

A REPORT ON THE PRELIMINARY RECON-  
NAISSANCE OF THE PROPOSED KWOIEK CREEK  
DEVELOPMENT

File: 0203720  
December 1957

Submitted by:  
J.M. Jacobsen

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A REPORT ON THE PRELIMINARY RECONNAISSANCE  
OF THE PROPOSED KWOIEK CREEK DEVELOPMENT

ENGINEERING SERVICES DIVISION

File: 0203720

December 1957

Submitted by:

*J. M. Jacobsen*  
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Noted by :

*Noted R. J.*

T A B L E   O F   C O N T E N T S

	<u>Page</u>
SUMMARY . . . . .	i
RECOMMENDATIONS . . . . .	ii
INTRODUCTION . . . . .	1
AREA STUDY . . . . .	1
Topography . . . . .	1
Soils . . . . .	3
Climate . . . . .	3
Forest Utilization . . . . .	3
Transportation . . . . .	4
DESIGN - GENERAL . . . . .	4
Traffic Analysis . . . . .	5
Capital Cost and Amortization . . . . .	5
DESIGN OF SECTION I - MILE 00 - 9.5 . . . . .	6
Construction & Maintenance Costs . . . . .	6
Hauling Costs . . . . .	6
Total Unit Cost for Section I . . . . .	7
DESIGN OF SECTION II - MILE 9.5 - 14.25 . . . . .	7
Construction & Maintenance Cost . . . . .	7
Hauling Costs . . . . .	7
Total Unit Cost for Section II . . . . .	8
DESIGN SUMMARY OF SECTIONS I and II . . . . .	8
BRANCH ROADS . . . . .	9
RIGHT-OF-WAY . . . . .	9
CONCLUSIONS . . . . .	11
APPENDIX	

S U M M A R Y

Kwoiek Creek is part of the Botanie Creek S.Y.U., a tributary of the Fraser River, and lies approximately 15 miles south of Lytton. The drainage contains an estimated 43.3 M.M. net merchantable volume and the recommended annual cut is 2 M.M. for the first 20 year period.

Annual allowable cut of  
this block = 1 M.M. c.d.

The reconnaissance of the proposed road development was requested by Management Division March 20, 1956, and carried out by the Engineering Division in October, 1956.

The field reconnaissance and the subsequent analysis of construction and hauling cost for various classes of road indicated that the most economic standard would be a Class V road from the railroad, in the vicinity of the mouth of Kwoiek Creek, to Kwoiek Lake - distance of 9.5 miles, and a Class VII road from Kwoiek Lake to John George Lake - an additional distance of 4.75 miles. The costs are listed in the following table.

TABLE OF TOTAL DEVELOPMENT COSTS - 14.25 MILES

Section & Class	Total Const. Cost		Cost per Mile		Total Constr., Maint. & Haul Cost/C.c.f.	
	B/C.F.S.	Contract	B.C.F.S.	Contract	B.C.F.S.	Contract
<u>Sect. 1</u>						
Class V	\$259,049	\$298,315	\$27,200	\$31,400		
<u>Sect. 2</u>						
Class VII	38,000	43,700	8,000	9,200		
<b>TOTAL COST</b>	<b>\$297,049</b>	<b>\$342,015</b>			<b>\$2.86</b>	<b>\$2.98</b>

North Kwoiek Creek contains approximately 10% of the total volume of timber and therefore requires only a Class VII branch road which can most feasibly be developed by the logging operator. A branch road can likewise be developed for the small volumes in the upper reaches of Kwoiek Creek.

The required right-of-way traverses an Indian reserve, the Canadian Pacific Railway, several mineral claims, and a right-of-way easement granted to the Gold Dot Mining Company. These encumbrances will require clarification before the proposed road can be developed.

