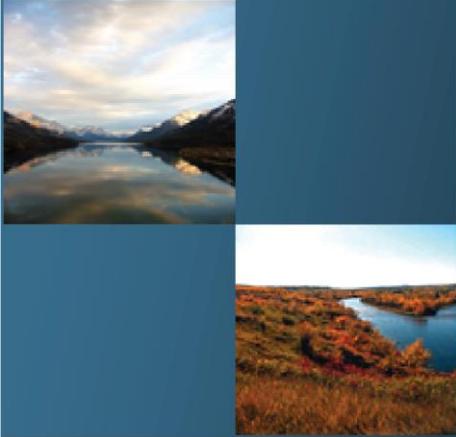
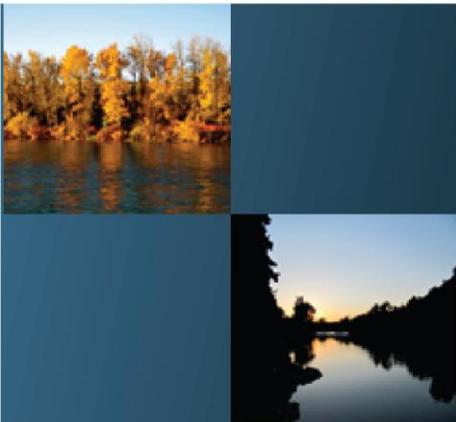


# The 2013 Great Alberta Flood: Progress Report on Actions to Mitigate, Manage and Control Flooding



Final version  
April 24<sup>th</sup>, 2014



[info@albertawatersmart.com](mailto:info@albertawatersmart.com)

WaterSMART Solutions Ltd  
#200, 3512-33 Street NW  
Calgary, Alberta T2L 2A6  
[www.albertawatersmart.com](http://www.albertawatersmart.com)

## Contents

|                                  |           |
|----------------------------------|-----------|
| <b>1. Introduction</b> .....     | <b>3</b>  |
| <b>2. Background</b> .....       | <b>3</b>  |
| <i>Purpose and Process</i> ..... | 4         |
| <b>4. Summary of Gaps</b> .....  | <b>4</b>  |
| <i>Short-Term Gaps</i> .....     | 5         |
| <i>Medium-Term Gaps</i> .....    | 6         |
| <i>Long-Term Gaps</i> .....      | 8         |
| <b>5. Summary</b> .....          | <b>9</b>  |
| <b>6. References</b> .....       | <b>10</b> |

## Introduction

Spring run-off and flooding have occurred frequently in southern Alberta over the last 140 years of recorded river flows. However, the June 2013 flood event proved to be the most devastating and damaging in our Province's recorded history. Tens of thousands of families and individuals were displaced from their homes, four lives were lost, businesses were greatly disrupted, and estimated property damage exceeded \$6 billion.

In the days and weeks following the flood, efforts focused on returning communities to business as usual. To do this, municipalities worked around the clock to get essential services such as water treatment and transportation operational again. The provincial government offered emergency funding to families impacted by the flood and volunteer workers helped with clean-up efforts. While the immediate needs of southern Albertans were met with enthusiasm and exceptional cooperation, a larger framework for recovery was being set in motion.

The Alberta government's creation of the Assistant Deputy Minister (ADM) Flood Recovery Task Force was initiated in the immediate aftermath of the June 2013 floods to support the Ministerial Flood Recovery Task Force. The ADM Flood Recovery Task Force is mandated with coordinating and supporting recovery efforts in communities impacted by the flood. In addition to the ADM Flood Recovery Task Force, a variety of activities have been undertaken by municipal governments, businesses, individuals and communities to rebuild areas impacted by the flood which have helped southern Albertans overcome the devastating impacts of this natural disaster.

Recommendations outlined in the original Flood White Paper, *The 2013 Great Alberta Flood: Actions to Mitigate, Manage and Control Future Floods*, were intended to provide logical, science-based, proactive actions that could be used to strengthen Alberta's ability to respond to natural disasters. While the majority of recommended actions have been addressed, gaps remain that will require attention to further achieve well-rounded and comprehensive decision-making in the area of flood mitigation. The purpose of this progress report was to engage as many water experts and members of the public as possible to capture all flood recovery and mitigation projects to date and address areas that requiring further action.

