PRINCE RUPERT, B.C. -

THE STUDY OF A PORT AND ITS HINTERLAND

by

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ABSTRACT

Prince Rupert, B.C. -

The Study of a Port and its Hinterland.

Prince Rupert is situated on Kaien Island, where sufficient level land is found to allow the construction of a city. Rugged micro-topography makes building difficult and has affected the pattern of land use. Topography also imposes controls upon the amount of land suitable for agriculture in Prince Rupert's hinterland.

Prince Rupert's climate though mild is wet and unpleasant, discouraging settlement unless some enticement is offered in terms of higher wages, larger profits or favourable employment.

The Bulkley Valley, the largest single area topographically suitable for agriculture within the mainland section of Prince Rupert's hinterland is marginal climatically for agricultural production.

The soils of Prince Rupert's interior hinterland do not seem likely to support more than 2000 farms. Graham Island seems to offer the best possibilities for large-scale agricultural settlement in the future.

The Prince Rupert Forest District has a total of 23,583 million fbm of timber on productive areas of which 19,780 million fbm is found within the coastal section. The estimated sustained annual yield on the coast is 280 million
fbm of which 195 million fbm is being cut at present to be processed largely in Vancouver mills. It is suggested that the establishment of sawmills near Prince Rupert would probably be successful.

The fishing industry, especially the halibut fishery, has provided the mainstay for Prince Rupert's economy since the city's inception. The major fisheries are extremely well developed and an increase in their importance seems unlikely.

Of the 1,954,430 h.p. of hydro power available within 160 miles of Prince Rupert only 2.5% is developed, due in large part to the lack of development of the other resources of the district. The Aluminum Company of Canada's Kitimat project will mark the first large scale use of this resource.

Prince Rupert was founded to serve as the Pacific coast terminal of the Grand Trunk Pacific Railway. It was planned from its inception. The street plan was laid out so that the greatest advantage could be taken of favourable topographic features. The plan was unsuccessful because the city never grew sufficiently to fit the scale of the plan.

From 1909 to 1925 construction of various pieces of large-scale port equipment went on. These were to provide for the trade with the Orient which Prince Rupert was expected to capture since it was 500 miles closer to the Orient than any other North American port. The trade never materialized because of the poverty of the Orient, the lack of settlement
along the line of the G.T.P.R. and the nature of the resources
tapped by the railway.

Over expansion of the city and the cost of construc-
tion on difficult terrain forced the city into bankruptcy
in 1933. This represented a disastrous readjustment of the
city to the realities of its environment.

The outlook at present is much brighter. The re-
sources of Prince Rupert's hinterland are in much greater
demand and their utilization is beginning. The development
of the resources will give a firm base to the city's growth
and the cycle of "boom and bust" is unlikely to occur again.
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Prince Rupert was chosen as a study because of the author's familiarity with the city and its problems. An article prepared on this subject met with sufficient approval at the 1949 meeting of the Association of Pacific Coast Geographers to be selected for publication in the 1950 edition of the Yearbook of the Association of Pacific Coast Geographers.

The underlying problem which the study seeks to solve is the lack of development in Prince Rupert. When the city was founded in 1909 it was expected that it would become a great world port, a trade centre to rival Vancouver, Seattle and Portland. Instead it became a small fishing village. Why did this happen? People in Prince Rupert believed that it was because the founder and manager of the Grand Trunk Pacific Railway, Charles M. Hay's died tragically in the sinking of the Titanic before his plans for Prince Rupert were completed. Mr. Hays proved his stature as a financier and railroadman by the rejuvenation of the moribund Grand Trunk Railway, but it is doubtful
whether even his energy and skill would have been sufficient to make the Grand Trunk Pacific a successful undertaking.

It was hoped that the application of geographic techniques would provide an answer to the problem of non-development. Since the growth of a city is dependant upon the functions that it performs for a tributary area a study of Prince Rupert's tributary area or hinterland was necessary. The focus of the study was centred upon Prince Rupert. The hinterland was investigated in so far as it has affected the growth of Prince Rupert, by a selection of material considered pertinent. No attempt has been made to study the influences in the reverse direction, the influences of the city upon the hinterland. Though these are extremely important it was felt that their study lay outside the field of the thesis.

The study consists essentially of two parts, one a series of systematic studies centred upon Prince Rupert and extending outwards as far as was considered necessary. The other section is a study of Prince Rupert itself, drawing together the findings of the previous section and assessing the influence of the geography of the hinterland upon the development of the city.

Three weeks of the summer of 1949 were spent in field work. During this time a functional map of the city was prepared and interviews conducted with pioneer residents and others. Special thanks are due to W.J. Raymond, W. Bell, H. Steen, A. McRae and Arthur Brooksbank for information on the early days of the city. R.D. Thain, City Clerk and
P. Lakie, District Freight Agent, Canadian National Railway, were also of great assistance. The author was privileged to correspond with George D. Hall of Pasadena, California, formerly of Brett and Hall, the firm of landscape architects that prepared the original plans for the development of Prince Rupert. He supplied much valuable information which would have been otherwise unobtainable.

The author has drawn liberally on John Q. Adams' pioneer work on Prince Rupert in Economic Geography of April 1938. Mr. Adams' general conclusion that the non-development of Prince Rupert was due to a lack of development in the hinterland was the basis for the author's more extensive study.

Dr. J.L. Robinson gave valuable criticism and guidance in the preparation of the thesis. Dr. J.R. Mackay facilitated the preparation of the maps. The assistance of my wife has been invaluable in all phases of this work, and without her help the preparation of the thesis would have been a much more difficult task.
Map 1

Place Names and Topography of Areas Adjacent to Prince Rupert

Source: One mile to one inch, National Topographic Series Map, Prince Rupert East Sheet.
Local Physiography

Kaien Island, upon which Prince Rupert is located, is one of a series of islands associated with the western margin of the Coast Range Mountains which are separated from the mainland by sea-invaded valleys. In the case of Kaien Island this separation is of a minor nature and in four places the island approaches within one-quarter of a mile of the mainland to form the tidal rapids of Zanardi, Galloway, Butze and Shawatlans.

Kaien Island and the majority of Tsimpsean Peninsula are underlain by sedimentary rocks of the Prince Rupert Formation, which form a pendant of sedimentaries on the western margin of the arcuate intrusion of the Coast Range
PHOTOGRAPH 1

B.C. GOVERNMENT AERIAL PHOTOGRAPH OF PRINCE RUPERT
Batholith. The rocks of the Prince Rupert Formation are Triassic in age and composed largely of quartzites and argillaceous quartzites, partly converted to quartz mica schists. They probably formed the country rock into which the Coast Range Batholith intruded in Jurassic times. The contact between these two formations is found at Sockeye, on the Skeena River, and thence across Tsimpsean Peninsula in a northeasterly direction.

The main control of physiography in this area has been the continental glaciation of Pleistocene times, and the alpine glaciers which persisted after the withdrawal of the continental ice sheet. There are two main trends to the physiographic forms in the Prince Rupert area. One follows the strike of the rocks in a northwest to southeast direction, as is seen in Work Channel, Tuck Inlet and the entrance to Prince Rupert Harbour. The other has a northeast, southwest trend as noted in the North Arm of Work Channel and Prince Rupert Harbour.

The relative relief of the area, though moderate in comparison with the Coast Range as a whole, is nevertheless considerable. The highest point on Kaien Island is Mount Hays which rises to a height of 2,320 feet. The mountain backbone of Kaien Island has a general northeast, southwest trend and is flanked to the northwest and southeast by lowland areas. Lowlands also fringe the northeastern end of the island in the vicinity of Shawatlan Rapids. On the southwestern end of the Island, bordering the entrance
to Prince Rupert Harbour, the slopes are extremely abrupt, the land rising from sea level to 1600 feet in one third of a mile.

The northwestern lowland area from Shawatlan Rapids to Pillsbury Point is approximately one mile wide. From Pillsbury Point to Fairview Point is narrows rapidly as the mountains crowd in upon the shore. It is upon the seaward fringes of this lowland that the city of Prince Rupert has been built, and for this reason the northwestern lowland will henceforth be called the Prince Rupert lowland.

Though in general this area can truly be termed a lowland the micro-topography is extremely rugged. The Prince Rupert lowland may be divided into three sections, the coastal ridge, the inland ridge and the inland depression. (See Map 2) The coastal ridge is the steep bluff which parallels the coast line throughout the lowland area. It is broken only where creeks have cut back into the interior depression. These small valleys also provide a convenient division of the coastal ridge into three further subdivisions.

The first section, to the east of Hays Creek, is characterized by the most precipitous rise from the waters edge. The land rises from sea-level to 200 feet in a horizontal distance of only 400 to 500 feet. Once this height is reached, however, the land becomes fairly flat with a relatively gentle dip toward the interior of the island.
Map 2
Physiographic Divisions of Prince Rupert

Source: Field Work.
PHOTOGRAPH 2

B.C. GOVERNMENT AERIAL PHOTOGRAPH OF KAIEN ISLAND FROM THE EAST

Prince Rupert is visible on the western side of the island. The lowlands flanking the island are clearly shown. Highway 16, linking Prince Rupert with the mainland is in the left foreground.
The second subdivision lies between Hays Creek and Morse Creek and here the main portion of the city is situated. The land rises steeply from the sea, though not as precipitously or continuously as in the first subdivision. Hays Creek, Cow Bay Creek and Morse Creek have cut steepsided valleys into the ridge face, which are used to provide entry into the city. (For Place Names see Map 3, page 9.)

The general elevation of the coastal ridge in the section between Hays and Morse Creek is only 100 feet, but since this elevation is achieved within 500 feet of the shore a rather formidable rise is presented. Originally the only flat-lying areas along the shore line were situated at the

PHOTOGRAPH 3
Fish Docks and Cold Storage. Scarp of the coast ridge to the right. Level land on which fish docks and rail lines are located was obtained by blasting.
Map 3

PRINCE RUPERT PLACE NAMES

Source: Field Work
mOUTHS OF THE CREEKS. THESE LEVEL AREAS WERE FORMED IN
PART BY EROSION OF THE ORIGINAL RIDGE AND PARTLY THROUGH
FLUVIAL DEPOSITION. THEY TENDED, THEREFORE, TO BE
TRIANGULAR IN SHAPE, WITH STEEP SIDES AND RELATIVELY FLAT
BOTTOMS. THE MAIN AREAS WERE AT THE MOUTHS OF HAYS AND
MORSE CREEKS, WHILE OTHER MINOR AREAS WERE FOUND AT THE
MOUTHS OF SMALL, NAMELESS CREEKS. THESE CREEKS DEBOUCHED
INTO COW BAY AND THE AREA NOW COVERED BY THE RAILWAY
STATION AND ROUNDHOUSE.

WHEN THE RAILWAY WAS CONSTRUCTED THE NECESSITY
FOR LEVEL LAND FOR SWITCHING YARDS AND SIDINGS FORCED THE
BUILDERS TO BLAST LARGE SECTIONS OF THE COASTAL RIDGE.
THE BLASTING WAS MOST EXTENSIVE IN THE AREA BEHIND THE
RAILWAY ROUNDHOUSE AND THE PROVINCIAL GOVERNMENT WHARF.

PHOTOGRAPH 4

CANADIAN NATIONAL RAILWAY STATION AND DOCK
NOTE THE OVERHEAD FOOT BRIDGE NEEDED TO CONNECT THE STATION
WITH THE COASTAL RIDGE.
In the areas where extensive blasting occurred the ridge rises almost vertically above the tracks and entry to the city can only be achieved by means of elevated ramps or steps. (See Photographs 3 and 4)

PHOTOGRAPH 5

Copy of Photograph by J.R. Wrathall

Prince Rupert's commercial core from the north. The large building in the centre of the semi-circular driveway is the Provincial Government Building. The principal streets from right to left are First, Second and Third Avenues. The scarp of the coastal ridge can be seen to the right of First Avenue and the scarp of the inland ridge to the left of Third Avenue.

In the section between Hays Creek and Cow Bay the coastal ridge reaches a height of 120 feet approximately 900 feet from the shore. From here the ridge dips
gently southward directly into the inland depression.

In the rest of the subdivision, that is from Cow Bay to Morse Creek, the ridge reaches a height of 80 to 120 feet within 100 to 500 feet from the shore. It then levels off until it reaches the foot of the inland ridge. This relatively level area has a width of from 1000 to 1200 feet and has been largely occupied by the city's commercial core. (See Photograph 5).

The third subdivision of the coastal ridge, from Morse Creek southwestward, has the appearance of a large roche moutonnee with its long axis parallel to the shore. From a height of 232 feet directly opposite Pillsbury Point the coastal ridge drops abruptly to the north, west and south toward the shore and the inland depression. To the northeast along the axis of the ridge the slope is more gradual with pronounced convexity.

The interior ridge is only developed in the area between Morse and Hays Creek. It rises precipitously from the relatively level inland extension of the coastal ridge and reaches an elevation of from 200 to 250 feet. From this height it dips gently into the inland depression. There is little concordance to this ridge top. Its greatest elevation is Acropolis Hill which is 299 feet high and stands at least 50 feet above the general level of the ridge.

The inland depression has a general elevation of 50 to 100 feet and has a gently rolling terrain. This area lies immediately back of the coastal and inland ridges.
These ridges generally dip imperceptibly into the inland depression.

The extremely rugged micro-topography of the Prince Rupert townsite makes road construction difficult. Photograph 6 illustrates the difficulties encountered with rock.

PHOTOGRAPH 6

Alley Near the Business District.

Blasting was necessary to construct the roadway.

Photographs 7 and 8 show the amount of construction work necessary to bring roads to feasible grades across sharply undulating terrain. The original plank roadways shown in photograph 9 have since been replaced by blacktop roadways. The wooden roadways were left as the foundation for present roads, the fill being placed on top of them. As the timbers of the original wooden roadway rot the fill
PHOTOGRAPH 7
Fill Necessary to Bring First Avenue to Grade.
The fill has begun to crumble away.

PHOTOGRAPH 8
Third Avenue just Before the Commercial Section is reached.
The fill necessary to bring the road to grade can be seen.
settles into the muskeg underneath, resulting finally in an extremely bumpy roadway.

PHOTOGRAPH 9
(Copy of Postcard - Date Unknown - Possibly 1910)
Looking west along 7th, 8th and 9th Avenues.
Interior depression mountains to the left, crest of the inland ridge to the right. Comment on the reverse of the original postcard, author unknown.
"This gives an idea of the back part of Rupert and in this you can see some of the smaller one room shacks and also the plank roadways. Notice the stumps everywhere and just fancy what a job they had to clear nearly 4 square miles of such thick forest. It was all like the wooded background four years ago and each tree had to be cut down and removed. No wonder it is still primitive."
PHOTOGRAPH 10

INTERIOR DEPRESSION AND MOUNTAIN CORE OF KAIEN ISLAND FROM ACROPOLIS HILL

PHOTOGRAPH 11

COPY OF POSTCARD BY W.W. WRATHAL

Kaien Island from the north. Prince Rupert in foreground.
Map 4
Regional Topography

Source: Map of Central British Columbia, Department of Lands and Forests, Victoria, B.C., 15.76 miles to one inch.
The micro-topography of the southeastern lowland of Kaien Island is much less diverse than that of the Prince Rupert lowland. It is gently rolling country with an elevation of 100 to 200 feet, muskeg covered and poorly drained.

Watson, Ridly and Lelu Islands and Port Edward townsite are a continuation of the southeastern lowland and have the same elevation. They are smaller in area; therefore the watercourses have steeper gradients and the land is better drained.

Digby Island may be regarded as a continuation of the Prince Rupert lowland with characteristically rugged micro-topography. The greatest elevation on the island is 325 feet which is found in the northwestern section.

The western coast of Prince Rupert Harbour is formed by a lobe-like southward projection of Tsimpsean Peninsula, which may be called Metlakatla Peninsula to differentiate it from the main Tsimpsean Peninsula. The trend of the topographic forms in the Metlakatla Peninsula is northwest, southeast, parallel to the strike of the rocks and the general alignment of the mountainous Tsimpsean Peninsula. The western side of the Metlakatla Peninsula contains the most extensive lowlands contiguous to Prince Rupert. The micro-topography resembles that of the southeast lowland of Kaien Island but drainage is somewhat better developed and the areas of muskeg are not as extensive. The eastern half of the Metlakatla Peninsula is very rugged, the most conspicuous feature of the relief being Mt. Morse which rises
to a height of 2,990 feet and has the well rounded summit typical of the mountains adjacent to Prince Rupert. Mt. Morse and its northwestern extensions form the western margin of the upper harbour and Tuck Inlet.

**Regional Physiography**

Work Channel, a thirty-mile long fiord, forms the eastern boundary of the Tsimpsean Peninsula. It is also the dividing line between sedimentaries and intrusives, with the Prince Rupert formation to the west and the Coast Range Batholith to the east. The rocks of the Coast Range Batholith extend from Sockeye to Amsbury. The mountains developed in these rocks are higher and more rugged than any discussed previously. The greatest elevations are to be found to the north of the Skeena River where the mountains rise to 6000 feet. South of the Skeena to Douglas Channel the general elevation is only about 4000 feet. The area south of the Skeena is, in fact, the lowest part of the Coast Range and forms a saddle between loftier mountains to the north and south.

Terrace stands at the junction of a great north-south valley and the valley of the Skeena. The cross north-south valley begins at the head of the Kitimat Arm of Douglas Channel and continues north to Aiyansh on the Nass River. At the Nass River the valley is continued northward by the upper Nass as far as White Creek. This cross valley, which may be called the Kitsumgallum-Lakelse Valley, is
covered to a depth of at least 250 feet by gravel, boulder clays and other unconsolidated material. The valley varies in width from one to six miles, with the greatest width at Terrace. It is flanked on either side by mountains which have a general elevation of 4000 feet. The divide between the Tseax and Kitumgallum rivers is 300 feet higher than the Skeena River at Terrace and the divide between the Lakelse and Kitimat Rivers is slightly higher. It is probable that it is a valley of erosion, cut when the combined waters of the Nass and Skeena flowed southward to empty into Kitimat Arm. Hanson suggested that "the Skeena River may have antedated the Kitumgallum-Lakelse system, which may have been robbed by the latter system perhaps in Cretaceous time and perhaps later still, in Tertiary or Pleistocene time, the lower Skeena may have recaptured its former waters".1

The valley of the Skeena below Terrace resembles a fiord. It is fairly straight and the mountains rise steeply on both sides. Its width remains relatively constant throughout this section, being 1.75 miles wide at the mouth of the Lakelse River and only two miles wide at Port Essington at the mouth of the Skeena. Above Terrace the Skeena has a normal stream course, narrowing in resistant beds and widening in less resistant strata. The Skeena below Terrace has been strongly glaciated but either has not been deepened appreciably or else has been filled by recent alluvium;

Kitimat Arm and the meandering Kitimat River are visible in the left background. Lakelse Lake is connected to Terrace by road. The ease with which the road could be extended to Kitimat can be seen.
probably the latter. Tidal action is effective as far up the river as Shames, a distance of sixty miles, and by slowing the velocity of the river has assisted in the formation of numerous small islands and sand bars which fill the lower river.

The physiography of Prince Rupert's hinterland is the most important single control of settlement. From the mouth of the Skeena to Hazelton the potential settlement sites consist of small scattered pockets of relatively level land carved in the steep valley-sides by tributaries of the Skeena. The Kitsumgallum-Lakelse Valley also falls into this category, differing only in size and origin from the others.

The Skeena River below Hazelton appears to be in the stage of youthful erosion. The sides of the river are either steeply V-shaped or are practically perpendicular, as in the Kitselas Canyon. Below Terrace the Skeena experiences its greatest decrease in velocity, and deposition becomes important, resulting in the formation of numerous small islands in the river. The Skeena below Terrace is a delta of the embayed type and the river will be forced to fill the channel from this point to the mouth before any seaward building of the delta will be possible. Agricultural land is limited to small alluvial fans and a few post glacial terraces which are quickly being eroded by the Skeena.

In the Skeena system the main area topographically suitable for settlement is found in the Bulkley Valley. From
PHOTOGRAPH 13
B.C. GOVERNMENT AERIAL PHOTOGRAPH
LOOKING EAST, UPSTREAM, OF THE SKEENA RIVER

The Ecstall River enters from the south, to the right in the photograph. The C.N.R. mainline can be seen following the north bank of the Skeena. Highway 16 joins the railway from the north, at Tyee opposite the Ecstall. The extremely rugged character of Prince Rupert's immediate hinterland and the paucity of agricultural land is well illustrated, as is the fiord-like character of the river and the resulting difficulty of rail and road construction.
the mouth of the Bulkley River, at Hazelton, for a distance of twelve miles upstream the valley is about four miles wide, with considerable areas of bench lands lying at an elevation of several hundred feet above the river. The valley gradually opens out until in the vicinity of Moricetown, 26 miles from the mouth, it attains a width of between eight and ten miles. Thirty miles farther up it widens to about 20 miles. Above Telkwa the valley continues to be wide and rolling and is almost prairie-like in appearance. In this valley, for the greater part of its length, the Bulkley occupies a deeply encised channel.

On the mainland, within a reasonable distance of Prince Rupert, the only other large area which may be topographically suited for settlement is found in the middle valley of the Nass from the vicinity of Aiyansh north to the Cranberry River. Little is known of this area, however, and investigation is necessary before more can be said, other than that lowland areas are known to exist.

To the west of Prince Rupert a large lowland area on Graham Island offers possibilities for settlement. The west coast of the island consists of a former plain of marine deposition of Tertiary age which has been uplifted with little deformation. Large areas of gently rolling and almost flat land exist, estimated to number some 800,000 acres.\(^2\)

\(^2\) *Canada's New Northwest*, North Pacific Planning Project, King's Printer, Ottawa, 1947, p. 15.
An examination of Map 5 (Page 26) shows that Prince Rupert's relationship to these areas is like that of a hub to a wheel. Areas even remotely suitable for agriculture are at least 90 miles away. At no time in the future can Prince Rupert hope for agricultural products at costs comparable with other cities that do not have this distance factor to overcome.

Economic Geology

Although Prince Rupert's hinterland contains rich and varied mineral wealth, the mining industry has been of minor importance to the city's development. The coastal mines, such as those near Stewart and the Surf Inlet Mines on Princess Royal Island are tributary to Vancouver rather than Prince Rupert. Equipment, food supplies and workers are only incidental. The mines of the interior are generally of small scale and their production is shipped eastward over the Canadian National Railways (C.N.R.)