## RECOMMENDATIONS

On the basis of the preliminary reconnaissance of the proposed Kwoiek Creek Development Road and the subsequent analysis of its economic aspects, it is recommended that:

1. A road be built on the approximate location shown on the map in the Appendix of this report and in accordance with the Forest Service specifications contained herein.
2. The road be of Class V standard for the first 9.5 miles (i.e. to Kwoiek Lake) and a Class VII standard from Kwoiek Lake to John George Lake. The costs are shown in the preceding Summary.
3. The right-of-way encumbrances be cleared before proceeding with the development and that the necessary application for right-of-way and reserve areas be made at an early date pending further consideration to the proposed development.

A REPORT ON THE PRELIMINARY RECONNAISSANCE  
OF THE PROPOSED KWOIEK CREEK DEVELOPMENT  
ROAD

INTRODUCTION

The reconnaissance of the proposed Kwoiek Creek Development Road was carried out by the Engineering Services Division, October 1956, as requested by Management Division, in a memorandum dated March 20, 1956, file 0214741. The purpose of the reconnaissance was to determine the feasibility and cost of building a suitable road from the Canadian Pacific Railway and Fraser River, at the mouth of Kwoiek Creek, to the mature timber in the Kwoiek Creek drainage, as shown on the map in the Appendix of this report.

AREA STUDY

Kwoiek Creek drainage is part of the Botanie Creek S.V.U. and is situated in the vicinity 15 miles south of Lytton, B.C. It has a mature volume area of approximately 20,700 acres, which contains a net merchantable volume estimated at 43.3 M.M. c.f., 13.1" + d.b.h. These volumes are distributed along the main creek drainages of this area (see map in the Appendix).

Topography

Kwoiek Creek is a tributary of Fraser River. The main drainage extends westward into the coast range mountains for approximately 15 miles, and is studded with several small lakes in its upper reaches.. The creek and lakes are fed by melting glaciers throughout the summer months.

Beginning at the mouth of the valley, the first 3-4 miles of the proposed route lies in a narrow, steep and rocky canyon. The canyon walls are in excess of 120% and extend into the creek bed with little or no moderation (c.f. map in Appendix). These walls contain numerous small ledges of broken pattern and frequently flank the creek by short, vertical rises.

Over the next 5-6 miles to Kwoiek Lake, the valley widens gradually but the slopes near the creek remain broken and range from 20 to 40 per cent. The width of the valley bottom at Kwoiek Lake is about 700-800 feet on either side of Kwoiek Creek. The whole 5-6 mile section contains many large rock slides; some slides are dormant and stable, others are active. The rock fragments in these slides are large, averaging about 2 or 3 feet in diameter, with some diameters as large as 20 feet. The entire valley thus far is characterized by the absence of suitable soil material for road construction. The remaining part of the valley, lying between the Kwoiek and John George Lakes, is characterized by deep soils and heavily wooded areas containing numerous streams. Most of the streams originate from sidehill seepage or springs. On flat terrain the soils are saturated with water, but the areas are not of swamp characteristic.

Kwoiek and John George Lakes, which, by virtue of their location, present the only suitable mill sites in the valley, are generally shallow around their shorelines. The shores are either too steep or too flat and swampy, leaving very little suitable area for mill settings. Of the two lakes, John George has the better facilities for mill sites.

The vicinity of the junction of the proposed road and the Canadian Pacific Railway requires considerable work in order to develop an area suitable for a siding with adequate storage space. The development in this area is restricted to one side or the other of Kwoiek Creek because of the Creek's wide, canyon-like channel which extends almost to the Fraser River. The reconnaissance determined that the north side of Kwoiek Creek presented the better overall topography for development. In the area lying north of Kwoiek Creek and west of the railroad, a more or less flat bench exists with suitable grounds for stock-piling. However, this bench is approximately 25 feet above the railroad which follows its edge by means of a 25 foot cut-bank. The only known source of gravelly material lies in this area, and if it is used for the construction of the proposed road, the elevation of the bench may be reduced sufficiently to provide a reasonably good area for loading lumber or logs on railway cars. The area between the railroad and the Fraser River, on the north side of Kwoiek Creek, is rough and steep. Excessive rock work can be eliminated, however, by carefully locating switchbacks down to the Fraser River if the latter is to be used for log transportation.

