REPORT

OF A

BOARD OF SURVEY,

AND

OPINIONS OF

MESSRS. GRAFF AND ERDMANN,

RELATIVE TO A PROPOSED ALTERATION OF THE PLAN ADOPTED BY COUNCILS FOR REBUILDING THE THIRD OR WESTERN SECTION OF THE FAIRMOUNT DAM.

PHILADELPHIA.
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1843.

REPORT.

To the Presidents and Members of Councils.

GENTLEMEN:—

Agreeably to the Resolution of Councils, recommitting the Report of the Watering Committee, with instructions to prepare a detailed statement of the facts in relation to the plan for rebuilding the western section of the Fairmount Dam, as proposed by Frederick Graff, Esq.,

Beg leave to submit the enclosed opinions of Messrs. Ellwood Morris, Alfred Dupont, William Strickland, and Benjamin Reeves, with the opinions of Messrs. Graff and Erdmann; also the following Resolution:

Resolved, That the plan for the rebuilding the third or western section of the Fairmount Dam be changed, and that the Watering Committee be, and they are hereby instructed to have said section rebuilt according to the plan and manner reported as above, by the Board of Survey, consisting of Messrs. Morris, Dupont, Strickland and Reeves.

JOHN P. WETHERILL, Chairman.
M. NEWKIRK,
HENRY C. CORBIT,
JAMES J. BOSWELL,
OWEN SHERIDAN,
HENRY F. RODNEY.

April 27, 1843.

TO THE WATERING COMMITTEE

OF PHILADELPHIA.

GENTLEMEN:—

THE COMMITTEE OF SURVEY, appointed by a resolution of the Watering Committee of Philadelphia, dated April 18, 1843, whose opinion was invited relative to "*a proposed alteration of the plan adopted by Councils for rebuilding the third or western section of the Fairmount Dam,*" REPORT THEREON, *as follows:*

That on Tuesday, the 25th of April, 1843, the undersigned proceeded to Fairmount with the Watering Committee; that having viewed the Dam in company with the committee, with Mr. Frederick Graff, the Superintendent of the Water Works, and with Mr. Frederick Erdmann, the Superintendent of the construction of the Dam; that having heard Mr. Graff in favour of the "*proposed alteration,*" and Mr. Erdmann in favour of *the present plan,* and having examined the drawings and documents submitted to them, they unanimously formed the following opinion, to wit:

I. That notwithstanding the success which last year attended the use of the coffer-dam of earth, under the skilful management of the Superintendent of construction, in rebuilding the eastern section of the Dam, it is, nevertheless, too bold an experiment in engineering, to be again repeated, *without the same necessity,* when the comfort of two hundred thousand people, and the safety of their property, depend so much upon its success, in shutting out a river like the Schuylkill, upon a line five hundred feet in length, and subjected—it may be—to a head of water of a dozen feet, or more.

II. That the "*proposed alteration*" in the plan of rebuilding the western section, now suggested by Mr. Graff, *ought to be adopted;* except, that the new dam should be placed eight or ten feet below the old dam, instead of three feet; this interval being carefully filled with good gravel puddling,

well placed against the sheet piling of the rear of the dam, which should be every where closely scribed to the rock bottom, in two rows.

By Mr. Graff's plan of proceeding, instead of re-constructing the present old dam from its base up, and fencing out the river during the progress of the work, as heretofore, by means of a coffer-dam of earth, planked and walled, at considerable expense, and yet liable to be washed away, if a leak should take place through it, or if it should be overtopped by a freshet, in which event, (the old dam being removed) the river would immediately occupy the western section, sweep every thing before it down to the solid rock, and render a very heavy outlay necessary to recover the ground lost; whilst in the mean while, the water service of the City would be cut off, and the navigation suspended—it might be—for months: instead, we say, of acting upon this perilous plan, Mr. Graff's proposition is to build a new dam, below the present one, which last, by a temporary addition to its height, may be made to shut off the body of the river from the site of the new work, and no part, or but a small part, of the old dam need be removed when the new one is finished; but it may remain, to be used hereafter for the same purpose.