The geological history of the area is extremely complex, and succeeding deposition, uplift and intrusion has resulted in a diversity of mineral deposits. It is probable that deposition was continuous in this area from Late Paleozoic well into Mesozoic time. The rocks of the Prince Rupert pendant are Triassic while those of the Hazelton Mountains and the Bulkley and Babine Range are mainly Jurassic or undifferentiated Lower Cretaceous and are composed of both sedimentary and volcanic rocks. Intrusives are extremely well represented in the area by
AREAS
TOPOGRAPHICALLY SUITABLE
FOR
AGRICULTURE
AFTER BRINK

MILES
Map 5
Areas Topographically Suitable for Agriculture
the Coast Range Batholith and the Cassiar-Omineca Batholith and their satellite intrusions to the east and west. These rocks were intruded during Jurassic and possibly into Lower Cretaceous times. It is at the contact between the intrusives and sedimentaries that most of the main metalliferous deposits are found at present and it is probable that future discoveries will occur in these areas, especially along the margins of the Cassiar-Omineca batholith.

At present, however, the minerals which have been most important in the economy of Prince Rupert have been the sedimentary minerals, notably coal. Coal is mined on a very small scale at only one point, Telkwa, but the whole of the production of 10,000 to 12,000 tons per year is used in the area, mostly at Prince Rupert. Production can be expected to increase when the Columbia Cellulose plant on Watson Island begins operation because they intend to use Telkwa coal in their power plant.

The coal of the Telkwa Basin is Lower Cretaceous in age and ranges from bituminous to semi-anthracite depending on the proximity of intrusions. Unfortunately the highest grades of coal are found in the areas where the greatest disturbance has taken place, and are consequently difficult to mine. The Telkwa basin has an area of about seven square miles underlain by coal-bearing rocks having a thickness of from 350 to 500 feet. These rocks contain five seams, three of which are more than three feet in thickness. Most of the coal measures are concealed by a heavy layer of alluvium and
Map 6
Regional Geology
glacial drift, and outcrops are confined largely to the immediate vicinity of Telkwa River and its tributary, Goat Creek, which have cut back the cover and revealed the coal-bearing strata. Mineable reserves are estimated at 56,000,000 tons of which only 28,000,000 tons are considered recoverable. The coal is extremely hard and suitable for shipping. Unfortunately the majority of it is not of coking quality.

The only other coal field of importance is the Groundhog coal area. It lies in the headwaters of the Skeena River 150 miles north of Hazelton. Four main seams have been located, one with a thickness of twelve feet, two four feet and one three feet thick. They are distributed through a stratigraphic interval of 1,240 feet. The coal is of very high grade being largely low volatile bituminous and anthracite. A conservative estimate of the mineable reserves of the Groundhog area gives a total of nearly 900,000,000 tons of probable and possible coal. Notwithstanding the high quality and large reserves of the coal field the probability of future mining is slight, due to transportation difficulties. At present the coal reserves are not of sufficient economic interest to warrant the construction of a rail line into the area. If, however, the desire for rail communication to Alaska were sufficiently strong to warrant the construction of a railway through

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4 Loc. cit.
British Columbia it would be wise to consider these coal reserves before deciding upon the route. Proposed route "A" of the Alaska Highway passes through the heart of the coal field, but highway construction cannot solve transportation difficulties.

Mention should also be made of the limonite deposits, 30 miles east of Terrace, on Limonite Creek, a tributary of the Zymoetz River. The ore is a surface deposit covered by a thin layer of moss, two to three feet thick. At least 500,000 tons of easily mined, nearly pure limonite is present and it is not improbable that the total is considerably in excess of 1,000,000 tons. Again the problem is one of transportation.

The foregoing sedimentary minerals have been discussed because their development is directly dependent upon the development of Prince Rupert and its hinterland. In monetary terms metalliferous deposits will probably be the most important in the near future. The development of the metalliferous deposits, however, will be dependent upon the condition of outside markets. Their development will benefit outside capital and secondary industries without having much influence upon Prince Rupert.

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Map 7
Regional Transportation and Place Names
Source: Map of Central B.C., Department of Lands and Forests, Victoria, B.C. 15.76 miles to one inch.
Chapter II

CLIMATE

Climatic Controls

The main control of the climate of Prince Rupert is the constant progression of easterly-moving depressions that pass over the northern British Columbia coast. These depressions are formed along the polar front, the meeting place of Tropical Marine and Polar Pacific Air. During the winter months the polar front moves well to the south and numerous storms are formed which move slowly eastward toward the northern Pacific coast. Depending on their circuit these storms are modified to a greater or lesser extent by marine influences. In most cases they are subject to a considerable maritime influence and arrive at Prince Rupert as relatively warm, moist unstable air masses. If the trajectory of the depression has been short - i.e. if it originates in the Bering Sea or the Gulf of Alaska and moves directly east and south, it is likely to be relatively cold and only slightly modified in its lower layers. Under such conditions it is likely to under-cut the less dense coastal air, lifting it and thereby causing very intense precipitation. The other case when the depression has travelled a long trajectory, results in the depression either overriding
the coastal air or gradually assimilating it as part of its own warm sector. In either case it results in a long, relatively light rainfall, accompanied by low, thick cloud cover.

To the effect of the depressions must be added the influence of water currents and orographic barriers. The strong positive anomaly presented by Prince Rupert's January temperature (35° F at 54° N Latitude) compared with Petropavlovsk, U.S.S.R., (12.7° F at 53° N Latitude), is due in part to the relatively warm Japanese Current. In general its influence is similar to the North Atlantic Drift on the west coast of Europe, though it is not as well marked.

Climate During the Winter Half-Year

The temperature regime associated with these conditions is typically marine. From September to March the difference in mean monthly temperature between Prince Rupert and Vancouver is at no time greater than 4° F and during November the difference in temperature is only 1° F. (Climate Table A.) At Masset on the Queen Charlotte Islands with a more marine location than Prince Rupert, the similarity of winter half-year temperatures between the northern and southern coast of British Columbia is even more remarkable. It indicates that latitude is not the main control of temperature in this area and that the same controls are operative in both the northerly and southerly sections of the British Columbia coast. Further proof of this view is afforded by
examination of other climatic tables for the September to March period. The only table in which Prince Rupert and Vancouver are not comparable during this period is that for monthly precipitation in inches (Climate Table B). It is probable that the difference between the amounts of precipitation in this instance is a measure of the influence of orographic barriers upon the climate of Prince Rupert. In this regard the winter half-year precipitation figures for Masset should be noted. Masset is at approximately the same latitude as Prince Rupert but the low lying nature of the northern coast of Graham Island does not present any topographic barrier and precipitation figures for the winter are comparable with Vancouver.

Two points in the immediate vicinity with lower temperatures than Prince Rupert should be noted: Woodworth Lake and Falls River, the source of Prince Rupert's water and power supply, respectively. Lower temperatures here are important for their influence on the supply of these two necessities. The relation of water consumption to temperature in Prince Rupert should be noted in this regard. During the winter of 1949-50 the consumption of water between November 21 and December 20 was 3,329,375 gallons,

1. Climate Table D. Monthly Averages of Extreme Highest and Extreme Lowest Temperature.
Climate Table C. Monthly Average Daily Maximum and Minimum Temperature.
Climate Table E. Average Monthly Number of Days with Measurable Rain, Snow and Precipitation of Any Sort.
between December 20 and January 21 the consumption was 19,226,000 gallons.\(^2\) The six-fold increase in water consumption was due to a combination of climatic and physiographic factors. During the period November 21 to December 20 the temperature was generally well above freezing, but during the period December 20 to January 21 it was extremely cold with temperatures well below freezing. Since the climate is generally mild in Prince Rupert (January average 35° F) and because of the amounts of rock present many householders neglect to bury their water pipes or else dig only shallow trenches. During cold weather householders with exposed waterpipes are forced to leave their taps running constantly if they wish to prevent the pipes from freezing. The increased consumption of water places a great strain on the waterworks at the time when they are least able to meet demands. The watermains are also in exposed positions, due again to the amount of rock encountered, and during the December 20 to January 21 period at least six breaks appeared in the mains due to freezing. These major breaks drained the distributing reservoir and stopped the flow of water to many sections of the city. The result was the freezing of at least 400 of the city's 2,400 water connections and the general jeopardy of the city's water supply.

The main hydro-station for Prince Rupert is located

at Falls River, a tributary of the Ecstal River. The catchment basin for hydro generation is relatively small and is dependent on regular and abundant precipitation for replenishment. During the period previously mentioned the freezing conditions prevented a steady supply of water to the dam and the plant was forced to shut down almost entirely.

An auxiliary plant at Woodworth Lake was unable to operate at capacity because of the peril to the city's water supply, which is also obtained from this source. In combination these factors resulted in an almost complete paralysis of the electrical supply.

Though it is not likely that this combination of factors will occur again, it is not impossible. Precipitation and temperature records at Woodworth Lake and Falls River, when correlated with runoff and available water, would give the engineers in charge some idea of what to expect and preparations could be made accordingly. If, at any time in the future the temperature falls below freezing the city can expect the consumption of water to increase at least sixfold and possibly more if water is available.

In response to the demand placed upon existing lines during the winter of 1949-50 a survey of the city's water system was conducted to see if any enlargement was possible. Enlargement of the existing mains will not, however, solve the problem of over consumption of water during freezing periods. A more practical expenditure would
be to grant subsidies to householders whose homes are on rock foundations to enable them to protect their water-pipes by burial or packing. This would eliminate the necessity for a constant running of water taps during freezing weather and would cut water consumption considerably.

Inland from Prince Rupert the maritime influence disappears rapidly. Terrace, approximately ninety miles east of Prince Rupert is the last point where any distinct maritime influence is felt. The precipitation here has a pronounced winter maximum, although the total is less than on the coast. Winter temperatures are considerably colder and both January and February have temperatures below freezing.

From Terrace to Hazelton the transition between marine and continental influences is completed. The whole of the Bulkley Valley falls into the continental variety with extremely cold winters, five months below freezing temperatures, and slight rainfall. (A more detailed survey of the climate of this area in relation to agriculture will be found in the discussion of the climate of the summer half year.)

Climate During Summer Half-Year

An attempt has been made previously to establish that during the period from September to March the climate
Climagraphs of selected stations and square of comfort after Taylor

Prince Rupert
Vancouver
Bergen, Norway

INCHES OF RAINFALL PER MONTH
Figure 1
CLIMAGRAPHS OF SELECTED STATIONS
AND SQUARE OF COMFORT
of Prince Rupert and Vancouver is very similar. This similarity is due to identical climatic controls. During the summer half-year when the climatic controls of each station is widely divergent a disparity in climate would be expected.

During the summer the formerly extensive Aleutian low shrinks to insignificant proportions and the depressions associated with this low are decreased in frequency and strength. There is a corresponding increase at this time in the size and stability of the California high. In southern British Columbia the California high becomes the dominant control bringing clear warm weather with few clouds and little rain. North of Vancouver Island the control of the California high becomes less marked.

Unfortunately depressions remain the major control of the climate of the northwest coast. At Prince Rupert there is a marked decrease in the amount of precipitation received, 4.77 inches in July as compared with 9.54 inches in January. The decrease in the number of rainy days, however, is not as well marked, 19 days with measurable rain in January as compared with 16 days in July. It would seem that the decreased frequency of depressions has been obviated, to a large extent, by their slow movement, which keeps the number of rainy days at a high level. These rainy days are not associated with cold front precipitation with their sudden showers and rapidly clearing skys, but with warm front precipitation, characterized by long continued drizzle. This point is emphasized by the hours of sunshine figures for Prince Rupert.
During the summer half-year Prince Rupert never experiences more than one-half the number of hours of sunshine received by Vancouver, and in July Prince Rupert receives only two-fifths as much sunshine as Vancouver, though Prince Rupert is 6° further north and consequently has a longer period of daylight at this time. Indeed Prince Rupert has the lowest total hours of sunshine recorded in Canada, although if recordings were taken at other points on the northern British Columbia coast Prince Rupert might lose this dubious distinction.

Mean monthly temperatures reach a maximum in August with a high of 57° F. This is low compared with the rest of settled Canada, and indeed is the lowest for a city of its size in Canada. It is due to the high amount of cloud cover and the moderating effect of marine influences.

In attempting to assess the role of climate as an influence on the development of Prince Rupert certain difficulties arise due to the nature of the correlations attempted. These correlations are largely aimed at relating climate to human responses. Most people would consider the climate of Prince Rupert distinctly unpleasant (see Climagraphs) largely because of the almost constant rainy weather. At best, in June, a resident of Prince Rupert has to accept the fact that every second day, on the average, is going to be rainy. It is difficult, therefore, to organize outdoor entertainment, whether it be professional
sports or a family picnic. Facilities for indoor entertainment are difficult to provide due to the expense involved, and they can never offer the same variety as outdoor sports. The chief solution of the entertainment problem has been in the form of drinking. In the year from April 1, 1948 to March 31, 1949, $1,410,000 worth of liquor was sold, in a town with a total population not greater than 10,000. This amounts to a per capita consumption of $141 of liquor per year compared with the provincial average of $39 per year. Part of this is due, no doubt, to heavy purchases by fishermen temporarily located in Prince Rupert during the fishing season, but purchases almost four times the provincial average can only be explained in terms of the boredom and depression induced in part by a dreary climate.

The dispiriting effect of the dank and gloomy climate induces in many people the desire to leave the city as soon as possible. Few people look forward to making Prince Rupert their permanent home; their desire is to stay only long enough to enable them to live comfortably somewhere else. There are many factors which indicate this. In the 1949 census Prince Rupert had the lowest percentage of owner-occupied dwellings of any city in the province, 43.7%. Prince Rupert also had the lowest percentage of homes with running water, flush toilets, electric lights, refrigeration, radios, electric vacuum cleaners, autos and furnace heating of any city in the province.

province. The last two are due to definitely traceable physical problems, the low number of autos to the lack of road communications, in 1941, with other parts of the province, and the lack of furnaces owing to the nature of the terrain which often precludes basements. The lack of the other appliances, however, was due either to poverty or to a belief that residence was only temporary and that there was no need to buy a home or to equip it comfortably. The possibility of poverty can be ruled out since retail sales in 1941 amounted to $598 per capita in Prince Rupert as compared to $387 for the province as a whole.⁴

Since many people have no intention of making a permanent residence in Prince Rupert they have little interest in civic responsibilities. They tend to form an inert mass that increases the difficulty of those who are really interested in making Prince Rupert a pleasant place to live, to achieve civic beautification or amelioration of those conditions which help to make the city unpleasant. It is perhaps possible to assess the unpleasantness of Prince Rupert's climate in monetary terms. In 1941 the census of merchandising and service establishments showed that the average receipts per establishment in Vancouver were $7,570 per year while in Prince Rupert they were $9,630 per year. The difference of $2,000 per year is a measure of the amount necessary to persuade a merchant that it is worthwhile to establish in Prince Rupert. The wage earner in Prince Rupert

⁴ B.C. Department of Trade and Industry, Regional Industrial Index of B.C., King's Printer, Victoria, 1948, p. 178.
Rupert receives approximately $2 per week more than does the wage earner in Vancouver, but this is not the true measure of the bonus which must be paid. Many of the workmen in Prince Rupert are those who have been unsuccessful in the more competitive labour market in the south. The employer, therefore, is forced to pay for more than he is actually receiving, in terms of ability and amount of work performed. This in turn presents a large cost differential which makes it extremely difficult for a Prince Rupert manufacturer to compete on a world market. This was well illustrated by the experience of the wartime shipbuilding industry in Prince Rupert, where costs were among the highest in Canada and productivity per man among the lowest.⁵

In summation it may be said that the climate of Prince Rupert is such that most people would not choose it as a place of residence without some added incentive in terms of increased monetary gain or ability to obtain employment. As a result the number of retired people in Prince Rupert is among the lowest in the province.

From the previous discussion it would seem that the entire population would be imbued with a desire to leave Prince Rupert. Since we are dealing with human likes and dislikes this is by no means true. Many skilled workmen

⁵ Brief submitted to the Board of Transport Commissioners by Canadian Pacific Airlines, Mimeographed, p. 23.
and people of means find the city and its climate extremely congenial and are perfectly content to establish there. A large number of them are people who are used to the climate either from being brought up in the city or having emigrated from European countries with similar climates. The large number of Norwegians in the city's population is significant in this regard. (See the homoclime of Bergen in Figure 1) In this connection there is, of course, the important factor of occupation to be considered. Almost all the Norwegians are engaged in some phase of the fishing industry, utilizing skills which they acquired in the Norwegian fisheries. Because they come from climates very similar to that of Prince Rupert they find it easy to adjust to their new environment. Recently, however, there has been an increasing tendency for Norwegian fishermen to move their permanent residences to southern British Columbia and to locate in Prince Rupert only during the fishing season. Large numbers still remain although they could, if they desired, locate in other centres.

An examination of the summer half-year climate of Prince Rupert's hinterland reveals a trend toward continentality very similar to that found during the winter half-year. Terrace in April has a mean monthly temperature almost identical with Prince Rupert's, but during June, July and August the temperature rises some 5° higher in Terrace, reaching a maximum in August with a temperature of 62°. The late summer maximum is indicative of marine influence, and
it is largely due to marine influence that Terrace experiences the warmest summer temperatures in Prince Rupert's hinterland. New Hazelton and the whole of the Bulkley Valley experience mean monthly summer temperatures not much above Prince Rupert. (Climate Table A.) The low summer temperatures in the Bulkley Valley are due not to lower daytime temperatures (Climate Table C) which are only 1 or 2 degrees below that of Terrace, but rather to the low night-time (minimum) temperatures which are from 4 to 5 degrees below Terrace. Terrace is sufficiently influenced by marine conditions to have moderate night-time temperatures, yet sufficiently far inland to have daytime temperatures some 5 to 10 degrees above Prince Rupert. Combined with adequate and well distributed precipitation and a long frost-free period the relatively high summer temperatures make Terrace the best agricultural area in Prince Rupert's hinterland from a climatic standpoint. All temperate crops can be grown here with little or no danger of killing frosts.

Unfortunately this is not true of the other areas in Prince Rupert's agricultural hinterland. The Bulkley Valley and the Vanderhoof-Prince George area are marginal climatically for many crops. According to Climate and Man "Extensive production of small grains in general is limited to areas with a frost-free period of 100 days or more. Where this period is less than 90 days, production is precarious and is possible only by prompt seeding and
use of earliest maturing varieties." An examination of
the frost-free records of the Bulkley Valley reveals that
nowhere in the Valley does the frost-free period approach
the 90-day frost-free figure. (Climate Table H.) The
frost-free figure should not, however, be considered by
itself. It indicates that small grain growing is extremely
precarious but does not rule out completely the possibility
of their successful growth. More significant in this regard
are the dates when the mean maximum exceeds and falls below
43°F and the average date when mean daily minimum tempera­
tures cross 32°F. (Climate Tables I and J.) St. Alburg,
Saskatchewan has been included in these charts as a compari­son since it is close to the northern limits of grain grow­
ing in the prairies, and even here successful ripening can
not be expected in every year. It is possible to grow
small grains throughout the railway belt but it is hazard­
ous in all sections, especially in the Vanderhoof area.
Adjustment by the farmers to this condition is seen in the
percentage of crop land devoted to hay production, and its
increasing importance, 39% of the crop land in hay in 1931
and 57% in hay in 1941. Strangely it is in the area with
the most precarious climate, the Vanderhoof district, that

6. U.S. Department of Agriculture, Yearbook of Agriculture,
1941, p. 323.

7. Canada's New Northwest, North Pacific Planning Project,
King's Printer, Ottawa, 1948, p. 151.

8. Refers to that area of Central British Columbia served
by the northern line of the Canadian National Railway
(C.N.R.), approximately 20 to 30 miles on either side
of the line.
the largest percentages of land are devoted to grain crops, over 42% compared to 15-25% in the rest of the region.

It has always been considered that the main obstacles to agricultural development in Prince Rupert's hinterland, from the climatic standpoint, were the hazards of temperature and the frost-free period. To this must be added another peril, that of drought. The application of Thornthwaite's new classification to stations in the Bulkley Valley bears out this statement. At only one station, Wistaria, is the moisture index well above the dividing line between the humid and dry climates, and even here the moisture index equals only 6.3. At the other three stations, New Hazelton, Smithers and Telkwa the moisture index equals 0.8, 1.5, and -3.5 respectively. This places these stations either within or extremely close to the boundary of the dry climates. In itself, the low moisture index does not mean that drought is a constant hazard, but it does mean that drought is a definite possibility.

Examination of the diagrams constructed for these stations of potential evapotranspiration and the soil moisture regime in comparison with the frost-free period and period with mean daily minimums above 32°F is also instructive (Figure 2). It can be seen that by the time the average frost-free period is reached every station has exhausted available soil moisture and is dependent upon rather

SOIL MOISTURE REGIME FOR STATIONS IN THE BULKLEY VALLEY

INCHES

WATER SURPLUS

WATER DEFICIENCY

SOIL MOISTURE UTILIZATION

SOIL MOISTURE RECHARGE

AVERAGE FROST-FREE PERIOD

PERIOD OF MEAN DAILY MINIMUMS ABOVE 32° F.

POTENTIAL EVAPOTRANSPIRATION

PRECIPITATION
Figure 2
SOIL MOISTURE REGIME FOR STATIONS
IN THE BULKLEY VALLEY
scanty precipitation for whatever moisture is available to the plants.

Examination of the period with average mean daily minimums above $32^\circ F$ gives a somewhat brighter picture with the first three to four weeks of this period coinciding with the time when moisture is available and potential evapotranspiration and growth can proceed as quickly as temperatures will allow. It must be remembered that this period, though more favourable for growth than any other time of the year, is more subject to killing frosts than any other period of the year. The farmer is therefore forced to delay his planting until the time when moisture is definitely deficient.

The deficiency is rendered more hazardous by the variability of precipitation within the summer half-year. At New Hazelton, the only station available for this study, conditions are similar to, if not better than the rest of the Bulkley Valley. Here, during a 27-year period, precipitation was average or above in 10 years, while it was below average in 17 years.\textsuperscript{10} We have seen that the stations in the valley, unlike many other localities, are also totally dependent upon summer precipitation for available moisture. Any summer with below average precipitation will affect directly the rate of crop growth, possibly delaying maturity.

\textsuperscript{10} \textit{Canada's New Northwest}, p. 156.
sufficiently to cause crops to be frost killed. The assessment of blame for crop damage is difficult, therefore, but assuredly moisture deficiency must be included as a further obstacle to successful utilization of Prince Rupert's agricultural hinterland.

Grain growing throughout the area is, therefore, distinctly hazardous and the production of hay crops, with related livestock and dairy production, and the growing of hardy vegetables such as potatoes, turnips, carrots and cabbage seem to be the best general climatic adaption. Specialized seed production has come into prominence in the area recently, and climatically the area is well suited to this type of production. With a specialty crop of this type restricted markets rule out the possibility of it ever becoming important to more than a few farmers.

The Bulkley Valley has yet another climatic disadvantage operating against it, in the lateness of crop maturity. Early vegetables, with their premium prices, will always be shipped to Prince Rupert from southern markets. By the time the first crops are ready to be taken from Central British Columbia, farm production is at a peak in the south and the northern farmer must accept prices far below those received by southern farmers for first crops.

