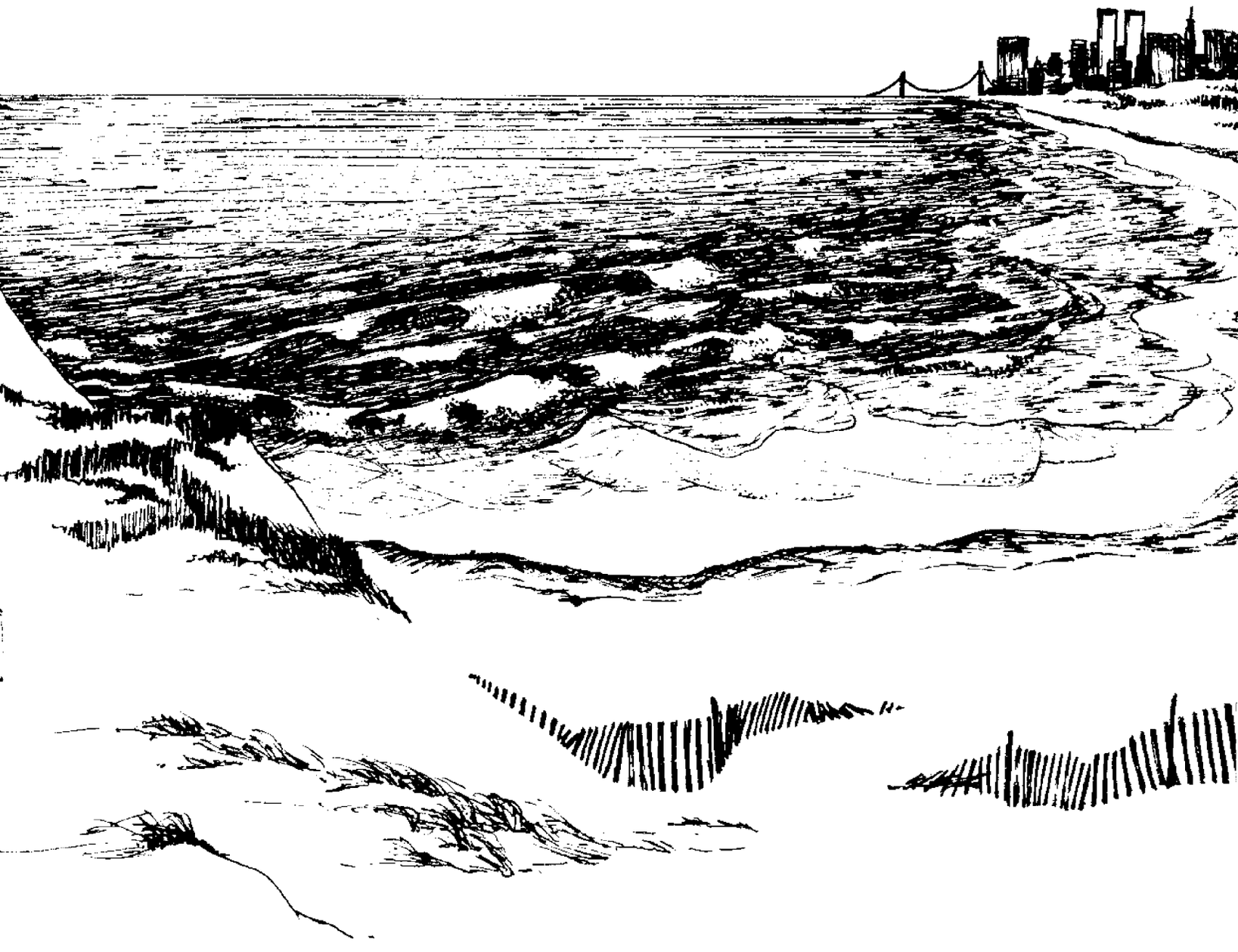
Port Facilities and Commerce

Alfred Hammon



MESA NEW YORK BIGHT ATLAS MONOGRAPH 20

The offshore water in the bend of the Atlantic coastline from Long Island on one side to New Jersey on the other is known as New York Bight. This 15,000 square miles of the Atlantic coastal ocean reaches seaward to the edge of the continental shelf, 80 to 120 miles offshore. It's the front doorstep of New York City, one of the world's most intensively used coastal areas – for recreation, shipping, fishing and shellfishing, and for dumping sewage sludge, construction rubble, and industrial wastes. Its potential is being closely eyed for resources like sand and gravel – and oil and gas.

This is one of a series of technical monographs on the Bight, summarizing what is known and identifying what is unknown. Those making critical management decisions affecting the Bight region are acutely aware that they need more data than are now available on the complex interplay among processes in the Bight, and about the human impact on those processes. The monographs provide a jumping-off place for further research.

The series is a cooperative effort between the National Oceanic and Atmospheric Administration (NOAA) and the New York Sea Grant Institute. NOAA's Marine EcoSystems Analysis (MESA) program is responsible for identifying and measuring the impact of man on the marine environment and its resources. The Sea Grant Institute (of State University of New York and Cornell University, and an affiliate of NOAA's Sea Grant program) conducts a variety of research and educational activities on the sea and Great Lakes. Together, Sea Grant and MESA are preparing an atlas of New York Bight that will supply urgently needed environmental information to policy-makers, industries, educational institutions, and to interested people. The monographs, listed inside the back cover, are being integrated into this *Environmental Atlas of New York Bight.*

MONOGRAPH 20 looks at what goes on in the Port of New York and New Jersey, the leading commercial seaport of the continental United States. Many kinds of ships travel the port's federal channel system, carrying a great variety of products, particularly petroleum, to nearly a hundred public and private marine terminals in the Port District. Evolving port technology has shifted to more container cargoes and bulk transport, and airplanes for passengers—leaving deteriorating buildings and rotting piers, a problem being faced. Hammon outlines present measures to cope with dredge spoils from the miles of channels, and ships' oily wastes and sewage, and reviews laws and agencies regulating port activities and development.

Credits

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Marine EcoSystems Analysis (MESA) Program
MESA New York Bight Project

Port Facilities and Commerce

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MESA NEW YORK BIGHT ATLAS MONOGRAPH **20**

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Figure 1. View of Brooklyn, Queens, and Manhattan (Courtesy of Port Authority of New York and New Jersey)

Introduction

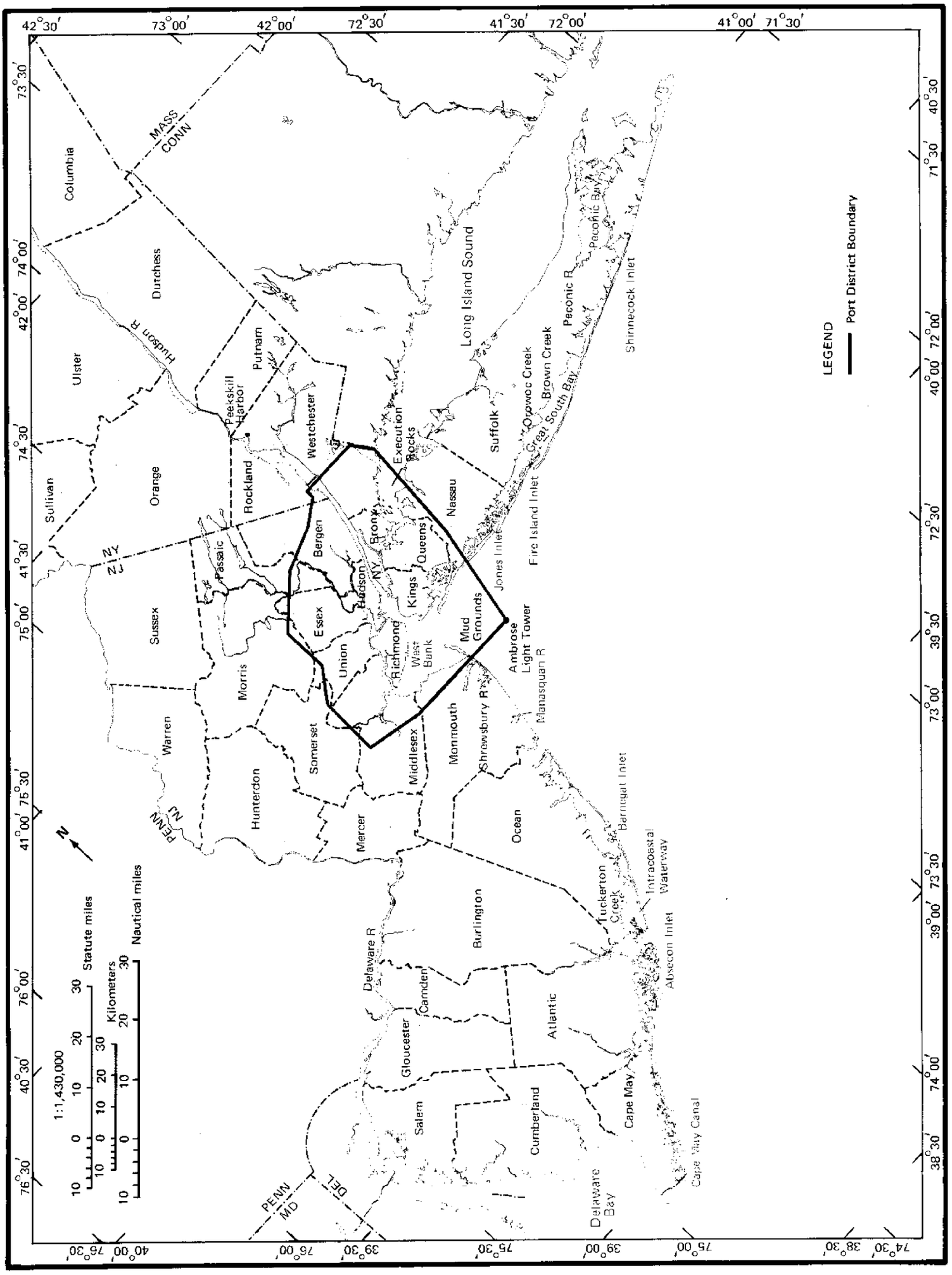
If we use membership in the American Association of Port Authorities to define a port, the only two ports leading directly into New York Bight are the Port of New York and the Port of Albany. Though both are considered major commercial seaports, this monograph confines itself to the Port of New York. The many inlets and small harbors along the Bight shores (Map 1) are not considered seaports in the same way that New York and Albany are. These small ports are used mainly for recreational boating, sport and commercial fishing, and tug and barge traffic.

The Port of New York is in the New York and New Jersey Port District created by the Compact of 1921 between the two states. The agreement also created the Port of New York Authority, now the Port Authority of New York and New Jersey. The Port District is a 1,500 mi^2 (3,900 km^2) area within about a 25 mi (40 km) radius of the Statue of Liberty (Map 1). It includes all or part of 17 counties—9 in New Jersey and 8 in New York*. The economic focal point of the Port District is New York City.

Approximately 755 mi (1,208 km) of shoreline border the port—460 mi (736 km) in New York and 295 mi (473 km) in New Jersey. Of the 17 counties in the Port District, only Morris and Somerset do not edge port waters. New York counties having activities associated with the port are New York and Westchester on the Hudson River; New York, Kings, Queens, and Bronx on the East River (Figure 1); and Richmond and Kings on Upper New York Bay. Locally oriented port activities can be found along the East River tributary waters of Flushing Bay, Newtown Creek, Harlem River, Eastchester Creek, Steinway Creek, and Westchester Creek, as well as

*The New York counties are Bronx, Kings (Brooklyn), Nassau, New York (Manhattan), Queens, Richmond (Staten Island), Rockland, and Westchester; the New Jersey counties are Bergen, Essex, Hudson, Middlesex, Monmouth, Morris, Passaic, Somerset, and Union.

Map 1. Regional ports outside Port District



Jamaica Bay. Several New Jersey communities have allotted portions of their waterfronts to activities connected with the port. These communities include Edgewater, Guttenberg, Weehawken, Hoboken, and Jersey City on the Hudson River; Jersey City and Bayonne on Upper New York Bay; Bayonne on Kill van Kull; Bayonne, Newark, Kearny, and Elizabeth on Newark Bay; and Linden, Carteret, Woodbridge, Sewaren, and Perth Amboy on Arthur Kill. Port-related activities also exist along the Raritan, Passaic, and Hackensack river systems.

America's Busiest Cargo Port

Among the 11 leading US continental seaports*, the Port of New York has long been the leader in ship arrivals and in tons of cargo.

In 1972, about 20% of all ship arrivals at the 11 leading seaports were at the Port of New York: over 9,000 vessels, compared to about 5,000 at Philadelphia, the next in traffic (Maritime Association of the Port of New York, Inc. 1973). Ship arrivals at New York were up about 4% over 1971. Summer is usually the busiest time (856 arrivals in August 1972) but winter is far from slow (698 in February 1972). About 28% of the arriving ships were documented in the United States; about 12% originated in the United Kingdom and northern Europe and about 12% in the West Indies and northern coast of South America.

As for cargo handling, in 1972 almost 197 million short tons moved through the Port of New York, up about 28% from 1971. US Army Corps of Engineers data for 1973—the most recent available—show that about 217 million short tons of cargo moved via the Port of New York, compared to 136 million short tons in New Orleans (second) and about 88.5 million short tons in Houston (third). Detailed data, while not yet complete for 1974, show a marked upward trend in volume compared to 1973 for some Port Authority marine terminals: up 11.8% at Elizabeth–Port Authority Marine Terminal, up 33.6% at Brooklyn–Port Authority Marine Terminal, and up 63.5% at Columbia Street Marine Terminal, for example (Port Authority of New York and New Jersey 1975*c*).

Of the nearly 197 million short tons of cargo in 1972, about 31% was foreign trade, mostly import. Nearly 54% of these imports consisted of kerosene and fuel oils; 23% was crude oil; 2% was sugar. Iron and steel scrap were among the major exports.

Domestic cargoes comprised over two-thirds of the 1972 total. Of this, about 40% was intraharbor cargo. Coastal trade was mainly petroleum. Table 1 compares Port of New York commerce in 1963 and 1972.

The Port of New York also handles more passenger ship movements than any of the leading US seaports. In 1972, 626,834 overseas passengers moved through the port, compared to 1,008,143 in 1963 (Port Authority of New York and New Jersey 1975*a*).

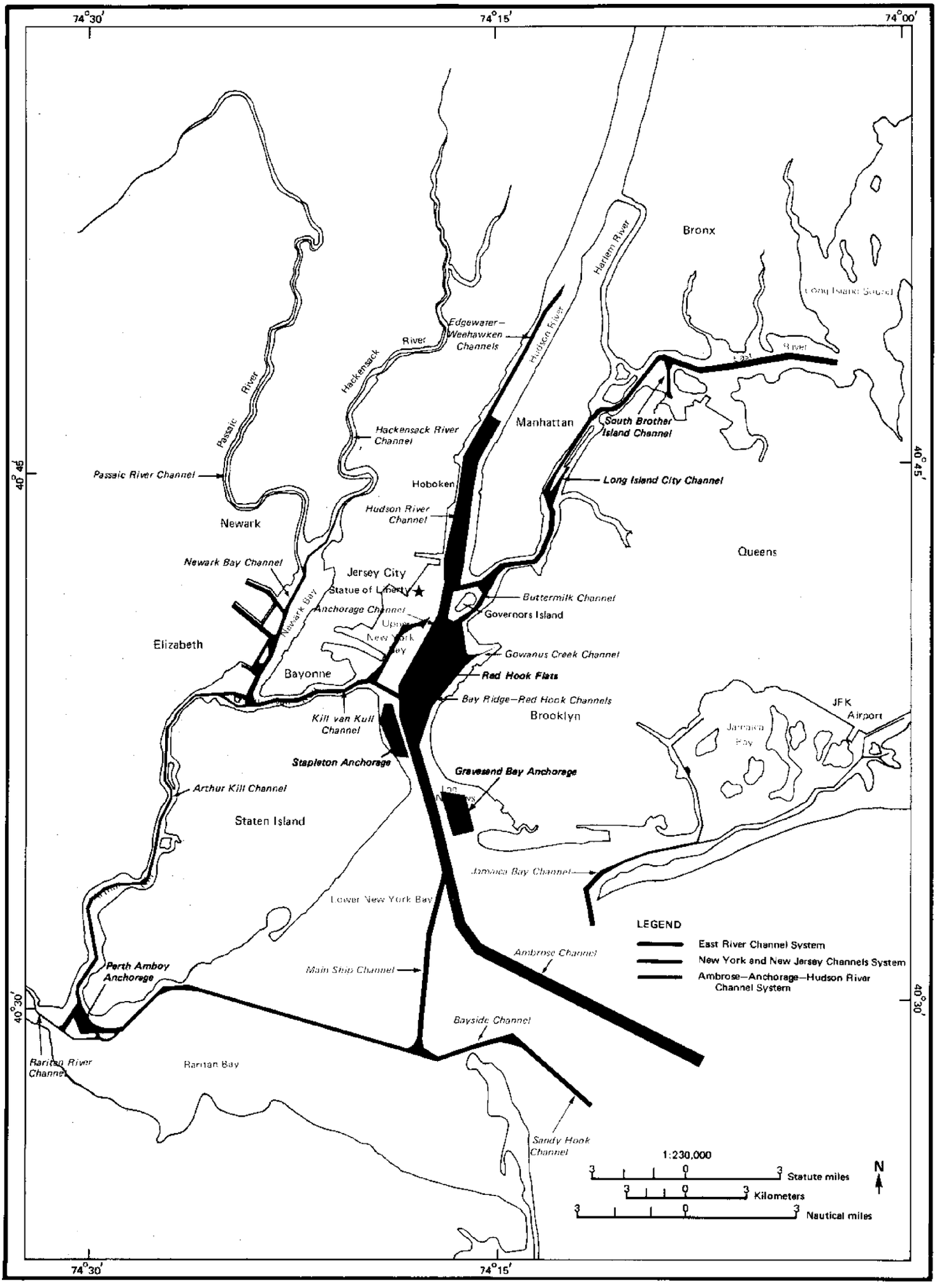
Table 1. Major commodities in waterborne commerce, 1963 and 1972

	1963	1972
	(millions of short tons)	
TOTAL	154.7	196.8
Domestic	107.5	135.0
Intraharbor	39.5	54.6
Regional	10.5	22.7
Coastal	57.5	57.7
Petroleum	40.2	44.6
Other	17.3	13.1
Foreign	47.2	61.8
Imports	40.0	56.2
Kerosene, gasoline, and fuel oils	19.3	30.5
Crude oil	9.0	13.1
Other	11.7	12.6
Exports	7.2	5.6

Source: US Army Corps of Engineers 1963, 1972*d*

*The leading US seaports are New York, New Orleans, Houston, Philadelphia, Los Angeles–Long Beach, Baltimore, Hampton Roads, San Francisco, Seattle, Portland, and Boston, as reported by the Maritime Association of the Port of New York, Inc.

