Regional District of Bulkley-Nechako

HRVA Electoral Area 'B' Committee Backgrounder

ELECTORAL AREA ‘B’ HAZARD IDENTIFICATION

FEBRUARY 2022

“Know the Risks, Make a Plan, Be Prepared”

CHAPTER 2: ELECTORAL AREA 'B' HAZARD IDENTIFICATION

Electoral Area 'B' Geographic Setting

Electoral Area B (Burns Lake Rural) is the rural area surrounding the Village of Burns Lake. The unincorporated communities within the area are Decker Lake, Donalds Landing, Palling, Rose Lake, Sheraton, Tintagel, Pendleton Bay and Forestdale. The area includes three first nations communities

Wet'suwet'en First Nation, Ts'il Kaz Koh (Burns Lake Band) and Lake Babine Nation.

The Wet'suwet'en First Nation is located west of Burns Lake in the central interior of British Columbia. It was formerly known as the Broman Lake Indian Band and is still usually referred to as Broman Lake, although this is no longer its official name. Members speak the Witsuwit'en dialect of Babine-Witsuwit'en, a Northern Athabaskan language. The main community is Palling Indian Reserve No. 1. (Cited from BC Assembly of First Nations web site) Ts'il Kaz Koh, also known as the Burns Lake band is a small First Nations community located in Burns Lake, BC. It is a member nation of the Carrier Sekani Tribal Council.

Ts'il Kaz Koh co-owns the Burns Lake Native Development Corporation (BLNDC) as one of 6 local First Nations (other nations include: Cheslatta Carrier, Lake Babine, Nee Tahi Buhn, Skin Tyee, and Wet'suwet'en). The BLNDC works to provide the following: assistance with business plan development, government grant applications, general advisory services, pre- and post-loan counseling and troubleshooting, economic and community development assistance to Bands and their communities, access to technical, financial, and management information, and develop, organize and run

workshops orientated towards economic development and business initiatives. (cited from BC Assembly of First Nations web site)

Lake Babine Nation is third largest Aboriginal Band in British Columbia. There are two reserve communities that fall within the Electoral area 'B' boundary, being Donald's Landing and Woyenne. Donald's Landing (I.R. #21) is located approximately 20 miles Northeast of Burns Lake, on the Babine Lake. Although, 12 families spend up to 9 months in the community, only one family presently lives on a year-round basis. Woyenne (I.R. # 27) is Lake Babine's largest community which is located within the municipal boundaries of the Village of Burns Lake. The reserve area is 60 hectares (140 acres) in size, with a growing population of more than 2,207 residing in 147 homes. Lake Babine central administration office also located on the Woyenne reserve. (Cited from Lake Babine Nation web site)

The area offers residents and visitors an abundance of recreational activities. World class mountain biking trails, olympic quality cross country ski trails, and 4828 km of shoreline on some of the most beautiful lakes in the world to name a few.

Located in Electoral Area "B" Burns Lake lies at the heart of the Lakes District. The land that isn't under water is covered in lush green forests or rolling golden hay. Burns Lake, in the geographic centre of BC, is the "Heart of the Lakes District." Although the villages population is 2,726, it serves as the supply centre for 8,000 people in neighbouring communities. Most major services are available in Burns Lake. The town's two malls and dozens of small stores retail everything from local artwork to hardware, groceries, and sporting goods.

The major industries in the Lakes District are Forestry, Agriculture and Tourism. Timber harvesting and lumber production support 37% of the total employment. The major employers in the Lakes District are in the forestry sector and include Babine Forest Products and Decker Lake Forest Products. The economy is primarily resource dependant and has remained stable over the last several years.

Selecting Hazards for Electoral Area 'B'

The first step in the HRVA process was to identify the possible hazards that will need to be analyzed in the study area. The list below is an adaptation of hazards identified in the BC Emergency Management Regulation and a reflection of the HRVA Committees Selection of Hazards as discussed. Climate change is recognized as having impacts on the frequency and intensity of many hazards and may also cause new hazards to emerge. This list will guide the HRVA analysis moving forward. The objective moving forward will be to prioritize the mostly likely hazards and consider historic experiences and future likelihood when scoring the frequency, severity, and consequence of each specific hazard.

Emergency ManagementBC

Regional District Bulkley Nechako HRVA 2022

HRVA Hazard List

Community: Electoral Area B **Date: 14-February-2022**

This hazard list is an adaptation of hazards identified within the BC Emergency Management Regulation

Atmospheric

- ☑ 1. Air Quality ↗
- ☑ 2. Extreme Heat ↗
- ☑ 3. Extreme Cold ↗
- ☐ 4. Fog ↗
- ☑ 5. Freezing Rain or Drizzle ↗
- ☑ 6. Space Weather ↗
- ☐ 7. Hail ↗
- ☑ 8. Hurricane/Typhoon/High Wind Event ↗
- ☑ 9. Lightning ↗
- ☑ 10. Snowstorms and Blizzards ↗
- ☐ 11. Tornado ↗

Disease & Epidemic

- ☑ 12. Animal Disease ↗
- ☑ 13. Human Disease (Includes Pandemic/Epidemic) ↗
- ☑ 14. Plant Disease and Pest Infestation ↗
- ☑ 15. Public Health Crisis

Fire

- ☑ 16. Structure Fire
- ☑ 17. Wildfire ↗

Geological

- ☑ 18. Avalanche ↗
- ☑ 19. Landslide/Debris Flow ↗
- ☐ 20. Land Subsidence (and Sinkholes) ↗
- ☐ 21. Submarine Slides

Seismic

- ☑ 22. Earthquake
- ☐ 23. Liquefaction
- ☐ 24. Tsunami (Telegenic and Terrestrial)

Volcanic

- ☐ 25. Ash Fall
- ☐ 26. Volcanic Flow (Pyroclastic, Lava, Lahars)

Hazardous Materials and Explosions

- ☑ 27. Explosions
- ☑ 28. Hazardous Materials Spill
- ☐ 29. Mine Incident
- ☐ 30. Nuclear Incident
- ☑ 31. Oil or Gas Pipeline Spill
- ☐ 32. Space Debris

Hydrological

- ☑ 33. Drought ↗
- ☐ 34. Seiche ↗
- ☐ 35. Storm Surge ↗

Flooding

- ☑ 36. Lake, River, and Stream Flooding ↗
- ☐ 37. Coastal Flooding ↗
- ☐ 38. Storm Water Flooding (urban, local, pluvial) ↗
- ☑ 39. Flash Flooding ↗

Infrastructure Failure

- ☑ 40. Dam and Spillways Failure ↗
- ☐ 41. Dike Failure ↗
- ☑ 42. Structure Failure ↗

Interruptions to Critical Services

- ☑ 43. Electrical Outage ↗
- ☑ 44. Food Source Interruption (supply chain, or community food stores) ↗
- ☑ 45. Telecommunications Interruption ↗
- ☑ 46. Transportation Route Interruption ↗
- ☑ 47. Wastewater Interruption ↗
- ☑ 48. Water Service Interruption (Includes shortage and contamination) ↗
- ☑ 49. Fuel Source Interruption ↗

Security

- ☑ 50. Cyber Security Threat
- ☐ 51. National Security Threat
- ☐ 52. Public Disturbance
- ☐ 53. Major Planned Event

Transportation

- ☑ 54. Aircraft Incident
- ☐ 55. Marine Vehicle Incident
- ☑ 56. Motor Vehicle Incident
- ☑ 57. Rail Incident

Note: Climate change is recognized as having impacts on the frequency and intensity of many hazards and may also cause new hazards to emerge. Those hazards identified as being impacted by changing climatic conditions are indicated with a "↗".

Electoral Area 'B' Hazard History

Electoral Area 'B' has experienced several events that have impacted residents of the region. The regularity and of the event happening determines the risk factor which will be used in the Hazard, Risk, and Vulnerability Analysis.

There are several well-known hazards in Electoral Area 'B' including wildfire, flooding, severe weather, industrial fires, train derailments. Many of these hazards are high risk and are a priority to all communities within the Regional District of Bulkley-Nechako.

Appendix 1, Historic Hazard Data, provides the details on recorded events in Electoral Area 'B'. The highest recurring event types and severity of impact in this area are:

- Wildfires;
- Flash Flooding; and
- Severe Weather.

The Regional District HRVA 2003 Hazard, Risk, and Vulnerability Analysis Priority Matrix identifies the following hazards:

FREQUENCY	Very Low	Low	High	Very High	
6			Fire – industrial (18)	Fire- interface & Wildfire, Flood (24)	**Frequent or very likely**
5	Avalanche (5)		Dangerous goods spill, Epidemic- human, Explosion transportation accident – Road (15)	Severe Weather (20)	**Moderate or likely**
4		Critical Facility Failure, Infrastructure Failure (8)	Transportation accident – Air, Rail (12)	Earthquake (16)	**Occasional, slight chance**
3		Epidemic – Animal (6)	Landslide, debris flow (9)		**Unlikely, Improbable**
2			Terrorism (6)		**Highly unlikely (rare event)**
1		Dam Failure, Mine Accident (2)		Volcano Eruption (4)	**Very Rare event**
	1	**2**	**3**	**4**	

SEVERITY

Risk index # is the Frequency x Severity.

The Village of Burns Lake Emergency Preparedness Plan 2020 - Hazard, Risk, and Vulnerability Analysis Priority Matrix identifies the following hazards (the Risk matrix was last updated April 24, 2012):

FREQUENCY	Very Low	Low	High	Very High	
6					**Frequent or very likely**
5		Severe Weather (10)	Dangerous Goods Spill; Transportation accident road & road (15)	Fire- interface & Wildfire (20)	**Moderate or likely**
4		Critical Facility Failure; Earthquake; Explosion or Emissions (8)	Epidemic – Human; Fire – Industrial; Flood; infrastructure Failure (12)	Earthquake (16)	**Occasional, slight chance**
3	Terrorism (3)	Dam Failure(6)			**Unlikely, Improbable**
2	Epidemic – Animal; Transportation Accident – Air (2)	Storm Surge (4)		Volcano Eruptions (8)	**Highly unlikely (rare event)**
1				Pest Infestation (4)	**Very Rare event**
	1	**2**	**3**	**4**	
			SEVERITY		

The following First Nation community emergency plans from 2010 each indicated the highest probability risks listed in order as follows:

Lake Babine Nation	Wet'suwet'en First Nation	Ta'il Kaz Koh Burns Lake Band
Windstorm	Fire	Snow, ice, hail, sleet, avalanche, blizzard
Heatwave	Snow	Fog
Snow	Windstorm	Disease that impacts humans
Biological hazard	Heatwave	Energy/power/utility failure
Hazardous spill	Hazardous Materials	Water control structure/dam/levee failure
Transportation accident	Transportation Accident	Communications system interruptions
Power failure	Power failure	Criminal activity
Communications system interruptions	Drought	

Defining Hazard Considerations for Electoral Area ‘B’

This section provides definitions from the HRVA Hazard Reference Guide 2021 Province of British Columbia, the Village of Burns Lake emergency management plan, and additional hazard research. These definitions and related information can help to inform the HRVA advisory committee in determining what hazards will be analyzed in this HRVA process.

The hazards are grouped in to three categories: Natural Hazards; Human-Caused Hazards; and Diseases, Pest Infestations & Epidemics. Hazards defined in this section are based on historical events that may have impacted Area ‘B’ and were included in the Hazard, Risk, and Vulnerability Analysis Priority Matrix’s from the Regional District HRVA 2003. This backgrounder has also been updated with input and further research resulting from the Hazard Identification workshop on February 7th, 2022. The top priority hazards identified by RDBN staff include:

Wildfire

Severe Weather

Rail Incidents

Known hazards are also identified on a map of electoral area ‘B’ and can be found in Appendix 2 of this chapter. Additional hazard definitions and information can be found in the provinces HRVA Companion Guide 2021.

If you have information on known hazards, resources or details on resiliency strategies related to the hazards listed below, please include these as notes and pass them on to the Regional District HRVA Coordinator for inclusion in the analysis.

Indigenous Traditional Knowledge

Long before European explorers and traders arrived in the late 1700s, Indigenous people in BC told stories and practiced traditions to share important knowledge about natural hazards. By repeating these stories, Indigenous people passed on valuable information about how to prepare for and survive disasters across time and across generations. (Prepare BC Emergency Management BC, 2019)

Those holding traditional knowledge can assist in understanding the nature of local hazards, suggest appropriate risk reduction and response mechanisms, and even give options for recovery based on past experiences. They can also help us recognize and respect the long history and rich traditions of First Nations communities on this land. (Munsaka, 2018) The Regional District recognizes the importance of learning from traditional knowledge and is looking to continually strengthen and develop relationships in the hopes that this knowledge can assist and inform future emergency planning and preparedness planning.

Summary of Climate Patterns

The information below has been summarized from the *Climate Patterns, Trends, and Projections for the Omineca, Skeena, and Northeast Natural Resource Regions, British Columbia - Technical Report 097,* 2016. (Foord, 2016)

Baseline climate of the Skeena Natural Resource District

Seasonal/Annual	Precipitation (mm)	Mean Temperature (°C)	Maximum Temperature (°C)	Minimum Temperature (°C)
Nadina District				
Winter	203.7	-7.9	8.0	-31.9
Spring	104.9	2.3	22.6	-21.6
Summer	141.1	12.5	29.4	-1.2
Fall	206.3	3.4	23.1	-17.6
Annual	652.0	2.6	29.6	-33.6

Skeena Natural Resource Region Climate Trends

The Skeena Natural Resource Region, which includes the Nadina District, has become warmer and wetter over the last century. Mean annual precipitation has increased 5.2%. Most significantly, summer precipitation has increased by more than 10%. The largest increases in precipitation have occurred in the Skeena (southern) portion of the Skeena−Stikine District. Mean annual temperature has increased in the region by 0.2°C. Seasonally, mean winter temperatures have increased the most throughout the region, by about 0.7°C. Winter precipitation has declined only int the Nadina District (by 19.5%). The Skeena (southern) portion of the Skeena−Stikine District has experienced large increases in precipitation resulting likely in moderate increases in temperature. Summers, overall, are getting warmer in the region. Fall maximum temperatures have declined significantly in the Nadina District (-1.6C).

