CANADA
DEPARTMENT OF MINES AND RESOURCES
MINES, FORESTS AND SCIENTIFIC SERVICES
GEOLOGICAL SURVEY OF CANADA

LEGEND

CRETACEOUS
UPPER CRETACEOUS
NANAIMO GROUP (3 - 12)

- GABRIOLA FORMATION: sandstone
- NORTHUMBERLAND FORMATION: shale, sandstone, conglomerate
- DE COURCY FORMATION: mainly sandstone
- CEDAR DISTRICT FORMATION: mainly shale
- PROTECTION FORMATION: mainly sandstone, coal
- NEWCASTLE FORMATION: mainly sandstone and shaly sandstone, coal
- CRANBERRY FORMATION: sandstone, shaly sandstone, conglomerate
- CRANBERRY AND NEWCASTLE FORMATIONS, undivided
- EXTENSION FORMATION: conglomerate, coal
- HASLAM AND EAST WELLINGTON FORMATIONS: 4A, chiefly shale; 4B, chiefly sandstone, some coal
- BENSON FORMATION: conglomerate

JURASSIC AND/OR CRETACEOUS
UPPER JURASSIC AND/OR LOWER CRETACEOUS
- Granodiorite and allied rocks

TRIASSIC AND (?) JURASSIC
UPPER TRIASSIC (MAINLY OR ENTIRELY)
VANCOUVER GROUP
- Andesite, basalt, spotsite, argillite, limestone, schist. May include some undifferentiated late Paleozoic rocks

Fault (dot indicates downthrow side)
Coal seam (W—Wellington, D—Douglas, N—Newcastle)

Geology by A. F. Buckham, 1943-1946
Base map by British Columbia Forest Service, 1937, with additions by A. F. Buckham

Main road
Secondary road
Railroad
Post office
Buildings
Pipe-line (or flume)
Wharf
Contour interval, 500 feet

LIST OF COAL MINES AND PROSPECTS

1. Extensible Collieries Ltd., No. 1 mine
2. Harewood-Wellington Collieries Ltd., Extensible mine
3. Little Ash mine
4. R. Dunsmuir and Sons, Wellington Colliery, Dunsmuir's original entry
5. " Wellington Colliery, Wellington mine, No. 7 slope
6. Canadian Collieries (Dunsmuir) Ltd., No. 9 mine
7. R. Dunsmuir and Sons, Wellington Colliery, Wellington mine, adit level
8. " Wellington Colliery, No. 1 shaft
9. " " , No. 2 shaft
10. " " , No. 3 shaft
11. " " , No. 4 shaft
12. " " , No. 5 shaft
13. " " , No. 6 shaft
14. East Wellington Coal Co. [South], No. 1 shaft
15. " " , No. 2 shaft
16. East Wellington Coal Co. Ltd., [Mill], East Wellington mine
17. Vancouver-Nanaimo Coal Mining Co., Ltd., East Wellington (Dingle Pit) mine No. 1
18. New Vancouver Coal Mining and Land Co., Ltd., Northfield mine
19. Western Fuel Co., Wakesiah mine
20. " Harewood mine
21. " Harewood mine, adit level
22. Canadian Collieries (Dunsmuir) Ltd., Extension Prospect mine
23. " Tunnel to Nos 1, 2, and 3 mines, Extension Colliery
24. " , Extension Colliery, No. 1 slope
25. " " " , No. 2 slope
26. " " " , No. 3 slope
27. " " " , No. 4 mine
28. " " " , No. 6 slope
29. " " " , Vancouver slope
30. " " " , Old No. 1 slope
31. " " " , Baker's mine
32. " , No. 7 slope
33. " , White Rapids mine
34. " , No. 8 mine
35. Wolf Mountain prospects
36. Black Jack outcrop
37. Hudson's Bay Co., No. 1 pit
38. " , No. 2 pit
39. " , Park Head level free
40. Vancouver Coal Mining and Land Co., Ltd., Douglas mine, water level
41. Hudson's Bay Co., Pumpkin Encampment prospect
42. " , Newcastle (Gage) mine
43. " , Fitzwilliam mine
44. Western Fuel Co., Boulder mine
45. " , Newcastle shaft
46. " , Protection mine
47. " , No. 1 mine
48. Vancouver Coal Mining and Land Co., Ltd., Douglas slope
49. " , Douglas shaft
50. " , New Douglas slope
51. " , New Douglas mine, adit level
52. Western Fuel Co., New Douglas [191] slope
53. Vancouver Coal Mining and Land Co., Ltd., Southfield No. 1 slope
54. " " , Southfield No. 2 slope
55. " " , Southfield No. 3 mine
56. New Vancouver C. M. and L. Co., Ltd., Southfield No. 4 slope
57. " " , Southfield No. 5 mine
58. Western Fuel Co., Reserve mine
59. Pacific Coast Coal Mines, Ltd., South Wellington Colliery, Feltick slope
60. " " , South Wellington Colliery, Richardson slope
61. " " , Abandon mine
62. Canadian Collieries (Dunsmuir) Ltd., Alexandria mine
63. " " , No. 5 mine
64. " " , No. 10 mine
65. Granby Consolidated Mining, Smelting and Power Co., Granby Colliery, No. 1 mine
66. Granby Consolidated Mining, Smelting and Power Co., Granby Colliery, No. 2 mine
67. Canmore Coal Co., Ltd., Round Island prospect

