



# City of Richmond

## Report to Committee

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**To:** Public Works and Transportation Committee      **Date:** June 27, 2025  
**From:** Milton Chan, P.Eng.  
Director, Engineering      **File:** 10-6060-01/2025-Vol  
01  
**Re:** **Fraser River Freshet and Flood Protection Update 2025**

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### Staff Recommendation

That the staff report titled "Fraser River Freshet and Flood Protection Update 2025", dated June 27, 2025, from the Director, Engineering be received for information.

Milton Chan, P.Eng.  
Director, Engineering  
(604-276-4377)

Att. 2

REPORT CONCURRENCE		
<b>ROUTED TO:</b>  Public Works	<b>CONCURRENCE</b>  <input checked="" type="checkbox"/>	<b>CONCURRENCE OF GENERAL MANAGER</b>  
<b>SENIOR STAFF REPORT REVIEW</b>	<b>INITIALS:</b>  	<b>APPROVED BY CAO</b>  

## Staff Report

### Origin

This report provides Council with a summary of the 2025 Fraser River freshet, along with an update on 2024 rainfall statistics and ongoing works regarding the City's flood protection program.

As detailed in the City's Flood Protection Management Strategy, Richmond is situated approximately 1.0 metre above sea level making flood protection integral to protecting the health, safety, and economic viability of the City. Richmond is protected from flooding by infrastructure that includes 49 kilometres of dikes, 599 kilometres of drainage pipes, 61 kilometres of culverts, 151 kilometres of watercourses and 39 drainage pump stations with an estimated replacement value of \$3.7 billion.

This report supports Council's Strategic Plan 2022-2026 Focus Area #3 A Safe and Prepared Community:

*Community safety and preparedness through effective planning, strategic partnerships and proactive programs.*

*3.1 Advance proactive, sustainable, and accelerated flood protection in collaboration with other governments and agencies.*

*3.3 Ensure the community is collectively prepared for emergencies and potential disasters.*

*3.4 Ensure civic infrastructure, assets and resources are effectively maintained and continue to meet the needs of the community as it grows.*

### Analysis

#### 2025 Fraser River Freshet

In recent years, milder winters have occurred throughout the province, which has contributed to reduced snow depth levels in southern BC. For 2025, the Province advised that average provincial snowpack levels were 13% of normal as of June 15, 2025. This has led to a reduced spring freshet with the peak Fraser River flows measured at Hope to be 7,060 m<sup>3</sup>/s on June 4, 2025, which is between a 1-year and a 2-year return period event.

Flows in the Fraser River are anticipated to increase slightly before levelling out further into June. Based on snow melt conditions and the level of remaining snow, it is anticipated that freshet flows are currently at or near the peak for the year.

Historical data over the past five years have been summarized in Table 1 below.

**Table 1: Peak Fraser River Flow Measured at Hope, BC Over the Past Five Years**

<b>Year</b>	<b>Peak Fraser River flow measured at Hope, BC (m<sup>3</sup>/s)</b>
2020	10,800
2021	9,800
2022	10,400
2023	9,130
2024	5,120
2025	7,060

No flooding has occurred in Richmond during the 2025 freshet. The City continues to be a leader in flood protection planning and mitigation through Council-endorsed capital projects and maintenance programs. Predicted climate change impacts, which include more extreme wet and dry weather events, could result in an increased variability in freshet flows in the future. This reinforces the need for the City's continued flood protection upgrade program.

#### 2024 Rainfall

##### *Significant Rainfall Events*

Rainfall highlights for 2024 include the following:

- The City received 1,511 mm of rainfall in 2024, which was the highest annual rainfall received over the last 10 years, 18% higher than the average over that period.
- October was the month with the most rainfall in 2024, with 278 mm of rainfall measured at the Fire Hall No. 7 rain gauge. This included the Atmospheric River event that occurred from October 18 to 20. This rainfall event had a statistical return period of 100 years, and the total rainfall recorded over the three days at the Fire Hall No. 7 rain gauge was 172 mm.
- During the October 18 to 20 Atmospheric River event, 75 operational staff worked over the response period, 630 sandbags were deployed by staff in the field with an additional 260 distributed to the public, and 87 service requests were created. Through lessons learned from the 2021 Atmospheric River event and Council endorsed action items, the cumulative drainage impacts felt by the community during this event were significantly less than the 2021 event. This is reflected in the significant reduction in service requests (shown in Attachment 1).

