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CLIMATE RISK AND RESILIENCE ASSESSMENT REPORT

RAYMOND

QUEST

FUNDED
BY:



Acknowledgements

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QUEST is a national non-government organization that works to accelerate the adoption of efficient and integrated community-scale energy systems in Canada by informing, inspiring, and connecting decision-makers. The organization commissions research, communicates best practices, convenes government, utility, and private-sector leaders, and works directly with local authorities to implement on-the-ground solutions. QUEST recognizes communities that have embraced these principles by referring to them as Smart Energy Communities. Visit us at www.questcanada.org

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Executive Summary

What this Report is About

The Climate Risk and Resilience Assessment Report assesses the overall resilience of the Town of Raymond to extreme weather events in the context of climate change. The report includes a review of the anticipated impacts of climate change in the decades to come, associated hazards, and an assessment of the resilience of the community to these events. The assessment identifies assets at risk, areas of strength, and potential opportunities for improvement.

This report is part of the “**Planning for Resilient Smart Energy Communities in Alberta**” project (2020) led by QUEST with funding from the Commission for Environmental Cooperation. The project supports four municipalities; Town of Black Diamond, Ponoka County, Big Lakes County and Town of Raymond, across Alberta to develop a climate risk and vulnerability assessment, using a combination of validated tools and methods.

This report is built on:

- The results of a Community Baseline Survey sent to municipal staff with the aim to identify policies in place, gaps, and collect other relevant information to prepare the workshop;
- The results of an Engagement Survey (consisting of the United Nations (UN) 10 Essentials and the Local Resilience Exercises) to gather individual perspectives on areas subject to specific hazards as well as assets and facilities at risk;
- A virtual community engagement session (Workshop 1) attended by five participants representing diverse stakeholder groups, including Emergency Management Organizations (EMOs), municipal staff from various departments and regional organizations. This half-day virtual workshop consisted of reviewing and discussing the results of the completed Community Baseline Survey and Engagement Surveys, as well as a group action planning exercise.

With these results, QUEST developed an analysis of the municipality’s strengths, gaps, and opportunities to improve resilience and adapt to a changing climate. These results will be used to develop tailored recommendations for the Town of Raymond.

Municipalities can strengthen their resilience to extreme events by making improvements to their planning and engineering, emergency preparedness and water management plans. These weather patterns may threaten the integrity of infrastructure such as roads, bridges, water supply, and telecommunications, most of which have not been built to withstand future extremes. Emergency preparedness, planning and construction practices for retrofits and new development that take into account the new climate reality can increase a municipality’s adaptive capacity. Acting now will reduce economic risk and save on the rapidly increasing long-term damages and costs associated with climate change.

Who is it Intended For?

This report is intended to inform municipal staff and Councilors about:

- the types of hazards associated with increasing extreme weather events
- areas, assets, and facilities at risks
- the level of preparedness of the community to mitigate risks associated with these events

