



Regional District of Bulkley-Nechako

# HRVA Electoral Area' G' Committee Backgrounder

ELECTORAL AREA 'G' HAZARD IDENTIFICATION

DECEMBER 2021

***"Know the Risks, Make a Plan, Be Prepared"***

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## CHAPTER 2: ELECTORAL AREA 'G' HAZARD IDENTIFICATION

### Electoral Area 'G' Geographic Setting

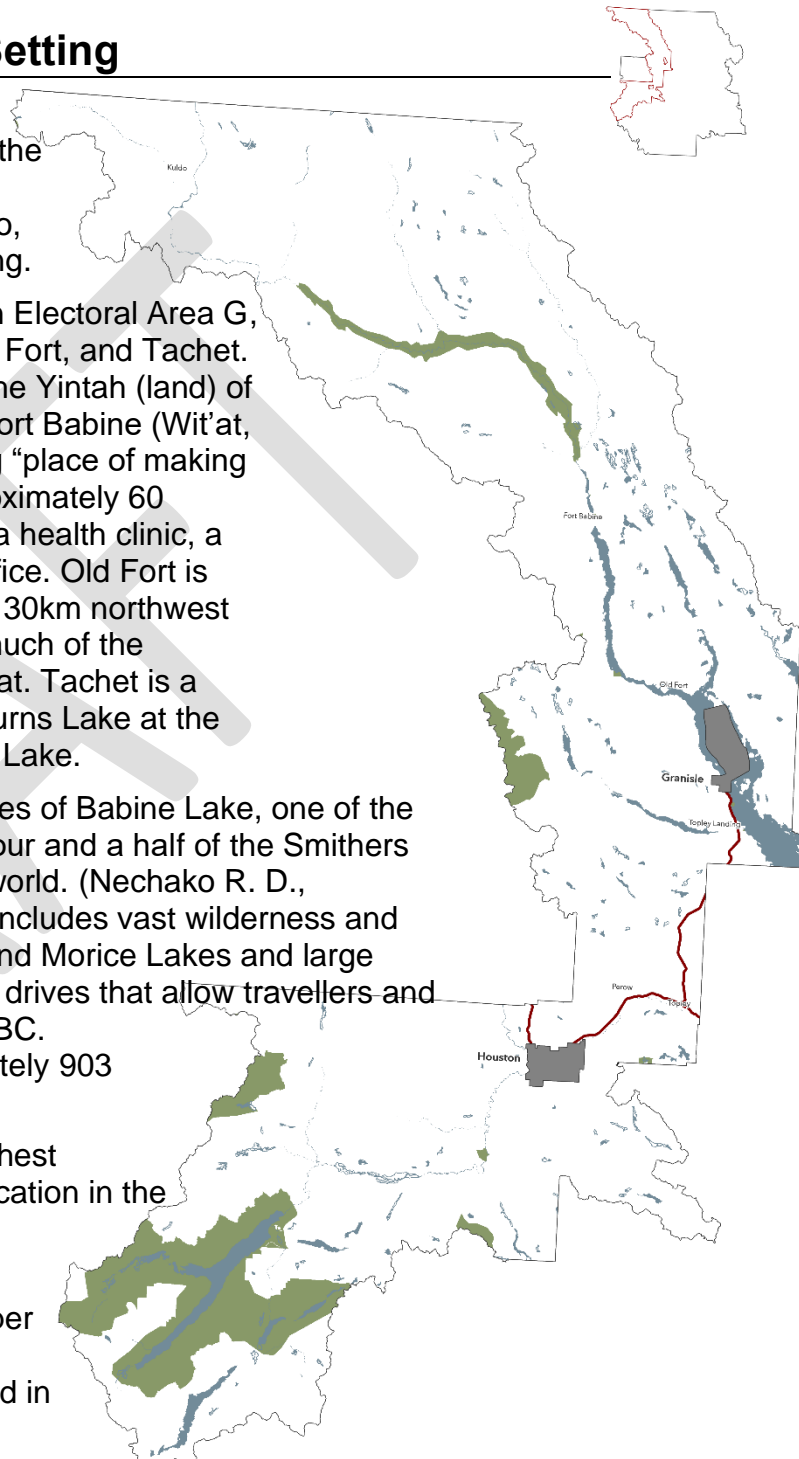
Electoral Area G (Houston Rural) is the rural area surrounding the District of Houston and the Village of Granisle. The unincorporated communities within the area are Perow, Kuldo, Smithers Landing, Topley, and Topley Landing.

Lake Babine Nation has three communities in Electoral Area G, they are the communities of Fort Babine, Old Fort, and Tachet. In addition, Electoral Area 'G' is situated on the Yintah (land) of the traditional territory of the Wet'sewet'en. Fort Babine (Wit'at, an abbreviated form of Wit'ane Keh, meaning "place of making dry fish" in the Nadut'en language) has approximately 60 permanent residents, an elementary school, a health clinic, a water treatment plant, and a satellite band office. Old Fort is also known as Nedo'ats and is located about 30km northwest of Granisle. The community is occupied for much of the summer and fall and is only accessible by boat. Tachet is a small community located about 95km from Burns Lake at the mouth of the Fulton River as it enters Babine Lake.

The Village of Granisle is located on the shores of Babine Lake, one of the world's largest natural lakes, and within an hour and a half of the Smithers airport and its connections to the rest of the world. (Nechako R. D., Electoral Area Profiles, 2020) The area also includes vast wilderness and natural landscapes and provincial parks around Morice Lakes and large rivers like the Morice River, as well as scenic drives that allow travellers and residents to take in the wilderness of central BC. The rural area has a population of approximately 903 people in the 2016 census.

Residents of Houston rural area have the highest percentage of apprenticeship or trades certification in the RDBN, and many work in construction and manufacturing.

In 1997, Huckleberry Mines, an open pit copper mining operation, opened 125 km south of Houston. Huckleberry mine operations ceased in August 2016. The mine remains on care and maintenance status and there has been discussions and exploration to indicate a restart plan is possible in the future.



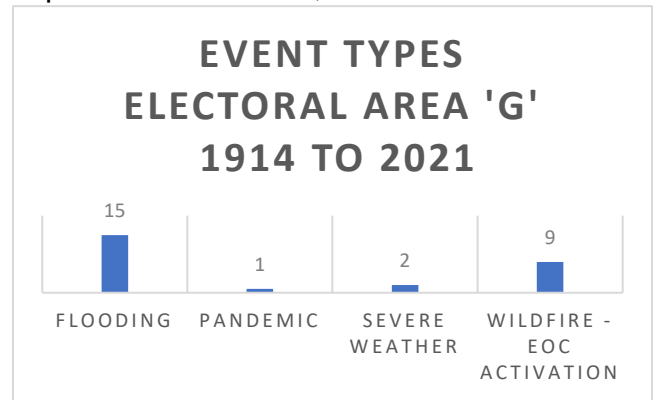
## Electoral Area 'G' Hazard History

Electoral Area 'G' has experienced several events that have impacted residents of the region since recorded in the 1950's. The regularity 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 'G' including flooding, wildfires, landslides, hazardous materials and explosions, transportation accidents, and interruptions to critical services. Many of these hazards are high risk and priority to all communities within the Regional District of Bulkley Nechako.

The graph below shows the actual event types experienced in Electoral Area 'G' from 1950 to 2021. The highest recurring event types and severity of impact in this area are:

- Flooding; and,
- Wildfire.



[Appendix 1](#), Historic Hazard Data, provides the details on recorded events in Electoral Area 'G'.

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.*

	Very Low	Low	High	Very High	
6					Frequent or very likely Moderate or likely
5			Epidemic – Human, Infrastructure Failure, Severe Weather (15)	Fire- interface & Wildfire (20)	
4		Fire – Industrial (8)	Critical Facility Failure (12)	Earthquake (16)	Occasional, slight chance Unlikely, Improbable
3	Transportation accident – Road, Fire – Urban/Rural (3)		Explosion or Emission (9)		
2	Dangerous Good Spills (2)	Epidemic - Human (4)			Highly unlikely (rare event)  Very Rare event
1			Earthquake (3)		
	1	2	3	4	

## Defining Hazard Considerations for Electoral Area 'G'

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This section provides definitions from the HRVA Hazard Reference Guide 2021 Province of British Columbia, and the District of Houston and the Village of Granisle emergency management plans. 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 'D' and were included in the Hazard, Risk, and Vulnerability Analysis Priority Matrix's from the Regional District HRVA 2003, District of Houston Emergency Preparedness Plan 2017, and Village of Granisle Emergency Preparedness Plan 2007. This backgrounder has also been updated with input and further research resulting from the Hazard Identification workshop on November 29<sup>th</sup>, 2021. The top four priority hazards identified by RDBN staff include:



**Wildfire**



**Flooding**



**Severe Weather**



**Rail Incidents**

Known hazards are also identified on a map of electoral area 'G' and can be found in [Appendix 3](#) of this chapter. HRVA Electoral Area 'G' Committee Workbook Backgrounder 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)
<b>Nadina District</b>				
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 in 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 (-1.6°C).

### 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

### 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)

- Like many northern communities, Houston experiences seasonal snowmelt that results in high levels of water that can sometimes overwhelm drainage infrastructure systems, resulting in flooding. The numerous rivers and creeks that run through Houston have records of historical flooding in the downtown core defined as a flood plain. (Houston, 2021)
- Electoral Area 'G' experiences a variety of flooding due to:
  - Heavy Rains or rain-on-snow events in spring, fall, and winter months;
  - Spring freshet flooding from rapid snow melt;
  - Intense precipitation at any time of year;
  - Ice jams in spring, fall, and winter months; and
  - Failure of private dams or flood protection works.
- The Bulkley, Morice and Buck Creek rivers are of the highest concern in the area. The District of Houston 2010 Official Community Plan contains a [floodplain map](#). However, residents remember both the Bulkley and Buck Creek being reduced to a trickle in past drought years.
- There are the six addresses in the 200-year floodplain in rural Area G and 649 addresses within the District of Houston municipal boundaries.
- The District of Houston has critical infrastructure located within the 200-year flood plain including the municipal water wells and sewage treatment facility.
- The [Regional District Floodplain Management Bylaw No. 1878, 2020](#) was established to reduce or prevent injury or the loss of life, and to minimize property damage, during flood events. This bylaw contains drawings for Quick to Houston as mapped for 20-year and 200-year frequency events mapped in 1982.
- The Province of BC has invested in [Flood Plain mapping](#) along the Bulkley from Quick to Houston and at Houston including Buck Creek. With the BC River Forecast Centre continual monitoring and forecasting river flows.
- See [Appendix 2](#) for Ministry of Environment hydrometric data reporting annual maximum daily discharge rates (m<sup>3</sup>/s) for five monitoring stations and three stations reporting annual maximum daily water level (m).
- The District of Houston owns and maintains four dikes listed under the Dike Maintenance Act. The dikes and the dike consequence classification of each dike are as follows (ltd., 2019):
  - Buck Creek Flood Protection on Buck Creek, Dike #81 – Major;
  - Industrial Area Flood Protection on the Bulkley River, Dike #82 – Moderate;
  - Town Dike HOU, Dike #83 – Moderate;
  - Flood Protection on the Bulkley and Buck Creek, Dike #84 – Moderate.<sup>1</sup>
- The Village of Granisle flooding has not deemed flooding a threat to this municipality (Grainisle, 2007).

