Chapter 40
Water Security Agency—Coordinating Flood Mitigation

1.0 Main Points

Flooding is one of the most common causes of disasters in Saskatchewan. Reducing or preventing flood damage can reduce impacts on the health and safety of residents and reduce the cost to government for disaster assistance. Flood mitigation involves the coordination and cooperation of numerous supporting provincial ministries and agencies in addition to landowners and municipalities.

The Water Security Agency (Agency) is mandated to promote and coordinate the management, administration, development, conservation, protection, and control of water within the province. As part of its mandate, the Agency is responsible for coordinating flood mitigation in the province.

For the period of August 1, 2013 to July 31, 2014, we found that the Agency had effective processes to coordinate flood mitigation except for the following areas. The Agency needs to:

- Work with others to determine and document municipalities with ongoing flood risks
- Work with others to evaluate gaps in flood mitigation initiatives in municipalities with ongoing flood risks

2.0 Introduction

This chapter sets out the results of our audit of the effectiveness of the Water Security Agency's processes to coordinate flood mitigation. Reducing or preventing flood damage can reduce potential negative impacts on the health and safety of residents and reduce the costs to the provincial government due to floods.

Floods are natural events that occur when water normally contained in a lake or river channel increases and spills out on to the adjacent land (floodplain). Floods are critical for riparian ecosystems.[1] However, when floods occur in areas used or inhabited by people, they can result in loss of life and/or expensive damage to infrastructure, such as buildings and roads.

Flooding is one of the costliest disasters in Canada. Every year, floods cost Canadians millions of dollars in property damage, lost production, lost wages, and lost businesses.[2] Floods also kill people and displace others from their homes. For example, the 2013 flooding in Alberta killed four people and forced 100,000 people from their homes. This flood was Canada's most expensive natural disaster, with insured damages of more than $1.7 billion.[3] Governments can spend millions cleaning up the aftermath and providing financial assistance to residents affected by such events.

[1] Riparian ecosystems refer to the interacting communities of organisms and their physical environment between land and a river or stream.
[2] www.ec.gc.ca/eau-water/default.asp?land=En&n=97439BCE-1 (20 October 2014)
[3] Insurance Bureau of Canada, Media Releases 2013.

2.1 Flooding in Saskatchewan

After droughts, flooding has been the second most common cause of disasters in Saskatchewan.[4] As well, "as a result of the changing nature of extreme events resulting from climate change, flooding may continue to be a common cause of disaster events in the provinces, particularly in urban areas, which are susceptible to high costs from extreme rainfall events."[5]

Flooding in Saskatchewan often occurs in the spring due to snowmelt and rain. The potential severity of floods during this time is dependent on the following three factors:

- Soil moisture levels, the amount of snowfall and the extent of basin storage during the preceding fall
- Runoff, particularly the snow-water equivalent at the time of the spring runoff (and the amount of rain that may come during snowmelt)
- The rate of snowmelt, with faster melts producing higher runoff peaks and volumes than slower melts

