



### The BAR IMPROVEMENTS TURNED DOWN.

By the Board of Engineers-- Present Commerce Does not Justify the Expenditure.

\$855 789 FOR 15ft. CHANNEL.

### Tillamook Too Near the Columbia River for a Second Harbor of General Interest.

We have received the reports of the engineers in regard to the improvement of Tillamook bar, and it is disappointing because the board of engineers turns down the whole project under the old worn out chestnut that the present commerce does not justify the expenditure of so large amount of money, and for the further reason that Tillamook is too near the Columbia river for a second harbor of general interest. It is a queer kind of logic that the engineers resort to when they correctly admit that there is tributary to Tillamook bay 15,120,000,000 feet of standing timber and a rich dairy country, and then fall back on the present amount of commerce to turn the project down. That amount of undeveloped resources is the proper way to look at the situation, and that does justify the expenditure, and it is along that line that the Oregon delegation should rip the Board of Engineers up the back for making such an inconsistent report and turning the project down without making a personal inspection and reporting the exact situation, viz., that the unsatisfactory condition of Tillamook bar does not warrant the expenditure of any more money for new industries to increase the commerce of Tillamook bay.

Whether Senator Fulton succeeds in getting the \$500,000 he has asked to be inserted in the civil sundry bill remains to be seen, and should that also meet a like fate the lumber manufacturers will remain stagnant and closed down until such time as the Board of Engineers can report the situation correctly.

The reports are given below in full for the benefit of our readers:

United States Engineer Office, Portland, Ore.

April 13, 1903.

General: In compliance with the intent of the river and harbor act of June 13, 1902, I have the honor to submit the following project, with estimate of cost of securing channels across the bar at the mouth of Tillamook Bay, Oregon, of 15 and 20 feet, respectively. The wording of the act is as follows:

Improving Tillamook Bay and Bar, Oregon: Completing improvement, twenty-seven thousand dollars; and the Secretary of War is authorized and directed to cause to be made a survey and an estimate of the cost of securing channels across said bar of fifteen and twenty feet in depth, respectively.

This survey for the new project was authorized under date of July 17, 1902, and was made in September, October, 1902. A tracing showing its results accompanies this report.

General description—Tillamook Bay, on the Oregon coast, empties into the Pacific Ocean about 50 miles south of the mouth of the Columbia River. The tidal area of the bay is about 13 1/4 square miles, the greater part of which at low tide presents a succession of low sand and mud flats traversed by four principal channels, which, although of fair depth near the entrance, gradually shoal toward the head of the bay.

Four small rivers or streams are tributary to the bay, viz., the Miami, Kilchis, Wilson and Trask, all of which come from the north and east. The amount of water flowing from these streams, however, is insignificant in comparison with the tidal discharge of the bay. The mean range of tide is 6.3 feet and the average rise of high water above the plane of reference is 7 1/2 feet. The bay connects with the ocean through a gorge 750 feet wide at low tide, with a maximum low-water depth of 60 feet.

The southern termination of a moderately high wooded ridge forms the north side of the entrance, a spur of which about 420 feet high, known as Green Hill, covered with fern and brush, lies immediately north of the gorge.

The entrance is bounded on the south by a low lying, sandy peninsula called Kincheleo Point, 4 miles long by from one-tenth to one-half mile wide at high tide. This peninsula is bordered on the sea side by a broad, low-water sand beach, backed by a ridge of sand dunes. It supports a scanty growth of grass and scrub pines.

The approaches to the bay are free from rocks or other hidden dangers. Cape Mears, on which the Government maintains a first-order light-house, lies about 5 miles south of the entrance, and the Nehalem River empties into the ocean 8 miles to the north.

At about 1 1/2 miles from the beach line at the mouth of the bay the ocean depth is from 15 to 16 fathoms. The crest of the ocean bar is situated about three-fourths of a mile from the general shore line at the entrance, and it is composed of fine shifting gray sand. There is

generally but one channel across the bar, whose direction seaward may vary from about northwest to southwest, and there is rarely less than 10 feet minimum depth at low water. The present information does not show any marked excess of movement of sand in either direction up or down the coast. There is a littoral current of varying force along the beach reaching a velocity of 2 miles per hour at a maximum. It is controlled entirely by the winds, which blow from the north-west in summer and generally from the southeast to southwest in winter. The tidal currents in the entrance gorge are strong on account of its narrowness and the considerable tidal discharge.

