

Post-Spring Non-Emergency Operation of the Red River Floodway

Manitoba has a significant network of flood protection infrastructure designed to work as a system to mitigate flooding. One of the most prominent pieces in the network is the Red River Floodway, which, along with the Shellmouth Dam and Reservoir, the Portage Diversion, the Assiniboine River dikes, the West Dike and the City of Winnipeg's primary dikes, protects Winnipeg from flooding.

In recent years, some Manitoba residents have suggested that use of the floodway should be expanded to regulate water levels in Winnipeg to enhance recreation and development opportunities. The recently completed *Provincial Flood Control Infrastructure Review of Operating Guidelines Report* examined the question of post-spring non-emergency floodway operation. The panel recognized the merit of increasing recreation and developmental opportunities in connection with the rivers in Winnipeg, but did not recommend in favour of non-

emergency operation. The panel was not opposed to non-emergency operation, but identified that the only path forward to pursuing it would be to bridge the differences between the interests of those in Winnipeg who would benefit with the interests of residents upstream that would be negatively impacted.

Currently, post-spring flood operation of the floodway can be done on a limited basis under Floodway Operation Guideline 4, *Emergency Operation to Reduce Sewer Backup in Winnipeg*. Non-emergency operation of the floodway would have impacts upstream and downstream of the floodway inlet control structure and may require regulatory approvals to implement changes to the current operating guidelines. This fact sheet is assembled to provide facts about post-spring non-emergency operation of the floodway.

Figure 1:

This aerial image from 2011 shows the Red River, flowing north into Winnipeg (left side of the image). The floodway inlet control structure is located mid-image on the river and the floodway channel inlet is upstream with the channel extending into the background. Not shown in this image are the West Dike and the floodway outlet control structure.





Figure 2:

Aerial view of the Red River and floodway infrastructure looking south. The West Dike is visible extending into the right side of the image.

The Red River Floodway

The Red River Floodway consists of four key components:

- A gated floodway inlet control structure on the Red River, south of St. Norbert. The two large gates rest in the bottom of the inlet control structure, but are raised in flood events to regulate the water levels.
- A 47 kilometre long floodway channel, which originates just south of Winnipeg and rejoins the Red River just north of Lockport. At its entrance (also called the inlet), there is an earth lip that minimizes the risk of ice entering the channel. Ice in the channel is undesirable because it could form ice jams against the bridges that cross the channel.
- A fixed weir floodway outlet control structure at the end of the floodway channel, where flows re-enter the Red River. This structure keeps water at non-erosive velocities in the floodway channel and it drops the floodway channel's water into the Red River without causing erosion.
- A 45 kilometre West Dike located south of Winnipeg also provides flood protection for the city. It prevents Red River floodwaters from flowing into the La Salle River and entering Winnipeg. The dike is high enough to handle wind and waves during major floods.

The Red River Floodway Current Operations

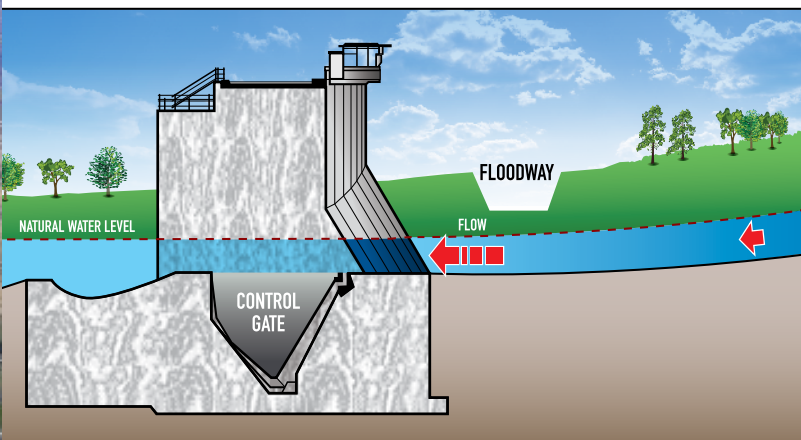


Figure 3: Floodway gates during low flow conditions

- As illustrated in Figure 3, under low flow conditions the water level in the Red River is below the floodway channel inlet lip. Under these conditions, all of the Red River flow passes through Winnipeg.

