

Flood Mitigation – Chronology

1993

Alberta Environment and Sustainable Resource Development (AESRD), now known as Alberta Environment and Parks (AEP), **released a study** entitled Review of Flood Stage Frequency Estimates for the City of Fort McMurray. The study defined the new 1:100-year flood¹ elevation level as 250.0 meters (m) and 1:40-year flood elevation level as 248.5 m.

2000

The Municipality **engaged a consultant**, Trillium Engineering and Hydrographics Inc., to **develop conceptual plans** for flood berms in the Lower Townsite² including Waterways. The report entitled An Evaluation of Providing Flood Control at Fort McMurray by a Staged Diking Approach (the “2000 Trillium Report”) used the **AESRD 1993 Study** as its research foundation and evaluated strategies for protecting the Municipality from ice related flood events. It included cost estimates for protection to the 1:40 and 1:100-year flood elevation levels.

The 2000 Trillium Report also provided an alignment similar to what is seen today and recommended either building to the 1:100-year elevation or diking to the 1:40-year elevation as a reasonable interim measure. In retrospect, this marked the **informal commencement of the Flood Mitigation Program**³ with permanent flood mitigation measures divided into individual sections, referred to as reaches⁴.

2007

Prairie Loop Boulevard (the section of Clearwater Drive from Riedel Street to Franklin Avenue referred to as Reach 6) was **built to the 1:40-year flood elevation** between 2007 and 2010 based on the conceptual plan for the Lower Townsite which was developed in the 2000 Trillium Report.

2009

The new **Lower Townsite Area Redevelopment Plan** was adopted by Council. This municipal plan referenced construction of basic flood protection systems to the 1:40-year flood elevation, Land Use Bylaw No. 99/059 requirements for additional flood protection to the 1:100-year flood elevation for new developments, and the need for additional technical studies to extend flood abatement.

2012

Saline Creek Drive construction began in 2012 and was **built to the 1:40-year** flood elevation from the Saline Creek Pedestrian Bridge to Horse Pasture Park in Waterways based on the Lower Townsite Area Redevelopment Plan. This project concluded in 2014.





2013

In June, the Hangingstone River overflowed its banks causing flooding to private properties as well as municipal and provincial infrastructure. The flooding that occurred in various parts of the Province during this time triggered the Government of Alberta (GOA) to enact **changes to the Municipal Government Act** with Bill 27: Flood Recovery and Reconstruction Act.

This legislation provided powers for controlling, regulating, or prohibiting any use or development in a floodway⁵. It also included a provision to exempt floodway development in specific municipalities with unique geographic circumstances and significant existing development in floodways. These **exemptions were provided to Fort McMurray** and Drumheller based on the grounds that it would be impractical, impossible, or economically detrimental for these municipalities to restrict floodway development. The letter is dated August 21, 2013 and notes:

“...the Ministerial Task Force responsible for flood recovery has agreed that the GOA should work with the RMWB to finalize and approve appropriate mitigation measures that would allow floodway development in Fort McMurray, providing it is adequately protected against a 1:100 event. Based on the proposal submitted by your municipality, these mitigation measures would include a continuous dyking system along the Snye/Athabasca, Clearwater and Hangingstone Rivers, built to a 1:100 flood risk level. In addition, I (Minister of Municipal Affairs), understand that the current land use bylaw will be amended to ensure habitable space is only built above the 1:100 flood risk level, with non-habitable space below this level required to have adequate flood protection measures certified by a professional engineer. It is important to emphasize that this permission to develop within the floodway is based on unique circumstances and strong protective measures, not on any modification of current provincial flood mapping”.

To establish **minimum requirements for new development below 250.0 m** (1:100-year flood elevation) and **restrict the development of habitable rooms⁶** below this elevation, the **Municipality passed Bylaw No. 13/032**, an amendment to the Land Use Bylaw No. 99/059 addressing development in the flood plain, on November 26, 2013.

2014

At this time, the Municipality was building flood mitigation measures to the 1:40-year flood elevation and **began evaluating design revisions** of planned roads, that had not yet been built, to incorporate the 1:100-year flood elevation.

In mid-2014, the Municipality commissioned a conceptual design from Northwest Hydraulic Consultants that updated flood modelling to incorporate the 2013 flood event data. The Fort McMurray Flood Protection Conceptual Design **confirmed the alignment of a three-phased flood mitigation plan** for the Lower Townsite, Waterways and Ptarmigan Court **at the 1:100-year flood elevation of 250.0 m**. This **conceptual design** informed a recommendation to Council and the endorsed conceptual plan has formed the basis of nearly all subsequent flood mitigation work to date.

