

REPORT
ON
"SHORT-TERM" BANK PROTECTION WORKS
FOR THE THREATENED AREAS IN THE
CAPILANO RIVER

Department of the Environment
Inland Waters Directorate, Pacific Region
Water Planning and Management Branch
1 May 1973

CAPILANO RIVER

1. Recent developments on the banks of the Capilano River near its mouth have focused attention on the area and awareness of the danger to structures and land imposed by river erosion. Recent shifting of the low water stream has caused the erosion of some 40 feet of bank near the Capilano 100 Tower and a similar loss of land in the region upstream of the Marine Drive bridge on the east bank. The reach of the east bank along the trailer court downstream of the bridge has also suffered erosion.

The aforementioned erosion has prompted the request for an evaluation of the situation and recommendations for measures to be taken to provide short-term protection for the land and structures until a decision has been reached on the long-term plans for the development of the area and the river.

2. The Capilano River is a steep-gradient mountain stream type of a river. Its bed and banks consist of material covering the entire range from sand to boulders. The Capilano Dam stands in the course of the river; however, it is operated for the water supply of Greater Vancouver and seems to effect very limited flood modification. The main tributary to Capilano River is Brothers Creek which discharges through the west bank of the Capilano some short distance above the Marine Drive bridge. Brothers Creek is also a mountainous-type stream contributing to the sediment load of the Capilano.

3. Bulldozing of riverbed gravel to some mild slope against the bank adjacent to the trailer court has had short-term success in affording bank protection. More failures would have occurred if the river discharge had reached the level that causes motion of the average-size stones of the riverbed.

4. In general, bank protection is effected by material heavier than the heaviest of the material found in the riverbed and by anchoring such material. The use of quarry rock riprap implies anchoring and interlocking of stones due to their angularity.

5. The design of long-term bank protection works should be based on the requirements of the long-term plan of development in the area and the uses and functions of the river. For the proper design of such works, the river should be considered as a whole rather than individually by the different owners of the bank areas and the interests on the riverbed.

Long-term design should also be based on hydrological studies and measurements of river levels. Works so designed will be constructed with proper foundation, such as toe trenches for riprap, rather than in the fashion described herein for the short-term protection.

6. "Short-term" solutions to such problems do not necessarily afford full protection for a short-term. They may resist the continuous erosive forces of the river for some time but they may fail suddenly in response to high flows and especially to surge-like augmentation of the flows which the Capilano experiences.

In other words, material from the riverbed cannot provide adequate bank protection simply because, if it can be moved by the river on the bed, it cannot, resting on a sloping bank, resist the erosion forces created by concentrated flows.

Recommendations for Bank Protection

7. After considerable study of the problem but without the benefit of hydrological studies, and in view of the fact that ideas for the development of the area are in the incubation stage, the following recommendations are made for "short-term" bank protection works:

(a) The sites to be protected are shown in the attached site plan and are designated as "Site A", Site B" and "Site C".

(b) First Alternative

This alternative involves the shaping of the banks of the three sites to a slope of not steeper than 1:1.5. The shaping of the bank may be done either by excavation and/or pushing riverbed material up the slope. On the prepared banks, a layer of riprap is to be placed by truck "end-dumping" to an approximate thickness of three feet.

The riprap should consist of rock as described in Appendix I.

It should be noted that this protection is neither permanent nor can it withstand the most adverse conditions which may be encountered during the ensuing one-year period if abnormally high flows or serious changes in direction of flow occur.

A rough cost estimate of this alternative is given in Appendix I. The indicated cost is rather high; however, the riprap brought into site will be available for re-use when the development plans have been decided and the overall bank and channel stabilization works are designed.

(c) Second Alternative

This alternative is less costly; however, it implies taking more serious risks. It is presented only because the area can be kept constantly under surveillance and is accessible for emergency works to be carried out on short notice should the need arise.

This alternative consists of shaping the banks to a slope of 1:2.5 by excavation and/or pushing up riverbed material. Selected heavy material from the riverbed is to be placed on the surface of the sloped banks.

(d) Third Alternative

This alternative is a compromise between the two previous alternatives and consists of riprap on "Site A" as per the first alternative and bank shaping for "Sites B and C" as per the second alternative.