There is another agricultural area which is a potential supplier of the Prince Rupert market whose climatic limitations must be looked into. This is Graham Island, one of the Queen Charlotte group, 90 miles to the west of Prince
Rupert. The climate here is completely maritime and summer temperatures are only slightly higher than at Prince Rupert. The precipitation picture is, however, much brighter. Total precipitation at Masset is about 40 inches less than at Prince Rupert, and indeed is some 3 inches less than at Vancouver. There are no figures available for hours of bright sunshine but observation of forest types leads to the belief that the number of cloudy days is quite high.\textsuperscript{11} Though it is unlikely that grain cultivation would be successful on the island all other temperate crops could be grown without fear of frost damage owing to the length of the frost free period. The 169 day frost-free period at Masset seems to be a more valid general figure for the northern coast than does Prince Rupert's figure of 198 days which is presumably due to the situation of the station. (Compare Masset, Port Simpson and Prince Rupert in Climate Table H.) Climatically Graham Island seems ideally suited for dairying and its associated occupations. A rather marked comparison may be drawn between eastern Graham Island and Ireland with similarities to be found in climate, soil, physiography and position in relation to the mainland, though in the important similarity of markets their relationship is antipodal.

\textsuperscript{11}"an important factor in determining the distribution of this type (Western-Hemlock-Sitka Spruce Type) is the relative lack of sunlight due to the large amount of cloudy weather which prevails; even in localities where the precipitation is not high. The Queen Charlotte Islands afford an instance of this —" Forests of B.C., H.N. Whitford and R.D. Craig, Commission of Conservation, Ottawa, 1918, p. 64."
Summary

During the winter half-year Prince Rupert's climate is characterized by an almost constant progression of depressions bringing long continued rain and heavy cloud cover. The number of depressions decrease during the summer half-year, but their slow movement compensates for the decreased frequency and keeps the number of rainy days at a high level. Most people would consider Prince Rupert's climate very dreary and depressing. It would seem that some kind of bonus, in the form of higher wages or profits or availability of preferred employment is necessary to induce most people to stay in Prince Rupert.

The most favourable climatic conditions for agriculture in Prince Rupert's hinterland are found at Terrace. Terrace is sufficiently close to the ocean to have the advantages of a marine climate - long frost-free period and high night-time temperatures during the summer, yet it is sufficiently far inland to experience relatively high day-time temperatures during the summer.

The frost-free period in the Bulkley Valley is highest at New Hazelton where 74 days are, on the average, frost-free. This is 16 days lower than the minimum considered necessary for the successful cultivation of small grain crops. The area is also marginal in moisture supply, with a possibility of drought in below-average years.

Graham Island seems climatically suited for dairy
production, with a long frost-free period and plentiful, well distributed rainfall.
TABLE A

MEAN MONTHLY TEMPERATURES IN DEGREE F.

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<th>Year</th>
<th>Jan</th>
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<th>Mar</th>
<th>Apr</th>
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| **Vancouver, B.C.** |     |     |     |     |     |      |      |     |      |     |     |     |      |
| Rain           | 18  | 15  | 17  | 14  | 12  | 11   | 7    | 8   | 9    | 16  | 19  | 22  | 168  |
| Snow           | 2   | 3   | 3   | 1   |     |      |      |     |      |     |     |     | 2    |
| Precipitation  | 20  | 17  | 17  | 14  | 12  | 11   | 7    | 8   | 9    | 16  | 19  | 22  | 172  |
### TABLE F

**AVERAGE MONTHLY AND ANNUAL HOURS OF BRIGHT SUNSHINE**

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AVERAGE WIND SPEED IN MILES PER HOUR AND PERCENTAGE FREQUENCY BY DIRECTION FOR PRINCE RUPERT, B. C.

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* Average Wind Speed in Miles Per Hour by direction.
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<th>Station</th>
<th>Ht. in Feet</th>
<th>No. of Years</th>
<th>Last Frost in Spring</th>
<th>First Frost in Autumn</th>
<th>Average F.F. Period Days</th>
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<td>Nov. 2, Sept 17, Nov. 30</td>
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### Table I

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<th>Station</th>
<th>Date When Mean Maximum Exceeds and Falls Below 43° F.</th>
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<td>Wistoria</td>
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<td>April 12 - October 20</td>
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### Table J

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<th>Station</th>
<th>Average Date When Mean Daily Minimum Temperature Crosses 32 Degrees F.</th>
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<td>Wistoria</td>
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<td>Vanderhoof</td>
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<td>St. Walburg, Sask.</td>
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Climate Tables A, B, C, F from B.C. Dept. of Agriculture, *Climate of British Columbia; Victoria, 1949*.
Tables I, J from Canada's New Northwest, North Pacific Planning Project, King's Printer, Ottawa, 1948.
Chapter III

SOILS

Local Soils

The soils of Kaien Island have developed since the retreat of the last continental glaciation from the area some 15,000 years ago. The land re-exposed by the retreat of the glaciers must have consisted largely of bare, well-scoured rock into which numerous shallow depressions had been gouged by the ice. The preglacial drainage system was eliminated and water from the abundant precipitation and the mountain core collected in the depression pockets and lowland areas. These filled merely to spill their waters into the next depression. The multitude of ponds and lakes, in conjunction with increasingly milder temperatures provided an optimum habitat for aquatic plants and organisms, and the process of converting fresh-water bodies into soil, known as a hydrosere, progressed with great rapidity. The ponds were first inhabited by rootless aquatic plants whose decayed remains finally became sufficient to allow the establishment of rooted plants around the margins of the ponds. These in turn provided a footing for the establishment of reeds and mosses. The spagnum mosses were also able to work their way back from the ponds relying upon moisture provided
by feeding streams. They were also able to build upon themselves since the spongy moss so lowered the velocity of water courses, large and small, that their marginal portions acted as a miniature dam in which the process could repeat itself. By this process of moss growing upon saturated moss, slopes up to twenty degrees could be covered by appreciable depths of moss cover. The last elements of the vegetative succession were the small shrubs and conifers which grew upon the mosses and contributed their undecayed twigs and rootlets to the developing soil. The soil resulting from this process is called muskeg. It has no distinctly developed profile. Beneath a cover of moss and litter from 2 to 3 inches deep its colour varies from brown to dark brown depending on the stage of decomposition of its composite materials, moss and coarser organic matter. The muskeg varies in depth according to the configuration of the underground terrain and may be anywhere from 3 to over 70 feet deep. The figure of 70 feet was obtained from a construction company who had driven pilings to this depth in order to obtain a firm foundation for a large wartime building. In one corner of this building they had been unable to attain firm footing after 70 feet and abandoned the attempt. The reason for these great depths will be clear after a study of Figure 3.

Muskeg is always water saturated and its consistency resembles that of a plastic solid. Another disadvantageous property of muskeg is its tendency to shrink
HYPOTHETICAL CROSS SECTION OF MUSKEG FORMATION

[Diagram showing a cross-sectional view of a muskeg formation with depth in feet on the y-axis and distance in miles on the x-axis. The muskeg is represented by a shaded area, and the bedrock is shown as a darker, solid line.]

- MUSKEG
- BEDROCK
Figure 3

HYPOTHETICAL CROSS SECTION OF
MUSKEG FORMATION
and crack when drained. This may occur during occasional long dry spells when the surface level of the muskeg may drop a foot or more. The shrinkage is due to the loss of volume which occurs when water is removed.

As an agricultural soil muskeg is generally very poor. Unless it is drained the constant saturation of the soil has a tendency to rot seeds. It also suffers from very marked mineral deficiencies and large quantities must be added if successful growth is to take place. For a short time one Chinese gardener maintained a farm of about two acres in the northeastern section of the town. He relied for plant nutrients on the surplus manure from a dairy herd which was in turn maintained on imported feed. When the dairy went out of business the gardener was forced to do likewise, thus ending the only commercial attempt to utilize the soil of Kaien Island.

The soil is, however, very important in its effect on construction. This is due to muskeg's lack of stability which presents some very difficult engineering problems. In house construction at Prince Rupert an attempt is generally made to rest the foundation on the underlying rock, either by removing the muskeg entirely, if it is sufficiently shallow, or by driving piles into the muskeg until bedrock is reached. Both these methods are expensive especially if the muskeg is of great depth. Since the depth of muskeg can vary greatly within a few feet it is
necessary to take "soundings" every two or three feet before a house is constructed to be sure that footing can be obtained in the area the house is to occupy. If the muskeg is too deep for either of these methods the house is often placed on piles driven into the muskeg or is placed on "pads". Pads are wooden boards about three by four feet which are placed under the pilings to give a greater holding area. Neither of these methods are particularly successful, the houses having a tendency to settle with the passage of time. For this reason the builder prefers to locate his home either on rock or where the rock is covered by a shallow cover of muskeg. This preference for home sites on rock, and the mild climate, results in houses often lacking a basement of the usual type. The basement in many homes is the space between the surface of the ground and the level of the first floor, with only a layer of wooden boards for protection from the outside. (See foreground photograph 39.) For this reason furnace heating is less common in Prince Rupert than anywhere else in British Columbia. If a house is built on muskeg a furnace is impossible, because of unstable foundations. If the house is built on rock, excavation is prohibitively expensive and if a furnace is desired the basement must be built in the manner described above. Penetration of cold through the wooden basement is quite easy and the advantages of furnace heating are equalled by the disadvantages of this type of house construction. Concrete would perhaps be more satis-
factory as a barrier against the cold and it is being used more and more in new home construction, although it is more expensive than wood.

The percentage of houses with running water and flush toilets is also the lowest in the province. This is due in part to the difficulty of constructing sewers and water mains in the city. In rock, blasting is necessary to achieve proper gradients, while in muskeg a large amount of fill is needed to maintain stability of the lines. Both of these operations are expensive and the city finds it difficult to provide the necessary lines. If the home owner is not serviced by sewer lines, septic tanks make it possible for him to enjoy the conveniences of the flush toilet. However, since many of the houses are built on rock, even this alternative becomes impossible.

Regional Soils

The lowland area of northeastern Graham Island is also covered to a large extent by muskeg. The muskeg in this section is not as much of a problem as on Kaien Island. The muskeg on Graham Island is nowhere very deep, varying from six to eight inches to two or three feet. It presents no problem for construction and few difficulties for agriculture. Mineral soils in most cases are sufficiently close to the surface to enable them to be mixed with the muskeg or to provide a firm foundation for drains. These
Map 8
Regional Soils

soils have been farmed successfully for many years at several places and good crops have been obtained. The problems of marketing, however, have been insuperable to date.

Since physiography has limited Prince Rupert's agricultural hinterland to attenuated strips along river valleys, many soil types are encountered (See Table 13). The Kitsumcallum-Lakelse Valley, the most favourable agricultural area in terms of climate and distance from market, is hampered by the limited amount of arable soil. Of 57,500 acres surveyed in this area 19,300 acres or 33% were privately owned of which only 2,700 acres or 4% of the total were developed. Of the remaining 38,200 acres of crown or reverted land, (i.e. land which is available for settlement) only 5,090 acres or 13% were considered arable, and 1,110 acres or 3% were considered limited arable. 1 On the arable land heavy stands of hemlock, spruce, red cedar and amabilis fir occur and to clear the 40 to 60 acres considered necessary to form an economical farm unit presents a formidable task for the potential settler. Other areas of suitable soils may be found in the southern part of this valley, between Lakelse Lake and Kitimat Arm. No surveys have been made of this southern area. On the basis of available information, arable soil

1. Information obtained from letter by D. Sutherland, Director, Land Utilization Survey to J. Devison, May, 1950.
is distinctly limited in the area and Prince Rupert must look elsewhere for future agricultural supplies.

The grey wooded soils begin at Woodcock on the Skeena. They form the largest single group of soils in north-central British Columbia, and, except for a few pockets of degraded black soils, occupy the whole of the area. In Table 13, 77,300 acres of this soil zone have been classed as arable or potentially arable, in the area from Hazelton to Vanderhoof. This figure must be treated with some reservations. The grey wooded soils are strongly leached of bases, iron and plant nutrients and in general have inferior physical properties and rather low natural fertility. To produce well, even the better types of soil must be built up through the use of legumes, manure and fertilizer. The minimum farm size has been estimated at 160 acres, of which a large proportion must be arable. Since this soil type is generally covered by fairly dense coniferous cover the pioneer farmer is faced by two grave disadvantages. He must make a large capital expenditure to remove the original forest cover from an extensive area and then must return a substantial proportion of his farm revenue to the land in order to maintain fertility. The combination of large initial expense and high cost of upkeep tends to keep this land distinctly marginal. Extensive

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settlement of these soils is, therefore, unlikely unless there are generous subsidies on the part of the government in the form of land clearing, etc.

The degraded black soils are more favourable for agriculture since they have higher natural fertility and sparser tree cover. This soil zone is associated with a park-land type of vegetation and has developed on generally rolling topography. It is found in the Bulkley Valley from Evelyn south to Houston, in the Francois-Ootsa Lake area and in small pockets around Vanderhoof. The same climatic conditions that permit the formation of this soil present problems for its agricultural use. Annual rainfall is low and variable and frost presents a distinct hazard. The rolling topography associated with these soils restricts the choice of crops to be grown, most farmers in the area concentrating on timothy. Unfortunately if timothy is frozen while green its nutritive qualities are adversely affected. Examination of Climate Table H will show that summer frosts are a distinct possibility throughout this area.

The importance of the factors of climate and physiography are, in the case of the Bulkley Valley, sufficiently detrimental to more than offset the advantages of superior soils. Thus we find that in Prince George, on grey forest soils, the marginal farm consists of 19 productive livestock units and 63 acres of cropland while at Smithers the figures are 29 productive livestock units and 135 acres
of cropland. The grey forest soils in the Prince George area, though better than similar soils in the Hazelton-Vanderhoof area, are not naturally as fertile as the degraded black soils. Favourable factors of topography and climate, however, make them much more valuable agricultural land.

The Francois-Ootsa Lake area marks the extreme limit of Prince Rupert's agricultural hinterland. The limitation is based solely on an economic factor which is subject to change, but which at present is extremely important, namely the equalization of freight rates at Endako. This is the point where the cost of shipping by boat from Vancouver to Prince Rupert and then by rail from Prince Rupert equals the cost of shipping directly by rail from Vancouver. Endako is, therefore, the boundary of Prince Rupert's non-competitive hinterland. It should also be noted that it is cheaper to ship goods in freight classes one to six from Vancouver to Prince Rupert than it is to ship them from Endako to Prince Rupert. (See Table 12).

By taking the arable and potentially arable acreage of Prince Rupert's agricultural hinterland as listed in Table 13 and applying the minimum farm sizes arrived at previously, some idea of the absolute maximum

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number of farms in this section may be derived. Using the figures of 60 acres on the brown podsolic (Terrace district), 135 acres on the degraded black, (Bulkley Valley) and 160 acres on the grey forest soils, (Hazelton to Endako) a grand total of 2,048 minimum-sized farms is obtained. The figure of about 2,000 farms is far too generous, since it is improbable that all the farms would be marginal, and a more realistic total would be somewhat closer to 1,500 farms. It does, however, serve to illustrate the paucity of agricultural land available in Prince Rupert's hinterland and gives one of the clues to the problem of the non-development of Prince Rupert.

Since no more than 2,000 farms and about 10,000 people can be supported by agriculture in this area, Prince Rupert must turn elsewhere if it wishes to become self-sufficient in food. The best alternative is offered by Graham Island. Surveys of the soil of the island are necessary as well as an examination of the problems of drainage and marketing, before it can be said definitely that this area can supply Prince Rupert's agricultural needs. On the basis of available evidence, however, it does seem probable.

Summary

Prince Rupert must realize that in expecting development along the Canadian National Railway's northern
line it is awaiting something which is not likely to occur. Factors of climate, soil and physiography make development precarious and place absolute limits on the amount of development possible. The land available is perhaps adequate to support a city of 15 to 20,000 population but in order to supply Alaska and the potential city of Kitimat other areas must be found. The general overestimation of agricultural land in Prince Rupert's hinterland has been due in large part to the inclusion of the Vanderhoof-Prince George area in the hinterland. Economically, however, this area can not be included, due largely to high shipping costs.
FREIGHT RATES TO SELECTED STATIONS FROM PRINCE RUPERT, B.C.

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</tr>
<tr>
<td>Smithers</td>
<td>202</td>
<td>168</td>
<td>135</td>
<td>101</td>
<td>92</td>
<td>79</td>
<td>55</td>
<td>45</td>
</tr>
<tr>
<td>Terrace</td>
<td>133</td>
<td>113</td>
<td>88</td>
<td>66</td>
<td>59</td>
<td>49</td>
<td>38</td>
<td>29</td>
</tr>
<tr>
<td>Vanderhoof</td>
<td>80</td>
<td>67</td>
<td>55</td>
<td>42</td>
<td>38</td>
<td>34</td>
<td>26</td>
<td>21</td>
</tr>
</tbody>
</table>

VIA STEAMER:  
Vancouver, B.C. to Prince Rupert, B.C.  
General Merchandise - $12.65 per 2,000 lbs. or 40 cubic feet - ships option, including terminal charges at both ends. (64cts per 100 lbs.)
### TABLE 13

**INVENTORY OF SOIL SURVEYED AREAS IN NORTH CENTRAL BRITISH COLUMBIA**

<table>
<thead>
<tr>
<th>CATENA</th>
<th>AZONAL SOILS</th>
<th>INDICATED USES 1949</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glacial Lacustrine Soils</td>
<td>Alluvial Soils</td>
<td>Other Uses</td>
</tr>
<tr>
<td>Shallow Soils, Rock</td>
<td>Arable Soils, Forestry</td>
<td>Chiefly Uses</td>
</tr>
<tr>
<td>Organic Alluvial Soils</td>
<td>recent Eroded Potatation</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SOIL</th>
<th>SOIL</th>
<th>LOCAL</th>
<th>AREA OF ACREAGE</th>
<th>Glacial Lacustrine Soils</th>
<th>Alluvial Soils</th>
<th>INDICATED USES 1949</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazelton</td>
<td>89,400</td>
<td>50,000</td>
<td>1,000</td>
<td>5,300</td>
<td>27,200</td>
<td>3,900</td>
</tr>
<tr>
<td>Vanderhoof Fort Fraser</td>
<td>678,460</td>
<td>276,970</td>
<td>273,850</td>
<td>26,800</td>
<td>57,390</td>
<td>23,350</td>
</tr>
<tr>
<td>Bulkley Valley Lakes Country</td>
<td>445,490</td>
<td>303,600</td>
<td>7,990</td>
<td>48,350</td>
<td>43,350</td>
<td>43,100</td>
</tr>
<tr>
<td>Grass Degraded Central Black Valley Lakes Country</td>
<td>189,980</td>
<td>172,240</td>
<td>17,740</td>
<td>126,060</td>
<td>63,920</td>
<td></td>
</tr>
</tbody>
</table>


*Vanderhoof-Ft. Fraser is not within Prince Rupert’s non-competitive hinterland. Included for comparison.*
Chapter IV

FORESTRY

The forest resources of Prince Rupert's hinterland represent one of her greatest potential sources of wealth and one in which much expansion can take place. Even the addition of the operations of a large new forestry concern, the Columbia Cellulose Corporation, will not bring the cut in the coast district up to the estimated annual yield, while the cut in the interior is still below the annual increment.

Forestry on the Coast

The composition of the forests of the northern coast is considerably different from those of the south, due to the more rigorous climate of the summer half-year. The Douglas Fir disappears north of Gardner Channel and is not present on the Queen Charlotte Islands. The percentage of Red Cedar also drops considerably, especially in the wetter and colder areas. The Western Hemlock is tolerant of shade and moisture and becomes the dominant tree in the northern coast, with the Sitka Spruce a co-dominant in wetter areas and the Amabalis Fir the co-dominant in the colder areas. Until recently the absence of Douglas Fir
in the coastal district has meant that comparatively little attention has been paid to logging for lumber, excepting the special case of Sitka Spruce on the Queen Charlotte Islands. The northern coast is so distant from the main centres of marketing and production, i.e. Vancouver, that only premium lumber such as the Douglas Fir or Sitka Spruce could stand the cost of shipment and still be able to compete with logs from further south. With the logging-off of the more valuable and accessible timber in the south, increased cutting in the north has become possible.

Logging in the Prince Rupert district will remain dependent upon depletion in the south unless a fundamental reorientation of logging operations occurs. At present, of a total cut of 195 million fbm for the entire north coastal district, 115 million fbm is being cut in the Queen Charlotte Islands. The majority of the cut is towed 400 miles to Vancouver for processing. About 1/3 of the cut is taken to Ocean Falls where the best grades are selected for lumber and are either sawn there or are sent to Vancouver, while the remainder is utilized in the production of pulp and paper at the Ocean Falls mill. The timber moves toward Vancouver because it is, or was, moving toward the market and because the Vancouver mills represent large capital investments which can not be moved or shut down. The northern coast is, therefore, a marginal lumber area, tenuously connected to Vancouver by a 400-mile transportation network.
The movement of logs to Vancouver was proceeding toward the market when the largest market for British Columbia lumber was the United Kingdom. The increasing importance of the United States' domestic market changed this picture and Vancouver is no longer on the natural route to market. Rail rates from Prince Rupert to the large eastern markets are the same as from Vancouver, and Prince Rupert is much closer to the forests of the northern coast than is Vancouver.

If the Columbia Cellulose Company decides to operate a sawmill to handle high-grade logs and species such as cedar which cannot be made into pulp wood, a start will be made which may ultimately change the picture of north coast logging. Instead of being a marginal timber reserve 400 miles from head office the area may become a producer in its own right. The difficulties of attracting and keeping labour in Prince Rupert, discussed previously in the climate section, must be borne in mind. Costs of production will be high in Prince Rupert but as long as these costs remain below the transport charges to Vancouver the industry can succeed.

Forestry in the Interior

Logging in the interior section of the Prince Rupert Forest District is considerably different from that on the coast. The operations are smaller and more numerous,
as may be seen in Forestry Table 6. The interior has twice the sawmill capacity of the coast, although it cuts only one half as much as the coast. Almost all of the interior cut is processed locally before being shipped, and since production in the interior is increasing steadily, it would seem to be profitable. If interior mills can operate successfully, shipping via railroad, it seems likely that similar methods would succeed in Prince Rupert. Indeed it is possible that the reason for the steady expansion of lumbering in the interior compared with the relative stagnation on the coast (See Forestry Table 4) can be traced to the fact that the interior ships directly to the market by railroad while the coast ships to the market via Vancouver.

Selective logging is more important in the interior due to smaller operations and difference in dimensions and species of trees. In selective logging only one specific tree is felled, generally chosen to conform to some size or species requirement, and then skidded out with horses. In this way only the larger trees are removed with little or no damage to reproduction. Clear cutting is only practised in stands of lodgepole pine.

The area selectively cut on the coast is due entirely to operations of hand loggers who cut selectively because they do not have the machinery to clear cut. Their selection is governed more by accessibility than any other factor.

A large number, perhaps the majority, of the in-
terior loggers are also farmers either whole or part time. Since the growing season in this area is short the farmer has a long period during which he can log, without seriously impairing his efficiency as a farmer. It provides a valuable supplementary source of income to the farmer.