For being constantly submerged, by the backwater of the new dam in front, the main part of the present dam will be preserved from further decay, and remain as it were, a permanent coffer-dam; for at a small expense it may be used as such, in future time, when repairs like the present shall again be required.

The advantages offered by this course have been experienced by one of the undersigned, in renewing dams upon the Brandywine, and its propriety is enforced by experience elsewhere, as well as in the next dam upon the Schuylkill, above Fairmount, where the new work was built in front of the old one.

III. That sufficient data was not before them, to enable an accurate estimate to be made of the relative cost of re-constructing the western section, upon the two plans in question; but inasmuch as the level of the rock at the proposed site of the new dam has been represented to us as being three feet, or

more, above the river surface at low tide; and it being further stated that the rock bottom dips *northward*, and consequently the average height of the new dam will be less than that of the old one; we entertain the belief, that notwithstanding some difficulties in drainage may be anticipated, owing to the dip of the rock up stream, which will bring the skill of the Superintendent into play, *still the "proposed alteration" of the plan adopted by Councils, promises to be less expensive than the execution of that plan;* but even were it more so, within reasonable limits, we conceive that its superior security would justify a greater outlay, though we have no reason to expect that such will be required.

IV. That occupying the river by a new structure, for a width of thirty feet, parallel to the present dam, will not affect the rise or action of the water along the western shore below the dam, in a perceptible manner.

V. That the "*proposed alteration*" will require a less time in construction than the present plan, or at the most, need not require a longer period.

In conclusion, we have to regret, that indisposition upon the part of Mr. Mifflin, (our remaining colleague) prevented his attendance, and deprived us of his aid in our deliberations.

All which is respectfully submitted.

ELLWOOD MORRIS,
ALFRED DUPONT,
WILLIAM STRICKLAND,
BENJAMIN REEVES.

Philadelphia, April 26th, 1843.

Office, Cherry Street, April 10, 1843.

JOHN P. WETHERILL, ESQ.,
Chairman of the Watering Committee.

DEAR SIR:—

Indisposition prevented me from attending the meeting of the committee on Wednesday, 5th of April. I instructed

my son to hand you the plan designed by me last year, for building the remainder of the dam on the rock bottom above low tide, in front of the old one, a distance of 530 feet in length.

By this alteration from the original plan of running straight across the river, all the delay in building a coffer dam 433 feet long, the danger of its being carried away by freshets, and a saving of at least $5000 will be effected; independently of which, the structure proposed can be completed in nearly the time that would be required to build the coffer dam.

In the report of Mr. Erdmann on the dam laid before Councils in January last, the following is contained:

"The portion of the dam finished, embraces all the difficult and most expensive part of the whole work, owing mainly to having its foundation at low water line. Great delay in the progress of this part of the work has been experienced, in consequence of the limited period of time allowed to work at each tide—in removing the old dam, as well as in laying the foundation for the new superstructure. This delay will not however be experienced in the section of the dam yet to be removed; the foundation of which is between three and four feet above low water, thereby allowing about eight hours for work during each tide, in place of from one to two, as was the case in the sections finished."

The above explanation of the remainder of the dam to be constructed being on the average less than eight feet high and to be built three to four feet above low water, in my opinion is conclusive that a coffer dam is not required.

In another part of the same report it is stated:

"The return section uniting with the western abutment will require no other protection than a slight water break when at common height, (I suppose common height of the river is meant,) as the old dam on that section will remain until the new superstructure is ready for backing. It will be seen, that

by this arrangement a large amount will be saved, at least 20 per cent upon the cost of labouring work and delay in time avoided, which would be caused by dividing the distance; (which I presume means—making the coffer dam in two sections of 216 feet 6 inches each, in place of one dam as proposed of 433 feet.")