On September 23, 2014, Council passed the following resolution:



“That Council approve a three-phase flood mitigation development plan that outlines priorities for flood mitigation in the Lower Townsite over the next four years; and

That Council direct Administration to apply for flood mitigation funding from the Alberta Community Resilience Program.”

Flood mitigation pre-construction and construction became an approved multi-year capital project in 2014. Significant mitigation milestones were achieved in 2014 with the completion of Reach 1 (along the Snye) being constructed to 1:100-year flood elevation and the commencement of land acquisition for Reach 8 (Fontaine Crescent).

2015

A **design contract was awarded** in early 2015 for Reaches 2 (Borealis Park), 7 (Longboat Landing/Franklin Avenue Right of Way), 8 (Fontaine Crescent), and 9 (Heritage Village).

On March 10, 2015, Council passed the following resolutions:

“That Administration be directed to incorporate the Waterfront Steering Committee recommendations for Snye Point Park in an expedient manner for the 2015 Western Canada Summer Games.

That Administration be directed to advise the former Waterfront Steering Committee members of the findings of the preliminary review related to Flood Mitigation/Prairie Loop Boulevard and Administration present final recommendations for the upcoming construction season to Council on April 14, 2015.

*That Administration undertake to **examine alternatives to the current Flood Mitigation Plan and present those findings** to Council on April 14, 2015.*

That Administration seek opportunities to incorporate the Waterfront Steering Committee recommendations, considered to be of medium to low impact and aligned or neutral, with existing or planned projects, programs and services.”

During this time, a **study was being contemplated by the GOA** with an intent to support overall disaster preparedness and planning by updating province-wide flood modeling to incorporate new data that could impact the 1:100-year flood elevation. As a result of this, from a municipal perspective, there was uncertainty with respect to what elevation was required for construction (1:40-year or 1:100-year) to be eligible for provincial grant funding. Because of this, **a one-year deferral was requested of the GOA by the Municipality** to implement flood mitigation. This deferral was later granted.

On April 14, 2015, Council passed the following resolution:

“That the construction of Reach 1 of Flood Mitigation along the Snye be finished, and the construction of Prairie Loop Boulevard between Riedel Street and McLeod Street be continued.



*That the Government of Alberta be requested to authorize a one-year deferral in implementing flood mitigation while alternative flood mitigation solutions are evaluated; and that the design and construction of the remainder of **Flood Mitigation and Prairie Loop Boulevard sub-projects be placed on hold**, pending resolution of the deferral request with the Government of Alberta.*

That Administration continue to interact with the former Waterfront Steering Committee and their recommendations regarding key design elements for Flood Mitigation and Prairie Loop Boulevard continue to be considered.

That identified alternative flood mitigation solutions be evaluated and recommendations provided on the preferred solutions in October 2015 for consideration through the 2016 Capital Budget process, pending resolution of the deferral request with the Government of Alberta.”

On November 3, 2015, Council passed the following resolution following multiple discussions with the GOA:

*“That until the Province completes its update of the river hazard (flood elevation) local study, the **remaining reaches of the Flood Mitigation Plan, including the completion of Prairie Loop Boulevard (PLB), proceed to be constructed to an elevation of 248.5 m. [1:40-year flood elevation]***

*That when the Province completes its update of the river hazard (flood elevation) local study, the Flood Mitigation Plan be updated by Administration and provided to Council, with recommendation to proceed or not to the elevation required by the Province to ensure eligibility for grants and disaster assistance along with a **cost-benefit analysis** of this option relative to **self-insurance and operational protection options**.*

That Administration send a letter to the Province summarizing recent discussions regarding the Province’s plans to undertake an extensive river hazard study and the impact this has on the Municipality’s Flood Mitigation Plan, access to grant funding and access to disaster assistance in the event of a flood.”

The latter half of 2015 focused on the Municipality’s **investigation of the following options:**

- Self-insurance through potential off-site levies, developer charges or developing a flood liability contingency fund;
- Operational mitigation (ice breaking and temporary mitigation in lieu of structural mitigation); and
- Discussions with the GOA to update key components of the provincial flood study, specifically how floodways are defined for ice jam floods, and whether the historic 1875 ice jam flooding event⁷ should be included in the modeling.