The Forestry Operations of the Columbia Cellulose Company

The forestry operations of the Columbia Cellulose Company are unique not only on the northern coast but in British Columbia as a whole. This company was the first to obtain a forestry management license, and to attempt the use of river driving to bring logs from the forest. Since its plant is located at Port Edward, 11 miles from Prince Rupert, it will be extremely important to Prince Rupert in the future. By the terms of the forestry management license the company agrees to practise scientific forestry on the areas leased. Cutting will proceed at a rate which will enable the forest to regenerate and grow to optimum merchantable size before it is cut again. The areas under lease to the company are not concentrated in one solid block but are scattered throughout the area between the Skeena and Nass. (See Map 17, p. 160). In most cases the company has been granted areas that would be difficult for smaller companies to utilize. The productive area allotted to the company amounts to approximately one quarter of the total productive area in the coast district (668,440 acres of a
total of 2,700,000 acres) while the volume of mature timber on this acreage amounts to only one fifth of the total mature volume on the coast. (4,345 million fbm of a total of 19,780 million fbm.) In addition much of their productive acreage is in areas which are now considered inaccessible, especially in the Upper Nass River Valley. Many of the most productive and accessible areas on the coast remain to be exploited by smaller companies.

On the first rotation the company must cut 14.5 million cubic feet of timber per year. Their license can be revoked if in any year they cut less than one half (7 million cubic feet) or more than one and one half (21 million cubic feet) of this amount. Moreover within a 10-year period the company must cut within 10% of the amount specified. The boundaries of the leased areas are not static and with the approval of the government they may be changed. For example if it is discovered that the area the company holds in the middle Nass is more suitable for farming than forestry this land will be removed from the lease and the company will be granted an equal area elsewhere. The company must manufacture 80,000 tons of unbleached pulp per year. The cedar logs on the company holdings may be turned into sawlogs, since they can not be used in the manufacture of pulp but all other logs, regard-

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1. From the contract between the Provincial Government and the Columbia Cellulose Company known as Forest Management License No. 1.
less of their quality, must be turned into pulp, unless permission is received from the government to do otherwise. The intention of this clause is to insure that all logs will receive the greatest amount of processing possible, thus adding to their ultimate value.

Cutting is to begin in the Kitsumgallum Valley to the north of Terrace and it is the intention of the company to drive the logs down the Skeena River to their plant at Port Edward. This is the first time that the common eastern technique has been attempted on a large scale in British Columbia and it was chosen presumably because the foresters and officials of the company received their training in the east. The success of the scheme is questionable as the Skeena River, in common with other British Columbia rivers, has a variation in flow which is not met with in the east. The ratio of flow on the Skeena at Usk is 101 to 1 as compared with the ratio on most eastern rivers of only 10 to 1. This is due to the copious precipitation which is held as snow in lofty peaks during the winter and released suddenly down precipitous slopes in the spring. Owing to the nature of the lower course of the Skeena the section from Terrace to the mouth abounds with sand banks and bars which represent the filling in of the embayed delta. These bars, especially towards the mouth of the river are composed of extremely

fine silt. With the large tidal fluctuations of the waters
of the northern coast, up to 24 feet, and the widely varying
rates of flow in the river the sand banks and bars have a
tendency to change with bewildering rapidity, and have been
known to make a formerly safe channel impassible during the
course of a day. To this difficulty is added another unique
hazard in the scores of gill netters that clog the mouth of
the Skeena during the salmon fishing season. Their nets
represent an extremely valuable piece of equipment, generally
worth from $600 to $1200. If these nets were to be damaged
by stray logs from the company’s booms, or by the booms
themselves, the fishermen would be quick to demand reimburse­
ment from the company. Since fishing is closed on the river
during Saturday and Sunday as a conservation measure the
company would be able to drive their logs during this period
without risk. A certain amount of equipment would be stand­
ing idle during a large part of the week, adding to the costs
of the operation. The fishing season, unfortunately, occurs
during the time when the river is most suitable for log
driving. In the company’s favour is the fact that the logs
of the interior are of smaller dimensions than those on the
coast and that they are to be brought down by experienced
eastern river drivers. The company has also gone to con­
siderable trouble to clear channels in the river to facili­
tate log driving. It is to be hoped that dredging and
dragging operations will not have to be repeated too often.
If the Columbia Cellulose Company is successful in its attempts
it is possible that this technique may be applied to other
rivers along the coast.

The question of how many men may be employed in this new operation has been the subject of much speculation. Using the table of labour requirement per unit of production found in the Transactions of the Second Resources Conference a fairly valid figure may be obtained.\(^3\) This method gives a figure of 282 men in the woods and 292 men in the mill. This means approximately 575 new primary producers, who will be receiving year-round wages, which will do much to make a stable and prosperous city.

The outlook for forestry is very hopeful. The estimated sustained yield for the coast is 280 million fbm, and cutting in 1948 amounted to 175 million fbm.\(^4\) The addition of the cut of the Columbia Cellulose Company will bring this total to 255 million fbm. Production can be increased by 25 million fbm and probably more without harm to the forests since much of the timber stand is mature, and thus receives little annual growth increment. Vancouver Forestry District, the only other coastal district, during the same year, was cutting at 188% of the annual growth rate and utilizing more hemlock and spruce than ever before. It seems inevitable that in the not too distant future Vancouver will be forced to rely much more heavily on the

\(^3\) B.C. Department of Lands, Victoria, B.C., 1949, p. 150.

\(^4\) Verbal information from the Prince Rupert District Forester.
forests of the northern coast. At present only the best and most accessible timber sites on the northern coast can be utilized to ship to Vancouver. As the search for timber sites proceeds farther and farther afield and costs of transportation to Vancouver increase, the probability of the successful establishment of sawmills in Prince Rupert increases. Indeed the industry could be successfully established at the present time, with its future assured by the ever increasing depletion of the forests of the southern British Columbia coast.
TABLE 1

INFORMATION SUPPLIED BY DISTRICT FORESTER, PRINCE RUPERT

Prince Rupert Forestry District

<table>
<thead>
<tr>
<th>Total Area</th>
<th>Productive Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coast</td>
<td>19.1 million acres</td>
</tr>
<tr>
<td>Interior</td>
<td>20.4 million acres</td>
</tr>
<tr>
<td></td>
<td>39.5 million acres</td>
</tr>
</tbody>
</table>

Merchantible timber accessible
Coast - 66% of the total productive area
Interior - 20% of the total productive area.

TABLE 2

MERCHANTIBLE TIMBER VOLUME ON PRODUCTIVE AREA IN MILLIONS OF F.B.M.

<table>
<thead>
<tr>
<th>Coast</th>
<th>Cedar</th>
<th>Hemlock</th>
<th>Spruce</th>
<th>Balsam</th>
<th>Lodgepole</th>
<th>Pine</th>
<th>Misc.</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4549</td>
<td>7094</td>
<td>5141</td>
<td>1770</td>
<td></td>
<td>1226</td>
<td></td>
<td>19780</td>
</tr>
<tr>
<td>Interior</td>
<td>614</td>
<td>1160</td>
<td>592</td>
<td>1052</td>
<td></td>
<td>128</td>
<td></td>
<td>3808</td>
</tr>
<tr>
<td>Total</td>
<td>4806</td>
<td>7708</td>
<td>6301</td>
<td>2362</td>
<td>1052</td>
<td>1350</td>
<td></td>
<td>23583</td>
</tr>
</tbody>
</table>

TABLE 3

ANNUAL LOGGED AREA 5 YEAR AVERAGE 1943-47

<table>
<thead>
<tr>
<th>Clear Cut</th>
<th>Selectively Cut</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coast</td>
<td>4708 acres</td>
</tr>
<tr>
<td>Interior</td>
<td>2113 acres</td>
</tr>
<tr>
<td></td>
<td>6821 acres</td>
</tr>
</tbody>
</table>
# TABLE 4

**CUT IN MILLIONS OF F.B.M.**

<table>
<thead>
<tr>
<th>Year</th>
<th>Coast</th>
<th>Interior</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1943</td>
<td>223</td>
<td>33</td>
<td>256</td>
</tr>
<tr>
<td>1944</td>
<td>235</td>
<td>43</td>
<td>278</td>
</tr>
<tr>
<td>1945</td>
<td>191</td>
<td>54</td>
<td>245</td>
</tr>
<tr>
<td>1946</td>
<td>125</td>
<td>62</td>
<td>187</td>
</tr>
<tr>
<td>1947</td>
<td>187</td>
<td>71.4</td>
<td>272</td>
</tr>
<tr>
<td>1948</td>
<td>175</td>
<td>84</td>
<td>259</td>
</tr>
</tbody>
</table>
### TABLE 5

**MERCHANTABLE TIMBER BY DRAINAGE BASINS**

Information from Regional Industrial Index of British Columbia
Department of Trade & Industry, Victoria, 1948

<table>
<thead>
<tr>
<th>Drainage-basin</th>
<th>Douglas Fir</th>
<th>Red Cedar</th>
<th>Western Hemlock</th>
<th>Spruce</th>
<th>Western Silver Fir</th>
<th>Lodgepole Pine</th>
<th>Yellow Cedar</th>
<th>Cotton Wood</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Douglas Channel-Kitimat Arm</td>
<td>8,500</td>
<td>97,500</td>
<td>264,600</td>
<td>138,200</td>
<td>893,700</td>
<td>25,600</td>
<td>6,300</td>
<td>25,600</td>
<td>2,672,300</td>
</tr>
<tr>
<td>Gardner Canal-Kitlope River</td>
<td>125,200</td>
<td>172,700</td>
<td>110,600</td>
<td>92,400</td>
<td>300</td>
<td>25,200</td>
<td>683,100</td>
<td>526,400</td>
<td>6,270,600</td>
</tr>
<tr>
<td>Grenville Channel-Banks Island</td>
<td>296,900</td>
<td>845,900</td>
<td>446,900</td>
<td>385,700</td>
<td>2,700</td>
<td>168,400</td>
<td>2146,500</td>
<td>583,000</td>
<td>3,585,100</td>
</tr>
<tr>
<td>Lower Skeena River</td>
<td>295,700</td>
<td>354,500</td>
<td>213,700</td>
<td>229,200</td>
<td>47,900</td>
<td>1114,300</td>
<td>1047,600</td>
<td>1114,300</td>
<td>5,580,000</td>
</tr>
<tr>
<td>Princess Royal-Hawkesbury</td>
<td>37,800</td>
<td>201,600</td>
<td>183,400</td>
<td>147,200</td>
<td>300</td>
<td>13,000</td>
<td>583,000</td>
<td>583,000</td>
<td>1,164,000</td>
</tr>
<tr>
<td>Roderick Island-Graham Reach</td>
<td>1512,200</td>
<td>2037,000</td>
<td>1954,700</td>
<td>24,700</td>
<td>321,500</td>
<td>5850,100</td>
<td>5850,100</td>
<td>5850,100</td>
<td>11,740,000</td>
</tr>
<tr>
<td>Work Channel-Klutzezmateen</td>
<td>1199,500</td>
<td>2755,700</td>
<td>2201,100</td>
<td>114,300</td>
<td>11,300</td>
<td>6270,600</td>
<td>6270,600</td>
<td>6270,600</td>
<td>12,940,000</td>
</tr>
<tr>
<td>Graham Island, Q.C.I.</td>
<td>25,800</td>
<td>329,400</td>
<td>144,600</td>
<td>69,900</td>
<td>400</td>
<td>39,300</td>
<td>609,400</td>
<td>609,400</td>
<td>779,000</td>
</tr>
<tr>
<td>Moresby Island, Q.C.I.</td>
<td>111,600</td>
<td>1893,000</td>
<td>1531,700</td>
<td>161,700</td>
<td>31,170</td>
<td>2654,570</td>
<td>3955,500</td>
<td>3955,500</td>
<td>7610,070</td>
</tr>
<tr>
<td>Lower Nass-Observatory Inlet</td>
<td>436,600</td>
<td>1196,100</td>
<td>424,600</td>
<td>505,300</td>
<td>31,170</td>
<td>2654,570</td>
<td>3955,500</td>
<td>3955,500</td>
<td>7610,070</td>
</tr>
<tr>
<td>Bulkley River East</td>
<td>1351,700</td>
<td>693,600</td>
<td>1566,100</td>
<td>254,300</td>
<td>11,140</td>
<td>4595,700</td>
<td>740,900</td>
<td>740,900</td>
<td>8440,600</td>
</tr>
<tr>
<td>Middle Skeena River</td>
<td>3,800</td>
<td>75,800</td>
<td>270,900</td>
<td>215,300</td>
<td>87,700</td>
<td>677,500</td>
<td>1721,100</td>
<td>1721,100</td>
<td>2398,600</td>
</tr>
<tr>
<td>Upper Nechako River</td>
<td>8,800</td>
<td>147,800</td>
<td>381,000</td>
<td>751,700</td>
<td>361,000</td>
<td>1505,900</td>
<td>1505,900</td>
<td>1505,900</td>
<td>3011,800</td>
</tr>
</tbody>
</table>

**NOTE** - in 1000's of board feet.
TABLE 6

SAW AND SHINGLE MILLS

<table>
<thead>
<tr>
<th>Year</th>
<th>Operating</th>
<th></th>
<th></th>
<th>Not Operating</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sawmills</td>
<td>Shingle Mills</td>
<td>Sawmills</td>
<td>Shingle Mills</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>M.B.M.</td>
<td>M.B.M.</td>
<td>M.B.M.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coast</td>
<td>25</td>
<td>1</td>
<td>608 *</td>
<td>5</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td>608</td>
<td>5</td>
<td>5</td>
<td>36</td>
<td>1</td>
</tr>
<tr>
<td>Interior</td>
<td>212</td>
<td>7</td>
<td>1,064</td>
<td>7</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>212</td>
<td>7</td>
<td>7</td>
<td>32</td>
<td>1</td>
</tr>
<tr>
<td>Totals</td>
<td>237</td>
<td>12</td>
<td>1,672</td>
<td>12</td>
<td>68</td>
</tr>
<tr>
<td></td>
<td>237</td>
<td>12</td>
<td>1,672</td>
<td>12</td>
<td>68</td>
</tr>
<tr>
<td>1947</td>
<td>205</td>
<td>9</td>
<td>1,288</td>
<td>9</td>
<td>52</td>
</tr>
<tr>
<td></td>
<td>205</td>
<td>9</td>
<td>9</td>
<td>52</td>
<td>1</td>
</tr>
<tr>
<td>1946</td>
<td>149</td>
<td>6</td>
<td>1,085</td>
<td>6</td>
<td>67</td>
</tr>
<tr>
<td></td>
<td>149</td>
<td>6</td>
<td>6</td>
<td>67</td>
<td>1</td>
</tr>
</tbody>
</table>

* Of the estimated capacity on the coast 350 M.B.M. is supplied by one sawmill at Ocean Falls.
Unlike the other resources of Prince Rupert's hinterland the fisheries resource is almost completely utilized at present, since the mainstays of the industry, halibut and salmon, are premium fish which command prices on the world market sufficient to enable them to overcome the high transportation charges. Most of the other fisheries are incidental to halibut and salmon, and are engaged in during periods when salmon and halibut cannot be caught. Thus, the other fisheries make use of capital equipment and skills which they could not support in themselves.

The fishing industry, especially the halibut fishery, has provided the major share of Prince Rupert's income since the city's founding. No major growth in the industry can be expected nor fortunately, a major decline. Since a fishery resource cannot be measured or equated in the usual way the most suitable technique for its investigation is historical. The observation of changes and trends of the past will tell us more about the fishery of the future than any other method since changes in the fishing industry will be in techniques rather than in amounts caught.
The Halibut Fishery

The fundamental control of a fishery is the habitat and habits of the fish concerned. These factors regulate the type of boats, the gear and the manner of fishing. The halibut begins life as a pelagic fish, floating in the currents above the spawning banks, which are generally quite deep, from 150 to 200 fathoms. They remain in these banks until they are mature when they seem to migrate to shallower banks, from 40 to 80 fathoms deep. When mature, halibut move about continually; stock which was tagged in the Gulf of Alaska was recovered as far south as Washington. Since the halibut is found principally in the more exposed areas of the continental shelf, sturdy ships of fair size are needed if the fishermen intend to remain on the banks any length of time. This is especially true in Area 3 (see map) where the fishermen are exposed to the full sweep of the North Pacific.

The halibut fishery began in 1890 in the waters off Cape Flattery, using the longline method fishing from dorries developed on the Atlantic coast. Improvements in techniques came almost immediately and the venturesome west coast fishermen adopted them much sooner than their Atlantic brethren. The Pacific fishermen were quick to adopt power motors, which allowed the use of power gurdies. The gurdies when used in conjunction with the goose neck enabled fishing to be carried out from the mother ship with a consequent in-
Map 10
Halibut Fishing Areas

crease in speed and efficiency of fishing.¹

By 1910 fishing had spread as far north as Cape Spencer, Alaska. The opening of the railway line to Prince Rupert in 1914, by providing quicker access to markets, increased the number of boats in the industry and extended their range. By 1925 halibut was being fished from Unimak Pass in the Aleutian Islands to northern California. However, the halibut catch had begun to decline in spite of ever extending operations. Fishing was carried on the year round and in areas close to the ports the catches had begun to drop alarmingly.

In 1923 a halibut treaty was signed between the United States and Canada allowing the formation of an International Fisheries Commission and instituting a three months closed season during the winter. This treaty, incidentally, was the first to be negotiated by Canada on her own behalf as a sovereign nation. By 1930 investigations showed that unless prompt action was taken the halibut fishery would be completely depleted. The Pacific coast was divided into three areas (Map 10, p. 93) with separate catch regulations provided for each. Area two is the most important of the three, and within the area the most important banks are found between the north end of Vancouver Island and Dixon Entrance.

¹. A gurdie - a mechanical device consisting essentially of a revolving drum around which the line is drawn in.
A gooseneck - a sheet-metal frame on the stern of a halibut boat over which the line is let out.
"On either side of this central area the conditions for production become less favourable and the abundance of many species taper off to the south and to the north. This tapering off in halibut stocks is not so apparent at the present time, due to the effect that fishing has had on the levelling off these original peaks of maximum abundance.”

Prince Rupert is the port best situated to serve the fishery of this productive area. Even prior to the arrival of the railway Prince Rupert had quite an extensive fishery, which the rail connection expanded. The industry is located at the point of production since high quality fish must be frozen as soon after landing as possible.

Once the equipment for freezing is set up it is less expensive

to add the cold storage rooms at the point of landing than to establish them at the market. The fish is held in Prince Rupert until there is a call for it, then it is shipped out in carload lots via express. The movement of fish to the market employs a few people during the winter months.

Since 1931 the International Fisheries Commission has been the greatest single control in the halibut fishery. Their object has been to prevent the destruction of the halibut banks by overfishing. To this end they have imposed catch restrictions sufficient to allow regeneration of stocks in all areas. With increasing numbers of fishermen entering the industry and increased efficiency of the boats the length of the fishing season has decreased. From 1935 to 1940 the trend toward an increasingly short fishing season was prevented by the cooperative action of the fishermen in agreeing to a lay-over of 10 days between trips and agreeing that each ship would catch no more than 3500 lbs. per man during the trip. The lay-over period and the restricted catch naturally prevented an oversupplied market and gave the fishermen a higher price during the depression years. With the coming of the war these restrictions were curtailed and the length of the season began to drop rapidly. (See Fisheries Table 1). During the war, the efficiency of the fish boats again increased, due to the high incomes the fishermen were receiving coupled with income tax regulations which allowed deductions for improvements to the boats. As a result most fishermen purchased newer and more powerful
diesel engines, echo-sounding devices and ship-to-shore radios. At the end of the war catch restrictions were not reimposed, largely because of the high prices for fish. Improved equipment soon resulted in a reduction of the halibut season to one month in Area Two. The shortening of the halibut season has had the effect of increasing the importance of Prince Rupert as a halibut port, especially for Canadian fishing boats, since the prime object is to remain as long on the fishing grounds as is possible and not waste time travelling to and from a distant port. Since Prince Rupert is the closest port almost all Canadian halibut is landed there.

The shortness of the season and the high price of fish has brought about other developments, particularly the growing importance of camps. Camps are scows towed close to the fishing grounds at the start of the season by the various fish buyers. They are equipped with temporary storage space for fish and are able to sell gas, oil and a few other basic requirements. Camps enable small boats with restricted holding capacity to sell their fish without taking the time-consuming trip into Prince Rupert or some other port. The camps are in touch with head office by radio and fast fish packers visit them regularly to drop off supplies and take the fish they have purchased into the main market. The camps accounted for 4 millions pounds of the 14 million pounds of halibut landed by Canadian fishermen from Area Two. The camps enable many types of small boats
to fish for halibut, particularly salmon trollers and gill netters.

These developments have tended to make the traditional Area Two or small halibut boats obsolete. These boats range from 5 to 10 tons in capacity and carry a crew of from 3 to 5 men. They fish only in Area Two waters since they are too small to extend their period of operations by fishing in Area Three after the closure of Area Two. The Area Two halibut boats are generally too large to engage in salmon fishing, and are not suited to this occupation. As an alternative they are often used for black cod fishing, which is not particularly lucrative. For the last few years, however, good prices have prevailed for black cod and the use of halibut boats has been generally successful. In an attempt to find employment for these boats, the fisheries department has been using scout ships to hunt for abalcore or tuna. In three years of operation they have met with reasonable success but so little is known about this type of fishery that prediction is impossible. Since a boat that can be used during only one month of the year is extremely expensive to operate, the traditional small halibut boat may soon be obsolete unless some way can be found to lengthen the season. It will probably be replaced by more adaptable boats of two types: the smaller ones capable of halibut fishing from the camps and then gill netting or trolling during the salmon season. The larger boats will be adapted for purse seining or packing during the salmon
season and will be converted to halibut fishing by removing the seine table and adding the goose neck. Boats fishing for halibut exclusively will remain, but they will be larger than at present, averaging a carrying capacity of 35 to 50 tons and will be capable of fishing any part of the North Pacific. This tendency can be discerned already, but a complete picture requires an examination of other forces operating in the industry, particularly the cooperative movement.

Fisheries and the Cooperative Movement

The cooperative movement was a product of the depression. In the early 1930's fishermen, in common with other primary producers, were forced to accept extremely low prices for their fish. In an effort to increase prices the fishermen set up a cooperative to handle the marketing of fish and to buy their gear and provisions. With the gradual return of prosperity after 1936 and the insatiable markets of the war years this venture succeeded and expanded. By the end of the war the cooperative had two large stores in Prince Rupert, a cold storage plant, bakery and restaurant. Almost all independent fishermen were members of the cooperative. A personal check covering 85% of the boats showed that of 90 halibut boats operating out of Prince Rupert only 10 did not belong to the cooperative.

