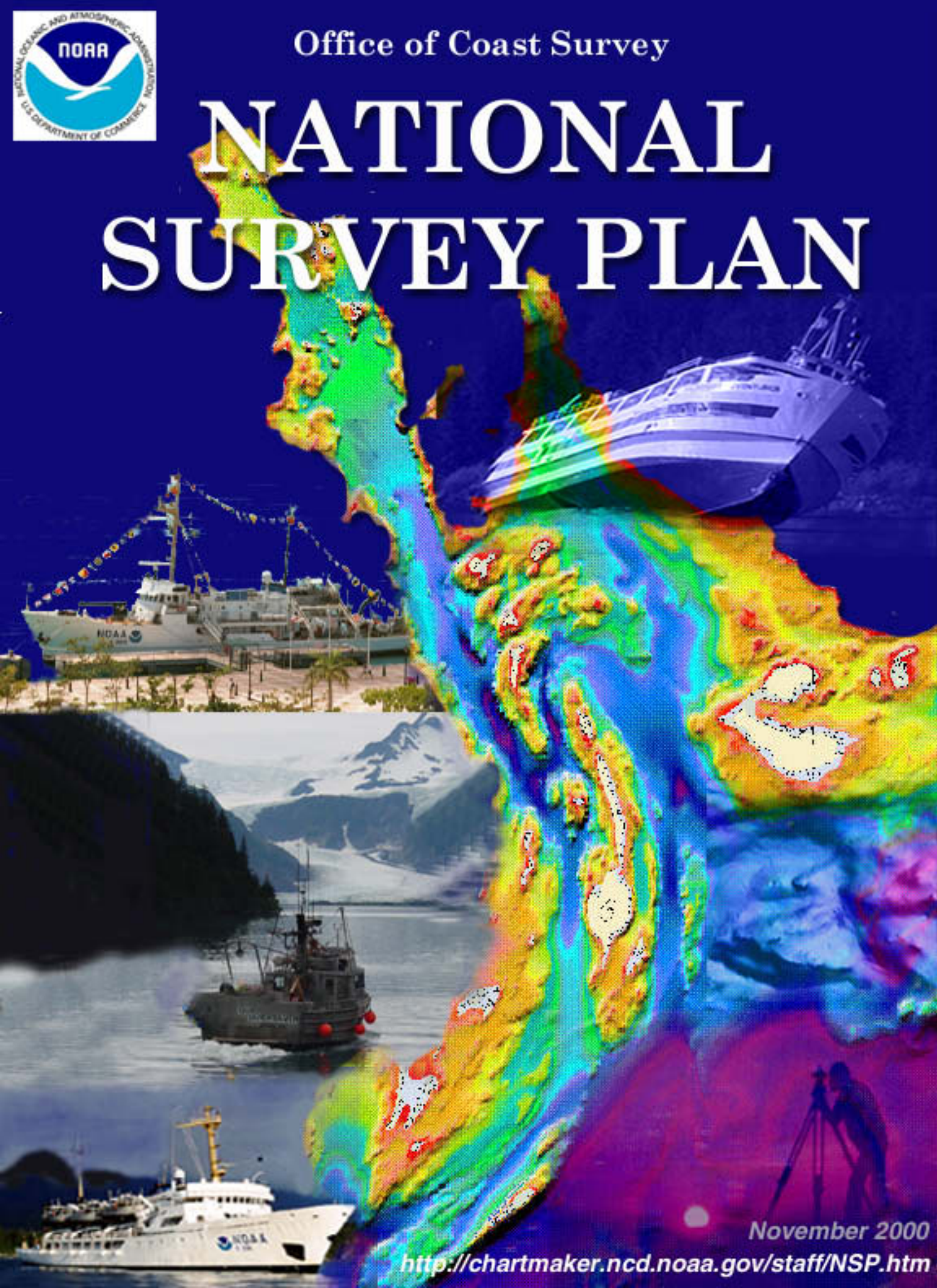
Office of Coast Survey

NATIONAL SURVEY PLAN



November 2000

http://chartmaker.ncd.noaa.gov/staff/NSP.htm

National Survey Plan

Introduction

The statutory mandate of the National Oceanic and Atmospheric Administration (NOAA) authorizes NOAA to provide nautical charts and related hydrographic information for the safe navigation of maritime commerce as well as provide basic data for engineering, scientific and other commercial and industrial activities. This mandate applies to the U.S. Exclusive Economic Zone (EEZ), an area of 3.4 million square nautical miles which extends 200 nautical miles offshore from the nation's coastline.

