Under the appropriation of March 3, 1879, of $15,000, it is proposed to continue the extension of the work in a northwesterly direction.

This work is in the collection-district of Vermont.
Burlington is a port of entry.
Nearest light-house, Juniper Island. Beacon-lights are also maintained on either end of the breakwater in this harbor.
Fort Montgomery is the nearest fort.
Amount of revenue collected at this port during the fiscal year, $105,093.89.

ORIGINAL ESTIMATE.

For 2,000 linear feet of breakwater extension in a northwesterly direction, as recommended in my report for the year ending June 30, 1874	$340,000 00

AMOUNTS APPROPRIATED.

By act of Congress approved March 3, 1875		$25,000 00
By act of Congress approved August 14, 1876		20,000 00
By act of Congress approved June 18, 1878		20,000 00
By act of Congress approved March 3, 1879		15,000 00
		80,000 00
Amount expended		54,873 59

Money statement.

July 1, 1878, amount available	$22,759 65	
Amount appropriated by act approved March 3, 1879	15,000 00	
		$37,759 65
July 1, 1879, amount expended during fiscal year	12,633 24	
July 1, 1879, outstanding liabilities	1,900 00	
		14,533 24
July 1, 1879, amount available		23,226 41
Amount (estimated) required for completion of existing project		260,000 00
Amount that can be profitably expended in fiscal year ending June 30, 1881		30,000 00

Abstract of bids for extension of breakwater at Burlington, Vt., opened August 15, 1878.

Bidders.	Crib.	Superstructure.
	Per foot.	*Per foot.*
Luther Whitney	$90 00	$18 00
John J. Bigelow and Alvaro Adsit	120 20	36 63

Abstract of contract for extension of breakwater at Burlington, Vt.

Contractor.	Residence.	Date of contract.	Subject of contract.	Remarks.
Luther Whitney	Chesterfield, Essex County, New York.	Aug. 23, 1878.	Extension of breakwater.	To be completed by December 30, 1879.

D 14.

IMPROVEMENT OF SWANTON HARBOR, VERMONT.

Under the appropriations of August 14, 1876, and June 18, 1878, contract was made with Luther Whitney for the construction of two cribs, with superstructure of 189 feet in length, to repair the damage done to the breakwater by ice-floes in March, 1878. The progress of the work

was very much retarded by the severe winter weather, and according to the terms of the contract should have been completed by the 20th February, 1879, but the contractor being unable to do so, an extension, approved by the Chief of Engineers, was given until July 20, 1879.

With the appropriation of March 31, 1879, of $6,000, it is proposed to complete the repairs to the breakwater.

The amount asked for the year ending June 30, 1881, will be applied to the extension of the breakwater in a northwesterly direction.

Swanton Harbor is in the collection-district of Vermont.
Nearest port of entry, Alburg, Vt. Fort Montgomery is the nearest fort. Nearest light-house, Windmill Point.
The amount of commerce to be benefited by this improvement, ——.

ORIGINAL ESTIMATE.

1,900 linear feet of breakwater	$240,000 00

AMOUNTS APPROPRIATED.

By act of Congress approved March 3, 1873		$15,000 00
By act of Congress approved June 23, 1874		8,000 00
By act of Congress approved March 3, 1875		10,000 00
By act of Congress approved August 14, 1876		2,000 00
By act of Congress approved June 18, 1878		20,000 00
By act of Congress approved March 3, 1879		6,000 00
		61,000 00
Amount expended		40,420 64

Money statement.

July 1, 1878, amount available	$22,600 50	
Amount appropriated by act approved March 3, 1879	6,000 00	
		$28,600 50
July 1, 1879, amount expended during fiscal year	8,021 14	
July 1, 1879, outstanding liabilities	14,364 00	
		22,385 14
July 1, 1879, amount available		6,215 36
Amount (estimated) required for completion of existing project		179,000 00
Amount that can be profitably expended in fiscal year ending June 30, 1881		5,000 00

Abstract of bids for repair of breakwater at Swanton Harbor, Vermont, opened November 18, 1878.

