresh water is piped to the wharf. The general store, which is also the post office, has some supplies, provisions, and hardware.

Browns Bay, on the west side of Mobjack Bay a mile south of Severn River, is marked by lights at the entrance and by bush stakes inside. Gasoline is available at a wharf, with a depth of 4 feet at the end, at the head of the bay. A store and post office are inland at **Severn,** about a mile westward of the wharf.

Dyer Creek, which empties into Chesapeake Bay 2 miles north of New Point Comfort, has depths of 3 feet in the entrance and 4 to 5 feet inside. The creek is bush-staked, but local knowledge is essential.

Horn Harbor, 3 miles northward of New Point Comfort, has depths of 6 to 9 feet in a narrow channel for about 2 miles above the bar, which is subject to change. A Federal project provides for a channel 7 feet deep and 100 feet wide across the bar; the controlling depth was 7 feet in May 1950. The entrance is marked by lights and day-beacons. Off **Sheep Island,** on the east side of the entrance channel, is a cluster of piles.

Traffic in Horn Harbor consists chiefly of fish and shellfish. Near the head of the harbor is a small boatyard that can haul out vessels up to 70 feet in length, 6 feet in draft, and 40 tons in weight for most general repairs; a small machine shop is nearby. Depths off the end of the dock are about 6 feet; gasoline and water are available.

Winter Harbor is entered 4.3 miles northward of New Point Comfort. This harbor and its tributary bays, sloughs, and creeks have general depths of 2 to 4 feet. The bar across the entrance has a depth of about 2 feet and is marked by a light on the north side.

Wolf Trap, 6 miles northward of New Point Comfort, is an area of broken ground, with numerous shoal spots 5 to 10 feet in depth, that extends about 3 miles into the bay. All of the shoal area is within authorized fish-trap limits. **Wolf Trap Light (lat. 37°24′.2, long. 76°11′.4),** 52 feet above the water and visible 13 miles, is shown from a square tower on an octagonal red-brick dwelling with a brown cylinder base, in depths of 16 feet, near the outer end of the shoal area; the radiobeacon and the fog signal are synchronized for distance finding. *Wolf Trap Light is 3 miles due west of a point 28.5 miles along Chesapeake Bay main channel from the Virginia Capes.*

The **danger zone** of a naval firing range (*see Chart 1223*) begins about 4 miles north-northeastward of Wolf Trap Light and extends northward to Tangier Sound Light; limits of the area and regulations governing it are given in § **204.46,** Chapter 2A.

The **control house** (*see Chart 1223*) of a former degaussing range is 3.5 miles due east of a point 29.5 miles along Chesapeake Bay main channel from the Virginia Capes and 4 miles off the eastern shore; the house is a good landmark and has a light and a bell.

Chart 534.—Piankatank River empties into the west side of Chesapeake Bay 11 miles northward of Wolf Trap Light. The entrance is between **Cherry Point,** at the north end of **Gwynn Island,** and **Stingray Point,** 2.5 miles to the northward. **Stingray Point Light (lat. 37°33′.7, long. 76°16′.2),** 34 feet above the water and visible 11 miles, is shown from a white hexagonal house on brown piles in depths of 6 feet 1.3 miles east of the point; the fog signal operates from September 15 to June 1. *Stingray Point Light is 6 miles due west of a point 39 miles along Chesapeake Bay main channel from the Virginia Capes.*

Traffic on Piankatank River consists of some fish and shellfish, petroleum products, shells, pulpwood, and posts. Drafts of vessels using the river are mostly 6 feet, but drafts up to 11 feet are on record. The river has **depths** of about 16 feet in the approach from northeastward through a buoyed lane in the fish traps, 16 feet or more for about 9 miles above the mouth, thence 14 feet for 2.5 miles, and thence 6 feet to

Freeport, on the west side 13.5 miles above the mouth. Lights and buoys mark the lower 6 miles of the river channel.

The mean range of **tide** is about 1½ feet in the lower part of Piankatank River. During severe winters, the river is closed by **ice** for short periods. **Repairs** can be made to small vessels in Fishing Bay.

Jackson Creek, on the north side of Piankatank River a mile above the mouth, has general depths of 8 to 10 feet. A Federal project provides for an entrance channel 2,640 feet long and 8 feet deep with a width of 60 feet increased to 80 feet at the outer end; the controlling depth was 8 feet in May 1950. The channel is marked by a light and daybeacons, and stakes usually define the channel edges.

The town wharf on the north side of the west arm of Jackson Creek has depths of 8 feet at the outer end. Just westward of the wharf is a small marine railway that can haul out boats up to 50 feet in length and 4 feet in draft; gasoline and some other supplies are available. The small landing on the point of land between the west and north arms has a depth of 5 feet at the outer end. The post office is at **Deltaville,** at the head of the north arm.

Hills Bay, on the south side of Piankatank River 2 miles above the mouth, has general depths of 14 to 20 feet and is the approach to Queens Creek and Milford Haven.

Queens Creek, which flows eastward into the head of Hills Bay, has a bar across the mouth with a depth of only 2 feet. The few broken piles that remain of the wooden jetty on the north side of the entrance are marked at the outer end by a light.

Milford Haven, the strait between Gwynn Island and the mainland to the southwestward, is entered from the head of Hills Bay. Traffic on the waterway consists chiefly of fish and shellfish carried in vessels drawing up to 7 feet. General depths in Milford Haven are 8 to 15 feet. A Federal project provides for a channel 10 feet deep and 200 feet wide from Hills Bay to Callis Wharf and Cricket Hill, and for a stone jetty about 400 yards long at the entrance. The controlling depth to the wharves was 10 feet in May 1950.

The jetty on the north side of the Hills Bay entrance to Milford Haven has a light at the outer end. The channel inside is well marked by buoys. The highway bridge that crosses from the mainland to Gwynn Island 0.3 mile from the jetty has a swing span with a horizontal clearance of 80 feet in the north opening and a vertical clearance of 12 feet.

Callis Wharf at **Grimstead,** on the Gwynn Island side of Milford Haven 0.7 mile from the jetty, has depths of about 10 feet alongside; gasoline, Diesel oil, and some other supplies are available. There is a small marine railway on the southeast side of the entrance to **Edwards Creek,** 0.4 mile eastward of the wharf.

Cricket Hill wharf, on the mainland side of Milford Haven 0.8 mile from the jetty, has depths of 10 feet at the face. There is an ice plant back of the wharf.

Milford Haven can also be entered directly from Chesapeake Bay at the south end of Gwynn Island. This passage, known as **Hole in the Wall,** has a controlling depth of about 3 feet and is used by small local boats, but it is exposed to heavy seas. A light marks the south side of the entrance.

A depth of about 6 feet can be carried southward and westward from Milford Haven into **Stutts Creek** (*see Chart 1223*), which is westward of Hole in the Wall. The channel in the creek is well marked by buoys. A marine service station on the north

side of the creek has a pier with depths of 8 feet alongside; gasoline and fresh water are available.

Fishing Bay, on the north side of Piankatank River 4 miles above the mouth, has general depths of about 20 feet; an 11-foot shoal in the middle of the entrance can be easily avoided. On the east side of the bay is narrow 1-mile-long **Stove Point Neck.** The marine railway at the head of the bay can haul out vessels up to 200 feet in length; the machine shop repairs gasoline and Diesel engines and does hull work. **Ruark** (*P. O.*) is a village near the shipyard.

Dixie is a village on the south side of Piankatank River 9 miles above the mouth; gasoline and provisions are available, and Diesel oil can be delivered by truck. The oil wharf at Dixie has depths of about 6 feet at the outer end.

In 1952, a vehicular and passenger **ferry** operated from Dixie to the north side of the river; the fixed highway bridge being constructed was to have a horizontal clearance of 80 feet and a vertical clearance of 42 feet.

Charts 534, 535, 536.—Rappahannock River empties into the west side of Chesapeake Bay 45.5 miles by channel from the Virginia Capes. Fredericksburg, 93 miles above the mouth, is the head of practical navigation.

Traffic on Rappahannock River consists chiefly of petroleum products, pulpwood, shellfish and shells, chemicals, lumber, and some sand and gravel. Drafts of vessels using the river seldom exceed 11 feet and are mostly 7 feet or less.

Rappahannock River has natural depths of 30 feet or more for 24 miles, thence 14 feet or more to Tappahannock, 37 miles above the mouth. The Federal project for the improvement of the river provides for a **channel** 12 feet deep and 200 feet wide to Port Royal, 68 miles above the mouth, and thence 12 feet deep and 100 feet wide to Fredericksburg. The controlling depth is about 11 feet in the improved channel.

In general, vessels can **anchor** anywhere near the channel of Rappahannock River where the bottom is soft and the depth suitable. Deep-draft vessels will find good anchorage 3 to 5 miles from the mouth. Carter and Urbanna Creeks are used extensively as harbors by small craft.

The channel from the mouth of Rappahannock River to Tappahannock is comparatively straight, but gradually decreases in width and leads between shoals that make out from both banks. The principal **dangers** are marked. Strangers can take a draft of 10 feet to Tappahannock by day with the aid of the chart, but navigation of the narrow, crooked channel farther up requires local knowledge. There are rocks in places on both sides of the channel for 4 miles below Fredericksburg, and the shores should be given a good berth. Strangers can safely carry a draft of 5 feet to Fredericksburg with the aid of the chart.

Sailing directions for Rappahannock River are given in tabular form in Chapter 3. **Regulations** governing the operation of all drawbridges along the river are given in § **203.340,** Chapter 2A.

The mean range of **tide** is about 1 foot at the mouth of Rappahannock River, 1½ feet at Tappahannock, and 3 feet at Fredericksburg. The river water usually is **fresh** above Port Royal but is not suitable for boiler use.

The **currents** follow the general direction of the channel. In the upper reaches of the river the velocities and the times of slack water vary considerably, principally because of irregularities in drainage flow but affected to some extent by the winds.

The currents in the lower part of the river vary similarly but to a lesser degree. The *Current Tables* give detailed information for several places.

During severe winters, **ice** closes the river nearly to its mouth, but in ordinary winters the channels are usually kept open by the river traffic. Ice sufficient to interfere with navigation of small craft will usually be encountered in January and February, particularly above Port Royal.

Freshets occur during the spring and fall, but are of short duration and are not ordinarily dangerous to shipping. The highest level on record was 33 feet above low water at Fredericksburg, but the usual height due to freshets is not more than 9 to 12 feet and only occasionally rises above the wharves. The freshet effect on the water level decreases rapidly below Fredericksburg and is ordinarily negligible 11 miles down river.

The principal places along Rappahannock River for **supplies** and small-vessel **repairs** are Broad Creek, Carter Creek, and Urbanna Creek.

Chart 534.—The entrance to Rappahannock River is between Stingray Point, discussed earlier, and **Windmill Point,** 3 miles to the northward; the mid-channel point is 1.5 miles northwest of Stingray Point Light, 2.7 miles west-southwest of Windmill Point Light, and 45.5 miles (*7 miles west by north of the 38.5-mile point in the bay channel*) from the Virginia Capes. The shores on both sides of the entrance are wooded; the two lights are the most prominent landmarks.

Rappahannock Spit extends outward from Windmill Point for about 4 miles and has depths of 4 to 18 feet. **Windmill Point Light (lat. 37°35′.8, long. 76°14′.2),** 36 feet above the water and visible 11 miles, is shown from a white hexagonal house on brown piles, in depths of 12 feet on the spit, 2.2 miles from the point; the light has a fog signal. *Windmill Point Light is 4 miles due west of a point 41 miles along Chesapeake Bay main channel from the Virginia Capes.*

Depths of 10 feet can be carried across Rappahannock Spit anywhere outside Windmill Point Light. About 0.4 mile outside the light, a buoyed lane that extends northeastward through the fish traps is a short cut for light-draft vessels approaching the river from northward.

Broad Creek, on the south side of Rappahannock River a mile above the mouth, is used by oystermen and fishermen. A Federal project provides for a channel 7 feet deep, 100 feet wide, and 4,100 feet long from deep water in the river to deep water in the creek; the controlling depth was 7 feet in March 1952. Daybeacons mark the channel across the flats at the entrance. The boatyards on the northwest side of the creek can haul out craft up to 75 feet in length and 8 feet in draft; gasoline and lubricants are available, and Diesel oil can be trucked in.

Windmill Point Creek, on the north side of Rappahannock River 1.7 miles above the mouth, has depths of 1½ feet at the entrance and 8 to 10 feet inside. The channel is bush-staked.

Mill Creek, on the south side of Rappahannock River 5 miles above the mouth, has depths of 4 to 6 feet and is entered through a narrow channel marked by two lights. The wharves east of the creek are in ruins.

Locklies Creek, on the south side of Rappahannock River 6 miles above the mouth, has depths of about 5 feet. The creek has some traffic in sand and gravel. The approach is marked by lights and buoys. There is a marine railway in Locklies Creek

that can haul out boats up to 30 feet in length and 4 feet in draft. Gasoline and provisions can be obtained.

Whitestone Beach, on the north side of Rappahannock River 5.8 miles above the mouth, has two prominent white pavilions; the small wharf has a depth of about 9 feet at the outer end.

A fish factory and wharf are conspicuous on **Cherry Point,** on the north side of Rappahannock River 6.2 miles above the mouth; the landings on the wharf have depths of 12 feet or more at their faces. The **ferry** landing 0.7 mile northwest of Cherry Point is marked by lights.

Grey Point, on the south side of Rappahannock River 7 miles above the mouth, is a terminus of the **ferry** that operates across the river to Cherry Point; the landing is marked by lights.

Carter Creek, on the north side of Rappahannock River 8 miles above the mouth, is the approach to the villages of Weems and Irvington. Traffic on the creek consists chiefly of shellfish and shells. Drafts of vessels using the creek seldom exceed 11 feet and are mostly 6 feet or less.

A Federal project for the improvement of Carter Creek provides for an entrance channel 15 feet deep and 200 feet wide across the bar; for a channel in Eastern Branch at Galley Hook Point 12 feet deep, 100 feet wide, and 1,100 feet long; for a channel in Carter Cove 12 feet deep, 100 feet wide, and 1,700 feet long; and for a jetty 742 feet long on the southeast side of the entrance. Controlling depths, in May 1950, were 15 feet in the entrance channel, 12 feet in Galley Hook Channel, and 8½ feet in Carter Cove. The entrance to the creek is marked by lights and buoys. The mean range of **tide** is about 1½ feet.

Carter Creek has a power plant, an ice plant, and several oyster houses. The creek is used extensively as an anchorage. Gasoline, Diesel oil, fresh water, ice, and provisions are available at **Weems,** on the west side of the creek, and at **Irvington,** on the east side. In **Carter Cove,** at Weems, is a marine railway that can handle vessels up to 180 feet in length; the machine shop repairs gasoline and Diesel engines and does hull work. The landings at Weems have depths of 6 feet alongside, and those at Irvington have depths of 6 to 10 feet.

Corrotoman River, on the north side of Rappahannock River 9.5 miles above the mouth, has depths of 18 feet or more for 4 miles to the junction of Eastern and Western Branches. The mean range of **tide** is about 1½ feet in the river.

Whitehouse Creek, on the west side of Corrotoman River 0.8 mile above the mouth, has depths of 7 feet to the landing at **Bertrand,** on the north side 0.5 mile from the entrance; small amounts of gasoline and supplies are available. **Taylor Creek,** on the east side of Corrotoman River 2.5 miles above the mouth, has depths of 5 feet for about 0.5 mile above the entrance; an overhead cable near the entrance has a vertical clearance of 50 feet. **Myer Creek,** on the west side 3 miles above the river mouth, has depths of 8 feet for a mile.

Eastern Branch of Corrotoman River has depths of 15 feet for 2 miles and thence 6 feet or more for 1.5 miles. **Western Branch** has depths of 12 feet or more for 3 miles and thence 6 feet for about a mile. The river channel is obstructed by shoal spits and middle grounds, but the principal shoals as far as the fork, and for 0.5 mile above in Western Branch, are marked by lights and buoys. A cable **ferry** operates, daytime

only, from **Ottoman Wharf,** on the southwest side of Western Branch 1.3 miles above the fork, to **Merry Point,** on the opposite side.

Chart 535.—Urbanna Creek empties into the southwest side of Rappahannock River 13.5 miles above the mouth. The town of **Urbanna** is on the west side of the creek near the entrance. Drafts of vessels using the creek seldom exceed 8 feet and are mostly 4 feet or less.

A Federal project for the improvement of Urbanna Creek provides for a channel 10 feet deep and 150 feet wide from deep water in Rappahannock River to Burtons wharf, 0.6 mile above the jetties, and for a turning basin 10 feet deep, 400 feet wide, and 1,575 feet long; the controlling depth was 8 feet in May 1950. Above the wharf, depths are 6 feet or more for about 0.7 mile, and small craft can go about another mile upstream.

The entrance to Urbanna Creek is protected by jetties, riprap on the north and timber on the south. The channel between the jetties is marked by two lights. The mean range of **tide** is about 1½ feet.

Many small vessels harbor in Urbanna Creek. The wharves at Urbanna have depths of 7 to 14 feet alongside. Gasoline, Diesel oil, fresh water, ice, provisions, and marine supplies are available. A marine railway at the town has a hauling capacity of 110 tons and can handle vessels up to 70 feet in length; the machine shop repairs gasoline and Diesel engines and does hull work. Open and covered boat storage is available.

The highway bridge over Urbanna Creek 0.7 mile above the entrance has a swing span with a horizontal clearance of 30 feet and a vertical clearance of 5 feet; **regulations** governing operation of the drawspan are given in **§ 203.245,** Chapter 2A.

Robinson Creek, on the west side of Rappahannock River 14 miles above the mouth, has depths of 5 feet in the entrance and 3 feet to the head. **Remlik Wharf,** just south of the creek, is about 300 yards long and has depths of about 8 feet at the outer end.

Lagrange Creek, on the west side of Rappahannock River 15 miles above the mouth, has depths of 7 feet in the entrance and 3 feet for 1.5 miles upstream. On the southwest side of the creek is a boatyard that can haul out craft up to 50 feet in length and 4 feet in draft; gasoline, ice, provisions, and some other marine supplies are obtainable. The wharf has depths of 4 feet at the outer end.

Weeks Creek, on the west side of Rappahannock River 17 miles above the mouth, has depths of about 2 feet but is seldom used.

Greenvale Creek, on the east side of Rappahannock River 17 miles above the mouth, has depths of 1½ feet across the shoals at the entrance. The channel is marked by bush stakes. The oyster-house landing on the west side just inside the entrance has depths of 4 feet alongside; small amounts of gasoline are available. The long wharf 0.6 mile northwest of Greenvale Creek has depths of about 4 feet at the outer end.

Monaskon is on the east side of Rappahannock River 18.5 miles above the mouth. The wharf is in ruins, but a few local fishermen use the south side of the inner end where they are protected by the shell islet to westward.

Parrotts Creek, on the southwest side of Rappahannock River 20 miles above the mouth, has depths of 3 feet in the entrance and 2 feet to near the head. **Waterview** is a village on the southeast side of the entrance.

Deep Creek, on the east side of Rappahannock River 20.5 miles above the mouth, has depths of 2 feet across the flats at the entrance and 4 to 6 feet into the several branches. The creek usually is bush-staked. **Boer** is a village on the east side of the entrance.

Mulberry Creek, on the northeast side of Rappahannock River 22 miles above the mouth, has depths of 6 feet in a dredged cut at the entrance and 4 to 5 feet for a mile upstream. A light marks the west side of the entrance channel, and a shell islet, nearly awash at high water, is at the inner end of the cut. Gasoline and provisions are available at **Morattico,** on the northwest side of the entrance.

Lancaster Creek, on the northeast side of Rappahannock River 23.5 miles above the mouth, has depths of 5 feet for a mile and thence 2 feet to **Woodhouse Landing,** 4 miles above the entrance. A marine railway on the west side of the entrance can haul out boats up to 30 feet in length and 4 feet in draft for minor repairs; gasoline and provisions are available. **Morattico Creek,** which empties into the north side of Lancaster Creek 0.7 mile above the entrance, has depths of 3 feet at the entrance and 2 feet to near the head. A post office is at **Simonson,** on the peninsula between Morattico Creek and upper Lancaster Creek.

Bayport is on the southwest side of Rappahannock River 23.5 miles above the mouth; the wharf has depths of 7 feet at the outer end but is in poor condition. **Butylo,** a mile northwestward of Bayport, has a wharf with depths of 3 feet at the outer end; the wharf has a fresh-water connection and gasoline is available at the top of the bluff.

Farnham Creek, on the northeast side of Rappahannock River 26 miles above the mouth, has depths of 2½ feet in the entrance and for 3 miles upstream. A fixed highway bridge 0.7 mile above the entrance has a horizontal clearance of about 30 feet and a vertical clearance of about 6 feet.

Sharps is on the northeast side of Rappahannock River 27 miles above the mouth. The wharf has depths of 10 feet at the outer end but is in poor condition. There are several storage tanks at the shore end of the wharf.

Bowlers Rock Light (lat. 37°49′.5, long. 76°44′.0), 23 feet above the water and visible 10 miles, is shown from a black skeleton tower on a cylindrical base, in depths of 6 feet, on the southwest side of Rappahannock River channel 28 miles above the mouth; the fog signal operates from September 15 to June 15. **Bowlers Rock,** covered 7 feet and buoyed, is on the east side of the channel 500 yards east-southeastward of the light; a submerged wreck is on the southwest edge of the channel 100 yards north-northeastward of the light; and foul ground extends up river along the southwest edge of the the channel for 1.3 miles from the light. **Bowlers Wharf,** on the southwest shore, is in ruins.

Totuskey Creek empties into the northeast side of Rappahannock River 31 miles above the mouth. A Federal project provides for a channel 10 feet deep from that depth in the river to and including a turning basin below Totuskey Bridge; the controlling depth was 7 feet in June 1949.

The channel is marked by entrance buoys, a lighted range across the bar, and by numerous daybeacons, but it is narrow in places and difficult to follow without local knowledge. At **Booker Bar,** 2.5 miles above the entrance, a timber and brush dike on the northeast side of the channel is awash at high water.

Totuskey Bridge, 4 miles above the entrance, is a fixed concrete span with a horizontal clearance of 24 feet and a vertical clearance of 10 feet. A good landing on the

southeast bank just below the bridge has depths of 12 feet at the face and is used by small oil tankers. Barges load pulpwood at a landing on the opposite shore about 0.2 mile below the bridge.

Wellford is on the northeast side of Rappahannock River 32 miles above the mouth; only the outer piling of the former wharf show above low water. **Wares Wharf** is directly across the river from Wellford; there are storage tanks on the shore.

Piscataway Creek, on the southwest side of Rappahannock River 35 miles above the mouth, has depths of 3½ feet in the entrance and 5 feet or more for 5 miles upstream. A fixed bridge 4 miles above the entrance has a horizontal clearance of 30 feet and a vertical clearance of 8½ feet. Piling of a former bridge are 100 yards upstream.

Hoskins Creek empties into the southwest side of Rappahannock River 36.5 miles above the mouth. A Federal project provides for a channel 10 feet deep from that depth in the river to the highway bridge 0.6 mile above the mouth of the creek, with widths of 100 feet through the bar in the river and 80 feet within the creek, and a turning basin of the same depth 250 feet long and 200 feet wide at the public landing 0.4 mile above the mouth; the controlling depth was 10 feet in February 1953. The channel is marked by a lighted range at the entrance and by several daybeacons inside.

A marina, with an overhead lift crane of 2 tons capacity, is on the north side of Hoskins Creek about 400 yards from the entrance; gasoline, water, ice, and marine supplies are available, and Diesel oil is trucked in. The fixed highway bridge 0.6 mile above the entrance has a horizontal clearance of 34 feet and a vertical clearance of 8½ feet.

Tappahannock is on the southwest side of Rappahannock River 37 miles above the mouth. A wharf, with a conspicuous storage shed on the end, has depths of 9 feet at the outer end but is in poor condition. Just south of this wharf are mooring dolphins to which tankers tie up; depths at the dolphins are about 12 feet. The highway bridge over the river at Tappahannock has a swing span with a horizontal clearance of 100 feet and a vertical clearance of 10 feet; the northeast opening is used.

Mount Landing Creek, on the southwest side of Rappahannock River 38.5 miles above the mouth, has depths of 1½ feet across the flats at the entrance and deeper water inside for 3.5 miles. A fixed bridge near the entrance has a horizontal clearance of 30 feet and a vertical clearance of 9½ feet. The creek is used by fishermen.

Cat Point Creek, on the east side of Rappahannock River 39 miles above the mouth, has depths of about 3 feet across the bar at the entrance and deeper water inside for 7 miles. A highway bridge over the entrance to the creek has a retractile span with a horizontal clearance of 31½ feet and a vertical clearance of 7 feet. A highway bridge 6.5 miles above the entrance has a swing span with a horizontal clearance of 31 feet and a vertical clearance of 4 feet; **regulations** governing operation of the drawspan are given in § **203.245,** Chapter 2A.

Occupacia Creek, on the west side of Rappahannock River 44 miles above the mouth, has depths of 3 feet across the bar at the entrance and 4 feet for 6 miles up the middle branch; an overhead cable 2.5 miles above the entrance has a vertical clearance of 35 feet. **Bridge Creek,** the eastern branch, has depths of 3 feet to a fixed bridge a mile above its entrance.

Carter Wharf, on the east side of Rappahannock River 47 miles above the mouth, 10 miles above Tappahannock Bridge, has some conspicuous buildings; the landings are in ruins. **Layton,** on the west bank 50 miles above the mouth, has two wharves; the

lower is in fair condition and the upper is in ruins. **Leedstown,** on the north bank 52 miles above the mouth, has several landings, all in poor condition.

Chart 536.—Camden is a village on the south side of Rappahannock River 66 miles above the mouth. The landings are in poor condition.

Port Royal is on the southwest side of Rappahannock River 67.5 miles above the mouth; the pier is in ruins. The highway bridge that crosses the river from Port Royal to **Port Conway** has a swing span with a horizontal clearance of 100 feet and a vertical clearance of 8 feet; the northeast opening is used.

Newton Rock, on the southwest side of Rappahannock River 91 miles above the mouth, is 50 feet from shore and is almost awash at high tide; the best water is 100 feet off the rock.

Fredericksburg is on the west side of Rappahannock River 93 miles above the mouth. The city has some trade by water, mostly in motor vessels and barges drawing 8 to 10 feet. Practical navigation terminates at the wharves at the southern end of the city, but small boats can go about a mile farther up river. Anchorage space is limited, so vessels usually make fast to the wharves. The principal wharves have depths of about 12 feet at their faces. The fixed railroad bridge just above the wharves has a horizontal clearance of 90 feet and a vertical clearance of 44 feet. The fixed highway bridge 700 yards farther up has a horizontal clearance of 152 feet and a vertical clearance of 50 feet.

Chart 534.—Fleets Bay, on the west side of Chesapeake Bay just northward of Rappahannock River entrance, is the approach to Little Bay and Antipoison Creek, and to Tabbs, Dymer, and Indian Creeks.

Depths of 8 feet can be taken through **Little Bay,** on the south side of Fleets Bay, westward in a narrow channel into **Antipoison Creek** and upstream for a mile. The bay and creek are used by boats with drafts up to 6 feet. A fish factory on the south side of Antipoison Creek 0.6 mile above the entrance has a wharf with depths of 10 feet at the face; another fish factory and ice plant directly across the creek has a wharf with depths of 6 feet at the face. **Harpers Creek,** on the south side of Antipoison Creek 0.7 mile above the entrance, has depths of 5 feet to a yard that can haul out and repair boats up to 50 feet in length and 4 feet in draft.

Tabbs Creek, on the west side of Fleets Bay 1.5 miles northward of Antipoison Creek, has depths of only about 1 foot over the bar at the entrance but 7 feet or more for a mile upstream. The creek and its approach are unmarked.

Dymer Creek, on the west side of Fleets Bay 2 miles northward of Antipoison Creek, has depths of 15 feet in the approach and for a mile above the entrance, thence 8 feet for another mile. The creek is used by vessels drawing up to 13 feet. The approach through Fleets Bay is well marked by buoys, one lighted, and the narrow entrance channel has a light on either side.

Poplar Neck Creek, on the south side of Dymer Creek a mile above the entrance, has a yard that can haul out boats up to 40 feet in length and 4 feet in draft and make hull repairs. A fish factory on the south side of Dymer Creek 1.1 miles above the entrance has a wharf with depths of 14 feet along one face.

Indian Creek, at the northwest corner of Fleets Bay 3 miles northward of Antipoison Creek, has depths of 14 feet for 1.8 miles, then shoals to 6 feet 0.8 mile farther

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up. Traffic on the creek consists chiefly of pulpwood, petroleum products, shellfish and shell. Drafts of vessels using the creek seldom exceed 9 feet and are mostly 6 feet or less. The approach through Fleets Bay and the channel in the creek are well marked by lights.

Kilmarnock Landing, on the west side of Indian Creek 2 miles above the entrance, is at the foot of a paved road that leads 1.5 miles inland to the town of **Kilmarnock,** which has stores, hotels, theaters, and a Public Health Service **outpatient office.** The dock and boat basin at the landing have depths of about 12 feet; gasoline, Diesel oil, fresh water, ice, and other supplies are available. There are oil wharves just above and below the basin.

Dividing Creek empties into the west side of Chesapeake Bay about 8 miles north-northwestward of Windmill Point Light. The creek has depths of 14 feet in the approach and for a mile above the entrance, then shoals gradually to depths of 6 feet 1.5 miles farther up. The creek is used by boats with drafts of 5 feet or less. The approach between the shoals off the entrance is well marked by lights and buoys.

A **danger zone** (*see Chart 1223*) for Naval firing extends along the east side of the bay channel; limits of the area and regulations governing it are given in **§ 204.46,** Chapter 2A. **San Marcos Wreck,** in the northerly part of the area, is 4 miles due east of a point 48 miles along Chesapeake Bay main channel from the Virginia Capes; the wreck bares about 1 foot at low water and is marked by an obstruction buoy.

A **danger Zone** for Naval guided-missiles tests is centered 5 miles due east of a point 53 miles along the bay channel from the Virginia Capes; limits of the area and regulations governing it are given in **§ 204.44,** Chapter 2A.

Great Wicomico River empties into the west side of Chesapeake Bay 13 miles northward of Windmill Point Light. The entrance is between **Dameron Marsh** and **Bull Neck,** 1.7 miles to the northward. The principal marks for the entrance are Great Wicomico River Light and the buildings at Fleeton, on Bull Neck.

Great Wicomico River Light (lat. 37°48′.2, long. 76°16′.1), 42 feet above the water and visible 12 miles, is shown from a white hexagonal house, with brown piles and roof, in depths of 9 feet 0.6 mile southeast of Bull Neck; the light has a fog signal. *Great Wicomico River Light is 4.5 miles due west of a point 53.5 miles along Chesapeake Bay main channel from the Virginia Capes.*

Great Wicomico River has **depths** of 17 feet or more for 5.5 miles above the entrance, thence 10 feet or more for 2 miles, and is navigable for small craft for another 2 miles. Vessels entering the river for shelter usually anchor in depths of 15 to 20 feet off and in the entrance to Cockrell Creek. **Fish traps** usually will be found on the shoals at the entrance to the river; the approach can be made on a due west course between the buoys marking the limits of the designated trap areas.

The channel in Great Wicomico River is marked by lights for 4 miles from the entrance. The mean range of **tide** is 1 foot at the entrance. **Ice** does not close the river to navigation except in severe winters, and then only for brief periods; Cockrell Creek is considered a secure harbor from ice.

Cockrell Creek, on the northeast side of Great Wicomico River a mile above the mouth, has depths of 14 feet for 1.4 miles above the entrance, then shoals gradually to 6 feet a mile farther up. The creek has a sizable amount of water-borne commerce, and numerous fish factories operate along its shores. The wharves have depths of 8 to 15

feet at their faces. Drafts of vessels using the creek are as much as 14 feet but seldom exceed 12 feet.

Fleeton, on the southeast side of the entrance to Cockrell Creek, has a marine service station that can supply gasoline, Diesel oil, fresh water, and ice. **Fairport** is on the west side a mile above the entrance. **Reedville,** on the east side 1.5 miles above the entrance, is a **customs** port of entry at which marine documents are issued and has a Public Health Service **outpatient office;** gasoline, Diesel oil, water, ice, provisions, and some ship chandlery are available. The boatyards along Cockrell Creek can handle vessels up to 100 feet in length.

Mill Creek, on the southwest side of Great Wicomico River a mile above the mouth, has depths of 12 feet or more through a crooked channel across the flats and for a mile above the entrance, thence 8 to 10 feet for another mile.

Cranes Creek, on the west side of Great Wicomico River 1.5 miles above the mouth, has several small privately owned wharves along its banks and is used by boats drawing up to 5 feet. A Federal project provides for a channel 6 feet deep and 80 feet wide from deep water in the river to deep water in the creek; the controlling depth is about 6 feet. The entrance is marked by daybeacons.

Mila, on the west side of Great Wicomico River 3.5 miles above the mouth, has a landing with a depth of 8 feet at the outer end.

The highway bridge over Great Wicomico River 6 miles above the mouth has a swing span with a horizontal clearance of 101 feet in the north opening and a vertical clearance of 7½ feet. The several small landings on the east side of **Glebe Point,** at the north end of the bridge, have depths of 5 to 8 feet at the outer ends; gasoline is available.

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CHAPTER 12

Chesapeake Bay Western Shore

Potomac River

Charts 557 to 560

POTOMAC RIVER empties into the west side of Chesapeake Bay 66 miles by channel from the Virginia Capes. The river is the boundary between Virginia on the west and Maryland on the east and is the approach to Alexandria, Washington, and many smaller communities and landings.

Hains Point, Washington, at the junction of Anacostia River, Washington Channel, and Virginia Channel, is 94 miles above the mouth of Potomac River. The head of tidewater navigation is at Chain Bridge, Washington, 101 miles above the mouth. The greatest width, 6.4 miles, is between **Thicket Point,** Virginia, and **Kitts Point,** Maryland, 11 miles above the mouth (*see Chart 557*).

Traffic on Potomac River consists chiefly of petroleum products, sand and gravel, and some newsprint, pulpwood, and fertilizers. Drafts of vessels using the river are mostly 15 feet or less, but coastwise or foreign vessels drawing as much as 23 feet call at Alexandria.

Channels.—Potomac River has channel depths of 39 to 92 feet for 20 miles, thence 24 feet or more to the first bar cut, 32 miles above the mouth. A Federal project for the improvement of the river provides for a channel 24 feet deep and 200 feet wide between the mouth and Hains Point, Washington. The dredged cuts are maintained at or near project dimensions and are well marked.

Anchorages.—Vessels bound up or down Potomac River anchor anywhere near the channel where the bottom is soft; the deeper-draft vessels sometimes anchor in Cornfield Harbor or St. Marys River (*see Chart 557*). Above Alexandria, vessels usually go to the wharves; there is little or no anchorage for anything but small craft. Near the mouth of the river, small craft can find secure anchorage in most of the tributaries; Smith Creek (*see Chart 557*) is said to have the best protection from all winds.

Fish-trap areas extend up river from the mouth to Blakiston Island. Limits of the areas are marked by buoys and are shown on Charts 557 and 558.

Danger zones.—Potomac River is used extensively by the military establishments for testing operations and gunnery practice. Limits of the danger areas and regulations governing them are given in **Chapter 2A.**

Sailing directions for Potomac River are given in tabular form in Chapter 3.

Tides.—The mean range of tide is about 1½ feet at the mouth of the river, 2 feet in the vicinity of Blakiston Island, 1 foot at Maryland Point, 1½ feet at Indian Head, and 3 feet at Washington. Above Washington, the river is tidal as far as Chain Bridge.

The tides are influenced by the force and direction of the wind and by freshet conditions, and may at times vary considerably. Daily predictions for Washington are given in the *Tide Tables*.

Currents.—The velocity of the tidal currents in Potomac River is variable and is influenced by the force and direction of the wind; the set is usually in the direction of the channel. During freshets there is little or no flood current. The *Current Tables* give detailed information for a number of places along the river.

Ice.—During severe winters the tributaries of the Potomac are closed by ice and the river is frozen over to Cedar Point; the upper part is then closed to navigation. During ordinary winters the powered vessels plying the river keep the channel open.

Freshets occur at irregular intervals, but usually do not interfere with the navigation of the river below Alexandria unless accompanied by floating ice. In Washington Channel, during the highest freshet within recent years, the river rose about 11½ feet above mean low water.

Pilotage is compulsory between Chesapeake Bay entrance and Smith Point, at the mouth of Potomac River, for all vessels other than those exclusively engaged in the coastwise trade and those exempted by United States statutes. Vessels bound up the Potomac may take either a Virginia or a Maryland pilot.

Virginia pilotage of vessels from Smith Point to Washington is $4.00 per foot of draft when no sea pilotage is paid and $1.50 per foot when sea pilotage is paid; sum total of sea and river pilotage is not to exceed $6.50 per foot. Sea pilotage rates are given at the beginning of Chapter 9.

Maryland pilotage rates from the Virginia Capes to Washington and from Washington to Baltimore are the same as from the Virginia Capes to Baltimore.

Chart 557.—The entrance to Potomac River is between Smith Point and Point Lookout, 10 miles to the north-northwestward; the width normal to the channel is about 5 miles. The mid-channel point in the entrance is 6.6 miles northwest of Smith Point Light and 66 miles (*7 miles northwest of the 59-mile point in the bay channel*) from the Virginia Capes.

The **fish-trap areas** in the lower river are marked by buoys and are shown on the chart. **Danger zones** for military testing operations extend from the mouth of the river to the upper limits of the chart; limits of the areas and regulations governing them are given in **§ 204.40,** Chapter 2A.

Smith Point, on the south, or Virginia, side of the entrance to Potomac River, is low and inconspicuous. A shoal area that extends eastward from the point has depths as little as 11 feet 2 miles from shore; a buoy marks the northeast edge of the shoal.

Smith Point Light (lat. 37°52′.8, long. 76°11′.0), 52 feet above the water and visible 13 miles, is shown from a white square brick tower and octagonal dwelling on a brown cylindrical pier about 2.5 miles east by south of the point; the radiobeacon and the fog signal are synchronized for distance finding. The light is on the east side of **Smith Point Shoal,** which has a least depth of 18 feet. *Smith Point Light is 1 mile due west of a point 58 miles along Chesapeake Bay main channel from the Virginia Capes.*

Little Wicomico River empties into Potomac River at Smith Point. A Federal project provides for a channel 8 feet deep, 150 feet wide, and 4,800 feet long from deep water in Potomac River to deep water in Little Wicomico River, and for two stone jetties extending to the 8-foot contour in Potomac River. The controlling depth was

4 feet in January 1953. The entrance channel is marked by lights. There is little traffic on the river except by local fishermen.

Sunnybank (*P. O.*) is a village on the south side of Little Wicomico River 1 mile above the entrance. Gasoline, ice, and some other supplies are available. A vehicular **ferry** crosses the river at Sunnybank. A marine railway 3.5 miles above the entrance can haul out boats up to 45 feet in length and 4 feet in draft for general repairs.

Point Lookout, on the north, or Maryland, side of the entrance to Potomac River, is low but is well marked by a light, a water tank, and a hotel. The shoal that extends about 1 mile southward from the point is marked at its outer extremity by a bell buoy. **Point Lookout Light (lat. 38°02′.3, long. 76°19′.3),** 41 feet above the water and visible 12 miles, is shown from a white dwelling on the point and has a fog signal. *Point Lookout Light is 5 miles due west of a point 68 miles along Chesapeake Bay main channel from the Virginia Capes.*

Cornfield Harbor, between Point Lookout and **Cornfield Point,** 2 miles to the northwestward, is sheltered from northerly and northeasterly winds; vessels bound up and down the bay frequently use it as an anchorage for the night. The shoaling is gradual except off Cornfield Point and at the south end of the shoal that extends southward from Point Lookout; at these places the hard sand bottom drops off abruptly. An 18-foot spot is about 0.6 mile westward from Point Lookout, and a 10-foot spot, marked by a buoy, lies between it and the shore to the northeast. A wharf just west of the light extends 330 feet out from shore and has a depth of 12 feet at its outer end. **Point Lookout Creek,** 0.3 mile east of Cornfield Point, has a depth of about 2 feet in its entrance.

Coan River, on the Virginia side of Potomac River 8 miles above the mouth, has depths of 13 to 7 feet for 4.5 miles to within 0.5 mile of the head. The river is used mostly by local oyster and fish boats. A 500-yard lane in the approach is kept clear of fish traps; the initial course through the lane is **230°.** The entrance to Coan River is marked by buoys and a light and is easy to navigate; the channel above is marked at the critical points by pile daybeacons and bush stakes. The mean range of **tide** is about 1½ feet at the entrance.

Kingscote Creek, on the north side of Coan River 0.6 mile above the mouth, has depths of 8 feet for most of its 1-mile length. A shoal extends halfway across the entrance from the point on the west side. **Lewisetta** (*P. O.*), on the east side of Kingscote Creek 0.3 mile above the entrance, has a small cannery and a store where gasoline and some provisions can be obtained; the landing has depths of about 4 feet alongside.

The Glebe, on the west side of Coan River 0.7 mile above the mouth, has depths of 9 to 16 feet to the forks 1.5 miles above the entrance; the south fork has depths of 9 to 7 feet for 0.6 mile. The channel in The Glebe is clear except for a shoal that extends well off from the point on the south side 0.6 mile above the entrance. **Cowart** (*P. O.*), is on the north side of the entrance to The Glebe; a boatyard 0.2 mile west of Cowart can haul out vessels up to 60 feet in length and 5 feet in draft.

Stevens Point is on the west side of Coan River a mile above the mouth. The boatyard on the south side of the point can haul out vessels up to 55 feet in length and 6 feet in draft.

The wharf at **Bundick,** on the west side of Coan River 3.4 miles above the mouth, has depths of 9 feet at the outer end; gasoline and some supplies are available at a nearby

store. An overhead power cable crosses the river at Bundick. **Coan** wharf, directly across the river from Bundick, is in ruins.

Smith Creek, on the Maryland side of Potomac River 10 miles above the mouth, is used by many small fishing and pleasure boats and has the best protection along this part of the river from all winds. The depth over the bar is about 12 feet, and the same depth can be carried 1.4 miles above the entrance into either of the two main branches. The entrance is well marked by lights and buoys. The lane through the fish traps can be navigated on a course of **355°**.

Wynne, on the east side of the entrance to Smith Creek, has good wharves with depths of 6 to 10 feet at their outer ends; fuel and other supplies are available on most of them. The shipyard on the north side of Wynne has two railways that can haul out boats up to 60 feet in length, 7 feet in draft, and 50 tons in weight for hull and engine repairs; depths at the wharves are about 10 feet. Gasoline, Diesel oil, fresh water, and marine supplies can be obtained on the shipyard wharves, and ice can be brought from Wynne.

St. Marys River, on the Maryland side of Potomac River 11.5 miles above the mouth, is 2 miles wide at the entrance and 600 yards wide at St. Marys City, 5.5 miles up. The channel has depths of 20 feet or more to St. Marys City, then shoals gradually to 12 feet at **Martin Point** and to 8 feet at **Tippity Wichity Island,** 8 miles above the mouth. St. Marys River is sometimes used as an anchorage by the deeper-draft vessels seeking shelter from heavy gales, but small boats prefer Smith Creek. The river has very little traffic other than local fishing craft. The course through the fish traps off the entrance is **345°**. The mean range of **tide** is about 1½ feet.

St. George Island, on the west side of the entrance to St. Marys River, is long, low, and sparsely wooded. The island is thickly settled, mostly by oystermen and fishermen, and is also used to some extent as a summer resort. **St. George Bar** extends 1.3 miles southeastward from the island and is marked at its outer end by a lighted buoy.

St. George Creek, which empties into St. Marys River along the northeast side of St. George Island, has a narrow, crooked channel with depths of 10 feet or more for 3.5 miles. The creek is used extensively by oystering and fishing boats the year around and by pleasure craft during the summer. The usual drafts of boats seen in the creek are 3 to 5 feet, but it has been used by deeper drafts. The channel is well marked by lights.

Depths of about 5 feet can be carried into St. George Creek through the passage between the mainland and the northwest end of St. George Island. There are spoil banks on each side of the Potomac River end of the passage, but the channel is marked by lights and daybeacons. The fixed bridge over the passage has a horizontal clearance of 32 feet and a vertical clearance of 15 feet.

The village of **Piney Point** (*P. O.*) is on the southwest side of St. George Creek 2.5 miles above the mouth and 0.5 mile above the passage at the northwest end of St. George Island. Depths at the wharves are 5 to 6 feet. Gasoline and other supplies can be obtained, and Diesel oil can be trucked in.

Priests Point, on the east side of St. Marys River 3 miles above the mouth, has a large building and a water tank, and a light is 300 yards offshore.

Windmill Point, on the west side of St. Marys River 3.5 miles above the mouth, is a low yellow bluff with a cluster of trees at the outer end.

St. Marys City (*P. O.*), on **Church Point,** east side of St. Marys River 5.5 miles above the mouth, was the original capital of Maryland. Few traces of the original town remain, but the statehouse was reconstructed in 1934 from the ruins of several other buildings nearby. A low church spire is visible above the trees; a monument on the end of the point and an elevated water tank are prominent. A landing on the south side of the point has a depth of about 9 feet at the outer end.

Yeocomico River, on the Virginia side of Potomac River 12 miles above the mouth, has depths of 19 to 16 feet to the forks 1.4 miles above the entrance. Lights mark the channel to the forks, and bush stakes usually mark the edges of the tributary channels. The initial course through the fish stakes off the entrance to the river is **244°**. The mean range of **tide** is about 1½ feet.

West Yeocomico River, the west fork of Yeocomico River, has depths of 13 to 7 feet to **Kinsale** (*P. O.*), on the southwest side 1.7 miles above the entrance. The highway drawbridge at Kinsale has a horizontal clearance of 29 feet and a vertical clearance of 9 feet; the northeast opening is obstructed. The cannery landing has depths of 6 feet at the outer end. The bulkhead wharf just southward has depths of 10 feet alongside; the grain elevators on the wharf are prominent. Gasoline and provisions are available at Kinsale, and Diesel oil can be trucked in.

South Yeocomico River, the south fork, has depths of 13 to 7 feet to **Lodge** (*P. O.*), on the west side 2 miles above the entrance. Fresh water can be obtained from a pipe on the cannery wharf at **Mundy Point** (*P. O.*), on the west side of the entrance; the depth at the wharf is 6 feet. Several small landings on the south side of the point have depths of 9 feet at their outer ends. Gasoline, Diesel oil, provisions, and some other supplies are available at the store.

Harryhogan Point (*P. O.*) is on the west side of South Yeocomico River a mile south of the entrance. The marine railways at the settlement can handle vessels up to 80 feet in length. The north landing at the cannery has depths of 9 feet alongside, and the south landing has depths of 5 feet. The lumber-mill landing 0.2 mile southwestward has depths of 7 feet alongisde. Gasoline and some supplies are available in the village.

Piney Point is on the northeast, or Maryland, side of Potomac River 16 miles above the mouth. A light, 34 feet above the water and visible 11 miles, is shown from a white tower on the point and has a fog signal. The lighthouse wharf and the small private landings on the southeast side have depths of about 5 feet at their outer ends. The prominent T-shaped **oil pier** that extends 1,100 feet southwestward from the point has a 684-foot outer face, with depths alongside of about 35 feet, and is marked by privately maintained lights.

Chart 558.—Limits of the **fish-trap areas** that extend up river as far as Blakiston Island are marked by buoys and are shown on the chart. **Danger zones** for military testing operations extend the length of the chart; limits of the areas and regulations governing them are given in **§ 204.40,** Chapter 2A.

Herring Creek, on the Maryland side of Potomac River 19 miles above the mouth, has depths of 1 to 2 feet in the entrance and 4 to 8 feet inside. The entrance channel shifts during storms and has strong **currents** at strength of ebb.

A shoal extends 0.5 mile offshore from **Ragged Point,** on the southwest, or Virginia, side of Potomac River 19.5 miles above the mouth. A light, 44 feet above the water and visible 12 miles, is shown from a white hexagonal house on brown piles, in depths of 7 feet, near the outer edge of the shoal; the fog signal operates from September 15 to June 1.

Lower Machodoc Creek, on the Virginia side of Potomac River 22 miles above the mouth, has depths of 17 to 12 feet for 2 miles, thence 9 feet for a mile, and thence 8 to 5 feet to a point 4 miles above the entrance. The critical part of the channel is marked by lights and buoys as far as the narrows 2.2 miles from the entrance, and the shoals usually are bush-staked. The creek can be approached on a general southerly course.

Branson Cove is on the east side of Lower Machodoc Creek a mile above the entrance. A Federal project provides for a channel 7 feet deep and 60 feet wide to a boat basin in the cove; the controlling depth was 7 feet in January 1950.

The village of **Coles Point** (*P. O.*) is along the shore of Branson Cove. The wharves have depths of about 6 feet at the outer ends. The marine railways can handle boats up to 40 feet in length and 7 feet in draft. Gasoline, provisions, and some other supplies are available, and Diesel oil can be trucked in. There is a large oyster-packing plant on the south side of the entrance to the cove.

Gasoline and some other supplies also can be obtained at **Tidwells** (*P. O.*), on the west side of the narrows 2.2 miles above the entrance to Lower Machodoc Creek.

Nomini Bay, on the Virginia side of Potomac River 25 miles above the mouth, has general depths of 20 to 15 feet and is the approach to Nomini Creek and Currioman Bay. The shoaling is abrupt on the east side of the bay and gradual on the west side.

Nomini Creek, which empties into the head of Nomini Bay from southward, has a controlling depth of about 7 feet for 3.7 miles to the Nomini bridge, above which depths of 6 feet are reported for 1.5 miles to the Prospect Hill bridge, thence 3 feet for about 0.5 mile farther. Traffic on the creek consists chiefly of seafood and fertilizer. Most of the vessels using the creek draw 2 to 4 feet, but deeper drafts have been noted.

There is a long jetty on the east side of the entrance to Nomini Creek. A light at the outer end of the jetty, another light, and buoys mark the dredged cut that extends to deeper water a mile above the entrance. The mean range of **tide** is about 2 feet.

Buckner Creek, on the east side of Nomini Creek at the inner end of the jetty, has depths of 2 to 3 feet in the entrance and 5 to 6 feet inside. The creek is usually bush-staked.

Gasoline, ice, and provisions are available at **Beales Wharf,** on the east side of Nomini Creek 2 miles above the entrance; at **McGuires Wharf,** on the south side 2.7 miles up; and at **Nomini,** on the west side 3.7 miles above the entrance. The landings have depths of about 7 feet at their faces.

The highway bridge at Nomini has a swing span with a horiztonal clearance of 39 feet in the west opening and a vertical clearance of 5½ feet; the east opening is not used. The fixed highway bridge at **Prospect Hill,** 5 miles above the entrance, has a horizontal clearance of 30 feet and a vertical clearance of 10 feet.

Currioman Bay is separated from the west side of Nomini Bay by **Hollis Marsh,** a narrow 2-mile-long spit which is wooded in the middle. Currioman Bay has depths of 7 to 10 feet in the entrance from the head of Nomini Bay and in most of the area back of Hollis Marsh; the entrance from Potomac River at the northwest end of Hollis Marsh has depths of only 2 to 3 feet. The entrance from Nomini Bay is marked by

buoys which should not be confused with those marking Nomini Creek entrance, just eastward.

Breton Bay, on the Maryland side of Potomac River 25.5 miles above the mouth, is a favorite anchoring ground for yachts. Commercial traffic in the bay consists chiefly of petroleum products and logs. Drafts of vessels using the bay are mostly 6 feet or less, but it is navigated occasionally by vessels drawing up to 11 feet.

The bay has depths of 15 to 13 feet for 3.5 miles, thence 11 feet for 0.5 mile to the lower end of a dredged cut that leads to Leonardtown, 5 miles above the entrance. The Federal project provides for a channel 10 feet deep and 200 feet wide to Leonardtown; the controlling depth was 8 feet in 1948.

A 1,000-yard lane extends through the fish traps off the entrance to Breton Bay; the initial course through the lane is **352°**. The shoal that extends eastward from Heron Island Bar to the Breton Bay approach is marked by an obstruction buoy, and another shoal that extends southwestward from **Huggins Point,** on the east side of the entrance, is marked by a light. Buoys and lights mark the bay channel to within 0.5 mile of Leonardtown. The mean range of **tide** is about 2 feet in Breton Bay.

Combs Creek, on the north side of Breton Bay 1.5 miles above the mouth, has depths of about 6 feet to the landing at **Ewells** (**Compton** *P. O.*). The narrow entrance is between shoal spits marked by stakes. The marine railways on the west side of the creek can haul out boats up to 60 feet in length. The landing just inside the mouth of the creek has a depth of 5 feet alongside; gasoline and some other supplies are available.

A channel with a controlling depth of 6 feet, marked by private pile daybeacons, leads into the bight just southwestward of the entrance to Combs Creek. The boatyard in the bight can haul out and make general repairs to vessels up to 85 feet in length. Gasoline and water are available.

Lovers Point is on the east side of Breton Bay 3 miles above the mouth. A bar with depths of less than 1 foot extends 500 yards northwestward from the point and is marked at its outer end by a light. **Abells Wharf,** on the east side of Lovers Point, has depths of 8 feet at the face; gasoline and provisions are available.

Buzzard Point is on the west side of Breton Bay 4.5 miles above the mouth. A light marks the outer end of a bar that extends off the point. It has been reported that the bar now extends channelward from the light and that the light should be given a berth of at least 25 feet.

Leonardtown (*P. O.*) is on the north side of Breton Bay 5 miles above the mouth. Gasoline, water, and ice are available on the wharf, and provisions can be obtained in the town.

Blakiston (St. Clement) Island is on the north side of Potomac River 27 miles above the mouth. On the south end of the thinly wooded island is a large building which is an abandoned lighthouse. About 100 yards north of the building is a prominent cross which commemorates the first Catholic mass by English settlers in America on March 25, 1634. Shoals extend from the island in all directions. The long wharf on the inner side of the island near the north end has a depth of about 16 feet at the outer end.

Heron Island Bar, about 1 mile northeastward of Blakiston Island, is an extensive

shoal area entirely covered at high water but mostly bare at low water; the bar is marked at the eastern and western ends by buoys.

St. Clement Bay, on the Maryland side of Potomac River back of Blakiston Island, has three entrances. The eastern entrance, between Heron Island Bar and the mainland, is by way of the Breton Bay lane through the fish traps; this entrance has depths of 20 to 16 feet and is easily followed in the daytime. The middle entrance, between Heron Island Bar and Blakiston Island, has depths of 14 feet and is approached through a 500-yard lane in the fish traps on an initial course of **352°**; this entrance is narrow and crooked but is marked by a light and buoys and is easily followed in the daytime. **Dukeharts Channel,** between Blakiston Island and the mainland 0.5 mile to the north-northwestward, has depths of 8 feet and is buoyed from Potomac River to the junction with the middle entrance; the buoys are numbered from east to west and should be followed closely to carry the best water.

St. Clement Bay has channel depths of 14 feet for 3 miles, then shoals gradually to 6 feet 5 miles above the entrance. The mean range of **tide** is about 2 feet.

The village of **Coltons Point** (*P. O.*) is on the west side of the entrance to St. Clement Bay. The marine service pier has depths of 6 feet at the outer end; gasoline, Diesel oil, fresh water, and ice are available.

St. Patrick Creek, on the west side of St. Clement Bay 0.5 mile above the mouth, has depths of 2 to 3 feet in the entrance and 8 to 2 feet inside; the creek is much frequented by fishermen and oystermen. **Palmers** (*P. O.*), on the south side 0.4 mile above the entrance, has a landing with depths of 5 feet at the face; gasoline and some other supplies are available. About 0.5 mile above Palmers is a marine railway that can haul out boats up to 40 feet in length and 3 feet in draft; only hull repairs can be made.

Canoe Neck Creek, on the west side of St. Clement Bay 1.1 miles above the mouth, has depths of 11 feet in the entrance, then shoals gradually to 6 feet a mile upstream. The landing at **Morris Point,** on the south side just above the entrance, has depths of 6 feet at the outer end; gasoline and some provisions are available. The small marine railway can haul out boats up to 50 feet in length and 3 feet in draft.