Skeena Natural Resource Region Climate Projections

Climate projections for the northern regions and districts were made for 2055 (2041–2070). Mean annual temperature in the Skeena Natural Resource Region is projected to increase by 3.1°C, with minimum temperatures increasing more than maximum temperatures. Mean annual precipitation for the Nadina District is projected to increase by 5%. Increases will likely be as rainfall because precipitation as snow is projected to decrease by about 35%. Precipitation is projected to increase the most in the fall. The number of growing degree-days will increase, and the number of frost-free days will increase. The greatest increase in the number of frost-free days is projected to occur in the spring.

A Note about Climate Change:

Climate change impacts both the frequency and intensity of many hazards. It may also cause new hazards to emerge. In this HRVA methodology, climate change is not indicated as a separate hazard; however, those hazards identified as being impacted by climate change are indicated with a special symbol. e.g. Drought (BC E. M., 2021)

Natural Hazards

Wildfire

An unplanned fire - including unauthorized human-caused fires - occurring on forest or range lands, burning forest vegetation, grass, brush, scrub, peat lands, or a prescribed fire set under regulation which spreads beyond the area authorized for burning.

The wildland urban interface (WUI) is any area where combustible forest fuel is found adjacent to homes, farm structures or other outbuildings. This may occur at the interface, where development and forest fuel (vegetation) meet at a well-defined boundary, or in the intermix, where development and forest fuel intermingle with no clearly defined boundary. **(Service B. W., 2021)**

- Forest fires are an integral part of the ecosystems of the Lakes TSA and stand replacing fires are frequent. Lodgepole pine is a fire-adapted species and is well suited to prompt re-establishment after fires. Fires provide nutrient cycling, complexity, resiliency, and biological legacies within the ecosystem. between 1933 and 2009, fires in the Lakes TSA burned an average of about 400 hectares per year and rarely did they exceed 1000 hectares in size. In the past decade, the average has increased tenfold to about 42 000 hectares per year. In 2010, about 28 000 hectares were burned by the Binta Lake fire; in 2014 the Chelaslie River and China Nose fires burned about 92 000 hectares and in 2018, a total of eight large wildfires impacted 209 000 hectares within the total geographic boundary of the Lakes TSA. (Forest Analysis and Inventory Branch Ministry of Forests, April 2019)
- There are 74 addresses in Electoral Area 'B' in a medium Wildfire Urban Interface risk area.
- The Wildland-Urban Interface (WUI) occurs where homes, structures, and critical infrastructure are found adjacent to or intermixed with combustible vegetated lands. Historically in BC, the WUI was created by buffering an area, using geographic information systems, where structure density is greater than 6 structures/km² by 2 km. The 2 km buffered area was originally designed to represent a reasonable distance that embers from a wildfire can travel to ignite a structure.
- Wildfires rank among the threats of highest concern for the Village of Burns Lake. Generally, from May to October of each year, this community faces a serious threat from wildland fires. (Village of Burns Lake, 2020)
- Most of the area surrounding Burns Lake is heavily forested and is therefore very dependent on the logging and lumbering industry. Farms and ranching, as well as summer homes along the rivers and lakes of the area, result in many cleared openings in the forest cove. The interface surrounding the Village is mostly private land and while much of this is cleared, a wildfire approaching Burns Lake would probably not be stopped by these cleared areas. Also, the lake forming Burns Lakes' south-western boundary is not wide enough to stop a rapidly moving wildfire. This interaction of people and wilderness creates a recipe for wildland urban interface fire. (Village of Burns Lake, 2020)
- There was a total of 111 fire starts with an average of 11 fires per year, within and around the Village of Burns Lake for the period from 2007 – 2016. (Capling, 2019)
- In February 2016 the provincial government awarded a community forest licence to the 6 first nations and 2 local governments – Chinook Community Forest. Chinook

Community Forest is undergoing a Wildfire Mitigation Planning process, in part to address the ongoing threat to the land-base and our communities.
- The Burns Lake Community Forest has developed a Landscape Fire Management Plan and highlights the overall risk rating of the tenure area is considered high. (Blackwell, 2019)
- Highest hazards of concern in our area.
- Corridor closures are possibility if a fire is nearing transportation routes.
- Pest infestations caused higher risk of wildfire hazards.

Comments and questions for consideration and further research:
- How on-going logging is creating open areas, is it helping or hindering fire behavior and risk?
- Could BCWS show modeling on the affects of removing brush and debris from the forests and how windspeed may impact fire behavior?

Notable fires outside Electoral Area 'B'

- In 2018 2,117 fires consumed 1,354,284 ha of land, which surpassed the previous record of 2017 of approximately 1.2 million ha. 66 evacuation orders were issued, affecting 2,211 properties. Total suppression cost reached $615 million. Approximately half of the area burned was south and east of the Village.
- In the summer of 2018, the RDBN mobilized its emergency management structure for over 72 days in response to 15 major fires which resulted in 64 evacuation orders and alerts with 1,544 dwellings under evacuation order, affecting approximately 3,475 people and requiring the relocation of over 3,000 livestock. Eight dwellings and over 45 other structures were lost and a declaration of state of local emergency was in place from August 1 to September 20. (Inc., 2019)
- Additional wildfire accounts can be found in Appendix 1.

Related Hazards: Air Quality / Extreme Heat / Lightning / Structure Fire / Explosions / Drought / Structure Failure / Electrical Outage / Telecommunications Interruption / Transportation Route Interruption / Water Service Interruption.

Flooding: Lakes, Rivers, and Stream

Flooding is the overflow of natural drainage channels, natural shorelines and/or human-made facsimiles leading to partial or complete inundation from the overflow of inland or tidal waters, and/or the accumulation or runoff of surface waters from any source. **(BC E. M., 2021)**

- In the Burns Lake are, rivers are not an issue; however, low lying areas near smaller streams and the lake adjacent to the Village can be subject to localized flooding during the spring freshet or during periods of heavy rain events. Also, the stream flowing down the gully between 5th and 8th avenues could have major flooding and erosion potential. (Village of Burns Lake, 2020)
- There are no Ministry of Environment hydrometric data monitoring stations in Electoral Area 'B'.
- Localized flooding along Burns Lake and Endako River.
- Hauz Loop Road is a flooding concern.

- No specific areas but anyplace near water bodies. Houses near Burns Lake could get impacted.
- Beaver dams cause an increase flooding as they build up greater volume of water and then let go.
- Burns Lake Band Reserve floods when the lake levels rise.

Comments and questions for consideration and further research:

- Is there a study on water supply in regard to climate change for our area?

Notable floods in Electoral Area 'B' include:

- Additional flood accounts can be found in Appendix 1.

Related Hazards: Hurricane/Typhoon/High Wind Event / Landslide/Debris Flow / Storm Water Flooding / Flash Flooding / Dam and Spillways Failure / Dike Failure.

Area B Weather Hazards

Climate Norm's	
Burns Lake 1971-2000[1]	**Babine Lake Pinkut Creek 1981-2010[2]**
Annual Rainfall 291.3 mm Annual Snowfall 189.8 mm Average Temperature, January -10.5 C Average Temperature, July 14.3 C Frost-free Days 108 days Hours of Sunshine 1621 hrs. per year Maximum Temperature 38.1 C (June 27, 2021) Minimum Temperature -46.7 C (Jan. 24, 1972) Maximum hourly wind speed recorded 61 S km/hr - November 25, 1979	Annual Rainfall 307.5 mm Annual Snowfall 163.3 mm Average Temperature, January -7.3 C Average Temperature, July 14.7 C Average Length of Frost days - 122 Hours of Sunshine 1827 hrs. per year Maximum Temperature 33.9 C (July 31, 1971) Minimum Temperature -44.4 C (Jan. 25, 1972) Maximum hourly wind speed recorded 53 km/hr E- Dec 27, 1990

- In Area 'B', one Environment Canada station monitored Climate Normal from 1981 – 2010 being Babine Lake Pinkut Creek and one station that monitored Climate Normal from 1971 – 2000 at Burns Lake.
- According to Environment Canada Burns Lake station, the minimum extreme temperature recorded was -46.7 degrees Celsius and occurred on January 24th, 1972. On average, there were less than 6.6 days in a year where the temperature reaches below -30 degrees Celsius. (Canada E. , Climate Normal 1971-2000 - Burns Lake, Climate ID 1091169, 1971-2000)
- Atmospheric River effects can be seen throughout the region. An **atmospheric river, or AR**, is a large, narrow stream of water vapour that travels through the sky. It can stretch to 1,000 miles (1,600 kilometres) long and more than 400 miles (640 km) wide, and on average, carries an amount of water equivalent to 25 Mississippi Rivers. As the rivers cross from the ocean to the land — particularly to mountainous regions like the B.C. coast — the vapour condenses into precipitation, sometimes dumping a month's worth of rain or snow in a matter of days. Less-intense ARs are essential to many

[1] (Canada E. , Climate Normal 1971-2000 - Burns Lake, Climate ID 1091169, 1971-2000)
[2] https://climate.weather.gc.ca/climate_normals/results_1981_2010_e.html?searchType=stnProx&txtRadius=200&selCity=&selPark=&optProxType=custom&txtCentralLatDeg=54&txtCentralLatMin=14&txtCentralLatSec=00&txtCentralLongDeg=125&txtCentralLongMin=46&txtCentralLongSec=00&txtLatDecDeg=&txtLongDecDeg=&stnID=456&dispBack=0

continents' water supply by bringing it from the warmer tropical oceans. But the bigger and more intense they get, the more dangerous they can be, triggering landslides and flooding resulting in tens to hundreds of millions of dollars in damage or more. The warmer the air is, the more water vapour an AR can carry. As the atmosphere's average temperature rises, then, an atmospheric river can grow — and when it makes landfall, it can release more rain or snow than in years past. (Linch, 2021)

- Environment and Climate Change Canada is working to create a new warning system that would act as a Canadian version of AR warnings. This system is predicted to be publicly ready in the fall of 2022. (Linch, 2021)

Snowstorms and Blizzards

Meteorological disturbance giving rise to a heavy fall of snow, often accompanied by strong winds. Snowstorm and blizzards impact upon transportation, powerlines and communications infrastructure, and agriculture. **(BC E. M., 2021)**

- Snowfall is a common occurrence in the winter months for the entire Area B. Although it is rarely heavy enough to pose a significant risk, severe snow events cause power failures. This was experienced with the severe snow event of 1996 and Oct. 2006.

Notable Storm events in Electoral Area 'B' can be found in Appendix 1.

Related Hazards: Extreme Cold / Freezing Rain or Drizzle / Avalanche / Structure Failure / Electrical Outage / Food Source Interruption / Telecommunications Interruption / Transportation Route Interruption / Fuel Source Interruption / Aircraft Incident / Motor Vehicle Incident.

Extreme Heat

Heat waves can be characterized by temperatures significantly above the mean for an extended period, or by a combination of high temperatures with high humidity and a lack of air motion. Heat waves impact upon the very young, the elderly and those with cardiovascular conditions. Heat waves also impact upon agriculture. **(BC E. M., 2021)**

Notable Heatwaves in the Electoral Area 'B' include:

- The last week in June 2021 brought about unprecedent heat in British Columbia and across western Canada. With forecasts stating it was the warmest stretch since records have been kept (In many instances 100+ years) ((MSC), 2021). With CBC reporting 486 sudden deaths over a five-day period from June 25th – 30th, 2021 195% increase over the approximately 165 deaths that would normally occur in the province over a five-day period. (Service B. C., 2021)
- Temperatures reaching 38.1 'C on June 27, 2021. (NAVCAN, 2021)

Related Hazards: Lightning / Animal Disease / Human Disease / Plant Disease and Pest Infestation / Public Health Crisis / Structure Fire / Wildfire / Drought / Food Source Interruption / Water Service Interruption.

Lightning ↗

Generally, all the various forms of visible electrical discharge that are produced by thunderstorms; often seen as a bright flash of light in the sky. Lightning impacts air transportation, powerlines and communications infrastructure and causes forest fires. (BC E. M., 2021)

- Lightning occurs virtually year-round in the Pacific coastal region. The average date of the beginning of lightning season in Western Canada (1999-2018) for British Columbia - Interior – North and high mountain ranges is June 1st. The Average date of the end of the lightning season in Western Canada (1999-2018) is between October 1st and November 1st. (Canada G. o., Lightning Statistics, 2016)
- The Canadian Lightning Detection Network (CLDN) was established in 1998 and consists of over 80 lightning sensors distributed across Canada. (Canada G. o., Lightning, 2016)
- Some quick facts regarding forest fires from Natural Resources Canada, Forest fires started by lightning, represent 45 per cent of all fires and 81 per cent of the total area burned in Canada, and occur in remote locations and often in multiple clusters. (Canada G. o., Lightning Statistics, 2016)
- There is no total ground to cloud lighting strike data for the Burns Lake area. (Canada G. o., Lightning Statistics, 2016) There are lightning strike maps from the Provincial Strategic threat analysis found in Appendix 2 – hazard maps in this document.

Related Hazards: Hail / Wildfire / Storm Water Flooding / Flash Flooding / Electrical Outage / Telecommunications Interruption.

Space Weather ↗

A disturbance or fluctuation in the earth's magnetic field, associated with solar flares. The impact may include disruption of electrical grids, communications systems, navigation equipment, and satellite operations. Resource operations including surveying, drilling, and pipelines may also be negatively affected. (BC E. M., 2021)

- The source of space weather is the Sun. The Sun is a million times larger than Earth and so distant that its light takes eight minutes to reach us. When violent solar phenomena occur, they create space weather effects on Earth, which can pose a hazard for human activities. (Government of Canada, 2021)
- Effects from solar activity include (but are not limited to) geomagnetically induced currents in power systems and pipelines, azimuthal errors in directional drilling, disruptions to HF radio communication and GPS navigation, and failure or mis operation of satellites:
  - Magnetic disturbances induce electric currents in long conductors such as power lines and pipelines causing power system outages or interfere with pipeline corrosion systems.
  - Magnetic disturbances directly affect operations that use the magnetic field, such as magnetic surveys, directional drilling, or compass use.
  - Radio waves used for satellite communications or GPS navigation are affected.

- Effects on satellites including radiation damage, memory upsets, phantom commands, surface charging and internal charging. (Government of Canada, 2021)

Related Hazards: Cyber Security Threat / Telecommunications Interruption / Electrical Outage / Transportation Route Interruption.