The fishermen who are members of the cooperative
naturally wish to sell to the organization whenever possible, selling to private companies only when the cooperative cannot handle their catch. This situation was resented by the private companies since it placed their supply in a precarious position. In order to assure themselves of a supply the private companies began to place more camps near the grounds and also offered to build or subsidize the construction of boats which would sell exclusively to them. When building boats they chose the large type of boat since they had sufficient capital to do this and realized that the larger boats would be more profitable to them. Since the head offices of the fishing companies are located in Vancouver the large boats tend to be concentrated in that city. There are, of course, a number of medium and large sized boats located in Vancouver which are owned by independents, but a survey of the two principal Canadian fleets showed the following -

<table>
<thead>
<tr>
<th></th>
<th>Vancouver</th>
<th>Prince Rupert</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total boats</td>
<td>90</td>
<td>107</td>
</tr>
<tr>
<td>Large boats</td>
<td>43</td>
<td>42</td>
</tr>
<tr>
<td>Medium boats</td>
<td>43</td>
<td>42</td>
</tr>
<tr>
<td>Large or Medium boats</td>
<td>66%</td>
<td>40%</td>
</tr>
</tbody>
</table>

The majority of the Vancouver boats are of the large or medium size which are capable of fishing anywhere along the Pacific coast, while the majority of the Prince
Rupert fleet is composed of small ships capable of fishing only Area Two. Both these fleets sell their catch in Prince Rupert, and are differentiated by their wintering place. In Vancouver of 48 boats checked only 8 were members of the cooperative. Since almost all independent fishermen on the coast are members of the cooperative it is to be presumed that most of the Vancouver boats are company owned or subsidised.

The strength of the cooperative in Prince Rupert may be attributed to two primary causes. The first is the ethnic homogeneity of the Prince Rupert fishermen. Of the 90 boats checked only 7 were skippered by men with British surnames, the rest were Norwegians. In a strange country it is natural that ties of nationality and occupation should help weld the fishermen into rather closely-knit groups in which the spread of the idea of cooperation would be relatively easy. The small size of the city also assisted in the formation of the cooperative. Fishermen in Prince Rupert could not avoid coming into contact with each other. Argument, discussion and the observation of results were easy and inevitable. In Vancouver, as in any large city, personal contact, the basis of cooperation, is more difficult, because of the size and anonymity of a city. Prince Rupert was, therefore, the driving force behind the formation and expansion of the cooperative movement in the Pacific Coast Fisheries.

The majority of the cooperative members are owners
of the medium and small sized boats and it is in their interest to find some way of lengthening the season, if only to prevent their equipment from becoming obsolete. Biological evidence seems to be in favour of lengthening the season - "short seasons are considered biologically unsound by the Commission because they do not allow the taking of the maximum yields from the stocks."\(^3\) If some form of lengthening the season is adopted it will have two effects, to preserve the usefulness of the Area Two or small halibut boat and to lower the amount of halibut landed in Prince Rupert. If a lay-over of 10 days is decided upon the tendency will be for all boats to return to their home ports to sell their catch, which will mean that only Prince Rupert boats will sell at that port, with a consequent reduction in amount landed.

The Salmon Fishery

Since the salmon has an entirely different habitat and life cycle than the halibut, the fishery associated with it is also different. The basis of the salmon industry is the habit of the fish to return to its home stream to spawn after maturing in the open sea. The concentration of the salmon into a relatively small area, the width of the stream mouth, makes them easy to catch. Three principal methods are

used, trolling, gill netting and purse seining. Trolling is used to catch high quality fish on their way to the mouth of the river, and accounts for only a small proportion of the catch. Most of the catch in the Skeena and Nass Rivers is accounted for by gill netters, with only a small portion being taken by purse seine.

This has been the case since before the turn of the century when the fishery began. The sailboat was supreme in the northern salmon fishery up until approximately 1925. With declining fish stocks it became increasingly difficult to make good catches with a sail boat, and in the period from 1925-30 almost the whole of the fishery was converted to gas engine. This conversion to power boats increased the flexibility and mobility of the fleets and laid the ground for many changes. The most important was the decrease in the numbers and the increase in the size and efficiency of the canneries. In the days of the sailboat 25 scattered canneries were necessary to properly service the fisheries on the Skeena and Nass Rivers, now only six are needed.

The number of boats on the two rivers has been steadily decreasing from a peak of 3,000 in 1925. In 1948 there were approximately 1,100 boats on the Skeena and Nass. Decreasing numbers have been accompanied by increasing

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4. Verbal information, District Supervisor, Dominion Department of Fisheries, Vancouver, B.C.

5. Ibid.
PHOTOGRAPH 15
LOOKING ACROSS HARBOR AT
MT. MORSE
FISHERMAN'S FLOAT IN THE
FOREGROUND
Floats are relatively empty
since this was taken during
fishing season. Boats in
foreground with tall poles
are salmon trawlers. Small
boats without poles are gill
netters. The large boat to
the left is a seiner.

efficiency and the boats at present are more than capable
of handling all the available fish. Nor has the amount of
fish landed declined appreciably, very serious declines in
high quality sockeye being made up by increased landings of
cohoe and chum.

Prior to the war the northern salmon fishery was
largely in the hands of the native Indians, who represented
about 50% of the fishermen in this district. The rest of
the fishery was divided about equally between white and
Japanese fishermen. The Japanese fishermen, removed from
the coast during the war, were replaced in part by addition­
al white and Indian fishermen and in part by increasingly

6. Ibid.
efficient gear and boats. This poses a potentially dangerous sociological problem for the post-war period. Undoubtedly some Japanese fishermen will want to return to their former occupations, but they will be returning to an industry which has expanded to its productive limits. Every Japanese fisherman who returns threatens the livelihood of someone already employed in the fisheries, probably the somewhat inefficient Indian fisherman.

The price that the fisherman receives for his catch and the wage that his wife and daughter receive for work in the cannery is the only return that Prince Rupert receives from this fishery. Cannery supplies, machinery and additional labour are all supplied from Vancouver. Similarly all the salmon canned in the north is shipped to Vancouver for marketing. This practice developed in the pre-war years when Britain formed the main market for canned salmon, and Vancouver was the most convenient centre from which to ship. As with timber, this is no longer the case and the majority of the canned salmon pack is sold either in eastern Canada or the United States. With this new orientation of markets, cannery men would be well advised to examine the possibility of shipping direct from Prince Rupert.

The length of the season in the fishery is decided by the Provincial Department of Fisheries. At present the

7. Verbal Information, District Supervisor, Dominion Department of Fisheries, Vancouver, B.C.
season embraces almost the whole duration of the various salmon runs; the problems of escapement and regeneration being met by a two-day closure of the fishery during every week of the season.

Both of the major fisheries impose a seasonal rhythm on the fishermen. Many attempts have been made to utilize idle equipment and skills by the development of new fisheries. These have been successful in part, and thriving black cod, flat fish, abalcore and herring fisheries do exist. At present, however, they employ only a small number of boats and men, and it is unlikely that they can be expanded sufficiently to engage all the available men and equipment of the two major fisheries. As yet this problem has not become too pressing since the majority of fishermen can make enough money during the few months of fishing to keep them comfortably throughout the rest of the year. The job seekers are those who have had a poor season and those who wish to work during the winter in order to add to their capital. The problem of jobs for men in these two classes is difficult but by no means insoluble. If fish prices were to drop and large numbers of men were to seek winter employment the situation would become impossible.

Summary

The fisheries of Prince Rupert are efficient, well-
equipped and well-developed. Increased production in the more important fisheries is now unlikely, but a slight increase is possible in many of the minor fisheries, should market conditions warrant development. The industry has shown itself to be extremely alert in the application of modern technology to fishing, preserving and marketing. Improvements in the future will be adopted as quickly as in the past.

Prince Rupert is destined to play an important part in this industry by virtue of her geographic position. How important will depend upon the unforeseeable decisions of the International Fisheries Commission and the management of the salmon canneries.
### TABLE I

**DECLARED LANDINGS BY REGULATORY AREAS**

All poundage is shown in 1000's of pounds — i.e. 000 is omitted.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1931</td>
<td>923</td>
<td>14629</td>
<td>7018</td>
<td>21647</td>
<td>20887</td>
<td>765</td>
<td>21652</td>
<td>36439</td>
<td>7783</td>
<td>44222</td>
</tr>
<tr>
<td>1935</td>
<td>1489</td>
<td>13113</td>
<td>8955</td>
<td>22068</td>
<td>22533</td>
<td>1251</td>
<td>23784</td>
<td>37135</td>
<td>10206</td>
<td>47341</td>
</tr>
<tr>
<td>1940</td>
<td>779</td>
<td>14396</td>
<td>11102</td>
<td>25498</td>
<td>25396</td>
<td>1582</td>
<td>26978</td>
<td>40571</td>
<td>12684</td>
<td>53255</td>
</tr>
<tr>
<td>1945</td>
<td>529</td>
<td>13230</td>
<td>11750</td>
<td>24980</td>
<td>25605</td>
<td>1551</td>
<td>29156</td>
<td>39364</td>
<td>15301</td>
<td>54665</td>
</tr>
<tr>
<td>1948</td>
<td>282</td>
<td>13273</td>
<td>14203</td>
<td>27476</td>
<td>23276</td>
<td>4453</td>
<td>27729</td>
<td>36831</td>
<td>18656</td>
<td>55487</td>
</tr>
<tr>
<td>1949</td>
<td>437</td>
<td>12784</td>
<td>13531</td>
<td>26315</td>
<td>23492</td>
<td>5135</td>
<td>28627</td>
<td>36713</td>
<td>18666</td>
<td>55379</td>
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</tbody>
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### TABLE II

**LANDINGS BY PORTS FROM AREAS 2 AND 3 BY U.S. AND CANADIAN VESSELS COMBINED**

<table>
<thead>
<tr>
<th>Year</th>
<th>Vanor.</th>
<th>New W.</th>
<th>Prince</th>
<th>Rupert</th>
<th>Misc.</th>
<th>Total</th>
<th>Seattle</th>
<th>S.E. Alaska</th>
<th>West Alaska</th>
<th>Misc.</th>
<th>Total</th>
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<tbody>
<tr>
<td>1931</td>
<td>1066</td>
<td>16792</td>
<td>516</td>
<td>18374</td>
<td>15201</td>
<td>8240</td>
<td>1464</td>
<td>24925</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1935</td>
<td>2242</td>
<td>12964</td>
<td>1921</td>
<td>17127</td>
<td>22067</td>
<td>6532</td>
<td>12</td>
<td>114</td>
<td>28725</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1940</td>
<td>1996</td>
<td>18580</td>
<td>3314</td>
<td>23890</td>
<td>18773</td>
<td>9305</td>
<td>182</td>
<td>326</td>
<td>28566</td>
<td></td>
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</tr>
<tr>
<td>1945</td>
<td>1910</td>
<td>15272</td>
<td>2498</td>
<td>19680</td>
<td>11951</td>
<td>19060</td>
<td>2181</td>
<td>1264</td>
<td>34456</td>
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<td>1948</td>
<td>1829</td>
<td>14984</td>
<td>4144</td>
<td>20957</td>
<td>9013</td>
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<td>1949</td>
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<td>4698</td>
<td>1097</td>
<td>32741</td>
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### TABLE III

**SIZE OF THE UNITED STATES Fleets**

<table>
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<tr>
<th>Area 2</th>
<th>Area 3</th>
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<tbody>
<tr>
<td>No. of Boats</td>
<td>No. of Men</td>
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<td>Astoria</td>
<td>14</td>
</tr>
<tr>
<td>Seattle</td>
<td>77</td>
</tr>
<tr>
<td>Ketohikan</td>
<td>96</td>
</tr>
<tr>
<td>Petersburg</td>
<td>70</td>
</tr>
<tr>
<td>Juneau</td>
<td>66</td>
</tr>
<tr>
<td>Wrangell</td>
<td>21</td>
</tr>
<tr>
<td>Sitka</td>
<td>30</td>
</tr>
<tr>
<td>Western Alaska</td>
<td>—</td>
</tr>
<tr>
<td>Total 1949</td>
<td>374</td>
</tr>
<tr>
<td>Total 1948</td>
<td>403</td>
</tr>
<tr>
<td>Total 1931</td>
<td>167</td>
</tr>
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</table>
TABLE III (Cont'd)

SIZE OF CANADIAN FLEETS

<table>
<thead>
<tr>
<th></th>
<th>Area 2</th>
<th>No. of Boats</th>
<th>Area 2</th>
<th>No. of Men</th>
<th>Area 3</th>
<th>No. of Boats</th>
<th>Area 3</th>
<th>No. of Men</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vancouver Is.</td>
<td>34</td>
<td>118</td>
<td></td>
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<td></td>
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<tr>
<td>Vancouver</td>
<td>86</td>
<td>514</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Prince Rupert</td>
<td>105</td>
<td>521</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total 1949</td>
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<tr>
<td>Total 1948</td>
<td>249</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total 1931</td>
<td>83</td>
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<td></td>
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<td></td>
</tr>
</tbody>
</table>

TABLE IV

LENGTH OF HALIBUT FISHING SEASON IN AREAS 2 AND 3

<table>
<thead>
<tr>
<th>Legal Opening Date</th>
<th>Closing Dates Area 2</th>
<th>Closing Dates Area 3</th>
<th>Length of Fishing Season Area 2</th>
<th>Length of Fishing Season Area 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Areas</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1929</td>
<td>Feb. 16</td>
<td>Nov. 15</td>
<td>Nov. 15</td>
<td>9</td>
</tr>
<tr>
<td>1930</td>
<td>Feb. 16</td>
<td>Nov. 15</td>
<td>Nov. 15</td>
<td>8</td>
</tr>
<tr>
<td>1931</td>
<td>Feb. 16</td>
<td>Oct. 31</td>
<td>Oct. 31</td>
<td>8</td>
</tr>
<tr>
<td>1932</td>
<td>Feb. 16</td>
<td>Oct. 22</td>
<td>Oct. 30</td>
<td>8</td>
</tr>
<tr>
<td>1933</td>
<td>Feb. 1</td>
<td>Aug. 25</td>
<td>Oct. 26</td>
<td>8</td>
</tr>
<tr>
<td>1934</td>
<td>Mar. 1</td>
<td>Aug. 19</td>
<td>Oct. 27</td>
<td>5</td>
</tr>
<tr>
<td>1935</td>
<td>Mar. 1</td>
<td>Sept. 6</td>
<td>Dec. 26</td>
<td>5</td>
</tr>
<tr>
<td>1936</td>
<td>Mar. 16</td>
<td>Aug. 10</td>
<td>Nov. 3</td>
<td>4</td>
</tr>
<tr>
<td>1937</td>
<td>Mar. 16</td>
<td>July 28</td>
<td>Oct. 19</td>
<td>4</td>
</tr>
<tr>
<td>1938</td>
<td>Apr. 1</td>
<td>July 29</td>
<td>Oct. 29</td>
<td>3</td>
</tr>
<tr>
<td>1939</td>
<td>Apr. 1</td>
<td>July 29</td>
<td>Oct. 28</td>
<td>3</td>
</tr>
<tr>
<td>1940</td>
<td>Apr. 1</td>
<td>July 13</td>
<td>Sept. 26</td>
<td>3</td>
</tr>
<tr>
<td>1941</td>
<td>Apr. 1</td>
<td>June 30</td>
<td>Sept. 14</td>
<td>3</td>
</tr>
<tr>
<td>1942</td>
<td>Apr. 16</td>
<td>June 29</td>
<td>Sept 25</td>
<td>2</td>
</tr>
<tr>
<td>1943</td>
<td>Apr. 16</td>
<td>June 20</td>
<td>Sept 28</td>
<td>2</td>
</tr>
<tr>
<td>1944</td>
<td>Apr. 16</td>
<td>July 9</td>
<td>Nov. 30</td>
<td>1</td>
</tr>
<tr>
<td>1945</td>
<td>May 1</td>
<td>June 15</td>
<td>Sept. 24</td>
<td>1</td>
</tr>
<tr>
<td>1946</td>
<td>May 1</td>
<td>June 11</td>
<td>Aug. 19</td>
<td>1</td>
</tr>
<tr>
<td>1947</td>
<td>May 1</td>
<td>June 8</td>
<td>Aug. 17</td>
<td>1</td>
</tr>
<tr>
<td>1948</td>
<td>May 1</td>
<td>June 1</td>
<td>July 11</td>
<td>1</td>
</tr>
</tbody>
</table>


Map 11

Water Power Resources

Hydrography is of concern only in so far as one of its manifestations, hydro-electric potential, influences the development of Prince Rupert. The result of the combination of rugged terrain and copious precipitation can be seen in the map of hydro-electric potentials. Within a radius of 160 miles from Prince Rupert, i.e. within practical transmission distance at present, there is a potential of 1,954,430 horse power at ordinary minimum flow or 2,547,080 horse power at ordinary six months flow. This represents 23% of the hydro potential of British Columbia. The area has only 2.5% of the developed water power in British Columbia. The non-development of hydro-power is tied in with the non-development of other resources, previously discussed. There are, moreover, certain special difficulties of hydrology and terrain which in themselves hinder development. The most important is the extreme variation between maximum and minimum flow.¹ The same rugged terrain which makes possible the hydro-potential makes

¹ See Page 83.
utilization difficult. Power sites tend to be situated in small pockets at stream mouths which are isolated by high and rugged mountains. Construction of transmission lines varies from difficult to impossible and in many cases utilization can only take place at the source of power. Only industries to whom hydro-power represents the major raw material could locate in such an isolated position.

Hydropower Potentials and Future Development

Of these industries the most important by far is the aluminum industry. At present intensive surveys of the Tweedsmuir Park area are being conducted with a view to the establishment of an aluminum industry on the northern British Columbia coast. The details of the scheme can be readily understood by an examination of the accompanying map (Map 17). The power plants are to be built near the head of a small alluvial fan carved out of the sheer sides of Douglas Channel by the Kemano River. Unfortunately this site is not large enough to allow the development of a town-site and aluminum plant. These are to be built at the mouth of the Lakelse-Kitsumgallum Valley in the vicinity of Kitimat, where extensive areas of level land are available and where rail and road links with the rest of the world can be easily built. If plans are carried out a city of about 50,000 people is to be established to utilize the 1,500,000 horse
PHOTOGRAPH 16

B.C. GOVERNMENT AERIAL PHOTOGRAPH LOOKING WEST ALONG GARDENER CANAL

Kemano River immediately to the right below the picture. Power station for the aluminum company's project will be located here with transmission lines leading to Kitimat, 40 miles to the north. The difficulties of constructing transmission lines in this mountainous terrain is easily seen.
PHOTOGRAPH 17

B.C. GOVERNMENT AERIAL PHOTOGRAPH OF THE HEAD OF KITIMAT ARM AND THE KITIMAT RIVER FROM THE SOUTH

The river flows through the relatively level Kitsumgallum-Lakelse cross valley. This is the projected site of the aluminum refineries; utilizing power developed from the lakes in Tweedsmuir Park. Note the tidal flats on either side of the Kitimat River and the limited amount of water frontage available.
power that will be developed. The aluminum company has stated that it will try to attract other users of cheap electricity, such as fertilizer plants and pulp mills, since they do not contemplate the use of all the power themselves. Certain difficulties will attend the development of Kitimat, especially an attempt to make it a large deep-sea port. Extensive mud flats extend out from the mouth of the Kitimat River for a distance of about $\frac{1}{2}$ to $\frac{3}{4}$ of a mile. This seriously restricts the amount of waterfrontage available unless extensive dredging is undertaken. Another impediment is the strong winds reported for this area. The north-south alignment of the mountains and the great extent of the through valley, from Devastation Channel to the Nass River, acts as a natural funnel for the winds. It is to be suspected that the major directions of the winds at Kitimat are north and south and they are reputed to be extremely strong, especially in the winter. Investigation of this point is necessary, but known factors of climate and physiography indicate that it is probable.

The importance of this new industry will be extremely far reaching, and will open up a new era in central British Columbia. Already anticipation of its establishment has had an influence. When the recent growth of Prince Rupert made it necessary for the Northern British Columbia Power Company to expand their generating capacity they decided to do so by means of diesel units rather than expand-

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2. See page 183.
The influence of the establishment of a new city in this area will be discussed under future development since it will have a profound effect on all aspects of the region.
Chapter VII

FOUNDING OF PRINCE RUPERT

Construction of Grand Trunk Pacific Railway (G.T.P.R.)

It is not difficult to find the reason for the founding of Prince Rupert. It was established as the Pacific Terminus of the Grand Trunk Pacific Railway. The question resolves itself, therefore, into the more complicated one of "Why was the railroad constructed, and why was this particular site chosen?" An examination of resources and their development leads to the conclusion that such resources as are available in the area tapped by the railroad are what might be termed secondary resources, that is resources which, by reason of low quality or high development costs are destined to remain untapped until other more easily utilized sources are exhausted. This was not, however, the view of the founders of the Grand Trunk Pacific Railway. To quote from one of their publications, "Prince Rupert is surrounded by a country whose natural resources are more rich and varied than those of any other country known to the present generation".¹ This is no isolated opinion of a railway publicist, Its tenor is echoed by

¹ Prince Rupert, B.C. Grand Trunk Pacific Railway Co., Montreal, 1911, p. 17.
almost all who passed through the region, and it must have been believed by the railway's founders or they would not have spent the money they did in constructing the line. Moreover the whole spirit of the country favoured expansion and extension. Laurier had called the 20th century, Canada's century, and well he might. The period from 1901 to 1911 was one of incredible expansion as an examination of the following table shows -

<table>
<thead>
<tr>
<th></th>
<th>1901</th>
<th>1911</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area of occupied farms in acres</td>
<td>63,422,338</td>
<td>108,968,715</td>
</tr>
<tr>
<td>Production of wheat in bushels</td>
<td>55,572,365</td>
<td>132,077,547</td>
</tr>
<tr>
<td>Value of livestock</td>
<td>$268,651,026</td>
<td>$615,457,833</td>
</tr>
<tr>
<td>Exports of wood and wood products</td>
<td>$33,099,915</td>
<td>$56,334,695</td>
</tr>
<tr>
<td>Mineral Production</td>
<td>$65,797,911</td>
<td>$103,220,994</td>
</tr>
<tr>
<td>Gross value of manufactured products</td>
<td>$481,053,375</td>
<td>$1,165,975,639</td>
</tr>
</tbody>
</table>

In addition the incumbent Liberal party, led by Sir Wilfred Laurier, was perpetually embarrassed by the success of the Canadian Pacific Railway, a railroad whose construction had been hindered by the previous Liberal administration and whose fortunes were aligned under the banner of Conservatism. Laurier and the Liberals wished to be associated with progress

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2. Talbot, F.A., The Making of a Great Canadian Railroad, Musson, Toronto, 1912. "The interior (of central B.C.) is nothing but one huge garden, where an equable climate prevails and where nature has bestowed everything for the practice of agriculture upon the most successful scale with lavish profusion.", p. 229.

and expansion, which at that time meant association with a pioneering railway. There are a maze of political and economic pressures surrounding the early history of the Grand Trunk Pacific Railway which do not concern this paper. Suffice it to say that a railway was to be constructed to the west.

