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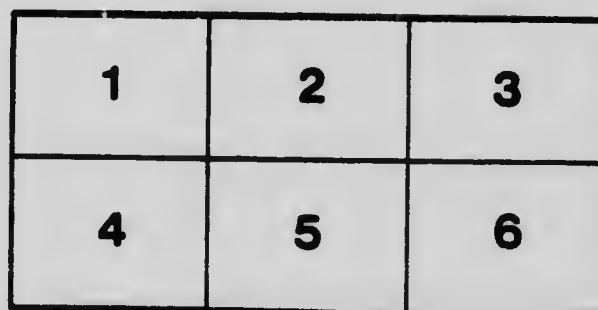
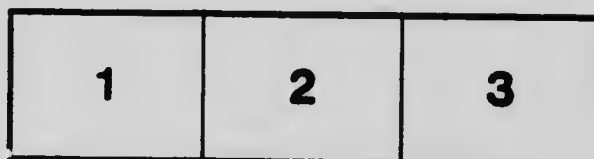
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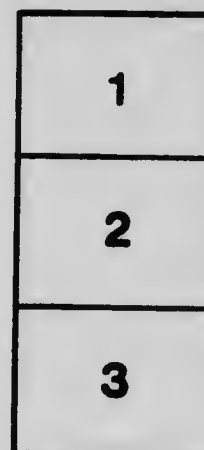
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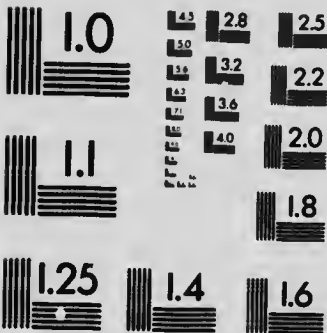
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DEPARTMENT OF MARINE AND
FISHERIES

REPORT

ON

VANCOUVER HARBOUR, B.C.

TO THE

HON. C. C. BALLANTYNE

Minister of Marine and Fisheries

1919



OTTAWA

J. DE LABROQUERIE TACHÉ

PRINTER TO THE KING'S MOST EXCELLENT MAJESTY

1919

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MEMORANDUM.

HARBOUR IMPROVEMENTS, VANCOUVER, P.C.

The development of a comprehensive scheme for adequate port facilities at Vancouver has for many years been urged upon this Department. The subject has received a great deal of attention by the Harbour Commissioners of Vancouver, by the Minister and officers of this Department, and by the Minister and officers of the Department of Public Works.

In the year 1912, Mr. A. D. Swan, C.E., of Montreal, was commissioned by the latter Department to report on the requirements in the way of terminal facilities at the port of Vancouver.

By direction of the Minister of Marine and Fisheries, and under the authority of Order in Council of the 15th October, 1918 (P.C. 2515), Mr. Swan was instructed to investigate further and report on the immediate and urgent requirements in the way of facilities at the port of Vancouver.

Mr. Swan's reports on both occasions are herewith submitted. There is also submitted an outline of the scheme of harbour improvements prepared by the Harbour Commissioners, and a memorandum in reference thereto by Lieut.-Col. W. P. Anderson, C.E., C.M.G., Chief Engineer of the Department.

Respectfully submitted,

A. JOHNSTON.

Deputy Minister of Marine.

OTTAWA, February 28, 1919.

Montreal, January 31, 1919.

HARBOUR OF VANCOUVER, B.C.

1. Introductory.

I left Montreal on 19th November, 1918, and after visiting Vancouver and Victoria, B.C., returned on 22nd December. I had previously visited Vancouver in December, 1911, and January, 1912, and at that time prepared a report and made certain recommendations dated 29th March, 1912, addressed to the Minister of Public Works.

2. Present Conditions.

A certain amount of wharfage for vessels of reduced draught, has, in addition, been provided at False creek and Granville island, referred to hereafter.

3. Tonnage.

	Tons.
Seagoing vessels, inwards.....	1,566,018
" " outwards.....	1,459,868
Coasting trade, inwards.....	1,634,352
" " outwards.....	1,796,600
Total.....	6,456,838

	Tons.
Seagoing vessels, inwards..	2,509,445
" " outwards..	1,010,658
Coasting trade, inwards..	1,996,963
" " outwards..	2,521,847
Total..	8,038,913

Seagoing vessels, inwards.. . . .	Tons.
" outwards.. . . .	1,890,873
Coasting trade, inwards.. . . .	1,643,382
" outwards.. . . .	3,549,997
	3,806,496
Total.. . . .	10,890,748
	Tons.

and for the period April to 1st December, 1918, were as follows:—

Seagoing vessels, inwards.....	1,153,384
" " outwards.....	961,373
Coasting trade, inwards.....	2,407,385
" " outwards.....	2,635,567
For eight (8) months.....	7,158,209

4. Customs Returns.

Customs returns for the year 1907 were.....	\$2,172,930 00
" " " " 1911 ".....	6,230,838 00
" " " " 1917 ".....	7,333,411 00
and for the eleven months from January to November, 1918, were.....	7,959,942 00

5. Inland Revenue.

Inland Revenue for the year 1907 was.....	\$ 403,724 00
" " " " 1911 ".....	526,212 00
while for 1917 it had increased to.....	884,625 00
and for the eleven months, January to November, 1918 ..	557,225 00

6. Grain Handling Facilities.

In 1912, there was practically no equipment or facilities of any sort for handling grain, except one very small sacking granary belonging to the Canadian Pacific Railway, but since that time the Dominion Government has constructed a very large grain elevator at the new Government pier on Burrard inlet, from which was shipped from August, 1917, to August, 1918, 667,900 bushels. From August, 1918, to the present, they have handled only 370,959 bushels. This elevator was built under the supervision of the Grain Commissioners of Canada, and, from the magnitude of the structure, they evidently expect to do a very large volume of business.

The railway facilities for handling the grain in the vicinity of the elevator are of the most meagre and inadequate description, connected by a single track with the main line of the Canadian Pacific Railway. The railway siding accommodation is entirely out of proportion to the elevator.

7. Widening Entrance at First Narrows and Additional Wharfage.

SUMMARY OF FORMER RECOMMENDATIONS.

The work of widening the First Narrows has been proceeded with and the Narrows dredged to a width of about 1,000 feet with 32 feet depth at low water. This work is considered to be a great improvement. It has not yet been completed to the extent of my former recommendations, but there does not appear to be any immediate necessity for recommencing it at the moment, as there are other works more urgently required.

Additional wharfage recommended to be provided east and west of the British Columbia Sugar Refinery.

The new Government pier has been constructed in this locality.

Wharfage should be provided at North Vancouver. Nothing has been done in regard to this, and conditions are considerably changed since my former report as there is no use providing wharfage until railway facilities are given, and these had been arranged for at the time of my previous report by the Second Narrows bridge, which was intended to be proceeded with at once, but this has not been done. This matter is referred to hereafter.

8. False Creek.

False creek recommended to be dredged and to be used for coastwise traffic. A considerable amount of dredging has been carried out so as to give 20 feet at low water from the Canadian Pacific Railway bridge upwards.

The upper end of False creek recommended to be filled in and used as a great central railway terminal. This has been given effect to and the work nearly completed and a considerable portion is now occupied by the Canadian Northern Railway and the Great Northern Railway.

As will be seen from the plans, there are established along the shores of False creek a great many saw-mills, factories, shipyards, and other industries most advantageously situated.

At the time of my previous report there was only from two to eight feet of water at low tide available in False creek, but about twenty feet at low water has now been provided for a restricted width, which should be extended as required. Unfortunately, however, owing to differences of opinion as to liability in event of damage, the dredging in the vicinity of the lower or Canadian Pacific Railway bridge has not been carried out and a dam or barrage has been left in the vicinity of the bridge, making the dredging above ineffectual and further, no doubt, probably tending to the accumulation of sewage.

9. C.P.R. Bridge Across False Creek.

My former report on this matter is as follows:

"The C. P. R. bridge near the mouth is a timber trestle structure, the piles of which require renewing very often owing to the attacks of teredo, and when next being renewed, the position could be changed a little as shown on the drawing, so that the opening span would be at a much better angle for shipping passing through than at present and this without damaging the railway approach; moreover, the foundations of the bridge when reconstructed should be carried down to such a depth that the outer end of False creek below this bridge could be dredged to 30 feet at low water, if desired."

My recommendations in connection herewith have not been given effect to, although continuous renewals are constantly being made. In addition to this, in order to permit the new vessels constructed at Messrs. Coughlin's shipyards, to get to sea, a span of the bridge has to be completely removed on each occasion. I understand the Harbour Commissioners have disputed the right of the C.P.R. having erected this bridge, and I had some discussion with the chiefs of the C.P.R. officials regarding same and no doubt some amicable arrangement can be arrived at, as everyone concerned admits that the bridge in its present condition and position is a serious obstruction to traffic, and I recommend that, if it is considered necessary to have a bridge for railway traffic in this vicinity, it might, with advantage, be moved up in much closer proximity to the Granville Street bridge, and that it should cross over the Harbour Commissioners new Granville Island, somewhat as sketched on the plan.

10. Granville Island and its Effect on False Creek Channel.

Since my former report, an industrial area known as Granville island, has been constructed by the Harbour Commissioners, for the purpose of providing industrial land at a reasonably cheap rate and having facilities for shipping either by land or water. The approximate area reclaimed is about thirty-five acres, of which about one-third has been already leased. This work was approved of by the Privy Council on March 28, 1916. The total cost of the work so far is \$209,718, but the quay walls have not been completed. In order to pay for this work, the Harbour Commissioners were authorized to issue \$300,000 of bonds, bearing interest at 5 per cent, and maturing in five years, secured on the property and controlled by the Harbour Commissioners. The annual rental now being collected for thirty-two lots already rented, is \$14,346, while the rental value of unleased lands is about \$18,359.

This work is somewhat in keeping with the recommendations contained in my former report, that the land at the side of False creek should be reclaimed for industrial purposes and wharfage constructed along the front, and on plan No. 4.

dated March, 1912, which accompanied my report, I showed a channel up the middle of False creek to be ultimately dredged to a width of eight hundred (800) feet, and a depth of twenty (20) feet at low water. I gave the width of this channel serious consideration and discussed same privately with some of the most eminent harbour engineers in London, and I am still of opinion that it is the correct width to aim for, so as to allow shipping to lie comfortably on both sides of the channel and at the same time leave adequate room for vessels to pass in midstream. In addition, I wanted to prevent a current which, owing to the necessity of having a large turning basin at the inner end of the creek, would tend to be formed if the width were too restricted. Most unfortunately, this Granville island has been carried much too far into the middle of the channel, as shown on the plan accompanying this report, thereby restricting the future width of the channel at the lower end to about four hundred (400) feet instead of eight hundred (800) feet shown as originally designed, in addition to which the line of the main front wharfage is not parallel to the centre pier abutment of the new Granville street bridge. Consequently, it will not be possible to moor vessels at the island wharfage on the lower side of the bridge, otherwise there would be every tendency for a vessel passing through the bridge pier opening, to collide with a vessel moored at the island. In addition, when the dredging towards the top end of the creek is completed, there would be an increase in current through the narrow waterway in the vicinity of Granville Street bridge.

As the quay wall has not yet been constructed along this front, I recommend that this matter should receive attention and the line of the quay wall on the downstream side at least, moved back a considerable distance, so as to permit an increased width of channel at this point.

11. C.N.R. Wharfage at False Creek.

The Canadian Northern Railway, when negotiating with the city of Vancouver in regard to railway terminal facilities at the head of False creek, agreed to construct certain wharfage in the vicinity of the Main Street bridge. I am sorry I cannot see any good reason why in this most magnificent site, right at the head of False creek and close to a great central railway terminal yard that wharfage should be constructed capable of accommodating only small boats or scows. Legal proceedings having been taken some time ago by interested parties the work was suspended, and consequently it is still incomplete. I therefore recommend that it should be further considered before the work is recommenced.

11a. Dredging of North Arm of Fraser River.

North Arm of the Fraser river recommended to be dredged to permit of light draught craft.—This recommendation has been given effect to by the Public Works Department, but not completed.

11b. Memo from Vancouver Board of Trade relating to Dry Dock Railway Terminal and Port Equipment.

When I was in Vancouver, a large deputation of the Board of Trade met me and presented the following report, dated November 27, 1918:—

The Vancouver Board of Trade desires to take advantage of the opportunity presented by your professional visit to this city to point out for your consideration some of the present and future requirements of this port.

The natural advantages, both geographical and physical, and the immensely rich resources which, when marketed, must have their outlet through our port, will create, in time, a city whose population will rank with the world's largest seaport. The growth of Vancouver during the thirty-two

years of its existence has been without parallel in the history of any large city. This growth should be fostered by every means in the Government's power; and the port should always be ahead of the requirements of the business offering for the moment.

At the present time it is undoubtedly lacking in—

- (1) A dry dock;
- (2) A terminal railway;
- (3) Proper port equipment, in the shape of electric cranes, wharves,

warehouses, a suitable fireboat, log-booming grounds, etc.

A dry dock is the first necessity of the port. Steamboat owners prefer to send their boats to a port where they know that, in case of accident, a good dry dock is available. Before the war, ship repairing had been carried on to some extent, but was handicapped severely owing to this shortage. Many thousands of tons of new shipping have been built during the war in this port.

This industry has been a most valuable one to the city, giving employment to many men at high wages. Such an industry must ultimately mean the establishing of iron and steel works in British Columbia. Shipbuilding cannot become permanent unless the port is equipped with a dry dock.

We would urge that, in view of the fact that no responsible man or firm is taking advantage of the "Dry Dock Subsidy Act" to build such dry dock, one be built by the Government as a Government work, and commenced at once.