Drought

Drought is a recurrent feature of climate involving a deficiency of precipitation over an extended period, resulting in a water shortage for activities, communities, or aquatic ecosystems. In BC, combinations of insufficient snow accumulation, hot and dry weather, or a delay in rainfall may cause drought. (BC E. M., 2021)

- Drought can lead to reduced water availability for household and business use. Lower stream flows may cause warmer river temperatures, affecting fish and other aquatic life. Low stream flows can also affect the growth of agricultural crops and limit the water available for irrigation. Low flows and extended periods of low precipitation can also have impacts on groundwater levels. Aquifers – particularly those at shallow depths - may develop a lower water table due to drought in any given year and from previous drought seasons, as there may not be enough water to recharge the aquifer. If natural water sources or adequate storage are not available in a community, it may also lead to insufficient supplies for firefighting. (Econics, May 2021)

Notable regional incidents involving drought:

- Due to relatively normal to high snowpacks in the spring, early forecasts did not flag a drought risk for 2018. However, a heat wave in late spring rapidly depleted snowpacks and caused freshet flooding earlier than normal. That, and the lack of precipitation from July to November, created extensive dry conditions across lots of the province.
- In 2018, the Northwest, Upper Fraser West, Upper Fraser East, and Nechako regions reached Level 2 to Level 3 drought ratings, meaning these areas were very dry. (BC Agriculture & Food Climate Action Initiative, 2019)

Related Hazards: Extreme Heat / Lightning / Animal Disease / Human Disease / Plant Disease and Pest Infestation / Public Health Crisis / Wildfire / Food Source Interruption / Water Service Interruption.

Air Quality

Solids, liquids, or gases which, if discharged into the air, may result in statutory air pollution. (BC E. M., 2021)

- Communities in this region experience air quality episodes due to elevated particulate concentrations at various times throughout the year. Particulate matter is a concern for human health and from an aesthetic point of view. Burns Lake has an air quality monitoring station that provides an Air Quality Health Index (AQHI), hourly air quality readings, and related health messages. The AQHI reports on the health risks posed by a mixture of pollutants, including particulate matter ($PM_{2.5}$[3]), ground-level ozone (O^3),

[3] $PM_{2.5}$ Particulate matter with a diameter of less than 2.5 micrometers (µm). One micrometer is one millionth of a metre. PM2.5 is included in fine particulate and is a subset of PM10 (when measuring PM10, it includes PM2.5). PM2.5 is typically associated with combustion sources (smoke) and is more closely related to adverse health effects than larger particles.

and nitrogen dioxide (NO^2). (BC A. Q., 2021) These readings illustrate the level of health risks with a number and advice on minimizing health risks from air pollutants.

- The most significant air pollutant in the Bulkley Valley Lakes District (BVLD) is fine particulate matter, $PM_{2.5}$, from open burning, industrial sources, wood burning appliances, backyard burning, transportation road dust and vehicle emissions. A study conducted by Elliot and Copes (2011) has estimated that between 16 to 74 deaths each year are attributable to fine particulate matter concentrations in Northern and Interior Health Regions alone. (Zirnhelt, June 21, 2021)
- In Canada, wildfires can significantly increase air pollution levels of fine particulate matter ($PM_{2.5}$) posing the greatest human health risk (Canada H. , 2021).
- Elevated $PM_{2.5}$ typically occur in the autumn and winter months when dispersion is poor and many different emission sources (industry, space heating, open burning) are active. (Zirnhelt, June 21, 2021)
- Springtime road dust being PM 10 becomes a challenge.

Notable Air quality data in Electoral Area 'B' includes:

- The Province of BC has two active Air Quality Monitoring station located in this region Burns Lake Fire Centre and the Burns Lake Sheraton East. (Columbia P. o., Air Quality Data BC, 2021)The Burns Lake Sheraton East station only monitors temperature, wind speed and directions.
- There was an average level of 8.27 $PM_{2.5}$ over the last ten years (data missing for 2012 and 2011) with the highest average year in 2018 with an average level of 16 $PM_{2.5}$. 7-10 $PM_{2.5}$ is a High Health Risk according to the AQHI.
- Since 2009 Burns Lake air quality, annual mean $PM_{2.5}$ concentrations, has not exceeded the provincial air quality objectives (8 or 25 ug/m3) consistently, except for the 2018 exceptional fire year.
- A day is considered an advisory level day if the daily (24-hour) concentration is greater than the provincial objective of 25 ug/m3 for PM2.5 and PM 10. The following chart provides the number of air quality advisory days and Smokey sky bulletin days in Burns Lake issued by the Ministry of Environment since 2013[4]:

Year	# of days under advisory for fine $PM^{2.5}$	# of days under advisory for fine PM^{10}	Smokey sky bulletin days
2013	0	15	/
2016	1	7	/
2017	1	8	23
2018	3	7	46
2019	0	16	4
2020	0	8	6
2021	1	6	4

- There is one Purple Air Quality Monitoring stations in Burns Lake.

Related Hazards: Human Disease / Public Health Crisis / Structure Fire / Wildfire / Ash Fall / Explosions / Hazardous Materials Spill / Oil or Gas Pipeline Spill.

[4] Data received from Ben Weinstein Sr Air Quality Meteorologist Monitoring, Assessment and Stewardship Environmental Protection on August 12, 2021

Hurricane / Typhoon / High Wind Event

Hurricanes are tropical cyclones with maximum sustained surface winds of at least 64 knots (118 km/h). Hurricanes are known as typhoons in the western Pacific, very severe cyclonic storms in the North Indian Ocean, and severe tropical cyclones in Australia. There are five classes of hurricane intensity as outlined by the Saffir-Simpson Scale. (BC E. M., 2021)

- Wind is becoming more and more of an issue especially taking out power lines and falling across the roads, account of extreme wind events are anecdotally reported as happening very frequently.

Related Hazards: Hail / Lightning / Snowstorms and Blizzards / Tornado / Landslide/Debris Flow / Explosions / Hazardous Materials Spill / Seiche / Storm Surge / Lake, River, and Stream Flooding / Coastal Flooding / Storm Water Flooding / Flash Flooding / Dam and Spillways Failure / Dike Failure / Structure Failure / Electrical Outage / Food Source Interruption / Telecommunications Interruption / Transportation Route Interruption / Wastewater Interruption / Water Service Interruption / Fuel Source Interruption / Aircraft Incident / Marine Vehicle Incident / Motor Vehicle Incident / Rail Incident

Landslide/Debris Flow

Debris avalanches and debris flows.
Debris avalanches are extremely rapid debris flows of mud, rock, brush, trees, and other debris propelled by torrential rains.
Debris flows are a form of rapid mass down-slope movement of a slurry of loose soils, rocks, and organic matter. (BC E. M., 2021)

- The Village of Burns Lake OCP identifies hazard conditions and environmental sensitive Development Permit Areas. These regulations allow subdivision and/or development in a potentially hazardous area or down slope from a hazardous area only if appropriate. This may require confirmation from an engineer that the land is safe for the proposed use.
- Unstable ground along creeks in the region.
- Fort Babine has avalanche terrain along its single transportation route.
- Gully in Burns Lake could be a landslide consideration.
- After a wildfire, all the vegetation is gone leading to soil instability which increase the risk of landslides.
- Low possibility but high consequence.

Comments and questions for consideration and further research:

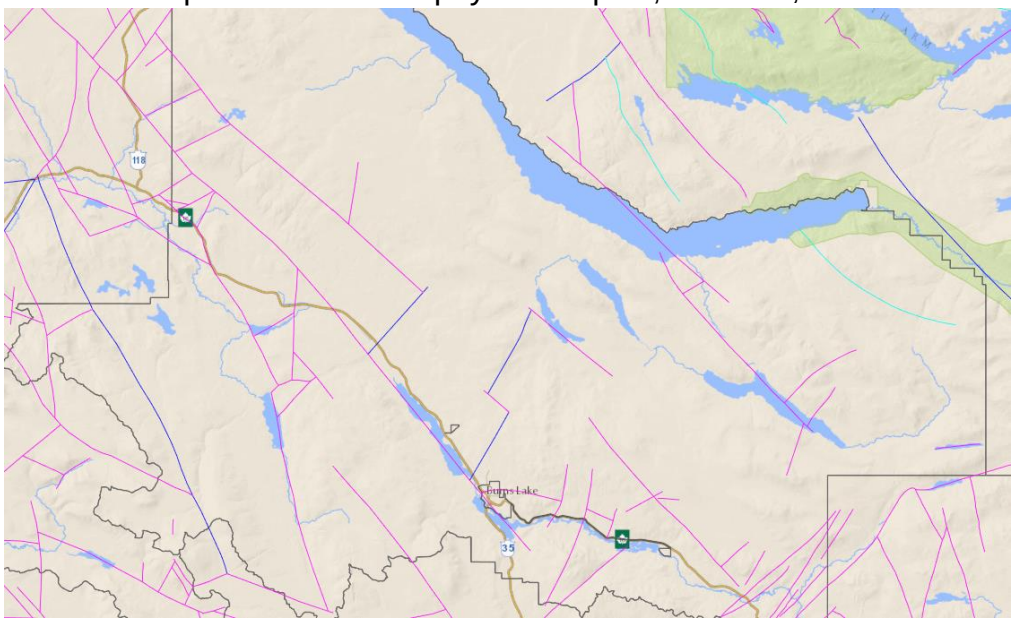
- Landslides in coastal inlets could create localized tidal waves. Is that applicable to lakes?

Related Hazards: Avalanche / Land Subsidence / Submarine Slides / Tsunami / Seiche / Lake, River, and Stream Flooding / Flash Flooding / Structure Failure / Electrical Outage / Telecommunications Interruption / Transportation Route Interruption.

Earthquake

An earthquake is defined as the shaking of the ground due to movement along a fault rupture. When a large magnitude earthquake occurs, energy traveling in seismic waves may cause damage to structures, trigger landslides, liquefaction, or other geologic hazards and, in certain circumstances, generate tsunamis. Impacts from earthquakes can be widespread and severe. (BC E. M., 2021)

- The Regional District's risk for seismic activity is considered medium to low (Canada G. S., 2015).
- In electoral area 'B,' there is no record of earthquakes. (Natural Resources Canada, 2021)
- Regional District residents would experience minimal physical impact; however, there could be a significant event that could impact the delivery of goods and services, depending on the location of the epicentre and the impact on major transportation routes from the east and the south.



- A map showing faults lines within Electoral Area 'B' reveals that many faults do exist. Most faults in the regional district are of the Strike-Slip (pink) variety, but there are a few Thrust (light blue) type faults. *See map – source: Imap*BC, retrieve Nov 2nd, 2021.
- The five most significant earthquakes in BC occurred in 1700, 1946, 1949, 1970 and 2012. They ranged in magnitude from 7.3 (1946) to 9.0 (1700).
- The Village of Burns Lake may be indirectly affected by damage to other provincial zones. Outside suppliers, such as food delivery, may be unable to offer services, forcing the local communities to turn to alternative sources, which may mean delays. Natural gas, hydro, and transportation corridors may also be compromised.

Related Hazards: Structure Fire / Avalanche / Landslide/Debris Flow / Land Subsidence / Submarine Slides / Liquefaction / Tsunami / Explosions / Hazardous Materials Spill / Mine Incident / Oil or Gas Pipeline Spill / Seiche / Dam and Spillways Failure / Dike Failure / Structure Failure / Electrical Outage / Food Source Interruption / Telecommunications Interruption / Transportation Route Interruption / Wastewater Interruption / Water Service Interruption / Fuel Source Interruption / Marine Vehicle Incident / Motor Vehicle Incident / Rail Incident.

Radon

Radon is an invisible, odorless gas that can seep into your home through cracks in floors, walls and foundations. Radon comes from the natural breakdown of uranium in soil, rock and water. Radon is the second leading cause of lung cancer in Canada. As radon breaks down it forms radioactive particles that can get lodged into your lung tissue as you breathe. (Association, 2021)

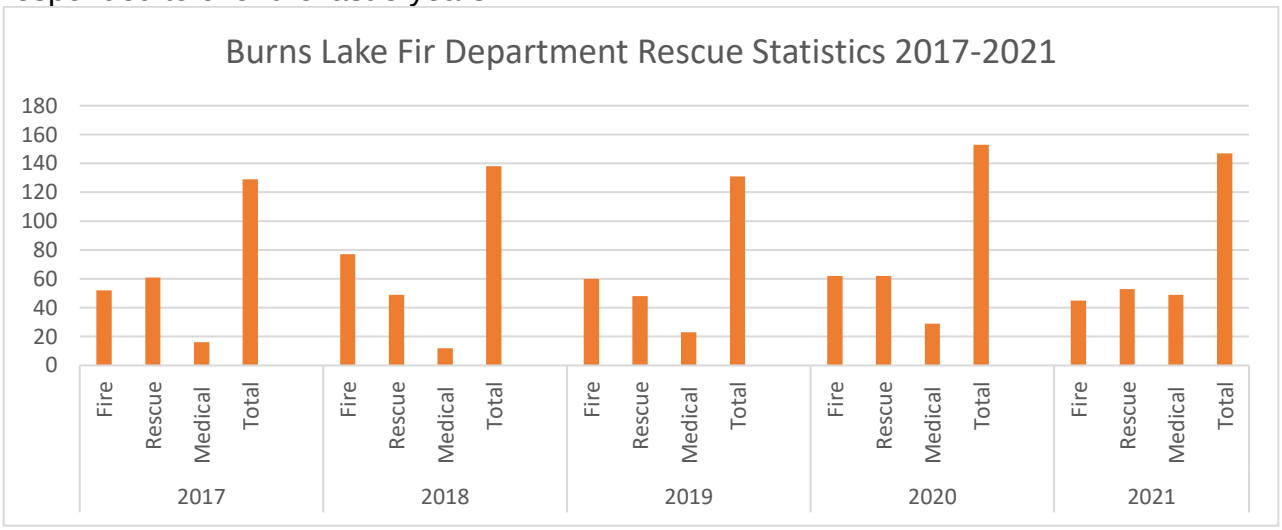
- RDBN redirects inquires on Radon to the BC Lung association Radon Awareness Program.
- Due to geological factors, some areas in British Columbia have naturally higher surface levels of radon than others. Many of these areas are in the Interior and Northern parts of the province. However, indoor radon accumulation can vary widely from building to building, even in the same neighborhood. Even if you live in an area with generally lower levels of radon, it is still recommended to test your home for radon. BC Centre for disease control has an interactive map displays indoor radon levels recorded in homes across BC. In the Northern BC region, it is estimated that 18% of homes tested are in the medium range for radon levels and 4% of homes tested are in the high range for radon levels. Health Canada recommends testing every home for radon because levels can vary widely from house to house, even in the same neighborhood.

