74TH CONGRESS, 1st Session | COMMITTEE ON RIVERS AND HARBORS, HOUSE OF REPRESENTATIVES, U. S. | DOCUMENT No. 70

BELGHAM

BELLINGHAM HARBOR, WASH.

LETTER

FROM

THE CHIEF OF ENGINEERS, UNITED STATES ARMY

TRANSMITTING

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS ON REVIEW OF REPORTS HERETOFORE SUBMITTED ON BELLINGHAM HARBOR, WASH., WITH ILLUSTRATION

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, July 26, 1935.

Hon. J. J. MANSFIELD,
Chairman Committee on Rivers and Harbors,
House of Representatives, Washington, D. C.

MY DEAR MR. MANSFIELD: 1. The Committee on Rivers and Harbors of the House of Representatives, by resolution adopted January 29, 1934, requested the Board of Engineers for Rivers and Harbors to review the reports on Bellingham Harbor, Wash., submitted in House Document No. 187, Seventieth Congress, first session, with a view to determining if the further improvement of the Squalicum Creek waterway is advisable at the present time. I enclose herewith the report of the Board in response thereto.

2. Bellingham Harbor is on the east side of Bellingham Bay, 90 miles north of Seattle. The city water front available for terminal developments is separated from deep water in the bay by tidal flats approximately one-half mile wide. The improvement authorized by Congress provides for two channels across these flats. One of these, Whatcom Creek waterway, has been deepened by local interests to 35 feet. Squalicum Creek waterway, near the northern end of the harbor, has an entrance channel 26 feet deep and 200 feet wide, with a turning basin at its head. The United States completed the entrance channel in 1931, and local interests have provided the same depth in the southerly half and westerly end of the inner basin. They

U. S. ENGINEER OFFICE
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SEATTLE, WASH.

have also constructed extensive bulkheaded fills on the adjacent tidal flats and a detached rubble breakwater 1,500 feet long southwest of the basin. The total Federal cost to June 30, 1934, was $201,000, of which approximately $30,000 was for deepening the Squalicum Creek waterway entrance channel. Local interests report their total expenditures for harbor improvement, including terminal developments, at $916,000. The further improvement now desired is the deepening of the Squalicum Creek entrance channel and the 26-foot areas in the basin to 30 feet, and the extension of the breakwater for a distance of 200 feet, the United States to assume future maintenance of the deepened portion of the basin and of the entire breakwater.

3. The city of Bellingham, with a population of 31,000, is the only important community in the area tributary to the harbor. It is adequately served by rail and improved highway facilities. Vessel commerce in 1933 amounted to 417,000 tons, consisting principally of lumber, canned salmon, pulp, paper, coal, and petroleum products. Rafted logs totaled 841,000 tons and the car-ferry traffic 103,000 tons. Most of this commerce now moves over wharves on Whatcom Creek waterway and on the city's southern frontage where natural deep water obtains near shore. Squalicum Creek waterway, on which the 1933 commerce totaled only 28,000 tons, is used principally by pleasure craft and the 30 vessels of the fishing fleet.

4. The Board of Engineers for Rivers and Harbors, concurring in general with the district and division engineers, concludes that the value of the waterway and breakwater to general navigation, and the large expenditures heretofore made by local interests on harbor improvement, justify the assumption of the future maintenance of these works by the United States. The Board believes that an extension of the existing breakwater in a direction making an angle of about 45° with the center line of the entrance channel would provide as much protection as the proposed 200-foot westerly extension and at lesser cost, but considers the slight additional protection to be gained incommensurate with the cost of either extension. The Board recommends modification of the existing project for Bellingham Harbor, Wash., to provide for maintenance of the southerly half and westerly end of the Squalicum Creek Basin, shown as areas B and C on the accompanying map, to a depth of 26 feet at mean lower low water, and for the maintenance of the present breakwater to a crest height of 14 feet, all at an estimated cost of $2,000 annually in addition to that now required, provided that no dredging be done within 75 feet of wharves, piers, or similar structures.

5. After due consideration of these reports, I concur in the views and recommendations of the Board.

Very truly yours,

E. M. Markham,
Major General,
Chief of Engineers.

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS

War Department,
Board of Engineers for Rivers and Harbors,
Washington, July 15, 1935.

Subject: Bellingham Harbor, Washington.
To: The Chief of Engineers, United States Army.

1. This report is in response to the following resolution, adopted January 29, 1934:

Resolved by the Committee on Rivers and Harbors of the House of Representatives, United States, That the Board of Engineers for Rivers and Harbors created under section 3 of the River and Harbor Act, approved June 13, 1902, be, and is hereby requested to review the reports on Bellingham Harbor, Washington, submitted in House Document Numbered 187, Seventieth Congress, first session, with a view to determining if the further improvement of the Squalicum Creek waterway is advisable at the present time.

2. Bellingham Harbor is on the east side of Bellingham Bay, 18 miles south of the international boundary and 90 miles north of Seattle. In the southerly half of the harbor natural deep water extends close to shore, but steep hills restrict the space available for terminal developments. The northern half of the city water front is separated from deep water in the bay by tidal flats approximately one-half mile wide. Under the present project for improvement, two channels have been provided across these flats. Whatcom Creek waterway, which has a project width of 363 feet and a depth of 26 feet for the outer 3,800 feet and 18 feet for the inner 1,300 feet of its length, was completed in 1913. Local interests have deepened the central portion of this waterway to 35 feet. Squalicum Creek waterway, near the northern end of the harbor, consists of an entrance channel 26 feet deep, 200 feet wide, and 1,800 feet long, flared at its inner end to a basin 592 feet wide and 1,550 feet long. The United States completed the entrance channel in 1931, conditioning its work upon local interests providing the same depth in the southerly half and westerly end of the inner basin. Local interests have fulfilled this requirement and have also constructed extensive bulkheaded fills on the adjacent tidal flats, and a detached rubble breakwater 1,500 feet long southwest of the basin, which serves to protect partially this fill from wave action. The total Federal cost to June 30, 1934, was $201,000, of which approximately $30,000 was for deepening the Squalicum Creek waterway entrance channel. Local interests report their total expenditures for harbor improvement at $916,000, including terminal developments.

