From Muddy Waters to Clear Plans: Practical Resources for Flood Risk Management

MTI - Engineering and Technical Services Division

MTI - Manitoba Emergency Management Organization (EMO)

Land Acknowledgement

We acknowledge that we are gathered on Treaty 1 Territory and that Manitoba is located on the Treaty Territories and ancestral lands of the Anishinaabeg, Anishininewuk, Dakota Oyate, Denesuline and Nehethowuk nations.

We acknowledge that Manitoba is located on the Homeland of the Red River Métis.

We acknowledge that northern Manitoba includes lands that were and are the ancestral lands of Inuit.

We respect the spirit and intent of Treaties and remain committed to working in partnership with First Nations, Inuit and Métis people as we walk the shared path of truth and reconciliation.

Overview

- Why Flood Risk Matters for Planning
- Understanding Risk (Hazard, Exposure, Vulnerability)
- Planning Tools to Reduce Flood Risk
- Using Flood Maps in Planning Decisions
- Why Planning Choices Affect Disaster Funding
- Interactive Flood Map Demonstration
- Questions & Discussion

Setting the Scene:

Planning Through Turbulent Times

Why Flood Risk Matters for Planning Momentum

Impact of Flooding Hazards

Flooding is a costly hazard amplified by climate change, disrupting communities and planning efforts.

Shift to Proactive Planning

Proactive, risk-informed strategies are essential to maintain planning momentum amid uncertainty.

Flood Risk as a Planning Tool

Understanding flood risk helps prioritize actions to reduce losses and supports clearer, stronger decisions.

Turning Uncertainty into Opportunity

Clear, actionable insights enable communities to build resilience despite changing conditions.

Background on Flooding

What is Flooding?

- Flooding occurs when water overflows onto normally dry land.
- It can result from heavy rainfall, rapid snowmelt, storm surges, or overwhelmed drainage systems.

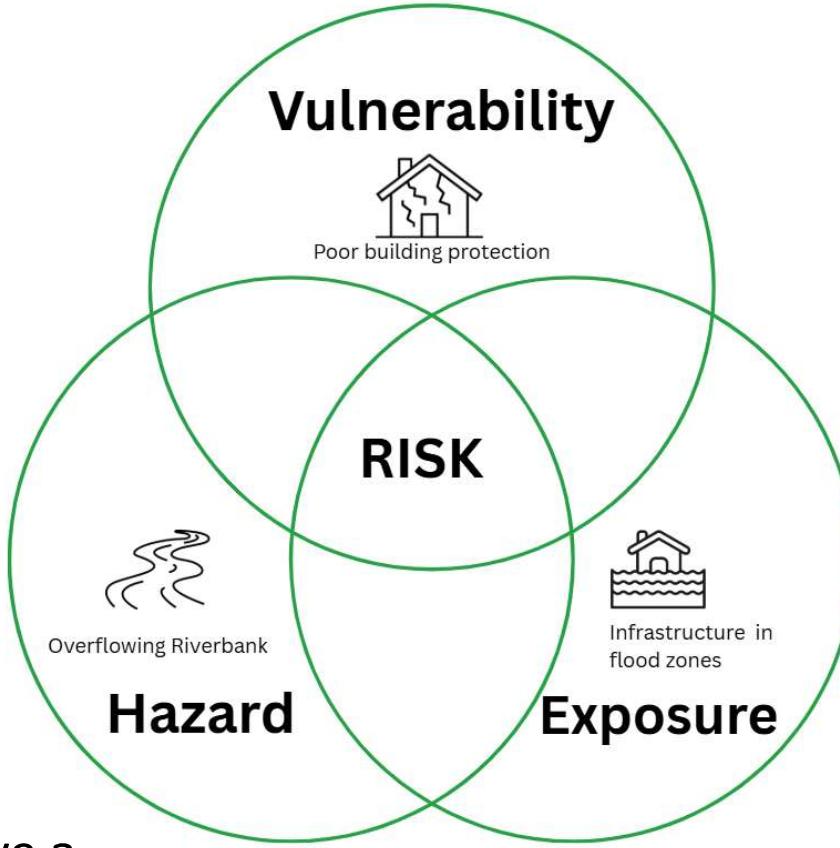
Impacts of Flooding:

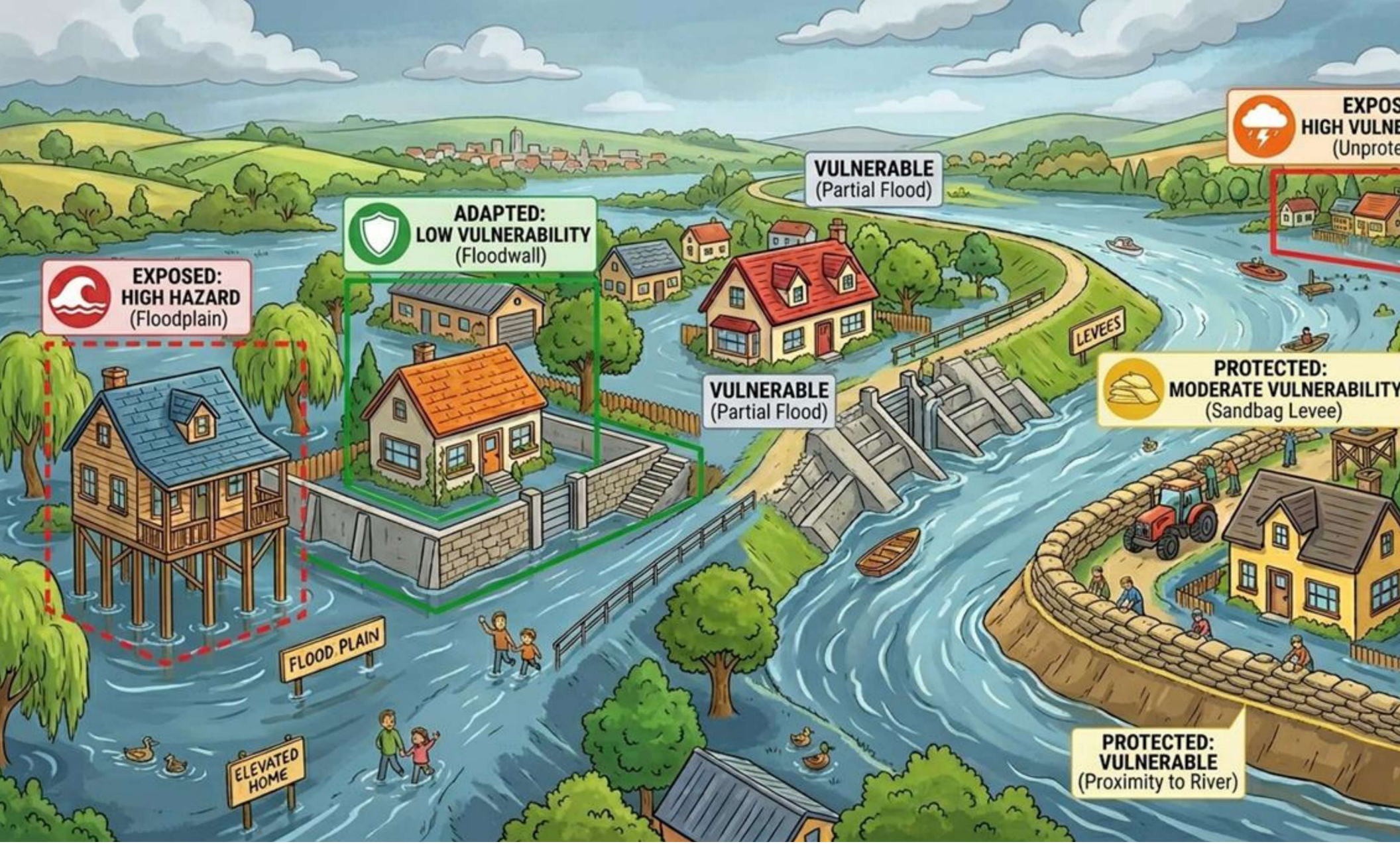
- Damage to homes, infrastructure, and businesses
- Disruption of transportation and essential services
- Financial strain on individuals and governments
- Long-term recovery challenges for communities

