Report on Raising of Brestwork
Along Riverside Drive
in Placentia

Placentia

ShawMont Newfoundland Limited

Department of Environment

Environment Canada
REPORT ON RAISING OF BRESTWORK
ALONG RIVERSIDE DRIVE
IN PLACENTIA

Prepared by:
SHAWMONT NEWFOUNDLAND LIMITED

SMR-32-88  DECEMBER, 1988
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Water Resources Division  
Dept. of Environment and Lands  
Government of Newfoundland and Labrador  
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St. John’s, Newfoundland  
A1C 5T7  

Dear Dr. Ullah:  

We are pleased to submit our final "Report on Raising of Brestwork Along Riverside Drive in Placentia". This final report incorporates the Technical Committee's comments on the draft report.  

We appreciate the opportunity to have worked on this analysis for you and gratefully acknowledge the assistance provided by your staff.  

Yours very truly,

Vice-President  
Engineering  

DHB/gar
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1.0 INTRODUCTION

This report was authorized by the Department of Environment and Lands on behalf of the Canada-Newfoundland Flood Damage Reduction Program on 1988 12 19, based on the Department’s verbal request for a proposal on 1988 12 06, and ShawMont’s letter proposal dated 1988 12 06.

The scope of the work was to:

1. Estimate the cost of raising the brestwork along Riverside Drive, for the purpose of flood control for the 1 in 100 year flood.

2. Determine the benefit-cost ratio for the raising of the brestwork, including the construction of the wave wall along the beach.

3. Provide ten (10) copies of the final letter report including, including a description of the alternatives considered, any assumptions made and cost estimates.

2.0 BACKGROUND INFORMATION

On 1988 11 30 ShawMont submitted its final version of report number SMR-23-88 entitled “Report on Reassessment of Economic Analysis for Flood Control Measures in Placentia”. This report was a review of the economic analysis presented in the Placentia Hydrotechnical study* and compared the benefit-cost for raising Riverside Drive to several different levels, and thereby providing different levels of flood protection.

The Town Council of Placentia are still concerned about the aesthetics of raising Riverside Drive and, therefore, requested a review of raising the brestwork only, leaving Riverside Drive at its present level and retaining the boardwalk.

3.0 REVIEW OF ALTERNATIVES

As proposed, several alternatives for raising the brestwork and boardwalk were reviewed. They were:

a) Construct a new brestwork and boardwalk to the required 1 in 100 year flood level, above Riverside Drive, leaving Riverside Drive at its present level. The new construction would be

3.0 REVIEW OF ALTERNATIVES (Cont'd)

a) Cont'd adjacent to, and outside of, the existing brestwork and would be double close-sheeted with timber on the water side.

b) Same as (a) above except the new brestwork would be on top of the existing brestwork, assuming the existing brestwork is in good condition and will not require replacement prior to replacement of the new construction (assumed 30 years).

c) Construct a close sheeted structural facing of heavy timber on the water side of the existing brestwork, with the structural facing extended above the boardwalk to the required 1 in 100 year flood level. In this case the structural facing would be cantilevered above the brestwork to provide a water barrier and would replace the existing hand rail in some areas.

Of the three alternatives considered, only alternative (a) was considered to be a practical alternative. The existing brestwork is understood to be in poor physical condition and could not be assumed to be capable of providing the structural support required of it in alternatives (b) and (c). Therefore, the present evaluation of benefit-cost was limited to alternative (a).

4.0 ECONOMIC ANALYSIS

In developing the details of the preferred alternative (alternative (a) described in Section 3.0), a more economical design was found. Instead of raising the brestwork and boardwalk to the required 1 in 100 year flood level (elevation 2.34 m, including 0.3 m for freeboard), it would be more economical to construct the brestwork up to, or slightly above, the existing road level and to construct an impermeable and stable wall above the boardwalk level to the required flood level. The proposed conceptual detail of the new brestwork is shown on Drawing BI-84979-2 in Appendix II.