If the proposed development of Kwoiek Creek valley is approved, the siding area described in the foregoing paragraph will have to be acquired by either lease or purchase from the Department of Indian Affairs whose Reserve #4 includes the area in question. A temporary siding could then be constructed on the proposed siding area near the present Canadian Pacific Railway bridge by Kwoiek Creek. This temporary siding would facilitate the movements of machines and supplies during construction of the road and/or until the proposed siding area is developed. Because the method of acquiring the land for the siding is unknown at the present time, no allowance has been made for its purchase or lease in the reconnaissance estimates. However, the estimates do include landscaping costs for the proposed siding.

### Soils

As has been previously described, the soils over the first 9 miles of road leading up to Kwoiek Lake consists chiefly of solid rock or rock slides. Very little other material is found along this portion of the proposed route. The rock slides are not useable in their present form for building of sub-grade because the particles are much too large. They are also too large to be handled by the rock crusher. The gravelly material found near the vicinity of the railroad will, of necessity, be used to level off the subgrade wherever necessary on rocky portions of the road. The gravelly material is of very poor quality, being composed of about 80% sand, 20% minus 2" gravel, and the remainder of small boulders. This is the best surfacing material the area has to offer, and it will therefore be necessary to utilize it to the best advantage in conjunction with crushed rock.

The soils between Kwoiek and John George Lakes are chiefly silts and clays impregnated with large boulders. These soils are frequently saturated with water and will require special attention to their drainage during and after road construction. A heavy surface layer of stabilized material will be required on the subgrade along various parts of this section.

### Climate

The area is subject to heavy snowfall during the winter period, restricting the logging season to 7 months a year. Spring run-off is rapid and results in excessive swelling of all the creeks. In many cases, the creeks have been unable to carry the large volumes of water during the peak run-off period and has resulted in streams running rampant throughout the adjacent wooded areas. It will be necessary therefore, to carry out considerable study of the drainage problems of this area in order to provide ample safety factors in the design of drainage structures. Large capacity culverts and/or bridges were used in the reconnaissance estimates, and four per cent of the contingency fund estimated for unforeseeable drainage problems.

### Forest Utilization

The main species are spruce, fir and white pine, with secondary species of balsam, cedar and hemlock. The main product will be the sawlog, which may or may not be processed to lumber before being shipped out of the area. Logs may be shipped out by rail or by means of the recently developed water route of the Fraser River. The latter method would take logs to points downstream for processing.

The Kamloops District office has suggested large sales in this area. This was presumably meant to reduce the number of operators because of difficult terrain and the high cost of building roads suitable for dense traffic. Since the annual allowable cut is predetermined, the truck traffic would remain more or less constant regardless of the number of operators. However, increased traffic can be expected from additional administrative vehicles and equipment as the number of operators increase.

The distribution of the timber in the valley provides ample room for several logging operations, but shipping facilities at the railhead will be limited to an estimated two operators. This situation may be alleviated if some operators utilize the Fraser River for transportation of their logs.

The net merchantable volume of 13.1" d.b.h. is estimated at 43.3 M.M. c.f. An annual cut of 2 M.M. c.f. to remove the mature timber in a maximum of 25 years has been recommended by R. Tannhauser, Working Plans Division. This cut will be used in this report pending approval or alteration of this cut by Management Division.

### Transportation

There are no public roads in this vicinity lying west of the Fraser River. The Trans-Canada highway is located on the east side of the Fraser, but there are no bridges to provide access across the river.

The Canadian Pacific Railway is located on the same side of the Fraser River as Kwoiek Creek. It will provide one means of shipping forest products out of the area. A railroad siding is situated approximately 1/4 mile north of Kwoiek Creek, but this siding does not provide easy access from the proposed road. The siding area is cut out from a steep sidehill with no room for loading facilities. It is further cut off from the proposed road by rock terrain, part of which was deeply cut for the railway subgrade. It is estimated that an additional siding can be more economically developed near the junction of the railroad and proposed road, as previously suggested.

