

Annex D

Sahtu Region Hazard Identification Risk Assessment



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1 Executive Summary

The 2014 Sahtu Region Hazard Identification Risk Assessment (HIRA) identifies the hazards and examines the risks that pose a threat to the people, property, environment and economy of the Sahtu Region. This type of assessment is a critical part of any emergency management program. Identified hazards can be used in preparedness programs, emergency response plan exercises, and training and awareness programs.

Governments have limited resources and planning for every possible hazard is not a realistic approach. However, an informed ranking of hazards provides a cost-effective approach to hazard mitigation, emergency planning and response. This assessment identified and rated twenty hazards that could affect the Sahtu Region, and then ranked them in order of emergency planning priority. Each region of the Northwest Territories (NWT) has some unique features that were taken into consideration in rating and ranking their hazards.

The Sahtu Region Hazard Summary (insert) provides a list of the hazards ranked into three categories of high, medium and low. These rankings are supported by the Sahtu Region risk matrix (page 6) and the information outlined in the hazard narratives in Section 2, "Hazard Narratives." Each hazard narrative contains risk mitigation strategies to help emergency planners improve their preparedness and response plans. The rankings were determined using best practices methodology combined with insight from communities and local experts and therefore, may not be identical to risks assigned using other methods or criteria.

The Sahtu Region borders the Yukon Territory on its western side, Inuvik Region to the north, the North Slave Region on the east and Dehcho Region to the south. The five communities in the Sahtu Region account for 6% of the NWT's population and 5% of its personal income. The population of the region is just

Sahtu Region Hazard Summary

High

1. Fire/Explosion
2. Flood

Medium

3. Industrial Emergency
4. Critical Infrastructure Failure - Energy Crisis
5. Critical Infrastructure Failure - Water Contamination
6. Snow Load Hazard
7. Weather - Winter Storm
8. Transportation Accidents
9. Human Disease
10. Critical Infrastructure Failure – Other
11. Earth Movement – Other
12. Ice Hazard

Low

13. Earth Movement - Permafrost Degradation
14. Weather - Wind Storm
15. Weather - Other Extreme
16. Food and Agricultural Emergency
17. Earth Movement - Earthquake/ Tsunami
18. Civil Unrest
19. War/ International Incident
20. Falling Debris

over 2500 people (2011 census).

Norman Wells is the largest community in the region with just over 800 people. It is the commercial and administrative centre and has the highest average level of income in the NWT. It serves as a regional air hub and the region's primary service and supply centre.

In the Sahtu Region, Fire/Explosion and Flood were found to be the highest risk hazards. These hazards have frequently caused extensive damage to people, property, the environment and the economy in the region. Both of these hazards are also expected to increase in frequency due to climate change, causing more extensive damage to communities in the future.

There are a number of reasons that the Fire/Explosion hazard ranked high. First of all, Délı̨nę, Fort Good Hope, Norman Wells and Tulita have development areas with a high or extreme wildfire hazard. The industrial activities in the region have a high forest fire risk classification as well. The Sahtu Region has the NWT's only producing oil field, and ships over \$500 million in oil annually via the Norman Wells - Zama Lake (Alberta) pipeline. Explosives are stored very near the community of Norman Wells for industrial use. Furthermore, urban fires in the isolated Sahtu Region communities with volunteer firefighters can lead to the loss of critical infrastructure. The isolated nature of the Sahtu Region communities, lack of adequate fire-fighting resources and bulk fuel storage in or close to each community increases the risk.

Floods have caused losses in the Sahtu region and are likely to continue to do so. Norman Wells oil operations have been impacted by flooding. The communities of Tulita and Fort Good Hope are currently designated flood risk areas.

1.1 Sahtu Region Risk Matrix

FREQUENCY	Likely	✓ Earth movement-permafrost degradation	✓ Critical Infrastructure Failure-energy crisis	✓ Fire/Explosion ✓ Flood
		✓ Weather-wind storm	✓ Critical Infrastructure failure-water contamination	
		✓ Weather-other extreme	✓ Weather-winter storm	
	Unlikely	✓ Food and agriculture emergency	✓ Snow load hazard	✓ Industrial emergency
			✓ Human disease	✓ Transportation accident
✓ Critical Infrastructure Failure-other			✓ Earth movement – other	
Rare		✓ Ice hazard		
		✓ Civil unrest	✓ Earth movement-earthquake & tsunami	
		✓ Falling debris	✓ War/International incident	

1.2 Emerging Issues

There has been a recent major discovery of oil in shale deposits near Norman Wells. Tungsten, emeralds and other minerals have been discovered in the region and significant potential exists for the development of hydro. Future resource development and the related infrastructure growth and urban expansion may increase exposure to hazards related to permafrost thaw, flooding and coastal erosion. Prospective mining development, a change in oil and gas extraction, or a shift in demand for natural resources could have an impact on the Sahtu Region exposure to industrial accidents, fire/explosion and other hazards. Future development of these industries in forested areas could increase fire risks over the next ten years.

Large scale infrastructure projects have inherent risks in their construction. The GNWT is committed to the design, development, construction, and maintenance of a highway extending NWT Highway 1 (the

Mackenzie Highway) from Wrigley to the Dempster Highway. The construction and maintenance of new highways could impact the hazard ranking presented in this document.

1.3 Climate Change

Climate change strongly affects the hazards of the NWT. Temperatures have already increased by 3 to 4 degree Celsius over the past 50 years in the NWT and this rate will continue or increase. Climate change shifts the wind and cloud patterns and changes how many storms and lightning strikes impact the region. Northern climate change has been hard to predict but these are some of the effects that could increase the frequency or impact of hazards in the future:


- Rapidly rising temperatures (Fire/Explosion Hazard, Transportation Accidents Hazard, Critical Infrastructure Hazards, Earth Movement Hazards, Human Disease Hazard);
- Shorter, warmer winters (Transportation Accidents Hazard, Critical Infrastructure Hazards);
- Increased rain and snowfall in many regions (Flood Hazard, Snow Load Hazard, Weather Hazards, Earth Movement Hazards);
- More extreme fall and winter storms (Weather Hazards);
- Less predictable weather (Weather Hazards);
- Increased winds in some areas (Weather Hazards);
- Thinner ice (Ice Hazard);
- Lower water levels in some lakes and rivers (Critical Infrastructure Hazards, Water Contamination Hazard, Transportation Accidents Hazard);
- More forest fires in some areas (Fire/Explosion Hazard); and
- Rising sea levels (Flood Hazard, Earth Movement Hazards).

A more extensive discussion on climate change can be found in the 2014 NWT HIRA Section 8.3 Specific Climate Change Report.

2 Hazard Narratives

2.1 High

2.1.1 Fire/Explosion

		Definition Uncontrolled burning and/or a sudden, violent release of gas under pressure which causes or threatens loss of life and property and environmental damage	Class Natural and Human-induced
Figure 1: Tulita Wild Fire 1995 (Source: GNWT, MACA)		NWT greatest impacts to date 950 Evacuated Estimated Total Cost \$12,044,118	
		Climate Change Projected to increase both frequency and consequence	
Mitigation Strategies	<ul style="list-style-type: none">✓ Consider implementing FireSmart programs for the community and include the response capabilities for urban/rural/wildland fires.✓ Create fire education training and awareness sessions for first responders and the public.✓ Enforce fire prevention practices.		
Vulnerability		Description	
People		High injury and fatality potential from the immediate threat of the fire and the blast as well as an increased mortality rate and respiratory symptoms due to smoke.	
Infrastructure		Total loss or damage to most infrastructure including public buildings, roadways, rail-lines, power facilities and water treatment plants. Smoke can impede evacuation of remote communities by air.	
Communications		Any existing power lines can be damaged and destroyed by fire/explosion cutting off communication links. The same holds true for microwave towers in regions without in-place power lines.	

Sahtu Region Exposure/History

Table 1: Wildfires and Urban Fires with Losses of \$500,000 and Over

Where	When	Impact
Port Radium (Mine Fire)	1951	Urban fire – Mine. Estimated Total Cost: \$4,000,000

Where	When	Impact
Norman Wells	1993	Wildfire - Community threatened.
Sahtu Region of the NWT (Fort Norman (in the Hamlet of Tulita), Norman Wells, Yellowknife and Délı̨ne)	June 6-15, 1995	Wildfire - Damage was incurred by provincial, municipal and private property. Fort Norman was evacuated on June 6, and Norman Wells was evacuated on June 9. Norman Wells was under a State of Emergency from June 8-14. Evacuated: 950 Estimated Total Cost: \$3,432,310
Norman Wells	March 1996	Urban fire – Dormitory. Estimated Total Cost: \$1,000,000
Délı̨ne	May 1998	Urban fire – Store. Estimated Total Cost: \$1,400,000
Norman Wells	July 21, 2003	Wildfire - Declared a state of emergency. About 100 people were evacuated due to thick smoke. Estimated Total Cost: \$121,846
Tulita	Oct 2007	Urban fire - Chief Albert Wright School. Estimated Total Cost: over \$500,000
Délı̨ne	2011	Wildfire - Community Evacuation. Evacuated: 103

Wildfire

Lightning activity over the Mackenzie Basin Region is short but intense, with a strong peak in cloud-to-ground lightning during July. The maximum area of lightning activity is influenced by local moisture sources and by topography. Lightning causes up to 80% of the forest fires in the NWT. The following Sahtu Region communities have a wildfire FireSmart hazard of High or Extreme:

Table 2: FireSmart Hazard Areas of High or Extreme in NWT According to Community CWPP

Community	Development Area	FireSmart Hazard
Délı̨ne	Proposed Residential Area.	Extreme
Fort Good Hope	High potential fire behaviour within the community interface and the vast areas of similar fire behavior immediately west of the community. High wildfire risk.	
Norman Wells	Moderate to high for wildfire.	
Tulita	New residential subdivision.	Extreme
	North and east perimeter developments in the main townsite area.	High to Extreme

Many of the industrial activities in the Sahtu have a high or moderate forest fire risk classification including land clearing, timber harvesting, timber processing, mechanical site preparations and other

silviculture treatments, gas or oil well operations, mining, highway maintenance and construction, engineering operations, plant harvesting, manufacturing, milling, trenching, and the use of explosives.


