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PARLIAMENT OF TASMANIA.

ENTRANCE TO MERSEY RIVER (DEVONPORT):

REPORT BY C. NAPIER BELL, M. INST. C.E.

Presented to both Houses of Parliament by His Excellency's Command.

REPORT ON ENTRANCE TO MERSEY RIVER (DEVONPORT).

By C. Napier Bell, *M. Inst. C.E.*

April, 1890.

Sir,

Acting under your instructions, I have inspected the Port of Devonport and the mouth of the Mersey, and I find that some work has been done in dredging the bar on the lines laid down by me in my Report in 1882. By sections and soundings taken in September, 1889, it appears that a considerable quantity of sand has been removed from the inner part of the bar, but the shallowest part being untouched, there is as yet no useful result to the navigation of it. The dredging has been done by a Priestman dredge, which has worked about 18 months at it, and is said to have removed 36,000 cubic yards. From the manner of working this dredge in more or less isolated patches, I should think it is probable that much of what it has done is again silted up.

I do not consider a Priestman dredge to be the most suitable for this work; and the Marine Board having arranged to hire a powerful bucket-dredge, I shall expect much better results from its working. This dredge, working with the *Agnew* as a hopper-barge, will raise about 600 cubic yards per day at a cost of eleven pence, and the average working days per month will be about 18. At this rate the bar would be dredged to a depth of 10 feet at low water in 16 months, and to 15 feet deep in about 32 months, always supposing there was no silting up again in the dredged channel.

In the dredging operations, the material of which the bar is composed has been thoroughly tested, and is found to consist of, first, a top crust 18 inches to 2 feet thick of stones from 6 inches in diameter and less, more or less encrusted together; in places there are patches on the surface of thin slabs of cemented sand and gravel. Below this crust the deposit consists of small gravel, and deeper down of very small gravel the size of peas. The other parts of the bar contain more sand with very fine gravel, and in places there are beds of soft white sand.

I am of opinion that it would be advisable to dredge off the top crust of stones to the width of 400 feet before submitting the bar to any artificial scouring, which, if the stones were not removed from the full width, would have the effect of dropping the boulders to the bottom of the new channel, where they would pave the bottom as they do now. After this top crust is removed the bar may then be dredged to the intended depth, and to the width of 300 feet on the space coloured pink in the plan submitted herewith.

In dredging with a ladder-dredge care must be taken that the waves are not so high as to cause motion of rolling or pitching in the dredger, which would be likely to damage the ladder of buckets, and this necessary precaution it is which will restrict the working days to about 18 in the month as mentioned above.

It is not possible for me to say whether the channel dredged through the bar will maintain its depth without the aid of the training walls; but as the depth of the bar will be both increased and maintained by the effect of the training wall, I consider that it is at least the safest plan to carry out the construction of the east breakwater at the same time as the dredging.

In the plan submitted herewith I have shown the works which I propose for the general improvement of the port in the future, as desired by the Chairman of the Marine Board in his letter to me. The plan shows the east breakwater slightly altered in position from that marked in my former report. It shows also a training wall on the west side of the bar, which should be built if the current caused by the east breakwater should prove too sluggish for the depth of water which it is now desired to establish, that is, 15 feet at low water spring tide.

These walls should be built on a mound of rubble stone tipped from trucks, and the height above high water at which it will be necessary to build them will be entirely regulated by the safe height above the waves at which the roadway on top can be maintained. The size of stones to be placed on the slopes to secure them from the violence of waves will vary with the exposure, and will be best ascertained from experience as the work is carried out; but where the mounds extend beyond the sand into deep water, rocks of one to ten tons will be necessary to save the slopes from being flattened down by the waves in storms. The training walls inside the river can be constructed of small stones, and need not be higher than half tide level, which is quite effectual for the object required in training the currents.

I found that there was much difference of opinion regarding the Mussel Rock; and giving due consideration to all that I heard on the subject from the Harbour Master, I conclude that to remove it would rather increase the difficulty in navigation which is experienced at present, and I propose to train the current at this bend to a regular curve of large radius by a training wall of rubble stone raised to high-water mark, as shown on the plan. At the same time the opposite point should be dredged to the limit shown on plan, thus leaving a clear channel with a width at the bottom of 250 feet. This will quite remove the difficulty at present caused by the Mussel Rock. The training wall is shown to start from the outer end of the rock, and with a curving of 2000 feet radius will cut off a part of the deep bay below the rock, and end at the shore in a tangent to the line of channel to be dredged over the bar.