The proposed arrangement assumes that the existing brestwork is not structurally competent and that the new brestwork must be an independent structure. It was also assumed that the new brestwork could be constructed immediately adjacent to the existing structure and that the existing structure would essentially be left in place. In fact, the existing boardwalk and upper timbers could be removed and replaced with gravel to increase the shoulder width of Riverside Drive; however, the cost to do this was not included in the cost estimate.

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The new brestwork would be constructed on a prepared base by excavating an approximately 0.5 m deep and 2-3 m wide trench along the front of the existing structure. A close-sheeted timber floor and facing (the facing timbers would be driven as far as possible into the seabed to effect a water cutoff) would provide a reasonably impermeable structure to limit the flow of water through or around the brestwork during high water levels. The timber facing would comprise an impermeable membrane and would be constructed to a minimum elevation of 2.34 m, thereby providing 0.3 m of freeboard for the 1 in 100 year flood level of 2.04 m. The timber facing would be a structural component of the brestwork extending approximately 1.2 m above the new boardwalk, to provide a hand rail and water barrier to high water levels.

At each end of the brestwork (approximately 1,000 m long) earthfill dykes would tie the brestwork to high ground, thereby providing a continuous barrier to the high water levels in the Northeast Arm, the Narrows, and Swan Arm. The extent of the earthfill dykes, brestwork and details of the dykes are shown on drawing Bl-84979-2 in Appendix II.

The construction of the new brestwork would require the demolition of two existing structures located along the existing brestwork. These are the old shed and dock, called the Alyward's property at the north end of Riverside Drive, and the fishing wharf located near the south end of Riverside Drive. It is understood that the Alyward's property is in a delapidated condition and should be removed whether or not the brestwork is constructed. For this reason the cost of demolition of this property is not included in the cost estimate for the new brestwork. The fishing wharf is a relatively new structure and must only be demolished to facilitate construction of a continuous brestwork. It could be replaced, outside of the brestwork, once the brestwork was completed, or it could be incorporated into the brestwork.

4.1 COST ESTIMATE

To provide cost data for a review of the benefit-cost of constructing the new brestwork along Riverside Drive, a detailed cost estimate was prepared and is provided in Appendix I. This estimate was based on the same year's dollars as used in the Hydrotechnical Study and the most recent reassessment of the economic analysis (December, 1984 dollars).
4.1 COST ESTIMATE (Cont'd)

For the cost estimate, the latest available mapping* used in the most recent report on the reassessment of the economic analysis for the flood control measures in Placentia, was used to prepare a profile and typical cross-sections for Riverside Drive as shown on Drawing B1-84979-2 in Appendix II. These were based on spot elevations and contours from the mapping, supplemented by field observations and basic measurements taken for the recent investigation noted above.

4.2 BENEFIT-COST ANALYSIS

A benefit-cost analysis for the new construction was completed using the same water level/damage values and the same principles and methodologies for computing average annual damages, present values and benefit-cost ratios, as used in the previous studies. The present value analysis includes the cost of reconstructing the brestwork in year 30.

Table 4.1 provides a comparison of the benefits and costs for the new brestwork and the original raising of Riverside Drive to elevation 2.34 m. Both alternatives include the cost of the wave wall along the Placentia beach. It can be seen that the benefit-cost ratio for the new brestwork is considerably less than for the raising of Riverside Drive (1.3 versus 2.2).

5.0 CONCLUSIONS

Based on the review of brestwork construction along Riverside Drive the following conclusions are made:

1. The most practical alternative would be a new, independent structure constructed outside of the existing brestwork.

2. The rockfilled timber crib portion of the brestwork should only be constructed to elevations equal to or just above the adjacent Riverside Drive elevations and the barrier to high water levels provided by an impermeable structural timber wall attached to the outside of, and cantilevered above, the timber crib.

