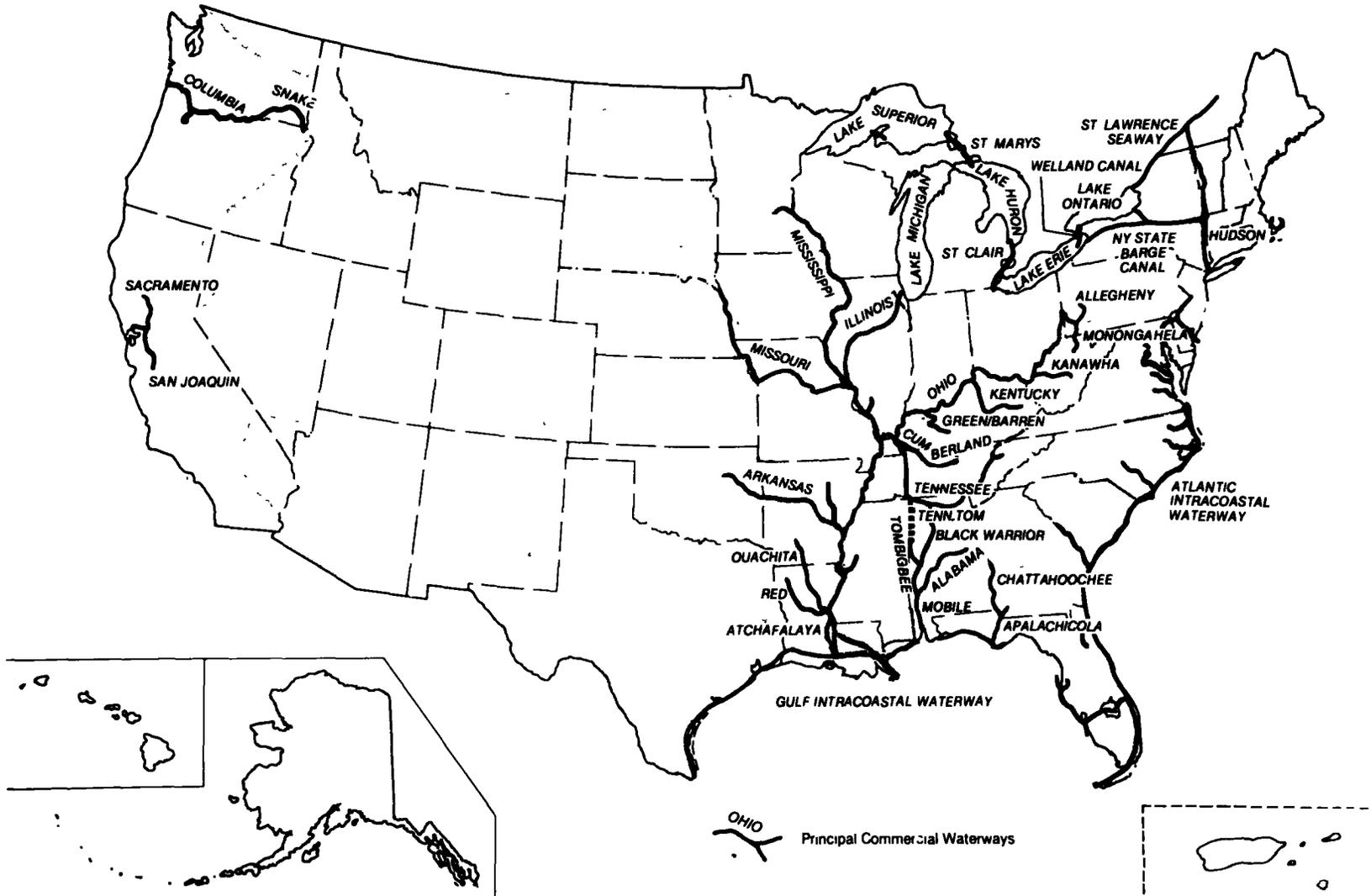


National Waterways Study □ History of Navigation & Navigation Improvements on the Pacific Coast

HISTORY OF NAVIGATION & NAVIGATION IMPROVEMENTS ON THE PACIFIC COAST



THE NATIONAL WATERWAYS PACIFIC COAST



HISTORY OF
NAVIGATION &
NAVIGATION
IMPROVEMENTS
ON THE
PACIFIC COAST

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January 1983
Navigation History NWS-83-11

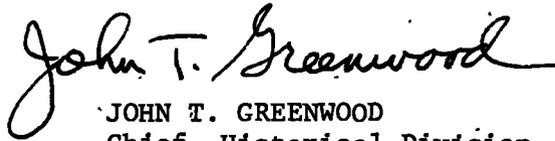
AUTHORITY FOR THE NATIONAL WATERWAYS STUDY

The Congress authorized the National Waterways Study (NWS) and provided the instructions for its conduct in Section 158 of the Water Resources Development Act of 1976 (Public Law 94-587):

The Secretary of the Army, acting through the Chief of Engineers, is authorized and directed to make a comprehensive study and report on the system of waterway improvements under his jurisdiction. The study shall include a review of the existing system and its capability for meeting the national needs including emergency and defense requirements and an appraisal of additional improvements necessary to optimize the system and its intermodal characteristics. The Secretary of the Army, acting through the Chief of Engineers, shall submit a report to Congress on this study within three years after funds are first appropriated and made available for the study, together with his recommendations. The Secretary of the Army, acting through the Chief of Engineers, shall upon request, from time to time, make available to the National Transportation Policy Study Commission established by Section 154 of Public Law 94-280, the information and data developed as a result of the study.

PREFACE

This pamphlet is one of a series on the history of navigation done as part of the National Waterways Study, authorized by Congress in Public Law 94-587. The National Waterways Study is an intensive review by the Corps of Engineers' Institute for Water Resources of past, present, and future needs and capabilities of the United States water transportation network. The Historical Division of the Office of the Chief of Engineers supervised the development of this pamphlet, which is designed to present a succinct overview of the subject area.

A handwritten signature in cursive script that reads "John T. Greenwood". The signature is written in black ink and is positioned above the printed name and title.

JOHN T. GREENWOOD
Chief, Historical Division

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Chapter 1

EARLY NAVIGATION ALONG THE PACIFIC COAST

Beginning in the 16th century, western European explorers sailed up and down the Pacific Coast, slowly discovering its natural harbors while searching futilely for wealth and the Northwest Passage.¹ Spain played the principal role in collecting navigation information of the Pacific Coast. Spurred by discoveries of wealth in the Aztec and Inca empires in Central and South America, the Spanish sent sea and land expeditions further north to investigate uncharted shores and unknown lands.²

Legends about fabulous wealth in the Californias, and in the magical cities like Quivira and Cibola also inspired the Spanish.³ Hernando Cortes and other explorers sought a northwest passage to Asia, which appeared on a map in 1562 as the Strait of Anian.

Cortes' last expedition in 1539-1540 under Francisco de Ulloa reached the head of the Gulf of California, sailed back down to the tip of Baja California, and rounded Cape San Lucas reaching Cabo del Engano at 30° north latitude. This expedition cartographically established Baja California as a peninsula, but not until 1701, when Padre Kono supplied additional evidence, did the "island" of California disappear from maps and globes.⁴

In 1542 and 1543 Joao Ridrigues Cabrillo explored the California coast in two ships, discovering San Diego Bay, which he called San Miguel; traversing the Santa Barbara channel; visiting the villages of the Chumash Indians; and naming geographic features. The expedition, however, failed to sight the entrance to San Francisco Bay. At Cabrillo's death in 1543, his chief pilot, Bartholomé Ferrelo may have reached the 44° latitude just north of the southern boundary of Oregon.⁵

Since Spain kept geographic details and sailing knowledge secret for security reasons, later expeditions usually sailed ignorant of previous successes. The Board of Trade, however, did add new navigation data to the Padrón Real, a master chart, closely secured in Seville. The Board released portions of the Padrón Real when necessary to carefully selected Spanish explorers.⁶

The Spanish expanded their knowledge of the winds and currents of the Pacific Ocean beginning in 1527 with Cortes' first expedition

under the command of Alvaro Saavedra. The expedition sailed west to the Moluccas, but encountered only disaster. In 1542 Lopes de Villalobos led an expedition that took possession of the Philippines for Spain. Miguel Lopes de Legazpi's conquest of the islands in 1565 formalized Spanish control of the islands and assured its control of the Pacific Ocean.⁷ With Manila as the center of Spanish trade in Asia, a new route between the Philippines and New Spain was imperative.

In 1566 Fray Andres de Urdaneta and Eastaban Rodriguez established a route from Manila to Acapulco by following prevailing winds and currents across the North Pacific and then south along the Pacific Coast pushed by northwesterly coastal winds.⁸ To find a place for shelter and repairs for Manila galleons, Spain further explored the California coast searching for harbors of refuge. But a foggy coast; exhaustion from the difficult voyage, the fear of shoals, reefs and rocks; and trepidation over possible trials for violating orders prevented the masters of the Manila galleons from exploring the Pacific Coast.⁹

In 1579 the English captain Francis Drake destroyed Spanish dominance in the Pacific by successfully raiding Spanish shipping along the coasts of Central and South America.¹⁰ Emulating Drake, another English sea captain, Thomas Cavendish, with three heavily armed vessels that preyed on relatively defenseless Manila galleons, not only duplicated Drake's circumnavigation in 1587-1588, but also captured more booty than Drake.¹¹

These raids stimulated further Spanish exploration of Alta California and showed the need for a harbor of refuge for Manila galleons. Spain also wanted to discover the Strait of Anian. Prior to the Cavendish raid, Francisco Gali, sailing from Manila in 1584, made landfall on the California coast at approximately 37°50' north latitude and concluded he had spotted the Strait of Anian.¹² In 1587 Pedro de Unamuno anchored either at Morrow Bay or the waters of Santa Cruz, but fog and hostile Indians prevented him from exploring the Alta California coast and persuaded him to head for the haven of Acapulco.¹³ The final attempt in the 16th century to explore the Alta California coast failed when in 1595 Sebastian Rodriguez Cermeno's vessels ran aground after having made landfall at around 42° north latitude.¹⁴

With the support of royal funds, Sebastian Vizcaino led an exploratory expedition in 1602-1603 to chart the Pacific Coast from Cabo San Lucas to Cape Mendocino. Violating his instructions not to change the Cabrillo place names, Vizcaino renamed most of the bays, points, and islands he charted. Vizcaino's work permanently influenced the cartography and navigation of California. Expeditions in the last quarter of the 18th century studied his logs, reports, and maps before voyaging

northward along the California coast. The expedition, however, failed to discover San Francisco Bay. It reported sighting the mouths of large rivers north of Cape Mendocino, and later generations concluded from this that there was a northwest passage between the Atlantic and Pacific Oceans. Until the late 18th century this confused the cartography of western North America.

Vizcaino also discovered a very good harbor of refuge, which he named Monterey for the Viceroy of New Spain. Vizcaino recommended Monterey Bay as a shelter for the Manila galleons to replenish their supplies and spirits. The new Viceroy, however, thought that Monterey was too far from New Spain's settled areas to be defended. He also deemed it unwise to establish a port on the California coast, which he feared would attract rival nations to the area.¹⁵

After Vizcaino, Spain's official policy discouraged further explorations northward, partly because Spanish leaders feared the discovery of a northwest passage would harm Spanish interests in the Pacific. Spain also lacked the resources to expand northward. Foreseeing no economic benefits from further explorations, private interests abandoned efforts at exploiting the area.¹⁶

Henry R. Wagner concluded that:¹⁷

The first period of active exploration of the northwest coast which began with the expedition of Ulloa, ended with that of Vizcaino. In spite of all difficulties encountered a fairly thorough examination of the coast had been made as far north as Pt. Reyes and some knowledge of it, at least, had been obtained as far as Pt. St. George.

During the 17th century Spanish explorers, missionaries, and soldiers planted settlements in Baja, California, and colonized New Mexico. In 1701 Padre Kino proved by his travels that California was not an island. Spain did not begin to colonize San Diego and Monterey until 1769.¹⁸ A century and a half passed before Spain once again worked to strengthen its mastery of the Pacific, especially against the English, who were becoming more active in the area, and the Russians, who had long been established on the North Pacific Coast.

Having expanded across northern Asia to reach the Pacific Ocean, by 1700 Russia began to explore the north Pacific and Arctic waters. In 1728 Vitus Bering discovered the strait that bears his name.

Competition among trading companies helped advance exploration of the Pacific Coast.¹⁹ The sea otter that ranged from Kamchatka to Baja, California, attracted the Russians and later the English and Americans. The Russian fur trade in the Aleutians added to the geographical knowledge of the North Pacific and built up a thriving trade with the Chinese, who highly prized the sea otter's fur. With the fur trade vital to the Siberian economy, Russia expanded into the North Pacific.

Reacting to Russian activities and English efforts to find the Northwest Passage, in 1769 Visitador José de Galvaez and Viceroy Carlos Francisco de Croix of Mexico organized an expedition to colonize Alta California, explore the Pacific Coast to the Aleutians, and establish a base in the North Pacific. Captain Gaspar de Portola commanded the expedition, which included a group of Franciscan missionaries led by Fray Junipero Serra. Two vessels were sent to meet the expedition at San Diego, but only one vessel arrived. When the Spanish reached San Diego, Father Serra established the first of 21 missions. Portola pushed on to Monterey Bay, which he failed to recognize because of the 17th-century explorers' glorified description of it. More importantly, Portola discovered San Francisco Bay, which had eluded previous sea explorers.²⁰ In 1774 Captain Juan Bautista de Anza established a land route from Mexico to Alta California. In 1775-1776 he led settlers to Monterey and established a presidio and mission at San Francisco.²¹

To explore the continental coastline beyond California, Spanish authorities sent an expedition under Juan José Pérez in 1774 and one under sea captains, Bruno de Hezeta and Juan Francisco de la Bodega in 1775. Pérez first sighted land near the present Alaska-Canada boundary, encountered the Haida tribe off the Queen Charlotte Islands, and reached the latitude of 55°30'. On his return, Pérez saw Vancouver Island and sighted Nootka Sound, alleged to be the most strategically important harbor north of San Francisco Bay.

Pérez, however, missed the Strait of Juan de Fuca. Whether Juan de Fuca, after whom the strait is named, actually made the voyage of discovery is controversial. His name was attached on maps of the Pacific Northwest in 1787 when Captain Charles Barkley found the long lost strait, which he named after the alleged discoverer. Barkley's discovery eliminated a notable gap in the cartography of these waters.²²

To strengthen their sovereignty in this area and to evict non-Spaniards, Spain ordered a second expedition north in 1775. During this expedition, Captain Hezeta recorded seeing the Columbia River,

which he called Rio de San Roque. Spain's policy of secrecy, coupled with Hezeta's failure to explore the river, allowed Robert Gray in 1792 to name it after his vessel, Columbia. This not only supplanted Hezeta's label on European maps but, more important, laid the basis for the American claim to Oregon.

In the meantime Bodega, with the second vessel, located a sound that he named Bucareli and travelled north to 58°30'. On his return trip to Monterey, Bodega located Tomales Bay naming it for his family. (A smaller inlet just to the north is today Bodega Bay.) Based on these expeditions Spain believed that its claims over the area were secure from foreign encroachment.²³

By 1779 cartographical discoveries made it impossible to construct a fairly complete map of the Pacific Coast as high as 58°. Spanish navigators thoroughly knew the bays of San Francisco, Bodega, Trinidad, Bucareli, and Remidios. In addition, Spain had taken formal possession at four different coastal sites between San Francisco and the 58th parallel.²⁴

The British obtained a copy of the journal of Hezeta's 1775 expedition. From the journal, Captain James Cook learned about Spain's geographic accomplishments, which he concluded had reached 58°20' north latitude. In 1775 the British equipped an expedition led by Cook to determine if the Northwest Passage between the Atlantic and Pacific existed. In 1778 Cook explored the coast from Oregon at 44°31' north, sailing far enough north to conclude that a northwest passage did not exist. Continuing northward, he placed English names on large islands, straits, and mountains, supplanting the Spanish toponymy. Cook's discoveries laid the foundations for British claims to the northwest coast.²⁵

Wagner concluded that the high price that Cook received in China for a few otter skins led to the dispute over the place he called Nootka Sound. After Cook's trip to China and return to England, British fur traders rushed to the Pacific Coast. The result was a complete exploration of most of the coast as well as a conflict with the Spanish who objected to the British settlements.²⁶

Spanish authorities, unsuccessfully, debated how to stop Cook's explorations. In 1779, however, the same year in which the Cook expedition, without Cook, returned to examine the coast further, Spain sent out an expedition under Ignacio de Arteaga. Arteaga carried the latest charts of the North Pacific, including one with Russian information. At the entrance to Prince William Sound, Arteaga

took formal possession for the Spanish crown, reiterating Spanish claims to sovereignty as far as 61⁰ north latitude.

Spain, however, failed to pursue her claims along the Pacific Coast. Spain did not anticipate that the lucrative sea otter pelts would bring traders from other nations, which would challenge Spain's claims to sovereignty of the Pacific Coast. Spain's failure to publicize the achievements of the expeditions of 1774, 1775, and 1779 destroyed her claims to sovereignty based on prior discovery. Moreover, Spanish involvement in the American Revolution against Great Britain forced Madrid to concentrate on protecting the valuable established parts of the empire. Spain no longer had the resources to legitimize its claims.²⁷

Swarming with the lucrative sea otter that brought fabulous prices in China, Nootka Sound became the focus of international rivalry. After 1785 merchants from several nations rushed there, aware that late-comers faced diminishing fur resources. An American, John Ledyard, who served as a marine on Cook's Northwest Pacific expedition, impressed on Thomas Jefferson the potential value to American interests of the Northwest Pacific waters and lands. Ledyard also influenced merchants in Boston, Salem, and New York, who provided two ships, the Columbia and Lady Washington, with capable captains, John Kendrick and Robert Gray. In September 1788, both ships arrived in Nootka Sound. In 1790, Captain Gray returned after successfully circumnavigating the world. The expedition was a commercial failure; however, the merchants backed a second expedition under Captain Gray on the Columbia.

President George Washington and Secretary of State Thomas Jefferson urged Gray to cooperate with Spanish authorities on the western coast, but still conduct his trading activities. From 1790 to 1793 Gray sailed the waters of the Pacific Northwest, secured a cargo of furs, and sailed for China where he reaped a handsome profit for his American backers. More significant than his commercial success was his rediscovery of the "Great River of the West," which he named after his ship. The new nation now stood ready to challenge the older, more powerful European nations for control of the Pacific Coast.²⁸

France also chose this time to determine its role on the Pacific Coast, and sent a well-equipped expedition commanded by Jean Francis Galaup, Comte de la Perouse, to take possession of land beyond Spanish territory, evaluate French fur-trading prospects, gather scientific information, and circumnavigate the globe. After visiting Alaska's Lituya Bay, Galaup concluded that he lacked the resources to explore the heavily indented shores of the North Pacific Coast. Thereupon, he sailed south, replenished his supplies at Monterey, and disappeared

forever in the South Pacific. By sending his journals overland from Kamchatka, however, he insured the survival of information collected by his expedition. Galaup advised France not to make any claims in the Northwest, in order not to lose Spain's friendship.²⁹

Russia equipped an expedition in 1790, ostensibly for scientific purposes, under Joseph Billings, an English sea captain, who reinforced Russia's claims to Alaska. Russian ships pursued the sea otter south along the Pacific Coast, bringing Russia closer to California and New Spain, which alarmed Spanish authorities.³⁰

Faced with these challenges to its claims and chagrined by the acclaim that the official British and French expeditions received in Europe, Spain planned the most elaborate scientific expedition in its naval history. Spain also wished to improve the general maps of the west coasts of North and South America. In 1791 Commander Alejandro Malaspina arrived in the Pacific to spend a month exploring, measuring, cataloging, and depicting the relatively unknown Pacific Coast. After exploring many passages off Yukatat Bay, Malaspina also concluded that a northwest passage did not exist. Malaspina, however, urged Spanish authorities to participate in the sea otter trade, for Spain possessed special trade advantages with its established route to Asia by way of Manila and its items from Mexico and California such as copper, cloth, and abalone shells, which the Northwest Indians preferred. Unable to compete with Spanish merchants, foreign merchants would abandon the Pacific Coast, leaving it to Spanish control. Foreign traders easily prevented that from happening.³¹

To strengthen its claims to the Pacific Northwest, and contest Spanish authority, England relied on diplomacy and exploration. A dispute over the Spanish seizure of English vessels at Nootka Sound nearly resulted in war. The Spanish, however, were far too weak to enforce their claims to the entire Pacific Northwest. In the face of British threats, the government in Madrid yielded and signed on 28 October 1790 the Nootka Sound Convention. By its terms, Spain acknowledged Britain's right to navigate and fish in the Pacific and to trade and establish settlements in the interior. The Convention effectively opened the western coast of North America to Canadian expansion.

Following their dispute, both Great Britain and Spain sent expeditions to establish claims and explore unknown passageways. The two nations were particularly interested in the Strait of Juan de Fuca, which had been only partially explored. An easy waterway into the North American interior would offer a significant advantage in a

contest for control of the Northwest. In the words of one authority, sovereignty "became a matter of occupancy--the hinge on which, before another half century was out, the whole Oregon question between the United States and Great Britain would swing."³²

Spain sent expeditions to learn if any of the strait's channels penetrated Hudson or Baffin Bays. By charting the coast from Bucareli Sound southward, Jacinto Caamano unveiled a maze of islands, channels, and inlets that proved that land previously considered part of the mainland was an archipelago.³³ In 1792 Spain established a fort at Neah Bay.

Because of an account published in 1802, Alcalá Galiano and Cayitano Valdes' expeditions of 1792 are the best known. During their investigation of the Strait of Juan de Fuca, they encountered Captain George Vancouver's British expedition. This Spanish voyage also confirmed that the strait was not the long-sought Northwest Passage.³⁴ Unfortunately for Spain, it failed to publicize Galiano and Valdes' geographical and navigational studies of the Pacific Coast, which undermined Spain's claims to the area.

Vancouver's work, however, was published on his return to England. A veteran of Cook's expedition, Vancouver skillfully carried out his instructions to search for the elusive Northwest Passage, examine all inlets, determine the navigability of large rivers, investigate the history of any European settlements on the Northwest Coast, and exchange charts of discovery with any Spanish officials he encountered. Through his three expeditions of 1792, 1793, and 1794 he hoped to claim for Great Britain all land in the Northwest from 37°20', near where Drake had operated, to Russian Alaska. Vancouver found features within the Strait of Juan de Fuca that had escaped the Spanish. He also sometimes ignored Spanish discoveries--he renamed Boca de Caamano after one of his officers, Peter Puget. Vancouver not only examined and designated Puget Sound's many channels, but also proved it did not lead to a northwest passage. He passed through the Inland Passages to enter the Pacific Ocean. Vancouver agreed with the Spanish that the land mass behind Nootka Sound was an island (later named Vancouver Island). On 4 June 1792, Vancouver took possession of the Pacific Northwest for Great Britain, calling it New Georgia for George III. With Gray's help, he located the mouth of the Columbia River. While Gray had ascended the river some 25 miles, Vancouver's officers reached a spot over 100 miles from the ocean.³⁵

By 1800 European and American navigators had mapped the coastline and concluded that the Northwest Passage did not exist. Little improvement

on the accuracy of the recorded observations could be made until the geodetic surveys of the 19th century.³⁶ The 1802 Spanish maps and the English maps based on the charts of Vancouver and Aaron Arrowsmith, the English géographer, were in use with little change until then.

After navigators learned that the Northwest Passage did not exist, Americans and Europeans began searching for an overland route to the Pacific Ocean. The lucrative fur trade with the Indians remained the incentive. The British with their Hudson's Bay Company and the North West Company had dominated the fur trade in the Northern interior since France's defeat in 1763. The British had the greatest stake in this new route, especially as a counter against their chief rivals, the American traders. Alexander Mackenzie, a partner of the North West Company, was the first explorer to reach the Pacific Coast north of Spanish settlements. By portaging west and south from Lake Athabasca, ascending the Peace River, and finally descending the Bella Coola River, Mackenzie reached the Pacific far to the north of Vancouver Island. He missed a rendezvous with one of the boats of Vancouver's expedition by only six weeks. Mackenzie's explorations offered definite proof that there was no Northwest Passage.³⁷ To halt the Americans, Mackenzie proposed a string of trading posts connecting the Pacific Coast with Canadian establishments east of the continental divide.³⁸

After the United States acquired the Louisiana Territory, President Thomas Jefferson sent Captains Meriwether Lewis and William Clark up the Missouri River, across the continental divide, down the Snake River to the Columbia River and the Pacific Ocean. The Lewis and Clark expedition increased geographical knowledge of the area and strengthened the American claim to the Oregon country. When Lewis and Clark reached the Pacific in 1805, American vessels trading in the area outnumbered the British. Trade between the Atlantic Coast, the Northwest Coast, and China strongly aroused the interests of the politically powerful American merchants in Pacific Coast trade routes. The sea otter trade attracted American merchants to California as well as to the Northwest Coast. When the sea otter became scarce in the North Pacific, traders shifted to California waters where the sea otters still flourished. After 1800 American sea captains engaged in contraband fur operations along the California Coast.³⁹

The Russians also advanced toward California at the expense of Spain, which was forced to neglect her colonies during the Napoleonic Wars. The Russians established Fort Ross in 1812 and a fort at Honolulu. The international situation allowed the Russians an opportunity to

control the Pacific Coast; the venture failed economically, however. In 1841 the Russians sold Fort Ross to John Sutter.⁴⁰

During these years Britain and the United States resumed their rivalry in the Northwest, which centered on the Columbia River. In 1811 John Jacob Astor founded Astoria, at the mouth of the Columbia, as a trading post for trade with the interior, Russian Alaska, and China. Since the British and the Spanish had evacuated Nootka 16 years earlier, Astor had established the first European settlement between Sitka, Alaska, and Fort Ross, California. The British matched the Americans. David Thompson and a party of North West Company men founded Kullyspell House on Lake Pend Oreille in 1809 and another group established Spokane House in 1810. Thompson also travelled up the Columbia to the mouth of the Snake River to claim the watershed of the Columbia River basin for Great Britain.⁴¹

Through military conquest and diplomatic agreements the United States gained control of the Pacific Coast from the Mexican border to the 49th parallel at the expense of Indians, Spanish, Russians, and British. The navigation problems of that area became the sole responsibility of the United States.⁴²

In spite of 300 years of extensive exploration, the Pacific Coast from the Strait of Juan de Fuca to San Diego Bay remained forbidding with dangerous currents, winds, and weather patterns. Only three good harbors lay along this shoreline--majestic Puget Sound with its innumerable islands, inlets, bays, and harbors; magnificent San Francisco Bay, which gave access to the fertile inland valleys of the Sacramento and San Juaquin; and beautiful San Diego Bay.

The United States first officially explored the Pacific Coast when Charles Wilkes in 1841, commanding five naval vessels, reconnoitered the area and carefully recorded his observations in his published Narrative. To him, as well as others, the sand bar at the mouth of the Columbia River and violent winter storms appeared to make entrance into that channel virtually impossible. Wilkes related, however, that:⁴³

Nothing can exceed the beauty of these waters, and their safety: not a shoal exists within the straits of Juan de Fuca, Admiralty Inlet, Puget Sound, or Hood's Canal, that can in any way interrupt their navigation by a seventy-four gun ship. I venture nothing in saying, there is no country in the world that possesses waters equal to these.

But from the Columbia River to the California border Wilkes noted that the forested headlands, rocky beaches, sand dunes, and forbidding cliffs allowed for no port for even the smallest sea going vessels.⁴⁴

San Francisco Bay's matchless qualities as a harbor on a surfbeaten coast aroused the enthusiasm of visitors. Wilkes referred to it as one of the finest harbors in the world, which could shelter Europe's combined navies. Richard Henry Dana believed that the bay's navigation facilities and anchorage rendered it more valuable than San Diego.⁴⁵

The West's expansive unoccupied areas awaited exploitation. The key to developing the land between the Mississippi River and the Pacific Ocean depended on an improved transportation system. Steam improved communication between the Pacific Coast and the rest of the world. It not only revolutionized land travel, but also river and ocean travel. The federal government had an important role in improving the communication system. The government sponsored numerous military and postal roads, nurtured the development of railroads, and improved the navigability of harbors and rivers.⁴⁶

Until the middle of the 19th century, navigation aides along the Pacific Coast were virtually nonexistent, except for an occasional open brazier or a small oil lamp that guided ships safely into harbors. Once the United States acquired its Pacific Coast territories and the gold rush started, the public quickly pressed for improved navigation aids.

On 28 September 1850 Congress authorized the construction of 16 lighthouses on the Pacific Coast, but appropriated funds for only 9 of them. The U.S. Coast Survey selected the lighthouse sites. In 1852 Congress created a nine-member Lighthouse Board that included military and naval officers and scientists. This law also authorized the President to assign either an Army or Navy officer as an inspector for each lighthouse district. For the Eleventh District Major Hartman Bache, Army Engineer, operating out of San Francisco, increased and insured proper construction.