Explosion

Many communities have large fuel tanks needed to prepare for the winter months. This large fuel load can result in an explosion if an ignition source is introduced. Nearby forests increase the fire load and the risks to the communities.

Community Meeting Feedback

In the Sahtu Region, residents confirmed a high exposure to the Fire/Explosion Hazard. The isolated nature of the communities, lack of adequate fire-fighting resources and bulk fuel storage in or close to the community increases the risk. Urban fires in isolated communities with volunteer firefighters can lead to the loss of critical infrastructure. Explosives are stored very near the community of Norman Wells for industrial use.

2.1.2 Flood

		Definition An overflow or surge of water which causes or threatens loss of life and property and environmental damage	Class Natural Hazard
<p>Figure 2: Flooding in Fort Good Hope – May 2005. (Source: GNWT, MACA)</p>		NWT greatest impacts to date 1800 Evacuated Estimated Total Cost \$3,500,000	
		Climate Change Projected to increase both frequency and consequence	
Mitigation Strategies	<ul style="list-style-type: none">✓ Outline a water management and community development policy.✓ Develop and exercise plans/programs for:<ul style="list-style-type: none">○ watershed management;○ river/lake/ocean modeling/prediction and monitoring;○ erosion control; and○ flood response.✓ In the face of rapid snowmelt and intense rains in spring and summer, communities susceptible to flash flooding should review and improve their drainage facilities and protect vulnerable buildings and facilities		
Vulnerability		Description	
People		Evacuation of communities due to flood events is common. Deaths and injury due to flooding can occur during heavy rainstorm events which can interfere with evacuation attempts. Deaths in the NWT due to flooding are rare.	
Infrastructure		Personal property damage can be extensive. Contamination by floodwaters, structural damage, and mold can destroy buildings. Roads can be damaged or washed away. Damage to infrastructure can be extensive. Flooding can also negatively affect utilities and critical infrastructure. Utilities such as wastewater treatment, electricity and gas may be disrupted in the event of a flood. Emergency ground vehicles may be unable to respond if roads and bridges are flooded, washed out or covered by debris.	
Communications		Communication towers can be damaged by flooding events.	

Sahtu Region Exposure/History

When	Where	Impact
June 29 - July 3 and July 11-15, 1988	Norman Wells	Two severe flood events occurred in the Liard and Mackenzie River Basins of southwestern NWT.

May 11-14, 2005	Fort Good Hope	Jackfish Creek and Rabbitskin River rose to the point that 50 people were evacuated from Fort Good Hope. A state of emergency was declared. Estimated Total Cost: \$920,000
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In Norman Wells, overtopping of islands in the Mackenzie River (used as production bases for ESSO Resources Canada Ltd. oilfields) by ice and water necessitates the shutdown of wells during breakup. This is to prevent wellhead damage and oil spills. The community itself is not flood prone.

These two communities in the Sahtu are designated flood risk areas:


- Tulita; and
- Fort Good Hope.

Community Meeting Feedback

The residents confirmed the high flood hazard risk in Fort Good Hope and Norman Wells.

2.2 Medium

2.2.1 Industrial Emergency

 <p>Figure 3: ConocoPhillips wants to expand its camp at its fracking program in the Sahtu Region of the Northwest Territories, 28 February 2014. (Source: CBC News)</p>		Definition Emergencies involving businesses that handle dangerous goods, hazardous wastes or chemicals or engage in potentially hazardous activities	Class Human-induced Hazard
		NWT greatest impacts to date Environmental Damage	
		Climate Change Projected to increase both frequency and consequence	
Mitigation Strategies	<ul style="list-style-type: none">✓ Identify the industries in each community and rank according to risk.✓ Ensure back-ups are in place for the industries ranked as critical.✓ Ensure appropriate safety and emergency plans are in place.		
Vulnerability	Description		
People	Industrial accidents have an enormous impact on the health of workers and on the economy in general, which is reflected in the death, disability and personal suffering of workers on one hand, and in absence from work, loss of productivity and health costs on the other.		
Infrastructure	Industrial accidents can have a dramatic negative affect on physical and virtual systems which are considered critical. This would include fires or explosions, oil spills which could impact water treatment and dam failure which could impact power supply.		
Communications	Communications hubs in small communities could be damaged by an industrial accident in the community.		

Sahtu Region Exposure/History

Oil and gas industries are the most common hazardous industries in the Sahtu Region.

When	Where	Impact
From 1943 to 1945	Norman Wells, NWT, to Whitehorse, Yukon Territory	CANOL Crude Oil Pipeline No. 1 lost approximately 17,838,500 L of oil through spills and 9,864,400 L was left in the line and storage tanks. Although some burning was done during salvage operations, most residual oil was drained onto the soil surface.


When	Where	Impact
Sept 07, 1986	Norman Wells	Esso Resources Canada Ltd., Imperial Oil Tank #53, Mainland Facility, Sahtu Region - 21,136 Gallons Crude Oil (Hazardous Materials Spill Database).
Aug 20, 1991	Unknown	Production Processing Facility Esso Resources Canada Ltd., Imperial Oil Tank #53, Mainland Facility Tank Leak – equipment damage 16,800 Gallons Crude Oil (Hazardous Materials Spill Database).
May 04, 1992	Norman Wells	Interprovincial Pipelines, Norman Wells Pipeline, 25 km N of Ft Simpson - 26,420 Gallons Crude Oil (Hazardous Materials Spill Database).
May 05, 1997	Norman Wells	Imperial Oil Transfer line, CPF to Tank 401 - 63,000 Gallons Crude Oil (Hazardous Materials Spill Database).
2012	Norman Wells	Imperial Oil Resources NWT Ltd., Norman Wells - 80000 L Oil Emulsion (Hazardous Materials Spill Database).
2013	Norman Wells	Husky Energy Inc. had a series of safety violations. National Energy Board found violations including: “significant deficiencies within the accommodations and kitchen areas that could affect the health and safety of personnel;” a “loss of consciousness and subsequent fall of a water truck operator” that wasn’t reported for more than a week; and an equipment and procedural shortfall that “led to the occurrence of a flash fire.”

Community Meeting Feedback

Throughout the region there are historical uranium mines and dumps that could impact communities if they have not been properly closed and treated.

In Norman Wells, there is oil and gas production right next to the community and the Enbridge pipeline and a local pipeline both run through it. Any industrial accident involving these operations could impact the population.

2.2.2 Critical Infrastructure Failure - Energy Crisis

 <p>Figure 4: A propane aerator was loaded into a Hercules aircraft en route to Norman Wells. The aerator will be used to provide a propane-air mixture to keep the community heated. Natural gas to the community was shutoff due to a pipeline break, May 2011. (Source: NNSL/photo courtesy of ATCO Energy)</p>	Definition Failure to provide energy required to meet basic human needs, sustain the economy, and protect public safety and security	Class Human-induced Hazard
	NWT greatest impacts to date Declared state of emergency	
	Climate Change Projected to increase both frequency and consequence	
	Mitigation Strategies	<ul style="list-style-type: none">✓ Understand the potential risks associated with Critical Infrastructure Failure – Energy Crisis.✓ Build partnerships between stakeholders.✓ Ensure back up/alternate systems in place for life safety.✓ Ensure emergency response plans in place.
Vulnerability		Description
People		Given the severe weather in the north, the population relies on a steady and safe supply of energy to provide heating in the winter. Most areas of the NWT are extremely isolated and the health hazards of being left without energy/power are both physical and mental.
Infrastructure		Water lines and sewage lines can freeze and break in severe winter weather without heat or flowing water. Loss of power can cause a situation where pipes burst in the colder temperatures.
Communications		Loss of electrical power can cause disruption to communication systems such as radio and television which people rely on for information.

Sahtu Region Exposure/History

When	Where	Impact
May 31, 2011	Norman Wells	Due to an Enbridge pipeline malfunction, the town nearly ran out of natural gas. There were 268 households and over 100 businesses which would be directly impacted by the shortage. A determination was made that, if necessary, supply would be cut-off to commercial users first in order to preserve as much gas as possible for the households.

When	Where	Impact
January 28, 2013	Norman Wells	The town declared a state of emergency as gas shortages became acute.

In the Sahtu Region, there are two main energy sources used to generate electricity: natural gas, and diesel fuel. Natural gas-fired power plants provide electricity to the community of Norman Wells. The town of Norman Wells will lose its main fuel source for heating their buildings in the fall of 2014. The remaining Sahtu Region communities have electricity provided by diesel-fired power plants. Fuel must be shipped into the communities by pipeline, barge, ice road or air. A shortened ice road season, barge or pipeline disruption, or prolonged extreme weather events can lead to shortages of fuel in communities.