Surveys.—The United States Coast Survey chart of 1867 shows that 9 feet could be carried out at lower low water within narrow limits, and in the buoy list of October, 1885, it is stated that there was then only 7 feet of water on the bar, but the next year 16 feet could be carried over it at high tide. The United States Engineer Department has made three surveys of the bar. The first, made in 1891, shows a channel leading out about in a west by south direction, with a least depth at mean lower low water of 11 feet; the second, made in 1897, gives the channel in about the same position, but slightly more to the south, the lower low-water depth being 14 feet; the third survey, made in September-October, 1902, and upon which this project is based, shows the channel in about its most northerly position, leading over the bar about northwest by north, with a least low-water depth on the bar of 13 feet. It shows the width between the inside and outside 18-foot curves to be about 3,500 feet, and that between the 12-foot curves to be about 1,800 feet. Previous to the survey of 1902 an automatic tide gauge was operated at Hobsonville, near the mouth, for a period of a year and the plane of lower low tide determined, to which the soundings on the map of the last survey are referred. All of the surveys show a well-defined south spit extending seaward in a westerly direction from Kincheleo Point, with little or no indication of any tendency for the main channel to break through it and assume a southerly direction.

Plan of Improvement.—It is assumed that the depths mentioned in the act above quoted refer to mean lower low water, the plane of reference generally adopted for the surveys and works of improvement along the coast.

As so many unknown factors enter into the problem of the improvement of a sandy bar harbor, it would appear to be impossible to plan any work the exact effect of which in the way of permanent depth could be determined mathematically in advance; at the same time, by comparing the capacity of the harbor in question with that of others which have been improved to various depths, a fair idea of what may be expected from certain works of control can be obtained.

The following table gives the tidal area of some of the smaller coast harbors with the average bar depths both before and after improvement, tide range, etc.:

HARBOR.	Tidal area in square miles.	Approximate range of tide.	Average least bar depth at low water before improvement.		Average present least bar depth at low water, about—		Remarks.
			Feet.	Feet.	Feet.	Feet.	
Cook Bay	24	4.2	9 to 12	18 to 20	Improved.		
Yaquina Bay	5	6.2	7	12	Do.		
Siuslaw	5 1/2	5.0	6	7	Partially improved.		
Coguille	3 1/2	4.2	4	6	Do.		
Umpqua	9 1/2	5.0	11	11	Not improved.		
Tillamook	13 1/4	6.3	10	10	Do.		

It would seem that the conditions at Tillamook are relatively favorable to improvement in bar depths, and it is thought that the tidal flow and ebb discharge from Tillamook Bay, if properly directed, and if the movement of the shifting sand into the entrance is checked by suitable works, can be made to maintain a permanent low-water depth of 15 feet, and perhaps as much as 20 feet, at a considerable increase in cost.

The mean tidal discharge throughout the average ebb amounts to 74,000 cubic feet per second. This of course, is greatly increased at spring tides and the average maximum flow is, of course, much larger. This out flow has excavated the deep hole in the gorge, but as it flows seaward it spreads out over a large arc, and consequently its ability to scour the bar is weakened. The sand agitated by the waves in the immediate vicinity of the entrance is carried into the bay by the flood to be again sliced out by the powerful ebb currents and re-deposited on the bar and spits in the vicinity. The greater part of the moving sand undoubtedly is furnished by the more extensive south spit.

After a careful study of the map and local conditions, the following project for obtaining 15 ft at mean lower low water is submitted. It involves the construction of a north high-tide jetty of rubble-stone from the permanent North Head near Green Hill, running seaward in a general westerly direction on a gentle curve concave to the ebb current for a distance of about 5,000 feet from high-

water mark. This jetty would act partially to prevent the greater part of the sand movement on the north side, but chiefly as a training wall to gently control the ebb current and to keep it from spreading out to the north, and to confine it between this jetty and the shoal south sand spit.

At the same time it would seem desirable to build a shorter high-tide south jetty extending out from Kincheleo Point 4,400 feet from high-water mark, to check the cyclic sand movement into the harbor from the south.