By 1855 lighthouses operated on Alcatraz Island; Point Bonita, which marked the entrance to San Francisco Harbor; Point Pinos on Monterey Peninsula; and Farallon on the searoad to San Francisco Bay. The lighthouse at Point Loma was replaced in 1891 with a new, more visible lighthouse. The Fort Point lighthouse was later dismantled and reestablished in another sector of Fort Winfield Scott in San Francisco.⁴⁷

By the end of 1858 the federal government added eight more lighthouses along the Pacific Coast. In California coastal lights flashed warnings from Table Bluff for Humboldt Bay (replaced in 1891 and ruled inactive in 1972), Santa Barbara, and Point Conception. In Oregon the first Umpqua lighthouse toppled into the sea in 1861. For 37 years Congress refused to provide funds for a replacement, but so many ships were wrecked that in 1894 Congress finally funded a replacement at a site where it could survive the battering ocean waves.⁴⁸

On the coast of Washington Territory, a Lighthouse District under an Army Engineer constructed lighthouses at Wallapa (Shoalwater), on historic Tatoosh Island off Cape Flattery, and at Cape Disappointment at the north portal to the Columbia River. As if to emphasize the dangers, the ship carrying building material for the latter lighthouse foundered in the dangerous entrance to the Columbia River.⁴⁹

Where it was impracticable to build lighthouses, lightships operated lights and fog signals. The first Pacific Coast lightship was established off the mouth of the Columbia in 1892. Other lightships were placed at San Francisco (1898), Blunts Reef (1905), Umatilla Reef (1898), and Swiftsure Bank (1909). All have been replaced by buoys except the lightship at the Columbia's entrance.⁵⁰

In addition to lights that warned ships about treacherous waters, the federal government added sound with foghorns. On Point Bonita sound producers were transformed to help mariners in the fog. In 1856 the original fog signal was an eight-foot cannon with a six-inch bore that proved troublesome to lighthouse keepers who had to fire it periodically to warn vessels when the weather closed in. A large bell that tolled from a bellboat anchored off the point, replaced it within three years. In 1872 a steam foghorn replaced the bell. It was succeeded by a diaphone that could be heard 30 miles out to sea. This gave way to a super tyfone horn.⁵¹ Today radio and radar assists mariners navigate in foggy weather.⁵²

A vessel is not in sight of one or more lights in only a few places along the coast. Radiobeacons and fog signals are at most of the major light stations. Low-powered market radiobeacons, for local use only, are along the coast.⁵³

In addition, electronic navigation--radar, loran, and the radio direction finder--help determine their position in any weather. The many points, headlands, and large offshore rocks along the rugged coast give accurate radar ranges and bearings.

The Coast and Geodetic Survey provides some of the most significant navigation aids. Originally called the U.S. Coast Survey, the Coast and Geodetic Survey changed its name in 1850.⁵⁵ When the United States expanded to the Pacific Coast, the existing maps of the area appeared more than adequate. Harbors, headlands, distances, and climatic conditions had been described well.⁵⁶ Among the available charts and surveys were those of the Englishmen George Vancouver, Frederick W. Beechey, Edward M. Belcher, and Henry Kellett; Frenchmen Abel du Petit-Thouars and Eugene DePlot de Mofras; the Americans Charles Wilkes and Cadwalader Ringgold of the U.S. Navy (Ringgold opportunely charted San Francisco Bay and the lower Sacramento River in 1849); and the earlier Spanish and Russian explorers. The increased traffic and population stimulated by the gold mania after 1849, however, demonstrated the "pressing need for more accurate and detailed surveys of this suddenly popular quarter of the globe."⁵⁷

To get more detailed surveys, Alexander Dallas Bache, Superintendent of the U.S. Coast Survey, sent a survey party under George Davidson to San Francisco in 1850. During the 1850s, Davidson's group surveyed the coasts, harbors, and tidal estuaries of the Pacific Coast to help solve navigation problems. The team began working in September 1850-- charting water areas; determining depths, channels, and currents; fixing the true positions of the more prominent headlands on the coast; mapping the rocks and shallow bottoms that constituted navigation hazards; recommending suitable locations for lighthouses; and collecting other information of value to the federal government, such as the volume of commerce at the ports. Other teams, staffed primarily by naval officers on detached service, like Lieutenant James Alden, conducted hydrographic studies of the ocean, its floor, and tides.⁵⁸

Davidson's party spent little time surveying San Francisco Bay (the major entry point for the 49ers), because of the accuracy of earlier English charts and of those prepared by the naval officers Ringgold and William P. MacArthur. Instead, the group turned their attention south and north of San Francisco. During the last few months of 1850 and the early months of 1851, Davidson and his assistants determined the exact longitude and latitude at Point Conception and San Diego and completed surveys for lighthouse locations at Point Pinos, Monterey Bay, and Point Loma on San Diego Bay.

In the spring of 1851, Davidson and his crew sailed for the mouth of the Columbia River, which sailing captains considered dangerous because of the constantly shifting bar. In 1851, the Coast Survey completed observations of the mouth of the Columbia and determined the precise geographical locations of Cape Blanco, Oregon (the most prominent

headland between the Columbia River and Cape Mendocino) and Port Orford (the major port for all of southern Oregon). After 18 months the Coast Survey published charts of Points Conception and Pinos; the bays of Trinidad, Humboldt, San Francisco and San Diego; and the mouth of the Columbia River.⁵⁹

In 1852 the Coast Survey parties moved to Puget Sound. The survey parties had assumed that the sound was well-mapped, but discovered that a great deal of work needed to be done.⁶⁰ For all its seemed advantages, Puget Sound presented hazards to sailing vessels because the mountains along its shores stopped the wind, its strong currents were unknown, and the deep water made it difficult for ships to anchor when in danger.⁶¹ Davidson's objective was to discover and chart where ships could anchor when "struggling against a strong current and light winds."⁶²

By 1855 the Coast Survey had surveyed and published charts of harbors, inlets, and other anchorages as well as of currents and navigation hazards along the 1,500-mile coastline from the Mexican border to Puget Sound.⁶³ In preparing these charts, Davidson and his assistants also named some of the capes, mountains, inlets, and other geographic features that had not been named or whose original titles had disappeared.⁶⁴

In 1858 the Coast Survey published The Directory for the Pacific Coast, a comprehensive guide to navigation of the Pacific Coast from San Diego to Puget Sound. According to Alexander D. Bache, the scope and purpose of this directory:⁶⁵

is, to give a description of the bay, harbor, portion of the coast, and its leading features, the history of its discovery, with notes and remarks of the earlier navigators, and a comparison, sometimes, of existing characteristics with those assigned in earlier times. The facilities for navigation, geographical position, and magnetic variation follow, with sailing directions for entering the bay or harbor, or passing along the coast. The leading features of the tides are given. General remarks close the paragraphs, each of which is headed with the name of the portion of the coast described in it. References are added, giving the dates of the Coast Survey charts for all the localities for which charts have been published.

A second edition of The Directory was published in 1862, a third in 1869, and another in 1889. With the 1869 edition the title was changed to Coast Pilot. In recognition of its value, coastal seafarers labelled it "Davidson's Bible."⁶⁶

It is understandable why the work became so highly esteemed. For several decades after the 1850s, Davidson's surveys and maps "provided Pacific Coast mariners with their most accurate and available guides for coastal navigation."⁶⁷ The Coast Pilot of 1889, the fourth and final edition, stands as an appropriate monument to Davidson, for it, "together with his other guides and reports, has never been significantly revised or superseded by anyone."⁶⁸

There are about 3,000 aids to navigation along the Pacific Coast and Hawaii. Moreover, new electronic navigation devices either supplement or supplant the light and sound of the past.⁶⁹ Modern mariners are in a better position than those of earlier years to cope with the vicissitudes of the unfriendly, rugged, and mountainous Pacific Coast.

Chapter 2

EARLY NAVIGATION IMPROVEMENTS IN THE SAN FRANCISCO BAY AREA

Although many European mariners sailed past San Francisco Bay as early as 1542, the bay was not discovered until November 1769, when members of Gaspar de Portola's expedition sighted the great expanse of the bay's southern arm.¹ Before a settlement could be founded as a bulwark against the Russians, a nautical survey was needed. On 5 August 1775, the packet boat San Carlos, commanded by Captain Manuel de Ayala, passed through the narrow entrance to San Francisco Bay, where Ayala and his men stayed for 44 days. His pilots, José Cañizares and Juan B. Aguirre, thoroughly charted the bay from outside the entrance into its southern arm and to the north and east as far as San Pablo and Suisun Bays.²

In 1776 settlers travelling overland from Mexico with the intrepid soldier, Captain Juan Bautista de Anza, colonized San Francisco. The settlers established both a presidio and a mission. After Anza selected a site for a fort near the harbor entrance, Father Pedro Font prophetically wrote in his diary:³

I think that if it could be well settled like Europe there would not be anything more beautiful in all the world, for it has the best advantages for founding in it a most beautiful city, with all the conveniences desired, by land as well as by sea, with that harbor so remarkable and so spacious, in which may be established shipyards, docks, and anything that might be wished.

To strengthen their hold on San Francisco Bay, the Spanish established Mission Santa Clara and the pueblo of San José on the banks of the Guadalupe River in 1777.⁴ Mission San José, about 20-miles northeast from the pueblo, was established 20 years later in 1797.⁵ Spanish sailors, soldiers, priests, and colonists discovered, explored, surveyed, and settled the shores and waters of San Francisco Bay and partly fortified its entrance, but Spain's restrictive commercial policies delayed the economic development of the port.

Initially the port relied on the San Blas supply ships for food, implements, and other necessities.⁶ Because New Spain could not meet the economic needs of the soldiers and missionaries, local San Francisco officials permitted small-scale trade with Russians and other foreign intruders. Father Narcisco Duran of Mission San José acquired several launches and traded goods with the Russians at Fort Ross, 70-miles north of San Francisco.⁷

When California officially became part of Mexico in 1822, the trade restrictions lessened. The hide and tallow business flourished and whaling vessels arrived at San Francisco.⁸ As early as 1824 merchant ships anchored at the more sheltered Yerba Buena cove in preference to the Presidio's exposed anchorage. In 1825 William A. Richardson, an Englishman who had systematically surveyed San Francisco Bay, applied for a site at the cove. Not until 1835 did Governor José Figueroa approve a settlement at Yerba Buena and appoint Richardson as the captain of the port.⁹

The founding of Yerba Buena, San Francisco's third settlement, marked the beginning of the city's commercial development. Jacob P. Leese, an American merchant, and Richardson built the first commercial structures at Yerba Buena. Leese built a store at the cove and hired William S. Hinckley and Nathan Spear as partners to manage the business at Monterey. Hinckley and Spear later moved to Yerba Buena. In 1841 Leese sold his house and lot to the Hudson's Bay Company.¹⁰

The same year the United States evinced official interest in San Francisco Bay by outfitting the Wilkes naval-scientific expedition. Lieutenant Charles Wilkes had special instructions to explore the Pacific slope and survey the bay in six months. In his autobiography Wilkes wrote:¹¹

When we arrived at San Francisco there were no houses and the only accommodation was in the upper deck cabin of a ship which had been removed to the shore by Capt. Hinckley & Mr Spears. . . . Besides the cabin there was a large frame building occupied by the Agent of the Hudson Bay Company, a billiard room and bar, and a blacksmith Shop and a few outside shanties. At the time of our visit these few buildings was known by the name of Yerba Buena and may be said to be the basis from which, in a very few years, the great city of San Francisco was to arise from the impulse given to it by the discovery of the Gold deposits (sic) in the Sacramento Valley on the estate of Capt Suter (sic) new New Helvetia.

While his officers surveyed the bay and the San Joaquin and Sacramento Rivers, Wilkes spent most of his time aboard the Vincennes at anchor in Sausalito cove. Richardson told Wilkes about the different parts of the bay and suggested places for examination. With Nathan Spear, Wilkes discussed the likelihood of future United States acquisition of California. The expedition's most important contribution was its report, which pointed out trade opportunities and the excellence of San Francisco harbor.¹²

Although the area's hide and tallow trade began to decline by the mid-1840s, United States interest in San Francisco remained strong. Sailors and marines from the U.S.S. Portsmouth, commanded by Captain John B. Montgomery, occupied Yerba Buena on 9 July 1846 following the outbreak of the Mexican war. Montgomery and his men raised the United States flag in front of the customhouse on the plaza as the Portsmouth fired a 21-gun salute.¹³

The arrival of United States warships, the demand for military supplies, the growth in population, and the expansion of commerce led to an increase in the number of ships entering San Francisco Bay. Immediately following United States possession of Yerba Buena, three American whalers, the Abigail, Jeanette, and Paladian, entered the cove. The American bark Moscow, the British man-of-war Juno, and the American ship Brooklyn had also anchored in the bay in July 1846. The Brooklyn brought a large group of Mormon colonists from New York. In August, five more American whalers and two Bremen whalers, the Patriot and Europa, came into the bay.

The next month at least 15 vessels arrived.¹⁴ On 5 September 1846, the "Marine Intelligence" column of the Californian reported that the whalers Isaac Howland and Cabinet, the barks Columbus and Prescott, and the hide ships Sterling and Tasso were in port. The launches brought the wheat crop to market and carried lumber.¹⁵ Although San Francisco trade statistics for 1847-1848 are fragmentary, they indicate that the town had become the chief port of entry in California surpassing Monterey, San Pedro, Santa Barbara, and San Diego. For the last quarter of 1847, San Francisco's exports and imports were \$49,598 and \$53,590, respectively. Eighty-five merchant ships arrived for the year ending April 1848.¹⁶

The California Star in April 1847, noted the "numerous merchant vessels" that furnished commercial houses "with large supplies of merchandize (sic) of every discription (sic)."¹⁷ A few months later, Edward Gilbert of the Star concluded that "San Francisco is destined to become the great commercial emporium of the north Pacific coast."¹⁸

Gilbert refuted the contention that Monterey or Benicia, on the Carquinez Strait, could surpass or compete with San Francisco. San Francisco's harbor was safer and larger and the city had easy access by water to the rich Sacramento and San Joaquin valleys. Gilbert asserted that Santa Clara, at the southern end of the bay, would become one of San Francisco's tributaries rather than a rival.¹⁹

Even before the gold rush a few small craft penetrated the Sacramento River searching for trade opportunities. In 1847 Captain William D. Phelps of the Alert, owned by Bryant, Sturgis & Co. of Boston, sailed up the Sacramento in a boat to trade and explore.²⁰ Sloops and launches plied the bay from San Francisco to landings at Benicia, Sonoma, and the Embarcadero de Santa Clara.

The first steamer to navigate San Francisco Bay arrived in late 1847. On 19 October, the Russian bark Naslednich put into San Francisco 15 days out of Sitka. The California Star announced the arrival:²¹

Steam ho! The Russian bark, Naslednich, recently arrived from Sitka, has on board a small, though complete steamer, the property of W. A. Leidesdorff Esq. of this place. This "little monster" is now in process of adjusting, having been disjointed merely for packing purposes, and is destined to swim the Bay in all directions, a stranger no less useful than curious. After being fitted up, she performs an excursion to some point or another, to test her sailing qualities.

William A. Leidesdorff, a prominent San Francisco merchant, purchased the vessel from the Russian American Company to use in his hide and tallow trade on the shallow sloughs flowing into San Francisco Bay. Renamed Sitka or Little Sitka, the 37-foot long steam launch had a 9-foot beam and an 18-inch draft. Her initial successful trips around Yerba Buena Island and from the island to San Francisco were followed by an unsuccessful voyage for hides to the Embarcadero de Santa Clara. A trip to the Sonoma Embarcadero, however, proved fruitful. The Sitka was also the first steamer to ply the Sacramento River when she steamed up to Sutter's Fort in November 1847.

The first steamer on San Francisco Bay sank on 12 February 1848 during a storm while at anchor. Her hull was raised and the engine removed. The hull later became the schooner Rainbow, which operated on the Sacramento River.²²

On 1 January 1848, the California Star advertised a regular packet service for Sonoma. The "fast sailing" sloop Stockton, "handsomely fitted up" to make regular trips to Sonoma, left San Francisco every Monday and Sonoma every Wednesday. Captain Briggs arranged freight and passage at San Francisco while Andrew Hoepener acted as agent at Sonoma.²³ Small craft also sailed from San Francisco southward to the Embarcadero de San José. The San Francisco merchant, William D. M. Howard, operated a launch in 1847 that took passengers to San Jose. Chester S. Lyman, a surveyor, took passage in the launch and described it as a "small craft, or large sail boat with one mast, having a little cabin at the stern about 6 ft. by 4 & 3 ft. high."²⁴ In his diary, Lyman described the tortuous windings through Guadalupe Slough before reaching the landing place. At the embarcadero Lyman observed that the ship Santa Cruz was ready to start for San Francisco.²⁵

In 1839 Governor Juan B. Alvarado had granted Jacob Leese and Salvador Vallejo two lots for storehouses at Yerba Buena, one at the "landing-place." They were also given the privilege of erecting a wharf, which was to be considered the property of the Mexican government and for the use of commerce in general.²⁶ The wharf, however, was flimsy and did not last.

Shortly after the American occupation of Yerba Buena, Thomas O. Larkin, William H. Davis, and Eliab Grimes organized the Yerba Buena Wharf Company. On 8 October 1846 they petitioned Governor Robert F. Stockton for a water lot extending into the bay channel upon which they intended to erect a wharf. Their petition, in part, stated:²⁷

Beg leave to represent to your Excelency (sic) that the Commercial Community of this Port, are under great disadvantages in landing Merchandize (sic), and Shipping produce, on the beach, that at half tide or low water it is impossible to land goods, or take off produce. The Commerce of the Town increasing, these disadvantages daily become apperant (sic), and with it the impossibility of facilitating business, with only the beach for a landing.

On 11 October 1847, at its Monday evening meeting, San Francisco's town council enacted an ordinance appropriating \$1,000 to erect a pier at the foot of Broadway. Section two of the ordinance stated:²⁸ "That the pier shall not be less than ten feet wide and of sufficient height to resist the action of the sea tide, and one hundred and fifty feet in length, commencing at the rocks projecting from the bank to be continued eastward in a parallel with Broadway." The council

appointed William S. Clark, Robert A. Parker, and William D. M. Howard to superintend and contract for the materials and work. At the same meeting the council appropriated \$10,000 to build a public wharf at the foot of Clay Street. They appointed Howard, Elbert P. Jones, and William A. Leidesdorff to superintend its construction.²⁹ Two months later, on 13 December, the council appropriated an additional \$2,000 to complete the Broadway Wharf.³⁰

Construction of the two wooden wharves at the foot of Clay and Broadway Streets proceeded slowly. Work on the Broadway wharf began in December 1847, but was suspended the next month for lack of funds. In February 1848 the council stopped all the work except for the Clay Street wharf, where they could use the lumber on hand.³¹ A clash between partisans of the two wharf locations was largely responsible for the delays. The value of real estate around the landside terminus of a wharf became an important factor in urban sectionalism.³²

In 1847 William S. Clark obtained a deed from Alcalde Washington A. Bartlett for two lots at the foot of Broadway in the northern end of Yerba Buena cove. Although these lots had been formerly granted to Leese and Vallejo, Clark built a crude wooden wharf out over the rocks to the point. In September 1848 the brig Belfast, with a cargo of lumber from New York, tied up at the wharf, which came to be known as Clark's Point. Part of the lumber from the Belfast was used to make the Broadway Wharf more substantial. Real estate values soon increased by 50 percent near the improved landing.³³

The discovery of gold in 1848 caused northern California's population to mushroom. Many 49ers arrived by sea and continued their journey to the gold diggings by water. A splendid system of waterways stretched out from San Francisco Bay. Steamboats on the Sacramento and San Joaquin Rivers carried miners, food, and supplies to jumping-off places and returned to San Francisco with gold and other products.³⁴

In March 1849, President Zachary Taylor appointed James Collier of Connecticut as collector of customs for San Francisco. Collier travelled overland to California, arriving on 12 November. The next day he wrote his first report to Secretary of the Treasury William M. Meredith, stating,³⁵ "I am perfectly astounded at the amount of business in this office." He observed that a recent day's tonnage included over 30,000 tons on foreign ships and nearly 90,000 tons on American vessels. Over 40 percent of the ships arriving in San Francisco were foreign. Collier, complaining about the high cost of living at San Francisco, advocated higher salaries. He wrote:³⁶ "I am occupying what was the old Mexican custom-house, constructed of unburnt brick.

It is a long, dark, one story building, in miserable condition." Collier remarked that the roof leaked and that he had "no vault for the safe-keeping of the public money."

Although Collier remained in office for only 15 months, he accomplished much. San Pedro and Santa Barbara became ports of entry. He moved the customhouse to a new four-story brick building, which was later destroyed by fire. Collier successfully reduced smuggling on the Pacific Coast and was largely responsible for establishing a United States Marine Hospital in San Francisco.³⁷ On 27 February 1851, Thomas Butler King of Georgia replaced Collier.³⁸

The California gold rush also stimulated Oregon and Washington's economy. Lumber, wheat, potatoes, salmon, butter, and beef were shipped to California in exchange for gold. Coastal shipping between the Pacific Northwest and California became both extremely important and extremely hazardous.³⁹ Transportation historians generally agree that river steamboats on the Sacramento and San Joaquin Rivers and their tributaries and on the Columbia River system greatly contributed to the development of the region.⁴⁰ Stimulated by the possibilities for marine business on the Pacific Coast, steam and sailing craft also increased rapidly after 1848.⁴¹

At the time of the gold rush there were two water routes from the Atlantic to the Pacific Coast, one around Cape Horn and the other to some port on the coast of Mexico or Central America, overland to the Pacific, and by sea once more to California or Oregon. While most emigrants came on overland trails from the Missouri River to the Pacific, thousands preferred the sea route, particularly when severe winter storms closed the overland route. After arriving in San Francisco, the gold seekers found they could book passage on sailing vessels and steamboats for Sacramento and Stockton, the interior supply centers respectively for the northern and southern mines.⁴²

With rare foresight, the United States government contracted with the Pacific Mail Steamship Company to begin the Isthmus-California-Oregon mail service on 1 October 1848. When the company's steamship California reached the Pacific Coast of Panama, the crew found the shore swarming with Americans demanding passage for the gold fields. Soon a parade of ships of every sort sailed through the Golden Gate carrying thousands. Many officers and their crews abandoned their vessels on the mudflats for the gold rush.⁴³ On 19 June 1849, Lieutenant Cadwalader Ringgold of the United States Navy, who later surveyed San Francisco Bay, wrote a confidential letter to Secretary of the Navy William B. Preston, asserting that the "strong arm" of the

federal government should be extended over "this immense and magnificent land" to prevent bloodshed and confusion. Ringgold continued:⁴⁴

Foreigners are flocking in, goods smuggled in along the coast, and jealousy and deep hostility engendered between those hordes of intruders and our interprising (sic) and adventurous countrymen. A large fleet of merchantmen are at anchor here, exceeding a hundred sail, requiring an effective squadron to regulate and keep them in order.

San Francisco grew from about 20,000 in the winter of 1848-1850 to approximately 50,000 in the winter of 1854-1855. By 1887 California had a population of more than 500,000.

The 1850s marked the golden age of the American merchant marine. From 1849 to 1854 towering clippers carried the bulk of the world's high-sea commerce, including the California trade. During the height of the gold rush, clippers brought most of the merchandise from the east via Cape Horn.⁴⁵ A shortage of merchant ships and the demands of the new California market combined to send freight rates skyrocketing and produce this maritime prosperity. In contrast to the rule-of-thumb navigation that made earlier passage to California a grueling contest between the sailing masters and the sea, the clippers used Matthew Fontaine Maury's published research and directions on ocean currents and winds to reduce the average time of a voyage around Cape Horn to 133 days and to make possible the amazing 91-day passages of the Flying Cloud, Swordfish, and Andrew Jackson.⁴⁶ When the freight rates dropped in 1856 to \$15 per ton, the rate required to break even, the clipper ships disappeared,⁴⁷ having helped the United States expand westward, and, "for the moment, [making] the American merchant marine the greatest in the world."⁴⁸

San Francisco Bay, together with the Sacramento and San Joaquin Rivers, afforded easy access to Mother Lode country and created a complex of settlements tied economically, politically, and socially to the bay. Draft steamers and sailing vessels moved miners and supplies quickly to the gold fields. In 1851, rates to Sacramento dropped from \$25 per passenger and \$50 per ton for freight to \$1 for both. In 1854 the owners rationalized the river competition by forming the California Steam Navigation Company. In 1871 the Central Pacific Railroad absorbed the company in one of the first railroad take-overs of a steamboat service.⁴⁹ The California Steam Navigation Company and the Pacific Mail Steamship Company offer important examples of how Americans solved communications problems between the Atlantic and

Pacific Coasts and the unexpected demands of the California trade, which hoped to capitalize on the newly created wealth of a booming population.⁵⁰

Between 1849 and 1854 additional wharves were built along the eastern edge of San Francisco. In May 1849 leading merchants organized a wharf association to raise capital. By December they had finished 800 feet of Central Wharf. A fire in June 1850 destroyed much of the wharf, but it was quickly repaired. By 1854, Central Wharf extended 2,000 feet into the bay and large vessels, laying alongside, discharged goods at low tide. In addition to the Broadway, Clay, and Central wharves, the city had the California Street, Market Street, Sacramento Street, Washington Street, Jackson Street, Pacific Street, Cunningham's and Law's Wharves, and Howison's Pier.⁵¹

Until 1856 the southern part of San Francisco County extended to San Francisco Creek and included present San Mateo County. Here the three port towns of Mezesville or Redwood City, Ravenswood, and Spanishtown or Half Moon Bay grew. In 1851 Redwood City began when Captain A. Smith built a small house at the head of navigation of Embarcadero or Redwood Creek and inland about four miles from the open waters of the bay at Rancho de las Pulgas. The place owed its growth and importance to its natural advantages as a shipping point and its proximity to the vast redwood forests. G. M. Burnham built the schooner Redwood in 1851,⁵² the beginning of local industry.

In 1854 S. M. Mezes laid out the town of Mezesville. On 3 April, the San Francisco newspaper, Daily Alta California, advertised the sale of village lots reporting that Mezesville, at the Redwood Embarcadero on Puglas Rancho, was a delightful town offering "great inducements" for business as well as "agreeable" residences. The newspaper announced:⁵³ "It is laid off on both sides of a Creek, having deep water, and high banks, allowing great convenience for shipping lumber and produce, and unloading merchandise." Mezesville became a thriving lumber port and when it was incorporated in 1867, the town changed its name to Redwood City.⁵⁴

On 18 February 1854, a group of San Francisco merchants and Pulgas Rancho landowners petitioned the California legislature to grant them the privilege of extending a wharf from the lower part of Pulgas Rancho to the channel of San Francisco Bay. The petitioners claimed that the increased population of the southern portion of San Francisco County and the shipment of produce and lumber required facilities better than those afforded by the natural creeks. On 7 April, the legislature enacted a measure authorizing John K. Hackett and Charles D. Judah

to construct the Ravenswood Wharf to 1,500 feet from the "highlands" across overflowed lands of the bay. A month later, L. R. Townsend drew, and C. H. Tracy surveyed, a town plat. Isaish C. Woods, one of the founders and a partner of Adams Express Company, named the town Ravenswood. ⁵⁵

After laying out the lots, several promoters erected a few buildings. Expecting a booming business they built a wooden pier that jutted 1,500 feet from land into deep water. The Daily Alta California of 18 July 1854, advertised that the steamer Guadalupe would sail at 10 a.m. on Tuesday, Thursday, and Saturday from the Vallejo Street Wharf in San Francisco for Ravenswood and Alviso. From 22 September to 28 November 1854, the California Steam Navigation Company advertised in the Daily Alta California that the Guadalupe under Captain E. Z. Clark and the steamer Sophie under Captain S. Card left daily from the Vallejo Street Wharf at 10 a.m. for Alviso and returned from Alviso every day at 9 p.m., touching at Ravenswood both ways.⁵⁶

Ravenswood promoters hoped their town would become a railroad terminal, but the panic of 1855 and the failure of Adams Express Company ended their dream. The town, however, remained an important farming and shipping center for the southern part of San Francisco Bay for another 60 years. In 1868 Lester P. Cooley bought a ranch on the former town site and rights to the Ravenswood Wharf. Cooley made extensive repairs to the wharf, which became known as Cooley's Landing.⁵⁷

Following the Mexican War, Californians settled in Spanishtown or Half Moon Bay. An isolated community on the coastside of the San Francisco Peninsula, the settlement became a port. In 1855 J. G. Ward was granted a franchise for a wharf. After the town became part of San Mateo County, J. G. Denniston received a second wharf franchise in 1858. By the 1860s, farmers regularly shipped grain from the Half Moon Bay area to San Francisco. In 1868 Josiah P. Ames, with two partners, constructed a wharf stretching 1,000 feet beyond the breakers at present-day Miramar. Ames built a warehouse adjacent to his wharf. The small shipping center was soon called Amesport.⁵⁸ In its shipping news column of 27 June 1874, the Daily Alta California stated:⁵⁹ "The Caroline Meadow from Amesport Landing, with 1,750 sacks of potatoes came up to the Jackson Street wharf yesterday afternoon."