Bearing further on the dry dock question, it need only be pointed out that a conservative estimate of the amount of repairing work alone lost to this port during 1917 is placed at \$1,500,000.

A terminal railway is an essential part of the development of the port. Facilities must be provided to connect the different railway systems, so as to permit of an interchange of traffic and rapid transfer of both incoming and outgoing freight. Such a terminal railway should include connection with North Vancouver by way of a bridge over the Second Narrows.

The equipment of the port is much behind what it should be, considering the volume of business done. There is a lack of suitable fireboats for the protection of the millions of dollars' worth of merchandise collected on the wharves and in the warehouses of the waterfront. There are no suitable cranes for the speedy handling of package and other freight. We believe that, with modern equipment, the cost of handling cargoes could be reduced 50 per cent. The wharf and cargo sheds are still insufficient for the business offering.

This board submits these points for your consideration, and would urge that as Vancouver is already one of the largest, and has a possibility of becoming the largest port in Canada, it is entitled to most liberal consideration at the hands of the Government, and that the Government should supplement the promise given to the delegation which waited upon it from this board at Ottawa, in 1917, by proceeding to at once develop and treat the port of Vancouver as a national port to the same extent, and on similar lines, to that of Montreal.

All of which is respectfully submitted.

C. E. TISDALL,

Chairman, Port Development Committee.

12. North Vancouver.

At present there is practically little or no wharfage for commercial purposes at North Vancouver with the exception of a somewhat primitive landing stage for car ferry in connection with the Pacific Great Eastern Railway. The means of communication between Vancouver city and North Vancouver is by ferry boat, owned and operated by the city of North Vancouver. The number of passengers carried during the year 1917 was 2,500,000, while for the eleven months of 1918 the number is 2,720,906. The population on the north shore is estimated at approximately 12,000 to 15,000.

The receipts from the city ferries for the year 1917 amounted to \$110,642 while for the eleven months of 1918 they amounted to \$155,709 as compared with \$86,000 for 1910, and \$138,000 for 1911.

The industries in North Vancouver include the Lyall Shipbuilding Company, the Wallace Shipyards, Limited, North Shore Iron Works, and the Vancouver Creosote Company, which receive and forward. I was informed, approximately about 100,000 tons per annum. The Capilano Timber Company has recently spent approximately \$1,000,000 in opening up its timber limit, and propose in the immediate future to erect a large mill. Small copper and zinc mines are being operated on the Lyne creek at the present time. There are a number of large saw-mills in the immediate vicinity, including the Dollar Timber Company at Roche Point; Vancouver Cedar Mill at Roche Point; Cedars Limited, Lyne Creek; Lyne Valley Lumber Company, Lyne Creek; Vedder River Shingle Company, Hollyburn; Askew Shingle Mill, North Vancouver, etc.

I visited the whole of the above industries and interviewed the representatives, each and every one of whom complained of excessive freight rates and absolutely inadequate means of transportation.

It is evidently costing about \$65 per tank car to transport creosote oil from Vancouver across the inlet to North Vancouver; one firm averaging about \$4,000 per annum for this item alone. When times become normal this company anticipate obtaining much larger supplies of creosote, so that the matter of cheaper transportation is of considerable importance to them.

The shipyards complain very much of the disadvantage under which they are operating owing to the absence of railway connections with Vancouver. The only railroad connections for heavy goods being by transfer barges operated by the following railroads from their respective terminal points: Canadian Pacific railroad from Vancouver, Canadian Northern railroad from Port Mann, Great Northern railway from New Westminster.

The shipyards also complain of serious delays in getting the goods even after they have been delivered in Vancouver, the delays in some instances being from twelve to fourteen days. One shipyard stated: "On several occasions during the last two years, this delay has necessitated partial closing of our plant, laying off for the time being 400 or 500 men, and badly disrupting our entire organization."

A further matter complained of is the additional freight rate from Vancouver to North Vancouver, the charge by the railroad companies for delivering cars to North Vancouver being 0.07½ cent per hundred pounds on all westbound transcontinental freight and 0.10 cent per hundred pounds on what is known as local shipments. I was also informed that terminal rates on westbound transcontinental freight, are the same to Victoria as to Vancouver, and the industries at North Vancouver feel very strongly that their freight should be handled at the same rate as Victoria which is nearly 80 miles farther distant.

13. General Remarks on Probable Future Traffic at the Port.

From its geographical position, Vancouver is the Pacific terminus of the great Canadian transcontinental railway systems, all of which have terminals in Vancouver, in addition to which there is considerable business from the United States over the

Great Northern, Northern Pacific, and the Chicago, Milwaukee and St. Paul railways, all of which have connections with the port. From its nearness to the magnificent forests, fisheries, mines, and fruit-growing and wheat lands, from the rapid growth of its manufactures and industries, and from the fact that it ought to form the gateway to the East, one cannot be otherwise than optimistic as to the future trade of the port if modern facilities and proper equipment for handling cargoes are provided at the earliest possible date, so that it may not be handicapped by allowing rival American ports to get so far ahead that it would be difficult for Vancouver to regain what she has lost through lack of foresight and preparation. Judging from the great ports of Europe, those that are doing the biggest business and doing it most efficiently, are the ports that have kept their facilities ahead of actual requirements, and great development has invariably been followed by increase of trade and population.

It has been well stated:—

He who can most economically and quickly reach the markets of the world can control the commerce of the world. A decrease in transportation expense not only facilitates commerce but creates commerce and manufacture.

The foreign trade of a country or a city is great, as the country or city develops facilities for the flow of commerce through its gates and its very existence as a foreign trade power may, therefore, depend upon its transportation efficiency.

Transportation efficiency has long been recognized by those countries which were the leaders in foreign commerce, as a terminal problem, and their main purpose has been to obtain the utmost development of terminal facilities for the economical and rapid transfer between vessel and shore.

In considering the probable future traffic at the port, it is somewhat difficult to arrive at sound conclusion— as to what immediate development is necessary. In ordinary circumstances, one would naturally turn to the trade of the port for the last three or four years, but owing to war conditions, and the fact that enormous supplies have been shipped to Russia, China and Japan, and other centres through Vancouver, which might, in ordinary peace times, be shipped by other routes. I concluded that I must not base any recommendations on the recent trade returns, as they were abnormal. There is little doubt of this, as I know of considerable freight shipped to India and Singapore from Vancouver which had to be transhipped at Hong Kong, owing to the fact that there were no direct sailings from Vancouver and the sailings from New York direct during war time, were very uncertain. These goods were held in Hong Kong sometimes for upwards of sixty days before connection was made with steamers going to their ultimate destination. These shipments, in normal times, would, without question, I presume, have gone direct from New York. At my request, the Canadian Pacific Railway kindly prepared statements for me as to their total import, export, and coastwise traffic at the port from 1913 to 1918, which was as follows:—

1914	over	1913	21% decrease.
1915	"	1913	3% "
1916	"	1913	112% increase.
1917	"	1913	164% "
1918	"	1913	195% "

From the rapidly increasing business with the East, I think it most probable that there will be a very considerable future increase in traffic over the year 1913. I therefore interviewed personally each and all of the large shippers now exporting from or importing into Vancouver, and obtained a statement as to what additional wharfage they were prepared to make use of if it was provided and properly equipped at reasonable charges, so that such recommendations as I make hereafter are based practically on actual requests for immediate facilities, and if a comprehensive plan of the whole general scheme is now approved, the future accommodation can be increased from time to time as trade and commerce expands and the necessity for such increase in wharfage arises.

Owing to the lack of wharf accommodation and facilities at Vancouver, the total charges for wharf handling and storage amounts to practically \$4.95 per ton for thirty (30) days as compared with \$1.60 at New York and \$2.30 at Seattle. The reason given me for the charges at Vancouver being so high was on account of the limited accommodation and lack of wharf facilities. At New Orleans the insurance on cotton is 0.30 cent per \$100; at the C.P.R. wharfage at Vancouver the insurance is \$1.50 to \$2.35 per \$100.

One firm wrote me that it costs importers 0.15 cent per 100 pounds more for charges into the port of Vancouver than into Seattle, as it takes steamers so long to unload at Vancouver. The same firm states that there is no space available on the wharves at Vancouver for storing import or export cargo. They are allowed ten days' time on the wharves for which they pay 0.60 cent per ton wharfage charge; if they wish to leave a shipment there for thirty (30) days it costs \$4.95 per ton, as the storage rate advances each week, and even at this very heavy rate the wharf companies do not wish goods stored on their wharves, as space is so limited. Under those conditions an importer, therefore, has to cart his goods from the wharf to his warehouse, then when he wishes to reship them he has to cart them back again. They wrote: "You can readily see it is almost impossible for import houses to handle shipments through the port of Vancouver with conditions at they are to-day, in competition with importers in Seattle and other Pacific Coast ports."

In addition to the present traffic handled at the harbour, there appears every reason to suppose that business which is now being handled through American ports and of which a considerable quantity is ultimately for Canada, can be attracted to Vancouver if proper facilities and plant are provided. I refer more particularly to oil storage tanks for non-inflammable oil, for the handling of which traffic there are no facilities at present, although there have been actual requests for same. The import of vegetable oils in 1917 from the Orient, through Pacific Coast ports, is reported to have been to the value of over \$70,000,000, three-quarters of which, it is estimated, was discharged at Seattle. At the beginning of the year 1918, a reliable firm offered to guarantee that it would handle at least one-half million cases of oil at Vancouver if the facilities were provided. In view of the United States restrictions on importing oils to Canadian points through American ports, Canadian manufacturers of foodstuffs, soaps, paints, etc., requiring such oils, will have to depend on some other means of supply—direct shipment to Canada or otherwise. I was informed Seattle Port Commission tanked three million cases of oil in 1917, and estimates that in 1918 the amount will be five million cases. The commission's plant at Seattle consists of concrete tanks, heating rooms, and dumping tables. The charge for storage on these tanks is one dollar per day, twenty-five thousand gallons. In March, 1918, I was told there were fifteen million gallons of oil at Seattle. At that time Seattle's tanking capacity was four and one-half million gallons, and it was expected this would be increased by the end of the year to six million gallons. Several of the largest firms in the oil business consider this oil trade will not only stay, but rapidly increase, and the demand for such oils in Canada is already great. Evidence of this was given by the fact that three or four of the largest companies approached the Harbour Commissioners of Vancouver with pressing requests for storage and handling accommodation at the port.

Another source of business for the handling of which there are no facilities at present, and which is the most prominent natural industry of the district, is the exportation of lumber. I received a deputation from the large lumber interests and discussed this matter.

The object of a lumber-distributing wharf is to enable ships to take full cargoes of lumber which has been assembled from many interior mills.

Apparently, the want of economical facilities for assembling shipments and the cost of handling lumber and shingles from the smaller mills, has made it impossible, in the past, for any except the larger mills to participate in export business.

I understand that, with the facilities provided by the Seattle Harbour Board, lumber can be unloaded from cars and scows and placed in position for loading onto a vessel at very small cost, while without these facilities, the cost of transferring and handling the lumber simply debars the smaller mills from the export business.

The lumber interests informed me that the establishing of an assembling yard with facilities for handling the products of the mills, would be the greatest boom that could be offered to the lumber industry, as it would enable them to operate at times when the interior market was buying lightly, and that if there were facilities for storing their lumber at a wharf they would be in a position to raise money on this lumber when required, if it was stored on the harbour property. The following is a petition signed by some seventy of the principal lumber mill representatives:—

"We, the undersigned lumber and shingle manufacturers and dealers respectfully petition your port to establish at some accessible point, a wharf for the assembling of lumber and shingles, with suitable facilities to ensure cheap handling from both scows and cars, and accessible to ocean-going vessels. We would suggest something along the lines of facilities afforded by the Seattle Harbour Board, and believe such an arrangement will enable mills which have been in the past debarred from the export trade, either by location or size of mill, to market a portion of their product for foreign consumption and so relieve congestion here."

14. Recommendations.

In view of the foregoing, I therefore recommended with absolute confidence, that a comprehensive scheme for wharf areas, railway terminals, roads, sheds, warehouses, and freight-handling facilities in general, should be designed on a broad basis and constructed by degrees as required, and that the following should be commenced as soon as possible as they are required now.

- (1) A booming ground for lumber should be provided in English bay.
- (2) A timber export wharf provided in one or other of the alternative positions referred to hereafter.
- (3) A harbour terminal railway.
- (4) Provision for six new deep-water berths or wharves at once.
- (5) Mechanical equipment provided at the new Government wharf, and other wharves when constructed.
- (6) Equipment for non-inflammable oil storage in some suitable site.
- (7) Provision of a fire tug, fitted with powerful crane, which tug shall be used as an auxiliary car ferry to serve immediate needs to North Vancouver.
- (8) Provision of dockage facilities for passengers and other traffic in connection with Canadian National railways.
- (9) Removal of present C.P.R. bridge across False creek, and, if necessary, construct new bridge in suitable location.
- (10) Provision of suitable landing facilities at North Vancouver for auxiliary car ferry with railway connections.
- (11) Second Narrows bridge should be constructed as part of the complete scheme if not immediately, at an early date.
- (12) Dry dock to be constructed by Government, if not arranged for by private interests at early date.

15. Brief Recommendation of Works Recommended.

BOOMING GROUND.

A large deputation representing the lumber industries of the district discussed with me the necessity for provision of a booming ground for logs, and a site suggested as being suitable was English bay.

In Vancouver harbour, owing to the prevalence of the teredo (a worm which very rapidly destroys timber) lumber booms must be stored on tide flat land, that is,

between high and low water, so that as the tide recedes, the lumber is exposed to the sun and air, which destroy the worm.

As lumber is one of the most important local industries, and the accommodation requested seemed to me reasonable, and the provision of same would only entail very moderate expense, I recommend this facility be provided.