Risk = Hazard x Exposure x Vulnerability

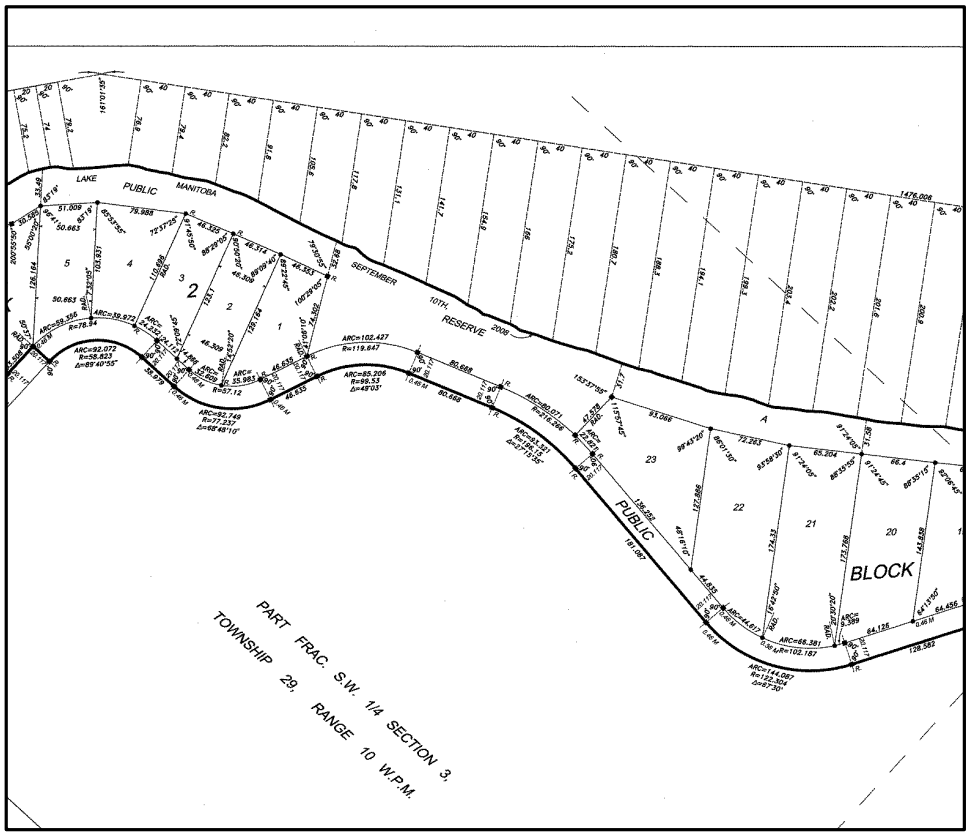
- Hazard
  - a physical event with potential damage like flooding characterized by depth, extent, and frequency.
- Exposure
  - identifies people, buildings, and infrastructure located in hazard-prone areas at risk of damage
- Vulnerability
  - describes how susceptible exposed elements are to damage based on design, preparedness, and social factors.
- Risk
  - Result from combining hazard, exposure, and vulnerability, showing potential flood consequences.

Planners don't control the hazard—but they have a major influence on exposure and vulnerability.




EXPOSED:
HIGH HAZARD
(Floodplain)
ADAPTED:
LOW VULNERABILITY
(Floodwall)
VULNERABLE
(Partial Flood)
VULNERABLE
(Partial Flood)
LEVEES
PROTECTED:
MODERATE VULNERABILITY
(Sandbag Levee)
FLOOD PLAIN
ELEVATED HOME
PROTECTED:
VULNERABLE
(Proximity to River)

Land Use Planning Tools



- Development Plans & Secondary Plans: designate hazard lands
- Zoning By-laws: restrict uses in 1-in-200-year flood areas
- Shoreline & riparian protection
  - 30 m minimum setback
- **Risk avoided is risk eliminated**

Flood Protection Standards in Planning

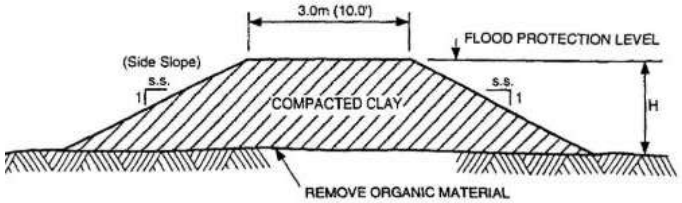
- Provincial planning standard:
  - 1-in-200-year flood OR flood of record (whichever is higher)
- Used to guide:
  - Development location and suitability
  - Required flood protection levels
- Already embedded in most Development Plans
  - ~85% of municipalities in mapped flood-risk areas
- In some locations, the flood of record exceeds the 200-year flood

Structural Controls

- Dikes
- Existing infrastructure improvement
- Elevating existing structures.