St. Clement Shores, a settlement on the east side of St. Clement Bay 3 miles above the mouth, has several small private landings with depths of 2 to 3 feet at the outer ends.

St. Catherine Sound, on the Maryland side of Potomac River 29.5 miles above the mouth, has depths of 5 to 9 feet behind **St. Catherine Island.** The entrance from southeastward, in the vicinity of Dukeharts Channel, and the channel behind the island are marked by a light and daybeacons; the outlet to the mouth of Wicomico River on the northwestward has depths of only about 2 feet. The wharves along the shore of the sound are all privately owned.

Whites Neck Creek, on the north side of St. Catherine Sound, has depths of 4 feet in the entrance and 6 to 2 feet inside. A marine service pier on the west side just inside the entrance has depths of 6 feet at the outer end; gasoline, water, and ice are available, and provisions can be obtained nearby. The marine railway can handle boats up to 45 feet in length and 7 tons in weight.

Wicomico River empties into the Maryland side of Potomac River 31 miles above the mouth. Commercial traffic on Wicomico River consists chiefly of shellfish and some pulpwood. Drafts of vessels using the river are mostly 6 feet or less.

The river is characterized by long spits, with little depth and abrupt outer ends, that extend to the edges of the channel in several places. The entrance is 1.3 miles wide between **St. Margaret Island** on the east and **Cobb Island** on the west. **Cobb Point Bar,** which extends a mile southeastward from the island, is marked at the outer end by a light; and the shoal that extends 0.5 mile westward from St. Margaret Island is marked by a buoy.

The Wicomico River channel has depths of 40 to 15 feet for 4 miles, thence 8 feet with local knowledge for 3.5 miles, and thence 6 to 3 feet to the head, 11 miles above the mouth. The channel is marked at the most critical points for about 8 miles. The mean range of **tide** is about 2 feet.

Neale Sound, on the west side of Wicomico River between **Cobb Island** and the mainland, has depths of 7 to 12 feet and is a secure anchorage for motorboats. Both entrances are marked by lights and the critical part of the channel at the northwest end is marked by daybeacons; the aids are numbered from Wicomico River westward to Potomac River. A Federal project provides for channels 7 feet deep and 100 feet wide through the Wicomico River entrance and 6 feet deep and 80 to 60 feet wide through the marshy barrier at the Potomac River entrance; controlling depths, in December 1948, were 7 feet in the Wicomico River entrance and 4 feet in the Potomac River entrance.

The highway bridge over Neale Sound 0.6 mile from the Wicomico River entrance has a bascule span with a horizontal clearance of 22 feet and a vertical clearance of 8½ feet; **regulations** governing operation of the drawspan are given in § **203.245,** Chapter 2A. The marine railways just eastward of the Cobb Island end of the bridge can haul out boats up to 40 feet in length and 4 feet in draft for general repairs. The landing has depths of 6 feet alongside; gasoline, water, and marine supplies are available. Gasoline also is available at a landing on the north side of Neale Sound westward of the bridge.

Rock Point is on the west side of Wicomico River 1.2 miles above the mouth. The outer end of the bar that extends 0.4 mile east-northeastward from the point is marked by a light. The wharf on the south side of the point has depths of 7 feet at the face; water is piped to the wharf, and gasoline and provisions are available at the village of **Rock Point** (*P. O.*).

Bushwood (*P. O.*) is on the east side of Wicomico River 1.5 miles above the mouth. The outer end of the wharf is in ruins but the inner end can accommodate small boats. Gasoline and provisions are available near the wharf.

Charleston Creek, on the west side of Wicomico River 3 miles above the mouth, is used by oyster boats as an anchorage. No supplies are available.

Chaptico Bay, on the east side of Wicomico River 6 miles above the mouth, has depths of 5 to 2 feet. The bay has no wharves and little water-borne commerce.

From Nomini Bay to within 2 miles of Popes Creek, the Virginia shore of Potomac River is backed by high ground. Along this stretch are **Nomini Cliffs, Stratford Cliffs, Horsehead Cliffs,** and the valleys between them.

Popes Creek, on the Virginia side of Potomac River 33.5 miles above the mouth, leads to **Wakefield** and **George Washington Birthplace National Monument.** The controlling depth is about 1½ feet in the entrance, and a stone jetty 2 feet high extends

200 feet offshore from the point on the north side. **Currents** in the entrance are reported to have velocities as high as 4½ knots at strength.

Mattox Creek, on the Virginia side of Potomac River 36 miles above the mouth, has depths of 7 to 5 feet in a narrow crooked channel for 1.5 miles to the ruins of **Wirt Wharf** and **Massey Wharf,** thence 8 to 3 feet for another 2 miles to a fixed concrete highway bridge. The entrance is marked by lights and a buoy.

Colonial Beach (*P. O.*) is a summer resort on the Virginia side of Potomac River 37 miles above the mouth. The largest of the wharves on the river side of the town has depths of 6 feet at the outer end.

Monroe Creek, back of Colonial Beach, is entered between **Gum Bar Point,** at the south end of the town, and **Sebastian Point,** 150 yards westward. The creek is used extensively as an anchorage. A Federal project provides for a channel 8 feet deep and 100 feet wide through the bar at the entrance and for a channel inside 7 feet deep and 100 feet wide to the Colonial Beach waterworks at **Robins Grove Point,** on the east side 0.7 mile above the entrance, and for an anchorage basin 500 feet wide at the head of the project; the controlling depth is about 7 feet. The entrance and the inner channel are marked by lights and buoys.

Gasoline, water, ice, and provisions are available along the inner side of Colonial Beach. The marine railways just below Robins Grove Point can handle boats up to 50 feet in length and 4½ feet in draft. The landings in the basin have depths of 7 feet at their outer ends. A yacht club is on the eastern side of the entrance to Monroe Creek.

Chart 556.—Potomac Beach (*P. O.*) is on the Virginia side of Potomac River 39 miles above the mouth. The former ferry wharf and an oil wharf are the only usable landings. The oil wharf has depths of about 8 feet alongside; the storage tanks are prominent. Gasoline and some provisions are available.

Rosier Creek, entered just westward of Potomac Beach, has depths of 2 feet in the entrance and 7 to 3 feet for a mile upstream. The creek has no wharves and is little used.

Upper Machodoc Creek empties into the Virginia side of Potomac River 41 miles above the mouth. The **United States Naval Proving Ground** is at **Dahlgren,** on the north side of the entrance to the creek, but also occupies land for a considerable distance along the south shore; limits of the **danger zones** and regulations governing them are given in **§204.40,** Chapter 2A. The tanks and radio masts at Dahlgren are prominent.

A deep channel has been dredged from the Potomac River main channel to the Dahlgren naval installations; the controlling depth in the channel and principal basin is 20 feet or more. The channel is well marked. The mean range of **tide** is about 1½ feet.

Above Dahlgren, Upper Machodoc Creek has depths of 7 to 5 feet to **Little Ferry Landing,** 3.5 miles above the entrance, thence 7 to 2 feet for another 2 miles to **Milford Landing.** Only small piers are found along the banks. The creek is little used, and no supplies are available.

Williams Creek, on the north side of Upper Machodoc Creek a mile above the mouth, has depths of 3 to 2 feet to the highway bridge a mile above the entrance. An

overhead cable 0.6 mile above the entrance has a vertical clearance of 25 feet. The creek is little used.

Lower Cedar Point Light (lat. 38°20′.4, long. 76°59′.4), 38 feet above the water and visible 11 miles, is shown from a white skeleton tower on brown piles, in depths of 3 feet, on the west edge of Potomac River main channel 42.5 miles above the mouth and 0.7 mile westward of **Lower Cedar Point;** the light has a fog signal. A pyramidal structure 800 yards northwestward of Lower Cedar Point Light also is marked by a light.

Morgantown is back of Lower Cedar Point on the Maryland side of Potomac River 42.5 miles above the mouth. A channel dredged to depths of 10 feet, and marked by buoys and a lighted range bearing **061°**, leads to the ruins of a wharf on the south side of the point. There are strong cross **currents** on both ebb and flood. The landings that remain intact are suitable only for small boats. Depths of 6 feet can be taken to the landings by passing eastward of the shoal south of Lower Cedar Point; the south end of the 0.7-mile-long shoal is marked by a light. Gasoline and some provisions can be obtained at Morgantown.

Chart 559.—Potomac River Bridge, 44 miles above the mouth, has a fixed channel span with vertical clearances of 135 feet for a width of 480 feet and 105 feet for a width of 700 feet. The centerline of the main span has a fog signal and is marked by a flashing red aviation obstruction light and by a fixed green light surmounted by three fixed white lights mounted vertically 15 feet apart. The bridge also is marked by fixed red lights on the main trusses and approaches.

A **danger zone** for military testing operations extends 4 miles up river from the bridge; limits of the area and regulations governing it are given in **§204.40,** Chapter 2A.

Persimmon Point is on the west, or Virginia, side of Potomac River 45 miles above the mouth. A 4-foot shoal on the west edge of the channel 0.6 mile southeastward of the point is marked by a light.

Popes Creek, on the Maryland side of Potomac River 45.5 miles above the mouth, is not navigable. The village of **Popes Creek** (*P. O.*) is the terminus of a railroad from Baltimore and Washington. A depth of 8 feet can be taken to the railroad wharf. Gasoline and provisions are available in small quantities. A buoy marks a 3-foot spot just south of the wharf.

Between Popes Creek and Upper Cedar Point, 4.5 miles up river, the Maryland shore of Potomac River bends northward about 2 miles to form **Port Tobacco River Flats,** which have shoal spots of 3 to 5 feet but generally navigable depths of 7 to 10 feet. **Port Tobacco River,** at the head of the bight, has depths of 7 feet for 2 miles and thence 5 to 3 feet for another 1.3 miles. The mean range of **tide** is 1½ feet.

Chapel Point, on the east side of Port Tobacco River 1.2 miles above the mouth, is a summer resort; the wharf on the south side has depths of about 7 feet at the face. No gasoline or supplies are available. The village of **Port Tobacco** (*P. O.*), 4.4 miles above the mouth of the river, is now above the head of practical navigation.

Mathias Point is on the Virginia side of Potomac River 48 miles above the mouth. The landing on the northwestern side of the point is in ruins. A light, 44 feet above the water and visible 12 miles, is shown from a white hexagonal structure on brown piles, in depths of 3 feet, on the south edge of the channel 0.3 mile northward of the point; the fog signal operates from September 15 to June 1. Another light, 0.5 mile north-

northeastward of the first, is in depths of 3 feet on Tobacco River Flats, along the opposite edge of the channel.

Upper Cedar Point is on the Maryland side of Potomac River 50 miles above the mouth. A light, 34 feet above the water, is shown from a white square structure on brown piles, in depths of 3 feet, on the north edge of the channel 0.5 mile southeastward of the point; the fog signal operates from September 15 to June 1. The light should be given a berth of at least 200 yards.

Nanjemoy Creek, which empties into the Maryland side of Potomac River 51.5 miles above the mouth, has depths of 7 to 4 feet for about 4 miles. There are no landings along the creek.

Riverside is on the Maryland side of Potomac River 53 miles above the mouth. A light marks the outer end of the wharf ruins.

Metomkin Point is on the Virginia side of Potomac River 53.5 miles above the mouth. A light, in depths of 1 foot 0.5 mile off the point, marks the shallowest part of a shoal area along the southeast edge of the channel.

Maryland Point Light (lat. 38°21′.0, long. 77°11′.9), 42 feet above the water, is shown from a white hexagonal structure on brown piles, in depths of 9 feet, on the south edge of the Potomac River channel 0.7 mile southeastward of **Maryland Point** and 56 miles above the mouth; the light has a fog signal. Other shoals east and west of the light are marked by buoys.

Potomac Creek, on the Virginia side of Potomac River 58.5 miles above the mouth, is used only by small motorboats. **Bull Bluff,** on the south side of the entrance, is high and wooded. The creek has depths of 7 feet in the entrance, thence 3 feet for 2 miles. The best water favors the south side of the entrance.

Aquia Creek, on the Virginia side of Potomac River 61 miles above the mouth, has depths of 4 to 5 feet to **Coals Landing,** 5 miles above the entrance. A buoy and two daybeacons mark the entrance; there are no aids above. A fixed railroad bridge, 3 miles above the entrance, has a horizontal clearance of 43 feet and a vertical clearance of 26 feet. The mean range of **tide** is about 1½ feet at the entrance.

Smith Point, on the Maryland side of Potomac River 62 miles above the mouth, is marked by a light. **Clifton Beach** is on the point. The broken piling of a former landing 300 yards south of the light are nearly awash at high water.

There is **danger** of striking submerged hulks in the mile-wide former restricted anchorage area that extended 2.5 miles up river along the Virginia shore from directly opposite Smith Point.

Liverpool Point is on the Maryland side of Potomac River 65 miles above the mouth. **Mallows Bay,** on the north side of Liverpool Point, is a ship-graveyard area; the western danger limit is a line from Liverpool Point to Sandy Point. A buoy marks the inner edge of the river channel off the bay. The southern part of the bay has unobstructed depths of 5 feet to the submerged wreck near the head. On the southern shore is a small bulkhead landing.

Sandy Point, on the Maryland side of Potomac River 66 miles above the mouth, is marked by a light; the fog signal operates from September 15 to June 15.

An aviation-school wharf on the Virginia side of Potomac River 66.5 miles above the mouth has depths of about 8 feet at the outer end. The short dredged channel that leads to the wharf has a controlling depth of about 7 feet and is marked by a buoy. About 0.2 mile north of the wharf, a diversion canal 10 feet deep connects **Chopawamsic**

Creek with the river; three fixed bridges over the canal have minimum clearances of 10 feet horizontally and 10 feet vertically.

Quantico, on the Virginia side of Potomac River 68 miles above the mouth, is the site of the **United States Marine Barracks.** The T-pier has depths of 25 to 30 feet at the face, and the launch harbor has depths of about 10 feet. The pier has a fog signal on the outer end. The lights of Quantico are prominent at night.

Quantico Creek, on the west side of Potomac River 68.5 miles above the mouth, has depths of 7 feet in a narrow, crooked entrance channel and about 2 feet for 2 miles upstream. The fixed railroad bridge over the entrance has a horizontal clearance of 29 feet and a vertical clearance of 8 feet. A small landing on the south side of the entrance is used by local pleasure boats.

The two stacks of a power plant are conspicuous just north of **Possum Point,** on the Virginia side of Potomac River 69 miles above the mouth. A privately maintained light marks the wharf 0.2 mile northward of the point.

Chicamuxen Creek, on the Maryland side of Potomac River 69 miles above the mouth, has depths of 5 feet in the entrance but shoals rapidly farther up. The creek is little used.

The **Government wharf** on the Maryland side of Potomac River 71 miles above the mouth has depths of 15 feet at the outer end and is marked by a light. The wharf is on the southwest side of the entrance to Mattawoman Creek.

Mattawoman Creek, on the Maryland side of Potomac River 72 miles above the mouth, has easily navigated depths of 7 to 5 feet for a mile to the marsh that extends southeastward from **Deep Point** to the edge of the channel; the outer end of the marsh is marked by a clump of trees. Above this marsh, the channel has depths of 30 to 10 feet for 3 miles but meanders back and forth between the flats and is almost impossible to follow without a guide. The mean range of **tide** is about 1½ feet at the entrance.

Powells Creek, on the Virginia side of Potomac River 72 miles above the mouth, has depths of 4 to 5 feet in the approach and 1 to 2 feet through the railroad bridge and for a short distance upstream. The fixed railroad bridge 0.3 mile above the entrance has a horizontal clearance of 40 feet and a vertical clearance of 26 feet; the old bridge 60 feet beyond has some piling removed. The two stacks of the District of Columbia incinerator plant show prominently at **Cherry Hill,** a mile southward of the bridge.

Chart 560.—Occoquan Bay, on the northwest, or Virginia, side of Potomac River 74 miles above the mouth, has general depths of 5 to 7 feet. The entrance is 2.5 miles wide between **Freestone Point** on the southwest and **High Point** on the northeast; the channel is 0.3 mile off High Point. A man-made rocky islet, 3 feet high, is near the center of the bay, a mile westward of High Point. The bay has little commerce; it and its tributaries are used as an ice harbor when the river channel is closed above.

Neabsco Creek, which empties into the southwest side of Occoquan Bay along the north side of Freestone Point, has depths of 4 to 2 feet. The fixed railroad bridge over the mouth of the creek has a horizontal clearance of 30 feet and a vertical clearance of 36 feet.

Belmont Bay, the northeastern arm of Occoquan Bay and 2 miles from the latter's entrance, has general depths of 3 to 4 feet. Belmont Bay is said to be rocky throughout; the rocks are covered at low water except during northwest winds.

Occoquan Creek empties into the head of Occoquan Bay along the west side of

Belmont Bay. The creek has natural depths of 7 to 25 feet. A Federal project provides for a channel 6 feet deep and 150 feet wide through Occoquan Bay from Potomac River to **Taylors Point,** on the southwest side of the entrance to Occoquan Creek, and thence 100 feet wide to the town of Occoquan; the controlling depth was 5 feet in 1947. The channel is marked by buoys and lights through Occoquan Bay and to within 0.4 mile of the first bridge over Occoquan Creek. The mean range of **tide** is about 1½ feet at the entrance to the creek.

Two fixed bridges over Occoquan Creek 3.6 miles above the bay entrance have minimum clearances of 115 feet horizontally and 66 feet vertically.

Occoquan, on the southwest side of Occoquan Creek 5 miles above the bay entrance, is the head of navigation. Channel depths off the Occoquan bulkheads are about 10 feet. The cable over the creek has a vertical clearance of 42 feet. The District of Columbia workhouse is across the creek from the town.

The **wharf** on the Maryland side of Potomac River 74.5 miles above the mouth has depths of 12 feet at the outer end of its northern face. The small-boat basin on the lower side of the wharf has depths of 4 feet. The intake house just above the wharf has a fog signal.

Indian Head is a high, wooded bluff on the southeast, or Maryland, side of Potomac River 75.5 miles above the mouth. The town of **Indian Head** is back of the bluff. The Indian Head wharf has depths of 12 to 15 feet at the face.

Glymont is on the Maryland side of Potomac River 77 miles above the mouth. A light is shown from a tankhouse just offshore in depths of 6 feet; the fog signal operates from September 15 to June 15. Another light, on a pile cluster 0.4 mile below the Glymont light, marks the outer end of a submerged sewer.

Craney Island, on the west side of Potomac River channel 77.5 miles above the mouth, is a tiny islet marked by a clump of trees and surrounded by an extensive shoal. Between the islet and the Virginia shore is a narrow unmarked channel with depths of 7 feet.

Pomonkey Creek, on the Maryland side of Potomac River 78 miles above the mouth, has depths of 7 to 3 feet in the entrance but little water inside.

Gunston Cove, on the Virginia side of Potomac River 80 miles above the mouth, has depths of 3 to 5 feet in the entrance and 5 to 7 feet inside. The peninsula between Gunston Cove and Dogue Creek, 2 miles to the northeastward, is a part of the U. S. Army reservation of **Fort Belvoir.**

The Army landing on **Whitestone Point,** on the north side of the entrance to Gunston Cove, has depths of 4 feet at the face and in the approach; the small-boat basin immediately westward also has depths of 4 feet. The outer piles of a former wharf are just eastward of the landing; boats approaching the landing or basin pass outside the marker buoy off these piles.

Pohick Bay and **Accotink Bay,** which join at the head of Gunston Cove 2 miles from the entrance, have depths of 2 to 3 feet for about 0.5 mile from the junction. Pohick Bay is foul with submerged duck-blind and fish-net stakes. Parts of both bays are within the **danger zone** of a Fort Belvoir target range; limits of the area and regulations governing it are given in **§ 204.40,** Chapter 2A.

The U. S. Fish and Wildlife Service Wharf, on the Fort Belvoir shore of Potomac River 81.5 miles above the mouth, has depths of 18 feet at the outer end. The fish hatchery at the shore end of the wharf is operated by the Virginia Commission of Game

and Inland Fisheries but only when the shad are running in the river. A U. S. Army wharf just north of the hatchery wharf has depths of 6 feet at the outer end. The light northward of the wharves has a fog signal.

Dogue Creek, on the Virginia side of Potomac River 82 miles above the mouth, has depths of 3 to 5 feet but is foul with grass and submerged duck-blind stakes and is little used.

Marshall Hall, on the Maryland side of Potomac River 82 miles above the mouth, has an amusement park. Excursion boats operate between Marshall Hall and Washington. The southerly wharf, Government-owned, has depths of about 16 feet at the face and is marked by a light; landing is not permitted. The wharf at the amusement park has depths of about 10 feet at the face.

Mount Vernon, the **home of George Washington,** is on the Virginia side of Potomac River 83.5 miles above the mouth. The custom of tolling the ship's bell while passing Mount Vernon is said to have originated the night of Washington's death, December 14, 1799. The buildings are open to the public daily from 9 a. m. to 5 p. m. Excursion boats operate between Mount Vernon and the city of Washington. A Federal project provides for a channel 200 feet wide and 9 to 10 feet deep between the main channel of Potomac River and the Mount Vernon wharf, with a turning basin of the same depth and a radius of 200 feet at the wharf; the controlling depth was 10 feet in 1948. The channel is well marked by buoys.

Little Hunting Creek, on the Virginia side of Potomac River 84 miles above the mouth, has depths of about 4½ feet in a narrow channel, sometimes marked by bush stakes, for about 0.6 mile above the entrance. A stone-arch bridge over the entrance has a horizontal clearance of 51 feet and a vertical clearance of 19 feet for a width of 25 feet.

Sheridan Point is on the Virginia side of Potomac River 85 miles above the mouth. A light in depths of 3 feet 0.3 mile southeast of the point marks the north edge of the channel.

Piscataway Creek, on the Maryland side of Potomac River 85.5 miles above the mouth, has depths of 2 to 7 feet but is now little used. Sand and gravel dredges once operated in the creek.

Fort Washington, on the Maryland side of Potomac River 86 miles above the mouth, was built early in the nineteenth century for the protection of the then new nation's capital; the fort is now a unit of National Capital Parks. The wharf on the point has depths of about 12 feet at the face; fresh water is available. The light on the wharf has a fog signal. **Swan Creek,** just above Fort Washington, has depths of 2 feet in the entrance.

Riverview is an excursion resort on the Maryland side of Potomac River 86.5 miles above the mouth. The wharf has depths of 7 feet at the face but is in poor condition. A light is shown from the end of the wharf.

Broad Creek, on the Maryland side of Potomac River 88 miles above the mouth, has general depths of 2 to 4 feet. **Indian Queen Bluff** is on the north side of the entrance. The creek is little used.

Rosier Bluff, on the Maryland side of Potomac River 89.5 miles above the mouth, is wooded and prominent. Only piles remain of the wharf just below the bluff. A light is shown from a pile in depths of 6 feet below the bluff.

Hunting Creek, on the Virginia side of Potomac River 90 miles above the mouth, has depths of 1 to 6 feet. Fixed highway bridges cross the creek 0.6 and 0.9 mile above the entrance. The lower bridge is a 3-arch structure with a horizontal clearance of 44 feet and a vertical clearance of 9 feet for a width of 20 feet; the upper bridge has a vertical clearance of 3½ feet.

On the Maryland side of Potomac River opposite Hunting Creek is an extensive bight that has been dredged for sand and gravel. Depths are 8 to 20 feet in the inner part of the bight but only 2 to 5 feet along the edge of the river channel.

Jones Point, on the Virginia side of Potomac River 90.5 miles above the mouth, is on the north side of the entrance to Hunting Creek and at the lower end of the Alexandria water front. A light, 60 feet above the water and visible 11 miles, is shown from a white skeleton tower on the point.

Alexandria, Virginia, is on the west side of Potomac River 91 miles above the mouth. Commercial traffic includes petroleum products, sand and gravel, and fertilizer materials; foreign vessels drawing as much as 23 feet unload newsprint and some other cargoes.

Pilotage to Alexandria was discussed at the beginning of the chapter. **Towboats** are available. **Quarantine** inspection is the same as for Washington. Alexandria is a **customs** port of entry at which marine documents are issued; the customhouse is in the Post Office Building.

Jurisdiction of the District of Columbia harbor master extends up river from Jones Point. Harbor regulations prescribe a **speed** limit of 10 statute miles per hour when passing the wharf area of Alexandria except in emergencies.

Some of the cargo wharves that extend nearly a mile along the Alexandria water front are owned by the Government, but most are privately owned and several of these are open to the public by special arrangement. In some places along the water front, particularly the upper part, old piling are a **hazard** to approaching vessels. Gasoline, water, ice, provisions, and general supplies are available.

Oxon Creek, across Potomac River from Alexandria, has bare flats in the approaches and general depths of 1 to 3 feet inside. Sand dredges have cut channels through the flats and made holes inside, but local knowledge is needed to find the deeper water.

Goose Island, between the river channel and the north side of the creek entrance, has bare flats on its north side. Only piling and rock remain of the old landing at **Fox Ferry,** on the south side of the entrance.

Marbury Point is on the east, or District of Columbia, side of Potomac River 92 miles above the mouth. A bush-staked channel with depths of about 7 feet leads to the point. Just north of the point is the **Blue Plains** sewage-disposal plant. The pier 0.4 mile above Marbury Point extends to deep water and is marked at its outer end by a light and a fog signal. The **Bellevue** pier, 0.7 mile above Marbury Point, is marked by a light and a fog signal; an aviation light is back of the pier.

Fourmile Run, on the Virginia side of Potomac River 93 miles above the mouth, has general depths of 11 to 30 feet for most of its 0.5-mile navigable length but there is a 5-foot spot about 250 yards off the south and west shores. The dredged entrance channel has depths of about 13 feet and is marked by lighted buoys and a lighted range; the rear range is visible through a lane in the trees and bushes. About midway along the north side of the entrance channel, two rows of piles, spaced 100 feet apart, extend northward over the flats to the airport; each pile is marked by an aviation landing light.

The Washington Sailing Marina is in the cove on the south side of Fourmile Run just above the entrance.

Washington National Airport occupies the extensive filled area on the west side of Potomac River 94 miles above the mouth. This section was formerly **Gravelly Point.** Many domestic and international airlines use the airport day and night.

Giesboro Point is on the Washington side of Potomac River opposite the airport. Submerged pile remains of several former wharves extend out about 150 feet from shore in the vicinity of the point.

Washington, District of Columbia, on the east side of Potomac River 96 miles above the mouth, is the **Capital of the United States.** The city, with its impressive memorials and public buildings, is one of the most beautiful in the world and is host to a constant stream of visitors. Prominent from the river are the Capitol dome, the Washington Monument, and the Lincoln and Jefferson Memorials.

Commercial **traffic** in Washington Harbor consists chiefly of sand and gravel and petroleum products; there is also some passenger traffic. The mean range of **tide** is about 3 feet; daily predictions for Washington are given in the *Tide Tables.* **Currents** are variable but the set is usually in the directions of the channels, and there is little or no flood current during freshets; information for several places in Washington Harbor is given in the *Current Tables.* **Ice** closes the river at Washington during severe winters, but powered vessels keep the channels open during ordinary winters. During the highest **freshet** in recent years, the river rose about 11½ feet above mean low water in Washington Channel.

Pilotage to Washington was discussed at the beginning of the chapter. **Towboats** are available. Vessels subject to **quarantine** inspection shall notify the Division of Foreign Quarantine, U. S. Public Health Service, Health, Education, and Welfare Building (South), Fourth and D Streets, S. W., Washington, D. C.; the Public Health Service maintains an **outpatient clinic** in the same building. Washington is a **customs** port of entry at which marine documents are issued; the customhouse is in Georgetown.

The District of Columbia **Harbor Master,** who is the officer commanding the Harbor Precinct of the Metropolitan Police Department, regulates the operation, navigation, mooring, and anchoring of all vessels within the waters of the District of Columbia and enforces all laws and regulations relating to the harbor. The person in charge of any vessel, 26 feet or more in length, entering the harbor, shall, if he intends to remain over 24 hours, report the date and time of arrival without delay and shall also report immediately before finally departing, to the Harbor Master at the Harbor Precinct wharf, Maine Avenue and M Street, S. W., or to any police officer under his command.

Hains Point, Washington, 94.6 miles above the mouth of Potomac River, is 0.4 mile north of the junction of Virginia Channel, Washington Channel, and Anacostia River, which comprise **Washington Harbor.** A lighted buoy marks the outer end of the shoal that extends southward from Hains Point.

Anacostia River extends northeastward from its junction with Potomac River south of Hains Point. A Federal project provides for a **channel** 24 feet deep and 200 feet wide to the Eleventh Street bridge, with a turning basin 24 feet deep, 800 feet wide, and about 2,400 feet long opposite the Naval Gun Factory; thence 24 feet deep and 200 feet wide to a turning basin of the same depth and 400 feet square at the foot of Fifteenth Street, S. E., 2.6 miles above the mouth. Controlling depths were 24 feet to the Eleventh

Street bridge in 1950, thence 21 feet to the foot of Fifteenth Street in 1947. Above the improved channel the river has depths of about 12 feet to a point 4 miles above the entrance, thence 6 feet for another mile.

Anchorage areas have been established by the District of Columbia on the southeast side of Anacostia River between the second and fifth bridges; the areas are marked by buoys. No vessel shall come to anchor in the usually travelled channel northwest of the established areas.

Anacostia River is crossed by six **bridges** between the mouth and the head of navigation. The South Capitol Street bridge, 1.4 miles above the mouth or 95.7 miles above the mouth of Potomac River, has a swing span with a horizontal clearance of 150 feet and a vertical clearance of 42 feet. The Eleventh Street bridge, 2.2 miles above the mouth, has a bascule span with a horizontal clearance of 100 feet and a vertical clearance of 21 feet; **regulations** governing operation of the drawspan are given in **§ 203.330,** Chapter 2A. The John Philip Sousa Bridge at Pennsylvania Avenue, 2.8 miles above the mouth, has a fixed span with a horizontal clearance of 114 feet and a vertical clearance of 33 feet in the middle 40 feet. The Pennsylvania Railroad bridge, 3.3 miles above the mouth, has a vertical-lift span with a horizontal clearance of 32 feet and a vertical clearance of 6 feet down and a horizontal clearance of 35 feet and a vertical clearance of 29 feet up. The Benning Bridge, 4.4 miles above the mouth, has a fixed span with a horizontal clearance of 40 feet and a vertical clearance of 17 feet. The Pennsylvania Railroad bridge, 6 miles above the mouth, has a fixed span with a horizontal clearance of 69 feet and a vertical clearance of 12 feet.

The commercial water front of Anacostia River extends along the north side from the mouth to the Pennsylvania Railroad lift bridge. The piers and bulkhead wharves are privately owned or used by Government agencies. The Corinthian Yacht Club is near the entrance and the Washington Yacht Club is between the second and third bridges. Gasoline, water, and ice are available along the river, and the marine railways can handle boats up to about 50 feet in length.

Washington Channel extends northward along the east side of Hains Point for 2 miles from the junction with Potomac River to the Fourteenth Street causeway. The Federal project provides for a channel 24 feet deep and 400 feet wide the length of the waterway; the controlling depth was 19 feet in 1950.

Anchorage areas have been established by the District of Columbia along the west side of Washington Channel; the areas are marked by buoys. No vessel shall anchor in the channel outside these areas. Harbor regulations prescribe a **speed** limit of 6 statute miles per hour in the anchorage areas and in the upper half of the channel.

The principal passenger wharves and other facilities of Washington are on the eastern side of Washington Channel. The water front is owned by the Federal Government, which leases the facilities to private organizations and companies; only the municipal wharves are open to public use. The municipal fish wharf is open to all, charges for wharfage or dockage varying according to the commodity handled. Excursion boats operate from the passenger wharves, and one line has regular sailings to Norfolk.

The Capital and Columbia Yacht Clubs are near the head of Washington Channel and, together with several boatyards and service floats, provide all types of service for small craft. Gasoline, Diesel oil, water, ice, and marine supplies are available. The

largest marine railway can handle vessels up to 80 feet in length and 50 tons in weight; the machine shop repairs gasoline and Diesel engines and does hull work.

Virginia Channel is the local name for that part of Potomac River between Hains Point and Georgetown. The Federal project provides for a channel 24 feet deep and 400 feet wide from below Hains Point to the Francis Scott Key Bridge at Georgetown; usual depths are 18 to 20 feet but, in April 1953, a 12-foot shoal extended across the channel at a point about 0.8 mile above Hains Point.

A **measured nautical mile** on course **337°** begins just above Hains Point. The front markers are yellow triangles on the **Potomac Park** seawall rail, and the rear markers are yellow diamond shapes on poles. The half-mile markers are yellow rectangles with black vertical center lines.

The railroad **bridge** 1.3 miles above Hains Point and 96 miles above the mouth of Potomac River has a swing span with a horizontal clearance of 104 feet and a vertical clearance of 18 feet; the northeast opening is used. The highway bridge 200 yards above the railroad bridge has a bascule span with a horizontal clearance of 106 feet and a vertical clearance of 25 feet. The highway bridge 350 yards above the railroad bridge has a swing span with a horizontal clearance of 99 feet and a vertical clearance of 18 feet; the northeast opening is used. **Regulations** governing operation of the drawspans are given in **§ 203.325,** Chapter 2A.

On the northeast side of Potomac River 200 yards above the highway swing bridge is the entrance to the **Tidal Basin;** depths are about 4 feet in the entrance and 8 to 10 feet in the basin.

Directly across Potomac River from the Tidal Basin is the **Pentagon Lagoon.** Depths are about 5 feet in the entrance and 7 to 10 feet in the lagoon. The fixed bridge over the entrance is a stone arch, 100 feet between piers, with a vertical clearance of 18 feet over the middle 41 feet. On the north side of the lagoon just above the bridge is a marina with extensive berthing facilities; gasoline, water, and ice are available. The 2-foot shoal off the marina is marked. **Boundary Channel,** which extends northward from the lagoon between **Columbia Island** and the Virginia shore, is shallow and is crossed by several fixed bridges.

Arlington Memorial Bridge, 2.3 miles above Hains Point and 97 miles above the mouth of Potomac River, has a bascule span with a horizontal clearance of 142 feet and a vertical clearance of 30 feet; **regulations** governing operation of the drawspan are given in **§ 203.325,** Chapter 2A. Harbor regulations prescribe a **speed** limit of 6 statute miles per hour above the bridge.

Theodore Roosevelt Island, on the west side of Potomac River 97.5 miles above the mouth, is a park area. Boats should not attempt to pass between the island and the Virginia shore.

Francis Scott Key Bridge, 98.3 miles above the mouth of Potomac River, connects **Georgetown** on the Washington side with **Rosslyn** on the Virginia side. The bridge has a fixed channel span, 207 feet between piers, with a vertical clearance of 61 feet over a middle width of 80 feet. The stone piers of the former Aqueduct Bridge, just above Key Bridge, are 109 feet apart and stand 3 to 5 feet above the water.

The commercial wharves of Georgetown are between Key Bridge and Rock Creek, 0.6 mile down river. The wharves, which are mostly of the bulkhead type, are privately owned and are used by tugs, barges, and tankers. A small tanker wharf is just below the Rosslyn end of the bridge.

Above Key Bridge, Potomac River is unmarked and very rocky but there is good water along the Virginia shore; barges go to within 0.5 mile of **Chain Bridge,** 101 miles above the mouth. Several boat clubs are just above the Georgetown end of Key Bridge.

5 An **anchorage area** has been established by the District of Columbia on the shoals between Key Bridge and the **Three Sisters Islands,** which are on the Georgetown side 0.5 mile above the bridge; the area is marked by buoys. No vessel shall anchor between the designated area and the shores.

CHAPTER 13

Chesapeake Bay Western Shore

Patuxent and Severn Rivers

Charts 1224 to 1226

FROM Potomac River to Patuxent River, the western shore of Chesapeake Bay is mostly low, although the 100-foot contour does come to within a mile of the water midway between the two rivers. Above Patuxent River, the ground rises, and 100-foot elevations are found close back of the shore along the unbroken stretch northward to Herring Bay. Above Herring Bay, the 100-foot contour is pushed back by the tributaries. Except for the developed areas, the shore is mostly wooded.

The bay channel has depths of 39 feet or more and is well marked by lights and buoys. The principal tributaries are Patuxent River, Herring Bay, West River, South River, Severn River, and Magothy River.

The **fish-trap areas** that extend along this entire section of the western shore are marked at their outer limits and are shown on the charts. **Ice** is encountered in the tributaries, particularly during severe winters.

Chart 1224.—The **danger zone** of an aerial gunnery range and target area begins off Point Lookout and extends northward to Cedar Point; limits of the area and regulations governing it are given in **§ 204.42,** Chapter 2A.

A middle ground with depths of 13 to 18 feet is about 8 miles eastward of Point Lookout; the area within the 18-foot curve is about 5 miles long in a north-south direction and 2 miles wide. The stranded wreck near the middle of the shoal is marked by lighted buoys; the wreck is 3 miles due east of a point 68 miles along Chesapeake Bay main channel from the Virginia Capes.

Chart 557.—St. Jerome Creek, on the west side of Chesapeake Bay 5 miles north of Point Lookout, has general depths of 4 to 8 feet above the dredged entrance and is used principally as an anchorage for oystering and fishing boats. The Federal project provides for a channel 100 feet wide and 7 feet deep from the bay to the vicinity of Airdele, thence 60 feet wide to deep water in the creek; the controlling depth was 7 feet in 1950. The entrance is marked by buoys and a lighted range.

There are several small wharves along St. Jerome Creek. The landing at **Airdele,** on the south side just above the entrance, has depths of about 5 feet at the channel face; gasoline is available.

Point No Point, on the west side of Chesapeake Bay 6 miles north of Point Lookout, has no prominent natural marks. **Point No Point Light (lat. 38°07′.7, long.**

76°17′.4), 52 feet above the water and visible 13 miles, is shown from a white octagonal brick dwelling on a brown cylinder, in depths of 22 feet, 1.6 miles southeastward of the point; the light has a fog signal. *Point No Point Light is 1.7 miles due west of a point 73.5 miles along Chesapeake Bay main channel from the Virginia Capes.*

An **aerial target** is 1 mile due west of a point 79 miles along Chesapeake Bay main channel from the Virginia Capes; limits of the prohibited area and regulations governing it are given in § **204.42,** Chapter 2A. The 200-yard-square target area has rock and concrete piers at the corners and in the center, all in depths of 37 feet. Each pier is 50 feet in diameter and 12 feet high; the corner piers are marked by lights, and one has a fog signal. Lighted buoys are moored east and west of the target.

Hooper Island Light (lat. 38°15′.4, long. 76°15′.0), 63 feet above the water and visible 13 miles, is shown from a white conical tower on a brown cylinder base, in depths of 18 feet near the outer edge of the shoals, 3 miles westward from Hooper Islands; the light has a fog signal. *Hooper Island Light is 3 miles due east of a point 82 miles along Chesapeake Bay main channel from the Virginia Capes.*

Chart 553.—The inclosed Navy **seaplane** basin 8.5 miles north-northwestward of Point No Point and 2 miles southwestward of Cedar Point has depths of about 10 feet; a light marks the outer end of the north breakwater.

Cedar Point is 10 miles north by west of Point No Point. A light, 45 feet above the water, is shown from a tower on dwelling on a tiny islet 0.3 mile off the point and 85 miles above the Virginia Capes. The shoal that extends 0.5 mile eastward from the light is marked at its outer end by a lighted bell buoy.

Patuxent River empties into the west side of Chesapeake Bay 86 miles above the Virginia Capes. Commercial traffic consists chiefly of logs and pulpwood, shellfish and shells, and petroleum products. Drafts of vessels using the river are mostly 7 feet or less and seldom exceed 11 feet.

The river has natural depths of 27 feet in the approach, 30 to 100 feet for 16 miles upstream, thence 23 feet to the Benedict highway bridge 19 miles above the mouth, thence 14 to 9 feet for 14 miles to Nottingham, and thence about 7 feet to Bristol Landing, 39 miles above the mouth. The channel is fairly easy to follow as far as the Benedict bridge, and the principal shoals are marked by lights and buoys; the channel above the bridge is narrow in places and is marked only by an occasional buoy.

Vessels frequently **anchor** off the mouth of Patuxent River for the night; shelter from westerly winds is found in depths of 20 to 30 feet close to shore on the north side of the approach. Shelter from easterly winds is found in depths of 30 to 60 feet in the channel about 1.5 miles above the entrance.

Bottom in Patuxent River channel is mostly soft as far as the Benedict highway bridge, and vessels can anchor where convenient. Small vessels anchor in the creeks back of Solomons Island but there is little swinging room. St. Leonard Creek is a good small-vessel anchorage in any weather.

The mean range of **tide** is about 1 foot at the entrance to Patuxent River, 1½ feet at Benedict, and 2½ feet at Nottingham. **Current** information for several places in the river is given in the *Current Tables.* **Ice** closes the river to near the mouth in severe winters.

The principal places along Patuxent River for **supplies** and small-vessel **repairs** are in the creeks back of Solomons Island. Supply and repair facilities also are available in Cuckold Creek.

Patuxent River empties into the head of the bight between Cedar Point and **Cove Point,** 5 miles to the northward. **Cove Point Light (lat. 38°23′.2, long. 76°22′.9),** 45 feet above the water and visible 12 miles, is shown from a white tower on the point; the radiobeacon and the fog signal are synchronized for distance finding. *Cove Point Light is 1 mile due west of a point 90 miles along Chesapeake Bay main channel from the Virginia Capes.* The daytime **vessel-reporting station** at the light communicates with Baltimore by telephone. The high bluffs on **Little Cove Point,** 1.5 miles to the southward, are prominent.

The entrance to Patuxent River is between **Drum Point** and **Fishing Point,** 0.9 mile to the southward; the mid-channel point is *4 miles west of the 86-mile point in the bay channel.* The shoals that extend off Fishing Point and **Hog Point,** a mile to the east-northeastward, are marked at their outer ends by lighted buoys.

Drum Point Light (lat. 38°19′.2, long. 76°25′.3), 46 feet above the water and visible 12 miles, is shown from a white hexagonal house on brown piles in depths of 1 foot at the point; the light has a fog signal. *Drum Point Light is 4 miles due west of a point 86 miles along Chesapeake Bay main channel from the Virginia Capes.*

The **Patuxent River Naval Air Station** is along the south side of the entrance. The inclosed seaplane basins 0.8 and 1.5 miles from the mouth have general depths of 11 to 15 feet. A **restricted area** off the Naval Air Station begins at the mouth of the river and extends upstream about 2.5 miles; limits of the area and regulations governing it are given in **§ 207.125,** Chapter 2A.

Solomons Island, on the north side of Patuxent River 2 miles above the mouth, is joined to the mainland on the northwest by a causeway. The shoal that extends 500 yards southward from **Sandy Point,** at the south end of the island, is marked at its outer end by a lighted buoy. **Solomons** (*P. O.*), the village on the island, is populated mostly by oystermen and fishermen. The wharf of the **Chesapeake Biological Laboratory** on the east side of the island has depths of 8 feet at the outer end and is marked by a light; **storm warnings** are displayed, daytime only, on the wharf.

Back Creek and **Mill Creek** have a common entrance between Solomons Island and the mainland 200 yards to the north-northeastward. The main approach, between the island and the shallow middle ground to the eastward, has depths of 20 to 25 feet and is marked by lights and a lighted buoy. The second approach, between the middle ground and the mainland to the northward, has depths of 12 feet and is marked by buoys.

The two creeks separate just above the entrance. Mill Creek goes eastward of a shallow spit with a small islet at the southern end, and Back Creek goes westward; the spit and the islet are marked by lights.

The Back Creek cove between the islet and the inner side of Solomons has general depths of 15 feet and is used as an anchorage by many yachts and fishing boats. The marine service pier has depths of 15 feet at the outer end; gasoline, Diesel oil, fresh water, ice, provisions, and some marine supplies are available. The marine railway in the cove can handle vessels up to 75 feet in length; the local machine shop repairs gasoline and Diesel engines and does hull work.

Back Creek has depths of 12 feet for 0.5 mile above the cove, thence 10 to 6 feet for

another 0.7 mile. The numerous piers along the creek have depths of 7 to 12 feet at their outer ends.

Mill Creek has depths of 16 to 12 feet for 1.2 miles, thence 10 to 4 feet for another mile. The marine railway on the east side 0.4 mile above the entrance has a hauling capacity of 75 tons and can handle vessels up to 125 feet in length.

Town Point is on the southwest side of Patuxent River 3 miles above the mouth. There are small landings along the north side of the low point.

Point Patience is on the northeast side of Patuxent River 3.6 miles above the mouth. A light is shown from a pile structure in depths of 6 feet near the tip of the point, and a buoy marks the shoal just outside the light. The long Government piers on the east and west sides of the point have depths of 20 feet or more at their outer ends; limits of the **restricted area** in the vicinity of these piers and regulations governing it are given in **§ 207.125,** Chapter 2A.

Mill Creek and **Cuckold Creek** have a common entrance on the west side of Patuxent River 4.5 miles above the mouth. A buoy marks the outer end of the shoal that extends 0.4 mile southeastward from the point on the north side of the entrance. Mill Creek, which extends southwestward from the entrance, has depths of 15 to 10 feet for a mile, thence 8 to 3 feet for another 0.5 mile to the head.

Cuckold Creek, which extends northwestward from the entrance, has depths of 15 to 11 feet for a mile, thence 10 to 4 feet into the several arms. A marine service dock, with depths of 6 feet at the outer end, is on the south side of Cuckold Creek 0.9 mile above the entrance; gasoline and ice are available. The marine railway at the dock can handle boats up to 75 feet in length and 50 tons in weight.

Hellen Creek, on the east side of Patuxent River 5.5 miles above the mouth, has depths of 3 feet over the bar at the entrance, thence 11 to 5 feet for a mile; the deeper water favors the east side of the entrance and is marked by a lighted range. The creek is used principally as a small-boat harbor.

St. Leonard Creek, on the northeast side of Patuxent River 7 miles above the mouth, has depths of 15 to 10 feet for 2 miles, then shoals gradually to 1 foot at the head, 3.5 miles above the entrance. Safe anchorage in any weather is available in depths of 15 to 21 feet 0.5 mile above the entrance. The shoal that extends 0.4 mile southward from **Petersons Point,** on the northwest side of the entrance, is marked at its outer end by a light.

Sotterley Wharf is on the southwest side of Patuxent River 8 miles above the mouth.

Broome Island, actually a mainland peninsula, is on the northeast side of Patuxent River 9.5 miles above the mouth. A light is shown from a pile structure in depths of 6 feet 0.2 mile southward of the peninsula.

Island Creek, which empties into Patuxent River along the east side of Broome Island, has depths of 8 to 10 feet for a mile, but there are unmarked shoals, particularly along the west side of the entrance; a light marks the east side of the entrance.

The village of **Broome Island** (*P. O.*) is on the west side of Island Creek about a mile from the outer end of the peninsula. There is a marine railway that can haul out boats up to 40 feet in length and 3 feet in draft. Gasoline, ice, and provisions are available in small quantities.

Parkers Wharf is on the northeast side of Patuxent River 11 miles above the mouth. The best water in the approach is from south-southeastward.

Battle Creek, on the northeast side of Patuxent River 13 miles above the mouth, has depths of 10 to 7 feet for 1.5 miles, but local knowledge is needed to navigate between the 2-foot shoals on either side of the channel just above the entrance. The shoal that extends 0.3 mile southwestward from the point on the east side of the entrance is marked at its outer end by a light.

Sheridan Point is on the northeast side of Patuxent River 16 miles above the mouth. Directly across the river are **Persimmon Creek** and **Washington Creek,** with depths of 7 feet in a common entrance, but shallow above and little used.

Trent Hall Creek, on the southwest side of Patuxent River 17.5 miles above the mouth, and **Indian Creek,** a mile farther up, have depths of 5 feet in the entrances, thence 3 feet for about 0.6 mile upstream.

The highway bridge that crosses Patuxent River 19 miles above the mouth from **Town Point** on the west side to **Hallowing Point** on the east side has a swing span with a horizontal clearance of 50 feet and a vertical clearance of 15 feet; **regulations** governing operation of the drawspan are given in § **203.245,** Chapter 2A.

Benedict (*P. O.*), a village just below the west end of the highway bridge, is the head of commercial navigation on Patuxent River. The marine service dock at Benedict has depths of 6 feet at the outer end; gasoline, water, and ice are available. Other docks along the water front have depths of 5 to 9 feet at their outer ends.

Fish traps and stakes make navigation difficult above Benedict. **Swanson Creek,** on the west side of Patuxent River 20.5 miles above the mouth, has depths of 4 to 2 feet for a mile but is little used.

Hunting Creek, on the east side of Patuxent River 21.5 miles above the mouth, has depths of 5 to 4 feet for a mile, thence 3 feet for another 2 miles. The creek is used by motorboats.

Lower Marlboro (*P. O.*) is a village on the east side of Patuxent River 28 miles above the mouth. The State landing has depths of 12 feet at the face.

Nottingham is a village on the west side of Patuxent River 33 miles above the mouth. The landing is in ruins.

The abandoned railroad bridge, with superstructure removed, 38 miles above the mouth of Patuxent River, has a horizontal clearance of 78 feet; only the west channel opening is used.

Western Branch of Patuxent River, 38.2 miles above the mouth, is navigable for only a short distance. **Upper Marlboro** (*P. O.*), 3.5 miles up Western Branch and 2 miles west of Hills Bridge, is a village along the railroad.

Bristol Landing is on the east side of Patuxent River 39 miles above the mouth. **Hills Bridge,** 40 miles above the mouth, has a single fixed span with a vertical clearance of 7½ feet.

Between Cove Point and **Rocky Point,** 2.4 miles to the northwestward, is a **measured nautical mile** on course **322°.** The range markers at the ends of the course are targets 4 feet square, with 2-foot black circles, on piles. The rear markers are about 230 yards from shore, and the front markers are 200 yards farther off. The markers are unlighted.

Flag Harbor, 6.3 miles northwest of Cove Point, has an entrance channel with depths said to be at least 6 feet. The 600-foot stone jetties on either side of the entrance are marked by privately maintained lights. The dredged basin back of the jet-

ties is L-shaped. Gasoline and lubricating oils are available; water must be carried from shore.

Chart 551.—Kenwood Beach, 9 miles northwest of Cove Point, has a small-boat pier. **Dares Beach,** 12.5 miles northwestward of Cove Point, has a prominent elevated tank.

Plum Point, 15 miles above Cove Point and 104.5 miles from the Virginia Capes, has a small yacht basin with a bulkheaded entrance that has depths of about 2 feet. The ruins of a pier are 0.4 mile south of the basin.

The **danger zone** of the **Naval Research Laboratory** firing range extends out from the western shore of Chesapeake Bay 107 miles above the Virginia Capes; limits of the area and regulations governing it are given in **§ 204.32,** Chapter 2A.

Chesapeake Beach is a summer resort on the western shore of Chesapeake Bay 109 miles above the Virginia Capes. The wharf ruins that extend a half mile into the bay are marked at their outer end by a light.

Fishing Creek empties into Chesapeake Bay along the north side of Chesapeake Beach. A Federal project provides for a channel 7 feet deep with widths of 100 feet and 60 feet from deep water in the bay to an anchorage basin in the marsh 500 feet above the mouth of the creek, and for twin stone jetties about 1,000 feet long; the controlling depth was reported to be 5 feet in 1952. Lights mark the outer ends of the jetties, and a lighted range marks the channel.

A fixed highway bridge 250 yards above the inner ends of the Fishing Creek jetties has a horizontal clearance of 36 feet and a vertical clearance of 10 feet. Gasoline, Diesel oil, water, and ice are available at the bulkhead on the south side of the entrance.

North Beach is a small resort about a mile north of Chesapeake Beach. A pier with depths of about 3 feet at the outer end has good mooring facilities for small boats. Gasoline is available.

Chart 550.—Holland Point, on the western shore of Chesapeake Bay 111 miles above the Virginia Capes, has shoal areas extending in all directions; depths of 11 feet are 1.3 miles to the eastward and northeastward. Buoys mark the outer edges of the shoals.

Herring Bay, between Holland Point and the marsh 3 miles to the northward, has general depths of 14 to 7 feet and is used considerably as an anchorage. **Long Bar,** with depths of 2 to 5 feet, extends from the north side of the bay to within a mile of Holland Point and is marked at its south end by a light. Good westerly-weather anchorage is available in depths of 15 to 20 feet east of the bar; small vessels usually anchor west of the bar in depths of 7 to 12 feet, protected somewhat from easterly weather by the bar.

Rockhold Creek, at the northwest corner of Herring Bay, has good shelter for small boats. A Federal project provides for a channel 7 feet deep and 60 feet wide from the 7-foot contour in Herring Bay to the vicinity of the county wharf on Rockhold Creek, with a turning basin at the head of the channel and a 900-foot stone breakwater on the east side of the entrance; the controlling depth was 6 feet in 1947.

A light marks the outer end of the breakwater, and lights and daybeacons mark the dredged channel. The mean range of **tide** is about 1 foot.

There are several small communities along the shores of Herring Bay and Rockhold Creek. **Fairhaven** is on the west side of the bay and **Deale** is on the east side of the creek.

The fixed highway bridge a mile above the entrance to Rockhold Creek has a horizontal clearance of 19 feet and a vertical clearance of 10 feet. The improved channel extends almost to the bridge; depths above the bridge are 3 to 2 feet. Most of the piers along the creek have channel depths at their outer ends. Gasoline, Diesel oil, water, ice, and provisions are available. The marine railway can handle boats up to 50 feet in length and 20 tons in weight; repairs are made to gasoline and Diesel engines.

West River, on the west side of Chesapeake Bay 119 miles above the Virginia Capes, has depths of 14 to 12 feet for 1.5 miles, then shoals gradually to 7 feet 3 miles above the mouth. Shoals extend nearly to mid-river off some of the points. The channel is marked by buoys and lights. The mean range of **tide** is about 1 foot.

Parish Creek, on the south side of West River 0.5 mile above the mouth, has general depths of 2 to 3 feet but has been improved by dredging. The Federal project provides for a channel 8 feet deep and 50 feet wide from deep water in West River to the head of the south fork of Parish Creek, and an anchorage basin 6 feet deep at the junction of the two forks; the controlling depth was 5 feet in 1948. The entrance channel is marked by lights.

Shadyside is at the head of the south fork of Parish Creek. Depths at the landings are about 5½ feet. Gasoline is available at several of the landings. A marine railway in the south fork can handle boats up to 50 feet in length and 20 tons in weight; a nearby shop repairs gasoline and Diesel engines and does hull work. Another railway in the west fork has about the same capacity.

Rhode River, on the north side of West River a mile above the mouth, has depths of 11 to 9 feet for 2 miles. A light marks the shoal on the east side of the entrance, and daybeacons mark the inner channel.

Cadle Creek, on the east side of Rhode River a mile above the mouth, has depths of 4 to 7 feet. Gasoline, water, ice, and provisions are available at **Mayo** (*P. O.*), on the east side of Cadle Creek 0.3 mile above the entrance. A marine railway in the creek can handle boats up to 45 feet in length; a local machine shop repairs gasoline and Diesel engines and does hull work. There is a yacht club on the west side 0.5 mile above the entrance.

Bear Creek, on the north side of Rhode River 1.5 miles above the mouth, has depths of 9 to 5 feet for a mile. **Carr Wharf,** on the east side of the entrance, has depths of 10 feet at the outer end. A marine railway in the creek can haul out boats up to 40 feet in length and 4 feet in draft.

Contees Wharf, on the north side of Rhode River 2 miles above the mouth, is in ruins. The wharf about 200 yards to the westward has depths of 7 feet at the outer end.

Galesville is on the northwest side of West River 2.5 miles above the mouth. The wharves have depths of about 6 feet at the outer ends. Gasoline, water, ice, and provisions are available. A boatbuilding yard at Galesville can haul out vessels up to 65 feet in length and 6 feet in draft.

South River, on the west side of Chesapeake Bay 121 miles above the Virginia Capes, has depths of 14 feet for 6 miles, thence 13 to 8 feet for a mile, then shoals gradually to 2 feet at the head, 8.5 miles above the bay. Several of the creeks that empty

into the river have good depths and are used extensively by local yachts and motorboats. Buoys mark the principal shoals in the lower half of the river.

