

# Regional District of Comox-Strathcona

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02 December 1988

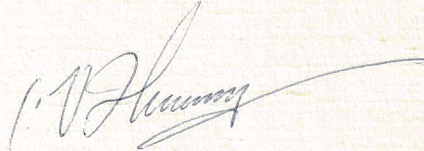
Director M. McGeein  
3914 Wavecrest Road  
Campbell River, B.C.  
V9W 5T7

Dear Sir:

Please find attached the report that you loaned me last week.  
We were able to Xerox the plan adequately.

We have reviewed the report word for word and can find no absolute elevations. The references to dyke elevations are "elevations of the flood of record plus one meter". I am assuming the flood of record is the one in December 1980. More details will be required before construction.

Yours truly,



C.V. Flemming, P.Eng.  
Director of Engineering

CVF/jmc  
Enclosure

THAT PART OF VANCOUVER ISLAND WHICH INCLUDES:

MEMBER MUNICIPALITIES: Campbell River • Comox • Courtenay • Cumberland • Sayward  
Gold River • Tahsis • Zeballos

ELECTORAL AREAS: A - Baynes Sound - Islands • B - Comox North • C - Black Creek - Puntledge • D - Oyster Bay - Buttle Lake • E - Quinsam  
F - North Campbell River • G - West Coast - Nootka • H - Sayward - Bloedel • I - Cortes • J - Coast - Discovery