<sup>1</sup> Dike consequence summary by region can be accessed:

[https://www2.gov.bc.ca/gov/content/environment/air-land-water/water/drought-flooding-dikes-dams/integrated-flood-hazard-management/dike-management#dike\\_conseq](https://www2.gov.bc.ca/gov/content/environment/air-land-water/water/drought-flooding-dikes-dams/integrated-flood-hazard-management/dike-management#dike_conseq)



- Flood season has now extended into the Fall and Winter months.


**Notable floods in Electoral Area 'G' can be found in [Appendix 1](#).**

**Comments and questions for consideration and further research:**

- How are salmon bearing rivers affected by fall flooding?
- How is the flooding between Topley and Houston affecting the railway?
- What are the capabilities and resources of response to flooding? I.E. SAR, RCMP, Fire?

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

### **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 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) With the Bulkley-Lakes (inclusive of Area G) reaching level 3 July and August, being very dry. (Columbia P. o., British Columbia Drought Information Portal, 2021)

**Comments and questions for consideration and further research:**

- How does drought impact wildfire hazard and what is the potential of increase in drought conditions?

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

### 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)

- There is one known geotechnical hazards affecting Ministry of Transportation Roads in the area on Forestry Point Road – An ongoing issue with slow moving landslide. A partial repair was completed in 2018, issues continue along other segments of the road. No highway detours. Forest service roads may be used to provide an alternate route. <sup>2</sup>
- One identified avalanche path within the RDBN boundary which is monitored by the forecaster of the Northwest Avalanche Program out of Terrace. The path is at Doris Lake (KM48 on Babine Lake Road). It is a relatively small path, but does have the potential to cover the road, and close access for residents at Smithers Landing and Fort Babine. n the Babine Lake Road Slide. <sup>3</sup>
- Forestry roads are more prone to landslide events, and along the Bulkley River
- No knowledge of land subsidence.

#### Comments and questions for consideration and further research:

- Will we see an increase in landslides along Buck Creek, and between the Bulkley and North Road?

**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.

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<sup>2</sup> Information provided by the Roads Area manager in Smithers (SA25) on October 4<sup>th</sup>, 2021 by email.

<sup>3</sup> Same as above

## Area G Weather Hazards

- In Area G there is only one Environment Canada station that monitors Climate Normal in Topley Landing.
- According to Environment Canada Topley Landing station, the minimum extreme temperature recorded was -41.7 degrees Celsius and occurred in January 25<sup>th</sup>, 1972. On average, there are less than 1.8 days in January where the temperature reaches below -30 degrees Celsius. (Canada E. , 1981-2010)

### **Climate Norm's 1981-2010<sup>4</sup>**

Annual Rainfall 322.0 mm  
Annual Snowfall 216.1 mm  
Average Temperature, January -8.5 C  
Average Temperature, July 14.6 C  
Frost-free Days 113 days  
Hours of Sunshine 1811 hrs. per year  
Maximum Temperature 34.4 C (July 31, 1971)  
Minimum Temperature -41.7 C (Jan. 25, 1972)

### **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 G, although it is rarely heavy enough to pose a significant risk, however severe snow events cause power failures. This was experienced with the severe snow event of Oct 2006 (Grainsle, 2007).
- Road Access issues after a snowstorm especially in rural areas.

**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 'G' include:**

- The last week in June 2021 brought about unprecedented 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

<sup>4</sup> Station Topley Landing (Canada E. , 1981-2010)

reporting 486 sudden deaths over a five-day period from June 25<sup>th</sup> – 30<sup>th</sup>, 2021. (News C. , 2021)

- Temperatures reaching 37°C on June 29, 2021. (Online, 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)

### Notable lightening data in Electoral Area 'G':

- 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 1<sup>st</sup>. The Average date of the end of the lightning season in Western Canada (1999-2018) is between October 1<sup>st</sup> and November 1<sup>st</sup>. (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 lightning strike data for the Houston or Granisle area. (Canada G. o., Lightning Statistics, 2016) Historical Lightning strike data is included in [Appendix 3 – Hazard Maps](#).

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

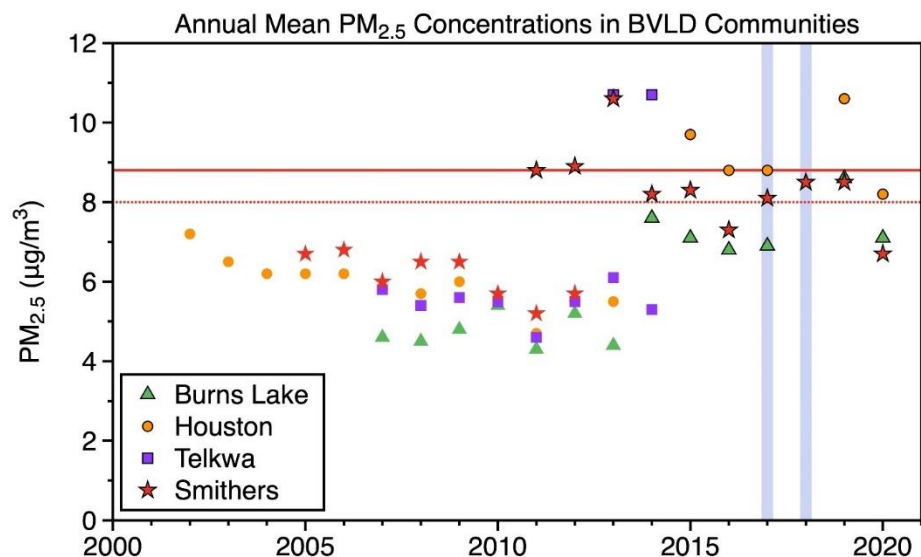
## Air Quality

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. Houston 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 \(PM<sub>2.5</sub><sup>5</sup>\)](#), ground-level ozone (O<sup>3</sup>), and nitrogen dioxide (NO<sup>2</sup>). (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 – Witset to Endako) is fine particulate matter, PM<sub>2.5</sub>, 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<sub>2.5</sub>) posing the greatest human health risk (Canada H. , 2021).
- Elevated PM<sub>2.5</sub> 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)

### Notable Air quality data in Electoral Area 'G' includes:

- <sup>6</sup>The Province of BC has one active Air Quality Monitoring station located in this region [Houston Firehall. \(Columbia P. o., Air Quality Data BC, 2021\)](#) There was an average level of 8.5 PM<sub>2.5</sub> over the last ten years (data missing for 2019-2021) with the highest average year in 2013 with an average level of 10.2 PM<sub>2.5</sub>. 7-10 PM<sub>2.5</sub> is a High Health Risk according to the AQHI.
- Between 2002 - 2013 Houston air quality, annual mean PM<sub>2.5</sub> concentrations, has been below the provincial air quality objectives (8 or 25 ug/m<sup>3</sup>) consistently, with 2014-current being above the provincial objectives.



<sup>5</sup> PM<sub>2.5</sub> Particulate matter with a diameter of less than 2.5 micrometers (µm). One micrometer is one millionth of a metre. PM<sub>2.5</sub> is included in fine particulate and is a subset of PM<sub>10</sub> (when measuring PM<sub>10</sub>, it includes PM<sub>2.5</sub>). PM<sub>2.5</sub> is typically associated with combustion sources (smoke) and is more closely related to adverse health effects than larger particles.

<sup>6</sup> The dashed red line is the provincial air quality objective (8 or 25 ug/m<sup>3</sup>, depending on the figure). The solid red line is the Canadian ambient air quality standard.

- 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. The following chart provides the number of air quality advisory days in Houston issued by the Ministry of Environment since 2013<sup>7</sup>:

Year	# of days under advisory for fine PM <sup>2.5</sup>
2016	4
2017	4
2018	1
2019	11

- There is one Purple Air Quality Monitoring stations in Houston.

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

### 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.

<sup>7</sup> 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)

**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

### **Freezing Rain or Drizzle**



Rain that freezes on impact to form a coating of clear ice (glaze) on the ground and on exposed objects. (BC E. M., 2021)

**Related Hazards:** Extreme Cold / Fog / Hail / Snowstorms and Blizzards / Electrical Outage / Telecommunications Interruption / Transportation Route Interruption / Aircraft Incident / Motor Vehicle Incident.

## 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)

- The District of Houston has a Community Wildfire Protection Plan developed in 2018 (Pro-Tech Forest Resources Ltd., 2018). The plan identifies that prevailing winds and probable wildfire fire threat will be from the southwest of the community and recommends a number of treatments that the forest enhancement society of BC has been working to mitigate in 2021 (Kozuki, 2021).
- There are 145 addresses in the Topley area, 375 addresses in the Granisle area, and 1719 addresses in the Houston and surrounding area in a high Wildfire Urban Interface risk area.<sup>8</sup> In addition, there are 326 addresses in electoral area 'G' 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/km<sup>2</sup> 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.
- The Village of Granisle Community Wildfire Protection Plan 2017 identifies the wildfire risks within and surrounding the community of Granisle, describes the potential consequences if a wildfire was to impact the community, and examines possible ways to reduce the wildfire risk. (Pro Tech Forest Resources Ltd., 2017)
- Wildfire has been ranked to be the threat of highest concern for the Village of Granisle. Generally, from May to October of each year, this community faces a serious threat from wildland fires. Most of the area surrounding Granisle is heavily forested and is therefore very dependent on the logging and lumbering industry. A power line right of way follows the south, west, and north boundaries of the village. While work has been completed on constructing a fire break using the power line right of way more work needs to be done making the land between the power line and the populated parts of the village more fire resistant. (Grainisle, 2007)
- Summer homes dot the shores of Babine Lake north and south of the Village. As well the small resort community of Topley Landing, Tachet, Old Babine and Fort Babine could be evacuated to Granisle should a wildfire threaten them. The interaction of people and wilderness creates a recipe for wildland urban interface fire.
- Forests tend to be dry, there is still lots of dead bug wood that is fuel for fires.
- The Regional District of Bulkley Nechako operates a [FireSmart program](#) that is a federal, provincial, and community-based program that encourages the public to take simple, scientifically proven steps to increase wildfire resiliency. In 2021 the RDBN

<sup>8</sup> This data was collected on October 8, 2021 from the RDBN GIS system

FireSmart educator conducted 31 home assessments in Electoral Area 'G' to help residents better understand and apply these practices on their properties and homes. These assessments came with funding for mitigation work.

