

• LETTER

FROM

THE SECRETARY OF WAR,

COMMUNICATING,

In obedience to law, an engineer report of an examination or survey of the harbor of Norfolk, Virginia, and of the Elizabeth River.

MARCH 4, 1872.—Referred to the Committee on Commerce and ordered to be printed.

WAR DEPARTMENT,
March 1, 1872.

The Secretary of War has the honor to transmit to the United States Senate and House of Representatives, in further compliance with the requirements of section 3 of the act approved March 3, 1871, an engineer report of an examination or survey of the harbor of Norfolk, Virginia, and of the Elizabeth River.

WM. W. BELKNAP,
Secretary of War.

OFFICE OF THE CHIEF OF ENGINEERS,
Washington, D. C., February 29, 1872.

SIR: I herewith transmit a report from Major W. P. Craighill, Corps of Engineers, of a survey or examination of Elizabeth River, and of the harbor of Norfolk, Virginia, made in compliance with the act of March 3, 1871.

Elizabeth River, through its southern branch, is connected with the waters of Albemarle Sound by the Dismal Swamp Canal, in which the United States have a pecuniary interest as the owners of eight hundred shares of its stock, and the Albemarle and Chesapeake Canal, eight miles farther up the stream. These two canals are the principal outlets of the commerce of Northern and Eastern North Carolina. Major Craighill estimates that, to obtain a depth of seven feet at low water as far up as the lock of the Albemarle and Chesapeake Canal, would require an expenditure of about \$25,000. He also reports the sum of \$30,000 could be advantageously expended in the next fiscal year in improving the approaches from the sea to the harbor of Norfolk.

Very respectfully, your obedient servant,

A. A. HUMPHREYS,
Brigadier General and Chief of Engineers.

Hon. W. W. BELKNAP,
Secretary of War.

UNITED STATES ENGINEER OFFICE,
No. 399 DRUID HILL AVENUE,
Baltimore, Md., January 31, 1872.

GENERAL: A survey or examination of Elizabeth River and the harbor of Norfolk, Virginia, was ordered in the appropriation bill for the improvement and survey of rivers and harbors, approved March 3, 1871.

The field-work was taken in hand as soon as other requirements permitted, and was executed in the months of September and October, 1871, under the immediate supervision of Captain C. B. Phillips, Corps of Engineers, zealously and intelligently assisted by Mr. J. E. Weyss and Mr. Gilbert Thompson.

Other duties, which could not be postponed, delayed the completion of the office-work until this time. The reports of Captain Phillips, dated January 30, 1872, are submitted herewith, with documents and maps, as stated therein.

Captain Phillips suggests a plan of improvement for Elizabeth River, which would give a depth at low water of 7 feet, as high up as the lock of the Albemarle and Chesapeake Canal. The estimated cost is \$18,000.

As the tide rises nearly three feet, this additional depth could be then had at high water each day.

If Congress should decide to make an appropriation for the Elizabeth River, the plan of improvement indicated by Captain Phillips would be judicious. I think, however, the work would be found somewhat more extensive than his estimates contemplate, and would cost not less than \$25,000. If the improvement is to be undertaken, it would be a decided economy to have the whole sum appropriated at one time.

The business of the canals of which the Elizabeth River is the outlet, especially the Albemarle and Chesapeake Canal, has increased notably in the past year, as shown by extracts given below from the last annual report of the president of that company, Mr. Marshall Parks.

"The Elizabeth River is navigable for vessels from Norfolk to the locks of the canal, for vessels drawing eight feet at high tide. The rise of tide averaging three feet, it is therefore quite impossible for vessels drawing more than five feet to go up to the locks at low water; hence a delay of a few hours often occurs in reaching the canal, interfering with the regular departure of steamers from Norfolk. To make this channel sufficient at low water, will require an improvement of the river, and it is hoped the recommendation made by the United States engineers, who are now making an instrumental survey of the river, will induce Congress to make the necessary appropriations for its improvement.

