



Municipal Emergency Management Plan

Hazard, Risk, and Vulnerability Assessment

RESPONSIBLE AGENCIES	
Lead	Town of High River
Support	Alberta Health Services
	ATCO Gas
	Fortis Alberta
	Royal Canadian Mounted Police
	M.D. of Foothills No. 31
	TELUS



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Hazard, Risk, and Vulnerability Assessment

2015-06-22

APPROVAL

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Mayor and Council		2015-06-22
	Approved By: Craig Snodgrass	Date (yyyy-mm-dd)

REVISION HISTORY

Rev.	Date	Summary of Changes	Author	Reviewed By
00	2015-06-22	Initial Release	Carly Benson	Jim Simpson

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Glossary

Term	Definition
Alberta First Responder Radio Communication System (AFFRCS)	Government of Alberta initiative to improve interoperability between emergency services.
Consequence	The outcome of an event affecting objectives.
Emergency	An event that requires prompt co-ordination of action or special regulation of persons or property to protect the safety, health or welfare of people or to limit damage to property or the environment.
Emergency Operations Centre (EOC)	A protected site from which members of the Emergency Management Agency coordinate, monitor and direct emergency response and recovery operations.
Hazard	Any potential source of damage, harm or adverse effects on people, property, the environment and/or the economy. A hazard is a source which, alone or in combination, has the intrinsic potential to give rise to risk. NOTE: This term is used interchangeably with the term <i>risk source</i> in this document.
Hazard, Risk, and Vulnerability Assessment (HRVA)	A systematic assessment of the risks – natural, human, and technological – that may impact the Town of High River. Each risk is ranked based on the probability of its occurrence and the severity of its impact. This document forms the foundation for all emergency plans within the Town.
Likelihood	The chance of something happening.
Mass Casualty Incident (MCI)	Any incident in which emergency response resources are overwhelmed by the number and severity of casualties.
Risk	The effect of uncertainty on objectives. Risk is expressed in terms of the consequences of an event and the associated likelihood of occurrence.
Risk Event	The occurrence or change of a particular set of circumstances. A risk event describes how a risk source, or hazard, will affect a specific facility or operation.
Risk Source	See <i>Hazard</i> .
Risk Treatment	A process of administrative or structural controls put in place to modify risk.
Royal Canadian Mounted Police (RCMP)	The agency having jurisdiction for law enforcement within the Town of High River.
Town of High River	The administrative branch of the municipality that includes all those employed and contracted by the Town of High River.

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1.0 INTRODUCTION

1.1 Purpose

The Hazard, Risk, and Vulnerability Assessment (HRVA) is an analysis and ranking of the risks – natural, human, and technological – that may impact the Town of High River. It is the foundation for all subsequent emergency plans within the Town and provides a basis from which the Town of High River makes risk-based decisions to address vulnerabilities, mitigates hazards, and prepares for and responds to emergencies.

1.2 Scope

This HRVA primarily involves risks and hazards that threaten the Town of High River and are the responsibility of the Town to provide a response in order to protect residents and maintain service levels. The risk assessment takes into account climate change forecasts predicting an increase in the frequency and severity of extreme weather events in addition to historical trends and data.

Consideration is also given to regional events that do not directly impact town residents but may require some support in terms of resources or facilities within the town.

Each risk is ranked based on the probability of its occurrence within a ten-year period and the severity of its impact.

The scope does not include the assessment of risks to private property or specific facilities.

1.3 Objectives

The objective of the HRVA is to identify potential hazards and areas of vulnerability within the Town of High River in order to make risk-based choices to address vulnerabilities, mitigate hazards and prepare for response to and recovery from hazard events. Specifically, this HRVA:

- Identifies the hazards that threaten High River;
- Assesses the risk of each hazard; and
- Recommends measures that can be taken to prevent or mitigate the impact of the identified hazards.

1.4 References

This HRVA utilized the process and standard set out in the International Standards Organization *ISO 31000 Risk management – Principles and guidelines*.

2.0 RISK IDENTIFICATION AND ASSESSMENT

Based on the HRVA process followed in the development of this plan (as set out in ISO 31000 Risk management – Principles and guidelines), 29 potential risk events were identified for High River. In this document, a risk event is defined as follows:

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The realization of a hazard requires the implementation of the High River Emergency Operations Centre Response Plan in order to respond to the adverse effect of that hazard on the operations of the Town and its ability to deliver services.