Should these jetties be built, no doubt the enrockment would be beaten down toward their outer ends to mean tide, and even much lower at their seaward extremities.

The distance between the end of the south jetty and north jetty, as laid down on the map, is about 1,600 feet. The proposed south jetty would skirt the north edge of the spit closely, and prevent too great a widening of the entrance channel and the risk of the shoals forming therein. It is thought that this arrangement would result in strengthening and building up of the south spit, which, acting as a submerged jetty, will tend to prevent any tendency for the channel to cut out to the south, and it seems probable that a navigable channel of 15 feet in depth at mean low water will be secured, and the bar will not be advanced seaward to any great extent.

For the 20-foot project, the north jetty should be extended 1,000 feet further seaward on the same curve to sea, and at the same time the south jetty 3,800 feet on a curve, so that the ends of the two jetties would be 1,000 feet apart. This width, however, is approximate, and can be varied as may seem desirable at time of construction. The estimates would not be materially altered by moderate changes. These two long jetties will probably extend the bar farther seaward, but it will be in deeper water, and the detrimental sand movement over the spits and into the channel and thence to the bar would be almost entirely checked, and it is hoped that as much as 20 ft. at mean lower low water would be secured on the bar.

The method of construction of the jetties is assumed to be the same as that heretofore adopted for the Oregon coast harbors, and consists of a foundation brush mattress on which a mound of rubblestone blocks, weighing up to 10 tons or more each, is deposited from a double-track pile-trestle tramway extending from the shore in advance. In making the estimates the enrockment is figured at 20 feet wide on top with side slopes of 1 on 2 beyond the six foot contour. To allow for settlement and scour the depth is taken as 2 feet more than the map shows, and the top of enrockment one foot above ordinary high tide. In computing the volume of stone required for the jetties the displacement of the mattresses is neglected, as in their compressed state they add an inconsiderable amount to the volume of the jetty. Timber and brush can be cheaply obtained in the vicinity, but from the most accurate information available it is believed there is no very suitable stone

for jetty purposes to be obtained on Tillamook Bay or very near by, and in making the estimate I have put the price \$1.25 per ton.

To protect the shore from scour along the approach to the north jetty and this part of the tramway from drift, the estimates provide for a brush mattress 2 feet thick and 22 feet wide, to be laid on the channel side and ballasted with about 4 tons of stone per linear foot. It is possible that a part of the approach may not require this protection.

The estimates provide for a foundation brush mattress 3 feet by 22 feet wide, to be laid in the middle along line of both jetties. Sand-binding grasses should be planted on the south spit, from where the jetty crosses it southward, to gradually cover a wide strip connecting the permanent vegetation in that direction. No separate item for this is placed in the estimates, as the amount for contingencies will cover it.

The General Government has appropriated the total sum of \$105,700 to date for the improvement of Tillamook Bay, most of which has been expended in accordance with the existing project to obtain a channel 9 feet deep from Hobsonville up to Tillamook city at high tide.

Resources and Commercial Statistics.—There are four small towns tributary to the waters of Tillamook Bay—Hobsonville, Bay City, Garibaldi and Tillamook city, the chief of which is Tillamook city, with a population of about 1,000 people, located on Hoquar-ten Slough, about 10 miles from the entrance. There is no railroad commu-

ication to the bay, and the locality is isolated and cut off from market by the Coast Range Mountains. The only means of transportation, other than by water, is over rough mountain roads.

A fair-sized sawmill is located at Hobsonville, owned by the Truckee Lumber Company, and this mill ships most of its products by steam schooners to California markets.

A great deal of the country adjacent to Tillamook Bay is still a virgin forest, undeveloped and thinly populated. It contains some of the finest forests of fir, spruce, and hemlock in Oregon, and it is estimated that there are 21 townships tributary to the bay, upon which there are 15,120,000,000 feet B. M. of standing timber. Near the upper end of the bay is a considerable body of good grazing land, and the making of butter and cheese is one of the principal industries. A salmon cannery is located at Garibaldi, which puts up about 10,000 cases annually. A small steamer of 131 tons net makes a regular trips as possible between Tillamook and Astoria on the Columbia River, making the run in about seven hours.

The following are the estimates made for the two projects called for by Congress:

ESTIMATES.  
For channel carrying 15 feet depth across the bar at mean lower low water.

