

## Alberta's Water Challenges:

### Issues and Opportunities

#### EXECUTIVE SUMMARY

Proper water management is essential for the future environmental, social and economic prosperity of Alberta. To this end, objectives in Alberta's current water policies and legislation enable improvements for water management and environmental stewardship. For example, the *1999 Water Act* continues to provide the legislative framework for implementing the *Water for Life* strategy, although some clarification is needed on water licence transfers, stormwater use and water reuse to optimize the utilization of water, particularly in water- short basins. Collaborative water management in each of Alberta's 11 major watersheds, involving all those with an interest in the utilization of water in the watershed, is the best way of ensuring improved water management.

Over the next year, there are several key Government of Alberta (GoA) initiatives that would have a significant positive impact on water management in Alberta:

1. **Support collaborative water management and watershed organizations across Alberta.** Provide sustainable funding for watershed management across Alberta, through the Watershed Planning and Advisory Councils (WPACs) and other watershed-based governance structures. Acknowledge the critical role that these stakeholder-led organizations play in water management.
2. **Support regional water management in the Athabasca Region.** Develop a comprehensive Water Management Plan (WMP) and launch the suite of policies and frameworks needed to guide this Plan. The WMP forms a key part of the Lower Athabasca Regional Plan (LARP). Support the Regional Municipality of Wood Buffalo in building a regional water and waste system.
3. **Address groundwater issues by committing resources to research groundwater.** Invest the resources needed to map groundwater and coordinate the research work currently underway. This will specifically support our oil sands, hydraulic fracturing, and agricultural industries as well as rural communities that depend on groundwater for domestic use.
4. **Confirm the critical role of the Alberta Environmental Monitoring, Evaluation, and Reporting Agency (AEMERA) in sustainably managing our resources.** Clearly define the roles and responsibilities of AEMERA, and invest the financial and human resources needed to ensure that it is set up for success. There is an urgent need to show progress in this area.
5. **Maintain momentum on flood and drought adaptation and mitigation strategies and actions.** Continue systematically assessing options for flood adaptation and mitigation, based on good science and engineering, while recognizing the social and environmental impacts of these actions. Ensure that both flood and drought are considered in building the resilience of the entire watershed.
6. **Leverage existing investments in water research and technology development.** Acknowledge the important roles that research and technology developments play in achieving these goals.

## **PURPOSE**

The purpose of this discussion paper is to outline the key issues involved in water management in Alberta, and identify the opportunities for resolving these issues. Some opportunities for action are suggested for consideration in determining priorities and programs in water over the next year.

## **BACKGROUND**

Compared to other countries in the world, Canada is viewed as having significant sustainable water resources. Canada is projected to be one of very few countries expected to show an improvement in crop yield between now and 2050. Pressure will increase for Canada to produce more food in a world where increasing food production is threatened by declining water availability and quality. Because 66% of the irrigated land in Canada is in Alberta, this pressure will have a significant impact on Alberta.

Alberta is also home to the oil sands industry and a large portion of hydrocarbon production from the Western Sedimentary Basin. Water is the key input and key output for production of these energy sources. According to GoA statistics, water use in petroleum production is 6% of total water used annually in Alberta, compared to 69% used in agriculture. Most of the 6% of water used in petroleum production is in the water rich basins in the north, while most of the agricultural use is in the water short south.

The tension between water use for food production and water use for energy production results in a key water policy issue for Alberta, which is “the Water-Energy-Food Nexus”. More specifically, in Alberta the greatest competition for water is between instream flows, food and municipalities in the south and between instream flows, energy and municipalities in the north. The concept of the Nexus has gained considerable visibility over the last several years, particularly as the study of the Nexus has embraced issues including risk assessment and water-energy trade-offs. Interestingly, Alberta is a central case study for international experts investigating risk assessment and the Nexus, including the World Business Council on Sustainable Development. This is due to the wide range of water issues experienced in Alberta, including varied industrial uses, extreme weather events, pristine water courses starting in the mountains, major cities centrally located in watersheds, and transboundary issues. As a result of these conditions, Alberta has a spotlight on its water issues and water management practices.