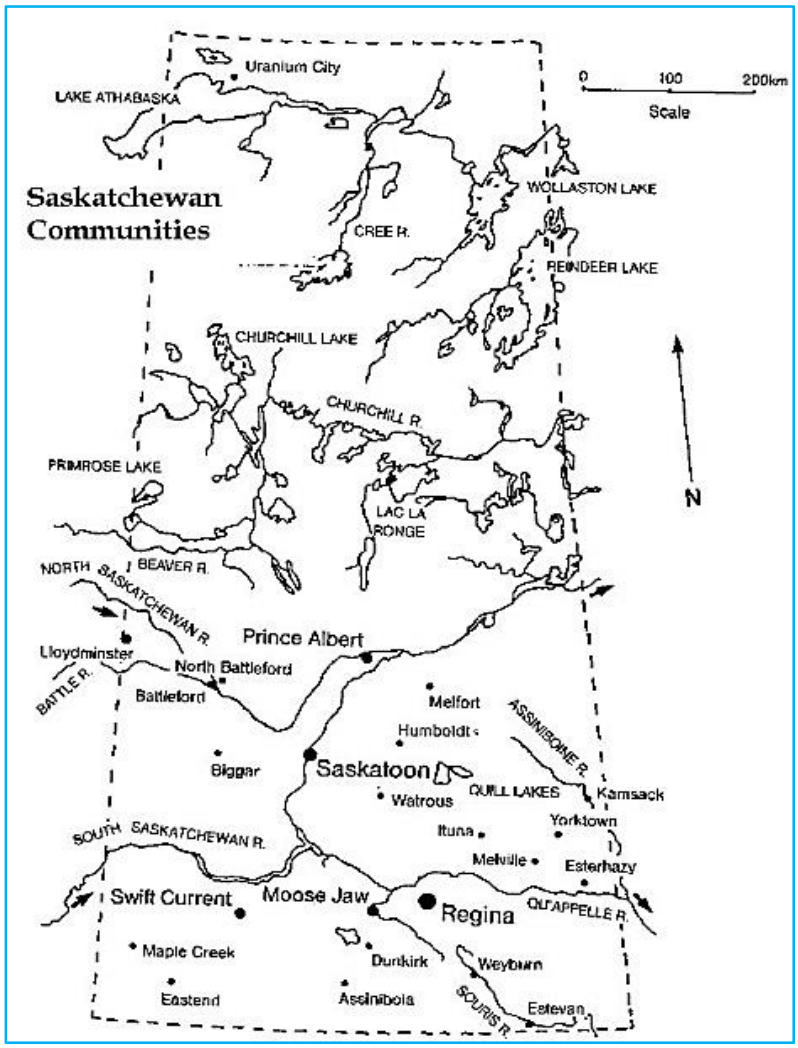
In recent years, flooding due to large rain events in the late spring and early summer have become more prominent.

In addition to floods along river systems, Saskatchewan has experienced floods in poorly-drained basins and terminal water bodies (bodies of water that do not have natural drainage outlets). Examples of these terminal water bodies include Quill Lake and Old Wives Lake.[6] Because water cannot drain out of terminal water bodies, their water levels are determined by the balance of precipitation and evaporation. In years of significant precipitation, the water level in poorly-drained basins and terminal water bodies rises and, at times, spills out causing flooding.

Floods in Saskatchewan occur along water sources, including three of its major river systems: the South Saskatchewan River, the Souris River, and the Qu'Appelle River (see **Figure 1** for the location of these rivers). Many of Saskatchewan's municipalities,[7] including the cities of Saskatoon and Prince Albert, are located adjacent to these major river systems and hence are in flood-risk areas.

[4] The Institute for Catastrophic Loss Reduction, *Telling the Weather Story*, p. 44.
[5] Ibid.
[6] Conversation with Water Security Agency.
[7] Under *The Municipalities Act*, the Minister of Government Relations may, by order, constitute any area with Saskatchewan as a municipality and may incorporate them as a city, town, village, resort village or northern village or hamlet.

Figure 1—Map of Saskatchewan Including Major River Systems



Source: www.yellowmaps.com/maps/saskatchewan_province_map.htm (25 September 2014).

2.2 Saskatchewan Water Security Agency's Role in Coordinating Flood Mitigation

The Water Security Agency Act gives the Saskatchewan Water Security Agency (Agency) several responsibilities and powers related to flood mitigation including the mandate to:

- Promote and coordinate the management, administration, development, conservation, protection, and control of the water, watersheds, and related land resources of Saskatchewan

- Manage, administer, develop, control and protect the water, watersheds and related land resources of Saskatchewan

Part of the Agency's responsibilities is to lead the implementation of the *25 Year Saskatchewan Water Security Plan* (25-Year Plan). The Government released this Plan in 2012. As shown in **Figure 2**, the 25-Year Plan includes 10 flood mitigation actions led by

either the Agency (**in bold**) or the Ministry of Government Relations.[8] Also, as reflected in **Figure 2**, flood mitigation involves the coordination and cooperation of numerous supporting provincial ministries and agencies in addition to landowners and municipalities.

