1872 Proposal by Clemens Herschel, Civ. Engr., to Dam the North River

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Original

July 1963

WILLIAM G. VINAL
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Norwell, Mass.

"Shingle" Dyke

NORTH RIVER

4th Cliff

To help interpret manuscript

In a U.S Coast Survey
Map (1870), Prof. B. Peirce, Supt
by H.L. Whiting asst by 4 students of M.I.T.
"Slanting Spar" refers to Sandpit SE of
4th Cliff, or a spar buoy with mast
above water, usually upright but in
this case slanting
Shingle dyke refers to
flat stones worn by water
to make a "Shingle Beach"

Rogers Wharf →

Slanting Spar

Old Mouth →

Scale 1/40,000

Civil Engineering in all its branches.
Iron and other Bridges and
Roofs, Hydraulic Engineering, Roads,
River and Harbor Improvements,
&c., &c.
Branch Office in Bartlett's Block.
JAMAICA PLAIN

OFFICE OF CLEMENS HERSCHEL,
CIVIL AND HYDRAULIC ENGINEER,
9 STATE STREET,

Boston, June 15 1872

To the Town of South Scituate,
Thomas J. Tolman and others, owners of
North River Marshes;

Gentlemen:

Agreeable to your instructions, I have devised plans for the drainage of North River marshes in conformity to the provisions of Chap. 287 Acts of 1871 and have made an estimate therefor and beg leave very briefly to report:

General Remarks and Data. The situation of the North River marshes is more than ordinarily favorable for their drainage and improvement.

Between Rogers Wharf, the location of the proposed dyke, and Waterman and Barstow's Ship Yard, there are about 2338. acres of marsh land, including islands, and about 815 acres of rivers and creeks at high-water mark.

The amount of fresh water to be supplied through the sluices was ascertained by measuring the outflow at North River Bridge and of every stream emptying into North River below this point, April 3d, 4th & 5th, 1872.

at a time when the snow was melting and the river and creeks were at what may be called ordinary spring high water.

Their sum total was found to be 256 cubic feet per second.

In the calculations, provision was made for discharging this quantity and besides an effective rain fall of 2 inches per 24 hours on about 3500 acres, which amounted to 291.5 cubic feet per second more, making a total capacity of discharge of 547. cubic feet per second, without raising the inside water level higher than about 2 feet 2 inches below the present marsh level.

These duties are evidently all that need be required of the proposed sluices.

Without the rain-fall, the inside water would not rise within about one foot of the above height, that is, only up to 3 feet 2 inches below marsh level and generally with an average flow of the river, the inside water level would be lower still.

In all these cases I have supposed a channel 40 feet wide to be dredged or dug through the bar at Blanting Spar, its bottom on a level 2½ feet above ocean low water; the sluices I propose however to place with their flooring on the

level of ocean low water, so that if for any reason it should ever be desirable to drain the marshes at a still lower level than is now contemplated, the improvement and dredging out of the river below Rogers Wharf will furnish a ready means for that purpose.

The required works may be enumerated as.

1.] the dyke and sluices at Rogers Wharf;
2.] digging a channel through the shoal at Slanting Spar;
3.] raising the natural dyke or shingle beach from Rogers Wharf to St. Cliff, and
4.] the dam at Waterman and Barstow's Ship Yard.

Dyke and Sluices at Rogers Wharf. } The proposed dyke and sluices are shown on the accompanying drawing.

There are to be three sluices, each 9 feet 7 inches wide by 7 and the centre one 8 feet high inside measurement.

The centre one is made 1 foot higher to enable small boats the more easily to pass through the sluices when the gates are open.

The dimensions of the timbers have been taken ample, so as to insure a greater degree of durability and safety for this work.

than is customary on structures of a less important character.

It is proposed to place the 3 sluices in what is now the deepest part of the river, about 220. feet off of Rogers Wharf and to build them inside of a temporary coffer-dam.

The drawings will probably explain themselves.

All iron work on the gates &c. to be galvanized.

At the inside end of the sluices there is to be an ordinary sliding gate to be raised or lowered by means of a windlass.

These gates to come into use to dam back the fresh water should it ever be desired to flood the meadows.

The dyke is to be formed of gravel taken from the adjoining hill.

The top of the dyke to be placed on a level 2½ feet higher than was reached by the storm-tide of April 16. 17 & 18. 1857, generally known as the "Minot's Storm", or about 8½ feet above marsh level.

The cross-section of the dyke to be as shown, flatter on the sea side than on the inside, being respectively 1 on 1½, 1 on 2, and 1 on 3, and 1 on 1½.

The top width abt. 6. feet.

These dimensions and levels should be the same at all times; care should be taken in the construction of the dyke to prevent settling, by wetting and rolling the materials as they are carted on, and if the dyke should nevertheless settle after finishing, the original height should be restored.

The river is about 360. feet wide off Rogers Wharf and about 800 feet more of low dyke will be required to meet the highland part of the shingle levee.

Digging a channel at Slauting Spar.

The required channel at Slauting Spar needs to be about 1000. feet long, 100 feet wide and average less than 1½ feet in depth to bring the bottom on grade 2½ feet above ocean low water.

It would perhaps be most advantageous to dig this channel last of all.

The natural dyke or shingle levee.