3. The city of Bellingham has a population of 31,000. It is the only important community in the area tributary to Bellingham Harbor which comprises the western portion of Whatcom County, Wash., and the nearby islands in Puget Sound. The mainland area is well served by railways and improved highways. The vessel commerce of Bellingham Harbor, consisting chiefly of lumber, canned salmon, pulp, paper, coal, and petroleum products, has averaged 561,000 tons annually during the last 10 years, and in 1933 amounted to 417,000 tons. In the latter year rafted logs totaled 841,000 tons and the car-ferry traffic 103,000 tons. Most of this commerce now moves

over wharves on Whatcom Creek waterway and on the city's southern frontage, where natural deep water obtains near the shore. Squalicum Creek waterway, on which the 1933 commerce totaled only 28,000 tons, is used principally by pleasure craft and for the 30 vessels of the fishing fleet. In that year it was entered by only three vessels drawing as much as 18 feet.

4. Local interests request that the United States deepen the Squalicum Creek entrance channel and the 26-foot areas in the basin to 30 feet and extend the breakwater for a distance of 200 feet, and assume the future maintenance of the deepened portions of the basin and of the entire breakwater. They claim that the waterway if improved would become the outlet for commerce originating at nearby coal mines, and for a sugar refinery, a cement plant, and a limestone quarry located conveniently with respect to it; and that it offers the only sites available for further industrial expansion. The breakwater extension is desired chiefly to afford greater protection to oil terminals and a marine railway at the inner end of the basin. The Port Commission states that it has now reached its maximum legal indebtedness and cites the large expenditures already made by local interests as justifying further Federal participation.

5. The district engineer estimates the cost of the requested deepening at $10,500, and maintenance of the basin areas at that depth at $500 annually. Maintenance of the existing breakwater to a crest height of 14 feet is estimated at $1,500 per year. He sees no present necessity for the requested 30-foot depth, as vessels engaged in the commerce anticipated by local interests do not require greater than the present depth of 26 feet. The breakwater extension should, in his opinion, be deferred until its necessity has been demonstrated. He points out that elsewhere in his district waterways similar to the Squalicum Creek Basin are now maintained by the United States and believes that there is no reason for making an exception in this case. Similarly, he believes that the United States should assume maintenance of the breakwater, which was constructed largely with Federal relief funds and is an essential improvement. The division engineer concurs except as to the advisability of the breakwater extension. Personal observation of the effects of recent severe storms has convinced him that a westward extension of 200 feet is necessary to a full realization of the benefits of the investment already made. He points out that local interests have shown initiative in developing their harbor and have contributed to the limit of their ability. They now offer to furnish land and quarry rights. The division engineer therefore recommends modification of the existing project for Bellingham Harbor to provide for maintenance of the present deep area in Squalicum Creek Waterway, shown as areas B and C on the accompanying map, to 26 feet at mean low water, for extension of the existing breakwater 200 feet westward, and for the maintenance of the entire breakwater as extended, all at an estimated cost of $50,000 for new work and $2,000 annually provided local interests furnish, free of cost to the United States, the necessary rights-of-way, quarry rights, and spoil-disposal areas.

6. From the data presented the Board was not convinced of the advisability of the United States undertaking at this time the requested breakwater extension. Local interests were so advised and invited to present additional information to the Board. Several

communications were received, urging the extension to protect existing docks and structures and boats using the waterway, and on June 27 a committee of the Board visited the site and conferred with local interests.

Views and Recommendations of the Board of Engineers for Rivers and Harbors

7. The Board concurs with the reporting officers in the view that the value of the Squalicum Creek Waterway and breakwater to general navigation, and the large expenditures heretofore made by local interests on harbor improvements, justify the assumption of the future maintenance of these works by the United States. Maintenance dredging should not extend closer than 75 feet to wharves or similar structures. The Board is of the opinion that an extension of the existing breakwater in a direction making an angle of about 45° with the center line of the entrance channel would provide as much protection as the proposed 200-foot westerly extension, and at lesser cost. However, the cost of the extension would not be compensated for by the slight additional protection that it would afford. The Board reports, in compliance with the committee resolution, that no further improvement of the Squalicum Creek waterway is advisable, but recommends modification of the existing project for Bellingham Harbor, Wash., to provide for maintenance of the southerly half and westerly end of the Squalicum Creek Basin, shown as areas B and C on the accompanying map, to a depth of 26 feet at mean lower low water, and for maintenance of the present breakwater to a crest height of 14 feet, all at an estimated cost of $2,000 annually in addition to that now required, provided that no dredging be done within 75 feet of wharves, piers, or similar structures.

For the Board:

G. B. Pillsbury,
Brigadier General, Corps of Engineers,
Senior Member.

REPORT OF THE DIVISION ENGINEER

SYLLABUS

The division engineer recommends modification of the existing project for Bellingham Harbor, Wash., so as to provide for maintenance of areas B and C in Squalicum Creek Waterway to a depth of 26 feet at mean lower low water, for extension of the breakwater recently constructed by local interests to the westward for a distance of 200 feet, and for the maintenance of this breakwater as extended, all at an estimated cost of $50,000 for new work and $2,000 per annum for maintenance, provided local interests furnish free of cost to the United States the necessary rights-of-way, quarry rights, and areas for disposal of dredged material.

War Department,
Office of Division Engineer,
North Pacific Division,
Portland, Oreg., January 18, 1935.

Subject: Review of reports on Bellingham Harbor, Wash.
To: The Chief of Engineers, United States Army.

AUTHORITY

1. A review of the reports on Bellingham Harbor, Wash., submitted in House Document No. 187, Seventieth Congress, first session, with a view to determining if the further improvement of Squalicum Creek waterway is advisable at the present time was requested in a resolution of the Committee on Rivers and Harbors of the House of Representatives adopted January 29, 1934. The district engineer has held a public hearing and his report is enclosed.

DESCRIPTION

2. Bellingham Harbor, Wash., is located on Bellingham Bay, an arm of Puget Sound, about 18 miles south of the international boundary and 90 miles north of Seattle. The locality is shown on United States Coast and Geodetic Survey Chart No. 6378. The harbor extends along the shore opposite Bellingham for a distance of about 2 miles. There are three waterways, I and J Street waterway, Whatcom Creek waterway, and Squalicum Creek waterway. Except in these waterways tide flats extend into the bay for a distance of about one-half mile, beyond which there is deep water. The tidal range between mean lower low water and mean higher high water is 8.5 feet and the extreme tidal range is 16.5 feet. The prevailing winds are from the southeast, southwest, and west. The main part of the harbor is exposed to the south and southwest.