Map 2. Major federal ocean channels



Transverse Mercator Projection

The Channel Systems

The Port of New York can be entered from the Atlantic Ocean by way of Lower New York Bay, Long Island Sound, or Raritan Bay. The Lower New York Bay entrance, served by Ambrose Channel and an alternate route via Main Ship Channel, is used mostly by ocean vessels; this entrance also provides access to Jamaica Bay. The federal channel systems (Map 2), with their major branch and spur channels, are:

1. *Ambrose–Anchorage–Hudson River–Edgewater–Weehawken channels system* (Lower New York Bay entrance), also serving Main Ship Channel, Bay Ridge–Red Hook–Gowanus Creek channels, Buttermilk Channel, and Jamaica Bay Channel;
2. *East River channel system* (Long Island Sound entrance), also serving South Brother Island Channel and Long Island City Channel; and
3. *New York and New Jersey channels system* (Raritan Bay entrance), namely, Raritan Bay, Arthur Kill, and Kill van Kull channels and serving also Newark Bay Channel, Hackensack River Channel, Passaic River Channel, and Raritan River Channel.

Table 2. Authorized widths, depths, and lengths of major federal channels in Port District

Channel	Width Range		Controlling Depth of Route Segments		Approximate Length	
	ft	m	ft	m	mi	km
Ambrose–Anchorage–Hudson River	2,000	610.0	45 & 48	13.7 & 14.6	22.0	35.4
Edgewater–Weehawken	550-750	167.8-228.8	32	9.8	5.0	8.0
Sandy Hook–Bayside–Main Ship	500-1,000	152.5-305.0	30 & 35	9.2 & 10.7	9.8	15.8
Bay Ridge–Red Hook	1,200-1,750	366.0-533.8	40	12.2	4.0	6.4
Gowanus Creek	100-500	30.5-152.5	30	9.2	0.8	1.3
Henry Street Basin Branch	150	45.8	30	9.2	0.2	0.3
Buttermilk	1,000	305.0	35 & 40	10.7 & 12.2	2.3	3.7
Jamaica Bay	500-1,000	152.5-305.0	18 & 20	5.5 & 6.1	5.0	8.0
Northern branch	200-300	61.0-91.5	12 & 18	3.7 & 5.5	5.0	8.0
Eastern branch	200-250	61.0-76.3	15	4.6	8.0	12.9
East River	550-1,000	167.8-305.0	35 & 40	10.7 & 12.2	16.5	26.5
South Brother Island	400	122.0	35	10.7	1.0	1.6
Long Island City	500-900	152.5-274.5	30	9.2	1.4	2.3
New York and New Jersey	300-1,400	91.5-427.0	35	10.7	31.0	50.0
Raritan River and Bay	80-800	24.4-244.0	10, 15, 25 & 35	3.1, 4.6, 7.6 & 10.7	20.0	32.2
Arthur Kill	300-800	91.5-244.0	35	10.7	13.0	20.9
Kill van Kull	650-1,400	198.3-427.0	35	10.7	6.0	9.7
Newark Bay	500-1,000	152.5-305.0	35	10.7	4.7	7.6
Hackensack River	150-400	45.8-122.0	12 & 30	3.7 & 9.2	16.5	26.5
Passaic River	150-300	45.8-91.5	10-30	3.1-9.2	15.4	24.8

Source: US Army Corps of Engineers 1972*a*

Bottom widths in these channels range from 100 through 2,000 ft (30.5 through 610 m); controlling mean low water (MLW) depths at downstream entry points range from 25 through 48 ft or 7.6 through 14.6 m (in this section all channel depths are referenced to MLW). Numerous shallow channels for harbor and recreational vessels connect with these basic systems to constitute the extensive and complex waterways serving the port. The major ones are listed in Table 2. Table 3 provides a comparison between 1963 and 1972 of vessel movements and cargo tonnage on the three channel systems and their main branches. Although more recent data may be available, the slow rate of change makes the 1972 data adequate for the purposes of this monograph.

Ambrose–Anchorage–Hudson River Channels System

Ambrose–Anchorage–Hudson River channels system is the main entrance into the Port of New York via The Narrows (Figure 2); an alternate route is Sandy Hook–Bayside–Main Ship channels. Ambrose–Anchorage–Hudson River channels system has a limiting depth of 45 ft (13.7 m), a width of 2,000 ft (610 m), and a total length from the sea entrance to West 59th Street (Manhattan) of about 22 mi (35.4 km). From there northward for 5 mi (8 km) Edgewater–Weehawken Channel hugs the New Jersey shore at a depth of 32 ft (9.8 m) and a width of 550 to 750 ft (167.8 to 228.8 m) to West 156th Street (Manhattan). This channel then continues up the Hudson River beyond Albany.

Sandy Hook–Bayside–Main Ship channels, which join Ambrose Channel about 9 mi (14.5 km) above the sea entrance, have widths from 500 to 1,000 ft (152.5 to 305 m) and a controlling depth of 30 ft (9.2 m). This route is used by large and unwieldy ocean tows and barges to avoid the heavily trafficked Ambrose Channel.

In 1972 the two harbor entrance routes accounted for 33,716 vessel movements, an increase over the 28,437 recorded in 1963. Cargo tonnage on the Hudson River segment of this channel system (between Upper New York Bay and 178th Street, Manhattan) was mainly to or from upstream points—particularly the Port of Albany—and consisted largely of petroleum.

Table 3. Vessel movements and commerce by channel system, 1963 and 1972

Channel	Vessel Movements		Commerce (million short tons)	
	1963	1972	1963	1972
Ambrose–Anchorage–Hudson River–Sandy Hook–Bayside–Main Ship	28,437	33,716	120.5*	174.2*
Bay Ridge–Red Hook–Gowanus Creek	173,296	33,992	15.1	11.2
Buttermilk	16,622	18,239	2.0	3.0
Jamaica Bay	40,309	19,705	6.2	4.6
East River	132,880	77,190	50.3	52.0
New York and New Jersey (Raritan Bay, Arthur Kill, Kill van Kull)	110,750	130,828	103.9	135.7
Newark Bay	17,621	29,161	23.6	33.0
Hackensack River	8,168	11,200	3.7	4.9
Passaic River	16,206	14,877	10.1	7.8
Raritan River	11,616	14,551	6.6	9.8

*The Narrows to The Battery segment

Source: US Army Corps of Engineers 1963, 1972*d*

Cargo (millions of short tons)	
1963	1972
120.5	174.2 (including 10.2, Albany)

Commodities over 100,000 short tons in 1972

	Tons (millions)
Fuel oil	14.6
Crude oil	2.2
Gasoline, kerosene jet fuel	1.4
Iron and steel scrap	0.6
Vegetable oils	0.2

Ambrose–Anchorage–Hudson River channels system also handles the port's prime flow of passenger vessels.

A number of liquid and dry bulk cargo facilities, as well as containership terminals, are located along the New Jersey shore. The Brooklyn waterfront is crowded with general cargo, container, and bulk cargo facilities. Available waterfront properties along Ambrose–Anchorage–Hudson River channels also contain abandoned and rundown structures and are subject to shoreline siltation but are still suitable for use by marine-related bulk industries. Some industrial growth is taking place along the New Jersey shore, but very little of it is presently concerned with ocean transportation. At this time not much open land is available for development on the New York waterfront, though some land might be redeveloped through clearance or fill operations. The trend toward replacing obsolete waterfront structures with housing, office buildings, parks, and other nonport uses is taking place in both Manhattan and New Jersey.

Bay Ridge–Red Hook–Gowanus Creek Channels. Bay Ridge Channel runs east out of Anchorage Channel, starting at The Narrows, and joins Red Hook Channel, ending at Buttermilk Channel just south of Governors Island. Bay Ridge and Red Hook channels are primarily terminal access channels to the Bay Ridge–Red Hook waterfront of Brooklyn, consisting almost entirely of the Erie Basin–Port Authority Marine Terminal and various private and City

Figure 2. Upper New York Bay and The Narrows (lower right) (Courtesy of Port Authority of New York and New Jersey)

of New York terminals and shipyard facilities. General cargo, container, and bulk cargo facilities make up much of this waterfront area.

Bay Ridge and Red Hook channels together are 4 mi (6.4 km) long, with widths from 1,200 to 1,750 ft (366 to 533.8 m) and a depth of 40 ft (12.2 m). Where Bay Ridge Channel joins Red Hook Channel—3 mi (4.8 km) north of its beginning—Gowanus Bay, 40 ft (12.2 m) deep, narrows toward the east into Gowanus Creek Channel, 500 ft (152.5 m) wide off 28th Street in Brooklyn, and then shallows to 30 ft (9.2 m). The 150 ft (45.8 m) wide Henry Street Basin Branch Channel, about 27.5 ft (8.4 m) deep and 0.2 mi (0.1 km) long, runs north from Gowanus Creek Channel to serve the now inactive Port Authority Grain Terminal. Gowanus Creek Channel narrows further to about 100 ft (30.5 m) and a depth of 18 ft (5.5 m) at Sigourney Street. The Corps of Engineers is presently studying Gowanus Creek Channel for possible deepening.

Vessel traffic dropped precipitously on these waterways, from 173,296 movements in 1963 to 33,992 in 1972. Cargo moved on Bay Ridge and Red Hook channels also dropped between 1963 and 1972, whereas Gowanus Creek Channel cargo remained relatively constant.

Cargo (millions of short tons)

	1963	1972
Bay Ridge—Red Hook	10.5	6.2
Gowanus Creek	4.6	4.9

Commodities over 100,000 short tons in 1972

	Commodity	Tons (millions)
Bay Ridge—Red Hook	Sugar	0.2
Gowanus Creek	Fuel oil	0.9
	Coffee	0.1

Buttermilk Channel, 2.3 mi (3.7 km) long and 1,000 ft (305 m) wide, passes between Brooklyn and Governors Island, linking with Anchorage and Red Hook channels to the south and East River Channel to the north. Its easterly half is 40 ft (12.2 m) deep, its westerly half, 35 ft (10.7 m) deep. It serves the US Coast Guard Base on Governors Island and the Brooklyn—Port Authority Marine Terminal as an access channel; for Bay Ridge and Red Hook channels it is a cut-off between Anchorage and East River channels. General cargo and container facilities occupy much of the shoreline of Buttermilk Channel.

Waterborne carge on Buttermilk Channel grew moderately between 1963 and 1972, paralleling a growth in vessel movements from 16,622 in 1963 to 18,239 in 1972.

Cargo (millions of short tons)

1963	1972
2.0	3.0

Commodities over 100,000 short tons in 1972

	Tons (millions)
Newsprint	0.3

Jamaica Bay Channel commences just south of Rockaway Point where it is 1,000 ft (305 m) wide and 20 ft (6.1 m) deep and turns east into Rockaway Inlet, where it shallows to 18 ft (5.5 m) and narrows to 500 ft (152.5 m). About 5 mi (8 km) from its beginning and just east of the Marine Parkway Bridge, the channel divides into northerly and easterly reaches. The northerly reach starts at 18 ft (5.5 m) deep and 300 ft (91.5 m) wide and terminates nearly 5 mi (8 km) away off Fresh Creek Basin where it is 12 ft (3.7 m) deep and 200 ft (61 m) wide. The easterly reach runs about 8 mi (12.9 km) to Thurston Basin at 15 ft (4.6 m) deep and 200 ft (61 m) wide; it has short spurs into Inwood Creek and Mott Basin. The northerly reach is east of the Floyd Bennett Coast Guard Air Station on Barren Island; the easterly reach is south of John F. Kennedy International Airport.

Vessel movements on Jamaica Bay Channel dropped from 40,309 in 1963 to 19,705 in 1972. This trend coincided with a decline in cargo tonnage, most consisting of petroleum.

Cargo (millions of short tons)

1963	1972
6.2	4.6

Commodities over 100,000 short tons in 1972

	Tons (millions)
Gasoline	1.3
Fuel oil	1.0
Jet fuel	0.9
Miscellaneous waste and scrap	0.6

East River Channel System

East River channel system extends for more than 16 mi (25.7 km) from Throgs Neck Bridge in Long Island Sound to the East River's terminus at Hudson River Channel in Upper New York Bay. At the Hudson River, the channel is about 1,000 ft (30.5 m)

wide and 40 ft (12.2 m) deep as far north as the former New York Naval Shipyard in Brooklyn. From there northward the channel shallows to 35 ft (10.7 m); widths range from 550 to 1,000 ft (167.8 to 305 m) until the channel reaches naturally deep water in Long Island Sound. The 30 ft (9.2 m) deep, 1.4 mi (2.3 km) long Long Island City Channel, 500 to 900 ft (152.5 to 274.5 m) wide, runs off the main channel east of Welfare Island to 43rd Drive in Long Island City, where it ends. South Brother Island Channel, 30 ft (9.2 m) deep, 400 ft (122 m) wide, and about 1 mi (1.6 km) long, connects East River Channel with the Astoria waterfront, passing between South Brother and Rikers islands shoreward toward the south.

Improvements on portions of East River channel system have been authorized or have been under study by the Corps of Engineers. Deepening of South Brother Island Channel to 35 ft (10.7 m) was authorized in 1970 (River and Harbor and Flood Control acts). This channel serves fuel-carrying vessels. Dredging work commenced in mid-1974 and will be finished in mid-1976. The Corps of Engineers also completed a study (1972*c*) proposing a 6.3 mi (10.1 km) deepening to 45 ft (13.8 m) of the northerly lane of the East River Channel between Throgs Neck Bridge and North Brother Island; deepening of the easterly lane to 40 ft (12.2 m) 1.7 mi (2.7 km) above the former New York Naval Shipyard from The Battery was also proposed. No construction has yet been authorized, however, due to a lack of local government participation in the project.

East River shipping dropped markedly from 132,880 vessel movements in 1963 to 77,190 in 1972. Cargo, over half of which was just passing through, remained relatively constant.

Cargo (millions of short tons)	
1963	1972
50.3	52.0 (29.4 "through")

Commodities over 100,000 short tons in 1972

	Tons (millions)
Fuel oil	9.7
Sugar	0.5
Cement	0.4
Crude oil	0.2
Sand, gravel, crushed rock	0.2
Bananas	0.2
Limestone	0.2
Lumber	0.2

On the Manhattan side of the East River, general cargo piers are gradually being replaced with housing, office buildings, and recreational facilities. Most shipping activity takes place along parts of the Bronx, Queens, Brooklyn, and mid-Manhattan waterfronts.