Human Caused Hazards

Structural Fire

Urban fires are fires that occur in a residential, commercial, or industrial community. Rural and urban fires occur on a frequent basis in many parts of the province, and of provincial concern are the fires that cause many deaths and injuries, those that are beyond the ability of the local resources to respond or those that cause severe economic losses. For interface fires, see wildfires. (BC E. M., 2021)

- Mutual Aid Agreements between Burns Lake and neighbouring communities and the Regional District are a means of ensuring adequate response to a major fire.
- Below is a chart outlining the number of callouts that the Burns Lake Fire department responded to over the last 5 years:



Notable Structural Fires in the Electoral Area 'B' include:

- On January 20, 2012, the Babine Forest Products sawmill exploded and burned. Two workers lost their lives, and 19 others were injured. Friction from machinery and airborne wood dust was the cause. Fire apparatus and ambulances from neighbouring communities aided in the response. The mill was rebuilt and commenced operations.
    - Volunteer fire department response to the mill explosion - their task was much bigger than what they have been trained for - blown away by demand as it was rare and consequential - trained for structural firefighting, however in this incident injured people needed support from fire department, burns lake was under resourced by ambulance and fire - during that response the weather was extreme snow, cold temperatures, at decker lake the power flickered. What would have happened if the power went out in the village? The social and community impacts to the people of the community were drastic, there were large crowds of concerned family members at the hospital. The Doctor on call that event was skilled in triage and was able to respond to the event efficiently. The consequences were huge and could have been even larger. The community rebuilt the mill which was a huge recovery success.

Related Hazards: Air Quality / Lightning / Wildfire / Explosions / Structure Failure / Electrical Outage / Telecommunications Interruption / Water Service Interruption.

Rail Incident

An incident involving a passenger, cargo or light-rail train that results in damage, bodily injury, or death. (BC E. M., 2021)

- The CN Rail northern main line crosses the area from east to west roughly paralleling the Highway # 16 corridor traveling along the lakes and through the Village of Burns Lake.
- The CN Rail northern mainline serves most of the communities along this northern corridor and thus is very crucial to the economic and to a lesser extent to the social wellbeing of the area. To have rail service interrupted for any length of time would seriously impact the transport of goods to and from the area. A major rail accident in or near the Village of Burns Lake could seriously impact Burns Lake particularly if hazardous materials were involved.
- Rail traffic will increase substantially over the next few years as the Prince Rupert container port construction continues and this will further increase the risk of, and the effects of a CN Rail transportation route failure.
- There are volumes of hazardous materials transported by CN rail along this route to Prince Rupert including:

Substance PIN # [5] and Recommended Evacuation Radius[6]	
LP Gas UN1978	Initial downwind evacuation for at least 800m
Gasoline UN1203	Initial evacuation for 800 meters in all directions
MTBE (Methyl-tert-butylether) UN2398	Initial evacuation for 800 meters in all directions
Methanol UN1230	Initial evacuation for 800 meters in all directions
Fuel Oil Diesel Fuel UN1202	Initial evacuation for 800 meters in all directions

[5] PIN means product identification number as designated by Transportation Canada for the transportation of dangerous goods.
[6] Distances for evacuation zones can be references in the North American 2016 Emergency Response Guidebook available at https://www.phmsa.dot.gov/sites/phmsa.dot.gov/files/docs/ERG2016.pdf

Caustic Soda UN1823	Initial evacuation for 800 meters in all directions
Sulphuric Acid UN1830	Initial evacuation for 800 meters in all directions
Anhydrous Ammonia UN1005	Initial evacuation for 1600 meters in all directions
Hydrogen Peroxide UN2014	Initial evacuation for 800 meters in all directions
Chlorine UN1017	Initial evacuation for 800 meters in all directions
Sulphur Dioxide UN1079	Initial evacuation for 1600 meters in all directions

- In March of 2020, a CN train derailed east of Prince George BC, forcing a school evacuation. This derailment included seven cars carrying liquefied petroleum gas (LPG), an extremely flammable product. Twenty-eight cars went off the tracks. (Trumpener, 2020)
- Train is of concern with fuels, and exports along the tracks.
- One committee member stated they put out a fire on the railway tracks in 2021.
- Death in community around rail lines - need to find ways to increase education and awareness for youth on crossing tracks. Issues with rail safety and education and how to portray them to youth - particularly when it comes to youth with Burns Lake Band.
- Rail danger and foot traffic - i.e., kids in school would walk across the rail line as short cuts - small in terms of community impact but public education component.
- Hampton Lumber is directly along the rail line and risk.
- EOC for Burns Lake and RDBN is in the rail hazardous evacuations zones.

Notable Rail Incidents in Electoral Area B:

- July 25, 2014. West of Burns Lake, British Columbia. A CN train rammed into a logging truck at an uncontrolled crossing, knocking 22 train cars and 2 locomotives off the tracks. An undisclosed amount of diesel fuel was spilled. (CTV News July 25/14) (Railroaded, 2015)
- 5km east of Burns Lake, Tintagel Rd, 2021 there was a coal train derailment.
- May 10th, 1967 major train derailment in Decker Lake. Derailment was caused by a washout of the tracks under the Powderhouse Creek that was experiencing heavy runoff where water covered the highway and the tracks on the shore of decker lake.

The derailment caused a fire from the engines. Took two days to clear the line.


Vol. 2; No. 43 BURNS LAKES, BRITISH COLUMBIA, WEDNESDAY, MAY 10, 1967

- Mid 90's a coal train derailment near the mill, memory that the train cars almost ended up on the highway.
- Late 60's or early 70's train derailment containing grain.

Comments and questions for consideration and further research:

- What do we know about how many wildfires have been started from the rail lines?
- Can we have two suggested evacuation zones, one for rail hazardous materials and one for highway hazardous materials?
- Concerns and consequences on hazardous materials spill in burns and area - how many people would be impacted?

Related Hazards: Avalanche / Landslide/Debris Flow / Explosions / Hazardous Materials Spill / Transportation Route Interruption / Fuel Source Interruption.

Oil or Gas Pipeline Spill

Pipeline and gas well leaks and explosions occur when natural gas or gasoline pipelines, valves, or components rupture, by accident, by mechanical failure or corrosion. Gas leaks can also be caused by natural hazards such as earthquakes or landslides. (BC E. M., 2021)

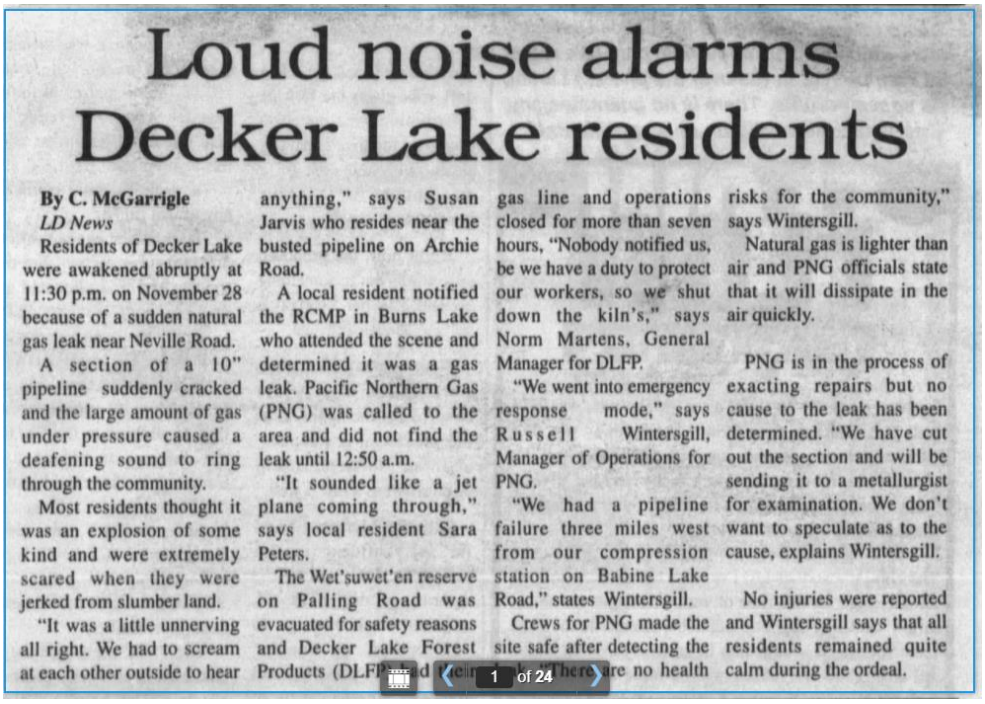
- A natural gas pipeline owned by Pacific Northern Gas serves the Highway # 16 corridor from Prince George to Prince Rupert. The line crosses the area approximately 7 kilometers north of the Village of Burns Lake with a feeder line entering the Village from the north.
- There are dangers from the rupture of this pipeline from incidents such as earthquakes and landslides anywhere along the entire line. An interruption of gas supply could have serious economic consequences to industry dependent on natural gas for their

day-by-day operations. An interruption of gas supply during winter conditions would have even more serious consequences to heating systems.

- Pacific Northern Gas (PNG) Core Emergency Response Plan (ERP) is an operational guide designed to be used by staff to prepare effectively, respond to, and recover from both emergencies and disasters. (Pacific Norther Gas, 2020)This Plan identifies the following events that may activate response:
  - Natural disasters;
  - Human-caused: equipment failure and severe damage; environmental incidents security threats and acts of violence; and,
  - Information technology incidents.
- TransCanada Coastal GasLink Project is a pipeline currently under construction in directly south of Burns Lake running close to or parallel to the Electoral Area 'B' and 'E' boundaries:
  - Approximately 670 kilometres (416 miles), the Coastal GasLink pipeline project will safely deliver natural gas across northern B.C. After Coastal GasLink delivers the natural gas from northeastern B.C. to the LNG Canada facility in Kitimat, B.C., LNG Canada will prepare it for export to global markets by converting the gas to a liquefied state – also known as LNG. (Coastal GasLink, 2021)
  - Section 6 of the Coastal GasLink pipeline runs 85 km in length South of Burns Lake to Houston. This section of the pipeline route is 100% cleared, 76.9% graded, and 30.8% installed. Currently, there are 386 workers at 7-mile Lodge. (Coastal GasLink, 2021)
  - The proposed pipeline will be underground except at valve sites and compressor stations. The pipeline proposed to be monitored 24 hours a day, 365 days a year. With satellite technology, sensors within the pipeline send data every five seconds to our state-of-the-art control centre. If low gas pressure is detected, the valves on the affected section close automatically and are evaluated by our team of highly trained professionals, assessing the next steps. (Coastal GasLink, 2021)
  - Coastal GasLink has prepared a comprehensive Emergency Response Plan that outlines procedures to protect the public, emergency responders, property, and the environment in the unlikely event of an emergency.
- Response times to oil and gas pipeline spills - doesn't take much to disrupt rural infrastructure in a big way and can take lots of time to be usual again.
- Mainline north of Polling East Rd where the pipeline crosses the Highway - could impact the highway. History of pipelines causing fire, or other impacts.
- Example out of PG - FN reserve was impacted by an LNG incident.

Notable Gas Pipeline Incidents in Electoral Area B:

- November 28th, 2002 a sudden natural gas leak near Neville Road, a section of the 10" pipeline suddenly cracked and a large amount of gas under pressure caused a deafening sound to ring in the community. Wet'suwet'en reserve and Palling Road were evacuated- no injuries PNG responded.



Loud noise alarms Decker Lake residents

By C. McGarrigle
LD News

Residents of Decker Lake were awakened abruptly at 11:30 p.m. on November 28 because of a sudden natural gas leak near Neville Road.

A section of a 10" pipeline suddenly cracked and the large amount of gas under pressure caused a deafening sound to ring through the community.

Most residents thought it was an explosion of some kind and were extremely scared when they were jerked from slumber land.

"It was a little unnerving all right. We had to scream at each other outside to hear anything," says Susan Jarvis who resides near the busted pipeline on Archie Road.

A local resident notified the RCMP in Burns Lake who attended the scene and determined it was a gas leak. Pacific Northern Gas (PNG) was called to the area and did not find the leak until 12:50 a.m.

"It sounded like a jet plane coming through," says local resident Sara Peters.

The Wet'suwet'en reserve on Palling Road was evacuated for safety reasons and Decker Lake Forest Products (DLFP) had [illegible] gas line and operations closed for more than seven hours, "Nobody notified us, be we have a duty to protect our workers, so we shut down the kiln's," says Norm Martens, General Manager for DLFP.

"We went into emergency response mode," says Russell Wintersgill, Manager of Operations for PNG.

"We had a pipeline failure three miles west from our compression station on Babine Lake Road," states Wintersgill.

Crews for PNG made the site safe after detecting the [illegible] "There are no health risks for the community," says Wintersgill.

Natural gas is lighter than air and PNG officials state that it will dissipate in the air quickly.

PNG is in the process of exacting repairs but no cause to the leak has been determined. "We have cut out the section and will be sending it to a metallurgist for examination. We don't want to speculate as to the cause, explains Wintersgill.

No injuries were reported and Wintersgill says that all residents remained quite calm during the ordeal.

1 of 24

Related Hazards: Animal Disease / Human Disease / Plant Disease and Pest Infestation / Public Health Crisis / Explosions / Hazardous Materials Spill / Fuel Source Interruption.