Figure 2—Excerpt of Flood Mitigation Actions from the *25 Year Saskatchewan Water Security Plan* and the *Water Security Agency 2013-14 Annual Report*

Item #	Action	Year to be Completed	Lead Provincial Ministry/ Agency	Supporting Provincial Ministries/ Agencies	Status*
5.1a	Develop improved flood forecasting tools	2016	**Water Security Agency**	N/A	This action is to be initiated in 2014-15
5.1b	Develop a provincial emergency flood response plan that addresses community, individual and local government responsibilities	2014	Government Relations	Water Security Agency, Agriculture, Health, Highways and Infrastructure, SaskPower, Social Services	Not yet initiated
5.1c	Develop a strategy to ensure communities and the public have access to flood hazard information and are aware of potential flood risks	2014	**Water Security Agency**	Government Relations, Health	Not yet initiated
5.1d	Undertake a flood risk assessment of municipal drinking water and wastewater infrastructure	2016	**Water Security Agency**	Government Relations	Systems at risk of flooding understood at Environmental Project Officer level. A formal survey-based assessment has not yet been initiated and remains pending.
5.1e	Encourage municipalities to map flood risk areas associated with under-capacity of wastewater and storm sewer infrastructure as projected in the Insurance Bureau of Canada's report on impacts associated with climate change	Ongoing	Government Relations	Water Security Agency	Not yet initiated – Agency waiting for Ministry of Government Relations input

[8] The Ministry of Government Relations is responsible for the provincial emergency management plan and for working with municipalities on various matters including flood mitigation.

Item #	Action	Year to be Completed	Lead Provincial Ministry/ Agency	Supporting Provincial Ministries/ Agencies	Status*
5.1f	Implement the flood protection and prevention measures established in *The Statements of Provincial Interest Regulations*** into local official community plans and zoning bylaws	Ongoing	Government Relations	Water Security Agency	Being implemented as communities renew their official community plans and zoning bylaws. 62 new official community plans were submitted during 2013-14
5.1g	Pursue negotiations with Canada to develop and implement a new long-term federal-provincial program for flood mitigation as part of an all hazards program	2014	Government Relations	Water Security Agency, Agriculture	In its 2014 budget, the federal government indicated its intent to develop a federal provincial program, but no substantive negotiations have occurred.
5.2a	Assess the range of alternatives and implement strategic actions to manage drainage	2013	**Water Security Agency**	Agriculture, Environment, Government Relations	Online drainage consultation process undertaken and a range of alternatives for drainage legislation, management practices and enforcement options were discussed. Insightrix is preparing a paper to help WSA identify alternatives and develop strategic actions for the future.
5.2b	Develop a results-based drainage works approval process and associated enforcement strategy, including the potential use of financial penalties	2014	**Water Security Agency**	Agriculture, Environment, Government Relations	Held broad consultations with Online Drainage Forum. A discussion paper for further consultations is nearly complete.
5.2c	Develop new strategies to effectively address excessive moisture concerns on agricultural lands, including provision of information and advice on proper drainage design and management and consideration of the benefits of wetland retention and restoration	2014	**Water Security Agency**	Agriculture, Environment, Government Relations, Saskatchewan Crop Insurance Corporation	Work underway. WSA is working with a number of communities to create new Conservation Area Authorities to collectively address excess water challenges.

Source: Saskatchewan Water Security Agency, *25 Year Saskatchewan Water Security Plan* (2012) and *Water Security Agency's 2013-14 Annual Report*.
* Per the *Water Security Agency's 2013-14 Annual Report*.
***The Statements of Provincial Interest Regulations, 2012* require planning documents to prohibit the development of new buildings and additions to buildings in the flood way of the 1:500 year flood elevation of any watercourse or water body.

Saskatchewan should be prepared to experience potentially larger and more frequent extreme weather events in the future, including floods.[9] Being prepared is important because these flooding events can have huge impacts on people and on our economy.

[9] According to the Insurance Bureau of Canada report, *Telling the Weather Story*, as a result of the changing nature of extreme events resulting from climate change, flooding may continue to be a common cause of disaster events in the provinces, particularly in urban areas, which are susceptible to high costs from extreme rainfall events.

Floods can also be costly to the provincial government as it provides assistance to those affected (e.g., through the Provincial Disaster Assistance Program – see **Figure 3**). Reducing or preventing flood damage can reduce the cost of cleanup and reduce potential negative impacts on the health and safety of residents. The Agency plays a key role in coordinating flood mitigation.