Maritime commerce has escalated since the 1950s and is projected to double within the next 20 years. This increase in commerce accompanies expansion of the length, width, and draft of ships carrying cargo; 1000-foot long, 120-foot wide, 50-foot draft vessels are not uncommon on our Nation's waterways. Today, more than 95% of U.S. foreign trade by weight (two billion tons) travels by sea. Approximately one half of this cargo is petroleum or hazardous materials. **Safe and efficient movement of goods through U.S. ports is vital to maintaining a competitive standing in global economics.** Additionally, environmental damage caused by vessel groundings and collisions at sea is cause for increasing concern. These trends emphasize the critical need for high-accuracy nautical charts to support a safe and profitable waterways system. The production of high-quality charts depends on the availability of up-to-date, reliable hydrographic survey data.

NOAA developed this National Survey Plan to address current trends in maritime navigation and to support NOAA Promote Safe Navigation (PSN) and interagency Marine Transportation System (MTS) initiatives.

Critical Need for Modern Surveys

To meet its charting mandate, NOAA maintains a suite of approximately 1000 nautical charts that cover the EEZ. Many areas portrayed on nautical charts have never been adequately surveyed. Nearly half of the depths published on current charts were measured using lead line techniques before 1940. Additionally, sounding distributions can exceed 500 meters and may not represent significant water depths.

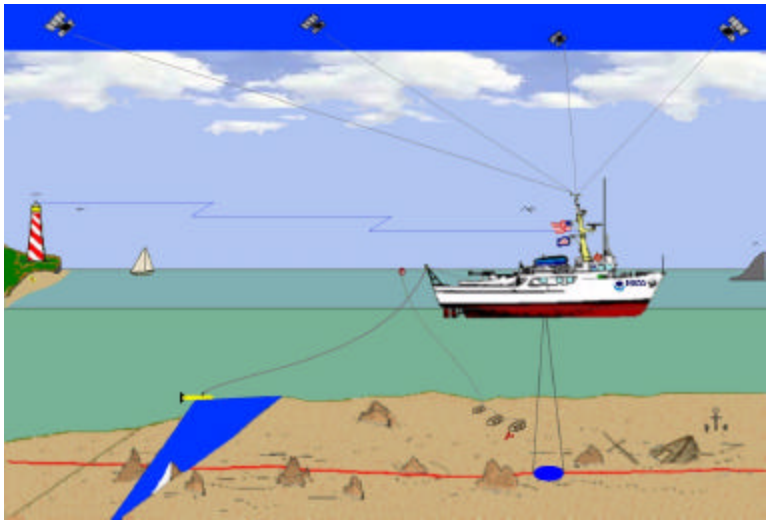
Historic surveys prove insufficient on modern charts for many reasons. Current sounding inventories represent a partial description of the seafloor. Widely spaced survey lines may not contain adequate soundings to portray rocks and obstructions which protrude above the sea bottom. Many navigation areas are dynamic; shoals, wrecks, bridges and changing shorelines are hazards that warrant periodic observation. Historic sounding positions are less accurate than positioning available to modern vessels using the Global Positioning System (GPS) and electronic navigation chart (ENC) systems. Navigators may not understand these and other accuracy limitations of data from older surveys and may place their vessels at risk.