The entrance to South River is between **Saunders Point** and **Thomas Point,** 1.8 miles to the northeastward. **Thomas Point Shoal Light (lat. 38°53′.9, long. 76°26′.2),** 43 feet above the water and visible 12 miles, is shown from a white hexagonal structure on brown piles, in depths of 7 feet near the outer end of the shoal, 1.2 miles east-southeastward of the point; the radiobeacon and the fog signal are synchronized for distance finding. *Thomas Point Shoal Light is 1 mile due west of a point 121.5 miles along Chesapeake Bay main channel from the Virginia Capes.*

Selby Bay, on the southwest side of South River 1.7 miles above the mouth, has general depths of 8 to 11 feet. The channel to **Selby Beach,** on the northwest side of the bay, is marked by daybeacons. A yacht club is on the south side of Selby Beach. A marine service pier at the community has depths of 9 feet at the outer end; gasoline, water, and ice are available. A marine railway in the southern part of the bay can handle boats up to 35 feet in length; gasoline and water are available.

Ramsay Lake has a narrow entrance from the south end of Selby Bay; depths are about 2 feet in the entrance and 7 to 8 feet in the lake. The fixed highway bridge over the Selby Bay entrance has a horizontal clearance of 18 feet and a vertical clearance of 9½ feet. A shallow canal at the northeast end of the lake permits direct passage into South River and is the entrance most used.

Brewer Creek, on the southwest side of South River 3 miles above the mouth, has a controlling depth of about 5 feet through the narrows 0.2 mile above the entrance. A marine railway at the head of the southeast arm can haul out boats up to 35 feet in length.

Glebe Creek, on the southwest side of South River 3.5 miles above the mouth, has depths of 16 to 11 feet for a mile. A marine railway in the cove on the north side just above the entrance can handle boats up to 40 feet in length.

The highway bridge at **Edgewater,** 5 miles above the mouth of South River, has a swing span with a horizontal clearance of 70 feet and a vertical clearance of 13 feet. The marine service pier just below the south end of the bridge has depths of 14 feet at the outer end; gasoline, water, and ice are available.

A **speed** limit of 8 statute miles per hour, between May 1 and May 15, is prescribed by **§ 207.120,** Chapter 2A, for the part of South River, including tributaries, above the Edgewater bridge.

Beards Creek, on the south side of South River 5.7 miles above the mouth, has depths of 15 to 8 feet for a mile; a shallow spit extends halfway across the entrance from the point on the northwest side. A marine railway on the west side of Beards Creek 0.5 mile above the entrance can handle boats up to 50 feet in length and 6 feet in draft.

The highway bridge at **Riva,** 6 miles above the mouth of South River, has a swing span with a horizontal clearance of 40 feet and a vertical clearance of 8 feet; **regulations** governing operation of the drawspan are given in **§ 203.245,** Chapter 2A.

Chart 566.—Severn River, the approach to Annapolis, empties into the west side of Chesapeake Bay 125 miles above the Virginia Capes. Commercial traffic consists chiefly of petroleum products, sand and gravel, and some shellfish. Drafts of vessels using the river are as much as 14 feet but are mostly 6 feet or less.

The river has depths of 18 feet or more for 9 miles, thence 15 to 7 feet for 1.5 miles to within a mile of the head. The channel is well marked as far as Annapolis, above which it is marked at the critical points and is easy to follow.

The mean range of **tide** is about 1 foot and is greatly influenced by winds. The velocity of the tidal **current** seldom exceeds ½ knot. **Ice** seldom interferes with navigation except in severe winters and then only for a short time.

The entrance to Severn River is between Tolly Point and Greenbury Point, 2 miles to the northward. **Tolly Point** is wooded and has many houses. **Tolly Point Shoal,** with depths of 4 to 5 feet, extends a mile east-southeastward from the point and is marked at its outer end by a lighted buoy.

The entrance to **Lake Ogleton** is on the southwest side of Severn River 0.8 mile above Tolly Point. The lake has depths of 7 to 9 feet but the narrow entrance is only about 2 feet deep. The small private wharves along the shore of the lake are used chiefly for mooring pleasure craft.

The **Annapolis Roads Club** is on the southwest side of Severn River a mile above Tolly Point. The clubhouse halfway up the wooded slope back of the shore is prominent. The wharf has depths of 10 feet at the outer end.

Greenbury Point is on the north side of the entrance to Severn River. The tall towers of the Naval radio station on the point are prominent from up and down the bay; each tower has a flashing red light on top and fixed red lights at ⅓ and ⅔ the height.

Greenbury Point Shoal Light (lat. 38°58′.1, long. 76°27′.3), 40 feet above the water and visible 12 miles, is shown from a red skeleton tower on piles in depths of 9 feet 0.4 mile south of the point; the fog signal operates from September 15 to June 15. *Greenbury Point Shoal Light is 3 miles due west of a point 126 miles along Chesapeake Bay main channel from the Virginia Capes.* A 3-foot depth at the outer tip of the shoal is 250 yards westward of the light and only 100 yards northeastward of the buoyed entrance channel.

A Naval deep-draft **anchorage area** is southeast of Greenbury Point, and several smaller Naval anchorages and areas where anchorage is prohibited are west and northwest of the point; limits of the areas and regulations governing them are given in **§ 202.159,** Chapter 2A.

Seaplane **restricted areas** extend eastward from Greenbury Point and southward from Tolly Point; limits of the areas and regulations governing them are given in **§ 207.115,** Chapter 2A.

Back Creek, on the southwest side of Severn River 0.7 mile above the mouth, has depths of 7 to 9 feet for most of its 1-mile length. A light marks the outer end of the breakwater on the south side of the entrance, and a light and a daybeacon mark the south side of the narrow entrance channel. The creek is used mostly by oyster and fish boats drawing 3 to 5 feet. There are numerous small piers at **Eastport,** on the peninsula between Back Creek and Spa Creek, to the northwestward. The boatyards along Back Creek can haul out and make ordinary repairs to vessels up to 45 feet in length and 4 feet in draft. Gasoline and supplies are available.

Spa Creek, on the southwest side of Severn River 1.4 miles above the mouth, has depths of 14 to 12 feet for 0.5 mile, thence 10 to 6 feet for 0.7 mile to near the head. Drafts of vessels using the creek are mostly 10 feet or less. The largest of the marine railways along the south, or Eastport, side of the creek can handle vessels up to 125

feet in length, 11 feet in draft, and 300 tons in weight; vessels are built and general repairs are made. Marine supplies and provisions are available.

The highway bridge that crosses Spa Creek from Eastport to Annapolis 0.4 mile above the entrance has a bascule span with a horizontal clearance of 40 feet and a vertical clearance of 16 feet.

Annapolis, the capital of Maryland, is on the north side of Spa Creek. The **United States Naval Academy** occupies the entire northeastern part of the city between Spa Creek and Dorseys Creek, 0.7 mile to the northwestward. Annapolis is a **customs** port of entry at which marine documents are issued. **Storm warnings** are displayed day and night on the southeast seawall.

The two inclosed basins on the Severn River side of Annapolis and most of the water front on the north side of Spa Creek below the highway bridge are Naval Academy installations; the basins have depths of 14 and 18 feet, and the bulkheads and wharves in Spa Creek have depths of 6 to 12 feet at their faces.

Market Slip, 250 yards below the north end of the highway bridge over Spa Creek, is 250 yards long and 40 yards wide and has depths of 10 to 8 feet; the slip is open to the public and is used extensively by small craft.

The marine service dock just below the north end of the Spa Creek bridge has depths of 10 feet at the outer end; gasoline, Diesel oil, fresh water, ice, and marine hardware are available.

On the northeast side of Severn River across from Spa Creek are other Naval installations. The inclosed basin on the west side of **Carr Point** has depths of about 12 feet. A **restricted area** extends around the U. S. Naval Engineering Experiment Station northwest of the basin; limits of the area and regulations governing it are given in **§ 207.116,** Chapter 2A.

Dorseys Creek, on the southwest side of Severn River 2.1 miles above the mouth, has depths of 11 to 8 feet for most of its 1-mile length; the best water in the entrance is along the south side. Four drawbridges cross the creek from Annapolis on the southeast bank to **West Annapolis** on the northwest bank; minimum clearances through the swing span in the first and the bascule spans in the others are 40 feet horizontally and 5 feet vertically. **Regulations** governing operation of the drawspans in the second and third bridges, close together, are given in **§ 203.245,** Chapter 2A.

The highway **bridge** 2.4 miles above the mouth of Severn River has a bascule span with a horizontal clearance of 75 feet and a vertical clearance of 16 feet; **regulations** governing operation of the drawspan are given in **§ 203.310,** Chapter 2A. The railroad bridge 3 miles above the mouth has a swing span with a horizontal clearance of 62 feet and a vertical clearance of 6 feet.

Weems Creek, on the southwest side of Severn River 3.2 miles above the mouth, has depths of 13 feet for 0.8 mile, thence 11 to 9 feet for 0.3 mile to near the head. An unmarked shoal extends 300 yards eastward from the point on the north side of the entrance. The highway bridge 0.5 mile above the entrance has a swing span with a horizontal clearance of 28 feet and a vertical clearance of 6 feet; **regulations** governing operation of the drawspan are given in **§ 203.245,** Chapter 2A.

The fixed highway **bridge** 3.5 miles above the mouth of Severn River has a horizontal clearance of 134 feet and a vertical clearance of 80 feet.

Round Bay, beginning 6 miles above the mouth of Severn River and continuing for 2 miles, is merely an expansion of the river. The bay has general depths of 17 to 23 feet and is traveled extensively by motorboats.

Forked Creek, on the north side of Severn River 9 miles above the mouth, has depths of 16 to 10 feet for most of its 0.4-mile length. The marine service pier in the creek has depths of 9 feet at the outer end; gasoline, fresh water, and ice are available. The marine railway at the pier can handle boats up to 50 feet in length and 25 tons in weight; a machine shop in the vicinity repairs gasoline and Diesel engines and does hull work.

Whitehall Bay, on the west side of Chesapeake Bay, is between Greenbury Point and **Hackett Point,** 1.5 miles to the northeastward. The bay has general depths of 13 to 10 feet. The entrance channel is about 300 yards wide between **Whitehall Flats** on the west and **North Shoal** on the east, both with depths of 3 to 4 feet; a lighted buoy marks the outer end of North Shoal.

Mill Creek, which empties into the northwest corner of Whitehall Bay, has depths of 3 feet over the bar across the entrance, thence 7 to 14 feet for 1.5 miles to near the head.

Whitehall Creek, which empties into the northeast corner of Whitehall Bay, has depths of 13 to 10 feet for a mile, then shoals gradually to 1 foot at the head, 0.8 mile farther up. The narrow, crooked entrance channel is marked by daybeacons. The marine service pier on the northeast side of Whitehall Creek 1.4 miles above the entrance has depths of about 8 feet at the outer end; gasoline, Diesel oil, water, and ice are available. The marine railway at the pier can handle boats up to 50 feet in length and 50 tons in weight; the machine shop repairs gasoline and Diesel engines.

Meredith Creek, which empties into the northeast corner of Whitehall Bay just eastward of Whitehall Creek, has depths of about 6 feet in a very narrow entrance, thence 10 to 7 feet for 0.7 mile, then shoals gradually to 1 foot at the head, 0.6 mile farther up.

Chesapeake Bay Bridge (*see also Charts 550 and 1225*), 127.5 miles above the Virginia Capes, is 3.7 miles long from shore to shore; the western end is 0.5 mile southwestward of Sandy Point, and the eastern, or Kent Island, end is 4 miles south-southwestward of Love Point.

The suspension span over the main channel 1.4 miles from the western end of the bridge has a horizontal clearance of 1,500 feet and a vertical clearance of 187 feet. Flashing red aviation obstruction lights, 354 feet above the water, mark the tops of the two suspension towers. The center of the span is marked by a range of two green lights mounted just below the outermost edges of the span structure; a set of three white lights is arranged in a vertical line above each green light. A fog signal is mounted on each side of the center of the span.

The fixed span over the secondary channel 1.2 miles from the eastern end of the bridge has a horizontal clearance of 690 feet and a vertical clearance of 62 feet. The center of the span is marked by a range of two green lights similar to those on the suspension span. A fog signal is mounted at the center of the span.

Red lights mark the ends of the bridge piers, except those adjacent to the main channel, between points 0.3 mile from the western end and 1 mile from the eastern end. Lighted buoys mark the main channel on either side of the bridge.

Sandy Point Light (lat 39°01′.0, long. 76°23′.1), 51 feet above the water and visible 13 miles, is shown from a red brick dwelling, with white roof, on a brown cylinder pier in depths of 13 feet 0.4 mile northeastward of **Sandy Point.** The light has a fog signal and is equipped for **radio direction-finder calibration service;** see *Light List* for alerting whistle signals and operational information. *Sandy Point Light is 0.5 mile due west of a point 129 miles along Chesapeake Bay main channel from the Virginia Capes.*

Baltimore Light (lat. 39°03′.5, long. 76°24′.0), 52 feet above the water and visible 12 miles, is shown from a white, octagonal, brick dwelling on a brown cylinder pier, in depths of 22 feet, 1.4 miles off the west, or Gibson Island, shore of the bay; the fog signal operates when the ice runs. *Baltimore Light is 0.4 mile due west of a point in Baltimore channel 131.5 miles above the Virginia Capes.*

Magothy River, which empties into the west side of Chesapeake Bay 1.7 miles westward of Baltimore Light, has depths of 12 feet or more for 6 miles. The river is used mostly by boats drawing 3 to 5 feet but it has been entered by vessels drawing 10 feet or more. There are many excellent anchorages in the numerous tributaries, and the area is a favorite cruising ground for local yachts. A light and a lighted buoy mark the entrance, and buoys mark the critical points along the lower half of the 12-foot channel.

The entrance to Magothy River is between **Persimmon Point** and Mountain Point, 0.5 mile to the north-northeastward. **Mountain Point,** the southernmost extremity of **Gibson Island,** is a sandy spit at the foot of a high wooded bluff; the peak of a pavilion on the point is prominent.

Deep Creek, on the south side of Magothy River 0.5 mile above the mouth, has depths of 7 to 5 feet for 0.6 mile to near its head. The creek is sometimes used as an anchorage by small craft.

Sillery Bay, which empties into the north side of Magothy River along the west side of Gibson Island, has general depths of 8 to 13 feet. The bay is the approach to Magothy Narrows and the harbor on the north side of Gibson Island; the eastern shore of the island is connected with the mainland on the north by a causeway.

The privately marked channel through **Magothy Narrows** has depths of about 10 feet, and there are depths of 9 to 10 feet in **Inner Harbor,** off the community of **Gibson Island.** The Gibson Island Yacht Club has facilities in the harbor. **Storm warnings** are displayed, daytime only, at Gibson Island.

A marine service pier on the east side of the entrance to **Redhouse Cove,** at the west end of Inner Harbor, has depths of 9 feet at the outer end; gasoline, water, and ice are available. A local boatyard can haul out vessels up to 50 feet in length and 6 feet in draft.

A **speed** limit of 8 statute miles per hour is prescribed by **§ 207.110,** Chapter 2A, for the waters between Magothy Narrows and Inner Harbor.

Blackhole Creek, on the north side of Magothy River 3.5 miles above the mouth, has depths of 1 foot in the entrance, thence 12 to 2 feet for most of its 0.5-mile length. A special small-vessel **anchorage area** is in the cove on the west side of Blackhole Creek 0.2 mile above the entrance; limits of the area and regulations governing it are given in **§ 202.72,** Chapter 2A.

Cypress Creek, on the southwest side of Magothy River 4 miles above the mouth, has depths of 7 to 9 feet for 0.4 mile, then shoals gradually to the flats at the head, 0.3 mile farther up; the entrance is marked by daybeacons. Gasoline, Diesel oil, water, ice, and marine supplies are available at a marine service pier on the south side of the entrance to the northwest arm. A marine railway on the southeast side of Cypress Creek 5
can haul out boats up to 75 feet in length and 30 tons in weight; a nearby machine shop repairs gasoline and Diesel engines and does hull work.

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CHAPTER 14

Chesapeake Bay Eastern Shore

Cape Charles to Chester River

Charts 1222 to 1226

THE Eastern Shore of Cheapeake Bay, from Cape Charles to Chester River, is mostly low and has few prominent natural features. The mainland and the islands are subject to erosion, and many of the islands and points have completely washed away. **Fish-trap limits** are shown on the charts and usually are marked by black and white horizontal-banded buoys. In the tributaries of Pocomoke Sound, **ice** sufficient to interfere with the navigation of small vessels may be encountered at any time from January through March. The ice from Pocomoke and Tangier Sounds does not interfere with the larger vessels in the bay, but the smaller oyster and fish boats frequently are held up, especially in Kedges and Hooper Straits, and sometimes require assistance.

Chart 1222.—Wise Point, the mainland tip of **Cape Charles,** is discussed in Chapter 9, which also describes Fisherman Island, Cape Charles Light on Smith Island, and the Atlantic entrance to Chesapeake Bay.

Kiptopeke Beach, 3.2 miles northward of Wise Point, is the Eastern Shore terminal of the automobile and passenger ferry that operates across the lower part of the bay to Little Creek. The breakwaters that protect the ferry dock consist of obsolete ships filled with sand and sunk end-to-end; they are marked by lights. Gasoline, water, and ice can be obtained on the dock. Just northward of the ferry terminal is **Butlers Bluff,** which has steep bare faces that are conspicuous from the bay.

Old Plantation Creek, about 7 miles northward of Wise Point, has depths of 1½ feet over the bar across the mouth and upstream for about 2 miles. Many of the bars and middle grounds are marked by discolored water and the channel is usually marked by bush stakes, but it is narrow and difficult to navigate without local knowledge. The opening in the thick woods at the mouth is visible from outside. No supplies are available along the creek.

Old Plantation Flats Light (lat. 37°13′.7, long. 76°02′.8), 39 feet above the water and visible 11 miles, is shown from a square white structure on brown piles, in depths of 10 feet, on the north end of the flats 1.5 miles off the creek; the light has a fog signal. *Old Plantation Flats Light is 4.5 miles due east of a point 19 miles along Chesapeake Bay main channel from the Virginia Capes.*

Cape Charles Harbor, 9 miles northward of Wise Point, is a dredged basin on the south side of the town of **Cape Charles.** A Federal project provides for a channel 18

feet deep and 500 feet wide from a point 0.3 mile northwest of Old Plantation Flats Light to the Cape Charles Harbor entrance, a distance of 2.4 miles; thence a basin in the harbor of the same depth, 600 to 1,000 feet wide, and 3,000 feet long; and thence a channel 10 feet deep, 100 to 180 feet wide, and 260 feet long to a basin of the same depth, 180 feet wide and 420 feet long, at the head of Mud Creek. The project also provides for a stone jetty on the north side of the harbor entrance and a sand mole on the south side. In 1947, controlling depths were 16 feet in the entrance channel and harbor and 10 feet in Mud Creek.

The channel into Cape Charles Harbor is well marked by lights, lighted ranges, buoys, and fog signals. The mean range of **tide** is 2½ feet. The tidal **currents** set across the entrance to the dredged channel, but farther north they follow the general direction of the axis. The channel is exposed to westerly winds but is partially protected by the flats to the westward and seldom is too rough for motorboats. Navigation is not hindered by **ice.** Because of the limited space in the channel and harbor, the larger vessels and tows occasionally are somewhat of a hazard to small boats.

Cape Charles is a **customs** port of entry where marine documents are issued. The town is a terminus of the Pennsylvania Railroad, which operates car floats to Little Creek. Gasoline, Diesel oil, water, ice, and provisions are available at Cape Charles.

Cape Charles Harbor is owned by the Pennsylvania Railroad but is open to general navigation. Small craft seeking shelter in the harbor should moor so as not to interfere with the railroad vessels. The larger vessels load and discharge at the wharf on the north side of the harbor, and fishing craft and other small boats make fast to the bulkhead on the south side and at the eastern end. Depths alongside the wharf range from 14 feet at the western end to 22 feet at the eastern end. The municipal bulkead on the south side of the inner basin is said to have depths of 5 to 9 feet alongside; gasoline is available in this basin.

Cherrystone Channel is a passage that leads from deep water about 2 miles south-southeastward of Old Plantation Flats Light, extends northward behind the flats and is followed to some extent for more than a mile by the inner part of the project channel leading to Cape Charles Harbor, and continues northward past the harbor to Kings Creek and Cherrystone Inlet. This channel has natural depths of 12 feet or more all the way from its southern end to the vicinity of **Cherrystone Island,** which is a mile north of the harbor, and is marked by buoys southward of the project channel and by buoys and lights to the northward.

Kings Creek empties into Cherrystone Channel from eastward opposite Cherrystone Island. A Federal project provides for a channel 8 feet deep, 100 feet wide, and about 1 mile long into Kings Creek from that depth in Cherrystone Channel and for an anchorage and turning basin 8 feet deep, 250 feet wide, and 500 feet long at the head of the channel. No work had been done on the project through 1952.

The creek has depths of 3½ feet over the bar across the entrance and upstream for about a mile. The shoal that extends out from the north side of the entrance bares at low water and is marked by buoys. Kings Creek is a good small-boat harbor and is used extensively by oystermen and yachtsmen. A marine railway along the creek can haul out boats up to 40 feet in length and 10 tons in weight for minor repairs. Gasoline and Diesel oil can be obtained at the landings just inside the entrance.

Cherrystone Inlet extends northeastward from Cherrystone Channel and Cherrystone Island. The inlet has depths of 9 feet to a point about 2 miles above the island,

thence 2 to 4 feet. The channel in the inlet sometimes is marked by bush stakes, but it is narrow and difficult to navigate without local knowledge.

Boats bound for Kings Creek or Cherrystone Inlet can leave the Cape Charles Harbor channel just west of the jetty on the north side of the harbor entrance and proceed northward in Cherrystone Channel. Depths of 2 to 4 feet over the flats that extend southward 2 miles along the west side of Cherrystone Channel from Cherrystone Island limit the draft that can be carried over that area from westward and northwestward. The area between Cherrystone Island and **Wescott Point,** which is on the west side of the entrance to Cherrystone Inlet and 0.5 mile north of the island, bares at low water.

An **explosives anchorage area** is 6.5 miles north-northwestward of Cape Charles Harbor and 4 miles offshore; limits of the area and regulations governing it are given in § **202.165,** Chapter 2A.

Chart 1223.—Mattawoman Creek and **Hungar Creek** have a common outlet to the bay 8 miles northward of Cape Charles Harbor. Hungar Creek extends about 4 miles in a northeasterly direction to the village of **Bridgetown.** The creek has depths of about 4 feet in a narrow channel for 2 miles, thence 3 feet for an additional mile, and thence about 1 foot to Bridgetown. The entrance to the creek is marked by lights. Some supplies can be obtained at Bridgetown.

Mattawoman Creek extends about 2 miles in a southeasterly direction and has several branches at its head. The creek has depths of about 4 feet for 1 mile in a narrow crooked channel, and thence 2 feet to the head of navigation. The best approach to the creek is to follow the lights as if entering Hungar Creek, and when almost to the innermost light, off **Wilsonia Neck,** turn right sharply and follow the bush stakes southeastward and southward along the shore.

A **danger zone** for Naval firing begins about 12 miles north-northwestward of Cape Charles Harbor and extends northward to Tangier Sound Light; limits of the area and regulations governing it are given in § **204.46,** Chapter 2A.

Nassawadox Creek, 13 miles northward of Cape Charles Harbor, extends about 5 miles in a northeasterly direction. The bar across the entrance is said to have a depth of only 1 foot, but there is deeper water inside. The entrance is marked by a buoy and a light. Above the entrance the channel is narrow and unmarked; the flats on either side are nearly bare at low water, are covered by marsh grass in the summer, and are usually well defined. The creek is used by local craft with drafts of not more than 3 feet. The mean range of **tide** is about 2 feet.

Church Creek, which empties into Nassawadox Creek from southeastward 1 mile above the mouth, has depths of about 2 feet to its head; it is little used. **Bayford** (*P. O.*), on the southeast side of Nassawadox Creek 1.5 miles above the mouth, has a wharf and a store.

Warehouse Creek, which empties into Nassawadox Creek from eastward 2 miles above the mouth, has depths of 3 feet to within a mile of **Franktown** (*P. O.*). **Stewarts Landing,** on the east side of Nassawadox Creek 4 miles above the mouth, has a small marine railway that can haul out boats up to 40 feet in length, 2½ feet in draft, and 5 tons in weight for minor repairs.

Occohannock Creek empties into Chesapeake Bay from eastward 18 miles north-

ward of Cape Charles Harbor; a fixed bridge 6 miles above the entrance is the head of navigation. A Federal project provides for a channel 9 feet deep and 100 feet wide into Occohannock Creek from that depth in the bay to **Morley Wharf,** on the south side 4 miles above the mouth. The controlling depth to Morley Wharf was said to be 4½ feet in 1951. The mean range of **tide** is about 2 feet.

The channel over the bar at the mouth of Occohannock Creek is marked by numerous buoys, but it is narrow and tortuous and is difficult to navigate without local knowledge. The channel within the creek also is narrow but the ends of the shoals are marked by buoys all the way to Morley Wharf. Directly across the creek from Morley Wharf is **Davis Wharf,** which has a store and a post office; the actual wharf at the latter place has long been in ruins.

Craddock Creek, 20 miles northward of Cape Charles Harbor, has depths of 3 feet across the flats at the entrance and deeper water inside nearly to its head. The best water is near the bay shore on the southward, thence along the north side of the entrance, and thence in mid-channel to the head. There are no commercial wharves along the creek.

Nandua Creek empties into Chesapeake Bay 23 miles northward of Cape Charles Harbor and 12 miles due east of a point 43 miles along the main channel from the Virginia Capes. A Federal project provides for a channel 9 feet deep and 100 feet wide across the bar at the mouth of the creek, a distance of about 700 feet. The controlling depth over the bar was 6 feet in March 1950. In November 1948, controlling depths in the natural channel within the creek were 8 feet to the ruins of **Cedar View Wharf,** 2 miles above the mouth, and thence 5 feet to the settlement of **Nandua,** 3 miles above the mouth. The mean range of **tide** is about 1½ feet.

A bell buoy marks the approach to Nandua Creek, and a clump of pine trees is prominent on the south side of the entrance. A light and several buoys mark the entrance, but the channel is narrow and shifting and local knowledge is needed to carry the best water. The shoals at the entrance usually can be distinguished by the difference in color of the water, but in rough weather the water is so clouded that they are not readily visible. Several daybeacons mark the critical parts of the natural channel to Nandua.

The wharf at Nandua has depths of 5 to 6 feet alongside. Fresh water is available, and gasoline, Diesel oil, ice, and provisions can be delivered. A marine railway at the settlement can haul out boats up to 40 feet in length and 3 feet in draft for minor repairs.

Back Creek empties into the north side of Nandua Creek a mile above the mouth. **Hacksneck** (*P. O.*) is a village on Back Creek. A depth of 3 feet can be carried across the flats from the channel in Nandua Creek to Hacksneck. Supplies are available in limited quantities at the village.

Butcher Creek, 2 miles northeastward of Nandua Creek, has depths of 2 feet at the entrance and deeper water inside. The creek has no wharves and is little used except for crabbing.

Pungoteague Creek, 3 miles northeastward of Nandua Creek, is said to have depths of 9 feet to the town of **Harborton,** 2 miles above the mouth, and thence 6 feet to the ruins of **Boggs Wharf,** 3 miles above the mouth. The creek shoals rapidly above the latter point. Barges load pulpwood at Harborton. The approach to Pungoteague Creek is marked by lights and buoys, and the channel within the creek is marked by buoys and daybeacons as far as Harborton. The mean range of **tide** is about 1½ feet.

Onancock Creek, 6.5 miles northeastward of Nandua Creek, carries a sizable traffic in petroleum products, pulpwood, and fertilizers. A Federal project provides for a channel 12 feet deep and 200 feet wide across the bar, a distance of 5,200 feet, and generally 100 feet wide in the creek to a point roughly 1,200 feet above the mouth of North Branch (at Onancock), widened at the upper end to form a basin 200 feet square, and for a turning basin at Onancock. The project also provides for a channel 6 feet deep and 100 feet wide in the lower 500 feet of Joynes Branch and an anchorage basin 6 feet deep at the mouth of Titlow Creek, both at Onancock.

In March 1950, controlling depths were 11 feet from Chesapeake Bay to the town of Onancock, 12 feet in the North Branch channel, 6 feet in the Joynes Branch channel, and 6 feet in the Titlow Creek basin. A light and several buoys mark the entrance to the creek, and numerous daybeacons mark the channel all the way to the wharves at Onancock. The mean range of **tide** is about 1½ feet.

Gasoline, water, and ice can be obtained at a dock on the south side of Onancock Creek a mile above the mouth; the dock has depths of 7 feet at the outer end. Pulpwood is loaded on barges at **Poplar Cove Wharf,** on the north side 2.3 miles above the mouth; a boatyard at the wharf can haul out and make minor repairs to boats up to 35 feet in length, 4 feet in draft, and 5 tons in weight. Gasoline, provisions, and some marine supplies are available at **Onancock,** 4.3 miles above the mouth, and Diesel oil can be delivered by truck.

Chesconessex Creek, 9 miles northeastward of Nandua Creek, has depths of 12 feet in the approach channel and for about a mile above the mouth to a line midway along the south shore of **Tobacco Island,** thence 5 feet to **Chesconessex,** 2 miles above the mouth, and for an additional 0.6 mile above the village. The creek is used by many small local boats. The approach is from eastward of Watts Island Light and is marked by buoys; the channel above the mouth is sometimes marked by bush stakes. The mean range of **tide** is about 1½ feet.

Pompco Creek, 10 miles northeastward of Nandua Creek, is between Tobacco Island and the entrance to Pocomoke Sound. The creek has depths of 7 feet in the approach from the buoyed channel off Chesconessex Creek and for about a mile above the mouth. Pompco Creek has no wharves and is used only by small local boats. The minimum depth is 1 foot in the passage eastward and southward around Tobacco Island to the inner part of Chesconessex Creek.

The southern, and main, entrance to **Pocomoke Sound** is 10 miles northward of Nandua Creek and 15 miles due east of a point 53 miles along Chesapeake Bay main channel from the Virginia Capes. Extensive flats occupy most of the sound, though a channel, wide and deep at the entrance but comparatively shallow in its most northerly part, leads to Pocomoke River, the most important tributary.

The shores of Pocomoke Sound are low and without prominent natural landmarks. The critical points along the main channel between the entrance and the mouth of Pocomoke River are marked by lights and buoys. The Virginia-Maryland boundary line is marked by white spar buoys. The sound is used by many local oyster and fishing boats and by some tugs and barges. Small boats can enter from northwestward in Tangier Sound by way of Broad Creek, which is discussed later. The mean range of **tide** in Pocomoke Sound is about 2 feet; for information on **currents** see the *Current Tables.*

A string of marshy islands and large shoals separates the lower part of Pocomoke Sound from Tangier Sound on the westward. **Watts Island,** southernmost of the string, is marshy and wooded; the south end of the island is 3.5 miles from the mainland and 1.8 miles due west of the mid-entrance position. Watts Island Light is 1.5 miles south-southeast of the island.

Little Fox Islands, 5 miles northward of the entrance, are bare and marshy; the flats between these islands and Watts Island are very shallow and cannot be navigated without local knowledge. **Great Thorofare,** just northward of Little Fox Islands, is said to have depths of 2 feet and is sometimes used by local boats.

Great Fox Island, 6 miles northward of the entrance to Pocomoke Sound, is a group of low islands, the northeasternmost of which is marked by a large building. **Cedar Straits,** between Great Fox Island and the mainland marsh area to the northeast, has depths of about 1 foot and is little used even by local boats.

Beach Island is on the east side of the main entrance to Pocomoke Sound. From the light marking the east side of the sound channel off Beach Island, a crooked tributary channel, marked by buoys, leads east-northeastward, then southeastward, in depths of 8 feet or more between shallow flats for 5 miles to the mouth of **Deep Creek.** Within the creek, depths are 6 feet or more for 2 miles, thence 2 feet to the head of navigation.

Deep Creek is used only by small local boats, many of which enter from Hunting Creek on the eastward by way of **The Notch,** a passage behind the 1½-mile chain of islands which separates the outer parts of the two creeks; the minimum depth in The Notch is about 1 foot. There are several wharves along Deep Creek. A boatyard at the settlement of **Deep Creek,** 3 miles above the mouth of the stream, can haul out and make minor repairs to vessels up to 50 feet in length, 3 feet in draft, and 5 tons in weight.

From the light off Beach Island, another tributary channel leads northeastward, then eastward along the buoys on the south side of **Guilford Flats,** then southeastward for a total of 7 miles in depths of 10 feet or more to the mouth of **Hunting Creek;** the tributary channel also can be approached from anywhere along the main channel from southwestward to northwestward of the outer buoys at Guilford Flats.

Within Hunting Creek, depths are 7 feet to **Bagwell Creek,** which empties into the northeast side 2 miles above the mouth, and 4 feet to the wharf at **Hopkins** (*P. O.*), a village 2.5 miles above the mouth. The channel is clear for about a mile above the mouth and is marked by a light and buoys, but above the buoys it is narrow and, though usually bush-staked, is difficult to navigate without local information.

Guilford Creek is 2.5 miles northeastward of Hunting Creek, with which it has a common approach from the main channel as far as the inner buoy on the south side of Guilford Flats. The channel to Guilford Creek continues eastward along the flats, then turns northeastward and rounds a buoy off the mouth of the creek; the total distance from the main channel is a mile more than for Hunting Creek and depths are 6 feet or more all the way. Within Guilford Creek, the depths are 6 to 4 feet; the creek has no wharves and is used only by small local boats.

Messongo Creek empties into the east side of Pocomoke Sound 4.5 miles northward of Hunting Creek. The best approach to Messongo Creek is from west-southwestward and the distance from the main channel is about 6 miles. The last mile of the approach is marked by buoys. Depths of 7 feet at the mouth of the creek shoal gradually to about 1 foot at the village of **Marsh Market,** 2.5 miles above. The creek

is used only by small local boats. A depth of about 1 foot can be carried northwestward from the mouth of Messongo Creek to Starling Creek and Saxis by way of a passage through the marsh.

Chart 1224.—Starling Creek empties into the southeast side of the Pocomoke Sound main channel 11 miles above the entrance. A Federal project provides for a channel 7 feet deep and 60 feet wide from that depth in Pocomoke Sound to the mouth of Starling Creek, a distance of about 0.4 mile, with a turning basin of the same depth, 100 feet wide, and 1,000 feet long within the creek. The controlling depth was 5 feet in June 1951. A light marks the outer end of the entrance channel.

Saxis, a village on the northeast side of the Starling Creek turning basin, is the center of a considerable shellfish industry. The village has many prominent white buildings. Gasoline and Diesel oil can be obtained at the Saxis bulkhead and some provisions are available in the village.

Pocomoke River, which empties into the northeast end of Pocomoke Sound, carries a large tonnage of petroleum products, pulpwood, and fertilizer. The improved approach to the river begins in natural depths of 7 to 8 feet 13 miles above the entrance to the sound, and follows a dredged cut through the flats, a channel between an earth dike and the northern shore, and a land cut through **Williams Point** to comparatively deep water in the mouth of the river 16 miles above the sound entrance.

A Federal project provides for a channel 7 feet deep and 100 feet wide from that depth in Pocomoke Sound to deep water in Pocomoke River. The controlling depth was 6 feet in June 1951.

The approach channel is well marked by lights and daybeacons. Within the river the channel has ample depth and width, and navigation is easy for 20 miles. The remainder of the channel to Snow Hill is narrow and crooked, is unmarked, and requires some local knowledge to carry the best water. The mean range of **tide** is about 2½ feet at Shelltown and 3 feet at Pocomoke and Snow Hill, but it is considerably affected by winds. **Freshets** cause a rise of 1 to 5 feet at Snow Hill but are not dangerous. The water is **fresh** above Rehobeth.

Shelltown (*P. O.*) is a village on the west bank of Pocomoke River a mile above the mouth. Gasoline and provisions can be obtained at a store in the village. The landing is in very poor condition.

Rehobeth (*P. O.*) is a village on the west bank 7.5 miles above the mouth of the river. Gasoline and provisions are available. The landing is in poor condition.

Pocomoke City is on the east bank 14 miles above the mouth of the river. The town has rail communication, and all kinds of supplies are available. The bulkhead landings are in poor condition. The railroad bridge over the river at Pocomoke City has a swing span with a horizontal clearance of 61 feet and a vertical clearance of 2½ feet; the best water is in the western opening. The highway bridge 0.5 mile above the railroad bridge has a bascule span with a horizontal clearance of 64 feet and a vertical clearance of 2 feet.

Shad Landing is on the east bank of Pocomoke River 22 miles above the mouth. **Snow Hill** is a town with rail communication on the east bank 26 miles above the mouth. A Federal project provides for a channel 9 feet deep and 130 feet wide from Shad Landing to the bridge at Snow Hill; the controlling depth was 9 feet in March 1948. A highway bridge just above the wharves at Snow Hill has a bascule span

with a horizontal clearance of 40 feet and a vertical clearance of 1½ feet; **regulations** governing operation of the drawspan are given in **§203.245,** Chapter 2A. The river is navigable for 2 miles above the bridge.

Marumsco Creek and **East Creek,** 3 and 4.5 miles, respectively, westward of the mouth of Pocomoke River, have depths of 2 feet but neither is much used. **Ape Hole Creek,** 8 miles west-southwestward of Pocomoke River and 10 miles northward of the entrance to Pocomoke Sound, has depths of 2 feet to its head; there are crab pens and an oyster house on the northwest side of the creek.

A line of marshy islands and flats, with Tangier Island at the south end, separates Tangier Sound from Chesapeake Bay on the westward; the principal thorofares between the islands are Kedges and Hooper Straits. Watts Island and the other islands and shallow passages on the east side of the southern entrance to Tangier Sound have been described in connection with Pocomoke Sound.

A **danger zone** for Naval firing extends southward from Tangier Sound Light; limits of the area and regulations governing it are given in **§ 204.46,** Chapter 2A. A **danger zone** for Naval guided-missiles tests is centered at a point 4.3 miles westward of Tangier Sound Light; limits of the area and regulations governing it are given in **§ 204.44,** Chapter 2A.

Tangier Island is low, sparsely wooded in the middle, and bare on the north and south ends. **Tangier** (*P. O.*) is a village midway along the eastern side of the island; a church spire in the village is prominent. Oystering, crabbing, and fishing are the principal industries of Tangier and the smaller communities on the island. Gasoline, Diesel oil, water, ice, provisions, and some marine supplies can be obtained at Tangier, and the island has telephone and motorboat communication with Crisfield.

Broad Creek, 10 miles west-southwestward of Pocomoke River and 8 miles northward of the main entrance to Pocomoke Sound, is a crooked thorofare that connects the northwest side of the sound with Little Annemessex River in Tangier Sound. A Federal project provides for a channel 6 feet deep and 100 to 130 feet wide from that depth in Pocomoke Sound through Broad Creek to the same depth in Little Annemessex River, a distance of about 2.5 miles. The controlling depth was 6 feet in July 1951. Both ends of the passage are marked by lights and the southern end has several buoys. The passage is used extensively by oyster boats.

Chart 1223.—Tangier Sound Light (lat. 37°47′.3, long. 75°58′.4), 39 feet above the water and visible 11 miles, is shown from a white square tower on brown piles in depths of 5 feet and has a fog signal. *Tangier Sound Light is 9.5 miles due east of a point 52.5 miles along Chesapeake Bay main channel from the Virginia Capes.*

The mid-channel point in the southern, and main, entrance to **Tangier Sound** is 1 mile northeastward of Tangier Sound Light; the south end of Watts Island is 4.5 miles to the east-southeastward and the south end of Tangier Island is 2 miles to the west-northwestward. The sound is 28 miles long and 2.5 to 5 miles wide. The broad and deep channel that extends the length of the sound is bordered by extensive flats, but the critical points are marked by lights and buoys.

A Federal project provides for a channel 8 feet deep, 100 feet wide in the outer part and 60 feet wide in the inner part, from that depth in Tangier Sound to a turning

basin 7 feet deep and 200 feet square at the town of Tangier. The controlling depth was 6 feet in September 1951.

The outer end of the Tangier channel is 1.1 miles northeast of Tangier and a mile west of a point 3 miles along the Tangier Sound main channel from the southern entrance. The Tangier channel passes between a fair-sized marshy island on the southeast and the easternmost point of Tangier Island on the northwest and is well marked by lights and daybeacons.

The flats between Tangier Island and Smith Island, on the north, are shallow and can be navigated only by very small boats at high water; a line of telephone poles extends across the flats from island to island.

Chart 555.—Smith Island is actually a large group of marshy islands separated by narrow thorofares; travel from island to island is entirely by boat because there are no bridges. **Tylerton, Ewell,** and **Rhodes Point** are small villages, all with post offices, along the interior channels; oystering and fishing are the principal industries. Gasoline can be obtained at the villages, and provisions are available in limited quantities. The island has telephone and motorboat communication with Crisfield.

A Federal project provides for a channel 7 feet deep and 60 feet wide from Tangier Sound through **Big Thorofare,** the land cut at Ewell, **Levering Creek,** and again through Big Thorofare to the vicinity of **Swan Point,** thence 7 feet deep and 100 feet wide through the offshore bar to deep water in Chesapeake Bay, with twin jetties at the bay entrance; and for a channel 4 feet deep and 25 feet wide from Big Thorofare into **Tyler Creek.** In September 1951, controlling depths were 6 feet from Tangier Sound to Chesapeake Bay and 4 feet into Tyler Creek. The total length of the channel through Smith Island is 5 miles and it is well marked by lights and daybeacons. The eastern end of the channel is 2 miles west of a point 10 miles along the Tangier Sound main channel from the southern entrance; the jettied west end is 7 miles due east of a point 65.5 miles along Chesapeake Bay main channel from the Virginia Capes.

Local fishermen in shallow-draft boats sometimes approach Tylerton from southward at high water, leaving the main channel in Tangier Sound about 6 miles from the southern entrance and following the deeper water northward into Tyler Creek. Several thorofares with depths of about 2½ feet lead westward from the interior of Smith Island into Chesapeake Bay; the principal thorofare leads to Rhodes Point and is marked on the north side of the bay entrance by a light. Navigation of all these channels requires some local knowledge.

Kedges Straits, between Smith Island on the south and large, low, uninhabited **South Marsh Island** on the north, are used by vessels bound from northward in Chesapeake Bay to points southward of Manokin River in Tangier Sound. The inner approach to the straits is from a point about 15 miles along the Tangier Sound main channel from the southern entrance.

A depth of 10 feet can be carried through the straits and they are easy of navigation if the chart is followed closely. **Holland Island Bar Light (lat. 38°04′.1, long. 76°05′.7),** 42 feet above the water and visible 12 miles, is shown from a white hexagonal house on brown piles in depths of 9 feet on the north side of the Chesapeake Bay approach to Kedges Straits; the light has a fog signal. *Holland Island Bar Light is 6.5 miles due east of a point 70 miles along Chesapeake Bay main channel from the Virginia Capes.*

Solomons Lump Light (lat. 38°02′.9, long. 76°00′.9), 47 feet above the water and visible 11 miles, is shown from a white octagonal frame dwelling, with a square tower, on a brown cylinder in depths of 7 feet on the Smith Island side of Kedges Straits; the light has a fog signal.

The mean range of **tide** in Kedges Straits is about 1½ feet but it is affected considerably by winds. Easterly winds raise the water and northwesterly winds lower it sometimes as much as 2 feet below the normal level. The **current** floods eastward into Tangier Sound; the average velocity at strength of flood or ebb is about 1 knot. In severe winters, floating **ice** makes navigation of the straits dangerous.

Holland Straits are between South Marsh Island on the southeast and Bloodsworth, Adam, and Holland Islands on the northwest; small, low **Spring Island** is midway through the straits. The straits are shallow at both the Chesapeake Bay and Tangier Sound ends and the unmarked channels should not be used without local knowledge. The inner approach to Holland Straits is from a point 22 miles along the Tangier Sound main channel from the southern entrance.

The deepest water in Holland Straits is between Spring Island and Holland Island. Sand bars 1 to 5 feet deep obstruct the bay entrance, and patches of eel grass uncover in the sound entrance on the lower tides. The best entrance to Holland Straits from Tangier Sound for boats up to 4 feet in draft is by way of the narrow passage between tiny **Deep Banks Island** and South Marsh Island.

Holland Island and **Adam Island,** just to the northward, are low, marshy, and uninhabited; there is a lookout tower on Adam Island. **Bloodsworth Island** is a large marsh with scattered clumps of trees. **Okahanikan Point Light,** 45 feet above the water, is shown from an observation tower in latitude 38°11′.7, longitude 76°05′.6, off the northwest point of the island; another tower is in depths of 13 feet 2.2 miles to the south-southwestward and a mile offshore. Bloodsworth Island is within a **danger zone** for naval firing and bombing; limits of the area and regulations governing it are given in § **204.36,** Chapter 2A.

Hooper Strait, between Bloodsworth Island on the south and Hooper Islands and Bishops Head on the north, is the most northerly direct passage from Chesapeake Bay into Tangier Sound and is used by vessels bound from northward in the bay to tributaries at the north end of the sound. The inner approach to the strait is from a point 26 miles along the Tangier Sound main channel from the southern entrance; the bay entrance is 8 miles due east of a point 79 miles along Chesapeake Bay main channel from the Virginia Capes.

The narrow, crooked channel through Hooper Strait has a controlling depth of about 12 feet. The shoals on either side are well marked and strangers should have little difficulty in making the passage if they pay close attention to the chart. **Hooper Strait Light (lat. 38°13′.6, long. 76°04′.5)**, 41 feet above the water and visible 12 miles, is shown from a white hexagonal house on brown piles in depths of 9 feet midway along the north side of the channel; the light has a fog signal. **Sharkfin Shoal Light (lat. 38°12′.1, long. 75°59′.2)**, 44 feet above the water and visible 12 miles, is shown from a white hexagonal house on brown piles in depths of 7 feet on the south side of the approach from the main channel in Tangier Sound; the fog signal at the light operates from September 15 to June 1.

The mean range of **tide** is about 1½ feet at Hooper Strait Light and 2 feet at Sharkfin Shoal Light, but in the fall and winter long-continued northerly winds may

lower the water as much as 2 feet below the normal level. The **current** floods eastward into Tangier Sound; the average velocity at strength of flood or ebb is about 1½ knots. In the sound the tidal currents in general follow the channels; the velocity is greatly influenced by the force and direction of the wind. Current information for a number of locations in Tangier Sound and vicinity are given in the *Current Tables*. In the winter vessels navigating Hooper Strait are in danger from running **ice.**

Little Annemessex River, the approach to the town of Crisfield, empties into Tangier Sound 2 miles east-northeast of a point 9 miles along the main channel from the southern entrance to the sound. The entrance to the river is 0.8 mile wide between **Great Point** on the south and **Island Point** on the north. Prominent features are a square brick stack near the outer end of the narrow spit that extends 0.7 mile eastward from Island Point, and the ice plant and other buildings on the Crisfield water front.

In May 1949, controlling depths in Little Annemessex River were 10 feet in the main channel to a point opposite the ice plant 300 yards above the railroad pier, 7 feet in the spur channel to the wharves 0.3 mile northeastward of the ice plant, 7 feet from the ice plant to the Annemessex Canal, 7 feet for 0.3 mile east-southeastward from a point in the canal channel 0.9 mile above the railroad pier to an L-shaped mooring basin, and 7 feet in the basin.

The main channel is well marked by lights and buoys and is easily followed. **James Island Light,** 37 feet above the water and visible 11 miles, is shown from a skeleton steel tower and black tankhouse on a cylindrical base in depths of 9 feet on the north side of the approach a mile outside the river; the fog signal at the light operates from September 15 to June 15. **Old House Cove Light,** 40 feet above the water and visible 11 miles, is shown from a black skeleton tower on a white tankhouse on piles in depths of 6 feet on the north side a mile above the mouth of the river. The mean range of **tide** in Little Annemessex River is about 2 feet; the tidal **currents** have a maximum velocity of about 1 knot.

Old House Cove, on the north side of the river and just northwestward of the light, has depths of 3 feet. From the main channel at the light, a natural channel with depths of 7 feet leads southeastward for a mile to the northern end of **Broad Creek,** a much-traveled passage from Pocomoke Sound which was described earlier in this chapter.

Jenkins Creek, which empties into Little Annemessex River close northeastward of Broad Creek, is used by fishermen and crabbers. Depths of 3 feet can be carried 0.5 mile above the mouth of the creek, thence 2 feet for 0.5 mile farther to a fixed highway bridge with a horizontal clearance of 16 feet and a vertical clearance of 6 feet; small boats pass through the bridge to piers on the north shore.

Crisfield, on the east side of Little Annemessex River 2 miles above the mouth, is a railroad terminus and an important shipping center for seafood. The harbor is used by many oyster, fish, and crab boats with drafts of 2 to 6 feet. Small freight and passenger boats operate daily to Tangier and Smith Islands.

Storm warnings are displayed, daytime only, at a lumber yard on the Crisfield water front. The town is a **customs** port of entry at which marine documents are issued and has an **outpatient** office of the United States Public Health Service.

The Crisfield water front is largely built up with bulkhead wharves and timber piers, most of which are privately owned but open to the public on equal terms. Some

of the terminals have mechanical freight-handling equipment but most of the freight is transferred by hand. Depths at the wharves and piers range from 5 to 12 feet, the deepest being at the outer end of the railroad pier.

Somers Cove, on the south side of the railroad pier, has general depths of 2 to 3 feet. A 6-foot channel leads to the crab factories on the north shore of the cove, and a 4-foot channel leads to the factories on the west shore. A highway bridge over the entrance to Somers Cove has a retractile span with a horizontal clearance of 1½ feet; **regulations** governing operation of the drawspan are given in § **203.250,** Chapter 2A.

Gasoline, Diesel oil, water, ice, and provisions are available at Crisfield. The largest marine railway at the town can haul out vessels up to 135 feet in length, 9 feet in draft aft, and 150 tons in weight; the yard makes hull and engine repairs and can supply most metal fittings, but machined parts usually are made in Norfolk.

Above the wharves at Crisfield, Little Annemessex River has depths of 2 to 5 feet outside the dredged channel and is used only as an anchorage for small craft. From the head of the river, 3 miles above the mouth, **Annemessex Canal** extends northward for 2 miles to deep water in Big Annemessex River. The canal had a controlling depth of 5 feet in May 1949. Both ends of the canal are marked by lights and daybeacons. The tidal **current** floods northward in the canal and ebbs southward; the estimated maximum velocity is 1¼ knots.

Big Annemessex River empties into Tangier Sound 2.5 miles northeast of a point 14 miles along the main channel from the southern entrance to the sound. The river has depths of 8 feet for 4 miles, thence 5 feet for 1 mile, and thence 3 feet for 1 mile. The channel is marked as far as Colbourn Creek. The mean range of **tide** is about 2 feet.

Annemessex Canal, already described, enters the south side of Big Annemessex River 1.3 miles above the mouth. **Jones Creek,** close eastward of the canal, has depths of 5 feet for about 1 mile above the mouth but the channel is narrow, crooked, and unmarked.

Colbourn Creek, on the south side of Big Annemessex River 3.5 miles above the mouth, has depths of 4 feet for about 0.7 mile, thence 2 feet for 0.5 mile. The planing mill on the point on the east side of the entrance has a small pier with depths of about 5 feet at the outer end. Excellent storm **anchorage** is available in depths of 5 feet, good holding bottom and completely landlocked, in midstream 0.3 mile above the mill.

Manokin River empties into the east side of Tangier Sound 2.5 miles north-northeastward of a point 15 miles along the main channel from the southern entrance to the sound and directly across the sound from Kedges Straits, described earlier. The entrance to the river is 3.5 miles wide between **Hazard Point** on the southeast and low **Little Deal Island** on the northwest but is obstructed by numerous shoals.

The main channel of Manokin River is narrow and crooked and favors the southeast shore. In 1949, the channel had depths of 10 feet to abeam of **St. Pierre Island,** on the north side 4 miles above the mouth of the river, thence 6 feet to within 0.5 mile of **Locust Point,** on the northwest side 7 miles above the mouth, and thence 1 foot to **Princess Anne,** in latitude 38°12′, longitude 75°42′, 15 miles above the mouth. Above Locust Point, the river is used chiefly for its oyster beds. The channel is marked as far as St. Pierre Island. The mean range of **tide** in Manokin River is about 2½ feet. Most of the piers and wharves along the river are in poor condition.

Deal Island, between Little Deal Island and the mainland, has a sizable shellfish industry. **Lower Thorofare,** between Little Deal Island and the south end of Deal Island, has an improved channel that begins a mile east-northeastward of a point 20 miles along the main channel from the southern entrance to the sound.

A Federal project provides for a channel 7 feet deep and 60 feet wide in Lower Thorofare from that depth in Tangier Sound to and including a mooring basin of the same depth, 100 feet wide, and 300 feet long in the marsh at the head of the cove at Wenona. The controlling depth was 7 feet in 1950. The channel is marked by lights and buoys.

Wenona (*P. O.*), a village on the south end of Deal Island, is 0.7 mile above the outer end of the improved channel. The mooring basin has a good bulkhead and several small piers. Gasoline and provisions can be obtained at the village.

Upper Thorofare, between Deal Island and the mainland, has an improved entrance channel that begins a mile eastward of a point about 24 miles along the main channel from the southern entrance to Tangier Sound. A Federal project provides for an entrance channel 9 feet deep and 100 feet wide, protected by jetties, thence irregular widths and depths in Upper Thorofare to the highway bridge 0.2 mile from the outer ends of the jetties; in April 1953, the channel, turning basin, and anchorages were at project depth. Beyond the bridge a depth of 1 foot can be carried southeastward for 2.5 miles to Manokin River.

The entrance to Upper Thorofare is marked by a light, a lighted range, and buoys. The fixed highway bridge over Upper Thorofare between Deal Island and **Chance** (*P. O.*), a village on the mainland, has a horizontal clearance of 21 feet and a vertical clearance of 11 feet. Gasoline and provisions can be obtained at the village.

Chart 567.—Wicomico River empties into the north end of Tangier Sound 4 miles east-northeastward of a point a mile southward of the inner approach to Hooper Strait, described earlier, and 25 miles along the main channel from the southern entrance to the sound. The entrance to Wicomico River is 1.5 miles wide between **Long Point** on the south and **Nanticoke Point** on the north.

A Federal project provides for a channel 14 feet deep and 150 feet wide from Chesapeake Bay to Salisbury. The controlling depth was 11 feet in 1949. **Great Shoals Light (lat. 38°12′.8, long. 75°52′.8),** 37 feet above the water, is shown from a white square house on brown piles in depths of 4 feet on the north side of Wicomico River 0.5 mile above the mouth; the fog signal operates from September 1 to June 1. The channel is marked all the way to Salisbury.

The mean range of **tide** in Wicomico River is about 2½ feet at the entrance and 3 feet at Salisbury. Strong tidal **currents** set across the main channel off Monie Bay, and in severe winters heavy ice from the bay is a source of danger. **Ice** usually forms on the river as far down as Whitehaven; in ordinary winters the channel usually is open to navigation, but in severe winters it is often closed for extended periods. Waterborne **commerce** is largely in petroleum products but sizable tonnages of commodities, sand and gravel, fertilizer, and shellfish also are carried on the river.

Monie Bay is a large cove on the southeast side close within the mouth of the river. The bay has depths of 4 feet to the head, but it is used only by small local boats. **Monie Creek** and **Little Monie Creek,** at the head of the bay, are unimportant, although the former has deep water for some distance above its mouth.

Webster Cove is on the south side of Wicomico River 3.5 miles above the mouth. A Federal project provides for a channel 6 feet deep and 60 feet wide in Webster Cove from the 6-foot contour in Wicomico River to a basin 6 feet deep, 100 feet wide, and 400 feet long in the marsh at **Pine Beach.** Controlling depths were 5 feet in the channel and 6 feet in the basin in 1949. **Mount Vernon** is a village 0.3 mile inland from Pine Beach; **Mount Vernon Wharf,** 5 miles above the mouth of the river, is private property.

Whitehaven (*P. O.*) is a village on the north bank 6.5 miles above the mouth of the river. Gasoline and provisions can be obtained at the village. Most of the docks are in very poor condition. The cable **ferry** that crosses the river at Whitehaven operates during daylight hours only; the cables drop when the ferry is not crossing.

Wicomico Creek, on the south side 8.5 miles above the mouth of the river, is navigable for small craft for several miles. The entrance channel is sometimes bush-staked.