Figure 3—Four Years of Provincial Disaster Assistance Program (PDAP) Expenses

Fiscal Year	PDAP Expenses* (in millions)
2013-14	$ 46.8
2012-13	72.6
2011-12	157.1
2010-11	48.2
Total:	$ 324.7

*Source: *Public Accounts Volume 2*, 2010-11 to 2013-14. The PDAP expenses include expenses related to flood damage and other disasters; flood damage makes up most of the expenses.

3.0 Audit Objective, Scope, Criteria, and Conclusion

The objective of this audit was to assess whether the Water Security Agency had effective processes to coordinate flood mitigation. Flood mitigation refers to initiatives undertaken by any party to reduce or prevent the damage of future floods. We assessed the Agency's processes for the 12-month period of August 1, 2013 to July 31, 2014.

This audit did not examine flood disaster emergency response and recovery processes (e.g., processes used to respond to an emergency or to address damages or required cleanup as a result of flooding).[10]

To conduct this audit, we followed the standards for assurance engagements published in the *CPA Canada Handbook – Assurance*. To evaluate the Agency's processes, we used criteria based on our related work, literature including reports of other auditors, and consultations with management. The Agency's management agreed with the criteria (see **Figure 4**).

We examined the Agency's policies, procedures, plans, and reports. We interviewed Agency staff, observed the forecasting system, and examined files and documents that related to coordinating flood mitigation.

[10] Flooding can result in structural damages to buildings, roads and bridges, and can damage sewer and power infrastructure.

Figure 4—Audit Criteria

Effectively coordinating flood mitigation includes processes to:

1. **Determine and Communicate Flood Risks**
   - 1.1 Collect and analyze data related to floods (e.g., forecast water level and flow patterns)
   - 1.2 Identify potential flood-risk areas
   - 1.3 Communicate flood risks to those potentially impacted
2. **Develop and Conduct Flood Mitigation Initiatives with Others (e.g., Government Relations, Agriculture, federal government, individuals) in Flood-Risk Areas**
   - 2.1 Analyze whether flood-risk areas are being mitigated
   - 2.2 Plan flood mitigation initiatives in conjunction with others (consider priorities, responsibilities, gaps, and overlaps)
   - 2.3 Conduct flood mitigation initiatives the Agency is responsible for
3. **Monitor Flood Mitigation Initiatives**
   - 3.1 Communicate with others and compile data on achievement of initiatives
   - 3.2 Report progress
   - 3.3 Take action as required

We concluded that, for the period of August 1, 2013 to July 31, 2014, the Water Security Agency had effective processes to coordinate flood mitigation except it needs to:

- **Work with others to determine and document municipalities with ongoing flood risks**
- **Work with others to evaluate gaps in flood mitigation initiatives in municipalities with ongoing flood risks**

4.0 Key Findings and Recommendations

In this section, we describe our key findings and recommendations related to the audit criteria in **Figure 4**.

4.1 Determination of Ongoing Flood Risks Needed

4.1.1 Forecasting Flood Risks

To predict where immediate floods will occur, forecasting is necessary. The objective of flood forecasting is to interpret data collected, estimate the amount of runoff expected to occur, predict the level and timing of water levels in flood-risk areas, and provide the forecast to users on a timely basis. Users of the Agency's forecasts include the Agency, SaskPower, Manitoba Hydro, the Province of Manitoba, ferry operators, municipalities, irrigators, the State of North Dakota, SaskWater, and the general public.

Forecasts the Agency produces can be grouped into three broad areas: spring runoff forecasts, ongoing forecasts for Saskatchewan's major river systems, and event-driven forecasts. The Agency makes these forecasts available to interested stakeholders and the public by posting them on its website.

We found each February, March, and April, the Agency produces a spring runoff forecast with broad predictions of river runoff levels for the upcoming spring/summer (i.e., water levels in rivers from spring snowmelt) across the province. It predicts whether

the runoffs will be low, average, or high. Spring runoff forecasts can indicate the areas of potential flooding. To make these forecasts, the Agency uses data such as fall moisture conditions, the amount of winter snowfall, the expected rate of snow melt, and river and lake levels.

Throughout the spring and summer, we found the Agency generates ongoing forecasts for each of Saskatchewan's major river systems (e.g., Saskatchewan River). These ongoing forecasts provide more specific updates from which flood warnings can be developed. When specific risks are identified (e.g., heavy anticipated rainfall), the Agency generates event-driven forecasts to predict flood risks resulting from the event.