Alberta’s seven major water basins each have their own unique water challenges. In short, approximately 80% of the natural water supply is located in the northern part of the Province, while approximately 80% of the province’s population lives in the southern part of the Province. That said, within each basin there can be shortages or surpluses depending on specific situations at the sub-basin level. For example, despite being located in the water-rich Peace River basin, Grande Prairie has severe water challenges due to the limited capacity of the Wapiti watershed and associated groundwater resources. The key message here is that regional water management must consider local issues. Because water is very personal, and each person experiences water in their own way, this complicates planning at a regional and provincial level. While there is a desire to implement regulatory systems that are Province-wide, these systems must be flexible to promote adjustment for the local conditions through Water Management Plans.

That said, the *Water for Life* strategy launched in 2003 and updated in 2008 currently provides the framework for guiding water policy in Alberta. As stated on the GoA website, the goals of the *Water for Life* strategy are:

- Safe, secure drinking water, which commits the GoA to maintaining not only the capital infrastructure that supports drinking water treatment and distribution, but also the sources of that water.
- Healthy aquatic ecosystems, including defining what a healthy aquatic ecosystem looks like (including measurable criteria) and determining information is required before decisions can be made.
- Reliable quality water supplies for a sustainable economy, including improvements in surface and groundwater management, as well as consideration of transfer and use systems (for example, dams, irrigation canals, and water licences).

The following are the three key directions that guide the implementation of these goals:

- Knowledge and research, including information sharing and educational tools, as well as improving scientific understanding.
- Partnerships, engaging citizens, communities, industries, and government through the Alberta Water Council, Watershed Planning and Advisory Councils, and Watershed Stewardship Groups.
- Water conservation, through a combination of improving the ability to capture and store water during high flow periods, as well as improving water practices through conservation, efficiency, and productivity efforts.

The current *Water Act* is the legislative framework guiding water management in Alberta. This Act provides the legal framework necessary for water allocation and management. However, there are gaps in this legislation that should be addressed to enable truly effective water quantity and quality management. For example, the legislation does not provide clear guidance on water conservation and reuse, including stormwater use. Renewal of these policies to encourage water conservation and reuse is the next step in their success.

The current *Water Act* also clearly separated water rights from land rights so that a landowner with a water licence can monetize the water licence separately from monetizing their land. This separation enables water licence transfers from the landowner to another water user. For example, the Watermark residential subdivision located in Rocky View obtained a water licence for country residential use, which was originally allocated for agricultural use. This example illustrates that water license transfers are already occurring in Alberta.

The *Alberta Land Stewardship Act (ALSA)* and *Land-Use Framework (LUF)* provided the legislative and policy framework respectively for regional plans, of which two plans were completed. The South Saskatchewan Regional Plan (SSRP) was released in July 2014, and the Lower Athabasca Regional Plan (LARP) was released in August 2012. Water issues figure prominently in both of these regional plans.

There is an approved Water Management Plan (WMP) in the South Saskatchewan Region, but there is no approved WMP in the Lower Athabasca Region.

## **Water Issues in Southern Alberta**

Throughout the South Saskatchewan region, limitations on available water remain an important constraint for economic development, community growth, social development and environmental health. As people from across Canada and the world continue to move to Alberta, a reliable water management system is integral to adapt to the inevitable variations in water supply and to support future growth in this region.