To reach the Pacific in British Columbia is a difficult task. Only two convenient passageways exist, one following the Fraser to the extreme southern coast, the other following the Skeena to the extreme northern coast. At two other points, Bella Coola and Squamish, an opening can be found, but in both these cases gradients are prohibitive for the establishment of a first class railroad. From the beginning the objective of Charles M. Hays, general manager and later president of the Grand Trunk and Grand Trunk Pacific Railroad, was a first class railroad, with low gradients and few curves. Their rival, the Canadian Pacific Railway, already controlled entry to, and large sections of, the Fraser Valley and Vancouver, so it was decided to strike to the Pacific by way of the Skeena. On the lower Skeena only three places afford sufficient level land in conjunction with good harbours to be potential sites for the terminal of a great railway. These are Port Simpson, Kitimat and Kaien Island. Port Simpson was very difficult to approach. A long and expensive diversion north from the Skeena was necessary in order to reach it. Kitimat was easy to approach by railway but in addition to having a somewhat
restricted harbour, was far off the route to the Orient. Ships would have had to steam an extra 165 miles in confined waters to reach this port. Kaien Island was close to the mouth of the Skeena, possessed level land, and seemed to have an extensive natural harbour, except for one unfortunate restriction. All the existing admiralty charts showed a rock in the centre of the entrance to the harbour which effectively blocked entry to large ships. A re-survey of the entrance showed that the charts were in error and Kaien Island was immediately chosen as the terminus of the railway. This decision was agreed to by the Provincial Government on May 4, 1904. The decision was to remain secret for a considerable period since the company did not want their position complicated by squatters and other undesirables.

Early Development of Prince Rupert

On November 23, 1906 a Post Office was established on Kaien Island and shortly after the town was named. The name was chosen in a competition conducted by the Grand Trunk Pacific Railway; the winner, a Winnipeg girl, receiving $200 for the name Prince Rupert. Construction on the railroad did not begin until May 7, 1908, though clearing of the town-site had commenced before this time.

The Grand Trunk Pacific Railway wished to make Prince Rupert an efficient, well functioning city which would be a credit to them in the future. They wished to avoid
SETTLEMENT PATTERN
APRIL 13 1909

1000  2000  3000  4000  5000
FEET
Map 12
Settlement Pattern, April 13, 1909.

Source: Field Work.
straggling uncoordinated development which would detract from the beauty and utility of the city. This desire sprang in part from high-minded ideals and in part from a sound sense of economic values, since a planned city would ultimately be more valuable to the company. Whatever the motives, the decision was unique on this continent. Prince Rupert was to be the terminus of a great railway, a world port to rival Vancouver, Seattle and Portland and it was to be planned in all its phases.

Until the city lots went on sale on May 29, 1909 an attempt was made to forestall settlement while extensive surveys were conducted. This was successful for a time since the Grand Trunk Pacific Railway controlled all the land and docks. John Houston, founder of Prince Rupert's first newspaper was able to thwart the company's desires by staking a mineral claim, on which he established a tent and printing press. After this, overt opposition to settlement ceased and a straggly community was allowed to grow up.

A blueprint, dated April 13, 1909 was found by the author during the course of field work in a real estate office in Prince Rupert. It was signed by J.H. Bacon, Harbour Engineer at Prince Rupert and represents the settlement pattern just prior to the official sale of lots. It is extremely interesting since it shows the form that development of the city would have taken if it had been left to its own devices (Map 12). Examination shows that growth
was centred at the meeting point of rail and water about the Grand Trunk docks and extended inland in a typical "ribbon" development at right angles to the shore. Consultation with pioneer residents reveals that the houses along the main street, Center Street, were the typical undifferentiated conglomeration of homes, retail stores and industrial establishments associated with an infantile settlement. An interesting development was the location of better class homes upon the inland ridge, a tendency which was to remain a permanent feature of the town.

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4 Information supplied by W.J. Raymond, at that time reporter on and later editor of the "Evening Empire".
Chapter VIII

PLANNED DEVELOPMENT OF PRINCE RUPERT

The town, if left to itself, would most likely have developed an intimate relationship with the waterfront, with the main streets directed towards it wherever topography permitted. Growth would have taken place from the waterfront inland on several flanks with roads parallel to the water remaining of secondary importance.

What actually happened was almost completely different. During 1908 and 1909 the native vegetation was removed from the projected townsite. Gangs of men under the direction of Foley, Welch and Stewart completely cleared the dense tree cover of the northwestern section of the island. All the trees were burned immediately after felling and a continual pall of smoke covered the city. Strangely enough none of the tree cover seems to have been utilized for lumber, though quantities were imported from Vancouver, for dock construction, roadways, ties and numerous other uses. By early 1909 the whole of the townsite was cleared and the scene was set for the final layout of the city.

Basis of the City Plan

The actual city plan was devised by Brett and Hall, a firm of landscape architects from Boston, Massachusetts.
Map 13
Prince Rupert Topography
Source: Blueprint 200 feet to one inch, from the City Engineer's Office, Prince Rupert.
Their object was to:

"plan for a model city, capable of large expansion - free from the dangers of congestion to traffic, preserving for the future an opportunity for wise municipal improvements - indicating suitable sites for churches, schools, parks and cemetery - and locating railway yards and wharves so as best to serve the city."¹

The planners soon realized that any plan for the city would be conditioned by topographic controls.

"It was discovered that the trend of several planes, (the coastal and inland ridges of the physiographic section) constituting what is to become the business section, were all either northeast or southwest, in other words, that the long axes of these separate planes were approximately parallel in direction. This discovery was of far reaching importance, for it indicated that the main streets of the several planes should be parallel, and subsequent study convinced the designers that not only would the business section be best served by a rectangular system of blocks - with considerable variation, but that the construction of straight avenues --- would be less costly than curving avenues."²

The decision was made, therefore, that the natural growth, proceeding inland from the waterfront was to be replaced by planned growth which would proceed parallel to the water, and a considerable distance inland, taking advantage of the more favourable topography. Every opportunity was taken to accentuate the importance of the axial streets parallel to the coast. The axial streets were made wide and long while cross streets were made short and narrow so that few businesses would face the cross streets. It was found


². Ibid. p. 81.
impossible to connect the coastal with the inland ridge in more than three places and the authors of the plan suggest the institution of an electric lift between the two sections, should the demand arise.

Criticism of the City Plan

It is doubtful whether any other plan could have been more successful in adjusting city layout to topography. Streets were planned so that advantage was taken of every favourable configuration of the landscape. A study of the road pattern upon a topographic map reveals this very clearly. In certain areas considerable fill was necessary to bring the streets up to a reasonable grade, in others large amounts of blasting. It is obvious that these problems would have been much worse if any other plan had been attempted.

The plan has been almost a complete failure and has brought more disadvantages than advantages to the city. Why? Because the scale of the plan was wrong. The client for whom the plan was prepared was the Grand Trunk Pacific Railway. It was impossible for them to conceive of a town with a population of less than 50,000 people. They would never have built their railway to this point if they had believed otherwise. The reason for this fundamental error was the lack of a proper appreciation and understanding of the resources of the railway's hinterland, a failure to appreciate geo-
graphic control of a city's growth. A city is set up to perform some function in its regional setting. In itself it is sterile and is dependent for its wealth and livelihood upon the tasks which the region calls upon it to perform. In a rich and well developed region these tasks are many - administration, distribution, manufacture - all the functions which a modern city performs are well developed and give employment to the city's inhabitants. In a poorly endowed and underdeveloped region there is little call for the services of a city, and the several functions that it performs tend to be rudimentary and skeletal. Thus the relationship between region and city is intimate and fundamental.

It was impossible to conceive of Prince Rupert as a city of 50-100,000 people when the resources of her hinterland were considered in their spatial and economic relationships. In themselves they are considerable but when they are seen in the total national and world wide picture of resources and markets, their distance, compared with other similar resources, from centres of population, is sufficient to class them as marginal. The scale of planning could have been more closely approximated if geographic techniques had been employed. Indeed if the directors of the Grand Trunk Pacific Railway had a proper appreciation of the geography of the country their line was to traverse they never would have built the railroad.
Wherein and to what extent was the plan wrong?

On the reproduction of a map prepared for the Grand Trunk Pacific Railway by Brett and Hall the area which today contains the whole of the city of Prince Rupert was set aside as a business district, 1500 acres in extent, by modern standards a business district sufficient for a city of 150,000 people.\(^3\) On the eastern side of the island the whole of southeastern lowland was proposed as a residential area, while the section north of Watson Island was intended to be an industrial section. The western half of Digby Island was also intended to be residential.

Brett and Hall had recommended that "the lots in the business section and wholesale section be lots of 25' frontage (with every effort being made to sell them in pairs or multiples of 25' frontage) and that the residential sections of the city be of 50' (or preferably 60') frontage." Further "the 100 foot depth of lots for the business district was, in our opinion, the most desirable depth for business in terrain where the slopes were steep, but in the residential section at least 150-foot depth was desirable."\(^4\)

In May, 1909 when the city lots went on sale they were all in the "business district." Presumably the directors of the company believed that since this was the business district, 25-foot lots would be quite adequate, though it

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3. Applying the figure of 10 acres per thousand population obtained from "Standards Developed for the Planning of Tacoma", Mimeographed sheet from Department of Architecture, U.B.C.

is to be wondered where the company expected the purchasers to live. Persistent rumors have insisted that the 25-foot lot was chosen to allow for a greater number of land parcels, so that the greatest possible profit could be derived from their sale. Be that as it may the important result was that the entire townsite was sold as 25-foot lots. Housing on 25-foot lots has resulted in depressed conditions and slums in most North American cities. The lots are too narrow to permit garden development, spacious and airy housing, or privacy. In many cases houses are built on double lots in Prince Rupert to allow these amenities. Many houses are, however, built on single lots, cheek and jowl with their neighbours, while large tracts of empty land exist. This situation is typical of third class housing in the city.
Chapter IX

EARLY EXPANSION OF PRINCE RUPERT

Almost all plans and phases of the early development of Prince Rupert were conditioned by the feeling that expansion was inevitable. A phrase from a report on harbour development perhaps typifies the atmosphere in the city circa 1913.

"It has to be kept in view that the waterfront and railway terminal are intended to provide for one of the most extensive railway systems of the world, which, in a comparatively short time must take care of a vast overseas traffic in addition to an evergrowing coastwise commerce..."¹

This atmosphere prevailed from 1909 to 1915, reaching a height probably in 1913. Much construction was carried on in this period, but more often lots were acquired for speculation rather than building.

Situation in 1915

The result of the boom and construction period was the shaping of the map marked May 1915. The map is of

¹. Bogue, Virgil G., Consulting Engineer, "The Development of the Waterfront and Railway Terminals, Prince Rupert, B.C.", G.T.P.R., March 8, 1913, p. 6
   cf. Talbot, "...the port is destined from its strategically powerful commercial situation to assume a prominent position on the Pacific coast, and moreover, will develop into a thriving industrial and railway centre..." p. 320.
Map 14
Land Use, Prince Rupert, May 1915.
Source: Field Work.
Copy of postcard - date unknown - possibly 1910. Looking northwest toward harbour from 3rd Avenue. Comment on reverse of original, author unknown - "This photo shows one of our lots. It is right in the heart of the best business quarter and if you care to buy it, I think I can obtain it for you for $50,000 - the owner very kindly does not charge extra for the rock on it, which will cost about $6,000 to blast off - This sort of thing is taken as a matter of course in Prince Rupert, but it strikes a newcomer as 'fierce'."

value in that it allows us to compare the functional pattern of the town at that date with a similar map prepared for the present.  

2. A note should be made of the source, which could be of value in plotting the morphology of other urban areas. It is taken from insurance maps, which presumably are kept for all urban centres. These maps are intended to assist in evaluating fire insurance premiums and to that end lists the size of house, its construction, the purpose for which it is used as well as its location with respect to fire fighting equipment. It is unfortunately impossible to give a precise quality rating to residential units, though shacks can be separated from ordinary housing units. A rough generalization of residential areas can be made by noting the incidence of shacks as compared to ordinary residential units.
The heart of Prince Rupert is its waterfront area. It is composed of four separate units. One is centred on the original docks, and contains the railway station. Another is found below Market Place and consists primarily of the Provincial Government coastwise dock. The third comprises the area, undeveloped in 1915, between Cow Bay and Hays Creek and the last the Seal Cove area with the cold storage plant as its focal point.

The Seal Cove and Hays Creek sections of the waterfront are separated by a physical obstacle, the precipitous coastal ridge. The Provincial Government dock and the G.T.P.R. dock are likewise separated by steep cliffs. In both these cases rail connection has been achieved, but nothing else, since it was necessary to blast the road bed from the sides of the coastal ridge. Three of these units, therefore, require separate entries to the town. In two cases use is made of the small valleys of former water courses, which have disappeared since the development of the town. The entrance to the G.T.P.R. docks is by means of an overhead bridge which runs from the dock to the coastal ridge as an inclined plane parallel with the water.

In 1915 there was a definite lack of small boat facilities, except for the cold storage plant. The pattern was one of concentration on large scale port facilities with little provision for small boats. This was the result of deliberate policy on the part of the railway company. The
Looking north-east at the railway yards and large scale port facilities. The coastal ridge to the right - large dock on the left is the ocean dock with overhead ramp connecting it to warehouse constructed by the Americans during the war.
PHOTOGRAPH 20

Copy of postcard - date unknown - possibly 1910 - looking west from the coastal ridge at the Grand Trunk Pacific wharf. The overhead ramp leading from the dock to the coastal ridge is still in existence providing the only road link between the city and the docks in this section.

Waterfront development plans for 1913 envisage construction of seven piers and 18 quays for a total waterfrontage of 35,471 feet. The only section reserved for small boats was the Cow Bay area.

It was planned to place seven piers in the Fairview area where bottom conditions made it possible to build the normal type of dockage, at right angles to the shore. The rest of the area from Morse to Hays Creek was to be a continuous line of quays except where the precipitous coastal ridge made approach impossible. Quay construction was the only dock type that could be used between Hays and
Morse Creek since the sea bottom drops away abruptly a short distance from the shore. Within 30-40 feet of the shore, depths of 50 feet are recorded, while in almost every case depths of 35 feet are achieved within this distance. Since the tidal range is very high, 24 feet at the maximum, very long and expensive pilings would be necessary to carry the docks outwards at right angles to the shore. In the area occupied by the G.T.P.R. wharf the piles were driven down into fill obtained by blasting. Filling served a two-fold purpose in extending the railway yards inland and building the docks somewhat farther out. Nevertheless, piles up to 110 feet long had to be employed on the seaward sides of the wharf.\(^3\)

Little accurate knowledge of the amount of blasting necessary to build the docks in Prince Rupert can be obtained. The Prince Rupert paper in 1909 mentions that 250,000 cubic yards of rock had to be removed at the site of the roundhouse,\(^4\) (below 7th St.). Pioneer residents report that it took three steamshovels working 24 hours per day, two years to clear away the rock from one blast.\(^5\) The blasting was undertaken in some cases merely to cut a ledge sufficiently wide to allow the railway to connect the scattered pockets of level land, in other cases to expand the coastal ledge

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5. Information supplied by Alex McRae, pioneer printer.
for railway yards or docks. The major waterfront activities can be readily correlated with areas of level land. The roundhouse and G.T.P.R. wharves were built at the mouths of small watercourses, where limited areas of land were available, though blasting was necessary to expand them to the desired size. The drydock was built on one of the largest areas of level land close to tidewater. However, it was not sufficient for the anticipated need. In this case extensive fill was necessary on the tidal estuary of Hays Creek. The fill in the Hays Creek section was obtained from the blasting...
which took place on either side to provide larger railway yards or space for docks.

After 1915 expansion took place primarily in the remaining areas of level land, at Cow Bay and Morse Creek.

The town plan is to be criticized in the allocation of level land close to sea level. It should have been obvious that this type of land was exceedingly rare in Prince Rupert and every effort should have been made to conserve it for future industrial expansion. A fairly sizeable section roughly equal to six city blocks in area, to the northeast of Morse Creek, was permanently assigned to housing. This section seems to be the remnant of an old river terrace, flat, fairly wide and not very difficult of approach from the sea. It seems distinctly unwise to have allotted this area to housing both because of the scarcity of level land
PHOTOGRAPH 23

Prince Rupert from the west. Railway yard in left foreground. Level area (in centre) with scattered houses is former terrace of Morse Creek. Behind and to the left of the terrace is the coastal ridge with several apartment houses. Beyond is the inland ridge with first class houses. The backdrop is provided by the rugged mountains of Tsimpsean peninsula.
close to sea level and because of the proximity of the housing to the railway yards with the attendant disadvantages of noise, smoke and hazard to children.

On the relatively level area between the crest of the coastal ridge and the foot of the inland ridge the commercial core developed. It is centred on Third Avenue because the projected main street, Second Avenue, passed largely into the hands of speculators. They demanded such outrageous prices for this choice property that honest merchants who really wished to build were forced to take lots on Third Avenue, where the shopping centre sprang up.

PHOTOGRAPH 24

Looking northwest along 2nd Avenue, the 94-foot wide street that was intended to be the main street of Prince Rupert. Note the many vacant lots, the result of speculation during construction of the city. Prices were so high for these lots that merchants who wished to build located on 3rd Avenue.

In 1915 the commercial core was concentrated in the area between Fulton and Eighth Street with a linear extension
Buildings on Second Avenue, the projected main street. Both were built in 1910 during the first expansion of Prince Rupert. Their sites were originally identical. The building to the left, the Canadian Bank of Commerce was constructed by a concern to whom convenience was a great asset and who could afford to purchase a site on the main street and blast down to street level. The building to the right was a club house, which desired convenience sufficiently to purchase a lot on the main street. The advertising value of the prominent position plus the cost of bringing the site down to street level was sufficient to deter them from this project. Today both these buildings lie slightly off the main centre of the town and people must go out of their way if they wish to visit them. The building to the right in the picture is a good illustration of the difficulties faced in covering water pipes leading to homes.

along Third Avenue toward McBride Street. This disposition reflects the importance of Fulton Street as an entry to the residential area, with the commercial core centred about this traffic artery.

The scarp of the inland ridge rises immediately behind the commercial core. The physiographic break is
accompanied by a similar break in the functional pattern. Land use changes abruptly from commercial to residential. No information on the quality of housing is available for

PHOTOGRAPH 26

Looking southwest along Fraser Street, the Scarp of inland ridge to the left with first class residences and a public school visible. Commercial section to right.

PHOTOGRAPH 27

View of inland ridge from the west. McBride Street and lawns of Provincial Government building in the foreground. First class residences on crest of coastal ridge in left and right background.
1915 but it is significant that shacks do not appear in any numbers until Sixth Avenue is reached. Probably the well-drained, well-lighted areas at the height of the inland ridge were occupied by residences of the better type while the slope toward the inland depression contains somewhat poorer housing.

Beyond McBride Street the amount of built-up land drops considerably, with an even greater drop beyond the Hays Creek Bridge. These areas were somewhat removed from the main focus of the town, Fulton Street and Third Avenue, and represented suburban areas which were expected to fill up shortly with the inevitable growth of the town.

Many typical symptoms of pioneer growth can be seen in the 1915 map - the large number of shacks and semi-permanent dwellings, the scattered pattern of housing and the existence of large open tracts of land close to the city centre. In the case of Prince Rupert, however, much of this is obscured by the intricate street pattern.

Another indication of a pioneer city was the existence of a brothel district or segregated area. Its open operation indicates the low moral tone of the town, a situation typical of pioneer cities. The highest housing density in the city was found in the segregated area where expansion was limited by law. The segregated district survived in Prince Rupert until the Second World War when it was closed at the insistence of the military authorities. The combina-
tion of sociological and geographic factors which contributed to this long, if not honourable, life span are rather interesting. The area was situated at the foot of the Acropolis Hill, whose steep slopes separated it effectively from the main portion of the city. Below it stretched the muskeg of the interior depression which had been set aside as a park reserve in the city plan. The only street by which entry could be made to the section, although an extension of Fulton Street, a principal through street, was planned on the contour so that the area was hidden to the eye within a space of a half-block. This meant that the area was almost completely isolated from the main part of the town. In this position its existence could be easily forgotten by respectable elements in the town, and its survival was thereby facilitated. Another reason for its long existence was the fact that the town never really grew out of the pioneer stage, and it is only since the end of the last world war that Prince Rupert has received a large, stable working population that contains a high percentage of families who would object strenuously to its existence.
Map 15
Land Use, Prince Rupert, Summer, 1949.

Source: Field Work.
Chapter X

THE CITY IN 1949

Changes Since 1915

The examination of the functional map of the city in 1949 on page 146 reveals some rather important changes. The map was prepared in July, 1949 and, therefore, includes many changes which may be attributed to the war. By ignoring the construction classified as wartime, a fairly accurate picture of the pre-war situation may be obtained. Three differences from the 1915 map may be noted immediately, (1) the extension of housing beyond Morse Creek, (2) the additions to the large-scale dock facilities in the form of the grain elevator and large quays and, (3) the extension of small boat facilities on both sides of the drydock. They are manifestations of several trends, which will be considered in the following section.

The Reasons for the Changes

In 1915 the city had reached the end of its first expansion based on railway construction and speculation. Since World War I was confined almost entirely to Europe, little attention could be paid to places as distant from the
frontlines as the northern coast of British Columbia. There was, therefore, a very severe recession in Prince Rupert. The majority of the settlers believed that once the world had righted itself and attention could again be paid to the Pacific Coast, Prince Rupert would come into its own and that post-war expansion was inevitable. Meanwhile the railway company which had been the founder of Prince Rupert found itself in very serious financial difficulties. Along with the Canadian Northern and several other overexpanded lines it was united to form the Canadian National Railways, under the direction of the Federal Government. The bankruptcy of the Grand Trunk Pacific Railway was symptomatic of conditions which would eventually influence Prince Rupert.

For several years after the war real prosperity seemed to come to the city. To meet the post-war shortage of shipping the drydock and shipyard commenced building freighters. They constructed about eight 10,000-ton vessels in the period 1919 to 1925. Construction was also begun on a 1,250,000-bushel grain elevator as well as additional docks for ocean-going ships. Both of these projects were undertaken with the assumption that Prince Rupert was shortly to become a world port, the North American entrepôt for the Asiatic market. Needless to say this did not come about.