* * * * *

"The lock has worked well, and, from its peculiar construction, so well adapted to the trade, rafts half a mile in length pass through it without being disconnected. The time and expense saved to lumbermen by this arrangement is appreciated by them. The gates, which have been in use ever since the construction of the canal, have had slight repairs during the past year, but are now in a questionable condition. Arrangements have been made for building two pairs, and if, on taking the others out, it is found that by repairing that portion above water, and the part more exposed to decay, they can be repaired, they may be restored without very great additional expense. It is proposed, at the first favorable opportunity, to build gates of iron, as being more durable. As no iron lock-gates are used on the canals of this country, we shall, if we introduce them, be the pioneer in this, as we have been in so many improvements.

"This canal is the only one in this country on which steam is used exclusively. The legislature of the State of New York, at its last session, offered a reward of \$100,000 to any party that would introduce steam as a motive-power on the Erie Canal, in a manner that would prove as economical as horse-power, and attain a higher rate of speed. Such a large reward has stimulated the inventive genius of our people, and hundreds of plans have been suggested, not one of which, to this time, has accomplished greater results than are now attained on this canal.

"When the Albemarle and Chesapeake Canal was projected as a steam canal, *with no tow-path*, its projectors were looked upon as visionaries. The result of their labors has proved the soundness of their judgement. More than 35,000 vessels have passed through their canal propelled or towed by steam, no animal power having been used.

"The inland navigation, extending from the sounds of North Carolina to Baltimore, Philadelphia, and New York, continues to attract the attention of shippers. Efforts are being made to induce capital to embark in the establishment of a steam tow-boat line, with suitable barges, to run from all portions of Eastern North Carolina and Virginia to Norfolk; thence by inland route to the great Atlantic cities. It is believed the expense of transportation can be reduced below that of sail vessels. The great increase of the traffic in lumber, railroad ties, shingles, staves, corn, naval stores, telegraph-poles, and heavy ores, makes the establishment of such a line a necessity.

"During the past year many enterprising lumbermen have purchased largely of timbered lands in Eastern North Carolina, bordering on the creeks and rivers, and have

gotten out a vast quantity of mill-timber, which has been rafted to the North. This business is destined to create a revolution in the lumber trade. The towing through the sounds and up the Chesapeake Bay has been done with economy and safety; in fact, the loss has been far less than on the Susquehanna River.

"The business of the canal has steadily increased, not so rapidly as we could wish, but still there has been a steady increase, notwithstanding there has been no addition to the population of the country.

"Immigration has not set in. The Northwest still continues to attract foreigners. Until some concerted movement is made to induce immigration to the South, its superior advantages in climate, soil, and markets will not be appreciated. Eastern North Carolina presents inducements to settlers which need only be known to prove attractive. The country adjacent to this canal embraces a territory as large as all the New England States together, excepting Maine, and has a navigation exceeding 1,800 miles in extent, offering easy and rapid communication to the principal markets of the country. If these facts were known to the emigrant, the population of this section would be augmented to double its present number before another decade.

"The increase in cotton during the past year has been 9,562 bales; fish, 5,924 barrels; peas and beans, 3,167 bushels; potatoes, 7,215 bushels; wheat, 987 bushels; timber and sawed lumber, 674,593 feet; shingles, 15,529,400; staves, 134,000; fresh shad, 200,000; watermelons, 23,600.

"The following articles decreased: Naval stores, 5,256 barrels; corn, 64,700 bushels; railroad-ties, 11,824; wood, 5,252 cords.

"There has been a considerable increase in articles not heretofore mentioned, viz: Juniper, poplar, and beach logs—rafts, 49; 1,967 cords; peaches, 8,335 boxes; passengers, 3,813.

"The number of vessels going north was 2,471; south, 2,429; total, 4,900, composed as follows: Steamboats, 1,656; schooners, 944; sloops, 555; barges, 183; lighters, 1,030; boats, 483; total, 4,900.