- The most intense rainfall event of 2024 occurred October 27 to 28, when the Hamilton Community Centre rain gauge recorded a rainfall intensity of 17.8 mm/hr for a 1-hour period. This rainfall event has a statistical return period of 10 years; however, this intensity was not sustained, as the total rainfall recorded for both days was approximately 32 mm.

The City's drainage system is designed to withstand a 10-year return period rainfall event. The drainage system performed well during winter rainfall events, despite being subjected to a more statistically extreme event during the October 2024 Atmospheric River. The total annual rainfall over the last 10 years is included in Attachment 2.

In advance of anticipated weather events, an Operations Response Plan is initiated, and a number of actions are taken by staff to reduce localized flooding and respond to the anticipated weather event. Examples of actions taken to prepare the drainage system are increasing capacity by lowering water levels in the canals, adjusting settings at pump stations, clearing heavy leaf routes, inspecting and servicing identified hot spots, pre-planning the best deployment of resources, and preparing sandbags for both staff and public use. After a weather event, staff review data from rain gauges, level sensors, SCADA, service requests, and staff observations to implement action items. These efforts ensure the continued improvement and readiness of the City's drainage system.

#### *Atmospheric River Initiatives*

Using lessons learned from the November 2021 and October 2024 Atmospheric River events, a number of initiatives to assess and improve the City's drainage system have been undertaken.

Ongoing initiatives include coordinating with the Ministry of Transportation and Transit (MoTT) to identify drainage infrastructure upgrades and facilitate maintenance to address localized flooding issues, monitoring results of maintenance activities in drainage catchment areas, and developing specifications for acquiring independent portable fuel supplies during extreme weather events.

Completed initiatives include large-scale maintenance activities for drainage infrastructure in the Horseshoe Slough catchment, increased coordination with cranberry farms and City staff, investigation and review of existing drainage system locations to determine long-term upgrades, development of a sandbag staging and distribution program to help protect private properties during extreme weather events, construction of site drainage improvements and relocation of electrical equipment for the Edgemere Sanitary Pump Station, and upgrades to fuel supply infrastructure at the Works Yard.

Staff will continue to implement flood protection infrastructure upgrades and emergency response protocols to enhance the City's flood resilience during extreme weather events.

#### 2024/2025 Winter Storm Events

City crews deployed water gates on Mitchell Island as a precautionary measure on November 20, 2024 in response to heightened flood risks posed by the combination of a king tide and storm

surge. The Britannia flood wall was also erected during periods of high water events. The event did not result in any flooding.

Overall, seasonal high tides and king tides were not significant over the winter, and the City's diking system performed well. There were no reports of dike overtopping, breaching, or other flood related concerns during this period. Erosion and debris run up continue to be addressed as part of the dike maintenance program.

### Infrastructure Improvements

The City's flood protection system has a replacement value of approximately \$3.7 billion. The City is actively implementing the Council-endorsed accelerated flood response program and upgrading flood protection infrastructure to address the impacts of growth, infrastructure age and climate change.

#### *Capital Dike Upgrades*

Current climate change science estimates that sea levels will rise approximately 1.0 metre by the year 2100 and 0.2 metres of land subsidence will occur over the same time period. The City's Flood Protection Management Strategy is the guiding framework for continual upgrades and improvements to the City's flood protection system. A key action identified in the City's Flood Protection Management Strategy is to continue raising the City's perimeter dike to 4.7 metres in advance of climate change induced sea level rise.

The following dike improvement projects have been approved through the capital budget and are progressing or getting underway:

- Design of north dike upgrades between Lynas Lane and No. 2 Road;
- Design of south dike upgrade between No. 4 Road and No. 5 Road;
- Design of south dike upgrade between 6080 Dyke Road to Gilbert Road; and
- Preliminary design of north dike upgrades between Knight Street and the CN Rail Trestle Bridge.

Funding to construct dike upgrades will continue to be requested through future capital projects for Council's consideration as part of the annual budget process. The City will also continue to seek senior government grant funding opportunities to support dike raising projects.