New York and New Jersey Channels System

Kill van Kull and Arthur Kill channels, when linked to Raritan Channel, constitute the 31 mi (49.9 km) long New York and New Jersey Channels. These waterways are 35 ft (10.7 m) deep and from 300 to 1,400 ft (91.5 to 427 m) wide. They serve New Jersey and the west and north shores of Staten Island. Their southerly entrance is the Atlantic Ocean off Sandy Hook and their northerly terminus, the 45 ft (13.7 m) Anchorage Channel in Upper New York Bay. Leading into this waterway are Newark Bay–Hackensack River–Passaic River channels to the north and Raritan River Channel to the south.

Between 1963 and 1972 vessel traffic on New York and New Jersey Channels grew from 110,751 to 120,828 movements. This was accompanied by a growth in cargo tonnage, most composed of petroleum and its products.

Cargo (millions of short tons)	
1963	1972
103.9	135.7

Commodities over 100,000 short tons in 1972

	Tons (millions)
Fuel oil	22.6
Crude oil	16.3
Gasoline, benzine, kerosene, jet fuel	13.6
Tar and asphalt	1.6
Basic chemicals	1.0
Lubricating oil and grease	0.8
Limestone	0.6
Plastics	0.2
Miscellaneous petroleum and coal products	0.2
Liquid sulphur	0.2
Liquified gases	0.1
Nonmetallic minerals	0.1

Deepening New York and New Jersey Channels to as much as 45 ft (13.7 m) was studied by the Corps of Engineers (1973). It would have benefited tankers up to 80,000 deadweight tons and would have been particularly useful to petroleum product tankers, normally from 25,000 to 45,000 deadweight tons. However, the Corps estimated deepening would cost $350 million or more and would not produce commensurate transportation benefits. The plan was abandoned.

Newark Bay–Hackensack River–Passaic River Channels. This channel network extends in a Y north from the Kill van Kull; Newark Bay Channel is the stem and the Hackensack and Passaic rivers, the eastern and western arms of the Y. Below the junction of the two rivers the channel is 35 ft (10.7 m) deep and 500 to 1,000 ft (152.5 to 305 m) wide. From the junction, a 30 ft (9.2 m) deep and 300 ft (91.5 m) wide channel runs northeast up the Hackensack River for 4 mi (6.4 km) to a small turning basin, then narrows and shallows to 12 ft (3.7 m) for an additional 12.5 mi (20.1 km). Passaic River Channel runs for 2.5 (4 km) northwest at 30 ft (9.2 m) deep and 300 ft (91.5 m) wide, then begins to shallow progressively to 20, 16, and 10 ft (6.1, 4.9 and 3.1 m) for another 13 mi (20.9 km).

In 1972 Congress directed the Corps of Engineers to study the feasibility and justification of deepening the Kill van Kull–Newark Bay Channel route between St. George (Staten Island) and the New Jersey Turnpike Extension Bridge to as much as 45 ft (13.7 m), plus widening and easing bends to handle more safely and efficiently the increasingly larger tankers, containerships, and general cargo ships using this waterway (Resolution of House Committee on Public Works 14 June 1972). The Corps began its study of this improvement early in 1974; completion is scheduled for 1976. Deepening of the lower portion of Hackensack River Channel was authorized to 32 ft (9.8 m), the upper portion to 15 ft (4.6 m); this work has not yet begun, however. No plans exist to improve Passaic River Channel.

The 10-year trend in vessel traffic for the three waterways indicates a drop for the Passaic River only.

Vessel Movements

	1963	1972
Newark Bay	17,621	29,161
Hackensack River	8,168	11,200
Passaic River	16,206	14,877

These trends were reinforced by those in cargo tonnage during the same period. Most cargo was petroleum and dry bulk commodities.

Cargo (millions of short tons)

	1963	1972
Newark Bay	23.6	33.0
Hackensack River	3.7	4.9
Passaic River	10.1	7.8

Commodities over 100,000 short tons in 1972

	Commodity	Tons (millions)
Newark Bay	Fuel oil	0.7
	Kerosene	0.5
	Crude oil	0.3
	Minerals	0.2
	Salt	0.2
Hackensack River	Tar and asphalt	0.3
	Sand and gravel	0.1
Passaic River	Gasoline	1.5
	Fuel oil	0.9

Raritan River Channel leads west from Sandy Hook Channel in Raritan Bay up the river almost 6 mi (9.7 km) to the Raritan Industrial Center (formerly the Raritan Arsenal). A southerly spur runs along the south shore of the river for 0.6 mi (0.9 km), terminating at the Titanium Company, Inc. in Sayreville, NJ. These channels have a maximum 25 ft (7.6 m) downstream depth and range from 200 to 300 ft (61 to 91.5 m) wide. Ocean traffic generally ends 3 mi (4.8 km) upstream at the Amerada–Hess Company in Perth Amboy where the channel is 300 ft (91.5 m) wide.

Vessel movements on Raritan River Channel rose from 11,616 to 14,551 between 1963 and 1972. Cargo tonnage, dominated by petroleum, also increased.

Cargo (millions of short tons)

1963	1972
6.6	9.8

Commodities over 100,000 short tons in 1972

	Tons (millions)
Fuel oil	0.6
Sand and gravel	0.3
Crude oil	0.1

Other Channels in the Port District

In addition to the channel systems constituting the prime ocean shipping waterways of the Port of New York, there are smaller channels within the boundaries of the Port District (Table 4).

On these waterways, shallow draft river and harbor vessels move commerce comprised principally of petroleum products, sand, gravel, crushed stone, cement, clay, and metals and scrap.

Table 4. Commerce on other channels in Port District, 1963 and 1972

	Authorized Depth (MLW)		Authorized Length		Commerce (millions of short tons)	
	ft	m	mi	km	1963	1972
Bronx River	10	3.1	2.5	4.0	0.6	0.4
Coney Island Channel	20	6.1	1.3	2.1	6.2	4.0
Eastchester Creek	10	3.1	5.0	8.0	2.0	2.1
East Rockaway Inlet	12	3.7	1.0	1.6	1.4	3.4
Flushing Bay and Creek	15	4.6	2.9	4.7	2.5	2.5
Harlem River	15-18	4.6-5.5	7.6	12.2	1.4	0.8
Manhasset Bay	8	2.4	1.4	2.3	0.6	0.5
Newtown Creek	12-23	3.7-7.0	5.2	8.4	8.3	5.2
Port Chester	3-12	0.9-3.7	1.7	2.7	0.4	0.5
Tarrytown	12	3.7	1.0	1.6	0.4	0.6
Westchester Creek	12	3.7	2.6	4.2	0.7	0.6

Source: US Army Corps of Engineers 1963, 1972*d*

Waterways and Inlets Beyond the Port District

Numerous shallow waterways and inlets exist as ports along Long Island's southern shore and the New Jersey coast outside the boundaries of the Port District (Map 1). Most are involved in finfish and shellfish industries or in intraregional movements of petroleum products, sand, gravel, crushed rock, or cement. Only 15 of these inlets or waterways are recorded as having handled commerce in 1972 (Table 5). In addition to commerce, they accounted for over 4.1 million passengers, presumably engaged in commercial fishing or recreational activities; Great South Bay accounted for 1.3 million passengers and the New Jersey Intracoastal Waterway, 1.0 million.

Peekskill Harbor (NY) on the Hudson River handled 223,485 short tons of petroleum products and water as cargo in 1972.

Anchorages

Anchorages provide a "parking place" for ships to await the availability of a berth, cargo, or repairs, to escape a storm, to await proper tides, or to reduce their drafts to pass over shallow channels by partial unloading into barges, called *lighterage*.

In 1963 (the most recent data year) the Port of New York offered 61,736 acres of man-made and natural anchorage space; man-made anchorages have

Table 5. Commerce on waterways and inlets beyond Port District, 1972

Inlet/Waterway	Commerce (short tons)
Long Island	
Brown Creek	220
Fire Island Inlet	167,581
Great South Bay	171,921
Jones Inlet	1,710
Orowoc Creek	1,311
Peconic Bay and River	921
Shinnecock Inlet	1,115
New Jersey	
Absecon Creek	290
Absecon Inlet	79,904
Barnegat Inlet	71
Cape May Canal	292
Intracoastal Waterway	38,534
Manasquan River	6,366
Shrewsbury River	175,490
Tuckerton Creek	768
TOTAL	646,494

Source: US Army Corps of Engineers 1972*d*

been dredged to depths from 20 to 40 ft (6.1 to 12.2 m). Of this total acreage, 57,354 acres constituted natural anchorages in Lower New York, Gravesend, Sandy Hook, and Raritan bays; the remaining 4,382 acres were in Upper New York Bay. Only 613 acres in the Upper New York Bay area were then considered man-made anchorages; these have since been under expansion.

The port's prime and most used deepwater anchorages, the New York Harbor Anchorages, are in Upper New York Bay (Map 2). The area off Staten Island between the Verrazano–Narrows Bridge and St. George offers natural water depths from 25 to 80 ft (7.6 to 24.4 m) and is the port's most popular deepwater anchorage. Across Upper New York Bay toward Brooklyn lies the Red Hook Flats Anchorage area. Deepening of this area was begun in 1969 by the Corps of Engineers. When entirely finished in 1976, the improvements will provide 35, 40, and 45 ft (10.7, 12.2, and 13.7 m) depths in lower Red Hook Flats and a 35 ft (10.7 m) depth in upper Red Hook Flats. Gravesend Bay Anchorage in Lower New York Bay will be deepened to 47 ft (14.3 m); most of the area has already been dredged to this depth. Further deepening will take place in 1976 and 1977.

Another man-made anchorage area lies off Perth Amboy in Raritan Bay near the junction of Raritan River Channel and New York and New Jersey Channels. This anchorage offers depths to 37 ft (11.3 m). A 38 ft (11.6 m) man-made anchorage is authorized for Raritan Bay where Raritan Bay and Main Ship channels join west of Sandy Hook, but this anchorage has not yet been constructed.

The remaining anchorages in the port are shallow and used by small coastal, harbor, and recreational craft.

Navigation Safety

Harbor safety is largely the concern of the Corps of Engineers, US Coast Guard, major waterfront municipalities, and pilots. The Corps of Engineers is responsible for constructing and maintaining waterways and keeping them clear of drift, sunken vessels, and other navigational obstructions, as well as preventing shore structures from impeding upon navigable waters. The Coast Guard regulates vessel and terminal safety, licenses or certifies the crews of US flag ships, provides and maintains navigation aids, conducts ice-breaking operations, controls anchorage use, provides search and rescue services, regulates bridge construction and operation, provides port security, assists in firefighting and pollution control, and administers the Federal Water Pollution Control Act. Fire and police protection are essentially municipal functions; both New York City and Newark have special marine units for this purpose.

Pilotage and Navigation

Navigating an ocean vessel into, out of, and through harbor waters is in the hands of a skilled pilot, who joins or leaves the ship at pilot stations at Ambrose Light Tower, Yonkers (Hudson River), or Execution Rocks (Long Island Sound). The principal pilotage organization is the Sandy Hook Pilots Benevolent Association, whose 127 members underwent years of training to obtain state licenses as branch pilots. Federally licensed and independent pilot groups also exist. Commissions in New York and New Jersey regulate the qualifications of the Sandy Hook Pilots Benevolent Association. While technically in charge of the navigation of the ship in the harbor, the pilot is legally the servant of the shipmaster with whom remains ultimate responsibility for the safety of the ship. Nonetheless, state law requires the engagement of a pilot or other mariner so qualified, essentially for vessels engaged in foreign trade.

The harbor or bar pilot guides a ship from the ocean pilot station to anchorage or to just off the ship's terminal. Relying on an intimate knowledge of the harbor and of ship handling, the pilot navigates the vessel through waterways designated by lighted and unlighted navigation aids or markers provided and maintained by the Coast Guard. A system of colors, stripes, flashing lights, or occulting lights is used for individual identification of these markers. Actual maneuvers of the ship are controlled by federal navigation laws known as the *Rules of the Road.* Inland waterway rules differ somewhat from those used in international waters.

The docking and undocking of the vessel is the responsibility of another specialist, the docking pilot. He directs the assisting tugboats through intricate vessel docking and undocking maneuvers, calling

upon his skills in ship handling and his knowledge of the effects of wind, tide, and currents. The port has a fleet of about 350 tugs with horsepowers up to 3,000. Some are used in docking and undocking operations, others in towing.

The harbor and docking pilots are essential to efficient and safe navigation of ocean ships into and out of the port.

Vessel Traffic Control

The 1972 Ports and Waterways Safety Act empowered the Coast Guard to develop and operate vessel traffic services in US ports and to otherwise control the movement time, size, and speed of ships in especially hazardous areas or situations, like collisions and groundings, which can cause damage and loss of property, injury or death, or threaten the environment with spills of oil or toxic chemicals, for example. Following passage of the act, the Coast Guard began a series of projects at specific ports—including the Port of New York—aimed at developing vessel traffic services.

The Third Coast Guard District, with the aid of an advisory committee made up of people with shipping, port, pilotage, maritime, boating, and environmental experience, is engaged in developing a New York Harbor Vessel Traffic Service. As presently conceived, the plan calls for a ship reporting system, radar surveillance, and television identification. These will be implemented in stages (Third Coast Guard District 1975).

Under the ship reporting system, begun in 1974, a vessel approaching designated danger and precautionary areas broadcasts her name, speed, direction, and destination on a frequency that must be continuously monitored by other ships by VHF–FM radiotelephone. Upon receiving such a broadcast, nearby ships respond to work out desirable passing, overtaking, or crossing maneuvers. When the Coast Guard sets up its Vessel Traffic Control Center, expected to be on Governors Island in 1976, its personnel will monitor such communications.

Later, perhaps by 1977 or 1978, the system will be equipped with two radar units electronically linked to the center. The Coast Guard center will be able to follow ship movements visually and to warn nearby ships of impending navigational problems through its own shore-to-ship radiotelephone. From communications input, the system will broadcast traffic situation information. Low-light television cameras will also be positioned at several harbor vantage points to provide the center with supplemental information on traffic disposition, ship identification, and situation reports for correlation with other data.

Although initial compliance is at present voluntary, adherence to the system and its procedures will ultimately be made mandatory, in the interest of universal reliability. The prerogatives and skills of the onboard master or pilot will still have an advantage, however, over even precise vessel operation by the system. For the time being at least, Vessel Traffic Service procedures are expected to continue to be subordinate to the navigation *Rules of the Road,* especially where conflicts arise.

Fire and Police Protection

New York City's Fire Department Marine Division maintains a fleet of eight fireboats stationed in city waters to assist in fire-fighting operations throughout the port. Some boats are capable of pumping 20,000 gallons of water per minute. Newark also maintains a fireboat, stationed on the Passaic River.

Patrolling port waters to conduct emergency and rescue work, enforce safe navigation, prevent vandalism and theft, and otherwise assist mariners is the responsibility of the Harbor Patrol Unit of New York City's Police Department. This unit maintains and operates 11 special purpose launches from 27 to 52 ft (8.2 to 15.9 m) long.

Harbor Dredging

The Corps of Engineers constructs and maintains the port's system of 78 federal waterways at depths prescribed by federal public works legislation. Siltation rates in the harbor vary by waterway; these rates, together with the length, width, and depth of the waterway, influence the volume of material to be removed and the frequency of removal. In 1966 the Corps dredged 9,500 yd^3 (7,220 m^3) of material from the East River. Between 1968 and 1971, 348,000 yd^3 (264,480 m^3) were removed from New York and New Jersey Channels. In 1972, 370,000 yd^3 (281,428 m^3) were dredged from the main Hudson River Channel. In 1973, 291,000 yd^3 (221,160 m^3) were taken out of Bay Ridge Channel and 582,500 yd^3 (442,700 m^3) out of Edgewater–Weehawken Channel. Newark Bay maintenance dredging in 1974 totaled 67,700 yd^3 (51,452 m^3). Data on maintenance dredging of lesser channels in the harbor are not readily available.

The dredged material must be disposed of in an economically sound, navigationally efficient, and environmentally acceptable manner. Traditional disposal has been on land, in diked areas, or at sea. The Corps of Engineers is currently studying new methods in the Dredged Materials Research Program being conducted at the Waterways Experiment Station in Vicksburg, MS; the program will cost an estimated $30 million and is due for completion in 1978.

Land disposal has generally been ruled out as being locationally unacceptable, excessively costly, or unavailable. The Corps is studying the feasibility of constructing a diked disposal area in the vicinity of Hoffman and Swinburne islands off Staten Island in Lower New York Bay (Corps of Engineers 1972*b*). At present, sea disposal appears to be the only workable alternative.