"The tolls north and south last year were \$47,632 56; this fiscal year, \$55,778 72—a gain of \$8,116 16. The towing last year was \$10,567 61; this year, \$8,806 77—making a loss of \$2,760 79.

"Norfolk County has of late years been a garden for New York and other large cities. The rapid and frequent steam communication centering at Norfolk City has great facilities for the transportation of early fruits and vegetables to the northern markets. Such has been the rapid growth of this business that, to accommodate it, steamships are daily departing for Baltimore, Philadelphia, New York, and Boston.

"Lands contiguous to the city of Norfolk, which, before the development of this business, did not command over \$10 to \$20 per acre, are now selling from \$300 to \$1,000 per acre.

"The lands along the line of the canal in Virginia, and those upon North Landing River and Currituck Sound, North Carolina, convenient to navigation, may become equally as valuable, because they can produce vegetation from five to ten days earlier than Norfolk, and they possess facilities for reaching the market by water, which is less expensive and better than land transportation."

The report of Captain Phillips points out several changes in the condition of the harbor of Norfolk since the last map by the United States Coast Survey. He gives satisfactory explanations of the probable causes of those changes, which deserve attentive consideration as well upon the part of the authorities of the United States as of the State of Virginia, and the cities of Norfolk and Portsmouth, in order that the causes of injury of the same kind may be guarded against in the future. The channel has shoaled to some extent opposite the mouth of the Western Branch.

The sum of \$30,000 could be advantageously expended in the next fiscal year in improving the approaches from the sea to the harbor of Norfolk, should Congress deem it expedient to make such appropriation.

Estimates.

Elizabeth River	\$25, 000
Norfolk Harbor	30, 000

Very respectfully, your obedient servant,

WM. P. CRAIGHILL,
Major of Engineers.

Brigadier General A. A. HUMPHREYS,
Chief of Engineers U. S. Army, Washington, D. C.

UNITED STATES ENGINEER OFFICE, 2425 K STREET,
Washington, D. C., January 30, 1872.

MAJOR: I have the honor to state that, in accordance with instructions received from you, I have completed a survey of the Elizabeth River, Virginia, and I submit herewith my report, accompanied by a tracing from the original chart of the survey.

I was assisted in the survey by Messrs. J. E. Weyss and G. Thompson, the party consisting otherwise of seven laborers and boatmen.

The Elizabeth River unites with the James and Nansemond Rivers in forming that magnificent estuary of Chesapeake Bay known as "Hampton Roads."

The three branches of the Elizabeth River are known respectively as the Southern, Eastern, and Western Branches, of which the first is the most important.

At the confluence of the Southern and Eastern Branches (about seven miles from the mouth of the river) are located the important cities of Norfolk and Portsmouth, the former on the right, and the latter on the left bank.

A survey of Norfolk Harbor having been ordered and completed, and a map and report upon the same having been prepared, I shall in this report confine myself to the Southern and most important branch of the Elizabeth River above the United States navy-yard.

The sheet accompanying the report on Norfolk Harbor shows that portion of the river below the confluence of the three branches, the Eastern and Western themselves; and also the position of the United States navy-yard referred to above. The various interests connected with these localities are touched on in the report upon Norfolk Harbor. I have adopted this plan, in order to avoid a set of disjointed sheets.

Referring, then, to the Southern Branch alone, this survey was undertaken in conjunction with the survey of Norfolk Harbor, the point of operations for each day being decided by the state of the weather.

The survey was accomplished between the 27th of September and the 31st of October last; eighteen days in all being occupied on the survey.

The low and marshy condition of the shores compelled a resort to triangulation at various points, the chain being called into requisition whenever its use was possible.

Total length of shore absolutely run by chain, $7\frac{1}{4}$ miles; number of occupied stations, 166; number of unoccupied stations, 157; number of angles read, 1,729; number of soundings, 8,708.