EXISTING PROJECT

3. Prior to 1910 the project for Bellingham Harbor provided for a channel 12 feet deep in Whatcom Creek waterway. The costs were $56,582 for new work and $1,092 for maintenance, a total of $57,674. The existing project adopted by the Act of June 25, 1910, and modified by the act of July 3, 1930, provides for dredging a channel known as Whatcom Creek waterway for its full width to a depth of 26 feet in the outer 3,800 feet and a depth of 18 feet for 1,300 feet at the inner end, and for a channel in Squalicum Creek waterway 26 feet deep and 200 feet wide from deep water in the bay to the main pierhead line, being section A shown on the map, subject to the provisions that local interests give assurances satisfactory to the Secretary of War and the Chief of Engineers that they will dredge and maintain at their own expense the inner channel areas B and C and will construct a suitable public terminal. Areas A, B, C, and D are shown on the map with the reports under review and on the map with the district engineer's report. The estimated cost of the work in Squalicum Creek waterway is $25,000 for new work and $500 annually after the first two years for maintenance. New work was completed in Whatcom Creek waterway in 1913 and in Squalicum Creek waterway in 1931. The estimated cost of maintenance for Whatcom Creek waterway is $2,000; the average for the last five years has been about $2,400. No maintenance dredging has been necessary in Squalicum Creek waterway. Costs to

June 30, 1934, under the existing project have been as shown in the following table:

	New work	Maintenance	Total
Whatcom Creek	$81,782	$30,974	$112,756
Squalicum Creek	30,231	125	30,356
Total	112,013	31,099	143,112

The work required of local interests has been accomplished.

4. The port of Bellingham has dredged a basin in Whatcom Creek waterway 35 feet deep, 330 feet wide, and 1,000 feet long. At Squalicum Creek it has dredged areas B and C as required by the project, has dredged area D for use as a fishing-boat basin, has constructed a rubble-mound breakwater, 1,500 feet long, south of the waterway, and has constructed other facilities for the commercial development of the harbor. Local interests have spent about $916,000 for harbor improvements of which $155,231 was for dredging areas B and C, and $51,000 was a part of the cost of the breakwater, the balance being financed from C. W. A. funds. The total cost of the breakwater was $139,000.

TRIBUTARY AREA

5. The port of Bellingham is coextensive with Whatcom County, which has an area of 2,082 square miles and a population of about 59,000. The county extends from Puget Sound to the summit of the Cascade Mountains, and except for the lower section of the Nooksack River valley is mountainous and forest-covered. Bellingham Harbor serves the western part of Whatcom County and the islands lying to the west. Bellingham, with a population of about 31,000, is the county seat and the only important city.

6. The principal resources of the tributary area are timber, farm products, fish, coal, clay, and limerock. Lumbering is the most important industry and furnishes the bulk of commerce. Other industries are farming, dairying, poultry raising, fishing, mining, manufacturing of cement, pulp, paper, and furniture, and the preparing and canning of food products. Three transcontinental railroads serve Bellingham and two connect with the Canadian Pacific Railway. There are good state and county roads in the area. Existing terminals are adequate for the present and prospective commerce, but there is room for added facilities. On Squalicum Creek waterway there are three wharves, a marine ways and repair plant, and an oil-bunkering wharf.

COMMERCE

7. The water-borne commerce of Bellingham Harbor is made up mainly of lumber, canned salmon, pulp, paper, coal, cement, petroleum

products, and rafted logs. The average annual traffic for the last 10 years and that for 1933 is shown in the following table:

Statement of traffic

Period	Vessel traffic	Floated logs	Total	Car ferry
	Tons	*Tons*	*Tons*	*Tons*
Average, 1924–33	560, 571	991, 735	1, 552, 306	159, 733
Year 1933	417, 063	841, 445	1, 258, 508	103, 200

Of the total traffic for 1933, 109,202 tons was foreign, 452,012 tons was coastwise, and 692,294 was local. The record of trips and drafts of vessels for 1933 shows 4,122 trips inbound and the same number outbound. Actual drafts are not recorded. Three vessels with maximum draft of 18 feet called at Squalicum Creek waterway. Thirty purse-seine fishing vessels with draft of 7 to 12 feet and various motor boats make use of this waterway.

IMPROVEMENT DESIRED

8. Local interests represented by the port of Bellingham request that areas A, B, and C in Squalicum Creek waterway be dredged to a depth of 30 feet and maintained by the United States, and that the United States extend the breakwater and assume its maintenance. They claim that on account of its favorable location and with the improvements now completed Squalicum Creek has developed a large commerce and that with the additional improvements requested it would become the outlet for the local coal mine, sugar refinery, cement plant, and limestone quarry.

9. The port authorities call attention to the large expenditures made by local interests for harbor improvements, and state that under the present financial condition of the port it will be impossible for them to contribute to the cost of the desired improvements. The tax income of the port amounts to about $50,000 per year while the present indebtedness amounts to about $400,000.

SPECIAL SUBJECTS

10. Except as discussed herein, there are no subjects which could be coordinated with the desired improvement so as to lessen the costs or compensate the Government for expenditures made in the interests of navigation.

VIEWS AND RECOMMENDATIONS OF THE DISTRICT ENGINEER

11. The district engineer in his report discusses the improvements desired by local interests and submits estimates of costs for various items of work, as follows:

Item and estimated cost

New work, dredging areas A, B, and C, 30 feet deep, 75,000 cubic yards, at 14 cents	$10, 500
Annual maintenance of areas A, B, and C	1, 000
Annual maintenance of the breakwater to +14 feet	1, 500

The district engineer is of the opinion that the present need for the 30-foot depth has not been demonstrated; that the prospective commerce will not be so great as claimed by local interests; and that the deepening to 30 feet should be deferred. He feels, however, that maintenance of areas B and C to a depth of 26 feet should be undertaken by the United States. The district engineer finds that the breakwater is an essential improvement for the protection of wharves and shipping and provides a needed small-boat harbor. Although not constructed to the full length contemplated, he believes any extension should be deferred until its need has been demonstrated. Since the breakwater was constructed largely at Federal expense, the district engineer is of the opinion that the United States would be justified in assuming the maintenance.

12. The district engineer recommends that the existing project for Bellingham Harbor be modified to include the maintenance of areas B and C in Squalicum Creek waterway to a depth of 26 feet at mean lower low water at an estimated annual cost of $500 and maintenance of the existing breakwater to a crest height of 14 feet above mean lower low water at an estimated annual cost of $1,500.

VIEWS AND RECOMMENDATIONS OF THE DIVISION ENGINEER

13. I concur in the views of the district engineer except as to the advisability of extending the existing breakwater at this time. After inspecting the locality recently and observing the effects of severe storms during this fall and winter, I am convinced that the breakwater should be extended to the westward about 200 feet in order to realize full benefit from the investment already made in the structure. This investment consists in large part of Federal funds spent for unemployment relief. Local interests have shown initiative in development of the harbor and have contributed toward the cost up to the limit of their ability. Under the circumstances it is believed that the United States would be justified in extending the breakwater as well as maintaining it. Local interests should be required to furnish necessary rights-of-way and quarry rights. This they are willing to do. This office estimates the cost of the proposed breakwater extension to be $50,000.