Province of British Columbia  
Ministry of Environment  
Water Management Branch

PRELIMINARY REPORT ON  
OYSTER RIVER FLOODING AND EROSION

by

A. A. Brown, P. Eng.  
Senior Hydraulic Engineer

Victoria, B. C., April 1982

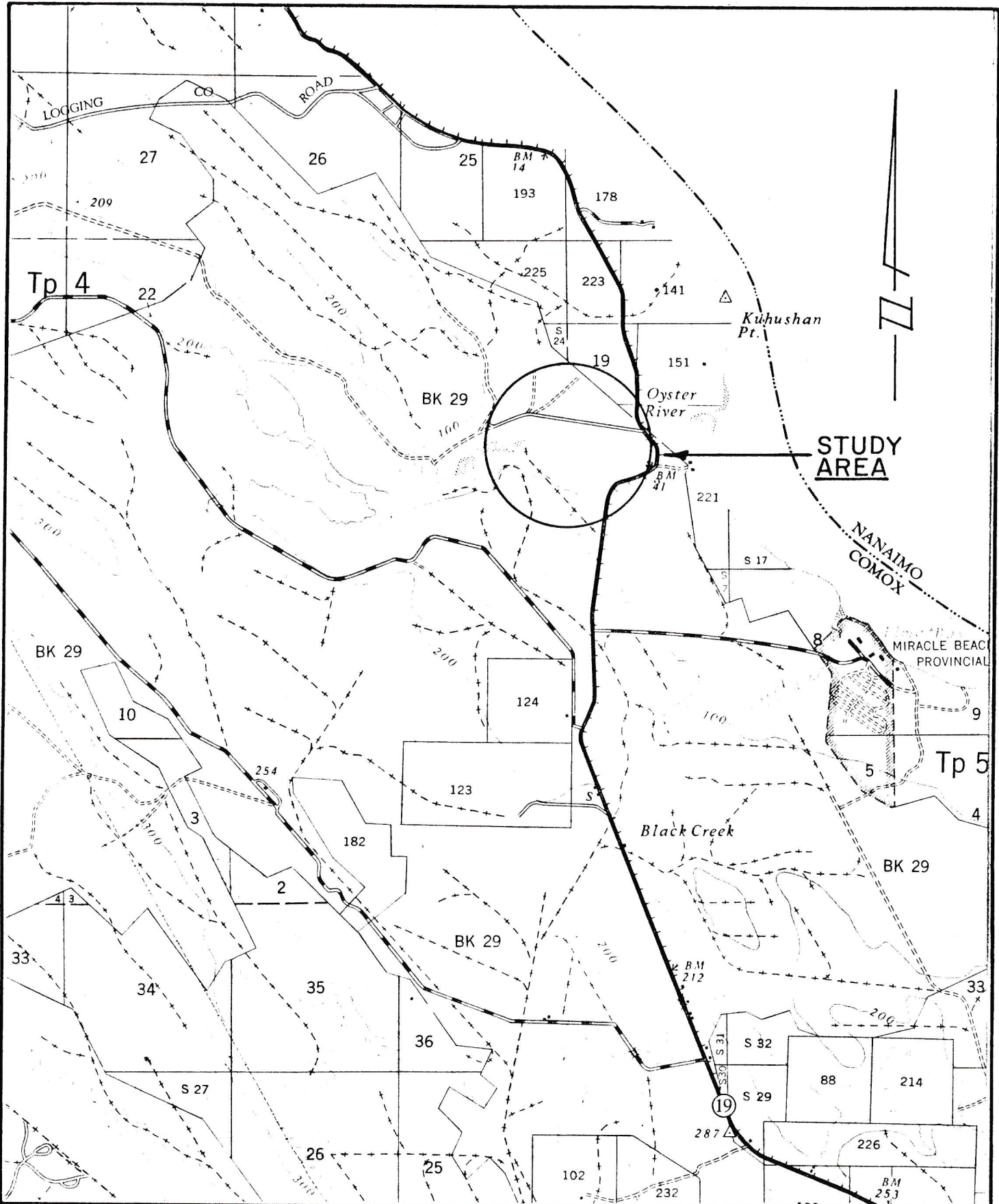
## SYNOPSIS

Flooding and erosion problems have occurred periodically on the Lower Oyster River over the past several years. In 1976, a cost-shared bank protection project was undertaken costing some \$160,000. In 1980, the Provincial Emergency Program funded repairs to the bank protection and logjam removal costing \$230,000.

The preliminary report proposing dyking and additional bank protection has been undertaken in response to a petition expressing concern over the possibility of the river jumping its banks and creating a new channel and to requests from individual landowners. The report proposes dyking estimated to cost \$216,000 and bank protection estimated at \$46,000. The dyking could, if desired, be carried out in three phases.

The report concludes that the question of funding and scope of the project should be determined prior to undertaking final design.





Province of British Columbia  
 Ministry of Environment  
 WATER MANAGEMENT BRANCH

TO ACCOMPANY REPORT ON  
**OYSTER RIVER**  
 FLOODING AND EROSION  
 SITE PLAN

*A. Brown*

A. BROWN ENGINEER

SCALE VERT  
 HOR. 1:50,000

DATE  
 FEB, 1976

FILE No. 0253786-19 DWG. No. 4918-73-13-8

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## INTRODUCTION

For approximately the last 15 years there have been erosion and flooding problems reported on the lower Oyster River. The river has its source at the 1000 metre level in Pearl Lake, approximately 5 km east of Buttle Lake. In this vicinity it drains peaks, such as Mt. Mitchell and Alexandra Peak which are up to 2000 metres high. From here it flows to the northeast, emptying into the Strait of Georgia some 46 km distant. See Drawings 4918-73-31-7 & 8. The drainage area is approximately 375 square km and includes several tributaries such as Adrian, Piggott and Woodhus Creeks and the Little Oyster River. The upper portion of the watershed is reported to have been logged recently. In the lower reaches the river occupies a u-shaped valley about 30 metres wide and is well contained until it emerges at upper Glenmore Road. See Drawing 4918-73-31-13. Here the river is currently occupying a channel along its stable southern margin. There are numerous old channel scars visible in aerial photographs in the area north of Glenmore Road. It thus appears that the river has at some previous time flowed in this area and that the sub-soil consists of gravel which the river deposited when it was flowing in that area.

Problems on the river normally occur in the late autumn, early winter when heavy rainfall and melting snow combine to cause high flows. Flooding and erosion have recently occurred on November 13, 1975 and December 26, 1980 when the average daily flow in the river was 260 and 220 cubic metres per second respectively. The estimated return period of these events is 5 to 8 years. The estimated one in 200 year flow is 500 cubic metres per second.

## BACKGROUND

In 1976, following the high flows in November 1975, bank protection was placed in three areas (see Drawing 4918-73-31-13) on a 75%-25% cost sharing basis with the local 25% share being provided through a specified services area created under the Regional District of Comox-Strathcona. A proposal to construct some dyking on upper Glenmore Road was deferred at that time.

In December 1980, high flows occurred again and considerable erosion and flooding damage was done in two areas. Extensive dyking and riprap repair work was undertaken to these two areas, on the left bank between the two highway bridges and on the right bank downstream of the old Island Highway bridge (as shown on Drawing 4918-73-31-13). In addition, minor repairs to the existing rock riprap were made and one large log jam and two smaller ones were removed. All this work was paid for under the Provincial Emergency Program at no cost to the residents. The cost was approximately \$230,000.

