Managing Flood Hazard Identification in Alberta

Alberta Environment James Choles, Chandra Mahabir, Bryce Haimila, Pat Stevenson May 8, 2008

### Outline

- Introduction
- History and uses
- Defining the flood hazard area
- Data Collected
- Design Flood
- Dykes
- Designation

### Outline (continued)

- Frequently Asked Questions
- Education
- Conclusions

# Introduction



# North Saskatchewan River at Rocky Mountain House, 2005.





### How to prevent flood damages?

- Don't have flood vulnerable development in flood hazard areas
- Need to identify flood hazard areas

### Uses of Flood Hazard Mapping

- Identify flood hazard areas within a community for the **design** flood
- Planning tool for municipalities
- Allow for the passing of appropriate land use controls to minimize the flood risk to development

### Uses of Flood Hazard Mapping (continued)

- Educate the general public by increasing the general awareness of flood hazards
- First step in planning structural flood mitigation measures

### Outcome

### This results in

- increased public safety
- reduced future flood damages

### Floods Addressed

 Overland flow from a water body such as a river or lake caused by excessive flow or an ice jam



June 2005



Fort Macleod June 1995

Groomania Am Cumuma La



Fort McMurray April 1977

# History

- Alberta Environment has produced flood hazard maps since the 1960's
- FDRP Agreement signed in 1989 between Canada and Alberta to cost share flood hazard mapping
- Agreement terminated in 1999, mapping not complete
- AENV continuing on with mapping
- Part of Water for Life Strategy

### Guidelines

- FDRP terminated in 1999
- Review standard operating procedures
- Review and compile policies and decisions made over the years
- Flood Hazard Identification Program Guidelines

### Floods Addressed

- Overland flow from a water body such as a river or lake caused by excessive flow or an ice jam
- not groundwater/water table problems
- not drainage problems
- not storm water
- not structure (e.g. dam) failure
- not debris jams

### Flood Hazard Area

- Total area inundated by the design flood
   -1:100 year open water flood, ice jam flood
  - unregulated flow



### Calgary 1950



#### Fort McMurray April 1997



#### Peace River April 1979



### Peace River April 1979



#### Edmonton 1915

### Flood Hazard Area (continued)

divided into two parts

 flood fringe
 floodway



### Floodway

• The area that has the deepest, fastest and most destructive waters during the design flood event



Okotoks June 2005



#### Okotoks June 2005

# Floodway Criteria

- 1 metre depth
- 1 m/s velocity
- 0.3 metre rise in water elevation
- Calgary



### Flood Fringe

- The portion of the flood hazard area not included in the floodway
- the land along the edges of the flood risk area that has shallow water (less than 1 metre deep) with low velocities (less than 1 m/s) during the design flood event



Okotoks June 2005



### **Final Flood Elevations**

• Final flood elevations are calculated assuming that the entire flood fringe has been filled in



### Data Collected

- High-water marks
- Aerial flood photography
- Rating Curves
#### • High water mark collection













#### Red Deer, June 2005



Historic rating curves for the Red Deer River at Red Deer for the period January 1, 1998 to 2007. Note the natural variation between the rating curves.

# Design Flood

- Flood that may occur in any one year based on a certain probability
- Based on open water or ice jam flooding or combination
- 1:100 year return period flood as the benchmark flood event
- Once an event is chosen, then it is referred to as the design flood event

Province/Territory	Number of communities	Regulatory Flood	Definition of Floodway
B.C.	143	1:200	(1)
Alberta	66	1:100	Hydraulic (2)
Saskatchewan	24	1:500	Hydraulic (2)
Manitoba	26	1:100	Hydraulic (2)
Ontario	445	1:100 (3)	1:100
Quebec	510	1:100	1:20
New Brunswick.	15	1:100 (4)	1:20
Nova Scotia	6	1:100 (4)	1:20
P.E.I.		1:100 (4)	1:20
Newfoundland and Labrador	53	1:100 (4)	1:20
N.W.T	9	1:100	Hydraulic (2)
Nunavut		1:100	Hydraulic (2)

Notes:

1. The floodway in British Columbia is defined as the natural channel plus a minimum 30 m setback.

2. The hydraulic criteria uses 1 m depth, 1m/s velocity or 0.3 m water level rise

3. Ontario uses the Hurricane Hazel rainfall, the Timmins storm and the 1:100 elsewhere

4. The Atlantic provinces may also use a historic event provided the water levels are higher than the 1:100 flood

#### Design Flood (continued)

- Design flood based on natural flows
- Most dams are licensed for flow augmentation or hydroelectric power generation
- Provincial dams will be operated to dampen peaks as much as possible