Dam and Spillways Failure

A breach in the foundations, abutments, or spillways of a dam, which results in a sudden, rapid, and uncontrolled release of the impounded water. (BC E. M., 2021)

- The Dam Safety Regulation under the Water Sustainability Act, objective is to mitigate loss of life and damage to property and the environment from a dam breach by requiring dam owners to inspect their own dams, undertake proper maintenance on them, and ensure that these dams meet ongoing engineering standards. The dam administered under this regulation are associated with dams that store or divert fresh water from a stream or aquifer or both. These dams are inspected annually and assigned a failure consequence and risk rating according to the Dam Safety Regulations of BC. [7]
- In Area B there are 10 dams regulated under the Dam Safety Regulations, four of which have a failure consequence of significant and a failure probability rating being small. Meaning that the risk level is of no concern and includes regular audit programs to identify any changes to operation. Design and/or performance deficiencies may exist, but are actively monitored and are not expected to significantly increase failure potential over the near term. (Staff, 2009) Three of the four monitored dams are associated with Equity Mines and one is private.
- If a dam has a failure consequence of significant or higher than the owner is required to provide a record containing information for the use of the local emergency

[7] Michael Trudell, Senior Dam Safety Officer.

authorities for the dam for the purpose of preparing local emergency plans under the *Emergency Program Act.*

- Tailing Storage Facilities, including mining dams, in British Columbia are regulated under Part 10 of the Health, Safety and Reclamation Code for Mines in British Columbia (the Code), as established under the Mines Act. These facilities require annual inspections commonly called Dam Safety Inspection that report on risk data. This data is available to the public on the BC Mine Information website. There are no mine tailing ponds[8] in Area B.
- On a much smaller scale, there are many small dams, including beaver dams upstream from populated areas and these can be easily breached due to a severe rain or spring freshet event. One such dam that could pose an immediate threat to the Municipality would be the beaver dam at the east end of 9th Ave. A breach could cause street culverts to plug and streets to wash out along with localized flooding. Depending on the severity, homes along 6th Ave and the College of New Caledonia could be impacted. (Village of Burns Lake, 2020)

Mine Projects with Tailing Ponds and Dams in Area 'B'

- ***Equity Silver Project*** has four active dams, two of which are in Electoral Area 'G' and two in Electoral Area 'B'. Equity Silver Mine facilities located 35 km southeast of Houston[9]. The site has been in "Closure-Active Care" phase since 1994 and ongoing maintenance is required at the site due to Acid Rock Drainage (ARD) collection and treatment at the site. The Tailings Storage Facility (TSF) is retained by Dam No. 1 along the northern perimeter, by Dam No. 2 along the southern perimeter, the Diversion Dam along the western perimeter and high ground on the east side. (Thurber Engineering Ltd, 2020) All three structures are classified as having Very High consequence classification. Very high is described the table below:

Dam Class	Population at risk	Incremental losses		
		Loss of Life	Environmental and cultural values	Infrastructure and economics
Very high	Permanent	100 or fewer	Significant loss or deterioration of critical fish or wildlife habitat. Restoration or compensation in kind possible but impractical.	Very high economic losses affecting important infrastructure or services (e.g., highway, industrial facility, storage facilities for dangerous substances).

Table 1. 2013 CDA Dam Consequence Classification

- The last formal risk assessment (i.e. FMEA) for Equity Silver Project was completed in 2005 and is out of date. It is understood that a detailed FMEA is planned for 2021.The summary of consequence classifications for Dam No 1 & 2 is as shown in the adjacent table (Thurber Engineering Ltd, 2020):

Table 7. Summary of Consequence Classifications for Dam No. 1 and Dam No. 2

Dam	Population at Risk	Loss of Life	Economic and Social Losses	Environmental and Cultural Losses	Consequence Classification
Dam No. 1	High – Permanent	High -10 or less	High – infrastructure, public transit and commercial	High -Significant loss of important habitat – restoration highly possible to Very High -Significant loss of critical habitat, restoration possible	High to Very High
Dam No. 2	High – Permanent	High- 10 or less	High – infrastructure, public transit and commercial	Very High - Significant loss of critical habitat, restoration possible	Very High

[8] BC Mine information website: https://www.mines.nrs.gov.bc.ca/map
[9] https://www.mines.nrs.gov.bc.ca/map;project=5fa1e4034635c865df00c9d1

- Tailings Dam breaches would effect residents in Electoral Area 'G'.

Related Hazards: Hurricane/Typhoon/High Wind Event / Landslide/Debris Flow / Earthquake / Mine Incident / Storm Water Flooding / Flash Flooding / Dike Failure / Structure Failure / Electrical Outage / Water Service Interruption.

Electrical Outage

A deficit, interruption or failure of electricity or power systems, services, supplies, or resources. Power outages occur on a regular basis, however, they become a concern when the power outage is for a significant amount of time, when the temperatures are very low, or critical infrastructure, persons, livestock, or businesses are affected. (BC E. M., 2021)

- Power outages occur on a regular basis, however, they become a concern when the power outage is for a significant amount of time, when the temperatures are very low, or critical infrastructure, persons, livestock, or businesses are affected.
- Historical electrical outage events in Area 'A' are documented in association with other hazards accounts and can be found in Appendix 1.

Related Hazards: Space Weather / Lightning / Telecommunications Interruption.

Explosions

An explosion affecting a residential or non-residential area, resulting in partial or total destruction of the structure and/or bodily injury, smoke inhalation or death. (BC E. M., 2021)

- There are dangers from the rupture of this pipeline from incidents such as earthquakes and landslides anywhere along the entire line. An interruption of gas supply could have serious economic consequences to small business dependent on natural gas for their day-by-day operations. An interruption of gas supply during winter conditions would have even more serious consequences to heating systems in homes.
- Service stations, bulk fuel facilities, natural gas pipelines, and propane storage facilities are areas in the village that could propose a threat of explosion and/or fire.

Food Source Interruption

Food shortages occur when the population of a community undergoes a severe shortage of food. A severe shortage of food can lead to starvation, illness and, in extreme cases, death. (BC E. M., 2021)

- Statistics Canada provides data on the primary types of locations where BC residents buy their food. If residents in the region are representative of BC, they would be expected to buy 87% of their grocery shopping from supermarkets and other grocery stores. The remaining 13% is purchased from convenience and speciality stores. (Strategies, March 2021) Much of the food in the stores is shipped in through the major highway transportation corridors that are susceptible to external hazards and emergencies that can lead to food source interruptions in this region.

- Agriculture in the Burns Lake area is predominantly beef, hay, and multiple animal farms. There is one commercial green house in the region. (Strategies, March 2021). Burns Lake has the Green Zone that offers a good selection of local food products, one local farmers market
- The cost of locally grown and produced food remains high within the region.
- The average family in the Northern Health region Valley spends $1038 a month on groceries (BC Centre for Disease Control Provincial Health Services Authority, 2018). According to the RDBN food economic and hub assessment Electoral Area 'B' residents spend approximately $9,971 a year per household. (Strategies, March 2021)
- Canada's Food Price Report 2021, which forecasts an overall food price increase of between 3% and 5% this year. (Dalhousie University | University of Guelph | University of Saskatchewan | University of British Columbia, 2021)
- Food bank services is provided through the LINK.
- RDBN "Connecting Consumers and Producers" is a marketing project that promotes local food producers and provides resources to consumers that support eating locally produced food all year round.

Comments and questions for consideration and further research:

- How many resources do we have locally to sustain the communities and residents in the event of transportation interruptions of food supply shortages.
- Food security is critical because of the rural nature and our only source of contact to the outside world is Hwy 16.
- Observed Panic Buying in 2021;
- Public education around food sources - ie. grocery stores have backup plans in place - but through public education we could preserve our food quantities in time of emergencies - limit panic buying.

Notable Incidents involving food source interruptions:

- COVID-19 Pandemic (Started 2020) exasperated food insecurity for Canadian who already had food security and affordability issues. Locally, the 2020 COVID-19 Pandemic prompted transportation delays and crisis in availability of food at the grocery stores following the March 2020 provincial lockdowns. The grocery stores implemented purchase limits and store shelves were empty. "Food bank numbers in the local area increased by 22% at the start of COVID-19 and again increased now that government COVID subsidies have stopped." (Smithers Salvation Army Food Bank Coordinator, 2021)
- Big Bar Landslide, BC (2019) caused a decline in salmon fisheries affecting FN food supplies.
- The 2016 ice storms in the Lower Mainland prompted an inevitable crisis — highways were closed, and food trucks couldn't make it up here. Store shelves started emptying. This was compounded by the fact that the grocery store in neighbouring Houston had been closed for a few months and so everyone was shopping in Smithers. We were having a food system breakdown.
- Floods in Abbotsford in 2021 caused food shortages in the stores.

Related Hazards: Extreme Heat / Extreme Cold / Snowstorms and Blizzards / Animal Disease / Landslide/Debris Flow / Plant Disease and Pest Infestation / Public Health Crisis / Drought.

Water Service Interruptions

A deficit, interruption, or failure of water systems, services, supplies, or resources. (BC E. M., 2021)

- Water systems can fail because of drought, equipment failure and contamination of the water source by natural or deliberate means. The Village water system consists of water pumped from wells on Gerow Island to two large water storage towers at a higher elevation near the north part of the municipality. Water is used both for domestic and firefighting purposes. Burns Lake has a backup generator to operate the pumps in the event of a power failure.

Related Hazards: Animal Disease / Human Disease / Plant Disease and Pest Infestation / Public Health Crisis / Structure Fire / Wildfire / Drought / Wastewater Interruption.

Transportation Route Interruptions

An interruption or failure of transportation infrastructure or systems. This can include road, rail, or waterway damage, transportation delays due to weather and/or infrastructure failure. Transportation Route Interruptions are probable during disaster events. (BC E. M., 2021)

Comments and questions for consideration and further research:

- Due to atmospheric hazard increases, how much the maintenance demands are affecting the quality of service provided on our infrastructure.
- Highway 16 there is a risk of hazardous materials incidents, we do not know what is travelling on the highways.
- Extra-ordinary events affecting the highways and the contractors may not have the equipment to address these conditions.
- Human factor when it comes to motor vehicle incidents.

Related Hazards: Snowstorms and Blizzards / Wildfire / Avalanche / Landslide/Debris Flow / Earthquake / Liquefaction / Tsunami / Lake, River, and Stream Flooding / Aircraft Incident / Marine Vehicle Incident / Motor Vehicle Incident / Rail Incident.

Telecommunications Interruptions

The unavailability of services provided by the communications infrastructure resulting in significant inconvenience or an emergency event caused by human error, equipment malfunction or breakdown. (BC E. M., 2021)

- In the 2020 rain fall and subsequent slides and again in 2021 November floods in the lower mainland the local cell service was disrupted for long periods of time.
- The Amateur Radio Club in Burns Lake has members living throughout the Lakes District and has their own communications network. As well, most logging companies and their trucks have 2-way truck to truck radio communication capabilities.
- Burns Lake is also served by 3 commercial radio stations. CBC transmits out of Prince Rupert. CJFC Radio originates out of Terrace while BVLD Radio originates from Smithers. Omineca Cable from Vanderhoof is the cable provider in Burns Lake. PGTV

from Prince George is the local television station. Satellite television and the internet is a conduit for information from around the world. Social media and smartphones are now a major source of information sharing. These can be used to inform the public of emergency issues as well as give instructions. However, the same issues causing disruptions to Burns Lake can affect these facilities as well.

- Telecommunications - impacting communication during emergencies. so dependent on hydro and communications - but if cell tower or phone lines gone, we would be in trouble.
- During Y2K - 2010 fear that the telecommunications would have gone down - Burns did planning and communication.
- Forest fire that came close to highway 16 - information that was circulated that a threat from the fire was potentially going to damage the fiber optic line. Is this a realistic concern? are lines buried - TELUS is above ground.

Comments and questions for consideration and further research:

- SD/schools is a great resource regarding contacting families - ie Vanderhoof shooting event - very first time the provincial warning system had been used to advise the community. SD and kids and staff were not prepared for the communication element this situation provided. How can the School District fit it's plans in with the Regional District and strengthen communications? There is an interest to meet and talk on a regular basis to ensure we are prepared in our region.
- Amateur radio being useful - but need to better understand their resource. Contact Jim Theisen south of Burns Lake amateur Radio?
- How many homes listen to or have regular non-internet radio?

Related Hazards: Freezing Rain or Drizzle / Space Weather / Hurricane/Typhoon/High Wind Event / Lightning / Snowstorms and Blizzards / Tornado / Landslide/Debris Flow / Earthquake / Electrical Outage.

Wastewater Interruptions

A deficit, interruption or failure of wastewater or sewer systems, services, supplies, or resources resulting in significant inconvenience or an emergency event. (BC E. M., 2021)

Related Hazards: Hurricane/Typhoon/High Wind Event / Animal Disease / Human Disease / Public Health Crisis / Earthquake / Water Service Interruption.

Fuel Source Interruptions

A deficit, interruption, or failure of fuel systems, services, supplies or resources. This can include pipeline damage, transportation delays due to weather and/or shipping infrastructure damage, or general shortages due to market supply problems, or panic fuel hoarding during emergencies. Fuel Source Interruptions are probable during disaster events. (BC E. M., 2021)

- Most fuel is transported from Alberta via Trans Mountain Pipeline and railway. Prince George is the distribution centre, where fuel is then trucked to its destination. There is a refinery in Prince George that refines gasoline, diesel, propane butane and heavy oil.

Related Hazards: Hurricane/Typhoon/High Wind Event / Snowstorms and Blizzards / Wildfire / Landslide/Debris Flow / Earthquake / Oil or Gas Pipeline Spill / Transportation Route Interruption / Rail Incident.

Aircraft Incident

An incident involving one or more aircraft that results in damage, bodily injury, or death. (BC E. M., 2021)

- While the closest commercial airports are in Smithers 145 km to the west, and in Prince George, 226 km to the east, Burns Lake does have an airport approximately 20 km to the northwest of the village along Highway # 16 with a 5000 ft paved runway. This airport serves the municipality and surrounding area with access by private and chartered aircraft. Air transport is also an essential form of evacuating critically ill people to larger medical centres. Closure of this facility for any length of time would create an inconvenience to local small aircraft and businesses using this facility for their charter flights. Lack of emergency medivac flights would cause a serious health risk to the population.
- The Smithers Airport is the only airport within the Regional District of Bulkley-Nechako with scheduled air service. Air carriers include Air Canada, Northern Thunderbird Air, and Central Mountain Air.
- In addition to the risk of aircraft damage and injury to passengers, an aircraft crash may have other effects on residents. A wildfire may be started by an aircraft crash, causing damage to property and resources, and possible evacuation of residents.

Related Hazards: Fog / Snowstorms and Blizzards / Ash Fall / Explosions / Hazardous Materials Spill / Structure Failure / Transportation Route Interruption.