The site for the booming ground which I suggest is on the south side of English bay, on the fore-shore opposite a golf course, which land is owned by the Admiralty. In order to protect the lumber booms, I suggest that a short breakwater or rubble mound should be constructed running out from the shore for a distance of probably fifteen hundred feet, or a little farther, if necessary. This small breakwater would form a protection from any seas which might otherwise disturb the lumber, and at the head of the breakwater should be constructed a landing place or small wharf where the tug attending the timber boom, could be moored. In addition to the rubble mound, a few small clusters of piles to link up the boom, will be required.

Surveys will have to be made of the site before the work is proceeded with as the information which I have at present is rather meagre.

16. Timber Export Wharf.

As already mentioned, a timber export wharf seems to me to be not only advisable, but almost essential, as there is practically no provision at present at Vancouver for handling this business, and it is firmly believed that an immense volume of trade by the smaller class of vessels, a large number of which have been built during the war period, would be immediately secured, not only for trade to Great Britain and to ports on the Pacific such as South America, but in all probability to the eastern ports of Canada, by way of the Panama canal.

Regarding the approximate amount of export business available for shipment, if proper facilities were provided, the delegation of lumbermen whom I met felt confident that the first year's shipment would easily reach twenty-five million feet of timber, and the second year, probably fifty million feet. This quantity would only mean about 15 per cent of the present amount being shipped from Washington, Oregon, and British Columbia, and they thought it only reasonable to assume that in the next five years, the total amount shipped from the Pacific coast, would reach a billion feet. In that case Vancouver would still only be shipping 10 per cent of the entire amount.

If it is decided to establish a wharf for this purpose, there must be in close proximity, a considerable area of land for timber storage.

The following table gives the water-borne export of lumber from British Columbia for the years 1915 to 1917:—

Destination.	1915.	1916.	1917.
Australia.....	5,913,020	2,152,657	16,309,307
New Zealand.....	640,577	286,421	122,984
West Coast of South America.....	301,449	627,418	2,616,652
China.....	3,425,953	3,055,045	1,672,871
Japan.....	1,583,437	3,042,690	1,590,246
South Sea Islands.....	1,395,058	991,308	1,610,715
United Kingdom and Continent.....	38,112,299	19,801,629	13,447,946
Africa.....	5,329,042	10,114,885	6,022,828
Alaska.....		3,564,654	
Russia.....		39,816	
California.....	1,373,938		
India.....			1,529,014
Total.....	58,074,773	43,676,523	43,922,563

The wharf itself should be provided with good railway facilities and equipped with a large Gantry crane of a lifting capacity of probably about five tons, designed not only to handle lumber but to facilitate the transshipment of structural steel, machinery or other heavy equipment. This Gantry would be able to travel over the entire lumber storage areas so that lumber received either by rail or barge, may be tored on the wharf. On part of the wharf, a dry-lumber shed, say approximately five hundred feet long and about eighty feet wide or thereabout, of comparatively inexpensive construction, open at the sides and with a roof only and fitted with an overhead travelling crane of a span about eighty feet, to travel from one end of the shed to the other. There should, in addition, be a locomotive crane of say ten- or fifteen-ton capacity for rapid handling of the lumber, and other general purposes. This crane when not in use on the timber wharf, could, of course, be run in a few minutes, to any other part of the harbour, when required.

In regard to a suitable site for this wharf, I have considered several alternatives.

First.—The North Vancouver site marked "A" on the general plan situated on land in front of the Indian reserve, belonging to the Vancouver Harbour Commissioners, and immediately adjoining the Wm. Lyall Shipbuilding yard. There is a large area of tide flat land of an average width of about fifteen hundred feet by about a thousand feet in breadth, which would only require a few feet deep of filling in order to raise it to suitable quay level and an export wharf could be constructed projecting into Burrard inlet, or alternatively a quay wall could be constructed along the front of the property, as might be arranged hereafter if it is decided to develop this site. The particular attraction of this location is that the land actually belongs to the Vancouver Harbour Commissioners, and whether it should be ultimately decided to build this export wharf in this location or not, I have no hesitation in recommending that this area should be filled up by dredging immediately in front and using the material for filling, as the site is so excellent a location I do not think there would be any difficulty in leasing the property for other industries if the surface of the land was raised a few feet so as to bring it to the necessary level. The principal objection to the site as a timber wharf is the lack of railway connection with the main lines entering Vancouver except by car ferry across the inlet, at all events until such time as the Second Narrows bridge is constructed, if it is decided to proceed at a reasonably early date with that work.

Second.—At North Vancouver, near Moodyville, the site marked "B" on the general plan, there is considerable area of land which will, no doubt, become much more valuable as time goes on and which might probably be acquired now at a reasonable price. The principal attraction for establishing this wharf at North Vancouver seems to me to be the probability of being able to secure the site at reasonable cost. The principal objection is that all lumber is coming by rail to the new export wharf, and I was informed about 50 per cent would come by rail and would all have to be transferred across Burrard inlet by the auxiliary or other car ferry. Lumber delivered by scow or barge, would, of course, be in as good a position there as anywhere else, and if it should be decided to proceed at an early date with the Second Narrows bridge, then the railway disadvantage would be overcome probably in two years' time or thereabouts.

17. Port Moody Site.

Another alternative site for this export wharf which I examined, was at Port Moody, marked "C" on plan, where a site has been offered to the Harbour Commissioners. It is eighty-eight acres in extent, and there are a number of saw-mills now operating and in working order on the site. The total price asked from the Harbour Commissioners is \$550,000 payable in bonds. The rental of the saw-mills on this property at present equals \$18,000 per annum, which would approximately meet

interest on the purchase price of $3\frac{1}{2}$ per cent. It is considered that the balance of the property over and above the part required for the lumber wharf and the existing mills, if rented for other industries, would make the property revenue producing. I have given this alternative site at Port Moody serious consideration, more particularly as an order in council was passed on March 31, 1916, authorizing the property to be bought for this purpose. Port Moody was the original terminus of the C.P.R. The population of the town to-day is approximately about 2,000. The saw-mills on the property referred to are the principal industry in the district. There is a small steel-rolling mill at the head of tide water turning out about fifteen tons a day. The C.P.R. have a railway branching off here and running down from the head of Burrard inlet along the north shore to Ioco, the site of the Imperial Oil Company's plant, a distance of approximately three miles, or about four miles from the junction of the main line of the C.P.R. It is approximately about eight miles from North Vancouver to Ioco, where the Imperial Oil Company have a very extensive plant, said to be valued at about three million dollars.

The advantages put before me of the Port Moody site were that a large area of land could be acquired for what was stated to be a very reasonable price and that it was considered a further advantage to have a lumber exporting wharf, which admittedly is inflammable, some distance away from the other part of the harbour.

My objections to Port Moody are *first*, that it is served only by the C.P.R. Consequently, all lumber coming in by rail over the Canadian National or other railway systems, would have to be transferred to the C.P.R. and hauled over their main line to Port Moody.

Second, I see no reason why the Harbour Commissioners should buy out and become the owners of large saw-mills now occupied and in working condition. It seems to me they are an existing industry that there is no good reason for disturbing.

Third, I see considerable disadvantage in having to tow sawn lumber arriving by barge or scow past Vancouver Harbour proper away up Burrard inlet about ten miles to Port Moody, bearing in mind that it would all have to be brought back again either on scow for shipment at Vancouver or the larger vessel would have to go up to Port Moody to get either its whole or part cargo. If, however, there is some reason with which I am unacquainted, that it is advantageous to establish this wharf at Port Moody, then I would recommend that the saw mills be undisturbed and the wharf constructed somewhere in the vicinity of the present long timber pier.

A *fourth* alternative site which I considered, was on the main front at Burrard inlet, but having in view the large area of land required for storage purposes, in connection with a timber export wharf, I consider that the main front at Burrard inlet for this purpose, would be too expensive.

Fifth.—I have considered a site at Kitsilano which has considerable attractions, mainly, from the fact that the land at Kitsilano Indian reserve has been expropriated by the Harbour Commissioners. Part of this area would be available for lumber storage and is not necessary for other purposes meantime.

A second advantage would be that it would have good railway service by the new harbour terminal railway recommended hereafter, which would be connected with all the railway entering Vancouver.

A third advantage is that lumber arriving by scow of which, I understand, a considerable amount would come down the Fraser river, would have shorter tow, and would avoid having to go through the First Narrows. This latter, however, I do not consider serious and if a vessel was loading in Burrard inlet and taking on part cargo of lumber, she would either have to be transferred to Kitsilano or the lumber taken either by rail or scow from Kitsilano to Burrard inlet.

On comparing the various sites, therefore, I conclude that the advantages seem to rest with the site at Kitsilano, or the first site marked "A" at North Vancouver. Before definitely deciding on same, however, the question of future development of deep water berthage at Kitsilano must be decided and is referred to hereafter.

18. A Harbour Terminal Railway.

The economical advantage of publicly administered switching facilities in the immediate vicinity of dock wharves have been amply demonstrated in the case of Montreal harbour, where the different railway companies, at points designated in the harbour, hand over their cars, properly marshalled, to the Harbour Commissioners, who place them where desired at the freight sheds, grain elevators and other places for loading and unloading, and the cost of removing freight to and from the cars has been reduced about 50 per cent.

Such a harbour railway not only affords facilities for transshipping freight and switching cars from one railway line to another and from railway to wharf and vice versa, but also connects with the different industries located along the harbour front to which are shunted all manner of raw materials, supplies and manufactured goods.

The harbour or terminal railway in practically all of the great European ports is considered an absolute necessity, and the terminal charges of the railroads involve the entire development of the port.

Such a railway connects the piers and wharves of the port in such a manner that a car loaded at any pier may travel to any other pier or to any railroad line. The important freight movement is not from one pier to another, but from pier to railroad main line. Montreal is one of the most conspicuous examples of a publicly owned and operated harbour terminal line. It has been most successful.

Previous to the harbour terminal railway being constructed at Montreal, the switching charges amounted to something approximating twelve dollars per car with very often a delay of several days in some cases. Now that the terminal railway is provided, the same service is performed expeditiously at a rate of \$5 for through traffic and \$2.50 to any point in the central harbour. No fact is better established, then, that the improvement of a means of conducting traffic by making it most convenient, most rapid, or cheaper, is certain to increase the amount of that traffic and to an extent which frequently surpasses the most sanguine estimates of the effect. Over and above this, there is the important factor of competition with other ports and the attractive force of outstripping rivals in the nature and convenience of the accommodation afforded, which will not only draw traffic from other routes, but establish new traffic which, but for the convenience and advantages offered, might have passed in other directions or never have had any existence at all.

The following quotation from a pamphlet published by a late Dock Commissioner at New York shows what importance is attached there to the Railway access to the wharves being under independent control:—

"Terminal monopoly of a port no longer consists in controlling the docks rather in controlling the marginal Railroad behind the docks, which connects them and their warehouse and factory adjuncts with their docks, public markets, and factories, and with all the railroad systems reaching the port."

The best North Sea ports are each in a sense, simply a series of railroad routes around the fore-shore, and the fundamental principal of port organization everywhere, is to arrange for a marginal railroad traffic in the rear of the docks that shall be as public and unimpeded in its movement as in the water front traffic in front of them.

It has been proved that a belt line or harbour terminal railway can perform the service cheaper, as well as better, than private lines, and still leave the Port Authorities a little profit.

At San Francisco, a harbour belt line was established in 1891, and is owned, controlled, and operated by the State Board of Harbour Commissioners.

At New Orleans the harbour belt line is owned and operated by the Public Belt Railroad Commission, which serves eleven different Railroads.

Nearly all of the more successful European Dock Systems each have their terminal railroad operated by the Port Authority. One of the largest and most successful I know of is that of Bristol, England.

From information gained at Vancouver, and from the numerous complaints of excessive charges and serious delays in handling traffic there, it seems to me a harbour terminal railway would overcome many of the present disadvantages and prove a decided attraction to the port, and I have no hesitation in recommending that the necessary property should be acquired and the work proceeded with. A harbour terminal railway has been already approved by the Privy Council, dated March 31, 1916. The estimated cost of the right of way and construction through sundry properties, from the Kitsilano Indian reserve to the Heaps Mill property on Burrard inlet, being estimated therein at \$1,552,861, but it has since been estimated that this amount might easily be considerably reduced and still be quite sufficient and that much of the property could be exchanged leaving only \$600,000 to be provided in cash. The acquisition and negotiations in connection with the purchase of the necessary property for the construction of this terminal railway, if approved, will require very considerable study and negotiations, more particularly, as in all probability, a considerable amount of the property might possibly be acquired through exchange of property already belonging to the Harbour Commissioners. This question has been preliminary investigated in an exhaustive manner, by Mr. Cartwright, Civil Engineer, Vancouver, on behalf of the Vancouver Harbour Commissioners but the subject is one which would require further study, and I believe that much of the necessary negotiations in connection therewith could be carried out and settled amicably as many of the various proprietors seem anxious to be able to get increased railway facilities.

The approximate suggested route of the Terminal Railway is shown on the plans.

It will be seen from the general plans that the present bridge at the lower end of False creek, known as the C.P.R. bridge, is shown to be done away with, and is referred to under item No. 9. A new bridge in substitution thereof, is shown to be constructed somewhere in the vicinity of the present Granville Street high-level bridge.