Another mode of transportation developed in recent years and applicable to the proposed Kwoiek Creek development, is the Fraser River. Logs can be bundled and dumped in the river and picked up at Yale where they are sorted and processed, or reshipped to other destinations. Losses due to breakage or permanent hang-ups are reportedly as low as 2%. The extent to which this means of transportation will be used with respect to Kwoiek Creek logging is beyond the scope of the preliminary investigation.

There is only one route into Kwoiek Creek valley: the route shown on the map in the Appendix, and following the approximate route of the creek itself. The branch road into North Kwoiek Creek was not investigated other than to ascertain proper alignment with the main road.

### DESIGN - GENERAL

The design will be based on the requirements of traffic and on the sum of unit construction and hauling costs to determine the most suitable and economic class of road for this development. In the calculation of construction costs for various classes of road, allowance was made for the reduction of each class of road to one class lower in areas of costly construction. In each case of reduction in road class, the areas involved large quantities of solid rock.

### Traffic Analysis

Logging traffic will be determined on the following assumption:

1. Annual cut of 20,000 C,c.f. (= 2 M.M. c.f.)
2. Seven months logging season per year.
3. 20 net working days per month.
4. Eight hour work day.
5. Sixteen C,c.f. per truck load.

The truck traffic is then calculated as follows:

$$\text{Number of vehicles/hour} = \frac{20,000(2)}{7(20)(8)(16)} = 2.2$$

This figure should be increased by one-third to allow for overhead traffic concerned with logging operations and also for outside traffic such as that of the Forest Service, and holders of mineral claims. A conservative estimate of the density of traffic can then be assumed to be 3 vehicles per hour.

A density of 3 vehicles/hour can be safely handled by any class of road down to class 6. This statement is supported by the fact that the main road extending to the junction of North Kwoiek Creek where density will be reduced, is only 7.5 miles long. This means that the average number of vehicles met by any one vehicle travelling in either direction over the entire 7.5 miles at an average speed of 15 m.p.h. or more, is not greater than one vehicle. The expected traffic density will therefore not be a controlling factor in class determination.

### Capital Cost and Amortization

The terrain over which the proposed route traverses involves considerable rock work. The proposed road requires a minimum of two major bridge crossings (Kwoiek Creek) and special attention to drainage problems. This indicates a high cost of construction. A preliminary estimate indicated the standard of road would be in the neighbourhood of a class 4. Estimates were therefore compiled for classes 3, 4 and 5 on a mile-by-mile basis for each of clearing, subgrade, surfacing and maintenance costs. The summaries of these costs are available for reference in the Engineering Work Files.

Estimates for operator's cost of construction were not worked out. Indications are that the operators' cost will be identical to that of the Forest Service in this particular area, if no adjustments are made with respect to right-of-way clearing costs when this operation is carried on in conjunction with the operators' logging activities. If the operator does build the road, adjustments in the clearing allowances can readily be made from the Forest Service Costs in the appraisal of stumpage. This can best be done by the Stumpage Appraisal Officer as he sees fit. Mile by mile clearing costs are available from the Engineering Work files for this purpose.

Approximately one-half the total volume of net merchantable timber in Kwoiek Creek valley lies westerly of Kwoiek Lake. North Kwoiek Creek contains 2,300 acres of merchantable timber with a net volume of approximately 4.55 M.M. c.f., 13.1" d.b.h. Since the latter volume is relatively small compared to the volume westerly of Kwoiek Lake, and since mills may be located on this lake, the break in class of road (if any) would logically be at Kwoiek Lake instead of at the junction of North Kwoiek Creek. This assumption is used for purposes of cost analysis. The first 9.5 miles from the railroad to Kwoiek Lake will be referred to as Section 1 and the next 4.75 miles between Kwoiek and John George Lakes as Section 2.

#### DESIGN OF SECTION I - Mile 00 to 9.5

##### Construction and Maintenance Costs

The following table lists the costs of construction, maintenance and amortization for the main road from the railroad to Kwoiek Lake. Amortization is charged against the total annual cut of 2 M.M. c.f. (= 20,000 C.c.f.) for 20 years on a straight line depreciation basis.

