

POWELL RIVER TO SQUAMISH VALLEY ROAD LINK

ORDER OF MAGNITUDE COST ESTIMATE

A. Preamble

The scope of the project is not distinctly defined. In particular we are not aware of the developmental opportunities that would serve as justifications for such a huge project. In the absence of such clarifications we had to make some assumptions to come up with some kind of rough order of magnitude of construction cost. The assumptions are:

- ◆ In the absence of clear developmental opportunities, the purpose of the project is to establish a more direct connection between the Sunshine Coast and the Sea to Sky corridor,
- ◆ The new project would have to provide equal or better advantages, safety, and savings to that offered by the existing Road/Ferry/Road combination.
- ◆ The project alignment provided to Highway Engineering is that it follows the existing logging road alignment. It is therefore expected to be safely used by the public and the logging industry. The standard of the project should at least match the standard of Hwy. 101 in the vicinity of Powell River.

The Project is conceived as consisting of the following major components:

1. Upgrading of the existing logging roads to the standard set above
2. Linking the missing sections across Pacific Coast Ranges where long stretches of tunnels are expected

B. Sources of Rates for Estimates

We have resorted to the following three sources for the preparation of the estimates:

1. Vancouver - Squamish Highway Planning and Pre-Design Engineering Study, By Hamilton Associates, November 1989
2. Construction and Rehabilitation Estimating Book, February 1997, MoTH
3. Culliton Creek to Cheakamus Canyon Functional Design, UMA, 1998

C. Rates for Estimates:

Based on the above mentioned sources, we have established unit rates to be applied to the upgrading and widening of existing roads and to the new constructions

Rates for Tunnels:

We referred to Hamilton's Draft (identified as STS/TECH Report 014 in Planning's Files) for estimating of tunnel costing. On page 82 under D. Construction of Tunnel Structure, for a two lane tunnel, the report establishes a cost of 25 million/Km. The tunnel considered in the study vary from 600m to 2600m..

The same report, under C. Construction of Bridge Structures establishes \$1,200 per m². The Construction & Rehabilitation Estimating Book establishes \$2,200 per m². The multiplying factor

is approximately 2. The tunnels in this project are much longer (6-8 km) and therefore the ventilation and lighting, refuge for emergency situations, variation in rock type are factors that should be taken into consideration. We will enhance the multiplier to 2.4. Hence the cost per kilometre of tunnel would be 60 million per km.

Rates for road works:

We will use the following rates derived from above mentioned sources:

Upgrading of the asphalt section along the Squamish River @ \$100,000 per km

Upgrading single lane to two lane	
Easy/moderate construction conditions	\$ 750,000 per km
Difficult construction conditions	\$1,500,000 per km
Extremely difficult construction conditions	\$4,000,000 per km
New Construction, Extremely difficult construction conditions	\$6,000,000 per km

Rates for Bridges and crossings

Major Bridge over Squamish River	\$3,000,000 per unit
Elaho River	\$5,000,000 per unit
Sims Creek	\$2,000,000 per unit
Upgrading of single lane bridges to two lane (averaging)	\$1,000,000 per unit

A) Upgrading of existing Logging Roads:

1. Highway 99 to the upper reaches of Sims Creek, 81 km.

◆ **Hwy 99 turn-off to Skowishin Power House**

The first 22 km of asphalt/seal coated road would require drainage improvement, rehabilitation of pavement and minor realignments

22 @ 100,000 = 2,200,000

◆ Replacement of single lane bridge

1 @ 1,000,000 = 1,000,000

Sub - Total = \$3,200,000.00

◆ **Power House to Squamish crossing, 28 km**

◆ From the end of the two lane to the Squamish River crossing, the road is single lane gravel. It is 28 km. Long. The section has relatively easy portions with some steep, narrow and rocky areas. We shall assume an average between easy and difficult construction i.e. 1.2 million/km

28 @ 1,200,000 = 33,600,000

◆ 7 single lane wooden bridges to be upgraded to two lane

7 @ 1,000,000 = 7,000,000

◆ A major Bridge at Squamish

= 3,000,000

Sub - Total = \$43,600,000.

◆ **Squamish crossing to Elaho crossing , 10 km**

- ◆ This portion of road is on very difficult terrain with the river on one side and the mountain on the other. The widening has to be effected on the mountain side. Barrier should be placed along the river side throughout its length.

10 @ 4,000,000	=	40,000,000
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- ◆ Barrier on the river side

10 @ 120,000	=	1,200,000
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- ◆ Upgrading of minor single lane crossings

4 @ 1,000,000	=	4,000,000
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- ◆ Elaho Bridge, Major

1 @ 5,000,000	=	5,000,000
	Sub -Total	= \$50,200,000.00

◆ ***Elaho crossing to Sims Creek, 21 km***

- ◆ The initial 15 km is on relatively flat/rolling terrain. The widening to two lane would be at easy/moderate rate

15 @ 750,000	=	11,250,000
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- ◆ The last 6 km section is built on very steep and difficult terrain

6 @ 4,000,000	=	24,000,000
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- ◆ Small Bridges

6 @ 1,000,000	=	6,000,000
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- ◆ Sims canyon Bridge

1 @ 2,500,000	=	2,500,000
	Sub - Total	= \$43,750,000.00

Total to Upgrade Squamish/Sims Valley = \$140,750,000.00

2. StillWater to Eldred River Valley, 70 km

- ◆ The road width diminishes the further away it is from Stillwater. The first 45 km is approximately 6m wide. The terrain is relatively rolling. Since the base is slightly wider than the road section on the Squamish side the rate is assumed at 500,000/km

45 @ 500,000	=	22,500,000
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- ◆ The remaining 35 km is less than 5m wide and the terrain is more difficult.

35 @ 1,500,000	=	52,500,000
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- ◆ Upgrading of minor crossings

18 @ 1,000,000	=	18,000,000
	Sub - Total	= \$93,000,000.00

3. Hunaechin Valley Road, 10 km.

- ◆ Similar to the latter section of the Eldred Valley road the section is assumed difficult to construct

10 @ 1,500,000	=	15,000,000
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- ◆ Major crossing at Skwawka River

1 @ 2,500,000	=	2,500,000
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- ◆ Minor crossings 4 @ 1,000,000

4 @ 1,000,000	=	4,000,000
	Sub - Total	= \$21,500,000.00

Total to Upgrade Stillwater to Hunaechin = \$114,500,000.00

TOTAL FOR UPGRADING EXISTING ROADS = \$255,250,000.00

B) New Links:

1. Eldred - Hunaechin Link:

This link will consist of a steep grade road construction to a certain elevation on both sides connected by a tunnel.

- ◆ 8 km of Steep grade and very difficult terrain construction including minor structures
12 @ 6,000,000 = 72,000,000
 - ◆ Tunnel
6 @ 60,000,000 = 360,000,000
- Total for Eldred to Hunaechin = \$432,000,000.00**

2. Hunaechin to Sims

This stretch of approximately 21 km crosses the icefields and glaciers, and appears extremely difficult and challenging.

- ◆ 13 km of extremely difficult construction including minor structures
13 @ 6,000,000 = 78,000,000
 - ◆ 8 km of tunnel
8 @ 60,000,000 = 480,000,000
- Total for Hunaechin to Sims = \$558,000,000.00**

TOTAL FOR NEW LINKS = \$990,000,000.00

C. Total Project Estimate:

The total cost of upgrading the existing logging roads and the construction of the new links is estimated at the following.

GRAND TOTAL FOR THE PROJECT = \$1,245,250,000.00

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