## Background

This Progress Report is a follow-up document to the original Flood White Paper entitled, *The 2013 Great Alberta Flood: Actions to Mitigate, Manage and Control Future Floods* released by Alberta WaterSMART on August 2, 2013. Specifically, the following six recommendations provided the focal point for the analysis of actions and next steps to be determined:

1. Anticipate and plan for more extreme weather events, including both flood and drought;
2. Improve our operational capacity to deal with potential extreme weather scenarios through better modeling and data management;
3. Investigate the cost-benefit balance of investing in physical infrastructure such as on and off-stream storage, diversions, and natural infrastructure such as wetlands;
4. Consider flood risks in municipal planning and strengthen building codes for new developments in floodplains;
5. Evaluate options for overland flood insurance, and;
6. Manage our water resources collaboratively, following examples of the Bow River Consortium and the Cooperative Stormwater Management Initiative, and ensure Watershed Planning and Advisory Councils (WPACs) across the province have proper authority and funding.

### ***Purpose and Process***

The purpose of this progress report was to engage members of the public and water experts to capture flood recovery and mitigation projects to date and address areas that require further action. The analysis was structured around actions outlined in the *Great Flood White Paper*, matching actions currently underway or taken to date with the recommendations. This allowed the research team to identify gaps. These gaps were subsequently sorted into three stages depending on the length of time needed to resolve: short-term (in 2014), medium-term (into 2015) and long-term (2015 and after).

The first draft of the *Progress Report* was distributed to the original contributors of the *Flood White Paper* to provide feedback. Comments provided by contributors have been included in the final version of the *Progress Report*. Additionally, a version of the *Progress Report* was posted [here](#) on the Alberta WaterPortal for input and comments from the public. For the final version, every effort was made by the authors to include comments received. Any errors or omissions in this document are the responsibility of the authors and not the contributors.

### **Summary of Gaps**

Overall, significant progress has been made on many of the action items recommended in the *Great Flood White Paper*. While many action items are currently underway or have been addressed, there remain a number of options that have not yet been pursued. Each open action item has been summarized within a timeline of short term gaps that should be addressed within 2014, medium-term gaps that can occur by 2015, and long-term gaps that should be considered for broader water management after 2015. Open action items are summarized within these three timelines:

### 1. Short-term gaps

- Conduct cost-benefit and risk analyses to assess the best use of capital funds to support infrastructure spending decisions – Underway but not yet completed.
- Conduct cost-benefit and risk analyses to assess the best use of capital funds to support municipal planning and land-use decisions – Underway but not completed.
- Use the best available risk assessment tools – This is a focus of the City of Calgary's Expert Panel, but we are unclear on specific progress on this action.

### 2. Medium-term gaps

- Improve predictive capacity through increased modeling and data management – Well underway but not yet completed.
- Develop a better understanding of the relationship between flooding and groundwater – Just now receiving increased attention.
- Re-evaluate the potential for slumps and mudslides during flood events – Just now receiving increased attention.
- Engage public health professionals in assessing flood mitigation measures – Not done to date to the best of our knowledge.
- Improve watershed management, especially headwater areas so that natural wetlands and riparian zones continue to act as a buffer for heavy rainfall – Identified as a key issue but not yet underway.

### 3. Long-term gaps

- Refine our zoning and building codes – Underway but not yet completed.
- Consider creating a Headwaters Management Authority – No action to date.
- Implement a Water Literacy Campaign – Underway but more to do.

This *Progress Report* expands on these three gap areas in an effort to inform current policy discussions and encourage public awareness of recovery and flood mitigation actions done to date. The observations provided indicate areas where there is still room for improvement.

#### 1. Short-Term Gaps

Short-term gaps refer to recommendations that have not been fully addressed or observed in the original *Great Flood White Paper*, but should be considered in 2014. Additionally, these gaps have been identified in our analysis as the most-pressing and important areas to fulfill before a decision is made on flood mitigation methods.