It will be seen from general plan that the C.P.R. now have a railway line running from their main line at Burrard inlet, right through the centre of the town, passing through some of the busiest streets by level crossings, to their yards situated on False creek. It seems to me that this part of the C.P.R. system connecting Burrard inlet with False creek, should be considered in connection with the proposed negotiations in regard to the harbour terminal railway, as, apparently, this part of the C.P.R. line is a serious danger to the community. Nevertheless, I think it is a matter more directly concerning the city authorities of Vancouver, and it would appear feasible to connect up a railway system on the east side of False Creek by a new line running along the head of the creek, nearly parallel to Main street, which would connect with the railway serving the west side. Thence passing under a new subway to be constructed at Main street and so reaching the newly constructed railway terminal yards on the land recently filled in for this purpose at the head of False creek.

Alternative routes for this terminal railway are shown at Granville island, which have certain advantages and disadvantages, and the ultimate decision as to location would depend on the nature of the negotiations with the proprietors as to whether the Railway should be carried over the Harbour Commissioners' Granville Island property, or round the main land.

19. Fire Tug.

The question of providing a suitable fire boat for the protection of the harbour property and other property abutting thereon was laid before me by the Vancouver Board of Trade, who urged very strongly the advisability of providing protection for the enormous amount of merchandise collected on the wharves and warehouses of the water front.

On first consideration I was inclined to think this was a matter which should be dealt with by the city authorities and the necessary fire protection provided by them

just as they would supply a new fire engine for street service, but on further consideration, as the property of the Harbour Commissioners and the Government has now reached considerable value, and having in view the construction of new wharves and other facilities herein recommended, then, as a matter of insurance it seems to me advisable that a fire tug should be provided leaving over the question as to what proportion of the cost and up-keep of same should be paid by the city of Vancouver or the railway companies or other interests who occupy a vast amount of the harbour frontage.

It is feasible to design and provide a tug boat fitted with fire fighting appliances which could be used in conjunction with a large scow to form an auxiliary car ferry serve between Vancouver and North Vancouver, which, owing to the present inadequate facilities is evidently urgently required. As this boat would never be outside the limits of the harbour, in the event of fire she could immediately be disconnected from the scow forming the car accommodation and proceed with all haste to the fire. In addition I would suggest that this fire tug should be provided with a fairly powerful crane which would be available for lifting heavy goods, or such operations as might be required within the precincts of the harbour; in addition the tug should have towing facilities so that she could be hired when otherwise free for small tows within the harbour limits; such a vessel from its combination of uses, would, in my opinion, prove an asset to the port.

20. Mechanical Equipment.

There is little or no mechanical equipment for handling cargoes at any of the wharves owned either by the Government, the railways or private interests. The question of whether it is an advantage or a disadvantage to equip a port with modern appliances so as to facilitate the most rapid loading and discharging of cargoes is a subject which harbour authorities have been giving considerable study during the last few years, and the consensus of opinion undoubtedly now is in favour of the provision of modern equipment. This subject was considered to be of so great importance by the Institute of Civil Engineers that a special lecture was given thereon by Sir John Purser Griffiths, M. Inst., C.E., from which I take the liberty of giving some quotations hereafter. I have personally been in communication with practically all of the most important port authorities in Great Britain, as well as abroad, and at the same time communicated with many of the largest steamship companies, seeking their opinions on the advantages or disadvantages of port authorities equipping their harbour and docks with modern machinery. In almost every instance I learned that electric appliances were being provided at practically all of the great ports, and some of the largest shipping companies wrote me that if my views were given effect to they would increase dispatch by from 10 per cent to 25 per cent. At one port alone fifty-six (56) new electric cranes had been recently installed.

My object in recommending the provision of mechanical equipment is to reduce the cost of raw materials and the finished article to the consumer. Reduction in the cost of transport between the source of supply and the manufacturer or consumer is the primary object of such appliances. Rapid loading and discharging of vessels is an important factor in freight charges. It is obvious that the port which gives vessels the most rapid dispatch will become popular with the ship owner and favourably influence freights to that particular port.

As long ago as the Engineering Conference in England in 1917, the late Sir Wm. White stated:—

It has been obvious to me for many years that greater rapidity in dealing with cargoes must be the essence of success in commercial operations.

and more recently Sir John Purser Griffiths stated:—

Our port authorities have been slow in realizing the importance of rapid dispatch in loading and clearing ships frequenting their ports. They have

frequently checked the extension of port equipment by excessive charges, forgetting that it is not so much making a profit out of such appliances which should be sought as making the port as a whole more efficient and economical.

Shore equipment is essential for the handling of materials on shore, and for hastening the clearing of wharves and sheds. This is as essential as the discharging of the vessel, for if the landed cargoes are not rapidly removed, the discharge of the vessel is delayed for want of quay space upon which to land the cargoes. The congestion of our ports from which the nation has suffered during the present war has been largely due to imperfect facilities for handling the goods when landed.

In my opinion it is only by such appliances that one can insure rapid discharge of the ship, keep down port charges, and thus make the port financially sound and attractive to both ship owners and traders. Incidentally such equipment should not be called "labour-saving appliances," but "labour-aiding appliances." If the port is not sufficiently provided with well designed sheds and ample quay space as well as appliances for the handling and sorting of merchandise of all description loss and extra expense will be incurred.

I will not enter into detail as to the class or amount of equipment which should be provided at the moment. Generally speaking, electric cranes are most favourably looked upon as they can be utilized for so many different purposes. In his recent book on terminal facilities, Professor MacElwee, in speaking of cranes, states:—

It is by such machinery as is installed in every foreign commerce port of England, Germany, France or Holland, 6,000 tons transference per day are to be compared with the 1,500 tons at New Orleans. The ships' detentions will be one-third or one-fourth the time, and for the same berthing linear frontage four times as many ships can be berthed in a given period. The rental cost per ton would be one-fourth, and on a tonnage basis all the overhead charges would be also one-fourth.

Official tests were made at Montevideo, South America, of twenty travelling jib cranes which were so satisfactory that thirteen additional cranes were ordered.

Similarly in speaking of the advantages of providing inclined elevators or conveyors, he states:—

In regard to the savings effected by this piece of apparatus the Metropolitan Steamship Company, whose docks are equipped with these machines, advise that there is a 25 per cent saving in time of discharging steamers by the use of inclined elevators. The Merchant and Miners Company of Baltimore reports a saving of 13 per cent to 15 per cent in handling cost. The New York Central Railway Company report an increase capacity in their Marine equipment of from 20 per cent to 40 per cent, depending on conditions. The old Dominion Steamship Company, whose piers at New York and Norfolk are equipped with these machines, also claim considerable saving.

Electric trucks for rapid handling inside sheds and other equipment have been proved to be very profitable investments. I therefore recommend that the Dominion Government wharf on Burrard inlet, which has no mechanical equipment, should be equipped with cranes and other necessary machines as soon as possible, and that in designing the new wharves and harbour sheds recommended herein provision should be made for their proper mechanical equipment.

21. Second Narrows Bridge

When I prepared my former report on Vancouver Harbour, dated 29th March, 1912, plans were then being prepared for a bridge across Burrard inlet at the Second Narrows, which scheme was being promoted by a private company. The object was to give access for railway, vehicular, and passenger traffic between Vancouver city and

North Vancouver. Complete plans were prepared by one of the best known Engineering firms in London, England. Tenders were invited, but for one reason or another the work was not proceeded with.

The bridge in question, as designed, was about sixty-four feet in width, giving one single railway track, two tramway tracks, two roadways, and a footpath, and the lowest tender for complete bridge was \$2,443,097.

Having in view the immediate construction of that bridge when I made my report, I recommended that one pier should be built at North Vancouver, as good railway facilities would be provided by means of the new bridge.

As already stated, the bridge has not been constructed, and until arrangements are made for its construction I do not see that very extensive wharf accommodation should be provided at North Vancouver, as owing to the present inadequate railway facilities, any wharf accommodation given would be very expensive to work.

In view of the fact that there are most excellent sites for wharf accommodation at North Vancouver which can be acquired at reasonable rates, and owing to the very large traffic now existing between North Vancouver and Vancouver city, I am strongly of opinion that the Second Narrows bridge should be proceeded with and the railway line extended from the site of the bridge down to North Vancouver city, and connected on to the present terminal of the Pacific Great Eastern railway. The width of Burrard inlet at the Second Narrows at low water level is only about 250 feet, and I venture to think I could design a very much less elaborate bridge than that previously proposed, giving quite sufficient accommodation for the traffic which is likely to use the bridge for many years to come.

I suggest that a bridge about fifty-three feet wide should be provided, which would give one railway track, one tram line, one roadway, and one footpath. This bridge would only be about eleven feet narrower than that formerly proposed.

I have gone into this matter very carefully with one of the largest bridge construction companies in Canada, and they agree with me that such a bridge as I suggest would be perfectly adequate for the purpose intended, and could be constructed complete for the sum of about \$1,650,000, or thereabouts.

If this bridge is proceeded with it would form a most important link in the railway service and would connect up all the existing industries on the north shore, and no doubt, many more industries would immediately locate there if they were provided with railway connections.

The tram line across the bridge would, no doubt, command a considerable rental from the tramway company.

The bridge I suggest would have a very large opening span so as not to interfere with shipping passing to and from Port Moody.

I consider this bridge to be a matter of public convenience and necessity. It affects the whole community, both business and residential, at North Vancouver more particularly, and that accordingly, only a reasonable proportion of the cost should be charged against Vancouver harbour. If, however, this view is not approved and the whole work charged against Vancouver harbour, then I am of opinion the Harbour Commissioners should be entitled to make some reasonable agreement with the city authorities of North Vancouver and district, that they should pay a proportion of the interest on the capital necessary to construct this bridge, if not immediately, at all events at an early date.

In the former scheme I understand the necessary capital was to be subscribed by Vancouver City, North Vancouver District, North Vancouver City, a subsidy from the Dominion Government, and a further subsidy from the Provincial Government.

22. Equipment for Non-Inflammable Oil Storage.

As already mentioned, application has been made to the Harbour Commissioners from some of the largest firms in the oil business for suitable facilities and tanks to permit of the importation of large quantities of non-inflammable oil into the port of Vancouver.

The port of Seattle has made provision for this trade, and is doing a very extensive business. The oil is received at Seattle in cans somewhat similar to coal oil or gasoline cans. The oils are semi-fluid or non-fluid, depending on the temperature, but readily softens when heat is applied. The use of steam coils is not permitted to liquify the oil, as the high temperature due to steam tends to discolour it. The oil in the cans is made liquid by placing the cans in tanks of hot water which are kept heated either by fire or by circulation of steam through pipes placed within the tanks. The cans are opened, and the oil is stored in large concrete tanks, these tanks being provided with heating devices for thinning the oil. Thereafter the oil is pumped from the tanks to tank railway cars as required. One of the principal firms at Seattle, who have asked for accommodation at Vancouver, operate their own tank cars, as they are one of the largest soap manufacturers in the world.

In February, 1918, another firm offered to guarantee that they alone would import at least one-half million cases of oil or its equivalent at Vancouver if the necessary accommodation was given them. As they stated, "In the face of strong probability of increasing our trade with the United States as well as with Canada in the near future, our customers, particularly in Canada, are pressing us to ship their requirements through Vancouver, due to present export restrictions in the United States. We are, therefore, desirous of ascertaining if some satisfactory arrangement cannot be made to our mutual advantage."

Another firm wrote on March 1, 1918, that, "If facilities were provided at Vancouver for the purpose of handling Oriental cargoes of soya bean, peanut, coconut and fish oils, we would be able to send to your port very large quantities of the above mentioned oils. . . . We have various customers in the Dominion who use considerable quantities of Oriental oils which have always been entered through the port of Seattle which necessitated their being bulked at this point and the oil then being shipped by tank cars into Canada. On oils without any duty charges into the States, this was satisfactory for a time, but on other oils, such as fish and peanut oil, on which there is a duty on entering the States, it has proved a very troublesome matter to have them brought here and then transhipped to Canada. If the facilities at Vancouver were adequate enough to allow steamers with Oriental oils to dock at that point so that the oil could be discharged from the boat to the dock and the tins immediately emptied over dumping tables, so that they could either be dumped into tanks or tank cars at a good rate of speed, we feel quite confident that at least 500,000 cases of Oriental oils could be shipped to Vancouver for consumption in the Dominion."

It should be borne in mind in connection with this matter, that the oils in question are not regarded as being of an inflammable nature and insurance companies do not raise any objection to their being handled on ordinary wharves.

In considering the foregoing, I have no hesitation in recommending that equipment should be immediately provided for handling this oil business, either at the new Government wharf or such other site as may be considered convenient and immediately available.

23. New Deep Water Berths

Under paragraph No. 13, herein, which deals with the probable future traffic at the port, I give my reasons for recommending the immediate necessity of providing additional deep water berthage, part of which is based on actual requests from some of the largest shipping companies at Vancouver, and only to a small extent on problematical business, and bearing in mind some reasonable accommodation which will no doubt be required for the new Canadian Government steamship business.

One new company which has recently been established at Vancouver, and already owns and operates three steamers for their Vancouver business, wrote me that they proposed increasing their fleet by four additional vessels, and that at the present time they had no permanent berth to handle their transpacific business, and that if they could get a permanent wharf where they could handle their business with up-to-date

facilities they would require same exclusively in order to conduct their business in an economical way, and that at the present time the accommodation which they could secure at the harbour is entirely inadequate to the freight they are handling. This company reckoned they could use two new berths exclusively.

Another very prominent exporting company, largely engaged in South American trade, stated that they required at least one additional berth for their exclusive use. After allowing for the provision of the necessary accommodation for the government steamships, and bearing in mind that another steamship company who have recently opened offices in Vancouver informed me that just as soon as they could secure additional steamers they intended commencing a regular trade at the port of Vancouver, but that their fleet had been almost entirely lost during the war. In view of all this it appears to me reasonable to immediately commence the provision of some five or six berths for deep water shipping.