Community	Power Source (NWT Power Corporation website)
Colville Lake	Three small generating units ranging from 75-90 kW.
Déłı̨́nē	Total installed capacity of the plant is 1.19 MW generated, one 550 kW and two 320 kW diesel generators.
Fort Good Hope	Three diesel generators with a total installed capacity of 1.23 MW.
Norman Wells	Power plant is a standby plant with two generating units. NTPC currently purchases the electrical energy from ESSO and resells it to the community. Total installed capacity of Norman Wells standby plant is 2.12 MW.
Tulita	Three diesel engines with a total installed capacity of 1.1 MW.

Norman Wells, Ft. Good Hope and Tulita, are supplied during the summer by barges traveling along the Mackenzie River. The remaining 2 communities, Déłı̨́nē and Colville Lake, are supplied only in the winter by trucks traveling the winter roads.

Community Meeting Feedback

Residents confirmed that Norman Wells was close to declaring a state of emergency due to gas shortages.

2.2.3 Critical Infrastructure Failure - Water Contamination

		Definition Serious contamination of drinking water or loss of supply, that presents a danger to the general health of the public	Class Human-induced Hazard
Figure 5: Colville Lake Water Treatment (Source: GNWT, MACA)		NWT greatest impacts to date Boil water advisories	
		Climate Change Projected to increase both frequency and consequence	
Mitigation Strategies	<ul style="list-style-type: none">✓ Understand the potential risks associated with Critical Infrastructure Failure – Water Contamination.✓ Plan for identification and reduction of contaminants into ground and surface water.✓ Ensure water sampling and monitoring program in place.✓ Ensure emergency response plans are in place.		
Vulnerability	Description		
People	The levels of contaminants in drinking water are seldom high enough to cause acute (immediate) health effects. Examples of acute health effects are nausea, lung irritation, skin rash, vomiting, dizziness, and even death.		
Infrastructure	Disasters that destroy infrastructure may result in water contamination by sewage. Chloride ions, usually found in seawater or acid rain, increase the conductivity of water and accelerate corrosion. Chloride can penetrate and deteriorate concrete on bridge decking and parking garage structures, and damage reinforcing rods, compromising structural integrity. It damages vehicle parts such as brake linings, frames, bumpers, and other areas of body corrosion. It impacts railroad crossing warning equipment and power line utilities by conducting electrical current leaks across the insulator that may lead to loss of current, shorting of transmission lines, and wooden pole fires.		
Communications	Chloride ions from acid rain significantly aggravate the conditions for pitting corrosion of most metals by enhancing the formation and growth of the pits through a process which weakens them over time.		

Sahtu Region Exposure/History

The responsibility for ensuring safe drinking water is vested with the Government of the NWT, which has passed specific public health legislation designed to ensure the safety of drinking water supplies. The Department of Health is the regulator and is responsible for enforcing the *Public Health Act*, *Water Supply System Regulations*, and *General Sanitation Regulations* as well as ensuring the *Guidelines for Canadian Drinking Water Quality* are met.

Community governments have the authority and responsibility to provide safe potable water to their residents. In communities where the community government is the owner and operator of the water treatment facilities, the community government is responsible for the treatment and safety of the water supply in those operations. Responsibilities include treatment of water to meet the *Guidelines for Canadian Drinking Water Quality*, the submitting of water samples to a laboratory for bacteriological and chemical analysis, and maintaining records of raw water quality, finished water quality and the amounts of chemicals used in treatment.


When	Where	Impact
2004	Colville Lake	Had no operating water treatment plant. The community has been under a boil water advisory since 2004. The boil water advisor will remain in place until the EHO is satisfied with the regulatory sampling regime.
Spring 2006	Tulita	A precautionary boil water advisory was issued because of problems with the filters at the WTP. No bacteria were found in the treated water. The advisory was lifted when the filters were fixed.
2009	Tulita	Boil water advisory during spring break up due to high turbidity.
May 2009	Most of the NWT communities	Oil sands development in the Wood Buffalo Region threatens the water supply to most of the NWT 33 cities, towns and hamlets which are located on water directly downstream from the oil sands. The main area of concern is that contaminants may be getting into the water system which would directly affect the drinking water of virtually all residents of the NWT.

Community	Public Water Source	Water treatment system classification
Colville Lake	Colville Lake	Small System
Délı́ne	Great Bear Lake	Small System
Fort Good Hope	Mackenzie River	Small System
Norman Wells	Mackenzie River	Class II
Tulita	Great Bear Lake	Class I

Community Meeting Feedback

Residents in the Sahtu spoke of concerns in Fort Good Hope where the water supply was located directly adjacent the Enbridge pipeline, meaning any incident with the pipeline would have an immediate impact on the water supply. Also mentioned was that Tulita relies of Great Bear Lake for its water supply but they have to boil water each and every spring as hazardous materials left on the ice during the winter fall into the water during spring break-up. Other communities in the Sahtu also mentioned that they have annual boil water alerts in the spring as they deal with the same issue.

2.2.4 Snow Load Hazard

		Definition Potential collapse of buildings due to the weight of build-up or drifting of snow	Class Natural Class
		NWT greatest impacts to date Property Damage (Roofs)	
		Climate Change Projected to increase both frequency and consequence Structures are built using historical snow load standards. When the snow load exceeds the standards, due to wetter, heavier, more frequent or drifting snow, structures can collapse.	
Mitigation Strategies	<ul style="list-style-type: none">✓ Include snow load hazards in community response plans.✓ Clear snow from public building rooftops.✓ Perform a Roof Risk Assessment on key community structures such as schools and community centers.		
Vulnerability		Description	
People		High numbers of injuries or deaths could occur if an occupied community building or school were to collapse.	
Infrastructure		Loss of the building and contents plus loss of the use of this building until repairs or a new structure can occur.	
Communications		Potential collapse of microwave towers due to snow load could impact the community's communications.	

Sahtu Region Exposure/History

Community Snow Load Risk Factors


Community	Community Snow Load Risk Factor
Colville Lake	High
Délı́ne	High
Fort Good Hope	High
Norman Wells	High
Tulita	High

Studies show that approximately one fifth of public buildings (22%) in the NWT are at risk of collapse due to changing/increasing snow loads. Public buildings at risk include schools, hospitals, community centers and medical centres. Of those buildings at risk, about 10% have been retrofitted since 2004, and another 12% are under a snow load watch status.

Community Meeting Feedback

Residents of the Sahtu Region have experienced more severe weather over recent years including heavier snows.

2.2.5 Weather - Winter Storm

 <p>Figure 7: Colville Lake – February 2013. (Source: Wayne Lennie, Arctic Energy Alliance)</p>		Definition Strong weather characterized by ice, snow and freezing rain	Class Natural Hazard
		NWT greatest impacts to date <ul style="list-style-type: none">• Infrastructure damage (power failure, airport damage)• Property damage	
		Climate Change Projected to increase both frequency and consequence	
Mitigation Strategies	<ul style="list-style-type: none">✓ Develop and enforce snow load standards.✓ Ensure that plans are in place for severe winter storms.✓ Develop/distribute and facilitate a public awareness program around how to prepare for and what to do in a severe winter storm.✓ Identify and communicate available “safe areas” for community members.		
Vulnerability		Description	
People		Heavy winds and cold temperatures can combine with power loss to cause injury and death that could be extensive. Blowing snow creates hazardous driving and working conditions (see Transportation Hazard).	
Infrastructure		Heavy winds and snow can cause damage to buildings, loss of power and water and sewage systems. Snow build-up on roofs can cause collapse (see Snow-Load Hazard).	
Communications		Snow and heavy winds can knock out communications systems.	

Sahtu Region Exposure/History

Winter storms cause millions of dollars of lost revenue due to shut down of operations and slow transportation of goods and services every year. The increased frequency of snowstorms has had an impact on roadway safety. More snow removal is necessary to allow for safe travel, and the transportation of goods.

Recent Blizzard Events


When	Where	Impact
March 5, 2003	Norman Wells	Prior to that Norman Wells had not had a blizzard in 20 years.
March 11, 2003	Norman Wells	Blizzard.

When	Where	Impact
Jan 17 and 18, 2012	Inuvik and Norman Wells	Winds at Inuvik peaked at 100 km/h, while more isolating blizzard conditions endured for over 24 hours. At Norman Wells it was an even longer 38 hours, blowing any previous records for blizzard duration by 7 to 21 hours respectively. Winds took off several roofs, including one at the Inuvik Airport, and lifted and shifted other items all around the region.

Community Meeting Feedback

The Sahtu Region has experienced more severe weather over recent years. There has been an increase in higher winds as well as heavier snows.