Tide-gauges were kept at four different points on the river, and mean low-water mark established as accurately as possible.

All soundings on the accompanying chart are reduced to this reference.

It may be properly remarked in this connection that the result of our observations for mean low water varied but very slightly from that established by the Coast Survey in 1866.

A remarkable fact connected with the tide in the Elizabeth River is, that the ordinary rise at the upper portion of the stream (at Albemarle and Chesapeake canal lock) is nearly as much as at the mouth, being about three feet at latter and 2.7 feet at the former point. The rise of the tide at the upper portion of the stream varies considerably, however, with the prevailing winds.

The Southern Branch derives its chief importance from the fact of its being the principal outlet for the commerce of Northern and Eastern North Carolina.

Two canals connect this river with the waters of Albemarle Sound, North Carolina.

The Dismal Swamp Canal, locking into the Elizabeth at a point about six miles above Norfolk, connects with the head-waters of Pasquotank River, North Carolina, which empties into Albemarle Sound.

The Albemarle and Chesapeake Canal locks into the Elizabeth at a point about eight miles farther up the stream, and connects with North Landing River, an affluent of Currituck Sound, North Carolina.

These canals open up an immense line of inland navigation, and about twenty counties in North Carolina find this their most convenient outlet.

Over the line of the Dismal Swamp Canal there was passed, during the year ending September 30 last, about 8,000 tons of inward or northern freight, and about 10,000 tons of outward or southern freight. Total receipts of the canal from tolls on the above, between \$12,000 and \$13,000. For details concerning this amount of freight, I refer to the annual report of the president and directors of this company for the year ending September 30 last. A copy of that report accompanies this. I also append a copy of a memorial of the Dismal Swamp Canal Company to the Senate and House of Representatives of the United States, dated December 20, 1871.

The General Government is largely interested in the stock of this canal.

A still larger amount of trade is carried on over the line of the Albemarle and Chesapeake Canal. During the year ending September 30, 1871, 4,900 trips were made through this canal by steamers, sloops, and craft of all kinds.

The total amount of tolls accruing to the company from this traffic amounted to about \$56,000, a gain of over \$8,000 above that of the previous year.

For the details of this trade I refer to the report of the president and directors of

the canal company for the year ending September 30, 1870 and 1871, respectively. These printed reports are herewith appended.

Below the lock of the Dismal Swamp Canal no difficulty is experienced in the navigation of the Elizabeth River. A deep and unobstructed channel exists up to this point, and, in fact, to a point about two miles further up the river.

The above remark should be qualified by stating that the Norfolk and Petersburg Railroad bridge, which crosses the river about three-fourths of a mile above the Dismal Swamp Lock, causes considerable annoyance to shipping, much of which is taken up and down the river in long tows. As many as five schooners sometimes constitute a single tow.

The draw of the bridge referred to is badly located. It is nearly over to the right bank of the river, away from the deepest water, and out of the course which shipping would take were it not for the bridge.

This evil, however, it appears, must continue to exist, as litigation has, I understand, failed to correct the matter.

Near Deep Creek, about five miles below the lock of the Albemarle and Chesapeake Canal, we first encounter water so shoal as to incommode the class of shipping which comes through the canal. From this point up, several shoals are encountered, and also a few turns in the course of the channel, so abrupt as to seriously interfere with the tows.

In the present state of the river, but 5 feet of water can be depended upon at all stages of the tide up to the upper lock.

The increasing trade would seem to call for at least seven feet at mean low water.

With this depth of water the capacity of the shipping might be increased, and the delay which is now experienced in waiting for high water be avoided.

A considerable amount has been expended from time to time by this company, in deepening the channel at particularly bad points; and one point has been cut off, where the turn in the channel was particularly abrupt. This latter point will be perceived by a glance at the map. This cut has worked well; the water in it has maintained its original depth, and the old channel is filling up.

In case of any contemplated improvement of this river, I would recommend two additional cut-offs.