(e) Fourth Alternative

This is the least costly alternative. It involves the greatest risk and, if adopted, should be backed up with an emergency plan. The banks would be shaped to a slope of 1:2.5 by excavation and/or pushing up riverbed material without selected heavy material being placed on the surface of the bank.

8. The estimating of costs for these alternatives is rather sketchy as it is based on very limited measurements and visual inspection of the sites. The unit cost used has been arrived at by adjusting known prices paid in other areas. The \$3.00 per cubic yard of material pushed against the banks from the riverbed allows for the selective placement of heavy materials on the prepared slopes.

9. It should be mentioned that the four alternatives presented are in order of ascending risks. However, it is not likely that the river will destroy any of the banks at a rate that would not allow for emergency work to be carried out, bearing in mind that the Kapilano 100 Tower is substantially protected already by a riprap-filled trench.

10. The selection of an alternative should be made by the owners, taking into account funds available for the works, considerations of responding to emergencies, and anticipated time until the development plans are finalized and the river is properly studied.

11. Regardless of which alternative is selected, construction of the works should be in accordance with the requirement of the Fisheries Service, Department of the Environment, attached herein as Appendix II.

12. Because of the nature of bank protection works, it is very desirable that the supervising engineer discuss the matter with the office of the Regional Director, Inland Waters Directorate, Vancouver, B.C.

Department of the Environment
Inland Waters Directorate, Pacific Region
Water Planning and Management Branch
1 May 1973