2016

In early 2016, a **review of operational flood mitigation options** including permanent demountable walls and temporary barriers, such as water filled bags, was in progress.



In May of 2016, the **region experienced the Horse River Wildfire**. Following the wildfire, engagement with residents in Waterways indicated a strong desire to rebuild in place. The Municipality **sought reassurance from the GOA** regarding implications of rebuilding in a flood-prone area and impacts on availability of Disaster Recovery Program (DRP)⁸ funding for those affected.

The **GOA issued a letter to the Municipality on December 13, 2016 allowing rebuild in the flood-prone areas**, given that the Municipality had already committed to structural flood mitigation for the Lower Townsite. The GOA specified that flood mitigation should be constructed to the current minimum 1:100-year flood elevation of 250.0 m, with an appropriate level of additional height or “freeboard”⁹. The freeboard height of 0.5 m was informed by the 2000 Trillium Report, the 2014 Northwest Hydraulic Consultants’ Conceptual Design, and the draft ISL Engineering and Land Services report entitled Flood Mitigation – River Ice Engineering and Geotechnical Investigation (Predesign) (which was later received as a final version in 2017).

This reconfirmed post-wildfire, that the **GOA’s required 1:100-year flood elevation remained in place** and the Municipality committed to building flood mitigation to 250.5 m. Council repealed¹⁰ amending Bylaw No. 13/032 to remove requirements for new developments below 250.0 m which enabled rebuild in Waterways.

In December of 2016, a report by IBI and Golder Associates entitled Benefit/Cost Analysis for Flood Mitigation Alternatives determined that **structural mitigation protection was far more cost-effective** than conventional insurance or self-insurance against economic loss. The design of Reaches 2, 7, 8, and 9 were paused while **research on demountable walls continued** to determine if they could withstand ice forces.

The **decision to build Reaches 3 and 4 to the 1:100-year** flood elevation level (250.5 m) through the Clearwater Drive project was made by Administration in late 2016/early 2017 and was informed by direction from the GOA with consideration of previous studies.

2017

The Municipality requested **a study to evaluate the performance of various mitigation options** such as berms, retaining walls, free standing walls, and demountable walls with respect to withstanding ice forces. Toward the end of 2017, the Municipality received the **final version of the study** from ISL Engineering and Land Services. The study¹¹ found that **standalone walls and demountable walls would likely not withstand the calculated ice forces**; therefore the **Municipality returned to the 2014 conceptual plan** at the 1:100-year flood elevation.

As Reach 6 had already been completed to the 1:40-year flood elevation in 2010, top up to the 1:100-year flood elevation would be required. Also, in response to post-2016 Horse River Wildfire findings, the Saline Creek Parkway Project was converted into an egress road project during this time. Detailed design commenced with a portion of this road to serve as flood mitigation.

2018

On February 13, 2018, study findings were presented to Council publicly **confirming permanent structural mitigation in the form of berms, retaining walls, and berm/retaining wall combinations**



were the recommended options. An overview of each reach was provided at this time, where it was noted Ptarmigan Court was a constrained space for construction.

In February of 2018, Council **approved the 2018 Capital Budget and 2019-2022 Capital Plan**, including the Flood Mitigation Program and an updated Clearwater Drive project designed to the GOA's minimal flood elevation standard. Notable successes this year included:

- **Resuming design work on Reaches 2, 7, 8 and 9**
- The Water Act¹² application process began for Reaches 7, 8 and 9
- Acquisition discussions for Reach 9 commenced
- Historical Resources Act approval was granted for Reaches 7, 8, and 9
- **Investigation into the feasibility of flood mitigation for Ptarmigan Court**
- The **commencement of design for Reaches 10** (north side of Saline Creek Parkway) and **10JHP** (J. Howard Pew Park along the east banks of Saline Creek)
- The intersection point of Reach 10 and 11 was changed to more efficiently make use of the Saline Creek Egress Road project work

2019

In 2019, there was significant coordination to prepare Reaches 9, 10 and 10JHP. Coordination included easements, alignment, finalization of Water Act approvals as well as separation of some reaches for tendering to expedite construction and maximize grant eligibility.

The **preliminary design for Reaches 10 and 10JHP was completed** and additional work was undertaken to examine alternative concepts for Ptarmigan Court.

2020

In early 2020, design work continued for Reaches 10 and 10JHP which included Water Act approvals, disposition amendments and coordination with shallow utilities. **Tree clearing and vegetation removal was completed** on Reach 9 alignment in preparation for construction season.