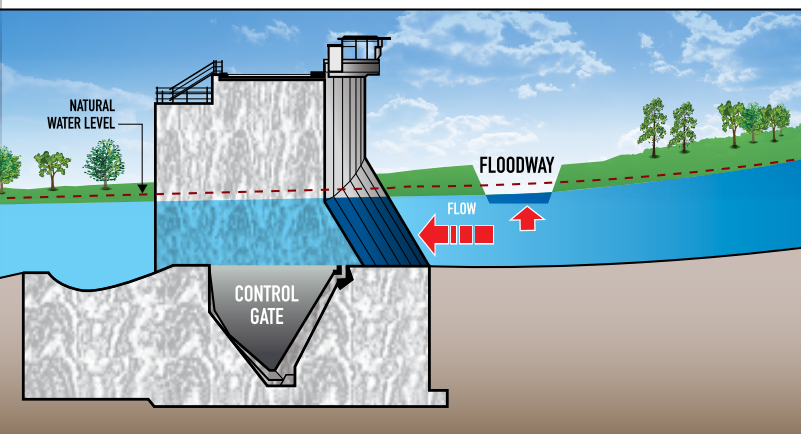


Figure 4: Floodway gates during high flow conditions

- As illustrated in Figure 4, when the water level in the Red River rises just above the top of the floodway channel inlet lip, most of the Red River flow still passes through Winnipeg, but some begins to flow into the floodway channel.
 - This splitting of flows between the floodway channel and the Red River results in a drawdown of water levels upstream of the floodway channel inlet. As a consequence, the water level at the floodway channel inlet drops below the natural level.

- The natural water level on the Red River at the floodway channel entrance is defined as the water level that would have occurred at this location in the late 1950's, if the flood control works had not been built. These works include the City of Winnipeg's primary dikes, the Red River Floodway, the Portage Diversion, Shellmouth Dam and Reservoir and the Assiniboine River dikes. The calculation of natural also accounts for a similar level of development and infrastructure to what was in place at the time when the floodway was designed.

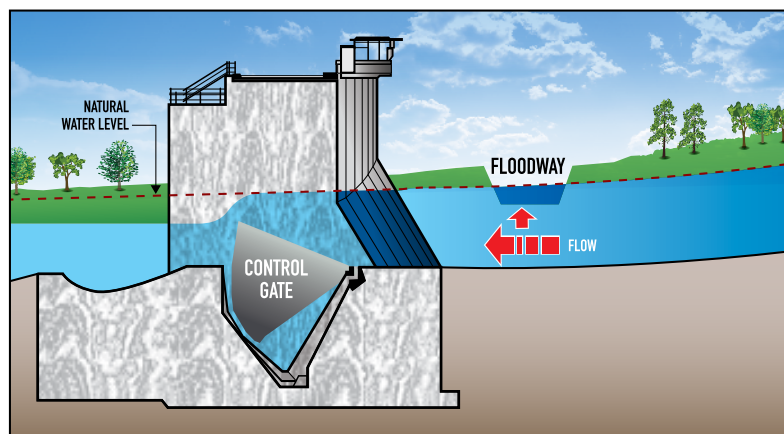


Figure 5: Floodway gates during Guideline 1 operation

- Under Floodway Operation Guideline 1, *Normal Operations*, the floodway gates are raised so that the water level south of the floodway channel inlet is restored to its natural level. This raising of water levels, in turn, results in more water spilling into the floodway channel and less flow going through Winnipeg (Figure 5). As Red River flows continue to increase, the level south of the floodway channel inlet drops below natural again and the gates are raised further to restore water levels to natural.
 - In all spring floods, except at the peak of the flood of 1997, the floodway has been operated under Guideline 1 to ensure that the water level south of floodway channel inlet was maintained at the natural level.
 - Guideline 1, *Normal Operations*, was used in the summers of 2005 and 2014 due to exceedingly high summer flows.