In the aftermath of the Mexican War, the American town and port of Alviso replaced the Embarcadero de Santa Clara. By 1849 several San José businessmen started speculating in land at the embarcadero. When San José became the state capital, they started plans to develop Alviso as a port for the new seat of government. On 22 April 1850, the day California's state constitutional convention adjourned,

regularly scheduled steamship service began between San Francisco and Alviso. The first steamships at Alviso were the Sacramento and Mint. As the capital at San José grew, additional steamers came into Alviso. On 28 January 1850, the Daily Alta California advertised that the "fast running iron steamer" Fire Fly would run regularly between San Francisco and the embarcadero at San José, leaving Central Wharf every Monday and Thursday mornings at 9 a.m. and returning on Wednesday and Saturday. One-way passage to Alviso was \$25. The same issue of the Alta also advertised the new steamer, William Robinson, under Captain James De Voe, which sailed for Alviso. Passage through to San José was \$20 and freight was shipped at \$2 per 100 pounds.⁶⁰

Despite a considerable increase in shipping, Alviso failed to become a boom town. The legislature moved to Vallejo in 1851, which slowed the growth of both San José and Alviso. Increased mercury production at the nearby New Almaden mines, and more lumber shipments from the Santa Cruz Mountains, however, increased Alviso's maritime activity. In 1852 Alviso incorporated and during the next year seven steamers plied between the town and San Francisco. Many schooners sailed the route carrying farm produce and a few passengers. Although Alviso attracted several investors in warehouses and wharves, settlers did not flock to the port town. The era of land speculation ended in 1854 and the community stopped expanding.⁶¹

In 1862 the California Steam Navigation Company operated the steamer Sophie McLane to Alviso. Two packet lines also ran between Alviso and San Francisco. Thomas J. West, owner of an Alviso warehouse, ran the schooners Long Island and Webster and the sloop San José. The Union Line, owned by C. C. Reed, John J. Ortley, and P. M. Angier, masters respectively of the schooners Maid of the Mill, Silver Cloud, and Union, competed with the West Line. In 1864 the railroad from San Francisco to San José was completed and Alviso's importance as a shipping point declined.⁶²

San Antonio began as a lumber port, but also developed because many gold seekers passed through on their way from San Francisco through Niles Canyon and Livermore Valley to the mines. In 1851 James B. Larue built a wharf at San Antonio and promoted the town. C. B. Strode, a San Francisco lawyer, laid out the nearby town of Clinton, which was connected by a road to San Antonio. In 1856 San Antonio and Clinton merged into Brooklyn Township.⁶³

Both Oakland and Alameda developed as real estate ventures, forerunners of California's future land speculations. In 1850 Horace W. Carpentier, Edson Adams, and Alexander Moon squatted on

land belonging to Vicente Peralta, claiming it as part of the public domain. After Peralta tried to eject them, they persuaded him to lease them the land. The trio erected a shanty near what is today the foot of Broadway Street in Oakland.

Largely through Carpentier's efforts, the legislature incorporated the town of Oakland on 4 May 1852. Carpentier, Oakland's first mayor, had an ordinance passed that made him sole owner of the entire waterfront and possessor of the exclusive right to build wharves, piers, and docks for 37 years. Not until 1911 did Oakland win the long legal battle to control its waterfront.⁶⁴

On all sides of San Francisco Bay wharves, piers, and docks accommodated the growing agriculture and manufacturing empires that by 1870 dominated the area. To improve transportation and communications between the bay area and communities up to 100 miles away, various promoters put together a combined local rail and ferry service.

By the 1850s the two sides of San Francisco Bay contrasted sharply. While San Francisco's economy grew rapidly, Oakland developed slowly as a residential city. San Francisco, surrounded by deep water and with steep hills and shifting sands, had little vegetation and was subjected to rolling fogs and chilly winds. The East Bay, with a more gracious and tranquil climate, appeared parklike with its broad and gentle slopes covered with groves of magnificent oaks that grew to the water's edge. Because the natural harbor was on the west side of the bay, San Francisco became the great gold rush port and commercial city. The Oakland area, nonetheless, also grew. The bay swept around Oakland with the estuary leading to the city's heart and there was ample room for expansion without the expense of digging down hills or filling up low places. The transbay ferry system made Oakland a city of beautiful homes.

On 13 September 1852, the Daily Alta California stated:⁶⁵ "The steamboats now ply regularly to Contra Costa, and Oakland is fast becoming a place of importance." The newspaper commented that hundreds left San Francisco every Sunday to escape the city's dust and enjoy the pure air in the East Bay. The Alta remarked:⁶⁶ "The City of Oakland will yet be to San Francisco what Hoboken is to New York."

Meanwhile, the whaleboat Pirouette operated briefly on a regular schedule between the San Antonio embarcadero and San Francisco. In 1850 Captain Thomas Gray ran a small propeller boat twice a week on a trial basis. Since his experiment proved successful, Gray began Sunday excursions with the sternwheeler General Sutter. On 4 August 1851, Carpentier and Andrew Moon obtained a license to run a ferry daily

from San Antonio to San Francisco. They chose Charles Minturn as their agent and used the small side-wheeler Hector. The partners eventually bought the steamers Caleb Cope, Red Jacket, and Erastus Corning. In 1852 Carpentier built a U-shaped wharf at the foot of Main (Broadway) Street. By summer the ferry made four crossings a day and six on Sundays. On 10 July the Daily Alta California announced:⁶⁷

The E. Corning has just been fitted up at great expense, expressly for this ferry route, and possesses every convenience for the ferriage of passengers, freight, stock and wagons.

Her cabins are elegantly furnished and this ferry now offers to the citizens of San Francisco and their families an opportunity to make a pleasant excursion across the bay of San Francisco, and enjoy the delightful climate and scenery of the Contra Costa side.

Carpentier and Minturn soon organized the Contra Costa Steam Navigation Company, a virtual monopoly of transbay service for several years. James B. Larue organized a rival ferry, the Oakland and San Antonio Steam Navigation Company in 1857. Larue put the steamer San Antonio into service and reduced the fare to 25 cents. Minturn then reduced the Contra Costa Steam Navigation Company's fare by half and tried to remove his rival by court action. Larue won in the legal contest and in 1859 he operated a second ferry, the Oakland. After Minturn's profits went down, he combined with Larue and they started a joint service with 25-cent fares.⁶⁸

In 1850, William W. Chipman and Gideon Aughinbaugh, the founders of Alameda Township, subleased the eastern end of the Encinal of San Antonio that two Frenchmen had leased from Antonio Peralta. The next year they planted fruit trees and bought the entire holdings from Peralta. Chipman and Aughinbaugh then partitioned off 43 four-acre lots (near present High Street), offering them for sale at an average price of 80 dollars. In 1853 they started a ferry service; an advertisement in the Daily Alta California of 22 August announced that the new steamer Ranger, with William W. Webster as master, would run to Alameda with connections to San Lorenzo and San Leandro.⁶⁹ As early as 1847, Robert B. Semple, founder of Benicia, inaugurated ferry service between Benicia and Martinez, across Carquinez Strait. The service lasted for more than a century.⁷⁰ By the early 1850s, in addition to the ferry service between San Francisco and the East and South Bay, ferries also reached North Bay communities such as Petaluma, Sonoma, Napa, Benicia, and Vallejo.

In 1849 the Secretaries of War and Navy appointed a joint commission of three Army Engineer officers and three naval officers to plan defenses along the Pacific Coast. The commission comprised Major John Lind, Major Cornelius A. Ogden, and Lieutenant Danville Leadbetter of the Army and Commander Lewis M. Goldsborough, Commander Gresham J. VanBrunt, and Lieutenant Simon F. Blunt of the Navy. The joint commission held its first meeting at San Francisco in April 1849, but did not accomplish much because of the gold rush. In the spring of 1850 the commission examined the bay area and recommended establishing a naval base at Mare Island.⁷¹

After examining the coast from the Columbia River to San Diego, the commission submitted its final report on 1 November 1850. The commissioner's concluded that San Francisco was the most important military position on the Pacific Coast. They recommended installing strong batteries on each side of the Golden Gate and on Alcatraz Island.⁷² In 1851 Chief Engineer Joseph G. Totten formed a Board of Engineers for the Pacific Coast, that consisted of the three army officers from the joint commission and two additional Engineers, Brevet Lieutenant Colonel James L. Mason and Captain Fredric A. Smith. The board planned casemated works for Fort Point and Lime Point and barbette batteries for Alcatraz Island.⁷³

In 1853 Totten appointed Colonel Joseph K. F. Mansfield, Senior Engineer on the Pacific Coast, but shortly afterwards Mansfield was promoted to colonel and ordered to inspect the Department of New Mexico. Lieutenant Colonel Mason replaced Mansfield as Senior Engineer. For the fiscal year 1854 Congress appropriated \$500,000 for the defenses of San Francisco and work started on Fort Point and Fort Alcatraz.⁷⁴ After inspecting New Mexico, Colonel Mansfield inspected the Department of the Pacific in 1854. While in San Francisco, he recommended placing at least 200 guns at Fort Point and increasing the armament at Alcatraz. He wrote, "I look upon this point as the key to the whole Pacific Coast in a military point of view, and it should receive untiring exertions."⁷⁵

By the mid-50s the San Francisco Bay Area was an important military complex with heavy guns at Fort Point, Lime Point, and Fort Alcatraz and an arsenal at Benicia. In 1851 Congress authorized a navy yard on the Pacific Coast. The next year a commission, headed by Commodore John D. Sloat, was sent to San Francisco Bay to recommend a site. This commission also selected Mare Island, just across the Napa River from Vallejo. The yard officially opened on 16 September 1854 commanded by Commander David G. Farragut.⁷⁶

The gold rush created a surge of shipping that increased the demand for navigation aids. In April 1852, Francis A. Gibbons and Francis X.

Kelly of Baltimore received a contract to construct eight lighthouses on the West Coast. They built the Alcatraz Island lighthouse first. San Francisco Bay eventually had the most elaborate system of lighthouses on the Pacific Coast.⁷⁷ Shortly after they finished the Alcatraz lighthouse, the contractors built one at Fort Point and, on 30 April 1855, completed one at Point Bonita off the Marin Headlands. Under the supervision of Frank Denver, they also finished the Farallon Islands lighthouse, about 32 miles west of the Golden Gate in 1855.⁷⁸ Its sturdy tower sentinel has guided thousands of ships since its light began operation on 1 January 1856.⁷⁹

With the outbreak of the Civil War in 1861, San Francisco's commercial and shipping interests became concerned about harbor defenses. Confederate privateers threatened California gold shipments and British, French, and Spanish warships carried on suspicious operations. Throughout the war, both civilian and military authorities petitioned the federal government for more adequate harbor defenses. In February 1863, the United States Pacific Squadron's sailing sloop Cyane arrived in San Francisco with orders to help defend the harbor at a location not covered by the guns of Fort Point and Fort Alcatraz. The Cyane came at an opportune time, for on 15 March she helped capture the Confederate privateer J. M. Chapman, which Asbury Harpending and Ridgley Greathouse had outfitted to intercept California gold shipments.⁸⁰

The threat of a privateer created hysteria. Authorities renewed their efforts to improve the inner harbor's defenses. They planned to erect fortifications on Yerba Buena Island and Rincon Point; however, they finally decided to locate the batteries on Angel Island.⁸¹ Even while the batteries on Angel Island neared completion, local authorities still feared that the harbor was not properly defended. On 5 August 1864, General Irvin McDowell, commanding the Department of the Pacific wired General Richard Delafield, Chief of the Corps of Engineers:⁸²

I am struck by the fact that at this time, in this distant port and in the present unsettled and delicate state of our affairs, there are now lying English, French, and Russian men-of-war covering the shipping and town completely, and that we have not a single gun, either ashore or afloat, bearing or that can be brought to bear on them, to require them to leave should we wish them to go. I think we need earth batteries on Yerba Buena and at the foot of Rincon Hill to control the harbor should vessels pass the lower lines.

Delafield replied to McDowell that ordinance for arming Yerba Buena Island and Rincon Point was not available. San Francisco's defenses were never impregnable during the Civil War, but additional

batteries at Fort Point and Fort Alcatraz tightened the defense ring around the Golden Gate. In the closing months of the war, the completed batteries at Angel Island protected the approaches to Mare Island Navy Yard.⁸³

The completion of the transcontinental railroad in 1869 ended California's isolation from the rest of the nation. Through the machinations of Carpentier and promoters of the Central Pacific, the railroad terminated at Oakland, a major disappointment to San Francisco. More important, the rails, new industries, and agriculture increased the population of the San Francisco Bay area from 114,074 in 1860 to 265,808 in 1870, nearly half the people living in California.⁸⁴

Although local governments and private enterprise cooperated to create this growth, they failed to manage properly the port of San Francisco. As a result of the rapid influx of population, the value of the San Francisco waterfront increased and there was a struggle over possession of the harbor. Real estate speculators led by Levi Parsons, John Felton, and Horatio Gates tried to secure a monopoly over the harbor shoreline. San Francisco's merchants opposed a scheme to give a private corporation title to the entire waterfront in exchange for constructing a sea wall. As early as 1855, speculators tried to push their scheme through the state legislature.⁸⁵ On 4 April 1860, the state senate enacted the bulkhead bill designed to create a gigantic monopoly of the San Francisco waterfront. Eight days later the assembly passed the bill and it went to Governor John G. Downey's desk. Parsons and Felton, who had lobbied the bill through the legislature, now applied pressure to Downey.⁸⁶

San Franciscans organized a Citizens' Anti-Bulkhead Committee to oppose the bill, which would give the San Francisco Dock and Wharf Company the right to build a sea wall with piers, wharves, and docks upon the 1851 water line and collect dockage and wharfage tolls. In considering the bill, Governor Downey carefully reviewed all the recorded testimony from committee hearings and studied the Engineers' plans. He vetoed the bill, stating that it "is calculated to work irreparable injury to our commerce, internal and external, of which San Francisco is, and must ever remain, the metropolis."⁸⁷ The city hailed Downey as a hero. The Bulletin called him the "Andrew Jackson of California." In an editorial entitled, "A Great Power Gone," the newspaper extorted:⁸⁸ "He has vetoed the most gigantic scheme ever presented to a Governor in America."

Mismanagement and corruption along San Francisco's waterfront contributed to the deterioration of port facilities. To stop this, the legislature in 1863 transferred control of the port to a State Board

of Harbor Commissioners. On 16 July 1864, Charles Goodall, the San Francisco harbor master, reported that the commissioners had substantially rebuilt the Vallejo Street Wharf. A year later, on 31 July, Goodall reported that three new wharves had been constructed at the foot of Jackson, Howard, and Main Streets while extensive repairs were made to other wharves.⁸⁹ By 1868 the board had repaired several wharves, built new ones, performed maintenance dredging, and constructed a sea wall.

To meet the commercial and transportation needs of the Pacific Coast, the area needed to improve navigation along the river systems and coastal harbors. The Army Corps of Engineers, to whom Congress delegated this function in 1824, stood ready to improve the West's navigation facilities, when and if Congress so authorized, Army Engineers were with the conquering American army in 1846 and remained to survey the new boundary between Mexico and the United States. After the Mexican War, Army Engineers concentrated on locating suitable transportation routes, surveying harbors, supervising the construction of lighthouses and wagon roads as well as purely military activities such as building coastal fortifications.⁹⁰

Recognizing the navigation needs along the Pacific Coast, in 1866 Congress established an office of the Army Corps of Engineers in San Francisco. The office had authority for "Rivers and Harbors of the Pacific Coast," an awesome responsibility for a handful of career officers, but one that they handled successfully. They prepared surveys and investigations, improved and maintained channels, and built, improved, and maintained breakwaters and jetties. They used snagging, dredging, and wing dams to maintain channels on the major rivers in California, Oregon, and Washington.⁹¹ Their surveys helped the federal authorities in Washington, D.C. decide what navigation improvements were feasible and necessary and to curb the grandiose navigation projects of many coastal communities.⁹²

San Francisco harbor inevitably received most of the Corps' attention, although they built California's first navigation improvement project at San Diego. In 1853 George H. Derby began to protect San Diego harbor from silting by building a structure to divert the San Diego River into False Bay. Inadequately funded, the poorly built structure was washed out by a flood.⁹³

The Army Engineers began clearing obstacles in San Francisco Bay and constructing lighthouses, fog signals, and fortifications in the 1850s. From that time the Army Engineers played the major role in maintaining or creating navigation channels on the coastline and inland river systems. With 450 square miles of water, San Francisco

Bay quickly became a major port on the Pacific Coast. Since 1867 in San Francisco harbor and since 1874 in Oakland harbor the Corps has overseen navigation improvements. San Francisco did not fear the potential rivalry of Oakland with its transcontinental railroad terminals or the control of Oakland by the Central Pacific Railroad Company. With most of the population and the bulk of the state's wealth, San Francisco felt secure, especially as its maritime business expanded as port facilities improved.⁹⁴

To improve navigation, San Francisco requested the removal of several rocks: Blossom Rock, located between Alcatraz and Yerba Buena Islands, lay "five feet below the water level at low tide"; Rincon Rock, a dangerous obstruction along the waterfront of San Francisco;⁹⁵ and Noonday Rock, approximately 3 miles from North Farallon Island and 33 miles west of the Golden Gate.⁹⁶ The Corps began work on Blossom Rock in 1867. After considering several plans, they decided in 1869 to remove the rock to the desired 24-foot depth.⁹⁷ The Corps awarded the contract to remove Rincon Rock in 1873, but in 1877 the Board of State Harbor Commissioners asked the Corps to accept the work although it was unfinished. Difficulties over the harbor lines and a disastrous explosion prevented completion of the project.⁹⁸ Noonday rock's depth made its removal dangerous. Although the Corps gave the contractor the spring and summer of 1878 to finish the task, the rock was quickly removed to 47 feet below mean low water.⁹⁹

In 1875 the Army Engineer removed the wrecked ship, Patrician, from the bay.¹⁰⁰ With the passage of the Rivers and Harbors Act of 1880,¹⁰¹ a major Corps activity became the removal of shipwrecks from navigable waters.

After Congressional authorization in 1874, the Engineers began improving the Oakland harbor to provide additional navigation facilities in San Francisco Bay. The Corps constructed twin jetties within the entrance to Oakland Estuary (San Antonio Creek) and dredged to a 10-foot depth.¹⁰² In 1881 project modification extended the jetties from the Oakland shore to deep water in the bay. Dredging between the jetties lowered the channel to 20 feet at low water.¹⁰³

During the 1870s the East Bay and San Francisco became more interdependent and complemented one another's economic growth. A new metropolitan rival, Los Angeles, strove to establish a major harbor at San Pedro Bay. In the next decade the Southern Pacific and the Santa Fe extended their railroad systems to Los Angeles, precipitating a land rush in Southern California. The port of San Francisco, however, retained its commercial and financial hegemony well into the twentieth century.¹⁰⁴

Chapter 3

IMPROVEMENTS TO THE SAN FRANCISCO

BAY PORT COMPLEX AND TRIBUTARIES

From 1848 until the mid-1860s gold was San Francisco's primary export. J. Ross Browne, special commissioner for the collection of mining statistics of the United States Treasury Department, reported that at the peak in 1864, the city exported a treasure (gold and silver) valued at \$55,707,201.¹ As gold shipments declined, the grain trade increased. In 1853 San Francisco imported \$8 million worth of wheat, flour, and beans. By 1861 California's farmers raised enough grain both to feed the expanding population and to export more than 2.4 million bushels of wheat and 186,000 barrels of flour.² As early as 1854 San Francisco shipped grain surpluses, but the first substantial cargoes were not shipped until the next year, when the bark Greenfield, loaded with wheat, and the barkentine Jennie Ford, with a partial cargo of flour, sailed for Australia.³

During the Civil War, California farmers produced more wheat and barley to meet the demands of the East and Great Britain.⁴ From the mid-1860s until the panic of 1893 wheat was California's largest and most profitable agricultural commodity. The Sacramento and San Joaquin Valleys were the major wheat growing areas, but grain grew in other areas such as the Santa Clara Valley.⁵ San Francisco's wheat exports increased from 381,768 centals in 1858-1860 to 22.3 million in 1882-1883.⁶ Grain shipments from San Francisco Bay area ports rose steadily during the '60s and '70s. In the peak year, 1881, the area exported 1.1 million tons of wheat and 343,000 barrels of flour.⁷

On the northern shore of Contra Costa County along the Carquinez Strait, the Central Pacific Railroad erected a ferryboat slip at Port Costa across from Benicia in 1879. The company also built at West Oakland the giant ferry steamer Solano, capable of carrying an entire train and its locomotive, for use at the Port Costa-Benicia crossing. This lessened the route between Oakland and Sacramento by several miles. The Solano operated for 51 years--and on 30 November 1930, she carried the last train across the Carquinez Strait.⁸ With the completion of the Southern Pacific Railroad bridges between Army Point in Benicia and Martinez, the unique rail-ferry service ended.⁹

Port Costa quickly became the world's greatest grain port. The first wheat was exported in 1880 and the port soon loaded more grain

vessels than San Francisco, Vallejo, and Oakland. From 1 July 1881 until June 1882, George W. McNear loaded 103 vessels at his Port Costa Warehouse and Dock Company.¹⁰ Other firms on the Carquinez Strait included the Nevada Warehouse and Dock Company between Port Costa and Martinez; the California Wharf and Warehouse Company, just west of Port Costa, operated by Balfour, Guthrie & Company of England; the Grangers Warehouse at Eckley; Eppinger & Company at Crockett; and Starr & Company at Wheatport, just west of Crockett. By 1884 grain warehouses and docks extended for several miles along Carquinez Strait. Trains and steamers towing barges from upriver landings made deliveries.¹¹

Wheat exports from San Francisco Bay ports remained high until after the turn of the century. Wheat was the number one export in 1900, but by 1909 it dropped to 60th.¹² The grain carriers contributed to the development of iron and steel manufacturing by bringing back cargoes of coal, coke, pig iron, and scrap iron from the mills in the East Bay. Many of the iron and steel plants converted these raw materials into agricultural machinery not only for California farmers, but also for shipment to various parts of the world. The Bay area diversified further with the establishment of explosives plants that served the western mining industry, railroad constructors, smelter plants, and a small oil refinery at Alameda Point.¹³

The Pacific Mail Steamship Company realized as early as 1865 that the transcontinental railroad would reduce traffic via Panama. The directors, deciding to open a steamship service to Japan and China, acquired a mail contract for the proposed line. Steamship service from San Francisco to Yokohama and Hong Kong began on 1 January 1867, when the steamer Colorado, a wooden sidewheeler of 3,728 tons, sailed from San Francisco.¹⁴ She returned on 20 March, completing the round trip in 78 days.¹⁵

During the 1870s sugar became an important economic tie between San Francisco and Hawaii. Claus Spreckels, a German immigrant, operated the Bay Sugar Refining Company, which by 1867 became the California Sugar Refinery. After the ratification of a reciprocity treaty with Hawaii in 1875, Spreckels invested heavily in Hawaiian sugar lands. In 1883 he organized the Oceanic Steamship Company as a direct line between Honolulu and San Francisco. The fast steamers Alameda and Mariposa carried Hawaiian sugar to the refinery's spacious wharf on the Potrero in San Francisco.¹⁶

Another shipping company in the Hawaiian trade originated in the 1880s, when Captain William Matson in the schooner William Frederick carried Mt. Diablo coal from Pittsburg Landing at the mouth of the San Joaquin River to the California Sugar Refinery in San Francisco.

In 1882 Matson became part owner of a small schooner and contracted to build a 640-ton schooner, the Lurline. By 1890 Matson had organized a fleet of sailing ships for the Honolulu-San Francisco traffic. The Matson Navigation Company began to compete with Spreckels and British shippers in the Hawaiian sugar trade. After the turn of the century, Matson acquired the larger steamers Lurline, Honolulu, and Wilhelmina.¹⁷

After the Civil War, the American whale industry moved from the Atlantic to the Pacific. For a time the whalers recruited and refitted in Honolulu, but after 1880 many New Bedford vessels transferred their registry and base of operations to San Francisco.¹⁸ From 1880 until about 1905, San Francisco steam whalers brought back profitable cargoes of oil and whalebone from the Arctic. In 1883 former competitors organized the Pacific Steam Whaling Company in San Francisco. The next year the Arctic Oil Works was established on the Potrero to refine and trade in whale oil.¹⁹

The 1880s and the first half of the 1890s marked the golden age of whaling in San Francisco. In 1887 the Arctic whaling fleet's annual catch included 37,260 barrels of oil, 304,530 pounds of whalebone, and 2,850 pounds of ivory.²⁰ The 1890 figures were lower with 14,807 barrels of oil and 229,402 pounds of whalebone and no report of any ivory. The Pacific Steam Whaling Company employed eight steamers during the season, two of which remained to winter in the north.²¹ Only 15 whalers sailed out for the season in 1902. The number declined to nine in 1908 and only the schooners Laetitia and Elvira comprised the fleet in 1912.²²

San Francisco Bay was also a center for the cod fishing industry from the Civil War until the 1920s. Captain Matthew Turner and the crew of the big Timandra discovered the first cod bank in the North Pacific in 1863. While becalmed in the Okhotsk Sea near Sakalin Island, the Timandra's crew began fishing and caught 30 tons of codfish. When the vessel returned to San Francisco, the fish were dried on Yerba Buena Island and then sold at 14 cents-per pound on the streets of San Francisco. In 1865 seven vessels were outfitted at San Francisco and sailed northward, profitably catching 470,000 codfish. In 1870, 21 San Francisco vessels took 1.3 million codfish or 11,850 tons.²³ The same year Thomas W. McCollam & Company built an extensive codfish yard on the southwest side of Corkscrew Slough at Redwood City.²⁴

In June 1879, four firms, Johnson & Veasy, McCollam & Co., N. Bichard & Co., and Lynde & Hough, were in the codfish industry. Prior to 1880 McCollam & Co. moved its yard from Redwood City to Pescada Landing.²⁵ The four companies used nine vessels, five of which were fitted out by Lynde & Hough. These vessels ordinarily caught 1,000

tons. The season began about 1 March and closed on 1 October, when the vessels returned to San Francisco Bay to wash and dry the fish for market.²⁶

By 1881 Johnson & Veasy had gone out of business. In 1898 McCollam & Co. and Lynde & Hough merged to form the Union Fish Company. At the turn of the century a company named Pacific Marine Supply had a codfish plant at Hunter's Point in San Francisco.²⁷ On 12 April 1902, this company changed its name to the Alaska Codfish Company and in 1904 it moved its plant to Greco Island at Redwood City.²⁸ At the end of its first year on the island, the company was prospering.²⁹ In early September 1912, the City of Papeete, W. H. Dimond, and John D. Spreckels arrived at Greco Island with 490,000 codfish. Joseph J. Hahir, the superintendent of the Alaska Codfish plant, employed 60 men in drying and packing the catch for market.³⁰

By 1929 only two California companies, the Alaska Codfish Co. and the Union Fish Co., were in the codfish industry. In July a fire destroyed the Alaska Codfish Co.'s Redwood City plant; thereafter the company shared the Union Fish Company's plant at Belvedere. The schooners of the two companies sailed from San Francisco Bay early in the year to the fishing grounds on the shallow banks on both sides of the Alaska Peninsula. After fishing all spring and during the early summer, the schooners delivered their fish to the Belvedere yard. As soon as the fish were processed, they were sent out from Belvedere by boat to San Francisco for worldwide distribution. The Alaska Codfish Co. was finally dissolved on 13 January 1939.³¹

Redwood logging in the East Bay on the opposite coast, or contra costa, from Yerba Buena possibly began as early as 1834. By 1840, loggers definitely were hauling lumber from the East Bay hills to the embarcadero of San Antonio (now East Oakland). Lumbering all but stopped in the San Antonio redwoods between late 1842 and 1846. During the summer and fall of 1847, Elam Brown and his fellow woodsmen whip-sawed lumber and hauled it to the San Antonio Embarcadero (at the present foot of Fourteenth Avenue in Oakland) from which it was shipped to San Francisco. By the summer of 1848 most of the loggers had left for the gold fields, but early the next year many returned to the San Antonio redwoods.³²

The gold rush created a tremendous demand for lumber. Before the gold rush, most of the lumber came from the primeval redwood forests of the San Francisco Bay area, but by the end of the 1850s these forests had disappeared. Lumber operators kept moving northward along the Pacific Coast or lumber was imported from the East.³³ Most vessels leaving Atlantic ports usually carried some lumber, shingles, and house

frames and occasionally prefabricated houses. Prefabricated houses and frames comprised a sizeable amount of the Maine to San Francisco trade from 1849 to 1852.³⁴ In 1850, 79 vessels debarked from ports in Maine such as Bangor, Bath, and Portland to San Francisco. The brig North Carolina, for example, carried 571,000 feet of white pine boards, 199,000 shingles, and 24 boxes of house materials along with nails, tin, wire, and 94,000 bricks.