#### THE PROBLEM

Work under the Provincial Emergency Program was restricted to restoring the river system and existing works as near as possible to the condition which existed prior to the December 26, 1980 flooding. Two problem areas which are illustrated on Drawing 4918-73-31-14 are still outstanding. These problems are as follows:

1. Overbank flow from the old river channels in the upper Glenmore Road area still occurs during high water, flooding eight homes and cutting off traffic along Glenmore Road. In addition, the local residents are quite concerned that the river may, if not checked, jump its banks during high flow and create a new channel through a subdivision and the U.B.C. farm area to the north. A petition containing some 165 names expressing this concern was sent to the Minister on February 20, 1981.
2. Erosion on the left bank of the river just upstream of the end of the rock riprap placed in 1976 has occurred. The erosion area is some 150 metres long and the bank height varies from 6 metres at the lower end to 2.7 metres at the upper end. Requests for assistance have been received from two land-owners who have recently built new homes. No homes are at present threatened and only minor loss of land is occurring at this time, but the upstream end of the riprap placed in 1976 is being threatened.

#### REMEDIAL WORKS

The obvious solution to the flooding problem on upper Glenmore Road



would be to raise upper Glenmore Road and tie it to the high ground to the north with a spur dyke. This was the proposed solution in the 1976 report and would provide set back dykes with a considerable overbank flow area; it would also reduce the amount of bank protection needed on dykes and would leave a river corridor to allow for future river development.

Because of recent housing development in the upper Glenmore Road area, this solution would leave several houses unprotected. It is thus proposed to construct a dyke along the alignment as shown on Drawing No. 4918-73-31-15. The work required, from upstream to downstream, consists of raising the existing logging road (200 m), constructing 400 metres of new dyke around the homes at the end of Glenmore Road, raising Glenmore Road (130 m) and constructing 500 metres of new dyke to the high ground at Lorna Lane.

The crest of the proposed dyke should be 4 m wide (6.7 m wide on Glenmore Road) and should be built to an elevation of the flood of record plus one metre. The dyke face will be protected by a 1 m thick layer of rock riprap where erosion could cause damage to the dyke. See Drawing 4918-73-31-16 for details of typical cross sections.

The proposed remedial work in the erosion area is to smooth the existing alignment by cut and fill, to shape the bank to a 1:5:1 slope, and to place a 1 metre thick layer of rock riprap. See Drawing 4918-73-31-17 for typical cross sections.

COSTS

The estimated cost of the dyke construction is as follows:

1. Clearing and grubbing - 6300 m <sup>2</sup> @ \$1.50	\$ 9,450.00
2. Scarify existing paved road surface and remove to spoil - lump sum	\$ 1,000.00
3. Supply, haul and place dyke and road fill - 10,700 m <sup>3</sup> @ \$6.00	\$ 64,200.00
4. Supply, haul and place rock riprap for dyke bank protection - 3,100 m <sup>3</sup> @ \$25.00	\$ 77,500.00
5. Supply, haul and place cold mix road surfacing - 1,200 m <sup>2</sup> @ \$12.00	\$ 14,400.00
6. Internal drainage	
- supply and install two 500 mm Ø 14 m long CMP with flap gates - \$2,700.00	
- install flap gate on existing 24" Ø CMP at end of Lorna Lane - \$ 800.00	
Subtotal - \$3,500.00	\$ 3,500.00
7. Miscellaneous - replacement of fences, minor seeding, movement of power poles if necessary	\$ 10,000.00
8. Contingencies - 20%	\$ 36,010.00
	Subtotal \$216,060.00
	Say \$216,000.00

The estimated cost of the rock riprap bank protection is as follows:

1. Bank preparation - 150 lineal metres @ \$6.00	\$ 900.00
2. Supply, haul and place 1,500 m <sup>3</sup> of rock riprap @ \$25.00	\$ 37,500.00
3. Plus 20% for contingencies	\$ 7,600.00
	Subtotal \$ 46,000.00

Thus the total cost of dyking and bank protection proposed is - \$262,000.00

The dyking work could, if necessary, be carried out in 3 phases as follows: (See Drawing 4918-73-31-15.)