TABLE OF CONSTRUCTION COSTS

Road Class	Dist. Miles	Total Construction Cost*		Total	Amort.	Cost/Ccf
		B.C.F.S.	Contract	Annual Maint. Cost	B.C.F.S.	Contract
3	9.5	\$363,466	\$419,995	\$3,385	\$1.08	\$1.22
4	9.5	300,556	343,684	2,498	0.88	0.98
5	9.5	259,049	298,315	1,513	0.73	0.83

\* Includes bridge cost of \$44,412

##### Hauling Costs

Hauling time for the various classes of road for this section was derived from tables given in "Cost of Hauling Logs....", Byrne, Nelson and Googins, with adjustments as required for the particular road under consideration. Trucks operate at \$12.00/hour with 16 C.c.f. loads.

TABLE OF HAULING COSTS

Road Class	Dist. Miles	Round trip Time - Min.	Delay time	Load & Unload Min.	Total Time	Total Cost	Cost/C.c.f.
3	9.5	47.5	9.5	34.0	91.0	\$18.20	\$ 1.14
4	9.5	51.3	10.3	34.0	95.6	19.12	1.20
5	9.5	60.0	12.0	34.0	106.0	21.20	1.33

Total Unit Costs of Construction, Hauling and Maintenance for Section I

The following table lists the total estimated costs for various classes of road.

TABLE OF TOTAL UNIT COSTS

Road Class	Const. & Maint. Cost/Ccf		Hauling Cost/C.c.f.	Total Cost/ C.c.f.	
	B.C.F.S.	Contract		B.C.F.S.	Contract
3	\$1.08	\$1.22	\$1.14	\$2.22	\$2.36
4	0.88	0.98	1.20	2.08	2.18
5	0.73	0.83	1.33	2.06	2.16

The economic advantage is in favour of a class 5 road by the amount of \$0.02/ C.c.f. over a class 4, as indicated in the preceding table. Since there are apparently no other reasons influencing the decision on the required class of road other than those already discussed in this report, it is recommended that a class 5 road be built on the first 9.5 miles of the proposed development.

DESIGN OF SECTION II - Mile 9.5 to 14.25

Construction and Maintenance Cost

The following table lists the costs of construction, maintenance and amortization for the road from Kwoiek to John George Lakes, mile 9.5 to 14.25. Amortization is charged against tributary timber estimated to yield a part of the recommended annual cut equal to 10,000 C.c.f. per year for the first 20 year period.

TABLE OF CONSTRUCTION COSTS

Road Class	Dist. Miles	Total Construction Cost		Total Annual Maint. Cost	Amortization Cost/C.c.f.	
		B.C.F.S.	Contract		B.C.F.S.	Contract
4	4.75	\$123,829	\$142,408	\$1,152	\$0.73	\$0.83
5	4.75	110,080	126,030	713	0.62	0.70
6	4.75	82,535	93,890	688	0.48	0.54
7	4.75	38,000	43,700	500	0.24	0.27

Hauling Costs

Hauling costs for this section is based on the same information as that for Section I. Since the alignment of the Section II is better than that of Section I, the hauling cost per mile will be correspondingly lower. The following table lists the cost of hauling over this section only, and no allowance is made for loading and unloading, since this time is allowed for in the cost analysis of Section I.

TABLE OF HAULING COSTS MILE 9.5 - 14.25

Road Class	Dist Miles	Round Trip Min.	Delay Min.	Total Time	Total Cost	Cost/C.c.f.
4	4.75	23.3	4.7	28.0	\$5.60	\$ 0.35
5	4.75	25.6	5.1	30.7	6.14	0.38
6	4.75	30.4	6.1	36.5	7.30	0.46
7	4.75	47.5	9.5	57.0	11.40	0.71

Total Unit Cost for Section II

The following table lists the total estimated unit cost for various classes of road.