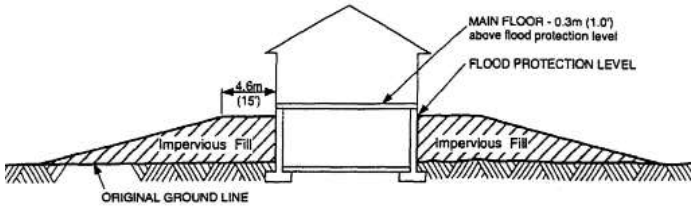
DIKE CROSS-SECTION

(minimum elevations)



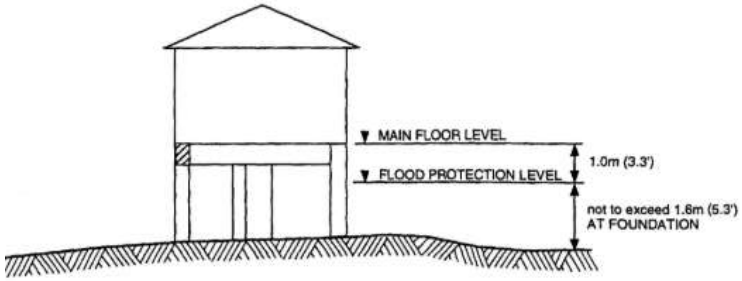
STRUCTURES WITH A BASEMENT OR CELLAR

(minimum elevations)

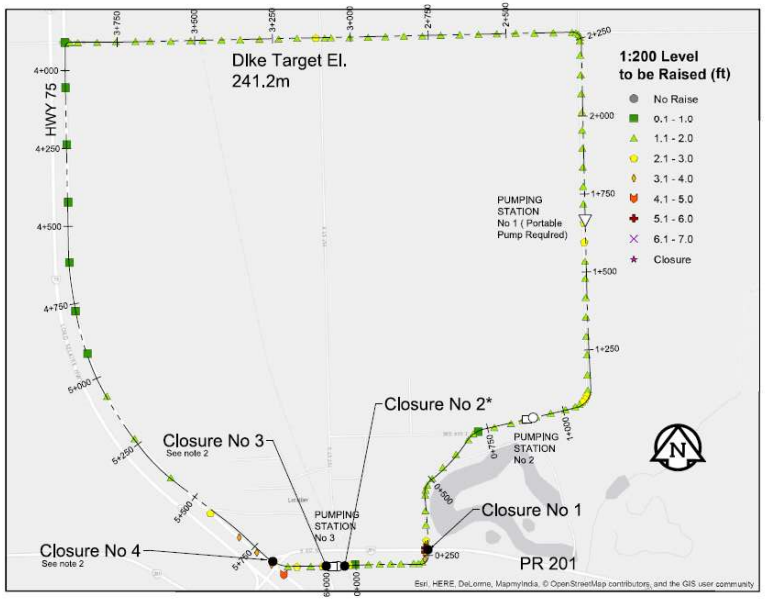


ELEVATED STRUCTURE

(minimum elevations)



Emergency Planning



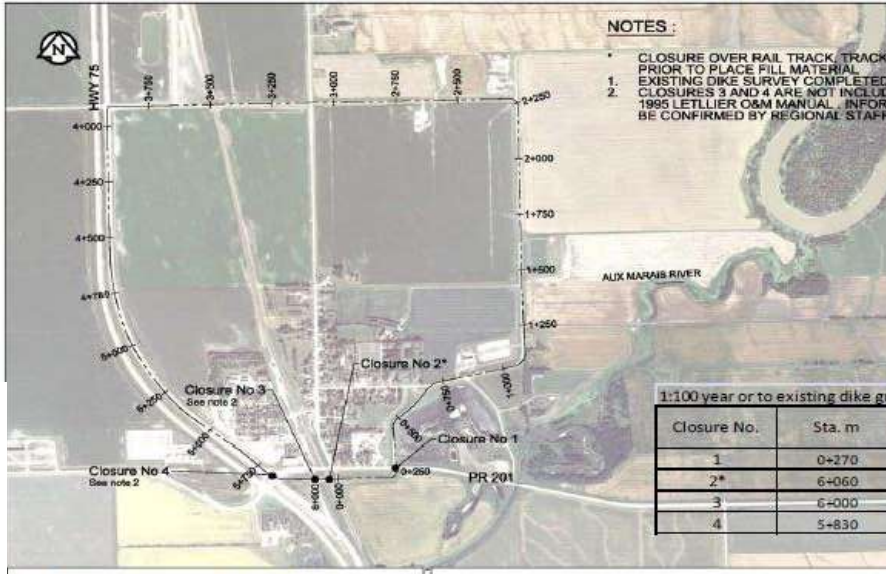
Closure No.	Sta. m	Fill QTY m³
1	0+270	1700
2*	6+060	600
3	6+000	700
4	5+830	2500

Compacted quantities (20%)

Dike Arm	Sta Range, m	Fill QTY m³
North	2+267 to 3+910	3500
West	3+910 to 5+845	2500
South	5+845 to 1+090	2200
East	1+090 to 2+267	2800

Compacted quantities (20%)

Truck routes from borrow areas to dike closure locations to be determined on site to suit field conditions



Closure No.	Sta. m
1	0+270
2*	6+060
3	6+000
4	5+830

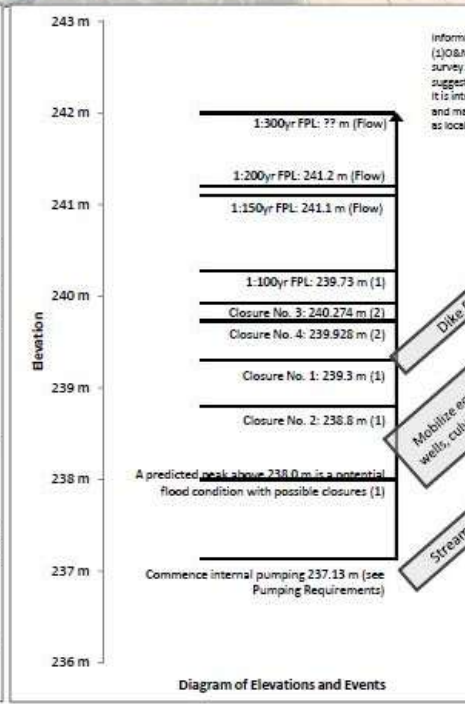
EARTHMOVING EQUIPMENT REQUIREMENTS
for closures only
as outlined in the O&M Manual
Fill material will be trucked in from St. Jean.
- Tandem trucks - Minimum 5 or as available for haul
- Front end loaders, tracked, min. size 1.5m³ - 1 for each closure for a total of 4.

