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Robert Ernest Usden

??
20th Congress,
1st Session.

[Doc. No. 254.]

Ho. of Reps.
War Dept.

CHESAPEAKE AND OHIO CANAL—EXTENSION OF

LETTER



FROM

THE SECRETARY OF WAR,

TRANSMITTING

A REPORT, MAP, AND ESTIMATE,

OF THE

CHESAPEAKE AND OHIO CANAL TO ALEXANDRIA,

IN THE

DISTRICT OF COLUMBIA.

APRIL 21, 1828.

Referred to the Committee on Roads and Canals.

WASHINGTON :

PRINTED BY GALES & SEATON.

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WAR DEPARTMENT, *April* 18, 1828.

SIR: I have the honor to transmit, herewith, a letter of the Chief Engineer, of this date, accompanied by a report, map, and estimate, of an extension of the Chesapeake and Ohio Canal to Alexandria, in the District of Columbia, called for by a resolution of the House of Representatives, of the 9th instant.

I have the honor to be, very respectfully,

Sir, your obedient servant,

JAMES BARBOUR.

Hon. ANDREW STEVENSON,

Speaker of the House of Representatives.



ENGINEER DEPARTMENT,

Washington, April 18, 1828.

SIR : In pursuance of your orders, I have the honor to transmit, herewith, the report, map, and estimate, of a survey of an extension of the Chesapeake and Ohio canal to Alexandria, in the District of Columbia, which was called for by a resolution of the House of Representatives, of the 9th instant.

I have the honor to be very respectfully, Sir,

Your obedient servant,

ALEX MACOMB,

Major General, Chief Engineer.

HON. JAMES BARBOUR.

Secretary of War.

Major General ALEXANDER MACOMB, Chief Engineer.

SIR: In pursuance of your directions, I have the honor to report the following estimates, made on a line of canal proposed from the "Three Sisters," above Georgetown, to Alexandria, on a level, thirty-seven feet above that of low tide in the Potomac.

By inspection of the map and profile accompanying this, it will be seen that the canal line will be not only quite serpentine, but pass over very uneven ground. From below the Georgetown Ferry to Alexandria, easy excavation, generally.

The following estimates, per mile, are for a canal of forty feet surface, twenty-eight feet bottom, and the depth of water four feet.

The calculations are for excavating, embanking, aqueducts, culverts, and bridges; additions at the end, for deepening, waste weirs, &c.

ESTIMATES.

First Mile.

Yards.	Amount c. y.	Descriptions.	Cents.	Dollars.
70 X 24 =	1,680	Rocks to blast—lining -	125	2,100
553 X 100 =	55,300	Loose rocks—steep slope -	20	11,060
500 X 40 =	20,000	Steep slope—large rocks to move -	18	3,600
40 X 200 =	8,000	Embankment of two gulfs -	12½	1,000
597 X .35 =	20,895	Variety of excavation -	14	2,925
		Two culverts -	-	600
		One road bridge -	-	200
		One large culvert -	-	2,000
				<hr/>
				23,485

Second Mile.

50 X 230 = 6,900	-	Deep valley	-	10	690				
70 X 302 = 21,140	-	Valley, 21 feet deep	-	12½	2,640				
53 X 128 = 6,784	}	Great embankment	-	18	3,204				
33 X 204 = 6,732									
30 X 59 = 1,770	17,802								
11 X 60 = 660									
16 X 116 = 1,856									
207 X 27 = 5,589	}	Sloping Common excavation	-	10	2,655				
1,310 X 16 = 20,960									
						Six culverts	-	-	1,800
						Two road bridges	-	-	400
		A long culvert	-	-	600				
					<u>11,989</u>				

Third Mile.

70 X 427 = 29,890	-	Gravelly Creek valley	-	18	5,380
30 X 200 = 6,000	-	Embankment	}	10	3,013
53 X 128 = 6,784	30,131	do			
667 X 41 = 27,347	-	Sloping	-	11	1,463
367 X 36 = 13,212	-	Deep cutting	-	10	917
573 X 16 = 9,168	-	Common excavation	-	-	600
		Two culverts	-	-	400
		Two bridges	-	-	700
		Culvert for Gravelly creek	-	-	
					<u>12,473</u>

ESTIMATE—Continued.