The Agency bases its ongoing and event-driven forecasts on weather forecasts from various sources, including Environment Canada and data from water monitoring stations. The Agency and Environment Canada collectively have about 300 water monitoring stations located in rivers and lakes throughout the province. Also, the Agency obtains water monitoring data from other provinces (e.g., Alberta). We found the Agency uses a risk-based approach and increases the frequency of its forecasting and reviews of data when high water levels are present that could result in floods.

We found that, unlike all other western provinces, the Agency does not integrate data into a physically-based hydrologic model[11] to aid in flood forecasting. Instead, the Agency generates forecasts using the professional judgement of its staff and current and historical data. The Agency recognizes there could be improvements in its forecasting system and has included an action in the 25-Year Plan to develop improved flood forecasting tools.[12] The Agency anticipates completing its analysis of flood forecasting tools in 2016.

4.1.2 Identification of Ongoing Flood-Risk Areas Needed

The Agency identifies municipalities facing immediate and seasonal flood risks through its forecasting process. For example, in the spring of recent years, the Agency identified municipalities at risk of seasonal flooding through its spring runoff forecast. In addition to the spring runoff forecast, the Agency relies on informal knowledge of its regional office staff (such as historical flooding) to predict municipalities that could be impacted.

While identifying areas with immediate and seasonal flood risks through forecasting is important to save people from imminent flood threats, a long-term view of ongoing flooding is necessary to effectively protect infrastructure from flood damage.

We found the Agency does not have a formal record of municipalities that have experienced damage from floods or that face an ongoing risk of damage from floods. Such a record would aid the Agency in determining where to plan and prioritize future flood mitigation initiatives with others (such as municipalities and the Ministry of Government Relations [Government Relations]) and could reduce the need for the Government to use emergency programs to pay for damage from flooding.

[11] Hydrologic models allow computerized physical simulations of water flowing through a system. Different scenarios can be run through these models to help decision makers understand possible impacts of flood events.
[12] Action item 5.1a noted in **Figure 2**.

1. **We recommend that the Water Security Agency work with others (e.g., municipalities and the Ministry of Government Relations) to determine and document municipalities with ongoing flood risks.**

4.1.3 Communicating Flood Risks to Those Potentially Impacted

As previously noted, the Agency uses its website to keep users of its forecasts and the public informed. Website users can subscribe to feeds that automatically update them with news and advisories posted by the Agency.

We found the Agency also posts public advisories that outline areas that could be impacted by potential flooding. As well, the Agency, along with Government Relations, holds public meetings with municipalities at risk of seasonal flooding to allow them to plan flood mitigation initiatives.

While the Agency uses its website to inform the public of potential flood risks, Government Relations, through its provincial emergency measures office, is responsible for official public communications about flood risks and coordinating disaster responses as necessary.

For municipalities facing an immediate flood risk, the Agency's role is to provide flood-risk information to Government Relations. When the Agency forecasts immediate floods risks, it requires updates each morning on regional conditions from its five regional offices, and then provides a daily update to Government Relations. Also, at these times, the Agency's regional offices may directly contact businesses and individuals potentially affected by immediate flood risks in their region.

4.2 Evaluation of Flood Mitigation Initiatives Needed

4.2.1 Need to Evaluate Whether Flood Risks are Being Mitigated

Because many municipalities in Saskatchewan already exist in flood-risk areas, flood mitigation initiatives are needed to reduce flood damage. Several stakeholders undertake flood mitigation initiatives including the Agency, land owners, and municipal governments.

The Agency works with agriculture land owners to mitigate flooding concerns through its processes to permit drainage structures and handle drainage complaints (see **Section 4.2.3** for further information).

As discussed in **Section 4.1.2**, the Agency does not have a formal record of municipalities that have experienced damage from floods or are at risk of damage from floods. In addition, we found that the Agency does not have a complete record of mitigation measures that have been taken, or that are necessary to adequately protect the at-risk areas from potential floods. As a result, we found the Agency did not analyze

whether current flood risks are being sufficiently mitigated. We found that the Agency's regional offices have only informal knowledge about some municipalities that face flood risks in terms of what the municipalities are doing or would like to do to mitigate the risks.