**Notable Wildfires in Electoral Area 'G' in [1922](#), [1983](#), [2014](#) and [2018](#). Please see [Appendix 1](#) for details on these notable wildfires.**

### **Notable fires outside Electoral Area 'G'**

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)

### **Comments and questions for consideration and further research:**

- How do we mitigate fire?
- Ranchers need to build stronger relationships with BCWS and MOA to enable faster movement of livestock.

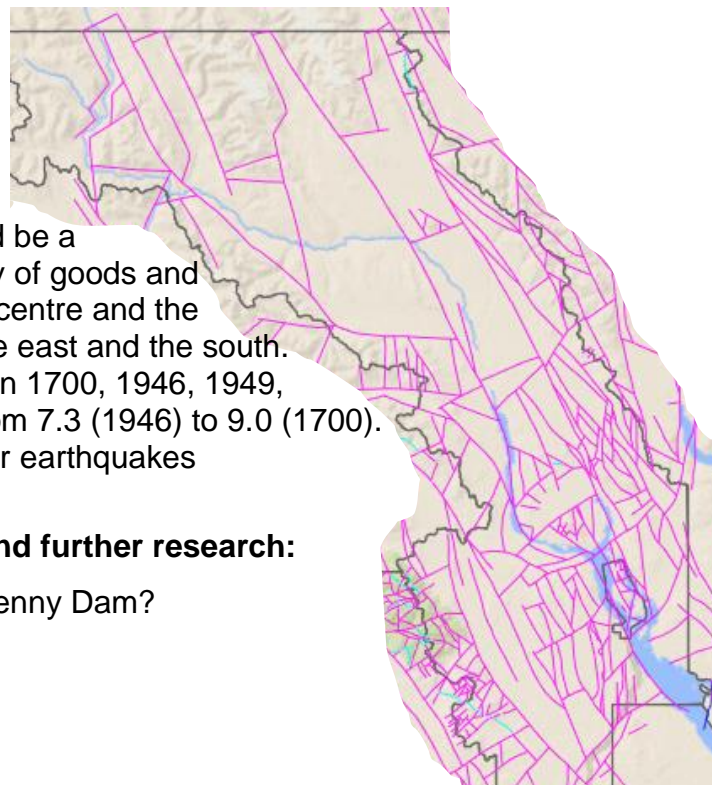
**Related Hazards:** Air Quality / Extreme Heat / Lightning / Structure Fire / Explosions / Drought / Structure Failure / Electrical Outage / Telecommunications Interruption / Transportation Route Interruption / Water Service Interruption.

### **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 'G' there is record of one earthquake near Houston on July 4<sup>th</sup>, 1991, being 2.8 in magnitude. (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.
- The five biggest earthquakes in BC occurred in 1700, 1946, 1949, 1970 and 2012. They ranged in magnitude from 7.3 (1946) to 9.0 (1700).
- Lake Babine Nation closer and more at risk for earthquakes
- Low risk earthquakes.



### **Comments and questions for consideration and further research:**

- What is the impact of an earthquake on the Kenny Dam?  
Need additional information on the effects.

**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.

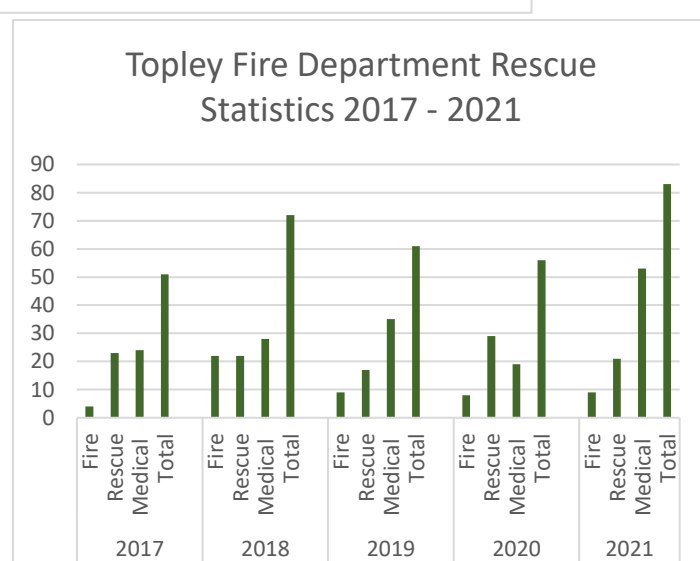
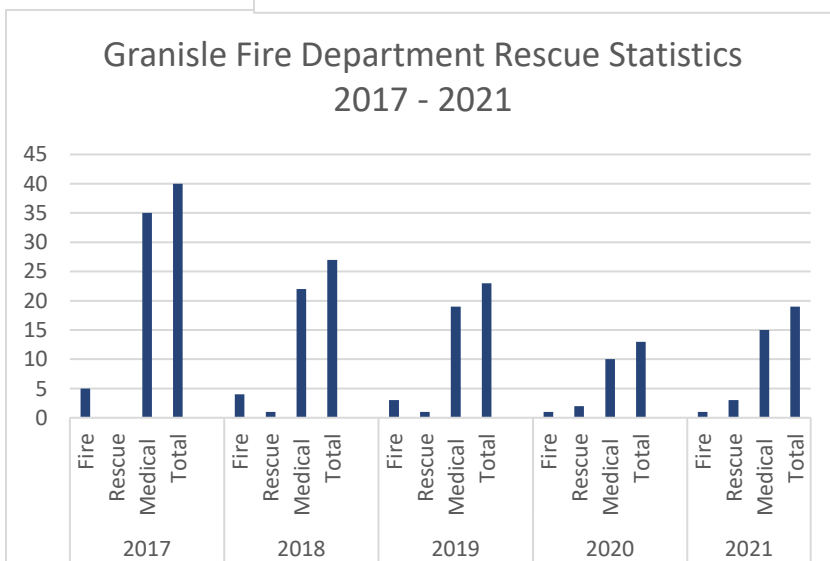
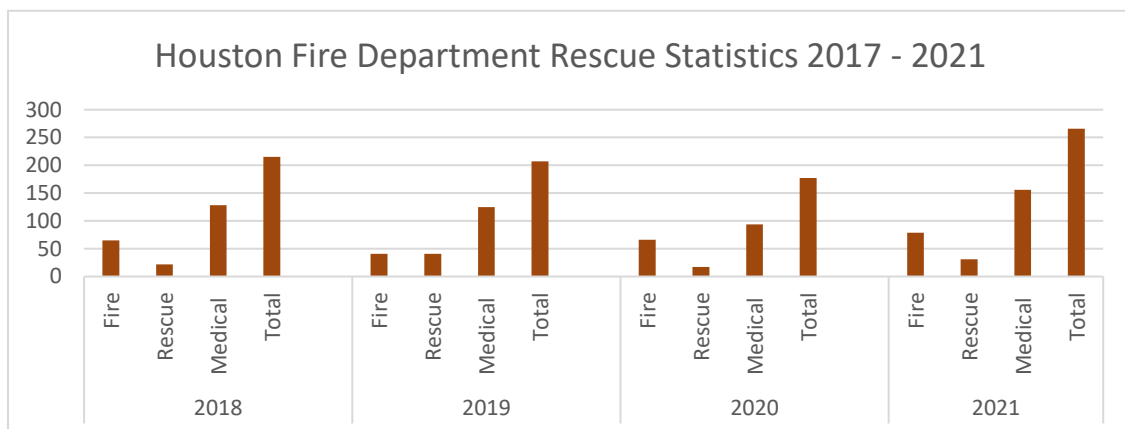
## Human-Caused Hazards

### 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 Granisle and neighbouring communities and the Regional District are a means of ensuring adequate response to a major fire. (Grainisle, 2007)
- It has been determined that Urban/Industrial Fires are not an issue in Granisle. (Grainisle, 2007)
- Structural fire is the highest priority in Topley area.
- Need for more education around residential fires, chimney fires and structural fires.
- Granisle there are not enough fire fighters to respond to residential homes. There were two structural fires in the recent history, one resulted in a fatality because the response capacity is challenged.
- Concern if Houston mill had a fire this would affect the town, questions on how to prevent this.
- There is a fire hall and fire truck in Fort Babine but no one is trained to drive or operate the fire truck.
- Below is a chart outlining the number of call outs that the Houston, Topley and Granisle Fire departments responded to over the last 5 years:



### Notable Structural Fires in the Electoral Area 'G' include:

- The District of Houston has responded to a number of fires at the Canfor Mill and the pellet plant in the last number of years. These fires have been controlled with the resources within the community.
- In August of 2012 Copeland Ave three storey apartment burned for nearly 12 hours before the Houston Fire Department was able to extinguish the fire. At the time this fire ranked among the largest structural fires Houston had seen. Twenty-one people lost their homes. (Husdon, 2012)

### Comments and questions for consideration and further research:

- Need to build capacity in Fort Babine and Granisle for structural fire response.

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

#### Structural Failure



Structural failure occurs when a building or structure collapses due to engineering or construction problems, metal fatigue, changes to the load bearing capacity of the structure, human operating error or other cause such as earthquake, flood, fire, explosion, snow or ice buildup. (BC E. M., 2021)

- In 2018 several roofs in Granisle caved in because of the snow load, one being the Granisle hotel.

**Related Hazards:** Hurricane/Typhoon/High Wind Event / Snowstorms and Blizzards / Structure Fire / Avalanche / Landslide/Debris Flow / Land Subsidence / Earthquake / Liquefaction / Tsunami / Explosions / Dam and Spillways Failure / Dike Failure.

#### 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. The railway serves most of the communities along this northern corridor and this is very crucial to the economic and to a lesser extent, to the social well being 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 the area could seriously impact residents and the environment, 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 # <sup>9</sup> and Recommended Evacuation Radius <sup>10</sup>	
LP Gas UN1978	Initial downwind evacuation for at least 800m
Gasoline UN1203	Initial evacuation for 800 meters in all directions

<sup>9</sup> PIN means product identification number as designated by Transportation Canada for the transportation of dangerous goods.