Lumber and building supplies came from all over the world to San Francisco. On 22 December 1850, the British bark Duke of Wellington arrived in the city, 195 days from St. Johns, New Brunswick. Part of her cargo comprised 258,000 feet of lumber, house frames, 40,000 shingles, 20 doors, and 45 pair of window sashes.³⁵

Redwood City or Mezesville began to ship lumber to San Francisco in the early 1850s. The Daily Alta California of 22 October 1857 stated that Redwood City "owes its importance to its being the only point adapted for the shipment of large quantities of redwood lumber and shingles which are constantly being made in the Redwoods, principally for the San Francisco market."³⁶ Santa Cruz and the northern coast counties also shipped lumber to San Francisco. Henry A. Meiggs established the California Lumber Company, building a mill at Big River or Mendocino City. By 1853 his schooners brought lumber from his mill to Meigg's Wharf in San Francisco, which extended 2,000 feet into the bay from the foot of Powell Street.³⁷

William A. Richardson, the former captain of the port of San Francisco, built a mill south of Bog River at Albion in 1853 and later another mill at Noyo. In 1863 Silas Coombs, Ruel Stickney, and Tapping Reeves constructed a mill at Little River. As mill towns developed along the Mendocino coast, schooners operating between Humboldt Bay and San Francisco called at Little River and the ports of Albion, Big River, and Noyo.³⁸ All along the Mendocino coast mills were built and chutes, wharves, and ports known as "dog-holes" appeared. San Francisco suffered six devastating fires in the early 1850s and lumber schooners from Mendocino dog-holes helped rebuild the city.³⁹

In 1849, Andrew J. Pope and William C. Talbot, arrived in San Francisco from East Machias, Maine. Their lumber and shipping business, Pope & Talbot, became important in the economic development of both the San Francisco Bay Area and the Pacific Northwest. In 1853 Pope & Talbot opened a mill at Teekalet, or Port Gamble, in Washington Territory. The firm soon expanded to Port Ludlow and Utsalady on Puget Sound. Before 1880, Pope & Talbot sold their lumber largely in the San Francisco area, but in 1886 they formed companies with John A. Hooper and his brothers to operate a chain of lumber yards in the Sacramento and San Joaquin Valleys. They organized the Port Costa Lumber Company, located at

Vallejo Junction, as a distributor for projected lumber outlets in the interior valleys. The Valley Lumber Company, organized in 1889 at Fresno, quickly developed yards at Kingsburg, Fowler, and Selma. The Hooper brothers and Pope & Talbot, working in both lumbering and shipping, demonstrated the close link between the two businesses in the San Francisco Bay Area. During the second half of the 19th century, San Francisco, Oakland, Vallejo, Redwood City, and Alviso were all significant lumber ports.⁴⁰

The lumber interests and residents of Redwood City and Alviso appealed to Congress for funds to improve navigation into their ports. The Corps' San Francisco office made a preliminary examination of Redwood City in 1882 and recommended dredging the channel to seven feet at high tide. The appropriation was delayed and improvements did not begin until April 1887.⁴¹ Congressman Charles N. Felton helped secure an \$8,000 appropriation for the harbor and work began on 21 April 1887. According to the Times-Gazette:⁴²

On that date a government dredger was towed down from San Francisco and anchored at Steinberger slough, from which point it was intended to work up to the center of the town to the warehouse and dock sites. The dredger, while one of the largest at that time in use by the government on this coast, was a new machine of an untried pattern, this being its first work. Buckets, operated by an endless chain over a boom, were used to raise the mud from the bed of the creek. These conveyed the mud to the hold of the craft, from which it was pumped through pipes to the shore, some distance from the banks.

It took three months of slow progress to remove 15,500 yards of soil, which created a 50-foot channel, 3-feet deep at low tide, and about 6,000-feet long. By the end of 1890, 100,000 yards of material had been dredged from the creek and harbor at a cost of \$23,400. In an October 1896 survey report, the Engineers recommended that the small upper slough not be deepened any further since it only benefited the owners of a lumber yard and a tannery.⁴³

During the 80s, the real estate boom in Santa Clara County, and San José in particular, increased the demand for lumber and brick. Several lumber companies established yards in Alviso, which became an important lumber port. Much of the lumber came to Alviso in sea-going vessels. The S. H. Chase Lumber Company of San José and Alviso in 1894 operated two vessels, the Fortuna and the Laura Pike, which plied between Alviso and the northern lumber districts of California and Oregon. In a single cargo the two vessels could carry 350,000 feet of lumber.

Vessels drawing more than 12 feet of water, however, came up Alviso Slough with difficulty.⁴⁴ In 1890 private parties unsuccessfully proposed to dredge, widen, and straighten Alviso Slough for three and one-half miles, from the deep water of San Francisco Bay to the wharves of Alviso.⁴⁵ Local residents appealed to Colonel William H. Heuer of the Corps to examine the entrance to Alviso harbor. In both 1890 and 1892, Heuer reported that the slough did not need improvements.⁴⁶

In 1897 the California legislature appropriated \$25,000 to improve Alviso Slough, but Governor James H. Budd vetoed the measure. On the night of 25 May, a mass meeting held at San José in support of Alviso Slough improvements passed resolutions censuring Budd's veto and appointed a committee to seek the desired improvements.⁴⁷

Meanwhile, in 1896 the Army Engineers proposed dredging a channel 7-feet deep at low water, 60-feet wide (80-feet wide opposite Alviso's wharves), and a turning basin. In March 1899, Congress appropriated \$48,000 for the work. Edward V. McCann of San Francisco contracted to do the work for six cents a cubic yard. McCann designed and built a novel dredger, which attracted much attention but did not do the job.⁴⁸ The San José Mercury of 14 January 1900, reported that McCann had "abandoned" his contract and that the dredger was "incomplete" and lying at the mouth of the channel, four miles north of the landing. A few days later the Mercury in an editorial, "The Alviso Fiasco," stated that the channel was "still a thing of the future."⁴⁹

Following McCann's failure, A. C. Aiken of San Francisco was given the contract to dredge the Alviso channel. He began work on 23 August 1900, but encountered difficulties. The Mercury of 14 January 1901 reported: "The bottom width, in the opinion of experts, is not a safe one. If the bottom were forty feet wider, a safe navigable channel would be secured."⁵⁰ On 19 June, Aiken finally completed the work. After inspecting the project, Colonel Heuer recommended that no further dredging be done since Alviso's commerce had not increased. In October 1904, however, bids were opened to redredge the channel.⁵¹ The Redwood City Democrat of 16 February 1905 reported:⁵²

The government has begun the work of improving Alviso harbor. An immense dredger was set to work there the first of the week. Two shifts of ten men each are employed, and the dredger will be run night and day. Captain Demerrett of the U.S. Engineering Corps is superintending the work. Harris Bros., sons of Former Sheriff Nick Harris, are in charge of the machine.

The dredging was finally completed on 5 June, but the improved channel did not increase shipping to and from Alviso. Despite

intermittent dredging from 1900 to 1905, the channel remained too narrow and shallow for larger craft. By 1910 the lumber trade no longer flourished at Alviso.⁵³

Following the explosion of the U.S.S. Maine in Havana Harbor on 15 February 1898, preparations for war with Spain were hastened in the San Francisco Bay Area. While Mare Island Navy Yard mechanics readied cruisers, private shipbuilding and repair firms put smaller craft into fighting trim. By mid-April rumors circulated that Spanish privateers from Chile and Peru would appear off the Golden Gate to attack Klondike treasure ships laden with gold.⁵⁴ On 25 April, when Congress declared war, Colonel Marcus P. Miller of the Third Artillery was placed in charge of harbor defenses at the entrance to the Golden Gate. Soldiers stationed at Fort Point mounted "sea coast guns."⁵⁵ At a special meeting, trustees of the San Francisco Chamber of Commerce recommended that citizens procure auxiliary cruisers to protect merchant vessels against Spanish privateers and organize an auxiliary to help defend the harbor.⁵⁶

San Francisco quickly became the great depot for men, freight, horses, and mules destined for the Philippines. Thirty thousand soldiers passed through the Presidio and Fort Mason enroute to the Philippines, Alaska, and Hawaii. Colonel Oscar F. Long, depot quartermaster and general superintendent of the Army Transport Service at San Francisco, faced the challenging and perplexing logistics problems of procuring ships to transport troops and supplies to fight a tropical war. The federal government chartered steamships from the Pacific Coast Steamship Company, Oregon Railway and Navigation Company, Pacific Mail Steamship Company, Oceanic Steamship Company, and the Alaska Packers Association.⁵⁷

As a result of the Spanish-American War, the United States emerged as both a Caribbean and a Pacific power. The famous 14,500-mile cruise of the battleship Oregon from Bremerton to Key West around the Horn demonstrated the need for an isthmian canal.⁵⁸ Anticipating the opening of the Panama Canal, San Francisco and every major Pacific Coast port began navigation improvement programs. Just as it benefited from the gold rush, San Francisco held the Panama-Pacific International Exposition.⁵⁹

Richmond, founded as a railroad terminal and oil port at the turn of the century, significantly affected the San Francisco Bay Area. Richmond's water commerce originated in the 1850s when Captain George Ellis built a rickety wharf, called Ellis Landing, on the mudflats near a large Indian shell mound. Ellis transported hay and grain across the bay to San Francisco in the schooners Sierra and Mystery.⁶⁰ In 1895, Augustin S. Macdonald, an Oakland real estate promoter, proposed making Point Richmond a railroad terminal. He persuaded Santa Fe Railroad Company officials and some local investors to purchase a 500-acre hay

ranch. On 3 June 1899, Macdonald filed a "Map of the Town of Point Richmond" in the Contra Costa County recorder's office at Martinez.⁶¹

In 1900, after overcoming many engineering obstacles in constructing a road from Stockton, the Santa Fe reached Point Richmond. At Ferry Point an 800-foot wharf was extended into the bay and the company bought the rebuilt ferry Ocean Wave to carry passengers and freight to San Francisco. On 3 July, the first train from Chicago arrived at Ferry Point. Bay area businessmen and shippers and San Joaquin Valley farmers welcomed the train, which marked the beginning of competition for the Southern Pacific Railroad.⁶²

With the coming of the railroad, the Pacific Coast Oil Company, a predecessor of the Standard Oil Company, moved its refinery from Alameda Point to land north of Point Richmond. In early 1902 the company built a wharf and by June, the Loomis began transporting crude oil from Richmond. With both the refinery and the railroad operating, Macdonald staged the first public sale of lots in the city he had founded.⁶³

To preserve San Francisco's maritime hegemony in the post-canal era, commercial associations led by the chamber of commerce and supported by the San Francisco Chronicle developed three strategies between 1911 and 1913. One urged placing all California ports under a uniform system of state control; another recommended giving San Francisco jurisdiction over its harbor; and a third placed all bay area harbors under a single administrative agency. Predictably, other cities and regions of the state rejected these moves.⁶⁴

Professor C. T. Wright of the University of California proposed a San Francisco Bay Area harbor district. The Board of State Harbor Commissioners, which controlled the port of San Francisco, suggested that the state manage all San Francisco Bay ports. Rejecting these proposals, Oakland, Richmond, Vallejo, and other bay communities pursued their own harbor plans.⁶⁵ No one wanted to be dominated by San Francisco even if that domination might lead to economic efficiency and strengthen the bay area's competitive position against the other major Pacific Coast ports.

In 1909 District Engineer Lieutenant Colonel John Biddle proposed improvements for Oakland Harbor. The next year a new plan was authorized. As Oakland prospered, other East Bay communities demanded deepwater facilities. Colonel Thomas H. Rees, who replaced Biddle, responded by devising a comprehensive plan in 1913 to meet the harbor requirements of the entire East Bay. Rees thought it unwise to provide each East Bay city with a separate and unconnected deepwater harbor. His plan called for a continuous deepwater channel from the entrance to the Oakland Estuary to Point Richmond.⁶⁶ The dredged material would be used

to reclaim 3,000 acres of tidelands between the bulkhead lines and the shoreline and create a dike on the western side of the channel. To make the project more attractive, the federal government would do the dredging and construct the dikes if Congress authorized the plan and appropriated the necessary funds. Each city would complement the federal improvements by projects of its own shoreward of the pierhead lines established by the government. Only Richmond made improvements based on the Rees plan.⁶⁷

Richmond's harbor originally was only six-feet deep in the outer harbor. The inner harbor, the mouth of Ellis Slough, was dry at low tide. In December 1913, a group of Richmond citizens and property owners appeared with Congressman Charles F. Curry before the Corps' Board of Engineers for Rivers and Harbors in Washington, D.C. to request an appropriation to develop the harbor. The Rivers and Harbors Act of 8 August 1917 adopted the Richmond harbor project and appropriated \$428,000, provided the city granted an equal amount. The project, which began in 1921, called for an entrance channel, 600-foot wide and 24-foot deep, with a turning basin at Point Potrero, and a channel to Ellis Slough. By 1924 the municipal wharf, located in the outer harbor, was accessible by deep water. The next year the inner harbor was made accessible for ocean-going ships.⁶⁸

By 1927 Richmond Harbor had 13 wharves. The Parr-Richmond Terminal was built in 1929 and the Ford Motor Company's wharf in 1931.⁶⁹ By 1939 Richmond boasted 19 wharves and docks.⁷⁰ In 1927 5.2 million tons passed through the port of Richmond. By 1941 it had almost doubled to 10 million, making Richmond the second port on the Pacific Coast in tonnage.⁷¹

The various cities along San Francisco Bay rejected proposals for unified management of the bay. San Francisco, Oakland, Richmond, and Redwood City depended on local bond issues and congressional authorizations to provide the harbor facilities and navigation improvements to allow each to remain competitive in the increased international and coastal trade expected from the opening of the Panama Canal in 1914. Yet, partly because of World War I and U.S. preoccupation with Europe, the canal did not actively promote the West Coast trade until the beginning of the 1920s.⁷²

Between 1911 and 1915 San Francisco's voters approved harbor improvement bonds for more than \$19 million.⁷³ During World War I the shipbuilding industry boomed in San Francisco, Oakland, and Alameda. By 1918 Oakland was known as the "Glasgow of the United States."⁷⁴ In the early 1920s competition among the ocean carriers gave West Coast products an inexpensive all-water route to the Atlantic seaboard and Europe through the Panama Canal. Western products, instead of moving

eastward by rail, moved westward to Pacific Coast ports. In a 1921 handbook about the port of San Francisco, J. H. McCallum, president of the Board of State Harbor Commissioners, described San Francisco Harbor facilities:⁷⁵

Forty piers of various sizes from 125 to 200 feet wide and 600 to 1,120 feet long, which provide a cargo area equivalent to 135 acres or 50 blocks, and sufficient to take care of about 1,500,000 tons of cargo per month.

There are more than 15 miles of berthing space, or sufficient to accommodate more than 250 vessels of average size at one time. There is a sufficient depth of water at all piers so that a vessel can dock, under its own steam, at any stage of the tide, the tidal range being from five to eight feet.

Cargo passing over San Francisco piers from 1 July 1926 to 30 June 1928 amounted to 21,985,937 tons. During the next fiscal biennium, the tonnage increased to 22,346,902 tons.⁷⁶ The Great Depression led to decreasing tonnage and revenues. At the close of the 1930-1932 biennium, harbor facilities included 43 piers, 15 passenger and automobile ferry slips, 6 car ferry slips, and 2 terminals with many small wharves and bulkhead wharves connecting the piers. The State Belt Railroad, which started in 1891 with 1 mile of track along the embarcadero, by 1932 comprised 66 miles of track extending from the Presidio to Channel Street. The Belt Line connected with the four railroads that entered the city and served the piers and industries adjacent to the embarcadero.⁷⁷

In 1921 San Francisco had 36 percent of California's shipping, but by 1933, it had declined to 21 percent. Conflict between the ship owners and longshoremen was a major reason for the decline.⁷⁸ In 1934 shipping and commerce in San Francisco suffered from both a longshoremen's strike and a general strike. Governor Frank F. Merriam called out the national guard to protect state property, in particular the State Belt Railroad.⁷⁹ Despite the violence on the embarcadero, the waterfront unions and employers compromised on several outstanding issues. Yet conflict continued on the waterfront. Between the 1934 strike and 1940 ten steamship lines withdrew from San Francisco. Seattle, Portland, Los Angeles, Oakland, and even Stockton took business away from San Francisco. Some viewed San Francisco as a "ghost port."⁸⁰

In 1936 the San Francisco-Oakland Bay Bridge was completed and the next year the Golden Gate Bridge, spanning the entrance to the bay, opened to traffic. The opening of the two bridges signaled the end of the bay's ferry system. To celebrate completion of the two bridges, San Francisco

staged the Golden Gate International Exposition in 1939 and 1940 on an artificial island built on Yerba Buena Shoals.⁸¹

The Corps built the island with partial funding by the Works Progress Administration. Lieutenant Colonel James A. Dorst served as District Engineer during construction and Captain F.A. Butler was in charge of the work. The Corps built a rock sea wall around 400 acres of shoals and pumped sand and mud dredged from nearby shoal areas into the rock enclosure. A wide causeway connected the reclaimed area, called Treasure Island, with Yerba Buena Island. The city of San Francisco intended to use Treasure Island as an airport after the fair closed, but it was leased to, and later acquired by, the Navy.⁸²

Just prior to the Japanese attack on Pearl Harbor, San Francisco ranked 18th among United States ports. When war came, the federal government expanded the port facilities in San Francisco, Oakland, Richmond, and other nearby communities. During the 45 months of World War II, more than 4,000 freighters and troopships passed under the Golden Gate carrying about 1.7 million military personnel and 23.6 million tons of cargo. By 1944 the port of San Francisco ranked first in the nation, briefly exceeding New York City in volume shipments.⁸³ Of the 152 vessels delivered by all United States shipyards during May 1944, 26 percent, or 40 vessels, were built in bay area yards.⁸⁴

In 1946 San Francisco began a two-phase, \$20 million development program that included the \$6 million Mission Rock Terminal, with a 29-acre docking facility. In 1955 San Francisco opened a World Trade Center in the reconstructed Ferry Building, originally built in 1898, to stimulate business. To further port modernization, the voters approved a \$50 million bond issue in 1958, which included the nine-berth Army Street Terminal at the Islais Creek area.⁸⁵ Meanwhile, the Board of State Harbor Commissioners, which administered San Francisco Harbor, was renamed the San Francisco Port Authority effective 11 September 1957.⁸⁶

San Francisco, like the other ports on the Pacific Coast, had little difficulty in obtaining funding for waterway construction projects to widen or deepen channels or in securing additional navigable channels. Chambers of commerce, civic officials, newspapers, and merchant and business organizations supported these projects, with the assistance of the National Rivers and Harbors Congress. This powerful lobbying organization, in which all members of Congress were ex officio members, conducted its own evaluation of proposed projects to determine which to support in Washington.⁸⁷

Federal improvements, authorized by Rivers and Harbors Acts from 1927 to 1937, and completed in 1959, included a channel 50-feet deep and

2,000-foot wide through San Francisco Bay; the removal of numerous rocks and shoals within the bay to a depth of 35 to 40 feet; a 35-foot deep approach to Islais Creek; and a channel 750-foot wide and 10-foot deep. These improvements, local and federal, helped San Francisco gather its share of the increasing maritime trade on the Pacific Coast. Between 1968-1977, commerce averaged 3.2 million tons annually through San Francisco Harbor, while nearly 56.2 million tons passed through the Golden Gate.⁸⁸ In 1965 the Port Authority's shipping revenues amounted to more than \$5 million revenue tons, which compared favorably for the same year to \$835,000 for Oakland and \$630,000 for Sacramento. In 1969 the state legislature transferred control of the port to the City and County of San Francisco, ending 106 years of operation by the state. The Port Authority was renamed the Port Commission.⁸⁹

Oakland planned to develop a first class harbor, which seemed essential to its future growth. The Southern Pacific and Western Pacific Railroad tried to push through the state legislature a measure creating a harbor commission that would divest the city of control of its waterfront. This stratagem, however, failed and only stirred Oakland's civic consciousness. In 1907 Oakland gained partial control of its waterfront by a United States appellate court decision, which the Southern Pacific finally accepted in a "compromise" with the city. On 1 May 1911, the state legislature granted Oakland full rights and title to virtually all of its tidelands. The city now possessed nearly two-thirds of the waterfront; private interests held the rest. Meanwhile, in 1909 the voters approved a \$25 million bond issue to finance port improvements. The Board of Public Works of Oakland unsuccessfully managed port development until it appointed Colonel William H. Heuer, United States Army Engineer, as supervisor of harbor developments. In 1910 contracts were let to construct a quay wall between Jefferson and Market Streets, and in the inner harbor dredging started at the foot of Livingston and Dennison Streets.⁹⁰

In 1911 A. A. Denison, Secretary of the Oakland Chamber of Commerce, asserted that Oakland and her sister cities were preparing terminal docks, quays, and warehouses in anticipation of the opening of the Panama Canal. Denison stated:⁹¹ "Beyond Oakland lies the Orient" and "Oakland, 'where rail and water meet,' is the strongest link in the commercial chain which is binding Occident and Orient." Writing about Oakland's docks in 1911, Daniel H. Bradley of the Oakland Tribune boasted that the port of Oakland would surpass San Francisco.⁹²

Until the late 1920s private interests provided most of the harbor development in the Oakland-Alameda area, except for the estuary, which

the Corps of Engineers dredged. Fred D. Parr, a shipping magnate, opened the Parr Terminal in 1920 on land leased from the city of Oakland. Despite the success of his terminal, Parr and city officials quarrelled over the terms of his lease, which wound up in a law suit. Parr won the legal dispute, but transferred his allegiance to Richmond and promoted harbor expansion there. Oakland had to repay Parr for his improvements on the waterfront, but finally the city took control of the Parr Terminal. In the early '20s Albers Brothers Milling Company constructed a huge warehouse and wharf, which became the bay area grain shipping center. In the inner harbor near the foot of Grove Street, the city built a warehouse and dock called Municipal Dock Number One. Managed by the Lawrence Warehouse Company, it became a place of call for ships of the Admiral Line, American Hawaiian Steamship Company, and Pacific Mail Steamship Company.⁹³

Oaklanders demanded further port development and in a special election in 1925 the voters approved a \$9.6 million harbor bond issue. By amending the city charter in 1926, Oakland established a Board of Port Commissioners that controlled the port area owned by the city. G. B. Hegardt, first port manager, administered the port on a sound financial basis. From proceeds of the sale of harbor bonds, a 1,700-foot wharf with a transit shed was erected at the foot of Fourteenth Street in the outer harbor. In the inner harbor, the port built a double pier and transit shed at both Grove and Clay Streets. Similar facilities were built in Brooklyn Basin at the foot of Ninth Avenue. In answer to shippers' complaints, who had to deal with the customhouse at San Francisco, the Treasury Department made Oakland a full port of entry in 1929 and established local customs service. After Rosenberg Brothers & Company of San Francisco, the world's largest shipper of dried fruit decided to ship their products through Oakland, the port attracted similar food-exporting concerns such as Libby, McNeil, & Libby, the world's largest shipper of canned goods. Between 1928 and 1937 Oakland's municipally-operated terminals more than tripled their volume of business despite the Depression.⁹⁴

While the citizens of Oakland gained better harbor facilities, their civic leaders also obtained federal assistance for channel improvements through various Rivers and Harbors Acts from 1922 to 1945. In the outer harbor Army Engineers dredged a 9,000-foot entrance channel and an 8,000-foot channel and turning basin, with controlling depths of 35 feet. In the inner harbor, with its major commercial waterfront, the Engineers developed a 37,000-foot entrance channel and turning basin, inner channels, a tidal canal, and two jetties, with controlling depths of 18 to 30 feet. As authorized in the 1962 Rivers and Harbors Act further modifications deepened the 30-foot inner channel to 35 feet and the lower 1,300 feet of

the north channel in Brooklyn Basin from 25 to 35 feet. These navigation improvements contributed substantially to the expansion of commercial shipping to the East Bay port, strengthened military activities at the Oakland Army Terminal, and increased recreational boating. Waterborne commerce at Oakland Harbor, not including cargo carried in military craft, averaged 6.2 million tons annually for 1968-1977. Oakland rivaled San Francisco and the other major Pacific Coast ports.⁹⁵

In January 1977, a 51-acre, three-berth container terminal opened in Oakland's outer harbor. At the Sea-Land Terminal, also in the outer harbor, four giant A-frame cranes and a 70-acre yard with a capacity for more than 2,000 containers served the world's largest containerships.⁹⁶ The following September, the 13-acre outer harbor Container Terminal Berth 4 opened, which was used principally by the Maersk Line, sailing under the Danish flag. A 40-ton gantry container crane⁹⁷ served its 750-foot wharf. Oakland became the largest container port on the Pacific Coast and with Los Angeles, Long Beach, and Seattle lead in general cargo tonnage on the Pacific Coast. Containerized cargo tonnage at the Oakland marine terminals increased from 365,084 in 1965 to 7.3 million in 1977. In 1978, 40 steamship companies served the port, including the Oakland-based American President Lines, the largest container shipping company in the Pacific.⁹⁸

Like other bay area ports, Richmond received valuable federal aid. Through authorizations in various Rivers and Harbors Acts from 1917 to 1954, the Corps completed channels up to 35-foot deep in the outer and inner harbors and turning basin, a rubblemound training wall 10,000-feet long parallel to the channel between Point Richmond and Point Petrero, and other minor improvements. Waterborne commerce through Richmond averaged about 17 million tons annually during 1968-1977 with 90 percent of the total petroleum and petroleum products.⁹⁹

At Redwood City, about 20 miles south of San Francisco, nine municipally owned and operated berths accommodate oil tankers and cargo carriers of up to 30-foot draft. Project improvements authorized by Congress in Rivers and Harbors Acts from 1910 to 1950 included an entrance channel, two turning basins, a connecting channel, an inner channel, and the off-shore San Bruno approach channel. Controlling depth was made 30 feet except for a shallow channel 5-feet deep extending to Steinberger Slough. Commerce in the harbor averaged about 1.2 million tons annually during 1968-1972. The products included salt, building cement, petroleum products, and iron and steel scrap.¹⁰⁰

San Pablo Bay and Mare Island Strait, Carquinez Strait, and Suisan Bay not only connect San Francisco Bay to the Sacramento and San Joaquin

Rivers, but also contain numerous privately owned terminals and wharves that serve industries, principally petroleum refineries. San Pablo Bay is the main northerly branch of the San Francisco Bay system. Mare Island Strait provides access to the Navy Yard. Through various Rivers and Harbors Acts from 1902 to 1945 Army Engineers dredged the 40,000-foot Pinole Shoal Channel, the 17,000-foot Mare Island Strait Channel and turning basin, and a maneuvering area at Oleum Pier, with controlling depths, ranging from 30 to 45 feet. About 5.7 million tons passed through the ports in San Pablo Bay and Mare Island in 1977.¹⁰¹

Suisun Bay Channel connects San Francisco Bay and the navigation channels of the Sacramento and San Joaquin Rivers. The existing project authorized by several Rivers and Harbors Acts from 1927 to 1935 and Section 107 of the Rivers and Harbors Act of 14 July 1960, consisted of a 13-mile main channel leading to the mouth of New York Slough and a 2-mile auxiliary channel with controlling depths of 30 feet and 20 feet, respectively. Commerce averaged 7.7 million tons annually during 1968-1977.

Gold made the Sacramento and San Joaquin Rivers the outstanding waterways of the Pacific Coast. The Indians travelled these rivers in fragile rafts and dugout canoes. Gabriel Moraga discovered the waterways in 1808 and other Spaniards explored them in 1811 and 1817. From the 1820s to the mid-1840s British and French-Canadian trappers sailed the rivers in whale boats and long boats, carrying beaver furs to Yerba Buena cove. Americans began to settle along and use the rivers in the 1840s. Following the discovery of gold by James W. Marshall on the American River, the rivers became the gateway to the gold fields. During the 1850s ocean-going as well as shallow draft vessels made their way to Stockton on the San Joaquin and to points up river from Sacramento with little difficulty. In 1850, 28 steamers, 23 barks, 19 brigs, and 21 brigantines plied the Sacramento, while similar vessels serviced the San Joaquin. In 1854, the California Steam Navigation Company was organized and soon monopolized the shipping service on the rivers.¹⁰²

Unfortunately, the mining methods, particularly hydraulic mining, clogged the river channels with muck and detritus, impairing navigation. Navigation of deep draft ships became impossible and seriously impaired the passage of shallow draft vessels. As grain production increased in the San Joaquin and Sacramento Valleys, the rivers became vitally important in transporting this new gold. To reestablish deepwater navigation on the San Joaquin River, a group of San Francisco and Stockton businessmen formed the Stockton Ship Canal Company in 1869. State Senator Nelson M. Orr, one of the founders, secured approval of an act "to construct and maintain a ship canal from the city of Stockton to deep water

on the San Joaquin River." To implement the plan, the company turned to Colonel Barton S. Alexander, an Army Engineer, who later gained fame as the "Father" of the Central Valley Project. Colonel Alexander proposed a channel 40-feet wide at the bottom, ranging from 17 to 22 feet deep. The channel was to extend from a point just below Stockton to Disappointment Slough some 20 miles down river, at which point the water was deep enough for ocean vessels to reach San Francisco. Community interests strongly supported the plan, as indicated by the Stockton Daily Independent of 21 November 1870:103

If we desire to reap the advantage consequent on being the outlet and inlet of this magnificent and productive valley, and control the commerce of its predestined wealth and population, we must without delay inaugurate and push forward the one great enterprise which will, it is conceded by all, insure that result--we must build the ship canal.