The Corps is empowered to designate dredged material disposal sites and to exercise strict control over the quantity and quality of material deposited from both federal and private dredging work, the latter by permit. In this matter, the Corps cooperates closely with the Environmental Protection Agency (EPA) and with local lawmakers. The area presently designated for dredged material disposal is the mud grounds (see Gross, in press). From 1965 through 1970, the mud grounds received 33.6 million yd^3 (25.5 million m^3) of mud and dredgings. The lowest volume was 1.1 million yd^3 (0.8 million m^3) in 1970; the highest, 8.8 million yd^3 (6.7 million m^3) in 1968. The annual mean for the six-year period was 5.6 million yd^3 (4.3 million m^3).

At this time there are no federal plans to relocate or discontinue dredge spoil disposal.

Major Ocean Terminal Development

Ocean terminal development in the port is largely, but not entirely, in the hands of two public agencies —the Port Authority of New York and New Jersey and the City of New York Department of Ports and Terminals. These agencies tend to concentrate on providing passenger and general cargo facilities. Most general cargo terminals built in recent years are for unitized and intermodal operations that handle general cargo in standardized containers or barges lifted aboard ocean vessels by special cranes or driven aboard specially designed ferry-type craft called "roll on/roll off" vessels. The port has a number of such facilities, newly built by these agencies but privately operated. Bulk cargo and industrial terminals, on the other hand, have been almost exclusively built and operated by the private sector.

Readers of this monograph have already stumbled against some of the jargon cherished by the shipping trade. Six common terms are defined below. A *containership* is specially designed to mechanically load, unload, and stow cargo containers of standard dimensions. A *container facility* is a marine terminal designed to service containerships. A *product tanker* is a vessel that carries refined petroleum in bulk. Manufactured or semimanufactured goods that move under "mark and count" are called *general cargo*. Raw materials, usually flowable and homogenous, that do not move under "mark and count" are called *bulk cargo*. A *breakbulk general cargo facility* is a marine terminal designed to service general cargo handled piecemeal or in lots other than containers and standardized units.

The major general cargo and passenger ocean terminal facilities in the Port District are located on both sides of lower Manhattan, on the New Jersey side of the Hudson River, on the Brooklyn waterfront, along northern Staten Island, and within the huge Port Authority terminals on Newark Bay.

Public Port Agencies

The Port Authority of New York and New Jersey is a financially self-supporting public corporate agency of the states of New York and New Jersey. Port Authority commissioners, six from each state, are appointed by the respective governors and serve without pay for staggered six-year terms.

The Port Authority can buy, build, lease, and operate transportation, terminal, and other commerce

facilities within the Port District. The agency is also responsible for promoting port commerce and protecting it from inequitable or discriminatory transportation charges and practices, for making recommendations to the state legislatures for new and improved transportation facilities, and for better ways of doing business.

Since 1948, when the Port Authority acquired Port Newark, the agency has invested over $450 million in providing the port with modern general cargo marine facilities. These facilities are usually leased under agreements with individual steamship carriers or terminal operating companies, which are responsible for day-to-day operations. The Port Authority's professional staff works closely with terminal users to help assure maximum cargo handling utilization, proper facility maintenance, and efficient management of the facilities.

The City of New York Department of Ports and Terminals is the agency responsible for carrying out functions connected with the city's waterfront, markets, and distribution industries. The department manages approximately 100 city-owned pier and waterfront properties, valued at some $400 million. Facilities may be rented under long-term lease, under permit, or under short-term usage arrangements. The department also regulates and supervises the use of the 578 mi (930 km) of waterfront within the city's five boroughs, including both privately and municipally owned areas.

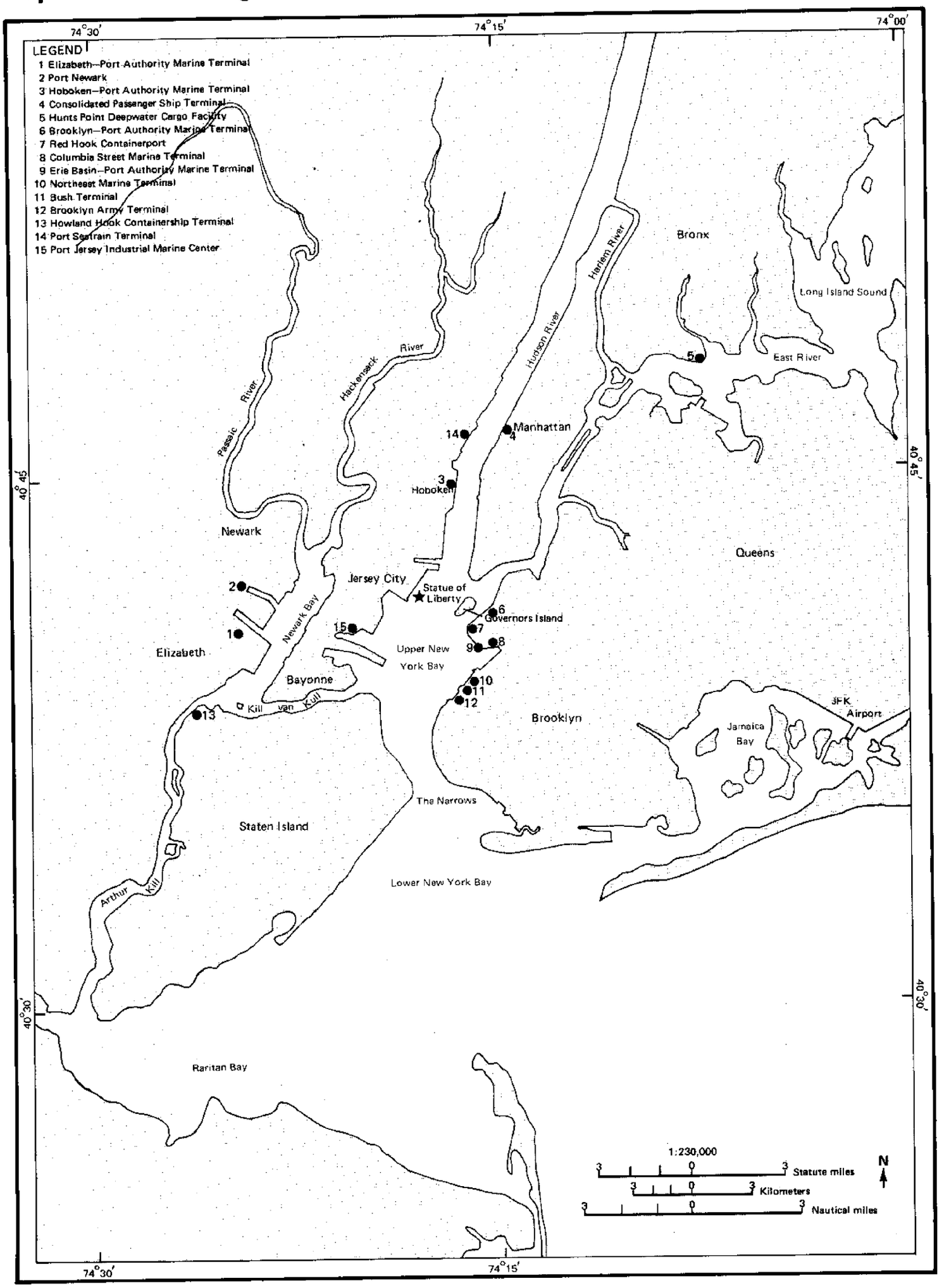
Map 3 gives the locations of the 13 public and 2 private terminals described below.

Publicly Owned and Developed Terminals

Elizabeth–Port Authority Marine Terminal (Figure 3) began operation in 1962 and is owned by the Port Authority. This 1,165 acre terminal, located in Elizabeth, NJ, on Newark Bay, is a $244 million development providing modern, efficient facilities for

Figure 3. Elizabeth–Port Authority Marine Terminal and Port Newark (Courtesy of Port Authority of New York and New Jersey)

Map 3. General cargo terminals



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steamship lines and shippers. It offers 19 cranes servicing 22 fully equipped container berths, 12 huge cargo distribution buildings with over 1 million ft² of space, 8 cargo terminal buildings, and 50 miscellaneous service buildings.

Within this facility, 8,471 ft of wharf and 364 acres are occupied by Sea–Land Service, Inc., the pioneer container steamship company. Sea–Land started operations in 1962 and expanded its terminal to its present size in 1974. The combination container and "roll on/roll off" vessels of Atlantic Container Line, Ltd. (ACL) began transatlantic operations from the Elizabeth terminal in 1967. ACL operates from a 1,550 ft long wharf at Elizabeth, supported by 65 acres of paved upland storage area. Adjacent to ACL is the Pittston Stevedoring Corporation, which operates 1,090 ft of wharf. In 1968, service at a three-berth, 87 acre containership terminal was inaugurated by International Terminal Operating Company, Inc. Maher Terminals, Inc. began service at its new 150 acre, 2,400 ft berth terminal in 1972.

During 1973, employment at Elizabeth Marine Terminal was equivalent to 2,000 people with an annual payroll of $21,417,000. The facility has the capacity to handle 13.4 million short tons of containerized cargo per year.

Port Newark (Figure 3), located in Newark, NJ, and adjacent to Elizabeth–Port Authority Marine Terminal on Newark Bay, is 8 mi from The Narrows by way of the Kill van Kull. The facility is being financed, developed, and operated by the Port Authority under a long-term lease with the City of Newark. In creating this 848 acre terminal, the Port Authority provided many improvements, including 17 new or rehabilitated cargo terminal buildings, 18 new wharfs, 34 cargo distribution buildings, 13 mi of roadway, public cold storage warehouses, a frozen meat inspection building, a wine terminal, a fumigation building, 70 miscellaneous service buildings, public truck scales, a Waterfront Commission Employment Information Center, the Seamen's Church Institute Recreation Center, two commercial bank buildings, 180,000 ft² of ground level storage buildings, and 330 acres of transit and open storage. There is a 10 acre railroad container transfer and storage yard. Over 38 mi of tracks permit railroad loading and unloading of cargo at the waterfront or at distribution buildings in the upland area of the facility.

Port Newark's newest terminal, opened in 1972 and comprising 3,058 ft of berths and 60 acres of upland, is leased and operated by Universal Maritime Service Corporation. Development has also begun in the "Navy Area" on the north side of the Port Newark Channel, in what was once a shipyard. Scheduled for completion in 1976, the "Navy Area" development will provide additional upland area and 2,500 ft of new berth space.

Beyond construction now under way, the Port Authority has proposed to expand Port Newark to accommodate the steadily growing volume of waterborne commerce. The Port Authority plan calls for leasing from the Penn Central Transportation Company a 95.6 acre parcel of land north of the New Jersey Turnpike Extension, building there about 830,000 ft² of cargo distribution and storage space and providing about 2.3 million ft² of paved upland area, at a total estimated cost of $19 million.

By the end of 1976, Port Newark will have over 4.25 mi of berth space, 416 acres of paved upland area, over 50 cargo storage and distribution buildings, and numerous specialized cargo installations. Its annual cargo handling capacity will be increased from 2.5 million short tons (in 1974) to 6.7 million short tons. The development of Port Newark through 1976 will represent a total investment of $185 million.

In 1973, employment at Port Newark was equivalent to 3,800 people with an annual payroll of $41,477,000.

Hoboken–Port Authority Marine Terminal. The Port Authority has spent well over $18 million to develop the Hoboken–Port Authority Marine Terminal, which it operates under a 50-year lease with the City of Hoboken and the US Maritime Administration. The development program included the construction of Piers A and B and the rehabilitation of Pier C–once used for passenger ships–as modern, efficient cargo piers. Piers A and B each provide 192,440 ft² of covered space and have the latest fire protection devices.

The terminal handled more than 336,000 short tons of cargo during 1973 and generated a payroll of $2,900,000.

Consolidated Passenger Ship Terminal (Figure 4) on the Hudson River was developed by the Port Authority under a lease with New York City and features six berths, new auto access ramps, rooftop parking, air-conditioned passenger lounges, automated baggage handling, and other refinements de-

signed to meet the needs of today's passenger ship travelers.

Opened in November 1974, this passenger ship terminal is integrated with the goal for overall development of the mid-Manhattan–Hudson River waterfront. The $40 million construction involved a complete rehabilitation and rebuilding of Piers 88, 90, and 92 (between 48th and 52nd streets). In addition, the existing Pier 40 at Houston Street is being used as a companion three-berth passenger facility.

Cruise passengers account for between 1% and 2% of New York's annual hotel occupany rate. On the whole, passenger ship activity contributed $137 million to the greater metropolitan area's economy in 1973 by generating income to restaurants, theatres, hotels, and other tourist enterprises.

Hunts Point Deepwater Cargo Facility. When finished, this new $37 million New York City deepwater cargo facility and refrigerated warehouse, begun in 1973, will handle 65% of all meat imports to the United States and will consolidate distribution of domestic meat provisions in both the city and the region. The facility will occupy 40 acres of the Bronx waterfront on the East River and will have a 1,700 ft pier capable of accommodating the newest designs of containerships, as well as barges. Its 5 million ft^3 warehouse will handle over 784 million short tons of meat annually.

At its planned opening in 1977, this installation will have 200 employees and an annual payroll of $1.1 million. Eventually more than 2,000 new jobs will be created by the deepwater cargo facility.

Brooklyn–Port Authority Marine Terminal (Figure 5) is the busiest of the marine cargo facilities owned by the Port Authority on the New York side of the port. The terminal extends southward along 2 mi of waterfront from the Brooklyn Bridge through Atlantic Basin. The Port Authority's redevelopment program, begun upon acquisition of the property in 1956, has replaced 25 obsolete piers with 12 new piers and rehabilitated one pier, at a total cost of $95,900,000.

The 13 modern piers—equipped with wide shipside cargo areas, ample shed space, upland broad truck platforms, and 60 acres of upland storage–

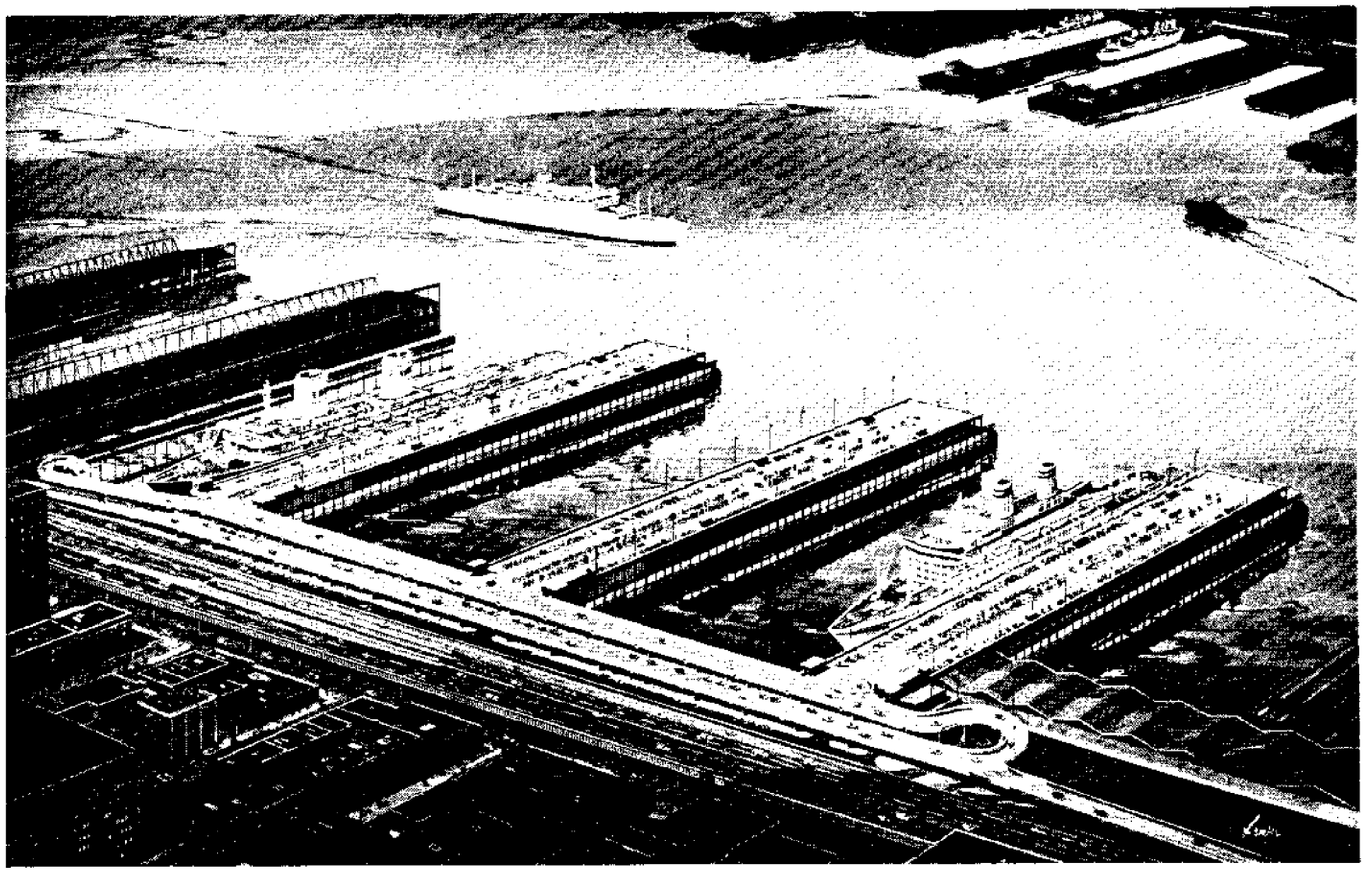


Figure 4. Consolidated Passenger Ship Terminal, Manhattan (Courtesy of Port Authority of New York and New Jersey)

contribute to fast, efficient handling of general cargo, palletized freight, and containerized cargo. During 1973, approximately 1.5 million tons of cargo passed through the facility. An Employment Information Center for the Waterfront Commission of New York Harbor has been in operation there since 1966.