24. Site for Deep Water Berths.

The question of the most suitable site for deep water berthage is a matter requiring much serious study and consideration as there are several alternative sites, each of which have many advantages. I will restrict myself in this report, however to two: first, the Burrard Inlet site; and second, the Kitsilano site at the mouth of False creek.

25. Site at Burrard Inlet.

Burrard inlet affords a magnificent natural deep water harbour, very well protected, and approached from English bay and the Pacific Ocean by the First Narrows, the water way of which is now about one thousand feet wide by thirty-two feet deep at low water.

In the past the First Narrows had a somewhat objectionable current, but this has been reduced by the dredging operations carried on during the last few years; there is, however, considerable prevalence of fog at the narrows which seems to hang there rather longer than at other places in the vicinity. The main water frontage of the city of Vancouver on Burrard inlet has been acquired or is being occupied by the Canadian Pacific Railway for a length of 8,225 feet. The rights of the Canadian Pacific Railway to occupy part of this frontage is disputed by the Vancouver Harbour Commissioners, but I do not propose entering into the merits of the matter, as apparently they involve legal questions. I have not, therefore, considered the development of this part of the harbour occupied by the C.P.R.; of course, if it is decided that the railway company are illegally occupying this frontage then its future development can be provided for.

There still remain very good sites for harbour development on the main water front east of the C.P.R. frontage extending from the British Columbia Mills Timber and Trading Company's property to the E. H. Heaps property east of the new government dock of a total frontage of about 7,000 feet, 1,200 feet of which is owned and occupied by a pier belonging to the Great Northern Railway Company. This site if developed regardless of cost, could provide twenty-four berths between the British Columbia Mills and the new Government wharf and three berths to the east of the new government wharf.

In order to develop this site a considerable length of water-front property would have to be acquired, although it might only be decided to proceed with one or more piers meantime, as land area for railway sidings must be provided even although only one pier were built. In order to have the necessary space for traffic the shore wharf from the Canadian Pacific Railway should be not less than about from 400 to 500 feet in width, and the piers jutting into the inlet for a length of about 1,250 feet of thereby, and a width of about 300 feet giving accommodation for four berths to each

pier the depth of water at the outer end of the pier would be considerable, and the harbour bottom in many places has a depth of soft mud about twenty-five feet deep, which would necessitate either this mud being removed and replaced with solid filling or the foundation carried down through the mud by cylinders, or some such method of construction to the hard bottom underlying the soft mud. I do not have sufficient borings or soundings to form accurate estimates of the cost of these piers, so for the purposes of this report have based my calculations on the actual cost of the new government pier recently constructed by contractors.

26. Desirable Depth of Water.

One point to be borne in mind in considering the location of the new deep water berths is the depth of water available so as to permit of the most desirable developments in ship dimension. Just previous to the commencement of the war this was a subject which was beginning to receive a good deal of attention, but during the last four years it has, of course, been a question of building ships in the quickest way possible to suit the present depth of our harbours and docks. Having peace conditions in view, however, I think that the ports making provision in the construction of new works for vessels of greater depth than those regularly in use now will reap material benefit, and that if the restriction imposed by the depth of water in harbour and docks was removed, vessels of much greater depth would be immediately constructed.

From the studies and opinions of some of the most eminent shipbuilding and naval architects of this day, cargoes and passengers could be carried at probably somewhere about half the cost if our harbours were deepened so as to allow a very considerable increase in the draught of the vessel. This question was referred to by Lord Pirrie for the information of the Dominion Royal Commission, and Lord Pirrie expressed a preference for at least 45 feet as the minimum depth which harbour engineers should recommend and work for, because although at the present moment 40 feet might be a satisfactory minimum working depth, the demand for shippers using the ports would grow so steadily as to make 45 feet necessary before even this depth could be achieved.

Sir John Biles also presented to the Institute of Naval Architects a lucid case in favour of increased depth. I do not suggest, however, that there is any necessity to provide and make provision at all of the berths for such increase, but that a few berths at the outer ends of the piers where the water is naturally deeper should be provided to say, 45 feet, and that the berths at the inner end could be considerably shallower. The site in question at Burrard inlet rather lends itself to this increased depth, but in order to make any use of it would mean the dredging to a very much greater depth than at present of the First Narrows, where there is only 32 feet at low water. Otherwise deep-draught vessels would have to wait for the tide before they could get into Burrard inlet. There is already established on this foreshore two most important plants doing considerable business; one is the British Columbia Sugar Refining Company, and the other is P. Burns and Company's Abattoir, but probably some amicable arrangement could be made with these as well as with some of the other proprietors as the provision of wharfage accommodation in the immediate vicinity of their industries would be a considerable asset. When the necessary foreshore land for the new government wharf was expropriated, the price was fixed by the court at \$1,200 per front foot, so that, assuming this rate had to be paid for the necessary property to be acquired from the British Columbia Mills to Heaps property, and making allowance for build-ings, the amount to be paid for the foreshore land would be somewhat in the vicinity of \$9,000,000. The price paid for the land and damages, etc., for the one new government wharf at Burrard inlet was \$564,640, equal to approximately \$41,809 per acre, and the cost of the available wharfage excluding sheds, equipment, etc., is about \$1,353 per lineal foot. For the sake of comparison with the Kitsilano scheme hereafter described, if I take 12,000 lineal feet of available wharfage at Burrard inlet, the area of land provided, including the surface area of the piers, would be about 67 acres.

27. Kitsilano.

There is an excellent site for the construction of deep-water wharfage at Kitsilano at the mouth of False creek, which I have shown on the plans as an alternative to development at Burrard inlet. The land at Kitsilano was an Indian reserve, and was expropriated by the Vancouver Harbour Commissioners on 7th September, 1916. The arbitrators appointed to fix the price for this land decided that the Vancouver Harbour Commissioners should pay \$666,200 for same. This price was appealed against on behalf of the Government, whereon the Harbour Commissioners, to avoid further expense, offered the sum of \$750,000 to the Government for the Kitsilano Indian reserve, and in May, 1918, a conference was held at Ottawa between the representatives of the Dominion Government, Provincial Government, and the Vancouver Harbour Commissioners, with a view to arriving at a settlement, in connection with the transfer to the Commissioners of the said lands, but nothing definite was settled.

I have assumed, however, for the purposes of this report, that the price will be agreed upon at \$750,000, or approximately \$10,714 per acre for 70.3 acres. There is a Y centre at the Kitsilano Indian reserve belonging to the Canadian Pacific Railway, approximately about seven acres in extent, which it would probably be advisable to acquire, and if the same rate per acre was paid for this land the amount would be in the vicinity of \$70,000. I have not, however, included this amount at the moment, as the matter would be one of adjustment or probable exchange with the Canadian Pacific Railway for other property.

The scheme shown for the development at Kitsilano when completed would provide berthage accommodation for twenty-one steamers. The entrance to the various basins is excellent.

The railway accommodation is also very good and in proportion to berthage accommodation, and a large area of land is available on the Kitsilano Indian reserve for warehouses or other industrial developments. In order to protect this site, as part of the scheme a sea wall or breakwater would be constructed, but as shown on the plans the inside of this sea wall would be available as a shipping berth.

The total cost of the complete development at Kitsilano, including land, dredging, and embanking, quay walls, sea walls, lighthouse, two-story reinforced concrete sheds, railway sidings, roads, lighting, equipment, and allowing the problematical amount of \$100,000 for probable rock excavation, and including engineering, would be \$18,750,000 for the whole scheme complete. For the purpose of comparing the cost of this scheme with the Burrard inlet development the cost of the wharves and land all complete, but without sheds or equipment, etc., would be approximately \$10,750,000, providing 12,000 lineal feet of available quay space equal to \$895 per foot of quayage, as compared with the cost of the new government wharf at Burrard inlet of \$2,164,640 for the bare wharfage and land, excluding shed equipment and providing 1,600 lineal feet of berthage equal to \$1,353 per lineal foot of available quay space. Assuming that the same amount of sheds and equipment was provided at either of the alternative sites, the cost of the wharfage and land at Kitsilano would be over 60 per cent cheaper than a similar amount of wharfage at Burrard inlet. As a comparison with those figures the cost of the new wharfage at Victoria, B.C., including the break-water, but excluding cost of land, was approximately \$1,364 per foot of available quay.

At Kitsilano the area of the Indian reserve is approximately 70 acres, in addition to which there would be provided the quay space on the shore wharf and new piers of an additional 68 acres, together making 138 acres of land, or practically 100 per cent more land available for development at Kitsilano than there would be at Burrard inlet. If the price tendered by the Harbour Commissioners of \$750,000 for the Indian reserve is finally approved, this would equal approximately \$10,714 per acre, as compared with approximately \$41,809 per acre for the government wharf land. I show on the plans at Kitsilano accommodation for twenty-one steamers, but I do not suggest for a moment that all this accommodation should be provided now, as the general scheme permits of the construction in units, and if this site is finally approved I suggest that the shore

quay which is 2,700 feet long and the first small pier 500 feet long, or a total of 3,200 feet would probably be ample to commence with. Taking the proportionate rate for the whole scheme this would provide six berths at an approximate cost of \$4,500,000 complete, including land, sheds, railway sidings, and equipment.

The foregoing estimates are all based on 1914 prices, with 25 per cent added thereto.

This shore quay at the mouth of False creek is, without doubt, much the cheapest site where deep water accommodation can be provided, with the least possible delay. Briefly, in comparing the two sites, the Burrard inlet scheme is a little nearer the commercial centre of the city than Kitsilano. The depth of water available at Burrard inlet is governed by the amount of dredging to be done in the future at the First Narrows, which is to-day 32 feet at low water. If additional wharfage is provided at Burrard inlet it should be in as close proximity as possible to the new government wharf, so as to be able to make further use of the new grain elevator, which has been constructed there, and which, from its location, only provides at present loading facilities at two berths, whereas, if the conveyor system is extended it could load grain at any number of berths within reasonable distance. Otherwise the one site does not seem to have many more advantages than the other with the all-important exception that the Kitsilano could be constructed at about 60 per cent less cost than Burrard inlet, and at the same time provide about 100 per cent more land for industrial development.

28. Provision of Dockage Facilities for Passenger and Other Traffic in Connection with Canadian National Railways.

I have consulted with the Executive of the Canadian National Railways in regard to the provision of facilities for passenger and other traffic at Vancouver, and they ask that docking facilities should be provided, and suggest False creek as being the most advantageous location for this traffic. I have therefore shown berthage accommodation on Granville island, on property belonging to the Vancouver Harbour Commissioners, below Granville Street bridge.

As already stated, it is highly desirable that this part of Granville island should be rectified, and I accordingly suggest that the desirable rectification could be given effect to in conjunction with the provision of the berthage accommodation for the National Railways. As an alternative to this site I suggest good accommodation could be provided at the head of False creek, adjoining Main street, which would be in very close proximity to the passenger terminals of the Canadian National Railway and the Great Northern Railway.

The removal of present Canadian Pacific Railway bridge across False creek.

Provision of suitable landing facilities at Vancouver for auxiliary car ferry with railway connections.

These two items have been sufficiently dealt with for preliminary purposes in the former part of this report.

29. Dry Dock.

I am of opinion that a dry dock should be provided at the Port of Vancouver at the earliest possible moment. Such a dock would not only make the port much more attractive to ship owners but should prove a sound commercial success. There is no dry dock at present at Vancouver, whilst at Seattle there are six dry docks, and a seventh is under construction. San Francisco has five dry docks, Portland two, Victoria one, Prince Rupert one. During the past few years two or three different private interests proposed constructing a dry dock at Vancouver, but owing to the war were unable to complete their financial arrangements.

When I was at Vancouver I had numerous interviews with various parties, and discussed this question, and advised that private interests should avail themselves of the provisions of the Dry Dock Subsidy Act and proceed with the construction of a dry

dock, and at the date of reporting, two or three different interests have intimated that they propose applying for the subsidy, and proceeding with the work. If any of them definitely arrange to do so, then it will not, of course, be necessary for the Government to take further action; but if they fail to complete their negotiations then I would advise that the Government itself should construct a dry dock and equip same complete with caissons, pumping plant, and keel blocks at a total cost which would not exceed \$3,500,000. After the dock is constructed, small parcels of land alongside could be leased to various ship repairing or ship building firms that wish to avail themselves of same, and each vessel entering the dry dock for repairs could invite competitive prices.

A large dry dock, of which I had the supervision of design and construction, was provided by the Dock Authorities of Bristol, England, some years ago, and has been most successfully operated on this principle. I have prepared complete detailed plans, specifications and estimates for such a dry dock at Vancouver, which have been approved by the British Admiralty, as being suitable for docking battleships. There are several alternative sites available and I have no hesitation in recommending that if this work is not proceeded with by private interests without further delay that the Government should then construct and operate same in the manner indicated herein.

30. Free Port.

I do not consider it comes within the province of my commission to advise whether a free port should be established at Vancouver or not. It appears to me this question is a National one which may possibly affect, to a small degree at least, the fiscal policy of the Dominion. I will therefore, restrict myself to stating what a free port really is. The name free port does *not* mean freedom from harbour or port charges, such as tolls or wharfage dues on cargoes, dockage of ships, towage, pilotage dues, etc.; briefly, it means freedom from Customs control. A reasonably large part of a port is segregated for the primary purpose of foreign commerce, and such part of the port is enclosed by substantial barriers so as to enforce the laws and regulations. This constitutes the free zone and from it all Custom-house activities, with the exception of precautions against smuggling, are excluded. Here the imported merchandise is landed, but it is not until the imports pass through the land or water gates of the enclosure that the duties incident to the collection of tariff dues begin, and the Customs dues are collected. If the imports are not taken for local consumption they may be re-exported without payment of any Customs dues. The same regulations apply to foreign raw material which may be manufactured inside the free port zone and intended for re-exportation. It appears to be, roughly, a new system of Customs collection and supervision, the Customs authorities having no jurisdiction until the goods are about to pass out at the gates of the free zone.