TABLE OF TOTAL UNIT COSTS - MILE 9.5 to 14.25

Road Class	Const. & Maint. Cost/C.c.f.		Hauling Cost C. C.f.	Total Cost/C.c.f.	
	B. C. F. S.	Contract		B.C.F.S.	Contract
4	0.73	0.83	0.35	1.08	1.18
5	0.62	0.70	0.38	1.00	1.08
6	0.48	0.54	0.46	0.94	1.00
7	0.24	0.27	0.71	0.95	0.98

A class 6 or 7 road is indicated as being the most economic. As was mentioned earlier in this report, traffic density is low and therefore a class 7 will carry the expected volume over this particular section satisfactorily. Since there are no further considerations apparent from the preliminary investigation, a class 7 road is recommended for Section 2.

DESIGN SUMMARY of SECTIONS I and II

The cost analysis of the proposed development has indicated a class 5 road from the railroad to Kwoiek Lake, a distance of approximately 9.5 miles, and a class 7 road from Kwoiek to John George Lake, a distance of 4.75 miles. The following table lists the combined costs of the two sections of the proposed road with the total capital and maintenance cost amortized on a straight line basis of depreciation against an annual cut of 20,000 C.c.f./year for the first 20 year period.

TABLE OF TO AL DEVELOPMENT COSTS - 14.25 MILES

Section & Class	Total Const. Cost		Cost per Mile		Total Const. Maint. & Haul Cost/C.c.f.	
	B.C.F.S.	Contract	B.C.F.S.	Contract	B.C.F.S.	Contract
<u>Sect. I</u>						
Class 5	\$259,049	\$298,315	\$27,200	\$31,400		
<u>Sect. II</u>						
Class VII	38,000	43,700	8,000	9,200		
<b>TOTAL COST</b>	<b>297,049</b>	<b>342,015</b>			<b>2.86</b>	<b>2.98</b>

The hauling costs (included in the total unit cost) in the preceding table, is the sum of hauling costs for the two sections of road as worked out in the sectional analysis. It is therefore the total cost of hauling logs from John George Lake to the railhead. For purposes of stumpage appraisal, each sale will have its own appraisal of hauling cost depending on the location of the sale with respect to the proposed road; i.e. a sale occurring along section I of the road will have a unit hauling cost equal to haul miles/9.5 miles times the unit hauling cost shown in the table for Section I, class 5 road. A sale located along section 2 of the road will have a unit hauling cost equal to the total unit hauling cost for section I, class V, plus an additional cost for section II equal to haul miles on section II/4.75 miles times the unit hauling cost shown in the table for section II, class 7 road.

#### BRANCH ROADS

There was no field reconnaissance carried out for branch roads. The office investigation indicated that two branch roads would be required: (1) a branch road leading into North Kwoiek Creek drainage to tap some 45,500 C.c.f. of mature volume which will provide approximately 10 per cent of the recommended annual cut. This branch will be in the order of a class 7 standard and could be built by the operator under direction of District Personnel. (2) A branch road leading into the headwaters of Kwoiek Creek, tapping approximately 18-20 C.c.f. of mature volume which would provide about 5 per cent of the annual cut. This road would be in the order of a class 7 standard and could also be built by the operator.

The remaining timber of Kwoiek Creek drainage is either directly tributary to the main proposed road or may be reached by operator-developed spur roads.

#### RIGHT-OF-WAY.

A search of the status of various private properties, easements, etc., traversed by the proposed road, revealed the following information (cf map in Appendix).

1. Indian Reserve No. 4, Whyeek - held by Department of Indian Affairs
2. Placer mine lease 569: Dead
3. Placer mine lease 570: dead
4. T.S. X74800: Sale held in abeyance pending future developments in F.M.L. applications and road reconnaissance report.
5. F.M.L. 0206721: Application held in abeyance pending further study of the area.
6. Easement for road right-of-way granted to Gold Dot Mining Co., Ltd., by Order-in-Council No. 1806, approved July 17, 1956. It contains a conditional clause whereby the Company must make use of the right-of-way for an access road within two years of date of approval . . . . that the road may be used by other parties "with or without compensation to the Company". The right-of-way thus granted lies on the south side of Kwoiek Creek and extends from I.R. #4 and follows Kwoiek Creek upstream for approximately 3½ miles. This easement conflicts with that portion

of the proposed B.C. Forest Service route lying east of Kwoiek Creek in the vicinity of reconnaissance mile 2.