In 1973 employment at this Brooklyn facility was equivalent to 2,246 people earning more than $25 million.

Red Hook Containerport. Under a 1974 lease with the City of New York, the Port Authority has been working on plans for a jointly developed containership terminal along Buttermilk Channel in South Brooklyn. The result is a new containership facility to be located on the Red Hook peninsula; it will cover 230 acres and cost approximately $54 million to build, starting in 1977. When open, around 1981, it will incorporate the most modern technological refinements and offer a two-berth containership terminal, a container loading and unloading shed, and additional cargo storage and truck backup space.

This project will create 500 new waterfront jobs and 2,200 port-related positions.

Columbia Street Marine Terminal, located on Gowanus Bay in Brooklyn, is a six-berth facility. Originally built in 1922 by the state as part of the New York State Barge Canal system, it was transferred to the Port Authority in 1944. Columbia Street Marine Terminal represents a Port Authority

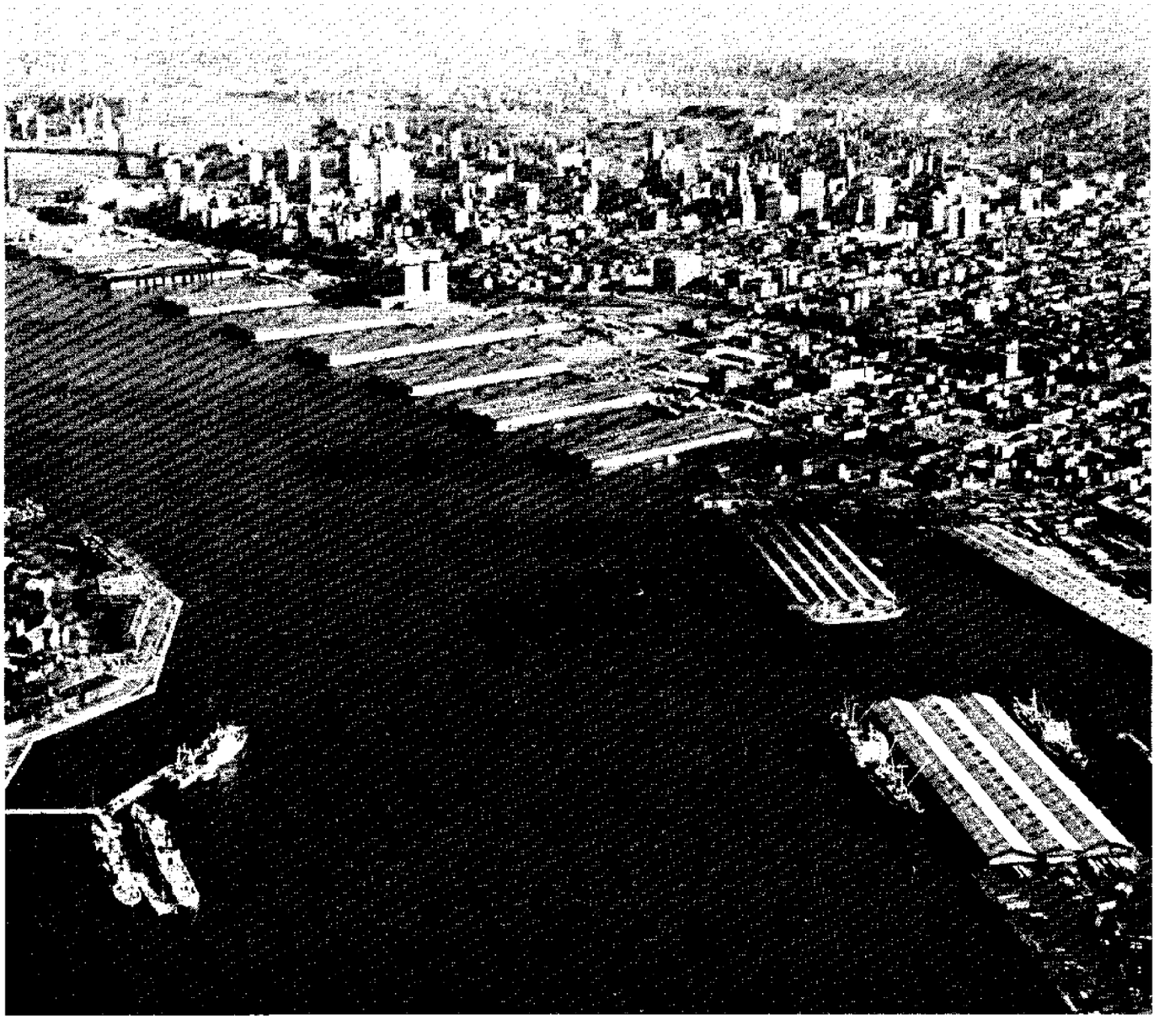


Figure 5. Brooklyn—Port Authority Marine Terminal (Courtesy of Port Authority of New York and New Jersey)

investment of $4.2 million in rehabilitation and improvements projects.

In 1973 the terminal handled 131,000 short tons of cargo; the annual payroll was almost $2 million.

Erie Basin—Port Authority Marine Terminal, located on Gowanus Bay in Brooklyn and owned by the Port Authority, includes property purchased in 1958 from the former Beard's Erie Basin, Inc. and the US Navy. The five-berth general cargo terminal is over 4,000 ft long and 300 ft wide, has two pier areas built on stone breakwaters, contains five transit sheds, and comprises 40 acres of upland. The Port Authority has invested over $12.8 million to rehabilitate this terminal.

This facility generates an annual payroll of more than $1.6 million.

Northeast Marine Terminal (Figure 6) in Brooklyn is the City of New York's first fully equipped container-breakbulk general cargo facility. Northeast Terminal employs 700 longshoremen and handles over 560,000 short tons of cargo annually. A planned three-phase, $50 million renewal program will eventually quadruple Northeast Terminal's cargo handling capacity to 2.2 million short tons per year and almost triple its work force to 2,000 longshoremen.

Northeast Terminal will feature two city-purchased "Starporter" gantry cranes whose lifting capacity and reach in all directions exceed that of any other crane model in the world. Phase one of the renewal program, between 33rd and 39th streets, has been operational since fall 1974. Phase two, involving the section between 29th and 33rd streets, is under construction and scheduled to open in 1977. Construction on phase three, between 39th and 51st streets, began late in 1974.

Bush Terminal (Figure 6), located south of Gowanus Bay in Brooklyn and once privately owned, provides a breakbulk general cargo operation that moves some 360,000 short tons of cargo annually. The City of New York purchased the terminal and negotiated a leaseback agreement with Universal Terminal Stevedoring, Inc. Development plans call for this facility to become a major area of expansion of the nearby Northeast Marine Terminal.

Brooklyn Army Terminal. The City of New York leases a portion of the 100 acre Brooklyn Army Terminal from the federal government and in turn subleases it to International Terminal Operators, Inc. as a general cargo facility. The terminal handles about 224,000 short tons annually and is among the few remaining areas on the Brooklyn waterfront suitable for development as a modern shipping installation.

Figure 6. Northeast Marine Terminal and Bush Terminal (Courtesy of New York City Economic Development Administration, photo by H. Wemple)

Howland Hook Containership Terminal. The City of New York's 1974 purchase of this 515 acre maritime complex on the Arthur Kill at Howland Hook, Staten Island, from American Export Lines inaugurated the full-scale development of a 187 acre containership facility, with United States Lines as its prime tenant and operator. American Export Lines, the original owner, will continue to sublease a portion of the facility and share operating responsibilities with United States Lines. This restructured terminal was built to handle 180,000 containers annually, or 18% of the container volume moving through the port, and create 500 waterfront jobs.

Scheduled future plans, as specified in the city's letter of intent with United States Lines, include a fourth ship berth, doubling of the existing container loading and unloading shed space, and 50 acres of new paving for container marshaling and storage areas. In addition to the container terminal, approximately 215 of the 515 acres in the Howland Hook tract will be developed as an integrated distribution facility that will generate 15,000 new jobs and attract $140 million of private investment for land improvements.

Privately Owned and Developed Terminals

Port Seatrain Terminal. The multimillion dollar Port Seatrain Terminal (Figure 7) is a privately owned and operated containership facility of Seatrain Lines, Inc., located along the Hudson River in Weehawken, NJ. Its two-berth, 903 ft long pier is 120 ft wide, with turnaround space for tractor-trailer units hauling containers. Port Seatrain also offers 210,000 ft^2 of warehouse space at its 80 acre facility.

The terminal employs about 500 people.

Port Jersey Industrial Marine Center (Figure 8), developed and operated by the Port Jersey Corporation, is the largest privately owned industrial park/containership complex of its kind in the port. It is located partly in Jersey City and partly in Bayonne, NJ, on Upper New York Bay. The overall complex, begun in November 1968, will, when finished in 1978, comprise 540 acres, 15 entry and departure gates, three "Starporter" cranes for containership operations, and a dry bulk handling facility, all totaling an investment of about $200 million.

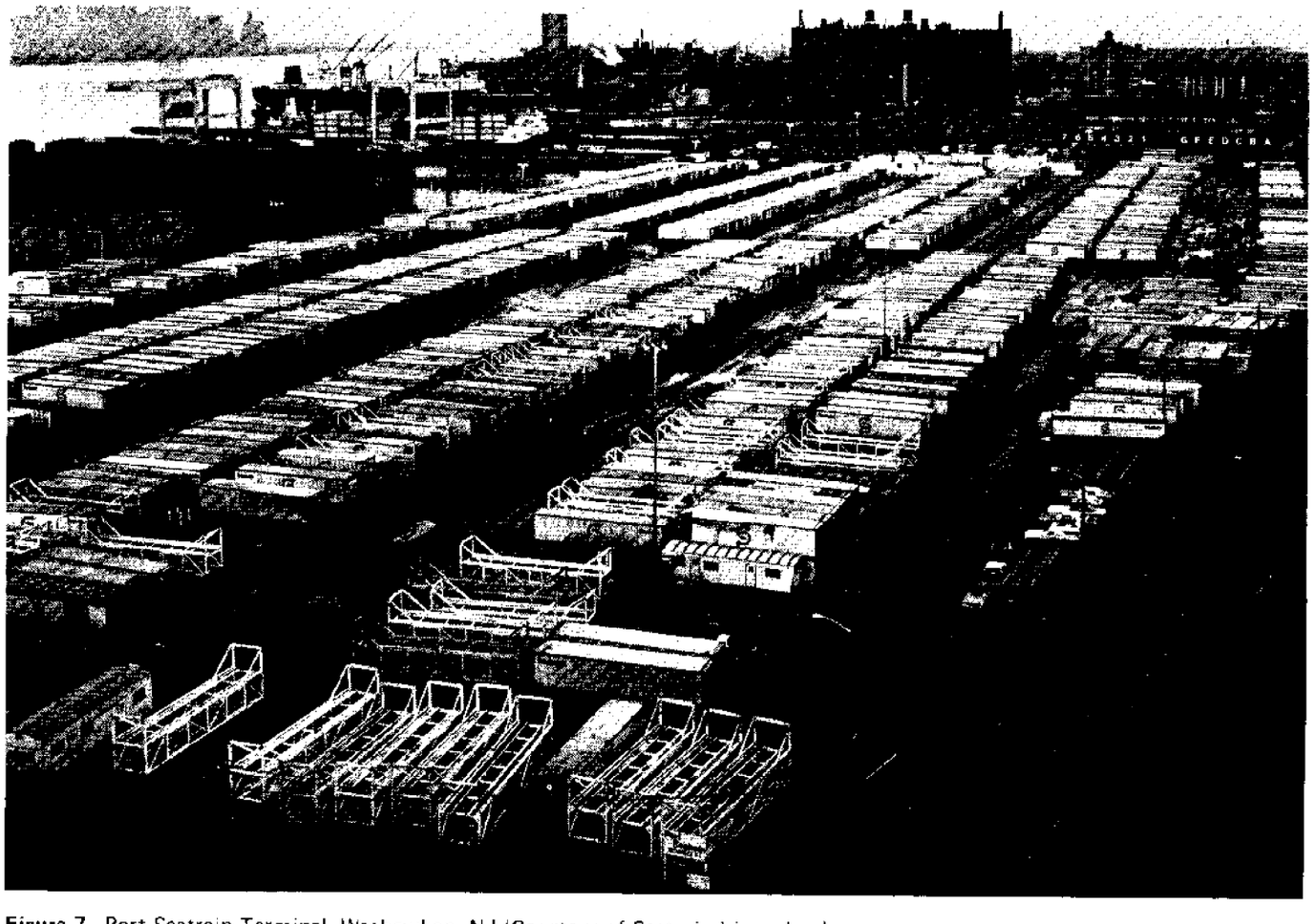
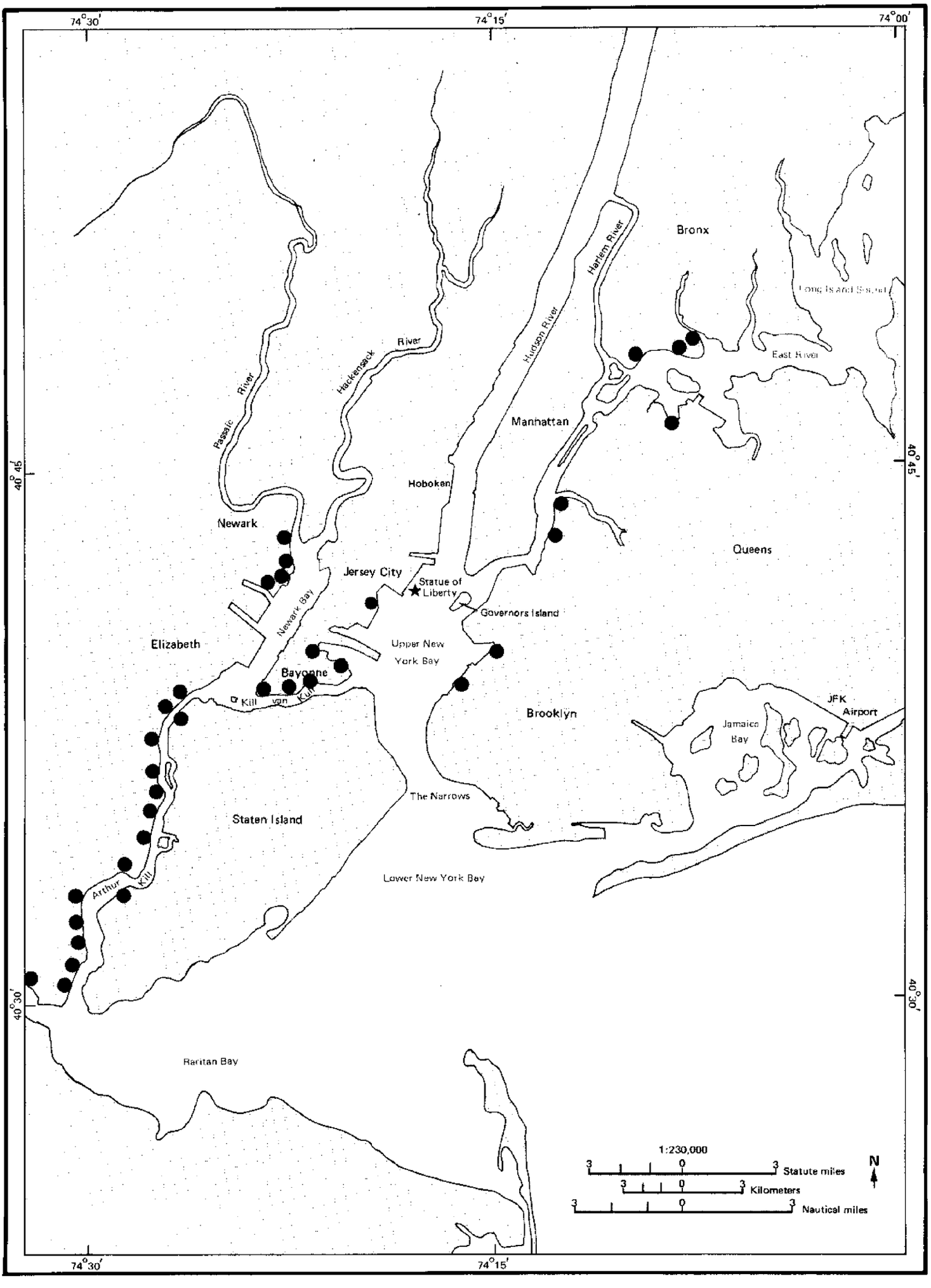


Figure 7. Port Seatrain Terminal, Weehawken, NJ (Courtesy of Seatrain Lines, Inc.)