# **Public Facilities**

- Most facilities use the 1:100 year return period flood
- Lifelines facilities that perform a function of significant importance to the health, safety and welfare of a community 1:500 year return period flood
- Vital Lifeline Structures (e.g. hospitals) 1:1000 year return period flood





#### Drumheller June 2005

#### Dykes (continued)

- Dykes are built to protect existing development
- Dykes are not built to create new development opportunities
- New development behind dykes should be floodproofed
- Flood lines assume dykes not present

# Designation

- Formal recognition of the flood hazard identification maps by the various levels of government
- Formerly under FDRP agreement with federal and provincial governments
- Section 96 of Water Act
- Required to consult with local government

- It documents the acceptance by all levels of government of the areal extent of the flood hazard area; and
- It signals the initiation of specific actions and policies by the provincial and municipal governments.

The provincial government :

 will ensure that provincial departments and agencies will not construct any developments in the designated flood hazard area that are vulnerable to flood damage;

 will ensure that provincial departments and agencies do not cost share any developments in the designated flood hazard area that are vulnerable to flood damage;

 will encourage the local authorities to adopt land use restrictions that prohibit development vulnerable to flood damage within a designated flood hazard area or, where appropriate, make such development subject to floodproofing requirements; and

• <u>may</u> restrict disaster recovery compensation programs such that no funding is available for costs or losses incurred as the result of a flood within any designated flood hazard area if the development was initiated after the date of designation, unless such a development was adequately floodproofed.

# Local Government Role

- Local government makes development decisions
- Adopting flood hazard maps
- Land use bylaws
- Environment continues to provide assistance

# Frequently Asked Questions

- Land value concerns
- Accuracy planning level
- What do the flood frequencies mean
- Flood hazard maps are planning tools for structural development
- Not meant to for emergency response

## Education

- If the public understands their risk from flooding, then they will be able to take appropriate individual action in response to flood warnings
- will reduce flood damages and reduce the risk of loss of life.

#### Education (continued)

- Open houses on designation days and at other times offer opportunities for the public to learn about flood hazards in their communities.
- Alberta Environment will continue to provide support to local governments after designation on flooding issues.

## Website for Maps

AENV website <u>http://www.environment.alberta.ca/</u> Reports / Data Flood Risk Map Information Flood Risk Map Information System



© 2001-2002 Government of Alberta

Alberta

Environment

GOVERNMENT



Alberta

Environment Home | <u>Contact Us</u> | <u>Privacy Statement</u> The user agrees to the terms and conditions set out in the <u>Copyright and Disclaimer</u> statement. © 2001-2002 <u>Government of Alberta</u>





Alberta

Environment Home | Contact Us | Privacy Statement The user agrees to the terms and conditions set out in the <u>Copyright and Disclaimer</u> statement. © 2001-2002 <u>Government of Alberta</u> 1 berto



Alberta

Environment Home | Contact Us | Privacy Statement The user agrees to the terms and conditions set out in the Copyright and Disclaimer statement. © 2001-2002 Government of Alberta Alberto



laimer statement.



Environment Home | <u>Contact Us</u> | <u>Privacy Statement</u> The user agrees to the terms and conditions set out in the <u>Copyright and Disclaimer</u> statement. © 2001-2002 Government of Alberta



# Summary

The flood hazard maps represent the best available delineation of the extent of flooding for the design flood in a community. Used by a community they can reduce flood damages and increase public safety.







# Appropriate Development in Floodway

Appropriate development in the floodway should typically be non-obstructive, low value and could include:

- parks and recreation
- natural areas
- roads and parking facilities
- bike/ski trails and related facilities

Appropriate Development in Floodway (continued)

- road and pedestrian bridges
- crop and pasture lands
- flood control works
- boat/canoe launching sites
- public utilities adjacent to or across the water course including intakes and outfalls



Okotoks June 2005



Sheep River June 2005

# Flood Proofing

- flood proofed development is allowed in flood fringe areas under AENV guidelines
- Flood proofing is defined as: design modifications to buildings such that no claimable damages occur for floods less than or equal to the design flood




Okotoks June 2005

## **Using Flood Elevations**

- Environment usually recommends adding a freeboard of 0.5 m to flood elevations for development purposes
- The freeboard adds an element of security to the calculated flood elevation
- It covers simplifying assumptions in the model, precision of the model, land settlement etc.