Hydrographic Surveying

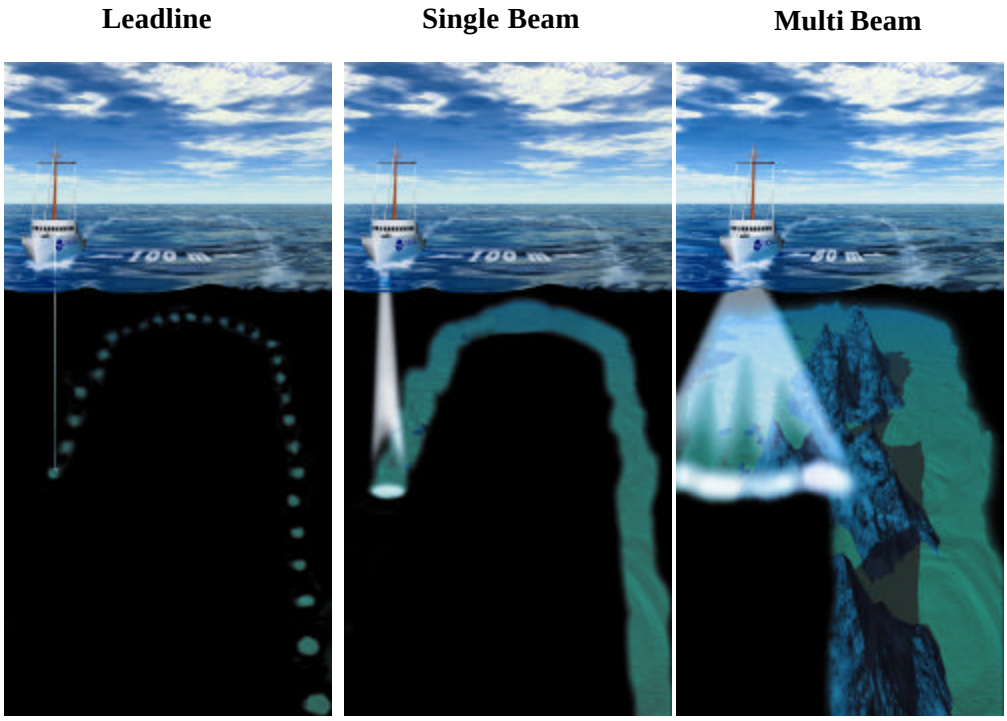
Data collection and compilation for nautical charts are the principle objectives of a hydrographic survey. Hydrographic survey data support a variety of maritime functions including port and harbor maintenance (dredging), coastal engineering (beach erosion and replenishment studies), coastal zone management, and offshore resource development. The primary data associated with all hydrographic surveys is water depth; however, there is also considerable interest in sea-floor composition (i.e., sand, mud, rocks) due to its implications for anchoring, dredging, marine construction, pipeline and cable routing, and essential fisheries habitat.

Data acquisition for nautical chart updates begins with the selection of a survey area and deployment of resources to accurately and efficiently conduct the survey. Following extensive planning, NOAA government or contractor field units conduct hydrographic survey operations. Survey teams calibrate all sounding systems prior to data acquisition to assure proper equipment operation. Data accuracy must comply with predetermined specifications. The field unit also installs tide gauges to monitor water level variations in the survey area. NOAA Center for Operational Oceanographic Products and Services (CO-OPS) receives tide gauge information via geostationary satellites and continuously monitors transmissions to detect instrument malfunctions.

GPS satellite systems provide precise positioning for survey data and additional accuracy is determined using the U.S. Coast Guard Differential GPS (DGPS) network. Fixed land stations monitor variations in GPS satellite signals and transmit correctors to survey platforms during data acquisition. DGPS broadcast sites provide correctors for most survey areas, but the remote areas, such as Alaska, require the placement and maintenance of independent DGPS ground reference stations.



Primary depth measurements are measured with multibeam sonar, or with a single beam echosounder if multibeam is not available. Multibeam technology obtains hundreds more soundings per unit time than single beam systems and covers a wide swath of the ocean floor. Some surveys employ sidescan sonar systems, which use a towed instrument to assist in detecting objects (wrecks, rocks, or other obstructions) that project from the sea floor. As potential hazards to navigation, these objects must be fully investigated by multibeam sonar or divers. Side scan and multibeam sonar are modern systems which provide "100% bottom coverage" of the sea floor, greatly enhancing the ability to detect hazards "undiscovered" by earlier surveys.



A hydrographic survey incorporates numerous other measurements or observations. These include sampling of the sea floor bottom material to determine adequate anchorage areas and precise positioning of aids to navigation, conspicuous landmarks, and offshore drilling structures. Also documented are the variations in the shoreline location or features along the shore (new piers, pilings, bulkheads).

Data acquisition produces millions of measurements, which need to be verified and complied to produce an accurate, understandable graphic depiction of the survey area. A digital version of the survey and a hard copy "smooth sheet" are produced for final quality assurance, nautical chart compilation, and archiving. A descriptive report accompanies each survey and provides detailed descriptions of items that cannot be explained in graphic form.