Map 4. Petroleum terminals



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This marine facility handled more than 265,000 short tons of cargo during 1972. The marine and industrial complexes combined employed more than 2,200 people.

Bulk Cargo and Industrial Terminals. The port also handles considerable volumes of bulk cargoes, both dry and liquid, particularly petroleum. Facilities provided and operated by private industry usually function as an integral part of their production, processing, or distribution activities. The prime locations of such terminals are along the Kill van Kull and Arthur Kill, Raritan Bay, Newark Bay, and the East River.

The port's 34 major oil terminals are shown on Map 4.

Deepwater Oil Terminals

The 35 and 45 ft (10.7 and 13.7 m) channel entrances to the Port of New York cannot accommodate supertankers, whose loaded drafts range from about 65 to 100 ft (19.8 to 30.5 m). In the early 1970s the Corps of Engineers, Maritime Administration, and others undertook North Atlantic studies dealing with the feasibility of developing offshore oil terminals in naturally deep water. Prime sites in New York Bight were in Raritan Bay, 13 mi (20.9 km) off Long Branch, NJ, and inside and outside Delaware Bay.

Because of concern with possible oil spills, with excessive and uncontrollable shoreside supportive development, and with an uncertain national energy policy, no plans exist for offshore oil terminals in the Bight at this time. Such facilities are being actively planned in the Gulf of Mexico, however.

Now the scene has shifted to oil drilling on the outer continental shelf (OCS). This would impose on the Port of New York demands for service vessels and supply depots, but since the number, siting, and scheduling of these drilling locations in the Bight is still unclear, no port facilities are presently under active development.

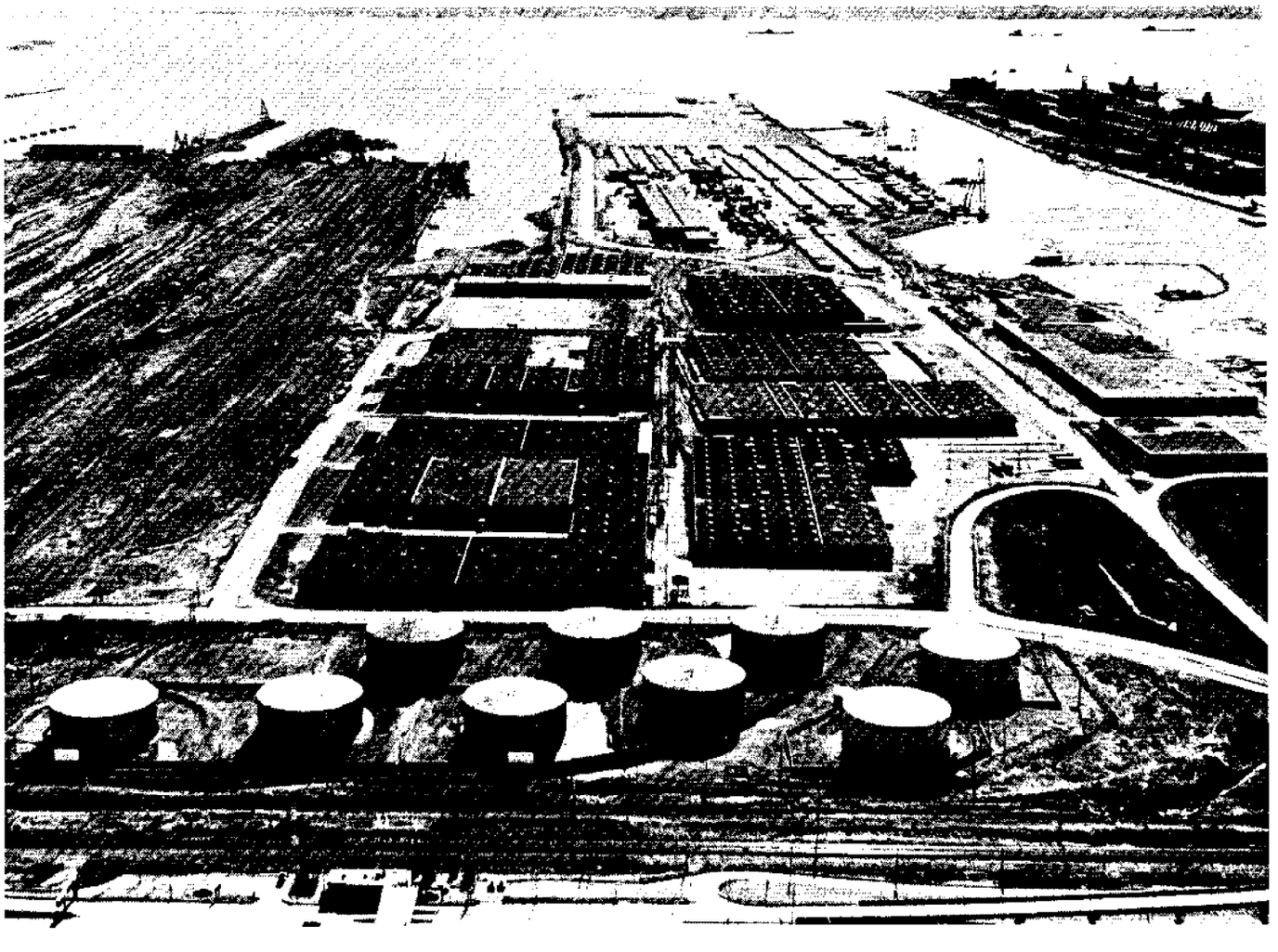


Figure 8. Port Jersey Industrial Marine Center, Jersey City and Bayonne (Courtesy of Port Jersey Corporation)

Federal Facilities

Federal agencies occupy a significant portion of the port's waterfront, and a number of installations involve activities related to the port and its shipping. Most of these are under the jurisdiction of the Department of Defense or the Department of Transportation, principally the Army, Navy, and Coast Guard (Map 5).

Army facilities include those of the Transportation Corps and the Corps of Engineers. The Transportation Corps, through the Military Traffic Management Command (MTMC), operates the Military Ocean Terminal, Bayonne (MOT Bayonne)—396 acres (160.4 hectares) located on a 2.5 mi (4 km) man-made peninsula jutting out into Upper New York Bay in Bayonne, NJ. Formerly known as the Military Traffic Management and Terminal Service, MTMC at Bayonne is jointly staffed with Army, Navy, and Air Force personnel who perform a variety of functions. These include arranging the movement of military troops and their dependents, all necessary military supplies, materials, and personal property. In 1975, the headquarters of the Military Traffic Management Command Eastern Area (MTMCEA) moved from its former Brooklyn facility to MOT Bayonne. The Brooklyn facility was closed insofar as military agencies were concerned when the headquarters of the Military Sealift Command Atlantic (MSCLANT) and its personnel also moved to MOT Bayonne early in 1976.

MTMCEA, a subordinate of MTMC, acts as traffic manager for 1,000 nearby military installations, activities, and Department of Defense contractors in the 34 states east of the Rocky Mountains. MTMCEA also supervises the activities of MOT units in Spain, Greece, Turkey, and the Azores. MSCLANT is responsible for procuring and moving Department of Defense cargo on its own vessels or on commercial ships. Each organization—MTMCEA, MOT Bayonne, and MSCLANT—remain separate and distinct at the Bayonne facility. Although their sharing of the installation was predicated on economy and the convenience of their proximity, each organization's mission stays the same, with the same complement of personnel. Approximately 2,600 military and federal civil service employees work at MOT Bayonne.

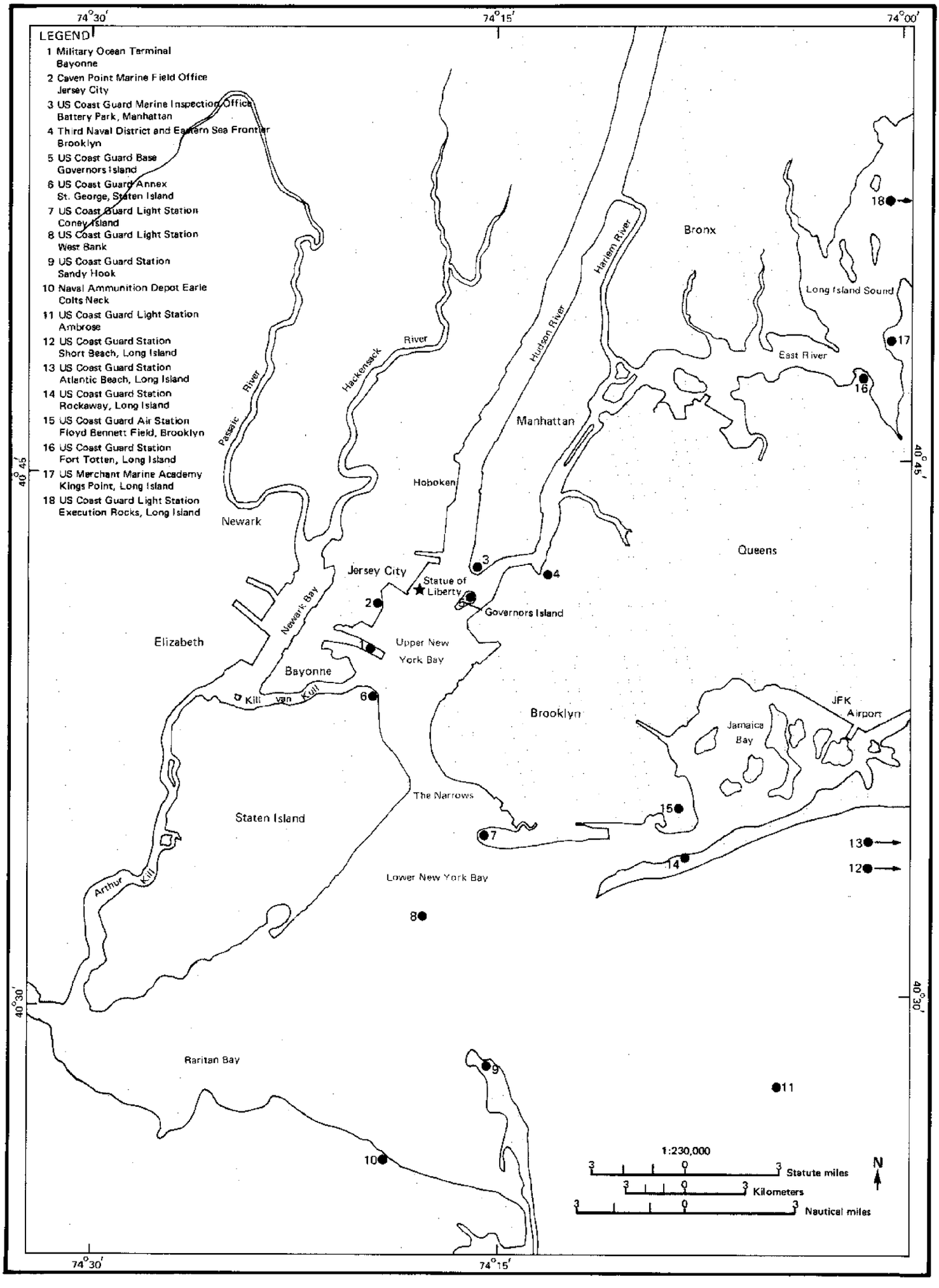
An important Corps of Engineers port facility is the Caven Point Marine Field Office at Caven Point in Jersey City, along the shores of Upper New York Bay near the Statue of Liberty. This 87 acre (35.2 hectare) installation, staffed by 75 civilians, is under the control of the New York District, Corps of Engineers, located in Manhattan. The Marine Field Office functions primarily as the Corps' operational base for its fleet of 12 vessels. The Caven Point facility also contains a 50-ton-a-day capacity incinerator for burning drift collected by the Corps under its drift removal activities in the New York–New Jersey Harbor.

A major Navy facility in the port is the headquarters site of the Third Naval District and Eastern Sea Frontier, located on an 11 acre (4.5 hectare) tract at Flushing and Washington avenues in Brooklyn, adjacent to the former New York Naval Shipyard. The Naval District is responsible for all naval activities in New York, Connecticut, and northern New Jersey; the Sea Frontier group's authority covers the Atlantic and Gulf coasts. Both commands are staffed by a total of 220 civilian and military personnel.

The Navy also maintains the Naval Ammunition Depot, Earle, in Colts Neck, NJ, on 11,425 acres (4,627 hectares) of land, 855 acres (346 hectares) of which front Raritan Bay. The facility includes a 2.9 mi (4.7 km) long pier complex extending into the bay, used for loading and unloading ammunition to and from Navy vessels and commercial ships. On 2 October 1974, EPA opened an oil and hazardous materials test tank at Earle. The 2 million gal (7.6 million l) test basin provides an environmentally safe place to develop and test devices and techniques for controlling oil or any floating materials on water. Earle is also the home base of the USS *Nitro*, an ammunition vessel manned by 300 uniformed personnel. The depot is staffed by approximately 1,190 military and civilian persons.

The major Department of Transportation waterfront tenant is the Coast Guard. Its principal base in the port is the 173 acre (70 hectare) Governors Island. Some 3,000 civilian and military personnel work at various organizational levels, including the Coast Guard Atlantic Area, Third Coast Guard District, Coast Guard Base New York, and the Captain of the Port of New York and Group New York. Six Coast Guard cutters and a variety of smaller craft are based on the island. Among the Coast Guard activities on the island are search and rescue, automated merchant vessel reporting (AMVER), port security, maintenance of navigational aids, ice reporting and breaking, environmental protection, merchant marine safety, ship boarding, small boat safety, and anchorage control.

Map 5. Federal waterfront facilities



Transverse Mercator Projection

The Coast Guard maintains search and rescue and water pollution investigative units at its Rockaway, Fort Totten, and Sandy Hook sections. These facilities are staffed by a total of 135 military personnel and occupy 75 acres (30.4 hectares). The Coast Guard's air branch is based at Floyd Bennett Field on Jamaica Bay on a 2 acre (0.8 hectare) site manned by 178 military personnel. The Coast Guard Marine Inspection Office, staffed by 81 military people, occupies 2 acres (0.8 hectares) along The Battery on lower Manhattan. Navigation aids are stored at a 6 acre (2.4 hectare) site at St. George, Staten Island. Ambrose Light Tower, situated in the Atlantic Ocean 7.4 mi (11.9 km) east of Sandy Hook and manned by nine military personnel, and the 1 acre (0.4 hectare) Coney Island Light Station, manned by a single civilian, facilitate vessel passage into and out of New York Harbor.

The Coast Guard maintains small installations in and around harbor approaches—such as at Atlantic Beach, Short Beach, West Bank, and Execution Rocks—as lifeboat stations and for navigation aids and miscellaneous purposes.

The Maritime Administration of the US Department of Commerce owns and operates the US Merchant Marine Academy on 70 acres (28.4 hectares) of land at Kings Point, Long Island, on the south shore of Long Island Sound. This educational institution trains about 1,000 midshipmen as Merchant Marine and Naval Reserve officers and is staffed by 384 civilians.

In addition to these facilities, federal agencies own and operate a number of shorefront bases in the port that are not directly involved in port and maritime activities. These include military unit headquarters, housing, training, and miscellaneous government functions.

The Harbor Shoreline

Blight and Drift

Like many of the nation's older urban ports, the Port of New York is seriously plagued with the remnants of obsolete and unused facilities and vessels along its shores and shoal waters (Figure 9). Aside from the dangers to watercraft from deteriorating piers, piling, bulkheading, and rotting sunken hulks, which regularly and often unnoticed release drift into navigable waters, their existence destroys the aesthetics and prevents the full use of the shore area. The Corps of Engineers regularly collects and disposes of such material from harbor waters. This does not cure the problem; it merely copes with it.