When private capital failed to provide the funds, community leaders turned to the federal government. To persuade Congress to adopt the project, the promoters stressed that water transportation from Stockton to Oakland or San Francisco would be cheaper than overland and the growing population and industry of the valley would create the demand for goods shipped via water. San Francisco Bay ports and business groups, however, opposed the Stockton project. In the Delta, Sacramento rivaled Stockton, but, because of its more central location in the valley, Stockton received the federal funds.

River navigation also conflicted with the farmers' irrigation needs. Opponents claimed that a deeper and straighter channel would increase flood damage and allow salt water to penetrate and pollute soils and fresh water supplies. Furthermore, the wave-wash from ships plying the river was likely to destroy levees at near-flood stages. Nonetheless, after years of pressure from local and state interests, in 1875 Congress authorized the Corps of Engineers to begin navigation improvements on the Sacramento River. A year later Congress appropriated a modest \$20,000 for the initial work of dredging the San Joaquin River to a nine-foot depth. By 1913 the nine-foot minimum depth had become a reality.¹⁰⁴

To resolve the problem created by hydraulic mining, Congress passed the Caminetti Act in 1893 that established the California Debris Commission. The commission, which consisted of three Army Engineers, was:¹⁰⁵

empowered and required to adopt plans for improving the navigation of the Sacramento and San Joaquin Rivers, project and construct works for impounding detritus and preventing the deterioration of rivers from the deposit of hydraulic mining and other debris, and devise means and issue permits for resuming and carrying on hydraulic mining operations under conditions that will not injure other interests in the state.

In 1910 the Debris Commission recommended a comprehensive plan to improve navigation and provide flood control on the Sacramento and San Joaquin Rivers. As in other plans, Congress approved portions of the plan. By 1917 Army Engineers had removed more than 24 million cubic yards of muck from the Sacramento River below its junction with Cache Slough. Inadequate funding and planning also hampered navigation improvements on the San Joaquin River. Between 1875 and 1925, however, stern-wheelers plied these rivers, increasing the desire of local interests for the elusive deepwater channels on the Sacramento and the San Joaquin. Strongly influenced by the California delegation, particularly Representative Charles Curry and Senators Hiram Johnson and Samuel Shortridge, Congress finally adopted the plan on 21 January 1927 that called for a channel with a 26-foot minimum depth and a 100-foot bottom width for the San Joaquin River. By the time dredges started work, the 26-foot depth was obsolete and Congress adopted a low-tide depth of 30 feet. The Corps completed the task by the end of the 1930s to accommodate the large 20th-century ships.¹⁰⁶

Stockton's port attracted numerous industries, and the District Port Commission of Stockton provided harbor facilities to handle the increased commerce. World War II and the Korean and Vietnam conflicts, which brought heavy traffic to the varied armed service centers near Stockton, justified federal expenditures for dredging and maintaining the deepwater channels.¹⁰⁷

During the Great Depression local interests revived a plan for a deepwater channel to connect the city of Sacramento with San Francisco Bay. The city groups allied themselves with the Sacramento Valley farmers, upon whose prosperity the city depended. The farmers, in turn, needed cheap transportation to distribute and market their products. Unfortunately, the farmers' excessive use of irrigation water lowered the water level enough to impair navigation. Turning to trucks and trains to ship their produce, the farmers further reduced commercial navigation on the Sacramento River, consequently threatening employment in Sacramento canneries. To prevent further unemployment and improve job prospects, the Chamber of Commerce once again proposed a deepwater shipping channel originally sponsored by the Sacramento Chamber of Commerce and the State of California in 1916. Despite support

by the Sacramento and Yolo County Boards of Supervisors and favorable survey reports by the state and city, the project failed to gain federal support. Finally in 1933 with the assistance of the politically powerful Senator Hiram Johnson, the city obtained authorization for a Corps study of the Sacramento River. The unfavorable report led to a dispute between the Corps and local and state interests that was not resolved until 1946 when Congress authorized the project in the Rivers and Harbors Act of 1946. This project called for a 43-mile long, 30-foot deep channel from Suisun Bay to a harbor at Sacramento; a triangular harbor and turning basin at Lake Washington; a barge canal with a navigation lock to connect the port with the Sacramento River; and a combination highway and railroad bascule bridge across the canal at the harbor end of the project.¹⁰⁸

On 19 July 1963, the port of Sacramento held its dedication ceremonies. The opening of the port realized the dream of William G. Stone, the port director, who had worked most of his life for the project. Stockton port authorities approved of its new rival, believing that ample tonnage existed in the Central Valley for both ports.¹⁰⁹

The container revolution jolted Stockton and Sacramento along with other ports on the Pacific Coast. Both envied Oakland, which adapted more rapidly than the other bay area ports to handling containers and trailers. During the 1960s Oakland captured the major share of the business. In 1967 Stockton port authorities developed plans for a container cargo terminal and in the 1970s organized "minibridge" shipments of Central Valley agricultural products. Not until 1977, however, when the port appointed Alexander Krygsman as director, did Stockton solve its shipping problems. Krygsman upgraded equipment, installed new bulk storage and loading facilities, but more importantly, brought in new accounts, so that the port won the respect of both employees and management. Under Krygsman's directorship the port began to make substantial profits.¹¹⁰

On the Sacramento River, the Army Engineers have plans to close the lock on the barge canal, that connects the Sacramento River and the Deep-water Channel. Since commercial traffic declined when the transport of petroleum products shifted from barge to pipeline and agricultural freight shifted to trucks, the canal has been used almost exclusively by recreational boating. With the federal government economizing, Army Engineers face the difficult problem of whether operating costs can justify recreational use for a project authorized for commerce.¹¹¹

Ironically, in passing the Rivers and Harbors Act of 1965, Congress adopted a comprehensive plan for the unified development of navigation improvements in the San Francisco Bay Area originally suggested by Lieutenant Colonel Rees at the start of the century. Under the 1965 law,

the Corps improved existing navigation projects from the main ship channel crossing the San Francisco Bar outside the Golden Gate to the port of Stockton on the San Joaquin River. This project called for improvements to five major navigation channels. The Corps planned to deepen the Stockton Deep Water Ship Channel from 30 to 35 feet, realign the channel to follow the False River cutoff route, and strengthen the levees along the channel. At San Pablo Bay and Mare Island Strait, the Corps wanted to deepen the Pinole Shoal Channel to 45 feet, lengthen it to about 11 miles, and dredge a 45-foot maneuvering area adjacent to Oleum Pier. The plan called for deepening the West Richmond Harbor through the west navigation opening of the Richmond-San Rafael Bridge from 35 to 45 feet, and enlarging and deepening the approach area to Richmond Long Wharf, as well as deepening and widening the Suisun Bay Channel. Finally, the Corps hoped to deepen the main ship channel across San Francisco Bar from 50 to 55 feet and deepen the main internal bay channels to 45 feet. After completing bank protection work between Venice Island and Stockton by 1972 and dredging the main ship channel across San Francisco Bar to 55 feet by 1974, the Army Engineers deferred further construction pending a complete reassessment of the project's environmental impact.¹¹²

Today the channels of the San Francisco Bay complex connect the ports of the bay region and provide sea access to the inland ports of Sacramento and Stockton. Landward, the port complex primarily serves the southwestern United States. Seaward, it serves Alaska, Hawaii, Washington, Oregon, the Gulf states, Canada, South America, Europe, and Asia.¹¹³

The only major landlocked anchorage north of San Francisco Bay is Humboldt Bay on the majestic redwood coast of California. Jonathan Winship, an American on a sea otter hunting expedition with the Russian American Company, explored the bay in the 280-ton ship O'Cain in the summer of 1806. Several townsites such as Union (Arcata), Bucksport, and Eureka were founded in the 1850s. Eureka later became the metropolis of the whole bay region. In 1881 Army Engineers built two rubble mound jetties to protect the harbor entrance to provide safe passages through the dangerous entrance channel.

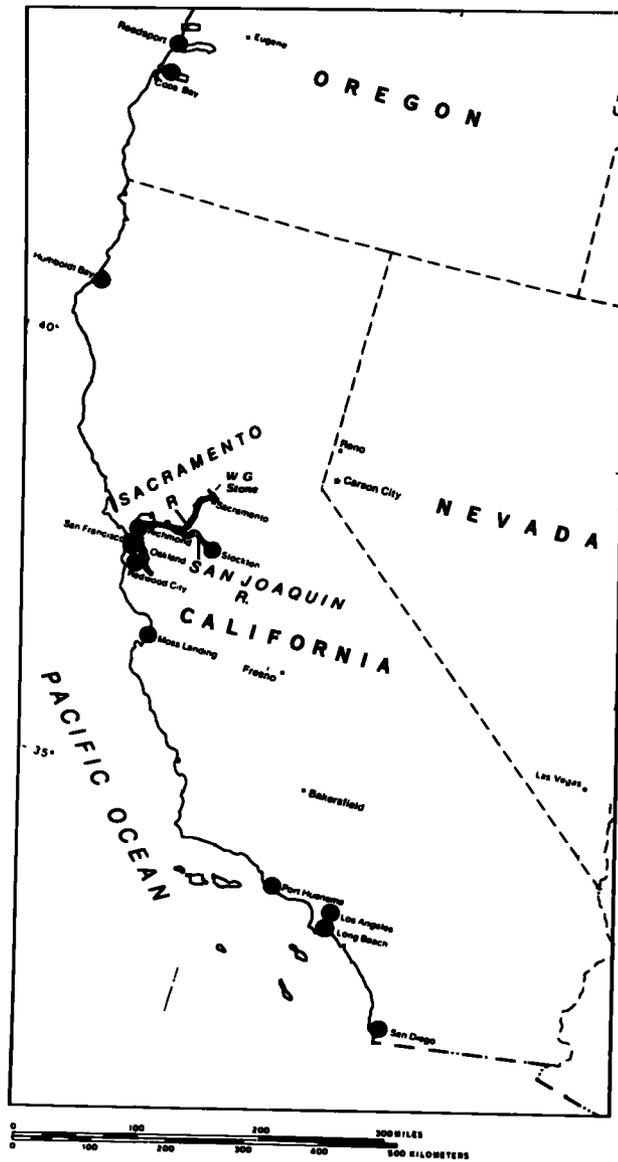
By 1907 commercial navigation based on timber exceeded 600,000 tons annually. To provide a better harbor, Congress adopted a project to expand the channel to an 18-foot depth, 300-foot width, and 6,200-foot length in the 1907 Rivers and Harbors Act. By 1908, when the Corps finished the project, they became convinced of the importance of maintaining the jetties. From then on the Corps worked periodically to repair the twin jetties that were continually damaged by severe winter storms. The latest major repairs were made in 1973-1974 and minor repairs were made in 1977. The existing harbor consists of nearly 2 miles of jetties, about 11 miles of channels, and a turning basin, with harbor depths ranging from 26 to 40

feet. Waterborne commerce consisting primarily of varied petroleum products, lumber and related products, and salt water fish reached 560,000 tons in 1965, 1.6 million tons in 1977.¹¹⁴

Crescent City Harbor located midway between San Francisco Bay and the mouth of the Columbia River serves an area of about 13,000-square miles in northern California and southern Oregon. The Corps began improving the harbor in 1881. The latest improvements were done in 1974. Waterborne commerce averaged about 284,000 tons annually during 1968-1977. Petroleum products made up the bulk of the cargo in 1977.¹¹⁵

Since 1848, mining, agriculture, whaling, fishing, lumbering, shipbuilding, flour, petroleum, and countless other industries have developed the San Francisco Bay Area ports. While a few ports have disappeared or become virtual ghost ports, most have survived with improved harbor facilities and financial benefits for their communities. With five million inhabitants the San Francisco Bay and Delta region is an important commercial, financial, and industrial center.

CALIFORNIA COAST



Chapter 4

COMMERCE AND NAVIGATION IN SOUTHERN CALIFORNIA

The history of San Pedro Bay with its mud flats illustrates how the cooperative efforts of enterprising local business interests with local, state, and federal governments converted a hostile environment into a significant shipping port. The process helped lift Los Angeles and Long Beach Harbors from sleepy pastoral communities into a dynamic metropolitan region with the greatest concentration of population, industry, agriculture, and communications on the Pacific Coast.¹

In 1834 Richard Henry Dana described the bay at San Pedro as "the hell of California." Returning 25 years later, Dana had not changed his mind; but others, among them Army Engineers, foresaw the evolution of a large modern harbor. Instead of a roadstead exposed to every wind and wave action except from the northwest, they saw a potential harbor area protected by Point Fermin from westerly winds and waves and partially from southern wave action by Catalina Island, about 25 miles away. In addition, the bottom held anchors very well and inland there was a land-locked lagoon.²

Despite the bay's uninviting character, irregular port service began with the Spanish founding of San Gabriel mission in 1771, and the Los Angeles pueblo in 1781. Spain attempted to exclude trading activities between foreigners, but the Americans with active trading interests in Asia, displayed an early interest in California's harbors as way stations for their Far Eastern trade.³

In 1805 the American ship, the Lelia Byrd, under Captain Shaler, pulled into San Pedro. Enroute back to Boston from the Hawaiian Islands, Shaler could not get provisions at Avalon on Catalina Island, but at San Pedro he quickly exchanged his New England manufactured goods for provisions. Soon a lively contraband trade developed in which sea otter skins, and then cow hides and tallow, were bartered for various items, including cloth, sugar, and household articles. Thus smuggling sparked Los Angeles' first real interest in the harbor at San Pedro.⁴

When Mexico achieved its independence from Spain, the new government opened all the ports, but established heavy duties. In 1826 San Pedro became a port of entry. The collector of revenue was stationed in Los Angeles, 22 miles away. In July 1928, the government closed the port to foreign vessels and legal trading shifted to Catalina Island. Smuggling, however, continued as a way of life for Californians and Americans.⁵

The headquarters for foreign trade shifted back to San Pedro in 1846 after Mexico confirmed the 1827 land grant known as the Palos Verdes Rancho. This rancho fronted on the shore of San Pedro Bay, but as was the Spanish custom, the government reserved 42 acres with 1,400 feet of water frontage (where the lower reservation of Fort MacArthur is presently located) for public use. Simultaneously war between the United States and Mexico erupted. In 1848 the United States acquired California through the terms of the Treaty of Guadalupe Hidalgo. Two years later California was admitted as a state.⁶

While Northern California boomed with gold, Southern California peacefully slumbered on in its pastoral economy. Many of Los Angeles County's future civil leaders who played a role in the early development of the harbor at San Pedro Bay, arrived then. Among them were "Admiral" Phineas Banning, who established a business that hauled freight and passengers from San Pedro Bay and Los Angeles throughout the southwest; John G. Downey, governor of California in 1860 and future financier; William Sanford, an early postmaster for Los Angeles; and Benjamin D. Wilson, a leader in the struggles against the Mexican governors of California.⁷

With the perspicacity characteristic of many of Southern California's leaders, these men combined their resources to purchase 2,425 acres from the Rancho San Pedro, which was owned by the Dominguez family for approximately \$20,000. Four years later they bought another 1,000 acres. At the head of a slough about four miles northeast of San Pedro, Banning established a town, which he named Wilmington after his birthplace in Delaware, and built a timber wharf. Shallow shifting entrances faced the inner harbor on both sides of Deadman's Island. Although these channels were crooked and unreliable, Banning and others discovered they could profitably take lighters through them to ocean-going vessels anchored in the open San Pedro Bay.⁸

San Pedro's coastal trade became greater than the aggregate trade of all the other U.S. ports south of San Francisco.⁹ Nevertheless, Banning and his friends recognized that the future of Los Angeles, and their own enterprises, depended on improving Wilmington as a port and obtaining better transportation, specifically a railroad, between Los Angeles and San Pedro Bay. In the late '60s, Banning had become a state senator and acquired the title of "General." Assisted by state and local officials and local newspapers, he persuaded the citizens of the city and county of Los Angeles to authorize the issuance of bonds, costing \$225,000, to finance a railroad between the city of Los Angeles and Wilmington. In 1869 the Los Angeles and San Pedro Railroad began operating, an additional stimulus for a deepwater harbor at San Pedro.¹⁰

Since the financial resources of Los Angeles and California could not provide an improved inner harbor at Wilmington, the people turned to

Washington. In 1868 Congress authorized a Corps survey of Wilmington harbor to determine its commercial needs and necessary navigation improvements. Upon completing his survey, Major R. S. Williamson recommended improving Wilmington harbor at federal expense. Although he advanced an ingenious plan to use the tidal flows to scour a channel to the desired depth by confining a tidal prism, he could not justify the cost of a protective breakwater of expensive granite blocks that was essential to his proposal. Under continuous pressure from local interests Congress authorized an inadequate appropriation of \$200,000 for the Wilmington breakwater in 1871. Major G. H. Mendell was assigned to form an acceptable plan. While accepting the Williamson proposal, he substituted cheaper wood and stone for the expensive granite. Because of the failure of the first contractor, an unsatisfactory original structural design, and lack of congressional appropriations, ten years passed before the project was finished. Finally, in 1881 a breakwater 6,700-feet long, of three types of construction, costing about \$530,000, closed the gap between Rattlesnake and Deadman's Islands.¹¹

During the delay local inhabitants vented their frustrations, calling the jetty, "Banning's Gull Roost." But the patience of the Engineers did not go unrewarded. Indeed, their expectations were exceeded. Many years later H. W. McOuat, an outstanding expert on harbors with the Los Angeles District, concluded that while the jetty was structurally deficient it did perform its intended function, scouring a dependable channel 250-feet wide and 10-feet deep. Engineers also could rely on tidal scour to maintain the desired depth with little or no dredging.

When the Engineers finished the project, local interests, impressed by Wilmington's growing commercial use and the increased size of ships, petitioned Congress for further improvements. Congress granted the request but again with inadequate funding. Once more relying on tidal scour, the Corps secured the desired 16-foot depth by extending the original east jetty beyond Deadman's Island to the 3-fathom curve. It also constructed a complementary west jetty that jutted out 3,500 feet from Timm's Point in the general direction of Deadman's Island, to maximize the tidal flow. The Corps completed the project in 1893.¹²

Local interests also obtained additional authorization to dredge 18 feet across the bar and widen and straighten the channel inside. The work, however, was delayed by a major controversy over the location of a deepwater harbor. The inner harbor improvements at Wilmington were designed for coastal shipping, not for deepwater vessels.¹³ Major Mendell noted this in his 1871 report to the Chief of Engineers. With the prescient attitude of an experienced engineer, he reported that although the Wilmington improvements were necessary, "it is apparent that a breakwater in the bay

of San Pedro, which would give security to vessels under its lee at all times, would be a very desirable construction, and it is probable that at some future day, the commerce of this bay may obtain such dimensions as to justify its construction, which could not be made under the expense of several millions of dollars".¹⁴ By 1890 all interested parties agreed except for the location of the deepwater harbor. This disagreement delayed Mendell's program for more than 25 years. During the struggle the Corps' very integrity was assailed.

Powerful, ambitious men, competing railroad interests, and aspiring communities in Southern California fought over the proposed deepwater harbor. Four special boards of Engineers, local and federal officials, civic-minded citizens and groups, and vitally-concerned business interests wrestled with the issue. Railroad development now became inseparable from harbor development in Southern California.

Los Angeles' emergence as the metropolis of Southern California was not inevitable. By the 1870s the city dominated the smaller communities and competitors around San Pedro and Santa Monica Bays, but it had a formidable rival in San Diego.¹⁵ With a deepwater harbor rivaling San Francisco, San Diego only lacked rail communication with the rest of the country, which it labored mightily to achieve by becoming a transcontinental railroad terminus. When Los Angeles, however, became the railroad terminus for the Southern Pacific, it became the focus of the population movement that "transformed Southern California into one of the nation's foremost urban centers."¹⁶

The railroads and Congress determined the location and the pace of railroad and harbor improvements in Southern California with momentous consequences for the region's future.¹⁷ In 1869 the small but vital Los Angeles and San Pedro railroad linked the inner harbor at San Pedro with Los Angeles, which had a population of 5,614 in 1870. That same year the first transcontinental line between Sacramento and Omaha joined at Promontory Point, Utah. The Southern Pacific, the successor to the Central Pacific, quickly planned to control transportation both to and within California. Local citizens and other business interests were determined to frustrate those ambitions.¹⁸

In extending a trunk line from San Francisco to Los Angeles, the Southern Pacific acquired certain perquisites, including the pioneer rail line to the harbor area. As the company controlled the pier and the lighterage equipment, it established a temporary monopoly. Interested in all-rail hauls between Los Angeles and San Francisco, the Southern Pacific neglected the development of shipping facilities in the Los Angeles area. Other business interests challenged the company by founding Santa

Monica several miles north of San Pedro on Santa Monica Bay, where they constructed an excellent deepwater pier, which they linked to Los Angeles by a railroad line. The Southern Pacific countered this challenge by absorbing the new company and destroying the pier. To forestall competition from any southern transcontinental railroad, the Southern Pacific established the first direct rail linkage of Southern California to the rest of the country by connecting with the Texas and Pacific Railroad. Ironically, this stimulated economic activity in the Los Angeles area and provided an incentive for increased commerce through Wilmington's port.¹⁹

In the mid-1880s a second transcontinental railroad, the Santa Fe, entered Los Angeles and San Diego. Although San Diego had an excellent natural harbor, it was too far away from Southern California's population centers to compete substantially against the potential harbor facilities within the San Pedro or Santa Monica Bays. In 1887 the Santa Fe opened a rail line from Los Angeles to Port Ballona (now Playa de Rey), but dredging efforts to open a channel from the ocean to the Ballona Slough failed dismally. Still seeking a seaport, the Santa Fe turned to Redondo Beach and constructed a short railroad from the beach to Los Angeles in 1888. A real estate company had built a substantial pier at Redondo Beach that took advantage of a submarine canyon to allow deep draft vessels to unload their cargoes directly upon railroad cars, thus eliminating the expense and difficulties of lighterage required at San Pedro. The Redondo Beach Company built a second railroad, the narrow gauge Redondo Railroad, to promote real estate sales in Redondo Beach. By 1891 Port Redondo had made significant inroads into Wilmington's maritime business. Although Wilmington and San Pedro handled twice as many vessels and twice as much tonnage as Port Redondo, their commerce was limited to coal and lumber, while Redondo had more lucrative and diversified types of business.²⁰

With only unprotected anchorage at San Pedro and Redondo, and with San Diego harbor impractical because of its distance from Los Angeles, local interests recognized that the development of the Los Angeles area required a protected major deepwater harbor as well as the inner harbor at Wilmington and San Pedro. Los Angeles business interests began to campaign for congressional funds for the harbor at San Pedro. Congress authorized a preliminary survey in 1886, the first of four different projects for a breakwater in San Pedro Bay. Upon completion of that survey in 1888, Colonel G. H. Mendell submitted the first San Pedro breakwater project to Congress at an estimated cost of \$4,045,700. Maine Senator William B. Frye, the influential chairman of the Senate Committee on Commerce, vigorously opposed the proposal.²¹

In the fall of 1889 the Senate Committee on Commerce came to the West Coast on an inspection trip. Escorted by Senator Leland Stanford,

president of Southern Pacific, and an ebullient delegation from the Los Angeles Chamber of Commerce, the committee went to San Pedro. To their dismay, Senator Frye, unable to visualize what the imaginative Angelenos saw at San Pedro, denounced the project. After a visit to Santa Monica, also under consideration, Frye concluded that this was the better site for a deepwater harbor, which made Santa Monica a formidable rival to San Pedro. Thus the first proposal for a harbor of refuge and commerce collapsed, but local interests were not that easily stopped.²²

In 1890 the Secretary of War, under instructions of a patient Congress, appointed Colonel G. H. Mendell and Lieutenant Colonels G. L. Gillespie and W. H. H. Benyaurd to examine the Pacific Coast between Points Dume and Capistrano to determine the best location for a deepwater harbor, prepare a plan, and estimate project costs. After detailed analysis, this board rejected all sites except San Pedro on the basis that a harbor there offered better protection both from prevailing winds and dangerous storms at less cost for equal development of the breakwater.²³

When the Mendell report was referred to the Senate Committee, no one anticipated any difficulties. Formidable opposition arose from an unexpected source--the Southern Pacific, which began the "Free Harbor Fight" between community interests and adverse private interests over the location of the deepwater harbor. For many reasons the Southern Pacific decided upon re-opening the whole issue of deepwater facilities in the Los Angeles region. In a long discussion around 1881, Colonel Mendell and Southern Pacific president Leland Stanford settled, as far as they were concerned, the need for the harbor and its location, but when Collis P. Huntington replaced Stanford as president of the Southern Pacific, San Pedro lost an important supporter. By 1888 the Southern Pacific had a monopoly on the western side of Wilmington Harbor and started to build a wharf from Point Fermin eastward into the outer harbor. But the federal government challenged the legality of the railroad's right of way that crossed a "government reservation" without a permit. The proposed pier also would be in danger during winter storms. In addition, Port Redondo had attracted much coastal shipping that had previously used the shipping facilities of San Pedro and the Southern Pacific. Moreover, in its own private preserve the Southern Pacific faced competition from another railroad, which removed any possibility of a monopoly at San Pedro. On the other side of the harbor other business interests purchased picturesque Rattlesnake Island, prosaically renaming it Terminal Island, and built the Los Angeles Terminal Railway via the new town of Long Beach to Los Angeles. In addition there was a rumor that this new railway would connect with the Union Pacific, an unpleasant prospect for the Southern Pacific. With characteristic boldness, Huntington abandoned the Point Fermin project; built a magnificent pier in Santa Monica Bay, "the longest of its kind in the world"; secured a right-of-way along the entire Santa Monica shoreline to the new

pier; and now sought to obtain breakwater protection at federal expense for the "long wharf."²⁴

A bewildered Congress authorized the Secretary of War to appoint a board of five Engineer officers to report whether San Pedro or Santa Monica was the best site for a harbor to accommodate the largest ocean-going vessels and to defend the area. Recognizing Huntington's powerful political influence, the Secretary of War appointed Colonel William P. Craighill, Lieutenant Colonels Henry M. Robert and Peter M. Hains, and Majors Thomas H. Handbury and C. W. Raymond--a very prestigious group. After considering all the factors the Craighill Board decided unanimously in favor of San Pedro. Once again the question appeared settled, but the Commerce Committee refused to appropriate any money in support of the project.²⁵

The Southern Pacific completed the "long wharf," cleverly naming it Port Los Angeles. The company began a campaign to gain public opinion in favor of its plan, but Angelenos were unhappy with the prospect of relying on the Southern Pacific for the growth of their city. Huntington failed to get majority support from the local interests. Harrison Gray Otis, the publisher of the Los Angeles Times; the Free Harbor League; and Senator Stephen M. White, who supported the San Pedro site, opposed Huntington. Huntington's influence on the Senate Committee, however, prevented any decision on the Craighill recommendations and with the country in economic doldrums, no money was available for the project.

In 1896, Huntington out-manuevered his opponents with an amendment to a proposal to dredge the inner harbor at San Pedro, which provided \$3.1 million for a breakwater in Santa Monica Bay. But after five days of debate, which attracted national attention, Senator White obtained an amendment that appropriated \$2.9 million for a breakwater and the appointment of another engineering board of unprejudiced members to determine the location. This time the board's decision would be final.