In August 2006, a WMP for the South Saskatchewan River Basin (SSRB) was approved that closed the Bow River, Oldman River, and South Saskatchewan River basins to new applications for water allocations due to concerns of water shortages. This closure triggered applications for water licence transfers, which are allowable only in the SSRB within the approved WMP. To date, there have been approximately 85 transfers approved, most of which are small transfers from one agricultural use to another agricultural use. There are a small number of higher profile transfers from agricultural, oil and gas production, and environmental uses to municipal projects and developers. The highest profile transfer was from the Western Irrigation District to Rocky View County to provide water for the Cross Iron Mills development. The transfer funded water conservation in the irrigation district, the conserved water was then licenced to new municipal development. There is a need for a more transparent system for water licence transfers in order to move water from where it is not being used efficiently to where it is needed for higher value uses. This issue has been extensively studied over the last six years by several internal and independent groups, although to date no policy clarification has been made.

The core principal of water management in Alberta is that water is owned by Alberta and is allocated through a system of decisions and recorded in licences. The licences are issued with priority numbers which enable those holding senior water licences to exercise priority in the event of a drought, or other circumstances where water supplies are limited. The priority system is designed to provide stability in infrastructure investment in municipalities, industry, agriculture and other uses. There are several tools in the Water Act to set those priorities. There are also tools to enable redistribution of priorities such as the assignments and transfers which can lead to effective water sharing. In the SSRB, large licence holders include irrigation districts, cities such as Calgary, Lethbridge and Medicine Hat, hydro-power companies, as well as the Province, which holds the environmental base flow licences. These license holders have a significant influence on how water is managed in their respective basins. A clear example of this is the City of Calgary's position on water supply in the *Calgary Metropolitan Plan*. Calgary supplies water to Airdrie, Chestermere and Strathmore, and soon will be supplying water to Okotoks. These communities required access to water (either for infrastructure or allocation) in order to grow; in exchange for access to water, they have agreed to development density provisions that will influence the pattern of their future growth plans.

Limited access to water diverted from the river through existing water licenses has resulted in interesting projects to access water in new ways. For example, the interface between urban and rural

development runoff and irrigation systems is driving the discussion of appropriate storm water management in the east side of the City of Calgary, as well as in the Taber region. Water reuse is becoming a significant issue in need of clearly defined policy, as the holders of water licenses look for ways to utilize wastewater streams for new development; an example of this is the utilization of reclaimed wastewater from the Bonnybrook facility as cooling water for the Shepard Energy Center generating station in east Calgary.

Water reuse and stormwater use raise a critical issue of 'return flow' to the rivers. For example, the City of Calgary returns as much as 95% of the water entering its two water treatment plants, and sometimes even more than its diversion due to infiltration into their sewage infrastructure, to the Bow River. If water is reused or stormwater is used, this return flow is reduced, reducing the overall flow in the Bow River. This causes concerns for water quality degradation as well as meeting the volume and flow requirements in the *1969 Master Agreement on Apportionment* at the Alberta-Saskatchewan border. This has the potential to become an interprovincial issue, and on the quality side has driven attention to phosphorous management and non-point source pollution. This issue is shared with the North Saskatchewan River downstream of Edmonton where 25% of the river is allocated but 20% is return flow. If all the return flow is reused the often preferred instream flows of 85% could not always be met.

The *Water for Life* goal of safe, secure drinking water commits the GoA to maintaining the capital infrastructure that supports drinking water treatment and distribution. In 2005, Alberta Environment and Sustainable Resource Development (AESRD) released a study that showed that 70% of the water treatment plants in Southern Alberta were ranked as 'poor'. Following this report, the GoA committed \$240 million per year in the 2007 provincial budget to address regional systems to improve treatment plant efficiency. While some significant improvements were made, this level of funding did not materialize in the budgets of later years. Some communities, such as Taber and Calgary, were able to update their water treatment systems. However, some communities, such as Lethbridge, have continuing investment programs to upgrade their water treatment systems. Investments in drinking water infrastructure must continue across the province, particularly in Southern Alberta.