Name.	Price per foot.
John Brady	$1,147 00
Luther Whitney	78 90

Abstract of contract for repair of breakwater at Swanton Harbor, Vermont.

Contractor.	Residence.	Date of contract.	Subject of contract.	Remarks.
Luther Whitney	Chesterfield, Essex County, New York.	Dec. 6, 1878	Repairing break-water at Swanton, Vermont.	To be completed February 20, 1879; extension granted to July 20, 1879.

D 15.

IMPROVEMENT OF OTTER CREEK, VERMONT.

By act of Congress approved June 18, 1878, $8,000 was appropriated for this work. After a careful examination of the creek by a series of soundings, extending from Vergennes Basin to Fort Cassin, its outlet, improvements were made at the following places:

The shoals in the vicinity of the Steamboat Landing have been removed, and the navigation from this point extending along either side of the basin as far up as the southern end of the upper Coal Dock greatly improved.

From this dock to and along the west side a cut has been dredged of sufficient capacity to enable vessels with their cargoes to reach the wharves at the foot of the falls.

From the center of this cut a cluster of some 30 piles, serving as a foundation to a former railroad-bridge pier, was removed.

At Bull Brook and Smith's Bends, the channel was both widened and deepened, and the channel at Sharkey's, Brick Yard, Gage's, Poor-House, Dead Creek, and Crittenden Bends widened and straightened. These improvements have necessitated the removal of 15,667 cubic yards of silt, sand, stone, clay, and trees. Some 432 leaning trees growing upon either bank of the creek, whose roots had been undermined by erosion and were in danger of falling over into the stream and thus obstructing navigation, have been removed.

Under the appropriation of March 3, 1879, of $5,000, it is proposed to continue operations on the improvement of the channel and basin.

The amount asked for the year ending June 30, 1881, will be applied to the further improvement of the channel and basin.

Vergennes, Vt., is in the collection-district of Vermont.

Nearest port of entry, Burlington, Vt.; nearest light-house, Split Rock. Fort Montgomery, Rouse's Point, the nearest fort.

The amount of revenue collected at Burlington, the nearest port of entry for the last fiscal year, $105,093.89.

Amount of commerce and navigation to be benefited by these improvements, ——.

The following statistics relating to the commerce of Otter Creek was supplied by the mayor of Vergennes:

The following is a low estimate of the commerce of Otter Creek during the year ending June 30, 1879: 3,000 tons of coal, 1,500 tons of kaolin, 4,000,000 feet of timber, 100,000 brick, 4,000 bushels of potatoes, 500 tons of merchandise.

During the season of navigation two steamers for freight and passengers have run between Vergennes and Westport, N. Y., and other ports on Lake Champlain.

ORIGINAL ESTIMATE.

Dredging dikes and fascine work	$57,646 00
Removing trees	500 00
	58,146 00

AMOUNTS APPROPRIATED.

By act of Congress approved June 10, 1872	$10,000 00
By act of Congress approved March 3, 1875	5,000 00
By act of Congress approved June 18, 1878	8,000 00
By act of Congress approved March 3, 1879	5,000 00
	28,000 00
Amount expended	21,577 49

Money statement.

July 1, 1878, amount available	$8,050 84	
Amount appropriated by act approved March 3, 1879	5,000 00	
		$13,050 84
July 1, 1879, amount expended during fiscal year		6,628 33
July 1, 1879, amount available		6,422 51
Amount (estimated) required for completion of existing project		30,146 00
Amount that can be profitably expended in fiscal year ending June 30, 1881		5,000 00

Abstract for bids for dredging in Otter Creek, Vermont, opened September 3, 1878.

Bidders.	Price per cubic yard.
John J. Bigelow and Alvarro Adsit	$0 32½
James D. Hancock	36

Abstract of contract for dredging in Otter Creek, Vermont.

Contractor.	Residence.	Date of contract.	Subject of contract.	Remarks.
Bigelow & Adsit.	Burlington, Chittenden County, Vermont.	Sept. 12, 1878	Dredging shoals in Otter Creek.	To be completed by December 31, 1878; completed.

D 16.