I am here at a loss to know why the whole length of the dam to be constructed this year, 530 feet, cannot be built on the plan proposed for the return section, by the arrangement of "*a slight water break*," and thus save the whole expense of a coffer dam! The whole length can be built in sections as well as the return section referred to above—the danger by freshets not being greater in one case than in the other!

I will here annex a part of a report made by Messrs. Josiah White and Daniel Groves, Esqrs., to the Watering Committee on this subject, dated 7th month, 5th day, 1842, as follows:

"The expediency of removing an old dam for the sake of occupying its foundation with a new one—when both are on the same naked rock in low water, and have half the whole dam exposed to floods during all the time, depending on the faithfulness with which the coffer dam is made, for the security of a city like ours, is beyond our comprehension. We feel no apprehension from any inconvenience to the navigation by putting the new dam in front of the old one."

To this I take leave to give the opinion of Joshua Lippincott, Esq., while President of the Schuylkill Navigation Company, who approved of the plan proposed of building a new dam in front of the old one on the rock bottom, which he said was not only preferable as to economy in its construction, but that it could be built without danger from freshets, and would also be more perfect by the old dam remaining as a barrier behind it.

Under all these considerations I am of opinion that the plan proposed will expedite the completion of the work.

The danger of coffer dams being carried away will be avoided—the expense of building them will be saved—whilst the old structure (like that at Flat Rock) will remain as a safe and lasting barrier to the new one.

Mr. Erdmann's estimate for coffer daming and finishing the work (as per report) is $14,793 00

My estimate for building a new dam in front of the old one, and for finishing the work, is $10,308 00

Making a saving of at least $4,484 00

Very Respectfully,
Your obedient servant,
FREDERICK GRAFF.

Mr. Erdmann's estimate for finishing the Dam,		$14,793 00
Frederick Graff's estimate the same as Mr. Erdmann's, with the exception of the coffer-dam, viz:		
23,200 feet of timber, at 5¼ cents, .	$1218 00	
530 feet of plank, at $1 56, . .	826 80	
530 feet of coffer-dam, not wanted,		
In lieu of which, for cutting down old dam, paving, &c., at $10, . .	5300 00	
10,000 feet of 2 inch plank, at $21, .	210 00	
3,000 feet of rough plank, at $15, .	45 00	
4½ tons of iron, at $80, . . .	360 00	
N. B. 9. 6. 0. 14. of iron was used in 1842.		
1,500 lbs. of spikes, at 6½ cents, .	97 50	
1,600 lbs. of cut spikes, at 5½ cents, .	88 88	
Smith's work, ...	300 00	
Salary, ...	1000 00	
	$9446 18	
Add, stone for new dam, extra.		
530 feet long, 18 wide, 6 high. } 2,300 perches; from which deduct for timber, 575, leaves to be procured 1725 perches, at 50 cts.,	862 50	
		10,308 68
Saving, . .		4484 32

Independent of which, the dam proposed can be finished in nearly the same time that would be required in building the coffer-dam, and removing the old one—whilst, if the base of the old dam is allowed to stand, it will be almost equal in strength to a double dam, (similar to the work at Flat Rock.)

When the new dam is finished, the surplus of stone that will remain on the safety bank, can either be sold, or removed as extra backing in deep water on the upper side of structure.

With great respect,

FREDERICK GRAFF.

March 6, 1843.

Philadelphia, April 25th, 1843.

To the Committee of Survey appointed by the Watering Committee.

GENTLEMEN:—

Being in charge of the rebuilding of the dam at Fairmount, and understanding by a note received on the 20th inst. from Register of the Watering Committee, that a Committee of Survey were to meet at the dam of Fairmount, to examine a Plan proposed for altering or changing the location of the western section of the dam at that place; and not having had an opportunity of seeing the proposed plan, or any specification of it, I deem it my duty, as superintendent of said work to guard its operations from any alterations which may have any bad effect on the interests of the city, and therefore take the liberty of addressing you on that subject. As I am led to believe the plan in question is the same that was proposed in June last, I will briefly give a few of the many objections, in my opinion, which exists to it, and refer you to the printed reports of 1839, 40, and 41, which will show the opinion of all gentlemen concerned, up to June 1842, at which time the plan above alluded to, was laid before the Watering Committee, acted upon and *rejected.*

The objections against this plan still exist, and the annexed report contains those objections made by me at that time.