This subject has been recently very exhaustively enquired into in the United States and has been favourably reported upon by many Port Authorities, one of the principal being the Industrial Bureau of the Merchant Association of New York.

Outside of the United Kingdom, where all the ports are practically free ports, some of the most important free ports are: Hamburg, hitherto said to be the greatest free port in the world; Trieste, Ostend, Copenhagen, Marseilles, Dunkirk, Bremen, Cuxhaven, Emden, Stettin, Messina, Genoa, Brilia, Calatz, Kustengi and Sulina in Roumania; Archangel and Kola in Russia; a number of the French and English West Indies; Malacca, Penang, and Singapore, Hong Kong, Aden, Gibraltar, and many others all have their free port areas.

The question of establishing a free port area does not *of course* apply to Vancouver, but presumably if the principle were found to be advantageous it would also apply to one or more of the principal ports on the Atlantic seaboard of Canada. I respectfully suggest, therefore, that the subject should be investigated by a small commission appointed for this purpose and the future establishment of free ports in Canada decided either for or against, as may be found most advantageous. If this should be recommended, then the Kitsilano site is almost ideal for a free port.

31. Drawings, Surveys and Borings.

The drawings accompanying this report are intended only to illustrate the broad general principles of the scheme of harbour development, and must not be considered as working drawings. Before these can be prepared, extensive surveys and many additional borings will have to be taken.

32. Approximate preliminary estimate of cost of First Unit of proposed works, and lands necessary to be acquired.

1. Booming ground for lumber should be provided in English bay, say..	\$ 50,000 00
2. Timber export wharf provided in one or other of the alternative positions referred to hereafter, say.. . .	250,000 00
3. A harbour terminal railway..	675,000 00
4. Provision for six new deep-water berths or wharves at once..	4,500,000 00
5. Mechanical equipment provided at the new government wharf, and other wharves when constructed	160,000 00
6. Equipment for non-inflammable oil storage in some suitable site..	25,000 00
7. Provision of a fire tug fitted with powerful crane which tug shall be used as an auxiliary car ferry to serve immediate needs to North Vancouver..	150,000 00
8. Provision of dockage facilities for passenger and other traffic in connection with Canadian National Railways..	200,000 00
9. Removal of present C.P.R. bridge across False creek, and if necessary construct new bridge in suitable location..
10. Provision of suitable landing facilities at North Vancouver for auxiliary car ferry with railway connections..	50,000 00
11. Second Narrows bridge should be constructed as part of the complete scheme, if not immediately, at an early date..	Entered below.
12. Dry dock to be constructed by Government, if not arranged for by private interests at an early date.	" "
Land at Kitsilano, say..	\$ 6,000,000 00
	750,000 00
Second Narrows bridge at early date..	\$ 6,750,000 00
	1,650,000 00
Add 10 per cent contingencies and engineering. . .	\$ 8,400,000 00
	540,000 00
Total..	\$ 9,240,000 00
If dry dock is constructed by Government, add. . .	3,500,000 00
First unit—Grand total..	\$12,740,000 00

33. Conclusion.

In conclusion, I beg to express my indebtedness for much valuable local information and assistance to the Members of Parliament, the Vancouver Harbour Commissioners and Secretary, the members of the Corporation of North Vancouver, the Boards of Trade, the Public Works Engineer, the City Engineer, and many others with whom I came in contact throughout the course of my investigation.

Trusting the recommendations respectfully submitted herein may be found to be of value and their merits proved by the future success of the port of Vancouver.

I have the honour to be, sir,

Your obedient servant,

A. D. SWAN,
M. Inst. C.E.

34. List of Plans Accompanying Report.

No. 1. General plan showing approximately the reputed ownership or occupation of lands and foreshore.

No. 2. General plan showing whole harbour with relative position of proposed works and alternative sites for new wharves.

No. 3. Plan of the Burrard inlet development scheme.

No. 4. Plan of Kitsilano development scheme.

NOTE.—Plans are on file at Department of Marine.

Following is first report of Mr. Swan, on Vancouver Harbour, dated March 29th, 1912, made on instructions from the Hon. Mr. Monk, then Minister of Public Works, and appended here for purposes of comparison.

Montreal, March 29, 1912.

Hon. F. D. MONK,
Minister of Public Works,
Dominion of Canada.

HARBOUR OF VANCOUVER, B.C.

SIR—Having been honoured with instructions from the Department of Public Works to proceed to Vancouver, B.C., and examine into and report on the general conditions, present facilities and proposed schemes, and make such recommendations for the future development of the harbour of Vancouver as seem to me most suitable to promote its growth and otherwise best serve the interest of the port and of the country, I beg respectfully to submit the following:—

I commenced the study of this work on December 12, 1911, started for Vancouver December 22, 1911, returned to Montreal January 10, 1912, and since then I have visited New York harbour and several of the great European shipping ports, including London, Liverpool, Bristol, Glasgow, etc., and have had the privilege of discussing with the chief engineers of several other harbours and docks, the broad general principle on which Vancouver harbour should be developed, so that as her commerce and trade increase, her harbours and wharves shall expand in the proper directions, each work making use of the natural facilities, and eventually forming part of a complete scheme for the development of one of the grandest natural harbours in the world.

While in Vancouver I met the following gentlemen: Aldermen Stevens, M.P., the aldermen and members of the corporation of the city of Vancouver; the mayor, aldermen and reeve of North Vancouver; Board of Trade; the Richmond and Point Grey Board of Trade; a representative from Port Moody; Mr. Keefer, resident engineer, Public Works Department; Mr. Worsfold, his chief assistant; Mr. Bayfield, marine superintendent, Public Works Department; the executive and engineers of the Canadian Pacific Railway, the consulting and assistant city engineers; the deputy harbour master, and many promoters of proposed private dock and wharf schemes.

I heard their opinions and had their views on the subject, and am indebted to them and others for much valuable information, assistance, and many courtesies throughout the course of my investigations.

PRESENT CONDITIONS.

The present facilities at the port of Vancouver consist of about one and a half miles of timber wharfage along the main front of the city at Burrard inlet, all of which is owned and operated by the C.P.R., but there is practically no equipment whatever for the handling of cargoes. In addition there are a number of small wharves to the eastward of that part operated by the C.P.R. all as shown on plan No. 2.

Further, there are the existing wharves along both sides of False creek, at many times in which there is only 2 or 3 feet of water at low tide. There is practically no other wharfage of consequence.

Present Boundary of Harbour.—The present boundary of the Harbour extends from an imaginary line from point Grey due north to point Atkinson, and includes the waters of English bay and Burrard inlet. The tonnage entering and leaving the harbour of Vancouver for the year ending March 31, 1910, was:

	Tons.
Seagoing vessels, inwards.....	1,566,618
" " outwards.....	1,459,868
Coasting trade, inwards.....	1,634,352
" " outwards.....	1,796,600
Grand total.....	6,456,838

which increased for the year ending March 1911, to the following:

	Tons.
Seagoing vessels, inwards.....	2,509,445
" " outwards.....	1,010,658
Coasting trade, inwards.....	1,996,963
" " outwards.....	2,521,847
Grand total.....	8,038,913

The Customs return for year 1907 were \$2,172,930 while for 1911 they have increased to \$6,230,838.

INLAND REVENUE.

The Inland Revenue for year 1907 was \$403,724, increasing to \$526,212 for 1911.

STEAMSHIP LINES AT PRESENT IN OPERATION.

The following are the principal steamship lines at present trading regularly to Vancouver:

The C. P. Royal Mail Steamship line to China and Japan.

The Canadian, Australian, Royal Mail Steamship line.

The Canadian Pacific Steamship Company.

(British Columbia) Service to Victoria, Seattle, Prince Rupert, etc.

Coasting service to all points on mainland, Vancouver island and Queen Charlotte islands to Salt Spring Mayne, Pender and other islands in the gulf of Georgia.

Ocean Steamship Company, Limited, and China Mutual Steam Navigation Company, Limited.

Direct service to and from the United Kingdom, Harrison direct line, Antwerp, Glasgow, Liverpool.

Pacific Coast Steamship Company, to and from San Francisco.

Canadian Mexican Pacific S.S.Co. Limited.

Grand Trunk Pacific Steamships.

Union Steamship Company, Limited.

Terminal Steamship Company, Limited.

Northern Steamship Company, Limited.

Roscowitz Steamship Company.

Vancouver Steamship Co., Limited.

Mosquito Fleet of Tugs and Barges.

Halibut fleet of 5 steamers, plying between Vancouver and the fishing grounds.

Grain Handling Facilities.—There is practically no equipment or facilities of any sort for handling grain, except one very small sacking granary belonging to the C. P. R.

PANAMA CANAL.

Practically every port on the Pacific coast is preparing for the greatly increased traffic expected on the opening of the Panama canal.

HARBOUR EXTENSIONS AT OTHER PORTS ON THE PACIFIC COAST.

Los Angeles has spent \$1,000,000 and definitely planned the outlay of \$10,000,000 and more.

San Francisco is now spending \$9,000,000. Oakland \$15,000,000, and Portland \$17,000,000.

Seattle is now planning great harbour extensions, and has already been voted \$5,000,000. In addition vast sums have been expended by the Grand Trunk Railway at Prince Rupert and other ports, and it has been estimated that, altogether, over \$100,000,000 is being spent on harbours of the Pacific coast in preparation for the opening of the Panama canal.

RECOMMENDATIONS FOR DEVELOPMENT OF VANCOUVER HARBOUR.

From the rapid increase of the population of Vancouver, the growth of its manufactures and industries, the development of its rich resources, its magnificent forests, fisheries, mines and fruit growing, because of its geographical position as Pacific terminus of the great railway systems and its nearness to the wheat lands, it cannot be otherwise than that the trade of the port shall be in proportion to the facilities which may be provided.

Judging from the great ports of Europe, those that are doing the biggest business and doing it most effectively, are the ports that have kept their facilities ahead of actual requirements and great development has invariably been followed by increase of trade and population.

I, therefore, recommend with the most absolute confidence that wharf areas, railway terminals, roads, sheds, elevators and freight handling facilities in general should be designed on the most liberal scale practicable, and constructed by degrees. In order to do so, the following is a brief summary of the works I suggest, and I wish it understood that the drawings accompanying this report, and showing these works, must be looked upon as illustrating the broad general principles only of the scheme of harbour development, and must not be considered in any way as working drawings.

SUMMARY.

1. The work of widening the First Narrows, which has been commenced is most necessary and should be carried on continuously.
2. The Burrard inlet is the natural deep water harbour for ocean shipping.
3. Additional wharfage should be provided along the harbour front from the C.P.R. pier.
4. Additional wharfage should be provided east and west of the British Columbia sugar refinery.
5. Wharfage should be provided at North Vancouver.
6. False creek should be dredged and used as the centre for coastwise traffic.
7. The upper end of False creek, east of Westminster Avenue bridge, should be entirely filled in and used as a great central railway terminal for all the railways that may enter Vancouver.
8. The North Arm of the Fraser river should be dredged to permit of light draft craft using same.

DESCRIPTION OF SUGGESTED WORKS.

Widening Entrance at First Narrows.—The work of improving the entrance to Burrard inlet by dredging the First Narrows so as to give a width of 1,200 feet and a

depth of 30 feet at low water, has been commenced, and I venture to think should be proceeded with continuously day and night, as even by so doing it will take over two years to complete, as there is fully 2,000,000 cubic yards to dredge. The Parthia shoal should also be dredged to 30 feet deep at low water, which means a further 70,000 cubic yards.

As will be seen on plan No. 1, the Capillano stream at present discharges right into the middle of the First Narrows, carrying with it in times of spate a considerable quantity of detritus which tends to silt up the water area at this place. This could be very much improved by diverting the outfall of this stream into its old channel so as to discharge in a southwest direction.

Burrard Inlet.—The Burrard inlet, in my opinion is the natural deep water harbour of Vancouver, which can be easily developed for ocean shipping.

The natural position to commence the construction of deep-water wharves should be as near to the centre of the city as circumstances will permit.

The foreshore rights along this part of the harbour, for a approximate length of about 8,000 feet, have been acquired by the Canadian Pacific Railway under charters, and timber wharves parallel to the shore have been constructed practically along its entire length, as well as one pier, marked "A" on plan No. 2. The sheds on same are also of timber, and there is practically no modern equipment whatever for handling cargoes.

Along the whole line of frontage occupied by the C.P.R., piers projecting into the inlet might be constructed with advantage. Immediately to the west of the sugar refinery there is an excellent site for wharfage without disturbing any existing industries of consequence.

Beyond Cedar grove for a length of about $\frac{1}{2}$ miles the frontage is not so suitable for wharfage as it is much more exposed to tidal currents.

Second Narrows, Bridges.—Beyond this, up to Port Moody, in each of the bays, avoiding the promontories, wharves might be constructed hereafter as required. Plans are now being prepared for a bridge across the Second Narrows, having street car and railway tracks, roadways and footpaths which will give a good connection between Vancouver city and North Vancouver, and give access for railway traffic along the harbour front on both sides of Burrard inlet, and no doubt at an early date the railway will be extended to the far west Peace River district.

Protection for Shipping Traffic to Port Moody.—In designing this bridge, care should be taken to ensure that the opening span should be of such a width as not to interfere with shipping traffic to Port Moody, or future development above the bridge, and no doubt this will be duly considered.

At present, there is practically no wharfage whatever for commercial purposes at North Vancouver, there is likewise no railway, the only means of communication being by a ferry boat system owned and operated by the city of Vancouver, yet, from the returns provided me by the Board of Trade, they had a tonnage of over 200,000 tons during 1911.