1. Phase I - Raise the existing logging road for 200 m and construct 400 metres of new dyke around the homes at the upper end of Glenmore Road. This would provide protection to the bulk of the homes most severely threatened during high water. In addition, it would greatly reduce the possibility of the river overflowing its banks during flood stages and eroding a new channel above the rock riprap works constructed in 1976. Since this area is the most vulnerable area to the creation of a new channel, reduction of this risk would represent a considerable benefit. The estimated cost of this work is \$86,000.
2. Phase II - Raise Glenmore Road for 130 metres and construct approximately 220 metres of new dyke. Since rock riprap bank protection is already in place in this section of river, the danger of the river creating a new channel by overbank flow from this section is not great. The proposed work will, however, prevent the river from overtopping Glenmore Road and will protect several homes from the threat of periodic flooding. The estimated cost of this work is \$97,000.
3. Phase III - Extend the dyke an additional 300 metres to the high ground east of Lorna Lane. This would close the gap and eliminate the threat of high water outflanking the dyke proposed in Phase II and flooding the lots west of Lorna Lane. The estimated cost of this work is \$33,000.

It should be noted that the rock riprap bank protection, estimated to cost \$46,000 is independent of the dyking project. It is recommended, that this work not be phased, but that it be done as a complete project.

#### MATERIAL SOURCES

Rock riprap from the Crown Zellerback pit at Wolf Lake was used for the 1976 project. Rock from a pit owned by Turnbull Trucking Ltd., Courtenay was used in the major repair work in 1980/81. The rock from both sources is quite sound and although the haul distance is considerable, no rock source of comparable quality is available locally. The rock from the Turnbull pit

is a little closer and is recommended if available.

There is a Ministry of Highways gravel pit located on Terrain Road approximately 1 km north on the Island Highway which may be suitable for dyke fill if available. Also, there are several gravel bars on the river which would be quite suitable if approval can be obtained from Federal Fisheries and the Fish and Wildlife Branch to remove material from the bars.

#### COORDINATION AND APPROVALS

Before this project can be implemented, various approval and permits have to be obtained and agreements entered into. Among the items which must be arranged for are:

1. Financing - A decision must be made on which parts of the project can be funded and a method of dividing the cost among the landowners benefitting must be decided upon. If financing is to be obtained through the Regional District of Comox-Strathcona, their concurrence is required.
2. An Approval under Section 7 of the Water Act is required for works in and about a stream from the Regional Water Manager, Nanaimo.
3. Concurrence on the project and on project timing must be obtained from the Federal Fisheries Service and the Fish and Wildlife Branch. In addition, their approval of using gravel from river bars will be required.
4. Right-of-way for construction and maintenance of the works must be obtained.
5. Since it is proposed to raise Glenmore Road and the logging road, the agreement of the District Manager of the Ministry of Highways and of Raven Timber Company, Campbell River will be necessary.

#### SUMMARY AND CONCLUSIONS

In order to solve the flooding and erosion problems along the lower Oyster River, it will be necessary to construct dykes, estimated to cost \$216,000 and to provide bank protection estimated to cost \$46,000. The dyking could, if desired, be undertaken in three phases, with Phase I being the highest and Phase III being the lowest priority. The bank protection is