- **Conduct an open and transparent cost-benefit and risk analyses to assess the best use of capital funds to support infrastructure and spending decisions.** While a cost-benefit analysis was conducted for the Flood Recovery Erosion Control (FREC) program, no specific announcements have been made on cost-benefit analyses for other infrastructure projects. This is an important area to pursue before a final decision on large flood mitigation infrastructure is made. Understanding the costs, benefits and risks of specific projects is integral to present and future uses of flood

mitigation developments. A cost-benefit analysis should also include an understanding of the benefits and risks of specific projects occurring in different watersheds as well as upstream and downstream risks of proposed projects. For example, contributors expressed concern with inadequate cost-benefit analyses of dry dam infrastructure that could easily become clogged with debris in the event of a flood, further requiring high maintenance costs. A cost-benefit analysis should also account for fairness by not passing costs and/or impacts from those who have chosen to own or develop property in at-risk floodplain areas to citizens that have not made the same choices.

- **Conduct cost-benefit analyses to assess best use of capital funds to support municipal planning and land-use decisions** in municipalities that have not already done so. In pursuing cost-benefit analyses, municipalities can create a foundation for evaluating the potential for new building codes and zoning plans against the cost of their implementation. Using this approach to understand the costs, benefits and risks associated with specific projects aids in municipal planning. This includes understanding the upstream and downstream impacts of specific projects.
- **Use the best available risk assessment tools** to determine the costs, benefits and risks of specific flood mitigation projects. For example, the PIEVC infrastructure vulnerability protocol, developed by Engineers Canada, has been proven to address and understand the risks and vulnerabilities of existing infrastructure to the threat of extreme climactic weather events. Using this tool would help the provincial and municipal governments consider and assess new investments in flood mitigation infrastructure.

## **2. Medium-Term Gaps**

Medium-term gaps refer to those recommendations that have received a considerable amount of work but remain unfinished. While work has been done to address these specific areas, gaps do remain that prevent full recovery efforts from being realized. Efforts to fully address these gaps can be achieved in 2015 with coordinated efforts of all stakeholders involved.

- **Improve predictive capacity through increased modelling and data management.** Projects including the Flood Forecasting Workshop, Flood Indicators Project led by Alberta WaterSMART and Alberta Innovates – Energy and Environment Solutions (AI-EES), and work done by Alberta’s River Forecast Centre have addressed flood forecasting, modelling and data management. Gaps remain, however, in provincial government flood risk mapping that can be used in conjunction with visualization tools such as the Bow River Operational Model (BROM). Also, the availability of technology such as GRACE satellite and RADARSTAT for groundwater is limited for government employees and academics to access. To improve Alberta’s predictive capacity for flooding, flood risk mapping and the availability of new technologies should be improved to ensure reliable modelling and data management systems are being used.

It is important to note that significant work is underway in this area that ensures good solutions will be implemented as quickly as possible.

- **Develop a better understanding of the relationship between flooding and groundwater.** This is a vitally important area for understanding the sources of flooding that has yet to be explored in Alberta. While surface water flooding has been addressed as the cause for major flooding across southern Alberta in 2013, little attention has been paid to the state of groundwater and its relationship with surface water. This is of particular importance in the western half of Alberta where most river flows are on and through highly porous alluvial aquifers. Any municipality where there is a significant alluvial aquifer, such as in High River, should address groundwater. Recently, significant attention has shifted to groundwater as a source of flooding which bodes well for an increased focus on groundwater issues in the next year.
- **Re-evaluate the potential for slumps and mudslides during flood events** to determine their impact on communities downstream. This area has received little attention yet has significant implications if not fully understood. Studies should be conducted that evaluate the entire watershed and how instability upstream can heighten risks and flood impacts downstream. This includes sediment loading that can severely harm flood mitigation infrastructure. This work is linked to the groundwater work noted above.
- **Engage public health professionals in assessing mitigation measures.** Collaboration between provincial and municipal governments with public health officials is important to the response and recovery processes after a flood occurs. An assessment of the effectiveness of boil water advisories and water restrictions placed on communities during the 2013 flood could provide lessons-learned that apply to future floods or droughts. Furthermore, issues of mental health recovery and resiliency are important and should be addressed.
- **Improve watershed management, especially headwater areas so that natural wetlands and riparian zones continue to act as a buffer for heavy rainfall.** Efforts in this area have been addressed by the Alberta WaterSMART and AI-EES *Bow River Basin Flood Mitigation and Watershed Management Project*; however, more analysis is needed to fully understand options for natural flood mitigation. Both public and water expert feedback to this *Progress Report* amplified the need for more natural flood mitigation options to be studied rather than focusing solely on hard infrastructure. For example, the Alberta Wilderness Association recommended that an environmental cost-benefit analysis be conducted for possible flood mitigation solutions to ensure actions do not have costly impacts on headwaters and downstream communities, water supply, as well as fish and wildlife habitats. Additionally, it will be critical to ensure that the South Saskatchewan and North Saskatchewan Regional Plans include substantive measures to restore and maintain landscape conditions that support snow retention, promote groundwater recharge and that slow the release of water from headwater regions through improved land management.