This training wall must be carefully set out so that the foot of its slopes shall not encroach on the intended line of the channel.

The training walls shewn inside the river are intended to confine the tide currents and guide their direction towards the proposed wharves so as to maintain the depth by their scouring action.

It will be seen that the wharfage accommodation provided is extensive, and I consider ample for any development of the trade that may be expected; there is also 700 feet of wharf provided for East Devonport, in a position where there is good depth of water, which will be maintained by the intended training walls.

The opening into the sea between the ends of the breakwater should be 800 feet, measured at high-water mark, but, as said above, for the present only the east breakwater should be constructed, and the west one not until the necessity for it becomes apparent.

Respecting the proper position for a bridge to connect East and West Devonport, I cannot undertake to say where it would be most convenient for traffic, or where it would best connect with the Railway, if a Railway and Traffic bridge combined is intended; but, as far as regards the convenience of the port and the shipping, if the bridge were placed close to and on the down river side of the quarry, it would be quite out of the way as regards the navigation of the port: but in building the bridge care should be taken to obstruct the waterway of the river channel as little as possible

The plan shows several spaces in the port where dredging will be necessary for the convenience of the shipping and to improve the waterway; no dredged material should be deposited in the area covered by the tides, as the depth on the bar depends on the capacity of the space which is filled by the tides, the daily filling and discharging of which regulates the force of the scouring action which maintains the depth of the entrance against the action of the sea, always tending to form a continuous beach.

The deepening of the bar will have the effect of increasing the range of the tide within the estuary above Whirlpool Reach, so that the channels leading to Latrobe will be deeper at high water and shallower at low water than they are at present, and any dredging that may be done in the shallow channels of this estuary will similarly have the effect of increasing the tidal range, and this of course will have a corresponding beneficial effect on the bar from the increased quantity of water going in and out over it.

I estimate the approximate cost of the works included in the plan as follows:—

	£
Total stone-work in walls	38,332
Total dredging to 15 feet below low water, 439,000 cubic yards	20,120
Total wharves	31,806
Reclaiming land from dredgings	4482
Cost of plant after re-sale	8000
	£102,740

This expenditure being spread over several years, or deferred altogether for several years, the expenditure required at present would be confined to the dredging of the channel to 10 feet, the east

breakwater, the training wall at the Mussel Rock, and the east training wall, the approximate of cost for which would be—

	£
East breakwater, east training wall, and Mussel Rock training wall	23,250
Dredging channel to 10 feet, 175,000 cubic yards.....	8020
Cost of plant after re-sale	7000
	£38,270

The only quarry I have seen which appears suitable for the rock required for the east breakwater is that near the Whirlpool Reach, and this requires a railway of over a mile and a half to reach it, the line being laid along the river bank just above high water. Care must be taken in quarrying the stone so as to secure rock of large size; and for this purpose tunnels should be driven into the rock at a low level, and in cross drives at the end of it. Dynamite or powder should be placed in chambers, which may be best fired by *instantaneous fuse* laid in wooden boxes, the explosive being also placed in boxes to keep it dry.

In the estimate of plant I have included one small locomotive engine, three cranes of ten tons or over, or one ten ton and two seven-ton cranes would do as well; also for 18 stone trucks, the end-tip trucks to carry 8 to 10 tons, and the side-tip 15 tons of stone, and it is quite likely that this plant may be procured secondhand from works of the kind which are finished elsewhere.

There does not appear to be any reliable plan of the Port of Devonport, and I found several errors in the one I had to use. I would therefore urge the necessity of making a careful survey of both banks of the harbour from the Heads to Whirlpool Reach, showing on it the railway, the wharves, jetties, adjacent buildings; and on this new plan the soundings, as shown on Captain Stanley's plan, should be transferred; then on the new plan the intended works can be laid down. A scale of 200 feet to the inch would be sufficiently large.

I have the honor to be,
Sir,
Your obedient Servant,

C. NAPIER BELL, *M. Inst. C.E.*

The Hon. the Minister of Lands and Works.