In 2013, the Agency conducted a study on its Emergency Flood Damage Reduction Program (EFDRP).[13] EFDRP provides, on a cost-shared basis, funding to assist individuals and municipalities with flood preparation. The results of the study highlighted the benefit of flood mitigation measures. The study concluded that through the $13.6 million that the Agency spent on flood prevention in municipalities, an estimated $407 million in damages from floods was avoided.[14]

Because of the benefit in conducting flood mitigation initiatives, it is important that the Agency not only know about areas at risk of flooding, but evaluate what has been done (by itself and others, e.g., municipalities) and what remains to be done and at what cost to protect developed areas at risk. Such an evaluation is key to determining where to plan and prioritize future flood mitigation initiatives with others (e.g., municipalities and Government Relations). For example, the Agency and Government Relations would be better prepared to identify priorities for the potential federal-provincial program for flood mitigation.[15]

2. We recommend that the Water Security Agency work with others (e.g., municipalities and the Ministry of Government Relations) to evaluate gaps in flood mitigation initiatives in municipalities with ongoing flood risks.

4.2.2 Planning Flood Mitigation Initiatives

The Agency plans to undertake certain flood mitigation initiatives each year. These include forecasting risks of floods, monitoring and regulating water flow in the operations of its dams, administering the EFDRP, approving drainage structures, providing technical advice to others on request, resolving complaints about drainage, and providing on-request safe building elevations for property developments. (See **Section 4.2.3** for further discussion).

The remainder of the Agency's planned flood mitigation work is driven by the flood-mitigation actions and priorities of the 25-Year Plan as described in **Figure 2**.

We found the flood mitigation actions and timelines set out in the 25-Year Plan were developed through comprehensive meetings between the Agency's executive management team and its senior and regional managers, and regular consultation with other supporting ministries (e.g., Government Relations). As well, the Agency held public consultations to obtain the views of Saskatchewan municipalities and organizations

[13] The study can be found at www.wsask.ca/Global/About%20WSA/Publications/2011%20EFDRP%20Report/2011%20EFDRP%20Report.pdf (24 September 2014).
[14] The damage prevented and money saved represents homes, infrastructure, businesses, farm buildings, and heritage buildings saved as a result of the preventative measures taken in the 2011 flood year.
[15] Action item 5.1g in **Figure 2**.

(e.g., watershed associations). Through meetings with Government Relations, it identified the appropriate lead agency for each action related to flood mitigation.

The Agency works with two main types of organizations, other than provincial agencies and municipalities, to develop plans to address flood risks. They are:

- Conservation and Development Authorities – There are about 90 authorities in the province. These are groups of agriculture producers that band together to work collectively to solve drainage problems on agricultural land.

- Watershed Associations – There are about 15 watershed associations in the province. These are groups of municipalities formed to jointly address shared flood risks, such as blocked creeks or channels that affect multiple municipalities. A watershed association may address this shared risk by undertaking a channel clearing project.

4.2.3 Conducting Flood Mitigation Initiatives

We found the Agency conducts the following flood mitigation activities as planned:

- Monitors and regulates water levels and flows when operating dams. The Agency owns and operates four major dams in the south of the province: Diefenbaker, Alameda, Rafferty, and Qu'Appelle. We found the Agency documents its rationale and obtains appropriate internal approvals for its dam operating decisions that can impact flooding.

- Approves drainage structures through a permitting process. Drainage structures are used to channel water off of land and into rivers or other drainage channels. If they are not designed or located properly, they can cause flooding. During the year, we found the Agency issued construction and operation permits for about 70 structures.

- Handles complaints about agricultural flooding and drainage. The Agency is responsible for handling complaints regarding agricultural flooding caused by a neighbour's activities. We found the Agency is having difficulty addressing drainage complaints on a timely basis. For example, during our audit period the Agency received 153 requests for assistance to resolve drainage complaints, and had over 100 outstanding requests at July 31, 2014. The Agency recognizes there are weaknesses in its processes and has included an action in the 25-Year Plan to develop a results-based drainage works approval process and associated enforcement strategy for agricultural lands.[16] The Agency has conducted an online forum and commissioned a study to identify alternatives to its current process for handling agriculture drainage approvals and complaints.