This barrier will form a part of the protection to the marshes no less important than that afforded by the dyke at Rogers Wharf.

Being exposed to the full force of the outside breakers, it must be higher than an inner or protected dyke.

I take the proper height for it, to be

that given by Prof. Mitchell of the U. S. Coast Survey, to wit. 14 feet above mean high water of the sea, or about 5½ feet higher than what I have taken for the top level of the dyke at Rogers Wharf.

Prof. Mitchell measured the elevation of the Shingle dyke between the 3d & 4th Cliffs, and I have levelled on that part of the shingle levee, lying between the 4th Cliff and Rogers Wharf.

Altogether about 5000. feet in length or one mile, will have to be raised about 2 feet on the average, to make this natural dyke nowhere less than 14 feet above mean high water of the sea.

There is this in favor of this part of the enterprize and of important advantage, that the natural tendency exprerienced for a great length of time, is to build up and lengthen this natural barrier.

Nature will favor any attempt at raising the same and work against any attempt to cut through or lower it.

I propose to raise the levee by a low embankment heaped up a little to the leeward of the highest part of the beach and of the shingle lying close by and should expect such an embankment to be increased

Dam at Waterman and Barstow's Ship Yard.

Chap. 287 Acts of 1871 provides that, "upon the closing of said (North) river with dam and flood-gates at Whites Ferry, said proprietors shall erect and maintain a dam or other suitable structure at or below a point formerly known as Waterman and Barstow's ship yard, and to construct the same in such manner that the water above said dam shall at no time be allowed to fall more than eight inches below the banks of the river above North River Bridge so long as the dam at Whites Ferry shall be maintained."

To effect all of this, I have designed an overflow dam or waste-weir 50 feet wide, whose top is to be about 1 foot 4 inches below the marsh level opposite the ship yard; on either side of this 50 feet space the dam is continued over the river and marsh tiel it strikes the upland. This part to be on a level about 1 foot 2 inches above that of the marsh.

At a summer low stage of the river, putting on 6 in flashboards will keep the water at the level prescribed in the act, while the removal or turning down of these flashboards at high water, which can be made to take place of itself by the increased pressure of

the water, will vent the high water run of the river without overflowing the rest of the dam. The dam is proposed to be a well built crib-work and stone dam, with hinged flash boards.

The low part over the marshes to be an embankment of gravel.

This structure increases the total cost, as will be seen in the estimates, by $2300. and it further increases the cost per acre of land benefitted, by diminishing the number of acres, so that without it the cost would be reduced to about nine (9) dollars per acre.

Estimates.

1.] Dyke and sluices at Rogers Wharf.

Earth-filling;	10500 cubyds	@ $ 0.40	4200.
Sheet piling:			
" " in coffer dam	61.5 M. B.M.		
" " sheet piling.	63.0 " "		
	124.5 " "	@ 30.00	3735
" " to drive.			
" " in coffer dam.	lineal ft. 616.0		
" " sheet piling.	" 700.0		
	1316.0	@ 1.25	1645.
			$ 9580.

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	1316.0	@ 1.25	1645.
			$ 9580.

Amount brought forward			$9580.
Puddling for coffer dam.	1186 cub. yds	@ 0.75	889.
Round piles	164 "	@ 5.00	820.
Sluice and gates:			
Timber, inclusive of 5% waste.	90 M^ft. B.M.	@ 35.00	3150.
Framing	" " "	" " 20.00	1800.
Iron bolts, straps, hinges &c.			1000.
Sowing dyke with grass seed	6000 □ yds	@ 0.10	600.
Pumping water,	30 days	@ $33⅓.	1000.
			18839.

2.] Channel at Blanting Span.

Excavation, ——	1933 cub. yds.		1000.

3.] Raising natural dyke on shingle beach.

Embankment:

Below 4^ft. Cliff,	2096 cub. yds		
Between 3^ft. and 4^ft. Cliffs,	300 " "		
	2396 " "	@ .30	718.

4.] Dam at

Waterman and Barlow's Ship yard. ——		2000.
Engineering and Superintendence, ——		1500.
		24057.
Add 15% for contingencies & omissions. —		3608.
		27665.

or about $11.83 per acre of marsh benefitted.

Finance. } A few words on the finances of the undertaking of draining the North River Marshes, though not coming strictly within the province of the Engineer, may not be considered out of place, when given for what they may be worth by one somewhat familiar with this part also of an enterprize of this kind.

Commissioners appointed by the Superior Court under Chap. 148 of the General Statutes, can raise for the expenses to be incurred by them in the prosecution of their duties, only so much money as parties having faith in the success of the undertaking and interested in its being carried out, will advance to them on security offered by a tax assessed and in default of payment of said tax, a tax title, on all the land benefitted.

At least so it has been held in one case where it was assumed that the Commissioners could not assess the tax, until the work was completed.

The fact of the improvement costing as much or more per acre as the land is now worth, need therefore deter no one from furthering the undertaking,

provided only the value of the land after it is benefitted be more than its original value added to this cost; if drained meadows are not worth $22. per acre, then the time has not yet come to do this work, but if it is worth more than $22. per acre and enough owners see this and are willing and ready to substantiate their ~~their~~ belief by advances of the funds necessary to bring about this increased value, then the improvement need wait no longer.

All of which is respectfully submitted.

Clemens Herschel
C.E.