A cable **ferry** crosses Wicomico River 15 miles above the mouth; the ferry operates during daylight hours only, and the cables drop when the ferry is not crossing. An overhead power **cable,** 17.7 miles above the mouth of the river and 0.3 mile below Shad Point, has a vertical clearance of 137 feet.

Shad Point is on the southeast side 18 miles above the mouth of the river. A boatyard on the point can haul out and make minor repairs to vessels up to 75 feet in length, 5 feet in draft, and 35 tons in weight. Gasoline and provisions are available nearby.

Salisbury is at the head of navigation 20 miles above the mouth of Wicomico River. The river forks at the city. A Federal project provides for channels 14 feet deep and 100 feet wide in the two forks, **North Prong** and **South Prong.** Controlling depths were 10 feet to the fixed bridge 0.4 mile above the entrance to North Prong in 1949 and 7 feet to the fixed bridge 0.5 mile above the entrance to South Prong in 1946.

The highway bridge over the entrance to North Prong has a bascule span with a horizontal clearance of 40 feet and a vertical clearance of ½ foot. The highway bridge over the entrance to South Prong has a bascule span with a horizontal clearance of 40 feet and a vertical clearance of 1 foot; a second highway bridge 0.2 mile above the first has a bascule span with a horizontal clearance of 40 feet and a vertical clearance of 6 feet. **Regulations** governing operation of the three drawspans are given in **§ 203.260,** Chapter 2A.

All kinds of supplies are available at Salisbury. A large marine railway at the city can haul out vessels up to 200 feet in length, 13 feet in draft, and 1,250 tons in weight. The owner of the railway uses it to repair the firm's own barges but will accept outside business when the railway is idle.

Chart 1224.—Nanticoke River empties into the north end of Tangier Sound 28 miles along the main channel from the southern entrance to the sound and about 3 miles northeast of the inner approach to Hooper Strait. The entrance to the river is between Nanticoke Point on the east and **Clay Island Point** on the west. Controlling depths were 11 feet to Sharptown in 1950, thence 9 feet to Seaford in May 1952.

From the mouth to Wetipquin Creek, the river is more than a mile wide and is obstructed by extensive shoals; most of the shoals are marked by lights or buoys but some local knowledge may be needed to keep in the best water. From Wetipquin Creek to Sharptown, the river has ample width and depth for any vessel able to navi-

gate the channel as far as the creek; the deepest water is usually near the points rather than in the bends.

The mean range of **tide** in Nanticoke River is 2½ feet at the entrance and 3 feet at Vienna. The tidal **current** averages about 1 to 1½ knots at strength of flood or ebb. The water is **fresh** above Vienna. **Ice** forms on the river in winter, but ordinarily there is enough traffic to keep the channel open. Spring **freshets** do not interfere with navigation. Water-borne **commerce** is mostly in petroleum products but sizable tonnages of fertilizers, pulpwood and logs, shellfish and shells also are carried.

Nanticoke (*P. O.*) is a village on the east bank 2.5 miles above the mouth of the river. A Federal project provides for a channel 7 feet deep and 60 feet wide, protected on either side by stone jetties in the river, to a small-boat harbor 7 feet deep, 120 feet wide, and 400 feet long in the marsh at Nanticoke. Controlling depths were 4 feet in the channel and 7 feet in the harbor in 1950. The channel is marked by lights and a lighted range. Nanticoke has several packing plants. Gasoline and provisions are available in limited quantities.

Bivalve (*P. O.*), a village on the east side of Nanticoke River 5 miles above the mouth, has a basin for skiffs and oyster boats.

Wetipquin Creek empties into the east side of Nanticoke River 7 miles above the mouth. In 1950, the controlling depth was 4 feet to the wharf at **Tyaskin** (*P. O.*), a village on the south side of the creek and just inside the mouth. Gasoline and provisions can be obtained at the village. A small hand-operated **ferry** crosses Wetipquin Creek 0.5 mile above Tyaskin.

Vienna is a village on the west bank of Nanticoke River 20 miles above the mouth. The bulkhead wharf just above the Vienna bridge is in good condition, and one dock just below the bridge is in poor condition but usable; all other docks are in very poor condition. Some supplies can be obtained at Vienna.

The highway bridge over the river at Vienna has a bascule span with a horizontal clearance of 80 feet and a vertical clearance of 17 feet. The overhead power cable 100 yards above the bridge has a vertical clearance of 135 feet.

Riverton is a village on the east bank of Nanticoke River 24 miles above the mouth.

Marshyhope Creek empties into Nanticoke River from northward 25 miles above the mouth. The creek is said to have depths of 5 feet to within 0.5 mile of **Federalsburg** (*P. O.*), a town 14 miles above the entrance.

The highway bridge over Marshyhope Creek at **Brookview,** 5 miles above the entrance, has a bascule span with a horizontal clearance of 60 feet and a vertical clearance of 11 feet; **regulations** governing operation of the drawspan are given in § **203.245,** Chapter 2A.

The fixed highway bridge over Marshyhope Creek at **Harrison Ferry,** 9 miles above the entrance, has a horizontal clearance of 53 feet and a vertical clearance of 2½ feet. A railroad bridge and a highway bridge, both fixed, cross the creek at Federalsburg.

Sharptown, Maryland, on the southeast bank of Nanticoke River 26 miles above the mouth, has several mills and canneries. Gasoline and provisions can be obtained in the town. The highway bridge over the river at Sharptown has a swing span with a horizontal clearance of 75 feet and a vertical clearance of 7 feet.

Broad Creek, Delaware, empties into the southeast side of Nanticoke River 29 miles above the mouth. A Federal project provides for a channel 8 feet deep and 70 feet wide to Laurel and for widening the channel below the railroad bridge at Laurel to

form a suitable turning basin. The controlling depth was 7 feet in 1944. The mean range of **tide** is 3 feet, and the extreme range is 4½ feet under ordinary conditions.

The highway bridge over Broad Creek at **Bethel,** 3.5 miles above the entrance, has a swing span with the south opening obstructed; the north opening has a horizontal clearance of 52 feet and a vertical clearance of 1 foot.

Laurel, on the south side of Broad Creek 6 miles above the entrance, has a fertilizer plant and several mills. Gasoline and provisions can be obtained at the town. The railroad bridge over the creek at Laurel has a swing span with the north opening obstructed; the south opening has a horizontal clearance of 40½ feet and a vertical clearance of 15 feet; **regulations** governing operation of the drawspan are given in § **203.245,** Chapter 2A. Three highway drawbridges cross the creek just above the railroad bridge; minimum closed clearances are 30 feet horizontally and 3½ feet vertically.

The vehicular cable **ferry** that crosses Nanticoke River at **Woodland,** 31 miles above the mouth, operates during daylight hours only; the cables drop when the ferry is not crossing.

Seaford, Delaware, on the northwest side of Nanticoke River 35 miles above the mouth, has several mills and factories. The railroad bridge over the river near the lower end of the town has a swing span with the northwest opening not used; the southeast opening has a horizontal clearance of 47½ feet and a vertical clearance of 1 foot; there is a strong cross **current** through the bridge. The highway bridge 0.3 mile above the railroad bridge has a bascule span with a horizontal clearance of 40 feet and a vertical clearance of 3½ feet. Depths of 7 feet are said to extend 1.5 miles above the highway bridge, and small boats can go to a mill dam 5 miles from the bridge, but there is little traffic above Seaford.

Fishing Bay empties into the north end of Tangier Sound 2 miles northwest of a point 27 miles along the main channel from the southern entrance and a mile north of the inner approach to Hooper Strait, described earlier. The entrance to the bay is 3 miles wide between Clay Island Point on the east and **Bishops Head** on the west. The partially marked channel in Fishing Bay has depths of 9 feet for 2 miles, thence 13 to 30 feet for 4 miles, thence 6 to 7 feet for a mile, and thence 4 to 3 feet to the head, 9 miles above the mouth.

Tedious Creek, on the west side of the bay and 2 miles above Bishops Head, has depths of 4 feet for 0.4 mile from the mouth, then shoals gradually to 1 foot at the head, 0.7 mile above the mouth. The cove at **Crocheron,** a village on the south side of the creek and just inside the entrance, has several small piers but is obstructed by stakes and crab pounds.

Goose Creek empties into the west side of Fishing Bay 3 miles above the entrance. A Federal project provides for a channel 6 feet deep and 60 feet wide from deep water in the bay to the wharves in the creek. The controlling depth was 6 feet in the marked channel in 1950.

McCreadys Creek empties into the east side of Fishing Bay 4 miles above the entrance. A Federal project provides for a channel 6 feet deep and 60 feet wide from deep water in the bay to the wharves in the creek. The controlling depth was 6 feet in 1950. The channel is marked by a lighted range.

Farm Creek empties into the west side of Fishing Bay 5 miles above the entrance. On the east side of the bay and directly opposite Farm Creek is **Fishing Point,** on which

is **Elliott,** a small village with a post office. A Federal project provides for a channel 6 feet deep and 60 feet wide from deep water in the bay to the wharves at **Toddville,** on the south side of Farm Creek 0.6 mile above the mouth. The controlling depth was 6 feet in 1950. The channel is marked by a lighted range and daybeacons.

Blackwater River empties into the west side of Fishing Bay 8 miles above the entrance. The river has depths of 3 feet in the mouth, thence 5 feet and in some places more than 30 feet for 7 miles; it is said to be navigable for many more miles.

Transquaking River, which empties into the head of Fishing Bay 9 miles above the mouth, has depths of 3 feet in the entrance and deeper water inside. The river is navigable for several miles.

Honga River extends northwestward from the western part of Hooper Strait, described earlier, for 14 miles between the mainland on the northeast and the Hooper Islands on the southwest; the river is more than a mile wide for most of its length. Honga River has a sizable traffic in shellfish and shellfish products.

The southern, and main, entrance to Honga River is between Hooper Strait Light, described earlier, on the east and a light off the most southerly of the Hooper Islands on the west. The narrow crooked channel in the river has depths of 13 to 55 feet as far as large **Wroten Island,** on the east side 8.5 miles above the southern entrance, and thence 8 feet for 1.5 miles to the improved channel leading northwestward and westward to Fishing Creek. Depths northward of the Fishing Creek channel are 4 to 5 feet, shoaling gradually to 2 feet at the head. The river is marked by lights and buoys as far as Fishing Creek.

Fox Creek empties into the northeast side of Honga River 2.5 miles above the entrance. A light marks the east side of the creek entrance and a daybeacon marks the point of a shoal that extends southeastward from **Paul Point.** The creek has depths of 8 feet to a line from Paul Point to **Wingate Point,** on the east side 2 miles above the entrance, then shoals gradually to 3 feet at the head, a mile farther up.

Duck Point Cove, on the east side just inside the entrance to Fox Creek, has general depths of 2 to 5 feet. A Federal project provides for a channel 6 feet deep and 60 feet wide into **Hearns Cove,** on the north side of Duck Point Cove, from that depth in Fox Creek to a mooring basin 6 feet deep, 100 feet wide, and 300 feet long at Wingate, at the head of the cove. The controlling depth was 6 feet in 1950. The channel is marked by lights. The oyster-packing plants at **Wingate** (*P. O.*) have small wharves to accommodate the oyster boats. Gasoline is available in limited quantities.

The three low **Hooper Islands** separate Honga River from Chesapeake Bay and Tar Bay. The two northerly islands are connected with each other and with the mainland by bridges. **Hoopersville** is a village on the middle island opposite a point 3.5 miles along the main channel of Honga River from the southern entrance. Only piling remain of the wharf on the inner side of Hoopersville. The village has packing plants, general stores, churches, and schools.

The highway bridge over the passage between the two northerly islands has a swing span with a horizontal clearance of 23 feet and a vertical clearance of 5 feet; the draw is opened from sunrise to sunset. In 1951, it was reported that depths of 4 or 5 feet could be carried through the bridge from Honga River to Chesapeake Bay; the passtge is marked by lights.

Chart 553.—Back Creek is midway along the inner side of the most northerly of the Hooper Islands and directly across Honga River from Wroten Island. **Fishing Creek** (*P. O.*) is a village at the head of Back Creek. The controlling depth into Back Creek is about 2 feet. Along the creek are a marine railway and several oyster houses. **Honga** is a village near the north end of the island. Gasoline, provisions, and some marine supplies can be obtained on the island.

Fishing Creek is between the northernmost of the Hooper Islands and **Meekins Neck.** The highway bridge over Fishing Creek has a swing span with a horizontal clearance of 27 feet and a vertical clearance of 6 feet; the draw is opened from sunrise to sunset. Along the creek are a public wharf and several private wharves.

A Federal project provides for a channel 7 feet deep and 60 feet wide from the 7-foot contour in Chesapeake Bay through Tar Bay and Fishing Creek to the 7-foot contour in Honga River. The total length of the improved channel is 4 miles and the inner approach is from a point 10 miles along the Honga River main channel from the southern entrance. The controlling depth was 4½ feet in June 1952. The project channel is well marked by lights.

The mean range of **tide** in Fishing Creek is 1½ feet. The **current** is estimated to have a maximum velocity of 3 knots at strength of flood or ebb.

Tar Bay, west of Meekins Neck and the most northerly of the Hooper Islands, is separated from Chesapeake Bay by **Barren Island** and a smaller island to the northward. The bay is shallow and unimportant outside the channel that leads from Chesapeake Bay to Fishing Creek and Honga River.

Depths of 1½ to 2 feet can be carried northward from the head of Honga River to Little Choptank River by way of **Great Marsh Creek** and **Lower Keene Broad,** thence east of **Dunnock Island** and through **Upper Keene Broad** and **Slaughter Creek.** The total distance from river to river is 10 miles. The thorofare can be entered from Chesapeake Bay through a narrow creek about 4 miles along the outer shore from the Tar Bay-Fishing Creek channel.

A fixed highway bridge over the thorofare at **Golden Hill,** a village 0.2 mile from Honga River, has a horizontal clearance of 24 feet and a vertical clearance of 6 feet.

The village of **Taylors Island** (*P. O.*) is on the west side of Slaughter Creek 2 miles from Little Choptank River and 8 miles from Honga River. The fixed highway bridge over the creek at Taylors Island has a horizontal clearance of 31 feet and a vertical clearance of 10 feet. The village has a general store; gasoline, water, and provisions are available. The northern part of Slaughter Creek is described later in connection with Little Choptank River.

Chart 551.—Sharps Island Light (lat. 38°38′.3, long. 76°22′.5), 54 feet above the water and visible 13 miles, is shown from a brown tower on a cylindrical pier in depths of 10 feet at the north end of a shoal with depths as shallow as 2 feet; the fog signal operates from September 15 to June 1. *Sharps Island Light is 3 miles due east of a point 106 miles along Chesapeake Bay main channel from the Virginia Capes.* Tiny **Sharps Island,** 1.3 miles south-southeast of the light, is subject to rapid erosion. Just south of the island is a small Naval **danger zone;** limits of the area and regulations governing it are given in **§ 204.34,** Chapter 2A.

Little Choptank River empties into the eastern side of Chesapeake Bay 6 miles

south-southeastward of Sharps Island Light. The river is obstructed by shoals but has depths of 11 feet in a narrow crooked channel for 7 miles and 5 feet for considerable distances into most of the tributaries. The river channel is marked by standard aids as far as Fishing Creek. The tributary channels have an occasional standard aid and usually are marked by bush stakes, but navigation is difficult without some local knowledge. The mean range of **tide** in Little Choptank River is about 1½ feet. The river carries a small commercial **traffic** in shellfish and shells.

The entrance to Little Choptank River is between **James Island** on the southwest and **Hills Point** on the northeast. James Island is subject to rapid erosion. On the mainland side of the shallow passage south of the island is **Oyster Cove,** which has general depths of 2 to 3 feet but is little used. Good **anchorage** is available in depths of 12 to 18 feet in the bight between James Island and **Hooper Point,** which is on the west side of the entrance to Slaughter Creek.

Slaughter Creek empties into the south side of Little Choptank River 4 miles above the mouth. The channel over the bar has a depth of 4 feet and is marked by lights. Within the creek, depths of 5 feet can be carried for 2 miles to the bridge at the village of **Taylors Island,** described earlier in connection with the inside passage from Honga River. The creek is used by oyster tongers and crab fishermen.

Brooks Creek, on the north side of Little Choptank River 4.5 miles above the mouth, has depths of 5 feet in a very narrow channel for 2 miles, thence 3 feet for 1 mile to the head. The creek is used only by small local boats.

Hudson Creek, on the north side of Little Choptank River 6 miles above the mouth, has depths of 6 feet for 3 miles, then shoals gradually in 0.7 mile to 2 feet at **Hudson,** a village at the head. The entrance to the creek is marked by buoys, and the upper reaches usually are bush-staked. Gasoline, water, and provisions can be obtained at Hudson.

Madison Bay, across Little Choptank River from Hudson Creek, has depths of 6 to 8 feet for 1 mile, thence about 2 feet for 0.5 mile to **Madison,** a village at the head. There is a small pier at Madison.

Fishing Creek, on the southeast side of Little Choptank River 7 miles above the mouth, has a controlling depth of 5 feet for 4 miles, almost to the forks at the head. There are several small piers along the creek and it is used extensively by boats bound for Church Creek, the principal tributary. The entrance is marked by buoys, and the upper reaches usually are marked by bush stakes.

Church Creek, on the south side of Fishing Creek 2.5 miles above the mouth, has depths of 6 feet for 0.8 mile, thence 3 feet for 0.8 mile, and thence 1 to 3 feet for 0.3 mile to **Church Creek** (*P. O.*), a village near the head. Gasoline and provisions can be obtained at the village.

Phillips Creek and **Beckwith Creek** empty into the north side of Little Choptank River 7.5 miles above the mouth. **Lee Creek** and **Gary Creek** empty into the head of the river 10 miles above the mouth. These creeks have depths of 2 to 5 feet but they have no commercial wharves and are used only by small local boats.

Choptank River empties into Chesapeake Bay 2 miles eastward of Sharps Island Light and is navigable for 57 miles to the town of Greensboro. Traffic on the river consists chiefly of sand and gravel, petroleum products, fish and shellfish, and shell.

The main approach to Choptank River is from southward and eastward of Sharps Island; the broad channel has a least depth of 24 feet. The approach between designated **fish-trap areas** northward and eastward of Sharps Island Light has a least depth of 10 feet. Both approaches are well marked.

The river **channel** has natural depths of 19 feet for 20 miles, thence 11 feet for 28 miles to the lower end of Pealiquor Shoal. The channel is marked by lights and buoys to Cambridge and thence by buoys to Tuckahoe Creek, 4 miles below Pealiquor Shoal; thus far the channel is easily followed, but above Tuckahoe Creek it is narrow, crooked, and difficult to navigate without some local knowledge. The channel through Pealiquor Shoal and thence to Denton and Greensboro is covered later in the running description of the upper river. The mean range of **tide** in Choptank River is about 1½ feet at Cambridge, 2 feet at Denton, and 2½ feet at Greensboro. The river water is **fresh** above the village of Choptank.

Two miles above Hills Point, on the south side of the entrance to Choptank River, is shallow **Trippe Bay** which is little used except by small oyster and fishing boats. The channel to **Brannock Bay,** at the head of Trippe Bay, is buoyed.

Tilghman Island, on the north side of the entrance to Choptank River, has a substantial crabbing, oystering, and fishing industry. The island, which is 3 miles long in a north-south direction, is subject to rapid erosion on its western side.

Blackwalnut Cove, at the south end of Tilghman Island, is used extensively by small boats. The harbor is well sheltered except from the south. A Federal project provides for a channel 6 feet deep and 60 feet wide to an anchorage basin 6 feet deep and 400 feet square near the head of the northeast prong. The controlling depth was 6 feet in August 1949. The channel and basin are marked by lights and buoys. The mean range of **tide** is about 1½ feet.

On the west side of the anchorage basin is the village of **Fairbank.** There are small piers at Fairbank and on the opposite side of the northeast prong. A small marine railway is on the shore of the northwest prong.

Dogwood Harbor, on the eastern side of Tilghman Island, has depths of about 7 feet to the packing-plant wharf at **Avalon** (*P. O.*). Gasoline, water, and provisions can be obtained at the village.

Knapps Narrows is between the mainland and the northern end of Tilghman Island. A Federal project provides for a channel 9 feet deep and 75 feet wide from deep water in Chesapeake Bay to deep water in Harris Creek, with a turning basin 7 feet deep and approximately 320 feet long and 120 feet wide west of the bridge over the narrows. The controlling depth was 7 feet in 1950.

The narrows and both approaches are marked by lights; **note** that the system of marking is from each entrance and reverses at the bridge. The highway bridge, which is about midway along the narrows, has a bascule span with a horizontal clearance of 50 feet and a vertical clearance of 7 feet. The mean range of **tide** is about 1½ feet.

Tilghman (*P. O.*) is a village at the island end of the highway bridge. The bulkheaded sides of the turning basin on the west side of the southerly abutment of the bridge are available for public use. Gasoline, water, ice, and some marine supplies are available. The larger of two boatyards along Knapps Narrows is east of the bridge and can haul out vessels up to 55 feet in length, 4 feet in draft, and 15 tons in weight; the yard makes general repairs, including some machine work.

Harris Creek empties into Choptank River from northward along the east side of Tilghman Island. The channel has depths of 10 feet and is marked by buoys as far as **Indian Point,** on the east side 4 miles above the mouth. Above Indian Point, the narrow unmarked channel has depths of 6 feet for 3 miles to the forks, thence 5 feet for 1 mile up **Northeast Branch** (*see Chart 550*), and thence 2 feet for 1 mile to the head of the branch, 9 miles above the mouth of the creek. **Northwest Branch** (*see Chart 550*) also extends about 2 miles from the forks and has a controlling depth of about 2 feet to its head.

Sherwood (*P. O.*) is a village on the west side of Harris Creek 4.5 miles above the mouth of Harris Creek. The county wharf at the village is available for public use.

Cummings Creek empties into the northwest side of Harris Creek 5.5 miles above the mouth. A depth of about 5 feet can be carried up Cummings Creek to the county wharf at **Wittman** (*see Chart 550*). The larger of two yards along the prongs just eastward of Cummings Creek can haul out boats up to 46 feet in length, 3 feet in draft, and 5 tons in weight and can make general hull repairs.

Broad Creek, on the north side of Choptank River 4 miles above the mouth, has depths of 16 feet as far as **Edge Creek,** on the east side 3 miles above the mouth. Above Edge Creek, the winding channel has depths of 9 feet for 3 miles, then shoals gradually to depths of 2 feet at the head, 7.5 miles above the entrance. The wide channel at the entrance to Broad Creek is marked, but some local knowledge is needed in the narrow unmarked upper reaches.

Balls Creek, on the west side of Broad Creek 1 mile above the entrance, has depths of 5 feet to its head; the narrow entrance is marked by a light. **Neavitt** (*P. O.*) is a village on the southwest side near the head.

St. Michaels, a town with its main water front on Miles River, can be reached from Choptank River by way of Broad Creek, thence southeastward in Edge Creek for 0.7 mile, and thence northward in **San Domingo Creek** for 2.3 miles to its head, 6 miles from the mouth of Broad Creek. San Domingo Creek has depths of 7 feet or more for most of its length and a controlling depth of 4 feet to St. Michaels.

Irish Creek, on the north side of Choptank River 5 miles above the mouth, has depths of 7 feet for 1.4 miles, then shoals gradually to 2 feet at its head, 2 miles above the entrance. The narrow approach channel is marked by buoys. The creek is used only by small local boats.

Tred Avon River, which empties into the north side of Choptank River 7 miles above the mouth, has natural depths of 16 feet or more for 5 miles, thence 11 feet for 1 mile to Peachblossom Creek. The channel from Peachblossom Creek to Easton is discussed later. Traffic in the river consists chiefly of petroleum products, shellfish, and fertilizers.

Choptank River Light (lat. 38°39′.4, long. 76°11′.1), 35 feet above the water and visible 11 miles, is shown from a white hexagonal house on brown piles in depths of 9 feet 0.6 mile outside the entrance to Tred Avon River; the fog signal operates from September 15 to June 1. Depths of 16 feet can be carried into the river 0.4 mile on either side of the light. The channel within the river is marked by lights and buoys for 7 miles, above which mid-channel courses can be steered with safety by boats drawing up to 5 or 6 feet.

Small motorboats can find **anchorage** near mid-channel in any of the larger tribu-

taries of Tred Avon River. The river bottom is quite firm but the bottom in the tributaries is mostly soft mud. There is excellent protection from the wind except when it blows up or down stream. The brush and trees that line most of the banks provide further protection from the wind.

Oxford is on the east side of Tred Avon River, 2 miles above the mouth. A tall silver water tank stands well above the trees and can be seen for a considerable distance.

A Federal project for the improvement of **Town Creek,** on the east side of Oxford, provides for a channel 10 feet deep and 100 feet wide for about 0.3 mile; thence 8 feet deep and 100 feet wide for about 0.2 mile; and thence 7 feet deep and 60 feet wide to a turning basin 100 feet wide and 200 feet long at the head, about 0.8 mile above the entrance. The project also provides for anchorage basins about 300 feet square adjacent to the 10-foot and 8-foot reaches, and with the same depths, in the two coves on the west side. The channel and basins were at project depths in July 1949.

The channel in Town Creek is well marked by lights, daybeacons, and buoys. The mean range of **tide** is about 2 feet. **Storm warnings** are displayed day and night from a mast in the town square.

The **ferry** landing on the river side of Oxford has depths of 14 feet at the face. Year-round ferry service is maintained to Bellevue, on the opposite side of the river. There are packing-house wharves on the west bank of Town Creek, and small piers are scattered along both sides of the creek.

Gasoline, Diesel oil, water, ice, and provisions are available at Oxford. The largest shipyard at the town can haul out vessels up to 110 feet in length, 9 feet in draft, and 200 tons in weight; the machine shop can repair gasoline and Diesel engines.

Bellevue is across Tred Avon River from Oxford. Year-round **ferry** service is maintained between the two towns. Several oyster-packing plants in Bellevue are prominent. The largest of the several fishing wharves has depths of 6 feet alongside.

Peachblossom Creek is on the east side of Tred Avon River 6 miles above the mouth. A Federal project provides for a channel 8 feet deep and 150 feet wide from Peachblossom Creek to Easton Point; the controlling depth was 6½ feet in March 1950. The channel is marked only as far as the shoals extending off **Watermelon Point,** on the east side 1 mile above Peachblossom Creek. The mean range of **tide** is about 2 feet.

Easton Point, 1 mile from the town of **Easton,** is on the east side of Tred Avon River 8.5 miles above the mouth. There are bulkhead wharves on Easton Point for the receipt and distribution of petroleum products.

Island Creek empties into the north side of Choptank River 8 miles above the mouth. The channel through the bar at the entrance has a controlling depth of about 4 feet and is marked by lights. Within the creek, the channel has depths of 9 feet or more for 3 miles.

Lecompte Bay, on the south side of Choptank River 10 miles above the mouth, has general depths of 7 to 13 feet. The entrance to the bay is between **Castle Haven Point** on the northwest and **Horn Point** on the southeast. Behind the inner end of the spit that extends 0.6 mile eastward from Castle Haven Point is a long pier at **Castle Haven** which has several large buildings. The pier and boathouse are privately owned and not open to the public.

La Trappe Creek empties into the north side of Choptank River 10.5 miles above the mouth. The channel in the creek has depths of 10 feet for 0.5 mile, thence 7 feet

or more to within 0.3 mile of **Trappe Landing,** 3 miles above the mouth. The entrance is marked by lights. The bulkhead at Trappe Landing has a depth of about 4 feet at the face. **Trappe** (*P. O.*) is a village 1.2 miles inland to the eastward of the landing.

Chart 552.—Cambridge, on the south side of Choptank River 15 miles above the mouth, has considerable trade by water and is the center of a fair-sized oystering and fishing industry. The town has railroad freight service. In July 1946, **Cambridge Harbor,** in the southeastern part of the town, had controlling depths of 10 feet to the Market Street bridge, thence 7 feet to the turning basin at the head, 0.6 mile above the entrance, and 6½ feet in the basin. The controlling depth into the municipal boat basin fronting on Choptank River 300 yards northwest of the harbor channel was 5½ feet in July 1946.

The channel into Cambridge Harbor is marked by buoys and a lighted range. The entrance to the municipal boat basin is marked by lights.

The Market Street bridge over Cambridge Harbor 0.3 mile above the entrance has a bascule span with a horizontal clearance of 55 feet and a vertical clearance of 8½ feet; **regulations** governing operation of the drawspan are given in **§ 203.270,** Chapter 2A. The highway bridge over Choptank River from the southeast side of Cambridge has a swing span with a horizontal clearance of 100 feet and a vertical clearance of 18 feet.

Storm warnings are displayed, daytime only, at the Cambridge Yacht Club in the municipal basin; the clubhouse resembles a ship's bridge. Cambridge is a **customs** port of entry at which marine documents are issued. The U. S. Public Health Service maintains an **outpatient** office in the town. Permission to anchor or tie up in the municipal basin must be obtained from the **harbor master.**

Gasoline, Diesel oil, water, ice, provisions, and some marine supplies are available at Cambridge. The largest shipyard at the town can haul out vessels up to 100 feet in length, 8 feet in draft, and 200 tons in weight; repairs can be made to gasoline and Diesel engines.

Bolingbroke Creek, on the north side of Choptank River 16 miles above the mouth, has depths of 3 feet over the bar at the mouth. The channel within the creek has depths of 5 feet for 2 miles to within 0.7 mile of the head.

Warwick River empties into the east side of Choptank River 20 miles above the mouth. **Secretary** (*P. O.*) is a village on the south side of Warwick River 1 mile above the entrance. The controlling depth to Secretary was 9 feet in 1947. The entrance to the river is marked by buoys. There are bulkhead wharves at Secretary.

Cabin Creek, on the east side of Choptank River 22 miles above the mouth, has depths of 5 feet for 0.6 mile, thence 2 feet for 1 mile nearly to the head. The fixed highway bridge 1 mile above the entrance to Cabin Creek has a horizontal clearance of 17½ feet and a vertical clearance of 7 feet; the cut-off piling of a former bridge are just under water on the downstream side of the present bridge. There are no wharves along Cabin Creek.

Hunting Creek, which empties into the east side of Choptank River 29.5 miles above the mouth, has depths of 3 feet over the bar at the mouth and 4 feet inside for 3 miles to a fixed highway bridge. The fixed highway bridge 0.4 mile above the entrance has a horizontal clearance of 15 feet and a vertical clearance of 8 feet.

Choptank is a village on the northeast side of Choptank River 30 miles above the

mouth. The small yacht harbor at Choptank has depths of 2 to 3 feet behind its wooden bulkheads. The old wharf northwest of the yacht harbor is in ruins.

The **overhead power cable** 35 miles above the mouth of Choptank River has a vertical clearance of 139 feet.

Dover Bridge, 37.5 miles above the mouth of Choptank River, has a swing span with a horizontal clearance of 79 feet and a vertical clearance of 10 feet.

Tuckahoe Creek empties into the north side of Choptank River 44 miles above the mouth. The channel in the creek has depths of 8 feet for 1.7 miles, thence 5 feet for 7 miles, and thence 2 feet to within 1 mile of the fixed highway bridge from **Hillsboro** to **Queen Anne,** at the head of navigation 11 miles above the entrance.

The channel in Tuckahoe Creek is unmarked and is crooked and difficult to navigate in places without local knowledge. The flats are covered with tuckahoes or marsh grass in the summer. The creek is used only by small fishing and pleasure boats. **Tuckahoe Bridge,** 1.7 miles above the entrance, has a fixed span with a horizontal clearance of 40 feet and a vertical clearance of 17 feet.

Williston is a small settlement on the east side of Choptank River 46 miles above the mouth. The bulkhead has rotted away and only moss-covered piling remain. There is a cannery at Williston.

Pealiquor Shoal is 48 miles above the mouth of Choptank River. A Federal project provides for a channel 8 feet deep and 100 feet wide through the shoal; the controlling depth was 8 feet in March 1953. The channel is marked by daybeacons to Denton.

Denton is a town on the east side of Choptank River 50.5 miles above the mouth. The controlling depth to Denton is the depth through Pealiquor Shoal. The highway bridge over Choptank River at Denton has a bascule span with a horizontal clearance of 48 feet and a vertical clearance of 4 feet. The railroad bridge 0.4 mile above the highway bridge has a swing span with a horizontal clearance of 49½ feet and a vertical clearance of 6 feet; **regulations** governing operation of the drawspan are given in **§ 203.245,** Chapter 2A.

Greensboro is a town at the head of navigation 57 miles above the mouth of Choptank River. A Federal project provides for a channel 8 feet deep and 75 feet wide from Denton to Greensboro; the controlling depth was 3½ feet in 1946. The channel is unmarked. The first of two fixed highway bridges at Greensboro has a horizontal clearance of 38 feet and a vertical clearance of 9 feet.

Chart 550.—Bloody Point Bar Light (lat. 38°50′.0, long. 76°23′.5), 56 feet above the water and visible 13 miles, is shown from a brown tower on a cylindrical foundation in depths of 7 feet a mile westward of the south end of Kent Island; the light has a fog signal. *Bloody Point Bar Light is 2 miles due east of a point 117.5 miles along Chesapeake Bay main channel from the Virginia Capes.*

The mid-channel point of the main entrance to **Eastern Bay** is 1.3 miles south-southeastward of Bloody Point Bar Light, the same distance southward of Kent Island, and 2.2 miles northward of Poplar Island. Light-draft vessels also can enter from southward through Poplar Island Narrows and from Chester River on the northward through Kent Island Narrows.

Eastern Bay is the approach to the town of Claiborne, to Miles River and the town of St. Michaels, and to several other tributaries. The shores are low and have

few prominent marks. The bay is traveled extensively by oyster and fishing boats. The channel into the bay is wide and deep; within the bay are large shoal areas, but depths of 25 feet can be carried without difficulty to the mouths of most of the tributaries.

Poplar Island, on the south side of the main entrance to Eastern Bay, is 1.3 miles long in a north-south direction and is low and wooded. Smaller **Jefferson Island,** southeast of the northern part of Poplar Island, and **Coaches Island,** east-southeast of the southern end, once were part of the large island. **Poplar Harbor,** formed by the three islands, has secure anchorage in depths of 4 to 6 feet.

Poplar Island Narrows has a least width of 1 mile between Coaches Island and the mainland to the eastward. The channel through the narrows has a controlling depth of about 6 feet and is marked by lights and buoys.

Ferry Cove, on the mainland side of Poplar Island Narrows, has depths of 6 feet in mid-channel to **Lowes Wharf** at the head and is used as an anchorage by local boats. The entrance is marked by a light and a buoy. The present wharf is the property of a fish-cutting plant and is not open to the general public. The village of **Sherwood,** mentioned earlier in connection with Harris Creek, Choptank River, is back of Ferry Cove.

Claiborne (*P. O.*) is a summer-resort village on the southeast side of Eastern Bay 5 miles by deep channel from the main entrance. A combination pier and jetty extends 0.2 mile west-southwestward from the Claiborne water front; the pier is in very poor condition. The former ferry landing is just south of the old pier. The ferry building and a white sanatorium in the village are prominent. The channel to Claiborne has a controlling depth of about 12 feet. Gasoline and provisions can be obtained at the village.

Kent Point, on the north side of the main entrance to Eastern Bay, is the southernmost extremity of **Kent Island,** which has a north-south length of 13.5 miles and a greatest width of 5.5 miles.

Cox Creek flows southward from the interior of Kent Island and empties into Eastern Bay between **Long Point,** 2 miles northeast of Kent Point, and **Turkey Point,** 3 miles farther to the northeastward. The mid-channel point in the mouth of Cox Creek is 5 miles by deep channel from the main entrance to the bay. The channel within the creek has depths of 22 feet for 1 mile, thence 11 feet for 2 miles, thence 7 feet for 2 miles, and then shoals gradually to 2 feet at the head of navigation, a fixed highway bridge 6.5 miles above the mouth.

Romancoke landing is on the west side of Cox Creek 1.5 miles northward of Long Point; the controlling depth to the landing is about 12 feet. Above the Romancoke landing, Cox Creek has no villages along its banks and is used mostly by oyster boats. The channel is very narrow in places and shallow water is close to the edges. The shoals are unmarked and local knowledge is needed to avoid them.

Crab Alley Bay empties into Eastern Bay from the interior of Kent Island between **Bodkin Island,** 0.8 mile east-southeastward of Turkey Point, and **Parson Island,** 2 miles eastward of Turkey Point. Bodkin Island is very small and is thickly wooded. Larger Parson Island is sparsely wooded and has a ragged appearance; a house is visible from some directions.

The mid-channel point in the entrance to Crab Alley Bay is 8 miles by deep channel from the main entrance to Eastern Bay. The principal channel in Crab Alley Bay has depths of 8 feet for 2.5 miles to Crab Alley Creek, in the northwestern part of the

bay, and is marked by buoys; one of the buoys marks a 2-foot shoal on the west side 2 miles from the entrance. The other channel branches northward 0.8 mile above the entrance to the bay and has depths of 6 feet to a point 2.2 miles from the entrance, thence 1 to 2 feet to the head, 0.4 mile farther up.

The mouth of **Crab Alley Creek,** between the main part of Kent Island on the west and relatively small **Johnson Island** on the east, is partly obstructed by very shallow areas that extend out from both sides. The channel within the creek has depths of 6 feet for 1.4 miles, then shoals gradually to 1 foot at the head, 0.6 mile farther up. About 1 mile above the entrance is a marine railway that can haul out boats up to 45 feet in length and 4 feet in draft.

The main entrance to **Prospect Bay,** in the northeastern part of Eastern Bay, is between Parson Island and **Piney Neck Point,** 2.2 miles to the east-southeastward. The mid-channel point in the entrance is 9 miles by deep channel from the main entrance to Eastern Bay.

Prospect Bay extends northward between Kent Island on the west and the mainland on the east for 5 miles to the bridges over **Kent Island Narrows.** The channel has natural depths of 21 feet for 2 miles, thence 11 feet for 1 mile, and thence 7 feet for 1 mile to the beginning of the buoyed approach to the narrows, which are discussed later in connection with Chester River.

Greenwood Creek is on the southeast side of Piney Neck Point in the eastern part of Eastern Bay. The entrance to the creek is 10 miles by deep channel from the main entrance to the bay. The best approach to Greenwood Creek favors the bay shore on the south side. The depth over the bar at the mouth is 4 feet. The channel within the creek has depths of 6 feet for 2 miles, thence 4 feet for 0.6 mile to within 0.3 mile of the head.

Miles River empties into the eastern part of Eastern Bay from southeastward, between **Tilghman Point,** at the northeastern end of **Rich Neck,** and **Bennett Point,** 2.3 miles to the east-southeastward. The mid-channel point in the entrance to the river is 8.5 miles by deep channel from the main entrance to the bay. The river channel has depths of 20 feet or more for 6 miles, thence 11 feet for 2 miles, thence 9 feet to the highway bridge 11 miles above the mouth, thence 6 feet for 2 miles, and thence 1 to 3 feet for 1.5 miles to the head, 14.5 miles above the mouth. A shallow **middle ground** about 2 miles above the entrance to Miles River bares in one place at low water but is well marked on all sides by buoys. Lights and buoys mark the river channel as far as the bridge. The small trade on the river is chiefly in shellfish and shells.

Tilghman Creek empties into the west side of the entrance to Miles River along the southeast side of Tilghman Point and Rich Neck. The outer end of Tilghman Point is heavily wooded. The creek has depths of 8 feet in the entrance and 11 to 8 feet inside for most of its 1-mile length. The very narrow entrance is marked by a light and a buoy.

Wye River empties into the east side of Miles River just inside Bennett Point at the entrance. The approach can be made from either north or south of the middle ground mentioned earlier. The northern approach has a controlling depth of 9 feet and the distance is 2.5 miles from Miles River entrance to Wye River entrance. The southern approach has depths of 30 feet or more and the distance is 4.5 miles. Both approaches are buoyed.

Small local boats are the principal users of Wye River and its several branches. The twisting channels are unmarked and local knowledge is needed to follow the deepest water. The channel in the river proper has depths of 25 feet or more for 2.5 miles, thence 15 feet for 1.5 miles, thence 10 feet for 2 miles, thence 6 feet for 2.5 miles, and thence 1 to 3 feet for 1 mile to the head, 9.5 miles above the mouth. Oyster bars are found along the channel edges in the vicinity of Wye Island. There are several landings along the river and its branches.

One mile above the mouth of Wye River, **Wye East River** extends northeastward and then eastward along the southeast side of **Wye Island.** The channel in the tributary has depths of 13 feet for 5.5 miles to the junction with Wye Narrows and Skipton Creek at the east end of the island. **Skipton Creek** extends eastward with depths of 6 feet for 1 mile, then shoals to 2 feet at the forks 0.3 mile farther up. Wye East River turns northward and has depths of 6 feet for 1 mile, then shoals gradually in 2.5 miles to a depth of 1 foot at the head, 9 miles from Wye River.

Wye Narrows follows the north side of Wye Island and has a total length of 4 miles between the junction with Wye East River at the east end of the island and the junction with Wye River proper at a point 4 miles above the river's mouth. The channel through the narrows has a controlling depth of 6 feet. Midway along the narrows is a fixed highway bridge with a horizontal clearance of 40 feet and a vertical clearance of 10 feet.

Long Haul Creek, on the west side of Miles River 5 miles above the entrance, has depths of 9 feet or more in most of its 0.6-mile length. The Miles River Yacht Club maintains the finger posts and the range that mark the channel into the small club harbor in the creek; the range has a bearing of about **285°** and is lighted from April 1 to December 1.

St. Michaels, a town at the head of a small harbor on the west side of Miles River, is 6 miles by deep channel from the entrance to the river and 15 miles from the main entrance to Eastern Bay. A tank and two church spires are prominent. The harbor has general depths of 9 to 11 feet and the entrance is marked by a light and a buoy. The mean range of **tide** is 1¼ feet.

The wharf on the north side of the entrance to the inner harbor has depths of 8 feet at the outer end. **Storm warnings** are displayed, daytime only, at the wharf. The cove at the head of the inner harbor has depths of about 4 feet and is frequently crowded with anchored yachts.

St. Michaels has railroad freight service. Gasoline, Diesel oil, water, ice, provisions, and some marine supplies are available. A local marine railway has a hauling capacity of 40 tons and can handle boats up to 65 feet in length; a machine shop on the premises repairs gasoline and Diesel engines and does hull work.

Leeds Creek is directly across Miles River from St. Michaels. **Fairview Point,** on the north side of the entrance, is thickly wooded; the cupola of a large Moorish-type dwelling 0.4 mile north of the point is prominent. The entrance is marked by buoys. The creek has depths of 8 feet for 2 miles to the point just below the village of **Tunis Mills,** then shoals gradually to 3 feet at the head, 0.5 mile farther up. The fixed highway bridge from Tunis Mills to **Copperville,** on the northwest side of the creek, has a horizontal clearance of 23 feet and a vertical clearance of 5 feet.

Oak Creek, on the south side of Miles River 8 miles above the entrance, has depths of 2 feet in the mouth and 3 to 5 feet to the village of **Royal Oak** at the head, 0.6 mile

above. The two bridges over the entrance to Oak Creek, the first with a swing span and the second with a bascule span, have minimum clearances of 24 feet horizontally and 2 feet vertically; **regulations** governing operation of the drawspans are given in **§ 203.285,** Chapter 2A.

Hunting Creek, directly across Miles River from Oak Creek, has depths of 8 feet for 1.5 miles, then shoals gradually to 4 feet 0.3 mile from the head, 3 miles above the mouth. A buoy marks the river channel off the mouth of the creek and the creek channel is marked by privately maintained daybeacons. The peninsula on the west side of lower Hunting Creek has a break-through 0.8 mile above the entrance; in 1951 work boats and other small craft were using the opening at high water.

The highway bridge over Miles River 11 miles above the entrance has a bascule span with a horizontal clearance of 34½ feet and a vertical clearance of 5 feet; **regulations** governing operation of the drawspan are given in **§ 203.280,** Chapter 2A.

The bay shore of Kent Island is low and wooded. A **measured nautical mile** on course **001°30′** is off **Brickhouse Bar,** which is 5.5 miles north of Bloody Point Bar Light and a mile west of Kent Island; buoys and shore ranges mark the ends of the course. Just north of the north range is a marine service station where gasoline, water, and ice can be obtained; the depth at the pumps is 4 feet.

Matapeake, 7 miles northward of Bloody Point Bar Light, has a landing with depths of about 14 feet at the face. The Kent Island end of **Chesapeake Bay Bridge,** described in Chapter 13, is 9 miles north by east of the light.

Chart 548.—Love Point Light (lat. 39°03′.4, long. 76°17′.0), 38 feet above the water and visible 11 miles, has a fog signal and is shown from a white hexagonal house on brown piles in depths of about 10 feet 1.4 miles northeast of Love Point. *Love Point Light is 2.5 miles due east of a point 132 miles along the channel from the Virginia Capes to the head of Chesapeake Bay.*

The main entrance to **Chester River** is between **Love Point,** the northern end of Kent Island, and Eastern Neck Island, 3 miles to the eastward. The approach is northward and eastward of Love Point Light. Light-draft vessels also can enter from Eastern Bay and Miles River on the southward by way of Kent Island Narrows. Traffic on the river consists chiefly of petroleum products, shellfish, fertilizers, and grains.

Chester River has natural depths of 20 feet or more for 19 miles, thence 12 feet for 9 miles, and thence 6 feet for 4 miles to Crumpton. The improved channel above Crumpton is covered later in the running description of the upper river. The river channel is marked by lights, lighted ranges, and buoys to Chestertown and by buoys to Crumpton.

The mean range of **tide** in Chester River is about 1 foot at the entrance, 1½ feet at Queenstown, 2 feet at Chestertown, and 2½ feet at Crumpton. The river is usually closed to navigation by **ice** for extended periods during ordinary winters; in mild winters the channel is kept clear most of the time by powerboats. The river water is **fresh** above Chestertown.

Love Point is a summer-resort village on the point on the west side of the entrance to Chester River. The old railroad pier on the river side of the village is in ruins.

Eastern Neck Island, on the east side of the entrance to Chester River, is about 3 miles long in a northwest-southeast direction and has a greatest width of 1.6 miles.

The island is sparsely wooded, and extensive grassy flats are found along the south shore. The island is connected with the mainland on the north by a fixed highway bridge over **Eastern Neck Narrows,** which is very shallow and little used.

Macum Creek and **Piney Creek,** 3.3 and 4 miles, respectively, along the Kent Island shore of Chester River from Love Point, are shallow and are used only as anchorages by small local boats. **Chester** is a village at the head of Macum Creek.

The approach to **Kent Island Narrows,** on the south side of Chester River, is from a point 4.5 miles along the river channel from the main entrance. A Federal project provides for a channel 7 feet deep and 100 feet wide from Chester River to Eastern Bay. The controlling depth was 7 feet in May 1950, but in November 1952 a depth of 6 feet was found in the Chester River part of the channel 0.8 mile from the Narrows bridges.

The channel through Kent Island Narrows is marked by numerous buoys. **Note well** that the system of marking reverses at the bridges. The highway bridge that crosses the Narrows 2 miles from the Chester River main channel has a bascule span with a horizontal clearance of 51 feet and a vertical clearance of 18 feet. The railroad bridge just south of the highway bridge has a swing span with a horizontal clearance of 38½ feet and a vertical clearance of 3 feet in the west opening; the east opening is not used. **Regulations** governing operation of the drawspans are given in § **203.290,** Chapter 2A. Along the Narrows are several piers adjacent to crab and oyster houses.

Wells Cove, on the mainland side 0.4 mile southeast of the Narrows bridges, has general depths of 1 to 5 feet. A Federal project provides for a channel 7 feet deep and 75 feet wide 800 feet into the cove from the 7-foot contour in Kent Island Narrows to a basin 7 feet deep and 300 feet square. The controlling depth was 7 feet in May 1950. The channel and basin are marked by buoys. On the shore of Wells Cove are a small wharf, a small marine railway, and a public landing.

Jackson Creek, on the south side of Chester River 5 miles above the main entrance, is a cove with general depths of 2 to 7 feet and is used as an anchorage by oyster boats. The channel is marked by buoys.

Winchester Creek, a mile eastward along the south shore of Chester River from Jackson Creek, has a very narrow entrance that is nearly bare at low water and depths of 3 to 7 feet inside. The creek is used as an anchorage by small local boats. The village of **Grasonville** is at the head, 0.7 mile above the mouth.

Queenstown Creek, on the southeast side of Chester River 6.5 miles above the main entrance, has depths of 9 feet for 0.3 mile to **Queenstown,** a village on the southeast side, thence 6 feet for 1 mile to within 0.3 mile of the head. An elevated tank in Queenstown is prominent. The entrance channel is bordered by very shallow grassy flats and is marked by lights and a buoy.

Tilghman Creek, on the east side of Chester River 7.5 miles above the main entrance, has depths of 2 feet over the bar and 8 to 3 feet inside to the head, 0.8 mile above the mouth. The creek is seldom entered.

The inner end of shallow 1-mile-long **Eastern Neck Narrows,** mentioned earlier in connection with the entrance to Chester River, is on the west side 9.5 miles above the entrance. **Church Creek,** which empties into the inner part of the narrows from northward, has depths of 3 feet in the approach from the river and the narrows and 6 feet inside for 1.2 miles to within 0.4 mile of the head; the creek is little used.

The mouth of **Grays Inn Creek** is a mile northwest of a point **11.5 miles** along the Chester River channel from the main entrance. The creek has depths of 8 feet for 2.3

miles to a small settlement on the west side, then shoals gradually to 1 foot at the head, 3.4 miles above the mouth.

The mouth of **Langford Creek** is 1.3 miles northward of the **11.5-mile point** in the main channel. The creek has depths of 12 feet over the bar and much deeper water inside to the forks 1.7 miles above the mouth; the channel is marked by buoys thus far. An unmarked shoal extends southwestward from small **Cacaway Island** toward the junction of the two fork channels; above the shoal the unmarked forks are clear in mid-channel. **East Fork** has depths of 10 feet for 3 miles, thence 7 feet for 1 mile to within a mile of the head. **West Fork** has depths of 10 feet for 2.7 miles, thence 6 feet for 0.7 mile into either of the two branches.

Long Cove, on the west side of Langford Creek 0.7 mile above the mouth, has depths of 4 feet to the head; the entrance is marked by buoys. **Lawyers Cove,** just northeast of Long Cove, also has depths of 4 feet. A marine railway in Lawyers Cove can haul out boats up to 40 feet in length and 20 tons in weight; a local machine shop can make repairs to hulls and gasoline engines. Gasoline, water, and ice can be obtained at the railway.

The common entrance to **Reed Creek** and **Grove Creek** is a mile southeast of the **11.5-mile point** in the main channel of Chester River. The channel to the fork 0.3 mile above the common mouth has a depth of 7 feet. Reed Creek extends southeastward and has depths of 7 feet for 1.5 miles from the fork, then shoals gradually to 1 foot a mile farther up. The channel in Grove Creek, which extends eastward, is only about 60 feet wide 0.3 mile above the fork but has depths of 5 feet through the narrows and upstream for a mile from the fork. An elevated tank east of the fork is prominent.

Corsica River empties into the east side of Chester River 13 miles above the main entrance. The tributary has natural depths of 8 feet for 3.7 miles, thence the controlling depth was 7 feet in 1948 to **Centerville Landing,** 5 miles above the mouth. The channel is marked by buoys for 3 miles, above which navigation is difficult without local knowledge. Gasoline and provisions can be obtained at the town of **Centerville,** 0.5 mile inland to the southward of the landing. The main wharf at the landing is in poor condition.

Southeast Creek, on the southeast side of Chester River 20 miles above the mouth, has depths of 3 feet for 1.8 miles, then shoals to 1 foot at the head of navigation 0.4 mile farther up. **Island Creek,** which empties into the south side of Southeast Creek 0.5 mile above the mouth, has depths of 3 feet in the entrance and 5 feet or more for 2 miles to a fixed highway bridge.

Chestertown, on the northwest side of Chester River 24 miles above the mouth, is a county seat and has bus and rail transportation. The highway bridge over the river at Chestertown has a bascule span with a horiztonal clearance of 60 feet and a vertical clearance of 12 feet. The wharves just below the bridge have depths of 8 to 12 feet at their faces. Gasoline, water, and ice are available.

Between Chestertown and Crumpton the channel is very narrow in places, with broad flats on either side that are almost awash at low water. Though marked by buoys in the more critical places, it is difficult to navigate without local knowledge and is more easily followed at low water.

Morgan Creek, on the northwest side of Chester River 26 miles above the mouth, has depths of 5 feet for 2.5 miles in a narrow crooked channel. The entrance is a nar-

row slough between flats almost awash at low water and is usually marked by bush stakes. A fixed highway bridge 0.6 mile above the entrance has a horizontal clearance of 100 feet and a vertical clearance of 8 feet.

Crumpton is on the south side of Chester River 32 miles above the mouth. The fixed highway bridge over the river at the town has a horizontal clearance of 40 feet and a vertical clearance of 14 feet.

A Federal project provides for a channel 6 feet deep and 60 feet wide from Crumpton to **Jones Landing,** 37 miles above the mouth of Chester River. The controlling depth was 2½ feet in 1946. The channel is unmarked and very difficult to navigate.

Rock Hall Harbor is 5 miles north-northeastward of Love Point Light. Traffic in the harbor consists chiefly of shellfish, shells, and petroleum products. The entrance is protected by jetties. Controlling depths in the entrance channel, the channel along the wharves, and the anchorage basin were 7 feet in 1946.

The approach to Rock Hall Harbor is from southward between **Swan Point Bar** and the mainland. The lighted range on the west side of Swan Creek is followed about north by west for 2 miles, then the harbor lighted range is followed about northeast by east for 0.8 mile to the buoy 100 yards off the jetties. The front light of the harbor range also marks the outer end of the east jetty; an elevated tank 0.4 mile back of the wharves is on or very close to the range line extended. A light also marks the outer end of the west jetty, and a light and daybeacons mark the channels in the harbor.

The wharves in Rock Hall Harbor have depths ranging to 9 feet at their faces. Gasoline, water, and ice can be obtained on the water front, and provisions are available in **Rock Hall** (*P. O.*), a village 0.4 mile inland to the eastward. A marine railway in the harbor can haul out vessels up to 65 feet in length and 50 tons in weight; the machine shop repairs hulls and gasoline engines and can make minor repairs to Diesel engines.

Swan Creek is a mile northwestward of Rock Hall Harbor and 0.7 mile southeastward of **Swan Point,** which is 137 miles above the Virginia Capes. The creek channel has depths of 7 feet for 1 mile above **Little Neck Island,** on the west side of the entrance, then shoals to 1 foot at the head of navigation, 2.3 miles above the entrance.

The shallow flats that extend 0.4 mile south-southeastward from Little Neck Island are marked by a buoy. The approach to Swan Creek is made on the same north-by-west lighted range used for Rock Hall Harbor. A partly submerged wreck is across the channel from Little Neck Island. Just south of the wreck are the ruins of an old ferry dock. Gasoline, water, and some provisions are available at the small piers opposite the north end of Little Neck Island.

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CHAPTER 15

Chesapeake Bay

Baltimore Harbor to Head of Bay

Chart 1226

THE most important of the many tributaries that empty into the northern end of Chesapeake Bay are Patapsco, Elk, and Susquehanna Rivers. Patapsco River forms Baltimore Harbor, and Elk River is the approach to the Chesapeake and Delaware Canal; the other tributaries are seldom used by vessels drawing more than 12 feet. The shores are mostly wooded in the undeveloped areas and rise to considerable heights in the vicinity of Northeast and Susquehanna Rivers.

There are extensive shoal areas in the upper part of the bay, and **fish traps** are numerous in season; fish-trap limits are shown on the chart. All of the tributaries are usually closed by **ice** for extended periods during the winter.

Chart 549.—Sandy Point Light and Baltimore Light, 129 and 131.5 miles above the Virginia Capes, were described in Chapter 13. The Baltimore channel and the channel to the head of Chesapeake Bay separate 0.5 mile eastward of Sandy Point Light; at Baltimore Light, the Baltimore channel and the bay channel are 0.4 mile and 3 miles due eastward.