NOTE. The Company named is, in each case, the one most prominently associated with the working of the mine. The first mining was in 1852 by the Hudson's Bay Company, succeeded in 1861 by the Vancouver Coal Mining and Land Co., Ltd., in 1889 by the New Vancouver Coal Mining and Land Co., Ltd., in 1902 by the Western Fuel Co., in 1918 by the Canadian Western Fuel Co., and in 1921 by the Western Fuel Corporation of Canada, Ltd., which, although bought in 1938 by Canadian Collieries (Dunsmuir) Ltd., continued to operate mines until 1939. Robert Dunsmuir discovered coal at the Wellington Collieries in 1869, and after 1871 operated as Dunsmuir, Diggle and Co. until 1883. This Company was succeeded in 1883 by R. Dunsmuir and Sons, in 1889 by the Wellington Colliery Co., Ltd., and in 1910 by the Canadian Collieries (Dunsmuir) Ltd which is still operating in the field.

SYMBOLS USED FOR MINE WORKINGS

Slope or adit
Shaft
Prospect

NOTE. The letter "V" beside a symbol indicates that it is an auxiliary opening used chiefly for ventilation

NANOOSE BAY
STRAIT OF GEORGIA
NANAIMO
GABRIOLA ISLAND
NORTHUMBERLAND CH.

FORMATION AND THICKNESS IN FEET

GABRIOLA	1400'±
NORTHUMBERLAND	2000'±
DE COURCY	900'±
CEDAR DISTRICT	750'±
PROTECTION	450'±
NEWCASTLE	175'±
CRANBERRY	400'±
EXTENSION	600'±
EAST WELLINGTON	35'±
HASLAM	600'±
BENSON	500'±

DOUGLAS SEAM
NEWCASTLE SEAM
WELLINGTON SEAM
BLACK JACK SEAM

NANAIMO COALFIELD
COLUMNAR SECTION

DESCRIPTIVE NOTES

The Vancouver group of metamorphosed volcanic and sedimentary rocks, chiefly andesitic lavas, is the oldest formation in the area. The rocks are probably mainly of Upper Triassic age, but no fossils have been found in them in the area, and they may include some undifferentiated late Paleozoic strata. They were deformed and mountain-building forces were intruded and metamorphosed by granitic and allied rocks, probably in late Jurassic or early Cretaceous time.

A subsequent period of erosion developed a coastal lowland with a relief of about 500 feet. On this were deposited about 7,000 feet of Upper Cretaceous sediments, the Nanaimo group. These include conglomerate, sandstone, shale, and coal, in long beds of broad accumulation. The stratigraphy is summarized in the accompanying columnar section.

Two periods of strong deformation are represented in the Nanaimo area. The first occurred after the rise of the intrusion of the granitic rocks. Probably the members of the Vancouver group were then tilted and faulted, although no structures have been distinguished as referable to the first period alone. The second affected the rocks of both the Vancouver and Nanaimo groups, and from a study of the regional geology is known to have occurred in post-Eocene time.

The structure of the Nanaimo area is dominated by strong faults crossing it from southeast to northwest. There are parts of a major fault zone extending along the east coast of Vancouver Island for at least 70 miles. Where the faults have been observed in the Cretaceous rocks they are chiefly thrusts. Cleavage is also common, whose attitudes, as on the Extension and lower Protection, but may occur, also opposed, in higher beds in the southeastern part of the area. In the higher formations only sharply overturned folds, involving actual rupture of the measures, have been seen. Traced along strike, most faults seem to be of the reverse or hinge type. Their strike on general northwest, but considerable divergences were noted, and in places the changes are rather abrupt.