There are, as usual, a number of reasons for the non-materialization of this dream, and it is difficult to
Minimum density residential district
Medium density residential district
Maximum density residential district
Minimum density commercial and industrial district
Medium density commercial and industrial district
Maximum density commercial and industrial district

ZONING DISTRICTS
Map 16
Zoning Districts

Source: Zoning By-Law, City of Prince Rupert.
weigh the importance of each factor, since they are closely interrelated. It has been stated that the reason that Prince Rupert never developed along projected lines was because the Grand Trunk Pacific Railway went into bankruptcy. But one of the reasons why the Grand Trunk Pacific Railway went bankrupt was the building of its Pacific terminal at Prince Rupert. The railroad was intended originally as a pioneer line, to tap areas unserved by existing lines, primarily in northern and central Alberta and Saskatchewan. At first it was intended that the railroad would break through the Rockies by way of the Pine Pass route, tapping the Peace River District. Line connections to Dawson, Y.T. were also projected, starting from Hazelton. Much of the line that was built went through untapped and undeveloped areas in Central British Columbia and Alberta. During and after World War I the flood of immigration characteristic of the pre-war decade dwindled to a trickle. This in turn meant that rapid development of pioneer areas was impossible; the tendency was rather to consolidate settlement that had taken place previously. The halt of immigration was not too serious for railways with lines that ran through already settled areas, but for the Grand Trunk Pacific Railway it was a serious blow.

The Grand Trunk Pacific Railway also had a very difficult debt structure to handle, due in part to policies of construction and in part to the difficulty of the terrain.
Charles M. Hays, general manager and later president of the company, insisted that his whole main line be constructed to the specifications of the line between Montreal and Toronto. It was to have a maximum grade of one quarter of one percent, a maximum curvature of four degrees and was to be constructed of 89-lb. rails. Usually pioneer lines are built with gradients up to four percent, curvatures of 12 to 15 degrees and 60-lb. rails, the theory being that these can be replaced after the line has begun to pay for itself. The construction of a superior line was intended to cut down costs of operation. For example, "a freight train on the Grand Trunk Pacific Railway could carry four times as heavy a load as it could on the Great Northern, Northern Pacific or Union Pacific, five times as much as on the Santa Fe and seven times as much as on the Canadian Pacific Railway". 1 However, construction costs were increased tremendously, especially in the section from Hazelton to Prince Rupert. In order to gain the most favourable grades for the 186 miles in this section over 12,000 miles of trial lines and surveys were run. 2 Between Terrace and Prince Rupert the movement of eight million tons of rock at a cost of $80,000 per mile was necessary to achieve grade. 3 High construction costs would not have been too serious if the railway had been able

2. Ibid. p. 74.
to obtain the freight shipments it had anticipated, for without pay loads it was impossible to effect the savings in haulage costs with which the construction costs could be paid.

One of the reasons why the loads did not materialize was the poverty of the Orient. Superficially the advantage of being the closest port in North America to "one fifth of the world and one half of its people" appears very great indeed.4 But an examination of trade figures proves otherwise. In 1938 the trade of the United States with the United Kingdom and France alone equaled American trade with the whole of Asia.5

For this Asiatic trade five ports were competing, where one or two would have been sufficient. The Pacific coast ports, especially Portland, Seattle and Vancouver, have been dependent for the main part of their trade on their connection with the North Atlantic by way of the Panama Canal. Only in the North Atlantic community do we find nations with sufficient surplus production to form a substantial basis for trade. In Asia the millions of people who should constitute a great market do not produce enough over and above the subsistence level with which to buy the products that North America can offer.

What had Prince Rupert to offer to the prospective shipper? Selection of cargoes is ultimately a function of the port's hinterland. There is, of course, wheat, which can be landed at Prince Rupert for the same rate as at Vancouver. In this case Prince Rupert must compete with Vancouver for the
product. For shipment to the Orient it would seem that Prince Rupert would have an advantage, since it is 540 miles closer to Asiatic ports, but this is not the case. In so called "normal" times, in this case during the between war years, trade is in the hands of private merchants. These merchants only rarely have sufficient capital to charter ships primarily for the purpose of carrying a capacity cargo of a single shipment, such as grain. They are more likely to lease a portion of the space on a ship which is already partly loaded with cargo. Shipping companies prefer to put into a port where they have a good possibility of loading a variety of cargo. For example, ships calling into Vancouver have the opportunity of procuring cargoes of timber products, fruits, metals, fertilizers and canned goods, to mention only a few. Moreover there are a number of ports in the immediate vicinity which offer possibilities of a cargo if nothing is available in Vancouver. There is also the inducement of small inbound cargoes for the large population centres of the southern mainland. In Prince Rupert this is not the case. There is no large population centre closer than Edmonton, which can be served equally well from Vancouver. There is, moreover, no variety of produce available from Prince Rupert's hinterland. In the discussion of the regional resources it was found that the minerals of Prince Rupert's hinterland were tributary to Trail, and thus in-

6. Information supplied by A. Brooksbank, Shipping Agent, Prince Rupert, B.C.
directly to Vancouver. Fishery products were tributary to Vancouver in the case of canned salmon or distributed in small periodic shipments in the case of halibut. Agricultural surpluses were non-existent in Prince Rupert's non-competitive hinterland, only existing in the competitive hinterland. Forestry exports were available in large quantities but since they represented, on the whole, inferior species to those available with equal ease from the southern coast, they remained unutilized. Thus Prince Rupert lacked a variety of products to induce the shipper to schedule shipping to the port. /

Another factor which hindered shipping from Prince Rupert, based on supposed geographic facts, was the establishment of Latitude 51 degrees as the limit for year-round summer load line. The load line, or Plimsol mark, is designed as a safety factor for merchant shipping, and is a series of marks on a ship's side regulating the depth in the water to which a ship may be loaded. It is intended to vary from sea to sea, and is supposedly regulated by storminess; in a calm or relatively calm sea a ship may be more deeply laden without hazard than in a stormy sea. The seas north of 51 degrees North latitude in the Pacific, including of course, the port of Prince Rupert, are considered sufficiently stormy to require that ships carry a lighter load during winter. The result is that "a vessel loading an 8,000-ton cargo is able to take 300 tons more at Vancouver than at this port
(Prince Rupert). In other words a grain ship, loading here, would have to get 21¢ a ton more to handle cargo from Prince Rupert than if loaded at Vancouver.\(^7\) The selection of latitude 51° North as the boundary between calm and stormy seas is unwarranted. In the section on climate it has been established that during the winter half-year Prince Rupert and Vancouver have an almost identical climate. Latitude 51 degrees North is an arbitrary boundary which has no basis in climatic fact, though climatic data is supposedly its criteria. Probably this decision was based on the fact that the Aleutian Islands, which are decidedly hazardous to navigate, extend to 52 degrees North. However on the Pacific coast of North America the line would have more meaning if placed between 58 and 60 degrees North latitude.

It is little wonder then that Prince Rupert failed as an entrepôt for world trade. In 1926 the grain elevator at Prince Rupert opened. During the next two years 13 million bushels of grain were shipped and after that shipment practically ceased. After 1929 the chief use of the elevator was for the storage of surplus grain the Federal Government was forced to buy from the Prairie farmers during the depression years. The record seems to indicate that shipping lines used the port once or twice, found that it was unprofitable and returned no more.

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Adjustment to the Actualities of the Environment

The collapse of the small overseas' trade meant that the realities of Prince Rupert's hinterland had finally brought their influence to bear upon the city. Prince Rupert was developed to serve a region whose potential had no basis in the realities of that period. The adjustment to reality was to be extremely difficult. It was complicated by the arrival of the great depression of the 1930's which made the process of adjustment even more difficult.

During the short post-World War I boom the residential area of the city was extended beyond Morse Creek by means of a bridge. Two longitudinal roads were driven along the central and seaward section of the coastal ridge in this area. The development beyond Morse Creek was intended to link the grain elevator to the city and to provide additional room for residences. A few scattered houses were located in this section and the city was faced with the problem of supplying services to them. Whatever housing space Prince Rupert required could have easily been found in the area between the two creeks. The expansion of housing beyond these limits, especially in a sprawling, scattered pattern based on the belief that vacant spaces would be filled as development proceeded, intensified already existing problems. As was mentioned previously the construction and maintenance of essential services on Prince
Rupert's peculiar terrain is expensive and onerous. When costs of development had to be borne by small population densities the task became impossible. The combination of overextended services and low population densities proved too great a burden for the city and it went into bankruptcy. On May 15, 1933 the Provincial Government assumed payment of the city's bonded debt and to protect its interests placed the direction of municipal affairs into the hands of a provincially appointed city manager.

The small settlement on Digby Island, at Dodge Cove, dates from this period. It represents the protest of a number of former city residents, largely fishermen, who moved across the harbour to establish their homes outside the city limits. They did this in order to escape what they considered unjustifiably high taxation on the part of the City of Prince Rupert, thus the name of the settlement, Dodge Cove. Unfortunately it must be reported that this settlement has grown sufficiently large to impose taxes in its own right and those who moved there to escape taxation have been forced to tax themselves.

Meanwhile other functional adjustments in the city pattern went on. On the map of 1915 the only section of the city devoted to the fishing industry was at the extreme northwestern tip of the island near Seal Cove. The fishing company was forced to build in this isolated position because the railway directors believed that the
more centrally located dock areas were too valuable to lease to the fishing industry. After 1915 the railway directors came to realize that the central dock areas were not going to be utilized by ocean and coastwise commerce and they opened the way for the use of these sections by the fishing industry. Gradually small boat facilities developed in the central districts, filling Cow Bay and extending to the limits provided on one side by the scarp of the coastal ridge and on the other by the drydock area. This section became densely packed with small boat floats, fish-packing and storage houses, ship chandleries and oil docks. Shortly before the outbreak of the Second World War it expanded beyond the drydock area to a point where expansion was limited by another steep scarp of the coastal ridge. The area, bounded on either side by physiographic barriers, was intensely utilized. (See Photos). This area served the fishing industry until the end of World War II when the decision of the cooperative to build a cold storage plant for themselves brought about another expansion. The cooperative built their storage plant between Pillsbury Point and Fairview Point, being the first industry to establish in this section of the waterfront. At this point the coast leads directly into the inland depression and the construction of a roadway to connect the docks with the rest of the city was not too difficult. Since the water shoals gradually in this
PHOTOGRAPH 30
COPY OF PHOTO CIRCA 1919
LOOKING NORTH FROM COW BAY TOWARD TUCK INLET
Drydock and shipyard in right background. Note large freighter being constructed.

PHOTOGRAPH 31
COPY OF PHOTOGRAPH BY J.R. WRATHALL -
LOOKING NORTHEAST FROM COW BAY
Floating pontoons of drydock visible in background. Compare the intensive utilization of this area by small boats with Photograph 30.
section construction of docks is easier than in other parts of the Prince Rupert waterfront. The main reason for development of the storage plant in this section was the growing scarcity of waterfrontage in the already built up parts of the city.

The changing pattern of land use was a direct reflection of changes taking place in the fishing industry. Though the importance of Prince Rupert as a landing port for halibut has remained unchanged, 16,792,000 lbs. landed in 1931 and 16,798,000 lbs. in 1949, the character of the fleets selling these totals has changed. In 1931 the Canadian fleet landed 7,783,000 lbs. of a total catch of 44,222,000 lbs. or approximately 17%. In 1949 the Canadian fleet landed 18,666,000 lbs. of a total of 55,379,000 lbs. or approximately 32%. It is clear that the Canadian fleet accounts for almost all the increase that has taken place in landings since conservation started. The increase has taken place steadily since 1931, and presumably one of the reasons for the increase in the Canadian landings were the advantages obtained by using Prince Rupert as a base port. Larger numbers of Canadian ships operating out of the port has meant increasing demands for dock space and supplies since Canadian ships procure all their needs in a Canadian port.

The increased number of power operated boats in the Skeena and Nass salmon fisheries after 1929 meant greater mobility and made easy the use of Prince Rupert as a base of supply, rather than the canneries.
While Prince Rupert was becoming an increasingly important fishing port the function for which it was designed became atrophied. The grain elevator became a storage bin for surplus grain bought by the Federal Government. The ocean docks stood empty except for occasional shipments of fish products in bond from Alaska. The drydock, designed to build and repair ocean liners was utilized to repair fishing boats and the coastal steamships of the Canadian National Railways. The commercial section of the city grew only slightly north-eastward along Third Avenue toward the growing small boat centre of Cow Bay.

Copy of photo by J.R. Wrathal. Third Avenue looking northeast. This is the heart of the commercial core. Note the wide streets.

The period between the two wars was a time of change and adjustment for Prince Rupert, not a period of growth. The
population of the city in 1915 was slightly over 7,000, in 1941 it was 6,714.

The character of the population changed considerably during this period, in response to the changing function of the city. The Scandinavian element, mainly Norwegians, came to form an increasingly larger section of the population. They became the mainstay of the halibut fishing fleet, applying techniques learned in the Norwegian fisheries to the fisheries of their new homeland. They represented the only new immigrants to the city. They replaced those of British stock who moved elsewhere after the boom collapsed. Those of British stock who remained still formed the majority of the population but there was no increase in their numbers. They were employed in the other functions that remained to the city, as Federal or Provincial administrators for the North Central British Columbia area which has its headquarters in Prince Rupert, in the roundhouse and other terminal facilities of the Canadian National Railway and in the merchandising and servicing trades. Most of the native-born population moved elsewhere once they came of age, for unless they wished to become fishermen there was little opportunity for advancement. The age composition of the city gradually changed. In 1915 Prince Rupert was made up almost entirely of youthful, vigorous citizens, as is typical of a pioneer city. Twenty-five years later the city was composed mainly of people of middle age, the remnant of those who had arrived during the

7. Census - 1921: English, 2,128; Scottish, 1,572; Scandinavians, 588.
Census - 1931: English, 1,682; Scottish, 1,402; Scandinavians, 1,046.
boom period.

The largest single racial element in Prince Rupert's immediate hinterland is the native Indian. They form an important and unique element in the city though they are not listed as permanent residents. For one block on Third Avenue to the west of Sixth Street, a type of ghetto has developed for the native Indian. Early in the city's history part of this block was settled by Chinese. Occupation by Chinese depressed land values as white merchants generally tried to avoid setting up stores in this section. The result is that the block has become a section of cheap hotels and beer parlours, poor cafes and rundown shops. At almost any hour of the day or night it is possible to find families of Indians leaning against store windows, laughing, joking or solemnly watching passersby. They stand about on the streets because they do not wish to return to the cramped, filthy room in a hotel or rooming house that they are forced to call their home while in the city. The Indian, even if he does possess the money can not get a room in a well appointed hotel because of racial discrimination. He is not supposed to come into the town. He cannot buy property or rent a home since he would lose his reservation rights. The lure of the city is strong, however, and in return for a chance to look at bright lights and store windows he is willing to put up with whatever hovel he can get. The government cannot take a realistic attitude by putting up decent, livable dormatories for the Indians since it is their policy that they stay upon
the reservations. But the Indian comes anyway, risking tuberculosis and other diseases in return for the joys of the city.

Influence of World War II on the City

One other set of influences has operated to produce the land use pattern shown in the 1949 map; the second world conflict, the 1939-45 war. The first industry to be affected was the drydock and shipyard, which began the construction of freighters shortly after the outbreak of the war. During the course of the war the shipyard constructed fourteen 10,000-ton freighters, four mine sweepers and one coastal freighter. Before the war there had been a small skeleton crew of some 100 workers who had been engaged in repair of fish boats and the Canadian National Railway coastal steamers. With full operations in the ship yards the working force grew until it employed close to 2,000 workers. Since almost all these people had to be brought in from outside the housing situation quickly became acute. The Federal Government constructed bunk houses for the single men and series of single housing units for married couples. The bunk houses were torn down after the end of the war but the single housing units, known as "wartime houses" were allowed to remain. These form a rather prominent feature of the cultural landscape of Prince Rupert and some explanation of their characteristics is necessary. In the siting of these houses several
Wartime houses on vacant lots in the built up part of city. Considerations were operative. They were intended to serve drydock workers and, therefore, were to be placed within easy reach of the plant. They had to be constructed cheaply and quickly which meant, ideally, that they should be located in one subdivision where the prefabricated parts could be handled with "assembly line" techniques. The ideal site from the builders' standpoint was to be found in the unoccupied section of the coastal ridge, east of Hays Creek. The city, however, objected. They pointed out, quite rightly, that within the more built up areas of the city there were numerous vacant lots with essential services already supplied; streets, water mains, electric lights, etc. The city felt that it would be cheaper both for themselves and the contractors if the vacant lots were filled. As usual in such cases the final result was a compromise. The bulk of the wartime housing was located on a section of the coastal ridge.
east of Hays Creek known as Rushbrook Heights. But scattered throughout the eastern part of the city were numerous housing units. During the course of the war 522 of these houses were constructed, which is a considerable number in view of the fact that there were only 1,592 buildings in Prince Rupert in 1941. After the war the shipyards closed down and it appeared that the city was about to return to its pre-war stagnation. For a time it was believed that the houses would be demolished for whatever scrap the contractors could salvage from them. The city was able to persuade the Federal Government that it would be better to sell the houses privately for the prices that the contractors were willing to give for them as scrap. The houses were sold for as low as $825 to both veterans and civilians. At present these houses are all occupied and are retailing for $3,000 to $4,000. The quality of the houses is, on the whole, poor. They suffer from the evils of haste, prefabrication and standardization. They are crowded close together on 25-foot lots, a perpetuation of the evil visited upon the city a generation before, and they are often sited upon muskeg. When they were built on muskeg they were supported on "mud sills", three-foot by four-foot wooden pads which were intended to "float" upon the muskeg. Since they were built extremely lightly there has been little tendency for them to sink or warp, but they are inclined to rock in a high wind.

The location of the majority of the wartime houses to the east of Hays Creek has brought about an important /
Second class housing to the left, wartime houses to the right. Note how closely the houses are spaced, due to the 25-foot lots.

change of population centre. It has not affected the location of the commercial core since geographic inertia was too strong to allow it to move. Instead Prince Rupert has had to institute a bus line which runs between the city centre and Seal Cove and serves to link the new population concentrations along Hays Cove and Sixth Avenue with other sections of the city. A new public school has also been located in this area to accommodate the increased population. These new houses will have another, as yet incalculable effect on the city. In the Prince Rupert of 1941 only 792 houses of a total of 1,592 were owned by the occupant. The 522 new houses added to the city are exclusively owner-occupied. These new owners will probably take a greater interest in civic affairs and betterment since they have a very real investment in the future of the city.
The preceding changes may be traced to a wartime use of a piece of large-scale dock equipment which had been constructed for other purposes. During the course of the war Prince Rupert was to assume the role that its founders had dreamed of, that of a great world port. The attack by Japan upon the United States in December of 1941 and their occupation of Kiska and Attu in the Aleutian Islands in 1942 made the rapid expansion of Alaskan defenses imperative. The established means of supplying Alaska was by way of the nearest port in the continental U.S.A., Seattle. However, 500 miles to the north, 500 miles closer to Alaska lay Prince Rupert, with a first-class railway linking it to the heart of industrial America. At a time when shipping was at a premium the elimination of 1000 miles from the round trip voyage of a cargo ship became extremely important. An added advantage was the possibility of using barges out of Prince Rupert, via the Inside Passage as far as Skagway, thus further conserving scarce shipping.

Prince Rupert was activated as a sub-port of the Seattle Port of Embarkation on the 20 of February, 1942. From that time to the end of the war 1,612,783 tons of freight were shipped through the port as well as an estimated 73,000 civilian construction workers and military personnel. Improvement of existing port facilities and new construction

Overhead ramp connecting docks (to the left) with large warehouse constructed by the American Army during the war (out of picture to the right).

brought the port capacity up to 50,000 cubic tons of freight per month. A large four-story warehouse with a floor space of 367,244 sq. ft. was constructed. The ocean dock was extended 400 ft. to 1240 feet giving a floor capacity of 300,000 sq. ft. and a movable crane was added to this dock with a lifting capacity of 75 tons. On the coastal ridge immediately behind the warehouse an administration office building was erected with 53,776 sq. ft. of floor space. On the crest of the Acropolis Hill a miniature city, known
Railway yards and ocean dock from the coastal ridge. Building in foreground with smoke stacks is the Canadian National Railway roundhouse.

to the local residents as "Little America", was erected to house the 3,500 officers and men necessary to maintain the port. On Watson Island, about 11 miles by road from Prince Rupert the Americans carved a staging area and ammunition dump out of the wilderness of the island. It included a semi-circular wharf about 3,600 feet in length, 1000 feet of which was constructed with a concrete deck, 60 feet wide with a double track railroad spur line. The remainder of the wharf was of timber crib construction with a single track railway spur line. During the war ships up to 10,000 tons berthed and loaded here. In all the Americans spent
PHOTOGRAPH 37

Copy of postcard by J.R. Wrathal. Aerial photograph of Watson Island from the west, prior to construction of Columbia Cellulose Company plant. Semi-circular wharf constructed by American Army in foreground. Kaien Island to left with south-eastern lowland of the island in the background.

twenty-two million dollars; in return they had a port which supplied the many needs of Alaskan defence, shipped considerable amounts of supplies to other Pacific war theatres, and saved vital shipping as well. With this increased activity Prince Rupert became an important link in North American defence and units of the Canadian services established bases there. These included the airforce station at Seal Cove, the naval barracks on the coastal ridge near the Canadian National Railway docks and the signals barracks on the coastal ridge west of Morse Creek. In 1945, at the height of the war, 20,000 ration books were issued in Prince
To this number must be added the members of the forces stationed in Prince Rupert. In total there must have been 25,000 people in Prince Rupert at this time, and possibly the figure was as high as 30,000.

At the end of the war the majority of these people moved out, and Prince Rupert was thrown back upon her own resources. People felt that Prince Rupert would return to its old way of life, that it would again become a small fishing port. It was for this reason that the wartime houses sold for so little, since few believed that post-war development would take place.

During the war a fundamental change had taken place in the nation-wide resource picture that was to have repercussions in Prince Rupert. It was the enormous wartime exploitation of resources, which made expansion into more remote areas necessary. This basic readjustment as well as the fact that much of the preliminary work had already been done by the United States Army served to attract the Celanese Corporation of America to Port Edward. They took over the island and the semi-circular dock and began construction of a twenty-five million dollar high alpha pulp plant. Their operation has already been discussed under forestry, and will be further discussed, along with the project of the Aluminum Company of Canada in the section entitled "The Future".

The other wartime installations have been put to

9. Verbal information from H.D. Thain, City Clerk.
various uses. The seaplane base at Seal Cove has been converted to civilian use, servicing the Canadian Pacific Airlines' daily flights to Sandspit as well as a number of private lines.

In 1950 it was suggested that Prince Rupert be provided with an airfield by converting Tugwell Island into an airstrip. The construction of airstrips provides few physical problems. However, the island is eight miles by water from Prince Rupert, making for very complex transshipment problems. Of the other wartime installations the naval barracks has been converted into a Canadian Legion clubhouse, the port administration offices into apartment blocks. A large Y.M.C.A. building constructed during the war for servicement has been taken over as a Civic Centre, serving as a valuable centre for indoor recreation in the city. The dock and warehouse space remains largely unused.