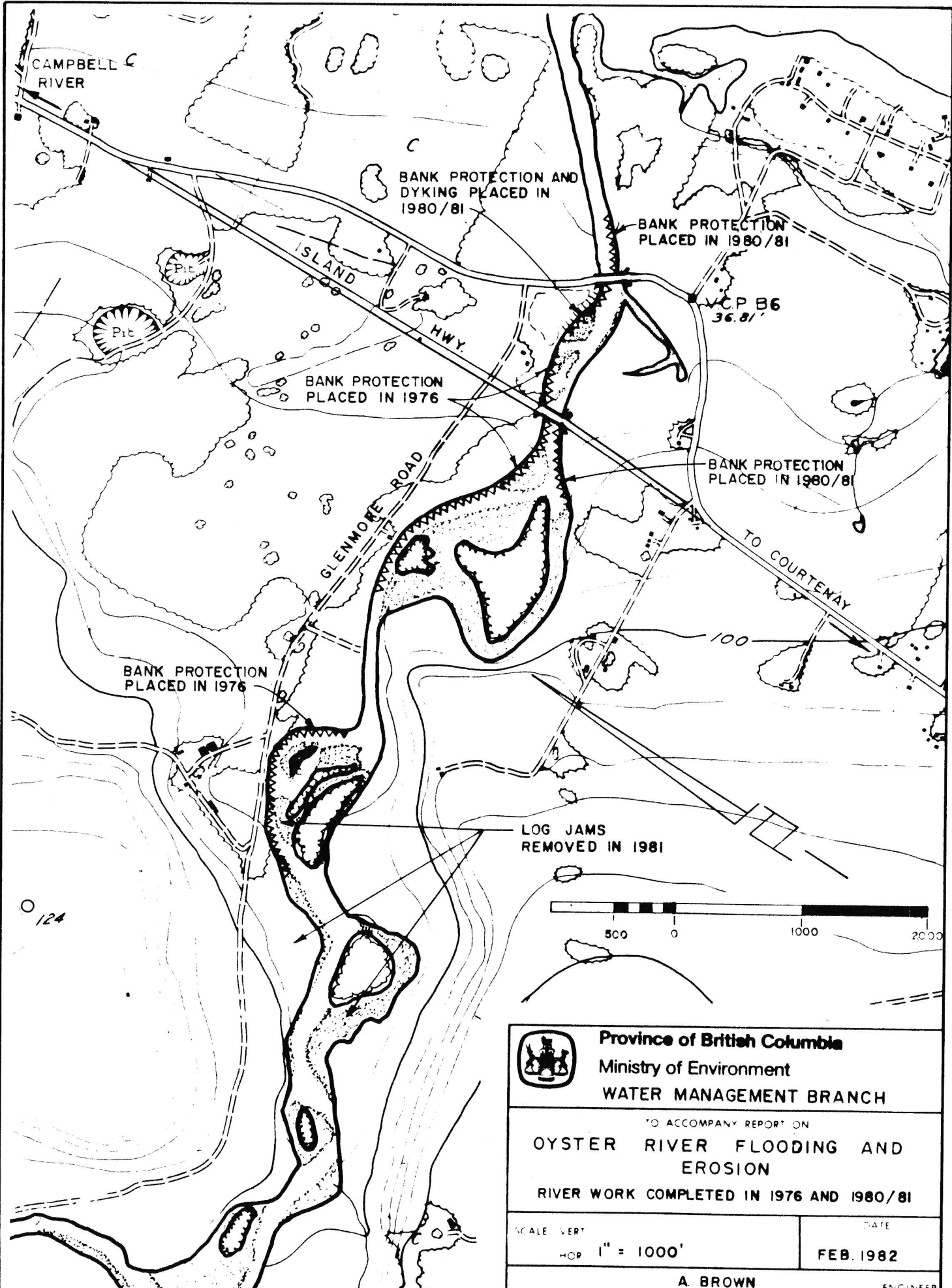
independent of the dyking.

Prior to undertaking detailed design and seeking the necessary approvals and agreements the question of funding and the scope of the project should be decided upon.



A. A. Brown, P. Eng.  
Senior Hydraulic Engineer  
Rivers Section  
Water Management Branch

AAB:sk1



CAMPBELL RIVER

BANK PROTECTION AND DYKING PLACED IN 1980/81

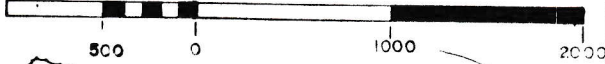
BANK PROTECTION PLACED IN 1980/81

BANK PROTECTION PLACED IN 1976

BANK PROTECTION PLACED IN 1980/81

BANK PROTECTION PLACED IN 1976

LOG JAMS REMOVED IN 1981



Province of British Columbia  
 Ministry of Environment  
 WATER MANAGEMENT BRANCH