SURVEYS OF THE COAST OF LONG ISLAND, NEW YORK, BETWEEN CONEY ISLAND POINT AND ROCKAWAY INLET, IN NEW YORK BAY; OF SHEEPSHEAD BAY, AND OF CANARSIE BAY, NEW YORK.

UNITED STATES ENGINEER OFFICE,
New York, February 11, 1879.

GENERAL: I have respectfully to report upon the following surveys authorized in the act approved June 18, 1878:

1. The coast of Long Island, N. Y., between Coney Island Point and Rockaway Inlet, in New York Bay.
2. Sheepshead Bay, N. Y.
3. Canarsie Bay, N. Y.

These surveys were made during the past season by parties in the field under the general direction of Mr. R. H. Talcott, assistant engineer, with instructions from this office. His report is annexed.

COAST OF LONG ISLAND.

Chart No. 1 compares the shore-line of 1878 with that of 1856, showing a receding of the eastern section of the shore of Coney Island, which is probably due to the shoals about Rockaway Inlet, which would act similarly to a jetty placed there and obstructing the supply of sand coming from the eastward. Coney Island Point has advanced to the eastward about six hundred feet. The lines of soundings made during the past season, and opposite to the eastern section of Coney Island, show no particular divergence from those of 1856, at least for depths of 3 and 4 fathoms smaller depths being, however, affected by the receding of the shore-line. The soundings made opposite to the western half of

Coney Island are over the bar shoals, in which there would naturally be changing positions and depths from year to year.

The most important element to consider is the advance of Rockaway Inlet, with its attendant shoals. From comparative charts obligingly furnished by the Coast Survey Office it appears that from 1841 to 1877 the inlet has advanced at the nearly uniform rate of 1 mile in twenty years.

IMPROVEMENTS OF ROCKAWAY INLET.

No permanent improvement, based upon fixing in its present position the course of the inlet, is possible; and no improvement should be contemplated which aims at more than temporary benefit, by works undertaken at infrequent and irregular intervals, with the object of insuring a reasonably direct discharge of water over the bar. Further consideration has led to no change in the views upon this improvement expressed in report from this office of March 8, 1878. (See Report of Chief of Engineers for 1878, Appendix D, pp. 425, 426.)

At the date of the last survey of 1877 there was a depth in the inlet of 15 feet, and no improvement was needed.

IMPROVEMENT OF CANARSIE BAY.

This bay forms a portion of Jamaica Bay (Chart No. 2), and the object of an improvement would be to make a navigable channel from certain points on shore to connect with the good navigable channels of Jamaica Bay. To make such channel from Canarsie Landing, leading through the shoals, it would be necessary to form a tidal basin, whose filling and emptying should be through the proposed new channel.

Dikes represented in blue show the extent of the basin, as also the line of channel connecting it with the deeper waters of Jamaica Bay. Improvement by dredging would not be permanent, owing to the absence of eroding currents.

The estimate for dikes constructed of creosoted timber is $88,000.

SHEEPSHEAD BAY.

The improvement of this locality is also by dikes marked in blue, by which the water flowing in and out would be compelled to take a certain channel, restricted in dimensions by the dikes.

Lines in blue also indicate the approximate position and extent of dikes intended to improve the entrance into the bay. The position and even existence of the inlet will depend upon the advance of Rockaway Inlet.

The present estimate for dikes of creosoted timber is $10,000.

The commerce of Canarsie and Sheepshead Bays, as indeed of the whole area discussed in this report, is undeveloped and the statistics unknown. The principal occupation is fishing, conducted in small vessels suited to the shoal navigation.

BREAKWATER ON THE COAST OF LONG ISLAND.

A breakwater, if ever constructed, would not be on the portion of coast examined, nor for the protection of local commerce. Its position would be distant from the shore of Long Island, between this and Sandy Hook, in water from 5 to 6 fathoms deep at low tide, and its object would be the protection of general commerce and of coasters between

the New England and Southern States. There appears to be a great deficiency of places of refuge between Delaware Bay and the east end of Long Island (except inlets of shallow draft suited to the small vessels employed in local commerce), which in the future will probably be met by the construction of harbors of refuge, one on the coast of New Jersey and tee other on the coast of Long Island, or by the construction of a large breakwater off the bar of Sandy Hook, where the latter would benefit more numerous classes of vessels. (See also report March 8, 1878, Report of Chief of Engineers for 1878, Appendix D, pp. 424, 425, 426.)