Prioritizing Survey Needs

Prioritizing survey areas to maximize the efficiency of the limited resources available for conducting hydrographic surveys is essential. To accomplish this, the 3.4 million square nautical miles of the EEZ were examined for navigational significance, giving highest priority to those nearshore areas with the greatest threat of natural and manmade hazards to marine navigation. As a result, approximately 500,000 square nautical miles of the EEZ were deemed "navigationally significant."

Navigationally Significant

Navigationally significant areas are defined differently in some areas due to varying characteristics of the sea floor. For instance, the offshore limit of the navigationally significant area of southern Alaska and the Pacific Islands is defined to be 100 fathoms, because of the rugged nature of the bottom. From shore, depths increase rapidly, but offshore rocky pinnacles rise from great depths to create potential hazards to navigation. Along the East and West coasts, this type of bottom configuration is much less likely to occur; a 20 fathom offshore limit is adequate to protect against likely natural hazards. The navigationally significant areas are therefore defined as the area from the coastline out to a depth of:

- 20 fathoms (120 feet) along the Atlantic and Pacific coasts,
- 20 fathoms (120 feet) in the eastern Gulf of Mexico,
- 50 fathoms (300 feet) in the western Gulf of Mexico,
- 100 fathoms (600 feet) in southern Alaska (Gulf of Alaska)
- 100 fathoms (300 feet) in western Alaska (Bering Sea)
- 20 fathoms (120 feet) along the north slope of Alaska,
- 20 fathoms (120 feet) in the Caribbean around Puerto Rico and the Virgin Islands
- 100 fathoms (600 feet) in the Pacific Islands.

The fjords and sounds of the Pacific Northwest and Alaska pose one exception to the depth limit. In these narrow waterways, the navigationally significant area extends from shoreline to shoreline, regardless of depth, in order to avoid a narrow strip of unprioritized (and unsurveyed) area down the center of the fjord. In addition, in the Great Lakes the navigationally significant area extends from shore to shore or from shore to the U.S./Canada maritime border.

Critical Areas

Navigationally significant areas are then subdivided based on the need for hydrographic surveys. The highest priority areas are called "Critical Areas." Critical survey areas are waterways with high commercial traffic volumes (cargo, fishing vessels, cruise ships, ferries, etc.), extensive petroleum or hazardous material transport, compelling requests from users, and/or transiting vessels with low under-keel clearance over the seafloor.

In 1994, NOAA identified approximately 43,000 square nautical miles, primarily coastal shipping lanes and approaches to major U.S. ports, as **critical areas.** These critical areas have also been referred to as the **critical survey backlog**. The critical survey area:

< Encompasses less than 1.5% of the entire U.S. EEZ.
< Represents only 9% of the navigationally significant areas.
< In addition, over 40% of all critical survey areas are in Alaskan waters.

Since the inception of the concept of critical areas in 1994, the NOAA hydrographic fleet and private contractors have reduced the critical survey backlog by approximately 10,500 square nautical miles.

Resurvey Areas

The examination of an area with modern survey methods does not preclude the need for subsequent surveys. Some areas require periodic surveys due to naturally occurring changes (e.g., silting, shoal migration, earthquakes), increased vessel size, or other changes in the navigational use of the area. Because most resurvey requirements are driven by natural changes to the sea floor, the time frame for resurveying varies by area. For example, Fire Island Shoal in Anchorage must be resurveyed every 2 to 3 years, while portions of the approaches to Chesapeake Bay and Delaware Bay can be resurveyed every 5 to 7 years.

Most areas identified for periodic resurveying fall within one of the critical survey areas. Over 5,000 square nautical miles have been defined as resurvey areas.

Other Priorities

The remaining navigationally significant areas can be subdivided into five priority levels, which are based on the age of the prior surveys in those areas and, to a lesser extent, vessel usage. The age of the survey is classified into three technological eras: pre-1940 surveys consisting of lead line soundings and sextant positioning; 1940 to 1970 surveys consisting of single beam echo sounders and improved positioning methods (including some electronic positioning); and post-1970 surveys consisting of modern automated survey technologies, electronic positioning and, in later years, DGPS positioning and full-bottom survey coverage.