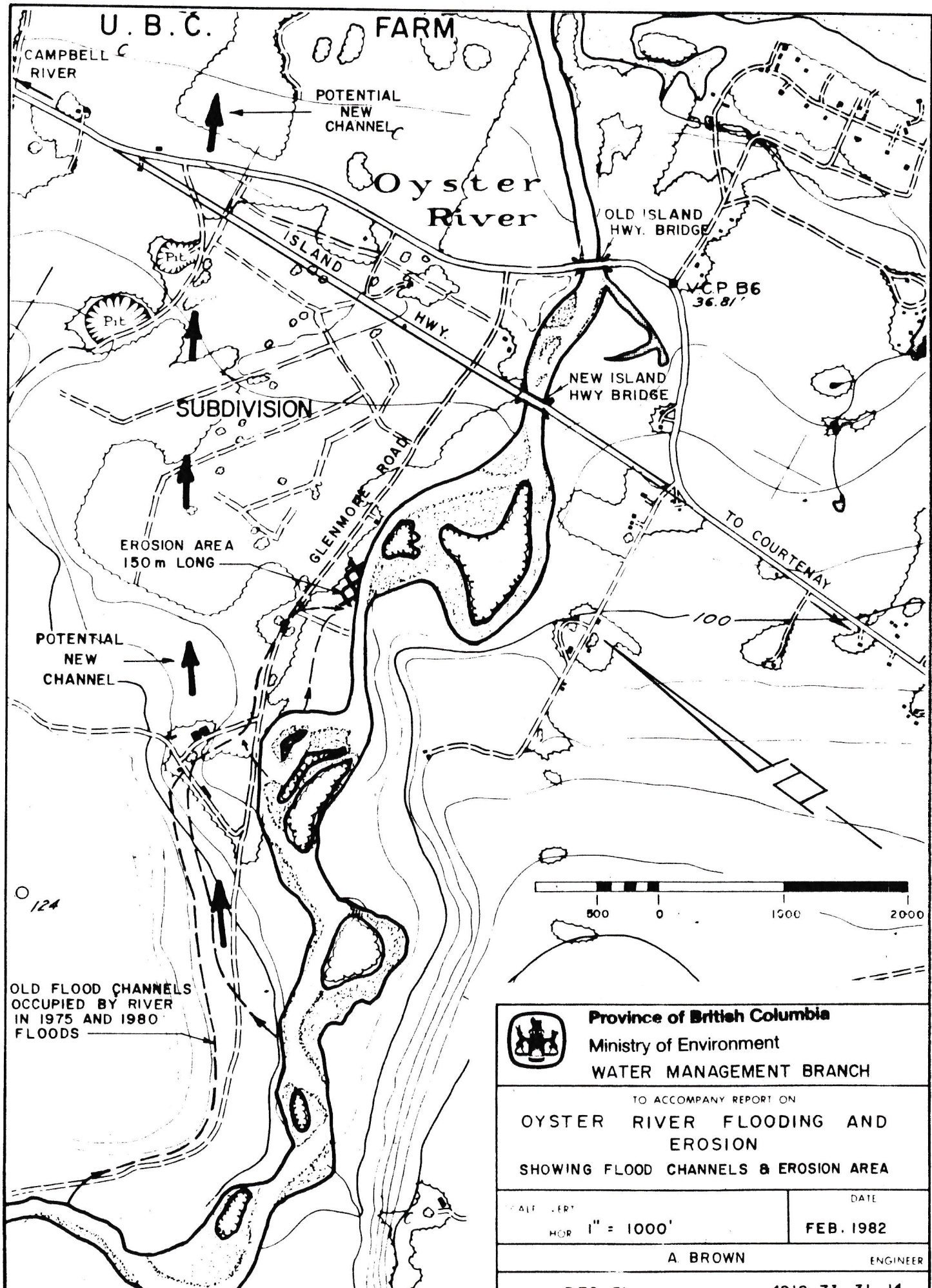
TO ACCOMPANY REPORT ON  
 OYSTER RIVER FLOODING AND EROSION  
 RIVER WORK COMPLETED IN 1976 AND 1980/81


SCALE VERT  
 HOR 1" = 1000'

DATE  
 FEB. 1982

A. BROWN

ENGINEER



 <b>Province of British Columbia</b> Ministry of Environment WATER MANAGEMENT BRANCH	
TO ACCOMPANY REPORT ON <b>OYSTER RIVER FLOODING AND EROSION</b> SHOWING FLOOD CHANNELS & EROSION AREA	
SCALE: VERT HOR 1" = 1000'	DATE <b>FEB. 1982</b>
<b>A. BROWN</b>	ENGINEER

# BROKEN ROCK RIPRAP SPECIFICATIONS

SI METRIC UNITS

IMPERIAL UNITS

% BY WEIGHT FINER THAN	MASS (kg)	APPROX. EQUIVALENT DIAMETER (mm)	% BY WEIGHT FINER THAN	MASS (lb.)	APPROX. EQUIVALENT DIAMETER (Inches)
100			100		
NOT MORE THAN 50	300	600	NOT MORE THAN 50	660	24
NOT MORE THAN 10	40	300	NOT MORE THAN 10	90	12