14. It is recommended that the existing project for Bellingham Harbor be modified so as to provide for maintenance of areas B and C in Squalicum Creek waterway to a depth of 26 feet at mean lower low water, for extension of the existing breakwater to the westward for a distance of 200 feet, and for the maintenance of the breakwater, including the extension, all at an estimated cost of $50,000 for new work and $2,000 per annum for maintenance, provided local interests furnish free of cost to the United States the necessary rights-of-way, quarry rights, and areas for disposal of dredged material.

THOMAS M. ROBINS,
Lieutenant Colonel, Corps of Engineers,
Division Engineer.

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REPORT OF THE DISTRICT ENGINEER

SYLLABUS

Local interests request the deepening of Squalicum Creek Waterway at Bellingham from 26 to 30 feet and its future maintenance by the United States, and also the completion and maintenance of a breakwater recently constructed for protection of the waterway. The district engineer recommends that the United States assume future maintenance of certain portions of the waterway at 26 feet and the maintenance but not the extension of the existing breakwater.

WAR DEPARTMENT,
UNITED STATES ENGINEER OFFICE,
Seattle, Wash., September 10, 1934.

Subject: Review of reports on Bellingham Harbor, Wash.
To: The division engineer, North Pacific division, Portland, Oreg.

AUTHORITY

1. This report, with map, is submitted in compliance with instructions from the Chief of Engineers dated February 7, 1934, and pursuant to a resolution of the Committee on Rivers and Harbors of the House of Representatives adopted January 29, 1934, which reads as follows:

Resolved by the Committee on Rivers and Harbors of the House of Representatives, United States, That the Board of Engineers for Rivers and Harbors created under section 3 of the River and Harbor Act, approved June 13, 1902, be, and is hereby, requested to review the reports on Bellingham Harbor, Washington, submitted in House Document Numbered 187, Seventieth Congress, first session, with a view to determining if the further improvement of the Squalicum Creek Waterway is advisable at the present time.

REPORTS UNDER REVIEW

2. The River and Harbor Act of January 21, 1927, authorized a preliminary examination and survey of "Bellingham Harbor, Wash., with a view to improving Squalicum Creek Waterway." The act placed no restrictions upon the character or dimensions of the improvement to be considered for that waterway. The reports called for by that act are published in House of Representatives Document No. 187, Seventieth Congress, first session, and recommended modification of the existing project for Bellingham Harbor, Wash., to provide for—

a channel in Squalicum Creek Waterway 26 feet deep and 200 feet wide from deep water in the bay to the main pierhead line, being section A shown on the map, at an estimated cost of $25,000, with $500 annually after the first 2 years for maintenance, subject to the provisions that local interests * * * will dredge and maintain at their own expense the inner channel, areas B and C, and will construct a suitable public terminal.

The River and Harbor Act of July 3, 1930, modified the project for Bellingham Harbor in accordance with the above recommendation and provided funds for the work.

DESCRIPTION

3. Bellingham Harbor, Wash., is about 18 miles south of the international boundary and about 90 miles north of Seattle. It comprises the northeasterly part of Bellingham Bay, which is an

arm of Washington Sound. It is approached from the Strait of Juan de Fuca and Puget Sound by way of Rosario Strait and Bellingham Channel, both of which are very deep. The harbor proper, which fronts the city of Bellingham, is about 2 miles wide from west to east and 4 miles long. There are wide tidal flats at the upper end of the harbor that extend as much as 2,400 feet from the meander line to low water. The system of harbor lines provides for three waterways over these flats to the shore, namely, I and J Street Waterway, Whatcom Creek Waterway, and Squalicum Creek Waterway. The two last named are under improvement by the United States and have been dredged to dimensions given in paragraph 14 below. Natural depths of 4 to 15 fathoms obtain in the harbor beyond the tide flats. The extreme tidal range is 16.5 feet and the range between mean lower low water and mean higher high water is 8.5 feet. The locality is shown on United States Coast and Geodetic Survey Charts 6378 and 6380.

4. The prevailing winds during the months from November to February, inclusive, are from the southeast. They veer around to the west in March and to the southwest in April, maintaining that prevalent direction until about the first of August, when they gradually resume their westerly direction.

The main waterfront of Bellingham, which includes the waterways mentioned, is exposed to southerly winds and seas.

TRIBUTARY AREA

5. The port of Bellingham is politically coextensive with Whatcom County, which has a land area of 2,082 square miles. The greater portion of this area, comprising the eastern part of the county, is mountainous and forms part of the Mount Baker Forest Reserve. Much of the westerly part of the county is embraced in the drainage basin of the Nooksack River, which empties into Bellingham Bay at its northern end. The drainage area of the Nooksack is about 825 square miles. Practically all of this area is commercially and industrially tributary to Bellingham Harbor. The jurisdiction of the port of Bellingham includes the port of Blaine, but the commercial sphere of the latter port is confined to its immediate environs and annual water shipments therefrom have decreased in recent years to about 2,000 tons. The area commercially tributary to Bellingham Harbor comprises, besides the western part of Whatcom County, only a small area southward of that county and the islands lying to the westward in Washington Sound.

6. The principal resources of the area tributary to Bellingham Harbor are its forests, coal beds, fisheries, farm lands, and natural deposits of lime rock and clay used in the manufacture of portland cement and brick. The timber resources of the Nooksack Basin are estimated to be over 6 billion feet board measure, of which 1,398,594 M feet b. m. are under Government control within the Mount Baker National Forest, and the remainder under private ownership. Soft coal has been mined at Bellingham and near Van Zandt and anthracite deposits have been prospected and partially developed in the

vicinity of Glacier. The production of bituminous coal from the Bellingham coal mines at Bellingham for the last 7 years has been—

	Tons		Tons
1927	288, 171	1931	164, 512
1928	266, 673	1932	118, 765
1929	213, 917	1933	88, 616
1930	223, 906		

There are also gold and silver mines and a marble quarry in Whatcom County. The agricultural district tributary to Bellingham Harbor consists mainly of the lower valley of the Nooksack River, wherein the alluvial and glacial soils are well suited to general farming, dairy ing, and poultry raising. Vegetables, grain, and forage constitute the principal crops, with dairy and poultry products also giving large returns. Bulb raising is an important industry. In recent years the annual value of agricultural products has been over $3,000,000.