WILLIAM THOMAS STRUTT,
GOVERNMENT PRINTER, TASMANIA.

RIVER MERSEY

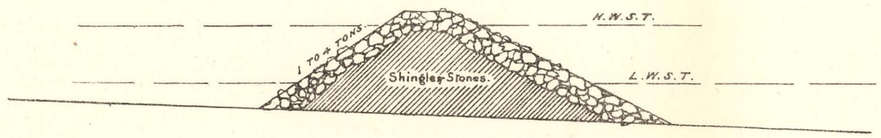
IMPROVEMENTS TO ENTRANCE

Plan attached to Mr. Napier Bell's Report April 1890.

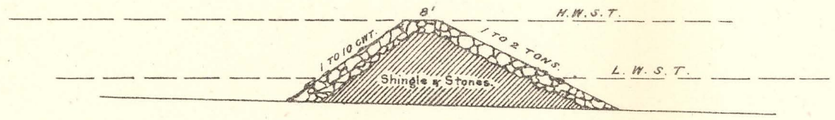
SCALE.

10 5 0 40 30 20 10 0 50 100 Feet.

WEST WALL FROM SEC: D, TO END, 500 FT.

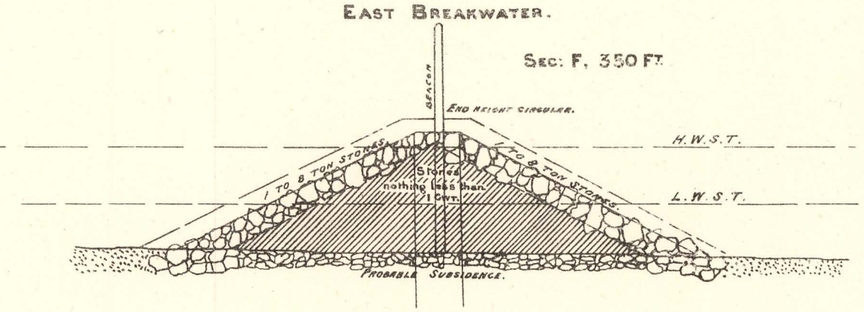


WEST WALL SHORE TO SEC: D, 1450 FT.

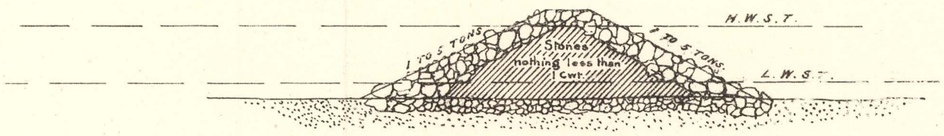


EAST BREAKWATER.

SEC: F, 350 FT.

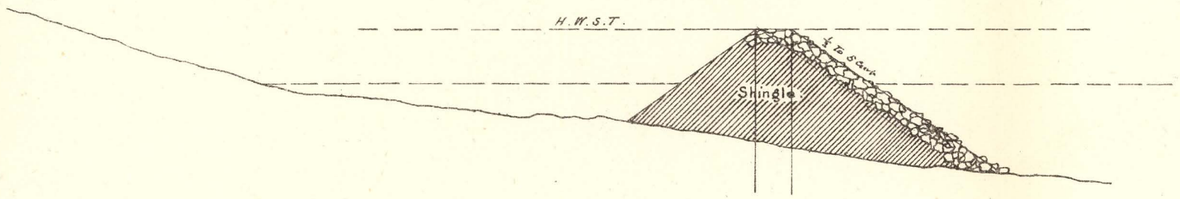


SEC: G, 900 FT.

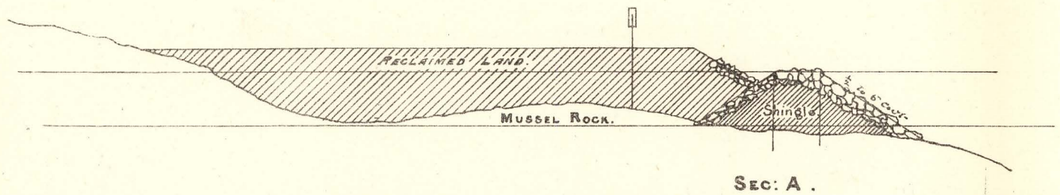


TRAINING WALL, 1050 FT.

SEC: C.

