

## Disaster Risk Assessment Summary 2024

The Disaster Risk Assessment is reviewed annually to account for changes that may alter the assessment of risk year-over-year and to identify new emerging risks.

### What are the highest risks and threats in Calgary?

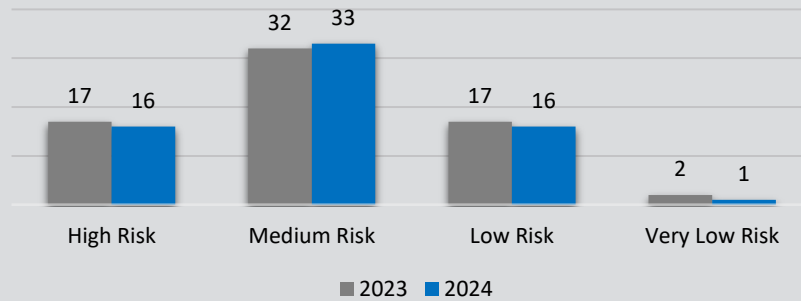
There are currently 16 hazards and threats assessed as High Risk that represent the most significant risk to Calgary and highest disaster management priority.

<b>Natural</b>	Extreme Cold Flood (Bow River) Flood (Elbow River) Heavy Rainfall	Hydrological Drought Pandemic Tornado Winter Storm
<b>Technological</b>	Critical Infrastructure Failure Dam Breach (Bow River)	Dam Breach (Elbow River) Rail Incident
<b>Human-induced</b>	Active Assailant Mass Attack	Mass Gathering Incident Protest or Demonstration (Illegal)

### What has changed since last year?

There are now 16 High Risks and 66 total risks. Water Contamination (Wildfires) was downgraded from High to Medium based on a reassessment of the potential economic impact. Stormwater Contamination (Outfalls) and Stormwater Contamination (Spill on Causeways) were removed as they are now accounted for under other risks. Refer to Appendix 1 for a complete summary.

### Overall Risk Summary: 2023 vs 2024



### What else are we monitoring?

Medium Risks that are currently trending upwards are monitored as they have the potential to become more severe in the future and may require pre-emptive risk treatment strategies to manage their risk.

#### Medium Risks – Trending Upwards

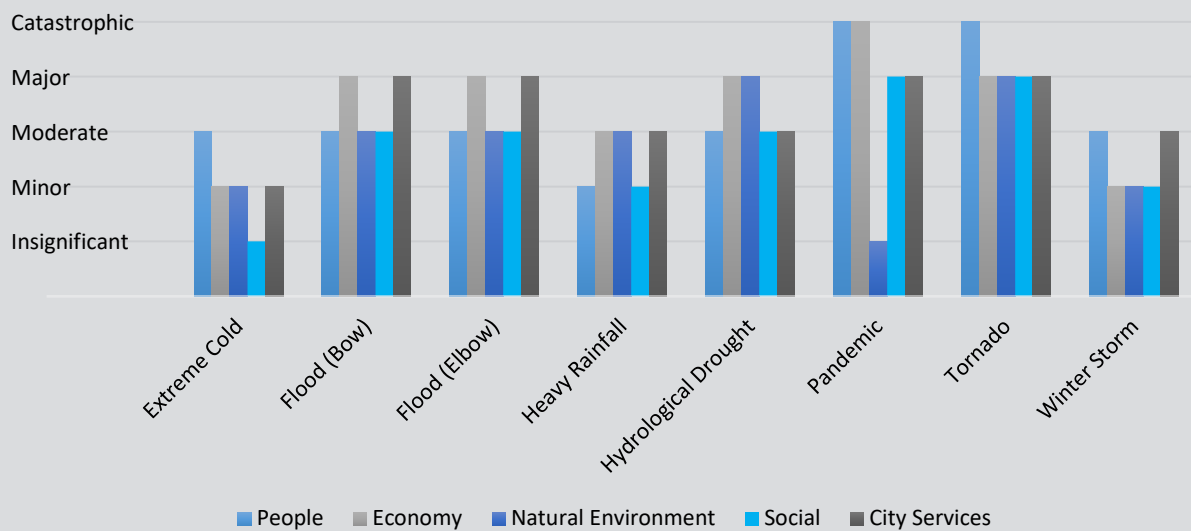
<b>Natural</b>	Basement Seepage Flooding Extreme Heat Extreme Solar Storm Major Solar Storm Poor Air Quality	Slope Failure/Landslide Stormwater Backup Flooding Water Contamination (Wildfires) Wildland/Urban Interface Fire Windstorm
<b>Technological</b>	Sanitary Failure (Lift Station) Supply Chain Interruption	Water Contamination (Distribution)
<b>Human-induced</b>	Cyber Attack (technology as Instrument) Cyber Attack (technology as target)	Data Fraud/Theft