7. The population of Whatcom County was 59,128 in 1930, of which the city of Bellingham, the county seat, contained 30,823 persons, making it the fourth largest city in the State of Washington. Outside of Bellingham, the largest town in the tributary area is Lynden, which had a population of 1,564 in 1930.

8. There are 8 lumber mills at Bellingham, one of which is among the six largest shippers of lumber by water in the world. There are 4 salmon canneries, 4 factories engaged in making dairy products, and 2 fruit and vegetable canneries. There is 1 paper factory and a paper pulp mill, 1 beet-sugar factory, 1 cement-manufacturing plant, and 1 factory that produces canned chicken. Reference to the production of the coal mine appears above. Of these industries, the coal mine, the sugar refinery, and the cement manufacturing plant are located near Squalicum Creek waterway and are naturally tributary to it. On the reclaimed land bordering this waterway are now located a furniture factory, a plant for manufacturing and repairing marine motors, and a marine railway; also storage tanks and pipe lines for dispensing fuel oil and oil products to vessels.

9. There are five banks in Bellingham, with combined deposits of $6,985,000 as of January 1, 1934.

RAILWAYS AND ROADS

10. Bellingham is served by three transcontinental railroads—the Great Northern; the Northern Pacific; and the Chicago, Milwaukee, St. Paul & Pacific. The Great Northern connects with Canadian lines at Blaine, and the Chicago, Milwaukee, St. Paul & Pacific with the Canadian Pacific at Sumas. Five regular automobile freight lines terminate at Bellingham, connecting this center with every populous locality in the port district as well as with the principal cities on the mainland of northwestern Washington. Eleven auto stage lines operate out of Bellingham. There are 155 miles of paved highways and approximately 300 miles of graveled highways in Whatcom County.

BRIDGES

11. There are no bridges over Squalicum Waterway.

PRIOR REPORTS

12. Examinations and surveys of this locality and reports thereon pertinent to this review have been made as follows:

(*a*) Preliminary examination and survey of Bellingham Harbor, Wash., ordered by the River and Harbor Act of March 2, 1907, are published in House Document No. 1161, Sixtieth Congress, second session. They are favorable for dredging the outer portion of Whatcom Creek waterway 26 feet deep at mean lower low water and inner portion 18 feet deep at an estimated cost of $92,250, on certain terms of local cooperation, and form the basis of existing project.

(*b*) Preliminary examination and survey of Bellingham Harbor, Wash., with a view to improving Squalicum Creek waterway were ordered by the River and Harbor Act of January 21, 1927. Reports are published in House Document No. 187, Seventieth Congress, first session, and are the reports reviewed herein. They were favorable to the improvement of Squalicum Creek waterway, as stated in paragraph 2 above.

(*c*) A preliminary examination and survey of "Bellingham Harbor, Wash., including the Nooksack River, with a view to determining the effect of the silt carried by this stream on shoaling in Bellingham Harbor, also with a view to the construction of a breakwater", were ordered by the River and Harbor Act of July 3, 1930. Unpublished reports on preliminary examination were submitted by the district engineer January 27, 1931, and by the division engineer February 6, 1931. These reports were unfavorable to the proposed improvements and it was recommended therein that no survey be made.

EXISTING PROJECT

13. Tide flats, extending as much as 2,400 feet from the meander line to low water, originally obstructed the entrance from deep water in the harbor to the city of Bellingham. Under a project adopted by the River and Harbor Act of June 13, 1902, and in accordance with a plan presented in House Document No. 80, Fifty-fifth Congress, first session, Whatcom Creek waterway was dredged to a depth of 12 feet at mean lower low water for its full width from its inner end to a railroad bridge then existing, a distance of about 2,570 feet, and thence 200 feet wide for a distance of about 1,400 feet to deep water in the bay. The cost and expenditures on this project prior to the adoption of the existing project in 1910 were $56,581.93 for new work and $1,092.05 for maintenance, a total of $57,673.98.

14. The existing project provides for (*a*) dredging a channel known as "Whatcom Creek waterway" for its full width of 363.2 feet from its head to deep water in Bellingham Bay, 18 feet deep at mean lower low water for 1,300 feet of its inner end and to 26 feet deep at mean lower low water for the outer, 3,800 feet; and (*b*) for an entrance channel in Squalicum Creek waterway 200 feet wide, 26 feet deep at mean lower low water from deep water in the bay to the main pierhead line, a distance of about 1,800 feet. This project was adopted by the following river and harbor acts: The act of June 25, 1910, which provided for Whatcom Creek waterway, and the act of July 3, 1930,

for Squalicum Creek waterway. (See par. 12 (*a*) and (*b*) for references to house documents.)

15. Whatcom Creek waterway was completed in 1913 and Squalicum Creek waterway in 1931. Shoals were removed from the inner portion of Whatcom Creek waterway in 1918, 1920, 1924, 1931, and 1933. Controlling depths as determined in August 1934 were 26 feet to within 2,100 feet of the head of the waterway, shoaling to 20 feet in the next 800 feet and to 18 feet 300 feet from head of waterway.

16. No maintenance work has so far been required in Squalicum Creek waterway and project depths obtain therein. The costs and expenditures under the existing project to July 1, 1934, have been $112,013.16 for new work and $32,191.36 for maintenance. The cost and expenditures on all projects for Bellingham Harbor to July 1, 1934, may be summarized as follows:

	New work	Maintenance	Total
Under previous project	$56, 581. 93	$1, 092. 05	$57, 673. 98
Under existing project	112, 013. 16	31, 099. 31	143, 112. 47
Total	168, 595. 09	32, 191. 36	200, 786. 45

17. New work on Squalicum waterway represents only $30,231.02 in the above totals and only the cost of one survey, about $125, is included in the maintenance column, so that by far the greater part of the money spent upon improvement of Bellingham Harbor has been for work on Whatcom Creek waterway.

18. The latest approved estimate for annual cost of maintenance for Whatcom Creek waterway is $2,000; for Squalicum Creek, $500 after the first 2 years. The cost of maintenance of Whatcom Creek waterway, including surveys for the past 5 years, has been in round numbers $12,000, or an average of $2,400 a year. Since the completion of the work in 1913, however, such cost has amounted to $31,000, or $1,550 a year, so that when considered over a longer period than 5 years the approved estimate is adequate. As area A, the entrance to Squalicum Creek waterway, has shown very little deterioration in the 2 years since its completion, no maintenance dredging will probably be required there for several years; therefore the present approved estimate of $500 a year is considered ample for maintaining area A. Maintenance of the inner areas is the responsibility of local interests under the existing project.