<sup>10</sup> 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>



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
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

- A regional example of the rail hazard can be seen from the incident in March of 2020, where 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)
- Creosote rail ties stacked in Topley are a fire hazard.
- Reported railroad concerns, and a year later this was not fixed.
- Concern that local first responders do not have the resources to deal with large or significant hazardous materials spills.
- Concerns about livestock on rail lines, with local experience being that ranchers are not permitted to fix rail line fencing and CN will not fix it upon request.
- District of Houston has been working on rail crossing safety improvements.

#### **Notable Rail Incidents in Electoral Area G:**

- On December 30<sup>th</sup>, 2011 in Topley, BC. there was a reported derailment. The hotbox detector indicated dragging equipment, upon inspection crews found that gondola car had derailed. There were no injuries and no Dangerous Goods. (Haggerstone, 2013)
- On May 18<sup>th</sup>, 2011 in Topley, B.C. a pedestrian was struck at a farm crossing resulting in a fatality. (Haggerstone, 2013)

#### **Comments and questions for consideration and further research:**

- Need or interest in a community safety plan which it comes to hazardous material spill on the rail in the District of Houston and surrounding area.

**Related Hazards:** Avalanche / Landslide/Debris Flow / Explosions / Hazardous Materials Spill / Transportation Route Interruption / Fuel Source 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 Houston. 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 75 reported casualty crashes<sup>11</sup> in Houston, and 10 in Granisle, 25 in Topley, and 1 in Fort Babine. (ICBC, 2020)
- Topley 6-mile hill is a challenge for transportation Trucks.

<sup>11</sup> "Casualty Crash" (ICBC collision data) motor vehicle crashes resulting in an injury or fatality.

- Concern about MVI with hazardous materials and casualties closing the Highway.
- Incidents of vehicles driving off logging roads.

**Comments and questions for consideration and further research:**

- Concern regarding the unknown hazardous materials traveling through towns on the highways.

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

### Aircraft Incident



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

- The district of Houston has air strip 8 miles west of Houston that is 4,00 ft x 75 ft wide and paved. The amenities at the Airstrip include aircraft parking, private hangers, terminal building available for training and information sessions, magnetic number on runway for navigation aid.
- Houston is on the flight path of planes coming from the south and towards Smithers.

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

- The Village of Granisle is served by a 18,000 gallon (US) propane storage tank near the main entrance to the Village and near the shore of Babine Lake. The liquid propane is then vaporized and distributed through underground pipelines throughout the village.
- 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.

**Related Hazards:** Structure Fire / Hazardous Materials Spill / Structure Failure / Electrical Outage / Telecommunications Interruption / Transportation Route Interruption / National Security Threat / Public Disturbance / Major Planned Event / Aircraft Incident / Marine Vehicle Incident / Motor Vehicle Incident / Rail Incident.

### 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 'G' are documented in association with other hazards accounts and can be found in [Appendix 1](#).

**Related Hazards:** Space Weather / Lightning / Telecommunications Interruption.

## 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 Electoral Area G is predominantly Beef cattle ranching, hay production and forage country. (Strategies, March 2021). Houston supports one custom cut and meat wrapping facility, a small farmers' market, and strong local support of the agriculture sector through grocers and restaurants.
- The cost of locally grown and produced food remains high within the region.
- The average family in the Northern Health region spends \$1038 a month on groceries (BC Centre for Disease Control Provincial Health Services Authority, 2018).
- 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)
- Vulnerable students in schools who rely on the School District food program, groceries are expensive and access is limited in Houston.
- Food programs for vulnerable families do not cover weekends in Houston.

### Notable Incidents involving food source interruptions:

- [COVID-19 Pandemic \(Started 2020\)](#) exasperated food insecurity for Canadian's 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." (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

### Comments and questions for consideration and further research:

- What can be done about the food panic when disasters hit and the supply chain is affected?

**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 in the Buck Flats area are connected to the creeks combined with Equity mines.
- Fort Babine transporting drinking water. There is no water treatment plant in place.

**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)

**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.

**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)

- If we do not have fuel, we cannot run emergency equipment.
- The majority of 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.

### 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).
- Irritation and concerns with the older populations in rural areas.
- Newspaper receives a lot of calls for assistance from the older population.

**Related Hazards:** Telecommunications Interruption / National Security Threat.

### Public Disturbance



An act or interruption that interferes with the operation of society and the ability of people to function efficiently. Examples include riots and demonstrations. (BC E. M., 2021)

- Public order is a concern during periods of unrest. Takes away from policing resources and creates capacity challenges for enforcement.
- Protests against vaccines are more of a nuisance that disruptive, building unrest and resentment in the community.
- Protests in the Morice affecting loggers and forestry workers and local RCMP. Most recently a Houston RCMP officer was run off the road by an aggressive protestor.

**Related Hazards:** Structure Fire / Explosions / Telecommunications Interruption / Transportation Route Interruption / Cyber Security Threat / National Security Threat / Major Planned Event.



## 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. n earthquake is defined as the shaking of the ground due to movement along a fault rupture. (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](#).
- In Area G there are 7 dams regulated under the Dam Safety Regulations, one of which has a failure consequence of high 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. (Staff, 2009)
- There is a dam on Irrigation Lake Park in Houston built in 1930's. Removal of the dam may have negative impacts on fish populations, and the recreation value of the municipality operated park and may also negatively impact two properties which may rely on the lake levels for a water supply and geothermal heating.
- The [Mines Act](#) and the accompanying [Health, Safety and Reclamation Code for Mines in British Columbia \(the Code\)](#) protect workers and the public through provisions for minimizing the health, safety and environmental risks related to mining activities. This includes regulations on tailings ponds and dams.

## Mine Projects with Tailing Ponds and Dams in Area 'G'

- **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<sup>12</sup>. 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

<sup>12</sup> <https://www.mines.nrs.gov.bc.ca/map;project=5fa1e4034635c865df00c9d1>

- 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

- **Bell mine**, located 16 km north of the Village of Granisle, operated from 1970 to 1992. The consequence categories for the dams at Bell Mine site were re-assessed as part of the 2018 Dam Safety Review (DSR). As per the 2018 DSR, the dams at the Bell Mine were classified as low. (Dixie Ann Simon, 2021)
- **The Granisle Mine** operated from 1965 to 1982, and the site is located 8 km north of the Village of Granisle. This mine has two tailing storage facilities. The consequence categories for the dams at Granisle Mine site were re-assessed as part of the 2018 DSR. The consequence classification for Dams 1 through 5 was reconfirmed as 'Low'. (Dixie Anne Simon, 2021)
- The Emergency Preparedness Plan (EPP) for the Bell Mine site was incorporated in the 2008 revision of the OMS Manual. A separate Emergency Preparedness and Response Plan for the combined Bell and Granisle Mines was issued in February 2013 and last updated March 2021. The plan included trigger action response plans.
- Dike failure in Houston a concern.
- Dam at irrigation lake could be a risk.

#### Comments and questions for consideration and further research:

- Is there a time when the equity tailings will be no longer a concern?
- Interested in knowing more about the Equity tailings pond risk to the Buck Creek residents. Could be catastrophic to drinking water for buck creek, but also to Houston and fish habitat.
- Given recent events in Chilliwack residents want to know what shape the Houston dike is in and if it needs to be fixed now instead of later?
- Water is the water quality and environmental risk to Lake Babine if the historic mines tailing ponds were to breach or leach?
- What are the compounds in the tailing's ponds found on the two closed mines at Babine Lake?

**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.

### 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)

- 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 7 of the Coastal GasLink pipeline runs 74km in length south of Houston to north of Morice Lake. This section of pipeline route is 91% cleared, includes project route and ancillary sites, not graded, 0% of the pipe is installed, and 216 workers are stationed at Huckleberry 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 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.

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

## Disease, Pest Infestations & Epidemic

### 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 (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 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)
- 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 a number of 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 [Bulkley IPMA Plant list for 2020](#) identified species listed in electoral area A and G.
- 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.

## 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)
- 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 (early 1800s). 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/>
- Limited access to health care in rural areas and in Fort Babine, although great vaccine delivery.
- Challenge of services reaching people when individuals were in isolation and had a fear of travel because of COVID.
- Granisle created a community grocery shop initiative during COVID as a response to support individuals who were at higher risk during COVID.

### Comments and questions for consideration and further research:

- How do we increase resources in hospitals and health clinics for a major crisis when we are currently understaffed?

**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 Northwest<sup>13</sup> 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 <sup>14</sup>
1	0	6	2	6	10	8	14	16	17	16

- 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 Columbians](#) 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>
- Drugs are infiltrating the communities, opioids are increasing, local health care and mental health crisis.
- In Fort Babine in November 2021 someone lost their life to opioids.
- BC Government has requested Canadian Government to decriminalize drugs and small amounts – up to 4 oz- as a prevention and harm reduction response. Houston RCMP are following this advocacy in hopes of some relief in the community.

<sup>13</sup> Smithers and Houston are in the Northwest [Health Service Delivery Area](#).

<sup>14</sup> <https://www2.gov.bc.ca/assets/gov/birth-adoption-death-marriage-and-divorce/deaths/coroners-service/statistical/illicit-drug.pdf>



- Houston has the health clinic and a walk-in clinic.
- Granisle and Houston are in different health districts in Northern Health.