NORTH JETTY.	
Cost of necessary land for site	\$2,000.00
Wharf and buildings at H.	8,000.00
Double-track tramway approach from G to D, 2,650 linear feet, at \$5	13,250.00
Double-track jetty tramway from D to E, 4,450 linear feet, at \$6	26,700.00
Shore protection of mats and stone from H to A, 4,930 linear feet, at \$6.20	30,566.00
Double-track jetty tramway from A to B, 5,600 linear feet, at \$6	33,600.00
Foundation brush mattress from A to B, 13,689 cubic yards, at \$1.20	16,426.80
Jetty enrockment from A to B, 272,378 tons rubblestone, at \$1.25	340,222.50
Engineering, superintendence and contingencies, 20 per cent	92,892.90
Total for north jetty...	\$557,358.20

SOUTH JETTY.	
Cort of necessary land for site	\$1,500.00
Wharf, buildings, etc., at G	10,000.00
Double-track tramway approach from G to D, 2,650 linear feet, at \$5	13,250.00
Double-track jetty tramway from D to E, 4,450 linear feet, at \$6	26,700.00
Foundation brush mattress, 10,877 cubic yards, at \$1.20	13,052.40
Enrockment of south jetty, 147,352 tons of rubblestone, at \$1.25	184,190.00
Engineering, superintendence and contingencies, 20 per cent	49,738.48
Total for south jetty...	\$298,430.88

SUMMARY FOR 15-FOOT PROJECT.	
North jetty	\$557,358.20
South jetty	298,430.88
Total cost of N and S jetties	\$855,789.08

Channel carrying 20 feet depth across the bar at mean lower low water.

NORTH JETTY.	
Cost of necessary land for site	\$2,000.00
Wharf and buildings at H.	8,000.00
Double-track tramway approach, H to A, 4,930 linear feet, at \$5	24,650.00
Shore protection of mats and stone from H to A, 4,930 linear feet, at \$6.20	30,566.00
Double-track tramway from A to C, 6,600 linear feet, at \$6	39,600.00
Foundation brush mattress from A to C, 16,133 cubic yards, at \$1.20	19,359.60
Jetty enrockment from A to C, 370,044 tons of rubble stone, at \$1.25	462,555.00
Engineering, superintendence and contingencies, 20 per cent	117,346.12
Total for north jetty ...	\$704,076.72

SOUTH JETTY.	
Cost of necessary land for site	\$1,500.00
Wharf, buildings, etc., at G	10,000.00
Double-track tramway approach from G to D, 2,650 feet, at \$5	13,250.00
Double-track jetty tramway from D to F, 8,150 linear feet, at \$6	48,900.00
Foundation brush mattress from D to F, 19,921 cubic yards, at \$1.20	23,905.20
Enrockment of south jetty from D to F, 397,351 tons, at \$1.25	496,688.75
Engineering, superintendence and contingencies, 20 per cent	118,848.79
Total for south jetty...	\$713,092.74

SUMMARY FOR 20-FOOT PROJECT.	
North jetty	\$704,076.72
South jetty	713,092.74
Total cost of N and S jetties	\$1,417,169.46

The above estimates seem high, but owing to the advanced prices of material and labor, the uncertainty of securing good rock in the vicinity, and to the general local conditions the figures are considered as low as they could safely be made.

It might be possible to obtain and maintain a channel of the required

depth across Tillamook bar by means of dredging, but owing to the prevalence of the heavy swell at this locality the greater part of the time, and to the fact that no dredging of like character has yet been done along this part of the coast, it was considered safer to base the estimates for improvement on permanent work. Should the dredging work on the bar at the mouth of the Columbia River soon to be undertaken prove successful, and the depths thereby secured be well maintained at a reasonable cost, it is possible that the expense of the improvement of Tillamook bar and its maintenance of dredging might prove to be less than the interest on the cost of the jetties.

Very respectfully, your obedient servant,  
W. C. LANGPITT,  
Captain, Corps of Engineers.

Brig. Gen. G. L. GILLESPIE,  
Chief of Engineers, U. S. A.  
(Through the Division Engineer.)

[First Indorsement.]  
U. S. Engineer Office, Northern Pacific Division,  
San Francisco, Cal.,  
May 4th, 1903.

Respectfully forwarded to the Chief of Engineers, U. S. Army.