President Grover Cleveland vetoed the entire Rivers and Harbors Act, but Congress over-rode his veto. The exclusion of Army Engineers from the new board was an unjust and galling reflection on the Corps, but it indicated the impossibility of influencing the technical judgment of Engineer officers. The Corps received its vindication from the new board. In October 1896 President Cleveland appointed Rear Admiral John G. Walker of the Navy as chairman, Augustus F. Rodgers from the Coast and Geodetic Survey, and three nongovernmental civilians, George S. Morrison, William H. Burr, and Richard P. Morgan, to the harbor selection board. Morgan, a Southern Pacific man, filed a minority report that favored Santa Monica, but the Walker Board's majority report recommended "in favor of San Pedro as the

location for a deep water harbor for commerce and of refuge in Southern California."²⁶

Huntington still refused to yield. With the assistance of the Secretary of War, Russell A. Alger, he delayed the project. Pressure from the U.S. Senate and hundreds of letters from Los Angeles, however, reached President William McKinley, who ordered Alger to advertise for bids. Major E. L. B. Davis in the San Francisco office of the U.S. Army Corps of Engineers opened the sealed bids on 10 February 1898, but Alger did not approve a contract for the work until July. Heldmaier and Neu of Chicago had the low bid of \$1,303,198, less than half the estimated cost. In the Senate the Santa Monica supporters failed to expend the balance of about \$1.6 million pro rata upon both Santa Monica and San Pedro.²⁷

Finally on 26 April 1899, the contractor dumped the first load of rock from Catalina Island while bay area residents held a Free Harbor Jubilee to celebrate. Just before this detached breakwater was completed in 1910, reconsideration of whether to fill the 1,900-foot gap between the breakwater and the shore led to a project to close the gap, which produced a completed breakwater 11,152-feet long.²⁸

With the outer harbor settled, Los Angeles focused its attention on municipally controlled development of the inner harbor, free from railroad domination. Under the guidance of Stanford, Huntington, and Edward H. Harriman, the Southern Pacific bought the tidelands of Wilmington Lagoon, which gave the railroad the chance to establish a monopoly at San Pedro Bay by giving it a major share of the city's waterfront and terminal facilities. Challenging the Southern Pacific, once again the ambitious city of Los Angeles tried to establish municipal control over an ocean gateway approximately 20 miles away.²⁹

To insure municipal control of the new harbor and provide land and facilities for commerce and navigation, the leaders of Los Angeles persuaded Congress to authorize a harbor line board. The board delineated harbor lines, annexed an area between one mile to a half-mile wide to connect Los Angeles to the harbor area, bargained for the annexation of the corporate towns of Wilmington and San Pedro, created a harbor commission to plan and operate the harbor, brought successful legal action to recapture tidelands illegally held by private interests, and obtained funds for harbor improvements. Having cleared away all major obstacles, Los Angeles, with the Corps' cooperation, was in a position to establish one of the finest man-made harbors in the world.³⁰

In 1912, the city of Los Angeles collaborated with the federal government to provide ocean shipping facilities by constructing channels and

terminals in the inner harbor. They completed the first municipal wharf in 1914, about the time that the Panama Canal opened.³¹ As anticipated, the Panama Canal stimulated the improvement of Pacific Coast channels and facilities.³²

In August 1914 Los Angeles prematurely celebrated the arrivals of the Oregonian, Missourian, and Washingtonian of the American Hawaiian Company at Pier A inaugurating intercoastal trade, when slides temporarily closed the canal. Intercoastal steamship service was abandoned during World War I; however, the harbor commissioners reported a phenomenal growth of commercial activity after the war ended in November 1918.

For the fiscal year ending 30 June 1916, Los Angeles Harbor handled more than 2 million tons of cargo valued at more than \$76 million and 2,787 vessels entered the port. For the year ending 30 June 1926, Los Angeles Harbor handled more than 23 million tons of cargo valued at more than \$804 million and 6,417 vessels entered the port.³³

In 1927 the U.S. Shipping Board ranked Los Angeles Harbor second to New York on the basis of tonnage and water-borne commerce handled. The harbor handled the most intercoastal trade, leading in the export of canned fish and petroleum oils and in the import of lumber. General cargo also increased. For fiscal year 1927-1928 more than 25 million tons of cargo and 7,532 vessels entered the harbor.³⁴

The port's growth paralleled that of Southern California and the Pacific Southwest. The 1920 census showed that Los Angeles had jumped from 17th in population in 1910 to 10th, making it one of the largest cities in the United States and the largest on the Pacific Coast. Equally as important, agriculture and industry grew in Southern California and the Pacific Southwest.³⁵

The Los Angeles Chamber of Commerce thought the inauguration of the Dollar Lines' trans-Pacific service between Los Angeles and the principal Asian cities, coupled with the scheduling of the 1928 Pan-Pacific Commercial Conference for Los Angeles, demonstrated Los Angeles' position in the international market. Oil development in Southern California was the major factor in increasing Los Angeles Harbor's export trade. Copper from Arizona's mines; borax from the Mojave Desert; fresh, dried, or canned citrus and other fruits from the farms of Southern California; cotton; and sardines were distributed by more than 100 shipping firms that serviced Los Angeles. Ships returned with crude rubber, green coffee, bananas, and hardwoods. "Without the development of a harbor as a gateway to the outside world even a considerable trade of Los Angeles would be an utter impossibility."³⁶

Displaying the same far-sighted vision as Los Angeles' leaders, a group in Long Beach developed a neighboring port that proved as beneficial to the prosperity of Long Beach as the harbor improvements at San Pedro and Wilmington were for Los Angeles. The development of the Long Beach Harbor began in 1905 when Los Angeles Dock and Terminal Company bought 800 acres of marshland and tidal sloughs to dredge a harbor and build wharves. In 1909 the city of Long Beach issued bonds and used the funds to purchase some frontage for a 500-foot municipal wharf that was completed in 1911. In 1916 the company, lacking the money to remove the silting caused by the 1911 and 1914 floods, deeded its harbor property to Long Beach.

Up to this time the Army Engineers had declined to recommend government assistance for Long Beach Harbor because of its proximity to Los Angeles Harbor. Since both harbors suffered from silt carried down from the floods in 1914 and 1916, the federal government approved a project to construct an intercepting dike about five miles inland and a leveed channel from the dike to the ocean. Long Beach and Los Angeles collaborated to convert Cerritos Slough into a 200-foot wide channel connecting the two inner harbors. Later the federal government expanded the channel to its present 400-foot width. Lacking sufficient frontage on the inner harbor and demonstrating faith in its future, Long Beach developed an outer harbor with breakwater and moles in 1924.³⁷

In the 1920s, efforts to combine the twin harbors of Los Angeles and Long Beach under a single port authority failed. Nevertheless, the two communities have cooperated to resolve common problems and each has the financial resources to improve its harbors as needed.³⁸

Full development of San Pedro's outer harbor began in 1930 when Congress authorized a detached breakwater that was completed in 1937. With the addition of two more detached breakwaters in 1942 and 1949, San Pedro Bay has the longest breakwater in the world, nearly 47,000-foot long, including two entrances. In the 1950s and 1960s Army Engineers dredged the entrance channel to the Los Angeles Harbor to 1,000-foot wide, deepened the outer harbor to a depth of 40 feet, and dredged the inner harbor to a depth of 35 feet. Cerritos Channel, which connects the two inner harbors, was widened to 400 feet with a 35-foot depth. Similar dredging deepened the Long Beach Harbor to 35 feet. Local agencies expanded terminal facilities to cope with commercial demands. Both the Los Angeles and Long Beach harbor authorities dredged their entrance channels to 52 and 62 feet, respectively, to special wharves to provide enough depth for supertankers. Since big ship technologies offer substantial economies in cargo movement, all major ports strive to provide adequate depths, widths, and facilities.³⁹

The early navigators would not recognize the San Pedro Bay that has a harbor complex, that affords more than 18-square miles of water surface in the lee of breakwaters, two outer harbors with protected anchorages, two inner harbors connected by a navigable channel, and an extensive system of turning basins and connecting waterways. This harbor complex can accommodate almost all oceangoing craft.⁴⁰

Los Angeles and Long Beach form the second, largest center of maritime commerce in the United States and handle the most tonnage on the Pacific Coast. Commerce through these harbors increased from 32 million tons in 1960 to nearly 68 million tons in 1977. Projections call for 95 million tons of commercial traffic in 2020. A significant factor in their growth is their relation to the sea lanes of international commerce. San Pedro Bay is close to the great circle route from Panama to Asia, which makes the harbor complex an economical and convenient place to stop for fuel or cargo. Of the more than 6,000 ships from 38 countries that entered the ports in 1966, nearly half were foreign vessels. Also, the ports are 200 miles farther east than any other major port on the Pacific Coast.⁴¹

The Port of Los Angeles is valued at \$560 million, encompassing 7,000 acres of land, comprising sheltered harbor waters, and 28 miles of waterfront. To international shippers the port offers a wide variety of cargo-handling facilities and equipment, including break-bulk, dry and liquid bulk facilities, Lighter Aboard Ship and Roll On/Roll Off terminals, and six large container terminals. Three major railroads and hundreds of trucking firms serve the port and extend the port's market area throughout the Southwest and across the nation.⁴²

The Port of Long Beach is valued at \$260 million. From 1928 to 1970, oil revenues and income from port operations financed the development of harbor facilities that include bulk loaders; liquid bulk terminals with up to 60 feet of water dockside, capable of accommodating vessels up to 150,000 deadweight tons; a spacious 320-acre container complex; and a terminus for Alaskan North Slope Oil. Three major transcontinental railroads and hundreds of interstate trucking companies serve the port.⁴³

U.S. Navy Department facilities, which include the Los Angeles Naval Base, the Long Beach Naval Station, the Long Beach Naval Shipyard, and Long Beach Naval Supply Center, are located on Terminal Island, centrally situated between the two ports. These facilities serve up to 30 naval vessels. The Navy complex comprises a specialized industrial shipyard and a naval support base, handling seagoing ships with appropriate facilities and logistical support.⁴⁴

From 1933 to 1970 commercial activity expanded substantially at the huge harbor complex in San Pedro Bay. Long Beach, however, surged ahead of Los Angeles. Long Beach handled nearly twice the commercial traffic while Los Angeles Harbor grew by only 20 percent. The explosive growth of Orange County attracted more coastal trade to Long Beach. As a result, Long Beach increased its share of the coastal trade from 20 percent in 1955 to 40 percent in 1969. By 1969 Long Beach exported more tonnage to foreign countries than the Port of Los Angeles, 6.2 million tons compared to 4.4 million tons. Long Beach had become the largest dry cargo port on the Pacific Coast by 1966.⁴⁵ Long Beach temporarily became the cargo tonnage leader for the Western United States by handling a total of 29,378,454 tons during fiscal 1975-1976.⁴⁶ Thus two separate, but competitive ports, located in San Pedro Bay with the same tributary area, the same trading patterns with about the same countries, and identical handling charges engage in a friendly rivalry.

San Diego, with the only large natural harbor in Southern California, expected to become the "pre-eminent urban center in Southern California," not Los Angeles. Except for San Francisco, San Diego Bay excelled the other Pacific Coast bays for capacity and safety. Because of these natural advantages "San Diego alone was a potential rival for the trade with the Orient and as a terminus of a southern transcontinental railroad".⁴⁷

High, steep mountains and the desert on the east, and Baja California on the south, isolated San Diego. Without an adequate water supply or transcontinental railroad connection until 1885, San Diego failed to develop until well into the 20th century.

As other ports have done, San Diego turned to the Corps for harbor improvements, recognizing that even natural harbors require periodic modifications. In 1853 Lieutenant George Horatio Derby constructed a makeshift levee to divert the San Diego River from San Diego Bay into False (Mission) Bay. In 1875 this was replaced with a substantial levee that conducted the river into False Bay, which prevented the silting of San Diego Bay. In 1890 Army Engineers established harbor lines that allowed local interests to properly place terminal facilities without infringing on ship channels.⁴⁸

In 1890 Congress allocated funds to eliminate shoaling in the entrance channel, secure depths of 24 and 26 feet in that channel, and widen certain portions. The Army Engineers used these funds to construct Zuniga Jetty in the San Diego Bay.⁴⁹ The military requirements of the Spanish-American War, the acquisition of island possessions in the Pacific Ocean, and the major wars of the 20th century largely determined the character and extend of the harbor's improvements. Furthermore, as the Annual Report of the Chief of

Engineers, 1913, stated, the completion of the Panama Canal would become a major factor in improving not only the San Diego Harbor, but the other Pacific Coast harbors. By 1910 the Engineers began to dredge the channel to 30 feet. In 1961 the U.S. Hopper Dræge Harding dredged the entrance channel to 42 feet, with various anchorages and interior channels of 26-, 30- and 35-foot depths. Congress authorized additional improvements in 1968. By 1982 San Diego harbor covered about 18-square miles at half tide. Under the leadership of the Unified Port District (San Diego, National City, Chula Vista, Imperial Beach, and Corodado) local authorities cooperated eagerly to construct ample harbor facilities for shipping. These facilities included 46,600-linear feet of wharves, of which 20,900-linear feet were municipally owned and 35,700-linear feet were privately owned.⁵⁰

Thus the people of San Diego with the assistance of the federal government turned into a reality what appeared to be the fanciful, wishful dreams of the San Diego Chamber of Commerce. In 1901 the Chamber issued a sketch of the harbor with 174 piers, all connected to railroads and Pacific sea lanes.⁵¹ Although by the 1960s San Diego "had lost out to Los Angeles,"⁵² its leaders capitalized on its fine natural harbors and ideal climate to demonstrate that smaller ports perform a necessary commercial function on the West Coast. By 1976 the port was handling over 2 million short tons of cargo per year.⁵³

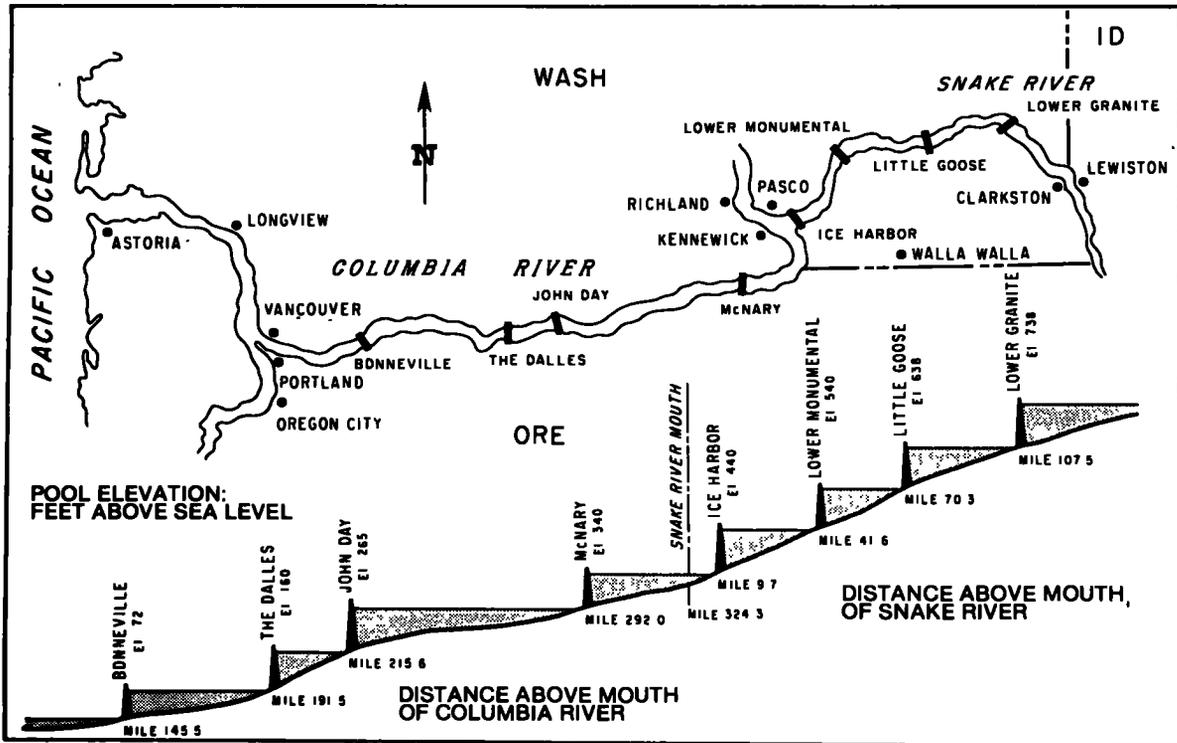
The Port of San Diego also includes one of the nation's largest naval facilities. It is home for 120 Navy ships (18 percent of the Navy's active fleet). The Navy is responsible not only for the character and extent of the primary harbor channels, but also for the 42 foot-deep entrance channel to the bay. The Navy contributes about \$1.2 billion annually to San Diego City and County.⁵⁴

Port Hueneme Harbor is the only deep draft harbor between San Pedro Bay, 65 miles to the south, and San Francisco Bay, more than 400 miles to the north. Through the efforts of Californians during World War II, Port Hueneme became a man-made, landlocked harbor connected to ocean waters by a jetty protected entrance channel with 35- to 40-foot controlling depths. The harbor interior has a controlling depth of 32 feet. The U.S. Navy as well as commercial vessels use the port. Commerce, mainly crude petroleum and fuel oils, averaged about 1.3 million tons for 1973-1977.⁵⁵

Los Angeles, Long Beach, San Diego, and Hueneme offer international shippers a wide variety of cargo-handling facilities and equipment and provide access to local and regional markets through the various inter-modal cargo transfer systems. However, anticipating future demands, Southern California port authorities are developing master plans to develop navigation and port-related facilities.⁵⁶

Figure D-34

PROFILE OF COLUMBIA-SNAKE WATERWAY NAVIGATION POOLS



Note: Sites of locks and dams are shown by a name or number.

Chapter 5

NAVIGATION AND COMMERCIAL IMPROVEMENTS IN THE PACIFIC NORTHWEST

The Columbia River flows for 300 miles along the northern boundary of Oregon after dropping south across Washington state from its Canadian source. It forms a vital link in the commercial life of the Pacific Northwest, tying together the ocean-oriented coastal plain and the great agricultural region beyond the Cascade Mountains. Draining 259,000-square miles, the Columbia delivers over half the water entering the Pacific from the United States. One of the Columbia's majestic tributaries, the Snake River, carries commerce to the western slopes of the Rocky Mountains. Another, the Willamette, flows southward, nearly reaching the California border. When first used by Europeans the Columbia had four distinct navigation regions: the tidal portion (reaching to what is now Portland, Oregon); the lower river between Portland and the Cascades; a middle pool extending from the Cascades to the Dalles; and the navigable stretch above the latter.

Local efforts, mostly private, to improve navigation on the river before 1865 were too limited to support the rapid growth of trade that developed in the Columbia River watershed. Craft larger than canoes and batteaux began moving commerce in 1827 when the Hudson's Bay Company started shipping lumber to Hawaii from its sawmill at Fort Vancouver. Twenty years later the first shipments from Willamette Valley farms left Portland for ready sale in San Francisco. That trade swelled with the California gold seekers.

In 1850 the first river steamer began operating between Portland and Astoria, at the river's mouth. The following year another paddlewheeler ran between Portland and the Cascades. In 1853 a craft built at the Upper Cascades hauled freight and passengers on the third section of the river to the Dalles. Finally, in 1859 a vessel travelled above the Dalles, which made trade with the Snake and Clearwater Valleys possible. Although segmented by the obstacles at the Cascades and the Dalles, the Columbia now had a system of steamers.

The growing river trade induced private interests to construct paths around the chief river obstacles. In 1851 the Portage Railroad built a mule-powered transfer line around the Cascades in Washington. A second line, the Oregon Portage Railroad, was built on the southern bank later in the decade. A wagon road around the Dalles rapids opened in 1856.¹

A group of Columbia River steamboat operators in 1860 pooled their interests to form the Oregon Steam Navigation Company. It quickly established a monopoly, taking control of both the Portage Railroad and the Oregon Portage Railroad. The company proved highly profitable, especially during the Salmon River gold rush in 1862. Later Idaho and Montana gold strikes kept river traffic busy during the rest of the decade.

Portland benefited from the increasing Oregon wheat trade and the development of the Idaho gold fields. It served as the trans-shipment point for supplies and produce shifting between river and ocean craft. In 1860 the venerable Pacific Mail Steamship Company halted its Portland-San Francisco service and the city had to rely on other, less satisfactory, shippers. Six years later the Oregon Steam Navigation Company gave the port a boost when it placed a large, new steamer on the San Francisco run in an effort to develop new business for the upriver steamers. The growing salmon packing industry along the lower reaches of the Columbia added to the impetus for river improvement. The city's leaders recognized that Portland's economic development depended upon a deep, clear channel connecting the city with the ocean.

Dredging the bars and removing the snags necessary to clear the channel to Portland exceeded local capabilities. Portland's merchants turned to Congress and in 1866 secured the first appropriation for a Corps rivers and harbors project on the Columbia River system. The initial project cleared the Willamette River near Portland. By 1869 the Corps had removed 33 snags and opened a 17-foot channel across the bars at Swan Island and at the mouth of the river.²

The Oregon Steam Navigation Company also successfully lobbied to have the Corps survey the long stretch of the Columbia from Portland to the mouth of the Snake River preparatory to the removal of some of the more dangerous obstructions such as the Umatilla, Homely, and John Day Rapids. The report led Congress to fund the removal of the entire John Day Rapids, completed by 1873.³

During the 1870s, the Corps also surveyed the mouth of the Willamette River, Willamette Slough, and the upper Willamette from Oregon City to Corvallis. Congress appropriated funds to construct wing dams to remove bars from those stretches of the river. Wing dams, which were simple and economical, forced the current to wash out bars and maintain adequate depths for the craft. The dams consisted "of logs 2 feet in diameter and [as] long as possible, to be thrown diagonally across the current and held in position by four piles, two at each end of the log; willow brush to be lodged against the upper side, and held in place by gravel." By concentrating the current

in the middle of the river, the dirt and gravel forming the bars washed downstream into areas where they would be harmless to river traffic. The placement and design of wing dams was critical. If improperly sited they merely moved the bar downstream or eroded the opposite bank. Nevertheless, they generally proved satisfactory temporary devices for controlling rivers.⁴

Recognizing the growing importance of the Columbia and Willamette Rivers as navigation waterways, the Army Corps of Engineers established a District office in Portland in 1871. The Portland District's major objectives were to remove immediate navigation obstacles and map the waterways. Engineer officers surveyed the problem areas at the mouth of the Columbia River including Point Adams, Cape Disappointment, the Astoria Sand Flats, Sand Island, and the bar at the mouth of the river itself. South of Portland, survey parties mapped the Yamhill and charted the Willamette from Eugene City to Portland. In the early 1870s the Engineers also reconnoitered the Snake River, but concluded that any substantial improvements would be difficult. A fourth survey looked for possible canal routes to bypass both the Cascades and the Dalles.⁵

By 1875 the Engineers had surveyed and removed several bars and rapids on the Columbia and Willamette Rivers. In addition, they removed dangerous snags and rocks, strengthened banks, and controlled shoaling by wing dams. The surveys provided information of immediate use and guided the Corps in planning future projects. The Engineers' work ensured that navigation became relatively safe and dependable both for deep draft vessels connecting Portland with the Pacific Ocean and for river craft travelling up the Columbia to the Snake or down the Willamette to Corvallis. The nearly ten-fold increase of river traffic from 1866 to 1876 demonstrated the value of the Corps' navigation improvements.⁶

Independent of the Engineers, private interests built a series of locks in 1873 at Willamette Falls in Oregon City to expedite the large wheat shipments moving from the upper valley to Portland. By 1915 the locks were no longer profitable and were sold to the Corps, who rehabilitated them. They still handle considerable traffic, particularly log rafts.⁷

During the 1880s "clearing, snagging, scraping, and damming, and blasting operations kept the Upper Willamette open for navigation for flat bottom boats all year as far as Salem" and for nine months of the year to Eugene. In the Rivers and Harbors Act of 1896, Congress authorized the maintenance of minimum channel depths of two and a half to four feet in the Willamette and Yamhill Rivers, which allowed light draft steamboats to reach Corvallis on the Willamette and Dayton on the Yamhill.⁸

No matter how effective and beneficial these navigation improvements were, this only solved the region's immediate transportation problems. For the next 50 years, the Engineers concentrated on permanent improvements such as jetties, canals, and locks.

Three projects on the lower Willamette River provided for permanent dams and revetting of the banks at Post Office Bar near Willamette Slough, Coon Island, and Nigger Tom Slough. A fourth project removed St. Helen's Bay on the Columbia. Completed by 1882, they created a 20-foot, year round, navigable channel from Portland to the sea. These projects were the first permanent structural navigation improvements in the Pacific Northwest. Portland District postponed its fifth proposal, closing the North Channel at Swan Island to eliminate the bar there, because of a disagreement over the wisdom of the project. When finally completed in 1927, however, it followed the original recommendations.⁹

In 1896 the Corps planned a small lock and dam near Lafayette, on the Yamhill River, and completed it in 1900. The lock and dam served as a conduit for timber bound for downstream mills for a quarter century. During the 1930s, its use drastically declined and the area became a county park in 1954.¹⁰

The most formidable navigation obstacles on the Columbia River were the rapids at the Cascades and the Dalles. Recognizing that the Columbia and Snake Rivers were the only routes to market for produce from eastern Oregon and for large portions of Washington and Idaho Territories, the Corps planned to conquer the Cascades first. At the Cascades a 16-foot fall in 3.5 miles presented an impassable set of rapids. The Corps started the Cascades Canal and Lock in December 1878, but the difficulty of the task, design revisions, and incompetent contractors delayed completion until 1896. The demands of other worthwhile, but costly, activities within the region also limited the funds.¹¹

Passage of the 12.5 mile stretch of rapids between Celilo and the Dalles took longer to achieve. Here the river plunged 81 feet between narrow walls and around whirlpools and massive basalt boulders. In 1893 Colonel G. H. Mendell proposed constructing a portage railroad. In 1905 Oregon finally built the railroad. The railroad served until the Corps completed its canal, which Congress authorized in 1904. The canal, with a series of five locks, opened in 1915 and proved a boon to shippers since it removed the last major obstacle to traffic as far as Priest Falls on the Columbia and Lewiston, and Idaho on the Snake River. The canal operated until 1956 when the Dalles Dam inundated the project.¹²

Corps' surveys also led to navigation improvements along the Clearwater River, an Idaho tributary of the Snake. Following studies by the Corps in

1870, Congress authorized a project to remove obstructions in the river. In three years of hard work the Engineers removed gravel, cobblestones, and boulders from a 40-mile stretch at the river's mouth. Until the 1930s, the Corps maintained the upper Columbia and Snake Rivers, removing rocks, reefs, boulders, ledges, and snags. In addition, by 1896 dikes constructed at Wild Goose and Log Cabin Rapids deepened the channel on the lower Snake River where dredges kept the gravel shoals from threatening river traffic.¹³

Closer to the mouth of the Columbia, the Engineers built wing dams, removed snags, and dredged the Cowlitz River in Washington during the 1870s to make it navigable during low water. In 1899 improvement work began on the Lewis River that enters the Columbia opposite St. Helens, Oregon. The construction of a series of dams on the river continued until 1965, but produced navigable water only for shallow draft craft.

The continuing problem of the constantly shifting bar at the mouth of the Columbia was less easily solved. In 1880 the Corps recommended an 8,000-foot jetty on the south side of the mouth. Four years later work started. When completed in 1895, the structure provided a channel of at least 30-feet over the bar. Although Portland reaped substantial benefits from these improvements, its deep-sea trade was decreasing. The railroads, which thrust their tracks into the wheat growing regions, enticed grain shipments away from Portland. By 1892 the port also lost its dominance in the Alaska trade to Seattle.

By 1902 additional work clearly was needed to eliminate shoaling and maintain a dependable channel across the bar at the Columbia's mouth. In 1913 the Corps completed additional dredging to 36-37 feet of safe water on the bar. Although less than the projected 40-foot depth, it proved adequate for all the vessels plying the river. In 1917 the Corps achieved the desired depth by constructing a jetty on the north side of the mouth. These improvements allowed the largest vessels on the Pacific Coast to enter safely the mouth of the Columbia. The area did not need extensive additional work for nearly 40 years.¹⁴

The Port of Portland, a public body authorized by the Oregon state legislature in 1891, initially tried to maintain a 25-foot deep channel to the sea. Like the earlier local efforts to maintain the route to the sea, the port soon discovered that the task was beyond its capabilities and appealed to Congress. Following an 1899 survey, the Rivers and Harbors Act of 1902 provided funds to complete the channel. The Corps, in cooperation with the port, finished the project in 1907. In 1912, Congress directed that the channel be deepened to 30-feet. The channel required no further

major work until 1930.¹⁵ This improved access to the sea helped Portland become a major steel shipbuilding center in World War I.

The Columbia River improvements coincided with the formation of James J. Hill's Great Northern Pacific Steamship Company, which gave his transcontinental railroads access to San Francisco. The steamship company built a pair of large express liners that ran between the Columbia River and the California ports from 1914 until the Navy took them over in World War I. Following the war neither vessel returned to the Columbia, but smaller craft operated into the 1930s.¹⁶ Then Portland's coastal passenger service died, as coastal passenger service did on both coasts, from the rise in automobile production and sharply rising labor costs.

In the Rivers and Harbors Act of 1925 Congress directed the Secretary of War, in collaboration with the Federal Power Commission, to estimate the cost of surveying navigable streams and their tributaries for possible combinations of navigation, flood control, and irrigation development. Among the rivers studied were the Columbia, Cowlitz, Lewis, Willamette, and John Day. Detailed surveys followed as money became available. In 1931 a comprehensive regional plan recommended development of the Columbia in stages as each segment became economically feasible. The plan included dams and locks at Grand Coulee, Foster Creek (Chief Joseph), Priest Rapids, the Dalles, and at the foot of the Cascades (Bonneville). Within two years both the Grand Coulee and the Bonneville dams were underway as part of the Public Works Administration program.¹⁷

Meanwhile the federal government undertook other, primarily navigation, projects. The Columbia River channel between Vancouver, Washington, and the mouth of the Willamette was deepened to 25 feet and widened to 300 feet. The next project was a 10-foot deep, 300-foot wide channel at Cathlamet, Washington, on the north side of Puget Sound Island about 40 miles from the mouth of the Columbia. In 1923, the Corps cut a passage 25-feet deep, 300-feet wide, and 1.5-miles long near St. Helens, Oregon, to connect the Willamette Slough with the main river channel. A fourth project, which the Port of Portland undertook in 1927 without federal money, eliminated the narrow channel northeast of Swan Island.¹⁸

In 1930 improvements to the navigation channel from Portland to the sea were continued because of the need to accommodate the larger vessels beginning to serve the port. By 1933 the Corps had widened the channel to 300 feet and deepened it to 35 feet.¹⁹ The Corps worked on several smaller navigation improvement assignments along the lower reaches of the Columbia River between 1933 and 1954 when it began to improve the river's mouth. Portland once again became the site of major shipyards during World War II because of its deep water.