LOCAL COOPERATION

19. Local interests were required to provide all necessary bulkheads and groins and pay for all necessary filling in connection with the improvement of Whatcom Creek waterway. They were also required to dredge to 26 feet at mean lower low water and maintain the inner channels of Squalicum Creek waterway designated as areas B and C on the map and to construct a public terminal upon that waterway. All these requirements have been complied with. The sum of $155,231.18 was expended on dredging areas B and C to the depth required by the act.

OTHER IMPROVEMENTS

20. In addition to the work required by the acts adopting the project, local interests deepened to 35 feet at mean lower low water a basin in the central part of Whatcom Creek waterway 1,000 feet long and 330 feet wide at a cost of $28,800.

21. Prior to the adoption of the project for Squalicum Creek waterway, the port of Bellingham had expended $125,132.71 on dredging its inner portions and had constructed bulkheads on both sides of the waterway. The spoil from dredging was used to reclaim some 30 acres of tide lands lying behind these bulkheads. In addition to the wharf for public use flanking the northerly side of the waterway which was required by the act, the port commission has constructed under permit from this Department a pier that extends from the wharf to the middle of the waterway and thence at right angles 150 feet shoreward along the axial line, thus partly enclosing the basin for fishing boats marked area D on the map; also under permits the commission dredged "area D" to 14 feet at mean lower low water and constructed in front of it a breakwater of pile and timber cribwork containing some rock, extending the northerly bulkhead to meet the breakwater. Two rows of single piles in contact were driven one on each side of the waterway to protect the entrance from seas, but most of the piles have since fallen out. Early in 1934 the commission, with the aid of Federal relief funds, undertook the construction under permit of a breakwater of rubble stone on the southerly side of the waterway. This breakwater has been completed, as indicated on the accompanying map, at a cost of approximately $139,000, of which sum the port contributed approximately $51,000. The port commission has also constructed warehouses for rental purposes upon the fill on the northerly side; a marine ways and marine repair plant at the head of the waterway; and an oil wharf for bunkering vessels on the south side of the waterway.

TERMINAL AND TRANSFER FACILITIES

22. There are 21 piers and wharves at Bellingham Harbor, of which 7 are on Whatcom Creek waterway, 3 on Squalicum Creek waterway, 10 on the bay south of these waterways, and 1 owned by the Olympic Portland Cement Co. is on the bay north of Squalicum waterway. Two of those on Whatcom Creek waterway are publicly owned and open to general public use; one, located near the entrance of the waterway, is owned and operated by the port of Bellingham. It is used as a general cargo wharf and does most of the foreign and overseas business of the port. The other located within the waterway is owned by the city and does a local business. The Citizens Dock, located at the head of Whatcom Creek waterway, and the wharf of the Bellingham Warehouse Co. on the bay south of that waterway, also do a general cargo business, the former local in character and the latter both local and overseas. The port commission wharf on Squalicum Creek waterway is open to public use and serves fishing boats mainly. Four fish cannery wharves, 3 lumber wharves, 4 oil wharves are included with those above described in the total, the remainder being industrial or used for private business purposes. Of the total, 12 have access to railroad tracks at the rear and 7 are pro-

vided with railroad tracks upon the wharves. Three of the wharves are equipped with traveling cranes, 2 have elevators, and 3 are supplied with gasoline tractors and trailers. The remainder are without modern facilities for quick handling of freight.

23. Existing wharves and piers and handling facilities are sufficient for present and immediately prospective commerce. There is some room for additional wharves on both waterways and in the sheltered portions of the bay to the southward.

IMPROVEMENT DESIRED

24. In order to ascertain the views and desires of local interests, the district engineer held a public hearing in Seattle on April 12, 1934, which was attended by 10 persons representing local interests, among whom were one of the port commissioners, the port manager, engineers from 2 railroads serving the port, and 6 business men from Bellingham. In response to the notice of public hearing, the Bellingham Port Commission presented a communication containing a request that areas marked B, C, and D on the map printed in Document No. 187, Seventieth Congress, first session, be maintained by the United States, and claiming in support of this request that the port district and other local interests have expended $916,000 in harbor improvements at Bellingham; that the port commission, in addition to dredging areas B, C, and D, have constructed 1,750 lineal feet of piers, numerous floats and other improvements for rental to industries on 30 acres of bulkheaded fills upon tide lands adjacent to Squalicum waterway. The commission points to the fact that Squalicum Creek has been diverted so that it no longer discharges its silt into the waterway and that a paved highway has been built to serve the facilities located upon the waterway, all such improvements having been at the expense of the port district. It is further claimed that this waterway, if further improved, will become the outlet for the output of the coal mine, sugar refinery, cement plant, and a limestone quarry; and that, as a result of the improvement already accomplished, 30 purse-seine fishing boats make their headquarters on the waterway, whereas no such boats used Bellingham Harbor as a home port prior to the improvement of Squalicum Creek waterway. In response to the notice of public hearing, the mayor of the city of Bellingham, the Bellingham Marine Railway & Boat Building Co., and the Bellingham Tug & Barge Co. submitted letters endorsing the statements made by the port commission. Copies of all communications received, also notice of public hearing and minutes of the meeting, are submitted as appendixes [1] of this report.

25. At the public hearing the representatives of the port district modified their written request that areas B, C, and D be maintained by the United States, by substituting the request that areas A, B, and C be dredged and maintained by the United States to a depth of 30 feet; and they made the further request that the breakwater partly constructed at date of hearing with Civil Works Administration funds be completed by the Federal Government. The breakwater has since been completed in accordance with the permit except for a proposed extension from its existing westerly end for a distance of 200 feet along the harbor line. It was advanced that the 30-foot

[1] Not printed.

depth is required for ships that transport coal and that trucks from the mine can approach Squalicum Creek waterway without passing through the congested streets of the city as is necessary in order to reach the port overseas terminal on Whatcom Creek waterway. No cooperation with a view to lessening the expense of the desired improvement to the Government was offered by the port authorities. They declared that the improvements already made have exhausted their borrowing capacity as well as their available funds.

COMMERCE

26. In 1933 rafted logs represented about two-thirds of the commerce of Bellingham Harbor, and vessel traffic the remainder. Of the latter, about 73 percent was coastwise and 27 percent foreign. The principal commodities carried in vessels were lumber, canned salmon, wood pulp, coal, pulpwood, paper, cement, and petroleum products. Detailed statements of freight traffic for the entire harbor for 1933 are given in table I and a comparative statement thereof for the last 10 years in table II.