Since 1994, the U.S. Coast Guard, marine pilots, and port authorities have identified numerous additional areas as critical to safe navigation and in need of new hydrographic surveys. These are due in some cases to geologic changes and in others to changes in vessel usage. For example: 1) sedimentation occurs near river mouths and many Alaskan glaciers have retreated miles inland, exposing uncharted sea bottom and potential navigation hazards to the increasing number of passenger ships cruising ever closer to glaciers, 2) Traffic patterns in some ports have been altered due to the increasing size of commercial vessels, new pier construction, sedimentation, and dredging.

Priority One

Assigned to navigationally significant areas that have:

< pre-1940 prior surveys
< petroleum transports over 1,000,000 tons or
< chemical transport over 100,000 tons or
< cargo traffic over 5,000,000 tons or
< passenger transport over 10,000

Nearly 73,000 square nautical miles are defined as Priority One.

Priority Two

Assigned to navigationally significant areas that have prior surveys dated prior to 1940, but no specified traffic level.

Over 120,000 square nautical miles are defined as Priority Two .

Priority Three

Assigned to navigationally significant areas that have pre-1970 prior surveys that have not been categorized previously as priority one or two.

Nearly 93,000 square nautical miles are defined as Priority Three.

Priority Four

Assigned to those areas with post-1970 prior surveys that have not been defined as a critical area.

Over 59,000 square nautical miles defined as Priority Four.

Post-1970 surveys were conducted primarily with electronic navigation, digital data acquisition and processing systems. However, they did not necessarily obtain the 100% bottom coverage of today's equipment.

Priority Five

Assigned to areas in the Gulf of Mexico and Alaska regions. These are areas of greater depth, 20-60 fathoms in the Gulf of Mexico, 20 - 100 fathoms in Alaska, which have unsurveyed areas or pre-1940 prior surveys where there is high traffic, numerous obstructions or highly irregular sea-floor topography.

Over 160,000 square nautical miles are defined as Priority Five.

The table below shows the mileage breakdown, in square nautical miles, of each priority level. The sum of the remaining critical areas plus the four priority areas equals the total of the navigationally significant areas.

NOAA/NOS Hydrographic Surveys Division

National Survey Plan

November, 2000

	Navigation Significant	Critical Areas Planned	Critical Areas Remaining	Resurvey Areas	Priority 1 Areas	Priority 2 Areas	Priority 3 Areas	Priority 4 Areas	Priority 5 Areas
East Coast	49,650	9,310	6,190	1,590	6,800	6,120	13,800	16,740	0
Gulf of Mexico	69,430	13,190	10,950	2,590	10,690	8,720	14,770	9,870	14,430
West Coast	5,150	1,470	1,050	430	0	2,530	770	800	0
Alaska	358,900	18,630	13,950	640	50,200	93,840	30,360	24,910	145,640
Great Lakes	46,250	270	270	0	4,760	3,260	32,600	5,360	0
Hawaii and Pacific Islands	6,640	70	70	0	130	5,350	440	650	0
Carribbean Islands	1,540	60	60	0	230	460	110	680	0
Total Areas	537,560	43,000	32,540	5,250	72,810	120,280	92,850	59,010	160,070

All areas reported in square nautical miles.

Conclusion

It is important to note that this document is dynamic and will evolve over time. The graphics shown are a snapshot of the current priorities. The National Survey Plan can be viewed on the world wide web at http://chartmaker.ncd.noaa.gov/staff/NSP.htm. The areas and associated numbers will change as surveys are completed and as shipping conditions change. For example, a port that today is defined as not critical may attain critical status if shipping levels increase or a new oil terminal is built. Similarly, an area defined as critical today may drop to a lower priority if shipping levels decrease or an oil terminal closes.

Please submit any comments or questions regarding the National Survey Plan to Chief, Hydrographic Surveys Division at HSD.Inquiries@NOAA.gov.

The safe maritime transport of people and cargo is vitally important to the economic and environmental health of the Nation. The U.S. maintains infrastructure based on modern hydrographic surveys which greatly reduce the risk of undiscovered hazards to navigation. This National Survey Plan identifies and prioritizes the areas in greatest need of such surveys, thereby ensuring the most efficient use of taxpayer- provided resources.

Vessels Currently Acquiring Hydrographic Data for NOAA