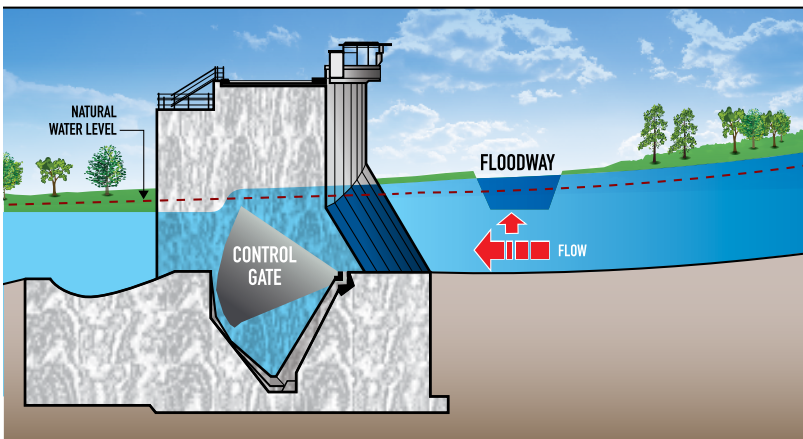


Figure 6: Floodway gates during Guideline 2 operation

- As illustrated in Figure 6, under Floodway Operation Guideline 2, *Major Flood Operation*, the floodway is operated to keep water levels in Winnipeg below the primary dike system, raising water levels upstream of the floodway channel inlet above natural. If forecasts indicate that levels at the floodway inlet will rise more than two feet above natural, the City of Winnipeg must proceed with emergency raising of the primary dikes and temporary protection measures on the sewer systems in accordance with the flood level forecasts within Winnipeg.
 - Under Floodway Operation Guideline 3, *Extreme Flood Operation*, the floodway gates are raised so that the water level at the floodway channel inlet is increased to the maximum level that can be held by the floodway west embankment and the West Dike. All additional flows are allowed to pass through Winnipeg.
 - Floodway Operation Guideline 4, *Emergency Operation to Reduce Sewer Backup in Winnipeg*, is applied post-spring flood when high water levels affect Winnipeg's storm sewer and combined sewer systems. The combination of high water levels and a high intensity rain storm can overwhelm the sewer systems causing basement flooding, resulting in damages and risk to health.
- If there is potential risk of high river levels concurrent with high intensity rainstorms, the floodway may be operated to lower water levels in Winnipeg by diverting some of the Red River flows into the floodway channel, reducing the damages and potential health risk caused by basement flooding in Winnipeg. This is accomplished by raising the inlet control structure gates, which raises water levels upstream; under this guideline, the water level cannot go higher than 760 feet at the gauging station just upstream of the floodway inlet.
 - Operation is considered an option if the level at James Avenue is at or above 14 feet. This guideline states that the floodway must not be operated to achieve a river level of less than nine feet at James Avenue. It should be noted that The Forks Riverwalk begins to get inundated with water when the Red River water level is 8.5 feet James Avenue and therefore The Forks Riverwalk will be at least partially flooded whenever river conditions are such that Guideline 4 is considered an option.
 - Emergency operation of the floodway to reduce the risk of sewer backup in Winnipeg has occurred in 2002, 2004, 2005 and 2010.
 - Artificial flooding of some land and roads south of the floodway inlet control structure occurs when water levels south of the floodway channel inlet are raised above natural levels under Guideline 2, 3, or 4. In these instances, the Manitoba government provides compensation to individuals who experience physical damages due to artificial flooding.