Hydraulic fracturing has emerged as a major issue over the last five years. Hydraulic fracturing in Alberta is particularly controversial in the SSR where access to water to support operations is limited in low water supply years. Currently, hydraulic fracturing companies have applied for and been granted Temporary Diversion Licenses (TDLs) by the Alberta Energy Regulator (AER) which allow them to utilize water on a temporary basis with no priority or investment security. Understanding the impact of hydraulic fracturing on water resources in a watershed is vital to ensuring that these operations are sustainable, both for water sourcing and disposal. To support this need, it is essential that the Province's groundwater resources are mapped and understood, including potential connectivity of deep saline formations to high quality groundwater aquifers and surface water features.

Finally, the potential impacts of extreme weather events must be better understood to inform future planning and mitigation measures. Flooding that occurred in 2013 and again in 2014 throughout the South Saskatchewan region drew the public eye to structural, non-structural and social considerations for flood mitigation. There are several options for flood mitigation on the Elbow, Bow and Highwood

Rivers, all of which carry significant price tags. Between 2000 and 2002, there was a severe widespread drought in Southern Alberta from Red Deer to Milk River that also caused serious losses.

Flood and drought mitigation planning must be done at a watershed level, recognizing that intervention in the river will impact the river environments downstream. Both structural and non-structural options require consideration. The engagement of key stakeholders in the watershed will better inform the assessment of impacts and options, particularly the environmental challenges and benefits. In most cases, the social policy issues are more visible than the engineering issues, and are often more challenging to address.

### **Issues in Northern Alberta**

In contrast, northern Alberta has an abundance of fresh water resources and an abundant supply of oil sands resources. The Athabasca River is the main source of fresh water for oil sands production, municipalities such as Fort McMurray, and many First Nations communities. In addition to the *Water for Life* strategy, the *Water Act*, and the *Alberta Land Stewardship Act*, public policies such as the *Water Conservation and Allocation Policy for Oilfield Injection* and *Directive 081: Water Disposal Limits and Reporting Requirements for Thermal In-Situ Oil Sands Schemes* address water use related to oil sands development. While water supply is generally abundant in northern Alberta, challenges remain with respect to temporal changes in streamflow, water needs for aquatic ecosystems, traditional uses, wastewater management and the impact on water quality related to oil sands production which remains a provincial, national, and international issue.

Surface water quality may be the largest visible issue for Alberta's oil sands. As part of the LARP, a Surface Water Quality Management Framework for the Lower Athabasca Region was issued by the GoA in August 2012 to address surface water quality limits; this Framework was updated in February, 2015. This Framework is meant to be supported by a robust monitoring system, which was identified by both the Federal and Provincial governments in an announcement in October 2012. The announcement initiated the Joint Oil Sands Monitoring (JOSM) program responsible for building capacity to monitor and report on specific indicators. In addition to JOSM, the Alberta Environmental Monitoring, Evaluation, and Reporting Agency (AEMERA) was formally launched in April 2014 to monitor, evaluate and report on key air, water, land and biodiversity indicators. AEMERA's mandate is to better inform decision-making by providing the necessary information to policy makers, regulators, planners, researchers, communities, industries and the public. To do this, AEMERA is tasked with providing open and transparent access to scientific data and information on the condition of Alberta's environment, including specific indicators as well as cumulative effects in specific locations. It is vital that this agency be properly funded and staffed to accomplish their important mandate.

Water use in the steam assisted gravity drainage (SAGD) operations continues to grow as new facilities are built. Moving forward, most growth in oil sands production is forecasted to come from SAGD operations. The result of this growth will be increased demands for input water and a need to manage increasing volumes of wastewater that are the output of the SAGD process. The current water source for SAGD operations is groundwater, which is generally water from saline aquifers as mandated by current

regulations. These same aquifers are often where wastewater is re-injected. To address this water use, the *Groundwater Management Framework* was released in June 2013 for the three oil sands producing regions in the Lower Athabasca region. Similar to other regulations to date, this Framework requires a monitoring system to support its implementation. As in the south, a better scientific understanding of groundwater issues is absolutely vital to support planning for more SAGD development.