As a result of widespread support by port, maritime, civic, and government interests in the Port District, in 1963 Congress directed the Corps of Engineers to study the feasibility of effectively combating the growing harbor drift and debris problem by clearing away the shoreline rubble and sunken hulks that generate it. The initial study, the New York Harbor Collection and Removal of Drift Project, was completed in 1968 and made the subject of public meetings begun in 1969; the findings and conclusions received virtually unanimous and enthusiastic endorsement by those who attended and by the press. In 1971, the Corps produced a final revision of the report, recommending the removal or repair of 1,972 derelict timber and steel vessels, and 330 dilapidated piers, wharfs, and miscellaneous structures, amounting to an estimated 29 million ft^3 of potential timber drift and debris. A Corps resurvey in 1975 modified this to 2,230 vessels, 100 shore structures, and 23.6 million ft^3 (Public Notice No. 8215, 17 August 1975).

Extensive cleanup of deteriorated shore structures is urgently needed, particularly along the New Jersey and New York shores of the Arthur Kill and Kill van Kull, the New Jersey and Staten Island shores of Upper New York Bay, and the New Jersey shore of the lower Hudson River (Figures 10 and 11). Map 6 identifies the primary locations of abandoned vessels requiring removal.

Total project cost at 1974 prices was estimated at $60,527,000, of which the federal government would pay $28,713,000 and nonfederal interests, $14,356,000. Owners of restorable structures would be required to undertake repairs estimated at another $17,458,000. Among the conditions of local cooperation would be a requirement of local govern-

Figure 9. Ship graveyard, Rossville, Staten Island (Courtesy of Port Authority of New York and New Jersey)

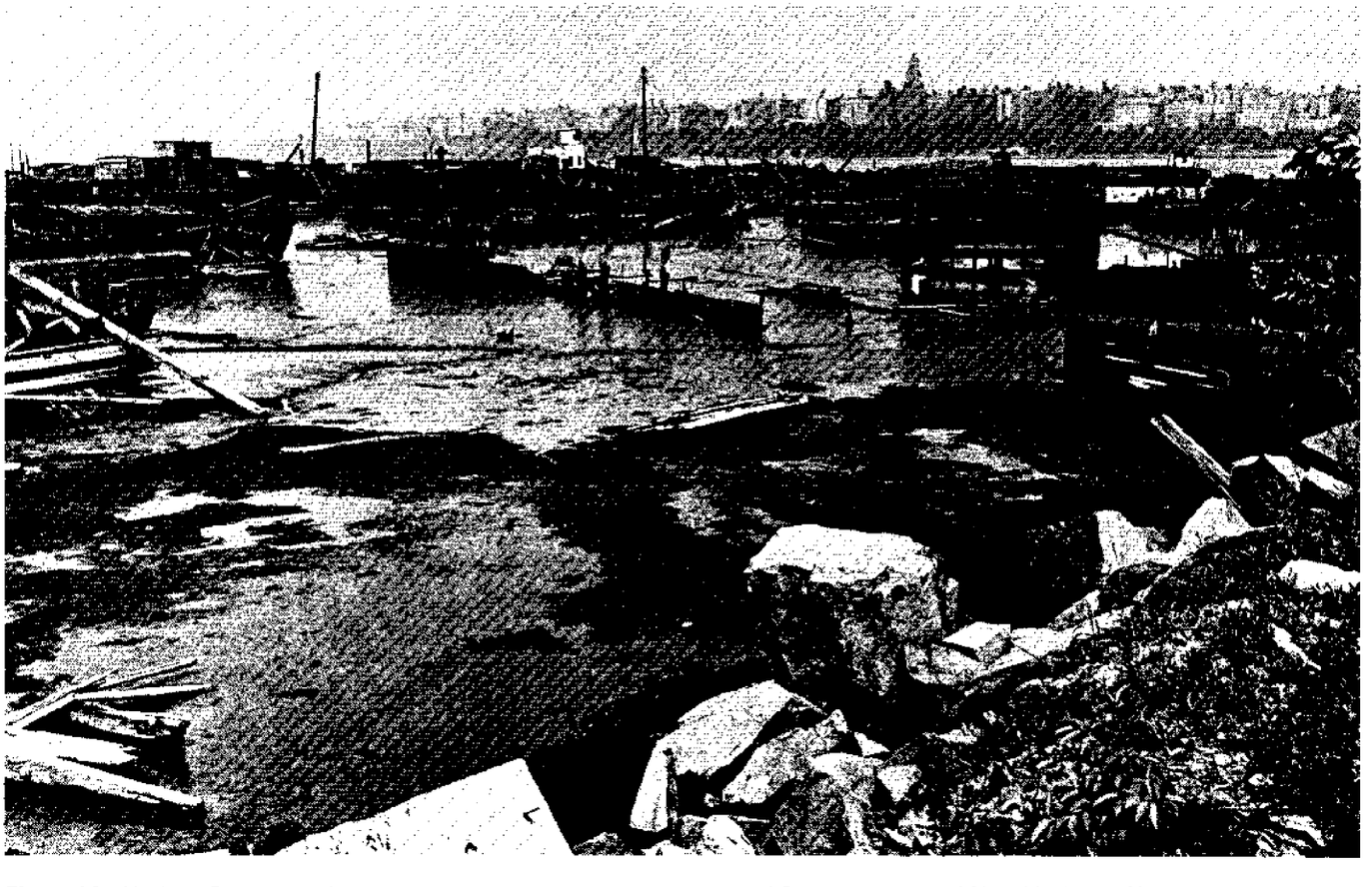
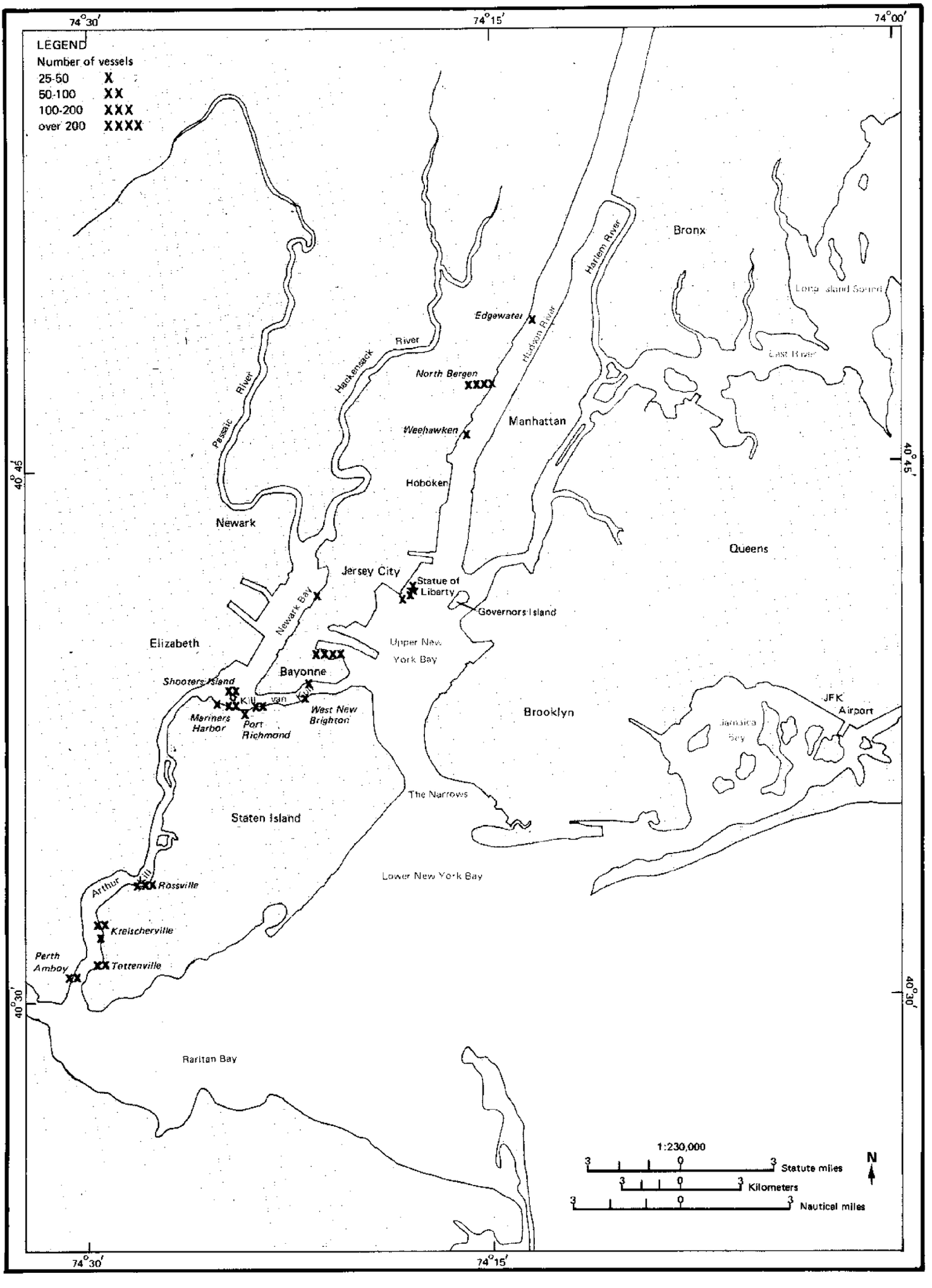


Figure 10. Hudson River waterfront decay, North Bergen, NJ (Courtesy of Port Authority of New York and New Jersey)

Map 6. Major concentrations of derelict vessels



Transverse Mercator Projection

ment to "enact and enforce local legislation during and after completion of work in political and physical subdivisions of the improvement area to prevent creation of sources of drift and debris" (Public Notice No. 8215, 17 August 1975).

According to the Corps, the benefits of the project are more than six times its costs. The major benefits would be the release of valuable waterfront land for productive purposes, restoration of waterfront aesthetics, less damage by drift to harbor and recreational vessels, reduced shoreline fire and rodent hazards, and reduced future costs in federal drift collection. It is anticipated that the entire project would take about eight years to complete.

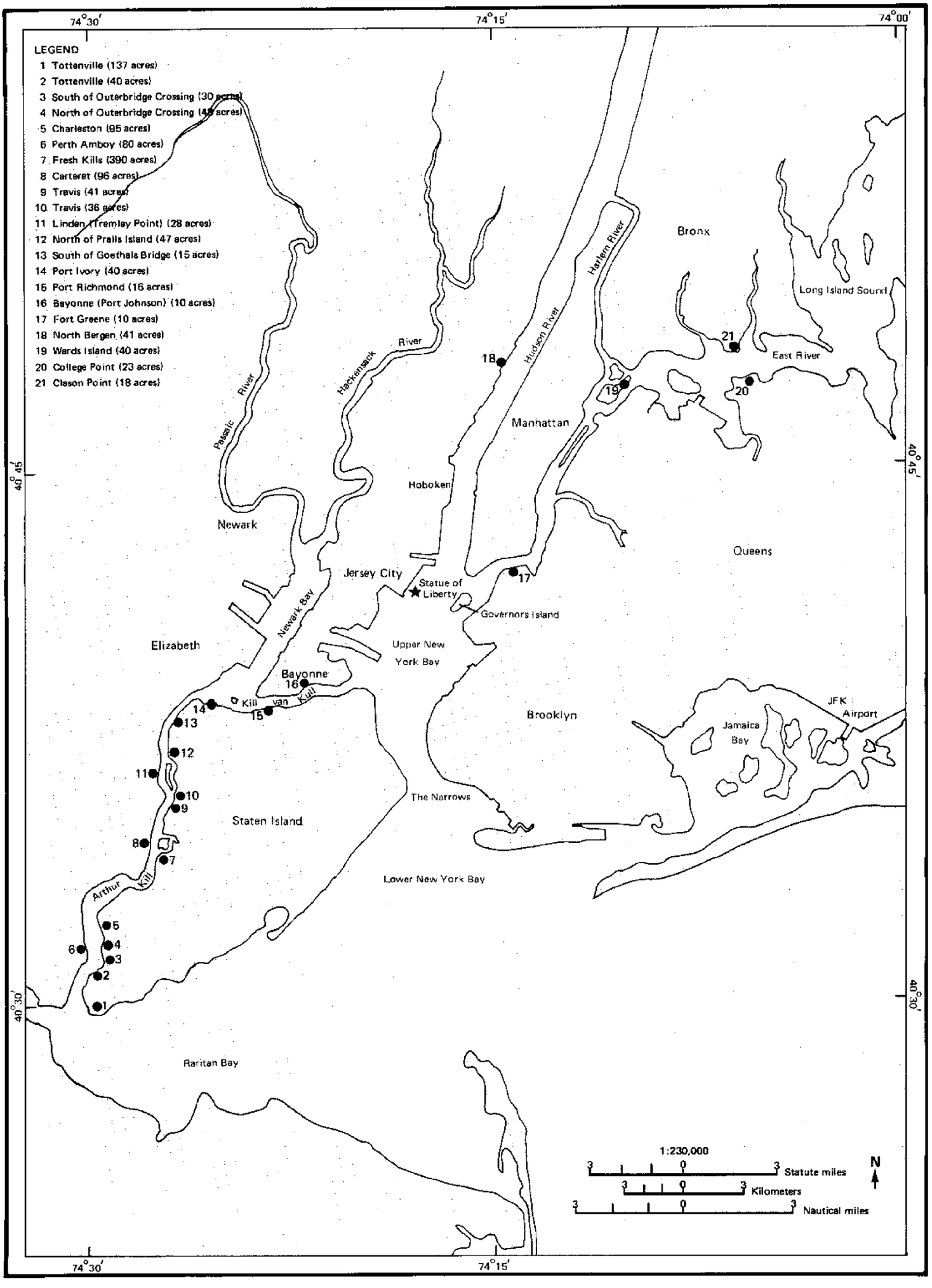
The Drift Project Report became an authorized Corps work project when the 1974 Water Resources Development Act was signed into law by President Nixon on 1 March 1974. The act also authorized the expenditure of $14 million in federal funds on the program. Present goals are to get the clearance work started in 1976 in conjunction with the development of Liberty State Park in Jersey City on the shores of Upper New York Bay behind Liberty and Ellis islands.

Available Land

Despite blighted land tracts and extensive development, the port still offers a surprising amount of undeveloped land along its bays and rivers. Most such parcels are relatively small, but a few large tracts do exist. Based on surveys undertaken in 1971, 1973, and 1974, the port has some 1,100 acres of land suitable for medium- to large-scale development oriented toward deepwater port activities. These acres were selected for their proximity to waterways at least 35 ft (10.7 m) deep (MLW), frontage of 300 ft (91.5 m) or more, and sizes of 10 acres (4.5 hectares) or more. In all, this land is composed of 19 separate or adjacent tracts up to 390 acres (158 hectares) in

Figure 11. Shoreline debris off Jersey City near Statue of Liberty (Courtesy of Port Authority of New York and New Jersey)

Map 7. Undeveloped land adjacent to deep water



Transverse Mercator Projection

Jersey and Staten Island shores (Map 7) of the Arthur Kill (Port Authority of New York and New Jersey 1975*b*).

Development Controls

Various federal, state, and local laws govern the development of facilities along the waterfront of the port. Several are especially significant.

A key federal law is the River and Harbor Act of 1899, empowering the Corps of Engineers to control shoreline construction protruding into navigable waters by issuing permits and to establish offshore boundaries, called "harbor lines," that delineate the limits of such construction. The issuance of permits must be consistent with the public interest, defined therein as "consistency with State plans and interests, effect on navigation, fish and wildlife, water quality, economics, conservation, aesthetics, recreation, water supply, flood damage prevention, impact on ecosystems, and, in general, the needs and welfare of the people." Through the Coastal Zone Management Act of 1972 the US Secretary of Commerce can award federal grants to assist states in developing and administering land and water use management programs for the coastal zone, giving full consideration to ecological, cultural, historic, and aesthetic values, as well as to the need for economic growth. Under this law, applicants for Corps permits must also obtain state certification for a construction project, though the Secretary of Commerce has the power to overrule any state objections under certain conditions, such as being inconsistent with the national interest.

In New York and New Jersey, the lands under navigable waters are held in public trust; thus their development requires state approval. For example, the riparian laws of New Jersey give the state title to lands now or formerly washed by tides and located below the natural mean high water line along the shore. Only the New Jersey Department of Environmental Protection (DEP) can sell or lease such lands and issue permits controlling any construction or physical change on them.

The states also regulate the development of their wetlands. In New York State, the 1973 Tidal Wetlands Law authorized the Department of Environmental Conservation (DEC) to inventory and map all tidal wetlands in the state. Upon completion of the inventory—mapping is now finished—the commissioner of environmental conservation is authorized to enter into cooperative agreements with local governments for the preservation of wetlands and is required to adopt land use regulations governing their use. The regulations will establish a permit system for designated activities within the inventoried wetlands.