**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.

#### 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)

- Only one Vet that services livestock in the area.
- No abattoirs in Houston, this creates a big challenge lined to food security, and the safety of food sources.
- Concerns about wild animal disease, the Elk and moose populations and health, these are a food source.
- Lake Babine Nation is and Fort Babine have been studying the health of Moose populations in their traditional territory. The study include, as follows: Moose Health Pilot Project will aim to collect 10 or 15 moose health (tissue and other data) samples and associated data. This data will contribute to develop current condition understanding of moose health in the region. Moose Mortality Monitoring. The project will aim to collect mortality data collected during ISP fieldwork and by coordinating with the conservation officer service and Lake Babine Nation hunters. Winter Habitat Validation. Surveying approximately 20 winter habitats to find out why the moose is on a decline in our territory. (Power, 2020)

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

## APPENDIX 1 – ELECTORAL AREA 'G' HISTORIC HAZARD EVENTS

Year	Event Type	Severity	Cause	Impact Effect	Description
1922	Wildfire			Residential Evacuation Forest Fire	In 1922 a 58,284 ha fire burnt south of Granisle along Babine Lake.  The largest historic fire to occur in the Houston WUI was in 1922 and was 448.5 hectares.
1951	Flooding	moderate	Spring Run off	Transportation	Heavy Rains and hot weather created flood conditions on the creeks flowing into the Bulkley River. Floodwaters threatened the new Houston Hotel and several houses were surrounded by water. The highway in places were under 60-90cm of water and a number of homes were threatened with evacuation around Buck Creek. Freight traffic was delayed for 36 hours.
1951	Flooding	low	Rain on Snow	transportation, rail	80.5mm of rain was recorded to fall in 2 days causing rivers and creeks to the flood level. The Telkwa river rose 6 ft. and threatened to flood the town's main thoroughfare. Three small washouts west of Houston held up a passenger train for 20 hours.
1962	Flooding	high	Spring Run off	Transportation, residential evacuation	Heavy rain for 24 hours caused Buck Creek to flood its banks, threatening homes, rail, and highway bridges west of Houston. Several families were evacuated. Creek washed out the bank to within a few feet of the new skating rink and swept away the pump house. Debris threatened the CNR railway bridge and highway 17 bridge which cause temporary highway closures. Sandbagging helped the shoulders of the highway from being washed out.
1964	Flooding	high	Spring Run off	Transportation, residential evacuation	A combination of late secondary runoff and a warm front accompanied by heavy thunderstorms triggered extensive flooding comparable to that of 1948. Two bridges washed out and several damaged. Four large culverts

Year	Event Type	Severity	Cause	Impact Effect	Description
					washed out and many were badly damaged. Houston Bridge 35 on Hwy 16 required considerable repair on the substructure as a result of driftwood damages. Three secondary bridges along Topley Rd 48km west of Burns Lake washed out resulting in 12 people stranded between the bridges having to be evacuated by helicopter. Topley Landing Rd. burnt Cabin Rd, Telkwa-Babine Lake Road were closed to traffic. Hwy 16 was closed for over 24 hrs. CNR reported problems with bridges being in danger.
1968	Flooding	high	Spring Runoff	Transportation	Warm weather with temperatures in the high 70s F (ca. 26o C), coupled with two days of warm rain brought rivers in the Bulkley Valley to the flood level. On May 20-21, the Bulkley, Telkwa, and Buck rivers went on the rampage. The Bulkley River was at its highest level since 1964. On May 20; floods threatened four families in Houston. Late on May 20 the approaches to Buck River washed out. The Buck River, fed by a heavy snowpack in an area denuded by a forest fire in 1961, was at its highest level in several years. The four families, who sustained about \$5,000-6,000 property damage, were evacuated. In Houston, a general store suffered extensive stock damage to stored winter goods. Traffic across the temporary Bailey bridge, just east of Houston, was halted for a while on May 20 as the approaches were threatened. On May 23, Buck River was reported to have dropped about 2 in. (5 cm) in the past 24 hours. Water was still 6-8 in. (15-20 cm) deep on some of the secondary roads. Logging operations were affected when a bridge on the Owen Lake Road south of Houston washed out.

Year	Event Type	Severity	Cause	Impact Effect	Description
1972	Flooding	moderate	Spring Runoff	Transportation	The Houston bridge washed out, making a 70-mi. (112 km) detour necessary. High water washed out the foundations of the Walcott footbridge west of Houston.
1983	Wildfire	High	Human caused	Transportation, Residential Evacuation	In May of 1983 a fire started by some fishermen smoking fish started a forest fire that in three days burned some 16,000 hectares, caused the evacuation of some 50 families in the Buck Flats area south of Houston, burned 2 farms and even threatened the community of Houston for a time. (Grainsle, 2007)
1986	Flooding	high	Spring Run Off Heavy Rain	Transportation	In the five days between June 15-19, Houston recorded 73.9 mm of rain. Heavy precipitation on the evening of June 14, continuing through to mid-day June 15, resulted in accelerated snowmelt. It caused flood flows in many local watercourses, including the Bulkley and Telkwa rivers. Floodwaters were reported to have risen more than 25 ft. (7.5 m) above normal level before receding. Further heavy rain on June 16 sustained these high flows.
1995	Severe Weather	moderate	Heavy Snow	Residential and Industrial damage	In Houston, one barn and the old BC Hydro building at 11th Street collapsed.
1995	Flooding	low	Spring Run off	Transportation Residential	On the evening of May 14, Buck Creek came close to washing out a section of Houston's diking system. Near the end of Haftner Road, off Riverbank Drive, a sharp corner of the dike was half washed out. Thanks to the call from a concerned resident, works crews managed to shore up the dike before Buck Creek could break through. Had crews been informed any later, the dike at this point might have burst, flooding nearby residences.

Year	Event Type	Severity	Cause	Impact Effect	Description
1997	Flooding	high	Spring Run off	Transportation	In the middle of May, a hot spell caused snow to melt at higher elevations and flooding. Unusually warm temperatures that melted snow faster than normal caused the heavy runoff. After floodwaters went over its tracks at several locations around Houston, CN Rail closed its northern main line. The Bulkley River rose threateningly high at the overpass west of town. The river was rising at about 1 in. (2.5 cm) an hour. Construction started on a dike to keep the Bulkley River from flooding the town. A dike, 2.5-km long and 2.5 m high was holding back 500 ac. (200 ha) of water at least 2 m deep. By the evening of May 14, Buck Creek was also rising rapidly, and Henry Creek was flooding the bottom of East Valley Road, surrounding nearby homes. A number of residents left their homes. On May 14, Houston high school students were excused from classes to fill sandbags. Some 150,000 sandbags had been used, with more on the way. At about 11 a.m., the gas main in town broke and four blocks had to be temporally evacuated. At 5 p.m., the new dike finally tied in with the existing one. The river was threatening to top another dike and had to be reinforced.
2002	Flooding	low	Spring Run off	Transportation Residential Evacuation	On May 23, heavy rains caused rivers and creeks to jump their banks in the Houston-Smithers area. The Bulkley River rose 75 cm over 24 hours. Excavators in front of bridges were pulling logjams and debris to prevent damage. In the District of Houston, floodwaters were right up to the doorsteps of some places, forcing four residents to evacuate their homes. Protective dikes built after the last serious flood in 1997 were holding and helped to reduce the impact of the water. Water also covered a section of