These proposed cut-offs are marked "A" and "B" on the chart accompanying.

In my estimates I have calculated for a channel sixty feet in width at bottom, and seven feet in depth at mean low water.

On the chart I have indicated in blue lines the course which I would recommend for such a channel over the shoals and also across the two points.

The material to be dredged consists almost solely of sand, especially at the cut-offs. In the bed of the river a small proportion of mud is found.

A plenty of room for depositing the material can be found at the old bends of the river, which would become neglected. Probably half of the removed material at the cut-offs could be deposited directly upon the banks.

The following estimates are herewith submitted as the probable cost of carrying out the improvements suggested above:

Excavating and removing amount of material as follows:

	<i>Cubic yards.</i>
At proposed cut-off "A"	10,704
At proposed cut-off "B"	16,760
Aggregate amount at shoals	13,356
Total	40,820
40,820 cubic yards of material, at 40 cents	\$16,328 00
Add for contingencies, superintendence, &c., 10 per cent.	1,632 80
Total	17,960 80

In conclusion, I beg to express my thanks to Messrs. Weyss and Thompson for the energy and ability which they displayed while engaged in the prosecution of this survey.

I am, major, very respectfully, your obedient servant,

CHAS. B. PHILLIPS,

Captain of Engineers, United States Army.

Major W. P. CRAIGHILL,

Corps of Engineers, United States Army, Baltimore, Maryland.

UNITED STATES ENGINEER OFFICE, 2425 K STREET,
Washington, D. C., January 30, 1872.

MAJOR: I have the honor to state that, in accordance with instructions received from you, I have completed a survey of Norfolk Harbor, Virginia, and I submit herewith my report, accompanied by a tracing from the original chart of the survey.

As stated in my report upon the survey of the Southern Branch of the Elizabeth River, the chart accompanying this report exhibits the lower portion of the river, (below Norfolk Harbor proper,) and so much of the Southern Branch as to include the United States navy-yard above Portsmouth.

For purposes of comparison, I have put upon this sheet (in a different color) the soundings as given by the most recent coast surveys. Our own soundings are in blue; those of the Coast Survey in black.

All these Coast Survey soundings were taken as far back as 1854, excepting opposite the navy-yard. The latter were taken in 1866. Only the most characteristic soundings have been put on this sheet, in order to avoid confusion; and it is trusted that the plan adopted will prove of service in studying the changes which have taken place in Norfolk Harbor during the last seventeen years.

I was assisted on the survey by Messrs. J. E. Weyss and G. Thompson; the party consisting otherwise of seven laborers and boatmen.

The survey was undertaken in conjunction with that of the Southern Branch; the point of operations for the day being decided by the weather, the calmer and more favorable days being taken for soundings in the harbor and at the lower part of the river.

The survey was accomplished between the 27th of September and the 31st of October last, twelve days in all being occupied on the survey.

From the navy-yard to the lower part of the city, the shores and wharves were put in by careful triangulation. Below the city a considerable portion of the shore-line was run in by the chain. A tide-gauge was established at the light-house opposite Norfolk, and carefully observed. A few observations for tide were also made at Craney Island. Nearly at the close of our observations, we learned from the Coast Survey their bench-mark for mean low water at Norfolk Harbor. On referring to it, we found that the low water established from our observations was almost identical with that of the Coast Survey.

Total length of shore-line run, $5\frac{1}{2}$ miles; number of occupied stations, 68; number of unoccupied stations, 59; number of angles read, 809; number of soundings, 5,577.

The city of Norfolk, Virginia, is located on the right bank of the Elizabeth River, at the confluence of the two branches known as the Southern and Eastern. The advantages which the city enjoys as a seaport are almost too well known to need more than a passing notice here. Her central position on the Atlantic seaboard; her mild climate, and consequent freedom from obstructions to navigation from ice; and her facilities for communication with a fertile and productive interior, give her natural advantages almost unsurpassed by any other city.