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Fourth Mile.

Yards. cub. yds.	Amount c. y.	Descriptions.	Cents.	Dollars.
40 X 163 =	6,720	-	16	1,075
80 X 144 =	11,520	-	-	-
89 X 134 =	11,926	-	-	-
87 X 86 =	7,482	-	14	4,722
70 X 40 =	2,808	-	-	-
93 X 48 =	4,464	-	16	714
1,301 X 20 =	26,020	-	10	2,602
-	-	Part common excavation—slope	-	600
-	-	Two culverts	-	600
-	-	Two road bridges	-	600
-	-	-	-	<u>10,313</u>

Fifth Mile.

200 X 32 =	6,400	Sloping surfacé	10	640
33 X 154 =	5,032	Embankment	14	711
36 X 80 =	2,880	-	-	-
66 X 70 =	4,620	-	-	-
107 X 83 =	4,066	Embankment	12½	1,446
-	11,566	-	-	-
36 X 122 =	4,392	Deep cuttings	14	1,098
72 X 48 =	3,456	-	-	-
26 X 36 =	936	Embankment	12½	117
1,184 X 17 =	20,128	Common excavation	10	2,018
-	-	Four culverts and one bridge	-	1,500
-	-	-	-	<u>7,525</u>

Sixth Mile.

93 X 96 = 8,928	-	-	-	-	13	1,160
100 X 132 = 13,200	-	-	-	-	15	1,980
33 X 36 = 1,188	}	5,288	-	-	13	687
50 X 82 = 4,100						
30 X 115 = 3,450	}	18,862	-	-	14	2,640
16 X 48 = 768						
73 X 128 = 9,344						
106 X 50 = 5,300	-	-	-	-	10	2,014
1,259 X 16 = 20,144	-	-	-	-	-	900
						<u>9,381</u>

Seventh Mile.

227 X 195 = 44,265	}	-	-	-	18	23,913
147 X 239 = 35,133						
151 X 354 = 53,454						
79 X 60 = 4,320	-	-	-	-	-	-
66 X 41 = 2,706	-	-	-	-	-	-
115 X 36 = 4,140	-	-	-	-	-	-
982 X 15 = 14,730	-	-	-	-	-	-
						<u>25,896</u>
Four Miles' run embankment—132,852	-	-	-	-	-	-
Two embankments	}	-	-	-	11	2,848
Deep cuttings						
do	-	-	-	-	-	-
Common excavation	-	-	-	-	-	-
Culvert for Four Mile run	-	-	-	-	-	3,000
Two culverts and a bridge	-	-	-	-	-	800
						<u>30,561</u>

ESTIMATE—Continued.

Eighth Mile.

Yards. cub. yds.	Amount c. y.	Descriptions.	Cents.	Dollars.
96 X 181	= 17,376	A valley	15	4,406
160 X 75	= 12,000	Two valleys	10	1,197
133 X 90	= 11,970	Deep cutting	12½	1,642
180 X 73	= 13,140	do		
100 X 70	= 7,000	Common excavation	10	2,446
1,991 X 16	= 17,456	Two culverts	-	600
		A longer culvert	-	600
		Two road bridges	-	400
				<u>11,291</u>

Ninth Mile.

100 X 103	= 10,300	Embankments	11	1,215
12 X 62	= 744			
107 X 78	= 8,346	Deep cuttings	14	1,966
150 X 38	= 5,700	Common excavation	10	2,226
1,391 X 16	= 22,256	Four culverts and a road bridge	-	1,500
		Three farm bridges	-	600
				<u>7,507</u>

866 yards of the Tenth Mile.

20x128=	2,560	}	20,480	}	10	2,048
10x30=	300					
10x103=	1,030					
200x36=	7,200					
626x15=	9,390					
						900
						<u>2,948</u>

RECAPITULATION.