- Provides information about safe building elevations for new developments. The Agency provides information about the 1:500 year flood level[17] to help individual homeowners, municipalities, and developers establish safe building levels for their lot or development. We found the Agency establishes 1:500 flood elevation levels for

[16] Action item 5.2c in **Figure 2**.
[17] A 1:500 year flood refers to a flood with a 0.2% chance of occurring. A 1:500 year flood level is the elevation that a flood of that magnitude is expected to reach.

new individual lots or developments based on existing data (e.g., current and historic water levels, topography of the area) and studies.

- Provides technical advice. Upon request, the Agency offers technical services for flood mitigation structure maintenance (e.g., berms or dikes) and channel clearing programs to address municipal and agricultural flood risks.

- Administers the Emergency Flood Damage Reduction Program (EFDRP). Through the EFDRP, the Agency provides advice to and funding for municipalities, businesses, non-profit organizations, individual farm and country residences, and cottages to prevent damage from imminent flooding. We found applications for funding were appropriately supported and approved. The EFDRP has operated since 2011. See **Figure 5** for EFDRP expenses for 2010-2011 to 2013-2014.

Figure 5—Expenses Related to Emergency Flood Damage Reduction Program (EFDRP)

Fiscal Year	EFDRP Expenses (in millions)
2013-14	$ 16.4
2012-13	7.8
2011-12	46.0
2010-11	11.4
Total:	$ 81.6

Source: Water Security Agency audited financial statements.

4.3 Flood Mitigation Initiatives Being Monitored

4.3.1 Compiling Data on Achievement of Initiatives

We found the Agency's regional offices provide senior management with weekly and monthly updates on activities they undertake, including flood mitigation initiatives such as drainage approvals, channel clearing approvals, drainage complaints, and the EFDRP. The Agency compiles these updates to reflect some of its flood mitigation work in the Agency's annual report.

As the lead agency for the 25-Year Plan, the Agency also receives annual updates on assigned actions from other participating agencies. The Agency and Government Relations have established lead contacts within their respective organizations for the flood mitigation initiatives. The Agency uses this information to report on achievement of flood mitigation initiatives in the 25-Year Plan in the Agency's annual report.

5.0 Selected References

Environment Canada. *Costs of Flooding*. Ottawa: Author. www.ec.gc.ca/eau-water/default.asp?lang=En&n=02A711101-1 (6 October 2014).

Environment Canada. *Flood Damage Reduction Program*. Ottawa: Author. www.ec.gc.ca/eau-water/default.asp?lang=En&n=0365F5C2-1 (6 October 2014).

Environment Canada. (unknown). General Information. Ottawa: Author. www.ec.gc.ca/eau-water/default.asp?land=En&n=97439BCE-1 (6 October 2014).

Insurance Bureau of Canada. (July 2012). *Telling the Weather Story*. Toronto: Author. www.ibc.ca/en/natural_disasters/weather_story.asp (26 September 2014).

Insurance Bureau of Canada. (September 2013). Media Releases 2013. Toronto: Author. www.ibc.ca/en/Media_Centre/News_Releases/2013/June_Alberta_Floods_are_Costliest_Insured_Natural_Disaster_in_Canadian_History.asp (6 October 2014).

Pomeroy, J. (October 2013). *Learning from the Floods of 2013, 2012, 2011*. Saskatoon: Author. www.arts.usask.ca/geography/news/news.php?newsid=3839 (6 October 2014).

Provincial Auditor of Saskatchewan. (2010). *2010 Report – Volume 2, Chapter 19, Watershed Authority–Processes to Identify Risks to the Water Supply*. Regina: Author.

Saskatchewan Water Security Agency. (June 2014). *2013-14 Annual Report*. Moose Jaw: Author.

Saskatchewan Water Security Agency. (April 2014). *2014 Spring Runoff Outlook*. Moose Jaw: Author.

Saskatchewan Water Security Agency. (December 2013). *2011 Emergency Flood Damage Reduction Program Report*. Moose Jaw: Author.

Saskatchewan Water Security Agency. (October 2012). *25 Year Saskatchewan Water Security Plan*. Moose Jaw: Author.