Risk events for the Town of High River were identified using the following sources:

- Historical data/records
- Subject matter expertise from responsible agencies/stakeholders
- Local knowledge
- Climate change forecasts

Not all hazards are risk events. A hazard may cause inconvenience or be part of routine operations (e.g. typical incidents handled by first responder agencies); a risk event means the hazard adversely affects the operation of the Town and its delivery of services.

Table 1 on the following page provides a summary of the risk events considered for the Town of High River. Each risk event was assessed for both likelihood (over a ten-year period) and consequence using the following scales/criteria:

Likelihood (within a ten-year timeframe):

Very Low (VL)	Low (L)	Moderate (M)	High (H)	Very High (VH)
Not expected to happen	Small likelihood, but could happen	Less than a 50-50 chance	More than a 50-50 chance	Almost certain to happen

Consequences:

Factor	Nil/Very Low	Low	Moderate	High	Very High
Fatalities	0-1	2-3	4-10	10-20	>20
Injuries/Health Impacts	0-10	10-20	20-50	50-100	>100
Displacement/Evacuation	None/Very low	<10	10-50	50-500	>500
Impact on Pets/Livestock	None/Very low	Some	Local	Widespread	Mass carcass disposal
Critical Infrastructure Damage	None/Very low	Temporary	1 Week	1 Month	Long-term
Private Property Damage	None/Very low	Minimal	Local & minor	Local & severe	Widespread & severe
Environmental Impact	None/Very low	Minimal	Local & minor	Local & severe	Widespread & severe
Operations Impact	None/Very low	Minimal	Some	Serious	Severe & long-term
Organizational Impact	None/Very low	Minimal	Some	Town blame	Serious Town blame
Social Impact	None/Very low	Minimal	Local & minor	Local & severe	Widespread & severe
Economic Impact	None/Very low	Minimal	Local & minor	Local & severe	Widespread & severe

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Table 1: Risk Identification Summary

Hazard	Risk Event	Likelihood	Consequence
Air crashes	Airplane crash at High River Regional Airport	L	L
	Helicopter crash at hospital	L	L
Motor vehicle crashes	MCI on Highway 2 and 2A	L	L
Severe winter storm/blizzards	Extended road closure due to heavy snowfall/blizzard or ice storm	L	L
	Infrastructure damage due to heavy snow	L	L
	Extended power outage >24 hrs. due to heavy snowfall/blizzard	L	L
Severe summer storm (high winds, hail, tornadoes, heavy rain)	Infrastructure damage and casualties from severe wind and hail (including tornado)	M	H
	Flash flooding overwhelms storm drain system	M	M
Disease and epidemic	Human epidemic/pandemic	L	H
	Economic effects of plant and animal disease	L	L
Fire - Interface	Grass fires	L	M
	Secondary effects from wildfires/interface fires	L	L
Fire - Urban	Major structural fire or explosion	M	M
Geological	Major sink hole due to underlying instability	L	L
Hazardous Material	Natural gas line break	M	L
	Vehicle Hazmat spill on DG route	H	M
	Hazmat release from industrial facility	M	M
Hydrological	Major flooding of Highwood River	L	VH
	Threat of major flooding of Highwood River	H	M
	River bank erosion due to river flooding	L	L
	Snowmelt flooding within Town	L	L
	Property flooding due to power failure	M	L
Utility failure	Extended power outage >24 hrs. due to flooding	L	L
	Failure of sewer system due to flooding	L	H
	Serious mechanical failure of sewage system main lift station	M	M
	Serious failure of water treatment plant	L	M
	Failure of communications systems	H	L
Civil disobedience	Civic disturbance	L	L
	Contamination of water supply	VL	H

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3.0 RISK EVALUATION

The risk events were plotted to determine an overall risk ranking in terms of consequence and likelihood. This risk ranking is used to prioritize mitigation and preparedness activities to address the most significant risk events first.