3. The benefit-cost ratio of constructing the new brestwork and the wave wall on the Placentia beach would be 1.3.

* Flood risk map of the Placentia area, prepared in 1984 from aerial photographs flown in June, 1984, to scale of 1:2500 with one and two metre contours.
## Table 4.1
Comparision of Benefits and Costs for Constructing Breastwork along Riverside Drive versus Raising Riverside Drive

<table>
<thead>
<tr>
<th>ALTERNATIVE</th>
<th>(1) WATER LEVEL (m)</th>
<th>FLOOD EVENT PROTECTION</th>
<th>PV BENEFITS ($1000)</th>
<th>PV COSTS ($1000)</th>
<th>NET PV ($1000)</th>
<th>B/C RATIO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raise Riverside Drive to El. 2.34 m + Wave Wall (2)</td>
<td>2.04</td>
<td>1:100 yr</td>
<td>2,913</td>
<td>1,307</td>
<td>1,606</td>
<td>2.2</td>
</tr>
<tr>
<td>Construct Breastwork along Riverside Drive + Wave Wall</td>
<td>2.04</td>
<td>1:100 yr</td>
<td>2,913</td>
<td>2,178</td>
<td>735</td>
<td>1.3</td>
</tr>
</tbody>
</table>

Notes:

1. Water level is expressed in metres above Geodetic datum.
2. This alternative was included in the Hydrotechnical Study and the Report on Reassessment of Economic Analysis for Flood Control Measures in Placentia. PV = Present Value, B/C Ratio = Benefit-Cost Ratio.
APPENDIX I
COST ESTIMATE
## APPENDIX I - COST ESTIMATE

**RAISE BRESTWORK ALONG RIVERSIDE DRIVE**

<table>
<thead>
<tr>
<th>Description</th>
<th>Unit</th>
<th>Cost</th>
</tr>
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<tbody>
<tr>
<td>Contractor Mobilization and Demobilization</td>
<td>Provisional</td>
<td>$20,000</td>
</tr>
<tr>
<td>Demolition of Existing Shed &amp; Dock</td>
<td>Provisional</td>
<td>$-</td>
</tr>
<tr>
<td>Demolition &amp; Replacement of Existing Wharf (Ch 0+800)</td>
<td>Provisional</td>
<td>$10,000</td>
</tr>
<tr>
<td>Excavation</td>
<td>1550m³ @ $15/m³</td>
<td>$23,000</td>
</tr>
<tr>
<td>Timber Crib Brestwork</td>
<td>2300m² @ $250/m²</td>
<td>$575,000</td>
</tr>
<tr>
<td>Close Sheeted Timber Facing</td>
<td>4200m² @ $100/m²</td>
<td>$441,000</td>
</tr>
<tr>
<td>Timber Decking (Boardwalk)</td>
<td>1480m³ @ $25/m³</td>
<td>$37,000</td>
</tr>
<tr>
<td>Mass Fill</td>
<td>5000m² @ $12/m²</td>
<td>$60,000</td>
</tr>
<tr>
<td>Wave Wall</td>
<td>300m @ $1450/m²</td>
<td>$435,000</td>
</tr>
<tr>
<td>Drainage Culvert with Flap Gate</td>
<td>Lump Sum</td>
<td>$15,000</td>
</tr>
</tbody>
</table>

Sub-Total                                        |                  | $1,616,000|
15% Contingency Factor                           |                  | $242,000  |

Total Construction                                |                  | $1,858,000|

Engineering including pre-design services (site survey, sub-surface investigations), design services, administration and inspection services during construction. | $186,000 |

Total Estimated Cost                              |                  | $2,044,000|

**Notes:**

- $3,000 maintenance to brestwork every 2 years.
- 100% reduction in flood damage for 1 in 20 and 1 in 100 year events.
- 30 years economic life on brestwork.

*Estimate does not include cost for demolition of the existing shed and dock since this should be removed whether or not brestwork is constructed.*