### 3. Long-Term Gaps

In our analysis, long-term gaps emerged as areas that remain predominant goals for water management in Alberta. These actions require more study and entail more time to implement given the need to address short term actions first. For this reason, the gaps identified below can be addressed post-2015.

- **Refine our zoning and building codes** to restrict developments on floodplains. Shortly after the June 2013 flooding in southern Alberta, the provincial government released *the Flood Recovery and Reconstruction Act, Bill 27* that restricts new construction and development projects on floodplains. Additionally, the City of Calgary recently proposed changes to the *City's Municipal Development Plan* and *Land Use Bylaw 1P2007* to address flood areas throughout the city. Further actions could be undertaken to address this gap, including a review of world-class zoning and building code practices as well as how economic levers can be used to discourage floodplain developments.
- **Relocation should be explored further as a form of flood-risk reduction.** Contributors to this *Progress Report* suggested that relocation strategies remain the most cost effective means of flood risk reduction. In any discussion of new or existing developments in the floodplain there should be further promotion of relocation. Contributors also advocated that if new developments are being kept out of the floodway then it is equally important to relocate developments at risk of being flooded again.
- **Consider creating a Headwaters Management Authority** that can manage and address watershed conditions within the provincial government. Implementing a management agency with the ability to oversee land-use decisions is important to regulating future developments throughout Alberta. Additionally, given the prevalence of flooding and drought conditions experienced in Alberta, a Headwaters Management Authority would help to address these extreme circumstances. This concept is consistent with the idea of a Provincial Water Authority as outlined in the Premier's Council for Economic Strategy (May 5, 2011), but is targeted towards land-use regulation on public land in source water areas.
- **Implement a water literacy campaign** to educate Albertans about the hydrological cycle, landscape, and climactic factors affecting water supply and flooding throughout the province and the impact of private decisions have on riparian function, flood risk, water recharge and water quality. Considerable information has been made available through the Alberta WaterPortal, the GoA Flood Mitigation website, WPAC's and watershed management groups, universities, the Telus Spark Science Centre, Telus World of Science and many other water organizations. The need for a proactive water literacy campaign was specifically identified by members of the public who provided feedback to this *Progress Report*.

## Summary

Much progress has been made since the June 2013 floods. Specifically, action items recommended in the original Flood White Paper, *The 2013 Great Alberta Flood: Actions to Mitigate, Manage and Control Future Floods* have received attention with some areas requiring further action. The key short term gap to be addressed over the next few weeks as investment decisions are contemplated is the need to complete a thorough cost-benefit analysis of the various options for flood mitigation. This analysis should be comprehensive and inclusive of environmental and life-cycle costs, as well as open and transparent to the public. Furthermore, there should be a separate and specific discussion about risk and how it is reduced, transferred or transformed. This gap was clearly identified by those contributing to the *Progress Report*.

## References

Public Infrastructure Engineering Vulnerability Committee. PIEVC. Engineers Canada.

<http://www.pievc.ca/e/index.cfm>

“Premier’s Council for Economic Strategy.” Government of Alberta.

<http://alberta.ca/premierscouncileconomicstrategy.cfm>

“Protecting Albertans from future floods.” Government of Alberta. Press Release: October 28, 2013.

<http://alberta.ca/release.cfm?xID=3525407F82569-C375-ACEB-66CCC4FAAA2DEAD0>

“Southern Alberta 2013 Floods: the Provincial Recovery Framework.” Government of Alberta, Flood Recovery Task Force. July 2013: pg. 5.

<http://alberta.ca/albertacode/images/Flood-Recovery-Framework.pdf>

Wood, James. “Province boosts costs of Alberta floods to \$6 billion.” Calgary Herald. Published September 24, 2014. Accessed April 7, 2014.

<http://www.calgaryherald.com/news/Province+boosts+cost+Alberta+floods+billion/8952392/story.html>