It is not intended here to more than glance at certain requirements of commerce, a further discussion of which would be foreign to the objects of this report.

Respectfully submitted.

JOHN NEWTON,
Lieutenant-Colonel Engineers, Bvt. Maj. Gen.

Brig. Gen. A. A. HUMPHREYS,
Chief of Engineers U. S. A.

REPORT OF MR. R. H. TALCOTT, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
New York, February 7, 1879

GENERAL: I beg leave herewith to submit the results of the surveys and examinations of the coast of Long Island from Coney Island Point to Rockaway Inlet, and of Sheepshead Bay and Canarsie Bay, Long Island, made during the past season.

The accompany charts are two in number: No. 1 shows the coast of Long Island from Coney Island Point to Rockaway Inlet and Sheepshead Bay, and No. 2 the western part of Jamaica Bay, Long Island, from Canarsie Landing to Rockaway Inlet.

The district embraced in both charts is in the collection district of the city of New York, which is also the nearest port of entry.

The nearest light-house is that at Fort Tompkins, on Staten Island, which is distant from Coney Island Point about 2.7 miles in a northwesterly direction.

The amount of commerce and navigation to be benefited is unknown.

Coney Island is a narrow strip of sand beach backed by salt meadows and separated from Long Island by a creek and Sheepshead Bay; it is a place of resort in summer, and large sums have been spent by companies and individuals in hotels and other improvements.

A comparison of the late survey with that of the United States Coast Survey of 1856 shows a very marked change in the shore-line from the west end of Rockaway Beach to the site of the Brighton Beach Hotel. In order to show the change graphically, the shore-line and half-fathom contour lines of the survey of 1856 have been traced in red on the accompanying chart.

Sheepshead Bay is a shallow sheet of water connected with New Inlet by a narrow channel, which is a succession of bars with 3 feet of water at mean low-water, alternating with holes of from 6 to 10 feet depth. New Inlet, the present entrance to the bay, is narrow and deep, but the bar just outside has only about 3 feet of water at mean low-water.

The village of Sheepshead, near the head of the bay, is a small collection of hotels and dwellings; the principal occupation of its inhabitants is fishing.

Canarsie Bay is the northwestern part of Jamaica Bay. Canarsie Landing is a small village on the north shore of the bay, and has a large hotel, which is a place of resort in summer.

During the summer a line of steamboats from this point connects New York and Brooklyn with Rockaway Beach, and ferry-boats are run all the year round to Barren Island, on Rockaway Inlet, where there are several large manufactories of fertilizers; its inhabitants are largely engaged in fishing.

The topography of Coney Island was mapped in the field by Mr. John Meehan, assistant engineer in charge of plane-table party, in the month of October. Captain C. P. Patterson, Superintendent of the United States Coast Survey, having furnished the geographical positions of a number of points in that locality, lately established by his assistants, only a few additional points were necessary, and those now determined by

occupying the Coast Survey stations. A system of small triangles connecting with the Coast Survey points furnished the necessary data for the topography and hydrography of Sheepshead Bay and for the hydrography off Coney Island. Mr. Charles G. Weir had charge of the hydrography, which was executed in the early part of November.

The soundings were taken with poles of 18 and 31 feet length, and were reduced to the plane of mean low-water as established by tidal observations at Coney Island Point and at Tappan's Wharf, in Sheepshead Bay, during one lunation, the day tides being observed. During the soundings off Coney Island the tides were observed near the Brighton Beach Hotel, and the soundings in that vicinity were reduced by these observations.

The survey of Canarsie Bay was made during the months of October and November by the parties under the charge of Messrs. Weir and Meehan; the former executing the triangulation and hydrography, and the latter the shore-line and topography by means of the plane-table.