Sevenfoot Knoll Light (lat. 39°09′.3, long. 76°24′.5), 42 feet above the water and visible 8 miles, is shown from a red cylindrical pile structure on the northeast side of the Baltimore channel 137 miles from the Capes; the light has a fog signal that operates from September 15 to June 15.

Baltimore Harbor consists of the entire Patapsco River and its tributaries; a part of the water front thus included lies outside the municipal limits of Baltimore but by State law is within the jurisdiction of the city Bureau of Harbors.

Patapsco River empties into the west side of Chesapeake Bay between Bodkin Point and North Point, 4 miles to the northward; the mid-channel point in the entrance, 2 miles northwest of Sevenfoot Knoll Light, is 139 miles from the Virginia Capes and 54 miles from Delaware River.

Channels.—A Federal project provides for a uniform main channel depth of 39 feet between the Virginia Capes and Fort McHenry, Baltimore. Dredging has been necessary in parts of lower Chesapeake Bay, discussed in Chapter 11, and in Patapsco River and approaches. In the area now being considered, the dredged part of the main channel begins about a mile southward of Baltimore Light and extends up Patapsco River to Fort McHenry, a total distance of about 17 miles.

The project also provides for a connecting channel 27 feet deep and 400 feet wide from the main channel at the mouth of Patapsco River to the channel up Chesapeake Bay to the Chesapeake and Delaware Canal. The connecting channel extends east-southeastward about 6 miles from the mouth of Patapsco River. The main channel and the connecting channel are maintained at or near project dimensions and are well marked by lights, lighted ranges, lighted and unlighted buoys.

Project channels into Curtis Bay, Northwest Harbor, and Middle Branch, tributaries of Patapsco River at Baltimore, are discussed later.

Bodkin Point is the low northeastern extremity of **Bodkin Neck,** on the south side of the entrance to Patapsco River. Shoals extend northward and eastward from the point to the edge of the main channel.

Bodkin Creek, which empties into Patapsco River along the inner side of Bodkin Neck, has depths of 7 to 9 feet in the approaches and for considerable distances into its branches. The channel is very narrow at the mouth of the creek and leads between extensive shoals. Buoys mark the approaches and the narrow entrance.

Back Creek empties into the west side of Bodkin Creek just inside the mouth. **Main Creek** is on the same side and is separated from Back Creek by **Spit Neck.** Both branches have depths of 7 to 9 feet almost to their heads and are much used by pleasure craft.

Gasoline, water, and ice can be obtained at a pier on **Graveyard Point,** on the south side of Main Creek 0.2 mile above the mouth. The marine railways on the point can handle boats up to 75 feet in length and 40 to 50 tons in weight; the well-equipped machine shop can repair gasoline and Diesel engines.

Rock Point is on the southwest side of Patapsco River 3 miles above Bodkin Point. Back of Rock Point is an elevated water tank, and a pier extends out from the Rock Creek side to depths of 6 feet or more. **White Rocks,** 0.6 mile northwest of Rock Point, are about 15 feet high and are marked by a light; the deepest water is north and west of the rocks.

Rock Creek, which empties into Patapsco River along the northwest side of Rock Point, has depths of 11 feet almost to the head except in the narrows off **Fairview,** on the east side 0.5 mile above the mouth, where the depth is only 8 feet over a width of 75 to 100 feet. Buoys mark the entrance and the narrows, and there is a light on the Fairview side of the narrows.

Wall Cove empties into the southeast side of Rock Creek along the south side of Fairview. The Maryland Yacht Club piers on the Fairview side of the entrance have depths of about 13 feet at their outer ends; gasoline, fresh water, and other supplies are available on the piers.

A boatyard in Wall Cove can haul out vessels up to 85 feet in length and 7 feet in draft and can make all kinds of hull and engine repairs. The yard can turn spars up to 120 feet in length and has a stiff-leg derrick with a capacity of 25 tons. Gasoline, Diesel oil, fresh water, ice, and other supplies are available.

Another marine railway on the northwest side of Rock Creek across from Wall Cove has a hauling capacity of 50 tons and can handle boats up to 50 feet in length; a nearby machine shop repairs gasoline and Diesel engines and does hull work. Gasoline, fresh water, and marine supplies are available at the railway; ice and provisions can be purchased in the neighborhood.

Stony Creek, on the southwest side of Patapsco River 5 miles above Bodkin Point, has depths of 12 feet or more almost to the head. The channel along the west side of the entrance is about 70 yards wide and is marked by lights and buoys; the east sides is obstructed by rocks, some of which bare at all stages of the tide. The highway bridge 0 8 mile above the mouth of Stony Creek has a bascule span with a horizontal clearance of 40 feet and a vertical clearance of 18 feet

Nabbs Creek, on the northwest side of Stony Creek, a mile above the mouth, has depths of 12 feet almost to the head. A yard on the south side of Nabbs Creek near the head has a marine railway with a hauling capacity of 20 tons that can handle boats up to 50 feet in length; the machine shop can repair hulls and engines. Gasoline, water, and ice can be obtained at the yard. Another yard in **Back Cove,** on the north side of the creek near the mouth, can haul out and repair boats up to 45 feet in length and can supply gasoline and water.

North Point is on the north side of the entrance to Patapsco River. **Old Road Bay,** which empties into the river along the west side of the point, has general depths of 7 to 12 feet. A rock, covered 1 foot, near mid-entrance is marked by an obstruction buoy, and another buoy marks the edge of the shoal that extends westward from North Point; a light, 0.25 mile off the north shore of the bay, marks the outer end of a shoal that extends 0.5 mile from the west shore.

North Point Creek and **Jones Creek,** which empty into the northeast and northwest corners of Old Road Bay, have depths of 6 to 8 feet; the approach to both creeks is eastward of the light off the north shore of the bay. The railroad bridges over the mouths of the two creeks have swing spans with horizontal clearances of 40 feet and vertical clearances of 3½ feet. A marine railway on the east side of Jones Creek 0.4 mile above the mouth can haul out boats up to 40 feet in length and 4 feet in draft; gasoline, water, and ice are available.

Chart 545.—Baltimore, Maryland, one of the major ports of the United States, is situated at the head of tidewater navigation on Patapsco River. The mid-harbor point, at the intersection of Fort McHenry Channel and Ferry Bar Channel 0.6 mile southeast of Fort McHenry, is 8 miles from the mouth of the river, 147 miles from the Virginia Capes, and 62 miles from Delaware River.

Principal imports are crude petroleum and petroleum products, iron ore, chrome and manganese, gypsum, sugar, and bananas; exports are chiefly grains, iron products, coal, and fertilizers. Coastwise receipts are crude petroleum and petroleum products, fertilizers, sulfur, and sugar; shipments are mostly petroleum and iron products.

Channels.—The main channel from the Virginia Capes to Fort McHenry was discussed at the beginning of the chapter. The branch channels will be covered in the descriptions of the tributaries.

Anchorages have been established by the City of Baltimore for the purpose of mooring, anchoring, and storing of vessels of all types in Baltimore Harbor, subject to such regulations as shall be prescribed by the Harbor Engineer, who is vested with the authority of locating, maintaining, and patrolling the areas. Limits of the anchorages are shown on Chart 545.

All vessels anchoring in the harbor shall anchor so as to keep within one of said anchorages and be subject to all rules and regulations which the Harbor Engineer may prescribe. All vessels, when at anchor between sunset and sunrise, shall comply with Federal regulations governing anchor lights.

The master or other person in charge of any vessel so anchored as to obstruct the free passage of any other vessel to or from an anchorage, wharf, or dock, or moored or anchored so that they will be or will swing beyond the boundaries of said anchorage, shall, upon being notified, immediately correct the condition, and if the condition continues beyond six hours from the time of the notification, a penalty of $25.00 for each and every hour beyond this time limit, or thirty days in the city jail, or both, shall, upon conviction, be imposed upon the person responsible therefor. If no person be on such vessel, upon whom said notice can be served, then the Harbor Engineer shall have such vessel removed and the expense for same shall be paid to the Harbor Engineer by the master, owner, or agent of such vessel. The Harbor Engineer shall have the authority to designate such other emergency anchorage locations in Baltimore Harbor as the needs may require and to maintain and patrol said locations until the emergency has ceased.

Anchorage A is in Canton Hollow in the Northwest Branch, Patapsco River. No vessel shall anchor within 300 feet of any pier or bulkhead fronting on this anchorage.

Anchorage C is east of Maryland Yacht Club and south of Ferry Bar. This anchorage shall be restricted to yachts. Vessels must anchor in such a way as not to block entrance to the slips of the nearby yacht clubs.

Anchorage No. 1 (Fort McHenry). This anchorage is to be used only as an overnight anchorage for vessels waiting to go to piers. No vessel may remain on this anchorage more than 12 hours without a permit from the Harbor Engineer.

Anchorage No. 2 (General Anchorage) is between Lazaretto Point and the Municipal Airport. No vessel shall remain longer than four days without obtaining a permit from the Harbor Engineer. This is to be a general anchorage for vessels with a draft of 24 feet and under.

Anchorage No. 3 (Riverview, General Anchorage) is between Fort McHenry Channel and the Municipal Airport. This anchorage shall be restricted to vessels of over 24 feet draft. No vessel shall remain on this anchorage longer than four days without obtaining a permit from the Harbor Engineer.

Anchorage No. 4 (General Anchorage) is between Sollers Point and the Municipal Airport. No vessel shall remain longer than four days without obtaining a permit from the Harbor Engineer. This is to be a general anchorage for vessels drawing 20 feet and under.

Anchorage No. 5 (General Anchorage) is between Fort McHenry Channel and Curtis Bay Channel. No vessel shall remain longer than four days without obtaining a permit from the Harbor Engineer. This is to be a general anchorage for vessels drawing 20 feet and under.

Anchorage No. 6 (Explosives Anchorage) is northeast of Fort McHenry Channel and just northwest of Fort Carroll. Vessels are to anchor here only for the loading and unloading of explosives; vessels loading explosives are to leave the port immediately upon the completion of the transfer.

Anchorage No. 7 (Quarantine Anchorage) is in the area west of Fort McHenry Channel and south of Curtis Bay Channel. This anchorage is to be used only by vessels waiting quarantine inspection. Special permits for use of the lower part of the anchorage for explosive loading of vessels may be issued in extraordinary cases.

Anchorage No. 8 (Dead Anchorage) is in Curtis Bay, south of Curtis Bay Channel. Vessels shall anchor so as not to swing within 100 yards of the channel. No vessel may occupy this anchorage without obtaining a permit from the Harbor Engineer. When the Harbor Engineer finds such action necessary to conserve space, he may require vessels in this anchorage to moor bow and stern or to one another.

Anchorage No. 9 (General Anchorage) is north of Ferry Bar Channel and southwest of Fort McHenry Park. This anchorage is to be used only by vessels using nearby docks while awaiting berths at piers. No vessel may remain in this anchorage more than 12 hours without obtaining a permit from the Harbor Engineer.

Aids to navigation.—The ship channels are well marked by lighted ranges and other lights, and by lighted and unlighted buoys. The City of Baltimore operates a **radar-control** system which provides a reliable guide for the safe movement of traffic in and

out of the harbor during periods of low visibility. The radar scope is in the port's radio control room where observations can be transmitted directly to harbor shipping over municipal ship-to-shore stations WMH and WJY; the antenna is 140 feet above the water and is mounted on city-owned **Recreation Pier,** on the north side of Northwest Harbor 0.2 mile west of Fells Point.

Sailing directions for the approaches to Baltimore are given in tabular form in Chapter 3.

Tides and currents.—The mean range of tide is about 1 foot at Baltimore; daily predictions are given in the *Tide Tables.* Prolonged winds of constant direction may cause substantial variation in the tide. Currents are weak and variable in the harbor; see the *Current Tables.*

Fogs occur chiefly from October to March, inclusive; during that period there are 12 days, on the average, with dense fogs. From April to September there are only two days, on the average, with dense fogs. Very light winds clear the fog away.

Ice.—Baltimore Harbor is frozen over during severe winters, but the municipal ice-breakers and the larger power-driven vessels keep the dredged channels open so that self-propelled vessels seldom have difficulty in entering the harbor. Ice conditions in the main channel are most severe in the vicinity of Sevenfoot Knoll Light, where ice moving from the northern end of Chesapeake Bay tends to collect in packs. Navigation from Baltimore to the upper end of the bay and the Chesapeake and Delaware Canal is likely to be interrupted by ice for short periods during an average winter.

Storm warnings are displayed day and night at the Anchorage Building, near Recreation Pier in Northwest Harbor. Daytime displays are made at the Maryland Yacht Club, at the entrance to Middle Branch.

Pilotage is compulsory for foreign vessels, vessels from a foreign port, and all vessels sailing under register bound to and from Baltimore or passing in or out of Chesapeake Bay by way of the Chesapeake and Delaware Canal, except American vessels employed in and licensed for the coasting trade. If such American vessel voluntarily takes a licensed pilot, it is required to pay the same fees as vessels bound to or from foreign ports.

Licensed pilots of the Maryland State Pilots Commission board inbound vessels arriving by way of the Chesapeake and Delaware Canal at Chesapeake City, Maryland. Vessels arriving by way of the Virginia Capes are spoken by a Maryland pilot boat off Cape Henry. Pilotage charges assessed by the Association of Maryland Pilots for each movement to or from Baltimore by either route are $6.50 per foot of draft for vessels drawing 13 feet and over, $5.00 per foot for vessels drawing 10 feet or less than 13 feet, and $4.50 per foot for vessels drawing less than 10 feet.

Towage.—A large fleet of tugs operated by several towboat companies is available at all times to assist vessels arriving or departing, in docking or undocking, and in shifting within the harbor.

Quarantine.—The United States Public Health Service operates a quarantine station at Leading Point, on the southeast side of the entrance to Curtis Bay, about 3 miles below Fort McHenry; the quarantine anchorage is east of the station. The United States Public Health Service Hospital is at Wyman Park Drive and 31st Street; and an outpatient annex is in the Customhouse. The city has numerous public and private hospitals.

Customs.—Baltimore is headquarters for the customs district of Maryland which includes all of that State and the District of Columbia. The Customhouse is at the corner of Lombard and Gay Streets.

Immigration.—The offices of the Immigration and Naturalization Service are in the Post Office Building. Inbound vessels are boarded immediately after quarantine inspection. Passengers denied entry by the immigration inspector are detained aboard vessel (medical cases excepted) until examined by a special board of inquiry.

Other Federal offices in Baltimore include U. S. Coast Guard examiner and marine inspection offices, a U. S. Navy Branch Hydrographic Office, and a Corps of Engineers district office.

Harbor regulations.—The mayor and city council of Baltimore are authorized to issue such rules and regulations for the government of the port as may be consistent with the provisions of the State statutes and with the authority granted by the city charter. The city Bureau of Harbors, under the direct supervision of a harbor engineer, has general jurisdiction over the physical operation of the harbor and port police activities. The harbor master, under the direct supervision of the city controller, regulates the use of public wharves and assists the harbor engineer in policing the waterfront and granting permission to use anchorage areas.

A city regulation relating to **speed** states that no vessel shall move in Northwest Harbor at a speed greater than 7 knots westward of a line from Fells Point to Locust Point and 9 knots eastward of said line, and that no vessel shall move in Patapsco River or tributaries within 300 feet of any pier or bulkhead at a speed greater than 8 knots. The master of any vessel violating this regulation shall pay a fine of not exceeding $100 for the first offense and not less than $50 nor more than $200 for each subsequent offense.

Terminal facilities.—The total length of developed waterfront in Baltimore Harbor, measured along the established bulkhead line, is about 23 miles. Extensive areas remain which are available for future development. The existing terminal facilities include wharves, piers, grain elevators, coal and ore piers, storage and bunkering facilities for fuel oil, terminal warehouses, marine railways, drydocks, and shipyards.

Supplies.—Bunker coal is available in Curtis Bay, at Port Covington, and in Northwest Harbor. Bunker oil can be obtained in Curtis Bay, at Fairfield, and in Northwest Harbor. Water of high quality for drinking and boiler purposes is available at practically all of the larger piers at charges that are but slightly higher than the cost to the pier operators.

Repairs.—Baltimore is well supplied with drydocking and hauling-out facilities. The largest floating drydock, in Northwest Harbor, has a lifting capacity of 20,000 tons and has handled vessels up to 600 feet in length and 22 feet in draft; a graving dock at the same plant has only slightly less capacity. Marine railways are available with lifting capacities up to 1,800 tons. Several smaller railways along the tributaries cater to the yachtsman and small-boat operator.

Baltimore has extensive facilities for wrecking and salvage. In addition to equipment especially designed for salvage operations, there are a number of heavy hoisting facilities which, though primarily designed for private industrial purposes, are available in case of need.

Communications.—Nearly all the piers, wharves, and docks in Baltimore Harbor are close to the center of the city and all are connected to it by wide, well paved streets.

Many of the piers have direct connections with the main-line railroads whose tracks extend to all parts of the port area.

Baltimore is served by the Pennsylvania Railroad, the Baltimore and Ohio Railroad, and the Western Maryland Railway. The Canton Railroad is a terminal line that operates about 35 miles of track in the port area and connects with the major roads.

More than 50 steamship services connect Baltimore with principal United States and foreign ports by regular sailings in the overseas, coastwise, and intercoastal trades.

Harbor Field airport is on the northeast side of Patapsco River 2 miles below Fort McHenry. **Friendship International Airport** is inland, about 7 miles southwestward of Fort McHenry.

Sparrows Point, on the northeast side of Patapsco River 3 miles above the mouth, is the site of large iron and steel works and a shipbuilding plant. The buildings, stacks, and tanks are prominent. About 2 miles along the main channel from the river mouth, **Sparrows Point Channel,** with depths of 35 feet or more, privately maintained and well marked, extends 1.1 miles on a lighted range bearing **354°** to the ore-handling wharves on the south side of the point. About 4 miles above the river mouth, a feeder channel with depths of 20 to 23 feet follows a lighted range bearing **038°**; buoyed branches lead eastward to the wharves and shipyard on the west side of the point. All of the facilities on Sparrows Point have good rail connections.

Bear Creek, on the northeast side of Patapsco River 4 miles above the mouth, has depths of 12 feet or more in the approach from the Sparrows Point feeder channel and for 3 miles upstream. The railroad bridge 0.2 mile above the mouth of the creek has a swing span with a horizontal clearance of 83 feet and a vertical clearance of 6½ feet; a gas pipeline just below the bridge is carried on a trestle to the edges of the channel, where it is submerged. **Humphrey Creek,** on the east side just above the bridge, is closed to navigation by a bulkhead across the mouth.

Peachorchard Cove, on the west side of Bear Creek a mile above the entrance, has depths of 9 feet for 0.4 mile to within 0.1 mile of its head. The boatyard on the south side near the head can haul out vessels up to 100 feet in length; the machine shop repairs gasoline and Diesel engines and does hull work. Gasoline, Diesel oil, fresh water, and ice are available at the yard.

The highway bridge that crosses Bear Creek just above Peachorchard Cove has a bascule span with a horizontal clearance of 129 feet and vertical clearances of 15 feet on the sides and 25 feet in the center. The railroad bridge 1.5 miles above the mouth of Bear Creek has a swing span with a horizontal clearance of 80 feet and a vertical clearance of 9 feet.

Lynch Cove, on the northwest side of Bear Creek 1.7 miles above the mouth, has depths of 12 feet for 0.5 mile, thence 9 feet for another 0.5 mile to its head; a 4-foot shoal in mid-entrance is marked by an obstruction buoy. A boatyard on the south side of Lynch Cove 0.5 mile above the entrance can haul out vessels up to 80 feet in length and 100 tons in weight; a nearby machine shop repairs gasoline and Diesel engines and does hull work. Gasoline, fresh water, ice, and marine supplies are available at the yard.

The highway bridge that crosses Bear Creek 2.5 miles above the mouth has a swing span with a horizontal clearance of 75 feet and a vertical clearance of 13 feet.

Fort Carroll is a stone and concrete structure on the northeast side of Patapsco

River main channel 4.4 miles above the mouth. A light, 45 feet above the water, is shown from a white structure on the west front of the fort; the fog signal operates from September 15 to June 15.

Hawkins Point, on the southwest side of Patapsco River 4.5 miles above the mouth, is at the southeastern limits of the City of Baltimore.

Leading Point, on the southwest side of Patapsco River 5.5 miles above the mouth, is the site of a Federal **quarantine station;** the quarantine **anchorage** is along the southwest side of the main channel east of the station. The quarantine wharf in **Thoms Cove,** on the southeast side of Leading Point, has a buoyed approach with depths of about 8 feet.

The long pier on the southeast side of Thoms Cove is in ruins, and vessels are cautioned against approaching because of possible underwater obstructions.

Curtis Bay, on the southwest side of Patapsco River 6 miles above the mouth, is the approach to large coal and oil wharves and to several industrial plants. The entrance is between Leading Point and Fishing Point, 0.8 mile to the northwestward; the mid-channel point is 1.1 miles westward along Curtis Bay Channel from its intersection with the main channel 5.2 miles above the mouth of the river.

The Federal project for **Curtis Bay Channel** provides for a depth of 35 feet and a width of 400 feet from the main channel to the head of Curtis Bay, a distance of 2 miles. The channel is maintained at or near project dimensions and is well marked by a lighted range bearing **267°** and by lighted and unlighted buoys.

The oil-bunkering wharves on **Fishing Point,** on the northwest side of the entrance to Curtis Bay, have depths of about 30 feet at their faces; one wharf can load at the rate of 1,000 barrels per hour. The Baltimore and Ohio Railroad coal pier at the head of Curtis Bay Channel has depths of about 35 feet alongside and can load at the rate of 2,000 tons per hour.

Stonehouse Cove empties into the head of Curtis Bay from northward. On the southwest side of the entrance to the cove is a large ore-handling wharf operated by the Baltimore and Ohio Railroad. The channel to the wharf from the head of Curtis Bay Channel is privately maintained at Curtis Bay Channel depths and is marked by a lighted range bearing **316°**.

Curtis Creek empties into the head of Curtis Bay from southward between **Sledds Point** and **Ferry Point,** 0.3 mile to the southwestward. The Federal project provides for a channel in Curtis Creek 35 feet deep and 200 feet wide from the head of Curtis Bay Channel to a point 750 feet north of Pennington Avenue bridge; thence 22 feet deep and 200 feet wide to the ordnance depot on the west side and to the Coast Guard depot in Arundel Cove. The channel was at or near project dimensions when last surveyed.

Cabin Branch, on the west side of Curtis Creek just south of Ferry Point, has depths of 18 feet or more to within 0.1 mile of a fixed bridge, with a horizontal clearance of 20 feet and a vertical clearance of 7 feet, 0.4 mile above the entrance. The industrial wharves on the north side of Cabin Branch have depths of 14 to 20 feet at their faces.

Several of the wharves on either side of Curtis Creek between the entrance and Pennington Avenue bridge have depths of 25 to 30 feet at their faces.

The Pennington Avenue bridge, 0.9 mile above the entrance to Curtis Creek, has

a bascule span with a horizontal clearance of 150 feet and a vertical clearance of 18 feet. A shipyard on the west side of Curtis Creek just north of the bridge has a railway with a hauling capacity of 400 tons; the shop repairs engines and wooden hulls.

The railroad bridge 1.3 miles above the entrance to Curtis Creek has a swing span with a horizontal clearance of 150 feet and a vertical clearance of 14 feet. An ordnance depot is on the west side 0.3 mile above the bridge.

Arundel Cove is on the east side of Curtis Creek 1.6 miles above the entrance. A Coast Guard depot is on the north side of the cove. The channel into the cove was discussed earlier. A fixed highway bridge 0.4 mile above the entrance to the cove has a horizontal clearance of 28 feet and a vertical clearance of 6½ feet.

A depth of 16 feet can be carried up Curtis Creek beyond the improved sections to the forks 2.3 miles above the entrance. **Marley Creek** (*see Chart 549*), the middle fork, has depths of 12 feet or more for 1.2 miles, then shoals gradually to 3 feet at a fixed bridge a mile farther up; the bridge has a horizontal clearance of 67 feet and a vertical clearance of 4 feet.

A marine service pier on the west side of Marley Creek 1.3 miles above the forks has depths of 12 feet at the face and is marked by a light; gasoline, fresh water, and ice are available. A marine railway directly opposite the service station can handle boats up to 65 feet in length and 6 feet in draft.

The **Fairfield** section of Baltimore begins about 6.5 miles above the mouth of Patapsco River and extends up river along the southwest side for more than a mile. Most of the piers and wharves have depths of 18 to 25 feet at their faces, but some have 30 feet. About 6.8 miles above the mouth, privately dredged channels, with depths of about 30 feet and marked by lighted ranges, lead to oil-bunkering wharves; one wharf can load at the rate of 1,800 barrels per hour. The largest of the floating drydocks at the upper end of Fairfield has a lifting capacity of 18,000 tons; repairs are made to engines, boilers, dynamos, and to wood or steel hulls.

Harbor Field is the airport on the northeast side of Patapsco River 6.5 miles above the mouth. **Colgate Creek,** which empties into the river along the northwest side of the airport, has depths of about 20 feet in the approach and for 0.3 mile upstream, thence 13 feet for another 0.5 mile. The factory buildings on the west side of the entrance are prominent; the bulkhead wharf has depths of 20 feet or more alongside. The highway bridge 0.3 mile above the entrance has a swing span with a horizontal clearance of 40 feet and a vertical clearance of 4 feet; **regulations** governing operation of the drawspan are given in **§ 203.300,** Chapter 2A. The railroad bridge 0.8 mile above the entrance has a swing span with a horizontal clearance of 30½ feet and a vertical clearance of 5½ feet; in 1952, the drawspan was reported to be bolted fast in the closed position.

The **Lower Canton** section of Baltimore begins on the northeast side of Patapsco River 7.5 miles above the mouth and extends westward to **Lazaretto Point.** Dredged and buoyed channels lead to the principal piers, which have depths of 30 feet or more at their faces. The Pennsylvania Railroad grain elevator, at the eastern end of Lower Canton, has a storage capacity of more than 4,000,000 bushels; the pier serving the elevator has berthing space for six deep-draft vessels.

Patapsco River turns sharply westward at the intersection of Ferry Bar Channel and main Fort McHenry Channel 7.8 miles above the mouth. About 0.7 mile wide

between **Fort McHenry** on the north and Fairfield on the south, the river narrows to a width of 150 yards 10 miles above the mouth and meanders off to the southwestward while the deep channel continues westward to Middle Branch. The first of several fixed bridges over the narrow part of the river has a horizontal clearance of 28 feet and a vertical clearance of 8½ feet; the river has depths of only about 1 foot across the flats in the approach to the bridge.

The Federal project for **Ferry Bar Channel** provides for a depth of 35 feet and a width of 400 feet westward from the main channel at Fort McHenry to Ferry Bar. The eastern section of the channel is maintained at or near project dimensions as far as the approaches to the Port Covington deep-draft piers. The western section had a controlling depth of 20 feet in October 1951. The channel is well marked by a lighted range bearing **270°** and by lighted and unlighted buoys.

The piers and wharves on the north side of Ferry Bar Channel immediately westward of Fort McHenry have depths of 12 to 20 feet at their faces.

The **Port Covington** section of Baltimore begins about 0.8 mile west of Fort McHenry and extends westward and southwestward to Ferry Bar. The principal piers in this section have depths of 35 feet at their faces, and the approaches from Ferry Bar Channel are buoyed. The Western Maryland Railway operates a grain elevator, with a storage capacity of about 4,000,000 bushels, and a coal-bunkering pier at Port Covington.

Ferry Bar, 2 miles westward along Ferry Bar Channel from Fort McHenry Channel, is the point on the east side of the entrance to **Middle Branch.** The Federal project provides for a channel (**Spring Garden Channel**) 27 feet deep and 250 feet wide from Ferry Bar to the Western Maryland Railway bridge. The channel has been partially dredged as far as the Hanover Street bridge and had a controlling depth of 23 feet in January 1950; above the bridge, the buoyed natural channel in Middle Branch has depths of 20 feet or more to within 0.2 mile of the head, 1.4 miles above Ferry Bar.

The slips and basin of the Maryland Yacht Club are on the southwest side of the entrance to Middle Branch. The basin has depths of about 10 feet and is best approached from the vicinity of the drawspan in the Hanover Street bridge. The yacht anchorage off the club is covered in the general description of anchorages.

The marine service stations between Ferry Bar and the north end of the Hanover Street bridge have piers with depths of about 8 feet at the outer ends; gasoline, fresh water, and ice are available. Boats up to 50 feet in length can be hauled out, and engine repairs can be made.

The Hanover Street bridge, which crosses Middle Branch 0.3 mile above Ferry Bar, has a bascule span with a horizontal clearance of 150 feet and a vertical clearance of 33 feet; **regulations** governing operation of the drawspan are given in **§ 203.305,** Chapter 2A.

A buoyed channel, with depths of about 18 feet, leads westward from Spring Garden Channel just above the Hanover Street bridge to a pier in **Smith Cove;** the pier has depths of about 14 feet at the outer end.

The Western Maryland Railway bridge, which crosses Middle Branch a mile above Ferry Bar, has a swing span with a horizontal clearance of 85 feet and a vertical clearance of 9½ feet. A marginal wharf just below the west end of the bridge has depths of 18 feet at the face. A pipeline 300 yards above the bridge is carried on a trestle to the edges of the channel, where it is submerged.

The entrance to **Northwest Harbor** is between Fort McHenry and Lazaretto Point, 0.3 mile to the eastward; the mid-channel point is 8.2 miles by main channel from the mouth of Patapsco River. The harbor has depths of about 35 feet to the principal piers on either side of the lower reaches and to the line from **Locust Point** on the southwest to **Fells Point** on the northeast, 1.2 miles above the entrance; thence about 30 feet for 0.6 mile; and thence about 21 feet to the head, 2.5 miles from the entrance.

The principal deep-draft piers in Northwest Harbor are on the southwest side between Fort McHenry and Locust Point and have depths of about 35 feet at their faces. Some of those on the east side of the lower harbor have depths of 30 to 32 feet, as have a few on the southwest side above Locust Point. Depths at the others range, in general, from 15 to 25 feet.

Bunker coal is available at the Pennsylvania Railroad pier on the east side of Northwest Harbor about 0.2 mile above Lazaretto Point; the pier has depths of 30 feet alongside. Bunker oil is loaded at the rate of 6,000 barrels per hour from the piers on the east side 0.7 mile above Lazaretto Point; depths alongside are 32 to 35 feet. The Baltimore and Ohio Railroad operates a grain elevator, with a storage capacity of about 4,000,000 bushels, on the west side 0.2 mile below Locust Point; depths alongside the piers are 35 feet.

The graving dock on the southwest side of Northwest Harbor 0.4 mile above Fort McHenry has handled vessels up to 420 feet in length and 15 feet in draft. The marine railway 0.4 mile west of Locust Point has a lifting capacity of 1,800 tons and has handled vessels up to 240 feet in length. The largest of the floating drydocks 0.7 mile westward of Locust Point has a lifting capacity of 20,000 tons and has handled vessels up to 600 feet in length and 22 feet in draft; a graving dock at the same plant has only slightly less capacity. Other marine railways, with lifting capacities up to 700 tons, are available in the upper harbor. Most or all of these plants repair engines, boilers, dynamos, and wood or steel hulls.

Chart 549.—Swan Point, on the east side of Chesapeake Bay 137 miles above the Virginia Capes, has been mentioned in Chapter 14.

Tolchester Beach, 4.5 miles north-northeastward of Swan Point, has an amusement park that is visited during the summer by excursion boats from Baltimore. The wharf has depths of 10 to 13 feet at the face and is marked by a light and a fog signal.

Fairlee Creek, on the east side of Chesapeake Bay 8.5 miles north-northeastward of Swan Point, has a narrow entrance between a jetty on the east and a long, low hook on the west. The creek is used by boats with drafts up to 6 feet at all stages of the tide. There are strong tidal currents in the entrance, which is privately staked. Boats entering should favor the jetty, then hold southward in the middle of the creek.

Worton Point is on the east side of Chesapeake Bay 149.5 miles above the Virginia Capes. A light is shown from a watch tower on the point during the ice season.

About 1.5 miles southward of Worton Point is **Worton Creek,** which has depths of 10 to 12 feet in the broad bight at the entrance and 7 feet inside for 1.4 miles. Good anchorage, protected from easterly winds, is available in depths of 11 to 12 feet just inside the entrance. The critical part of the channel, 0.5 mile above the entrance, is marked by buoys.

The marine railway at **Green Point Wharf,** on the east side of Worton Creek a mile above the entrance, can haul out boats up to 45 feet in length and 5 feet in draft.

258030°—54——23

The marina at **Buck Neck Landing,** on the east side of Worton Creek 1.4 miles above the entrance, has extensive berthage and storage facilities. The railway has a hauling capacity of 20 tons and can handle boats up to 60 feet in length. Gasoline, Diesel oil, fresh water, ice, and some other supplies are available at the marina. The public bulkhead that adjoins the marina wharf has depths of about 6 feet alongside.

North Point, on the north side of the entrance to Patapsco River, has been mentioned earlier in the chapter. **Shallow Creek,** which empties into Chesapeake Bay along the northeast side of the point, is just what its name implies.

A shallow passage 3 miles northeast of North Point is between the mainland and the southwest end of **Hart Island.** The passage has depths of only 1½ feet and is crossed by a fixed bridge with a vertical clearance of less than 3 feet. Narrow Hart Island, 1.7 miles long and mostly marsh, has an amusement park near the bridge and a thick clump of trees near the middle. **Miller Island,** a bare marsh, is just northeastward of Hart Island.

The common approach to Back River, Middle River, and Gunpowder River is between Miller Island and Pooles Island, 4 miles to the east-northeastward.

Pooles Island, low and wooded, is 1.2 miles long in a north-northeasterly direction and has an abandoned lighthouse on the west side near the north end. On the island are the white skeleton towers of two lighted ranges, the rear tower common to both. The north range marks a reach of the main channel leading to the Chesapeake and Delaware Canal. The south range marks a passage across the middle ground east of the island. Pooles Island is entirely within the Aberdeen Proving Ground; limits of the **restricted area** and regulations governing it are given in § **204.30,** Chapter 2A.

Pooles Island Bar Light (lat. 39°15′.7, long. 76°16′.7), 27 feet above the water, is shown from a black skeleton tower on a cylinder base, in depths of 18 feet 0.8 mile south-southwestward of the island; the fog signal operates from September 15 to June 15. *Pooles Island Bar Light is 2 miles due west of a point 145.5 miles along Chesapeake Bay channel from the Virginia Capes.*

A buoyed lane extends southwestward between fish-trap areas from eastward of Pooles Island to the Baltimore channel a mile southward of North Point. The lane has a minimum depth of 10 feet and is entered on the Pooles Island south range, **bearing 264°**; Pooles Island Bar Light is on the northwest side of the lane.

The approach to the rivers back of Miller and Pooles Islands is through a side lane, also buoyed, with an average width of about 1 mile. Pooles Island Bar Light is on the northeast side of the bay entrance to the lane and the direction is roughly northwest.

Hawk Cove, between Miller and Hart Islands and the mainland to the northwest, has depths of 8 to 11 feet and is a good anchorage.

Back River, which empties into the southwest end of Hawk Cove, has depths of 5 to 7 feet for 6 miles to a fixed highway bridge with a horizontal clearance of 44 feet and a vertical clearance of 14 feet; even the smallest boats seldom go above the bridge. The channel is unmarked but is clear except for a 4-foot middle ground about halfway between Hawk Cove and the bridge. A boatyard on the west side of Back River opposite the lower end of the middle ground can haul out and make general repairs to vessels up to 58 feet in length and 4½ feet in draft; gasoline and some marine supplies are

available. Another yard just below the west end of the bridge can haul out boats up to 30 feet in length and 3 feet in draft.

Charts 549, 1226.—Middle River entrance, 2 miles northwestward of Miller Island, is between **Booby Point** and **Bowley Point,** 0.8 mile to the northward. The river has depths of 8 to 9 feet for 3 miles to within 0.5 mile of a fixed bridge near the head of navigation. The channel is marked by lights and a buoy.

Sue Island, now joined to the mainland on the south side of Middle River 0.6 mile above the mouth, is the headquarters of the Baltimore Yacht Club. Depths of about 7 feet can be carried to the piers on the west side of the island. The light at the north end of the island operates from June 1 to September 15. **Storm warnings** are displayed, daytime only, at the club.

Frog Mortar Creek, on the northeast side of Middle River 1.5 miles above the mouth, has general depths of 6 to 8 feet. A privately dredged channel with depths of 12 feet or more leads from Middle River to the Glenn L. Martin seaplane basin on the west side of Frog Mortar Creek 0.5 mile above the entrance. A light marks the west side of the creek entrance, and an unlighted range marks the channel to the basin.

Dark Head Creek, on the north side of Middle River 2.3 miles above the mouth, has dredged depths of 7 to 9 feet for 0.6 mile above the entrance.

Hopkins Creek, on the southwest side of Middle River 2.6 miles above the mouth, has general depths of 6 to 8 feet. A marine service station on the south side of the entrance to Hopkins Creek has gasoline, fresh water, ice, and some marine supplies. There are several small marine railways in the vicinity.

The village of **Middle River,** at the head of navigation 3.5 miles above the river mouth, is on the main line of the Pennsylvania Railroad and has bus service to Baltimore. The Glenn L. Martin aircraft factory is in the vicinity.

Seneca Creek, which empties into Chesapeake Bay 1.5 miles northeast of Middle River, has depths of 8 feet in the entrance and 5 to 6 feet into the several arms. A light marks the outer end of the shoal that extends 0.5 mile southward from the point on the east side of the entrance.

Gunpowder River is 3 miles east-northeastward of Middle River and about the same distance west-northwestward of Pooles Island. Marshy **Spry Island,** just off mid-entrance, covers at high water and is to be avoided. The river has channel depths of 11 feet or more for 2 miles; thence 6 to 8 feet for 3.5 miles; and thence 4 feet to a fixed railroad bridge, with a horizontal clearance of 35 feet and a vertical clearance of 12 feet, 6.3 miles above the mouth. There is little or no traffic above the bridge.

The outer approach to Gunpowder River from westward of Pooles Island Bar Light has been mentioned. The inner approach is westward of Spry Island and is marked by buoys. The outer ends of the shoals that extend out from either side just inside the entrance also are marked by buoys.

Spry Island and most of Gunpowder River are within the **Aberdeen Proving Ground;** limits of the **restricted area** and regulations governing it are given in **§ 204.30,** Chapter 2A. A flashing red light is shown on **Robins Point,** at the south end of Gunpowder Neck, only when firing is in progress.

Chart 572.—Bush River is on the northwest side of Chesapeake Bay 149 miles above the Virginia Capes. The lower 5 miles of the river are within the Aberdeen

Proving Ground; limits of the **restricted area** and regulations governing it are given in § **204.30,** Chapter 2A.

The river has minimum depths of 7 feet to the railroad bridge 6.3 miles above the mouth, thence 5 to 6 feet for another 1.5 miles. The approach to the river and the channel inside are marked by buoys as far up as Tapler Point. The mean range of **tide** is about 1½ feet.

There is a Government wharf on **Tapler Point,** on the west side of Bush River 3.5 miles above the mouth. The approach to the wharf is marked by buoys.

The Pennsylvania Railroad bridge 6.3 miles above the mouth of Bush River has a bascule span with a horizontal clearance of 35 feet and a vertical clearance of 13 feet; **regulations** governing operation of the drawspan are given in § **203.245,** Chapter 2A. The power cable at the bridge has a vertical clearance of 37 feet. A high-voltage power cable about 200 yards below the bridge has a vertical clearance of 43 feet and is supported by towers on either bank and a tower near mid-river; a privately maintained light is shown from the southeast leg of the middle tower.

The village of **Bush River** is at the northeast end of the railroad bridge. The marine railway above the bridge has a hauling capacity of 20 tons and can handle boats up to 70 feet in length; the machine shop repairs gasoline and Diesel engines and does hull work. Gasoline and some other supplies are available.

The marine service dock on the west side of Bush River a mile above the bridge has depths of about 6 feet at the outer end. Gasoline, fresh water, and ice are available.

Romney Creek, on the northwest side of Chesapeake Bay 3 miles above Bush River, has depths of about 4 feet in a narrow entrance. The creek is within the Aberdeen Proving Ground and is closed to the public.

Still Pond, a roughly square bight on the southeast side of Chesapeake Bay 152.5 miles above the Virginia Capes, has general depths of 9 to 11 feet and is a good anchorage for small craft during easterly winds. **Churn Creek,** which empties into the southwest corner of the bight, has depths of 2 feet in the very narrow entrance and deeper water inside. **Stillpond Creek,** at the southeast corner of the bight, has depths of 3 feet in the very narrow entrance and 4 to 8 feet inside for 2 miles.

Sassafras River empties into Chesapeake Bay from eastward 156.5 miles above the Virginia Capes. The entrance is between **Howell Point** and **Grove Point,** 3.5 miles east-northeastward; the entrance width normal to the channel is about 1 mile. Howell Point is marked by a **light;** the fog signal operates from September 15 to June 15. The river is used by vessels drawing up to 12 feet, but the usual draft is 6 feet or less.

The river channel has depths of 13 feet for 11 miles, thence 7 to 3 feet for another 2 miles. The channel is broad and straight for the first 4 miles, then is narrow and crooked in places but is marked as far as the highway bridge 10 miles above the mouth. The mean range of **tide** is 1½ feet at Betterton and 2 feet at Georgetown.

Betterton is a summer resort on the south side of Sassafras River 2 miles eastward of Howell Point. The principal wharf has depths of 9 feet at the outer end. Excursion boats from Baltimore call at the wharf during the summer. Gasoline and some other supplies are available in the summer.

Turner Creek, on the south side of Sassafras River 4.5 miles above the mouth, has depths of at least 7 feet in a very narrow, unmarked entrance and for 0.6 mile upstream. The creek has several small landings along its shores and is much traveled by local pleasure boats.

Kentmore Park is a small community on the south side of Sassafras River 5 miles above the mouth. The community wharf has depths of about 6 feet at the outer end.

Back Creek, on the northeast side of Sassafras River 6 miles above the mouth, has depths of 7 feet in an unmarked entrance and for 0.5 mile upstream, thence 5 to 15 feet for another mile. The creek is little used.

Fredericktown, on the north side, and **Georgetown,** on the south side of Sassafras River 10 miles above the mouth, are connected by a highway bridge that has a bascule span with a horizontal clearance of 40 feet and a vertical clearance of 4½ feet.

The fuel docks just below the Fredericktown end of the bridge have depths of 8 feet at the outer ends; gasoline, Diesel oil, fresh water, ice, and other marine supplies are available. The marine railways can handle boats up to 75 feet in length and 60 tons in weight; the machine shop repairs gasoline and Diesel engines and does hull work. **Storm warnings** are displayed daytime only. Fredericktown also has a yacht club. The unmarked channel above the bridge is narrow in places and difficult to navigate without local knowledge.

Spesutie Narrows, on the northwest side of Chesapeake Bay 157 miles above the Virginia Capes, is between the mainland and **Spesutie Island,** close to the eastward. Depths across the flats off the southern entrance are 9 to 10 feet, and channels of like depth have been dredged into and along the narrows to the U. S. Army landings; the entrance channel is marked by lighted ranges and buoys, and the inner channel is well marked by buoys.

The fixed bridge over the north end of Spesutie Narrows, 2.5 miles from the south end, has a horizontal clearance of 13 feet and a vertical clearance of 8 feet. The passage under the bridge has depths of about 3 feet.

Spesutie Island and Spesutie Narrows are within the Aberdeen Proving Ground; limits of the **restricted area** and regulations governing it are given in **§ 204.30,** Chapter 2A.

Elk River, which empties into the east side of Chesapeake Bay 160 miles above the Virginia Capes, is the approach to the Chesapeake and Delaware Canal. The entrance to the river is between Grove Point and Turkey Point, 3 miles north-northeastward; the entrance width normal to the channel is about a mile.

Turkey Point is a thinly wooded bluff with abrupt slopes at the south end. A light, 64 feet above the water and visible 12 miles, is shown from a white tower on the bluff.

Elk River has natural depths of 17 to 12 feet for 9 miles to the mouth of Back Creek. The Federal project provides for a channel 27 feet deep and 400 feet wide down Elk River from Back Creek to deep water in Chesapeake Bay; the channel is maintained at or near project dimensions and is well marked by lighted ranges, lights, lighted and unlighted buoys. The mean range of **tide** is about 2 feet at the entrance to the river and 2½ feet at the head.

Bohemia River, on the east side of Elk River 5 miles above the mouth, has depths of 7 feet for 4 miles to the junction of **Great Bohemia Creek** and **Little Bohemia Creek,** thence 6 to 4 feet for 3 miles in Great Bohemia Creek and 7 feet for a mile in Little Bohemia Creek. The unmarked channel is broad and easily followed for 2 miles above the entrance, then becomes very narrow and crooked. The river is used by boats drawing 5 feet or less.

The cove on the southwest side of Bohemia River 3 miles above the entrance has depths of 3 to 5 feet and is much used as a small-boat anchorage. The marine service

pier on the northwest side of the cove has depths of 3 feet at the outer end; gasoline, fresh water, ice, provisions, and some other marine supplies are available on the pier. The marine railways at the pier can handle boats up to 36 feet in length and 10 tons in weight; minor hull repairs are made. **Hack Point** is a village on the southeast side of the cove.

The highway bridge 3.6 miles above the mouth of Bohemia River has a bascule span with a horizontal clearance of 40 feet and a vertical clearance of 12 feet.

Old Town Point Wharf, on the southeast side of Elk River 7 miles above the mouth, has depths of 10 feet at the outer end. This is a Government wharf and a reporting station for the west end of the Chesapeake and Delaware Canal.

Back Creek, on the east side of Elk River 9 miles above the mouth and 169 miles from the Virginia Capes, is the route of the Chesapeake and Delaware Canal and has been discussed in Chapter 7.

Above Back Creek, the natural channel in Elk River has depths of 9 to 5 feet for 6 miles to the junction of **Big Elk Creek** and **Little Elk Creek,** 15 miles above the mouth. The channel is narrow and crooked in places but is marked by buoys to within a mile of the junction. Traffic on the upper river consists chiefly of sand and gravel carried in motor vessels and barges drawing up to 9 feet.

A boatyard on the east side of Elk River 2 miles below the junction can haul out vessels up to 50 feet in length and 20 tons in weight; the machine shop repairs gasoline engines and does hull work. Gasoline, fresh water, ice, and some marine supplies can be obtained on the dock, which has depths of 5 feet alongside.

Big Elk Creek, on the east, and Little Elk Creek, on the west, have depths of 3 feet to the fixed highway bridges 0.6 and 0.4 mile above their respective mouths. **Elkton,** between the creeks and 16 miles above the mouth of Elk River, is on the main line of the Pennsylvania Railroad and has several industrial plants.

The natural channel of Chesapeake Bay turns northward off the mouth of Elk River and splits into two branches between Turkey Point and Spesutie Island, 2.3 miles to the westward. One branch rounds Spesutie Island and leads northward to Susquehanna River; the other hugs the west side of Turkey Point and high, thickly wooded **Elk Neck** and leads to Northeast River. The flats between the two branches are very shallow, and large areas bare at low water.

Fishing Battery Light (lat. 39°29′.7, long. 76°05′.0), 38 feet above the water, is shown from a black skeleton tower on the battery on the east side of the channel leading to Susquehanna River; the light is 165 miles above the Virginia Capes. Near the light are a house and a few trees. A shallow channel leads from the main channel to a basin on the west side of the light.

Swan Creek, on the western shore of Chesapeake Bay opposite Fishing Battery Light, has depths of 2 to 3 feet in the entrance and 3 to 10 feet inside for about 2 miles. The creek is little used except by boats going to the U. S. Army landing on the south side 0.5 mile above the entrance. The landing has depths of 4 to 5 feet at the outer end and is marked by a light.

Susquehanna River empties into the head of Chesapeake Bay from northwestward 168 miles above the Virginia Capes. The entrance is between **Concord Point,** marked by a light, and **Perry Point,** a mile east-northeastward.

A Federal project provides for a channel 15 feet deep and 200 feet wide from Chesapeake Bay to Havre de Grace; the controlling depth is about 13 feet. The dredged

section begins about a mile below Fishing Battery Light and is well marked by buoys. In the natural channel between Havre de Grace and Port Deposit, the river has depths of 15 to 50 feet.

The mean range of **tide** is about 1½ feet at Havre de Grace and 2 feet at Port Deposit. **Ice gorges** and **freshets,** once of frequent occurrence in Susquehanna River, now are modified by the Conowingo Dam, a few miles above Port Deposit, and by other dams farther up. The river usually is entirely closed by ice for about three months during the winter.

Havre de Grace, on the west side of the entrance to Susquehanna River, is on the main lines of the Pennsylvania Railroad and the Baltimore and Ohio Railroad. The town has little water-borne commerce, and most of the wharves are in poor condition. The oil wharf just above the first bridge has depths of about 15 feet at the face.

The Federal project provides for a channel 10 feet deep and 100 feet wide to a small-boat basin below Concord Point; the controlling depth was about 7 feet in May 1950. The south side of the basin is protected by an island, and the channel is marked by buoys. Fresh water is piped to the several landings in the basin.

A marine service pier just north of Concord Point has depths of about 7 feet at the face; gasoline, Diesel oil, fresh water, ice, and some marine supplies are available. The marine railway has a hauling capacity of 20 tons and can handle boats up to 50 feet in length; the machine shop repairs gasoline and Diesel engines and does hull work.

A rock, covered 6 feet and marked by buoys on the east and west sides, is about 200 yards off the Havre de Grace wharves and 500 yards below the drawspan of the first bridge. There are said to be several other rocks between this rock and the wharves that require local knowledge to avoid.

The Pennsylvania Railroad bridge, which crosses Susquehanna River from Havre de Grace to Perryville 0.8 mile above the mouth, has a swing span with a horizontal clearance of 100 feet and a vertical clearance of 52 feet; **regulations** governing operation of the drawspan are given in § **203.245,** Chapter 2A. Just below the bridge are the 14 stone piers of a former highway bridge; the piers stand about 15 feet above high water and are roughly opposite those of the railroad bridge.

In Perryville, at the east end of the bridge, the Pennsylvania Railroad maintains division repair shops. The buildings, tanks, and stacks of the U. S. Veterans Hospital are conspicuous in the southeastern part of the town, toward Perry Point. A short dredged channel leads to a Government landing 500 yards below the bridge. The wharves just above the bridge have depths of 7 to 12 feet alongside.

Garrett Island, 0.8 mile long and 0.4 mile broad, high and wooded, is in mid-river a mile above the mouth. The fixed highway bridge, which crosses Susquehanna River and the lower end of Garrett Island 1.2 miles above the river mouth, has a horizontal clearance of 320 feet and a vertical clearance of 87 feet. The Baltimore and Ohio Railroad bridge, over the river and the upper part of the island 1.6 miles above the river mouth, has a fixed channel span with a horizontal clearance of 500 feet and a vertical clearance of 86 feet; the channel is through the second opening west of the island.

Port Deposit is on the northeast side of Susquehanna River 4 miles above the mouth. The only landings are at the Navy Depot and at the shipyard. The Navy landing has depths of 12 feet along its outer face and is marked by a light. The shipyard bulkhead has depths of 6 feet alongside but is in poor condition.

Small boats can go a short distance above Port Deposit, but the channel is obstructed by rocks. **Conowingo Dam** is about 10 miles above the mouth of Susquehanna River.

Northeast River empties into the head of Chesapeake Bay 4.5 miles eastward of Susquehanna River and 167 miles above the Virginia Capes. The entrance is between **Red Point,** which is 5 miles north-northeastward of Turkey Point, and **Carpenter Point,** 1.3 miles to the west-northwestward. Commercial traffic on the river consists chiefly of sand and gravel carried in barges drawing up to 9 feet. The river is also used extensively by yachtsmen, and there are several boat-storage yards along its shores.

The river has channel depths of 10 feet for about 4 miles to within a mile of a dam at the head of navigation. The channel is well marked by buoys for most of its length. The mean range of **tide** is about 2 feet.

Charlestown, on the west side of Northeast River 2.5 miles above the mouth, is on the main line of the Pennsylvania Railroad. The marine service pier has depths of about 4 feet at the outer end; gasoline, Diesel oil, fresh water, ice, and marine supplies are available. The marine railway can handle boats up to 60 feet in length; the machine shop repairs gasoline engines.

Northeast Heights is on the east side of Northeast River 3 miles above the mouth. The marine service pier has depths of about 7 feet alongside; gasoline, fresh water, ice, and marine supplies are available. The marine railways can handle boats up to 50 feet in length and 20 tons in weight; the machine shop repairs gasoline and Diesel engines and does hull work. Extensive berthage facilities are available.

North East, at the head of navigation 4.5 miles above the mouth of Northeast River, has good rail and highway connections. Depths of about 7 feet can be carried to the town. Gasoline and some other supplies are available.

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COAST AND GEODETIC SURVEY.—Coast Pilots.—

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U. S. C. P. 2, Atlantic Coast, Cape Cod to Sandy Hook, 1950.
U. S. C. P. 3, Atlantic Coast, Sandy Hook to Cape Henry, 1953.
U. S. C. P. 4, Atlantic Coast, Cape Henry to Key West, 1948.
U. S. C. P. 5, Gulf Coast, Key West to Rio Grande, 1949.
U. S. C. P. 6, West Indies, Puerto Rico and Virgin Islands, 1949.
U. S. C. P. 7, Pacific Coast, California, Oregon, and Washington, 1951.
U. S. C. P. 8, Southeast Alaska, Dixon Entrance to Yakutat Bay, 1952.

U. S. C. P. 9, Alaska, Yakutat Bay to Arctic Ocean, 1947.
U. S. C. P. 10, Hawaiian Islands, 1950.
Distances Between United States Ports, 1938.

District Offices.—Eastern District: Office: 602 Federal Office Building, 90 Church Street, New York 7, N. Y.

The Eastern District comprises Connecticut (west of and including the Connecticut River), New York, New Jersey, Delaware, and Pennsylvania.

Southeastern District: Office: 418 U. S. Post Office Building, Granby Street between Brambleton Avenue and Bute Street, Norfolk 10, Va.

The Southeastern District comprises Maryland, Virginia, North Carolina, South Carolina, and Georgia.

Coast and Geodetic Survey Sales Agencies.—Agents marked with an (*) asterisk also handle certain United States Hydrographic Office publications.

Agents marked with a (†) dagger also handle United States Coast Guard publications.

DELAWARE:
Lewes: C. H. Ellis and Co., 121–123 Front St.
Wilmington: *Norem & Sons, Inc., 621 East Fourth St.

DISTRICT OF COLUMBIA:
Washington: †Superintendent of Documents, Government Printing Office.
Coast and Geodetic Survey, Department of Commerce Building, Constitution Ave and Fourteenth St.
*Aeronautical Services, Inc. 1616 K St. NW
The Washington Marina, 1300 Maine Ave., SW

MARYLAND:
Annapolis: †*Weems System of Navigation, 227 Prince George St.
Baltimore:
†*Keefer & Co., 43 South Gay St.
Middle River Boat Sales, 203 Patapsco Ave.
Officer in Charge, U. S. Coast and Geodetic Survey, 518 East 32nd St.
The Wm. H. Whiting Co., 428 East Pratt St.
†*Wilfrid O. White & Sons, 406 Water St.
Stickell-Wheeler Yacht Co., 1616 Mt. Royal Ave.
*Baltimore Nautical Supplies, 505 Water St.
Cambridge: Cambridge Office Supply Co.
Crisfield: J. P. Tawes & Brother.
Easton: The Shannahan & Wrightson Co.
Oxford: The Oxford Boatyard Co.
Sparrows Point: North Point Marine Hardware Co., N. Point Road and Wise Ave.
St. Michaels: The St. Michaels Co.

NEW JERSEY:

Atlantic City: †Marine Mart, Inc., Melrose and Massachusetts Avenues.
Bay Head: †Dale Yacht Basin, Inc.
Bridgeton: G. S. Electrical Co., 45 South Laurel St.
Cape May: Rafferty's Cape May Marina, Route No. 4, Inland Waterway.
Englewood: Cruiser Sales Co., 137 Route No. 4.
Fort Lee: †Wilson's Marine, Route No. 4.
Point Pleasant:
†Point Pleasant Hardware Co.
†The Ship Chandlers, Inc., 601 Bay Ave.
Shipbottom: Long Beach Marine, 8th St.
Toms River: Hotaling's Boat Yard.