The jetties, if built, will doubtless produce the depths contemplated, and they can probably be constructed within the limits of the estimates.

From the language in the clause relating to the appropriation for this particular work, an expression of opinion as to the necessity or worthiness of the appropriation does not seem to be required.

W. H. HEUER,  
Lieut. Col., Corps of Engineers,  
Division Engineers.

[Second Endorsement.]  
OFFICE CHIEF OF ENGINEERS,  
U. S. ARMY, May 15, 1903.

Respectfully referred to the Board of Engineers for Rivers and Harbors constituted by Special Orders, No. 24, Headquarters, Corps of Engineers, series of 1902, for consideration and recommendation.

By command of Brigadier General Gillespie:

A. MACKENZIE,  
Colonel, Corps of Engineers.  
[Third Endorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS, Washington, D. C., August 3, 1903.

Respectfully returned to the Chief of Engineers, U. S. Army.

The Board of Engineers for Rivers and Harbors has considered the within report of the district officer on a survey of Tillamook Bay, Oregon, made with a view to the preparation of a project, with estimate of cost, for "securing channels across said bar of fifteen and twenty feet in depth, respectively," the indorsement of the division engineer thereon, and other data available.

The district officer submits plans for obtaining the channels contemplated, and estimates that the 15-foot channel can be secured at a cost of \$855,789.08, and the 20-foot channel at a cost of \$1,417,169.46.

It should be noted that providing an increase depth across Tillamook bar will not enable that same depth to be carried to any of the ports on the estuary, since the interior channels shoal rapidly as one ascends.

No work has ever been done by the United States on Tillamook bar, but the channel from Hobsonville to Tillamook City has been under improvement since 1888. The object of the project, as last modified, was to secure a depth of 9 feet at high water up to Tillamook City, or 3 feet at mean low water. This project has been completed, but work of maintenance is in progress. The total amount appropriated to June 30, 1902, was \$105,704.68.

In view of wording of the act directing the survey, neither the direct officer nor the division engineer reported upon the desirability of the contemplated work. This Board, however, is required by law to report on this subject.

According to the Annual Report of the Chief of Engineers the amount of the commerce of this harbor for a period of thirteen years is as follows:

Year	Tons.
1889	3,571
1890	27,427
1891	28,292
1892	33,220
1893	18,316
1894	29,742
1895	25,977
1896	29,405
1897	35,885
1898	36,835
1899	17,640
1900	21,147

The principal articles of import during the calendar year 1901 were: Coal, 352 tons; grain, feed, and flour, 952 tons; and machinery, 435 tons; and of export dairy produce, 755; fish, 383 tons; lumber, 17,344 tons, and laths, 290 tons. No railroad reaches this bay from the interior. The imports are therefore for local use and consumption. The small volume of imports (2,201) is accounted for by the fact that the country bordering the bay is thinly settled, the entire population of Tillamook County in 1901 being but about 4,000. The trade with the outside world is carried on in vessels which draw, when fully laden, from 9 to 15 feet. Yet the total volume of exports in 1901 was but 18,946 tons.

The country contiguous to the bay is rich in forest and agricultural resources, and undoubtedly the products of field and forest will increase with time and with the settling up of the country. At the present time, however, the contrast between the commerce present and reasonably prospective and the sum required to provide even the lesser of the two channels referred to in the act is too great to warrant undertaking the work Tillamook Bay is about 50 miles from the mouth of the Columbia River, too near for a second harbor of general interest. Furthermore, in case any improvements were undertaken at Tillamook, in the absence of a railroad the exports from the bay would necessarily be drawn from but a limited section of country.

The Board is of opinion that it is not desirable at the present time for the United States to undertake the improvement of Tillamook bar to the extent of providing either a 15-foot or a 20-foot channel across it.

For the Board:

CHAS. J. ALLEN,  
Lieut. Col., Corps of Engineers,  
Senior Member Present.

[Fourth indorsement.]  
OFFICE CHIEF OF ENGINEERS,  
U. S. ARMY, Sept. 23, 1903.

The views of the Board of Engineers for Rivers and Harbors, as expressed in the preceding indorsement, are concurred in.

G. L. GILLESPIE,  
Brig. Gen., Chief of Engineers,  
U. S. Army.

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