The harbor proper, (or that portion of the river opposite the city,) although somewhat contracted, has, nevertheless, a good depth of water; while below, the city has opportunities for an almost indefinite expansion of her water-front.

The city of Portsmouth, Virginia, is located opposite to, and a little above Norfolk. More properly speaking, it is situated on the left bank of the Southern Branch of the Elizabeth. Her interests are, to a great extent, identical with those of Norfolk, and she possesses, in a less degree, the same natural advantages.

Immediately above the city of Portsmouth, and on the same side of the Southern Branch, is the United States navy-yard, known as the Gosport yard. This navy-yard has not yet regained the importance which it had before the late war; but its fine natural advantages will, doubtless, at some time, make it again an important naval station; and the General Government must necessarily always be particularly interested in the preservation of the channel below.

The population of Norfolk, according to the census of 1870, was 19,229, an increase of 4,609 during the previous ten years.

The population of Portsmouth in 1870 was 10,492, an increase of 1,004 during the previous ten years.

The main lines of communication between Norfolk and the back country are the Southern Branch of the Elizabeth River, the Norfolk and Petersburg, and the Seaboard and Roanoke Railroads.

The Southern Branch is connected with the waters of Albemarle Sound, North Carolina, by means of two canals—the Dismal Swamp and the Albemarle and Chesapeake. These two canals make tributary to Norfolk the produce and trade of some twenty counties in Northern and Eastern North Carolina; and have been referred to more particularly in my report to you of this date, concerning the survey of the Southern Branch.

The Norfolk and Petersburg Railroad was completed in 1858. It suffered severely during the late war, but has since recuperated to a great extent, and is now, by means

of its connections, an important outlet for the produce of a great tract of country, particularly of the tobacco region in the vicinity of Lynchburgh.

The Seaboard and Roanoke Railroad has its tide-water terminus at Portsmouth. This road is a link in the chain of passenger communication from Baltimore to the South, and also opens up a considerable trade between Norfolk and the interior of North Carolina.

Norfolk is the terminus of a line of ocean steamers to each of the following ports, viz: New York, Boston, and Philadelphia. The Bay steamers connect by a daily line with Baltimore, Md., and there is also a tri-weekly communication by steamer with Washington, D. C. Various lines of river steamers also connect Norfolk with Richmond, Yorktown, Cherrystone, and Hampton, Va., and various points in North Carolina.

An idea of the amount of the foreign trade of Norfolk will be gained by a glance at the statistics given below. I am indebted to Luther Lee, jr., esq., the courteous collector of customs at the port of Norfolk, for this information.

List of tonnage, crew, and number of vessels entered and cleared (coastwise) at the port of Norfolk, from January 1, 1871, to December 31, 1871.

ENTERED.

Tonnage.....	1,555,215
No. of crew.....	32,539
No. of vessels.....	1,455

CLEARED.

Tonnage.....	887,585
No. of crew.....	26,035
No. of vessels.....	1,003

List of tonnage, crew, and number of vessels (foreign) entered and cleared, from January 1 to December 31, 1871.

ENTERED.

Tonnage.....	19,310
No. of crew.....	861
No. of vessels.....	18

CLEARED.

Tonnage.....	12,092
No. of crew.....	387
No. of vessels.....	24

List of tonnage, crew, and number of American vessels entered and cleared, (foreign,) from January 1 to December 31, 1871.

ENTERED.

Tonnage.....	2,714
No. of crew.....	50
No. of vessels.....	4

CLEARED.

Tonnage.....	7,565
No. of vessels.....	32
No. of crew.....	340

Amount of duties collected at the port of Norfolk, Va., from January 1 to December 31, 1871.

Duties.....	\$143,971 82
Hospital tax.....	3,244 80
Tonnage tax.....	4,572 60

On consulting the accompanying chart, for the purpose of comparing our soundings with those of the Coast Survey, it will be perceived that a number of changes have taken place in the harbor during the past seventeen years.