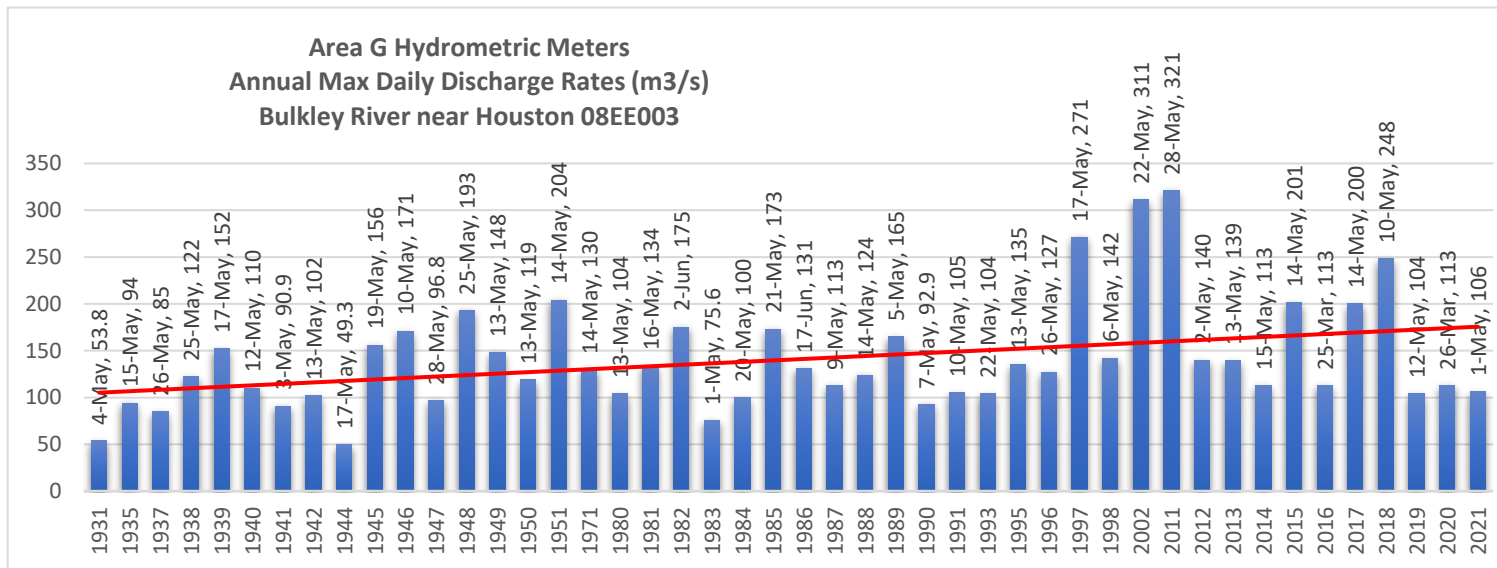
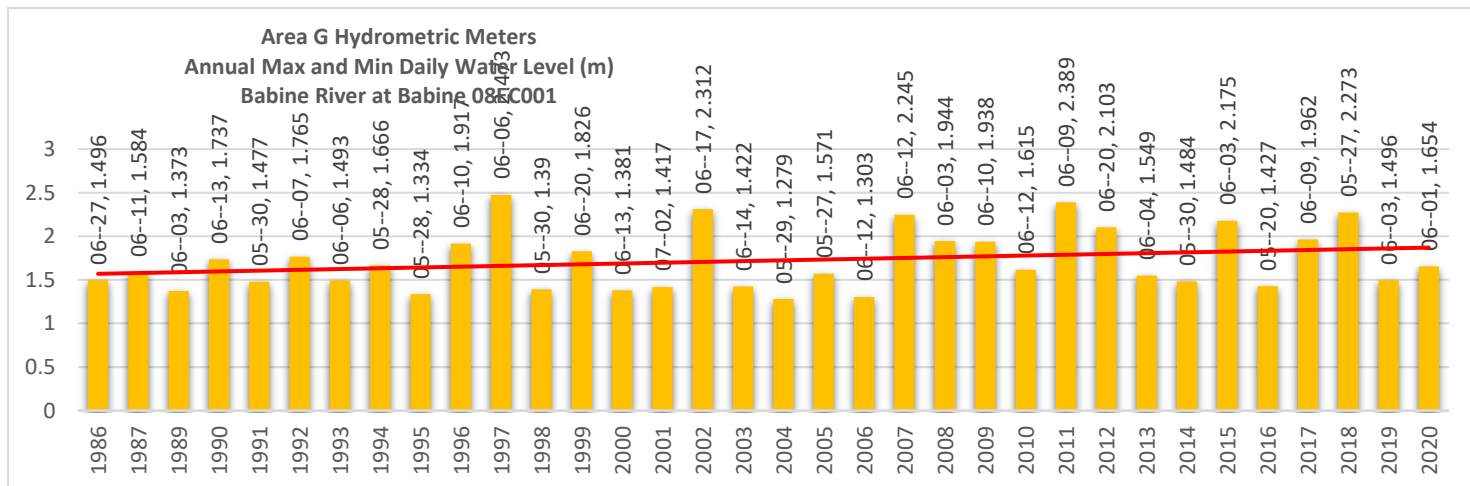
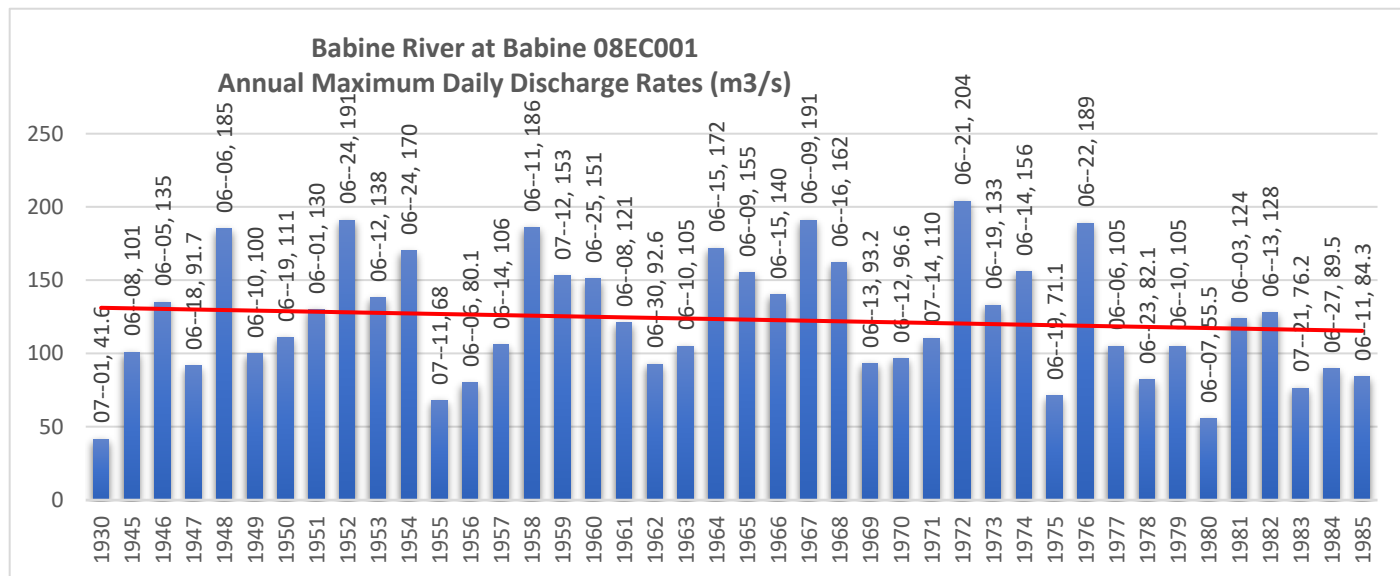
Year	Event Type	Severity	Cause	Impact Effect	Description
					Highway 16 east of Houston. Two CNR bridges were threatened, and farmers moved animals to higher ground. In Smithers and Telkwa, sandbagging continued in low-lying areas as water levels rose.
2002	Severe Weather	low	Spring Run off	Transportation Residential Evacuation	On May 23, heavy rains caused rivers and creeks to jump their banks in the Houston-Smithers area. The Bulkley River rose 75 cm over 24 hours. Excavators in front of bridges were pulling logjams and debris to prevent damage. In the District of Houston, floodwaters were right up to the doorsteps of some places, forcing four residents to evacuate their homes. Protective dikes built after the last serious flood in 1997 were holding and helped to reduce the impact of the water. Water also covered a section of Highway 16 east of Houston. Two CNR bridges were threatened, and farmers moved animals to higher ground. In Smithers and Telkwa, sandbagging continued in low-lying areas as water levels rose.
2002	Flooding				Houston District – Washed out Driveway/Road; Lot 2622 Hwy 16, 15 km east of Houston Perow Creek; A homeowner has been in touch regarding the loss of use of the driveway to her house due to flood waters from Perow Creek. The house is safe as the water is about 100 ft from it. The river is running over the bank into the property's lower pasture and has washed out the driveway and cattleguard leaving no safe access to the road. In order to access the highway they have to walk down the driveway and then out over 800 ft. of railway track. No one can get into the

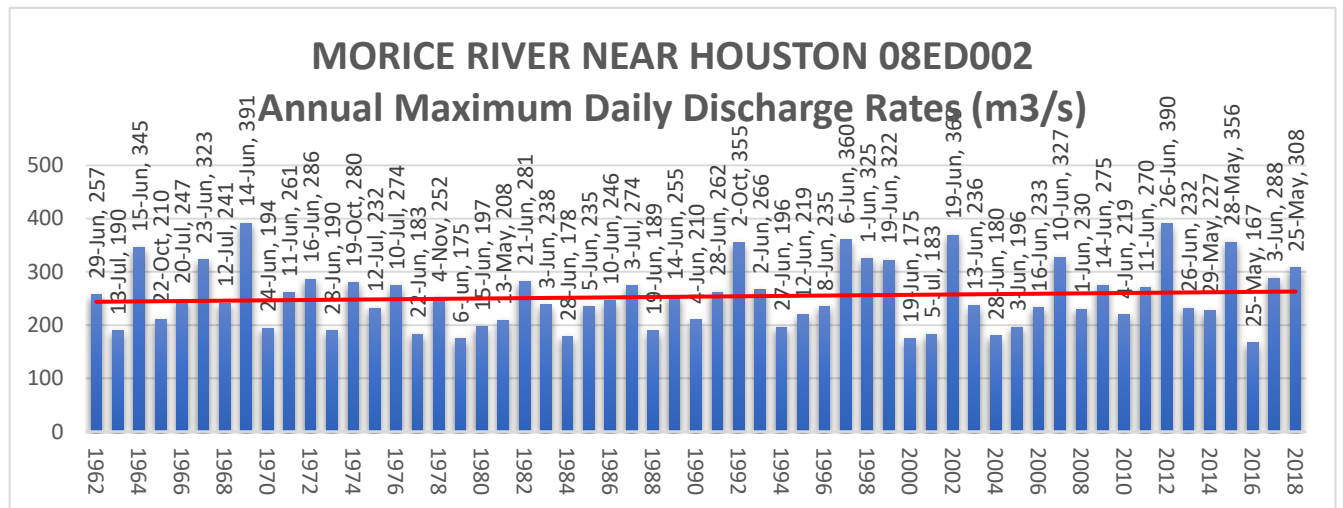
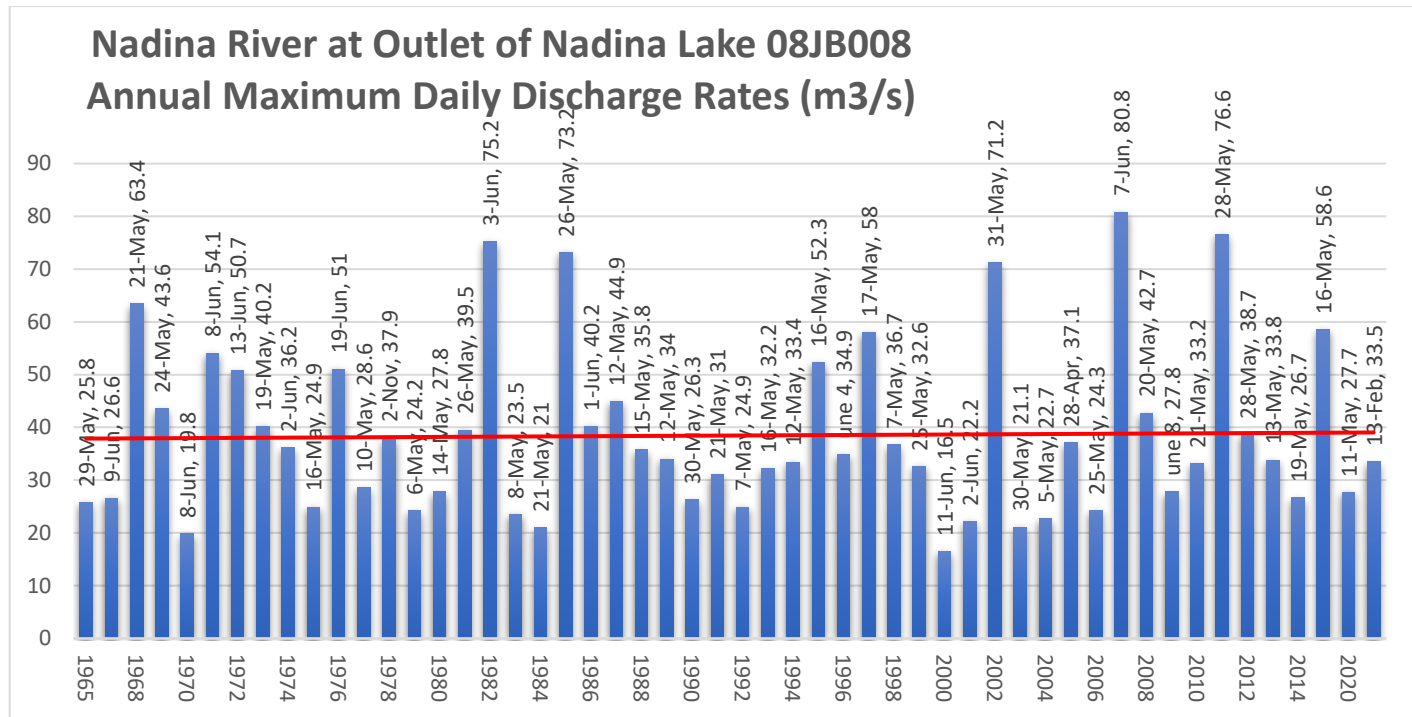