7. T.S. X66044: Held in abeyance pending outcome of Sloan Commission Report.
8. Khyeeka Mineral Claims 1, 2, 3, and 4 held by members of the Gold Dot Mining Co. and for which their right-of-way was obtained.

Should the proposed road development be approved and constructed as described in this report, the encumbrances to the required right-of-way must be cleared. Right-of-way through the Indian Reserve #4 must be leased or purchased and legally surveyed. The crossing of the Canadian Pacific Railroad must be approved by the Department of Transport and the Canadian Pacific Railway Company, and this crossing should then be legally surveyed. A foreshore reserve should be made along the Fraser River to provide ample grounds for bundling and dumping logs in the river. No foreshore rights on either Kwoiek or John George Lakes should be granted to any private concern pending further development of the proposed road. A right-of-way will be required through Khyeeka Mineral claims 1, 2, 3, and/or 4 and part of the right-of-way easement granted to Gold Dot Mining Company will be required for the proposed road development. Negotiations should be made with the Department of Indian Affairs for purchase, lease or rental of the area required for the proposed railroad siding if the proposed development is otherwise approved.

The search of various private properties, easements, timber sale applications, etc., indicate that the holders and/or applicants are, to a large extent, affiliated or related directly or indirectly with Gold Dot Mining Company. Precautions should be taken to prevent any private organization from acquiring control of access to Kwoiek Creek valley (and thereby reduce competition for public resources of the valley) pending the approval and final location of the proposed development road.

C O N C L U S I O N S

The preliminary field or office investigation of the proposed Kwoiek Creek development road concludes:

1. THAT the proposed development is feasible and economic.
2. THAT the most suitable and economic standard of road is a Class V design from the Canadian Pacific Railway in the vicinity of the mouth of Kwoiek Creek, to Kwoiek Lake - a distance of approximately 9.5 miles; a Class VII road from Kwoiek Lake to John George Lake - a distance of approximately 4.75 miles.
3. THAT the cost of the total development will approximate as follows:
 

(a) Constructed by contractor	\$342,000
(b) Constructed by B.C. Forest Service	\$297,000

The unit amortization costs, including maintenance, are \$0.94 and \$0.82 per C.c.f. respectively. *= + \$1.20/Mcft*

4. THAT the required right-of-way entails several encumbrances of private property, easements, etc., and these must be cleared prior to commencement of road construction.

A P P E N D I X

MINIMUM SPECIFICATIONS FOR Kwoiek Creek Road Mile 00 - 9.5

The road should follow the route shown on the accompanying map.

Design: Class V (reduced to class VI in heavy rock cuts)

Grades - Favourable - Sustained favourable grades should be avoided. Average for grades over 1,000 feet long not to exceed 3 %.

- Maximum allowable grade in pitches not longer than 400 feet long to be 12 %.

- Grade not to exceed 3 % average on switchbacks.

Adverse - Maximum on momentum grades not over 500 feet long not to exceed 3 %.

- Maximum on that part of grade over 500 feet long not to exceed 5 %.

Curves - Average radius of curves should not be less than 250 feet.

Minimum radius of curve 50 feet.

Minimum radius of switchback 50 feet.

Superelevation .....

Right-of-way

- No timber to be left standing within 10 feet of edge of road or excavations. All trees on the right-of-way shall be felled where practical parallel to the right-of-way. Merchantable logs shall be moved clear of work-area prior to grade construction.

MINIMUM SPECIFICATIONS FOR Kwoiek Creek Road (CONT'D).