The common weakness of the three Frameworks outlined above is that only a relatively short stretch of the Athabasca from Fort McMurray to Lake Athabasca is addressed. Given the full length of the Athabasca and variety of industries and other uses on this great river, it is critical to look at the Athabasca River as a watershed and connected system. For example minimum instream flows are applied to industrial water withdrawals in the lower river while they are not applied to uses upstream that continue to diminish the flow to downstream reaches. Fortunately, a project was recently launched to develop a Watershed Management Plan for the entire Athabasca watershed. Shell Canada is funding the first phase of this important work, which is being coordinated by Alberta WaterSMART and supported by AESRD. Developing this plan requires the involvement of the Athabasca Watershed Council (the WPAC on this river), and many watershed management groups. As in the South Saskatchewan region, sustainable funding for these mostly volunteer organizations is essential to ensure their participation.

Finally, the fast pace of development in the Lower Athabasca region has resulted in an uncoordinated approach to regional water and wastewater management. The potential for regional water management was recognized by the oil sands industry and has been pursued through the Regional Water Management Initiative first in the Oil Sands Leadership Initiative (OSLI) and now through Canada's Oil Sands Innovation Alliance (COSIA). The Regional Municipality of Wood Buffalo also recognizes the opportunity to coordinate and integrate industry needs, such as camps for oil sands workers, into their municipal plans. Regional water management in the Lower Athabasca region offers options to industry and communities for water supply and waste water disposal that can potentially reduce the overall impact of development on the environment as well as offer economic benefits.

## **OPPORTUNITIES FOR ACTION**

While water management issues are large and complex, great work has been done over the last decade to address these challenges. There are several opportunities for action that can influence water policy and issues to further show tangible results. The top six actions are summarized here.

### **1. Support Collaborative Water Management and Watershed Organizations across Alberta**

The water community throughout Alberta is a collaborative community with great expertise, experience and knowledge of Alberta's water systems and watersheds. There are a variety of players involved in water management in Alberta including the federal, provincial, and municipal governments, industry, local watershed groups, irrigation districts, hydro-power companies, non-government organizations and others. Supporting this collaborative community is required for these organizations to continue the innovation, guidance and research they offer. The following are some specific actions:

- Acknowledge the critical role of WPACs and Watershed Stewardship Groups (WSGs) in the management of Alberta's water resources, and the significant contribution that these organizations have played in the past and will play in the future, including nurturing and supporting the collaborative initiatives outlined below. Maintaining the local public knowledge base between significant events is essential to managing through a crisis when it arrives.
- Encourage collaborative management of Alberta's water resources, following the examples of the Bow River Working Group and the Cooperative Stormwater Management Initiative. By supporting collaborative water management, important work such as collaborative water modelling, studies on stormwater, water reuse, flooding, drought, cumulative effects and groundwater can be pursued. For example, the OASIS model developed for SSR by the University of Lethbridge and Hydrologics that is being applied to the SSRB through Alberta WaterSMART is collaborative work that improves the public's knowledge through modelling and data management. Public participation and knowledge is essential to managing change and government policy development. Funding through AIEES and CCEMC through their climate adaptation program has been critical to launching these initiatives.
- Implement long term sustainable funding for WPACs, WSGs, or similar governance structures across the Province, to allow these groups to pursue their objectives consistent with the direction of the *Water for Life* strategy. This funding can also support sharing of best practices and common systems among these groups to improve communication and efficiency. As noted in the previous point, project funding has launched several initiatives, but longer term sustainable funding is needed to keep these initiatives moving forward.
  - o Funding could be directed from the existing carbon levy towards watershed specific projects, core operations, and collaborative water management
  - o Funding may be tied to local water conservation efforts, or monitoring success
  - o Funding may be tied to completing Water Management Plans in each basin
- Set up a centralized group with dedicated resources and appropriate skill sets to provide direct support for the WPACs and other watershed stewardship groups for GIS, spatial analyses, and mapping/database support (i.e. for state of watershed reporting).
- Continue to utilize collaboratives within watersheds to support flood and drought mitigation initiatives. In 2014, the Bow River Working Group produced a detailed report offering guidance on flood mitigation options for the Bow River Basin from a system-wide, watershed perspective.