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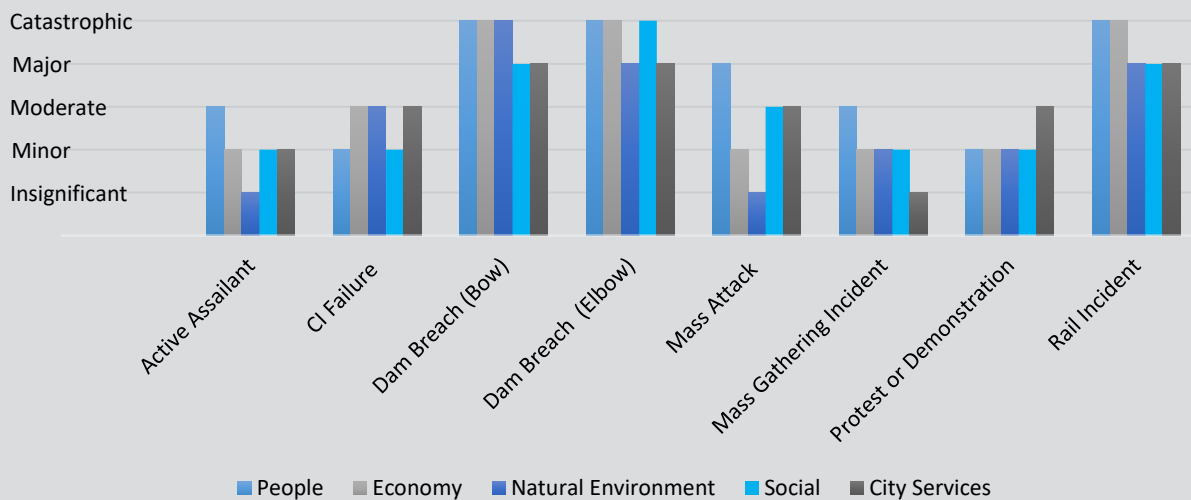
### Analysis of the 16 High Risks

The following charts summarize the impact scores for the 16 High Risks across the five impact dimensions: People (death, injury, or illness); Economy (economic activity, asset value, important industry, and supply chain); Natural Environment (ecosystems, species, and environmental values of interest); Social Environment (social fabric, community services, quality of life, and cultural assets); and City Services (city government and service delivery).

### Natural Hazards – Impact Scoring



### Human and Technological Hazards - Impact Scoring



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### Hazard and Threat Correlation Matrix

The worst catastrophes are combinations of events where a primary trigger event causes secondary cascading effects - resulting in the consequences being worse than if they had happened independently. The potential for one hazard or threat to trigger or exacerbate the effects of another is captured in this matrix. The darker areas (3 and 4) are the most critical as they have the highest potential to induce cascading events. The scoring is based on historical events, expert feedback, and an analysis of plausible future scenarios.

### Analysis

The correlation matrix illustrates the significant impact local hazards have on critical infrastructure and its importance to effective risk reduction. Critical infrastructure is the backbone of modern urban centres. Effective disaster response and recovery must be centred on building resilience into these systems, facilities, and services.