TABLE I.—*Commercial statistics of Bellingham Harbor, Wash., for 1933*

	Tons	Value
FOREIGN IMPORTS		
Animals and animal products: Clam shells	775	$3,000
Wood and paper:		
Logs, rafted	9,705	29,115
Paper	2,047	92,115
Pulpwood	8,414	28,750
Wood pulp	45	2,250
Nonmetallic minerals: Coal	1,363	12,267
Chemicals: Fertilizers	150	2,850
Unclassified: Miscellaneous merchandise	37	5,550
Total imports	22,536	175,897
FOREIGN EXPORTS		
Animals and animal products: Canned salmon	4,383	793,323
Vegetable food products:		
Beet pulp	115	1,725
Fruit and vegetables, canned	141	19,740
Sugar	35	2,450
Wood and paper:		
Box shooks	608	16,416
Lath	697	6,273
Logs and piles, barged	25,841	113,700
Lumber	42,911	407,654
Wood pulp	11,247	253,868
Nonmetallic minerals: Coal	332	2,988
Ores, metals and manufactures of: Scrap metal	320	4,480
Unclassified: Miscellaneous merchandise	36	5,400
Total exports	86,666	1,628,017
Total foreign	109,202	1,803,914
DOMESTIC COASTWISE RECEIPTS		
Animals and animal products:		
Meat products, canned	73	11,680
Salmon, canned	25,444	3,689,380
All other	91	22,750
Vegetable food products:		
Beer	22	2,860
Fruit and vegetables, canned	457	75,405
Fruit, fresh	358	39,380
Grain	129	2,451
Hay	427	8,967
Peas	425	24,339
Sugar	2,018	141,260
Wood and paper:		
Logs and piles, rafted	107,331	402,566
Paper	29	2,175

TABLE I.—*Commercial statistics of Bellingham Harbor, Wash., for 1933*—Cont'd.

	Tons	Value
DOMESTIC COASTWISE RECEIPTS—continued		
Nonmetallic minerals:		
Cement	$30	$450
Coal	130	910
Oils:		
Diesel	3, 598	33, 461
Fuel	14, 979	83, 882
Gasoline	29, 604	1, 184, 160
Lubricating	270	24, 300
All other	399	8, 379
Salt	1, 478	20, 692
Sulphur	7, 876	189, 024
Ores, metals and manufactures of: Hardware, light and heavy	5, 445	457, 380
Chemicals:		
Fertilizers	249	7, 470
Soap	100	12, 500
Unclassified:		
Empty containers	1, 441	230, 560
Fish-trap supplies	340	30, 600
Miscellaneous merchandise	13, 267	1, 393, 035
Roofing	209	15, 675
Total receipts	216, 219	8, 115, 691
DOMESTIC COASTWISE SHIPMENTS		
Animals and animal products:		
Milk:		
Canned	2, 530	303, 600
Powdered	307	27, 630
Salmon, canned	16, 702	2, 421, 790
Shells	240	2, 400
Vegetable food products:		
Beet, pulp	555	8, 325
Fruit and vegetables, canned	3, 144	503, 040
Grain	725	13, 775
Sugar	1, 205	84, 350
Wood and paper:		
Box shooks	6, 743	182, 061
Lath	3, 957	35, 613
Logs, piles and poles, barged	7, 691	38, 455
Logs and piles, rafted	39, 669	148, 758
Lumber	114, 338	1, 257, 718
Paper	2, 744	164, 640
Paper manufactures	163	12, 225
Shingles	1, 709	46, 143
Wood pulp	11, 363	454, 520
Wood-pulp screenings	708	16, 284
Nonmetallic minerals:		
Cement	3, 368	47, 152
Coal	4, 461	31, 227
Salt	251	3, 514
Unclassified:		
Empty containers	4, 110	657, 600
Fish trap supplies	100	9, 000
Furniture	105	26, 250
Miscellaneous merchandise	8, 905	1, 335, 750
Total shipments	235, 793	7, 831, 820
Total, coastwise	452, 012	15, 947, 511
LOCAL RECEIPTS AND SHIPMENTS		
Animals and animal products:		
Fish:		
Fresh	1, 874	206, 140
Canned	829	120, 205
Vegetable-food products:		
Feed, mixed	451	13, 530
Flour	70	2, 590
Sugar	122	8, 540
Hay	24	552
Wood and paper: Logs, rafted	684, 740	2, 567, 775
Nonmetallic minerals:		
Coal	1, 118	7, 826
Lime	215	2, 795
Limestone	6, 674	10, 011
Chemicals: Explosives	89	32, 040
Unclassified: Miscellaneous merchandise	1, 088	163, 200
Total, local	697, 294	3, 135, 204
Grand total, all traffic	1, 258, 508	20, 886, 629
ADDITIONAL TRAFFIC, CAR FERRY		
General merchandise (161 automobiles)	103, 200	4, 128, 000

TABLE II. *Comparative statement of traffic of Bellingham Harbor, Wash.*

Year	Vessel traffic		Rafted		Total		Passengers
	Tons	Value	Tons	Value	Tons	Value	
1924	548, 297	$26, 800, 369	471, 316	$2, 811, 402	1, 019, 613	$29, 611, 771	(1)
1925	624, 635	36, 595, 670	873, 736	4, 737, 815	1, 498, 371	41, 333, 485	(1)
1926	647, 463	36, 344, 195	1, 314, 015	7, 192, 875	1, 961, 478	43, 537, 070	(1)
1927	606, 181	26, 494, 144	1, 064, 489	5, 854, 689	1, 670, 670	32, 348, 833	122, 945
1928	875, 810	27, 608, 222	1, 452, 132	8, 688, 957	2, 327, 942	36, 297, 179	96, 263
1929	548, 136	25, 819, 226	1, 646, 037	8, 113, 606	2, 194, 173	33, 932, 832	39, 371
1930	582, 308	25, 026, 258	1, 254, 859	5, 019, 436	1, 837, 167	30, 045, 694	40, 931
1931	446, 389	19, 408, 668	679, 558	2, 457, 203	1, 125, 947	21, 865, 871	54, 260
1932	309, 424	14, 894, 477	319, 763	1, 105, 476	629, 187	15, 999, 953	70, 300
1933	417, 063	17, 738, 415	841, 445	3, 148, 214	1, 258, 508	20, 886, 629	28, 382

ADDITIONAL TRAFFIC

Year	Car ferry		General ferry, automobiles [2]
	Tons	Value	
1924	344, 945	$17, 940, 000	(1)
1925	218, 092	8, 941, 772	(1)
1926	200, 900	8, 236, 900	(1)
1927	121, 640	2, 432, 800	4, 638
1928	209, 000	8, 360, 000	6, 290
1929	148, 750	5, 950, 000	5, 830
1930	95, 929	5, 092, 500	3, 342
1931	91, 001	3, 827, 380	3, 598
1932	63, 875	2, 618, 875	1, 555
1933	103, 200	4, 128, 000	161

[1] Not reported. [2] No data except number of automobiles.