PENNSYLVANIA:

Philadelphia:
†John E. Hand & Sons Co., 243 Chestnut St.
†*Riggs & Bro., 310 Market St.
Marine Equipment & Supply Co., 116–118 Walnut St.

VIRGINIA:

Newport News: †*E. Smola Co., 134 25th St.
Norfolk:
Coast and Geodetic Survey District Office, Room 418, U. S. Post Office Bldg.
†*W. T. Brownley, 121 Randolph St.
†*Henry Eagleton Co., 430 Boush St.
†*E. Smola Co., 402 East City Hall Ave.
Richmond: Everett Waddey Co.

Monthly Mean Surface Water Temperatures

Place	Years of Record	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Mean
		°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.
Sandy Hook, N. J	14	35. 4	34. 5	39. 0	48. 4	57. 9	68. 1	73. 7	73. 9	69. 0	57. 9	48. 2	38. 4	53. 7
Atlantic City, N. J	38	37. 2	35. 9	39. 7	47. 1	55. 8	64. 6	69. 2	71. 6	69. 6	61. 1	51. 4	41. 4	53. 7
Breakwater Harbor, Del	7	38. 7	37. 5	43. 6	50. 0	59. 3	68. 9	73. 3	73. 0	71. 0	62. 9	52. 0	42. 0	56. 0
Philadelphia, Pa	24	35. 9	36. 0	41. 2	50. 9	63. 2	73. 4	78. 6	78. 3	72. 9	62. 0	50. 1	39. 6	56. 8
Old Point Comfort, Va	6	42. 5	42. 2	48. 0	56. 8	66. 7	75. 1	79. 8	79. 0	74. 9	65. 3	55. 0	44. 6	60. 8
Richmond, Va	5	43. 0	43. 6	48. 0	58. 1	68. 2	76. 4	81. 2	80. 9	75. 0	64. 6	52. 0	42. 4	61. 1
Washington, D. C	8	39. 5	39. 9	47. 8	58. 8	69. 7	78. 1	83. 4	82. 4	77. 0	65. 6	54. 2	41. 6	61. 5
Solomons, Md	14	38. 3	37. 8	43. 4	52. 7	64. 7	74. 5	79. 7	80. 4	75. 2	65. 3	54. 7	43. 2	59. 2
Cambridge, Md	6	39. 2	38. 8	44. 2	55. 2	65. 9	75. 1	80. 1	79. 4	73. 8	63. 5	52. 8	40. 5	59. 0
Baltimore, Md	38	37. 3	36. 7	42. 4	52. 5	64. 0	74. 0	79. 5	79. 6	74. 9	65. 2	53. 6	42. 7	58. 5

For temperature data in greater detail, see U. S. Coast and Geodetic Survey publication, *Surface Water Temperatures, Atlantic Coast, North and South America.*

Monthly Mean Sea Water Densities

Reduced to 15° C. (59° F.)

Place	Years of Record	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Mean
Sandy Hook, N. J	14	1. 0162	1. 0166	1. 0154	1. 0149	1. 0161	1. 0171	1. 0184	1. 0186	1. 0187	1. 0187	1. 0179	1. 0173	1. 0172
Atlantic City, N. J	38	1. 0232	1. 0233	1. 0232	1. 0231	1. 0233	1. 0235	1. 0236	1. 0235	1. 0234	1. 0235	1. 0234	1. 0233	1. 0234
Breakwater Harbor, Del	5	1. 0208	1. 0206	1. 0207	1. 0203	1. 0206	1. 0208	1. 0217	1. 0220	1. 0221	1. 0221	1. 0220	1. 0215	1. 0213
Philadelphia, Pa	24	0. 9994	0. 9994	0. 9995	0. 9996	0. 9998	0. 9999	0. 9999	0. 9998	0. 9998	0. 9997	0. 9996	0. 9995	0. 9997
Old Point Comfort, Va	6	1. 0140	1. 0132	1. 0123	1. 0123	1. 0128	1. 0134	1. 0149	1. 0154	1. 0153	1. 0153	1. 0156	1. 0147	1. 0141
Richmond, Va	5	0. 9992	0. 9990	0. 9992	0. 9993	0. 9995	0. 9996	0. 9997	0. 9996	0. 9995	0. 9993	0. 9992	0. 9993	0. 9994
Washington, D. C	8	0. 9991	0. 9992	0. 9992	0. 9993	0. 9996	0. 9996	0. 9997	0. 9997	0. 9996	0. 9994	0. 9993	0. 9992	0. 9994
Solomons, Md	14	1. 0103	1. 0102	1. 0090	1. 0076	1. 0074	1. 0076	1. 0086	1. 0092	1. 0104	1. 0114	1. 0120	1. 0111	1. 0096
Cambridge, Md	6	1. 0066	1. 0064	1. 0065	1. 0061	1. 0057	1. 0058	1. 0057	1. 0057	1. 0070	1. 0080	1. 0085	1. 0077	1. 0066
Baltimore, Md	38	1. 0065	1. 0065	1. 0054	1. 0037	1. 0035	1. 0037	1. 0042	1. 0049	1. 0063	1. 0073	1. 0074	1. 0072	1. 0056

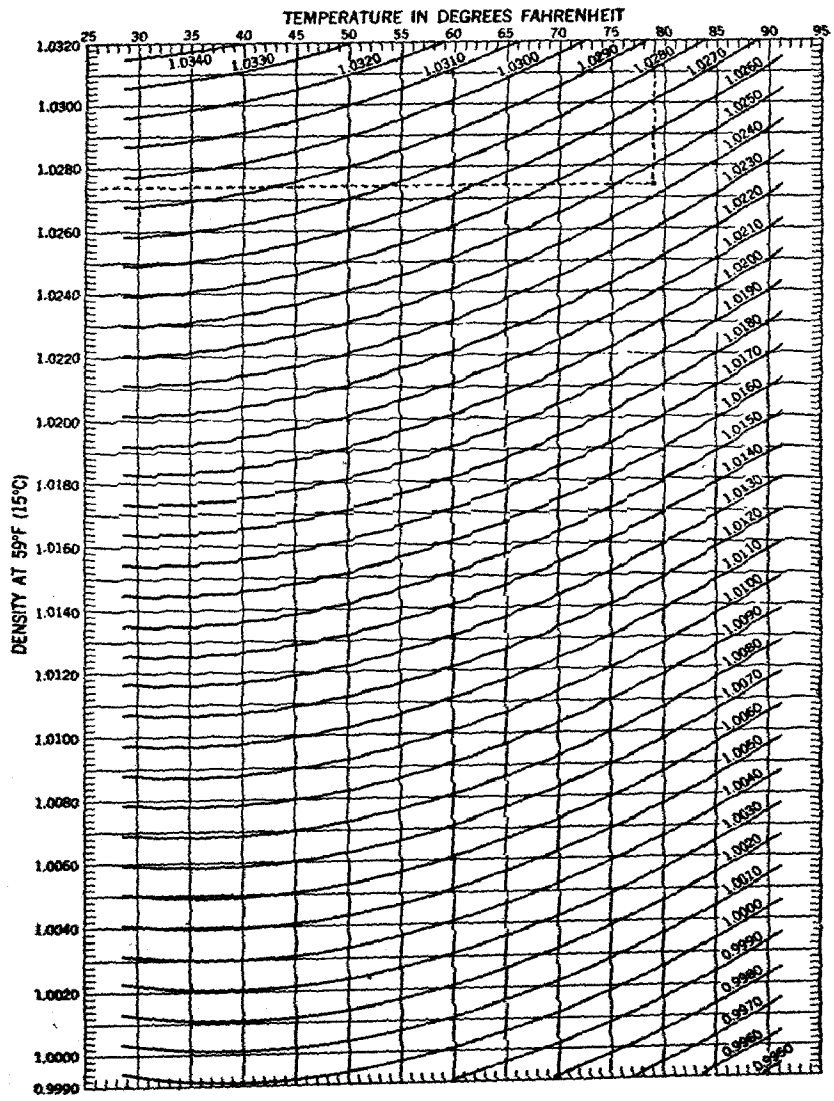
For density data in greater detail, see U. S. Coast and Geodetic Survey publication, *Density of Sea Water, Atlantic and Gulf Coasts.*

To convert any of the above densities at 15° C. to density at another temperature, see the accompanying graph, *Sea Water Density at Various Temperatures.*

Sea Water Density at Various Temperatures

The purpose of this graph is to provide the density of sea water at any temperature apt to be encountered when the density at the standard temperature of 59° F. (15° C.) is known. The densities are referred to the density of fresh water at 39°2 F. (4° C.) as unity.

To convert a density at 59° F. to density at another temperature, enter the graph horizontally from the left with the known density and downward from the top with the desired temperature; the position of the point of intersection with respect to the curves gives the density at the desired temperature. Interpolate between curves when necessary.



EXAMPLE: If certain water has a density of 1.0274 at 59° F., what would its density be at a temperature of 79° F.? Entering the graph from the side and top as shown by the dashed lines, it is found that the point of intersection lies about 4/10 of the way between curves 1.0240 and 1.0250, so that the density at 79° is 1.0244.

Distance Table, New York to Chesapeake Bay and Delaware Bay

DISTANCES GIVEN IN NAUTICAL MILES

From: / To:	New York (Battery), 40°42'.0 N., 70°01'.0 W.	Shark River, 40°10'.8 N., 74°01'.9 W.	Mile 0.0, N. J. Intracoastal Waterway, 40°06'.1 N., 74°01'.9 W.	Barnegat Inlet, 39°46'.0 N., 74°06'.3 W.	Atlantic City, 39°22'.6 N., 74°24'.9 W.	Cape May Harbor, 38°56'.9 N., 74°54'.4 W.	Cape May Canal Jetties, 38°58'.0 N., 74°53'.0 W.	Trenton (Marine Terminal), 40°11'.4 N., 74°45'.4 W.	Roebling, 40°07'.5 N., 74°46'.5 W.	Torresdale, 40°02'.5 N., 74°59'.3 W.	Philadelphia, 39°56'.8 N., 75°08'.3 W.	Chester, 39°49'.3 N., 75°22'.9 W.	Marcus Hook, 39°48'.2 N., 75°25'.2 W.	Wilmington, 39°43'.2 N., 75°31'.5 W.	Reedy Point, 39°33'.8 N., 75°32'.8 W.	Harbor of Refuge, 38°49'.0 N., 75°05'.2 W.	Delaware Bay Entrance, 38°47'.6 N., 75°01'.8 W.	Indian River Inlet, 38°36'.5 N., 75°04'.0 W.	Ocean City, Md., 38°19'.6 N., 75°06'.0 W.	Chincoteague, 37°56'.1 N., 75°22'.8 W.	Chesapeake Bay Entrance, 36°56'.3 N., 75°58'.6 W.	Cape Cod Canal Entrance, 41°46'.8 N., 70°29'.0 W.	Nantucket Shoals L. S., 40°17'.2 N., 69°36'.0 W.	Montauk Point Light, 4 miles 130° from light, 41°01'.7 N., 71°47'.3 W.	Diamond Shoal Light Ship, 35°07'.8 N., 75°14'.5 W.
New York (Battery)	----	36	40	62	93	128	142	266	260	248	238	222	220	214	203	152	149	145	161	207	266	182	228	121	345
Shark River	36	----	9	31	61	96	111	223	217	205	195	179	177	171	159	109	105	114	130	176	226	218	222	115	333
Mile 0.0, N. J. Intracoastal Waterway	40	9	----	24	55	90	102	216	210	198	188	172	170	164	153	102	99	107	123	169	220	222	224	117	327
Barnegat Inlet	62	31	24	----	34	69	83	196	190	178	168	152	150	144	132	82	78	87	103	149	200	244	240	132	306
Atlantic City	93	61	55	34	----	42	48	169	163	151	141	125	123	117	106	55	52	60	76	122	173	274	270	163	280
Cape May Harbor	128	96	90	69	42	----	4	133	126	114	105	88	86	80	69	18	15	25	44	90	140	309	305	198	247
Cape May Canal Jetties	142	111	102	83	48	4	----	113	107	95	85	69	67	61	49	15	15	28	47	93	144	324	326	219	250
Trenton	266	223	216	196	169	133	113	----	6	18	28	44	46	54	64	117	118	131	149	195	262	403	408	326	345
Roebling	260	217	210	190	163	126	107	6	----	12	22	38	40	48	58	111	112	124	143	189	256	397	402	320	338
Torresdale	248	205	198	178	151	114	95	18	12	----	10	26	28	36	45	98	100	112	131	177	244	385	390	308	326
Philadelphia	238	195	188	168	141	105	85	28	22	10	----	16	18	26	36	89	90	103	121	168	234	375	380	299	317
Chester	222	179	172	152	125	88	69	44	38	26	16	----	2	10	20	73	74	87	105	151	218	359	364	282	301
Marcus Hook	220	177	170	150	123	86	67	46	40	28	18	2	----	8	18	71	72	84	103	149	216	357	362	280	298
Wilmington	214	171	164	144	117	80	61	54	48	36	26	10	8	----	11	64	66	78	97	143	210	351	356	274	292
Reedy Point	203	159	153	132	106	69	49	64	58	45	36	20	18	11	----	53	54	67	86	132	199	339	344	263	281
Harbor of Refuge	152	109	102	82	55	18	15	117	111	98	89	73	71	64	53	----	4	17	35	81	148	289	294	212	231
Delaware Bay Entrance	149	105	99	78	52	15	15	118	112	100	90	74	72	66	54	4	----	13	31	78	157	285	290	209	227
Indian River Inlet	145	114	107	87	60	25	28	131	124	112	103	87	84	78	67	17	13	----	22	68	118	327	323	209	225
Ocean City, Md.	161	130	123	103	76	44	47	149	143	131	121	105	103	97	86	35	31	22	----	50	100	343	339	231	207
Chincoteague	207	176	169	149	122	90	93	195	189	177	168	151	149	143	132	81	78	68	50	----	73	389	385	277	180
Chesapeake Bay Entrance	266	226	220	200	173	140	144	262	256	244	234	218	216	210	199	148	[1] 128	118	100	73	----	399	389	322	117

[1] Inshore route for light-draft vessels.

Distance Table, Chesapeake Bay

DISTANCES IN NAUTICAL MILES

From: / To:	Reedy Point, 39°33.8′ N., 75°32.8′ W.	Chesapeake City, 39°31.8′ N., 75°48.9′ W.	Baltimore, 39°15.5′ N., 76°34.3′ W.	Annapolis, 38°59.1′ N., 76°28.6′ W.	Chestertown, 39°12.4′ N., 76°03.8′ W.	St. Michaels, 38°47.4′ N., 76°12.6′ W.	Cambridge, 38°34.4′ N., 76°04.4′ W.	Solomons, 38°19.0′ N., 76°26.9′ W.	Vienna, Md., 38°29.1′ N., 75°49.3′ W.	Salisbury, 38°21.9′ N., 75°36.3′ W.	Washington, D. C., 38°52.4′ N., 77°01.4′ W.	Crisfield, 37°57.6′ N., 75°51.9′ W.	Fredericksburg, 38°17.8′ N., 77°27.2′ W.	Cape Charles (City), 37°15.9′ N., 76°01.4′ W.	Yorktown, 37°14.6′ N., 76°30.4′ W.	West Point, 37°31.6′ N., 76°48.1′ W.	Newport News, 36°58.0′ N., 76°26.0′ W.	Suffolk, 36°44.3′ N., 76°35.0′ W.	Hopewell, 37°19.0′ N., 77°16.4′ W.	Petersburg, 37°14.1′ N., 77°24.0′ W.	Richmond, 37°31.4′ N., 77°25.2′ W.	Norfolk, (Sewall Point Grain Elevator) 36°55.9′ N., 76°20.4′ W.	Mile 0.0 Atlantic Intracoastal Waterway, 36°50.9′ N., 76°17.9′ W.	Chesapeake Bay Entrance, 36°56.3′ N., 75°58.6′ W.	Cape Cod Canal Entrance, 41°46.8′ N., 70°29.9′ W.	Nantucket Shoals Lightship, 40°38.0′ N., 69°17.2′ W.	Montauk Point Light, 4 miles 130° from light, 41°01.7′ N., 71°47.3′ W.	New York (Battery), 40°42.0′ N., 70°01.0′ W.	Diamond Shoal Lightship, 35°07.8′ N., 75°14.5′ W.
Reedy Point	----	13	62	65	79	83	98	104	144	145	213	141	247	170	190	210	208	212	267	262	285	206	196	[1]187	339	344	263	203	281
Chesapeake City	13	----	49	52	66	70	85	91	131	132	200	128	234	157	177	197	195	198	254	248	272	192	183	174	[2]352	[2]357	[2]276	[2]204	290
Baltimore	62	49	----	27	44	45	60	66	106	108	175	103	209	132	152	172	170	174	229	225	248	168	158	149	548	538	471	415	266
Annapolis	65	52	27	----	41	25	40	47	86	88	155	83	189	112	130	152	136	154	194	205	213	133	139	129	[2]405	[2]434	[2]328	[2]256	245
Chestertown	79	66	44	41	----	59	74	80	120	121	188	116	223	146	163	186	170	187	228	238	246	167	173	162	[2]451	[2]447	[2]339	[2]269	278
St. Michaels	83	70	45	25	59	----	44	51	90	92	159	87	193	116	134	156	140	158	198	209	217	137	143	133	[2]455	[2]452	[2]344	[2]274	249
Cambridge	98	85	60	40	74	44	----	43	82	84	151	79	185	108	126	148	132	150	190	201	209	127	135	125	[2]470	[2]466	[2]358	[2]288	241
Solomons	104	91	66	47	80	51	43	----	50	52	119	47	153	76	94	116	100	118	158	169	177	97	103	93	[2]477	[2]473	[2]365	[2]295	209
Vienna, Md	144	131	106	86	120	90	82	50	----	46	139	42	166	89	107	129	113	130	171	182	190	110	116	106	[2]516	[2]512	[2]404	[2]334	222
Salisbury	145	132	108	88	121	92	84	52	46	----	141	43	168	90	108	130	114	132	172	183	191	111	117	107	[2]518	[2]514	[2]406	[2]336	223
Washington, D. C.	213	200	175	155	188	159	151	119	139	141	----	136	223	146	164	186	184	187	242	238	261	181	172	162	[2]552	[2]557	[2]475	[2]403	279
Crisfield	141	128	103	83	116	87	79	47	42	43	136	----	131	54	72	94	78	96	136	146	155	75	81	71	510	506	399	329	187
Fredericksburg	247	234	209	189	223	193	185	153	166	168	223	131	----	124	142	164	148	165	206	216	225	145	151	140	580	576	468	398	256
Cape Charles (City)	170	157	132	112	146	116	108	76	89	90	146	54	124	----	28	50	31	48	89	99	108	28	34	24	464	460	352	282	140
Yorktown	190	177	152	130	163	134	126	94	107	108	164	72	142	28	----	22	55	58	114	110	132	52	44	34	432	422	356	299	150
West Point	210	197	172	152	186	156	148	116	129	130	186	94	164	50	22	----	63	81	122	132	140	60	66	56	496	492	384	314	172
Newport News	208	195	170	136	170	140	132	100	113	114	184	78	148	31	55	63	----	21	58	69	77	7	12	25	423	414	347	290	141
Suffolk	212	198	174	154	187	158	150	118	130	132	187	96	165	48	58	81	21	----	79	90	98	23	29	42	482	478	370	300	158
Hopewell	267	254	229	194	228	198	190	158	171	172	242	136	206	89	114	122	58	79	----	10	19	66	70	83	482	472	405	349	200
Petersburg	262	248	225	205	238	209	201	169	182	183	238	146	216	99	110	132	69	90	10	----	28	74	80	93	533	529	421	351	209
Richmond	285	272	248	213	246	217	209	177	190	191	261	155	225	108	132	140	77	98	19	28	----	84	88	102	500	490	424	367	218
Norfolk	206	192	168	133	167	137	127	97	110	111	181	75	145	28	52	60	7	23	66	74	84	----	6	22	421	411	344	288	139
Mile 0.0, Atlantic Intracoastal Waterway	196	183	158	139	173	143	135	103	116	117	172	81	151	34	44	66	12	29	70	80	88	6	----	28	468	464	356	286	144
Chesapeake Bay Entrance	[1]187	174	149	129	162	133	125	93	106	107	162	71	140	24	34	56	25	42	83	93	102	22	28	----	399	389	322	266	117

[1] Via Chesapeake Bay.
[2] Via Chesapeake and Delaware Canal.

Radio Bearing Conversion Table

Table of corrections, in minutes

[DIFFERENCE OF LONGITUDE IN DEGREES]

Mid. L.	½°	1°	1½°	2°	2½°	3°	3½°	4°	4½°	5°	5½°	6°	6½°	7°	7½°	8°	8½°	9°	9½°	10°
15°	4	8	12	16	19	23	27	31	35	40	43	47	50	54	58	62	66	70	74	78
16°	4	8	12	17	21	25	29	33	37	41	45	50	54	58	62	66	70	74	79	83
17°	4	9	13	18	22	26	31	35	39	44	48	53	57	61	66	70	75	79	83	88
18°	5	9	13	19	23	28	32	37	42	46	51	56	60	65	70	74	79	83	88	93
19°	5	10	15	20	24	29	34	39	44	49	54	59	63	68	73	78	83	88	93	98
20°	5	10	15	21	26	31	36	41	46	51	56	62	67	72	77	82	87	92	98	103
21°	5	11	16	21	27	32	38	43	48	54	59	64	70	75	81	86	91	97	102	108
22°	6	11	17	22	28	34	39	45	51	56	62	67	73	79	84	90	96	101	107	112
23°	6	12	18	23	29	35	41	47	53	59	64	70	76	82	88	94	100	105	111	117
24°	6	12	18	24	31	37	43	49	55	61	67	73	79	85	92	98	104	110	116	122
25°	6	13	19	25	32	38	44	51	57	63	70	76	82	89	95	101	108	114	120	127
26°	7	13	20	26	33	39	46	53	59	66	72	79	85	92	99	105	112	118	125	131
27°	7	14	20	27	34	41	48	54	61	68	75	82	89	95	102	109	116	123	129	136
28°	7	14	21	28	35	42	49	56	63	70	77	84	92	99	106	113	120	127	134	141
29°	7	15	21	29	36	44	51	58	65	73	80	87	95	102	109	116	124	131	138	145
30°	7	15	22	30	38	45	53	60	68	75	83	90	98	105	113	120	127	135	143	150
31°	8	15	23	31	39	46	54	62	70	77	85	93	100	108	116	124	131	139	146	155
32°	8	16	24	32	40	48	56	64	72	79	87	95	103	111	119	127	135	143	151	159
33°	8	16	25	33	41	49	57	65	74	82	90	98	106	114	123	131	139	147	155	163
34°	8	17	25	34	42	50	59	67	75	84	92	101	109	117	126	134	143	151	159	168
35°	9	17	26	34	43	52	60	69	77	86	95	103	112	120	129	138	146	155	163	172
36°	9	18	26	35	44	53	62	71	79	88	97	106	115	123	132	141	150	159	168	176
37°	9	18	27	36	45	54	63	72	81	90	99	108	117	126	135	144	153	163	172	181
38°	9	18	28	37	46	55	65	74	83	92	102	111	120	129	139	148	157	166	175	185
39°	9	19	28	38	47	57	66	75	85	94	104	113	123	132	142	151	160	170	179	189
40°	10	19	29	39	48	58	68	77	87	96	106	116	125	135	145	154	164	174	183	193
41°	10	20	30	39	49	59	69	79	89	98	108	118	128	138	148	157	167	177	187	197
42°	10	20	30	40	50	60	70	80	90	100	110	120	130	140	151	161	171	181	191	201
43°	10	20	31	41	51	61	72	82	92	102	113	123	133	143	153	164	174	184	194	205
44°	10	21	31	42	52	63	73	83	94	104	115	125	135	146	156	167	177	188	198	208
45°	11	21	32	42	53	64	74	85	95	106	117	127	138	149	159	170	180	191	201	212
46°	11	22	32	43	54	65	76	86	97	108	119	129	140	151	162	173	183	194	205	216
47°	11	22	33	44	55	66	77	88	99	110	121	132	143	154	165	176	186	197	208	219
48°	11	22	33	45	56	67	78	89	100	111	123	134	145	156	167	178	190	201	212	223
49°	11	23	34	45	57	68	79	91	102	113	125	136	147	158	170	181	192	204	215	226
50°	11	23	34	46	57	69	80	92	103	115	126	138	149	161	172	184	195	207	218	230
51°	12	23	35	47	58	70	82	93	105	117	128	140	152	163	175	186	198	210	221	233
52°	12	24	35	47	59	71	83	95	106	118	130	142	154	165	177	189	201	213	225	236
53°	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228	240
54°	12	24	36	49	61	73	85	97	109	121	133	146	158	170	182	194	206	218	231	243
55°	12	25	37	49	61	74	86	98	111	123	135	147	160	172	184	197	209	221	233	246
56°	12	25	37	50	62	75	87	100	112	124	137	149	162	174	187	199	211	224	236	249
57°	13	25	38	50	63	75	88	101	113	126	138	151	164	176	189	201	214	226	239	252
58°	13	25	38	51	64	76	89	102	115	127	140	153	165	178	191	204	216	229	242	254
59°	13	26	39	51	64	77	90	103	116	129	141	154	167	180	193	206	219	231	244	257
60°	13	26	39	52	65	78	91	104	117	130	143	156	169	182	195	208	221	234	247	260

Example. A ship in latitude 39°51′. N., longitude 67°35′ W., by dead reckoning, obtains a radio bearing of 299° true on the radiobeacon located in latitude 40°37′. N., longitude 69°37′ W.

Radiobeacon station	Latitude	40°37′ N.
Dead-reckoning position of ship	Latitude	39°51′
Middle latitude		40°14′
Radiobeacon station	Longitude	69°37′ W.
Dead reckoning position of ship	Longitude	67°35′
Longitude difference		2°02′

Entering the table with difference of longitude equals 2°, which is the nearest tabulated value and opposite 40° middle latitude, the correction of 39′ is read.

As the ship is east of the radiobeacon, a minus correction is applied. The Mercator bearing then will be 299°−000°39′=298°21′. To facilitate plotting, subtract 180° and plot from the position of the radiobeacon the bearing 298°21′−180°, or 118°21′ (Mercator bearing reckoned clockwise from true north).

CORPS OF ENGINEERS DISTRICTS.—New York, N. Y., District: Office—80 Lafayette Street, New York City.

The New York District comprises western Vermont, small portions of western Massachusetts and Connecticut, eastern New York including Long Island, and northeastern New Jersey . . . but not including Manasquan Inlet, N. J.

Philadelphia, Pa., District: Office—121 North Broad Street.

The Philadelphia District comprises a portion of southeastern New York, eastern Pennsylvania, western and southern New Jersey, northern and southeastern Delaware, and a small part of northeastern Maryland embraced in the drainage basin of the Delaware Bay and River system and those basins tributary to the Atlantic Ocean from Manasquan River, N. J., inclusive, to the south boundary of Delaware. It also includes the Chesapeake and Delaware Canal and the approach channel thereto in Chesapeake Bay and Elk River, Md.

Baltimore, Md., District: Office—24th and Maryland Avenue.

The Baltimore District includes the watershed of the Susquehanna River and its tributaries from headwaters to its mouth in Chesapeake Bay; eastern Maryland, southwestern Delaware, and eastern Virginia, embracing Chesapeake Bay and its tributaries north of Cove Point, Md., on the western shore of the bay, and Onancock River, Va., on the eastern shore, and the watersheds tributary to the Atlantic Ocean between the southern boundary of Delaware and a point north of White Creek and Gargathy Inlet on the Atlantic coast.

Washington, D. C., District: Office—First and Douglas Streets, NW.

The Washington District includes part of south central Pennsylvania, western Maryland, eastern West Virginia, and northern Virginia embracing the western part of Chesapeake Bay and its tributaries from Cove Point, Md., to a line due west through Wolf Trap Light to the watershed line between the northerly arm of Winter Harbor and Garden Creek, Va.

Norfolk, Va., District: Office—Foot of Front Street.

The Norfolk District embraces a small part of southeastern West Virginia, central and eastern Virginia, and a portion of northern North Carolina included in the west shore drainage basins tributary to the southern part of Chesapeake Bay south of the watershed line between the northerly arm of Winter Harbor and Garden Creek, Va., and the eastern shore drainage basins south of and including Onancock River, Va.; the drainage tributary to the Atlantic Ocean from White Creek and Gargathy Inlet, inclusive, to the Virginia-North Carolina state line.

BRANCH HYDROGRAPHIC OFFICES.—New York, N. Y.: Office, Room 202, 346 Broadway.

Philadelphia.—Room 1001, Customhouse.
Baltimore.—Room 13, Customhouse.
Norfolk.—Room 213, Customhouse.

COAST GUARD.—Commander, Third Coast Guard District, 80 Lafayette Street, New York 13, N. Y.

District includes Connecticut; New York, except that part north of latitude 42° N., and west of longitude 74°39′ W.; New Jersey; Pennsylvania east of longitude 79°

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W.; Delaware, including Fenwick Island.

Examiner Office, 80 Lafayette Street, New York 13, N. Y.

Examiner Office, 801 Customhouse, 2nd and Chestnut Streets, Philadelphia, Pa.

Marine Inspection Office, 80 Lafayette Street, New York 13, N. Y.

Marine Inspection Office, 801 Customhouse, 2nd and Chestnut Streets, Philadelphia, Pa.

Commander, Fifth Coast Guard District, New Post Office Building, Granby and York Streets, Norfolk, Va.

District includes Maryland, Virginia, and North Carolina.

Examiner Office, 209 Chamber of Commerce Bldg., Baltimore, Md.

Examiner Office, 204 Customhouse Bldg., Norfolk 10, Va.

Marine Inspection Office, 209 Chamber of Commerce Bldg., Baltimore, Md.

Marine Inspection Office, 204 Customhouse Bldg., Norfolk 10, Va.

Lifeboat Stations

Third Coast Guard District

Number	Station	State	Location
97	Sandy Hook	New Jersey	40°28′.2 N., 74°00′.8 W. On inner beach, 0.3 mile east of Sandy Hook Point Light.
100	Monmouth Beach	do	40°20′.5 N., 73°58′.5 W. On beach about 1 mile south of Seabright.
103	Shark River	do	40°11′.7 N., 74°00′.6 W. 0.5 mile north of inlet entrance.
105	Manasquan Inlet	do	40°06′.2 N., 74°02′.3 W. On south side of Manasquan Inlet.
109	Toms River	do	39°56′.1 N., 74°04′.4 W. On outer beach opposite mouth of Toms River.
113	Barnegat	do	39°45′.5 N., 74°06′.3 W. ⅜ mile south of abandoned light tower, Barnegat Light.
118	Bonds	do	39°32′.2 N., 74°15′.8 W. Inside point at Holgate, north side of Beach Haven Inlet.
119	Little Egg	do	39°30′.5 N., 74°19′.4 W. On north side of Little Egg Inlet.
123	Atlantic City	do	39°22′.7 N., 74°25′.4 W. North side of mouth of Clam Creek, opposite Gardner Basin.
126	Ocean City	do	39°17′.6 N., 74°33′.7 W. On south side of Great Egg Inlet.
128	Corson Inlet	do	39°11′.9 N., 74°39′.4 W. On inner beach, about 1 mile southwest of Corson Inlet.
130	Townsend Inlet	do	39°07′.7 N., 74°42′.6 W. On north side of Townsend Inlet.
133	Hereford Inlet	do	39°00′.4 N., 74°47′.5 W. At Hereford Light.
139	Lewes	Delaware	38°46′.9 N., 75°07′.2 W. Near beach of Breakwater Harbor, midway between Cape Henlopen and Roosevelt Inlet.
142	Indian River Inlet	do	38°38′.0 N., 75°04′.0 W. On outer beach, 1.5 miles north of inlet.

Lifeboat Stations—Continued

Fifth Coast Guard District

Number	Station	State	Location
146	Ocean City	Maryland	38°19′.9 N., 75°05′.1 W. On outer beach, 0.5 mile north of Ocean City Inlet.
149	Pope Island	Virginia	38°01′.4 N., 75°14′.8 W. On outer beach, 8.5 miles north-northeast of Assateague Light.
150	Assateague Beach	do	37°51′.8 N., 75°22′.1 W. On barrier beach, east side of Chincoteague Inlet and 3 miles south by west of Assateague Light.
152	Metomkin Inlet	do	37°40′.4 N., 75°35′.7 W. On north end of Cedar Island.
154	Parramore Beach	do	37°34′.4 N., 75°37′.0 W. On inner side of Parramore Island and 0.5 mile south of Watchapreague Inlet.
155	Little Machipongo Inlet.	do	37°27′.2 N., 75°40′.5 W. On inner side, north end of Hog Island.
157	Cobb Island	do	37°18′.3 N., 75°46′.6 W. On inner side of Cobb Island, near south end.
161	Little Creek	do	36°54′.7 N., 76°10′.6 W. 1.2 miles south of entrance to Little Creek.
162	Virginia Beach	do	36°51′.1 N., 75°58′.6 W. 4.7 miles south-southeast of Cape Henry Light.

Customs Districts and Ports of Entry

[The first port named in the following list is the headquarters port. * indicates ports authorized to issue marine documents]

Name of district	Limits of district	Ports of entry
New York	That part of the State of New York not expressly included in the districts of Buffalo, Rochester, and St. Lawrence, and also the counties of Sussex, Passaic, Hudson, Bergen, Essex, Union, Middlesex, and Monmouth in the State of New Jersey.	*New York, N. Y. *Albany, N. Y. *Newark, N. J. *Perth Amboy, N. J.
Philadelphia	That part of the State of Pennsylvania lying east of 79° west longitude, the State of Delaware, and that part of the State of New Jersey not included in the New York district.	*Philadelphia, Pa. (including Camden, and Gloucester City, N. J.) Chester, Pa. *Wilmington, Del.
Virginia	The State of Virginia	*Norfolk and *Newport News, including the waters and shores of Hampton Roads. *Alexandria. *Cape Charles City. Petersburg. *Reedville. Richmond.
Maryland	The State of Maryland and the District of Columbia.	*Baltimore, Md. (including Sparrows Point). *Annapolis, Md. *Cambridge, Md. *Crisfield, Md. *Washington, D. C.

PUBLIC HEALTH SERVICE

Quarantine Stations:

New York, N. Y.—Rosebank, Staten Island 5.
Philadelphia, Pa.—225 Chestnut Street.
Baltimore, Md.—Curtis Bay, Baltimore 26.
Fort Monroe, Va.

Additional ports of entry at which quarantine inspection and/or medical examination of aliens is performed, are as follows:

Alexandria, Va.
Annapolis, Md.
Atlantic City, N. J.
Cape May, N. J.
Long Beach Island, N. J.
Newcastle, Del.
Newport News, Va.
Norfolk, Va.
Piney Point, Md.
Richmond, Va.
Wilmington, Del.

Public Health Service Hospitals:

Staten Island 4, New York.
Norfolk 9, Va., Hampton Boulevard, Larchmont.
Baltimore 11, Md., Wyman Park Drive and 31st Street. Outpatient Annex, Customhouse, Baltimore 2, Md.

Outpatient Clinics:

NEW YORK:
New York, 67 Hudson Street, New York 13.
DISTRICT OF COLUMBIA: Department of Health, Education, and Welfare Bldg. South, 4th and D Streets SW, Washington.
PENNSYLVANIA:
Philadelphia, 225 Chestnut Street, Philadelphia 6.

Outpatient Offices:

DELAWARE:
Lewes, Savannah Road.
Wilmington, 600 West 10th Street.
NEW JERSEY:
Cape May, Columbia Avenue and Ocean Street.
Perth Amboy, Federal Building, 226 Market Street.
MARYLAND:
Cambridge, 1 Church Street.
Crisfield, 322 Main Street.
VIRGINIA:
Kilmarnock.
Newport News, 2903 West Avenue.
Reedville.
Richmond, 714 North Boulevard.

IMMIGRATION AND NATURALIZATION OFFICES:

BALTIMORE, Post Office Building, Calvert and Fayette Streets.

PHILADELPHIA, District Headquarters, Pennsylvania Bldg., 42 South 15th Street.
Entry and Departure Division, Customhouse, 2nd and Chestnut Streets.
Includes ports of Camden, Trenton, N. J., and Wilmington, Del.

NORFOLK, New Monroe Building. Includes ports of Newport News, Norfolk, Portsmouth, and Richmond.

Designated Ports of Entry for Aliens:

Dist. No. 3, New York, N. Y. Includes Perth Amboy.

Dist. No. 4, Philadelphia, Pa. Includes Delaware City, Lewes, New Castle, and Wilmington, Del.; Artificial Island, Billingsport, Camden, Deepwater Point, Gibbstown, Gloucester City, Paulsboro, and Trenton, N. J.; Chester, Essington, Fort Mifflin, and Marcus Hook, Pa.

Dist. No. 5, Baltimore, Md. Includes Newport News, Norfolk, Richmond, Old Point Comfort, U. S. Navy Mine Depot at Cheatham Annex, Alexandria Va., and Piney Point, Md.

BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE.—List of ports at which inspectors are located:

DISTRICT OF COLUMBIA: Plant Inspection House, 224 Twelfth Street, SW.

MARYLAND: Baltimore, 200 Customhouse.

PENNSYLVANIA: Philadelphia, 601–A Customhouse.

VIRGINIA:

Arlington, MATS Terminal Building, National Airport.

Norfolk, 411 U. S. Post Office and Courthouse Building.

LEGAL HOLIDAYS—The following are the legal holidays in the District of Columbia and the States of New Jersey, Pennsylvania, Delaware, Maryland, and Virginia:

January 1, New Year's Day.—All.
January 19, Lee-Jackson Day.—Virginia.
January 20 (in year following General Elections), Inauguration Day.—District of Columbia.
February 12, Lincoln's Birthday.—Delaware, Maryland ,New Jersey. Pennsylvania.
February 22, Washington's Birthday.—All.
March 25, Maryland Day.—Maryland.
Good Friday.—All except District of Columbia and Virginia.
April 13, Thomas Jefferson's Birthday.—Virginia.
May 30, Decoration or Memorial Day.—All except Virginia.
June 3, Confederate Memorial Day.—Virginia.
June 14, Flag Day.—Pennsylvania.
July 4, Independence Day.—All.
Labor Day.—All.
September 12, Defenders' Day.—Maryland.
October 12, Columbus Day.—All except District of Columbia.
Election Day.—All except District of Columbia.
November 11, Armistice Day.—All.
Thanksgiving Day.—All.
December 25, Christmas Day.—All.

Foreign Consuls

Argentina.—Baltimore, Philadelphia, Norfolk.
Belgium.—Baltimore, Philadelphia, Norfolk.
Brazil.—Baltimore, Philadelphia, Norfolk.
Burma.—Washington, D. C.
Canada.—Washington, D. C.
Chile.—Washington, D. C.; Baltimore, Philadelphia.
Colombia.—Washington, D. C.; Baltimore, Philadelphia.
Costa Rica.—Washington, D. C.; Philadelphia.
Cuba.—Washington, D. C.; Baltimore, Philadelphia, Norfolk.
Czechoslovakia.—Philadelphia.
Denmark.—Baltimore, Newport News, Norfolk.
Dominican Republic.—Washington, D. C.; Baltimore, Philadelphia, Norfolk.
Ecuador.—Washington, D. C.; Philadelphia.
El Salvador.—Baltimore.
Finland.—Washington, D. C.; Philadelphia, Norfolk.
France.—Washington, D. C.; Baltimore, Phildelphia, Norfolk.
Great Britian.—Washington, D. C.; Baltimore, Philadelphia, Norfolk.
Greece.—Washington, D. C.
Guatemala.—Baltimore, Philadelphia.
Haiti.—Norfolk.
Honduras.—Baltimore, Philadelphia, Norfolk.
Iceland.—Washington, D. C.; Baltimore, Philadelphia.
India.—Washington, D. C.
Iran.—Washington, D. C.
Israel.—Washington, D. C.
Italy.—Baltimore, Trenton, Philadelphia, Norfolk.
Latvia.—Washington, D. C.; Philadelphia.
Luxembourg.—Washington, D. C.
Mexico.—Washington, D. C.; Philadelphia, Norfolk.
Netherlands.—Washington, D. C.; Baltimore, Philadelphia, Newport News, Norfolk.
New Zealand.—Washington, D. C.
Nicaragua.—Washington, D. C.; Philadelphia.
Norway.—Washington, D. C.; Baltimore, Philadelphia, Newport News, Norfolk.
Pakistan.—Washington, D. C.
Panama.—Washington, D. C.; Baltimore, Philadelphia, Norfolk.
Peru.—Baltimore, Philadelphia.
Philippines.—Washington, D. C.
Portugal.—Baltimore.
Saudi Arabia.—Washington, D. C.
Spain.—Washington, D. C., Philadelphia.
Sweden.—Washington, D. C.; Baltimore, Philadelphia, Norfolk.
Switzerland.—Washington, D. C.; Baltimore, Philadelphia.
Uruguay.—Washington, D. C.; Baltimore, Philadelphia, Norfolk.
Venezuela.—Baltimore, Philadelphia.

Yacht Clubs

NEW JERSEY:

Atlantic City Yacht Club, 619–621 Sewell Ave., Atlantic City.
Atlantic City Tuna Club, 741 Massachusetts Ave., Atlantic City.
Avalon Yacht Club, 7th and Bay Aves., Avalon, Cape May.
Barnegat Light Yacht Club, 76th St., at Bay End, Harvey Cedars.
Bay Head Yacht Club, Bay Head.
Beach Haven Yacht Club, Engleside and West Ave., Beach Haven.
Brant Beach Yacht Club, Brant Beach.
Brielle Marlin and Tuna Club, Inc., Ocean Ave. and Riverfront, Brielle.
Brigantine Yacht Club, Brigantine.
Englewood Basin Yacht Club, Englewood.
Evening Star Yacht Club, West Shore Dr., Brigantine.
Greater Wildwood Yacht Club, Park Blvd. and Forgetmenot, Wildwood Crest.
Island Heights Yacht Club, Island Heights.
Lavallette Yacht Club, Lavallette.
Little Egg Harbor Yacht Club, Beach Haven.
Manasquan River Yacht Club, Brielle.
Mantoloking Yacht Club, Mantoloking.
Ocean Beach Yacht Club, Ocean Beach.
Ocean City Yacht Club, Bay Ave. and Battersea Road, Ocean City.
Ocean Gate Yacht Club, Ocean Gate.
Pine Beach Yacht Club, Midland Ave. and Riverside Dr., Pine Beach.
Pleasantville Yacht Club, Pleasantville.
Riverton Yacht Club, Delaware River at Riverton.
Schooner Island Yacht Club, Hildreth Ave. and Lake Rd., Wildwood.
Seaside Park Yacht Club, Bayview Ave., Seaside Park.
Shelter Cove Yacht Club, Shelter Cove.
Shippers Club, Camden.
Shore Acres Yacht Club, Osbornville.
Surf City Yacht Club, Surf City.
Talisman Corinthian Yacht Club, Cape May.
Toms River Yacht Club, Robbins Parkway, Toms River.
Trenton Yacht Club, 1171 Lamberton St., Trenton.

DELAWARE:

Lewes Yacht Club, Lewes.

PENNSYLVANIA:

Corinthian Yacht Club of Philadelphia, Essington.
Columbia Yacht Club, Philadelphia; 9202 N. Delaware Ave., Torresdale.
Delaware River Yacht Club, Milner St. and Grant Ave., Philadelphia.
Pennsylvania Yacht Club, Croydon.
Quaker City Yacht Club of Philadelphia, 7101 N. Delaware Ave., Philadelphia.
Riverside Yacht Club, Foot Wanamaker Ave., Essington.
Tri-State Yacht Club, Taylor Ave., Essington.
Wissinoming Yacht Club, Lardners Point, Philadelphia.

MARYLAND:

Annapolis Yacht Club, Compromise and Gloucester Sts., Annapolis.
Boumi Yacht Club, Mt. Vernon Pl., Baltimore.
Baltimore Yacht Club, Sue Island, Middle River.
Chesapeake Yacht Club, Shady Side.
Chesapeake Bay Yacht Club, Easton.
Cambridge Yacht Club, Mill St., Cambridge.
Corinthian Yacht Club of Baltimore, Stansbury Road, Dundalk.
Corsica River Yacht Club, Centerville.
Elk River Yacht Club, Old Field Point, Elkton.
Gibson Island Yacht Squadron, Gibson Island.
Glenmar Sailing Association, Wilson Point, Baltimore.
Maryland Yacht Club, Broening Park, Baltimore.
Miles River Yacht Club, Long Haul, St. Michaels.
North East River Yacht Club, North East Heights.
Potapskut Sailing Association, Pasadena P. O.
Rock Hall Yacht Club, Langford Bay.
Sailing Club of the Chesapeake, Annapolis.
St. Marys River Yacht Club, St. Marys City.
Sassafras River Club, Inc.; Eastern Neck Island.

MARYLAND—Continued

Selby Bay Yacht Club, Selby-on-the-Bay, Edgewater.
Solomons Island Yacht Club, Inc., Solomons.
Spesutie Island Boat Club, Aberdeen Proving Grounds.
Tockwogh Yacht Club, Fredericktown.
Tred Avon Yacht Club, Oxford.
Wellwood Country and Yacht Club, Charlestown.

DISTRICT OF COLUMBIA:

Capital Yacht Club, 1020 Maine Ave. SW., Washington.
Columbia Yacht Club, Maine Ave. and M St. SW, Washington.
Corinthian Yacht Club of Washington, D. C., 2nd and V Sts. SW, Washington.

VIRGINIA:

Cavalier Yacht and Country Club, Linkhorn Bay, Virginia Beach.
Fishing Bay Yacht Club, Store Point Neck, Urbanna.
Hampton Yacht Club, Hampton.
Mathews Yacht Club, Stutts Creek, Mathews County.
Mobjack Bay Yacht Club, Cardinal.
Norfolk Boat Club, Foot West Freemason St., Norfolk.
Norfolk Yacht and Country Club, Hampton Blvd.
Old Dominion Boat Club, 1 King St., Alexandria.
Richmond Yacht Club, Inc., near Dutch Gap, James River.
Virginia Yacht Club, Urbanna.

FISH AND WILDLIFE SERVICE.—Enforcement agents:

Toms River, N. J., P. O. Box 46.
Cambridge, Md., P. O. Box 71.
Tappahannock, Va., P. O. Box 173.
Chincoteague, Va., P. O. Box 58.

National Wildlife Refuges:

DELAWARE:

Bombay Hook.
Killcohook.

NEW JERSEY:

Brigantine.

VIRGINIA:

Back Bay.
Chincoteague.

NATIONAL PARKS.—The following are the National Parks or Monuments in the coastal areas described in this volume:

Colonial, most of Jamestown Island on the James River.
Appomattox Court House, at Appomattox, Va.
Fort McHenry, at Baltimore, Md.
George Washington Birthplace, at Wakefield on Popes Creek.

FEDERAL COMMUNICATIONS COMMISSION.—Regional offices: New York, 954 Federal Bldg., 641 Washington St., New York 14, N. Y.

District office engineers in charge: Philadelphia, 1005 New U. S. Customhouse, Philadelphia 6, Pa.
Baltimore, 508 Old Town Bank Bldg., Gay Street and Fallsway, Baltimore 2, Md.
Norfolk, Room 402, U. S. Post Office Bldg., Norfolk 10, Va.
Newport News, Room 106, U. S. Post Office Bldg., Newport News, Va.
Washington, D. C., Briggs Building, 22nd and E Streets, NW., Washington 25, D. C.

Commercial Broadcasting Stations Along the Coast

New Jersey

Frequency	Call	City	Position of antenna	Power	Hours of operation
1310	WJLK	Asbury Park	40°13′.1 N., 74°02′.6 W	250 w	6:30 a. m.–11:30 p. m.; 8:30 a. m.–11:30 p. m. on Sundays
1240	WSNJ	Bridgeton	39°27′.7 N., 75°12′.3 W	250 w	6:00 a. m.–12:00 midnight
1400	WOND	Pleasantville	39°23′.6 N., 74°30′.6 W	250 w	20 hours daily
1450	WFPG	Atlantic City	39°22′.6 N., 74°27′.1 W	250 w	6:55 a. m.–1:00 a. m.
1340	WMID	do	39°22′.5 N., 74°26′.6 W	250 w	7:00 a. m.–2:00 a. m.
1230	WCMC	Wildwood	38°59′.6 N., 74°49′.5 W	100 w	7:00 a. m.–12:00 midnight; 8:30 a. m.–12:00 midnight on Sundays
		Delaware			
1410	WDOV	Dover	39°12′.0 N., 75°33′.8 W	1 kw	6:00 a. m.–sunset
900	WJWL	Georgetown	38°42′.5 N., 75°24′.5 W	1 kw	sunrise–sunset
		Virginia			
1310	WGH	Newport News	37°02′.2 N., 76°24′.3 W	5 kw	6:00 a. m.–1:00 a. m.; 7:15 a. m.–1:00 a. m. on Sundays
1270	WHYU	do	36°53′.9 N., 76°24′.9 W	1 kw	6:00 a. m.–sunset
1230	WNOR	Norfolk	36°51′.8 N., 76°18′.4 W	250 w	24 hours daily
850	WCAV	do	36°51′.7 N., 76°21′.2 W	1 kw	5:59 a. m.–1:00 a. m.
1050	WRAP	do	36°50′.6 N., 76°12′.8 W	500 w	sunrise–sunset
790	WTAR	do	36°50′.4 N., 76°12′.7 W	5 kw	6:00 a. m.–1:00 a. m.; 7:55 a. m.–1:00 a. m. on Sundays

Aircraft Radio Ranges

New Jersey

Frequency	Place	Identifier	Approximate position of antenna	Power
212	Atlantic City	NBB	39°23′.8 N., 74°33′.4 W	Over 50 w
414	Atlantic City (R'b'n)	NBB	39°22′.6 N., 74°25′.7 W	50 w or more
365	Millville	MIV	39°25′.0 N., 75°08′.1 W	150 w or more
		Virginia		
227	Chincoteague	NKZ	37°56′.6 N., 75°33′.7 W	over 50 w
239	Norfolk	ORF	36°51′.0 N., 76°14′.5 W	over 50 w
284	Norfolk (U. S. Navy)	NGU	36°56′.2 N., 76°14′.0 W	over 50 w

WEATHER BUREAU.—Offices: Barometers may be compared with standards at the following offices:

Philadelphia, Pa., Room 1007, New Customhouse.

Baltimore, Md., Administration Building, Friendship International Airport, Anne Arundel County, Maryland.

Norfolk, Va., U. S. Post Office and Courthouse Bldg., 600 Granby St.

Radiotelephone broadcasts of weather information.—Regular broadcasts, including weather forecasts, small-craft and storm warnings, and other information, are made by commercial coastal harbor radiotelephone stations in plain language on the following schedules:

	Station	*Frequency (kcs.)*	*Local time*
WOX	New York, N. Y.	2522, 2590	1050, 2250
WAQ	Ocean Gate, N. J.	2558	0050, 1250
WEH	Wilmington, Del.	2558	0230, 1430
WHF	Quantico, Va.	2538	0005, 0605, 1205, 1805
WGB	Norfolk, Va.	2538	0000, 0600, 1200, 1800

Radiotelephone broadcasts by United States Coast Guard.—Local Notices to Mariners, hydrographic information, and storm and hurricane warnings are transmitted by radiotelephone in plain language on the designated frequencies, preceded by a preliminary announcement on 2670 kc., as follows:

	Station	*Frequency (kcs.)*	*Local Time*	
NMY	New York, N. Y.	2662	2350	1150
NMK	Cape May, N. J.	2662	0050	1250
NMN7	Baltimore, Md.	2702	----	1130
NMN	Norfolk, Va.	2702	0020	1220

Emergency broadcasts, including storm warnings, advisories, and urgent information, are transmitted immediately upon receipt and repeated on the next scheduled broadcast, unless information is canceled or superseded. Preliminary announcement is made on 2670 kc.

All radiotelephone broadcasts will be made through once at good writing speed.

Weather broadcasts by commercial radio stations.—The following table lists alphabetically the radio stations that have installed microphones in nearby Weather Bureau offices. From these offices forecasts and weather summaries including coastal offshore information are broadcast on regular schedule by Weather Bureau personnel.

Station	Call Sign	Frequency (kcs.)	Power (watts)	Time of broadcast (local time)		
				Weekdays	Saturdays	Sundays
Arlington, Va	WEAM	1390	50, 000	0630 0700	0630 0700	None
Atlantic City, N. J	WFPG	1450	250	1315	None	1315
Baltimore, Md	WBAL	1090	50, 000	0615 0705 1205	0615 0705 1205	None
New York, N. Y	WNYC	830	1, 000	0745 1345 1845	0745 1345 1845	0745 1345 1845
Norfolk, Va	WNOR	1230	250	1200	1200	None
Norfolk, Va	WTAR	790	5, 000	1200	1200	None
Richmond, Va	WMBG	1380	5, 000	1205	None	None
Richmond, Va	WRNL	910	5, 000	1255	1225	None
Trenton, N. J	WTTM	920	1, 000	0755	None	None

STORM WARNING DISPLAY STATIONS.—Stations marked with an asterisk (*) display warnings both day and night.

DELAWARE:
- *Delaware Breakwater, speaking station.
- Five Fathom Lightship.
- Overfalls Lightship.

MARYLAND:
- *Annapolis.
- Baltimore: *Anchorage Building; Maryland Yacht Club.
- Cambridge: Cambridge Yacht Club.
- Crisfield: Cochrane Lumber Company.
- Fredericktown: near Sassafras River bridge.
- Gibson Island.
- St. Michaels.
- Oxford: *Town Square.
- Solomons.
- Sue Island: Baltimore Yacht Club.
- Winter Quarter Shoal Lightship.

NEW JERSEY:
- Atlantic City: *Clam Creek; Kentucky Avenue; Tuna Club.
- Barnegat Lifeboat Station.
- Barnegat Lightship.

NEW JERSEY:—Continued
- Bay Head.
- *Bivalve.
- Bonds Lifeboat Station, Beach Haven.
- *Cape May Canal.
- Long Branch.
- Longport.
- *Manasquan Inlet Lifeboat Station.
- Monmouth Beach Lifeboat Station.
- Ocean City.
- *Sandy Hook Lifeboat Station.
- Scotland Lightship.
- Shark River Lifeboat Station.
- Townsend Inlet.

VIRGINIA:
- *Cape Henry.
- Chesapeake Lightship.
- Fort Eustis.
- *Fort Monroe.
- *Newport News.
- Norfolk: *Royster Building; Naval Operating Base.