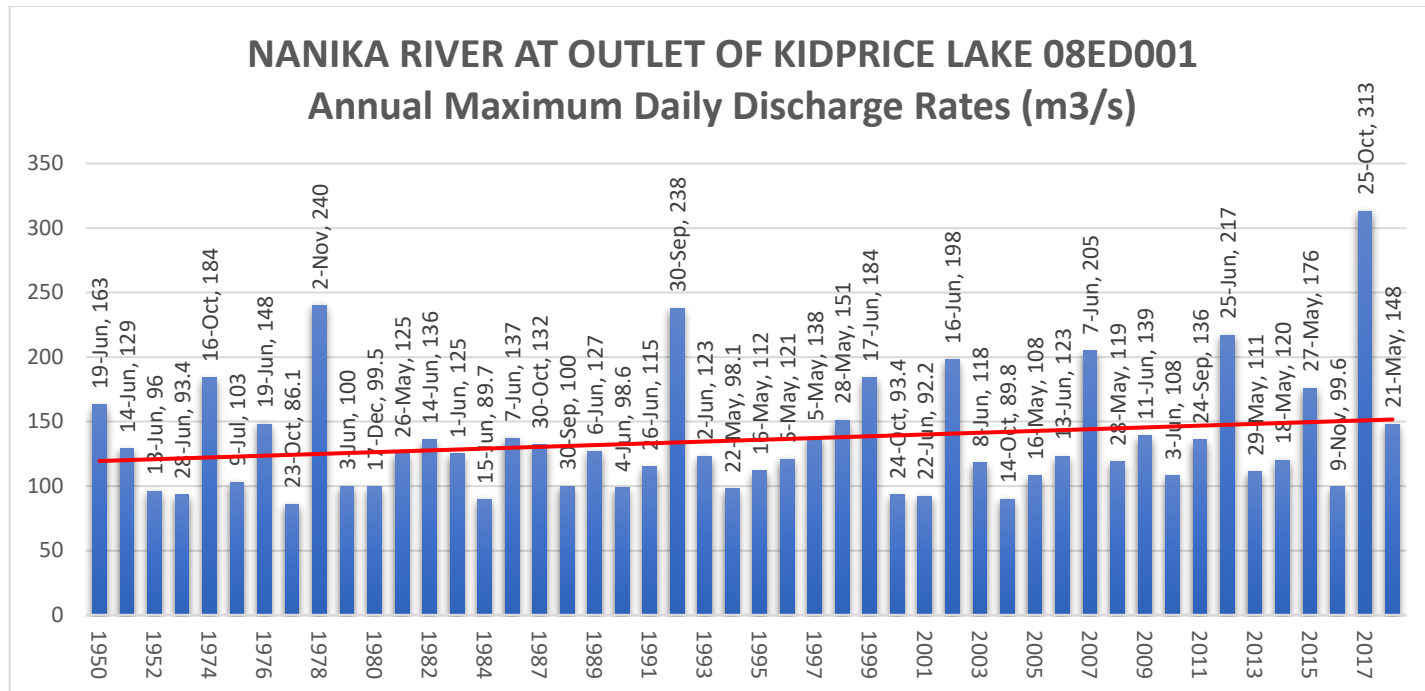
Year	Event Type	Severity	Cause	Impact Effect	Description
					property to sandbag as the access is washed out.
2004	Wildfire - EOC Activation	low	Lightning Caused		120 Hectares
2004	Wildfire - EOC Activation	low	Lightning Caused		2 Hectares
2004	Wildfire - EOC Activation	low	Lightning Caused		140 Hectares
2005	Flooding	low	Ice Jam		45-day activation Houston Bulkley River Ice Jam
2009	Wildfire - EOC Activation	moderate	Interface Fire East of Morice Lake	Transportation, Residential Evacuation	August 2, 2009, the Regional District of Bulkley-Nechako issued an evacuation order for persons residing in the area from the eastside of Morice Lake to the west side of Parrott Lake, North from Aspen Recreational Area to the Southside of Nadina, west of Morice River Forest Service Road and North of Morice River. The Regional District of Bulkley-Nechako has evacuated 5 homes in the area and put 127 homes on one hour evacuation alert. Evacuation Order rescinded Aug 11.
2010	Wildfire - EOC Activation	high	Interface Fire	Residential Evacuation	First alert issued Aug 15, upgraded to an Order on Aug 18. Aug 24 changed to an alert. 93 Homes in Evacuation Order, 123 in Evacuation Alert area. Reception Centres opened in Houston and Burns Lake 4 Roads block off to the public-Carroll Road, West Francois FSR, Roses Road, and Maurice River Road. Rescinded Order Aug 24.
2010	Flooding		flooding		Houston Bulkley River Ice Jam Task # 54869
2011	Flooding	high	Flooding		Evacuation Order was issued for Maxan and Bulkley PO, Severson Rd. May 19th- Order rescinded May 22. Harmatti Rd evacuation alert on May 22- rescinded May 25. Evacuation Alert

Year	Event Type	Severity	Cause	Impact Effect	Description
					May 25 for North Bulkley PO Alert on May 27 for Harmatti Road, Rescinded May 28, Evacuation Order on Severson Road May 27, Rescinded May 28.
2012	Flooding	low	Ice Jam Flooding	Transportation	Some residents had flooding, but no evacuations were issued. Some road blockage/re-routing in area
2013	Flooding		Freshet	Morice river flooding	
2014	Wildfire - EOC Activation		Wildfire	Residential Evacuation	China Nose (3,450 hectares), 15 km southeast of Houston; resulted in Evacuation Orders and Alerts
2016	Flooding		Flooding	Residential	July 15, 2016 - Flooding off Sam Rd, near Richfield Loop Rd. Topley
2017	Flooding	Moderate	Spring Freshet	Residential Evacuations and transportation	May 24 <sup>th</sup> 2017, May 12 <sup>th</sup> <a href="#">Alix Frontage Road</a> and parking lot flooded due to the heavy down pour of rain. sent out sand and sand bags to East Valley Road and Alix Frontage Road. Most of the water was coming from all around them. District offered people on Alix Frontage Road, if they lost their water and sewer, rooms in town for up to 72 hours.
2018	Wildfire - EOC Activation		Wildfire	Residential Evacuation	In 2018 Nadina Lake wildfire: 86,767 hectares, originated 40 kilometres south of Houston, the largest fire within the Nadina District in 2018.
2018	Wildfire - EOC Activation		Wildfire	Residential Evacuation	Wildfire Morice Lake Fires 9 people activated task # 102087
2020	Pandemic	moderate	Pandemic	Social economic	COVID-19 Pandemic, Business shut down and restrictions on gatherings and inter-community travel.