#### *Dike Rehabilitation*

Staff completed a major update to the Dike Operations & Maintenance Manual and continue to conduct annual inspection and maintenance programs to ensure that the City's dikes are well-protected against issues such as erosion and seepage. Notable inspection and maintenance work completed this year includes the following:

- Responded to seven high water events over 35 days of patrols;

- Installed two new staircases (at 4291 River Road and at the intersection of Lynas Lane and River Road) to improve pedestrian accessibility to the north dike;
- Installed 610 metres of rip rap armoring at various dike sections throughout the City to reinforce the waterside dike slope;
- Completed 415 metres of landside dike repairs and barrier installations on the north dike along River Road and south dike along Dyke Road to mitigate vehicle damage to the dike;
- Completed 30 metres of spot repairs to address damages resulting from storms, and 100 metres of dike repairs due to motor vehicle accidents (MVAs);
- Completed 240 metres of pathway improvements and removed large, woody debris from the shoreline over a 55-metre section on the north dike along River Road to avoid impacts to rip rap and dike slope stability;
- Upgraded four access gates to improve dike access for maintenance activities, dike patrols and emergency situations; and
- Completed 49 kilometres of brush cutting and inspections along the entire perimeter dike.

#### *Pump Station Upgrades*

Significant progress has been made in upgrading the City's drainage pump stations to accommodate growth and climate change. The total capacity of the City's drainage pump stations has increased by 30% since 2005.

Over the last 20 years, as part of the City's asset management program, 19 of 39 drainage pump stations have been rebuilt or upgraded. Upcoming drainage pump station upgrade projects include the No. 3 Road South and No. 9 Road-Westminster Highway Pump Stations.

During extreme events, a number of older pump stations operate near full capacity. These stations have been identified to require upgrades. Projects to upgrade or replace these stations are either included in current capital budgets or will be brought forward for Council's consideration as part of future capital budgets.

#### *Box Culvert Repair and Preventative Maintenance*

The City has approximately 61 kilometres of culverts, the majority of which are 40 to 50 years in age. Although the box culverts have a design life of 100 years, premature failure of some joints has been observed in recent years.

The City has implemented a preventative box culvert maintenance program to inspect the condition of box culverts and identify sections that require repair or replacement on a 7-year cycle. Staff are proactively managing the condition of box culverts by identifying and repairing deteriorating joints before they cause significant damage. Repair of significant defects identified through the program will continue to be presented to Council for consideration as part of the annual capital budget.

Staff inspected 10 kilometres of box culverts within 13 drainage catchments in 2024. Results of each inspection are documented in reports with supporting images and video recordings. This allows staff to monitor changes to the condition of box culverts, thereby better informing long-term infrastructure improvement planning. In 2024, no significant defects were encountered and all minor defects that were identified have been repaired.

Rehabilitation of the No. 4 Road box culvert from Westminster Highway to Granville Avenue is occurring in summer 2025. The rehabilitation will include conventional methods along with injection grouting to prevent infiltration into the box culvert and fill potential voids on the outside of the box culvert. Rehabilitation of the No. 4 Road box culvert between Alderbridge Way and Westminster Highway was completed in summer 2024. These projects mitigate the deterioration of the box culvert joints and extend the service life of the box culvert.

The box culverts in the Horseshoe Slough, Bath Slough, and No. 6 Rd South drainage catchment areas are scheduled for inspection in 2025.

### *Development*

The City has successfully partnered with developers to secure dike upgrades through development. In particular, the City is actively pursuing opportunities to construct superdikes, where land supporting development behind the dike is filled to the same elevation as the dike crest. This eliminates visual impacts of a raised dike structure on waterfront views, while providing an enhanced flood protection structure for the City.

Superdikes, constructed through development to date, include sections of the north dike near the Richmond Olympic Oval and No. 4 Road, as well as sections along the south dike at Riverport Way, Williams Road, and in Steveston. Superdike construction along the north dike, west of Shell Road, is expected to be completed by the end of the year.

### **Financial Impact**

None.

### **Conclusion**

The City observed the highest annual rainfall over the last 10 years in 2024 and below average freshet flows in the spring of 2025. The drainage and flood protection system performed well, with negligible freshet flood risk and a below average number of drainage-related service requests.

Demands on the drainage and flood protection system will continue to increase due to climate change and growth. The Flood Protection Management Strategy guides the City to proactively forecast, plan, and improve the City's flood protection system to meet long-term requirements. Through capital improvements, investment in preventative maintenance programs, and sound incident planning and response efforts, the City is able to manage flooding risks and maintain a high level of service to Richmond residents.

June 27, 2025

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Significant progress continues to be made in advancing the City's dike planning efforts and implementing infrastructure improvements to the City's flood protection system.



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Att. 1: Annual Drainage Service Requests 2015 - 2024  
2: Annual Rainfall Data 2015 - 2024