1st mile	\$ 23,485
2d do	11,989
3d do	12,473
4th do	10,313
5th do	7,525
6th do	9,381
7th do	30,561
8th do	11,291
9th do	7,507
Remainder	2,948

Total 127,473
 600 for three waste weirs
 1,000 a sum for grubbing
 29,600 for lockage, equalling \$ 800 per foot, or \$ 7,400 each, for four locks, 9 feet, 3 inches lift, each

\$ 158,673 Total amount for canal and locks, without any allowance for fencing.

An estimate of the cost of making said canal five feet deep, forty feet surface, and twenty-five feet bottom; slope of the banks, one foot and a-half base, to one foot perpendicular.

One foot in depth, taken from the bottom of the canal of four feet deep, &c. would require the removal of nearly three cubic yards, for each yard in length, in most cases of excavation: but in the *embankments*, a like quantity would be saved.

The embankments, together, measure 2,000 yards nearly, which, compensating for a like length of excavation, 4,000 yards, is taken from 16,706 yards, (total length) and there remains 12,706 yards \times 3 cubic yards = 38,118 cubic yards, which, coming from the *bottom*, may require to be put at 12½ cents the cubic yard; this makes the sum of \$ 4.765, which, being added to the total amount above, produces a total of \$ 163,438 for said canal, if made five feet deep, &c.

From measurements and soundings of the Potomac river, made in pursuance of directions of the Corporation of Georgetown, by Mr. George D. Avery, the place called the "Three Sisters" is shown to be a very unsuitable one, for a bridge of any kind. There is a distance of two hundred and sixty-two feet, which is over twenty feet deep—deepest part, seventy-six feet. In this deep water, the bottom is reported "soft," and the depth, to a solid foundation, is unknown.

By inspection of the *cross section* of the river, (accompanying this,) at a place just above the ferry, the greatest depth appears to be but fifteen feet at flood-tide, and the width but one hundred and five feet more, than at the *Three Sisters*.

The average depth of water above the ferry, may be put, at *ebb-tide*, eight feet; distance across, one thousand and forty feet. An aqueduct located at this place, would strike the west bank below that precipitous rocky shore which has so raised the estimate of the first mile. The sum thus saved on the *canal line*, would be full twenty thousand dollars.

Particular examinations of the nature of the bottom would be requisite, to enter into any calculation of the cost of an aqueduct over the Potomac at this place. The cost of the Rochester aqueduct over the Genesee river, exceeded one hundred dollars the foot run; *length* eight hundred and two feet; *cost* eighty-seven thousand one hundred and twenty-seven dollars. The Rochester aqueduct measures, from the top-water line to the rocky bottom on which it stands, but twenty-four feet. To eight feet, (average depth at low-tide,) add thirty-seven feet, (the height proposed above the ebb-tide) and the top-water line of this aqueduct would be forty-five feet above the averaged bottom—over *double* the height of the Rochester aqueduct. The item of pile-driving, to make sure foundations for piers and abutments, would probably be a considerable one. The cost of the whole *project*, would, likely, fall little short of three hundred thousand dollars.

If a canal between Georgetown and Alexandria were made to pursue the most economical route, as has been done along the shores of the tide-water between Medford and Boston, or between Troy and

Albany, and the idea of supplying water to the higher streets of Alexandria relinquished, a very different plan would present itself.

Let the river surface, by a dam above the ferry at Georgetown, be raised to a level of eight feet above that of ebb-tide, and a canal conducted on said level to Alexandria.

Such a canal would probably fall short of eight miles in length. Its bank would have its basis in the edge of the river, the whole distance, except in passing Alexander's island, and some alluvial flats below Four Mile run.