Hours of Operation of Fog Signals

Light station	January	February	March	April	May	June	July	August	September	October	November	December	Total
Ambrose Channel Light Vessel	123	86	116	86	113	89	69	43	70	57	55	76	983
Overfalls Light Vessel	80	65	71	43	72	58	37	23	55	49	43	43	639
Fourteen-foot Bank	92	58	68	30	43	23	13	4	45	27	45	37	485
Ship John Shoal	85	48	61	24	27	16	11	5	30	22	52	43	424
Christina North Jetty	59	31	49	12	12	7	6	6	19	12	42	43	298
Cherry Island	75	41	56	15	15	5	8	6	20	20	48	45	354
Fort Mifflin	48	33	48	16	10	9	11	12	46	24	42	44	343
Winter Quarter Shoal Light Vessel	35	50	67	48	68	50	8	6	23	16	25	23	419
Killick Shoal	29	38	28	13	26	13	2	1	11	10	26	29	226
Cape Henry	46	42	55	41	35	19	0	1	4	18	18	35	314
Thimble Shoal	31	31	37	18	15	6	1	1	4	13	23	28	208
Newport News Middle Ground	29	23	27	10	8	2	5	1	8	14	23	26	176
Deep Water Shoals	32	21	24	6	4	3	1	0	8	9	22	28	158
Jordan Point	12	10	8	1	1	0	1	1	2	8	14	15	73
York Spit	40	40	47	15	15	6	1	0	4	8	27	35	238
Bells Rock	17	18	13	7	3	2	1	0	16	18	23	16	134
Bowlers Rock	27	16	8	3	3	3	3	2	8	11	28	14	126
Windmill Point	58	46	64	21	18	6	1	0	7	16	25	45	307
James Island	51	35	35	10	8	2	0	1	8	3	24	33	210
Smith Point	60	58	62	21	19	7	1	0	11	6	23	31	299
Maryland Point	39	30	39	6	8	4	1	1	13	14	28	21	204
Fort Washington	38	38	27	6	4	4	1	2	20	20	38	21	219
Great Shoals	52	37	42	11	7	11	2	3	21	13	26	28	253
Cedar Point	60	49	56	17	16	8	0	1	10	12	28	30	287
Sharps Island	51	46	45	10	12	3	0	0	4	6	24	22	223
Choptank River	59	54	45	10	12	6	4	3	18	13	37	32	293
Bloody Point Bar	62	42	46	11	15	4	0	0	8	3	32	22	245
Sandy Point	74	53	73	20	20	6	2	1	11	9	35	38	342
Fort Carroll	49	29	33	6	2	2	0	1	11	5	33	23	194
Pooles Island	30	15	10	5	4	2	0	1	4	3	23	14	111
Turkey Point	70	22	54	13	20	9	3	4	10	20	55	45	325

Climatological Tables

COMPILED BY THE UNITED STATES WEATHER BUREAU

Aberdeen, Md. Position: Lat. 39°28′ N., Long. 76°10′ W. Altitude: 61 feet

Month	Pressure reduced to sea level: Mean: For month	Pressure reduced to sea level: Extremes: Highest	Pressure reduced to sea level: Extremes: Lowest	Air temperature in degrees F.: Mean: For month	Air temperature: Mean: Mean maximum	Air temperature: Mean: Mean minimum	Air temperature: Extremes: Highest	Air temperature: Extremes: Lowest	Average relative humidity	Average cloud amount 0-10	Precipitation: Average (inches)	Precipitation: Maximum in 24 hours	Precipitation: Percent of hourly observations recording snow and sleet	Average number of days with—: Precipitation 0.01 inch or more	Average number of days with—: Percent of hourly observations recording Fog	Average number of days with—: Percent of hourly observations recording thunderstorms	Average number of days with—: Percent of observations recording visibility less than 1 mile	Average number of days with—: Percent of observations recording gales (over 27 knots)	Wind: Mean velocity (knots)	Wind: Estimated maximum velocity (knots)	Wind: Percentage of observations from—: N	NE	E	SE	S	SW	W	NW	Calm
January	----	----	----	32.6	39.8	25.1	70	−2	----	----	2.25	----	4	9.2	7.2	0	7.8	1	8.5	40	18	14	4	3	8	13	20	18	2
February	----	----	----	34.7	42.4	26.7	72	5	----	----	1.66	----	3	6.6	6.8	0	7.6	1	9.6	(#)	16	13	3	4	10	12	18	22	2
March	----	----	----	41.0	49.7	32.0	84	9	----	----	4.24	----	4	11.2	4.3	.1	4.7	1	9.9	(#)	14	14	5	5	11	11	18	21	1
April	----	----	----	52.0	62.3	41.6	92	21	----	----	3.56	----	(*)	9.5	2.7	.2	2.8	1	9.6	(#)	13	14	7	9	13	12	14	17	1
May	----	----	----	64.7	75.1	54.3	96	35	----	----	3.06	----	(*)	10.2	1.1	.9	1.2	(*)	7.9	(#)	10	12	7	11	19	13	13	13	2
June	----	----	----	72.9	82.2	63.5	96	45	----	----	3.32	----	0	9.8	1.4	1.5	1.4	(*)	7.0	40	11	9	7	9	19	18	12	12	3
July	----	----	----	76.2	85.5	66.9	100	51	----	----	3.42	----	0	9.4	.9	1.2	.9	(*)	6.4	40	11	8	5	8	22	19	12	12	3
August	----	----	----	75.5	84.5	66.3	96	49	----	----	3.55	----	0	9.2	.6	1.3	.7	(*)	6.7	40	17	11	6	8	19	15	9	12	3
September	----	----	----	67.4	77.2	57.5	98	35	----	----	1.51	----	(*)	5.0	1.9	.5	1.9	(*)	7.0	40	20	14	5	7	15	12	10	13	4
October	----	----	----	56.6	66.1	46.9	96	23	----	----	3.70	----	(*)	8.2	3.7	.2	3.8	(*)	7.7	40	18	13	3	7	14	12	14	15	4
November	----	----	----	45.3	54.6	35.8	78	15	----	----	2.60	----	1	7.2	3.0	0	3.2	1	8.3	40	14	9	3	4	14	14	20	19	3
December	----	----	----	36.3	43.8	28.6	62	0	----	----	2.68	----	2	9.4	7.3	0	7.7	1	8.2	40	18	13	3	3	10	13	20	17	3
Mean	----	----	----	53.9	62.9	44.8	----	----	----	----	----	----	1	----	3.4	.5	3.6	1	8.1	----	15	12	5	6	14	14	15	16	3
Total	----	----	----	----	----	----	----	----	----	----	35.55	----	----	104.9	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Extreme	----	----	----	----	----	----	100	−2	----	----	----	----	----	----	----	----	----	----	----	(#)	----	----	----	----	----	----	----	----	----
Number of years record	----	----	----	8-9	8-9	8-9	8-9	8-9	----	----	8-9	----	8-9	8-9	8-9	8-9	8-9	7-8	8-9	7-8	7-8	7-8	7-8	7-8	7-8	7-8	7-8	7-8	7-8

*Less than one.
#Greater than 40 knots.

Atlantic City, N. J. Position: Lat. 39°22′ N., Long. 74°25′ W. Altitude: 8 feet

Month	Pressure reduced to sea level: Mean: For month	Pressure: Extremes: Highest	Pressure: Extremes: Lowest	Air temperature in degrees F.: Mean: For month	Air temperature: Mean: Mean maximum	Air temperature: Mean: Mean minimum	Air temperature: Extremes: Highest	Air temperature: Extremes: Lowest	Average relative humidity (0730, 1200, 1930)	Average cloud amount 0–10	Precipitation: Average (inches)	Precipitation: Maximum in 24 hours	Precipitation: Average snowfall (inches)	Average number of days with—: Precipitation 0.01 inch or more	Fog (heavy)	Thunderstorms	Visibility less than 1 mile	Gales, 27 knots	Wind: Mean velocity (knots)	Wind: Maximum velocity (knots)	Percentage of observations from—: N	NE	E	SE	S	SW	W	NW	Calm
January	30.11	30.98	28.80	33.8	40.6	26.4	68	−4	74	6.0	3.50	2.98	4.2	12	2	(*)	------	9	14.0	56	12	8	5	5	10	12	28	20	0
February	30.07	30.97	28.74	33.5	40.3	26.6	77	−9	73	5.5	3.28	2.66	5.0	10	2	(*)	------	8	13.8	63	11	9	5	6	12	11	25	21	0
March	30.02	30.96	28.37	39.6	46.3	32.9	79	8	73	5.6	3.68	2.63	2.3	12	2	1	------	9	14.7	59	8	11	6	7	17	11	22	18	(*)
April	30.00	30.72	28.94	48.1	54.9	41.4	90	15	72	5.6	3.26	3.15	.3	11	2	2	------	9	14.5	63	7	12	9	9	20	11	18	14	(*)
May	29.99	30.62	29.08	58.4	64.9	51.8	95	33	75	5.4	2.90	3.06	0	11	3	3	------	4	12.8	43	6	13	9	12	25	13	13	9	(*)
June	29.97	30.51	29.40	67.4	73.8	61.1	97	45	78	5.4	3.09	4.22	0	10	2	4	------	3	12.0	43	6	10	9	12	26	17	11	9	(*)
July	29.98	30.50	29.37	72.7	78.8	66.7	102	52	78	5.2	3.63	5.41	0	10	2	5	------	3	11.6	43	5	9	9	11	29	17	12	8	(*)
August	30.00	30.45	29.30	72.3	78.2	66.8	104	48	78	5.1	4.50	8.97	0	10	1	4	------	3	11.6	56	8	11	12	10	25	15	10	9	(*)
September	30.08	30.60	28.73	67.5	73.5	61.4	94	37	76	4.9	3.19	9.13	0	8	1	2	------	3	12.1	71	10	12	13	10	20	12	12	11	(*)
October	30.08	30.81	29.06	57.0	63.9	50.1	91	29	73	4.6	3.20	9.21	T	9	1	1	------	5	12.8	55	12	10	7	9	14	13	18	17	(*)
November	30.10	30.84	28.74	46.2	53.1	39.3	77	10	72	5.2	3.03	4.88	.6	9	1	(*)	------	6	13.5	57	10	7	5	8	13	15	25	17	(*)
December	30.10	30.90	28.84	36.8	53.7	30.0	68	−7	73	5.9	3.65	3.52	2.7	10	2	(*)	------	5	13.2	49	12	6	4	5	9	13	30	21	(*)
Mean	30.04	------	------	52.8	59.3	46.3	------	------	75	5.4	------	------	------	------	------	------	------	------	13.0	------	9	10	8	9	18	13	19	14	(*)
Total	------	------	------	------	------	------	------	------	------	------	40.91	------	15.1	122	21	22	------	67	------	------	------	------	------	------	------	------	------	------	------
Extreme	------	30.98	28.37	------	------	------	104	−9	------	------	------	9.21	------	------	------	------	------	------	------	71	------	------	------	------	------	------	------	------	------
Number of years record	73	73	73	71	71	71	71	71	21–57	47	71	71	61	71	40	71	------	2	23	22	22	22	22	22	22	22	22	22	22

T—Trace.
*Less than one.

Baltimore, Md. Position: Lat. 39°17′ N., Long. 76°37′ W. Altitude: 14 feet

Month	Pressure reduced to sea level: Mean: For month	Pressure reduced to sea level: Extremes: Highest	Pressure reduced to sea level: Extremes: Lowest	Air temperature in degrees F.: Mean: For month	Air temperature: Mean: Mean maximum	Air temperature: Mean: Mean minimum	Air temperature: Extremes: Highest	Air temperature: Extremes: Lowest	Average relative humidity (0730, 1200, 1930)	Percent of possible sunshine	Precipitation: Average (inches)	Precipitation: Max. in 24 hours	Precipitation: Average snowfall (inches)	Average number of days with—: Precipitation 0.01 in. or more	Average number of days with—: Fog (dense)	Average number of days with—: Thunderstorms	Percent of observations recording visibility less than 1 mile	Wind: Gales	Wind: Mean velocity (knots)	Wind: Maximum velocity (knots)	Wind: Percentage of observations from—: N	NE	E	SE	S	SW	W	NW	Calm
January	30.12	31.02	28.80	34.8	41.7	27.9	79	−6	66	49	3.42	3.27	6.2	11	2	(*)	13.1	------	7.0	39	9	12	5	5	5	8	16	14	26
February	30.08	30.96	28.96	35.6	42.8	28.4	83	−7	63	55	3.22	3.48	6.4	10	2	(*)	9.8	------	7.5	43	9	11	5	5	5	8	13	22	22
March	30.03	30.96	28.75	43.3	51.3	35.1	88	5	61	58	3.75	3.51	5.1	12	2	1	8.5	------	7.8	43	7	11	7	9	5	8	13	17	23
April	30.00	30.75	29.07	53.6	62.4	44.8	94	15	58	59	3.54	3.99	.7	11	1	2	3.4	------	7.7	41	8	12	9	15	6	8	13	15	14
May	29.98	30.62	29.00	64.7	73.7	55.7	98	34	60	61	3.54	3.25	T	11	(*)	5	2.3	------	7.0	35	7	12	6	14	7	9	12	12	21
June	29.98	30.50	29.38	73.3	82.1	64.5	105	46	62	64	3.64	4.47	0	11	(*)	6	1.7	------	6.8	44	8	8	7	14	10	14	9	9	21
July	29.97	30.39	29.38	77.8	86.2	69.4	107	54	63	65	4.43	4.02	0	11	(*)	8	1.0	------	6.4	47	6	9	7	14	15	14	8	6	21
August	30.00	30.47	29.08	75.6	83.7	67.5	105	51	66	64	4.51	7.62	0	11	(*)	6	2.4	------	6.2	43	8	10	8	12	10	13	8	7	24
September	30.07	30.62	29.27	69.3	77.5	61.1	101	39	67	64	3.54	6.07	0	8	1	3	5.3	------	6.3	38	7	15	7	11	8	9	9	8	26
October	30.10	30.84	29.11	58.1	66.6	49.6	97	30	65	63	3.03	5.30	.1	8	1	1	5.3	------	6.6	39	12	8	6	10	8	8	11	12	25
November	30.11	30.84	28.99	46.9	54.3	39.5	82	12	64	55	2.76	4.19	.7	9	2	(*)	6.7	------	6.9	38	9	9	3	8	9	9	17	15	21
December	30.12	30.92	28.73	37.4	44.1	30.8	74	−3	65	49	3.14	3.16	3.9	11	3	(*)	12.5	------	6.9	38	9	11	5	4	4	8	17	18	24
Mean	30.05	------	------	55.9	63.8	47.9	------	------	63	59	------	------	------	------	------	------	6.0	------	6.9	------	8	11	6	10	8	10	12	13	22
Total	------	------	------	------	------	------	------	------	------	------	42.52	------	23.1	124	14	32	------	------	------	------	------	------	------	------	------	------	------	------	------
Extreme	------	31.02	28.73	------	------	------	107	−7	------	------	------	7.62	------	------	------	------	------	------	------	47	------	------	------	------	------	------	------	------	------
Number years record	74	74	74	75	74	74	74	74	54–71	53	75	75	63	75	55	62	7	------	74	73	6	6	6	6	6	6	6	6	6

* Less than One.
T—Trace.

Cape May, N. J. Position: Lat. 38°53′ N., Long. 78°53′ W. Altitude: 16 feet

Month	Pressure reduced to sea level: Mean: For month	Pressure reduced to sea level: Extremes: Highest	Pressure reduced to sea level: Extremes: Lowest	Air temperature in degrees F.: Mean: For month, ½ max. plus ½ min.	Air temperature: Mean: Mean maximum	Air temperature: Mean: Mean minimum	Air temperature: Extremes: Highest	Air temperature: Extremes: Lowest	Average relative humidity	Average cloud amount 0–10	Precipitation: Average (inches)	Precipitation: Max. rainfall in 24 hours	Precipitation: Percent of observations recording snow (6 obs. daily)	Average number of days with—: Precipitation 0.01 in. or more	Average number of days with—: Percent of observations recording fog (vsby. <1,100 yds.) (6 obs. daily)	Average number of days with—: Percent of observations recording thunder and thunderstorms (6 obs. daily)	Average number of days with—: Percent of observations recording visibility less than 1¼ miles (6 obs. daily)	Average number of days with—: Percent of observations recording gales (>27 knots)	Wind: Mean velocity (knots)	Wind: Estimated maximum velocity (knots)	Wind: Percentage of observations from—: N	NE	E	SE	S	SW	W	NW	Calm
January	----	----	----	33.3	39.2	27.4	67	8	----	----	2.72	----	2	8.8	4	0	8	2	10.5	40	17	13	5	2	11	10	11	30	1
February	----	----	----	35.2	41.3	29.0	67	8	----	----	2.03	----	2	7.3	4	0	7	2	11.1	40	14	7	8	5	11	9	16	29	1
March	----	----	----	41.5	47.6	35.4	75	14	----	----	6.44	----	2	14.7	5	(*)	7	2	11.2	40	10	7	11	11	15	11	16	18	1
April	----	----	----	49.5	56.8	42.2	83	26	----	----	2.23	----	(*)	10.0	3	(*)	4	2	11.0	40	8	6	10	7	18	12	17	22	(*)
May	----	----	----	62.3	68.8	55.8	91	42	----	----	1.56	----	0	7.0	3	(*)	6	(*)	8.7	40	4	11	10	13	31	12	8	11	0
June	----	----	----	71.4	77.7	65.0	91	54	----	----	1.85	----	0	8.3	4	1	6	0	7.9	27	7	6	10	7	29	18	10	13	(*)
July	----	----	----	73.9	80.2	67.6	97	56	----	----	3.19	----	0	10.7	4	1	6	0	6.9	27	8	7	7	8	35	14	10	11	0
August	----	----	----	72.2	79.0	65.3	93	56	----	----	3.89	----	0	8.0	2	1	3	0	8.0	27	10	9	7	7	34	14	10	9	(*)
September	----	----	----	68.6	74.5	62.7	89	42	----	----	3.61	----	0	8.0	2	(*)	5	1	8.5	(#)	19	12	11	8	20	10	9	11	0
October	----	----	----	59.6	65.7	53.4	91	34	----	----	3.18	----	0	9.0	2	0	5	(*)	9.5	40	14	13	6	7	16	11	11	22	(*)
November	----	----	----	48.6	54.8	42.4	71	0	----	----	3.47	----	0	7.6	2	0	5	1	10.4	(#)	10	8	5	5	15	11	12	33	1
December	----	----	----	37.8	44.2	31.5	59	4	----	----	2.16	----	2	9.8	5	0	7	1	10.1	40	12	9	6	4	9	12	19	27	2
Mean	----	----	----	54.5	60.8	48.1	----	----	----	----	----	----	1	----	3	(*)	6	1	9.5	----	11	9	8	7	20	12	12	20	1
Total	----	----	----	----	----	----	----	----	----	----	36.33	----	----	109.2	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Extreme	----	----	----	----	----	----	97	0	----	----	----	----	----	----	----	----	----	----	----	(#)	----	----	----	----	----	----	----	----	----
Number years record	----	----	----	4–5	4–5	4–5	4–5	4–5	----	----	4–5	----	4–5	4–5	4–5	4–5	4–5	3–5	3–5	3–5	3–5	3–5	3–5	3–5	3–5	3–5	3–5	3–5	3–5

*Less than 0.5 percent.
Greater than 40 knots.

Chincoteague, Va. Position: Lat. 37°48′ N., Long. 75°27′ W. Altitude: 49 feet

Month	Pressure reduced to sea level: Mean: For month	Pressure reduced to sea level: Extremes: Highest	Pressure reduced to sea level: Extremes: Lowest	Air temperature in degrees F.: Mean: For month (½ max. plus ½ min.)	Air temperature: Mean: Mean maximum	Air temperature: Mean: Mean minimum	Air temperature: Extremes: Highest	Air temperature: Extremes: Lowest	Average relative humidity	Average cloud amount 0-10	Precipitation: Average (inches)	Precipitation: Max. rainfall in 24 hours	Precipitation: Percent of observations recording snow (6 obs. daily)	Average number of days with—: Precipitation 0.01 in. or more	Average number of days with—: Percent of observations recording fog (vsby. less than 1,100 yds.) (6 obs. daily)	Average number of days with—: Percent of observations recording thunder and thunderstorms (6 obs. daily)	Average number of days with—: Percent of observations recording visibility less than 1¼ miles (6 obs. daily)	Average number of days with—: Percent of observations recording gales (over 27 knots)	Wind: Mean velocity (knots)	Wind: Estimated maximum velocity (knots)	Wind: Percentage of observations from: N	NE	E	SE	S	SW	W	NW	Calm
January	----	----	----	33.0	39.1	27.0	55	12	----	----	3.78	----	1	10.5	3	0	6	0	7.6	27	14	11	3	1	5	13	10	39	4
February	----	----	----	39.0	46.3	31.6	69	18	----	----	4.55	----	1	15.0	4	0	6	0	7.8	27	13	12	8	4	8	13	7	33	2
March	----	----	----	42.9	50.8	35.0	79	20	----	----	8.11	----	2	14.0	2	0	3	(*)	9.2	(#)	14	9	8	9	11	20	4	21	4
April	----	----	----	51.9	60.3	43.5	81	28	----	----	6.17	----	0	17.0	2	0	3	0	8.9	27	8	8	10	3	16	21	10	21	3
May	----	----	----	66.0	74.3	57.7	89	48	----	----	1.15	----	0	5.0	1	(*)	1	0	8.3	27	5	6	13	8	23	27	6	10	2
June	----	----	----	77.2	85.6	68.7	97	56	----	----	2.21	----	0	8.0	0	1	(*)	0	7.7	27	5	6	9	6	19	16	20	17	2
July	----	----	----	75.8	83.3	68.4	97	52	----	----	3.42	----	(*)	10.5	(*)	1	(*)	0	6.5	27	4	7	7	5	31	23	13	4	6
August	----	----	----	74.0	82.1	65.9	95	44	----	----	1.54	----	0	6.5	0	1	(*)	0	6.2	27	8	8	5	8	24	21	13	9	4
September	----	----	----	69.0	75.6	62.3	91	46	----	----	4.80	----	0	10.0	4	0	4	2	7.4	40	12	15	7	5	12	14	12	20	3
October	----	----	----	55.4	63.2	47.5	79	38	----	----	6.65	----	0	7.0	1	0	3	1	6.4	40	11	11	4	5	8	12	13	30	6
November	----	----	----	46.5	55.6	37.4	69	28	----	----	0.40	----	0	10.0	1	0	3	0	6.6	21	5	5	1	3	9	20	12	36	9
December	----	----	----	37.3	44.8	29.8	63	16	----	----	1.54	----	1	9.5	3	0	3	(*)	7.4	40	19	9	1	4	3	13	20	29	2
Mean	----	----	----	55.7	63.4	47.9	----	----	----	----	----	----	(*)	----	2	(*)	3	(*)	7.5	----	10	9	6	5	14	18	12	22	4
Total	----	----	----	----	----	----	----	----	----	----	44.32	----	----	123.0	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Extreme	----	----	----	----	----	----	97	12	----	----	----	----	----	----	----	----	----	----	----	(#)	----	----	----	----	----	----	----	----	----
Number years recorded	----	----	----	3	3	3	3	3	----	----	2-3	----	3	2-3	3	3	1-2	1-2	1-2	1-2	1-2	1-2	1-2	1-2	1-2	1-2	1-2	1-2	1-2

*Less than 0.5 percent.
Greater than 40 knots

Dahlgren, Va. Position: Lat. 38°20′ N., Long. 77°02′ W. Altitude: 20 feet

Month	Pressure reduced to sea level: Mean: For month	Pressure reduced to sea level: Extremes: Highest	Pressure reduced to sea level: Extremes: Lowest	Air temperature in degrees F.: Mean: For month (½ max. plus ½ min.)	Air temperature: Mean: Mean maximum	Air temperature: Mean: Mean minimum	Air temperature: Extremes: Highest	Air temperature: Extremes: Lowest	Average relative humidity	Average cloud amount 0-10	Precipitation: Average (inches)	Precipitation: Max. rainfall in 24 hours	Precipitation: Percent of observations recording snow (6 obs. daily)	Average number of days with—: Precipitation 0.01 in. or more	Average number of days with—: Percent of observations recording fog (vsby. less than 1,100 yds.) (6 obs. daily)	Average number of days with—: Percent of observations recording thunder and thunderstorms (6 obs. daily)	Average number of days with—: Percent of observations recording visibility less than 1¼ mile (6 obs. daily)	Average number of days with—: Percent of observations recording gales (over 27 knots)	Wind: Mean velocity (knots)	Wind: Estimated maximum velocity (knots)	Wind: Percentage of observations from—: N	NE	E	SE	S	SW	W	NW	Calm
January	-----	-----	-----	36.7	44.3	29.1	77	2	-----	-----	3.14	-----	2	10.6	4	0	11	1	8.4	(#)	14	9	7	11	7	16	10	25	1
February	-----	-----	-----	37.3	45.6	29.0	87	2	-----	-----	2.74	-----	4	10.1	2	0	9	1	8.8	40	13	8	8	12	9	14	8	26	2
March	-----	-----	-----	45.0	53.9	36.0	85	10	-----	-----	2.91	-----	2	10.3	2	(*)	7	1	10.6	40	10	8	8	13	7	18	11	24	1
April	-----	-----	-----	53.8	62.9	44.6	95	28	-----	-----	3.52	-----	(*)	10.9	1	(*)	3	1	10.6	40	11	11	12	15	6	16	9	20	(*)
May	-----	-----	-----	64.7	74.1	55.3	95	36	-----	-----	3.11	-----	0	11.9	(*)	1	1	(*)	8.4	40	12	10	13	17	6	17	7	17	1
June	-----	-----	-----	73.4	82.0	64.9	101	42	-----	-----	3.26	-----	0	11.4	(*)	2	1	(*)	7.7	(#)	10	8	10	18	7	22	8	17	(*)
July	-----	-----	-----	77.2	86.0	68.5	109	50	-----	-----	4.41	-----	0	10.3	(*)	2	1	0	7.1	27	7	9	13	17	9	21	9	14	1
August	-----	-----	-----	75.8	84.1	67.6	103	48	-----	-----	6.67	-----	0	10.0	(*)	1	2	(*)	7.1	40	12	10	13	16	9	17	7	15	1
September	-----	-----	-----	70.0	78.3	61.7	99	38	-----	-----	3.78	-----	0	8.6	1	1	3	(*)	7.2	(#)	14	11	12	16	8	14	7	17	1
October	-----	-----	-----	58.2	67.2	49.1	91	26	-----	-----	2.39	-----	0	6.9	2	(*)	4	(*)	7.8	40	15	8	11	13	8	15	8	21	1
November	-----	-----	-----	48.2	56.5	39.9	85	6	-----	-----	2.84	-----	1	8.8	3	0	7	1	8.8	(#)	12	8	8	13	9	18	8	23	1
December	-----	-----	-----	39.2	47.0	31.5	87	6	-----	-----	2.22	-----	2	9.1	4	0	12	(*)	7.9	40	15	7	5	10	10	15	9	27	2
Mean	-----	-----	-----	56.6	65.1	48.1	-----	-----	-----	-----	-----	-----	1	-----	1.6	.6	5	(*)	8.4	-----	12	9	10	14	8	17	8	21	1
Total	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	40.99	-----	-----	118.9	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Extreme	-----	-----	-----	-----	-----	-----	109	2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	(#)	-----	-----	-----	-----	-----	-----	-----	-----	-----
Number years record	-----	-----	-----	15-20	15-20	15-20	15-20	15-20	-----	-----	15-20	-----	15-20	15-20	15-20	15-20	14-16	17	14-16	17	14-16	14-16	14-16	14-16	14-16	14-16	14-16	14-16	14-16

*Less than 0.5 percent.
#Greater than 40 knots.

New York City, N. Y. Position: Lat. 40°43′ N., Long. 74°00′ W. Altitude: 10 feet

Month	Pessure reduced to sea level: Mean: For month	Pessure reduced to sea level: Extremes: Highest	Pessure reduced to sea level: Extremes: Lowest	Air temperature in degrees F.: Mean: For month	Air temperature: Mean: Mean maximum	Air temperature: Mean: Mean minimum	Air temperature: Extremes: Highest	Air temperature: Extremes: Lowest	Average relative humidity [0730 1200 1930]	Average cloud amount 0-10	Precipitation: Average (inches)	Precipitation: Max. in 24 hours	Precipitation: Average snowfall (inches)	Average number of days with—: Precipitation 0.01 in. or more	Average number of days with—: Fog (heavy)	Average number of days with—: Thunderstorms	Percent of observations recording visibility less than 1 mile	Average number of days with gales (over 33 knots)	Wind: Mean velocity (knots)	Wind: Maximum velocity (knots)	Wind: Percentage of observations from—: N	NE	E	SE	S	SW	W	NW	Calm
January	30.09	31.01	28.61	30.9	37.4	24.5	68	−6	66	6.1	3.53	3.42	7.8	12	3	(*)	6.5	7	14.6	57	14	7	7	3	6	13	20	30	0
February	30.04	31.00	28.70	31.3	38.4	24.2	73	−14	64	5.8	3.52	3.25	9.7	10	2	(*)	6.8	6	14.8	63	16	8	8	4	7	13	15	29	0
March	29.99	31.00	28.38	37.7	45.4	30.2	84	3	63	5.9	3.79	3.60	5.8	11	2	1	5.0	7	14.3	61	12	8	8	6	10	12	13	31	(*)
April	29.99	30.71	29.03	49.4	57.2	41.6	91	12	61	5.9	3.31	3.72	1.1	11	1	2	2.2	5	14.0	56	12	11	11	8	12	11	11	24	0
May	29.96	30.64	29.02	60.6	68.5	52.6	95	34	63	5.6	3.21	4.17	0	11	2	4	2.9	3	12.1	60	13	9	10	9	15	15	11	18	(*)
June	29.95	30.56	29.34	68.8	77.0	60.5	97	44	66	5.7	3.48	3.88	0	11	2	6	2.4	2	11.4	58	14	7	8	9	19	17	11	15	(*)
July	29.97	30.51	29.35	73.8	81.7	65.9	102	54	69	5.7	4.22	3.80	0	11	1	7	1.3	1	10.6	59	13	6	6	8	21	19	13	14	(*)
August	30.01	30.45	29.28	73.1	80.1	65.2	102	51	70	5.5	4.33	5.05	0	10	(*)	6	1.8	1	10.5	44	15	11	8	8	19	18	10	11	(*)
September	30.06	30.61	28.72	66.8	78.7	59.8	100	39	70	5.1	3.59	6.17	0	9	1	3	2.0	1	11.0	70	16	10	8	7	15	18	11	15	(*)
October	30.06	30.72	29.06	56.3	68.7	49.0	90	27	67	5.0	3.45	9.40	T	9	2	1	1.8	8	12.6	56	17	9	5	5	12	17	14	21	(*)
November	30.09	30.82	28.70	44.2	51.0	37.3	75	7	68	5.8	3.11	3.62	1.1	9	2	1	1.7	5	14.1	53	11	8	7	4	10	19	18	23	(*)
December	30.08	30.93	28.73	35.0	41.2	28.8	69	−13	67	6.1	3.26	3.23	5.9	11	3	(*)	6.8	6	14.4	60	15	8	7	3	6	12	19	30	(*)
Mean	30.02			52.3	59.6	45.0			66	5.7							3.4		12.9		14	8	8	6	13	15	14	22	(*)
Total											42.80		31.4	125	21	31		52											
Extreme		31.01	28.38				102	−14				9.40								70									
Number years record	30	64	64	46	46	46	76	76	29-58	56	76	76	62	76	42	63	7	35	35	35	15	15	15	15	15	15	15	15	15

T—Trace.
*Less than one.

Norfolk, Va. Position: Lat. 36°51′ N., Long. 76°17′ W. Altitude: 11 feet

Month	Pressure reduced to sea level: Mean: For month	Pressure: Extremes: Highest	Pressure: Extremes: Lowest	Air temperature in degrees F.: Mean: For month	Air temperature: Mean: Mean maximum	Air temperature: Mean: Mean minimum	Air temperature: Extremes: Highest	Air temperature: Extremes: Lowest	Average relative humidity (0130, 0730, 1330, 1930)	Average cloud amount 0–10	Precipitation: Average (inches)	Precipitation: Maximum in 24 hours	Precipitation: Average snowfall (inches)	Average number of days with—: Precipitation 0.01 inch or more	Fog (dense)	Thunderstorms	Visibility less than 1 mile	Gales (over 27 knots)	Wind: Mean velocity (knots)	Wind: Maximum velocity (knots)	Percentage of observations from—: N	NE	E	SE	S	SW	W	NW	Calm
January	30.14	30.95	28.88	41.7	49.3	33.9	80	5	73	5.6	3.18	4.07	2.5	11	2	(*)	-----	3	10.6	45	17	17	6	5	13	15	15	12	0
February	30.09	30.96	29.04	42.4	50.5	34.2	82	2	69	5.2	3.38	3.45	2.7	11	2	1	-----	2	10.8	43	16	16	7	7	14	14	13	13	0
March	30.06	30.91	28.35	48.9	57.8	40.2	92	14	69	5.1	3.78	2.78	1.7	12	1	2	-----	4	11.5	50	13	16	8	9	16	15	12	11	0
April	30.02	30.71	29.02	57.1	66.1	48.1	95	23	67	4.8	3.33	5.19	T	10	1	3	-----	2	10.9	45	10	17	9	11	17	15	11	10	0
May	30.00	30.59	29.23	66.7	75.6	57.8	98	38	71	4.8	3.71	3.78	0	11	1	5	-----	1	9.8	50	8	16	11	11	19	18	11	6	0
June	30.00	30.46	29.39	74.8	83.3	66.2	102	49	74	4.9	4.24	5.97	0	11	1	7	-----	2	9.0	51	7	12	10	10	21	21	12	7	0
July	30.01	30.38	29.46	78.5	86.7	70.5	104	57	77	5.0	5.82	5.00	0	13	(*)	9	-----	2	8.6	46	5	12	10	10	24	22	12	5	0
August	30.02	30.41	29.37	77.4	84.8	70.1	105	56	77	5.0	5.28	6.84	0	12	(*)	7	-----	1	8.5	55	7	18	12	9	19	20	10	5	0
September	30.08	30.56	29.07	72.4	79.6	65.5	100	40	77	4.6	3.79	4.36	0	8	1	2	-----	1	8.9	49	10	22	15	10	17	13	8	5	0
October	30.11	30.64	29.35	62.1	69.7	54.8	94	31	75	4.4	3.07	6.29	T	8	2	1	-----	1	9.5	41	16	19	10	8	15	13	11	8	0
November	30.12	30.72	29.15	51.9	59.6	44.4	82	17	71	4.6	2.46	5.48	.2	8	2	(*)	-----	1	10.1	40	19	16	6	6	16	14	12	11	0
December	30.12	30.85	29.03	43.4	50.9	36.2	76	5	72	5.4	3.21	2.52	2.0	10	2	(*)	-----	2	10.2	50	19	16	6	4	12	16	16	11	0
Mean	30.07	-----	-----	59.8	67.8	51.8	-----	-----	73	5.0	-----	-----	-----	-----	-----	-----	-----	-----	9.9	-----	12	17	9	8	17	16	12	9	0
Total	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	45.25	-----	9.1	125	15	37	-----	22	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Extreme	-----	30.96	28.35	-----	-----	-----	105	2	-----	-----	-----	6.84	-----	-----	-----	-----	-----	-----	-----	55	-----	-----	-----	-----	-----	-----	-----	-----	-----
Number years record	45	45	45	76	72	72	76	76	9–59	40	76	76	76	76	54	62	-----	34	34	76	29	29	29	29	29	29	29	29	29

*Less than 1.

Philadelphia, Pa. Position: Lat. 39°57′ N., Long. 75°09′ W. Altitude: 26 feet

Month	Pressure reduced to sea level: Mean: For month	Pressure reduced to sea level: Extremes: Highest	Pressure reduced to sea level: Extremes: Lowest	Air temperature in degrees F.: Mean: For month	Air temperature: Mean: Mean maximum	Air temperature: Mean: Mean minimum	Air temperature: Extremes: Highest	Air temperature: Extremes: Lowest	Average relative humidity (0800, 1200, 2000)	Percent of possible sunshine	Precipitation: Average (inches)	Precipitation: Max. in 24 hours	Precipitation: Average snowfall (inches)	Average number of days with—: Precipitation 0.01 in. or more	Average number of days with—: Fog (heavy)	Average number of days with—: Thunderstorms	Percent of observations recording visibility less than 1 mile (#)	Gales	Wind (#): Mean velocity (knots)	Wind (#): Maximum velocity (knots)	Wind (#): Percentage of observations from—: N	NE	E	SE	S	SW	W	NW	Calm
January	30.13	31.02	28.67	32.6	39.5	25.7	73	−5	70	49	3.30	3.33	6.0	12	2	(*)	9.5	------	9.5	43	8	11	5	4	7	16	11	22	16
February	30.09	30.99	28.78	33.9	40.9	26.9	79	−11	68	57	3.32	3.86	6.8	11	1	(*)	8.3	------	10.0	43	8	10	4	4	6	14	12	25	17
March	30.04	30.96	28.54	40.8	48.6	33.0	86	5	66	58	3.39	2.79	3.8	12	1	1	6.0	------	10.3	46	7	12	5	6	8	16	14	20	12
April	30.01	30.71	29.00	52.1	60.9	43.3	93	14	62	58	3.05	2.77	.9	11	(*)	2	2.3	------	9.6	41	6	13	8	7	11	13	12	18	12
May	29.99	30.64	29.00	62.9	72.0	53.8	96	35	63	61	3.26	3.16	0	11	(*)	4	2.7	------	8.6	59	7	11	5	6	13	19	9	15	15
June	29.98	30.54	29.38	71.4	80.4	62.4	102	46	65	62	3.24	4.59	0	10	(*)	5	3.4	------	8.9	42	8	9	7	8	17	19	6	11	15
July	29.99	30.51	29.37	76.2	84.6	67.8	104	52	65	64	4.15	3.18	0	11	(*)	7	2.0	------	8.4	45	6	6	6	7	17	22	7	9	20
August	30.02	30.46	29.40	74.8	82.5	67.1	106	51	67	62	4.62	5.89	0	11	(*)	5	4.7	------	8.0	38	8	11	6	9	13	16	4	9	24
September	30.08	30.61	29.17	68.0	76.0	60.0	102	40	69	63	3.14	5.62	0	8	1	2	3.9	------	8.5	39	10	10	6	7	12	15	5	12	23
October	30.09	30.74	29.10	57.8	65.9	49.7	94	29	66	63	2.81	3.70	.1	8	1	1	5.4	------	8.6	50	11	9	4	6	9	13	7	18	23
November	30.10	30.84	28.88	45.7	52.6	38.8	77	8	68	53	2.70	3.38	.7	9	1	(*)	7.2	------	8.9	41	8	9	4	5	10	14	11	21	18
December	30.11	30.96	28.79	36.3	42.8	29.8	70	−5	68	49	3.43	3.78	4.1	10	2	(*)	8.2	------	9.3	43	9	10	4	3	6	14	12	24	18
Mean	30.04	------	------	54.4	62.3	46.6	------	------	66	58	------	------	------	------	------	------	5.3	------	9.0	------	8	10	5	6	11	16	9	17	18
Total	------	------	------	------	------	------	------	------	------	------	40.41	------	22.4	124	9	27	------	------	------	------	------	------	------	------	------	------	------	------	------
Extreme	------	31.02	28.54	------	------	------	106	−11	------	------	------	5.89	------	------	------	------	------	------	------	59	------	------	------	------	------	------	------	------	------
Number years record	76	76	76	47	58	58	75	75	26–58	52	75	75	61	75	75	75	9	------	74	74	9	9	9	9	9	9	9	9	9

*Less than one.
#Observations taken at Camden, N. J.

Richmond, Va. Position: Lat. 37°32′ N., Long. 77°25′ W. Altitude: 162 feet

Month	Pressure reduced to sea level: Mean: For month	Pressure reduced to sea level: Extremes: Highest	Pressure reduced to sea level: Extremes: Lowest	Air temperature in degrees F.: Mean: For month	Air temperature: Mean: Mean maximum	Air temperature: Mean: Mean minimum	Air temperature: Extremes: Highest	Air temperature: Extremes: Lowest	Average relative humidity 0730 1330 1930	Percent of possible sunshine	Precipitation: Average (inches)	Precipitation: Max. in 24 hours	Precipitation: Average snowfall (inches)	Average number of days with—: Precipitation 0.01 in. or more	Average number of days with—: Fog (heavy)	Average number of days with—: Thunderstorms	Percent of observations recording visibility less than 1 mile	Gales	Wind: Mean velocity (knots)	Wind: Maximum velocity (knots)	Wind: Percentage of observations from—: N	NE	E	SE	S	SW	W	NW	Calm
January	30.14	31.00	28.87	37.9	46.9	28.9	80	−1	71	50	3.21	2.66	3.6	10	2	(*)	9.4	------	7.1	42	15	10	4	7	17	14	8	9	16
February	30.10	30.97	29.00	39.6	48.8	30.3	82	−3	67	55	3.17	3.30	3.5	10	1	(*)	5.7	------	7.3	42	15	9	4	6	19	12	7	14	14
March	30.04	30.90	28.58	47.2	57.5	36.9	94	12	64	58	3.68	3.59	2.2	11	1	2	4.0	------	8.0	37	13	9	4	11	18	15	9	12	9
April	30.01	30.73	29.16	56.6	67.3	45.8	96	19	61	62	3.49	5.33	.4	10	(*)	3	2.2	------	7.6	40	15	9	6	12	17	11	8	11	11
May	29.98	30.59	29.15	66.5	77.2	55.8	98	35	63	67	3.79	2.39	0	11	1	6	2.8	------	6.3	40	15	8	6	10	20	13	7	8	13
June	29.99	30.47	29.40	74.1	84.0	64.2	104	43	67	65	3.90	3.69	0	11	(*)	8	2.3	------	5.7	41	11	6	6	11	22	12	5	9	18
July	29.97	30.41	29.46	78.5	88.3	68.7	105	52	70	66	4.73	7.26	0	11	1	10	3.2	------	5.6	32	10	7	5	11	23	15	5	5	19
August	30.02	30.45	28.93	76.5	85.8	67.2	107	49	72	62	4.42	5.71	0	11	1	7	2.5	------	5.4	37	11	9	6	11	20	12	4	6	21
September	30.08	30.58	29.43	70.5	80.2	60.8	101	40	72	64	3.25	6.68	0	10	2	3	5.2	------	5.5	31	14	10	7	11	15	11	4	7	21
October	30.10	30.69	29.30	59.6	69.9	49.2	99	28	69	65	2.88	4.81	T	7	3	1	5.0	------	6.0	36	17	7	4	8	14	11	6	12	21
November	30.14	30.88	29.12	48.3	58.2	38.4	83	14	67	59	2.21	2.77	.4	7	2	(*)	6.5	------	6.5	32	15	6	3	10	19	10	8	12	17
December	30.13	30.91	29.01	39.8	48.3	31.2	77	−2	70	50	3.29	2.52	2.8	10	2	(*)	6.9	------	6.6	36	17	9	2	4	16	14	9	10	19
Mean	30.06	------	------	57.9	67.7	48.1	------	------	68	60	------	------	------	------	------	------	4.6	------	6.5	------	14	8	5	9	18	12	7	10	17
Total	------	------	------	------	------	------	------	------	------	------	42.02	------	12.9	119	16	40	------	------	------	------	------	------	------	------	------	------	------	------	------
Extreme	------	31.00	28.58	------	------	------	107	−3	------	------	------	7.26	------	------	------	------	------	------	------	42	------	------	------	------	------	------	------	------	------
Number years record	49	49	49	50	49	49	49	49	29–49	44	50	49	49	49	49	49	10	------	49	49	10	10	10	10	10	10	10	10	10

T—Trace.
* Less than 1.

Trenton, N. J. Position: Lat. 40°13′ N., Long. 74°46′ W. Altitude: 56 feet

Month	Pressure reduced to sea level: Mean: For month	Pressure reduced to sea level: Extremes: Highest	Pressure reduced to sea level: Extremes: Lowest	Air temperature in degrees F.: Mean: For month	Air temperature: Mean: Mean maximum	Air temperature: Mean: Mean minimum	Air temperature: Extremes: Highest	Air temperature: Extremes: Lowest	Average relative humidity 0730 1930	Percent of possible sunshine	Precipitation: Average (inches)	Precipitation: Max. in 24 hours	Precipitation: Average snowfall (inches)	Average number of days with—: Precipitation 0.01 in. or more	Average number of days with—: Fog (heavy)	Average number of days with—: Thunderstorms	Percent of observations recording visibility less than 1 mile	Average number of days with gales (over 27 knots)	Wind: Mean velocity (knots)	Wind: Maximum velocity (knots)	Wind: Percentage of observations from—: N	NE	E	SE	S	SW	W	NW	Calm
January	30.10	30.98	28.74	30.5	39.3	25.0	73	−13	72	49	3.31	2.65	6.6	10	2	(*)	17.5	5	9.6	46	17	11	4	3	10	14	17	24	0
February	30.04	30.96	28.89	30.7	39.8	24.2	76	−14	70	55	3.27	2.68	7.6	9	2	(*)	13.0	4	9.7	46	18	11	6	3	11	11	14	26	0
March	30.00	30.97	28.51	39.1	49.8	32.7	86	1	68	58	3.40	2.61	3.8	10	1	1	13.5	5	10.2	43	16	10	6	4	14	11	13	26	0
April	30.00	30.70	28.99	49.8	60.7	41.6	93	11	66	62	2.94	3.69	.9	10	1	2	6.4	4	10.0	41	15	11	8	6	15	13	13	19	0
May	29.97	30.63	28.99	61.1	72.3	52.1	99	33	67	64	3.08	4.20	0	11	1	4	5.2	2	8.7	40	15	8	8	5	18	18	13	15	0
June	29.96	30.48	29.31	69.5	80.4	60.9	100	41	70	65	3.09	4.79	0	11	1	7	6.3	1	8.0	42	14	7	8	7	18	18	13	15	0
July	29.97	30.40	29.35	74.5	84.8	66.3	106	50	73	67	3.94	4.30	0	11	1	9	4.4	1	7.5	47	12	7	6	7	23	19	12	14	0
August	30.00	30.45	29.45	73.0	82.4	64.5	105	46	75	65	4.75	5.20	0	10	2	6	8.9	1	7.4	36	16	9	7	6	21	16	13	12	0
September	30.06	30.58	29.07	66.9	76.4	58.2	97	35	76	65	3.40	40.2	0	8	2	3	9.7	1	7.6	43	20	10	8	6	18	16	9	12	1
October	30.07	30.74	29.10	55.6	65.5	47.2	94	26	74	61	2.78	5.42	T	7	3	1	8.8	2	8.2	37	18	10	4	4	16	15	12	20	1
November	30.10	30.85	29.12	44.4	53.3	37.5	78	9	73	53	2.73	3.60	.8	9	2	(*)	10.6	3	9.0	36	13	9	5	3	16	16	16	22	0
December	30.09	30.94	29.74	34.4	42.1	28.1	70	−8	73	47	3.35	2.77	4.4	9	2	(*)	11.3	4	9.1	43	16	10	4	2	10	15	17	26	0
Mean	30.03			52.5	62.2	44.9			71	58							9.6		8.8		16	10	6	5	16	15	13	19	(*)
Total											40.04		24.1	115	20	33		33											
Extreme		30.98	28.51				106	−14				5.42								47									
Number years record	34	34	34	74	74	74	74	74	34	34	72	59	72	58	34	34	4	34	34	35	21	21	21	21	21	21	21	21	21

T—Trace.
* Less than one.

Washington, D. C. Position: Lat. 38°54′ N., Long. 77°03′ W. Altitude: 72 feet

Month	Pressure reduced to sea level: Mean: For month	Pressure: Extremes: Highest	Pressure: Extremes: Lowest	Air temperature in degrees F.: Mean: For month	Air temperature: Mean: Mean maximum	Air temperature: Mean: Mean minimum	Air temperature: Extremes: Highest	Air temperature: Extremes: Lowest	Average relative humidity (0730, 1330, 1930, 0130)	Average cloud amount 0–10	Precipitation: Average (inches)	Precipitation: Maximum in 24 hours	Precipitation: Average snowfall (inches)	Average number of days with—: Precipitation 0.01 in. or more	Average number of days with—: Fog (dense)	Average number of days with—: Thunderstorms	Percent of observations recording visibility less than 1 mile	Average number of days with gales over 27 knots	Wind: Mean velocity (knots)	Wind: Maximum velocity (knots)	Wind: Percentage of observations from—: N	NE	E	SE	S	SW	W	NW	Calm
January	30.13	31.01	28.85	35.0	42.6	27.3	77	−14	67	5.9	3.32	2.98	6.2	11	1.8	.2	12.9	1.3	6.5	37	15	8	7	4	17	13	6	29	1
February	30.09	30.97	28.71	35.4	43.6	27.3	84	−15	63	5.5	2.88	2.29	5.5	10	.9	.5	9.1	1.0	7.3	41	14	7	8	4	18	11	6	31	1
March	30.04	30.92	28.67	44.8	54.1	35.5	93	4	62	5.5	3.45	2.80	4.0	12	.8	1.2	5.5	1.6	7.5	41	13	7	7	5	19	13	5	30	1
April	30.02	30.74	29.10	54.2	64.3	44.0	95	15	59	5.2	3.30	3.21	.4	11	.6	2.3	2.0	.8	7.1	32	11	9	9	8	18	12	6	26	1
May	30.00	30.62	29.35	64.8	75.2	54.4	97	33	65	5.2	3.36	3.50	T	12	.3	5.3	1.6	.2	6.0	37	10	8	8	8	20	16	7	21	2
June	29.97	30.50	29.37	72.7	82.4	63.0	102	43	69	5.0	3.91	4.16	0	11	.2	7.2	.6	.5	5.4	36	10	6	7	6	19	22	8	20	2
July	29.98	30.52	29.40	77.2	86.7	67.8	106	52	71	5.0	4.37	5.80	0	11	.2	8.6	.8	.4	5.0	46	10	7	6	6	20	24	7	17	3
August	30.01	30.47	28.94	75.2	84.4	66.0	106	49	73	5.0	4.42	7.31	0	11	.3	5.9	1.0	.3	5.0	36	14	8	7	6	19	19	6	17	4
September	30.06	30.62	29.16	69.2	78.8	59.6	104	36	74	4.7	3.64	5.66	0	8	.7	3.0	3.7	.1	5.0	44	15	10	8	7	18	16	6	15	5
October	30.09	30.83	28.79	57.7	67.6	47.8	96	26	71	4.5	2.91	3.98	.1	8	1.6	.8	3.8	.2	5.4	36	14	8	5	5	16	16	9	22	5
November	30.13	30.84	28.99	46.7	55.5	37.9	83	11	67	5.3	2.46	3.20	.7	9	1.6	.4	7.6	.5	6.4	37	13	6	6	4	20	14	7	28	2
December	30.13	30.94	28.72	36.9	44.4	29.4	74	−13	68	5.7	3.09	2.70	3.3	10	1.5	.2	9.3	.8	6.3	34	14	7	7	3	17	14	7	29	2
Mean	30.05			55.8	65.0	46.7			67	5.2							4.8		6.1		12	8	7	6	18	16	7	24	2
Total											41.11		20.02		10.5	35.6		7.7											
Extreme		31.01	28.67				106	−15				7.31								46									
Number years record	73	73	73	50	50	50	75	75	31–41	62	50	75	58	75	74	63	9	41	14	74	25	25	25	25	25	25	25	25	25

T—Trace.

Ocean Area No. 1. Position: Lat. 35° N. to 40° N., Long. 70° W. to 75° W. Greenwich Noon Observations. Years Covered: 1878–1934

Month	Number of observations surveyed	Wind: Mean velocity (knots)	Wind: Percentage of observations from— N	NE	E	SE	S	SW	W	NW	Calm	Weather (percentages of observations recording): Haze	Mist	Fog	Drizzle	Rain	Snow	Showers	Thunderstorms	Light to moderate squalls	Heavy squalls	Gales (force 8 or over)	Exceptional visibility	Mean cloud amount (0-10)	Average air temperature	Average sea surface temperature
January	10,597	16.0	15	10	6	6	9	13	15	25	1	6	2	2	2	7	3	2	(*)	5	(*)	9	6	6.5	48.1	54.9
February	10,269	16.5	15	11	6	5	8	12	14	28	1	7	2	2	2	6	4	2	(*)	5	(*)	10	5	6.6	46.4	53.1
March	11,186	15.5	17	11	7	6	10	12	12	24	1	7	3	4	2	6	2	2	(*)	4	(*)	8	5	5.5	49.2	52.9
April	11,091	12.5	16	12	7	6	12	14	13	17	3	11	2	5	1	5	(*)	1	1	3	(*)	4	6	5.3	54.5	55.3
May	10,714	10.2	13	13	8	9	15	17	11	10	4	13	3	8	1	4	(*)	2	1	2	(*)	1	5	5.1	61.8	60.7
June	11,148	8.9	11	12	8	7	16	24	10	8	4	12	3	7	1	5	(*)	2	1	1	(*)	1	5	5.0	69.4	68.2
July	11,362	8.9	9	10	6	7	18	27	12	8	3	10	2	3	1	5	(*)	3	1	2	(*)	1	6	4.8	75.1	74.1
August	11,260	9.3	11	15	9	7	14	22	10	9	3	9	2	1	1	4	(*)	2	1	3	(*)	1	6	4.9	76.0	76.0
September	11,174	10.2	15	19	11	8	11	14	8	11	3	9	2	2	1	3	(*)	2	1	2	(*)	2	7	4.9	72.4	73.4
October	11,813	13.0	19	18	8	7	8	10	10	18	2	6	2	1	1	5	(*)	2	(*)	4	(*)	5	8	5.2	64.5	67.8
November	10,846	14.5	17	11	6	6	8	14	14	23	1	6	1	1	1	4	(*)	2	(*)	4	(*)	6	7	5.4	56.6	62.3
December	10,564	15.5	16	9	5	5	8	13	16	27	1	5	2	1	1	6	2	2	(*)	5	(*)	7	5	6.3	50.8	57.8
Mean		12.6	15	13	7	7	11	16	12	17	2	8	2	3	1	5	1	2	1	3	(*)	5	6	5.5	60.4	63.0
Total	132,024																									

*Less than 0.5 percent.

Ocean Area No. 2. Position: Lat. 35° N. to 40° N., Long. 75° W. to 80° W. Greenwich Noon Observations. Years Covered: 1879–1935

Month	Number of observations surveyed	Wind: Mean velocity (knots)	Wind: Percentage of observations from— N	NE	E	SE	S	SW	W	NW	Calm	Weather (percentages of observations recording): Haze	Mist	Fog	Drizzle	Rain	Snow	Showers	Thunderstorms	Light to moderate squalls	Heavy squalls	Gales (force 8 or over)	Exceptional visibility	Mean cloud amount (0–10)	Average air temperature	Average sea surface temperature
January	2,287	12.0	20	12	5	5	9	15	12	19	3	9	5	3	2	5	1	1	(*)	2	(*)	6	5	5.7	47.5	49.9
February	2,085	12.5	21	12	6	6	8	13	12	19	3	10	3	6	2	6	2	1	(*)	2	(*)	5	4	5.6	45.1	48.2
March	2,331	12.5	19	13	6	6	13	13	10	18	2	12	4	7	2	5	1	1	(*)	2	(*)	6	3	5.2	48.6	50.1
April	2,282	9.7	18	13	6	7	12	15	11	14	4	13	4	5	2	4	(*)	1	(*)	1	0	2	4	4.8	54.8	54.5
May	2,170	8.9	16	14	8	9	16	15	9.	9	4	14	3	5	1	4	(*)	2	1	2	(*)	1	4	4.8	63.8	61.8
June	2,271	7.6	12	14	6	6	17	21	10	8	6	12	3	3	2	4	(*)	2	(*)	1	(*)	1	4	4.7	71.2	70.0
July	2,090	7.6	10	10	7	9	18	25	9	7	5	10	2	1	1	4	(*)	2	1	2	(*)	1	7	5.0	76.1	75.0
August	2,222	8.0	13	16	8	7	13	22	10	7	4	8	2	1	1	4	0	2	1	2	(*)	1	7	4.7	76.7	76.6
September	2,184	9.3	18	23	10	7	9	13	8	8	4	9	2	1	1	3	(*)	2	(*)	2	(*)	2	6	4.6	73.6	74.1
October	2,410	10.6	25	20	8	6	6	9	7	15	4	7	5	2	1	3	0	1	(*)	2	(*)	3	7	4.5	64.4	67.9
November	2,300	11.6	21	13	5	5	8	11	12	21	4	7	3	3	1	3	(*)	1	(*)	2	(*)	4	6	5.1	55.7	61.2
December	2,462	11.6	22	10	4	5	9	13	13	20	4	7	3	3	1	5	1	1	(*)	2	(*)	4	5	5.6	50.0	54.1
Mean		10.2	18	14	7	6	12	15	10	14	4	10	3	3	1	4	(*)	1	(*)	2	(*)	3	5	5.0	60.6	62.0
Total	27,094																									

*Less than 0.5 percent.