PUMPING REQUIREMENTS
as outlined in the O&M Manual
See Sheet 2 or 3 for pump station locations.
- Inside water level 237.13 m commence pumping at south east station (Pump Station No.2)
- Inside water level 237.74 m commence pumping at south station(Pump Station No.3)
- Inside water level 238.3 m commence pumping at east gravity outlet location with portable pump. Crisafulli (temp)(Pump Station No.1)

SPECIAL SCENARIOS
- PTH 75 acts as the dike between Sta. 3+910 and 5+845
- Closure No. 2 over railway. Tracks to be removed prior placement of fill material.

ENVIROMENTAL PROCEDURES
Any placement of earthfill material near or adjacent to any waterway must be done in accordance with MI Best Management Practices. Notification of this work must be made to the WMEC Design Biologist.

PPE AND SAFE WORK PROCEDURES
All work to be done in accordance with MI Safe Work Procedures.



Planning with Flood Maps

Flood risk maps support planning decisions by:

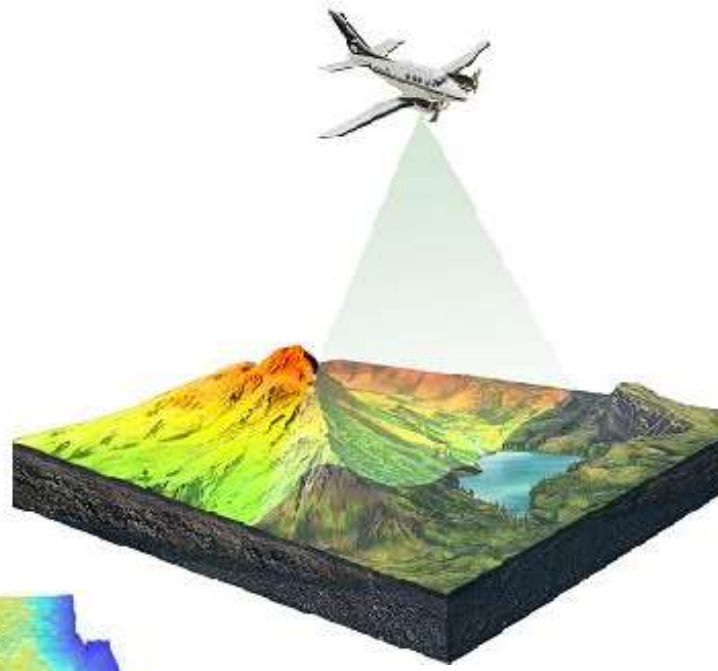
- Identifying areas exposed to flood hazards
- Showing differences in flood depth and extent
- Informing land-use designations and development suitability
- Supporting consistent, defensible planning decisions

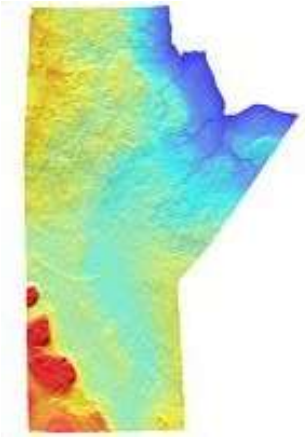
(Flood maps are decision-support tools — not predictions.)

How Flood Risk Maps Are Created

Important Acronyms

- LiDAR: **Li**ght **D**etection **A**nd **R**anging.
  - Surveying method that uses lasers to determine distances. When used in an airplane or helicopter, LiDAR can produce detailed topographic information for large areas
- DEM: **D**igital **E**levation **M**odel.
  - 3D digital representation of the earth's surface, without buildings or vegetation.





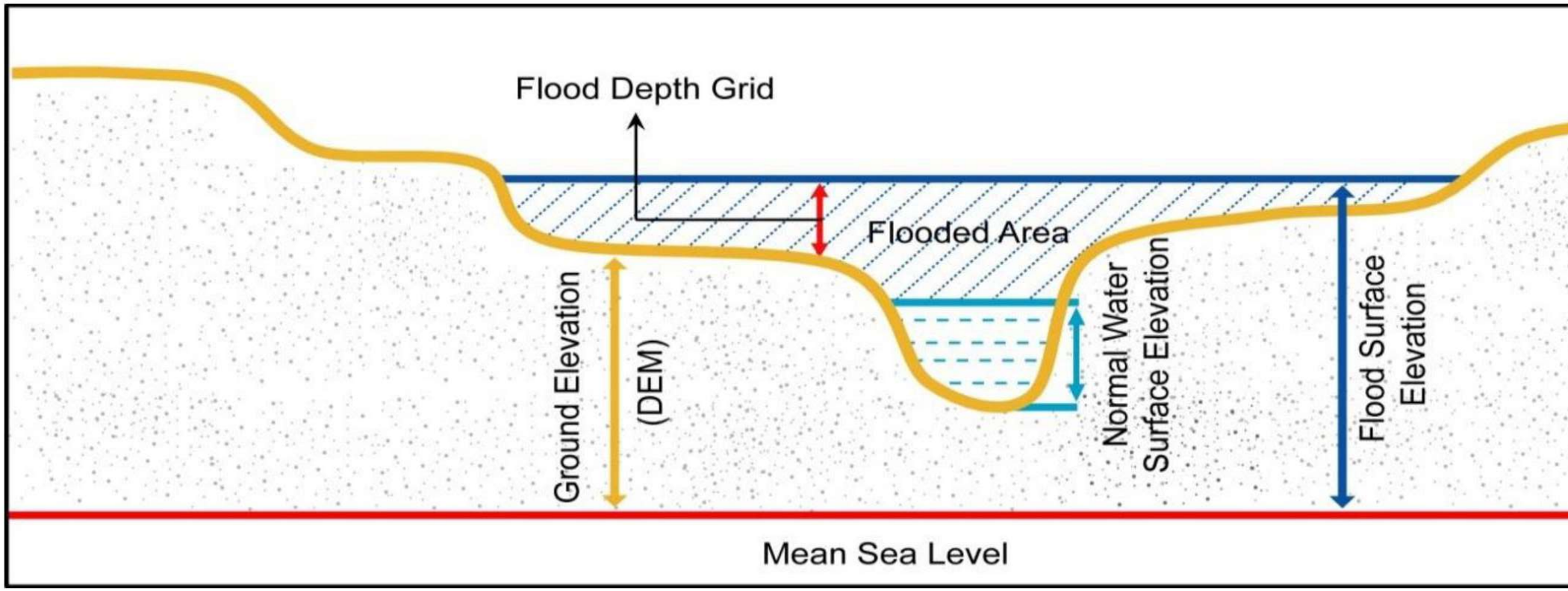
From Hazard Identification to Reliable Flood Maps