I will briefly consider the most important ones. One of the most striking changes is at the entrance of the harbor proper, opposite the light-house. The water at this point has, it will be seen, gradually deepened toward the left bank of the river, while the water in the vicinity of the naval anchorage (opposite the light-house) has become correspondingly shoaled.

These changes are undoubtedly due wholly or in part to three distinct causes, viz: 1st. The sinking of hulks on the Norfolk side of the channel during the early part of the war; 2d. The prolonged stay of deep-draught naval vessels at the anchorage-ground referred to; and, 3d. The running out of wharves from the opposite or right shore. The hulks which were sunk here have been removed since the war. The anchorage is still used by naval vessels while discharging their powder, before proceeding to the navy-yard above.

Concerning the running out of wharves opposite this point, a precedent justifying the continued encroachment of the wharves upon the channel from the Norfolk side seems to have been established in the result of the recent case of litigation connected with Pfeifer's wharf. The injunction which was asked for, to prevent the building of this wharf, was not granted by the courts. A causeway 175 yards in length now extends out from the shore to nine feet of water. It is unquestionable that this wharf and causeway detract much from the benefit formerly derived from the scouring effect of Paradise Creek and the bay included between the wharf in question and Town Point.

If a "port-warden's line" has ever been established at this part of the harbor, it is possibly not known, but it is certainly not respected.

We find slight and rather peculiar changes in the bed of the harbor between the county bridge across the Eastern Branch and the confluences of the two branches. We find a slight tendency of the channel to deepen immediately and for some little distance below the bridge.

Further down (some 800 yards below the bridge) shoaler water, which, as far as is known, has always existed, is encountered, and continues until the influence of the Southern Branch is felt. The depth of the shoaler water referred to has changed but little since the soundings were taken by the Coast Survey. It appears to have filled in very slightly. Its worst feature seems to be that the shoal is slowly extending along to the wharves immediately below the ferry. I attribute these changes to the existence of the county bridge across the Eastern Branch. The stream is considerably contracted at this point by a long causeway, which constitutes the southern extremity of the bridge.

This accounts, in my opinion, for the slight deepening immediately below the bridge, and also for the slight additional shoaling below, the removed material being deposited as soon as the wider portion of the stream is reached.

It will be perceived that a considerable deepening has taken place immediately at the confluence of the two branches. This would seem to be but the mere result of the changes just referred to, the gradual extension of the shoaler water near the ferry seeming to contract the width of the Southern Branch channel, and causing it to make deeper water.

From this point on toward the entrance of the harbor, and also in following up the course of the Southern Branch, the water in the channel seems to have pretty generally maintained its original depth.

The flats on the Portsmouth side have filled in to a considerable extent.

As stated above, the soundings opposite the navy-yard were taken by the Coast Survey in 1866. A considerable amount of dredging has since been done there by the Government.

On the whole, the condition of the harbor of Norfolk does not appear to have materially deteriorated since 1854, and it appears to me that the apprehensions of the people concerning it are rather exaggerated.

The area of cross-section at the entrance to the harbor may have diminished; if so, but very slightly, and the capacity and average depth of the harbor appear to be fully as great as seventeen years ago.

It would be well for the city to make every effort to prevent the continued encroachment of the wharves, unless duly authorized and constructed in accordance with some intelligent system. And, while providing for the future, it would also be well, if possible, to get rid of those structures already in existence which tend to injure the condition of the harbor.

In my opinion, it would be injudicious on the part of the General Government to attempt any improvement of Norfolk Harbor at present.

In conclusion, I beg to express my thanks to Messrs. Weyss and Thompson for the energy and skill displayed by them during the prosecution of this survey.

I am, major, very respectfully, your obedient servant,

CHAS. B. PHILLIPS,

Captain of Engineers, United States Army.

Major W. P. CRAIGHILL,

Corps of Engineers, United States Army, Baltimore, Maryland.