2.2.6 Transportation Accidents

 <p>Figure 8: One of the two trucks carrying a mix of water, chemicals and sand used at ConocoPhillips' N.W.T. fracking project that slid off the Sahtu winter road over the past week – March 2014. (Source: CBC News/courtesy of Roger Odgaard/Facebook)</p>		Definition All vehicle accidents which involve large loss of life and property damage	Class Human-induced Hazard
		NWT greatest impacts to date <ul style="list-style-type: none">Fatalities 32Infrastructure damage (power failure, airport damage)Property damage	
		Climate Change Projected to increase both frequency and consequence	
Mitigation Strategies		<ul style="list-style-type: none">✓ Enforce safety and prevention programs.✓ Ensure Dangerous Goods practices/regulations are followed.✓ Implement transportation route monitoring programs.✓ Confirm that emergency response plans in place for all areas to allow for prompt response to transportation accidents.	
Vulnerability	Description		
People	Accidents, specifically motor vehicle accidents, are one of the highest causes of death and injury to Canadians every year. Amongst young Canadians (below age 25) vehicular accidents are the number one cause of death in the country. Largest loss of life in one accident usually occurs on passenger flight accidents.		
Infrastructure	Any accident which occurs on a roadway has the ability to damage the roadway and therefore leave already isolated areas without any road access. The same holds true for aircraft accidents which may close down an airport making it virtually impossible to gain access to several communities in the NWT.		
Communications	Given that communication hubs are serviced by a single communication line, especially in the southern NWT, any accident may cut these lines leading to loss of communications.		

Sahtu Region Exposure/History

Transportation infrastructure in the Sahtu Region includes a network of winter roads, ports and airports.

Motor Vehicle Accident / Ice Roads Accidents

Winter access roads are open only in winter, usually from about mid-December to late March, but may vary with weather conditions and locations. Some of them are privately operated and maintained, and offer no services, emergency or otherwise. Unleaded gas, diesel and propane are available in most communities on the highway system, with repair facilities in larger towns. Distances between these services may be significant, however, and hours of operation limited.

To improve on safety, all trucks on ice roads must be equipped with two way radios, and drivers must report as they approach the numbered portages to alert each other of their presence on the same portage. In the Sahtu Region, winter road use can be restricted nighttime only to preserve the road infrastructure. In 2013, for example, the NWT Department of Transportation closed part of the Sahtu winter road system because drivers ignored its daytime closure and trucks severely damaged the road.

Marine Accident

There is also a well-developed marine freight route along the Mackenzie River to the Arctic Ocean. Navigation problems on the Mackenzie River include: a short shipping season (beginning of June to mid-October), ice conditions, low water levels (especially in the fall), four sets of rapids and decreasing daylight in the fall. Because of the rapids, barge tows must stop and each barge must be carefully moved through a channel to protect the cargo.

Aircraft Accident

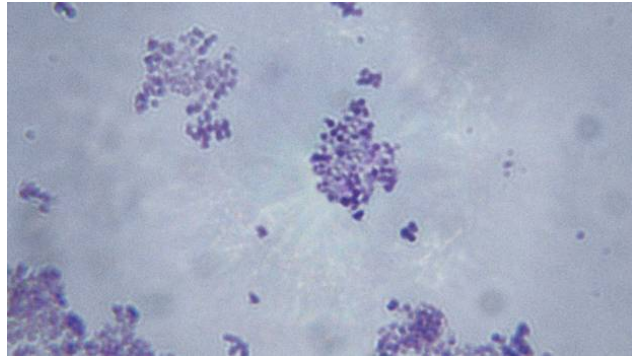
Statistically, approximately 30% of aviation accidents are weather related and up to 75% of delays are due to weather. The region experiences a number of aviation weather hazards including icing, poor visibility, wind shear and turbulence, weather fronts and thunderstorms. Aging infrastructure at some airports increases the community hazard exposure.

Community Meeting Feedback

The Norman Wells airport is located almost within the community. An aircraft accident would likely impact the population. In addition, the airport has no fire-fighting resources and a town by-law restricts personnel from the community from assisting in the case of an emergency at the airport unless requested and authorized by the SAO, as coordinator of the Community Emergency Response Committee. This arrangement has been exercised and has worked in practice during emergencies.

The highways in the Sahtu Region are mostly seasonal. During the spring break-up only heavy trucks can navigate the roads due to the ruts in the softening ground. This increases the probability of traffic accidents.

2.2.7 Human Disease

 <p>Figure 9: Staphylococcus aureus. (Source: Canadian Press, 12 Oct 2012)</p>		Definition A grave or widespread illness that presents a danger to people’s health	Class Natural Hazard
		NWT greatest impacts to date Fatalities 600	
		Climate Change Projected to increase both frequency and consequence	
Mitigation Strategies	<ul style="list-style-type: none">✓ Ensure disease monitoring plans are in place between all levels of government and private sector.✓ Ensure preparedness plans are in place.✓ Ensure response plans are in place and are exercised, including containment and quarantine procedures.✓ Human vaccination against anthrax is available for personnel likely to be involved in investigating or responding to anthrax outbreaks.		
Vulnerability		Description	
People		Injury and death from human disease can severely impact an isolated community where continual medical care is limited.	
Infrastructure		While human diseases do not impact infrastructure directly, some disruption in critical services could occur when enough of the population is affected. Support services to remote communities could be cut off during a pandemic or severe epidemic.	
Communications		N/A	

Sahtu Region Exposure/History

When	Where	Impact
1928	Mackenzie District	Influenza epidemic sweeps through the Mackenzie District, killing about 600 people, approximately 10 to 15% of the population of each village.
Since 2008	NWT wide	Methicillin-Resistant Staphylococcus Aureus (MRSA) infections. 55 hospitalizations (5 of them had to be flown south for treatment). Fatalities: 2
November 2009	NWT wide	H1N1 - 45 hospitalizations. Fatalities: 1

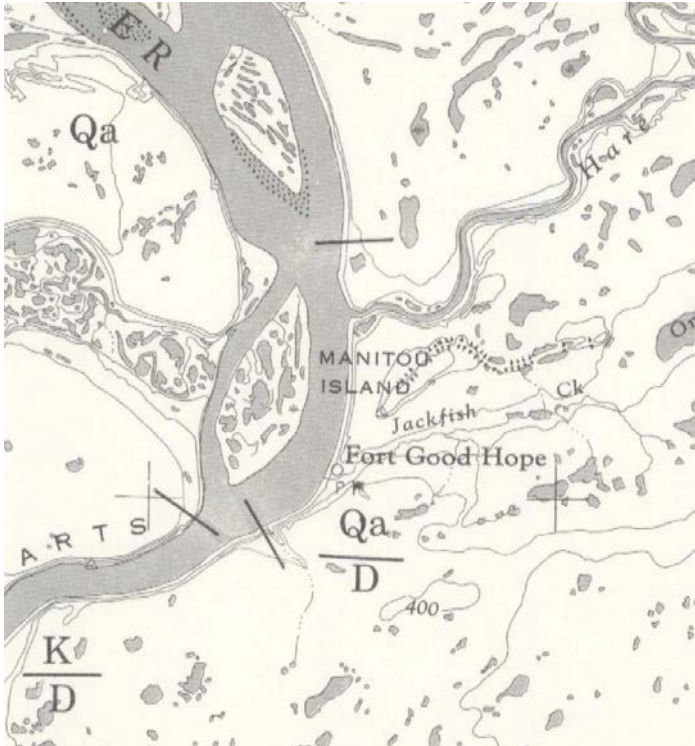
Pandemic

Worst case scenario in the GNWT Pandemic plan – each community may be completely isolated and little or no extra resources (human or material) will be available from the region, territory, or nation during the Pandemic period.

Community Meeting Feedback

This hazard was not mentioned as a concern at the Sahtu Region meeting.

2.2.8 Earth Movement – Other

		Definition Movement of the ground causing wide spread damage not involving permafrost degradation or earthquake	Class Natural Hazard
		NWT greatest impacts to date <ul style="list-style-type: none">• Fatalities 1• Property damage \$1,000,000• Infrastructure	
		Climate Change Projected to increase both frequency and consequence	
Mitigation Strategies	<ul style="list-style-type: none">✓ Develop and enforce building standards.✓ Develop/distribute and facilitate public awareness programs.✓ Ensure that emergency plans are in place.✓ Ensure “safe areas” are available and known to community members.		
Vulnerability		Description	
People		Some injuries or even death could occur in the territories from these earth movements, most likely riverbank collapse or sinkholes.	
Infrastructure		Damage to buildings, roads and other infrastructure has and is being caused by these earth movements including erosion, riverbank collapse and sinkholes. Also increase in maintenance costs associated with landslides and avalanches, even where no infrastructure damage occurs.	
Communications		Interruption can occur if earth movement impacts communication towers.	

Sahtu Region Exposure/History

Across the NWT, people have experienced losses from various earth movement hazards.

Landslides pose a threat in the Sahtu Region. In the Mackenzie Valley, there is an average of one landslide per 5 km. The dominant landslide types are retrogressive thaw flows (28%) and active layer detachments (26%) and about 47% of all landslides took place in moraine deposits.