The principal ground for the proposed alteration, at that time, was that danger was apprehended in the coffer dams; this, I

think, cannot be the case at the present time, as it was abundantly shown during the last season, over the deep part of the river; and the report on the close of the work will clearly show that the whole will be completed for some five to six thousand dollars within the appropriation.

The only grounds for proposing the alteration is, that it is supposed it will cost less money; this, I think doubtful, when all matters concerned, are taken into consideration. As there must be a coffer-dam constructed where the connexion is made with the main line of the dam. Another in front to include the basins formed by the rocks and old dam, in order to pump out the water. As this could not be done during one tide, the dam therefore must be made high enough to stop out the whole before they could be cleared of the water, which must be done before the foundation timbers could be properly laid in them, or the sheet planking fitted to the rocks.

In the construction of this dam, it will be necessary to cut through the old superstructure, and unite it with the present backing, otherwise the stone filling would permit the water to draw in and out at every ebb and flow of the tide.

In the dam, at the angle, it would again require the superstructure to be cut out to the rocks, that the backing may be puddled around the angle, and also to continue the sheet planking. This dam would be over one hundred feet long, which must be kept open during the whole progress of that section.

Taking these matters in connexion with the amount of new material required for backing and filling, it will be found they must overrun the cost of the present operations.

Another objection is, that an angle must be formed down stream. I would not be understood to say that, that angle could not be made strong enough; but the action of the water, and the pressure of the backing, would be acting upon it in the same manner as an arch being pressed upwards.

Another objection is, that I conceive the space between the dam and canal embankment too small to admit of further contraction, which must be the case, should the alteration be adopted.

A further objection is, that should future Councils deem it adviseable to erect a dam of more durable materials, the pro-

posed alteration would debar them from doing so, without first removing the part projecting beyond the present line of the face; these objections, in connection with destroying the beauty of the present line would in my opinion, be sufficient reason to set aside the uncalled for alteration.

I am, gentlemen, your's respectfully,

F. ERDMANN.

Philadelphia, June 21, 1842.

To the Chairman and Members of the Watering Committee.

GENTLEMEN:—

In compliance with your request that I should give an opinion in relation to the proposed alteration in the plan of renewing the dam at Fairmount, I beg leave to say,

The plan recently proposed was, in our survey of the dam last year, proposed by Mr. Towers, and after a full examination of the subject was rejected for the following reasons: 1st. The space being too small, in our opinion, to admit of further contraction at the western end of the dam, between that and the canal wall. 2nd. The difficulty and expense of founding a new eastern abutment. 3rd. The improbability of being able to settle cribs upon the loose stone sufficiently firm without clearing a birth for them. These were considered at the time sufficient reasons for determining upon and adopting the plan we are now pursuing, since which there has been no occurrence which could or should make an alteration necessary. The cost of the coffer dam already constructed is within the estimated amount, both as to time and money. And if it is not considered safe for a temporary purpose during the summer freshets, I would ask how the mound dam could be considered a permanent part of the works which is made of the same material and with no greater care.

In the proposed plan of building an additional dam in front of the old one, you would contract the space between the angle of the dam and the canal wall at least 30 feet which is now but 92 feet across, and is too small a space to vent the water, and

consequently banks the water over the canal banks during a high freshet.

In the new construction you will have to lay new foundation timbers in the hollows of the rocks which are always filled with water, (and some deep) the old foundation consequently remains perfectly sound and as good as any new work we can put in them.