APPENDIX I. EXTENT OF PROTECTION WORKS & ROUGH COST ESTIMATES

1. The location and extent of Site A, Site B and Site C are indicated on the attached site plan (Figure 1).

2. Cost Estimates

(a) Site A 1st Alternative

2nd Alternative

Rock Riprap 2000 CY @ \$25.00/CY = \$50,000

-

Excavation 1000 CY @ \$ 2.00/CY = 2,000
\$52,000

4000 CY @ \$3.00/CY = \$12,000

(b) Site B

Rock Riprap 1500 CY @ \$25.00/CY = \$37,500

-

Excavation 2000 CY @ \$ 2.00/CY = 2,000
\$39,500

5000 CY @ \$3.00/CY = \$15,000

(c) Site C

Rock Riprap 3000 CY @ \$25.00/CY = \$75,000

-

Excavation 1500 CY @ \$ 2.00/CY = 3,000
\$78,000

6000 CY @ \$3.00/CY = \$18,000

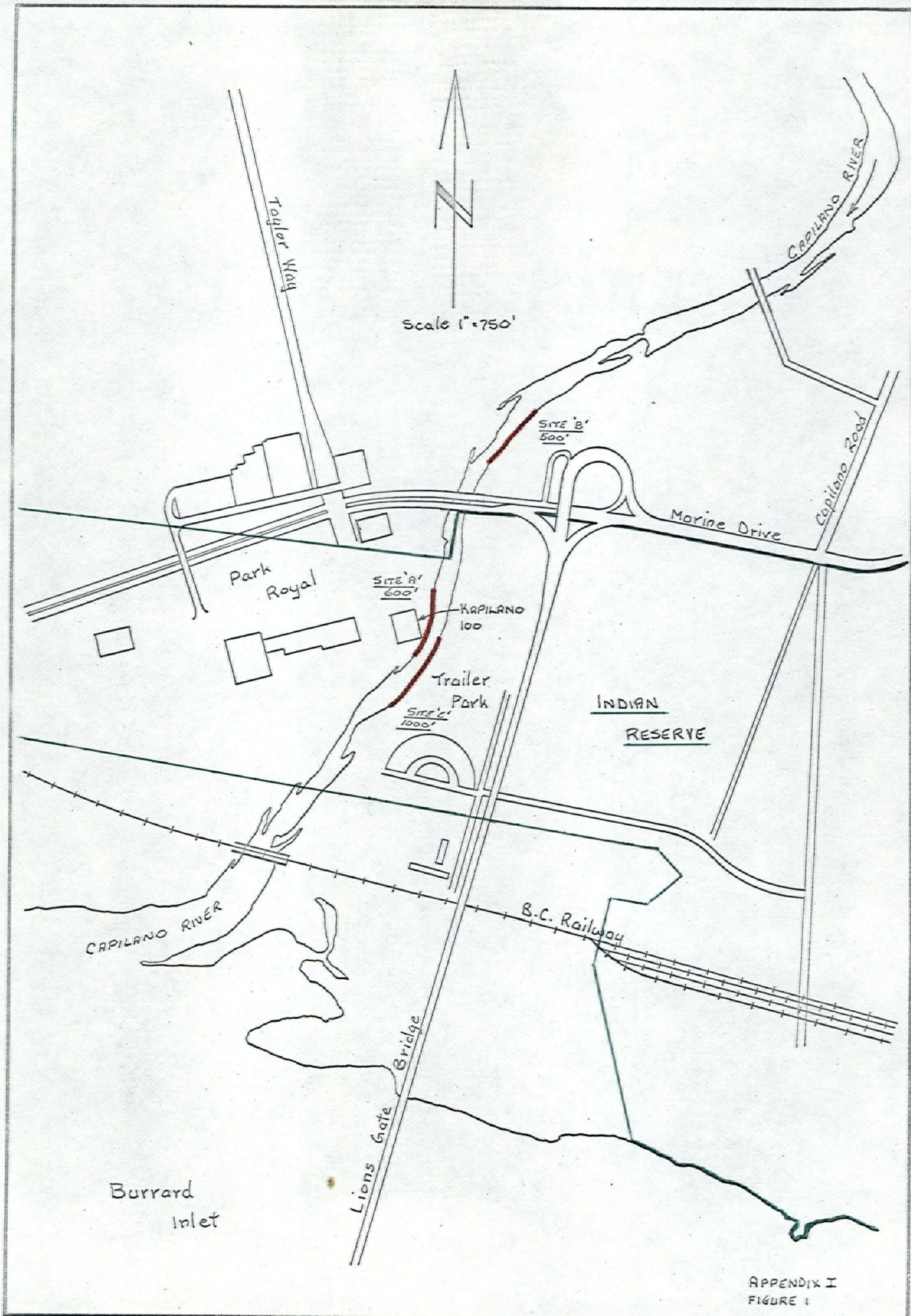
Totals: 1st Alternative \$169,500

2nd Alternative \$ 45,000

3rd Alternative \$ 85,000

4th Alternative \$ 20,000

Rock should be of the 750 lb. class.



APPENDIX I
FIGURE 1

EROSION PROBLEMS ON THE CAPILANO RIVER

APPENDIX II - Fisheries Data and General Instructions

SCOPE: This section covers the care and protection of the Capilano River with respect to fish and marine life during the proposed corrective action to alleviate the immediate erosion problems.

GENERAL FISHERIES DATA:

Table Showing Migration and Residency Periods

Specie		Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Adult Migration	Steelhead												
	Coho												
	Chinook												
	Pink												
	Chum												
Game Fish													
Fry & Smolt Migration													

GENERAL REQUIREMENTS OF THE FISHERIES SERVICE:

1. All earthwork, dredging, gravel removal, riprap and associated work shall be done in accordance with the terms of reference and/or procedures as specified by Mr. E.M. Clark, Regional Director, Inland Waters Directorate.
2. Fisheries Service approval of any work or any portion thereof does not constitute a blanket approval of any other agency who may have jurisdiction or interest in the proposed work or the site of the proposed work.
3. All pertinent sections of the Fisheries Act shall be complied with during all phases of the work. In addition, rock silt, cement grout, oil, grease, gasoline, scrap lumber or other substances, whether deleterious to fish life or not, shall not be placed in or allowed to enter the Capilano River during construction or after completion and acceptance of the work by Fisheries Service.
4. The contractor and the supervising authority shall submit to the Fisheries Service, a construction schedule complete with equipment list, hours of work and other pertinent data prior to commencement of work.
5. To minimize interference with adult spawners, Fisheries Service recommends that all river work should be completed on or before June 30, 1973. An extension of time may be granted upon submission of a revised construction schedule.
6. All work shall be performed in such a manner that migrating adult spawners, smolts and fry shall not be trapped in isolated pools and backwaters and they shall have free and unimpeded passage up and down the Capilano River at all times.