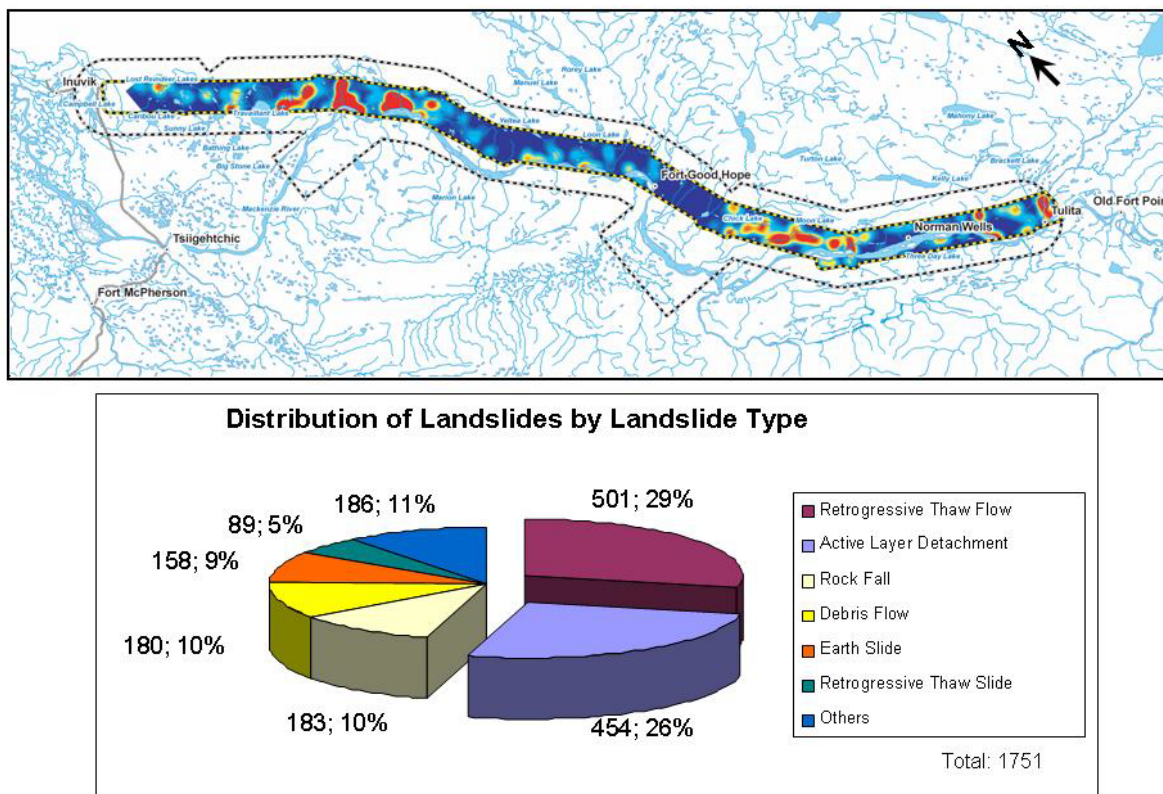



Figure 11: Upper figure—Landslide density map along the proposed pipeline corridor with some “hot spots” of higher density of landslides. These are situated near Travaillant Lake, Thunder River, Between Fort Good Hope and Norman Wells, and in the vicinity of Tulita.

Lower figure: Distribution of landslide types in the study area. (Source: Couture et al., 2007)

Community Meeting Feedback

In Fort Good Hope and Tulita, there are increasing occurrences of the riverbanks collapsing and these landslides are causing problems with road and technology infrastructure along the river. There have been issues with riverbank collapse and sinkholes throughout the Sahtu Region.

2.2.9 Ice Hazard

		Definition Formations or movements of ice which cause loss of life, property and/or environmental damage	Class Natural Hazard
Figure 12: Mackenzie River Breakup near Tulita. (Source: GNWT, MACA)		NWT greatest impacts to date <ul style="list-style-type: none">Property Damage	
		Climate Change Projected to decline	
Mitigation Strategies	<ul style="list-style-type: none">✓ Develop and enforce building standards for ice accumulations.✓ Develop/distribute and facilitate public awareness programs.✓ Confirm that ice storm emergency plans in place.✓ Ensure “safe areas” are available and known to community members.		
Vulnerability		Description	
People		Injury and loss of life can occur when oil rigs, boats or ships are damaged or sunk by ice (see Transportation Hazards).	
Infrastructure		Icebergs still threaten offshore oil rigs, fishing boats and ships. Ice shoves can damage buildings that are near to a body of water. Seabed gouging or strudel scour can damage off shore oil rigs or pipelines (see Industrial Hazards).	
Communications		None	


Sahtu Region Exposure/History

Research did not reveal any exposure or history of this hazard in the Sahtu Region. Please review the 2014 NWT HIRA for further information.

Community Meeting Feedback

The issue of ice hazards was mentioned specifically during the regional meeting held in the Sahtu. There have been incidents where ice has damaged pipes along the shore of the river which are intended to off-load fuel from barges. There have also been occurrences in Tulita where ice has moved on-shore during break-up causing considerable damage to houses and roads. In Délı̨ne, there have been situations where ice from the lake has been pushed into the community during break-up. This has caused minimal damage to this point.

2.2.10 Critical Infrastructure Failure – Other

		Definition Failure of services that meet basic human needs, sustain the economy, and protect public safety and security	Class Human-induced Hazard
<p>Figure 13: The Sahtu winter road system frequently faces load restrictions and closures. A large truck drives the Sahtu winter road, February 28, 2014. (Source: CBC News/Joanne Stassen)</p>		NWT greatest impacts to date <ul style="list-style-type: none">• Communications failure• Road Damages	
		Climate Change Projected to increase both frequency and consequence	
Mitigation Strategies	<ul style="list-style-type: none">✓ Understand the potential risks associated with Critical Infrastructure Failure – Other.✓ Build partnerships between stakeholders.✓ Ensure back up/alternate systems in place for life safety.✓ Ensure emergency response plans are in place.		
Vulnerability		Description	
People	People in the NWT rely on infrastructure to keep them supplied and in touch with other communities. Any infrastructure collapse could be catastrophic given the harsh nature of most areas where people live.		
Infrastructure	Airports are subject to closure regularly in the winter, ice roads rely on a consistent pattern of cold weather and all weather roads are also subject to closure during winter season. Any infrastructure collapse is also exacerbated by the fact that the isolated nature of these communities makes it extremely difficult to repair failed infrastructure. Given the isolated nature of most of the communities within the NWT, any incident which closes down an airport could be severe.		
Communications	Communications break downs are common throughout the north as severe weather can shut down facilities and “power bumps” often hamper effective communications. Again, given the isolated nature of the area, repair of these systems is often extremely difficult.		

Sahtu Region Exposure/History

When	Where	Impact
Oct 6, 2011	10 communities	Telesat’s Anik F2 satellite suddenly ceased operating. Remote northern locations were the most affected, with 10 of 33 NWT communities served by NorthwesTel seeing disruptions from the outage. First Air airline cancelled 48 flights, stranding about 1,000 passengers just before the Thanksgiving long weekend.


Community Meeting Feedback

The highways in the Sahtu Region are mostly seasonal. During the spring break-up only heavy trucks can navigate the roads due to the ruts in the softening ground. This increases the probability of traffic accidents.

Over the past few years, the level of the Mackenzie River has been very high and very low. This has obstructed the ability of barges to access communities to re-supply in the summer.

2.3 Low

2.3.1 Earth Movement - Permafrost Degradation

 <p style="text-align: center;">Natural Resources Canada</p>	Definition Movement of the ground causing wide spread damage caused by loss of permafrost	Class Natural Hazard
<p>Figure 14: Permafrost (permanently frozen ground) underlies most of the MacKenzie River—the longest in Canada. Rising temperatures linked to global warming are causing this permafrost to melt, contributing to disturbances in the landscape, such as the landslide near Old Fort Point in June 1997. (Source: Climate Hot Map/NRCan)</p>	NWT greatest impacts to date <ul style="list-style-type: none"> • Power failures • Road Damages 	
	Climate Change Projected to increase both frequency and consequence	
Mitigation Strategies	<ul style="list-style-type: none"> ✓ Develop and enforce building standards for building slumping and/or collapse. ✓ Develop/distribute and facilitate public awareness programs. ✓ Include permafrost degradation risk actions in emergency plans. 	
Vulnerability	Description	
People	Injury and death could result from the unexpected collapse of land or a building.	
Infrastructure	Permafrost has always figured heavily into Arctic infrastructure design, construction, and maintenance (NRTEE, 2009; CSA, 2010). Infrastructure systems in permafrost have depended on the stability of permafrost as a foundation material. Permafrost erosion along streams and rivers is threatening dikes, bridges and culverts.	
Communications	Some damage to communication towers possible.	

Sahtu Region Exposure/History

Ground movement caused by melting permafrost has resulted in the cracking or sloping of building walls and foundations. It has also resulted in heaving, slope failure, sinkholes and potholes, affecting all forms of infrastructure. Permafrost erosion along streams and rivers is threatening dikes, bridges and culverts.

A mixture of different types of permafrost is found under all of the NWT including: continuous, extensive discontinuous and sporadic discontinuous permafrost. For the widespread discontinuous permafrost zone (where communities of Norman Wells and Tulita are located), the ground temperatures could increase sufficiently to cause fairly strong impacts on building foundations. In Norman Wells, 14-26% of existing buildings could incur foundation damage due to permafrost degradation while the projected impacts on Tulita's buildings were found to be somewhat less severe.