27. The freight traffic for Squalicum Creek waterway included in the above is later reported as 28,000 tons.

28. Local interests claim that prospective tonnage of large amount will result from further improvement of this waterway, but as present depths and facilities sufficient for the commerce anticipated by those interests have not yet been utilized, the prediction of such increased tonnage does not at present appear justified.

VESSEL TRAFFIC

29. Foreign and coastwise freight vessels are loaded at the port terminal located near the entrance to Whatcom Creek waterway, at lumber wharves or at the cannery wharf near the south end of the harbor. Trips and drafts for 1933 for the entire harbor are given in table III.

TABLE III.—*Bellingham Harbor, Wash., trips and drafts of vessels, 1933*

Draft (feet) [1]	Inbound				
	Steamers	Motor vessels	Sailing	Barges	Total
31 feet 6 inches	2				2
30 to 31 feet 6 inches	6	2			8
28 to 30	22	9			31
26 to 28	48	9			57
24 to 26	86	24			110
22 to 24	124	1			125
20 to 22	98		6		104
18 to 20	36	1			37
Under 18	1, 203	2, 298		147	3, 648
Total	1, 625	2, 344	6	147	4, 122
Total net registered tonnage	1, 413, 320	356, 171	8, 234	40, 375	1, 818, 100
Total vessels of foreign registry	26	76		38	140
Total net registered tonnage	104, 534	169, 216		9, 500	283, 250

[1] Standard full-load drafts.

TABLE III.—*Bellingham Harbor, Wash., trips and drafts of vessels, 1933*—Con.

Draft (feet) [1]	Outbound				
	Steamers	Motor vessels	Sailing	Barges	Total
31 feet 6 inches	2				2
30 to 31 feet 6 inches	6	2			8
28 to 30	22	9			31
26 to 28	48	9			57
24 to 26	86	24			110
22 to 24	124	1			125
20 to 22	98		6		104
18 to 20	36	1			37
Under 18	1,203	2,298		147	3,648
Total	1,625	2,344	6	147	4,122
Total net registered tonnage	1,413,320	356,171	8,234	40,375	1,818,100
Total vessels of foreign registry	26	76		38	140
Total net registered tonnage	104,534	169,216		9,500	283,250

[1] Standard full-load drafts.

30. Three vessels with maximum draft of 18 feet called at Squalicum Creek waterway in 1933. Thirty purse-seine fishing vessels drawing from 7 to 12 feet use this harbor, besides various other fishing vessels and pleasure boats, mostly motor boats. Their trips and drafts are included in table III.

DIFFICULTIES ATTENDING NAVIGATION

31. Under ordinary conditions it is not difficult to enter Squalicum Creek waterway or to hold a vessel moored therein, but it is claimed by local interests that the waterway is exposed to southerly winds and seas for the duration of which vessels moored in the waterway are in danger. The Bellingham Marine Railway & Boat Building Co. state that thousands of dollars each year have been lost to that company on account of lack of protection from south and southwesterly winds.

SURVEY

32. The map accompanying this report (file E/9/1/46) shows the condition of Squalicum Creek waterway in October 1933. No material change in channel depths is believed to have taken place since that time. The location of the breakwater built this year has been placed upon the map.

PLAN OF IMPROVEMENT

33. Maintenance of the additional areas (B and C) as requested by local interests at a depth of either 26 or 30 feet is estimated to cost $500 per year, thus increasing the annual cost of maintaining Squalicum Creek waterway to $1,000 per annum. The estimated cost of new work to provide a depth of 30 feet in areas A, B, and C is $10,500. Removal of 75,000 cubic yards is required at an estimated unit cost of 14 cents. The cost of maintaining the existing breakwater to a crest height of 14 feet is estimated at $1,500 per year.

DISCUSSION AND CONCLUSIONS

34. The claim of local interests that prospective traffic in coal, sugar, cement, and limestone demands a depth of 30 feet in Squalicum Creek waterway does not seem well founded. The soft coal produced there cannot compete in foreign or east-coast markets, and coasting freight steamers do not require greater than the present depth of 26 feet. Up to this time, the largest freight ships that have used this waterway have not exceeded 18 feet in draft. Sugar shipments amounted to only 1,240 tons in 1933, and the cement company operates its own terminal. It is believed therefore that provision for a 30-foot waterway may be deferred pending more tangible developments.

35. The question as to whether the Federal Government should assume the maintenance of Squalicum Creek waterway is of no great importance as the cost is very small. There is no present need for maintenance work, and I believe future maintenance costs will probably not be beyond the means of the port. The question seems therefore to be one of general policy. As practically all other similar waterways in this district are being maintained by the United States, I see no reason for making an exception in this case.

36. The breakwater constructed largely with Federal relief funds is an essential improvement for the protection of wharves and shipping. In addition it provides a needed small boat harbor. It is constructed on very solid ground, and no great amount of settlement is anticipated. The commission was unable to obtain sufficient Federal aid for completing a proposed extension in a westerly direction. Such extension if found necessary should be made in prolongation of the existing structure to a point on the line of the south limit of the entrance channel. Such an extension of about 125 feet would increase the protection to the inner portion of the waterway. However, it is believed that this extension may well be deferred until its necessity is demonstrated. The Federal Government has constructed and now maintains numerous similar structures. For this reason and because the breakwater at Bellingham was constructed largely at Federal expense it appears that the United States would be justified in assuming its future maintenance.

WATER POWER AND OTHER SPECIAL SUBJECTS

37. In compliance with law, I report that, at the present time, there are no questions of land reclamation, water power, floods, or other related subjects that could be coordinated with the desired improvement to lessen the cost or to compensate the Government for expenditures made in the interests of navigation.

RECOMMENDATIONS

38. In view of the foregoing, I recommend that the existing project for Bellingham Harbor be modified to include the maintenance of areas B and C in Squalicum Creek waterway to a depth of 26 feet at mean lower low water at an estimated annual cost of $500 and the maintenance of the existing breakwater to a crest height of 14 feet at an estimated annual cost of $1,500.

C. L. STURDEVANT,
Lieutenant Colonel, Corps of Engineers,
District Engineer.

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