The rocks of the Nanaimo group are also folded, the folds executing these associated with displacements, being broad and open. The strike of the folds generally parallels that of the faults, and the faults, sharply overturned folds, and broad open folds all appear to have been caused by the same stresses.

Coal, from the Upper Cretaceous formations, is the chief economic mineral product of the area. The Nanaimo coalfield has, since 1852, produced almost half the total of coal mined in British Columbia, mainly from the Wellington, Newcastle, and Douglas seams, from which has come more than 90 per cent of the field's total production.

A thin seam occurs near the base of the Haslam formation near Black Jack Mountain (36). The few outcrops seen are thin and dirty.

Several coal seams lie near the base of the Extension formation. At the base is the main Wellington (No. 1) seam, 30 feet above is the Little Wellington (No. 2) seam, and 60 and 75 feet above are the Wellington Nos. 3 and 4 seams respectively. These upper seams rarely exceed 2 feet in thickness. The most conspicuous feature of the main Wellington seam is its variation in thickness due to undulations, chiefly in the roof. It averages 4 to 7 feet in thickness over a workable area 12 miles long and an average of 1 mile wide, exclusive of an outlier at Extension. Its floor is usually sandstone, and its roof is commonly shale although sandstone or conglomerate occur in some places. Partings of "rash" (partly formed coal) and slate are common in the seam. The most important mines working the Wellington seam were in the vicinity of Wellington and Extension. The productive area near Wellington is bounded by the outcrop and by faults on the north and northeast, and the seam becomes unworkable south of section 17 and east of the centre of range 7, Mountain land district. The Extension coal area is bounded by the outcrop and by faults on all sides but the east, where it was cut little mined east of range 7, Cranberry land district. The main Wellington seam was worked in all or has coal prospects listed from 1 to 35 inclusive, with the exception of 4, 6, 20, 21, 22, and 27, which worked the No. 2 seam. Both these seams were worked in properties 1 and 16, and the main seam and Nos. 3 and 4 seams in property 18.

A small seam, of very patchy occurrence, is found about 200 to 250 feet above the base of the Extension formation.

The Newcastle seam, at the base of the Newcastle formation, is the most restricted in distribution but the most regular of the three main seams, averaging about 3 feet 6 inches in thickness over a workable area of 2 by 1½ miles underlying Newcastle and Protection Islands. Its floor is usually fireclay or shale sandstone and its roof varies from sandy shale to fine conglomerate. The seam commonly lacks partings. It was worked in properties 38, 41, 42, 44-47, and 52.

The Douglas seam occurs in the Newcastle formation, an average of 60 feet above the Newcastle seam. It has a workable area 9(?) by 1½ miles. It averages a little more than 5 feet in thickness, but the thickness varies to much the same degree as the Wellington seam, and south of property 53 this irregularity is even more noticeable. Both floor and roof rocks are of variable composition, and undulations, causing variations in seam thickness, are most commonly in the floor. Partings of rock and "rash" are common, and in many places, especially in the south, the seam is strongly sheared. The most important mine in the Douglas seam was No. 1 mine (47), which was operated for 55 years (1883-1938) and yielded about 18 million long tons. Its workings, chiefly submarine, extended from the shafts (47) near to within a quarter mile of Jack Point, and from the Newcastle shaft (45) south to the south shore of Nanaimo harbour. This downthrown part of the Douglas seam, east of the harbour downthrow, was also worked in properties 43, 44, and 58. That part of the Douglas seam west of the downthrow has been worked almost continuously from the Hudson's Bay mines in the city of Nanaimo (37, 39, and 40) for more than 7 miles south to Cassidy, including the Southfield and South Wellington coalfields (48-49, 50-57, and 59-66).

An outcrop exposes a coal seam (67), considered by some to be the Douglas seam, on Round Island, but the available information is insufficient to prove this.

In the Protection formation five seams between 6 and 9 inches thick occur in places. This zone is that at which the Cumberland seams occur, but the seams do not occupy corresponding stratigraphic positions.

The experience of 82 years of mining and prospecting has delimited the areas of workable coal with considerable accuracy. It has shown that all the seams become unworkable seaward, on average of about 12½ miles from their outcrop western outcrop. The area east of Extensible mine (2) might support another mine for a few years, and prospecting in the Black Jack area (36) might possibly reveal workable deposits. Apart from these, when the present working mines (53 and 64) are exhausted, there appears little chance of further large-scale operations, although small-scale operations will probably continue for years.

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PAPER 47-22

NANAIMO COALFIELD
BRITISH COLUMBIA

Scale 1 mile to 1 inch

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