The Red River Floodway Potential Post-Spring Non-Emergency Operation

- Under a potential Guideline 5, *Post-Spring Non-Emergency Operation*, the floodway would be operated to lower and stabilize water levels in Winnipeg, with the primary goal of preventing the flooding of The Forks Riverwalk. Operating under Guideline 5 would be similar to operating under Guideline 4 in that the floodway gates would be operated to lower river levels in Winnipeg by raising river levels upstream of the floodway channel inlet above the natural water level, and so diverting a portion of the Red River flows into the floodway channel (Figure 7).
- This operation would be done on a non-emergency basis to provide a variety of economic and recreation benefits within Winnipeg.
- In many of the recent summer floods The Forks Riverwalk would still be under water even if an operating guideline for non-emergency floodway use had been in place.

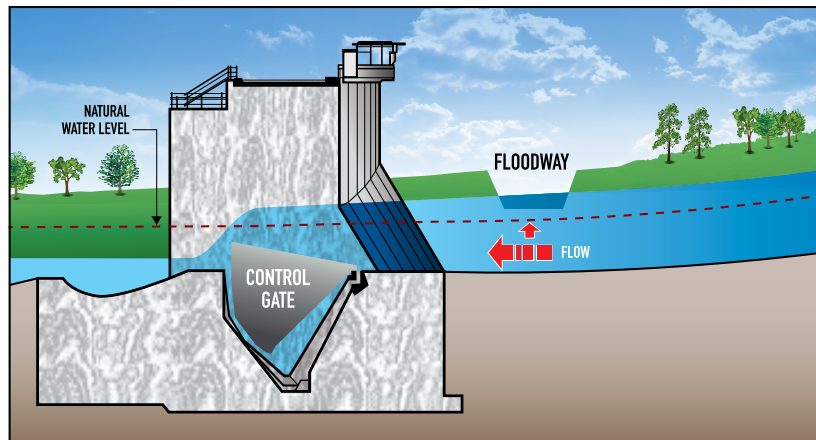


Figure 7: Floodway gates raised to lower water levels in Winnipeg under a potential Guideline 5, *Post-Spring Non-Emergency Operation*.

What are the Benefits of Post-Spring Non-Emergency Operation of the Floodway?

Non-emergency operation of the floodway is expected to result in:

- The Forks Riverwalk being flooded less often and being usable for longer periods during the summer and fall.
 - Since 1968, when the floodway was completed, there have been twenty post-spring floods where the water levels in Winnipeg were high enough to result in flooding of The Forks Riverwalk.
 - An analysis concluded that with the use of the floodway under a Guideline 5, *Post-Spring Non-Emergency Operation*, post-spring flooding of The Forks Riverwalk would have been prevented in ten years and in the other ten years, the duration of post-spring flooding within Winnipeg would have been reduced.
- A reduction in the rate of riverbank erosion on properties between the floodway inlet control structure and the point where the floodway channel's water re-enters the Red River.
- Increased recreational opportunities on and around the rivers within Winnipeg.
- Anticipated greater investment in commercial and recreational infrastructure and facilities around the rivers within Winnipeg.
- A reduced risk of basement flooding in Winnipeg as river levels will be lower when large rainstorms occur. Under operation Guideline 4, the relatively short lead time of reliable weather forecasts (two to three days) means that on occasion the floodway cannot be operated in time to reduce the risk of basement flooding caused by a storm event.

What are the Disadvantages of Post-Spring Non-Emergency Operation of the Floodway?