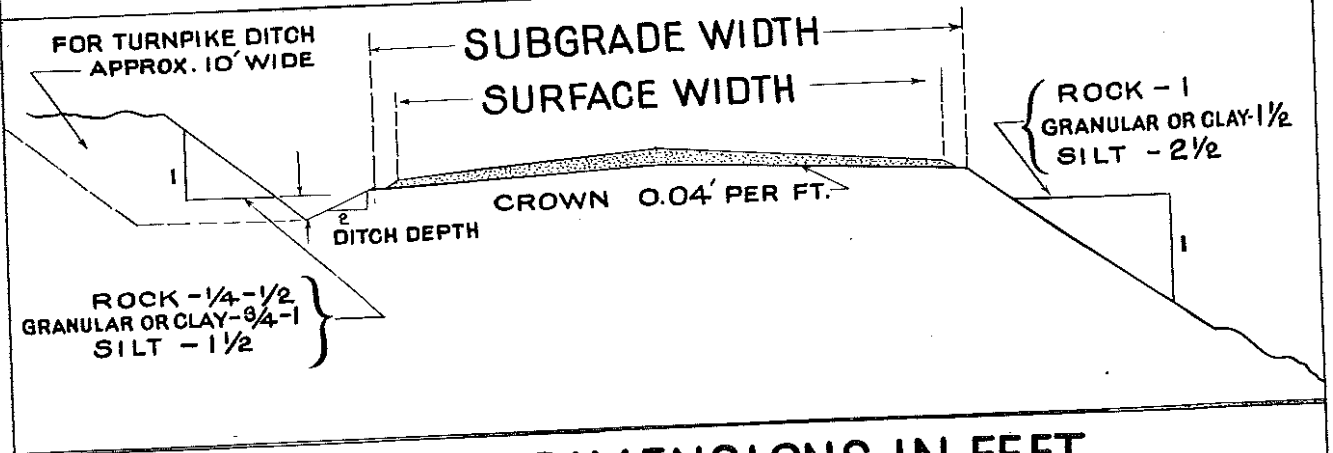
- Slash Disposal - Where the side slope is less than 20% or where there is insufficient common material, all slash and tops to be piled and burned away from green timber or reproduction. Where the side slope is greater than 20% and sufficient common material is available, slash can be buried under the road bed providing its volume does not exceed 10% of the fill cross-section and is covered by three feet of good road bed material. All slash shall be disposed of to the satisfaction of the Forest Officer in charge before completion of construction or commencement of logging operations.
- Surface - Depth to vary from 4 inches to 12 inches as required.
- Surface material to be suitable pit-run gravel or equivalent.
- Cross Drains or Culverts - Woodstave to be placed about 1,000 feet apart on grades up to 8% and about 500 feet apart on grades over 8%.
- Turnouts - Sight distance or approximately 1,000 feet or not less than 5 per mile.
- 100 feet of useable length.
- Minimum width including width of road 20 feet.
- Bridges - Capable of carrying 30 tons with adequate safety.

ROAD DIMENSIONS TO CONFORM WITH  
DRAWING NO. 52-P7.

# FOREST ROADS

## B.C. FOREST SERVICE

### ENGINEERING SERVICES DIVISION



### MINIMUM DIMENSIONS IN FEET

CLASS	SURFACE WIDTH	SUBGRADE WIDTH	② DITCH DEPTH	③ R/W WIDTH
1	24-28	34	3	90
2	20-24	30	2	80
3	18-20	24	1½	70
4	14	20	1½	60
5	12	16	1	50
6	10	12	1	40
7	—	10	—	—

- ① INCREASE CROWN TO 0.06' PER FT. ON SPOT GRAVEL SURFACES
- ② DITCH DEPTH MAY BE REDUCED TO 6" IN ROCK
- ③ R/W TO BE SUFFICIENT WIDTH SO THAT THE LINE OF CLEARING IS 10' FROM ALL EXCAVATIONS.

#### NOTE:

FOR TEMPORARY ROADS  
DISREGARD BANK SLOPES  
AND R/W WIDTH.

*Drawn by W.E. Parvum*

**F.F. SLANEY**

CHIEF ENGINEER  
DRAWING 52-P-7

REVISED MARCH, 1957