The industries at present consist of lumbering, of which there are four large companies, ship building yards, machine shops, sash and door factories, etc.

The returns from the city ferries in 1910 were \$86,000, in 1911, \$138,000.

The population is between eight and nine thousand.

Wharfage for North Vancouver.—I am of opinion that wharfage should be provided without delay, and most excellent sites for same are available at almost anywhere along the foreshore from about the east side of lot 266, a point approximately about $\frac{1}{2}$ of a mile west of the Indian reserve where there is a vast area of flat land suitable for terminals, to a point about $\frac{1}{2}$ a mile east of the ferry wharf, and again, in the bay between Moodyville and Lyon creek.

Probably one good wharf properly equipped would serve immediate needs, and others could be constructed from time to time as required.

False Creek.—The position of False creek is shown on plan No. 1, and to a larger scale on plan No. 4.

As will be seen from the plans there are already established along its shores, a great many sawmills, factories, and other industries most advantageously situated and if the proposed scheme of improvements is carried out, further facilities will be provided for the establishment of many more. At present there is only 2 to 8 feet of water at low tide, with a range of from 12 to 14 feet at high water.

BRIDGES.

There are at present 5 bridges across False creek.

1. C. P. R. bridge near the mouth.
2. Highway bridge at Granville street.
3. Highway bridge at Cambie street.
4. Vancouver, Westminster and Yukon Railway bridge.
5. Highway bridge at Westminster avenue.

I propose these bridges should be dealt with as follows:—

No. 1. *C. P. R. Bridge.*—The C. P. R. bridge near the mouth is a timber trestle structure, the piles of which require renewing very often owing to the attacks of teredo, and when next being renewed the position could be changed a little as shown on the drawing so that the opening span would be at a much better angle for shipping passing through than at present, and this without damaging the railway approach; moreover, the foundations of the bridge, when reconstructed, should be carried down to such a depth that the outer end of False creek below this bridge could be dredged to 30 feet at low water, if desired.

No. 2. *Granville Street Bridge.*—The highway bridge at Granville street would remain just as it is without being interfered with in any way.

I have inquired into the levels the bridge piers are founded at, and find that dredging could be carried down with safety at 22 feet below low water.

I propose, however, only dredging to 20 feet below low water.

No. 3. *Cambie Street Bridge.*—The highway bridge at Cambie street would not be interfered with, and dredging could be safely carried down to 22 feet at low water. I propose, however, only dredging to 20 feet below low water.

No. 4. *Vancouver, Westminster and Yukon Railway Bridge.*—The Vancouver, Westminster and Yukon Railway bridge is a timber trestle construction, and if my suggestions regarding the upper end of False creek are carried out, the bridge could be removed altogether as it would no longer be required.

No. 5. *Westminster Avenue Bridge.*—The railway bridge at Westminster avenue could be removed, and a roadway constructed on the land reclaimed, and from this point eastwards, I suggest the creek should be entirely filled up.

Proposed Improvements to False Creek.—I suggest that False creek should be dredged to 20 feet at low water and used for coastwise traffic.

The outer end below the first C. P. R. bridge could be dredged to 30 feet, when required, and used for ocean shipping, as there is ample first-class accommodation for same fronting the Indian reserve, this need not, however, be developed to commence with.

The full extent of the present water area at high water need not be dredged, so long as the width is not restricted to say less than 800 to 1,000 feet.

With this waterway and the main line of the wharves constructed somewhat as shown on plan No. 4, and the areas between same and the present shore filled in and reclaimed with the material dredged, very valuable would be the sites provided for new industries. The existing industries would be vastly improved and large areas would be provided for railway terminals, and other transportation facilities right in the centre of the city.

Regarding the area extending to about 300 acres immediately to the east of the Westminster Avenue bridge, which is at present dry at low tide and covered with a few feet of water at high tide. This area was granted to the city of Vancouver by Royal charter and I recommend that it should be entirely filled up with material dredged from False creek and the land so reclaimed used as a great central railway terminal, to which all the railways entering Vancouver should have access and from which ample railway facilities along both sides of False creek and Burrard inlet should be provided.

The North Arm of the Fraser river leaves the main river at New Westminster and flows westerly and north-westerly to the gulf of Georgia—it is about 17 miles long, measuring to low water mark in the gulf, and about 600 feet wide.

The land on the north side along practically its whole length, the greater part of which forms the municipality of Point Bray and South Vancouver, which have a population of about 30,000, would be most valuable for the development of new industries, of which there are already a number established, if there was sufficient depth of water for even light draft vessels.

I recommend, therefore, that the North Arm of the Fraser river should be dredged so as to give 10 feet of water at low tide. For about half of its length very little dredging would be required, but toward its outlet alongside Sea Island, there is only about 5 feet of water, and beyond this over Sturgeons bank, there is only a foot or two at low water.

To be effective, however, there would have to be constructed at the mouth of the river, two training walls, in the position somewhat as shown on plan No. 1, which is practically in agreement with Mr. LeBreton's report of February 8, 1908, on the Fraser river improvements to the citizens' special committee of New Westminster.

I am informed that a good deal of dredging had been already done at the mouth of this river, but that it had just silted up again. There is absolutely no use whatever in attempting to keep the mouth of this river open without constructing training walls, or other kindred works to train the channel to, otherwise it will merely silt up again, as the vast area at its mouth is a gigantic quicksand.

The type of training wall I would suggest is shown on plan No. 5 and consists of a mattress of brushwood with a super-structure or mound of rubble stone. This latter would be dumped from hopper-bottomed scows at high water and roughly trimmed by hand at low water as required. Material dredged from the channel of the river would then be deposited by hydraulic dredger at the back of the rubble mound.

PRIVATE SCHEME FOR HARBOURS AT VARIOUS SITUATIONS.

A number of schemes for suggested harbours and wharves were put before me by private interests, the sites of all of which I examined on the ground and carefully enquired into, but I will only refer herein briefly to a few of the principal.

Schemes for Spanish Bank.—Two different interests presented schemes for constructing a harbour and wharves at Spanish bank, near the extreme outer end of point Grey.

I have no hesitation whatever in saying, that in my opinion, Spanish bank is most unsuitable for the construction of harbour works. It is the most exposed position that can be found for miles, there is no flat land adjoining for the construction of railway terminals, as the shore immediately contiguous rises abruptly up to the headland on which is the site of the proposed University of British Columbia. Practically every foot of wharfage would therefore have to be reclaimed. In addition it is the furthest point from the city and in a district already being rapidly developed for residential purposes.

Scheme for harbour and wharfage in front of Sea Island & along the mouth of the North Arm of the Fraser River.—A gigantic scheme for the construction of a large harbour, having fully 30 miles of new wharves to the westward of Sea Island, and along

the north side of the mouth of the North Arm of the Fraser river and including the Spanish bank at point Grey, as shown on plan No. 7 and known as the Rorison scheme was put before me, and I have considered it very carefully.

This scheme is intended for the development more particularly of new industries on Sea island, and certain other lands near the mouth of the North Arm.

Briefly, it is not a site that I would select for the construction of a deep water harbour. Practically, the whole area is a vast shifting sand, where modern harbour construction work would be very expensive. That part of it on Spanish bank, I have already referred to, as being entirely unsuitable. The miles of deep water, quay walls, which they show on their plan along each side of the mouth of the North Arm of the Fraser river, would undoubtedly be of great benefit to the upper reaches of the river, and would save the cost of constructing the training walls which I proposed in connection with the dredging of the river to 10 feet.

I wish to be quite clear, however, that I do not consider the main part of the site a good one, but before the scheme is finally dealt with, the question of the jurisdiction of the whole harbour should be decided.

Scheme for Harbour and Wharfrage in Front of Lu Lu Island.—Another very large scheme for the construction of a harbour having about 17 miles of new wharves to the westward of Lu Lu island on Sturgeon bank between the mouths of North and South arms of the Fraser river.

"Pretty Scheme."—As shown on plan No. 6, and known as the "Pretty Scheme," was also put before me, and I have given it every consideration. This scheme is intended for the development more particularly of new industries on Lu Lu island and certain other lands near there.

My opinion already given on the "Rorison Scheme" applies exactly to this scheme as well.

The site of the proposed works is on the same kind of shifting sand and in my opinion the construction of harbour works would be very expensive. Of course the miles of new deep-water wharves shown on their plans would certainly benefit the upper reaches and the mouth of the main arm of the Fraser river, and here again the question of the jurisdiction of the whole harbour should be decided before the scheme is finally dealt with.

Scheme at North Vancouver—Lonsdale Scheme.—A private scheme for the construction of wharves in front of lot 265, North Vancouver, next to the Indian reserve, and known as the "Lonsdale Scheme," is a good site for harbour works, borings having been taken showing the material to be suitable, and there is a large area of flat land available for railway terminals. I was informed that a contract had already been placed for dredging and that immediate construction of wharves there was contemplated. The question of jurisdiction of the harbour should receive immediate attention.

GENERAL.

Frontage Owned by C. P. R. and F. W. and Y. Railways.—As shown on the plans a very large proportion of the water front nearest to the city of Vancouver has been acquired by the C. P. R. under charters granted.

The frontage around the upper end of False creek, which I propose shall be filled in as for a considerable length facing Burrard inlet near the sugar refinery, has been acquired by the Vancouver Westminster and Yukon Railway.

Grain Elevators.—As already mentioned, there is practically no grain storing or handling equipment whatever at the port, and it seems to me that considering the fact, that it takes fully two years to construct and equip a modern elevator, it will be wanted long before it is ready for use.

At present the Alberta grain is shipped during the period of navigation from Fort William and Port Arthur, but the Lake Superior ports are frozen up from the end of November until the beginning of May, and during these months export shipments from Western Canada must travel by rail all the way up to the Atlantic seaboard.

In cases of shipment from, say, the Calgary district this is a haul of nearly 3,000 miles; this haul from Calgary to Vancouver is about 600 miles, and even considering the mountain grades this should be much cheaper than hauling five times as far as to the eastern coast.

Apart, however, from traffic during the winter months, the haul from Calgary to Vancouver is about 600 miles as against 1,400 miles from Calgary to Fort William alone, after which the grain has to be carried by lake and canal or by lake and rail to Montreal.

Distance, comparatively speaking, is a minor point in connection with ocean freight; that is, the rate does not increase in proportion to the increased length of haul. Therefore, when the Panama canal is opened the rate from Vancouver to Liverpool will presumably be cheaper than the rate from Fort William to Liverpool; in addition to which, the rate from Calgary to Vancouver should be cheaper than the rate from Calgary to Fort William.

Grain from the Pacific Coast States in the United States is at the present time being sent to Liverpool by water. The quantity being raised in California, Washington, and Oregon is not only large, but increasing, and undoubtedly will still further increase when the Panama canal is opened; and in order to compete successfully with United States grain, Alberta grain will have to go westward and get the long haul by water.

The Grand Trunk Pacific Railway intends building grain elevators at Prince Rupert, and recently publicly announced that by the time the Panama canal was opened, they expected to ship practically all their Alberta grain and about one-half of their Saskatchewan grain via Prince Rupert instead of eastward. Admittedly the grades to Prince Rupert are not as bad as those to Vancouver, but Vancouver cannot afford to let this stand in her way. Owing to the rather delicate question of the ownership of the foreshore, I refrain for the moment from suggesting herein a particular site for a grain elevator; suffice it to say that there are numerous most excellent sites for the purpose and it is most important that no further valuable time should be lost before the construction of a grain elevator is commenced.

Types of Construction.—When the initial development of transportation facilities first commence in a new country, cheapness and rapidity of construction are usually the principal elements considered, and so far the harbour works at Vancouver have been carried out on these lines, almost all of the structures being of timber which owing to the presence of the teredo, which eats into the timber, has to be renewed, in some instances in a few months, but on the average in about three years.

New Works Should be of a More Permanent Nature.—The time has now arrived when works of a more permanent nature should be constructed, and I would strongly advocate that concrete and reinforced concrete should be adopted. Not only would such structures be impregnable to the teredo, but the sheds would be absolutely fireproof.

Practically all the new wharf sheds recently constructed or in the course of construction at the European ports I have recently visited are of reinforced concrete.

Type Drawings.—A type of probable construction for concrete piers and sheds is shown on plan No. 3, but is merely a suggestion and must not be looked upon as a design for working drawings.

Borings.—In considering the various proposals I have made use of all the borings previously taken of which I could get particulars from the Public Works Department, and where no information was available, I have had several bores sunk to test the nature of the ground.

APPROXIMATE COSTS.

Estimated Cost of Proposed Works.—Until the question of administration of the port is decided, I do not consider it is practicable to give the total cost of proposed works, but sufficient indication of same can be arrived at from the undernoted approximate figures:—

1. Approximate cost of a reinforced concrete pier 800 ft. long by 200 ft. wide.. . . .	\$ 480,000
2. Approximate cost of a two-story reinforced concrete shed 750 ft. long, complete.. . . .	295,000
3. Approximate cost of dredging False creek (no wharf work included).. . . .	1,350,000
4. Approximate cost of a reinforced concrete grain elevator. Capacity 2,000,000 bushels, equipped complete.. . . .	1,900,000
5. Approximate cost of dredging at North Arm of Fraser river.	200,000

SPECIAL NOTE.

It should be particularly borne in mind, that in connection with the proposed dredging of False creek large areas of land will be reclaimed practically right in the heart of the city which will prove a very valuable asset to put against the cost of the work.

Owing to the existing conditions at Vancouver where, as already mentioned, the greater part of the foreshore rights close to the city have been acquired by the large railway companies—it seems to me to be a matter of great importance and for considerable negotiation that some agreement should be arrived at with the various interests and settle the mode of procedure without clashing which would govern the future administration for the systematic development of the port.