- Flood Hazard Identification
  - The process starts by identifying flood types like riverine, pluvial, and ice-jam flooding relevant to specific areas.
- Use of High-Quality Data
  - High-resolution LiDAR elevation models and hydrometric data improve flood extent and depth accuracy.
- Hydrologic and Hydraulic Modeling
  - Models estimate floodwater input and simulate water movement through floodplains and channels.
- Validation and Transparency
  - Flood map outputs are validated against real events and emphasize transparency about uncertainties

Model Data

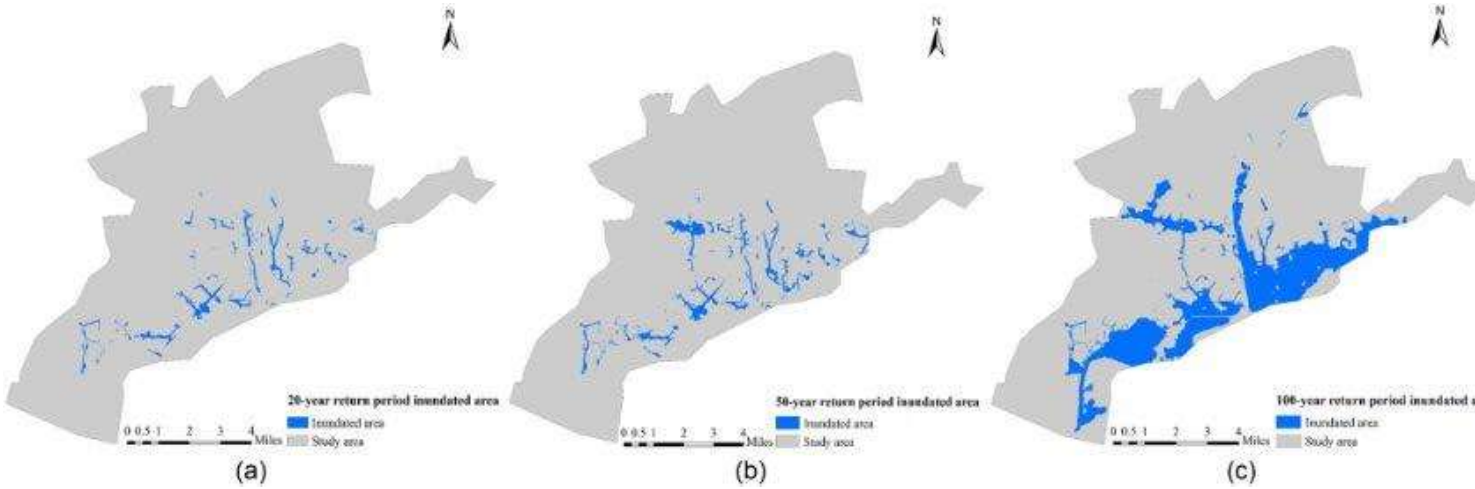
- Bathymetry data
  - Cross sections, sonar, etc.
- High resolution topographic data
  - 1m- grid DEM
  - Derived from LiDAR
- Crossing survey data
  - Bridges, culverts, etc.
- Dam & Reservoir characteristics (if applicable)
- Stream flow and water level data
  - Hydrometric gauges
  - Seasonal water level data from Water Operations

How the Data Comes Together



Model Scenarios

- Model may be used to simulate water levels for various return periods from 100-year to 700-year



Limitations

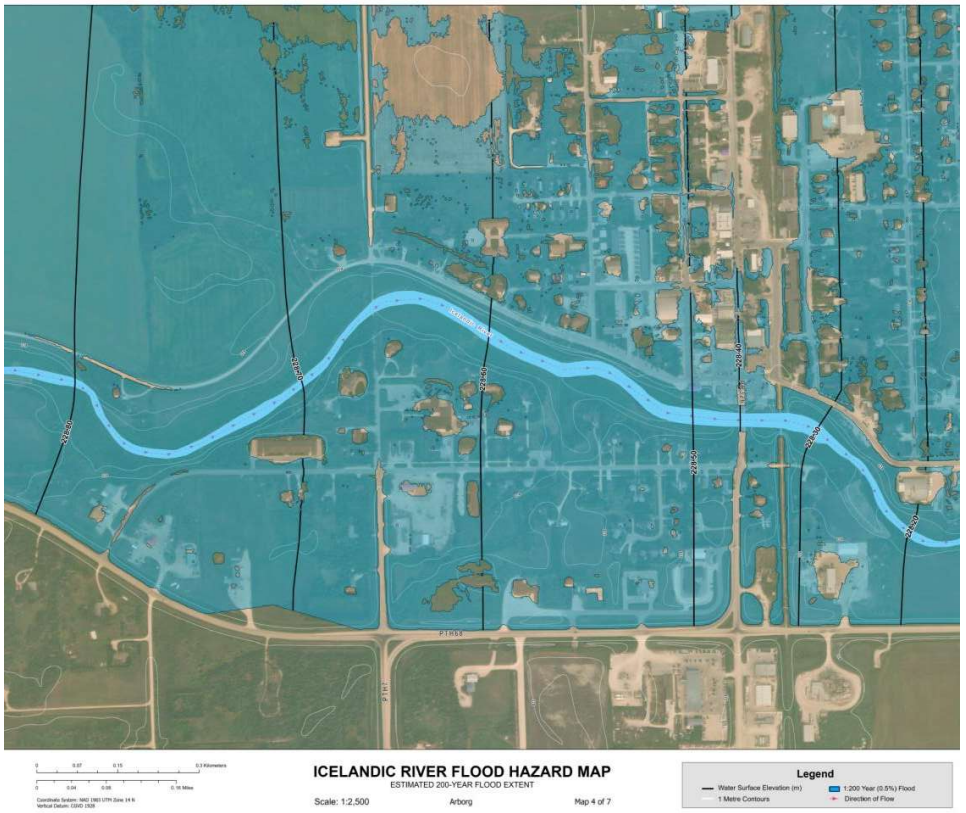
- Flood maps show the flooding resulting from flood flows on the river being studied.
- Localized drainage problems, ponding and inundation by major rain events are not shown, nor is flooding a long tributaries and small side channels.

