

Elbow River Flood Mitigation Project Decisions Fact Sheet

Benefit-cost analysis studies show the Springbank Off-stream Reservoir offers a higher benefit-cost ratio than the McLean Creek Dry Dam or Glenmore Reservoir Diversion (also known as the Calgary Tunnel).

Benefit-Cost Ratios for Proposed Projects

	Worst-Case Damage Scenario		Anticipated Damage Scenario	
	1:100 Protection	1:200 Protection	1:100 Protection	1:200 Protection
Springbank Off-stream Reservoir	1.87	2.07	1.32	1.32
McLean Creek Dry Dam	1.43	1.65	1.01	1.05
Glenmore Reservoir Diversion	1.21	1.20	0.81	0.83

Assumptions and Methodology

Assumptions and methodology used in **all three** benefit-cost analyses:

- Damage assessments were generated for nine return frequencies to calculate average annual damages, including: 1:2 year, 1:5 year, 1:10 year, 1:20 year, 1:50 year, 1:100 year, 1:200 year, 1:500 year and 1:1000 year.
- Damage estimates were also assessed under two cases:
 - a higher, or “worst case”, condition, and
 - a lower, or “anticipated case”, condition.
- Costs are based on the estimated capital and operational/maintenance costs presented in Section 4 of each report.
- Benefits are based on the quantification of flood damages averted as outlined in Section 5 of each report.
- The benefit/cost analysis has been carried out using a net present value analysis.
- A 100-year economic analysis was used.
- Annual operating and maintenance costs are assessed at \$1.8 million.

For both the **Springbank Off-stream Reservoir** and **Glenmore Reservoir Diversion**, \$8.9 million in capital costs were added to each project to account for required mitigation measures upstream in Bragg Creek and Redwood Meadows.

For the **Springbank Off-stream Reservoir**, an additional \$40 million in capital costs were added to account for land acquisition.

For the **McLean Creek Dry Dam**, an additional \$45 million in capital costs were added to account for the replacement or relocation of impacted Parks infrastructure.

For both the **Springbank Off-Stream Reservoir** and **McLean Creek Dry Dam**, it was assumed that once the design event is exceeded, full damages are incurred. This is due to the absence of additional hydrologic routing.

For the **Glenmore Reservoir Diversion**, it was possible to calculate the reduced damages that would be achieved as a result of the 500 and 700 cubic metres per second diversion (1:100 year and 1:200 year protection, respectively). The incremental flow was passed downstream and damages based on the reduced flood flow were computed to determine the net benefits. Consequently, a higher benefit can be attributed to the diversion scheme based on this higher level of analysis.

Total Estimated Costs for Proposed Projects

Below is a breakdown of the estimated costs for 2013-level protection used in the benefit-cost analysis for each project. Annual operating and maintenance costs of \$1.8 million were added to each project.

	Springbank Off-stream Reservoir	McLean Creek Dry Dam	Glenmore Reservoir Diversion (700 m ³ /s)
Estimated construction costs for 2013-level protection	\$214,768,000	\$294,581,000	\$498,200,000
Land acquisition	\$40,000,000		
Park/Infrastructure replacement		\$45,000,000	
Bragg Creek protection	\$8,900,000		\$8,900,000
Environmental Impact Studies		\$4,000,000	
TOTAL	\$263,668,000	\$343,581,000	\$507,100,000

Provincial Flood Damage Assessment Study

The Alberta government initiated the Provincial Flood Damage Assessment Study (PFDAS) in July 2014 to:

- Update/develop flood damage curves in select communities at risk of flood to 2014 economic values and establish adjustment indices for their use in 60 different flood-prone communities across Alberta;
- Develop a computerized model for estimating flood damages; and
- Undertake flood damage estimates for select communities in Alberta.

Key points regarding content and structural stage-damage curves include:

- Direct flood damages were estimated separately for residential and non-residential structures, and also for losses to structures versus contents;
- Potential losses vary significantly by the type of use, reflecting differences in construction materials, techniques and quality, and also in the amount and type of contents located in those structures;
- The analysis resulted in updated depth-damage curves for various categories of residential and non-residential structures and contents based on extensive first- and second-order research including representative sampling of residences and non-residential structures within selected functional groups.

Calgary, High River, Fort McMurray and Drumheller were identified as high priority communities and will be the subject of flood damage assessments undertaken as part of the PFDAS. Flood damage assessments for High River, Fort McMurray and Drumheller will be complete at the end of March.

The City of Calgary was selected for the pilot study due to recent flood damage experience, large inventory of residential and commercial structural types and categories, recent update of hydraulic modelling in 2012 and analysis of 2013 flood flows, and availability of accurate rehabilitation costs.

Total damage along the Elbow River (within Calgary) for a 1:100 year flood Anticipated Damage Scenario

Categories of Damage	Direct	Indirect	Total
Residential	\$299,716,000	\$44,957,000	\$344,673,000
Commercial	\$10,205,000	\$4,592,000	\$14,797,000
Infrastructure	\$69,666,000	\$13,933,000	\$83,599,000
Stampede	\$68,900,000	\$26,400,000	\$95,300,000
Total	\$448,487,000	\$89,882,000	\$538,369,000

The full versions of all reports are available at <http://www.alberta.ca/flood-mitigation-studies.cfm>.