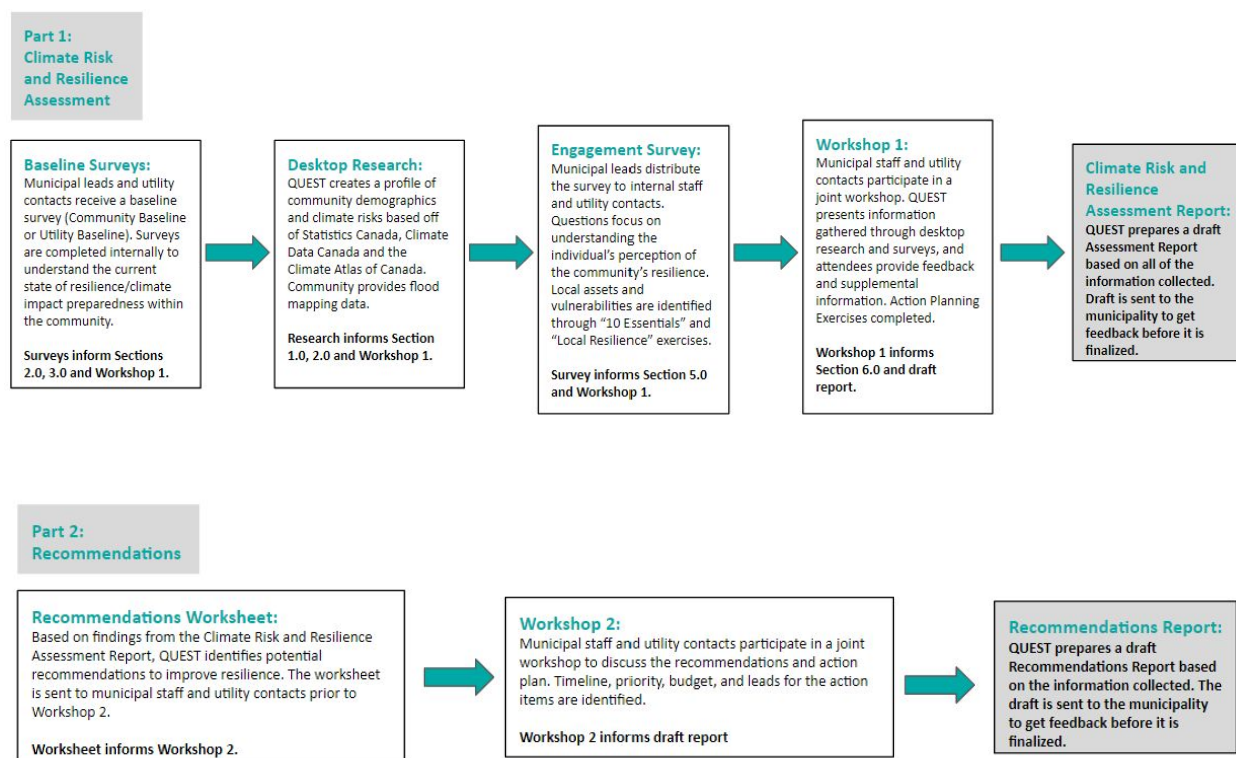
The report is intended to be used to inform future planning decisions and provides a benchmark to measure and monitor progress in developing and implementing resilience or adaptation strategies (i.e., to determine where improvements were made or may still need to be made).

QUEST appreciates the opportunity to work with the municipality and local stakeholders to help improve resilience and adapt to climate change.

What are the Next Steps?

This report (Part 1 of the Alberta Resilience Project) presents results that illustrate climate risks to Raymond, and the municipality's current state of resilience. Part 2 of the project extends this assessment work to prioritize action items that will improve the community's resilience and will be delivered to the communities in late fall 2020. Data collection and participatory workshop stages are displayed in the timelines below (Figure 1).

Figure 1. Timeline of the Alberta Resilience Project.



Summary of Key Findings

Based on the results of the Community Baseline Survey, the Engagement Survey and Workshop 1, the Town of Raymond is most concerned with the hazards presented in Table 1. All of these hazards may be exacerbated by climate change (see Section 2.4: Climate Projections).

Table 1: Major Hazards

Hazard Types	Description
Hydrological Hazards	Overland flooding is a major hazard. In 2013 the Town was very close to experiencing an extreme event caused by heavy rainfall and flooding. The Town has since completed a large-scale drainage project that can divert 271+ha of water away from the community. Climate projections indicate that Raymond will see an increase in precipitation, which may result in increased frequency and intensity of floods. The Town is used to experiencing dry and wet seasons, however projected increased temperature and precipitation will intensify these dry and wet periods.
Atmospheric Hazards	Annual high intensity winds from the nearby Pincher Creek area can damage infrastructure and cause injuries. Climate change will increase the frequency and intensity of extreme events, and wind storms may be more common in the future. The Town has not seen new maximum temperatures in the past 3 years, nor have there been heatwaves. However, climate projections indicate average and maximum temperatures will increase, with the number of hot days quadrupling.
Hazardous Material Spills	There are no specific speed limits in place for trucks carrying hazardous materials. The fire department is not aware of the type/quantity of material transported.
Grass Fire, Brush Fire, Forest Fire Wildland-Urban Interface Fires	Increased instances of fire are possible with dryer summer and fall conditions and increased frequency of extreme weather (e.g. lightning, drought). The Town is surrounded by agricultural land which may be at risk of grass/brush fire. The province has experienced some large and out-of-control grass, brush, and forest fires over the last few years.
Power & Water Outages	Water outages and drought in the summer and fall may become an increased risk to the Town. Climate projections indicate an increase in mean and maximum temperatures, as well as a quadrupling of hot days. These future temperatures will pose threats to water supply. Power outages have not been frequent in the area and the Town has improved energy self-sufficiency through solar installations. Climate change will serve to increase extreme events like flooding, wildfires, and wind storms, all of which pose threats to above ground electricity infrastructure.