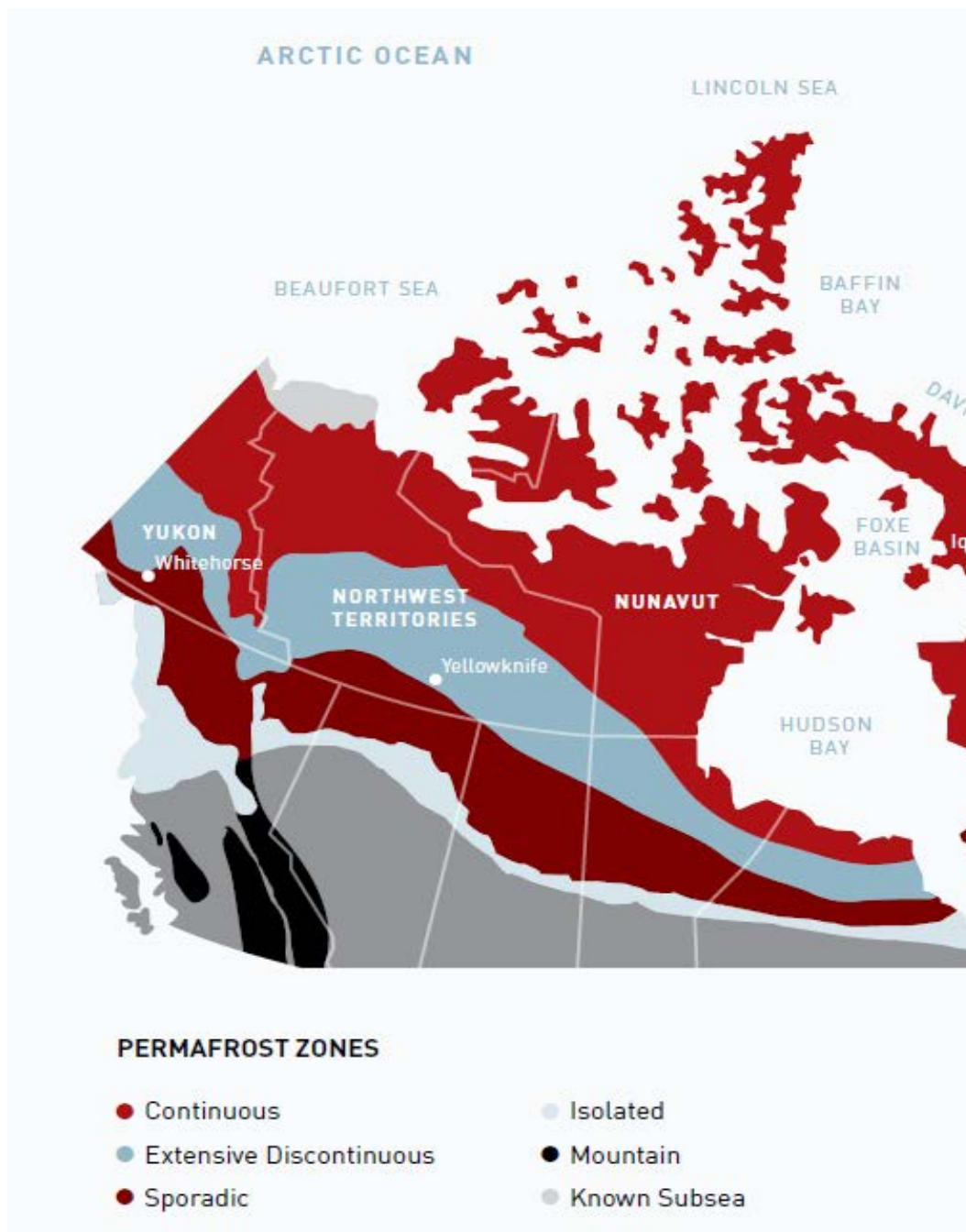
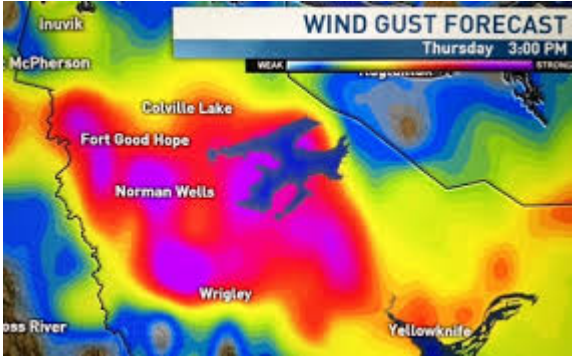


Figure 15: Permafrost Zones (Source: Atlas of Canada Permafrost Map)

Community Meeting Feedback

There was specific mention from Norman Wells in the Sahtu regarding the need to relocate certain buildings which had begun to shift dramatically due to this issue.

2.3.2 Weather - Wind Storm

 <p>Figure 16: A strong low pressure system moving through the NWT is bringing windy conditions as well as steady snowfall to the Sahtu. (Source: CBC News/Christy Climehaga)</p>		Definition Strong weather characterized by damaging movement of air	Class Natural Hazard
Mitigation Strategies		NWT greatest impacts to date <ul style="list-style-type: none"> Property Damage (drill rig) Infrastructure (transmission tower) Climate Change Projected to increase both frequency and consequence	
Vulnerability		Description	
People		All wind storms have the potential to cause injury or death due to structural damage, flying debris or storm surges. Hurricanes also can cause flooding (see Flood Hazard). Tornadoes can cause many injuries and death but are very rare across the NWT.	
Infrastructure		Heavy winds can cause great damage to buildings and infrastructure, and knock out power across large areas. Tornadoes can cause heavy damages but are very rare across the NWT.	
Communications		Heavy winds are often responsible for damage to communications towers.	


Sahtu Region Exposure/History

Research did not reveal any exposure or history of this hazard in the Sahtu Region. Please review the 2014 NWT HIRA for further information.

Community Meeting Feedback

Residents experienced more severe weather over recent years with an increase in stronger winds.

2.3.3 Weather - Other Extreme

<div><div><div>FEELING THE SUMMER HEAT!</div><div>* - Record Broken</div><div>NWT Yesterday</div></div><div><div><div>*Fort Liard</div><div>31.2°</div></div><div><div>Fort Simpson</div><div>31.3°</div></div><div><div>Deline</div><div>27.8°</div></div><div><div>*Thomsen River</div><div>24.2°</div></div><div><div>Yellowknife</div><div>24.7°</div></div></div><div></div></div> <div><div><div>Definition</div><div>All weather related hazards excluding wind storm and cold weather storms</div></div><div><div>NWT greatest impacts to date</div><div><ul style="list-style-type: none">• Power failures• Road Damages</div></div><div><div>Climate Change</div><div>Projected to increase both frequency and consequence</div></div></div> <div><div><div>Mitigation Strategies</div><div><ul style="list-style-type: none">✓ Develop and enforce building standards for identified extreme weather hazards.✓ Develop/distribute and facilitate public awareness programs.✓ Ensure that emergency plans are in place.✓ Ensure “safe areas” are available and known to community members.</div></div></div>		<div><div>Figure 17: •Temperatures soared near 30 degrees for many communities in the Sahtu, Dehcho, and Mackenzie Delta regions of the NWT this past weekend. August 6, 2013. (Source: CBC News/Christy Climehaga)</div></div>
<div><div>Vulnerability</div><div>People</div></div>	<div><div>Description</div><div>Extreme cold temperatures can cause injury and death. Temperatures of -55 and colder have an extremely high risk of causing injury as exposed skin can freeze in less than 2 minutes. Temperatures of -48 to -54 have a very high risk of causing injury as exposed skin can freeze in 2 to 5 minutes. Temperatures -40 to -47 have a high risk of causing injury as exposed skin can freeze in 5 to 10 minutes. Under foggy conditions, visibility is reduced to less than 1 kilometre and vehicle accidents can result (see Transportation Accidents Hazard). Ocean and lakes areas, and in particular the large lakes such as Great Bear Lake and Great Slave Lake, are cloud and fog prone through the fall until they freeze over completely (see Transportation Accidents Hazard).</div></div>	
<div><div>Infrastructure</div></div>	<div><div>Extreme cold temperatures can cause significant property damage, mechanical malfunctions and burst pipes. Drought can cause crop failure, depletion of municipal water sources, increase in forest fire risk (see Fire/Explosion Hazard) and insufficient water flow through waterways. Lighting storms can lead to fires (see Fire/Explosion Hazard). Combining heat wave with the dry climate of the Arctic creates ideal conditions for wildfires (see Fire/Explosion Hazard).</div></div>	

Vulnerability	Description
Communications	A geomagnetic storm can knock out communications and have a variety of effects on technology. Radio waves used for satellite communications or GPS navigation are affected by the increased ionization with disruption of the communication or navigation systems. The high energy particles affect satellites causing failure or equipment damage. The magnetic disturbances directly affect operations that use the magnetic field, such as magnetic surveys, directional drilling, or compass use. Magnetic disturbances also induce electric currents in long conductors such as power lines and pipelines causing power system outages or pipeline corrosion.


Sahtu Region Exposure/History

Research did not reveal any exposure or history of this hazard in the Sahtu Region. Please review the 2014 NWT HIRA for further information.

Community Meeting Feedback

This hazard was not mentioned as a concern at the Sahtu Region meeting.