A conjectural estimate of the cost of such a canal may be made as follows :

A bank based in the river edge for six miles, at 35,200 cubic yards per mile=211,200 cubic yards, at 10 cents	\$21,120 00
Two dollars the yard run for a paving to protect from the abrasion of the waves, (1,760×6×\$2)=	21,120 00
Across the bay at the mouth of Four Mile run, may measure 650 yards×90 cubic yards*=58,500 cubic yards at 20 cents	11,700 00
2,870 yards (that remains of 8 miles) of common excavation, along Alexander's island, &c. at 13 cubic yards=37,310 cubic yards at 8 cents	2,985 00
A dam across the Potomac, about	20,000 00
Two culverts	600 00
A waste-weir at Four Mile run	400 00
Two road bridges and two farm bridges	550 00
One eight feet lock	6,400 00
Total,	\$84,875 00

A towing-path bridge over the Potomac is yet unprovided. A road-bridge at Georgetown has long been contemplated ; and to this might be attached a bridge for the towing-horses to pass on, a proper distance above the proposed dam, as has lately been done on the Champlain canal, for passing the *Hudson*, above the dam at the head of Saratoga Falls, and the *Mohawk*, above the dam below the Cohoes Falls.

A towing-path bridge erected with such aid, would cost much less than the value of the water power, created by the erection of the dam. On each shore, hydraulic establishments, of great value in such a situation, might be located.

As locks from the canal into the river at Georgetown would, in all probability, be constructed, whether a canal was made to Alexandria or not, the cost of locking twenty-nine feet from the canal surface to the dam surface, is not taken into the estimate of this project.

* This calculation is for a mound, acting as a dam, the top wide enough for a towing-path across this bay ; if a canal carried over on an embankment should be found indispensable, the cost of crossing this bay would be more than doubled.

A Wooden Aqueduct, &c.

An aqueduct has been proposed here, of the description of those on which the Erie canal crosses and recrosses the Mohawk river, to wit: a wooden trunk, resting on stone piers and abutments.

The averaged cost of these two aqueducts was a little over fifty dollars the foot run; foundations of both upon a rock bottom, and the water very shallow, affording every facility for a cheap and secure foundation.

No such work as that here proposed has been erected in our timber country, but *calculations* for building piers in tide water, between Baltimore and Havre de Grace, are to be found in the report of Messrs. Bland, Winchester, and Patterson, made to the General Assembly of Maryland, 1823. The cost of the foundation of a pier in said report, is put at \$93 60.

The aqueduct here proposed must be 17 feet higher the averaged elevation of the two Mohawk aqueducts; but the above foundations, as they are calculated, bring the work from the bottom to the surface at low tide; therefore the cost of but *nine* feet in height, ought to be added to each pier.

A calculation of the cost of this aqueduct may stand as follows:

Length of the aqueducts 1.040 feet	× \$50 =	-	-	\$52,000 00
Foundations for 26 piers 26	× \$93 60 =	-	-	2,434 00
Additions to height of 26 piers 60*	yards × \$3 × 26 =			4,680 00

Whole cost of the aqueduct	-	-	<u>\$59,114 00</u>
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From the cost, as estimated, of the canal, (\$163,438,) take \$20,000 saved, by not crossing at the "Three Sisters," and there will be remaining	-	-	\$143,438 00
To which add the above cost of the aqueduct	-	-	59,114 00

And the whole cost of this project is	-	\$202,552 00	
From said sum deduct the cost (as above) of the <i>low level</i> project	-	-	84,873 00

And the remainder is	-	-	<u>\$117,679 00</u>
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Which expense is to be incurred for watering Alexandria three streets higher up, and obtaining abas infor sea vessels; add further to said expense, that of navigating, forever, a longer canal.

The survey and levels, map and profile, were made by Captain Hartman Bache, assisted by Lieutenants J. D. Graham, Boyce, and Wragg.

Very respectfully submitted by your obedient servant.

JAS. GEDDES, *Civil Engineer.*

* The cost of a cubic yard of *such* masonry gathered from the opinions of builders in Georgetown.





VERTICAL CROSS SECTION OF THE POTOMAC RIVER JUST ABOVE
THE GEORGETOWN FERRY



References

- a. a. Bottom of the river
- b. b. Water line at low tide
- c. c. Water line at usual high tides
- d. d. Water line at highest freshets

Scale, 150 feet to 1 Inch

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