Motor Vehicle Incident

An incident involving a truck, car, bus, farm vehicle, or any other motor- or person-powered vehicle that results in damage, bodily injury, or death. (BC E. M., 2021)

- Highway 16 runs through the region, transecting Burns Lake. This route contributes to the risk of motor vehicle crashes in the area, with the majority being reported along Highway 16. The chance of a hazardous materials spill is also high due to the growing volume of truck traffic.
- According to the Insurance Corporation of British Columbia North Central Crashes 2016 to 2020, there were 129 reported casualty crashes[10] in Burns Lake, and 1 reported casualty crashes in Decker Lake and 1 in Rose Lake and 1 in Tintagel (ICBC, 2020)
- Hazardous goods are transported through the Village of Burns Lake each day along Highway #16, and to a lesser extent, along Highway #35. The winding nature of Highway #16 through the Village is of particular concern as it is only a matter of time before an incident causes severe loss of property, injury or even death. While it is relatively unknown as to the materials transported along Hwy # 16,

[10] "Casualty Crash" (ICBC collision data) motor vehicle crashes resulting in an injury or fatality.

- The Village of Burns Lake uses Highway # 16, the main east-west corridor in this region of British Columbia, as its main street. The junction with Highway # 35 leading to the Southside lies within the municipality. Along these main provincial highway routes are many bridges, culverts and one vehicle ferry. Many secondary rural roads and many kilometres of forest service roads (FSR) connect with these main routes. A major traffic accident or fire could disrupt travel along Highway 16 through the village. While a major disruption within the municipality boundaries is unlikely, the failure of any of these main routes both east, west and south of the village boundaries would cut off vehicular supply routes, which in turn would have serious economic consequences. Not only would a highway failure inconvenience the travelling public, accommodating these travelers during a prolonged failure could have a serious impact on Burns Lake in the form of lodging and food supplies. As well a major road accident in or near the Village of Burns Lake could seriously impact Burns Lake particularly if hazardous materials were involved. (Village of Burns Lake, 2020)

Related Hazards: Fog / Freezing Rain or Drizzle / Snowstorms and Blizzards / Explosions / Hazardous Materials Spill / Transportation Route Interruption.

Cyber Security Threat

A circumstance or event with the potential to interrupt or adversely impact organizational operations, assets, or individuals (including mission, functions, image, or reputation). Cyber Threats occur through information systems via unauthorized access, destruction, disclosure, modification of information, and/or denial of service. Also, the potential for a threat-source to successfully exploit a particular information system vulnerability. (BC E. M., 2021)

- Cyber security is a big threat for government and businesses for business continuity.
- Increase in phone, Facebook, dating apps, and email scams affecting seniors and vulnerable populations. Limited statistics affecting the local community however recent news reports state that "British Columbians reported $3.5 million in losses to cryptocurrency investment scams in the first eight months of 2021" (Samanski-Langille, 2021).

Related Hazards: Telecommunications Interruption / National Security Threat.

Disease, Pest Infestations & Epidemics

Plant Disease and Pest Infestation

Plant diseases include invasive pests including insects and mites, and plant pathogens including fungi, bacteria and viruses' impact upon crops, forests, and urban environments. New introductions and/or widespread outbreaks could have severe economic and environmental consequences. **(BC E. M., 2021)**

- With climate change, shifts in the distribution, lifecycles, and prevalence of agricultural pests (insects, diseases, weeds, and invasive species) are anticipated. Increasing average annual temperatures (in particular winter minimum temperatures) combined with shifting precipitation patterns are already magnifying pest impacts, pest management complexity and associated costs of production.

- The region has been significantly impacted by Mountain Pine Beetle (MPB) outbreaks, in part due to increased winter survival rates. Modelling of changes to bio geoclimatic zones (BGC zones) how that the Interior Douglas Fir zone will spread northward and increase in area, while the Sub-Boreal Spruce zone will decrease dramatically. While this modeling was completed with a forestry lens, agricultural pests associated with these ecosystems would be expected to shift along with the BGC zones. (BC Agriculture & Food Climate Action Initiative, 2019)
- Within the total geographic boundary of the Lakes TSA, the MPB outbreak began in the late 1990's and the peak in mortality occurred in 2005. It is currently estimated that about 76 percent of the mature pine volume – or 49 percent of the commercially available volume – was killed by the mountain pine beetle. As of 2018, dead pine continued to account for half of the total harvest in the Lakes TSA. (Forest Analysis and Inventory Branch Ministry of Forests, April 2019)Since 2005, the Regional District of Bulkley-Nechako has partnered with the Northwest Invasive Plant Council (NWIPC) to address invasive plant species spread within the region. The NWIPC coordinates the invasive plant response based on priority areas and species and on funding availability through their network of partners. Specifically, funds contributed from the RDBN go toward several programs including local education and signage on invasive plants and invasive plant monitoring and treatment at RDBN owned and administered properties. In addition, the NWIPC administers the Private Landowner Rebate program that offers rebates to land owners that use contractors to treat for invasive plants on their property.
- The Northwest Invasive Plant Council (NWIPC) is currently targeting 60 invasive plants for management, as per the NWIPC 2020 Target Plant List. The list of species is reviewed, updated and approved by the membership every spring at the annual general meeting. The Lakes District IPMA Plant list for 2020 identified species listed in electoral area B and E.
- Invasive plant species up and down rail lines and highways taking over farm fields – Knapp weed, hock weeds. This results in spraying along Creeks and rivers causing harm to the environment.
- Agriculture producers can also experience challenges due to pests, including grasshoppers, aphids, cutworms and more. Some resources and information are linked below to help with identification, monitoring and management of pests in gardens and crops. Grasshopper Monitoring and Control in BC ; Pesticides and Pest Management - Province of BC

Related Hazards: Animal Disease / Human Disease / Public Health Crisis / Drought / Food Source Interruption.

Animal Disease

Precipitation in the form of lumps of ice mainly associated with thunderstorms. Hail ranges in size from that of a small pea to the size of cherries, but has been observed as large as grapefruit. Hail in Canada occurs most frequently during the summer when thunderstorm activity is at its peak.. (BC E. M., 2021)

- Risk of bovin – economic impacts in ranching community.
- Moose and fish population hazards – rural communities are reliant on food harvested from the land.
- Increase in grasshopper populations on farmers' fields devastating crops.

Related Hazards: Human Disease / Plant Disease and Pest Infestation / Public Health Crisis / Food Source Interruption.

Human Disease (Including Pandemic and Epidemic)

Diseases that are caused by pathogenic microorganisms and are spread directly, or indirectly, from one person to another. Diseases can impact public health, cause death, have economic implications, and result in mass casualty response. These include epidemics such as meningitis, pandemic flu, hepatitis, E. coli, and other communicable diseases.

A pandemic is the worldwide spread of a new disease. The total number of people who get severely ill can vary. However, the impact or severity tends to be higher in pandemics in part because of the much larger number of people in the population who lack pre-existing immunity to the new virus. (BC E. M., 2021)

Notable Pandemic Incidents in BC:

- COVID-19 Pandemic (2020)
- Ebola (2013-16
- H1N1 Flu Pandemic (2009)
- SARS Outbreak (2003)
- The lands in BC have been populated by the ancestors of First Nations since time immemorial. Epidemics spread through First Nations communities in advance of explorers. Some researchers have suggested epidemics reached the Northwest Coast as early as the 1500s, believing the well-known epidemics from the Caribbean and Central America may have spread to the Pacific Coast through native trade networks and social contact. Some of the recorded epidemics in the Interior were known to have originated on the prairies during the historic period. The introduction of infectious diseases from Europe and Asia into the Northwest Coast and adjacent areas, and an increase in the severity of warfare, had devastating effects on the people. Smallpox, influenza, measles, and whooping cough were recorded epidemics, with smallpox particularly recurring with devastating effects in the native population. The 1918-19 influenza pandemic was the last major epidemic to seriously affect First Nations and marked the end of the epidemic cycles that had begun over 150 years previously. In some cases, entire villages were significantly reduced in single disease events, with mortality rates ranging from 50% to 90% of the population. (First Nations Health Council, 2011)
- History of Pandemics: **https://www.visualcapitalist.com/history-of-pandemics-deadliest/** **Related Hazards:** Animal Disease / Plant Disease and Pest Infestation / Public Health Crisis.
- Concern about insect-based vectoring of disease- Lyme's disease, and West Nile less likely. Hampton has researched Lyme's disease and have a safety plan for their bush working staff. The BC Centre for disease control has a reportable disease database, Lyme's disease has zero reported cases in the region.

Related Hazards: Animal Disease / Plant Disease and Pest Infestation / Public Health Crisis.

Public Health Crisis

A localized or regional event that poses or causes a significant threat to the health of human populations. The event may be declared as a Public Health Emergency if the event meets at least two of the following criteria:

- a regional event that could have a serious impact on public health;
- a regional event that is unusual or unexpected;
- there is a significant risk of the spread of an infectious agent or a hazardous agent; and
- there is a significant risk of travel or trade restrictions because of the regional event.

An example of a Public Health Crisis is the contamination of a communities drinking-water supply by a hazardous material. If the event is regional in nature and poses a serious impact to public health, it may be declared a Public Health Emergency. (BC E. M., 2021)

- Overdose B.C.`s Public Health Emergency Progress Update on B.C.`s Response to the Overdose Crisis reported that on April 14, 2016, B.C.'s provincial health officer declared a public health emergency under the Public Health Act. In July 2017, the Ministry of Mental Health and Addictions was established, in part, to work in partnership to develop an immediate response to the overdose emergency. (Columbia B. , 2021)
- Preliminary data in 2021 has found that fentanyl or its analogues have been detected in 85% of all illicit drug toxicity deaths. In 2020, fentanyl or its analogues have been detected in 86% of deaths. (Service C. , 2021) In the Northern Interior[11] the Illicit drug toxicity deaths between 2011-2021 have increased and are reported as follows:

2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021[12]
8	12	8	11	15	24	35	63	34	84	56

- By Health Authority (HA), in 2021, the highest rates were in Vancouver Coastal Health (46 deaths per 100,000 individuals) and Northern Health (45 per 100,000). Overall, the rate in BC is 39 deaths per 100,000 individuals in 2021.
- The 2019 Taking the Pulse of the Population An Update on the Health of British Columbian identifies positive Mental Health as a public health challenge and a provincial goal. Collecting public health statistics as indicators to monitor this complex public health crisis. Under Section 66 of the Public Health Act, the Provincial Health Officer (PHO) has the authority and responsibility to monitor the health of the population in BC, and to provide independent advice on public health issues and the need for legislation, policies, and practices respecting those issues.
- Read: https://www2.gov.bc.ca/assets/gov/health/about-bc-s-health-care-system/office-of-the-provincial-health-officer/overdose-response-progress-update-aug-dec-2020.pdf

Related Hazards: Air Quality / Extreme Heat / Extreme Cold / Animal Disease / Human Disease / Plant Disease and Pest Infestation / Explosions / Hazardous Materials Spill / Structure Failure / Electrical Outage / Food Source Interruption / Telecommunications Interruption / Transportation Route Interruption / Wastewater Interruption / Water Service Interruption / Fuel Source Interruption.

[11] Burns Lake is in the Norther Interior Health Service Delivery Area.
[12] https://www2.gov.bc.ca/assets/gov/birth-adoption-death-marriage-and-divorce/deaths/coroners-service/statistical/illicit-drug.pdf