2.3.4 Food and Agricultural Emergency

		Definition Any emergency which affects food security, food quality or food safety for many people	Class Natural Hazard
<p>Figure 18: Caribou running, near Deline. (Source: Deline website)</p>		NWT greatest impacts to date <ul style="list-style-type: none">Food recall	
		Climate Change Projected to increase both frequency and consequence	
Mitigation Strategies		<ul style="list-style-type: none">✓ Ensure disease and recall monitoring plans are in place between all levels of government and private sector.✓ Ensure public awareness information and programs are available from the Federal Government and industry associations.✓ Ensure that response plans include containment and quarantine procedures.	
Vulnerability	Description		
People	Humans are reliant on a well regulated safe supply of food and agricultural processes. Any emergency caused by a failure of this system can impact on the immediate and long term health of anyone affected.		
Infrastructure	N/A		
Communications	N/A		

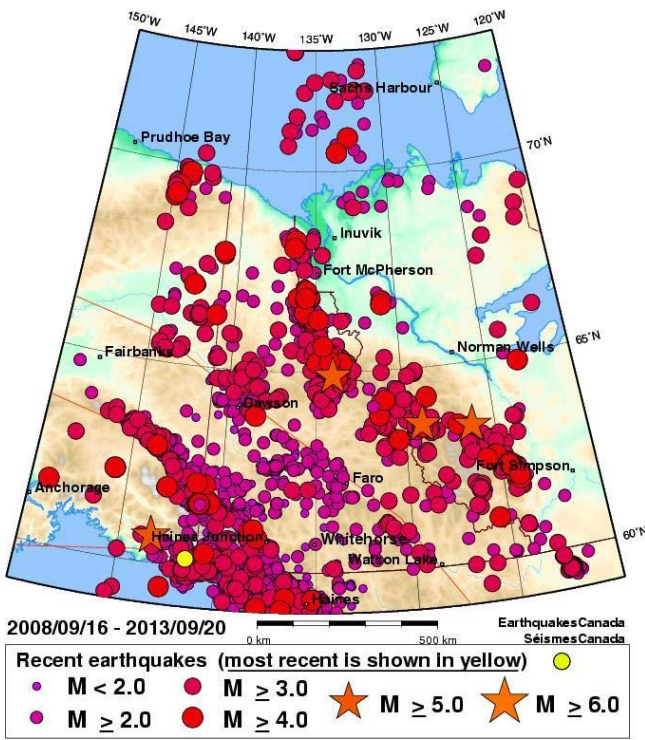
Sahtu Region Exposure/History

When	Where	Impact
Feb 12, 2012	All Co-op grocery Stores in the NWT	A brand of frozen hamburgers manufactured in Ontario was recalled as it may have been contaminated with E. coli. Consumption of food which contains this strain of virus can cause life-threatening illness.

Community Meeting Feedback

This hazard was not mentioned as a concern at the Sahtu Region meeting.

2.3.5 Earth Movement - Earthquake/ Tsunami

 <p>2008/09/16 - 2013/09/20</p> <p>Recent earthquakes (most recent is shown in yellow)</p> <p>● M < 2.0 ● M ≥ 2.0 ● M ≥ 3.0 ● M ≥ 4.0 ★ M ≥ 5.0 ★ M ≥ 6.0</p> <p>Figure 19: Earthquakes 2008-2013. (Source: Earthquakes Canada)</p>		<table><tr><td>Definition</td><td>Class</td></tr><tr><td>A slip along a fault in the earth causing the ground to shake and/or the large wave caused by it</td><td>Natural Hazard</td></tr><tr><td colspan="2">NWT greatest impacts to date Minor Property damage 1985</td></tr><tr><td colspan="2">Climate Change Could increase impact</td></tr></table>	Definition	Class	A slip along a fault in the earth causing the ground to shake and/or the large wave caused by it	Natural Hazard	NWT greatest impacts to date Minor Property damage 1985		Climate Change Could increase impact	
Definition	Class									
A slip along a fault in the earth causing the ground to shake and/or the large wave caused by it	Natural Hazard									
NWT greatest impacts to date Minor Property damage 1985										
Climate Change Could increase impact										
Mitigation Strategies	<ul style="list-style-type: none">✓ Develop or adopt and enforce building standards for earthquakes.✓ Develop/distribute and facilitate public awareness programs for what to do in the case of an earthquake or tsunami.✓ Ensure that emergency plans are in place.✓ Develop tsunami inundation mapping and hazard zones for at risk communities.✓ Plan and communicate “safe areas” for community members to go to in the event of an earthquake or tsunami.									
Vulnerability	Description									
People	Some injury and possible death may occur due to landslide or structural collapse caused by a major earthquake in the western part of the territory.									
Infrastructure	Structural damage to buildings and infrastructure could be caused by a major earthquake in the western part of the territory.									
Communications	Communications could be disrupted by a major earthquake.									


Sahtu Region Exposure/History

The northern Rocky Mountain Region is one of the seismically active areas of Canada. Communities in the west of the territory experience minor earthquakes each year which are rarely felt.

Community Meeting Feedback

This hazard was not mentioned as a concern at the Sahtu Region meeting.

2.3.6 Civil Unrest

		Definition People breaking the law in order to bring attention to their cause	Class Human-induced Hazard
<p>Figure 20: Marchers protest against fracking in Yellowknife last October. As of Mar. 17, close to 1,000 NWT residents have signed a petition expressing concern about hydraulic fracturing, March 17, 2014. (Source: Northern Journal/ Photo: Jack Danylchuk)</p>		NWT greatest impacts to date <ul style="list-style-type: none">Fatalities 9Property Damage (Mine)	
		Climate Change Projected to increase both frequency and consequence	
Mitigation Strategies		<ul style="list-style-type: none">✓ Have intelligence and monitoring plans in place with law enforcement and stakeholders.✓ Coordinate integrated response plans with stakeholders.	
Vulnerability	Description		
People	Civil unrest can directly impact the safety and security of individuals or groups of persons whether or not they are targeted by the unrest. There is also a threat of injury to public responders and those persons involved in the unrest.		
Infrastructure	Damage to public and private property is almost always a staple of civil unrest. There is also an increase in cyber terrorism which targets computer systems which control defense establishments as well as public utilities.		
Communications	Acts of civil unrest or terrorism can impact communications which disrupt public authorities' ability to deal with the unrest.		


Sahtu Region Exposure/History

Research did not reveal any exposure or history of this hazard in the Sahtu Region. Please review the 2014 NWT HIRA for further information.

Community Meeting Feedback

This hazard was not mentioned as a concern at the Sahtu Region meeting.

2.3.7 War/ International Incident

		Definition An action or clash that results in a wider dispute between two or more nation-states.	Class Human-induced Hazard
		NWT greatest impacts to date N/A	
		Climate Change Projected to increase in frequency	
Mitigation Strategies		<ul style="list-style-type: none">✓ Ensure notification and information/communication protocols are in place with Federal Government Departments.✓ Ensure appropriate emergency plans are in place based on the perceived or real risk of war and potential casualty threats.	
Vulnerability	Description		
People	The main effects of war on people are poverty due to destruction of properties and business, death and property destruction. War can also cause a dramatic impact on civilian health, because of the weapons which may be highly radioactive.		
Infrastructure	The most commonly held thoughts on war's effect on infrastructure is the destruction of roadways, railways and bridges to hamper an enemy's ability to move freely and accumulate forces at a given point. In recent wars there have been specific examples of water and power plants being targeted in order to dramatically impact the ability of a populace to survive in a given area.		
Communications	Communication facilities are likely the first to be targeted in any war or act of war or terrorism. Without communications authorities will be unable to respond to threats coherently and the loss of information can lead to a general state of panic amongst a population.		


Sahtu Region Exposure/History

Research did not reveal any exposure or history of this hazard in the Sahtu Region. Please review the 2014 NWT HIRA for further information.

Community Meeting Feedback

This hazard was not mentioned as a concern at the Sahtu Region meeting.

2.3.8 Falling Debris

		Definition Any object (such as a satellite) which survives its passage through the Earth's atmosphere and impacts Earth	Class Natural Hazard
<p>Figure 22: First piece of debris found from the crashed Cosmos-954 Soviet satellite, 1978. (Source: Wikipedia)</p>		NWT greatest impacts to date Environmental	
		Climate Change N/A	
Mitigation Strategies	<ul style="list-style-type: none">✓ Have monitoring and notification protocols in place with appropriate agencies (i.e. CSA, NASA, NavCan).✓ Ensure emergency plans are in place for potential risks associated with falling debris.		
Vulnerability		Description	
People		Any object falling to earth from space will be of concern in terms of public safety and there will always be a worry of people being injured or killed by falling debris. Given the low population of the NWT and rare occurrence of these events there is a low likelihood of this happening.	
Infrastructure		Damage to buildings, roads and other infrastructure would be a concern in the event of falling debris.	
Communications		An object which falls from space may impact a communications satellite or microwave tower which could directly impact communications in a region.	

Sahtu Region Exposure/History

Research did not reveal any exposure or history of this hazard in the Sahtu Region. Please review the 2014 NWT HIRA for further information.

Community Meeting Feedback

This hazard was not mentioned as a concern at the Sahtu Region meeting.

3 Existing Response Capabilities

This section provides a summary of Sahtu Region's response capabilities that were considered when assessing the regions overall risk to the hazards discussed in Section 2.

3.1 Emergency Response and Preparedness Organizations

Under overall management of the MACA Regional Superintendent, the GNWT is responsible for assisting Local Authorities within the Sahtu Region when requested, or assuming operational control when the Local Authority's capacity or jurisdiction is exceeded. In fulfilling these regional responsibilities the GNWT shall:

- Establish a committee to plan for and respond to emergencies;
- Develop and maintain the Sahtu Regional Emergency Response Plan;
- Implement plans and procedures for an integrated response to emergencies within the Region affected;
- Provide prompt and coordinated response to specific requests for assistance from the Local Authority and/or when the capacity of the Local Authority is exceeded;

The response to most emergencies is managed by the Local Authority, as the community government of the affected community. The Regional Emergency Response Committee is established as the body responsible for the planning and coordination of the area response to emergencies within each region. The Regional Emergency Response Committee provides support and assistance in specific areas as requested by the Local Authority. Should the emergency exceed the capabilities of the Local Authority to respond, or should its jurisdiction be surpassed, the GNWT may assume control of emergency operations in an effort to return conditions to normal under the authority of the Emergency Measures Officer, as the senior territorial emergency official appointed by the Minister Responsible for Civil Emergency Measures.