It does not come within the province of my commission to suggest whether:—

1. The harbour should be considered as a national port annexed over by the Government, and a commission appointed to manage same as at Montreal, or,—

2. The harbour should be acquired by the city of Vancouver and managed by a committee of the city council as at Bristol, England, and at Antwerp, or,—

3. The harbour should be controlled as a Port Trust under the management of a board of representatives appointed by the various interests, such as the city of Vancouver. The railway companies, the shipping companies, Board of Trade, private owners of wharfs, (as at Liverpool and Glasgow, or otherwise) but in the future interests, not only of Greater Vancouver, but of the whole province of British Columbia and Western Canada, and I would most strongly urge, that the harbour of Vancouver should be controlled by one board of administration under whose management I have no hesitation in predicting it would rapidly develop into its natural position as one of the greatest shipping ports of the world.

I have the honour to be, sir,

Your obedient servant,

A. D. SWAN,
M. Inst., C.E., M. Inst., M.E., M. Con. Sec., C.E.

NOTE.—Reference plans for this report are on file at Department of Public Works.

**REPORT OF THE CHIEF ENGINEER, DEPARTMENT OF MARINE AND
FISHERIES, ON THE VANCOUVER HARBOUR COMMISSIONERS' PLAN
FOR THE PROPOSED DEVELOPMENT OF VANCOUVER HARBOUR.**

**VANCOUVER HARBOUR COMMISSIONERS' APPLICATION FOR
PERMISSION TO ISSUE BONDS.**

The application of the Vancouver Harbour Commissioners for the approval by the Dominion Government of their proposition to issue bonds to the amount of \$5,000,000 for the development of a comprehensive scheme of terminal facilities for the port has been referred to me for consideration and report.

I may say that I am intimately acquainted with the conditions that exist in Vancouver harbour and with the difficulties that confront the Harbour Commissioners under existing railroad arrangements. I consider it of vital importance that one terminal radial system of railway communicating with the whole harbour front should be established, and it would undoubtedly be in the public interest that such a system should be under the control of the Harbour Commissioners and available for use by all the railways entering Vancouver without discrimination or favour. The sooner such terminal facilities are provided, the easier it will be to make arrangements, and I therefore very strongly recommend approval of the Harbour Commissioners' scheme.

Taking up the propositions of the Harbour Commissioners in the order in which they are set forth in the letter, I would state as follows:—

(1) The Kitsilano Indian reserve is a very valuable property, which is, while remaining under Indian control, absolutely useless. If purchased by the Harbour Commissioners for a reasonable price, it could be developed into manufacturing sites combined with a railway terminal or yard to very great advantage and there is no other property in the city so well adapted for utilization in this way. The scheme is not only a good one on the face of it, but would inevitably, with the return of prosperous conditions to the city, insure a large ultimate profit to the Harbour Commission.

(2) With regard to the property at Port Moody I know that this is now occupied by two going sawmills. Rental from these will carry the property. The sawmills occupy only one-fifth of the frontage and the remaining four-fifths are available for profitable development.

The large shoal flat in front of the property is admirably adapted for wharfage, boom storage, dock or elevator site. Mr. McClay submits to me a statement (Enclosure 49041-2-A) with regard to this property, also a plan of the property (Enclosure 49043-4-B), and a photograph showing the present condition of the tidal flat in front (Enclosure 31906-7-C).

(3) The Heap property is occupied by a sawmill now disused. It is chiefly valuable in consequence of its location and the large area of waterlot attached to it and is in immediate proximity to the Government wharf. The chief object in securing this would be the increased area of waterlot that would be secured by the Commission in the immediate front of the city of Vancouver. Mr. McClay submits Enclosure D, giving the assessed value of the property in detail to show that the price asked for it is a reasonable one, also a plan (Enclosure 49045-E) of the property.

(4) Rights of way sixty feet wide through sundry properties between Cambie street and Main street are required for the construction of the proposed radial railway. The Harbour Commissioners can obtain this right of way with little or no cash expenditure, as arrangements can be made with the owners of riparian lots to grant them waterlots in exchange for the portions of right of way with little or no cash expenditure, as arrangements can be made with the owners of riparian lots to grant them waterlots in exchange for the portions of right of way relinquished. Detail plans

showing the area required from each owner as well as the waterlot proposed to be granted in lieu of the portion of land lot required for right of way are submitted by the Commissioners and are attached hereto as Enclosure 49046-F. In my estimation this is a clever solution of the difficulty of obtaining these waterlots.

(5) The right of way from Kitsilano Indian reserve to Connaught bridge will require to be purchased from the Canadian Pacific Railway Company. The Harbour Commissioners propose to arrange to pay the Canadian Pacific Railway by granting them waterlots not already patented adjoining their ripa.

(6) The right of way through the Canadian Northern property at the head of False creek has been arranged for and the Canadian Northern Railway Company are willing to convey this on equitable terms.

(7) The right of way of the Great Northern Railway from the back to the front of the site has been practically arranged for on a basis of cost plus interest, payable in bonds. This proposition also involves the wharf property of the Great Northern Railway and the waterlots immediately eastward of the same. This is a valuable waterlot in the main harbour; I cannot insist too strongly that it is desirable that the Harbour Commissioners should secure all water frontage that they can get possession of in the neighbourhood of Vancouver and prices will never be as low as they are now.

(8) The right of way from the Great Northern property to the Government wharf and elevator and the Heap property will be a subject either for arrangement with the waterlot owners or with the Canadian Pacific Railway. Apparently sufficient allowance has been made at ruling prices to cover this absolutely necessary extension of the radial system.

(9) The extension along the front of the city of North Vancouver on the north side of Burrard inlet is included in this item. Such a road would connect the city water front with their terminal of the Great Eastern Railway. Except for the fact that property can now be procured to better advantage than when commercial activity revives, I see no hurry about the carrying out of this item. Mr. McClay claims that in connection with the movement of cars this portion is immediately necessary because in any case cars would be ferried across the harbour and the terminal scheme involves the provision of landing stages for freight cars.

Mr. McClay submits two general plans showing the layout of the several schemes which plans are submitted herewith as enclosures 49047 G, and 49048 H.

With regard to the estimate of cost and the estimate of revenue and expenditure, I do not feel competent to express a very decided opinion. I understand that the approximate cost represents actual values based on recent sales and also on the award in the expropriation of the Government wharf property. In some cases costs are based on arrangements already practically concluded with the railway companies. I find by the evidence before me that all parties—the several railways, the corporations of Vancouver and North Vancouver, business firms and private citizens—are unanimously in favour of having the scheme carried through. The Commissioners are receiving the support of interested parties because it is seen that the completion of the system of a terminal railway operated for the general good would be of service to each individual concern. I am therefore led to believe that the statement of approximate cost as submitted is sufficiently near actual conditions to justify the Government in the belief that an issue of \$5,000,000 in bonds would practically carry the scheme.

The estimate of revenue and expenditure submitted would show a marginal profit available for sinking fund. Mr. McClay claims that the cars shunted under present arrangements cost \$15 a car and submits enclosure I in support of this statement. If this be true his proposition to cut that cost in two would undoubtedly be a great boon to business men in reducing their freight expenses. The estimate for management appears to me to be low. However, the proposition as a whole has every appearance of being a self-sustaining one and if the bonds are not to be guaranteed by the Government, and I understand the Harbour Commissioners are not asking for such a guarantee, I can see no danger in authorizing the issue for the purposes detailed. As I understand the matter no more than a million and a half are required at first,

and the remaining amount would cover a gradual development covering a period of five years, and so invested as to become immediately revenue producing. As the expenditure increases the revenue will correspondingly increase, and the Harbour Commissioners claim that the loan would carry itself from its inception.

Plans to accompany this report are filed in my office, Marine Department, under No. 49041-S.

Respectfully submitted,

W. P. ANDERSON,
Chief Engineer.

OTTAWA, February 25, 1916.

(NOTE.—The numbers quoted in connection with enclosures mentioned in this report refer to the index filing number of the Chief Engineer's Records of the Department of Marine and Fisheries.)

MEMORANDUM FROM COMMISSIONER McCLAY OF THE VANCOUVER HARBOUR COMMISSION IN SUPPORT OF THE COMMISSIONERS' PROPOSAL FOR THE DEVELOPMENT OF VANCOUVER HARBOUR, DATED 23rd FEBRUARY, 1916.

TERMINAL FACILITIES.

Sir.—Referring to my letter of the 29th June last, addressed to Mr. H. H. Stevens, M.P., and submitted to you by the latter, I now beg, on behalf of the Vancouver Harbour Commissioners, to submit additional information as follows:—

The Commissioners, having carefully considered the scheme of terminal facilities at the harbour of Vancouver, desire to obtain possession of the following properties:—

- (1) *The Kitsilano Indian Reserve.*—Arrangements for the acquisition of this property are now in progress with the Department of Indian Affairs.
- (2) The property at Port Moody, marked red on the plan accompanying this letter, having a frontage of one-half mile and including a large tidal flat.
- (3) The property known as the Heaps property, on Burrard inlet, containing approximately sixteen and three-quarter acres as per plan attached.
- (4) The right of way through sundry properties between Cambie street and Main street, by the exchange of Crown grants and foreshore for the areas so required for right of way.
- (5) A right of way from Kitsilano Indian reserve to Comnaught bridge, as shown on the accompanying plan.
- (6) A right of way through Canadian Northern property to the head of False Creek, from Main street to Glen drive, as shown on plan. The Canadian Northern Railway officials have already expressed approval of the transfer of this property.
- (7) The right of way and tracks of the Great Northern Railway from point of intersection of Glen drive by the Canadian Northern Railway to Burrard inlet water front, together with:—
 - (a) The wharf property of the Great Northern Railway.
 - (b) The water front property immediately to the east of the Great Northern Railway Company's property, all as shown on plan.

(8) A right of way from the point of intersection of the Great Northern Railway and Burrard inlet eastward to Heap's mill property.

(9) A portion of the right of way of the Pacific and Great Eastern railway from D.L. 264 eastward to Hendry avenue, along the water front, as indicated on plan.

The estimated net cost of acquiring the properties heretofore alluded to is \$5,000,000. For details of estimated cost see memorandum attached.

To enable the Commissioners to acquire the aforesaid properties and to satisfactorily develop a comprehensive scheme of terminal facilities for the port of Vancouver, which operations, it is contemplated, will extend over a period of five years, it is proposed to issue bonds to the amount of \$5,000,000; and the approval of the Governor in Council as provided for in section 26, chapter 54, of the Acts of 1913, "An Act to incorporate the Vancouver Harbour Commission," is respectfully requested.

I am attaching to this letter a memorandum setting forth the manner in which the Vancouver Harbour Commission proposes to defray the interest and other charges involved in carrying out this programme.

I am, sir, your obedient servant,

S. McCLAY,

Harbour Commissioner.

A. JOHNSTON, Esq.,

Deputy Minister, Department of Marine,
Ottawa, Canada.

APPROXIMATE COST.

Approximate cost—

No. 1—Kitsilano Indian Reserve containing approximate 80 acres..	\$ 700,000 00
" 2—Port Moody property containing approximate 88 acres..	550,000 00
" 3—Heap's Mill containing approximate 164 acres..	650,000 00
" 2, 4, 5, 6, 7, 8—Right of way from Kitsilano reserve to Heap's mill property—1,242,289 sq. ft. at \$1.25 per sq. ft..	1,552,861 25
" 7 (a)—Wharf property of the Great Northern Ry. Co. (b) the water front property immediately to the east of the G. N. Ry. Co.'s property..	1,800,000 00
" 9—A portion of the right of way of the Pacific Great Eastern Railway from D.L. 264 eastward to Hendry ave., along the water front, as indicated on plan..	516,267 00
Amount of five-year bonds already issued on Mud flats which will be absorbed in \$5,000,000 issue..	200,000 00
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	\$5,969,128 28

Deduct from above amounts the following items due the Harbour Commissioners:—

C.P.R.—6,780,451 sq. ft. at 25 cents..	\$1,695,112 75
Gt. N.R. Co.—685,709 sq. ft. at 25 cents..	171,427 25
C.N.P. Ry.—269,505 sq. ft. at \$1.25, amount to be exchanged with private owners, 204,330 sq. ft. at \$1.25..	592,293 75
	<hr/>
	\$2,448,833 75
Leaving balance to be provided for..	<hr/>
Amount for improving Kitsilano Indian reserve..	\$3,520,294 50
	1,479,705 50
Making an issue of..	<hr/>
	\$5,000,000 00

ESTIMATE OF REVENUE AND EXPENDITURE TO BE DERIVED FROM THE ABOVE PROPERTY.

<i>Receipts.</i>		<i>Expenditures.</i>	
Leases and Crown grants	\$ 20,000	Administration	\$ 20,000
Harbour dues	39,000	Operation of wharves	12,000
New Government wharf	24,000	Operation of Mud flats	2,000
Gt. Northern Rty.	24,000	Operation of railway cars, say	
Granville Mud flats	30,000	\$1.25 per day	34,500
Gravel leases	3,000	Interest at 5 per cent on \$5,000,-	
Port Moody property	18,000	000	250,00
North Shore Rty., 3.56 miles, 1,300		Leaving for application of sinking	
cars per month at \$7.50 per car,		fund	46,500
equal for one year	117,000		
South Shore Rty., 1,000 cars per			
month at \$7.50 per car, equal for			
one year	90,000		
	<hr/>		<hr/>
	\$365,000		\$365,000

A detailed and comprehensive report on the Commissioners' proposed terminal railway, the cost of construction, etc., calculated on the basis of proposed exchange of water front property by the Commission for existing rights from private parties, prepared early in 1918, is on the department's file; also extensive data on the various items of proposed development furnished from time to time by the Harbour Commissioners.