Future updates/revisions

- Maps may need to be updated periodically
- Intend to add other sized events (1:50, 1:100, etc.) for comparison
- Study areas to be added as they are completed
- Feedback can be provided to MITWaterReview@gov.mb.ca

How to Read the Flood Risk Maps

- Flood protection levels show expected water height during the 1-in-200-year flood
- Ground elevation indicates existing land height relative to flood levels
- **Freeboard is not shown and must still be applied during development review**
- Contours and scale vary by urban and rural context
- Maps support planning-level decisions, not site-specific design



Accessing Flood Risk Information

Flood Mapped Areas

- Contact MITWaterReview@gov.mb.ca to obtain flood protection levels in the new mapped areas

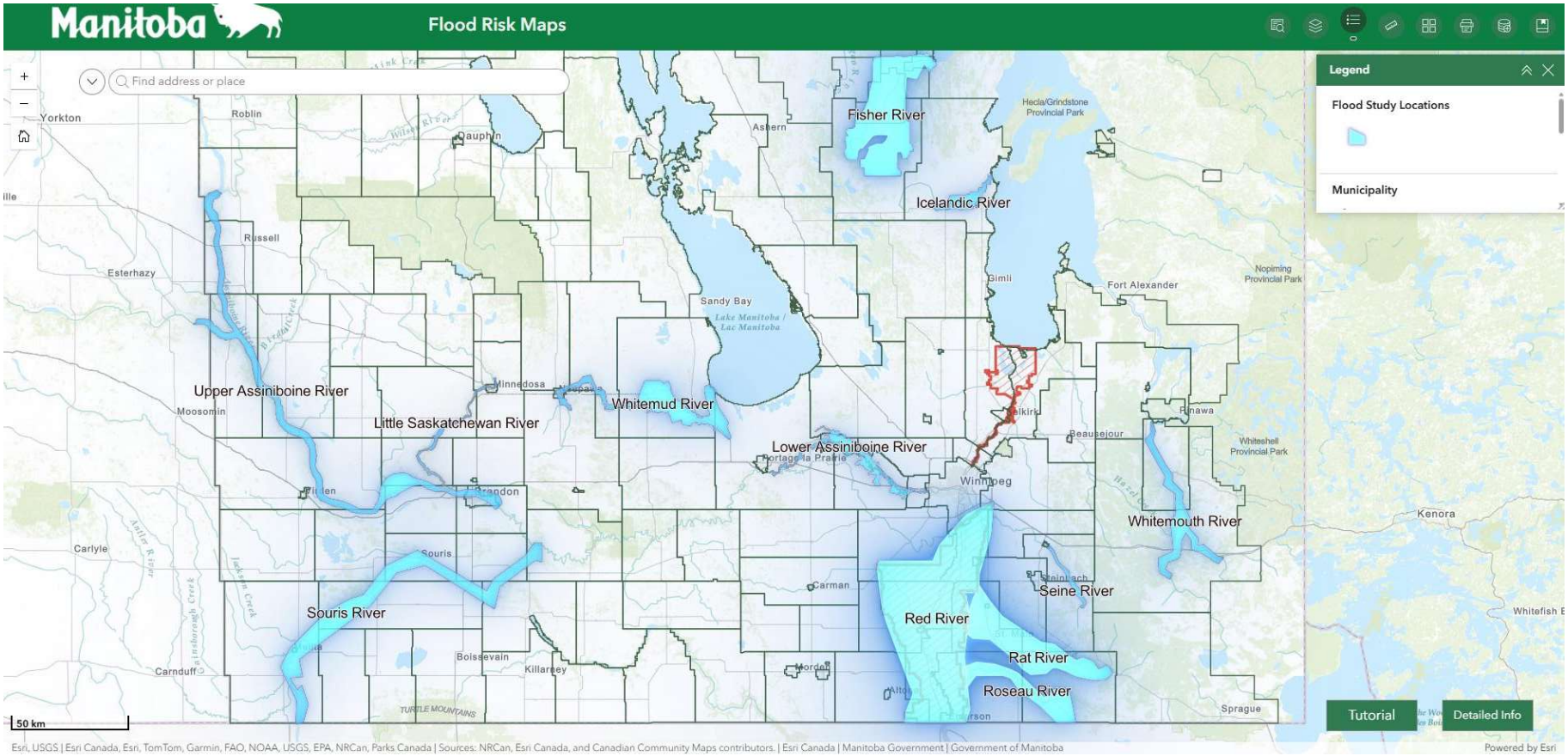
Non-Flood Mapped Areas

- Contact MITWaterReview@gov.mb.ca to see if there is information that can be used to approximate a flood protection level
- If there is no information, planning authorities may choose to conduct their own flood risk studies.

Additional permitting review required by MTI in Red River Valley and Lower Red River Designated Flood Areas