Table 2: Risk Evaluation

CONSEQUENCES	Very High		Major flooding of Highwood River			
	High	Contamination of water supply	Human epidemic/pandemic Failure of sewer system due to major flooding	Infrastructure damage and casualties from severe wind and hail (including tornado)		
	Moderate		Grass fires Extended power outage >24 hour due to major flooding Serious failure of water treatment plant	Major structural fire or explosion Hazardous material release from industrial facility Flash flooding overwhelms storm drain system Serious mechanical failure of sewage system main lift station	Vehicle hazardous material spill Threat of major flooding of Highwood River	
	Low		Helicopter crash at hospital MCI On Highways 2 & 2A Extended power outage >24 hours due to heavy snowfall Secondary effects from interface fires Major sinkhole due to underlying instability Snowmelt flooding within town Civic Disturbance	Natural gas line break	Failure of communications systems	
	Very Low			Flooding due to power failure		
		Very Low	Low	Moderate	High	Very High
LIKELIHOOD						

	Extreme risk: Immediate risk treatment required		Moderate risk: Some risk treatment required to reduce risks to lower levels
	High risk: High priority risk treatment measures required		Low risk: Additional risk treatment not likely required
	Negligible risk: Risk events do not require further consideration		

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4.0 RISK TREATMENT

For the risks that had an overall risk rating of moderate or higher, risk treatment measures were identified as means to reduce the risks to acceptable, practicable levels. Each suggested strategy was then assessed based on the following criteria:

- Time frame – How quickly could the strategy be implemented?
- Cost – Based on the existing Town budget, how much would the strategy cost?
- Effectiveness – How effective would the strategy be at reducing/eliminating the risk?
- Acceptability – How acceptable would the strategy be to the Town, its stakeholders, and residents?

The values assigned to each risk treatment measure are shown in the table below.

Time Frame	Cost	Effectiveness	Acceptability
Short – Can be implemented within 1 year	\$ - Can be completed within existing or planned budget allocation	Low – Will have minor effect on risk event	Low – Significant resistance from organization/public
Medium – Can be implemented within 1-5 years	\$\$ - Will require additional funding	Moderate – Will have moderate effect on risk event	Moderate – Moderate resistance from organization/public
Long – Will take longer than 5 years	\$\$\$ - Will require major additional funding/major capital program	High – Will virtually overcome risk event	High – Little or no resistance from organization/public

Table 3 on the following page outlines the risk treatment measures identified for each risk event that had a ranking of moderate or higher. Risk events that share common risk treatment measures (e.g. flooding) have been grouped.

Note: This table does not identify risk treatment measures that have already been implemented, as these were considered in the initial identification and ranking of risks.



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Table 3: Risk Treatment Measures

Risk Event	Risk Treatment Measure	Time Frame	Cost	Effective	Acceptable
High Risks					
Major Flooding of Highwood River	Continue implementation of High River Flood Mitigation	M	\$\$\$	H	H
Threat of Flooding of Highwood River	Relocate EOC (to improve command and control)	L	\$\$\$	M	H
	Maintain high level of Town flood response capabilities (dedicated staff, staff time and resources)	S	\$\$	M	L
	Add additional warning sirens	S	\$\$\$	L	M
	Implement first responder radio interoperability (AFRRCS)	M	\$\$\$	M	M
Infrastructure damage and casualties from severe wind and hail (including tornado)	Regionalize Everbridge (High River Alert) emergency mass-notification system	S	-\$ *	M	H
	Improve public-education related to severe weather warnings	S	\$	M	H
Vehicle hazardous material spill	Develop hazardous material response plan	M	\$	M	H
Moderate Risks					
Human pandemic or epidemic	Maintain Municipal Business Continuity Plan with permanent staff	M	\$\$	M	M
Failure of sewer system due to major flooding	<i>See risk treatments for Major Flooding of Highwood River</i>				
Major structural fire or explosion	Increase fire education and prevention	S	\$\$	M/H	H
	Locate new fire hall in NW	L	\$\$\$	M	M
Hazardous material release from an industrial facility	Consider the creation of a specific Hazardous Material Bylaw to include ground contamination	S	\$	L	M
	Review and update Bylaw 3596/88 Sewer and Water Treatment Bylaw	S	\$	L	H
	Develop an inspection process for all hazardous materials stored in/on commercial properties	M	\$	M	M
	Hire two dedicated fire inspectors to increase the number and frequency of inspections	M	\$\$	M/H	M
	Develop collective hazardous material database for all emergency contamination	M	\$\$	M	H
Flash flooding overwhelms storm drain system	Continue to upgrade drainage capacity as part of routine maintenance and replacement	L	\$\$	M	H
Serious mechanical failure of sewage system main lift station	Twin the force main	S	\$\$\$	H (90%)	L
	Upgrade aging mechanical components	M	\$\$	M	H
	Rebuild treatment plant closer to Town	L	\$\$\$	H	L
Failure of communications systems	Encourage interoperability discussions with and between key utility providers (identification of key areas of failure)	S	\$	M	M

*This measure would end up saving the Town money

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