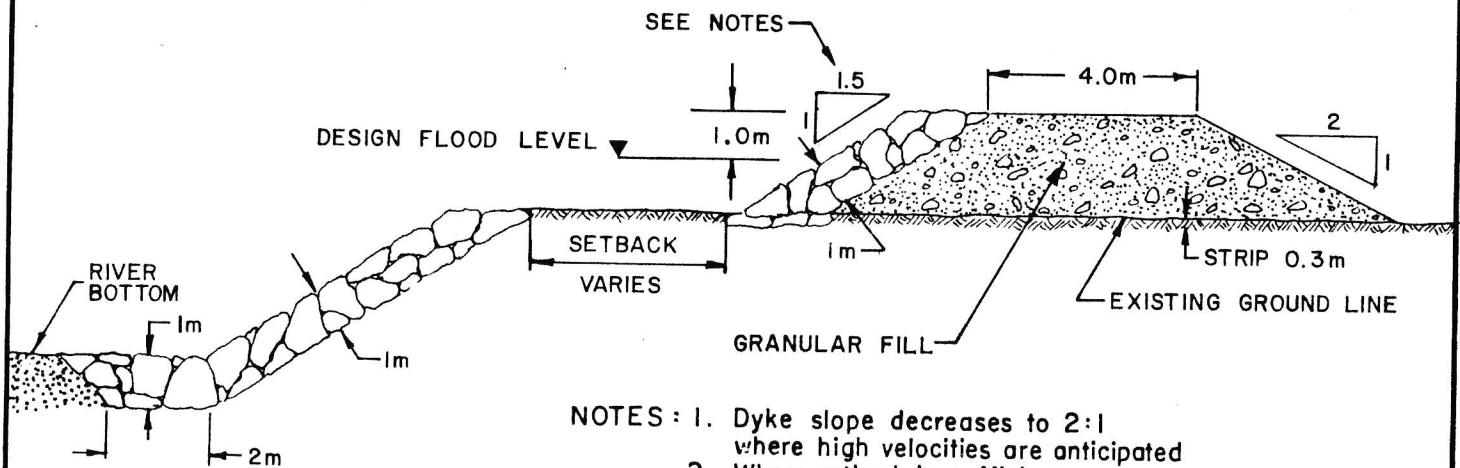
mm = MILLIMETRE

kg = KILOGRAM

1 kg = 2.2 lb

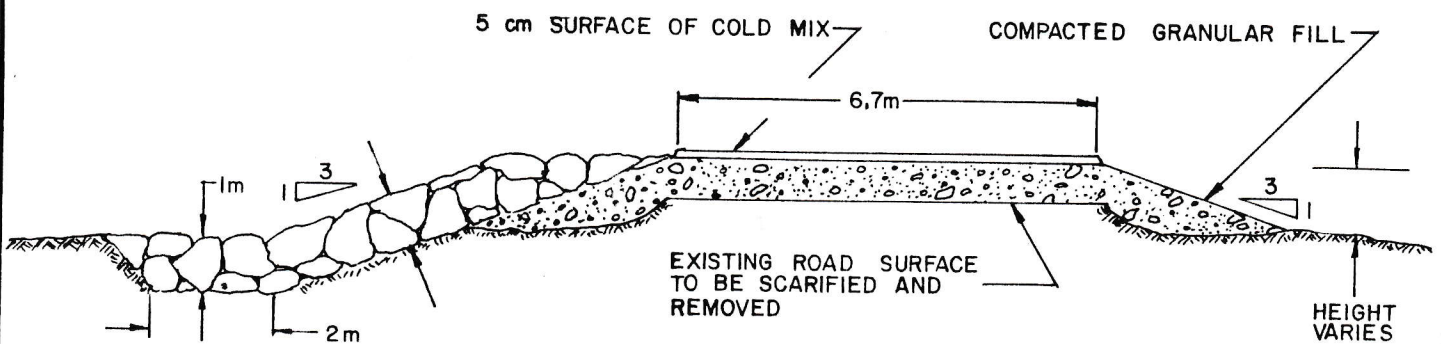
1000 mm = 1m (METRE) = 3.28 FEET

RIPRAP SHALL: 1. CONSIST OF DENSE, DURABLE, ROUGHLY EQUIDIMENSIONAL, ANGULAR PIECES.  
2. BE CLEAN AND REASONABLY WELL GRADED COVERING THE COMPLETE ALLOWABLE SIZE RANGE.