A channel 30-foot deep and 300-foot wide improved navigation between Vancouver and the mouth of the Willamette. In addition, dredging two turning basins of the same depth and width of 2,000 and 3,000 feet respectively enabled the construction of a large wartime shipyard at Vancouver during World War II. A project that provided a 27-foot deep, 300-foot wide channel as far as the Dalles improved navigation upstream from Vancouver. Because the traffic consists only of shallow-draft barges and towboats, the channel has been maintained only to a 15-foot depth since 1959.²⁰ In 1935 Congress assigned responsibility for maintaining a 35-foot depth in the Willamette River from its mouth to the Broadway Bridge to the Corps' Portland District. That same year Congress ordered a pair of auxiliary channels 30-foot deep designed to make shipping safer and passage quicker at St. Helens on the Columbia.²¹

In the 1950s the mouth of the Columbia needed further improvements because of the gradually deteriorating entrance and the decreasing depths caused by shoaling, which made the passage for larger deep-draft vessels dangerous. In addition, the rapidly increasing population along the Pacific Coast boosted trade prospects. The Army Engineers, after Congressional authorization, finished dredging a 48-foot channel across the bar in September 1957. Adequate depths require constant dredging and careful jetty maintenance. Between 1962 and 1964 the Corps rehabilitated the south jetty and in 1965 repaired the north jetty. The Corps repaired the pile dikes the following year. These maintenance operations allow fully-loaded ships and oil tankers to navigate the Columbia with considerable savings to business and customers. During storms these vessels can enter the mouth of the Columbia safely, for its 48-foot depth permits deep-draft vessels to pass over the bar with a clearance of at least 15 feet.²²

During the 1960s the Corps constructed navigation facilities for shallow-draft craft including the Hood River boat basin and Camas-Washougal turning basin in 1962, and the barge channel dredging and bank protection activities near Bingen, Washington, in 1963. In Baker Bay improved channels and mooring basins helped fishermen.²³

In 1975 the Corps completed a 40-foot deep channel from Portland and Vancouver to the sea to accommodate modern oceangoing vessels. Combined with the 48-foot depth at the river's entrance, the channel allows deep-draft vessels to use the lower Columbia. Upstream from Vancouver, river traffic, which consists primarily of towboats, barges, small freighters, and pleasure craft, has a 15-foot channel as far as Bonneville Dam. Following the completion of Lower Granite Dam in 1975, a 14-foot channel extended from Bonneville to Lewiston, Idaho. In addition, auxiliary channels 30- and 24-foot deep extend from the main channel to St. Helens and Ranier, Oregon, respectively.²⁴

Turning our attention to the Washington and Oregon coastline, we find that of its more than 4,100 miles most of it lies within Washington's Puget Sound, which has numerous inlets, bays, and passages. The region's major ports are Seattle, Tacoma, Everett, and Olympia, but numerous smaller ports and landings dot the shores of Puget Sound. At the smaller ports that serve the coastal stretch between the California border and the Strait of Juan de Fuca, the Corps carries out river and harbor improvements.²⁵

The controlling depth at the entrance to Puget Sound is about 200 feet while within the sound the bottom is generally more than 900 feet. As a result, harbor and terminal development requires a minimum of dredging. In addition, the Strait of Juan de Fuca and its connecting channels provide deep natural water access that allows vessels unrestricted size and speed when entering Puget Sound.²⁶

The Hudson's Bay Company established the European settlement on Puget Sound at Fort Nisqually in 1833 in the delta of the Nisqually River (near present day Steilacoom). Two years later the post became the home port for the Beaver, the first Pacific coastal steamer. The first American settlers in the area moved to Tumwater (near Olympia) in 1845, but few others joined them until after the Mexican War.

The settlers quickly discovered that Puget Sound's shores and islands supported great forests of tall, virgin fir trees. During the gold rush San Francisco suffered from explosions and frequent fires, which opened a market for lumber that the Puget Sound settlers seized. They shipped their first cargo southward in 1849 and the industry received a great boost with the establishment of steam powered saw mills in Seattle in 1852 and Port Gamble in 1853.²⁷ By 1855 timber shipments made their way not only along the Pacific Coast, but to world markets. The plentiful lumber attracted shipbuilders who established yards close to the saw mills. By 1874 the shipbuilding industry within the sound and at the lumber ports along the Pacific was well established. The coal mines, which first opened near Seattle in 1852 and around Bellingham Bay in 1853, added to the area's prosperity. By 1881 Washington mines shipped about 200,000 tons to San Francisco alone.²⁸

During the 1870s the Corps of Engineers began surveying the region's navigation obstacles. They examined the rivers that fed into the Sound--Puyallap, Skagit, Snohomish, and Chehalis--in an effort to identify obstructions that should be removed. By the early 1880s the Engineers had removed snags, built wing dams, and dredged on the Skagit, Snohomish, Nooksack (or Lumi), and Stillaguamish Rivers.²⁹

During the 1880s the Corps improved the ports along the Pacific. Coos Bay, a significant lumber and shipbuilding area, was beset with shifting sands and unpredictable tides that made navigation on its waters dangerous. To stabilize the entrance channel, the Engineers constructed a jetty that they completed in 1889. A similar structure controlled the shifting sands at Bandon, the port at the mouth of the Coquille River south of Coos Bay. In 1879 the Corps surveyed the dangerous entrance to Yaquina Bay, Oregon. The survey led to the construction of a 2,500-foot long jetty, but because of problems that developed during construction the structure had to be modified in 1888.³⁰ The Engineers frequently had difficulties constructing jetties along the Oregon and Washington coasts because the rugged coast seldom permitted placement of jetties in locations that protected them from the North Pacific's merciless pounding.

From the latter part of the 1880s until the 1920s the Portland District improved the bays and harbors along the Oregon and Washington coasts. Congress mandated these projects because of the growing number of sawmills and shipyards. One mill owner wrote: "We have only one market place-- S.F. We cannot load large enough vessels to go south [South America or Australia] or to the [Hawaiian] Islands; small vessels does (sic) not carry enough to make long trips, and large ones can't get over the bar".³¹

Since the jetties installed at Coos and Yaquina Bays and at the mouth of the Coquille River failed to provide the needed navigation improvements, the Corps constructed others. At Yaquina Bay two jetties, completed by 1896, successfully stabilized the channel at a 17-foot depth until 1919. At Coos Bay the deep draft of the large lumber carriers required an entrance depth of at least 20 feet, 7 feet greater than that existing on the bar. Once again the Engineers used twin jetties, which produced the desired depth in 1889. The channel, however, had to be dredged regularly to maintain the project depth. Additional dredging increased the depth on the bar to 22 feet after 1919. Because the sea constantly assaulted the Coos Bay jetties, the Corps asked Congress for funds to make repairs. As a result, the Engineers restored and strengthened the south jetty in 1928 and the north jetty the following year.

In 1817 improvements began on the Suislaw River entrance at Florence, Oregon, where a bar allowed only shallow draft vessels to enter. Scarce funds limited progress, but the Corps completed the project in 1917. The Corps dredged a 5-mile channel 17-feet deep by 1930 and maintained it until 1958. Regular dredging kept the channel at the mouth of the Coquille River at its designed 13-foot depth until 1942, when the north jetty was reconstructed. Tillamook Bay, about 50-miles south of the Columbia River entrance, received no major improvement until 1912 when Congress authorized the construction of a jetty and a channel 18-feet deep and 200-feet wide. In

1917 the Corps completed the project, which needed only minor improvements in later years.³² All of these projects eased access to the lumber ports serving Oregon's Coast Range forests.

Early Corps construction projects along the Washington coast included improvements to Willapa Bay and Grays Harbor. The Grays Harbor ports of Aberdeen and Hoquiam were important outlets for the logging industry on the Olympic Peninsula, which contained the densest conifer growth on earth. In 1892 the Army Engineers inaugurated a series of dikes and dredging operations to provide a 26-foot channel over the bar at the mouth of Willapa Bay and a 24-foot channel from the Bay to Raymond, just above the forks of the Willapa River. The projected depth on the bar was difficult to maintain and dredge because the shoal migrated. In February 1976 the Corps ceased dredging for deep-draft vessels for both environmental and economic reasons.³³

In 1896, the same year in which the Seattle District was created, Congress authorized the initial improvement of Grays Harbor. Since then the Seattle District has maintained a 30-foot deepdraft channel across the bar, which it secured with north and south jetties. Inside the bay, a 30-foot channel leads to Cosmopolis, about nine miles from the entrance. Despite the jetties, the Grays Harbor entrance tends to shoal and requires annual dredging.³⁴ These improvements allowed Aberdeen and Hoquiam to continue large-scale construction of wooden hulled vessels through World War I, which was exceeded only at the Puget Sound and Coos Bay yards.

From the beginning of settlement, the logging industry formed the economic base of coastal Washington and Oregon. The collection and shipment methods were relatively simple. Initially, lumberjacks harvested timber along the shores of Puget Sound and the larger bays and floated the logs to waiting vessels or hastily erected sawmills. When they exhausted the stands along the shore, the loggers moved inland along the navigable streams. They floated or towed the logs to the mills, which usually sat on the shore. The cut lumber could easily be loaded on sailing vessels and steam schooners that carried it to markets in California and beyond.

Unfortunately, some logs escaped from the massive booms to become "dead heads" or partially submerged obstacles to safe navigation. In the 1880s rivers like the Duwamish and White south of Seattle became virtually impassible because of these snags. This affected the farmers who, following behind the loggers, lacked an alternative way of getting their crops to market. This remained a problem until the railroads arrived some years later. Thus, freeing the rivers became an economic imperative. To help the farmers and loggers, the Corps constructed a fleet of snagboats that

removed snags; boulders, drift, sunken boats, and "leaners." This project kept the Skagit, Stillaguamish, Nooksack, Snohomish, and Snoqualmie Rivers navigable for the next 15 years.³⁵

Taking advantage of Puget Sound's deepwater basin, enterprising settlers established major settlements at Bellingham, Anacortes, Everett, Seattle, Tacoma, Olympia, and Port Angeles. Congress recognized Seattle's primacy in the area when it established the Seattle Engineer District in 1896. The creation of the Seattle District coincided with a massive expansion of the port's facilities. Seattle, already the leading port for Alaskan trade, was not surprised when hords of miners travelled through the port during the fall and winter of 1897-1898 when gold was discovered in the Klondike. The Alaska trade and Seattle's situation as the closest major United States port to Japan and North China ensured that its trade would grow. The great burst of lumber trade following the 1906 San Francisco fire added to the growth of shipping in Puget Sound.³⁶

Seattle's expanding trade led local promoters to undertake two improvement projects. One, the creation of Harbor Island in Elliott Bay in the years before World War I, involved no direct Engineer participation. The Corps, however, ultimately constructed the second project, the Lake Washington Ship Canal.

Almost from the beginning, Seattleites dreamed of a canal linking Puget Sound with Lake Washington. The King County coal fields stretched to within two miles of the lake, but moving the coal to Seattle's wharves was both difficult and expensive. Despite the difficulties, the mines traded briskly with San Francisco after the early 1880s. Both the mine and collier operators recognized that loading facilities on Lake Washington could reduce their costs and enhance their marketing ability. Moreover, the lake's fresh water would destroy the teredos, or shipworms, that infested the Seattle waterfront, devouring both wooden-hulled vessels and piling.

In 1871 the Army Engineers suggested three canal routes. The route chosen ran from Shilshole Bay in northern Seattle to Lake Union and on to Lake Washington. In 1886 private Seattle businesses had a small canal dug, but it was only large enough to float logs to the Seattle mills. In 1893 the Seattle and Lake Washington Waterway Company was formed to construct a larger canal. The company secured state authorization, but soon found the project too demanding for its limited resources and the project stopped in 1904. Years of wrangling, lobbying, and innumerable surveys followed in an effort to have the Corps complete the canal. In 1911 Congress finally agreed.

Over the next six years the Engineers pushed the project forward, closely following plans suggested by Major Hiram M. Chittenden in 1907. Colonel James. B. Cavanaugh, one of the most notable men to head the Seattle District, supervised the construction. The Lake Washington Ship Canal opened with great fanfare on 4 July 1917. It runs about eight miles entirely within the Seattle city limits. From deep water in the sound a channel 34-feet deep and 300-feet wide passes through Shilshole Bay to the Hiram M. Chittenden Locks. Beyond the locks an authorized depth of 30 feet extends to Lake Washington.³⁷

Seattle's major anchorage is in Elliott Bay, about three miles south of the canal entrance. The bay contains the man-made Harbor Island with its extensive terminals and shipbuilding facilities and is among the finest deepwater navigation basins in the United States.³⁸ The Corps plans to deepen the three waterways in the bay from 34 to 39 feet.³⁹ Elliott Bay's numerous sites with easy access to deep water allowed the shipyards to expand to meet the Navy and merchant marine's emergency needs in both World Wars. As a result Seattle contributed more vessels than any West Coast port in World War I and a substantial share in World War II.

Tacoma is second to Seattle in maritime importance. Its commercial growth benefited from the opening of eight waterways from the deep water in Commencement Bay to the port's wharves, terminals, and shipyards. These Corps projects have assured Tacoma's commercial position.⁴⁰

Everett, Olympia, Bellingham, and Anacortes and Port Angeles on the Strait of Juan de Fuca, have all benefited from the Corps' navigation improvements. None of these projects, however, represented a major Corps investment of energy or money.⁴¹ The Seattle District routinely removes navigation hazards such as snags, "deadhead" logs, and other debris from the bays, harbors, and waterways of Puget Sound and its tributaries. The district also clears the navigation channels of the major rivers within its boundaries.⁴²

After World War II, the increased size and draft of the cargo carriers necessitated further navigation improvements. Congress responded by authorizing a comprehensive study of water and related land resources around Puget Sound. The study arose partially from the anticipated use of the sound as a passage for oil tankers from the Alaskan North Slope fields. The Puget Sound Task Force of the Pacific Northwest River Basins Commission completed the study in 1970. Of particular significance, the study emphasized the need for planning that "should be accomplished both on an individual port basis and from the overall standpoint of the Puget Sound Area."⁴³ As always the future of waterborne traffic in the Puget Sound

area depended "to great extent on what the people themselves were willing to do and on what facilities they are willing to provide." With the area's economic prospects dependent upon a well-planned water transportation system, the people will probably continue to meet Puget Sound's navigation needs.⁴⁴

WASHINGTON/OREGON COAST



Chapter 6

NAVIGATION PROBLEMS IN THE AGE OF SUPERSHIPS

The Pacific Coast has a highly developed system of modern, well maintained navigation facilities along its entire 2,000-mile coast. Modern trends in ship design and advanced cargo handling techniques demonstrate, however, that major improvements are necessary for Pacific Coast ports and waterways to continue to operate efficiently. Containerization and the development of superships, in particular oil tankers, have created serious problems not only for the Pacific Coast but for all United States ports.

According to the Panel on Future Port Requirements of the United States, the dredging and maintenance of adequate channels is a major concern. The panel is concerned that the federal government, "through its power to withhold or extend authorization and funding for channel projects, is capable of directly influencing port development and port use."¹

For the Pacific Coast, the Committee on Public Works, United States House of Representatives, adopted a resolution on 12 October 1972 that stated:²

that the Board of Engineers for Rivers and Harbors is hereby requested to review the reports of the Chief of Engineers on commercial navigation channels and harbors along the Pacific Coast, including the area between Bellingham, Washington, and San Diego, California, with a view to promoting and encouraging the efficient, economic, and logical development of the facilities to accommodate present and future waterborne commerce and, in particular, determine facilities required to accommodate very large bulk cargo carriers including, but not limited to, offshore facilities.

In a partial response to this resolution, the Army Engineers conducted a study that described the comparative advantages and disadvantages of deepwater port facilities for petroleum along the West Coast. The study also discussed the most likely locations and type of facilities.³ The Corps studied 22 potentially suitable deepwater port sites on the Pacific Coast on the basis of engineering factors, environmental concerns, transportation economics, and public opinion. The Army Engineers concluded that with the Trans-Alaska Pipeline to Valdez three alternatives were economically and environmentally possible:

1. three deepwater ports located in each of Puget Sound, San Francisco Bay, and Los Angeles-Long Beach areas;
2. two deepwater ports, with one in the San Francisco Bay area capable of handling 210,000 dwt tankers, and one in the Los Angeles-Long Beach area, capable of handling 325,000 dwt.
3. a single deepwater port at either San Francisco or Los Angeles-Long Beach for tankers up to 475,000 dwt, with trans-shipment by ocean in smaller ships to other ports. Puget Sound would not need major additional facilities because of its depth.⁴

In addition, tankers can moor at an offshore buoy (monobuoy) connected to the shore by a pipeline. The study favored "either wharves in naturally deep and dredged harbors; or offshore monobuoys with underwater pipelines to shore."⁵

Since deepening and widening the channel approaches to all major United States ports would be "both physically impracticable and financially prohibitive," these ports, including those on the Pacific Coast, faced difficult environmental, capital expenditures, and national defense choices.⁶

The Pacific Coast ports have confronted the problem of adapting to containerization with some success. Los Angeles and Long Beach Harbors began shifting to containerized handling systems in 1958. The change required immense changes in both ships and port facilities. By the early 1980s containers at Los Angeles Harbor handled about 2 million tons of cargo annually while Long Beach Harbor handled 1.1 million tons per year. To make more space available for container storage, the port authorities cleared out unused transit sheds.

Los Angeles and Long Beach are known as "landlord ports." They can minimize the ports' financial risks by developing lease or contract agreements with private owners to guarantee minimum revenues that would cover the capital and operating costs of the facilities. Should any additional revenue be generated, port authorities often agree to share those funds with the private owners. Both ports have returned portions of their surpluses to the cities as a sort of dividend on their investment by the local government in port facilities. A "landlord port" owns or holds in trust the property that is managed for the benefit of private enterprise. San Francisco also is a "landlord port." However, Oakland and Seattle are "operating ports," under which the local governments control all port

functions. Each type has advantages, although in Southern California the port authorities believe that the landlord concept operating within a free enterprise system works best.

By 1980 Los Angeles Harbor had about \$17 million invested in container facilities. It operated two all-container terminals with 75 acres (54 net), and four container mixed cargo facilities with 64 acres. The city has planned an additional 131 acres of all-container and container-mixed cargo facilities. A 1971 study of container operations by the Port of Los Angeles revealed that about 40,000 tons of container cargo were handled per acre. By 1997 the port projected potential container cargo at 6.6 million tons.⁷ During any discussion of the harbors in San Pedro Bay the issue of combining the ports of Los Angeles and Long Beach continually arises. Los Angeles and other political entities and individuals seek to combine the two ports. Long Beach, however, believes that there is a good working relationship between the ports and they "have a healthy competitive atmosphere that fosters efficient use of both ports."⁸ Long Beach has remained aloof and competitive because of the benefit of its oil revenues. The port expanded so explosively in the 1960s that it threatened Los Angeles' supremacy along the Pacific Coast. In 1960, Long Beach invested \$83 million in land structures and facilities.⁹ The port also has more than \$50 million invested in container facilities that provide the largest container complex devoted exclusively to containerization in the Pacific trading area.¹⁰

To accommodate to the new container business, Los Angeles developed new facilities and improved and expanded existing ones. Los Angeles also persuaded Congress to fund the deepening of its main channel to 45 feet to accommodate large container vessels. After completion the channel will still be too shallow for more than half the ships. Mayor Tom Bradley believed that the project would enable Los Angeles Harbor to keep its competitive position as "the top port on the West Coast in net revenue and gross tonnage."¹¹ Congressman Glenn M. Anderson, who represented the interests of both harbors, diplomatically noted that he did not expect the deeper channels to remove much business from Long Beach and noted that Long Beach testified in favor of the project. He also commented that environmental considerations not only delayed the project, but also added to its costs.¹²

While these two ports were meeting the challenges of commodity trends, shipping requirements, and changing technology in the Pacific Northwest, the Port of Seattle, under the supervision of an enterprising group of administrators, also was determined to remain competitive in attracting more shipping traffic to their port. "With bewildering speed one expansion project followed on the heels of another and the Port's public relations department found itself hard pressed to stay abreast of its engineers."

Through sound management the Port of Seattle became one of the most innovative ports in the country in the 1960s and 1970s. One of the more successful developments was in the handling, storage, and shipment of bulk grains. The dimensions of a mammoth new grain terminal easily surpassed any similar structure in the Pacific Northwest. Nothing on the Pacific Coast matched this port for speed and convenience to grain shippers. Perhaps more significant, the harbor served deepdraft ships drawing up to 73-feet of water. In 1964 Sea-Land, a major operator of container shipping, offered weekly container service between Seattle and Alaska. In 1968 the company, from its Seattle headquarters, became the first American line to offer complete containership service between Japan and the United States. In 1970 the Port of Seattle made an agreement with a consortium of six Japanese containership firms that established Seattle as the first port of call for major Japanese cargo shippers. The Port of Portland was humiliated to have to truck many of their Japanese goods down from Seattle. Portland's efforts to reverse the agreement in the courts and before the Federal Maritime Commission failed.¹³

Portland discovered that containerization had steadily eroded the economic gains of the 1950s. Between 1963 and 1972, Seattle's foreign trade expanded by 111 percent, while Portland's increased only by 6 percent. One writer credited Seattle's expansion to decisions in both the maritime and aviation fields as well as the city's development of container facilities.¹⁴

In the meantime, the Port of San Francisco hoped to reverse the idea that it was a dying operation ("a theme so regularly heard that even staunch San Franciscans sometimes voice it").¹⁵ Cyril Magnin, president of the San Francisco Port Commission, worked to re-establish San Francisco's former position. In an interview in the San Francisco Chronicle of 4 December 1972, Magnin noted the port's efforts to regain some tonnage by establishing a new LASH (Lighter Aboard Ship) and terminal at Islais Creek (since opened). Magnin claimed these projects "would give San Francisco the most modern of all facilities on the Pacific Coast." The port planned to have a "roll-on, roll-off capacity" (where trucks drive the cargo onto the ships).¹⁶

To obtain competent leadership, the commission lured Thomas Soules away from the Port of Boston to serve as new port director. Soules expressed optimism that while there were no easy, instant solutions, the problems could be solved. He noted that: "People want the port to start being successful. I don't think a head-on competition with Oakland is fruitful. I'm going to look into more of a cooperative Greater San Francisco attitude."¹⁷ Optimists concluded that San Francisco now would resume "its rightful role as the Pacific's most important, best equipped port."¹⁸ This revival was extremely important to San Francisco, for its economy and growth had always been tied to the level of port activity.

Nevertheless, San Francisco grudgingly watched its once inferior sister port of Oakland surpass it. Oakland became the number one container port on the coast. At a cost of more than \$40 million, it tripled its facilities by 1978.¹⁹

For the Pacific Coast, where competition between ports has been particularly fierce, the future still depends on the federal government's port development policies. For almost 200 years the federal government has consistently supported navigation improvements, including port development without charge. But the government has carefully prohibited "discrimination among ports either by governmental or private actions." As a result, "federal port activities have had little or no effect on the competitive relationship among ports."²⁰

A study of federal port policy noted that technology and ecology have complicated traditional federal port development policies by requiring new administrative procedures and regulatory actions. The Corps' dredging program, which historically has maintained approximate competitive equality among the ports, will not be able to do so any longer. Modern container-ships and supertankers require deeper channels and harbors; however, the combination of environmental regulations and inflationary capital budgets "will reduce the amount of dredging possible at constant funding levels." Therefore, the Corps cannot continue its dredging program using existing funds without establishing priorities that effectively favor some ports over others. The report concluded that a comprehensive national study of port needs was necessary to determine the long-range impacts of decreased federally-funded dredging on maritime commerce.²¹

Lieutenant General John W. Morris, Chief of Engineers, agreed that:²²

The requirement to dredge our navigable waterways to insure proper channel depths for shipping, and the resultant need to dispose of the dredged materials, has become a problem of great national significance. Unless we can find ways to continue the maintenance of our waterways in the face of environmental, legal and technical constraints, a situation may be precipitated which could adversely affect the entire economy.

Thus, federal policy decisions on port development promise to alter the commercial importance of all American ports for years to come.

Pacific Coast ports are participating in cooperative port planning as they become aware that competition is not limited to neighboring ports,

but has expanded to include regions, states, and seaboard. In addition, port authorities and local and state officials under public pressure have recognized that by participating in the planning process, "port development programs will not be imposed but will reflect the interests of the ports, consistent with the public interest." No where is this attitude more apparent than on the Pacific Coast, where ports are preparing regional and state port systems studies.²³

In the San Francisco Bay region, the ports reactivated the Northern California Ports and Terminal Bureau (NORCAL) to cooperate with the Metropolitan Transportation Commission to develop a port and surface access system for the bay area. Similarly, the California ports stress cooperative efforts through the California Association of Port Authorities (CAPA) to develop a state maritime plan.²⁴

In the Pacific Northwest, the Washington Public Ports Association and the Port of Portland, in cooperation with the U.S. Maritime Commission, conducted a study to develop a planning base to support policy decisions on the development and use of public port facilities in Washington and Portland.²⁵ To help insure effective use and development of regional port resources, the study recommended including the Oregon ports along the Columbia River. The study stressed "the importance of new organizational approaches to port actions" and identified "the appropriate roles for collective action."²⁶

Under the sponsorship of the Water Resources Council, the Corps directed comprehensive regional studies that provided long-run projections of water and related land resource problems and solutions, including navigation.²⁷ The California Region Framework Study Committee surveyed the region's future needs for both commercial and recreational facilities.²⁸ The Puget Sound Task Force conducted a similar study for the Pacific Northwest.²⁹ Significantly, these studies involved comprehensive analyses of regional navigation requirements and favored regional cooperation on navigation planning involving competing ports.³⁰

Significant world events occur unexpectedly, however, that often prevent governmental and private institutions from determining the most efficient, economic, and logical ways of developing facilities to accommodate very large bulk-cargo carriers. The rush to export American steam coal is reaching stampede proportions as the United States expects to double its share of the world's coal market by 2000. In 1979 when the Organization of Petroleum Exporting Countries (OPEC) astronomically raised world oil prices, the United States became not only a victim but a beneficiary. Nations that had long burned oil now turned to relatively cheaper American coal to run their power plants. With the largest coal reserves in the world estimated

at 475 billion tons, the coal industry restored health to the U.S. balance of trade. The U.S. Commerce Department estimated that coal exports will add more than \$6 billion in trade income by 1985 and more than \$14 billion by 2000. American steam coal exports jumped from 2.5 million tons in 1979 to 16 million tons in 1980 with a predicted 30 million tons for 1981. Strikes in Australia and the uncertain political situation in Poland forced large users of metallurgical coal, like Japan, to turn to the United States for supplies. At the ports of Los Angeles and Long Beach coal exports escalated from practically zero in 1979 to an estimated 5 million tons for 1981. Ernest L. Perry, director of the Port of Los Angeles, and officials at other ports stated that the coal export boom caught them unprepared.³¹ "In 1980, we realized we didn't have the onshore capacity--the terminals or the equipment--for loading the ships. . . . We figure we lost from ten million to 15 million tons of coal sales last year, or about \$500 million in exports, because of port constraints."³²

As a result, Los Angeles plans to build a new coal terminal and dredge a 65-foot channel.³³ Because of the country's economic decline, the additional costs of environmental regulation, and the decreasing federal role,³⁴

the port of Los Angeles wants a capital cost sharing for its proposed coal facility with significant investment by the private sector. In the small Port of Stockton a new cement facility was developed solely by an importer who has an opportunity to recover his costs before he must relinquish the facility to that port.

The Port of Long Beach, with a channel 60-feet deep, has excellent trade relations with Japan and other Pacific rim nations that have long-range requirements for a stable energy source. Long Beach is working actively with private and governmental interests to develop efficiently the Western U.S. steam coal potential. Recognizing the crucial importance of deepwater port facilities for the export of western steam coal, the executive director of the Port of Long Beach serves on the Western Coal Export Task Force's advisory committee at the invitation of the governor of Utah. This task force is a coalition of over 70 Western U.S. coal producers, railroad executives, and port authorities. Under the leadership of the Western Governor's Policy Office (WESTPO), the task force plans to develop solutions to problems faced by U.S. steam coal exporters and Pacific Basin users, especially the identification of ocean port and other transportation bottlenecks.

To help fulfill these objectives, the Port of Long Beach has planned a coal export terminal that by 1990 will have the capacity for up to

30 million tons per year.³⁵ Although 40 other ports on the West Coast are considering building coal terminals, Los Angeles and Long Beach will have a distinct advantage in attracting coal-shipping traffic for the next several years. The bulk of American steam coal exports moving to the Pacific rim countries must pass through these two ports because the Panama Canal with a depth of less than 40 feet is too shallow for the planned larger coal carriers.³⁶

Some experts fear that the rush to expand facilities may produce more capacity than needed. This wasteful competition could result in the dissipation of resources. "All of a sudden, we have enough port facilities on the drawing boards to handle 310 million tons of coal a year," said T. L. Stebbins, a coal industry analyst with the Boston-based brokerage firm of Adams Harkness, and Hill Inc. "It's absolutely ridiculous. There's no way we could possibly mine that much coal."