The GNWT, through the Emergency Measures Organization, is responsible for providing assistance to support regional emergency operations, or assuming operational control when the incident is a matter of GNWT jurisdiction. In fulfilling its headquarters responsibilities the GNWT shall:

- Establish committees, comprised of various designated emergency agencies, to plan for and respond to emergencies;
- Develop and maintain the NWT Emergency Plan;
- Implement procedures for an integrated response to emergencies within any part of the NWT;
- Provide prompt and coordinated response to emergencies to assist regional emergency operations;
- Coordinate the provision of specialized assistance of agencies from the Federal Government and other provinces and territories not provided for in the Plan, and
- Assume direction and control of GNWT emergency operations when the emergency is a matter of Territorial Government jurisdiction.

In accordance with established Government of Canada emergency arrangements, Public Safety Canada (PSC) will assist the GNWT in responding to emergencies in the Northwest Territories. To fulfill its emergency responsibilities PSC has agreed to:

- Appoint a senior representative to TERC; and
- Coordinate the required assistance of federal departments and agencies not resident in the NWT during any GNWT response to emergencies.

Joint Task Force North (JTFN) - in accordance with Canadian Forces (CF) Directive "Provision of Essential Services to Civilian Authorities", JTFN may assist the GNWT in:

- Search and rescue;
- Communications;
- Emergency transportation;
- Provision of manpower and other resources;
- Disposal of hazardous materials; and
- Specialized training within the CF area of expertise.

3.2 Fire

The Fire Chief/Local Assistant is responsible for directing the activities of the Fire Department to ensure that loss of life, property or injury as a result of fire is prevented and/or minimized within each community. The Fire Chief/Local Assistant is the sole authority and command at the scene of a fire.

MACA delivers training to community government fire departments through its School of Community Government.

The Office of the Fire Marshal (OFM) protects the public from loss of life and property as a result of fire. The OFM has direct contact with fire departments and the public across the NWT. The OFM plays a regulatory role by enforcing the *Fire Prevention Act* and its associated regulations, namely, the *Fire Prevention Regulations*, *Fireworks Regulations*, and *Propane Cylinder Storage Regulations*. NWT has adopted Firesmart principles to identify, mitigate and document hazards.

Fire departments in the Sahtu Region are composed of volunteers.

Wildfire

The Department of Environment and Natural Resources directs the GNWT Forest Fire protection and suppression initiatives to provide:

- Assistance in the provision of and support to mobile/portable radio systems;
- Assistance in the procurement of radio communications equipment;
- Monitoring of weather, forest and fire conditions, forecasting fire behaviour and conditions to guide preparedness arrangements, and managing NWT forest fire suppression operations;

- Advice to the Emergency Management Office and communities on forest fire conditions and behaviour, and recommending appropriate courses of action (seasonal); and
- The requisition of special firefighting and safety equipment, and other specialized materials and supplies which are available (seasonal).

Environment and Natural Resources is working with communities in the NWT to develop and implement Community Wildfire Protection Plans (CWPP). These plans are designed to identify and reduce wildland fire risk in communities. CWPP's are becoming a national standard for agencies and communities responsible for wildland fire management. The process is recognized as a crucial first step in better preparing homeowners and communities to reduce the risk of loss.

Community Wildfire Protection Plans (CWPP) Sahtu Region

Colville Lake CWPP 2012

Délı̄nē CWPP 2012

Fort Good Hope CWPP 2010

Norman Wells CWPP 2010

Tulita CWPP 2011

3.3 Police

Police servicing in the NWT is designated as G Division and is split into a North and South District. There are currently seven RCMP Detachments in the Sahtu Region:

- Délı̄nē Detachment;
- Fort Good Hope Detachment – also services Colville Lake;
- Norman Wells Detachment; and
- Tulita Detachment.

3.4 Medical and Health Authorities

The Sahtu Region is administered by the Sahtu Health and Social Services Authority.

Sahtu Health and Social Services

Community	Health Care	Health Resources
Colville Lake	Receives health and social services from the Fort Good Hope Health Centre	Physician visits once a month.
Délı̄nē	Health Centre	3 Nurses, 3 Prevention and Health Promotion Workers, 2 Home Support Workers, Physician visits 5 days a month.
Fort Good Hope	Health Centre	3 Nurses, 3 Prevention and Health Promotion Workers, 2 Home Support Workers, Physician visits 5 days a month.
Norman Wells	Health Centre	4 Nurses, 1 Prevention and Health Promotion Worker, 1 Home Support Worker.
Tulita	Health Centre	3 Nurses, 2 Prevention and Health Promotion Workers, 1 Home Support Worker.

Ground Ambulance and Highway Rescue Services

No communities in the Sahtu region operate neither a community-based ground ambulance service nor a highway ambulance or rescue service. In light of the necessary resources, capacity, equipment and training, Health and Social Services Authorities generally do not provide support for ground ambulance services within communities or on NWT highways.

The GNWT utilizes a Highway Emergency Alerting Protocol (HEAP) to assist the RCMP and community Fire Departments in responding to vehicular accidents on territorial highways and winter roads. The Protocol describes a uniform plan for emergency response to highway accidents in various zones designated across the NWT. It guides the following activity:

- Establishing command authority;
- Dispatching resources;
- Accident reporting;
- Emergency landing procedures; and
- Clarifying medevac coverage areas.

The Stanton Territory Health Authority coordinates inter-facility and medevac services for the territory, including the Sahtu region.

3.5 Search and Rescue

SAR response to	Primary	Secondary
Aircraft incidents	Canadian Forces	RCMP Civil Air Search and Rescue Association (CASARA) Search and Rescue Volunteer Association of Canada (SARVAC) Any multi-tasked Federal aircraft or vessel
Marine incidents in tidal and international waters	Canadian Coast Guard	Canadian Forces Canadian Coast Guard Auxiliary (CCGA) Search and Rescue Volunteer Association of Canada (SARVAC) Any multi-tasked Federal aircraft or vessel Police force of jurisdiction Vessel of opportunity
Ground and inland water incidents	Parks Canada within National Parks, Crown owned land – military bases and training areas Territorial responsibility delegated to RCMP	Canadian Forces Canadian Coast Guard Any multi-tasked Federal aircraft or vessel Civil Air Search and Rescue Association (CASARA) Canadian Coast Guard Auxiliary (CCGA) Search and Rescue Volunteer Association of Canada (SARVAC)

Organization	SAR Responsibility
Royal Canadian Mounted Police	Coordination of public ground search and rescue (including inland waters).
Canadian Forces	Humanitarian assistance including air and marine search and rescue.
Fisheries and Oceans (Coast Guard)	Marine emergency alerting including ship spills and marine search and rescue under coordination of the National Search and Rescue Program and support of marine search and rescue volunteer training under the coordination of the National Search and Rescue Program.
Transportation Canada	Air search and rescue alerting and support of air search and rescue volunteer training under the coordination of the National Search and Rescue Program.
Park Canada Agency	Available to provide professional advice and support on search and rescue.

3.6 Canadian Forces

Headquartered in Yellowknife, NWT, JTFN is responsible for Canadian Joint Operations Command's single largest region by far. In fact, JTFN area of responsibility encompasses approximately four million square kilometres, or 40 per cent of Canada's land mass, and 75 per cent of its coastal regions.

Created as part of a broader transformation of the Canadian Forces in 2006, JTFN is one of 6 regional Joint Task Forces across Canada, and reports directly to Canadian Joint Operations Command, located in Ottawa, Ontario.

In addition to its headquarters located in Yellowknife, NWT, JTFN maintains detachments in Whitehorse, Yukon, and Iqaluit, Nunavut.

JTFN is responsible for the command of the Canadian Rangers in the North through the 1st Canadian Ranger Patrol Group and supports the Cadet program and the Junior Canadian Rangers program in the three territories.

In total, there are approximately 250 Regular Force, Reserve Force and civilian personnel who are working north of the 60th parallel within one of the following units:



Figure 23: 1st Canadian Ranger Patrol Group in NWT
(Source: Government of Canada, Canadian Army website)

- JTFN Headquarters and its two detachments in Iqaluit and Whitehorse;
- Area Support Unit (North);
- 1st Canadian Ranger Patrol Group;
- 440 (Transport) Squadron;
- 1 Field Ambulance Detachment; and
- C Company of the Loyal Edmonton Regiment.

**Sahtu Region
Communities with a
Ranger Patrol**

- Fort Good Hope
- Délı̨nę
- Tulita

4 HIRA Conclusions

This type of assessment is a critical part of any emergency management program. Identified hazards can be used in preparedness programs, emergency response plan exercises, and training and awareness programs.

Qualitative data, definitions and more extensive analysis of each hazard is provided in 2014 NWT HIRA Section 5 Hazard Narratives. Other regional summaries are contained in Appendix 8.7, which provides communities with a more locally focused risk assessment.

Hazards are interconnected, fluid, not subject to regional and territorial boundaries and may have unique outcomes. The Sahtu Region HIRA should be updated routinely when new information about hazards that could impact the Sahtu Region becomes available.