Using the Flood Risk Map

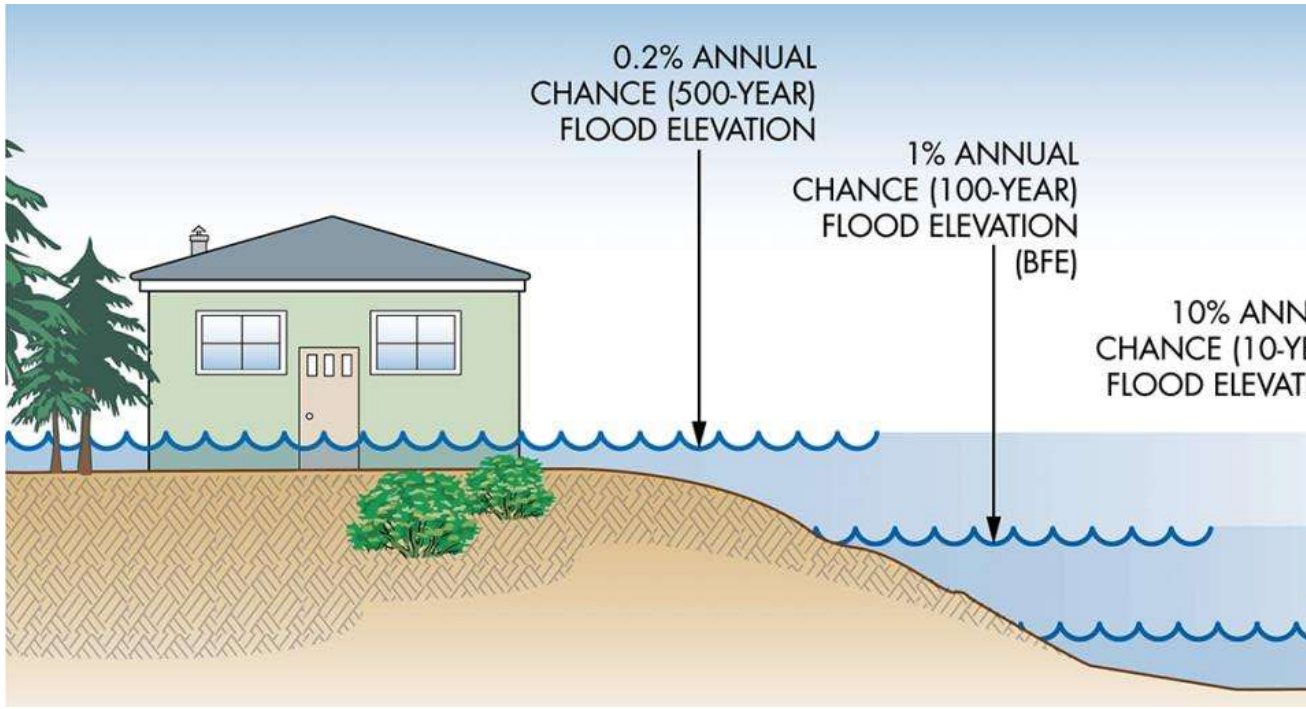
Flood Risk Map Website



1 in 200-Year Flood Protection Level

A flood event with a **0.5% chance** of occurring in any given year. A 100-year flood has a **1% chance** of occurring in any given year.

Does not mean it will occur only once every 200-years or on a consistent 200-year schedule



ASFPM Flood Guid

Disaster Financial Assistance:

What Has Changed?

Changes to the Disaster Financial Assistance Arrangements (DFAA)

- Target federal funding in **building resilience**, **reducing risk**, and supporting people
- Create stronger incentives and more flexibility for risk reduction and mitigation
- Enable climate resilient rebuilds and **reduce incentives to develop in high-risk areas**
- Underlying all changes, a push to modernize processes and increase efficiencies

Manitoba's Disaster Financial Assistance (DFA) Program

- Canada's new DFAA came into force in April 2025
- Manitoba updated its own DFA regulation and program in June 2025
- More supports available, but reduced federal cost-share (Manitoba covers more of the cost)
- New supports will help communities become stronger and more resilient over the long term.

What Does 1:200 Mitigation Mean For Your Community?

New construction - including structural renovations - in designated high-risk areas will no be eligible for DFA unless it is mitigated to a 1:200 flood event (approved for construction /building permit after April 1, 2025)

- This applies to public infrastructure and to private property

Existing assets in high-risk areas that suffer **major damage** during a DFA-eligible event must be **adequately mitigated.** If they are not, they will not qualify for future DFA programs.

- The cost of doing this mitigation is partially eligible for assistance.

What Does 1:200 Mitigation Mean For Your Community?

Next Steps

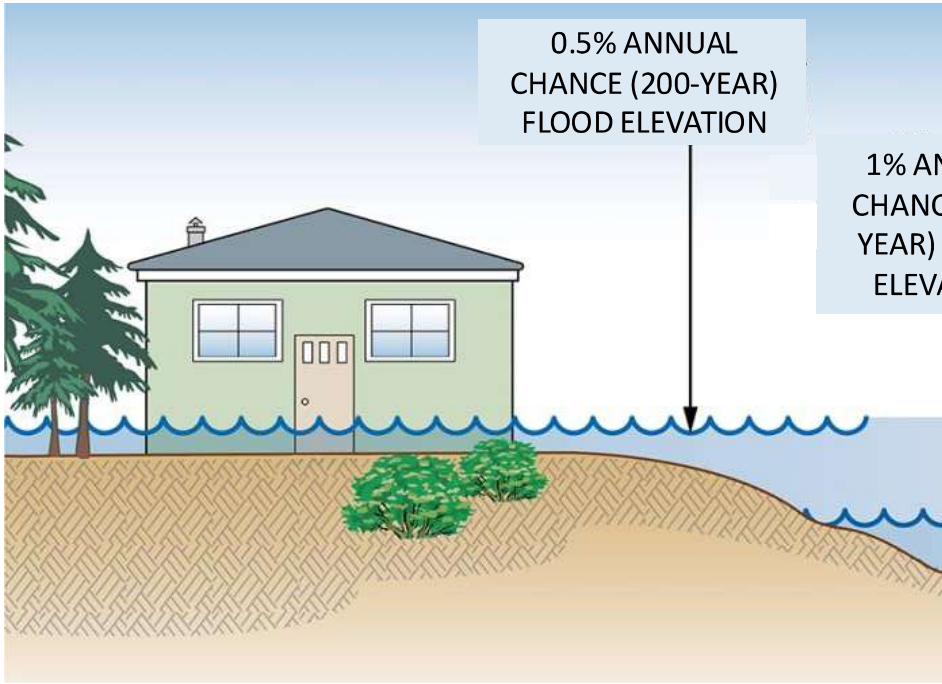
- Review building codes / standards and land use plans to protect your community from a 1:200 flood event.
- Consider community-level protections and also simpler solutions like requiring backwater valves.
- Let insurers know what you've accomplished -- it may lower rates and expand access to flood insurance in your area.

New Mitigation Funding Under DFA

- Disaster Resilient Enhancements
  - Provides additional funding equal to 15% of the cost to repair.
  - Enhancements for damaged sites includes projects like upgrading crossing sizes and adding culvert inlet grates.
- Disaster Mitigation (MIRA)
  - Provides funding equivalent to 25% of a local authorities DFA eligible costs to build resiliency in disaster affected areas.
  - More flexible for community-based solutions, such as planning, dikes, water retention, or relocating assets.

DFA/DFAA Requirements in High-Risk Areas

- **New assets** in high-risk areas are only eligible if **adequately mitigated**
- Existing assets in high-risk areas with **major damage** that are not **adequately mitigated** to prevent future damage **will not be eligible for future DFAA programs**
- This policy is already required in the existing DFAA; however, the level of mitigation is increasing
  - 200-year FPL is the new mitigation standard (previously 1 in 100-year FPL)
- Will use regulatory flood risk maps where they exist; federal model where they don't exist



For illustrative purposes only

Private Sector Mitigation Opportunities

The new DFA program allows for private sector claimants to receive additional funding to perform approved disaster mitigation projects on their property.