Industry officials disagree, however, citing government statistics that show that coal imports by consuming nations are expected to triple to 318 million tons annually by 1990 and reach 500 million tons a year by 1995. A report by the Utah Energy Office recorded that port constraints on the West Coast are a major roadblock to the export of coal from Colorado and Utah. By helping to transport coal from those two states, the United States could capture up to 20 percent of the steam coal market in the Pacific Basin.³⁷ Both the Los Angeles Times and the New York Times reported that the critical factor in the terminal-expansion program is whether the federal government will continue funding dredging to accommodate the cost-effective super-colliers, which can handle up to 150,000 tons a load or twice the size of the average carrier of 1981.³⁸

The Reagan administration stated that the choice of harbors for dredging would depend on the ability of the ports to repay the costs through user fees, an historic policy change. The administration, however, also is eager to take advantage of the demand for coal to restore the economic health of the U.S. trade balance. To determine coal policy, the administration created the blue-ribbon Interagency Working Group on Coal, consisting of top executives from more than a dozen government agencies, including the State Department. Malcolm Baldrige, Secretary of Commerce, charged the group in August 1981 that: "You can help us change into a major world energy supplier and provide a key element in this Administration's economic recovery program."³⁹ The administration's controversial policy elicited debate in both Congress and the commercial world at large.

Even if the federal government, through the Army Corps of Engineers and the Coast Guard, does not continue to bear 100 percent of the construction, maintenance, and operation costs of channels, harbor facilities, and

navigation aids the major ports probably would carry out these functions to remain competitive with each other and maintain the flow of commerce and world trade. The Pacific Coast harbors, however, still have the political power needed to persuade the federal government to maintain its role in improving navigation, which has proven so valuable not only to local communities but also to the nation.

CHRONOLOGY

- 1513 Vasco Nunez de Balboa discovered the Pacific Ocean.
- 1533 Fortun Jimenez discovered the Peninsula of California.
- 1539-40 Francisco de Ulloa explored the Gulf of California and sailed up the west coast possibly as far north as 30°N.'
- 1542-43 Joao Rodrigues Cabrillo examined the west coast of California. At his death in 1543, his chief pilot, Bartolomé Ferrelo, may have reached the 44° north latitude.
- 1565 Fray Andrew de Urdaneta and Esteban Rodriguez established the pattern for the return of the Manila galleons from Manila to Acapulco.
- 1579 Francis Drake, of England, duplicated the voyage of Cabrillo by sailing approximately to the present Oregon-California boundary, challenging Spain's control of the Pacific.
- 1584 Francisco Gali, sailing from Manila, made landfall on the California coast at approximately 37°50'.
- 1587 Pedro de Unamuno anchored in either Morro Bay or the waters off Santa Cruz.
- 1602-03 Sebastian Vizcaino charted the Pacific Coast from Cabo San Lucas to Cape Mendocino.
- 1701 Padre Kino reiterated that California is not an island.
- 1728 Vitus Bering entered the strait that bears his name.
- 1741 Bering explored the Alaskan coast.
- 1763 Treaty of Paris ended France's power in North America and made the Mississippi River the boundary between the British and Spanish North American empires.
- 1769-74 Gaspar de Portola and Fray Junipero Serra arrived at San Diego and discovered San Francisco Bay.
- 1769 Spain founded a mission and presidio at San Diego.

- 1774 Juan Bautista de Anza opened a land route from Mexico to California.
- 1774 Juan Perez sailed along the Pacific Coast to 55°30', saw Vancouver Island, and sighted Nootka Sound.
- 1775 Bruno de Hezeta discovered the mouth of the Columbia River and called it Rio de San Roque.
- 1775 Juan Bodega reached 58°30', named Burcareli Sound, and located Tomales Bay.
- 1775 Manuel de Ayala, commanding the packet boat San Carlos, sailed the first vessel into San Francisco Bay.
- 1776 San Francisco founded.
- 1777 San José, the first pueblo in California, founded.
- 1778 James Cook explored the Pacific Coast from Oregon at 44°31' north and placed English names on islands, straits, and mountains. He concluded that the Northwest Passage did not exist.
- 1779 Ignacio de Arteaga took formal possession as far north as 61° for Spain.
- 1781 Los Angeles founded.
- 1785 Empress of China opened the China trade for the United States.
- 1786 Jean Francis de la Perouse sailed up the Pacific Coast to Lituya Bay, Alaska, for France.
- 1787 Captain Charles W. Barkley named the Strait of Juan de Fuca.
- 1788 John Kendrick and Robert Gray, American merchants, arrived in Nootka Sound.
- 1790 Joseph Billings reinforced Russia's claims to Alaska.
- 1790 Nootka Convention weakened Spain's claims to the Pacific Northwest and strengthened England's.
- 1790-93 Robert Gray sailed along the Pacific Northwest and in 1792 entered the mouth of the Columbia River, which he named for his ship.

- 1791 Alejandro Malaspina led a Spanish scientific expedition to the Pacific Coast to explore, measure, and catalogue it.
- 1792 Jacinto Caamaño explored the waters of the Pacific Coast from Bucareli Sound southward.
- 1792 Spain established a fort at Neah Bay, the first European settlement in future Oregon territory.
- 1792 Alcala Galiana and Cayitano Valdez explored the Strait of Juan de Fuca.
- 1792-94 George Vancouver charted the Pacific Northwest and placed English names on important geographic features.
- 1793 Alexander Mackenzie reached the Pacific Coast from the east and traversed parts of the Columbia River by boat.
- 1796 Arrival of the Otter at Monterey opened trade between New England and California.
- 1802 March 16, Congress established the present Corps of Engineers and the U.S. Military Academy at West Point (the latter provided the country with its first engineering school).
- 1803 President Jefferson purchased the Louisiana Territory that extended from the Mississippi River to the Rocky Mountains and from Canada to the Gulf of Mexico.
- 1803 Lelia Byrd, under Captain William Shaler, smuggled along the California coast.
- 1805 Lewis and Clark Expedition reached the Pacific Ocean at the mouth of the Columbia River.
- 1807 February 10, Congress provided for the surveying of the coasts of the United States, but it was not until 1832 that anything of significance was done.
- 1808 In his report on roads and canals, Albert Gallatin recommended long range planning for resources like water and transportation on the grounds of national defense, political unification, and economic development of the west.
- 1809 North West Company founded Kullyspell House on Lake Pend Oreille.
- 1810 North West Company established Spokane House.

- 1811 The Pacific Fur Company, an American concern, founded Astoria at the mouth of the Columbia River.
- 1812 Fort Ross, Bodega Bay, California, established by the Russians.
- 1818 Convention of 1818 provided for joint occupation of Oregon Territory by the United States and Great Britain for ten years.
- 1819-1822 Transcontinental Treaty between the United States and Spain fixed California's northern boundary at 42^o, north, and released all Spanish claims north of 42^o to the U.S.
- 1821 Mexico won independence from Spain.
- 1822 The Sachem began the hide trade between Boston and San Diego.
- 1824 In the Act of 24 May Congress appropriated funds for navigation improvements on the Ohio and Mississippi Rivers, which marked the beginning of the Corps of Engineers' work in developing waterways and harbors.
- 1824 United States and Russia limited the southern boundary of Alaska to 54^o40', north.
- 1827 United States and Great Britain agreed to another joint occupation of Oregon Territory for an indefinite period.
- 1829 Hudson's Bay Company established trading post at Willamette Falls (Oregon City).
- 1833 Fort Nisqually, the first European settlement in Washington Territory, sponsored by Hudson Bay's Company.
- 1834 Jason Lee established the Methodist mission in Oregon Territory.
- 1835 Richard Henry Dana, Jr., arrived off the California coast aboard the Pilgrim, engaged in the hide trade.
- 1835 Pueblo de Yerba Buena established on June 25; the name was changed to San Francisco on January 30, 1847.
- 1836 Beaver, the first Pacific Coast steamer running on the Columbia River, appeared under the auspices of Hudson's Bay Company.
- 1836 Marcus Whitman and Henry H. Spalding established missions in the Oregon Territory.

- 1841 Lieutenant Charles Wilkes, U.S.N., reconnoitered the Pacific Coast.
- 1843 Great American migration headed for Oregon country.
- 1845 Portland founded; became the financial, commercial, and industrial center of the vast Columbia River basin.
- 1845 McAllister family settled at Tumwater, founding the first American settlement on Puget Sound.
- 1846 Treaty between the United States and Great Britain established American title to Oregon Territory and set the northern boundary at 49^o north to the middle of the channel between Vancouver Island and the mainland and from there a line running southward through the Strait of Juan de Fuca to the Pacific. Both countries had rights to free navigation to the channel and strait. (Water boundary finally settled in 1873).
1846. Mexican-American War.
- 1848 Treaty of Guadalupe Hildalgo between the United States and Mexico ceded to the United States territory that included the present states of California, Arizona, Nevada and Utah and portions of New Mexico, Colorado, and Wyoming.
- 1848 January 28, James W. Marshall reported his discovery of gold to Johann A. Sutter, which stimulated the great California gold rush.
- 1848 Congress established the Oregon Territory.
- 1848 Pacific Coast Board of Engineers made up of Army Engineers and Naval officials established to plan fortifications to protect the new west coast of the United States.
- 1849 California gold rush increased traffic to San Francisco Bay.
- 1849 Steamer service between the Isthmus of Panama and California began and extended to Oregon Territory for mail and freight.
- 1850 Pacific Mail Steamship Company opened mail service to Portland, Oregon.
- 1850 Local steamboating on the Columbia River began on a regular basis with the launching of the Columbia and the Lot Whitcomb; the Columbia ran between Astoria and Oregon City and the Lot Whitcomb on the Columbia and Willamette Rivers before moving to the Sacramento River as the Annie Abernethy.

- 1850 Lieutenant William P. McArthur reconnoitered the Oregon shoreline for the U.S. Coast Survey.
- 1850 Federal government assumed the major role in improvements for navigation.
- 1850 California admitted as a state.
- 1850 U.S. Coast Survey staff, under George Davidson, arrived at San Francisco to begin the survey to prepare accurate and detailed charts of the coastline from the Mexican border to Puget Sound and to recommend suitable locations for lighthouses.
- 1850 28 September, Congress authorized the construction of 16 lighthouses on the Pacific Coast; only 9 were built.
- 1851 First of a series of portage railways to traverse the cascades of the Columbia began operating.
- 1852 Seattle founded by 21 settlers and named after a friendly Indian tribe.
- 1852 Settlement on Commencement Bay, which became the town of Tacoma in 1874.
- 1852 First federal harbor improvement began at San Diego, California.
- 1852 Congress created Lighthouse Board of nine members, including military and naval officers and scientists.
- 1852 Augustus Timms laid out Timms' Landing, which gave him the most advantageous site available at San Pedro Bay as a landing place for ocean craft.
- 1852 San Francisco Bay port cities of Oakland and Alviso were incorporated.
- 1852 Commercial salmon fishing began in Puget Sound.
- 1853 Commercial salmon fishing started in the Columbia River.
- 1853 The firm of Pope & Talbot established a lumber mill at Port Gamble in Washington Territory.
- 1854 California Steam Navigation Company formed to establish a virtual monopoly on all steamship routes in California.

- 1854 Mare Island Navy Yard founded as the first naval base on the Pacific Coast.
- 1854 Phineas Banning, John G. Downey, Benjamin D. Wilson, and William T. B. Sanford purchased acreage from Rancho San Pedro that became the town of Wilmington in 1858, which served as an embarcadero for Los Angeles.
- 1854 The port towns of Mazesville (Redwood City) and Ravenswood laid out on the southern arm of San Francisco Bay.
- 1854-58 At Alcatraz the first official American government light-house on the Pacific Coast began operating. Other light-houses were at Point Pinos, Monterey (1856); Point Loma, San Diego (1855); Santa Barbara (1856); Point Conception (1856) some 40 miles west of Santa Barbara; Crescent City (1856); Cape Disappointment (1856), at the entrance to the Columbia River; Farallon Islands (1856); Point Bonita (1855) and Fort Point (1855), San Francisco Bay; Humboldt Bay (1856); Umpqua River (1857); Cape Flattery (1857), Washington; New Dungeness (1858), Strait of Juan de Fuca; Smith Island (1858), Juan de Fuca; and Willapa Bay (1858).
- 1856 Fogbell installed on Alcatraz Island to safeguard mariners during periods of persistent San Francisco fog.
- 1858 Directory for the Pacific Coast published.
- 1859 Oregon admitted as a state.
- 1860 Governor John B. Downey vetoed the bulkhead bill, preventing a private monopoly from gaining control of the San Francisco waterfront.
- 1860 Oregon Steam Navigation Company organized to control shipping on the Columbia River system.
- 1860-1890 Port of San Francisco dominated the grain trade.
- 1862 Congress passed the Pacific Railroad Act, to provide a railroad link to the Pacific Coast.
- 1863 A board of state harbor commissioners took effective control of the harbor and port of San Francisco.
- 1863 Peoples Transportation Company challenged the Oregon Steam Navigation Company's monopoly on the Columbia.

- 1863 Ben Holladay organized the California, Oregon, and Mexico Steamship Company; reorganized it into the North Pacific Transportation Company; and established service from Alaska to Mexico. After 1876 its marine routes passed to the Pacific Coast Steamship Company.
- 1866 Congress established an office of the Army Corps of Engineers in San Francisco as the authority for "Rivers and Harbors of the Pacific Coast."
- 1866 Corps undertook the first river and harbor work on the Columbia River system by dredging and snagging work on the Willamette River.
- 1867 Army Engineers began the removal of dangerous rock obstructions in navigation channels of San Francisco Bay.
- 1869 The Directory for the Pacific Coast renamed Coast Pilot, which became the official title.
- 1869 Los Angeles and San Pedro Railroad connected Los Angeles and San Pedro Bay at Wilmington, which aided the campaign for harbor improvements.
- 1869 Union Pacific and Central Pacific Railroads joined at Provo, Utah. The railroad connection assisted the Pacific Coast in obtaining future navigation improvements.
- 1869 Corps dredged and removed snags on the Willamette River.
- 1870 Thomas W. McCollam established a codfish yard on Corkscrew Slough at Redwood City, which later moved to Belvedere.
- 1871 Portland District, Army Corps of Engineers, established.
- 1871 Congress authorized the first harbor improvement at Wilmington, California, to make the inner harbor usable.
- 1873 First navigation improvement by Army Engineers on the Columbia River, blasting out the rapid at John Bay.
- 1873 Water boundary between the United States and Great Britain in the Pacific Northwest settled.
- 1874 Report of the Windom Select Committee favored a comprehensive program of waterways improvements to provide competition for railroads.

- 1875 Diversion dike diverted San Diego Bay waters from San Diego Bay to False (Mission) Bay.
- 1875 Army Engineers began improvements to Oakland Harbor to provide additional navigation facilities in San Francisco Bay.
- 1876 Southern Pacific Railroad connected Los Angeles with San Francisco, giving Los Angeles an advantage over San Diego.
- 1878 Work begun on Cascades Canal and Lock, but not completed until 1896.
- 1879 Henry Villard purchased the Oregon Steam Navigation Company and incorporated it into his Oregon Railway and Navigation Company.
- 1880 Section 4, 14 June 1880 Rivers and Harbors Act, authorized the Secretary of the Army to require the removal of sunken vessels from navigable waters (amended 2 August 1882 and 3 March 1899).
- 1880 June 14, the Rivers and Harbors Act authorized \$150,000 for surveys and examinations of the physical aspects of Oregon's coast and rivers.
- 1880 Army Engineers recommended an 8,000-foot jetty for the south side of the mouth of the Columbia River. The work, begun in 1884 and completed in 1913, resulted in 36-37 feet of safe water over the dangerous bar in the mouth of the Columbia River.
- 1881 Henry Villard purchased the Pacific Coast Steamship Company to tie his railroad empire, the Northern Pacific, to California markets.
- 1881 Dangerous entrance channel to Humboldt Bay improved for safe passage; channel improved further in 1907.
- 1881 Corps began improvements to Crescent City Harbor that continue to the present.
- 1882 First permanent structured improvements for navigation in the Pacific Northwest completed on Willamette and Columbia Rivers, which provided a 20-foot navigable channel from Portland to the sea.

- 1884 Congress passed general navigation legislation that directed that the first step in the planning process for navigation improvement be the preliminary examination by the District Engineer to determine whether a harbor or river is worthy of improvement.
- 1884 5 July 1884, Rivers and Harbors Act called for recommendations on alteration of navigation obstructions, prohibited the collection or levy of tolls or operating charges for passage through any canal or other navigation works belonging to the United States (amended by Rivers and Harbors Act of 3 March 1909), also provided for operation and repair of navigation works.
- 1888 Act of 24 April 1888 authorized the Secretary of the Army to use condemnation proceedings and donations for improvements to rivers and harbors and for maintenance or developing such work. (24 Stat. 94, 33 U.S.C. 608).
- 1889 Jetty completed to stabilize the entrance channel to Coos Bay, Oregon, a major harbor for the export of lumber.
- 1889 Sardine fishing began in Central California, which gave birth to the famous Cannery Rows in Monterey.
- 1890 Section 6, 19 September 1890 Rivers and Harbors Act, prohibited obstruction of navigation by deposits of refuse, etc., in navigable waters. Section 7 declared it unlawful to construct a wharf, pier, or other structure in navigable waters without the permission of the Secretary of the Army. Section 8 authorized the Secretary of the Army to remove wrecks of vessels obstructing navigation without liability to owners.
- 1890 Jetty on Zuniga Shoal constructed per House Executive Document 177, 50th Congress, 1st session.
- 1891 21 February 1891 Act required owners, agents, masters, and clerks of arriving or departing vessels on waterways improvements to furnish statistics on passengers, freight, and tonnage on the vessels. (26 Stat. 766, 46 U.S.C. 48; See also Section 11, Public Law 67-362).
- 1891 Corps built two rubbermound jetties protecting the harbor entrance to Humboldt Bay.
- 1892 First United States lightship on the Pacific Coast at the mouth of the Columbia River.

- 1893 1 March, The California Debris Commission established with some jurisdiction over hydraulic mining of the territory drained by the Sacramento and San Joaquin River systems. (27 Stat. 507, 33 U.S.C. 661).
- 1896 June 3, Walker Report (Senate Document 18, 55th Congress, 1st session) recommended a breakwater in San Pedro Bay in preference to Santa Monica Bay. As authorized by succeeding Congressional acts, the outer harbor consists of 42,000 feet of breakwater and with depths ranging from 35 to 40 feet. Authorized in 1976, the existing harbor project was further modified to 45 feet. Work began in 1981.
- 1896 Seattle District, Army Corps of Engineers, organized.
- 1897 First major Navy celebration held in San Diego, a prelude to San Diego as a naval base.
- 1897 Klondike Gold Rush set off a shipping demand, particularly for Seattle.
- 1897 Halibut fishing began when the New England Fish Company of Boston sent a ship to Seattle.
- 1898 Spanish-American War.
- 1899 Section 10, 13 March 1899, Rivers and Harbors Act, prohibited placing obstructions to navigation outside established federal harbor lines and excavating or depositing material in such waters, unless the Secretary of the Army authorized a permit for the works. Section 11 of this act authorized the Secretary of the Army to establish harbor lines beyond which no piers, wharves, etc., could be extended without a permit.
- 1899 Two jetties completed to deepen the entrance channel for Coos Bay, Oregon, to 20 feet. In 1919 Army Engineers dredged to 22 feet.
- 1900 Richmond founded as a railroad terminal and oil port on San Francisco Bay.
- 1902 Section 3, 13 June 1902, Rivers and Harbors Act, (Public Law 154, 57th Congress), authorized the establishment of the Board of Engineers for Rivers and Harbors (BERH) to review all survey reports authorized by Congress, except those under the jurisdiction of the Mississippi River Commission.
- 1902 Congress passed the Spooner Act to construct the Panama Canal.

- 1902 Rivers and Harbors Act funded the dredging of a 25-foot channel from Portland to the Pacific Ocean. Completed in 1907.
- 1902 From 1902 to 1945 navigation in San Pablo and Suisun Bays and Carquinez Straits improved.
- 1903 Tuna fishing began at San Diego making that port the center for tuna fishing.
- 1905 Section 4, 3 March 1905, Rivers and Harbors Act (Public Law 215, 58th Congress), authorized Secretary of the Army to prescribe regulations to govern the depositing of refuse in navigable waters.
- 1905 The Los Angeles Dock and Terminal Company bought 802 acres of marsh land to create the inner harbor of Long Beach.
- 1907 Admiral Line provided ocean service between Seattle and San Francisco.
- 1908 The Inland Waterways Commission recommended that federal rivers and harbors improvements consider all water uses, including flood control, water power, irrigation, and pollution control.
- 1909 Congress created a joint commission, the National Waterways Commission.
- 1909 Section 6, 3 March Rivers and Harbors Act, provided for replacement of obsolete locks and dams on authorized waterways (Public Law 317, 60th Congress).
- 1910 Rivers and Harbors Act provided for navigation improvements for Redwood City Harbor. Supported by various acts from 1910 to 1950.
- 1910 June 25, San Diego Harbor dredged to 30 feet. (House Document 961, 60th Congress, 1st session). Numerous navigation improvements subsequently authorized and constructed that provided controlling depths from 20 to 42 feet.
- 1911 May 1, the state of California granted to the coastal cities title to the tidelands and submerged lands within their city limits.

- 1911 Port of Seattle, a public corporation, created to supervise harbor development and administration of port facilities.
- 1912 National Waterways Commission among many recommended navigation improvements.
- 1912 Congress delegated discretionary authority to the Secretary of War to include in the permanent parts of navigation dams works as may be desirable for future federal development of water power.
- 1913 Representative William Kettner convinced Congress to appropriate funds for naval coding and radio stations in San Diego.
- 1914 Panama Canal opened.
- 1915 Corps opened a series of five locks and a canal to counter the rapids from Celillo to Dalles on the Columbia River.
- 1915 James J. Hill's Great Northern Pacific Steamship Company established service between the mouth of the Columbia River and San Francisco.
- 1917 First Harbor Commission for Port of Long Beach formed.
- 1917 Lake Washington Ship Canal linked Puget Sound with Lake Washington.
- 1917 North jetty in mouth of Columbia River built, which resulted in a depth of 40 feet that allowed the largest vessels of that day to cross the bar safely.
- 1917 Rivers and Harbors Acts from 1917 to 1954 provided navigation improvements for Richmond Harbor.
- 1918 Section 1, 2 March, Rivers and Harbors Appropriation Act, (Public Law 323, 65th Congress), stated that "at least one public terminal should exist, constructed, owned, and regulated by the municipality, or other public agency of the state and open to the use of all on equal terms. . . ."
- 1919 Pacific Fleet entered the San Diego Harbor.
- 1920 Section 500, 28 February, Transportation Act (Public Law 152, 66th Congress), stated the Congressional policy to promote water transportation and outlined how Secretary of the Army should promote water transportation.

- 1922 From 1922 to 1945, Oakland Harbor received navigation improvements through various Rivers and Harbors Acts.
- 1924 7 June 1924, Oil Pollution Act prohibited discharge of oil, except as permitted by the Secretary of the Army, from vessels into navigable waters of the United States.
- 1927 Section 1, 21 January Rivers and Harbors Act (Public Law 560, 70th Congress) authorized surveys in accordance with House Document 308, 69th Congress, on comprehensive development of navigation, water power, and flood control. This section laid the basis for some emergency relief projects of the 1930s and the basic plan of TVA.
- 1927 Under authorization of Rivers and Harbors Acts of 1927, 1935, and 1950 Army Engineers completed a deepwater channel 30-foot deep from Port Stockton to San Francisco Bay.
- 1928 Navy Landing built at El Embarcadero, Long Beach Harbor, to which sailors came ashore from ships of the U.S. Navy anchored offshore.
- 1930 Further improvements of the navigation channel from Portland to the sea began. Channel deepened to 35 feet by 1933.
- 1932 Fletcher Act (Public Law 16, 72d Congress) provided for recreational navigation.
- 1934 San Francisco suffered both a longshoremen's strike and a general strike.
- 1935 Portland District maintained 35-foot depths from the mouth of the Willamette River to the Broadway Bridge.
- 1935 Section 5, 30 August, Rivers and Harbors Act of 1935 (Public Law 409), required that navigation studies of the improvement of the entrance of the mouth of any river or inlet contain information about possible accretion-erosion effects on the shoreline for at least ten miles on either side.
- 1936 Oil discovered in harbor area of Long Beach, which provided the city with the financial means to compete with Los Angeles in port development.
- 1936 San Francisco-Oakland Bay Bridge completed.

- 1937 Golden Gate Bridge opened to traffic.
- 1938 Section 2, Rivers and Harbors Act of 1938, authorized Secretary of the Army, upon the recommendation of the Chief of Engineers, to exchange land or other property of the federal government for private lands or property that might be advisable in executing authorized river and harbor improvements.
- 1939 The Corps constructed Treasure Island on Yerba Buena Shoals in San Francisco Bay as the site for the Golden Gate International Exposition.
- 1942 U.S. Navy took over Port Hueneme and converted it into a major deepwater port.
- 1950 Army Engineers began collecting and removing floating debris from San Francisco Bay.
- 1957 Army Engineers completed dredging a 48-foot bar channel in the mouth of the Columbia River.
- 1958 Public Law 85-624 provided that fish and wildlife conservation receive equal consideration with other project purposes.
- 1960 Section 107, Rivers and Harbors and Flood Control Act of 1960, authorized construction of small navigation projects.
- 1961 Oil Pollution Act of 1961 implemented the provisions of the International Convention of the Prevention of Pollution of the Sea by Oil, 1954, (75 Stat. 402, 33 U.S.C. 1001).
- 1963 The inland Port of Sacramento opened.
- 1965 Congress authorized major improvement to existing navigation projects for San Francisco Bay harbor and channel complex and Stockton Deep Water Ship Channel.
- 1965 Water Resources Planning Act established a Water Resources Council to form policies to plan and develop water and land related resources projects and review regionally developed plans and periodic assessment of national water needs.
- 1966 Oil Pollution Act of 1961 amended by Public Law 89-551. Corps activities transferred to the Secretary of Transportation by Public Law 89-670.

- 1968 Section 117, Rivers and Harbors and Flood Control Act of 1968 authorized maintenance of excess depths required and constructed for defense purposes where the project also served essential needs of general commerce.
- 1968 Sea-Land became the first American line to offer complete containership between Japan and the United States with Seattle as its headquarters.
- 1969 Administration of the Port of San Francisco transferred from the State of California to the City and County of San Francisco.
- 1970 National Environmental Policy Act (NEPA), (Public Law 91-190) required an environmental impact statement (EIS) on proposed federal actions affecting the environment, directed all federal agencies to comply with the Act, and established the Council on Environmental Quality (CEQ).
- 1970 Section 103, Rivers and Harbors and Flood Control Act of 1970 provided for federal operation and maintenance of the general navigation features of small boat harbor projects authorized during the calendar year 1970.
- 1972 10 July, Ports and Waterways Act of 1972, Title I of Public Law 340, provided the Coast Guard with authority for establishing vessel traffic-control systems in congested or hazardous ports and waterways.
- 1972 Section 101, the Federal Water Pollution Control Act Amendments of 1972, established a national goal to eliminate all pollutants discharged into U.S. waters by 1985. Section 404 authorized a separate, permit program for the disposal of dredged or fill material in the nation's water to be administered by the Secretary of the Army through the Chief of Engineers.
- 1976 Work on the authorized 40-foot deep channel from Portland, Oregon, and Vancouver, Washington, to the sea completed.
- 1976 Sections 1-7, 26 July, Coastal Management Act Amendments of 1976 (Public Law 94-340), directed the Secretary of Commerce to administer and coordinate a coastal energy impact program to assist coastal states in their planning and management of energy developments in their coastal waters. Section 8 encouraged the coastal states to coordinate with each other and to develop plans for the sake of uniformity as well as give Congressional consent to agreements and compacts between two or more states.

- 1977 A modern container terminal opened in Oakland's outer harbor.
- 1978 21 October, Internal Revenue Code of 1954 Amendment (Public Law 95-502), allowed imposing a tax on fuel used by vessels in commercial waterway transportation, but exempted deep-draft, ocean-going, and passenger vessels. Established an Inland Waterways Trust Fund for revenue received from the tax on fuel to be available for the construction and rehabilitation for navigation on inland and intracoastal waterways.
- 1979 Trade between mainland China and Pacific Coast ports resumed after a 30-year lapse.
- 1980 Amended Section 2, 8 August, Act of February 19, 1895 (Public Law 96-324) (28 Stat. 672) direct the Coast Guard to establish approximate identifiable demarcation lines dividing the high seas from harbors, rivers, and other inland waters for navigation and other purposes. (54 Stat. 1020).

FOOTNOTES

CHAPTER 1

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