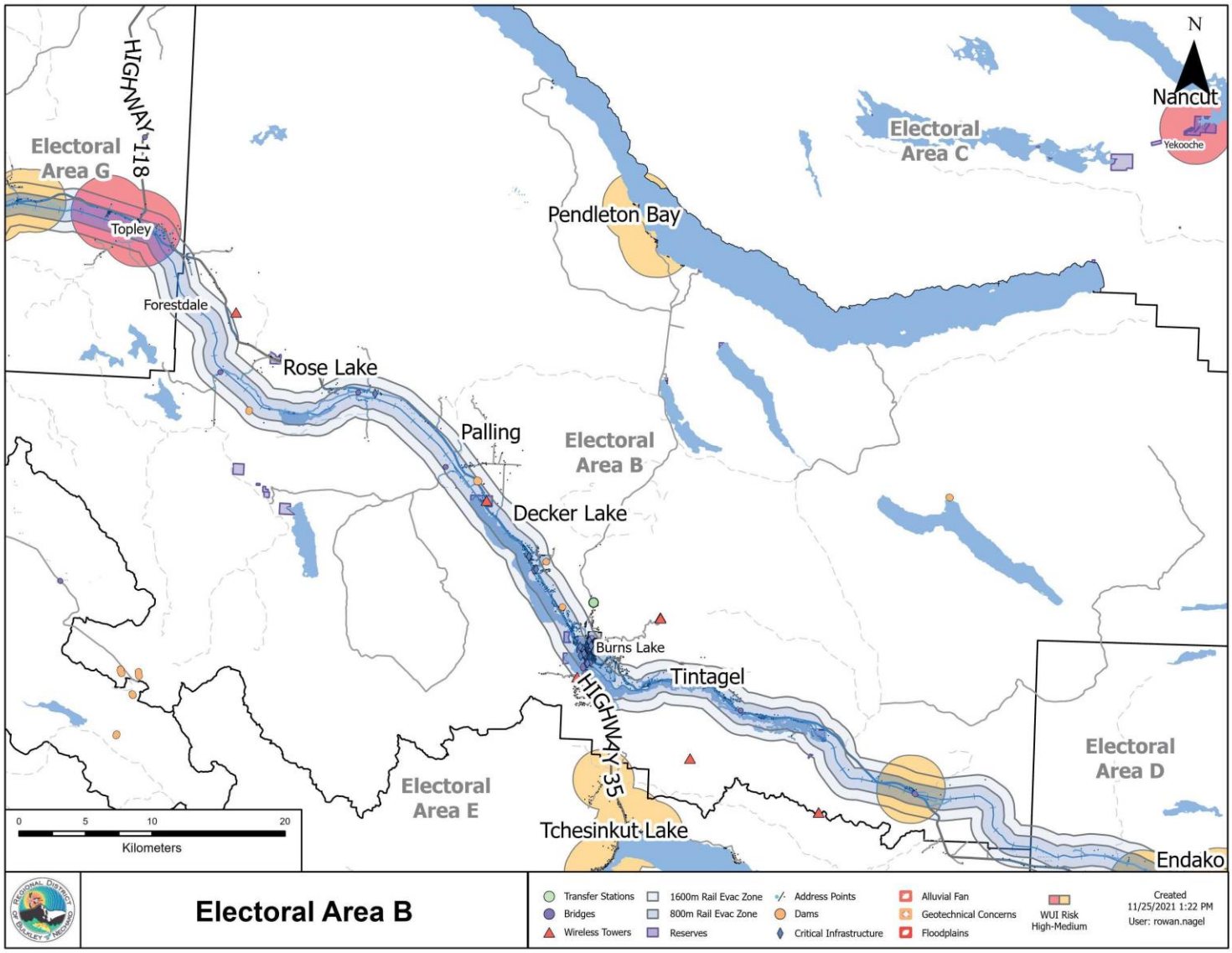
APPENDIX 1 – ELECTORAL AREA 'B' HISTORIC HAZARD EVENTS

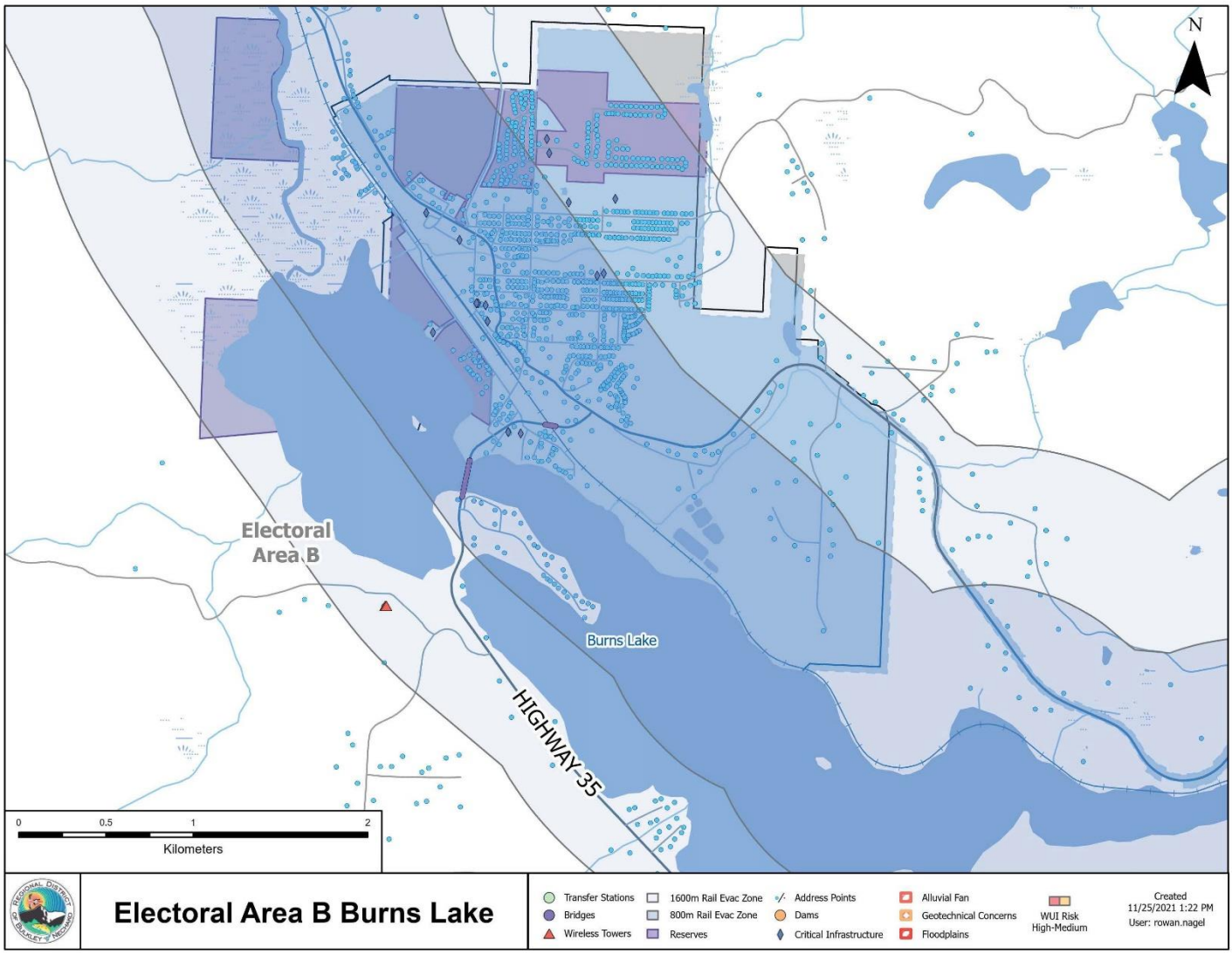
Year	Event Type	Severity	Cause	Impact Effect
1922	wildfire	high	person	12 wildfires ranging from 10 ha to 16,118 ha total fire size.
1930	Wildfire	High	Person	One fire was 16, 027 ha and the second was 3,681 ha, both human caused events.
1949	Rockslide	Low		September 1949 Around the middle of September, a rockslide came down in a rock cut 2 mi. (3.2 km) east of Burns Lake. It occurred as a freight train was passing and resulted in the derailment of seven cars and the disruption of rail service. One car derailed which then piled up six others. A few days later, when temporary tracks had been built around the slide and derailed cars, one car of a second freight train derailed, again disrupting traffic.
1952	Wildfire	High	Lightning caused	Fire was 6, 472 ha in size and lightning caused
1962	Flooding	high	Spring Run off	Heavy rains of 100mm in 36 hours caused Saul Creek to spill its banks, washing out Highway and CNR line. It flooded 5 homes and cut off and closed three schools. At the height of the flood the creek was 25 ft. deep in some places and 75 ft. wide. A temporary bridge had to be erected across Hwy 16 and another one over a washout 25.6 km east of Burns Lake at Tibbets Creek. A section of Hwy 16 had to be bulldozed out to allow the Saul Creek to run through and divert if away from a school. Flood waters washed out 15 ft. of rail track at Decker Lake (9.6 km west of Burns Lake) two homes at Tintagel were swept from their foundations into a raging creek. Another home was flooding in Decker Lake.
1964	Flooding	low	Flash flooding	Heavy rain caused smaller creeks and rivers to reach flash flood conditions.
1967	Wildfire	Moderate	Person	1,083 ha, person caused
1967	Flooding	low	Spring Runoff	In June, mountain snowpacks were similar to those in June 1964, which produced record high June to September volumes of runoff water and the third highest discharge on record. Ministry of Transportation recorded costs for general road repairs and washouts in the Burns Lake area at $4,866.81.
1994	Severe Weather	moderate	Heavy Rain on Snow	20 Roofs collapsed resulting in Building Inspector, Richard Wainwright issuing a Snow Advisory.

Year	Event Type	Severity	Cause	Impact Effect
1995	Severe Weather	Moderate	Snowstorm	In early January, heavy snowfall caused many roofs of commercial buildings and barns to collapse. In the rural Burns Lake area, at least eight Quonsets, arch-shaped corrugated steel structures, and four other buildings including the 1947-vintage gas station at Grassy Plains collapsed.
2002	Flooding			The lake has risen 6 feet higher than normal. An outbuilding is currently being affected on Geron Island. If water levels continue to increase another 6 to 7 feet there are 24 homes, 1 church and 1 school that could be affected. The main access road has been flooded, although there is an alternate route.
2005	Wildfire			
2006	Severe Weather, Electrical Outage	high	Heavy Snow	On October 28, a massive snowstorm that hit northern British Columbia dumped 2.5-3 ft. (75-90 cm) of wet snow in some areas. It was a result of a combination of two weather systems, a warm Pacific and a large cold front, colliding. The Smithers airport set a 24-hour October record of 62 cm of snow. The previous record set in October 1973 with 15.2 cm. On January 16, 1947, Smithers set an all-time high snowfall record of 105.5 cm. Early on October 28, the 244-km section of Highway 16 between Moricetown and Fraser Lake was temporarily closed, to be reopened the next day. The early season snowstorm left an estimated 15,000 BC Hydro customers in northwestern British Columbia without power. Affected communities included: Mackenzie, Prince George, Vanderhoof, Fort St. James, Fraser Lake, Burns Lake, Takla Landing, Houston, Telkwa, Smithers and Hazelton. Three transmission lines were down and due to impassable roads crews in some areas were relying on helicopters to access problem areas. On October 30, an estimated 2,500 customers were still without power. On November 2, six days after the storm, about 200 households in about 10 communities near Burns Lake were still without power. Most of these were unlikely to get service back for several more days. The area most heavily affected was the south shore of Francois Lake, about 25 km south of Burns Lake. Large trees coated with ice hampered repair efforts. BC Hydro representative Elisha Moreno said, "There was about a metre-and–a-half of wet snow; then it froze."

Year	Event Type	Severity	Cause	Impact Effect
				On Oct 29 and 30th of 2006, Burns Lake experienced a 90 cm snowfall and an accompanying 24 hr power outage. A joint EOC was set up with RDBN. Elderly was checked by snowmobile. Fuel was in short supply. Businesses had to shut down. Loaders and plows were hired to open streets. Roofs were shoveled. Major coordination and support from EMBC helped Burns Lake and neighbouring communities recover.
2011	Flooding	high	Flooding	Evacuation Order May 17 and rescinded May18. May 19 Evacuation Alert for Pendleton Bay, Auger Rd. Babine Forest Products, Cross Creek, Donalds Landing R. Ethel Rd, Wilson Rd. An Evacuation Order was issued May 20 for Pendleton Bay area from the North Rd FSR and Augier Main FSR and Babine Forest Product Barge location- rescinded May 22. Areas included Cross Creek, Donalds Landing Rd. and areas surrounding Ethel F Wilson Memorial Park, Augier Lake Rec Site, and Babine Lake Marine Park. Evacuation Alert for Grizzly FSR including area of Pinkut Creek and Talpin Lake. Evacuation - rescinded June 1. May 27 Evacuation Alert for Rose Lake Cutoff Road, Crow Creek Rd., and Thompson Rd. Evacuation Order Rescinded Harmatti Rd May 29. June1 Evacuation Alert- Rescinded June 3.
2012	Industry Fire	high		Babine Forest Products Mill burned down killing 2 employees and many injured out of 25 employees. Staff responded in support of the Village of Burns Lake EOC.
2014	Train Derailment	low	Crash	July 30, 2014, a CN train derailed near Decker Lake Forest Products due to a collision with a loaded logging truck. The crash and derailment saw the involvement of 22 intermodal cars and two locomotives, but not the entire train. There were no life threatening injuries but the driver of the logging truck was taken to the hospital.
2018	Flooding		flooding	Freshet Flooding ESS
2020	Pandemic	moderate	Pandemic	COVID-19 Pandemic, Business shut down and restrictions on gatherings and inter-community travel.
2021	Wildfire - EOC Activation	moderate	Wildfire	Bulkley Lake Wildfire - R11557 - 250 hectares as of July 9, 2021; Bulkley Lake – Incident # 210409

APPENDIX 2 – ELECTORAL AREA 'B' KNOWN HAZARDS MAP

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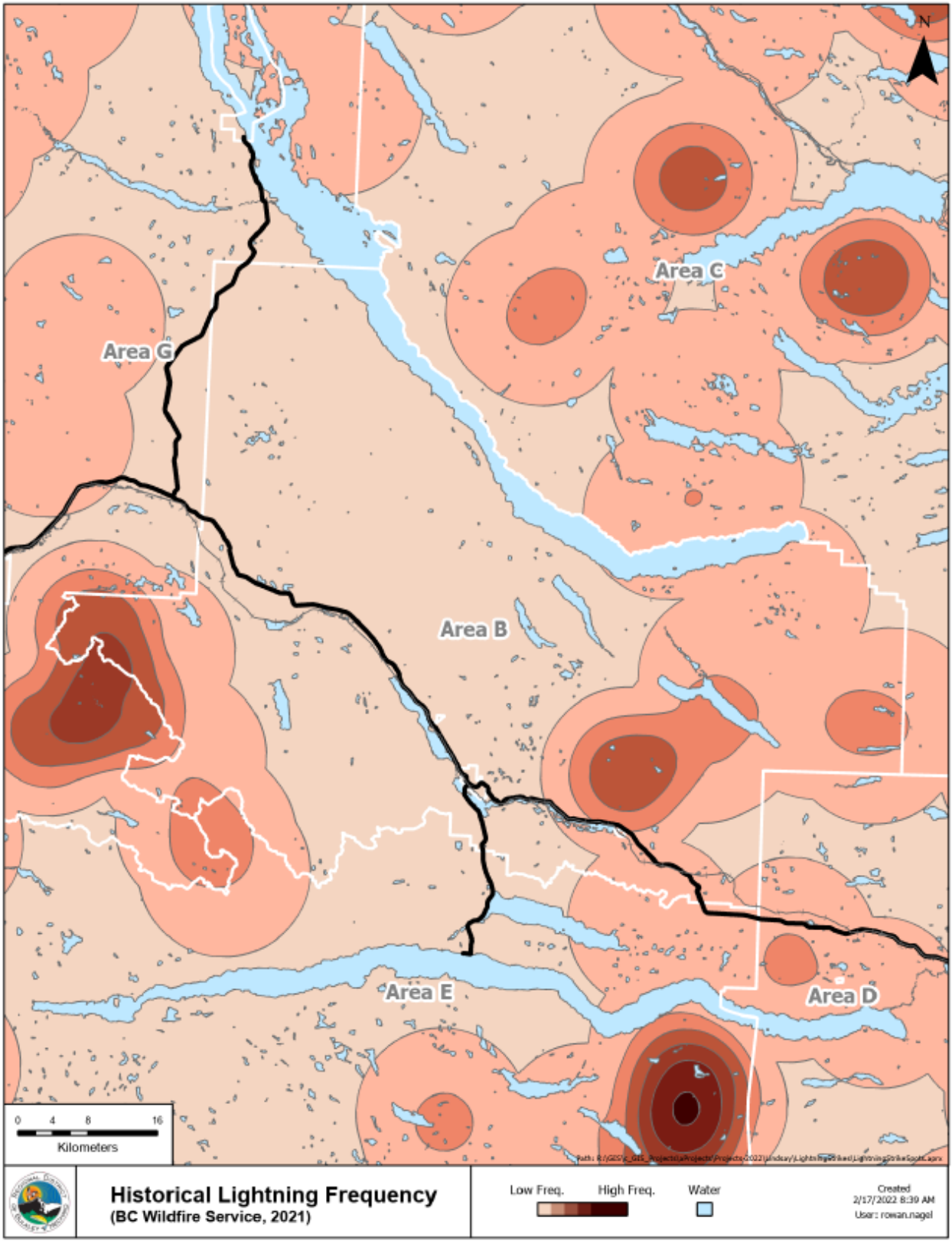
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Kilometers
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(BC Wildfire Service, 2021)
Low Freq.
High Freq.
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WORKS CITED

(MSC), M. S. (2021, June 30). *Avalanche Canada*. Retrieved from Mountain Weather Forecast: https://www.avalanche.ca/weather/forecast/2021-06-29

BC Agriculture & Food Climate Action Initiative. (2019). *Regional Adaptation Strategies: Bulkley-Nechako & Fraser-Fort George.* Bulkley-Nechako: BC Agriculture & Food Climate Action Initiative. Retrieved from https://climateagriculturebc.ca/app/uploads/RegionalStrategies-BNFFG.pdf

BC Centre for Disease Control Provincial Health Services Authority. (2018). *Food Costing in BC 2017.* Vancouver: BC Centre for Disease Control. Retrieved from http://www.bccdc.ca/pop-public-health/Documents/food-costing-BC-2017.pdf

BC, A. Q. (2021). Retrieved from Air Quailty Data: https://www.env.gov.bc.ca/epd/bcairquality/data/aqhi.html?id=AQHI-Smithers

BC, E. M. (2021, winter). *BC Government HRVA Guides and Tools for Local Government.* (W. 2. 2.1 edition, Ed.) Retrieved from HRVA Hazard Reference Guide: https://www2.gov.bc.ca/assets/gov/public-safety-and-emergency-services/emergency-preparedness-response-recovery/local-government/hrva/guides/hrva_hazard_reference_guide.pdf

BC, P. o. (March 2021). *SKEENA REGION COMMUNITY RESILIENCY INVESTMENT Update.* Smithers: Province of BC.