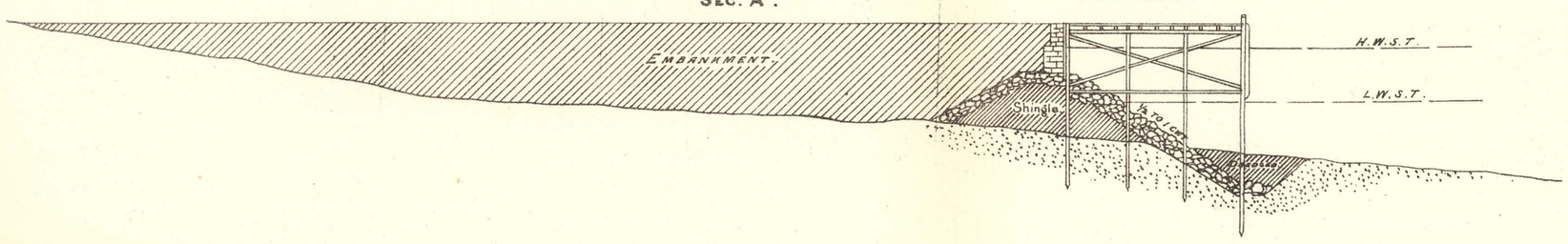


SEC: B.



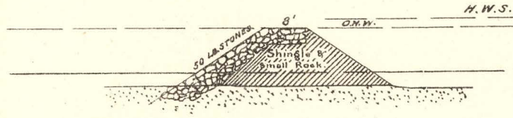
SEC: A.

NEW WHARF.

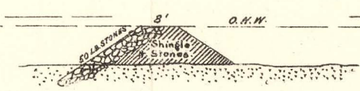


SEC: H, 1350 FT.

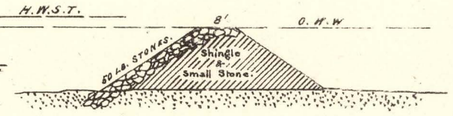
SEC: J, 750 FT.



SEC: K, 1100 FT.



SEC: L, 1200 FT.



A. Napier Bell M. Inst. C.E.

MOUTH
OF THE
RIVER MERSEY
Surveyed by
STAFF COMMANDER H.J. STANLEY R.N. 1884.
SHEWING PROPOSED IMPROVEMENTS.
SOUNDINGS IN FEET AND INCHES
Reduced to Low Water Springtides.
Expresses solid rock
Expresses Shingle or water worn stones
Sand.
100. 200. 300. 400. 500. 600. 700. 800. 900. 1000. SCALE. 1500 2000 2503 ft.
Plan attached to Mr C. Napier Bell's Report 1890.
LONGt SECTIONS.
EAST BREAKWATER
Horizontal Scale 200 Ft to 1 inch. Vertical Scale 40 Ft to 1 inch
Sec. F
Sec. H
WEST TRAINING WALL
Sec. D
High Water
Low Water
EAST TRAINING WALL
Sec. J
Sec. K
High Water
Low Water
MUSSEL ROCK WALL
High Water
Low Water
Sec. C
Sec. B
Reclaimed Land
Sand Flat
gradually uncovering with fall of tide
LIGHT
Sec. F.
EAST BREAKWATER
Sec. G.
Sec. H.
Breakers
Sec. E.
LIGHT
Sec. D.
WEST TRAINING WALL
Sec. J.
EAST TRAINING WALL
Sec. K.
TORQUAY.
Stewart's Mill
Slip
Sec. L.
HALF TIDE TRAINING WALL
DREDGED 10 FT. L.W.
DREDGED TO 10 FT AT L.W.
Edge of Slope
THIS LAND TO BE REQUIRED BY M. BOARD.
420 FT.
WHARF 1100 FT. BERTHAGE
TURN-TABLE
MARINE BOARD OFFICE
WHARF 800 FT.
Custom House
STA. RYS.
FORMBY STATION.
LINE OF WHARVES 960 FT.
Queen's Warehouse
Buffer Stop
Engine Shed
RECLAIMED LAND
Extension Center Line
Sec. A.
BEACON
Sec. B.
Sec. C.
MUSSEL ROCK
FORMBY.
Gum forest and Scrub
Flat Country
Gum Forest
with patches of ti-tree.