In April of 2020, the region experienced an **ice jam flood during river break-up**, which reprioritized focus and allocation of resources to support response and recovery.

In the early days following the flood event, the Municipality compiled a damage assessment of municipal assets, prioritized asset repair, and supported recovery efforts. **Engagement with property and business owners** in affected neighbourhoods commenced in June to share information and provide opportunities for feedback.

The *Improving Community Resilience: 2020 Overland Flood Considerations in the RMWB* report was presented to Council on July 14, 2020. It detailed the changing policy landscape, reviewed existing flood protection measures, explored the methodology of ice jam flooding risk reduction, identified risk treatments, and proposed policy options.

The Municipality continued with planned flood mitigation program tasks while revising designs to address flood damage and observations during the flood. Milestones included the following:





- Outline concepts for Reach 6
- Reach 7 design revisions incorporated a second line of defense
- Reach 8 was **assessed for potential impact of riverbank erosion** and following the review, was moved farther from the riverbank
- **Reach 9 construction commenced**

On September 15, 2020, **Council passed multiple resolutions** directing Administration to complete the following:

- For Downtown, Longboat Landing, Waterways, and TaigaNova Eco-Industrial Park:
 - Complete structural mitigation to a level of 1:200¹³ (250.9 m) by October 15, 2022
 - **Limit development below 250 m and introduce enhanced flood provisions** in the Land Use Bylaw for development above 250 m
 - Advocate on behalf of property owners to the Government of Alberta and the Insurance Bureau of Canada on the availability of overland flood insurance
- For Downtown, Longboat Landing, Ptarmigan Court, Waterways, and Draper:
 - Provide progress **updates every 90 days**
- For Longboat Landing:
 - Engage with residents about the **pedestrian walkway**
 - Ensure that a pedestrian walkway is part of the flood mitigation project taking into account feedback for Longboat Landing
 - Landscape all municipal property near Longboat Landing adjacent to the river on or before October 15, 2022, as part of flood mitigation
- For Ptarmigan Court:
 - **Conduct one-on-one engagements** to assess which option will work for each individual resident to determine whether buy outs, funding to raise properties to 250 m elevation (main floor elevation) or land swaps will work best for the majority of residents in that particular community and report back to Council once completed with accurate financial costing
 - Provide updates on discussions with the GOA specific to funding and land swaps related to this matter
- For Waterways:
 - Explore land swaps to property owners below 250 m subject to land availability
- For Draper:
 - Conduct one-on-one engagements with property owners under 250.9 m to gather information including property elevation, relating to whether funding to raise properties to 250.9 m elevation (main floor) or other forms of flood mitigation will be most amenable to property owner, and report back to Council with this information and full costing of all available options
 - Bring forward a backflow preventor program, including estimated costs, similar to that of the City of Edmonton, within 90 days



- Implement a sandbag program for residents and businesses of the Municipality affected by the 2020 flood and present the estimated costs
- Prepare, execute, and communicate a plan to mitigate the impact of any potential flooding until the protective infrastructure is complete

This direction resulted in the addition of **new project areas for TaigaNova Eco-Industrial Park and the neighbourhood of Draper**. It also prompted the review of the Hangingstone Expansion Area¹⁴ to ensure a consistent flood risk standard is applied to the Lower Townsite (1:200-year flood elevation level of 250.9 m).

The Municipality engaged the Insurance Bureau of Canada to advocate on behalf of property and business owners. The insurance challenges experienced in the Municipality are not unique to the region and requires a collaborative, multidisciplinary approach involving federal, provincial, and territorial government officials, the insurance industry, and stakeholders.

In November 2020, the Government of Canada recognized the challenge of continued urbanization in high-risk flood areas and directed the development of a new, low-cost **national flood insurance program** to protect homeowners at high risk of flooding and without adequate insurance protection. This included a national action plan to assist homeowners with potential relocation for those at the highest risk of repeat flooding.

The **Federal Task Force on Flood Insurance and Relocation is expected to submit its final report by Spring 2022**. More information on the Federal Task Force is available on the Public Safety Canada¹⁵ website.