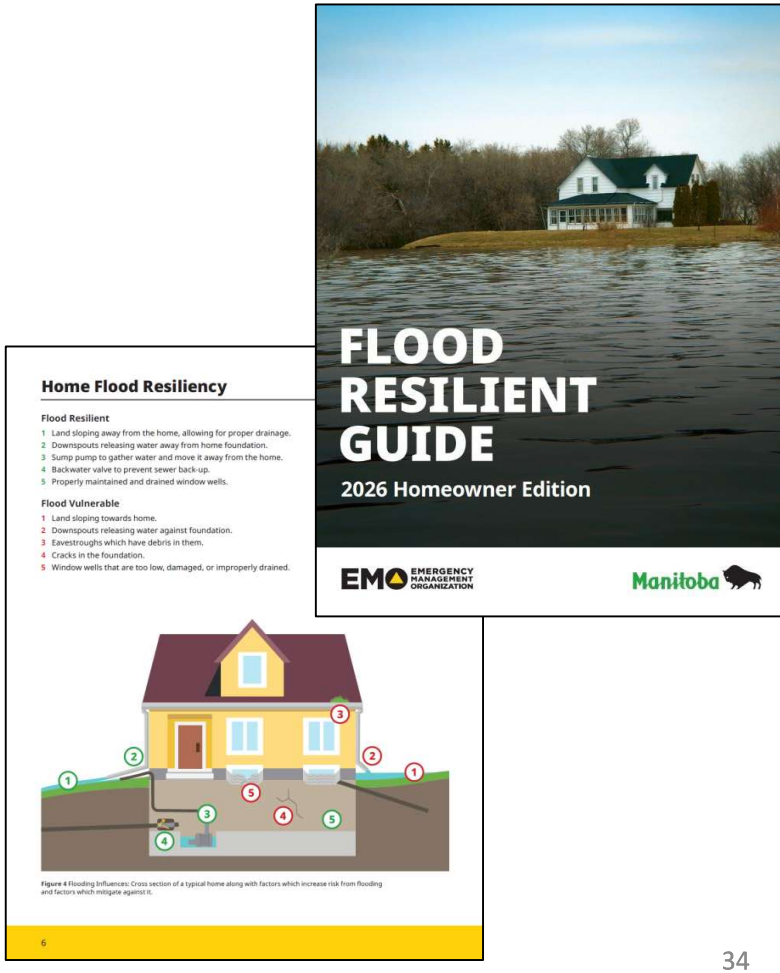
If applicable, upgrades required to meet building codes and standards are still eligible costs.

Manitoba EMO will work with private claimants to identify the most effective and appropriate ways to protect assets from future damage.

33

Private Sector Mitigation Opportunities

- To support the public sector, Manitoba created a Flood Resilient Guide.
  - This document provides information such as how water enters a home or what projects can be done to build resilience.
  - This will guide public sector mitigation funding under Disaster Financial Assistance.



Key Takeaways

Transforming Uncertainty Into Insight

Flood risk maps turn uncertainty into actionable insights that support proactive community planning.

Proactive Funding Alignment

Modernized Disaster Financial Assistance aligns funding with risk-informed, proactive decision-making.

Integrating Data and Policy

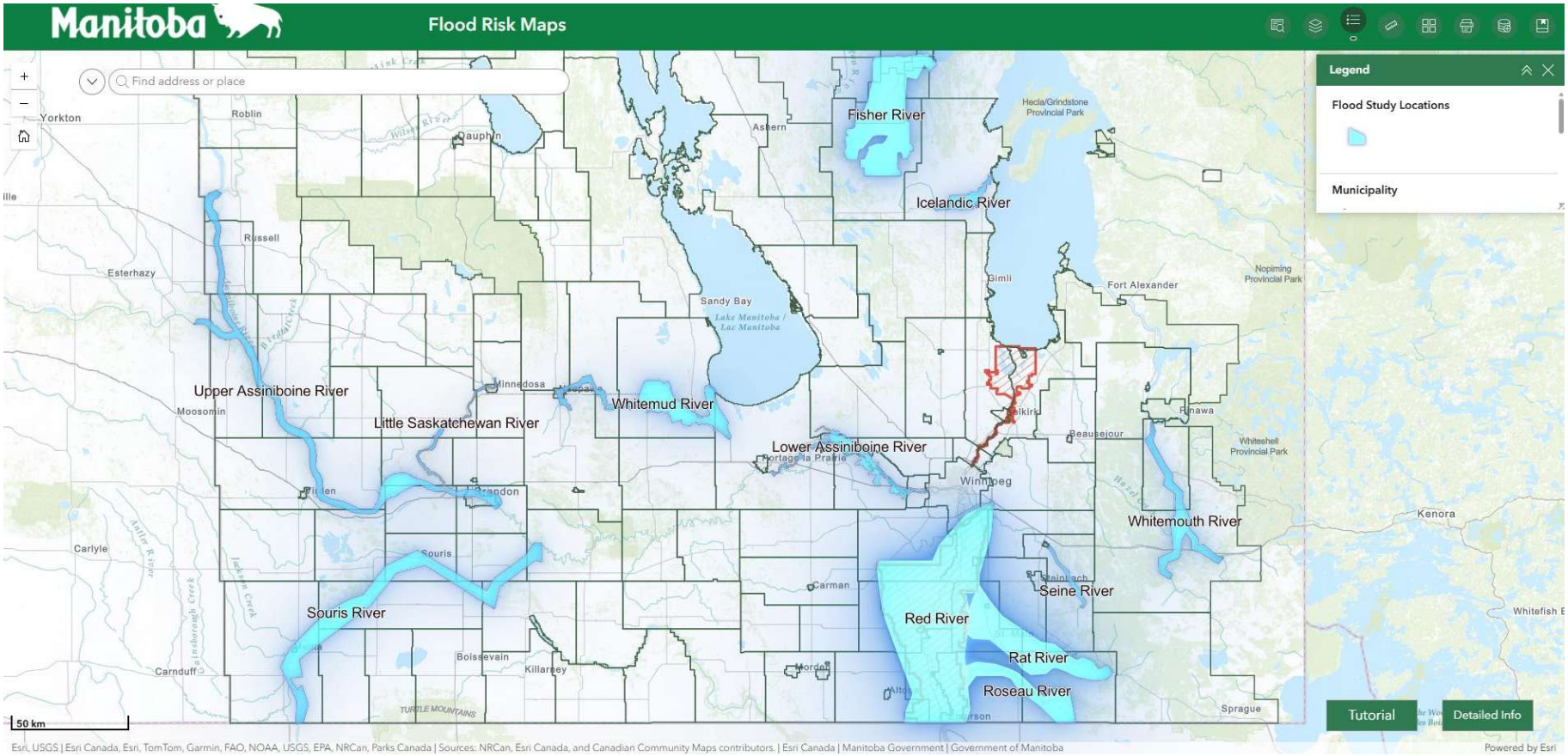
Combining technical data, policy incentives, and practical tools strengthens planning and infrastructure resilience.

Building Safer, Stronger Communities

Effective planning leads to safer infrastructure, stronger communities, and sustained momentum through challenges.

Using the Flood Risk Map

Flood Risk Map Website



Questions?