The execution of the triangulation was very much assisted by information kindly furnished by Captain C. P. Patterson, Superintendent of the United States Coast Survey, giving the geographical positions of the trigonometrical stations in that vicinity. These points were used as ends of base-lines for the establishment of the necessary sounding-stations, and saved the expense of the measurement of a base-line, which, owing to the marshy character of the ground, would have been both difficult and expensive.

The soundings were taken with poles of 18 and 31 feet length, and were reduced to the plane of mean low-water as established by tide-gauges located at the wharf at Canarsie Landing, and at a small wharf on the northeast end of Barren Island, which were observed upon for one lunation of the day tides. The lines of soundings embraced the main or big channel from opposite Canarsie Landing to the north end of Barren Island, and several of the lateral channels, especially that one leading to Canarsie Landing, and the whole of Deep Creek, from Dead Horse Inlet to the bay, The soundings on the flats and from the north end of Barren Island southward, including all outside as far west as Dead Horse Inlet, were reduced from a tracing obtained from the Coast Survey Office of a survey made in 1877. The tide-gauge on Barren Island was connected by a line of levels with a bench-mark on the island established by the United States Coast Survey parties, the elevation of which above the plane of mean low-water was kindly furnished by Captain Patterson. The result of the levels showed an immaterial difference in the planes of reference as established by our observations and those of the Coast Survey party.

The characteristic feature of Canarsie Bay is one large channel of good depth and width, from which numerous branches diverge. These branches divide the bay into islands, and generally lose themselves in the mud flats. The islands and shores are almost entirely salt marsh, bordered by vast mud flats, which were frequently left entirely dry at low-water.

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Yours, very respectfully,

R. H. TALCOTT,
Assistant Engineer.

Lieut. Col. JOHN NEWTON,
Corps of Engineers, Bvt. Maj. Gen., U. S. A.

APPENDIX E.

ANNUAL REPORT OF COLONEL J. N. MACOMB, CORPS OF ENGINEERS, FOR THE FISCAL YEAR ENDING JUNE 30, 1879.

UNITED STATES ENGINEER OFFICE,
Philadelphia, Pa., August 21, 1879.

GENERAL: In conformity with the requirements of General Orders No. 4, dated Headquarters Corps of Engineers, Washington, D. C., May 21, 1879, I have the honor to transmit herewith my annual reports on the surveys and examinations and the several works of improvement of rivers and harbors intrusted to my care.

In the course of the last fiscal year I have been prevented by sickness from taking that active part which I have been accustomed to in the duties of the field and office. I have also been absent from my station on duty with Boards of Engineers for about two months; but the duties of my station have not suffered from my absence, as they have been most ably performed by my assistant, Capt. William Ludlow, Corps of Engineers, to whom I am indebted for the zeal and intelligence he has displayed in forwarding, in every department, the works in my charge.

All details of information touching the various works are given under the respective heads in the inclosed subordinate reports.

I remain, very respectfully, your most obedient servant,

J. N. MACOMB,
Colonel of Engineers.

Brig. Gen. H. G. WRIGHT,
Chief of Engineers, U. S. A.

E 1.

IMPROVEMENT OF SHREWSBURY RIVER, NEW JERSEY.

The improvement of the river was begun with an appropriation of $14,000 in act of March 3, 1871, made pursuant to a report by Lieut. Col. J. D. Kurtz, Corps of Engineers, in October, 1870.

Dredging operations were carried on through the sand shoals near the mouth, and at Rocky and Jumping Points, and continued in 1872. In 1875 a partial survey was made, which showed that the formidable shoals of sand, due to repeated openings in times past through the narrow sea-beach that separates the river from the sea, between Rocky Point and its mouth, could not be sufficiently reduced or controlled by dredging operations alone, and Colonel Kurtz's report of February 1, 1876, indicates the necessity for permanent works to aid in their modification and to secure advantages gained.

The act of June 18, 1878, having appropriated a further sum of $18,000, with the approval of the Chief of Engineers, a thorough survey of the river from the entrance to above Upper Rocky Point on the Nave-