Blackwell, B. A. (2019). *Burns Lake Community Forest Landscape Fire Managment Plan.* North Vancouver: Burns Lake Community Forest. Retrieved from https://blcomfor.com/wp-content/uploads/2019/05/Burns-Lake-LFMP_14May2019_FINAL.pdf

Canada, E. (1971-2000). *Climate Normal 1971-2000 - Burns Lake, Climate ID 1091169.* Retrieved June 7, 2021, from Environmnet Canada Climate Normals: https://climate.weather.gc.ca/climate_normals/results_1981_2010_e.html?searchType=stnName&txtStationName=Smithers&searchMethod=contains&txtCentralLatMin=0&txtCentralLatSec=0&txtCentralLongMin=0&txtCentralLongSec=0&stnID=487&dispBack=1

Canada, E. (2021, 10 12). *Climate Normal 1981-2010 - Fraer Lake North Shore, Climate ID 109C0LF.* Retrieved June 7, 2021, from Environmnet Canada Climate Normals: https://climate.weather.gc.ca/climate_normals/results_1981_2010_e.html?searchType=stnName&txtStationName=fraser+lake&searchMethod=contains&txtCentralLatMin=0&txtCentralLatSec=0&txtCentralLongMin=0&txtCentralLongSec=0&stnID=557&dispBack=1

Canada, G. o. (2016, June 21). *Lightning*. Retrieved from Canadian Lightning Detection Network: https://www.canada.ca/en/environment-climate-change/services/lightning/canadian-detection-network.html

Canada, G. o. (2016, June 16). *Lightning Statistics*. Retrieved from Map of Canada’s lightning hotspots: https://www.canada.ca/en/environment-climate-change/services/lightning/statistics/maps-hotspots.html

Canada, G. o. (2016, June 16). *Lightning Statistics*. Retrieved from Map of Canada’s lightning hotspots: https://www.canada.ca/en/environment-climate-change/services/lightning/statistics/activity-canadian-cities.html#wb-auto-4

Canada, G. S. (2015). *Seismic Hazard Map of British Columbia.* Retrieved from earthquake canada: https://earthquakescanada.nrcan.gc.ca/hazard-alea/simphaz-en.php#BC

Canada, H. (2021, June 10). *Wildfire smoke 101: Wildfire smoke and your health*. Retrieved july 14, 2021, from Health canada wildfire smoke health: https://www.canada.ca/en/health-canada/services/publications/healthy-living/wildfire-smoke-health.html

Capling, S. M. (2019). *Village of Burns Lake Community Wildfire Protection Plan Update.* Burns Lake: Village of Burns Lake.

Coastal GasLink. (2021, October 29). *Construction Update.* Retrieved from Coastal GasLink: https://www.coastalgaslink.com/siteassets/pdfs/construction/updates/Coastal-GasLink-Construction-Update-October-29-2021.pdf

Coastal GasLink. (2021, September 22). *Saefty Operations Coastal GasLink*. Retrieved from Coastal GasLink: https://www.coastalgaslink.com/sustainability/safety/

Columbia, B. (2021, July 19). *Office of the Provinical Health Officer*. Retrieved from Current Health Topics: https://www2.gov.bc.ca/gov/content/health/about-bc-s-health-care-system/office-of-the-provincial-health-officer/current-health-topics

Columbia, P. o. (2021, 07 15). *Air Quality Data BC*. Retrieved from Current Air Quality Data: https://www2.gov.bc.ca/gov/content/environment/air-land-water/air/air-quality/current-air-quality-data#S

Columbia, P. o. (2021, July 26). *British Columbia Drought Information Portal*. Retrieved from Historic Drought Portal: https://www.arcgis.com/apps/MapSeries/index.html?appid=838d533d8062411c820eef50b08f7ebc

Dalhousie University | University of Guelph | University of Saskatchewan | University of British Columbia. (2021). *Canada's Food Price Report 11th Edition.* Saskatoon: DALHOUSIE UNIVERSITY. Retrieved from https://cdn.dal.ca/content/dam/dalhousie/pdf/sites/agri-food/Food%20Price%20Report%202021%20-%20EN%20(December%208).pdf

Econics. (May 2021). *British Columbia Drought and Water Scarcity Response Plan.* Victoria: MInistry of Environment and Climate Change Strategy Interagency Drought Working Group. Retrieved from

https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/drought-info/drought_response_plan_final.pdf

First Nations Health Council. (2011). *Implementing the Vision: BC First Nations Health Governance.* West Vancouver: First Nations Health Council. Retrieved from https://www.fnha.ca/Documents/FNHC_Health_Governance_Book.pdf

Foord, v. (2016). *Climate patterns, trends, and projections for the Omineca, Skeena, and Northeast Natural Resource Regions, British Columbia.* Forest, Lands, and NR Operations. Retrieved from https://www.for.gov.bc.ca/hfd/pubs/tr.htm

Forest Analysis and Inventory Branch Ministry of Forests, L. N. (April 2019). *Lakes TSA Discussion Paper.* Victoria: Province of BC. Retrieved from https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/stewardship/forest-analysis-inventory/tsr-annual-allowable-cut/14ts_tsr_dp_2019.pdf

Gareau, C. (2017, December 19). CN train derails north of Smithers. mithers, BC, Canada. Retrieved from https://www.interior-news.com/news/cn-train-derails-north-of-smithers/

Government of Canada. (2021, 12 06). *Space Weather Canada*. Retrieved from Learning About Space Weather: https://www.spaceweather.gc.ca/info-gen/index-en.php

Haggerstone, J. (2013, July 17). *Town of Smithers Council Agenda*. Retrieved from Report on Railway Occurences: https://smithers.civicweb.net/document/56658

ICBC. (2020, May 20). *ICBC Reported Crashes*. (C. i. Licence., Editor) Retrieved from

Search Burns LAKE Casuality Crashed Only.: https://public.tableau.com/app/profile/icbc/viz/ICBCReportedCrashes/ICBCReportedCrashes

Inc., E. M. (2019). *Review of the Regional District of Bulkley-Nechako Emergency Operations Centre Response to the 2018 Wildfires.* Burns Lake: Regional District of Bulkley-Nechako.

Linch, L. (2021, November 18). What are atmospheric rivers, and how are they affecting the B.C. floods? Vancouver, BC, Canada. Retrieved from https://www.cbc.ca/radio/whatonearth/what-are-atmospheric-rivers-and-how-are-they-affecting-the-b-c-floods-1.6253763

ltd., N. h. (2019). *BC Dike Consequence Classification Study.* Victoria: MInistry of Forests, Lands, Natural Resource Operations and Rural Development. Retrieved from Dike Consequence Classification: https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/integrated-flood-hazard-mgmt/dike_consequence_classification_study_2019.pdf

Munsaka, E. D. (2018). *The contribution of indigenous knowledge to disaster risk reduction activities in Zimbabwe: A big call to practitioners.* South Africa: Jamba - Journal of Disaster Risk Studies. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6014067/

Natural Resources Canada. (2021, 04 06). *EarthQuakes Canada*. Retrieved from Search the EarthQuake Database: https://earthquakescanada.nrcan.gc.ca/stndon/NEDB-BNDS/bulletin-en.php?display=1&endtime=2021-09-28T23%3A59%3A59&eventtype=L&latitude=54.508&limit=4001&longitude=-124.196&maxdepth=1000&maxlatitude=90&maxlongitude=180&maxmagnitude=10&maxradius=4.5045045045

NAVCAN. (2021, June 27). *Government of Canada Historical Data*. Retrieved from Hourly Data Report For June 27, 2021 - Burns Lake: https://climate.weather.gc.ca/climate_data/daily_data_e.html?StationID=574&timeframe=2&StartYear=1840&EndYear=2021&Day=14&Year=2021&Month=6#

Nechako, R. D. (2021, July 21). *Agriculture*. Retrieved from Connecting Consumers and Producers: https://www.rdbn.bc.ca/departments/agriculture/connecting-consumers-and-producers

Pacific Norther Gas. (2020). *PNG Core Emergency Response PLan.* Vancouver: Pacific Norther Gas. Retrieved from https://png.ca/wp-content/uploads/2021/01/PNG-Ltd-Core_2020.pdf

Patrick Ferguson, R. (2021, May 3). Wildfire Risk Reduction Officer, Skeena Stikine District, Ministry of Forests, Lands and Natural Resource Operations. *Bulkley Valley Wildfire Risk Reduction Public*. Hazelton, BC, Canada.

Prepare BC Emergency Management BC. (2019, January 01). *Get Ready Guide Education Material.* Retrieved from Master of Disaster Get Ready Guide: https://www2.gov.bc.ca/assets/gov/public-safety-and-emergency-services/emergency-preparedness-response-recovery/embc/master-of-disaster/learning-materials/mod_learning_work_book.pdf

PREPARED BY DALHOUSIE UNIVERSITY | UNIVERSITY OF GUELPH | UNIVERSITY OF SASKATCHEWAN | UNIVERSITY OF BRITISH COLUMBIA. (2021). *Canada's Food Price Report 11th Edition.* Saskatoon: DALHOUSIE UNIVERSITY. Retrieved from https://cdn.dal.ca/content/dam/dalhousie/pdf/sites/agri-food/Food%20Price%20Report%202021%20-%20EN%20(December%208).pdf

Rail, C. (2021-03-03). *Dangerous Goods Protectice Direction 36 Top 10 products Shipped in BC.* CN. Retrieved from https://www.cn.ca/-/media/Files/Delivering-Responsibly/PD-36/DG-PD36-British-Columbia-EN.pdf?la=en&hash=DA5A506E6F2C4655703D589DF937054660E5ECDD

Railroaded. (2015). *CN Railway Derailments, Other Accidents and Incidents.* unknown: Railroaded. Retrieved from https://railroaded.files.wordpress.com/2010/10/cn-railway-derailments-other-accidents-and-incidents26.pdf

Samanski-Langille, J. (2021, Nov 3). British Columbians reported $3.5 million in losses to cryptocurrency investment scams in the first eight months of 2021. Smithers, BC, Canada. Retrieved from https://www.interior-news.com/news/british-columbians-have-lost-3-5m-to-cryptocurrency-scams-so-far-in-2021/

Service, B. C. (2021, June 30). *Province of BC*. Retrieved from Chief coroner's updated statement on public safety during heat wave: https://archive.news.gov.bc.ca/releases/news_releases_2020-2024/2021PSSG0045-001280.htm

Service, B. W. (2021). *About the BC WIldfire Service*. Retrieved from Wildfire Glossary: https://www2.gov.bc.ca/gov/content/safety/wildfire-status/about-bcws/glossary

Service, C. (2021, August 31). *Stattistical Reports on Deaths in British Columbia.* Retrieved from BC Coroners Service: https://www2.gov.bc.ca/assets/gov/birth-adoption-death-marriage-and-divorce/deaths/coroners-service/statistical/illicit-drug-type.pdf

STAFF, B. P. (2020, May 13). *Interior News*. Retrieved from Coal train derails near Burns Lake: https://www.interior-news.com/news/coal-train-derails-near-burns-lake/

Staff, D. S. (2009, september 1). *Dam Safety Audit Program.* Retrieved August 2021, from Dam Safety policy legislation: https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/natural-resource-use/land-water-use/water-use/dam-safety/policy-legislation/dam_safety_audit_program-2013-amendment.pdf

Strategies, U. F. (March 2021). *RDBN Food Economy Assessment and Food Hub Feasibility Study.* Burns Lake: RDBN. Retrieved from https://www.rdbn.bc.ca/application/files/1316/2455/2474/V3-_RDBN_Food_Econ_and_Hub_Assessment_28_April_2021.pdf

Thurber Engineering Ltd. (2020). *Equity Silver Mine 2020 Dam Safety Review.* Calgary: BC Mine Information. Retrieved from https://www.mines.nrs.gov.bc.ca/p/5fa1e4034635c865df00c9d1/docs

Trumpener, B. (2020, March 15). *CBC News*. Retrieved July 13, 2021, from CBCNews: https://www.cbc.ca/news/canada/british-columbia/cn-derailment-dangerous-goods-school-evacuated-1.5491822

Village of Burns Lake. (2020). *Emergency Preparedness PLan Village of Burns Lake 2020.* Burns Lake: Village of Burns Lake.

Zirnhelt, N. (June 21, 2021).*BVLD Airshed Management Plan:A Community Action Plan for Clean Air.* Cariboo Environmental Quality Consulting. Smithers: Bulkley Valley Lakes District Airshed Managment Society. Retrieved from https://cleanairplan.ca/cleanairplan2012.pdf