In the course of this discussion the development of the residential districts in the period 1915-1949 was left untouched until note could be made of the several forces that have united to produce the end result. The incidence of shacks on the lower inland slope of the coastal and inland ridge has already been noted in the 1915 map. This tendency is emphasized in the 1949 map. The houses have been broken into four categories, first, second and third class houses, and wartime houses. The first-class houses in Prince Rupert correspond to second-class houses in most large urban areas. Only seven or eight houses in Prince Rupert could be compared with first-class houses in
exclusive residential districts in other cities. It is another indication that people with sufficient funds are inclined to go elsewhere or save their money to build a first-class home elsewhere. With this classification several important land-use patterns were found. The first-class housing was concentrated almost exclusively on the crest or seaward slopes of the inland or coastal ridge, in some cases immediately behind the commercial core. The concentration of first-class housing on the ridge tops is due to several factors. These sites are usually solid rock, or have only a shallow layer of muskeg and are thus superior building sites. They command a fine view of the harbour and tend to receive more light than the houses on the inland slope, a very important consideration in a place as gloomy as Prince Rupert. In the sections where the first-class houses rise immediately behind the commercial core they are sufficiently far above it not to be disturbed by noise and traffic. Moreover in these sections no direct communication exists between the commercial core and the first-class residential districts, and traffic is effectively by-passed.

On the downslope toward the inland depression the bulk of the houses fall into the second-class, with increasing numbers of third-class houses toward the inland depression. These sites are less desirable since they are often on muskeg and they do not have a fine view or as much light. The general pattern does not apply east of
PHOTOGRAPH 38

First-class house on double lot.

PHOTOGRAPH 39

The grain elevator from the coastal ridge. The flat laying land in the foreground is probably a former terrace of Morse Creek. Second-class residences occupy the area.
Hays Creek since growth in this section was not natural but was the result of mass wartime building.

The only planning legislation that Prince Rupert has at present takes note of this general pattern. The map of zoning follows very closely the existing pattern of land use. Many of the difficulties connected with urban centres such as conflicting land use on the rural-urban fringe and ribbon development along arterial highways has not occurred as yet in Prince Rupert. There will, of course, never be a problem of rural-urban fringe in Prince Rupert because of the lack of suitable farm land. The city in the future will have to be ready to combat ribbon development. This may occur, since the town has been linked by road with the rest of the continent and more particularly since the establishment of the pulp plant on Watson Island. The intention of the company is that the workers at the plant should find residences in Prince Rupert and commute to the plant, eleven miles away. There may be a tendency for many of the workers to locate along the highway leading to the plant instead of in the many vacant spaces within the city itself.

The city should take every means within its power to bring about a re-subdivision of the land. The twenty-five foot lots should be eliminated completely, although this will be extremely difficult in settled areas. It should be possible to stop the sale of single lots in the future. A thorough revision of the town plan is necessary, in light
of the changed functions that the town has assumed. Note should be taken of the ease with which the city may be broken into neighbourhood units, separated by the major streams.

Situation at Present

What is the situation today? It can only be described as deplorable. The difficulties of the site, the over expansion and bankruptcy of the thirties, the strain on facilities during the war have combined to bring the city to a regrettable state: "with water system inadequate, sewers collapsing, streets dilapidated and falling to pieces, sidewalks broken down and dangerous or non-existent - to mention only some of the essentials"¹⁰ to quote the local paper. Add to this the attitude of many of the residents that they are there only temporarily and it presents a very difficult problem indeed.

PHOTOGRAPH 40

Third-class houses in foreground - second-class houses behind. Note outdoor privy on the right.

The picture is not, however, completely black. The city has a firmer and more diversified foundation than before the war. There is little possibility of a disastrous setback since whatever expansion is taking place at present is due entirely to the demands of established industries, not to the expectations of the speculator. People coming to Prince Rupert in the future will be coming there with the intention of settling permanently. Many of the early residents of the city came merely because it was a boom town where they could get rich quickly. The majority of them never did get rich and so became very bitter with the city and lacked confidence in its future.

PHOTOGRAPH 41

Fill necessary to bring Second Avenue to grade. The small stream in the foreground has the appearance and smell of an open sewer, probably due to faulty septic tanks.
Map 17

Future Developments

Source: Forest Management Areas from the B.C. Department of Lands and Forests, Forest Management Licence No. 1.
Chapter XI

THE FUTURE OF PRINCE RUPERT

Since this thesis has attempted to explain the past development of Prince Rupert as it has been influenced by its regional setting it is only fitting that some prediction should be made on a similar basis.

Population on Basis of Present Development

There is a base population below which Prince Rupert is not likely to sink, somewhere around 6,500. This is the number that can be supported by fishing, administration and the operation of the railway. To this figure may be added the 600 workers to be employed by the Celanese Corporation in their pulp operations. Since this represents only primary producers, the figure should be multiplied by three to account for wives, children and others supported by service to these workers, giving a minimum population in the future of 8,300 to 8,500. At present the population is estimated at 9,200 but the construction of the pulp plant requires many more workers than its eventual operation.
Population on Basis of Development of Immediate Hinterland

Beyond this point all predictions are purely speculative, although they are based on an evaluation of known resources. Of the 280 million fbm which the coastal region of the Prince Rupert Forest District can produce on a sustained yield basis approximately 130 million fbm will be used in the pulp mills at Watson Island and Ocean Falls. The remaining 150 million fbm could, as previously suggested, be utilized economically in Prince Rupert. If the cut were processed as rough lumber, it would provide employment for approximately 500 men. Should this occur, the city could expect a population of the order of 10,000.

At present surveys are being conducted in Central British Columbia by the Aluminum Company of Canada to judge the feasibility of establishing an aluminum plant at Kitimat. The scheme involves the establishment of a dam on the Nechako River which will raise the level of the series of lakes in Tweedsmuir Park between 200 and 300 feet. The difference between the lowest of the lakes, Natalkuz Lake, the source of the Nechako, and the highest, Eutsak Lake is only 173 feet. The water will be tapped by way of Tahtsa Lake and would require a 10½-mile tunnel and a penstock of slightly over one mile to bring the water to the turbines. This would give a head of 2,560 feet on the Kemano River nine miles from tidewater at Gardiner Canal. There is sufficient land here for the construction of power plants,
but not sufficient to allow for the establishment of an aluminum refinery. The company's plan is to locate their refinery at the head of Kitimat Arm where there is an abundance of level land and the possibility of easy rail and road connection with the outside. Connection with the Canadian National Railway at Terrace could be achieved by the construction of 40 miles of rail, over easy gradients. One of the company's gravest problems will be the construction of the power line from the Kemano River to Kitimat since it involves construction of transmission lines over extremely rugged terrain. Newspaper reports indicate that the company contemplates the construction of a city of 50,000 people at Kitimat. This seems a somewhat high figure since Arvida, where similar amounts of power are involved, numbers only 15,000. The company has announced that it will encourage complementary power-using industries to use the surplus power. This will probably give a larger population than utilization of all the 1,500,000 hp. for aluminum refining. A more valid figure for the population of the future Kitimat would probably be 20,000.

What will this mean to Prince Rupert? Some people, including many residents of Prince Rupert feel that the growth of Kitimat will prevent the growth of Prince Rupert. This does not seem probable. The two cities are not conflicting but complementary. The development of Kitimat and

its fairly substantial population should bring a corresponding development of agriculture to supply this population with produce. It was previously outlined why Graham Island was considered the most promising section for agricultural development. If this is the case it is probable that Prince Rupert will be the landing point for the produce, since road transport is quicker than sea transport and Prince Rupert itself would supply a considerable market. If the goods were taken to Kitimat it would involve a sea journey of an extra 85 miles and then transhipment of part of them back to Prince Rupert.

Prince Rupert's greatest possibility is in the development of trade with Alaska and in this development Kitimat could not possibly compete. Instead the growth of Kitimat would put Prince Rupert in a position to compete with Seattle for this trade, due to the growth of the area as a market centre in its own right. At present Central British Columbia purchases almost all of its supplies from Vancouver, since it forms such a small market that it is not worthwhile to establish expensive distribution centres in the North. If Kitimat grows it will become feasible to establish a distribution centre in the North and supplies will be brought in directly from Eastern Canada and the United States. Rail rates from midwestern and eastern United States points are the same via Canadian rail lines to Prince Rupert as they are to the United States Pacific Coast ports.
Since Prince Rupert is 640 miles closer to Alaska than the nearest United States port considerable savings in transportation charges could be made if Prince Rupert were used to ship goods from the industrial centres of the east and mid-west. The same circumstances apply in the reverse direction. Transportation costs, have, in the past, been the greatest obstacle to development of Alaska. The only items which could be exploited profitably were salmon, hali-but, gold and furs; high cost items which could stand the transportation charges. Many known resources, such as the forests of southeastern Alaska, were left untouched because of high transportation costs.

At present trans-shipment of goods from Prince Rupert to Alaska in Canadian vessels is prohibited by the "Jones Act", although Canadian ships make regular calls at Alaskan ports carrying passengers and mail. If Alaska were to achieve statehood the Jones Act would become inoperative. In the referendum voting for statehood on October 8, 1946, an interesting distribution could be found. The cities on the seacoast, including almost all of the panhandle of Alaska, already served by Canadian steamship lines and, therefore, in a position to benefit most readily by the abolition of the Jones Act, voted overwhelmingly in favour of statehood. Ketchikan, only 94 miles north of Prince Rupert, showed the largest majority for statehood in the territory, over 3 to 1.

2. A detail analysis of the situation may be found in "Canada's New Northwest", North Pacific Planning Project, King's Printer, Ottawa, 1947, pp. 92-98.
The panhandle as a whole voted for statehood by a majority of 2 to 1. The other districts, especially in the interior of Alaska, where benefits of statehood in the form of lower transportation costs were not so obvious, did not vote so overwhelmingly for statehood. The final count for the territory as a whole stood at 9,630 for and 6,822 against statehood, a ratio of approximately 3 to 2, considerably lower than the majorities obtained in the panhandle. A bill passed the House of Representatives in 1950 granting statehood to Alaska. Opposition of the Senators from Washington State, watchful of the interests of Seattle, will make Senate passage difficult.

Trade with Alaska under present conditions is impossible, with or without the Jones Act. Sixty-five percent of the goods entering Alaska consists of foodstuffs. At present Prince Rupert imports the majority of her foods from Vancouver, and is thus in somewhat the same position as Alaska. Since Alaska's 100,000 population is scattered in many small pockets throughout the territory even shipment of manufactured articles from the east is difficult. Shipment of manufactured goods can only be done successfully in carload lots and there are no concentrations of population in Alaska to demand goods on this scale. Prince Rupert at present is too small to have the selection of merchandise on inventory to enable Alaskans to purchase directly from the Prince Rupert merchants. The

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4. Verbal information from Peter Lakie, District Freight Agent, C.N.R., Prince Rupert, B.C.
deadlock can only be broken if large scale development takes place. It matters little whether it occurs at Kitimat or at Prince Rupert. In either case Prince Rupert stands to benefit. Stable, well-organized production for a large market in Central British Columbia will enable Prince Rupert to offer goods and services in sufficient variety to compete with Seattle.

What would be the population of Prince Rupert if Alaskan trade were to develop? It would probably be from 20,000 to 25,000 in order to provide the necessary services to Alaska. Development of this magnitude would probably use all available waterfront space in the city itself as well as utilizing facilities at present unused. There are, however, large areas of fairly low, flat coastal land available for industry in the vicinity of Watson Island. Ridley Island, which is separated from Kaien Island by a tidal channel, is over three square miles in area and is nowhere higher than 200 feet. The whole of its western coast, over two miles in length, is sheltered from the open sea and has sufficient depth off-shore to accommodate any size of ship. Construction of docks would not be as difficult a problem as in Prince Rupert itself.

Population on Basis of Development of Oriental Trade

The final problem to be considered is Prince Rupert's future role in relation to the countries of the Pacific Basin. Prince Rupert can become an entrepôt for the Orient if Central
British Columbia can provide a sufficient diversity of goods for export and if developments in Asia provide increased purchasing power. Prince Rupert could supply timber, pulp and possibly low grade bottom fish. Grain could be shipped through the port with existing facilities. Kitimat would provide refined metal, fertilizer and possibly other items, if it develops. The question arises, why couldn't Kitimat assemble all these goods and serve as the Oriental port? There are several factors which must be remembered in this connection. Kitimat is at the head of a fiord and has only a limited amount of water frontage available, between 4 and 5 miles. Somewhat over half of the water frontage will require dredging or very long piers, because of the very extensive tidal flats, if ocean going ships are to be accommodated. The situation is similar to that of Squamish. There is ample space to provide dockage for the projected plant and a city of 15 to 20,000, but there hardly seems enough to provide for extensive trans-Pacific trade as well. Prince Rupert, therefore, could have a lumber export trade and probably a grain trade, without fear of competition from Kitimat, if conditions in the Orient are favourable.

This last series of speculations envisions growth of Prince Rupert by reason of the development of her immediate hinterland, by the extension of trade with Alaska and the growth of Oriental commerce. To each of these developments a probable future population has been assigned, a population of 10,000 for the utilization of the immediate hinterland, a
population of 20-25,000 for the utilization of the immediate hinterland plus extension of trade with Alaska. If to these two possibilities a third is added, growth of commerce with the Orient, a further upward revision of city size is needed, probably to 50,000. At each of these stages Prince Rupert may remain for a long time, since each stage is envisioned as the result of some development within Prince Rupert's hinterland. If an expected development does not occur, such as establishment of an aluminum refinery at Kitimat, the result will be a smaller total population in Prince Rupert.

A population of 50,000 people is the number that the founders of the railway assumed when they built the Grand Trunk Pacific Railway into Prince Rupert. It has been pointed out that this figure was far too high, considering the nature of the resources available in the area tapped by the railway. Exploitation of more favourably situated resources in other parts of Canada has proceeded steadily since the railway was commenced in 1910. To maintain or increase production in the future Canada must move farther and farther afield. The resources of Central British Columbia that were not sufficiently valuable and too distant from the market to exploit in the period from 1910 to 1940 have recently come into demand on world markets. They will be increasingly in demand as depletion of more accessible resources continues.

Prince Rupert's past has been filled with misfortune; at present its condition is deplorable, but its future is
bright. The establishment of the pulp plant of the Celanese Corporation of America at Watson Island marks the first large-scale local use of the timber resources of Prince Rupert's hinterland. It is probably the forerunner of several industries which will utilize the forest resources. Establishment of an aluminum plant at Kitimat would mark the first large-scale use of another plentiful resource, hydro-electric potential. It would seem that a new era has opened in Central British Columbia, one of sustained development utilizing resources within the area that have only come into demand on world markets during the last decade. With steady growth in the hinterland concomitant increase can be expected in Prince Rupert, based this time on actualities, not on speculation.
Chapter XII

CONCLUSION

Prince Rupert is situated on Kaien Island, part of a sedimentary pendant on the western margin of the Coast Batholith. Here sufficient level land is found to allow the construction of a city. Rugged micro-topography makes building difficult, however, and has affected the pattern of land use. Topography also imposes controls upon the amount of land suitable for agriculture in Prince Rupert's hinterland. For 90 miles in any direction from Prince Rupert the land is unsuitable for large scale agricultural production.

Prince Rupert's climate, although mild, would be considered distinctly unpleasant by most people. Throughout the year only one day in 3 is without precipitation of some kind and the hours of bright sunshine are the lowest recorded by any weather station in the settled part of Canada. The unpleasant climate discourages settlement unless some enticement is offered in terms of higher wages, larger profits or favourable employment.

Terrace, 90 miles inland on the Skeena River, is the last place where the maritime influence is distinctly felt. At this point the frost-free period is sufficiently
long to permit the growth of all temperate crops. The Bulkley Valley, the largest single area topographically suitable for agriculture within the mainland section of Prince Rupert's hinterland, has a distinctly continental climate. Winters are long and cold, summers short and cool. The longest frost-free period in the valley, at New Hazelton, is 14 days short of the minimum of 90 considered necessary for the successful production of small grains. Moisture deficiency also presents a problem throughout the valley, especially during the below average years.

The soil on Kaien Island consists entirely of a sub-mature soil known as muskeg. Its lack of stability presents serious difficulties in the construction of roads and homes and the tendency is to avoid building on it whenever possible. As an agricultural soil it is extremely poor since it is almost completely lacking in plant nutrients. Muskeg is also encountered in the northeastern lowlands of Graham Island but it does not present as great a problem in this area since it is quite shallow.

Three main soil types are represented in the mainland section of Prince Rupert's hinterland, brown podsolic, grey wooded, and degraded black soils. In total these soils do not seem likely to support more than 2,000 farms within economical shipping distance of Prince Rupert. The lack of agricultural land has been a hindrance to development along the C.N.R.'s northern line and has in turn prevented growth
in Prince Rupert. Graham Island seems to offer the best possibilities for large-scale agricultural settlement in the future.

The Prince Rupert Forest District has a total of 23,583 million fbm of timber on productive areas of which 19,780 million fbm is found within the coastal section. The estimated sustained annual yield on the coast is 280 million fbm of which 195 million fbm is being cut at present, largely in the Queen Charlotte Islands. The majority of the cut moves to Vancouver for processing over a tenuous 400-mile transportation network. It is suggested that the establishment of sawmills near Prince Rupert would probably be successful since high production costs at this point would probably be balanced by lower transportation costs.

The outlook for increased forestry production seems favourable. The coastal section of the Prince Rupert Forest District is being undercut by 30% of the annual growth rate while the only other coastal forest district, the Vancouver District, is being overcut by 88%.

The fishing industry, especially the halibut fishery, has provided the mainstay for Prince Rupert's economy since the city's inception. The major fisheries are extremely well developed, although several minor fisheries probably could be expanded. Prince Rupert's favourable position in relation to the fishing grounds has probably allowed Canadian fishermen to take over whatever increase has resulted
from the conservation practices of the International Fisheries Commission. Decisions of the Commission with regard to the length of the season will probably govern the part Prince Rupert is to play in the future of the halibut fishery.

The salmon fisheries of the Skeena and Nass Rivers have become increasingly centralized as the salmon fishermen have increased their mobility. Before the introduction of power boats 25 canneries were required to service the fishing fleets on the two rivers, now only six are needed. Probably the number will be still further reduced and the remaining canneries centralized at or near Prince Rupert.

Of the 1,954,430 h.p. of hydro power available within 160 miles of Prince Rupert only 2.5% is developed, due in large part to the lack of development of the other resources of the district. The Aluminum Company of Canada, however, has announced that it intends to develop 1,500,000 h.p. for an aluminum plant to be located at Kitimat. If the plan proceeds as announced it means that a new city of 15,000 people will be established on the northern coast.

Prince Rupert was founded to serve as the Pacific coast terminal of the Grand Trunk Pacific Railway, a major transcontinental rail line. The city was to be planned in all its phases and the railway procured the services of a firm of landscape architects to prepare plans for a city of a minimum of 50,000 people. The plan that they prepared recognized the fundamental topographic divisions in the town-
site and the street plan was laid out so that the greatest advantage could be taken of favourable topographic features. Although the plan has undoubtedly succeeded in reducing costs of road construction it has been more harmful than beneficial. The plan was prepared for a great port city of 50,000 people. Prince Rupert became a small fishing port of 5,000 people. The whole of the city was contained in the area set aside in the plan as the business district. Since the area was intended to be a business district the lots were only 25 feet wide by 100 feet deep, a size which is too small to provide the amenities necessary for a residential area.

From 1909 to 1925 construction of various pieces of large-scale port equipment went on. During this period a drydock capable of handling ships up to 20,000 tons, a grain elevator with a capacity of 1,250,000 bushels and several large docks were erected. These were to provide for the trade of the Orient which Prince Rupert was expected to capture since it was 500 miles closer to the Orient than any other North American port. The trade never materialized because of the poverty of the Orient, the lack of settlement along the line of the Grand Trunk Pacific Railway and the nature of the resources tapped by the railway. These resources are substantial in themselves but they were too distant from markets to compete with more readily available resources.
Over expansion of the city and the cost of construction on difficult terrain forced the city into bankruptcy in 1933. This represented a disastrous readjustment of the city to the realities of its environment. Another more peaceful adjustment to actualities was the expansion of small boat facilities from their centre at Cow Bay to limits provided by the topographic barriers of the coastal ridge.

From 1925 to 1940 the other sections of the city remained stagnant. The commercial core was centred at Third Avenue and Fulton Street, first-class residences stretched along the crest of the coastal or inland ridge with second and third-class residences situated between the crest of the ridge and the inland depression.

World War II brought many changes to the city. Because Prince Rupert is closer to Alaska than any other Pacific coast railway terminus intensive use was made of the port in transporting supplies and men to the territory.

Peace left a twofold legacy in the form of additions and improvements to the large-scale port facilities and the realization that Prince Rupert is the logical point from which to service Alaska. Goods can be brought from the industrial east and mid-west to Prince Rupert for the same cost as to Seattle. Since Prince Rupert is 640 miles closer to Alaska than is Seattle substantial savings in transport costs would be affected by use of the port. There are several factors hindering this at present, One is the Jones Act which
prohibits the use of Canadian ships in freight trade with Alaska. The others are the lack of large-scale agricultural production in Central British Columbia to supply the foodstuffs that represent the bulk of the shipment to Alaska, and the lack of population centres which would permit the establishment of a large-scale distribution centre, with its attendant advantages of wider selections, carload shipments and lower costs.

The increased population attendant upon the development of Kitimat may be sufficient to break this deadlock. If this does not occur Prince Rupert will probably remain a city of 8-10,000. If, however, the growth of Kitimat brings about the establishment of a distributing centre in Central British Columbia and causes the agricultural land on Graham Island to be put into production Prince Rupert will probably grow to a city of 25-30,000. The addition of Oriental trade, dependent upon peace in Asia as well as the general development of Alaska and Central British Columbia could bring an even higher population, possibly 50,000 people, although this is far in the future.
Books

Fleming, Sandforth, Reports and Documents in Reference to the Location of the Line and a Western Terminal Harbour, 1878, Ottawa, 1878.


The North Pacific Planning Project, Canada's New Northwest, King's Printer, Ottawa, 1948.


Periodicals


**Government Publications**


British Columbia, Department of Trade and Industry, *Regional Industrial Index of British Columbia*, King's Printer, Victoria, 1948.


Publications of Learned Societies


Unpublished Material

Bell, F.H., Prince Rupert and the Pacific Halibut Fishery, typed manuscript, International Fisheries Commission, University of Washington, Seattle, undated.


Brief, Submitted by Canadian Pacific Airlines, Limited, to Air Transport Board, mimeographed, 1946.

City of Prince Rupert, Zoning By-laws, 1941.

Copy of report submitted by Brett and Hall on April 14, 1908 to Frank W. Morse, Vice President and General Manager, Grand Trunk Pacific Railway, Montreal.


Letter to author from George D. Hall, 1190 South Pasadena Avenue, Pasadena, California, July 8, 1949.

Memorandum, Submitted to the Federal Government by Prince Rupert Industrial Development Committee, March, 1946.


Prince Rupert Forest District Management Report, 1948, Office of District Forester, Prince Rupert, B.C.


Newspapers


The Empire, (Prince Rupert), January 1909 to April 1910.
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