On December 15, 2020, **Council passed resolutions** directing Administration to:

- **Limit development below 250.9 m and introduce enhanced flood provisions** in the Land Use Bylaw for development above the 250.9 m elevation for the neighbourhoods of Waterways and Draper
- Continue with building a structural mitigation solution as previously directed for Waterways
- Determine the **feasibility of a grant program for lot-by-lot individual flood mitigation** solutions for properties in Draper where the underside of the main floor joists are below 250.9 m as the flood risk treatment for Draper and report back to Council
- Proceed with offering a **voluntary buyout** until May 31, 2021 to all property owners in Ptarmigan Court at the 2020 assessed value and also that the option to raise homes to 250.9 m, be offered until May 31, 2021

Ongoing work in 2020 included:

- Revisions to increase reaches to the 1:200-year flood elevation
- Water Act approval applications and an amendment to previously granted approvals
- A component of Saline Creek Drive designed to provide flood protection and egress was incorporated into Reach 11 as a flood mitigation priority
- **Completion of Reach 9**, including clay earthworks and landscaping
- Construction tender for Reach 7 closed



- The selection of a design consultant to advance the conceptual design through to detailed design for TaigaNova Eco-Industrial Park

Work also continued in response to the ice jam flood in 2020:

- The Municipality introduced **temporary measures** to protect and prepare the Lower Townsite in preparation for River Breakup 2021 which included the Sandbag Program, Backwater Valve Program as well as upgrades to the Fort McMurray Water Treatment Plant to protect overflow outfall sluice gates, flap gates, control system automation, etc.
- The Municipality engaged the **Oil Sands Community Alliance** to identify and discuss successes, challenges, and opportunities for flood mitigation and available resources to support preparedness planning.

Associated Engineering presented a report to Council demonstrating the need for improvements to **isolate any new storm infrastructure** planned for the Waterfront Park Project from the Lower Townsite storm system to ensure that the work completed will not contribute to any future flooding.

2021

In early 2021, a strong emphasis was placed on preparation for River Breakup 2021.

- Approximately 150 representatives from various provincial agencies, emergency management professionals, Indigenous partners, industry, utility providers, and the Municipality gathered virtually for a full-day **river breakup tabletop exercise** in 2021. This was the first time an operational exercise of this scale was completed for river breakup.
- The Municipality launched the **Alertable app** in the region to provide municipal emergency notifications directly to Wood Buffalo residents' mobile devices.
- **Daily River Breakup Community Updates** were introduced, which were distributed by e-mail to stakeholders and partners, and posted on the municipal website. Information and photos provided by the Alberta Environment and Parks River Forecasting Team informed these updates.

The initial elevation survey was procured to advance the lot-by-lot assessments for Draper and preliminary discussions were held with Alberta Environment and Parks regarding how to approach regulatory applications for lot-specific mitigation.

On June 8, 2021 Council carried two motions related to Ptarmigan Court Flood Mitigation. The first motion **extended the voluntary buyout deadline to July 30, 2021**. The second motion amended Ptarmigan Court Residence Flood Mitigation Program Policy FIN-340 (**Home Raising Program**) to be approved with an application deadline of July 30, 2021.

With respect to TaigaNova Eco-Industrial Park, detailed design is proceeding, and geotechnical investigations have commenced. In addition to work tasks that are common across all flood mitigation areas, oil and gas, and utility crossings must also be determined for TaigaNova. Construction of permanent structural mitigation is expected to start in Q2 2022 and reach completion by October 2023.



Council also approved the submission of the **National Flood Insurance Strategy and Community Resiliency Advocacy resolution** to the Alberta Urban Municipalities Association (AUMA), Rural Municipalities of Alberta (RMA) and Federation of Canadian Municipalities (FCM) Board of Directors. The resolution is as follows:

“THAT Council advocate for all levels of government, including the Government of Alberta, to participate in and contribute to the work of the National Task Force on Flood Insurance and Relocation:

- with the goal of developing a national high-risk residential flood insurance program and;
- to secure sustainable, long-term funding for provinces, Indigenous communities and municipalities for flood mitigation programs, projects and initiatives that increase overall community resiliency; and

THAT Council work with Administration on a campaign that engages professional lobbyists to bring forward our region’s challenges to the Government of Alberta and the Government of Canada;

THAT, the Mayor, on behalf of Council, be authorized to invite the Task Force to meet with our Municipality, either virtually or in-person, to understand the impacts floods have had on our region and our residents;

THAT Council authorize the submission of the attached resolution to the Rural Municipalities of Alberta (RMA) for consideration at its 2021 Spring Convention; and

THAT Administration be directed to develop resolutions for Council’s consideration at a later date in support of related advocacy efforts at the Alberta Urban Municipalities Association Annual Conference and the Federation of Canadian Municipalities Board of Directors and Annual Conference.”