Pending an effective date for the land use regulations, a moratorium has been established on any alteration to any tidal wetlands and on all land 300 ft (91.5 m) landward of the high water mark to 3 mi (4.8 km) seaward. The moratorium authorizes DEC to issue permits in cases of hardship for alterations to, or new construction in, tidal wetlands and adjacent areas. By mid-summer 1976, DEC held public hearings throughout the state on wetland land use regulations, inventory, and maps. After the hearings, final regulations and maps will be filed with counties and the state and the moratorium will be lifted.

In New Jersey, wetlands development is controlled by the 1971 Wetlands Act and the 1972 Flood Plains Act. These laws are administered by DEP, which issues construction permits in riparian lands and wetlands. The Wetlands Act requires that DEP set regulations controlling further dredging, filling, or otherwise altering natural features of New Jersey areas under the legal designation of wetlands, including state-owned riparian lands. DEP completed its mapping of wetlands in 1974; the regulations put forth in the Wetlands Act have a tremendous impact on future use of the designated wetlands.

The Flood Plains Act authorizes DEP to share in the regulation of development in New Jersey's flood-prone areas. The law provides that after such areas have been delineated, the state will publish controls applicable to those areas most likely to be flooded. Local authorities will be required to adopt protective ordinances in accordance with the state's guidelines for the remaining delineated areas. If local authorities fail to pass the ordinances, the state can assume the primary responsibility for these areas.

On 20 June 1973 the New Jersey Legislature passed the Coastal Area Facility Review Act giving DEP review power over all building in the coastal area designated by this law. This area extends south from Raritan Bay along New Jersey's shore, around Cape May to Delaware Bay, and up the Delaware River, a shoreline distance of 273 mi (439.3 km), ending just south of the Delaware Memorial Bridge in Salem County. Under the law, any individual, corporation, municipality, or developer of a major facility in this coastal area will have to obtain a permit from DEP for any of the 153 types of development project categories within the jurisdiction of this law. Such project applications must be accompanied by an environmental impact statement as defined in the

law. Although DEP has the power and responsibility to pass upon permit applications, the law also creates a Coastal Area Review Board to hear and act upon any appeal from a departmental decision.

Within the Port District in general, the role of local municipalities to determine and regulate their waterfront land use is based on the well-established home rule concept. Notwithstanding specific state-level controls exercised via the Riparian Rights Law, environmental laws, permits, and programs, under the home rule concept waterfront planning is left to local government units or their delegated planning agency or board. In New York State some state-level controls over specific waterfront activities have been delegated to cities with populations of 175,000 or more. This delegation does not exist in New Jersey.

Traditionally, zoning ordinances have been a very effective regulatory tool available to municipalities. Under the zoning resolutions adopted to control land use patterns, municipalities can determine present and future development of shorelines under their jurisdictions.

Shipboard Pollution Control

Since ancient times, ocean vessels have disposed of accumulated shipboard wastes by merely dumping them over the side. This was inexpensive, fast, efficient, required no special equipment, and imposed no operational constraints. In today's growing environmental awareness, however, concern for improving water quality is taking precedent over the loose vessel housekeeping practices of the past. Now the desire is to minimize or eliminate all vessel waste discharge into inland waters and the open sea.

Oily Wastes

Unfortunately, aboard vessels, oil and water sometimes do mix. This may occur when machinery lubricants or fuel oils drip into bilges, when fuel oil or cargo tanks are washed or deballasted, or when oily areas are scrubbed down. The oil and water mixture is commonly referred to as *oily waste*. All power-driven vessels eventually generate enough oily waste to require disposal.

Both the Water Quality Improvement Act of 1970 and the Federal Water Pollution Control Act of 1972 prohibit ships from discharging "harmful quantities" of oil into US navigable waters, upon adjoining shorelines, or upon contiguous zone waters (within 12 mi or 19.3 km of the United States). EPA has defined "harmful quantity" as the amount of oil violating applicable water quality standards or depositing a film, sheen, discoloration, sludge, or emulsion on the water or adjoining shoreline. It is generally accepted that a sheen can form with only 15 parts per million of oil.

In 1972 the Maritime Administration awarded a study contract to the Frederic R. Harris, Inc. consulting firm to estimate the volume of oily waste generated by vessel traffic in selected US ports, and the profitability of oily waste collection and separation facilities as a private business enterprise. The Port of New York was among the 11 ports in the study. The five-volume report (Harris 1973) dealt primarily with oily wastes generated by ocean-going vessels and barges and included techniques for estimating oily waste volumes. The Maritime Administration later suggested that these techniques be used as guidelines by any port or firm interested in developing an oily waste facility.

The Harris report predicted that an average daily oily waste volume of 3,973,000 gal (15,037,805 l) and 4,183,000 gal (15,832,655 l) would be generated in the Port of New York in 1975 and in 1980, respectively, under "no discharge" criteria. Harris concluded that these estimated volumes would exceed the processing capacity of the oily waste facilities currently located within the harbor but that expansion would probably occur to meet present and future demands.

On 13 June 1974 the Maritime Administration called upon private industry and port authorities throughout the nation to participate in meeting the potential need for shore facilities in port areas to receive, treat, and dispose of shipboard oily waste. This followed a 1973 Intergovernmental Maritime Consultative Organization (IMCO) conference on marine pollution through which the countries of the world were already drawing nearer to ratification of more stringent international agreements that would prohibit or greatly reduce oily waste discharge from

ships and would call for port facilities for receiving ship-generated oily wastes.

In response to this request, the Port Authority of New York and New Jersey studied the adequacy of existing oily waste facilities in the Port of New York. Study findings (1974*b*) concluded that at least seven facilities then existed in the port; the total annual oily waste processing capacity was nearly 5 million gal (19 million l). Contemplated expansion by these facilities would increase oily waste processing capacity to a total of 7 million gal (27 million l) annually.

Oily wastes in the port are collected by barge, tank truck, or shoreside pipeline. Vessels, such as tugs and towboats, barges, and other harbor craft, which do not normally operate in waters beyond the contiguous zone, have the greatest need for port oily waste collection and processing facilities. Many transoceanic shipping companies, however, appear to have plans to develop their own proprietary ship-terminal oily waste handling systems, specifically adapted to their own needs. For other ships, controlled offshore discharge of oily wastes is still permitted by law.

Sewage

Human waste is the primary constituent of shipboard sewage; laundry, galley, or other sanitary wastes are excluded here. Traditionally, ships have always pumped raw, untreated sewage overboard when and where generated. Because sewage discharge to a waterway can have detrimental effects on the marine environment, marine sanitation devices (MSDs) were developed to retain accumulated sewage aboard a vessel and discharge it at an acceptable location or to treat the sewage and discharge it to a waterway in a condition that meets environmental standards.

The Federal Water Pollution Control Act of 1972 authorizes EPA to promulgate performance standards for MSDs and authorizes the Coast Guard to certify the safety and construction standards of such devices and to enforce these regulations in US navigable waters. State and local marine sewage regulations are superseded by federal law, but provision is made for implementation of more stringent state and local standards when they can be justified.

EPA recently changed its policy from no discharge to controlled discharge. Sewage or effluent discharges are still totally prohibited in certain freshwater impoundments and rivers but permitted in all other waters. MSDs must be installed aboard new vessels (under construction on or after 30 January 1975) by 30 January 1977 and aboard existing vessels equipped with toilet facilities by 30 January 1980. Existing vessels equipped with Coast Guard-certified MSDs on or before 29 January 1976 will not be required to comply with the 1980 improved effluent quality aspects of the regulations for the operable life of the device. Installation of discharge-type MSDs is authorized, but effluents must contain neither a fecal coliform bacteria count over 1,000/ml nor visible floating solids. For MSD installations after 30 January 1980, effluent quality for the discharge type must be improved so that the fecal coliform bacteria count is not greater than 2/ml nor suspended solids greater than 150 mg/l. To ease the economic burden on vessel opeators, several exceptions to these regulations are permitted for Coast Guard-certified MSDs installed before compliance time.

Under the 1973 IMCO-proposed regulations, untreated sewage could be discharged as close as 12 mi (19.3 km) offshore under conditions yet to be fully determined and within 4 mi (6.4 km) if the sewage is pulverized and disinfected. These proposals, which require ratification by 15 nations that control at least half the world's merchant ship tonnage, apply to new vessels under contract at the time of ratification and within 10 years of ratification for existing vessels.

Thus, in the Port of New York, any vessel with a certified MSD can discharge sewage effluent into harbor waters. Vessels utilizing no-discharge type devices will require adequate on-board retention capacities and suitable port discharge facilities or continued permission to discharge on the high seas. Vessels with short stays in port, such as containerships and tankers, do not need large retention capacities. Vessels confined to harbor waters, such as tugs, barges, and ferries, need retention systems that may pose shipboard space problems and are likely to require shoreside facilities. Ocean-going passenger vessels, which face both space limitations and high in-port sewage generation, may encounter difficulties with retention systems unless shoreside facilities exist. Approved discharge systems not only present fewer space problems but also eliminate the need for shoreside collection facilities.

In the Port of New York, the companies that provide tank cleaning and oily waste disposal services usually also take care of shipboard sewage disposal from retention systems. Thus, the port should not need widespread, additional, specially developed facilities for processing marine sewage.

Summary

The Port of New York—often referred to as the Port of New York and New Jersey or the bistate Port of New York, since it is actually comprised of municipalities in both states—is geographically situated in the 1,500 mi² (3,900 km²) Port District within a 25 mi (40 km) radius of the Statue of Liberty. The port is linked to the Atlantic Ocean via Long Island Sound, Raritan Bay, and Lower New York Bay, and is served by a network of federal waterways and anchorages. A wide array of waterborne commerce, heavily dominated by petroleum, is moved on these waterways, aboard all kinds of tankers, freighters, and containerships. Shallow channels serve mainly intraharbor and regional tugboats and barges. Outside the Port District, small harbors and waterways along the New Jersey and Long Island coasts serve fishing, recreational boating, and barging interests.

Navigational safety in the port is in the hands of several agencies. The Sandy Hook Pilots Benevolent Association and other pilot groups furnish vessel pilotage in and out of the harbor; docking pilots, assisted by tugboats, handle actual docking and undocking maneuvers. The US Coast Guard cares for the various navigation aids marking the federal waterways, enforces the navigation laws, and provides harbor security and safety. The Coast Guard has plans for establishing on Governors Island in 1978 a New York Harbor Vessel Traffic Service, using radiotelephone communications, radar and television surveillance, and vessel traffic tracking to guide vessels more safely through the harbor. Fire and police protection belong to Port District municipalities. To keep the federal waterways clear for safe and efficient use at prescribed depths and widths, the Corps of Engineers does maintenance dredging.

Marine terminal development for ocean shipping in the port is both public and private. Two public agencies, the Port Authority of New York and New Jersey and the City of New York Department of Ports and Terminals, provide general cargo facilities, including those for containerships. Private industry concentrates on industrial and bulk cargo facilities, particularly those for petroleum. Studies have been conducted on developing deepwater petroleum terminals to accommodate the crude oil supertankers that cannot enter the harbor due to waterway depth limits, but no such facilities are as yet being built because of public concern for oil pollution and uncontrolled shoreline industrial development.

Though the port has among the finest marine terminals in the world, technological change and geographical shifts have left deteriorating shore structures and sunken hulks, which can become navigation hazards. In 1974 the federal government, with local participation, authorized a program for removing waterfront blight; the program began in 1976.

As in other US ports, control of ship pollutant discharge into harbor waters—like oily wastes and sewage—is basically subject to federal law, which allows controlled discharge on the high seas but applies more stringent regulations to harbor waters. The port does have adequate privately owned facilities for receiving and disposing of such pollutants where discharge is not allowed or where it is undesirable.

The Port of New York's long service to the New York Bight region has given rise to many ills that plague the urban estuary. This deep, well-sheltered harbor at the mouth of the Hudson has since the 1600s attracted ships and people from the world over. The growth of the city and of the region has rested upon the growth of the port. Development into an urban estuary has brought its now-familiar train of problems—pollution, congested shorelands, aesthetic disfigurement, and waterfront sprawl. But these problems are being faced in the ever-evolving life of the port, still the nation's major hub of trade, its busiest ocean trafficway.

References

City of New York. 1973. *Cityport day, December 18, 1973.* New York, NY.

Gross, M.G. In press. Waste disposal. *MESA New York Bight Atlas Monograph 26.* Albany: New York Sea Grant Institute.

Harris, F.R., Inc. 1973. *Port collection and separation facilities for oily wastes.* 5 vols. For Maritime Admin., US Dep. Comm.

Maritime Association of the Port of New York, Inc. 1973. *Statistical review of the number of ships calling at the eleven major ports of the US during calendar year 1972.* New York, NY.

National Technical Information Service, US Department of Commerce. 1973. *Ocean dumping in the New York Bight: an assessment of environmental studies.* Springfield, VA: NOAA.

Port Authority of New York and New Jersey. 1973. *Undeveloped land adjacent to deep water in the Port of New York.* Revised. New York, NY.

———. 1974*a*. *Marine Terminal fact sheets.* New York, NY.

———. 1974*b*. *Oily waste handling facilities in the Port of New York: an assessment of demand vs. existing and planned capacity.* New York, NY.

———. 1975*a*. *Foreign trade 1974, the Port of New York and New Jersey.* New York, NY.

———. 1975*b*. *Undeveloped land adjacent to deep water in the Port of New York.* Revised. New York, NY.

———. 1975*c*. *Via Port of New York,* pp. 10, 18. New York, NY.

Port Resources Information Committee, Inc. 1973. *New York port handbook 1973.* New York, NY.

Third Coast Guard District. 1975. *New York Harbor vessel traffic system specific operational requirements.* Revision B, undated, as modified by letter dated 21 Feb. 1975. New York, NY.

US Army Corps of Engineers. 1963. *Waterborne commerce of the United States, calendar year 1963,* pt. 1, *Waterways and harbors, Atlantic coast.* Vicksburg, MS: Eng. Div., Lower Mississippi Valley.

———. 1966. *The Port of New York.* New York and New Jersey Port Series no. 5 (rev. 1965), vol. 7, pt. 2. Washington, DC: Govt. Print. Off.

———. 1971. *New York Harbor collection and removal of drift, survey report on review of project.* New York: New York District.

———. 1972*a*. *Project maps—rivers and harbors.* New York: New York District.

———. 1972*b*. *A proposed interior disposal area for dredged materials and incineration residue in Lower New York Bay.* New York: New York District.

———. 1972*c*. *Survey study.* New York: New York District.

———. 1972*d*. *Waterborne commerce of the United States, calendar year 1972,* pt. 1, *Waterways and harbors, Atlantic Coast.* Vicksburg, MS: Eng. Div., Lower Mississippi Valley.

———. 1973. *Notice of report of navigation survey of New York and New Jersey channels.* New York: North Atlantic Div.

US Army Office of Chief of Engineers. 1972. *Digest of water resources policies and activities.* Washington, DC.

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17 **Aquaculture** Orville W. Terry, Marine Sciences Research Center, SUNY

18 **Artificial Fishing Reefs** Albert C. Jensen, NYS Dept. of Environmental Conservation

19 **Recreation** E. Glenn Carls, University of Waterloo, Ontario

20 **Port Facilities and Commerce** Alfred Hammon, The Port Authority of New York and New Jersey

21 **Sand and Gravel** John S. Schlee, US Geological Survey, with a section by Peter T. Sanko, NY Sea Grant Advisory Service

22 **Jurisdictional Zones and Governmental Responsibilities** Paul Marr, SUNY at Albany

23 **Demographic Patterns** Charles Koebel and Donald Krueckeberg, Rutgers University

24 **Transportation** Richard K. Brail and James W. Hughes, Rutgers University

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26 **Waste Disposal** M. Grant Gross, Chesapeake Bay Institute, Johns Hopkins University

27 **Water Quality** Donald J. O'Connor, Robert V. Thomann, and John P. St. John, Hydroscience, Inc.

28 **Air Quality** Volker A. Mohnen, Atmospheric Sciences Research Center, SUNY

29 **The Lower Bay Complex** Iver Duedall, Harold O'Connors, and Robert Wilson, Marine Sciences Research Center, SUNY

30 **Industrial Wastes** James A. Mueller and Andrew R. Anderson, Manhattan College

31 **Marine and Coastal Birds** Marshall A. Howe, Roger B. Clapp, and John S. Weske, US Fish and Wildlife Service

32 **Environmental Health** Joseph M. O'Connor, Chun Chi Lee, and Merril Eisenbud, Institute of Environmental Medicine, NYU Medical Center

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