## **2. Support Regional Water Management in the Lower Athabasca Region**

As noted earlier, Alberta is considered a central case study on water issues, driven in large part by water management practices in the Lower Athabasca region. A number of frameworks and directives have been issued to guide the development of the oil sands industry. However, there are policy gaps that must be addressed to promote collaboration among water users in the Lower Athabasca region. Clarification of policy is required on water reuse and the ability to utilize industrial and municipal treated wastewater as a water source for other industrial users. Policies and

regulations that address water treatment and discharge into the environment (river discharge and end pit lakes) must be issued and/or clarified. Many of these are close to completion, such as the Tailings Management Framework that was released by AESRD in March, 2015, which still requires the development of specific regulations by AER to implement the Framework.

As noted earlier, the LARP has been in place for two years now. In northern Alberta, it is vital that a WMP be implemented that covers the entire watershed, and includes the entire Athabasca River and oil sands region. This watershed approach would ensure that upstream and downstream challenges from current and proposed future development, water use, and climactic and land use changes on water are identified and addressed, including cumulative effects. A WMP for the Athabasca Watershed should be developed in conjunction with various industry sectors, municipalities, Aboriginal groups, and regulators in an open and transparent manner. This process should include the development and use of publicly available tools to support the plan and ongoing management decisions in the basin regarding future development and planning. The foundational work for this WMP is currently underway and should be supported. The Regional Municipality of Wood Buffalo has a significant role to play in delivery of water and waste water management services in the Lower Athabasca region. Wood Buffalo has outlined progressive plans for integrated infrastructure. Engagement by the GoA in these plans is important to ensure a fully regional perspective. Specific actions include:

- Issue the relevant policies and directives related to water use in oil sands, including the implementation directives identified in the recently released Tailings Management Framework and the updated Oilfield Injection policy.
- Make a clear policy statement in support of regional water management; work with the Regional Municipality of Wood Buffalo to develop their regional infrastructure for water and wastewater management.
- Approve the utility application submitted by the Regional Municipality of Wood Buffalo.
- Provide appropriate long term funding for the Athabasca Watershed Project, and provide sustainable funding for the Athabasca Watershed Council and other watershed management groups to ensure their full participation in this collaborative project.

### **3. Address Groundwater Issues by Committing Resources to Research Groundwater**

In Alberta, roughly 308 million cubic meters of groundwater is licensed annually, which is approximately 3% of the total annual water allocation in Alberta. The largest allocation of groundwater is for the Athabasca River Basin to support the oil sands industry, but local municipalities and agriculture are also major water users across the Province. Based on the Council of Canadian Academies 2009 report *The Sustainable Management of Groundwater in Canada*, Alberta's knowledge and utilization of groundwater lags behind other provinces in Canada.

Alluvial aquifers and groundwater resources are vital to supporting Alberta's natural infrastructure. Understanding the balance between input and output of groundwater is an important concept in the sustainable use of groundwater as a supporting resource for current and future development. It

is important to understand the effects of groundwater use on base flow contributions to streamflow during annual low flow conditions. In the South Saskatchewan region, groundwater became a major contributor to the 2013 floods when aquifers became so full that flooding continued in basements and underground parking structures days after the peak flood flow passed.

More extensive mapping would further improve our understanding of groundwater, including its potential use in more integrated water management programs. In the South Saskatchewan region, this mapping would help us to understand the hydrological cycle on a regional scale by detailing the interactions between aquifers, surface flow, precipitation, snowpack, snow melt, aquifer recharge and discharge, land cover and land use practices. Furthermore, it would help industry to understand groundwater resources in relation to practices such as hydraulic fracturing. Groundwater resources are an important area for regulators to consider given their role in providing water allocation decisions to new water applicants.