When constructed, the floodway was designed for large flood events and a variety of disadvantages would be experienced as a result of post-spring non-emergency operation. The following impacts may be caused or made worse by non-emergency operation of the floodway under a potential Guideline 5:

- **Artificial Flooding:** Operation of the floodway under Floodway Operating Guidelines 2, 3 and 4 results in higher than natural water levels upstream of the floodway channel inlet, causing upstream artificial flooding. Under The Red River Floodway Act, the Province of Manitoba must provide compensation for damages resulting from the artificial flooding caused by operation of the Red River Floodway. In all years of post spring operation under Guideline 4, compensation was provided to affected residents for tangible damages (ex: damages to agricultural crops, roads, backyards and gardens).
- **Physical:** Increased frequency of non-emergency operation may result in greater erosion, sliding and failures of riverbanks upstream of the floodway gates. It is also possible that the incremental negative effects on upstream river banks will have a negative impact on fish habitat and fish passage. Non-emergency operation may require the construction of fish passage alternatives, such as a fishway around the floodway inlet control structure. Additionally, wildlife habitat is expected to be impacted when upstream land is artificially flooded. The deterioration of vegetative cover in the floodway channel would be expected to occur, resulting in greater erosion of the channel base and sides, causing in-channel damage. This may also result in increased sedimentation and water quality problems.
- **Operational:** Longer and more frequent operation of the floodway would result in more stress and wear on certain structural elements of the floodway inlet control structure. Additionally, with more frequent operation of the floodway, navigation on the Red River would be impaired for additional periods. This would require federal approval as well as mitigative measures to accommodate navigation.
- **Infrastructure:** The R.M. of St. Clements uses the Dunning Road Crossing which extends over the floodway channel to access areas along PTH 59. With increased operation, the crossing would be more frequently under water and would be unusable.
- **Development Risk:** Keeping The Forks Riverwalk dry in at least half of the post-spring high-water years and lowering Winnipeg post-spring water levels in the remaining years is likely to increase development pressure in vulnerable locations in Winnipeg. Increased development in vulnerable locations such as those that are low-lying, close to the water and/or outside of the primary dike, could lead to increased damages during large flood events.

Additional considerations:

- Flow into the floodway channel does not occur until relatively high water levels in the Red River; this is because of the presence of the lip at the entrance of the channel. Thus, in order to effect the desired reduction in flows and water levels in Winnipeg under a potential Guideline 5, the floodway inlet control structure gates would have to significantly raise water levels upstream of the floodway channel inlet. When river flows are relatively higher, this could result in some amount of floodplain inundation upstream of the floodway inlet.
- Permanent removal of the floodway channel inlet lip is not considered an option as the inlet lip is used to keep ice out of the floodway channel during the spring break-up.
- Replacement of the floodway channel inlet lip with a control structure would be costly and would provide limited benefit to lowering river levels since the floodway channel flow carrying capacity is relatively small at lower water elevations, requiring the operation of the floodway inlet control structure gates to raise water levels upstream.
- In the summer, vegetation growth in channels tend to reduce efficiency, resulting in lower flows. This would especially be the case with the low floodway flows that would be experienced during most post-spring operation scenarios.

What is Required for Increased Post-Spring Non-Emergency Operation?

To allow increased operation of the floodway, the Province of Manitoba would be required to:

- Undertake a variety of physical works, and upgrades to existing works, estimated to have a one-time cost of \$55 million to \$80 million. The increased floodway operating costs are estimated at up to \$300,000 annually.
- Receive regulatory approvals to implement Guideline 5, *Post-Spring Non-Emergency Operation*. This process may be lengthy and costly.
- Compensate landowners for any damages caused by artificial flooding, as per the provisions of The Red River Floodway Act. Non-emergency operation under a potential Guideline 5 would increase the frequency of artificial flooding upstream of the floodway channel inlet. Instead of providing annual compensation, the province could consider buying land or purchasing a flood easement on the most affected upstream property affected by artificial flooding.
- Further assess the impacts to riverbanks, erosion rates, fish and fish habitat, wildlife and navigation. Depending on the nature and scope of impacts identified, further works or actions to mitigate for the effects of non-emergency floodway operation may be required. Mitigation activities may include:
 - Erosion protection for the floodway channel.
 - Construction of a fishway passage.
 - Offsetting any impacts to existing fish or wildlife habitat.
 - Options to facilitate navigation.

For more information, please contact:

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