In case of constructing the new dam an entire new filling of stone would be required, together with a new backing and an additional quantity of timber work below water; further, it was considered when the dam was originally constructed that 40 to 50 feet was a necessary width of base in the deep water. They have stood the test of upwards of twenty years. They were also sunk at a time when there were no impediments over the rocks but a mud covering and admitted of correct soundings being taken. The case is now widely different, and I doubt the practicability of sinking cribs upon the loose stone which is now in front of the dam, firm enough to retain their position in a line should the new dam be adopted.

In the event of sinking new cribs they should not be less then 40 feet up and down stream, and the backing not less than 15 to 16 feet wide; this would bring the new cribs 55 to 56 feet below the face of the present dam at the eastern side of the river. It is a settled matter in dam building that the base should be greater than the height to insure permanency which would not be the case were the base of the new cribs made 25 feet as is proposed—further, the old dam being open in front below water, it would be difficult to back it full, and until it was so it could not be made tight. This would also allow the backing to settle for a considerable time. I would further state that the loose stone on the bottom would act as an under drain, and unless removed the dam could not be made tight by backing between the old and new dams.

In the new construction the whole of the backing now on the old dam would be lost in effect, and might as well be 100 feet up stream as where it is. This backing is of the best quality, being composed of quarry dirt, and should be saved, if possible, as it cannot be replaced at this time.

The additional quantity of materials required in the new construction in placing the dam, say 30 feet from the old front at the west side, and 55 feet on the east side of the river, running east from the angle, and connecting in the present coffer dam with the old dam.

8924 perches of stone at 50 cents per perch,	$4,462 00
10,229 cubic yds. backing at 40 cts. per yd.	4,091 06
9600 feet timber work at 18 cts. per foot,	1,728 00
Making together,	$10,281 60

The plan on which we are now working, I presume is sufficiently understood, and does not require further explanation. From the progress made already in the work, I feel satisfied we shall complete the two sections, as was anticipated, by the middle or last of October, and secure for the winter.

From the soundings taken of the backing above the dam, I find we have all the materials in the old backing necessary for forming the coffer dams out to the angle, with the exception of the amount of stone and earth necessary for breaking off the water as in the present dam. In making the dam now in use, ten days of the time was expended in backing the old wharf pier, which I was not permitted to remove, and consequently had to fill in a depth of water from 10 to 12 feet deep, on the angle of the old bank. This of course would not be the case in the second coffer dam.

The soundings above referred to were taken correctly in 4 ranges and parellel with the ridge of the dam—No. 1 being 30 feet from the ridge—No. 2 being 40 feet—No. 3 being 50 feet, and No. 4 being 60 feet from the same line; making 4th sounding 70 feet from the face of the dam.

The following are the average of each line in depth from the surface of the water, it being 6 inches on the dam at the time. No. 1 being 30 feet from the ridge.

No. 1.	No. 2.	No. 3.	No. 4.
1 ft. 8¼ in.	2 ft. 3½ in.	6 ft. 3 in.	10 ft. 11½ in.

In our next we shall not require our dam so far up stream, as we shall meet the rock above low water, and can deposite all surplus stone on them in front of the dam, consequently

the breaking off the water can be done nearer the ridge of the dam, and will not require so much material. The rough diagram of the sections shows each sounding as they were taken. The first at the angle on the west side, thence eastward the distance to the coffer dam of 751 feet, which was divided into sixteen equal parts as near as circumstances would admit of, the distance up and down stream being correctly measured.

The amount of materials required to break off the water, will be as follows, taking the mode of calculation as in the materials for front additional dam.

980 cubic yds. gravel at 40 cents,	$392 00
400 perches of stone at 50 cents,	200 00
	$592 00

I would further beg leave to remark that the location of the old dam I conceive to be a good one, and should not be altered without some cause—if it were found, upon experience, to be too far from the canal, I should say, build one in front of it, and place the new one in the right place. We know what the effect of freshets are on the present dam, but we cannot say what they may be when altered, and when once done it does not admit of a remedy.