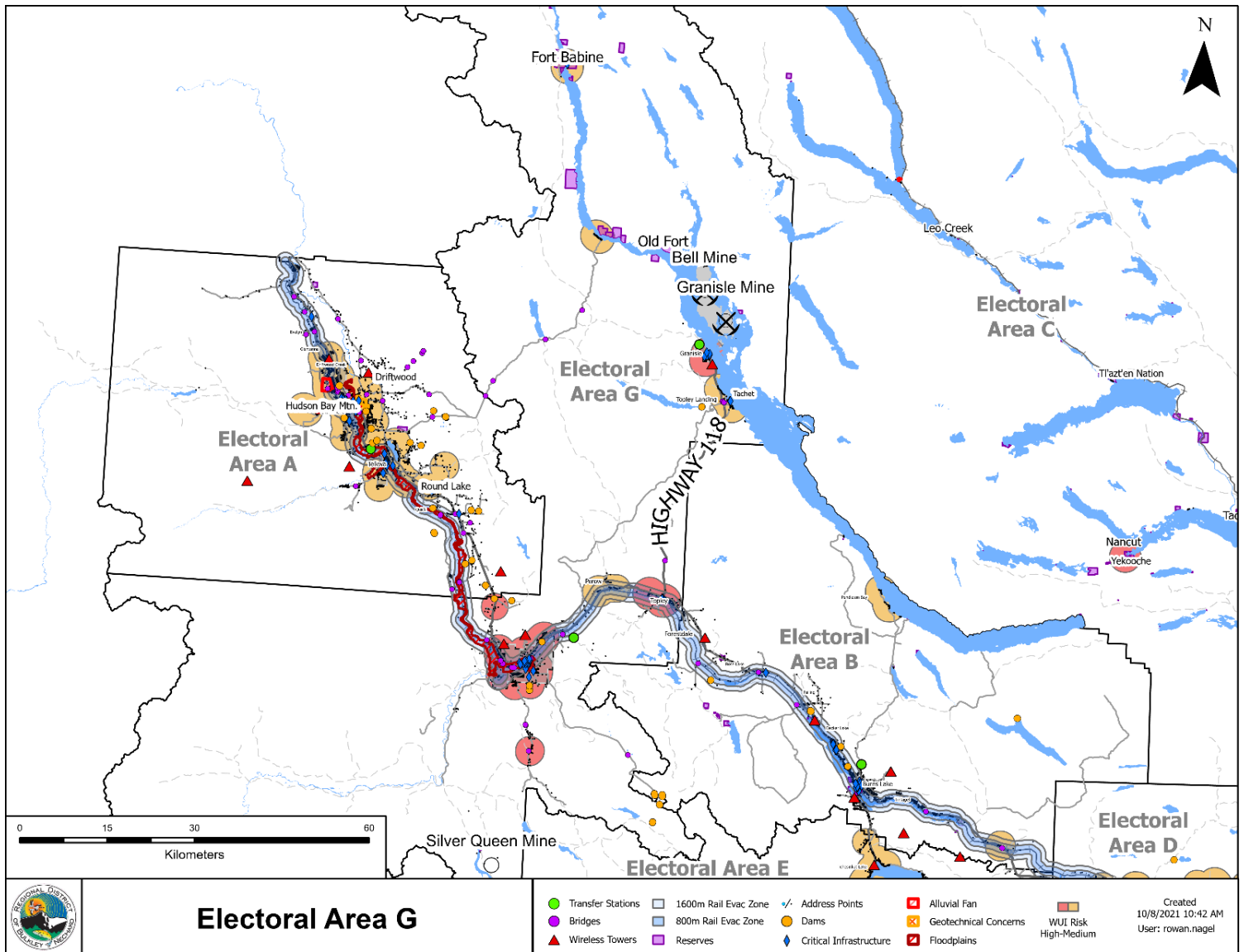
## APPENDIX 2 – ELECTORAL AREA 'G' HYDROMETRIC DATA



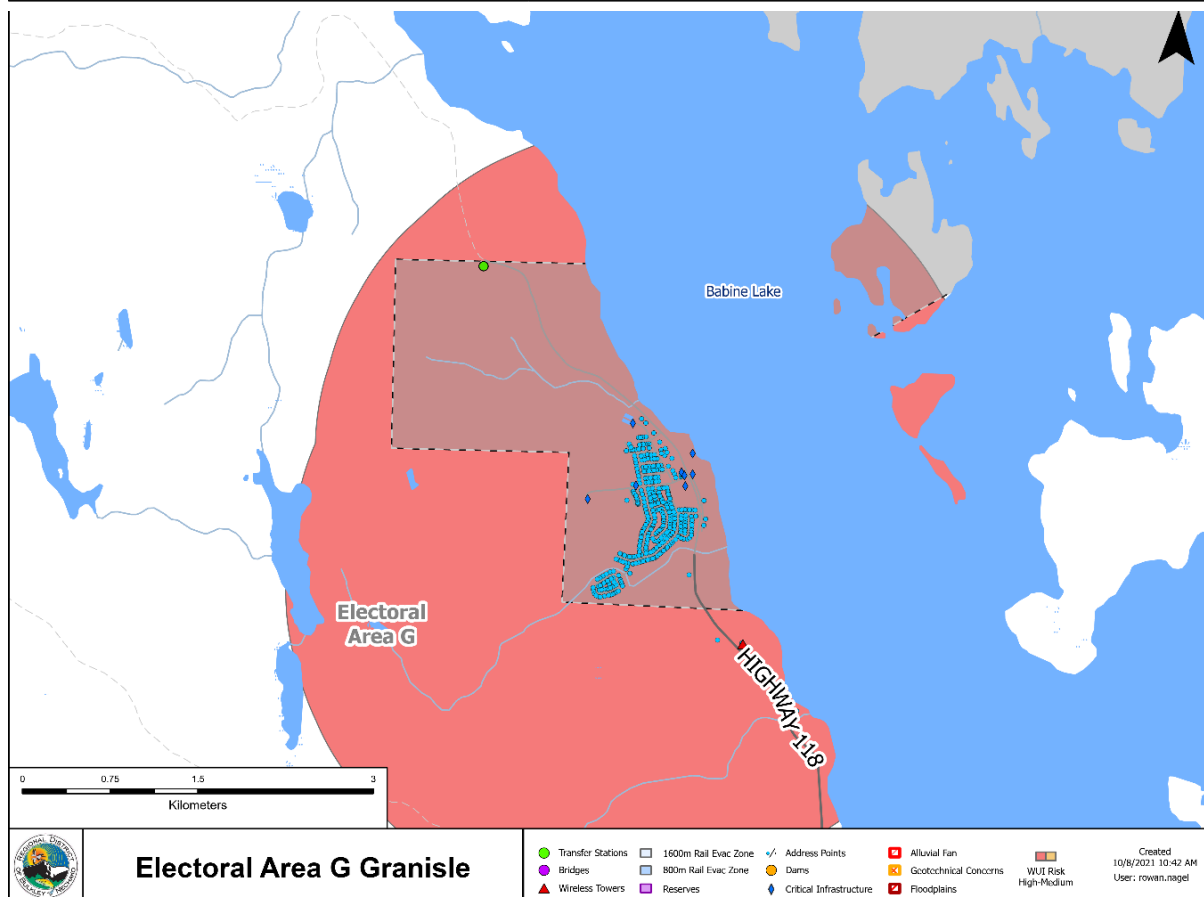
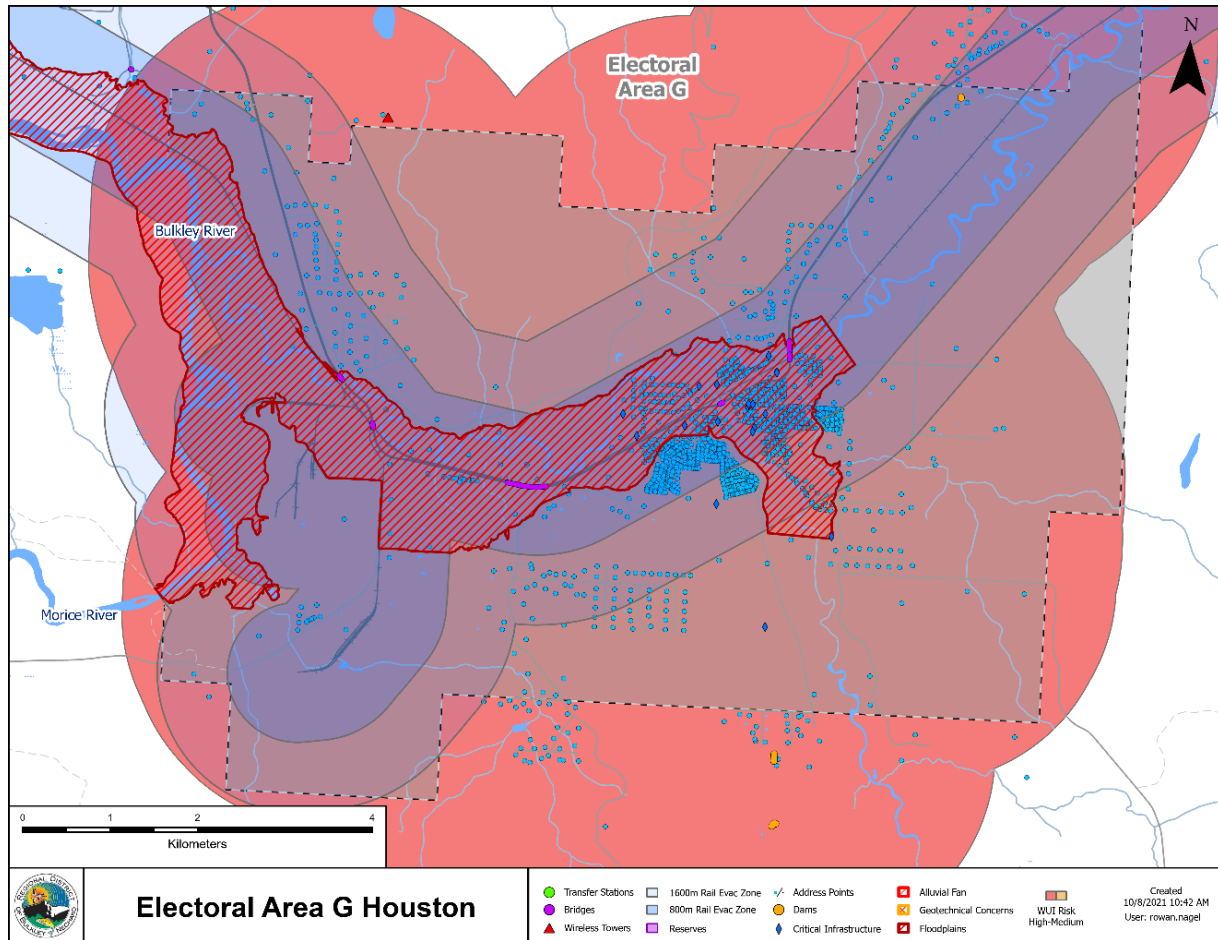


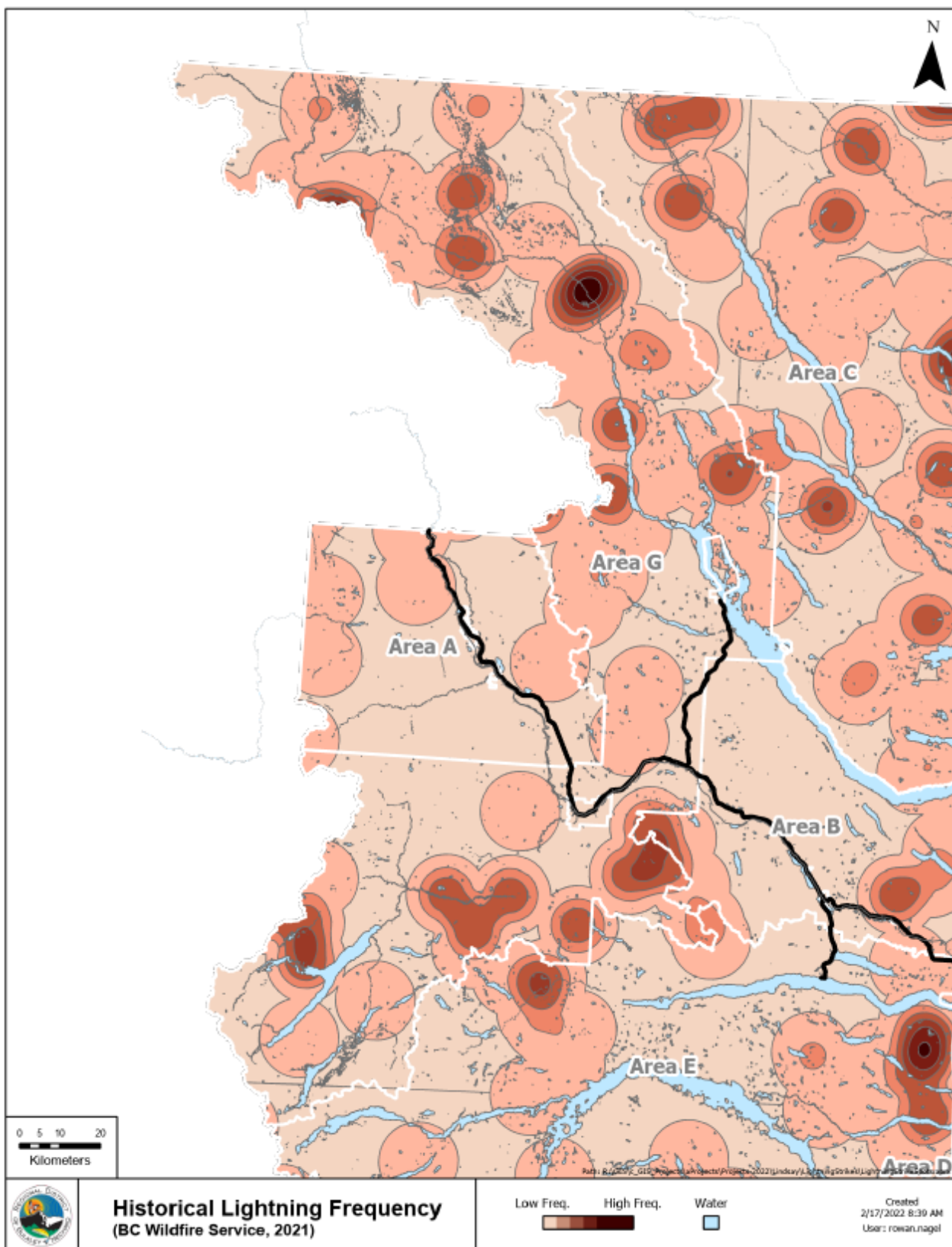


## APPENDIX 3 – ELECTORAL AREA 'G' KNOW HAZARDS MAP









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