All three resolution submissions received endorsement by these associations in 2021 signaling support throughout Alberta and the country for the development of a national high-risk flood insurance program and securing sustainable, long-term funding for provinces, Indigenous communities and municipalities for flood mitigation programs, projects and initiatives that increase overall community resiliency.





Footnotes

¹ A 1:100 (one-in-one-hundred)-year flood is a statistical designation meaning that in any given year there is a 1% chance an area will flood up to or beyond the set elevation. Some areas have experienced more than one 1:100-year flood in the same year. The amount of time spent in an area identified as being at risk for flooding increases the likelihood of being impacted by a flood during that time. For example, the likelihood of experiencing a 1:100-year flood in the at-risk area in 10 years is 9.6%, in 30 years the likelihood of experiencing a 1:100-year flood is 26.0%, and in 50 years it increases to 39.5%.

² The Lower Townsite is the area bound by Highway 63 along the west edge, the Snye to the north, the Clearwater River to the east, and the Hangingstone River to the south.

³ The Flood Mitigation Program is comprised of a series of continuous, permanent flood mitigation measures to reduce flood risk in Fort McMurray's Lower Townsite and Waterways.

⁴ Reach (plural "reaches") is a term used to divide the Flood Mitigation Program into smaller sections. Each reach is a standalone design and construction project that has or will be constructed to meet flood mitigation needs for the flood-prone areas.

⁵ A floodway is the portion of the flood hazard area where flows are deepest, fastest, and most destructive. The floodway typically includes the main channel of a stream and a portion of the adjacent overbank area.

⁶ A habitable room is defined in the Land Use Bylaw No. 99/059 as any room in a dwelling other than a non-habitable room (a space in a dwelling providing a service function and not intended primarily for human occupancy, including bathrooms, entry ways, corridors or storage areas). Sleeping units are habitable rooms.

⁷ The 1875 ice jam flood was a significant flood event in Fort McMurray's history. Accounts of the time relate that one of the houses that was part of the Hudson's Bay trading post was swept away, large trees were flattened by the force of the flood and that there was significant flood water incursion on the ground floor of another trading post house. As there were no river level gauges at that time, the flood elevation peak can only be estimated. Estimates have ranged from 251 m to 253 m. For this reason, some have held that the 1875 event should be treated as an anecdote only and should not be included in any flood modelling. The Municipality requested that the GOA take a closer look at the 1875 event as part of their river hazard study. The GOA's consultants concluded that based on witness accounts, maps and drawings of the trading post, and photos locating the trading post, a reasonably reliable estimate of the flood elevation peak could be made. The flood elevation was estimated to be 252.0 m at the confluence of the Athabasca and Clearwater Rivers, putting the 1875 event well beyond a 1:200-year event.



⁸ The Disaster Recovery Program (DRP) is a provincial program overseen by the Alberta Emergency Management Agency (AEMA) that can provide disaster recovery assistance to residents, small businesses, agriculture operators, and provincial and municipal governments when a disaster occurs that is considered: extraordinary, widespread, and insurance is not reasonably or readily available.

⁹ Freeboard is the vertical distance added to the actual calculated flood level to accommodate uncertainties in flood levels. Such uncertainties include hydraulic and hydrological variables, potential for waves, surges and other natural phenomena.

¹⁰ The repeal of Bylaw No. 13/032 was completed with Bylaw No. 16/021 on October 4, 2016.

¹¹ The Flood Mitigation – River Ice Engineering and Geotechnical Investigation (Predesign) study was received in draft in 2016 and reconfirmed the freeboard height of 0.5 m at that time.

¹² The Water Act is provincial legislation that supports and promotes conservation and management of water in Alberta. Compliance with the Act requires the submission of applications detailing the impact of proposed activity that may affect the land or vegetation under or around a waterbody, or may affect the location, flow, or quality of the water or aquatic environment. Applications undergo various levels of review and approval, including public engagement.

¹³ The 1:200-year flood elevation level is 250.4 m and the freeboard height is 0.5 m. This results in a design elevation of 250.9 m.

¹⁴ The Hangingstone Expansion Area is located along the Hangingstone River on the southern side of Grayling Terrace extending east towards Fire Hall 1.

¹⁵ Public Safety Canada coordinates across all federal departments and agencies responsible for national security and the safety of Canadians.