I submit the above with great respect,

F. ERDMANN.

Philadelphia, April 27th, 1843.

To the Chairman and Members of the Watering Committee.

GENTLEMEN:—

Permit me to express to you my views in relation to the proposed alteration of the plan of rebuilding the remaining portion of the dam at Fairmount; also, my opinion as to the plan pursued up to the close of our last season's work.

I beg leave here to say, that in forming the plan heretofore pursued, all the time and consideration that was due to so important a subject was devoted to it. It was also canvassed and deliberately examined by the gentlemen of the Watering Committee of 1841, before its adoption, submitted by that Com-

mittee to the City Councils, backed by the recommendation of Frederick Graff, Esq., superintendent of the works. With this strong recommendation, Councils adopted the plan proposed, and having confidence in the ability of the gentlemen composing that Committee, placed in their hands the duty of carrying it into effect. That committee engaged my services to carry out and complete the rebuilding of the dam on the plan recommended by me as the best, and adopted by Councils, after the recommendation of myself and others.

With full confidence in the plan, and also in the superintendent of its construction, whom they had appointed, as well as with the entire approbation of the superintendent of the water department, the Committee, at a proper season, directed the work to be commenced. With a full knowledge of the manner in which the coffer-dams were to be constructed, and a full explanation of the manner of proceeding with the work, there were no doubts expressed at the time, either on the part of the gentlemen of the Committee or on that of Mr. Graff, as to the practicability of accomplishing the object in view, with the most perfect safety: And here I beg leave to state that in the progress of the work, the plan adopted, has been strictly adhered to.

The work proceeded through all the different stages of water in the river, during the period from the second of May, 1842, to the close of the season, at which time, a larger amount of work had been performed than was anticipated, and in a manner highly satisfactory to all parties concerned, and to the public at large; and permit me here to remark as an evidence, that the public have not expressed any dissatisfaction with it, nor have Councils or the Committee expressed any dissatisfaction with the plan or its execution; nor have your Committee intimated any doubt of the competency of your superintendent of construction to execute the work in the manner proposed. Permit me, then, to ask where is the necessity of making an alteration in the plan of the work which has proved so entirely successful in every point of view? Where, I would ask, are the grounds for fear, in performing a less difficult task than has already been accomplished during the past season. I have not heard any of the gentlemen of Councils, or of the Com-

mittee express any fear of the safety of those coffer-dams. If there be fears, they must be in the minds of those who have but little knowledge of the subject, or who, from some cause, see things through a false medium, and discover danger where none actually exists. With this view of the matter, as superintendent of the work, and with due respect to the gentlemen under whom I have the honour to act, I take the liberty here to present my decided and deliberate objections to the proposed alteration in the plan of finishing the work at the Fairmount dam; and also my dissent from the decision of the Board of survey, made on the 25th inst., and offer the following reasons for so doing :—

1st. That the gentlemen composing that Board have not had sufficient opportunity afforded them, to examine fully into the nature of the plan in question.

2d. That the time devoted to the consideration of the subject, was too short for them to take fully into view all matters connected with the subject.

3d. That the grounds of fear expressed, and of danger to be apprehended in our coffer-dams are wholly without foundation, and arise from want of knowledge of their construction, and of an opportunity of estimating their capability.

4th. That the Board of Examiners are unacquainted with the action of high freshets in that particular situation.

5th. That the plan of the proposed alteration, recommended and exhibited, is entirely defective, and cannot be carried into effect, as is proposed, without incurring more risk by leaving the work more exposed than in the plan heretofore pursued.

6th. That the plan proposed, properly estimated, will cost more money than is represented.

And I respectfully appeal to the unbiassed judgment of the gentlemen of the Committee who, I conceive, are eminently better qualified to judge in this matter, as they have had a daily inspection of the whole progress of the work, and consequently are better able to set a proper estimate on the strength of the dams alluded to.

I am, gentlemen, your's &c.

F. ERDMANN.