Considerable resources have been invested in groundwater mapping over the years. The Edmonton-Calgary Corridor Groundwater Atlas is a great resource developed by the Alberta Geological Survey. This atlas examines non-saline groundwater located in the Edmonton-Calgary Corridor and highlights where groundwater resources are located. Expanding this Groundwater Atlas to include all of Alberta would be a useful next step in understanding Alberta's groundwater resources.

There are pockets of focused research work underway on various aspects of groundwater, including the Alberta Innovates Energy and Environment Solutions funded work at the University of Calgary on groundwater recharge and baseline isotope geochemistry. Coordination of this work would improve the overall understanding of groundwater challenges and opportunities in Alberta.

To address this gap in groundwater knowledge, the following actions are suggested:

- Proceed quickly with the next groundwater atlas. The priorities for study should be the South Saskatchewan region (the Bow, then the Oldman and South Saskatchewan, then the Red Deer), and then the Lower Athabasca region.
- Develop a coordinated and comprehensive plan to research, delineate and understand the groundwater resources in the province; ensure that this plan is properly resourced and set up for success.

#### **4. Invest the resources needed to ensure that AEMERA is set up for success**

Many of the suggestions listed above cannot be fully implemented without reliable data that is scientifically validated, where the monitoring activities and the resulting outputs are open, transparent, available and understandable to the general public. As noted earlier, effective implementation of the various frameworks for water quality management depends on effective monitoring. The credibility of the Province, and the oil sands industry particularly, rely on the transparency and quality of monitoring data; the ability to establish this credibility is core to the future of the industry and therefore to the prosperity of the Province.

AEMERA has been set up as an independent agency to provide this service. Although the need is large, this organization is still in its infancy. A clear commitment to AEMERA by the GoA is required to signal to industry and others that AEMERA is up and operating and will improve environmental monitoring. For the good of the industry and for Alberta, it is critical that AEMERA succeed in its mission and that this mission be pursued with urgency.

AEMERA has the challenge of integrating all the monitoring activities formerly conducted by JOSM, AESRD, the Biodiversity Institute, and many other organizations. This involves drawing from the vast but disjointed activities and resources already working to gauge, sample, study, collect and compile data on a broad set of environmental factors across the breadth of the Province. This is a monumental task that will require the very best minds in monitoring systems and in organizational design and integration. The recent and similar experience of the AER can be instructive. In addition, the role and responsibilities of AEMERA need to be clearly defined in relation to AESRD and AER.

The key suggestions in this area are:

- Reinforce the GoA's commitment to AEMERA publicly and within the civil service.
- Invest the resources in AEMERA to ensure it is set up for success. This includes financial resources as well as human resources.
- Clearly define the roles and responsibilities of AEMERA, AESRD and AER, the public and those who use or discharge water and emissions in monitoring and reporting.
- As soon as possible, develop and post AMEREA's information and data disclosure policy.
- Look for opportunities to provide good quality data publicly and transparently as quickly as possible. This will help to build trust that more is forthcoming.
- Take action urgently.

## **5. Maintain momentum on flood and drought mitigation strategies and actions.**

The 2013 floods that impacted much of the SSR showed that while we cannot prevent extreme weather, actions can be taken to reduce the likelihood of such large-scale destruction resulting from future extreme weather events. Collectively, a broad group of water practitioners from across Alberta, Canada and the world identified specific actions that can be taken to mitigate, manage, and control the impacts of extreme weather events resulting in both flood and drought. The output of these discussions was the White Paper titled, *The 2013 Great Alberta Flood: Actions to Mitigate, Manage and Control Future Floods*. Recommendations provided by these water practitioners include:

- Anticipate and plan for more extreme weather events, including both flood and drought;
- Improve our operational capacity to deal with potential extreme weather scenarios through better modelling and data management;
- Investigate the cost/benefit balance of investing in physical infrastructure such as on and off-stream storage, diversions, and natural infrastructure such as wetlands;

- Consider flood risks in municipal planning and strengthen building codes for new developments in flood plains;
- Evaluate options for overland flood insurance; and,
- Manage our water resources collaboratively, following the examples of the Bow River Working Group and the Cooperative Stormwater Management Initiative, and ensure Watershed Planning and Advisory Councils (WPACs) across the Province have proper authority and funding.