		Secondary Cascading Impacts															
		Active Assailant	CI Failure	Dam Breach (Bow)	Dam Breach (Elbow)	Extreme Cold	Flood (Bow)	Flood (Elbow)	Heavy Rainfall	Hydrological Drought	Mass Attack	Mass Gathering	Pandemic	Protest (Illegal)	Rail Incident	Tornado	Winter Storm
Primary Trigger Event	Active Assailant	1	2	0	0	0	0	0	0	0	1	1	0	1	1	1	0
	CI Failure	0	4	2	2	1	1	1	1	0	1	0	1	0	2	1	1
	Dam Breach (Bow)	0	3	4	1	0	3	3	1	1	1	1	0	1	3	1	0
	Dam Breach (Elbow)	0	3	1	4	0	3	3	1	1	1	1	0	1	3	1	0
	Extreme Cold	0	3	1	1	0	1	1	0	0	0	0	0	0	1	0	1
	Flood (Bow)	0	3	3	1	0	0	1	1	0	1	0	0	0	3	1	0
	Flood (Elbow)	0	3	1	3	0	1	0	1	0	1	0	0	0	3	1	0
	Heavy Rainfall	0	3	3	3	0	3	3	0	0	0	0	0	0	3	0	0
	Hydrological Drought	0	2	1	1	0	0	0	1	1	0	0	0	0	0	0	0
	Mass Attack	1	3	1	1	0	1	1	0	0	4	1	0	1	1	1	0
	Mass Gathering	1	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0
	Pandemic	0	3	1	1	0	1	1	0	0	1	2	1	2	1	1	0
	Protest (Illegal)	1	1	0	0	0	0	0	0	0	3	1	0	1	1	1	0
	Rail Incident	1	3	2	2	0	1	1	0	0	1	1	0	1	4	1	0
	Tornado	0	3	1	1	0	1	1	0	0	1	1	0	1	3	1	0
	Winter Storm	1	3	0	0	1	0	0	0	0	1	1	0	1	3	0	1

4	<b>Cascading potential:</b> an event of this type can potentially trigger other sub-category hazards/threats within the same category (i.e. human-induced, natural, technological).
3	<b>Strong potential:</b> an event of this type can potentially directly trigger an event of the second type.
2	<b>Weak potential:</b> there is some potential for an event to contribute to the causal mechanisms that would trigger the occurrence of an event of the second type.
1	<b>Indirect potential:</b> no mechanism to cause an event of the second type but the impact of the second event would be worse due to resources already deployed and abilities to respond reduced.
0	<b>No potential:</b> the two event types are uncorrelated and if they occurred coincidentally their consequences would be broadly the same as if they occurred independently.

Source: based on work from the University of Cambridge

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### Appendix 1: Risk Assessment Results

Assessed risk for all 66 hazards and threats analyzed in the current Disaster Risk Assessment.

<b>High Risk</b>	Active Assailant Critical Infrastructure Failure Dam Breach (Bow River) Dam Breach (Elbow River) Extreme Cold Flood (Bow River) Flood (Elbow River) Heavy Rainfall	Hydrological Drought Mass Attack Mass Gathering Incident Pandemic Protest or Demonstration (Illegal) Rail Incident Tornado Winter Storm
<b>Medium Risk</b>	Basement Seepage Flooding Bomb Threat incident Bridge Failure/Interruption Cyber Attack (Data Fraud/Theft) Cyber Attack (Technology as Instrument) Cyber Attack (Technology as Target) Electric Power Blackout Extreme Heat Extreme Solar Storm Hailstorm Hazmat Incident Industrial Accident Lightning Storm Loss of Major Transportation Corridor Major Solar Storm Poor Air Quality Riot	Road Accident Sanitary Forcemain Failure (Lift Station) Security Incident at City Facility Slope Failure/Landslide Stormwater Backup Flooding Structure Fire Supply Chain Interruption Telecommunications Failure Thunderstorm Transit Rail Incident Water Contamination (Distribution) Water Contamination (Downstream of Reservoirs) Water Distribution (Infrastructure Failure) Water Contamination (Wildfires) Wildland / Urban Interface Fire Windstorm
<b>Low Risk</b>	Aircraft Incident Earthquake (Magnitude 4.0+) Flood (Ice Jam) Fog Forcemain Failure (Purple Pipe) Forcemain Failure (Sludge) Gas Main Break Hostage Incident	Ice Accumulation Labour Action Moderate Pandemic Pipeline Incident (AER lines) Pipeline Incident (TNPL to YYC) Sanitary Failure (Water Body) Water Contamination (Spills) Water Contamination (Spills Upstream Glenmore)
<b>Very Low Risk</b>	Pump Station Failure (Bonnybrook)	