NOTES: 1. Dyke slope decreases to 2:1 where high velocities are anticipated  
2. Where setback is sufficient no riprap is required on dyke

## PROPOSED DYKE



NOTE: Approach ramps to raised sections of Glenmore Road and logging roads should be 40:1

## PROPOSED RAISED SECTION OF GLENMORE ROAD



**Province of British Columbia**  
Ministry of Environment  
WATER MANAGEMENT BRANCH

TO ACCOMPANY REPORT ON

**OYSTER RIVER  
FLOODING AND EROSION**

SCALE: VERT

HOR. NOT TO SCALE

DATE

MARCH, 1981

*A. Brown*

A. BROWN ENGINEER

FILE No. P-73-31

DWG. No. 4918-73-31-16



# BROKEN ROCK RIPRAP SPECIFICATIONS

## SI METRIC UNITS

## IMPERIAL UNITS

% BY WEIGHT FINER THAN	MASS (kg)	APPROX. EQUIVALENT DIAMETER (mm)	% BY WEIGHT FINER THAN	MASS (lb.)	APPROX. EQUIVALENT DIAMETER (inches)
100	1100	900	100	2400	36
NOT MORE THAN 50	300	600	NOT MORE THAN 50	660	24
NOT MORE THAN 10	40	300	NOT MORE THAN 10	90	12

mm = MILLIMETRE

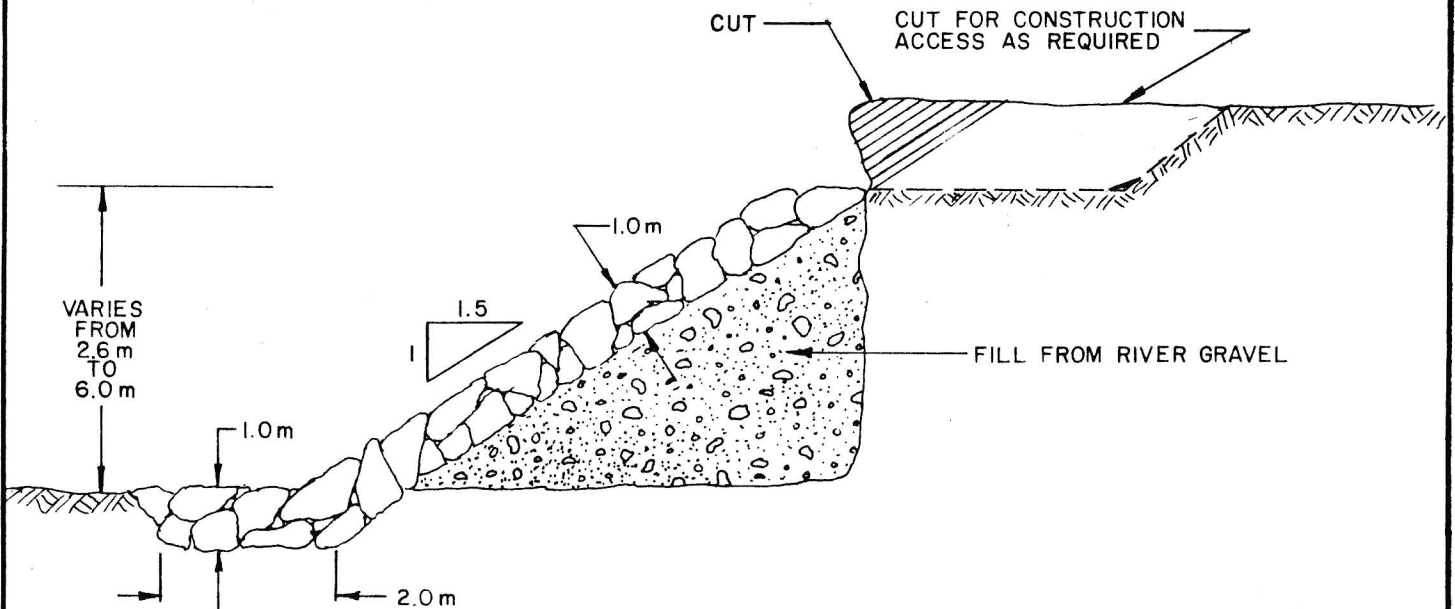
1000 mm = 1 m (METRE) = 3.28 FEET

kg = KILOGRAM

1 kg = 2.2 lb.

**RIPRAP SHALL :**

1. CONSIST OF DENSE, DURABLE, ROUGHLY EQUIDIMENSIONAL, ANGULAR PIECES.
2. BE CLEAN AND REASONABLY WELL GRADED COVERING THE COMPLETE ALLOWABLE SIZE RANGE.



**TYPICAL SECTION  
BROKEN ROCK RIPRAP**



**Province of British Columbia**  
 Ministry of the Environment  
 ENVIRONMENTAL AND ENGINEERING SERVICE  
 WATER INVESTIGATIONS BRANCH

TO ACCOMPANY REPORT ON  
**OYSTER RIVER  
 FLOODING AND EROSION**

SCALE: VERT. N. T. S.

DATE

*A. Brown*

**A. BROWN** ENGINEER