Since June 2013, much work has been done by the GoA, specific interest groups, and by collaborative groups in the watersheds to identify and assess various options for flood mitigation. It is clear that issues surrounding flood mitigation are as much social and environmental as they are technical. The key issue is the inevitable transfer of risk. Any actions taken to reduce the flood impact on one group of people or one set of infrastructure will by nature disadvantage another group or type of infrastructure at another area of the river basin. Therefore, it is easy to understand why many studies and recommendations that the GoA has received over the last fifty years have not been vigorously pursued.

It is vital that momentum be maintained on systematically assessing options for flood mitigation. Good science is needed to ensure that social issues or special interest groups do not drive solutions that compromise the integrity of the watersheds, which are the life blood of our communities and industries. Effective engineering is also required to ensure that the proposed solutions can be built and operated safely, within acceptable economic costs.

Flood mitigation must be an integrated part of building the resilience of the entire watershed and its communities given the full range of watershed dynamics including the severe floods and droughts that we have experienced over the last 120 years, and that we anticipate we will continue to experience.

Key suggestions in this area include:

- Utilize existing storage facilities in each basin for flood and drought mitigation, as well as environmental management. Specifically, implement the recommendations in the Bow River Project to utilize TransAlta's storage facilities on the Bow River.
- Move forward on the most effective infrastructure options on the Elbow River.
- Support the local flood mitigation measures already underway such as WRRP and ACRP
- Assess the options identified in the Bow and Red Deer Rivers Room for the River reports. Also, complete other Room for the River reports in the other critical basins.
- Support the Collaborative Stormwater Management Initiative and investigate other opportunities for collaborative stormwater management.

## **6. Leverage existing investments in water research and technology development**

Water in the energy, agricultural and environmental sector is a formidable driver for technology development and innovation, especially in conservation. Bringing water, energy, agriculture and

environment together will stimulate the development of integrated technologies and solutions. These sectors and their challenges are universal and as a consequence their market and commercialization opportunities are global. Because of the geographical and geological location of these markets and the challenges related to them, universities and Alberta Innovates as R&D centers naturally place Alberta in a leading position. This makes Alberta highly attractive for many excellent scientists and engineers and for companies acting as economic and technological solution providers. However, this potential head start is at stake if we do not bring ourselves actively into the global dialogue and aggressively promote our proven, technological and societal solutions.

The key suggestions in this area include:

- Develop a catalogue of all water technology companies and service providers operating in Alberta (this activity is currently underway). Ensure the catalogue is structured to allow companies to connect to each other and that it is kept current.
- Create a Water Innovation Centre to incubate and support new water technologies, water management initiatives and regulatory innovation, potentially leveraging activities currently underway at Innovates Calgary and other innovation hubs. Note that AI-EES is moving to fill this role.
- Showcase Alberta's water technology companies at international water events.
- Encourage and showcase technology field testing collaborations such as the Water Technology Development Centre at the Suncor Firebag facility.
- Showcase and continue to support the water technology and watershed management projects.

## **SUMMARY**

In summary, considerable work has been done by the GoA and by the water community over the last decade to improve water management in Alberta. The policy and legislative frameworks are in place to help guide effective watershed management and environmental stewardship. However, there are some key initiatives that can make a difference over the near term as described in this paper. The challenge for the GoA is maintaining momentum on the good work achieved to date while moving forward on critical initiatives in collaborative watershed management and planning, policy development to encourage conservation and efficiency, groundwater assessment, flood and drought response, monitoring and reporting. Alberta has a spotlight on its water issues and visible progress is needed to support the Province's future as an environmental leader.