Ocean Area No. 3. Position: Lat. 40° N. to 45° N., Long. 70° W. to 75° W. Greenwich Noon Observations. Years Covered: 1878–1933

Month	Number of observations surveyed	Wind: Mean velocity (knots)	Wind: Percentage of observations from— N	NE	E	SE	S	SW	W	NW	Calm	Weather (percentages of observations recording): Haze	Mist	Fog	Drizzle	Rain	Snow	Showers	Thunderstorms	Light to moderate squalls	Heavy squalls	Gales (force 8 or over)	Exceptional visibility	Mean cloud amount (0–10)	Average air temperature	Average sea surface temperature
January	3,060	14.5	13	10	6	6	7	12	23	22	1	7	4	4	1	6	7	1	(*)	4	(*)	6	5	6.4	38.2	43.0
February	2,779	15.0	13	11	6	6	6	10	23	24	1	7	3	5	2	6	8	1	(*)	4	(*)	7	5	6.1	36.9	40.4
March	3,159	13.5	14	10	7	7	10	10	20	20	2	8	4	8	2	5	5	1	(*)	3	(*)	5	6	5.7	39.7	40.4
April	3,368	10.6	12	11	6	7	12	15	18	16	3	9	5	10	1	5	1	1	(*)	1	(*)	2	6	5.3	45.2	43.3
May	3,722	8.0	12	11	9	7	14	18	14	10	5	12	6	18	2	5	(*)	1	1	1	0	1	5	5.5	53.2	50.2
June	3,612	7.2	11	10	7	6	14	22	14	9	7	15	6	18	1	3	(*)	1	(*)	1	(*)	(*)	4	5.1	62.1	58.9
July	3,788	7.2	9.	8	5	6	17	26	14	9	6	14	6	14	1	3	(*)	2	1	1	(*)	(*)	3	5.2	68.7	66.0
August	3,820	7.6	11	13	7	7	13	20	13	11	5	11	7	7	1	4	(*)	1	1	1	(*)	1	5	5.1	69.7	68.7
September	3,743	8.4	14	15	9	6	12	16	12	12	4	9	6	6	1	4	(*)	1	1	1	(*)	1	6	4.9	65.7	65.8
October	3,811	12.0	16	15	7	6	9	13	15	17	2	7	4	4	2	7	(*)	1	(*)	3	(*)	3	6	5.3	57.3	59.0
November	3,212	13.0	13	9	6	6	10	14	21	20	1	6	4	3	2	6	1	1	(*)	3	(*)	5	5	5.8	49.4	53.2
December	2,955	14.5	13	8	5	4	6	12	28	23	1	5	4	3	1	6	4	1	(*)	4	(*)	5	6	6.3	41.8	47.3
Mean		11.0	12	11	7	6	11	16	18	16	3	9	5	8	1	5	2	1	(*)	2	(*)	3	5	5.6	52.3	53.0
Total	41,029																									

*Less than 0.5 percent.

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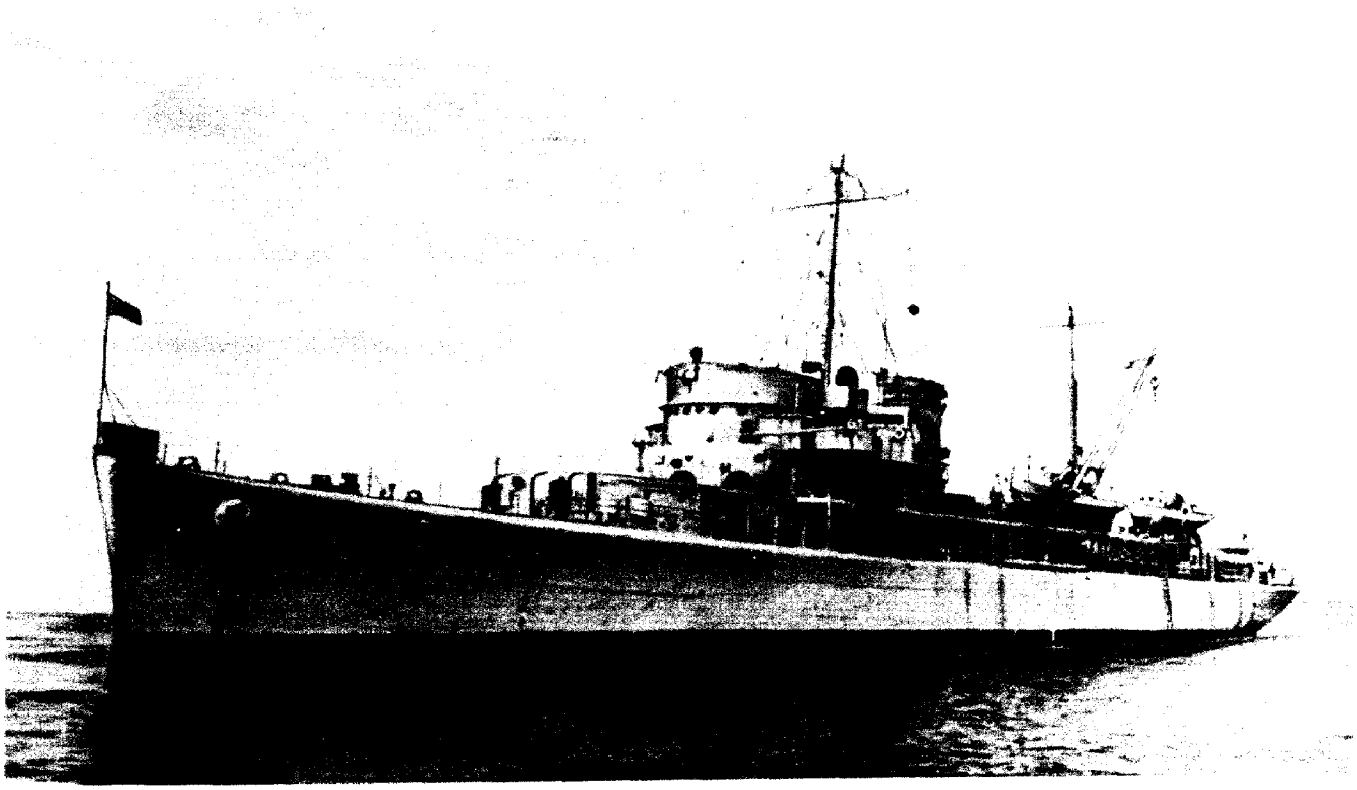
U. S. Coast and Geodetic Survey

NAUTICAL CHART
SYMBOLS AND ABBREVIATIONS



COAST AND GEODETIC SURVEY SHIP *PIONEER*

Chart No. 1

SYMBOLS AND ABBREVIATIONS FOR NAUTICAL CHARTS

The standard symbols and abbreviations which have been approved for use on nautical charts published by the United States of America are reproduced on the following pages.

Symbols and abbreviations are numbered in accordance with a standard form proposed by the International Hydrographic Bureau of 1939.

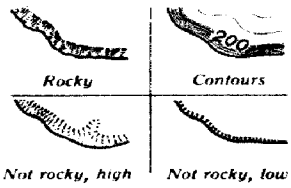
Vertical figures indicate that the symbol or abbreviation is in accordance with the I. H. B. standard.

Symbols or abbreviations which differ from those of the I. H. B., or which do not appear on the standard are indicated by slant figures.

Figures in parentheses indicate that the symbol or abbreviation is in addition to those shown on the standard.

A. The Coastline

1 *Shoreline unsurveyed*

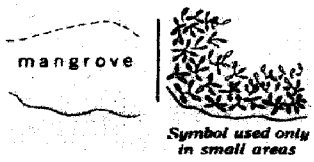


3 *Cliffy coastline (Bluffs)*

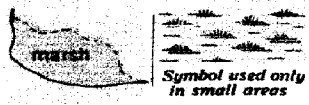
4 *Sandhills or dunes*

5 *Stony or shingly shore*

6 *Sandy shore*



7 *Mangrove*



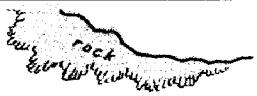
8 *Swamp or marsh*

11 Foreshores

a Mud flats

b Sand

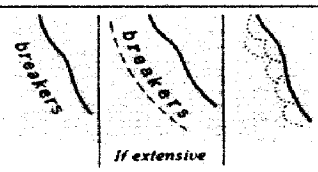
c Stones or gravel



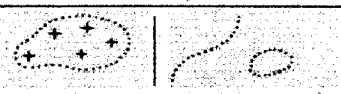
d Rock, uncovers at datum of soundings

f Sand and gravel

9 Coral, uncovers at datum of soundings (See O-10)



12 Breakers along a shore



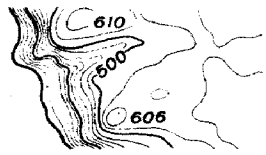
13 Limiting danger line

B. Coast Features

1	*G.*	*Gulf*
2	*B.*	*Bay*
(2a)	*B.*	*Bayou*
3	*Fd.*	*Fjord*
4	*L.*	*Loch,Lough,Lake*
5	*Cr.*	*Creek*
(5a)	*C.*	*Cove*
6	*In.*	*Inlet*
7	*Str.*	*Strait*
8	*Sd.*	*Sound*
9	*Pass.*	*Passage, Pass*
10	*Chan.*	*Channel*
11	*Entr.*	*Entrance*
13	*Mth.*	*Mouth*
14	*Rds.*	*Roads, Roadsted*
15	*Anch.*	*Anchorage*
16	*Hbr.*	*Harbor*
17	*P.*	*Port*
(17a)	*P.*	*Pond*
18	I.	*Island*
19	It.	*Islet*
20	Arch.	*Archipelago*
21	Pen.	*Peninsula*
22	C.	*Cape*
23	Prom.	*Promontory*
24	Hd.	*Head*
25	Pt.	*Point*
26	Mt.	*Mountain Mount*
27	Rge.	*Range*
29	Pk.	*Peak*
30	Vol.	*Volcano*
32	*Bld.*	*Boulder*
(33)	*Str.*	*Stream*
(34)	*R.*	*River*
(35)	*Slu.*	*Slough*
(36)	*Lag.*	*Lagoon*
(37)	*Thoro.*	*Thorofare*

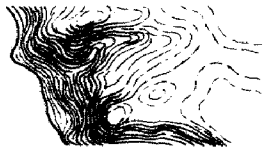
A-3944-1(15)++

C. The Land

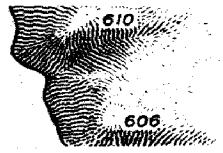


1 Contours

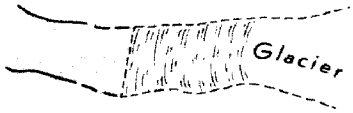
(a) Contours, approximate



(b) Form lines, no definite interval



2 Hachures



3 Glacier

TREE

A conspicuous clump or single tree of any kind useful as a landmark.

5 Isolated trees

wooded

9 Deciduous woodland

wooded

10 Coniferous woodland

2560 T.T.

(11) Elevation of top of trees

D. Control Points

1	△		Triangulation point(station)
2	⊙		Fixed point
3	256		Summit of height (Peak) (when not a landmark)
(a)	256		Peak, accentuated by contours
(b)	256		Peak, accentuated by hachures
(c)			Peak, when elevation has not been determined
(d)	⊙256		Peak, when a landmark
4	⊕	Obs. Spot	Observation spot
5		B.M.	Bench mark
6	∘	See View	View point
(9)		Astro.	Astronomical
(10)		Tri.	Triangulation
(11)		C. of E.	Corps of Engineers
(12)			
(13)			

E. Units

1	hr.	hour
2	m.;min.	minute
3	sec.	second
4	m.	meter
5	km.	kilometer
6	in.	inch
7	ft.	foot
8	yd.	yard
9	fm.	fathom
11	M.	nautical mile
12	kn.	knot
13	lat.	latitude
14	long.	longitude
17	cor.	correction
(18)	alt.	altitude
(19)	ht.	height
(20)		
(21)		
(22)		

F. Adjectives

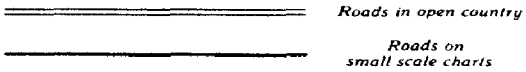
and other abbreviations

1	gt.	great
3	lrg.	large
4	sml.	small
7	mid.	middle
9	anc.	ancient
12	conspic.	conspicuous
16	dist.	distant
17	abt.	about
(19)	aband.	abandoned
(20)	extr.	extreme
(21)	concr.	concrete
(22)	bet.	between
(23)	estab.	established
(24)	exper.	experimental
(25)	discontd.	discontinued
(26)	fl.	flood
(27)	mod.	moderate
(28)	maintd.	maintained
(29)	elec.	electric
(30)	priv.	private, privately
(31)	prom.	prominent
(32)	std.	standard
(33)	subm.	submerged
(34)	approx.	approximate
(35)	cor.	corner
(36)	CL.	clearance
(37)	No.	number
(38)	Ave.	avenue
(39)	Hy.	highway
(40)	explos.	explosive
(41)	Blvd.	boulevard
(42)		
(43)		
(44)		
(45)		
(46)		

G. Harbors

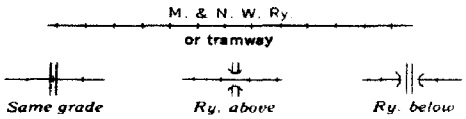
1		Anch.	Anchorage, large vessels (see No. P-12)
2		Anch.	Anchorage, small vessels
3		Hbr.	Harbor
6		Bkw.	breakwater
8			jetty (partly below M H W)
(8a)			jetty (small scale)
9		Pier	pier
11			groin (partly below M H W)
12	Anchorage prohibited	Anch. prohib.	Anchorage prohibited
13	spoil area		spoil ground
14	Trap		fish traps (actual shape charted)
(14a)		Fsh. stk.	fishing stakes when dangerous
16		Ldg.	landing place
18		Whf.	wharf
21		Dol.	dolphin
26		Quar.	Quarantine
29		Cus. Ho.	Customhouse
33		B. Hbr.	Boat Harbor
35			dock
36			dry dock (actual shape shown on large scale charts)
37			floating dock (actual shape shown on large scale charts)
39			patent slip (marine railway)
(39a)		Ramp	ramp
40	Lock		lock (point upstream)
45		Obsy.	Observatory
(46)			
(47)			

H. Topography

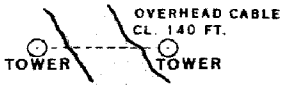


1 Roads (Rds.)

2 Track, footpath, or trail



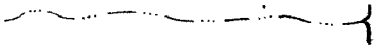
3 Railway (single or double track)
Railway (Ry.) Railroad (R.R.)



4 Overhead cable (OVHD. CAB.)

5 Power transmission line

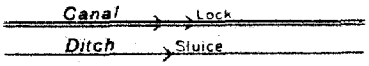
8 River or Stream



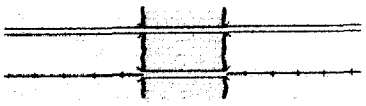
9 Intermittent stream

10 Lake (L.)

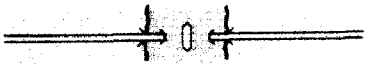
12 Marsh (See No. A-8)



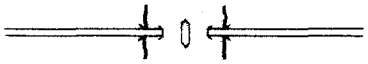
13 Canal or ditch (point upstream)



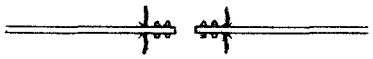
14 Bridge (fixed) (BR.)



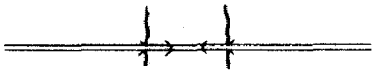
15 Drawbridge, in general



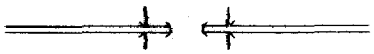
16 Swing bridge, that can be opened



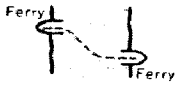
17 Pontoon bridge, that can be opened



(17a) Lift bridge

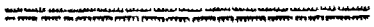


(b) Bascule bridge, that can be opened



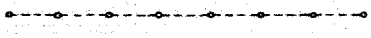
19 Ferry (Fy.)

21 Dam



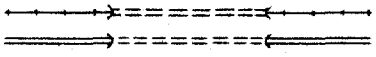
(25) Levee

(26) Lava flow



(27) Log boom

(28) Submerged piling, piling, stumps, and snags



(29) Tunnel (railroad or road)

(30) Viaduct

I. Buildings

When the buildings are prominent, they may be shown by landmark symbol with descriptive note. (see L-63)
The landmark symbol is used to indicate positions of objects when accurately determined.

1			City or town (large scale)
(1a)			City or town (small scale)
3		Vil.	Village
4		Cas.	Castle
5		Ho.	House
8		Ch.	Church
10			Temple
12			Mosque
13			Minaret
14		Pag.	Pagoda
16		Mony.	Monastery
18	Cem.	Cem.	Cemetery
19		Ft.	Fort (actual shape charted)
23	Airport		Airplane landing field
24			Airport (large scale)
			Small scale
(24a)			Airport (military)
(24b)			Airport (civil)
26	First St.		Street
27		Tel.	Telegraph
29		P.O.	Post Office
30		Govt.	Government
32		Hosp.	Hospital
34		Magz.	Magazine
35	MON.		Monument
36	CUP.		Cupola
37		elev.	elevation elevator elevated
40	Ruins		Ruins
41	TR.		Tower
42			Windmill
44	CHY.		Chimney
46			Oil tank
47		Facty.	Factory
(56)	GAB		Gable
(57)		Sch.	School
(58)		H.S.	High School
(59)		Univ.	University
(60)		Inst.	Institute
(61)		Co.	Company
(62)		Corp.	Corporation
(63)		Cap.	Capitol
(64)			Courthouse
(65)		Cath.	Cathedral
(66)		Bldg.	Building
(67)		Pav.	Pavilion
(68)		Ltd.	Limited
(69)		Apt.	Apartment
(70)		T.	Telephone
(71)			
(72)			

J. Miscellaneous Stations

2	Sta.	Station
3	C. G.	Coast Guard (similar to LS.S.)
(3a)	C. G. WALLIS SANDS	When the building is a landmark
6	LS.S.	Lifesaving station (See J-3)
7	Rkt. Sta.	Rocket station
8	PIL. STA.	Pilot station
9	Sig. Sta.	Signal station
10	Sem.	Semaphore
19	FS.	Flagstaff
(20)	W. B. SIG. STA.	Weather Bureau signal station
(21)	FP.	Flagpole
(22)	F. TR.	Flag tower
(23)	LOOK. TR.	Lookout tower
(24)	S'PIPE	Standpipe
(25)	BELL	On land
(26)		
(27)		

K. Lights

1		Position of light
2	Lt.	Light
3	LH.	Lighthouse
4	AERO	Aeronautical light
5		Lighted beacon
6		Lightship
7		Lighted buoy
10	REF	Reflector
(17)	Priv maintd	Private light (maintained by private interests; to be used with caution)
21	F	Fixed
22	Occ	Occulting
23	Fl	Flashing
24	Qk Fl	Quick flashing
(24a)	I Qk	Interrupted quick
26	Alt	Alternating
27	Gp Occ	Group occulting
28	Gp Fl	Group flashing
(28a)	S-L	Short-long
29	F Fl	Fixed and flashing
30	F Gp Fl	Fixed and group flashing
31	Rot.	Rotating
(39)	m.; min.	minutes
(40)	sec.	seconds
44		visible
44a	M.	nautical mile
47	Gp.	group
49	SEC	sector
61	Vi.	violet
63	Bu.	blue
64	G.	green
65	Or.	orange
66	R.	red
67	W.	white
(67a)	Am.	amber
68	OBSC	obscured
69	(U)	unwatched
70	Occas	occasional
71	Irreg.	irregular
73	Temp.	temporary
80	Vert.	vertical
81	Hor.	horizontal
(82)	D.	destroyed
(82a)	Exting.	extinguished
(83)	V. B.	vertical beam
(84)	Exper.	experimental
(85)	RGE	range
(86)	AERO	aeronautical

L. Buoys and Beacons

On entering a channel from seaward, buoys on starboard side are red with even numbers, on port side black with odd numbers. Lights on buoys on starboard side of channel are red or white, on port side white or green. Mid-channel buoys have black and white vertical stripes. Obstruction buoys are green, or have red and black horizontal bands. This system does not always apply to foreign waters. The dot of the buoy symbol, and the small circle of the light vessel and mooring buoy symbols and the center of the beacon symbol indicate their positions.

1	•	Position of buoy
2		Lighted buoy
3	BELL	Bell buoy
(3a)	GONG	Gong buoy
4	WHIS	Whistle buoy
5	C	Can buoy
6	N	Nun buoy
7	SP	Spherical buoy
8	S	Spar buoy
(8a)		Checkered buoy
12		Lightship
14	BW	Fairway buoy (B. & W. V. S.) (Mid-Channel)
18	RB RB	Junction buoy (R. & B. H. B.)
19	RB RB	Isolated danger buoy (R. & B. H. B.)
20	RB G	Wreck or obstruction buoy (R. & B. H. B.) or (G.)
22		Mooring buoy
24	Y Quar.	Quarantine buoy
(27)	BW	Fish trap buoy (W. & B. H. B.)
(28)		Anchorage buoy
(29)	Priv. maintd.	Maintained by private interests; to be used with caution
31	H. B.	Horizontal bands
32	V. S.	Vertical stripes
33	Chec.	checkered
41	W.	white
42	B.	black
43	R.	red
44	Y.	yellow
45	G.	green
(46)	Br.	brown
(47)	Gy.	gray
(48)	T.B.	temporary buoy
52	△RW Bn △W Bn ▲R Bn ▲ Bn	Unlighted beacon (Daybeacon)
(52a)	MARKER	Private aid to navigation
53	Bn	Beacon (See L-52)
63		Landmark
(63a)		Landmark, position approx
(64)	REF	Reflector
(65)	WOr WOr	Special purpose buoy

Note: Buoy and beacon symbols with topmarks may be shown on charts of foreign waters.

M. Radio and Radar Stations

1	R. Sta.	Radio station
2	R.T.	Radio telephone
3	R. Bn.	Radiobeacon
7	R. D. F.	Radio direction finder station
9	R. TR.	Radio tower
(9a)	R. MAST	Radio mast
(10)	R. TR. (WEAF)	Commercial broadcast
11	Ra.	Coast radar station
12	Racon	Radar responder beacon
(13)	Ra. Ref.	Radar reflector
(14)	Ra. (conspic.)	Radar conspicuous object
(15)	Ramk.	Ramark

N. Fog Signals

1	Fog Sig.	Fog signal station
6	SUB-BELL	Submarine fog bell (mechanical)
7	SUB-OSC.	Submarine oscillator
8	NAUTO.	Nautophone
9	DIA.	Diaphone
11	SIREN	Fog siren
12	HORN	Fog trumpet
13	HORN	Fog horn
14	BELL	Fog bell
15	WHIS.	Fog whistle
16	REED	Reed horn
17	GONG	Gong
(18)	D. F. S.	Distance finding station
(19)	GUN	Fog gun
(20)		

O. Dangers

(25)	
1	Rocks which do not cover; with their elevations above M.H.W.
* uncovers 2 ft | *(2)	
2	Rocks that cover and uncover, with heights in feet above datum of soundings
*	
(3a)	When rock of 2 is considered a danger to navigation
+	
(4a)	Sunken rock
+	
(4b)	When rock of 4a is considered a danger to navigation
(2) Rk	
(4c)	Shoal sounding on isolated rock replaces symbol
(21) Rk (21) Wk (21) Obstr	
6a	Sunken danger with depth cleared by wire drag (Feet or fathoms)
reef line	
10	Coral or rocky reef (below datum of soundings) See A-11g
11	Stranded wreck (any portion of hull above datum of soundings)
masts	
12	Sunken wreck with only masts visible
14	Dangerous sunken wreck with less than 10 fathoms of water over it (See 6a)
wreckage	
(14a)	A number of sunken wrecks
(21) Obstr	
(14b)	Obstruction of any kind

(51) wreck	
15	Wreck of known depth
16	Sunken wreck, not dangerous to surface navigation or over which the depth exceeds 10 fathoms
foul	
17	Foul ground
tide rips | Symbol used only in small areas	
18	Overfalls or tide rips
eddies	
19	Eddies
kelp | Symbol used only in small areas	
20	Kelp, any kind
(20a)	

21	Bk.	bank
22	Shl.	shoal
23	Rf.	reef
24	Le.	ledge
25		breakers (see A-12)
27	Obstr.	obstruction
28	Wk.	wreck
(28a)	Wks.	wreckage
33	cov.	covers
34	uncov.	uncovers
35	Rep.	reported
(35a)	Shoal (rep. 1948)	shoal reported
36	Discol.	discolored
41	P. A.	position approximate
42	P. D.	position doubtful
43	E. D.	existence doubtful
44	Pos.	position
(46)		
(47)		

P. Various Limits

1		Leading line (Range line)
4		Limit of sector
5		Channel or course recommended
(5a)		Alternate course
7	Cable area	Submarine cable
8	Pipeline Pipeline area	Submarine pipe line
9		Maritime limits in general
10		Limit of fishing zone (fish trap areas bounded by broken lines)
11		Limit of dumping ground (see Nos. P-9 & G-13)
12		Anchorage limit
13	Airport	Limit of airport
16		International boundary (also State boundary)
18		Ice limits
(21)	Bdy.	Boundary
(22)	Bdy. Mon.	Boundary monument
(23)		Reservation line

T. Tides and Currents

1	H.W.	high water
(1a)	H.H.W.	higher high water
2	L.W.	low water
(2a)	L.L.W.	lower low water
3	M.T.L.	mean tide level
4	M.S.L.	mean sea level
6	Sp.	spring tide
7	Np.	neap tide
(8a)	M.H.W.	mean high water
(8b)	M.H.H.W.	mean higher high water
(9a)	M.L.W.	mean low water
(9b)	M.L.L.W.	mean lower low water
10	I.S.L.W.	Indian spring low water
17	Str.	stream
18		current, general
19	2 kn	flood stream
20	2 kn	ebb stream
23	vel.	velocity
24	kn.	knots
(25)	1 2 3 4 5 6 7 8 9 10 11 0	Current Diagram, with explanatory note
(26)		

Q. Soundings

2	27	No bottom sounding
5	30 FEET MAY 1939	Dredged channels (controlling depth may be shown in separate note)
9	17 119	Swept areas (shown by green tint) (not yet covered by sufficient hydrographic surveys to show adequate soundings)
(9a)	22 18	Areas swept by wire drag to depth indicated
(12)	19	Soundings taken from older surveys or smaller scale charts
(16)	6 5 2a	Stream
(17)		Soundings on reefs that uncover
(18)		

R. Depth Contours & Tints

Feet	Fathoms
0	0
6	1
12	2
18	3
24	4
30	5
36	6
60	10
120	20
180	30
240	40
300	50
600	100
1,200	200
1,800	300
2,400	400
3,000	500
6,000	1,000
12,000	2,000
18,000	3,000
Or 10 fathoms and greater	

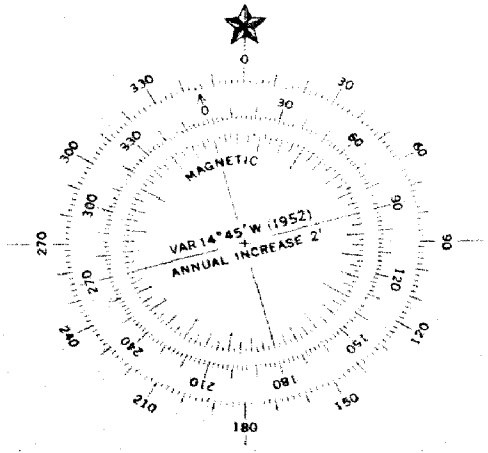
10

Or 100 (blue)

S. Quality of the Bottom

1	Grd.	ground
2	S.	sand
3	M.	mud
4	Oz.	ooze
5	Ml.	marl
6	Cl.	clay
7	G.	gravel
8	Sn.	shingle
9	P.	pebbles
10	St.	stones
(10a)	Sp.	specks
11	Rk.	rock
(11a)	Bld. (s)	boulder (s)
12	Ck.	chalk
13	Qz.	quartz
14	Co.	coral
(14a)	Co. Hd.	coral head
15	Md.	madrepore
(16a)	Vol. Ash.	volcanic ash
17	La.	lava
18	Pm.	pumice
19	T.	tufa
20	Sc.	scoriae
21	Cn.	cinders
22	Mn.	manganese
23	Sh.	shells
24	Oys.	oysters
25	Ms.	mussels
26	Spg.	sponge
27	Grs.	grass
28	Wd.	weeds
32	Fr.	foraminifera
33	Gl.	globigerina
34	Di.	diatom
35	Rd.	radiolaria
36	Pt.	pteropod
37	Po.	polyzoa
39	fne.	fine
40	crs.	coarse
41	sft.	soft
42	hrd.	hard
43	stf.	stiff
44	sml.	small
45	lrg.	large
46	stk.	sticky
47	brk.	broken
(47a)	rky.	rocky
50	spk.	speckled
51	gty.	gritty
53	fly.	flinty
54	glac.	glacial
56	wh.	white
57	bk.	black
59	bu.	blue
60	gn.	green
61	yl.	yellow
63	rd.	red
64	br.	brown
66	gy.	gray
67	lt.	light
68	dk.	dark
(69)	Ca.	calcareous
(70)		

U. Compass



Compass Rose

The outer circle is in degrees with zero at true north. The inner circles are in points and degrees with the arrow indicating magnetic north.

1	N.	north
2	E.	east
3	S.	south
4	W.	west
5	NE.	northeast
6	SE.	southeast
7	SW.	southwest
8	NW.	northwest
21	brg.	bearing
23	mag.	magnetic
24	var.	variation
(27)	deg.	degrees
(28)	dev.	deviation

Light Characteristics and Typical Lighted Buoys

PORT SIDE

Entering from seaward (read up)
Color: BLACK Numbers: ODD

COLOR OF LIGHTS

Green or White

SLOW FLASHING

(at regular intervals)

OCCULTING

(at regular intervals)

QUICK FLASHING

Marking important turns, etc., where particular caution is required.

Lighted

"5" Fl G 3sec
"5" Fl 3sec
"5" Occ G 3sec
"5" Occ 3sec
"5" Qk Fl G
"5" Qk Fl

Lighted Bell or Gong

"5" Fl G 3sec BELL
"5" Fl 3sec BELL
"5" Occ G 3sec BELL
"5" Occ 3sec BELL
"5" Qk Fl G BELL
"5" Qk Fl BELL

Lighted Whistle or Horn

"5" Fl G 3sec WHIS
"5" Fl 3sec WHIS
"5" Occ G 3sec WHIS
"5" Occ 3sec WHIS
"5" Qk Fl G WHIS
"5" Qk Fl WHIS

For JUNCTIONS or OBSTRUCTIONS

COLOR OF LIGHTS

White, Red or Green

INTERRUPTED QUICK FLASHING

For MID-CHANNEL or FAIRWAY

COLOR OF LIGHTS

White only

SHORT-LONG FLASHING

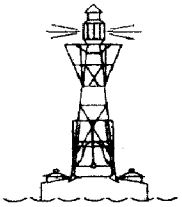
No special shapes

Buoy colors same as for unlighted buoys.

Lighted

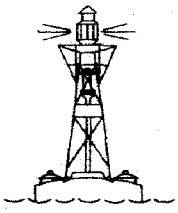
RB Qk Fl
RB Qk Fl R
RB Qk Fl G
BW "CH" S-L Fl

Lighted Bell or Gong



RB Qk Fl BELL
RB Qk Fl R BELL
RB Qk Fl G BELL
BW "CH" S-L Fl BELL

Lighted Whistle or Horn



RB Qk Fl WHIS
RB Qk Fl R WHIS
RB Qk Fl G WHIS
BW "CH" S-L Fl WHIS

STARBOARD SIDE

Entering from seaward (read up)
Color: RED Numbers: EVEN

COLOR OF LIGHTS

Red or White

SLOW FLASHING

(at regular intervals)

OCCULTING

(at regular intervals)

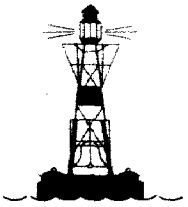
QUICK FLASHING

Marking important turns, etc., where particular caution is required.

Lighted

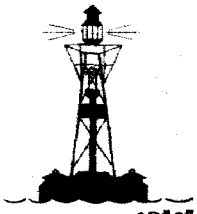
"6" Fl R 4sec
"6" Fl 4sec
"6" Occ R 3sec
"6" Occ 3sec
"6" Qk Fl R
"6" Qk Fl

Lighted Bell or Gong



"6" Fl R 3sec BELL
"6" Fl 3sec BELL
"6" Occ R 3sec BELL
"6" Occ 3sec BELL
"6" Qk Fl R BELL
"6" Qk Fl BELL

Lighted Whistle or Horn



"6" Fl R 3sec WHIS
"6" Fl 3sec WHIS
"6" Occ R 3sec WHIS
"6" Occ 3sec WHIS
"6" Qk Fl R WHIS
"6" Qk Fl WHIS

Combination lighted buoys may contain both light and *BELL*, *GONG*, *WHIS* or *HORN*.
Lights on buoys are white unless otherwise indicated.
Reflectors *(REF)* may be indicated on all floating aids.

Lighted Mooring Buoy

Qk Fl "C"

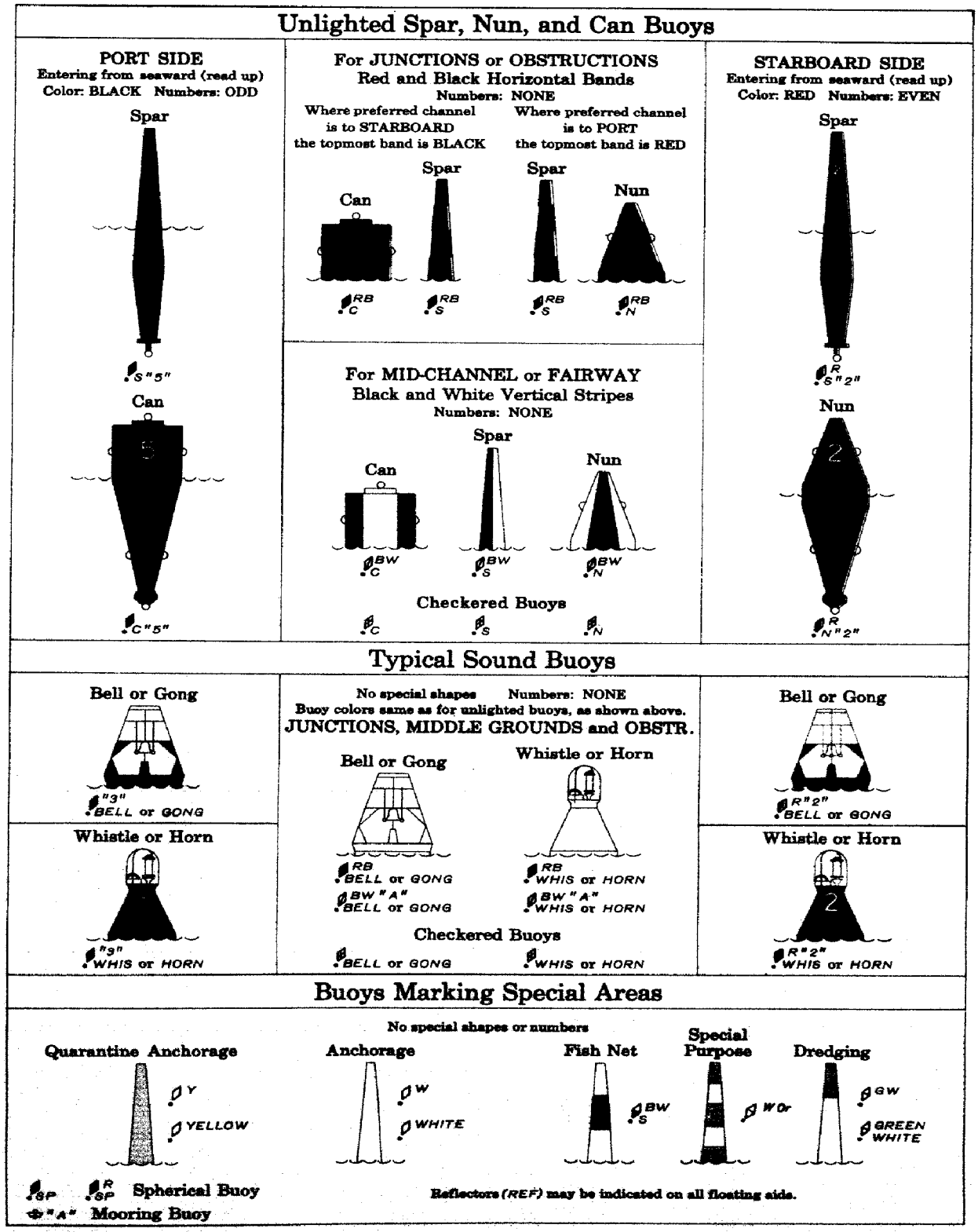
Lightship

BRENTON REEF
Occ 4sec 13M DIA

F, Fl, Gp Fl, Qk Fl, Occ, Gp Occ — May be used as prefix to any color light

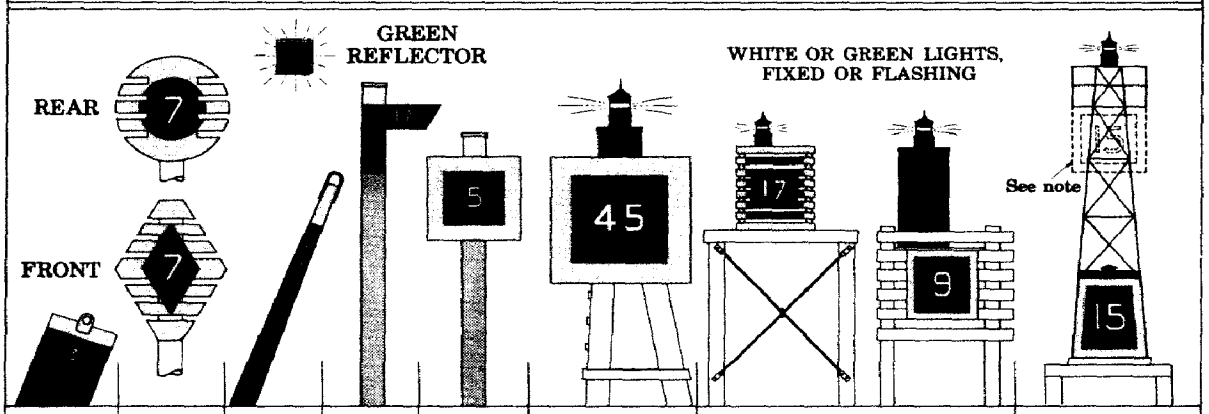
"5" Fl G 3sec
"2" Fl R 4sec
W "2C" Fl 2sec

Lighted buoyage of the United States with explanation of their standard chart symbols and abbreviations.



Unlighted buoyage of the United States with explanation of their standard chart symbols and abbreviations.

TYPES OF AIDS TO NAVIGATION
INTRACOASTAL WATERWAY

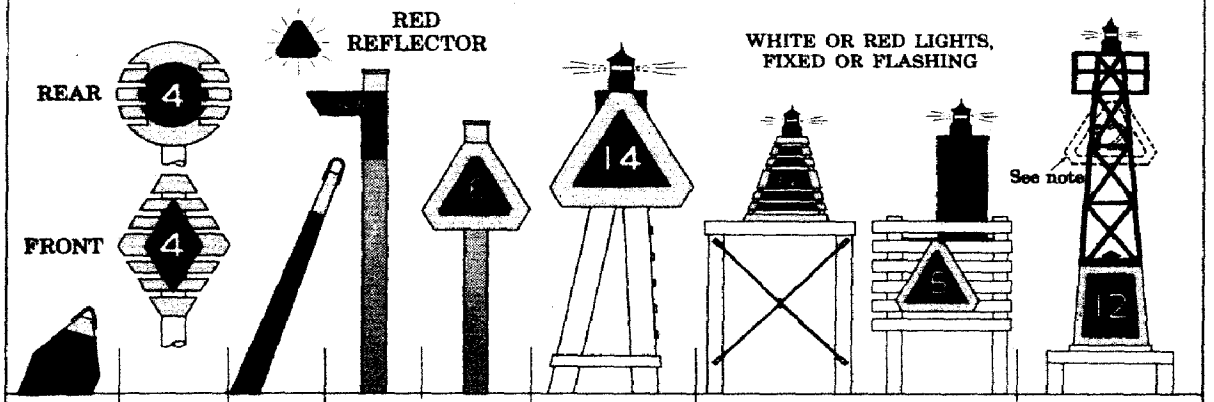


SPECIAL (S) CAN BUOY	RANGES ROUND, OVAL OR DIAMOND	SPAR BUOY 2nd.-4th. Class	DAYBEACONS Pointer	DAYBEACONS Daymark	3 PILE DOLPHIN	SLATTED, PILE STRUCTURES	SKELETON STRUCTURES
C "3"	"7" "7"	S "7"	"17"	"5"	Fl 2sec "45"	Fl G 5sec "17" F "9"	F G "15"

Supporting Structure may be painted White or Aluminum.

Note:- Daymark (shown dotted) added where needed. Border and number on Daymark where used.

PORT Side of channel (Black with Odd Numbers) entering from north and east and traversed to south and west respectively.

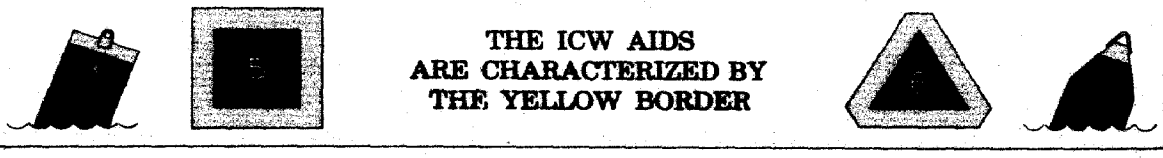


SPECIAL (S) NUN BUOY	RANGES ROUND, OVAL OR DIAMOND	SPAR BUOY 2nd.-4th. Class	DAYBEACONS Pointer	DAYBEACONS Daymark	3 PILE DOLPHIN	SLATTED, PILE STRUCTURES	SKELETON STRUCTURES
R N "12"	R "4" R "4"	R S "14"	R "14 A"	R "6"	Fl 2sec "14"	Fl R 5sec "12" F "6"	F R "12"

Supporting Structure may be painted White or Aluminum.

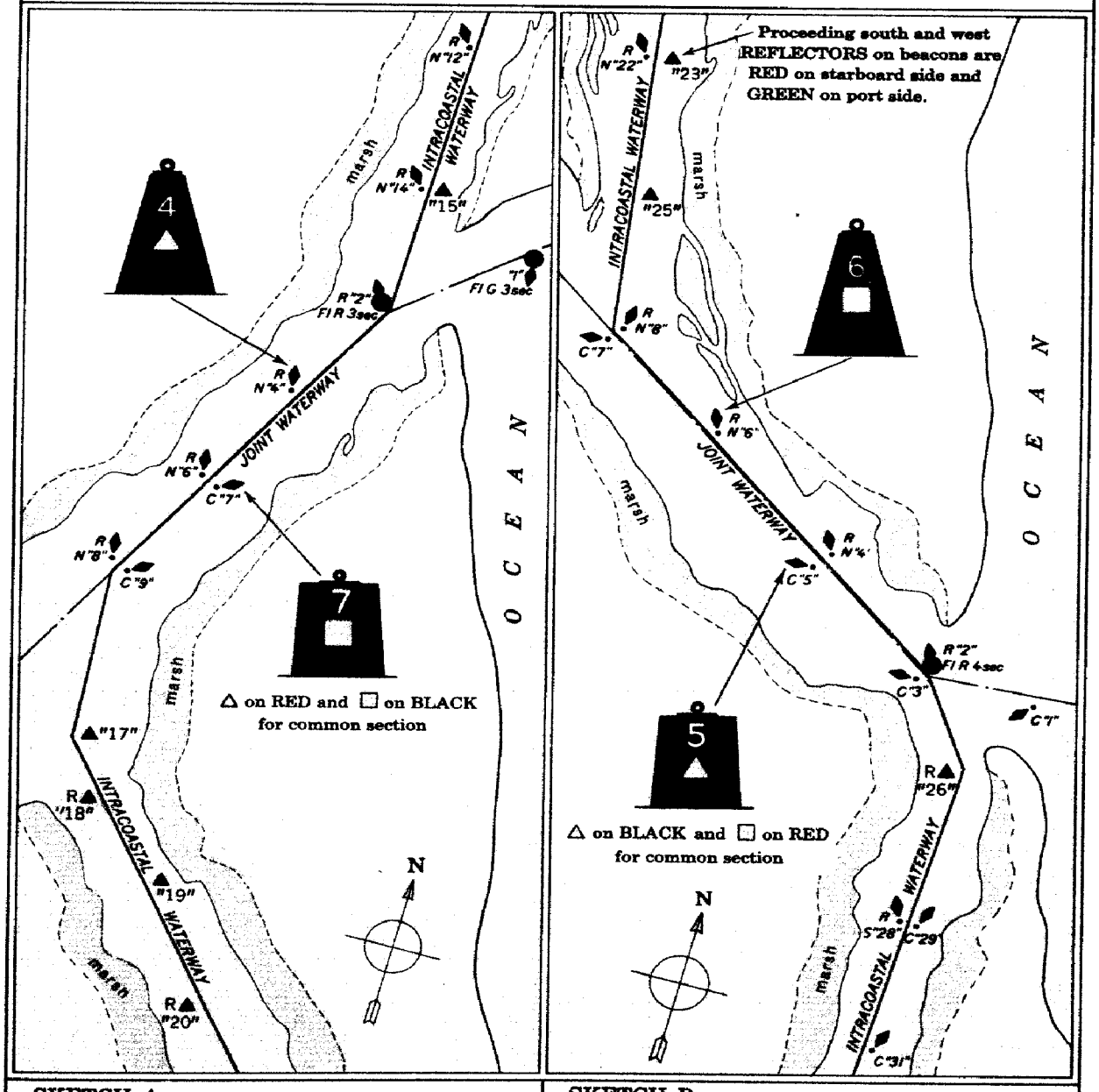
Note:- Daymark (shown dotted) added where needed. Border and number on Daymark where used.

STARBOARD Side of channel (Red with Even Numbers) entering from north and east and traversed to south and west respectively.



THE ICW AIDS ARE CHARACTERIZED BY THE YELLOW BORDER

ILLUSTRATING THE SYSTEM OF DUAL PURPOSE MARKING WHERE THE ICW AND OTHER WATERWAYS COINCIDE



SKETCH A:

ICW joins another waterway, which is numbered from seaward, at buoy No. 2 and is common with it to buoy No. 9. ICW numbers and yellow borders are omitted in this section but the △ or □ is used on the regular aids to designate the ICW.

SKETCH B:

ICW joins another waterway at buoy No. 8 and is common with it to buoy No. 3. This section is numbered in the opposite direction to that of the ICW. The ICW numbers and yellow borders are omitted from the regular aids but a △ or □ is shown to designate the ICW.

Distance of Visibility of Objects at Sea

The following table gives the approximate geographic range of visibility for an object which may be seen by an observer whose eye is at sea level; in practice, therefore, it is necessary to add to these a distance of visibility corresponding to the height of the observer's eye above sea level.

Height, feet	Nautical miles	Height, feet	Nautical miles	Height, feet	Nautical miles	Height, feet	Nautical miles	Height, feet	Nautical miles
6	2. 8	48	7. 9	220	17. 0	660	29. 4	2, 000	51. 2
8	3. 1	50	8. 1	240	17. 7	680	29. 9	2, 200	53. 8
10	3. 6	55	8. 5	260	18. 5	700	30. 3	2, 400	56. 2
12	4. 0	60	8. 9	280	19. 2	720	30. 7	2, 600	58. 5
14	4. 3	65	9. 2	300	19. 9	740	31. 1	2, 800	60. 6
15	4. 4	70	9. 6	320	20. 5	760	31. 6	3, 000	62. 8
16	4. 6	75	9. 9	340	21. 1	780	32. 0	3, 200	64. 9
18	4. 9	80	10. 3	360	21. 7	800	32. 4	3, 400	66. 9
20	5. 1	85	10. 6	380	22. 3	820	32. 8	3, 600	68. 6
22	5. 4	90	10. 9	400	22. 9	840	33. 2	3, 800	70. 7
24	5. 6	95	11. 2	420	23. 5	860	33. 6	4, 000	72. 5
26	5. 8	100	11. 5	440	24. 1	880	34. 0	4, 200	74. 3
28	6. 1	110	12. 0	460	24. 6	900	34. 4	4, 400	76. 1
30	6. 3	120	12. 6	480	25. 1	920	34. 7	4, 600	77. 7
32	6. 5	130	13. 1	500	25. 6	940	35. 2	4, 800	79. 4
34	6. 7	140	13. 6	520	26. 1	960	35. 5	5, 000	81. 0
36	6. 9	150	14. 1	540	26. 7	980	35. 9	6, 000	88. 8
38	7. 0	160	14. 5	560	27. 1	1, 000	36. 2	7, 000	96. 0
40	7. 2	170	14. 9	580	27. 6	1, 200	39. 6	8, 000	102. 6
42	7. 4	180	15. 4	600	28. 0	1, 400	42. 9	9, 000	108. 7
44	7. 6	190	15. 8	620	28. 6	1, 600	45. 8	10, 000	114. 6
46	7. 8	200	16. 2	640	29. 0	1, 800	48. 6		

Conversion Table, Degrees to Points and Vice Versa

° ′	Points	° ′	Points	° ′	Points	° ′	Points
0 00	N	90 00	E	180 00	S	270 00	W
2 49		92 49		182 49		272 49	
5 38	N ½ E	95 38	E ½ S	185 38	S ½ W	275 38	W ½ N
8 26		98 26		188 26		278 26	
11 15	N x E	101 15	E x S	191 15	S x W	281 15	W x N
14 04		104 04		194 04		284 04	
16 53	N x E ½ E	106 53	ESE ½ E	196 53	S x W ½ W	286 53	WNW ½ W
19 41		109 41		199 41		289 41	
22 30	NNE	112 30	ESE	202 30	SSW	292 30	WNW
25 19		115 19		205 19		295 19	
28 08	NNE ½ E	118 08	SE x E ½ E	208 08	SSW ½ W	298 08	NW x W ½ W
30 56		120 56		210 56		300 56	
33 45	NE x N	123 45	SE x E	213 45	SW x S	303 45	NW x W
36 34		126 34		216 34		306 34	
39 23	NE ½ N	129 23	SE ½ E	219 23	SW ½ S	309 23	NW ½ W
42 11		132 11		222 11		312 11	
45 00	NE	135 00	SE	225 00	SW	315 00	NW
47 49		137 49		227 49		317 49	
50 38	NE ½ E	140 38	SE ½ S	230 38	SW ½ W	320 38	NW ½ N
53 26		143 26		233 26		323 26	
56 15	NE x E	146 15	SE x S	236 15	SW x W	326 15	NW x N
59 04		149 04		239 04		329 04	
61 53	NE x E ½ E	151 53	SSE ½ E	241 53	SW x W ½ W	331 53	NNW ½ W
64 41		154 41		244 41		334 41	
67 30	ENE	157 30	SSE	247 30	WSW	337 30	NNW
70 19		160 19		250 19		340 19	
73 08	ENE ½ E	163 08	S x E ½ E	253 08	WSW ½ W	343 08	N x W ½ W
75 56		165 56		255 56		345 56	
78 45	E x N	168 45	S x E	258 45	W x S	348 45	N x W
81 34		171 34		261 34		351 34	
84 23	E ½ N	174 23	S ½ E	264 23	W ½ S	354 23	N ½ W
87 11		177 11		267 11		357 11	

Conversion Tables

FEET TO METERS

Feet	0	1	2	3	4	5	6	7	8	9
0	0. 00	0. 30	0. 61	0. 91	1. 22	1. 52	1. 83	2. 13	2. 44	2. 74
10	3. 05	3. 35	3. 66	3. 96	4. 27	4. 57	4. 88	5. 18	5. 49	5. 79
20	6. 10	6. 40	6. 71	7. 01	7. 32	7. 62	7. 92	8. 23	8. 53	8. 84
30	9. 14	9. 45	9. 75	10. 06	10. 36	10. 67	10. 97	11. 28	11. 58	11. 89
40	12. 19	12. 50	12. 80	13. 11	13. 41	13. 72	14. 02	14. 33	14. 63	14. 93
50	15. 24	15. 54	15. 85	16. 15	16. 46	16. 76	17. 07	17. 37	17. 68	17. 98
60	18. 29	18. 59	18. 90	19. 20	19. 51	19. 81	20. 12	20. 42	20. 73	21. 03
70	21. 34	21. 64	21. 95	22. 25	22. 55	22. 86	23. 16	23. 47	23. 77	24. 08
80	24. 38	24. 69	24. 99	25. 30	25. 60	25. 91	26. 21	26. 52	26. 82	27. 13
90	27. 43	27. 74	28. 04	28. 35	28. 65	28. 96	29. 26	29. 57	29. 87	30. 17

FATHOMS TO METERS

Fathoms	0	1	2	3	4	5	6	7	8	9
0	0. 00	1. 83	3. 66	5. 49	7. 32	9. 14	10. 97	12. 80	14. 63	16. 46
10	18. 29	20. 12	21. 95	23. 77	25. 60	27. 43	29. 26	31. 09	32. 92	34. 75
20	36. 58	38. 40	40. 23	42. 06	43. 89	45. 72	47. 55	49. 38	51. 21	53. 03
30	54. 86	56. 69	59. 52	60. 35	62. 18	64. 01	65. 84	67. 67	69. 49	71. 32
40	73. 15	74. 98	76. 81	78. 64	80. 47	82. 30	84. 12	85. 95	87. 78	89. 61
50	91. 44	93. 27	95. 10	96. 93	98. 75	100. 58	102. 41	104. 24	106. 07	107. 90
60	109. 73	111. 56	113. 39	115. 21	117. 04	118. 87	120. 70	122. 53	124. 36	126. 19
70	128. 02	129. 85	131. 67	133. 50	135. 33	137. 16	138. 99	140. 82	142. 65	144. 47
80	146. 30	148. 13	149. 96	151. 79	153. 62	155. 45	157. 28	159. 11	160. 93	162. 76
90	164. 59	166. 42	168. 25	170. 08	171. 91	173. 74	175. 56	177. 39	179. 22	181. 05

NAUTICAL MILES TO STATUTE MILES

1 nautical mile=6,080.20 feet. 1 statute mile=5,280 feet.

Nautical miles	0	1	2	3	4	5	6	7	8	9
0	0. 000	1. 152	2. 303	3. 455	4. 606	5. 758	6. 909	8. 061	9. 212	10. 364
10	11. 515	12. 667	13. 819	14. 970	16. 122	17. 273	18. 425	19. 576	20. 728	21. 880
20	23. 031	24. 183	25. 334	26. 486	27. 637	28. 789	29. 940	31. 092	32. 243	33. 395
30	34. 547	35. 698	36. 850	38. 001	39. 153	40. 304	41. 456	42. 607	43. 759	44. 911
40	46. 062	47. 214	48. 365	49. 517	50. 668	51. 820	52. 971	54. 123	55. 275	56. 426
50	57. 578	58. 729	59. 881	61. 032	62. 184	63. 335	64. 487	65. 639	66. 790	67. 942
60	69. 093	70. 245	71. 396	72. 548	73. 699	74. 851	76. 003	77. 154	78. 306	79. 457
70	80. 609	81. 760	82. 912	84. 063	85. 215	86. 366	87. 518	88. 670	89. 821	90. 973
80	92. 124	93. 276	94. 427	95. 579	96. 730	97. 882	99. 034	100. 185	101. 337	102. 488
90	103. 640	104. 791	105. 942	107. 094	108. 246	109. 397	110. 549	111. 701	112. 852	114. 004

STATUTE MILES TO NAUTICAL MILES

Statute miles	0	1	2	3	4	5	6	7	8	9
0	0. 000	0. 868	1. 737	2. 605	3. 474	4. 342	5. 210	6. 079	6. 947	7. 816
10	8. 684	9. 552	10. 421	11. 289	12. 158	13. 026	13. 894	14. 763	15. 631	16. 500
20	17. 368	18. 236	19. 105	19. 973	20. 842	21. 710	22. 578	23. 447	24. 315	25. 184
30	26. 052	26. 920	27. 789	28. 657	29. 526	30. 394	31. 262	32. 131	32. 999	33. 868
40	34. 736	35. 604	36. 473	37. 341	38. 210	39. 078	39. 946	40. 815	41. 683	42. 552
50	43. 420	44. 288	45. 157	46. 025	46. 894	47. 762	48. 630	49. 499	50. 367	51. 236
60	52. 104	52. 972	53. 841	54. 709	55. 578	56. 446	57. 314	58. 183	59. 051	59. 920
70	60. 787	61. 655	62. 524	63. 392	64. 261	65. 129	65. 997	66. 866	67. 734	68. 603
80	69. 471	70. 339	71. 208	72. 076	72. 945	73. 813	74. 681	75. 550	76. 418	77. 287
90	78. 155	79. 023	79. 892	80. 760	81. 629	82. 497	83. 365	84. 234	85. 102	85. 971