Based on all data collected and conversations with the community, the Town of Raymond considers itself to have very strong emergency preparedness procedures and energy systems in place. Participants expressed that there is strong interest in understanding where the municipality has room for improvement, and using that information to plan and act to improve resilience. The importance of communication and coordination, both internally and with external stakeholders, was emphasized as

being critical. Workshop attendees spoke with pride about Raymond's leadership in solar photovoltaics (PV) and emergency preparedness, and expressed interest in building expertise in climate change resilience. Table 2 below further highlights these strengths and potential areas for improvement. A comprehensive review of the hazards of concern, areas of strength and opportunities for improvement is outlined in Section 8: Summary of Results.

Table 2: Description of strengths and areas for improvement

Areas	Key Strengths	Key Areas for Improvement:
Vegetation	<p>The utility undertakes tree trimming to protect power lines and prevent outages.</p> <p>Powerlines for new subdivisions/development are put underground.</p> <p>Mutual Aid Agreement for fire response with other communities in Southern Alberta.</p> <p>The fire crew uses small pumper trucks for fast and economical response to brush fires.</p> <p>A Fire Prevention and Evacuation Plan is also in place.</p>	<p>Existing power lines for some key facilities are above ground.</p> <p>Ecosystem protection/natural buffers not considered in plans.</p>
Planning, Organization & Coordination	<p>Emergency Response Plan (ERP), Communications Plan, Land Use Plan, and Environmental Strategic Plan in place.</p> <p>The Town also has a standalone Solar Net-Zero Plan.</p> <p>Contact tree and annual meetings with utility.</p> <p>Raymond has alliances with local partners and neighbouring communities.</p> <p>Regular emergency response drills completed. Gradually building stockpile of emergency supplies.</p>	<p>Asset Management Plan underway but expensive to develop.</p> <p>No Climate Change Plan, no Resilience Plan, and no Community Energy Plan.</p> <p>The Land Use Plan does not take into account flood risk.</p> <p>No inventory of skills and resources.</p> <p>No budget for proactive risk reduction.</p>
Communications & Awareness	<p>The Town informs the public about what to do during an emergency.</p> <p>Agreement with the Southern Alberta HAM radio organization to enhance communication during times of</p>	<p>There has been limited climate change/resilience public education up to this point.</p> <p>No plans to reach vulnerable populations (homeless, low income, etc.) and limited coordination with the long-term care/health</p>

	<p>emergency/evacuation. Regional mobile Emergency Operations Centre for Communications is under development.</p> <p>Current Emergency Operations Centre (EOC) is based out of Town Hall which has backup power.</p> <p>Emergency crews can tap into the provincial emergency network and also have a local backup channel.</p>	<p>facilities responsible for evacuation.</p>
Energy Infrastructure	<p>Raymond is a net-zero community with a well-established solar power system.</p> <p>Investments in renewable energy, energy efficiency retrofits, and backup generators have been included in municipal budget.</p> <p>The only pipeline in the area is for local natural gas use and distribution.</p> <p>Hospital has backup power</p>	<p>The Town is unsure of oil and gas company monitoring and pipeline upgrade plans. However, the utility confirmed that monitoring does take place.</p> <p>Need a formalized, written list of all facilities with backup power/capability for backup power.</p>
Water and Wastewater Systems	<p>The municipality has substantial flood diversion berms and uses the golf course as a floodway in extreme events.</p> <p>Water treatment plant has solar panels with high levels of automation and innovation.</p> <p>Distributed water system with separate stormwater system.</p> <p>The Town is in the process of expanding the sewage lagoon.</p> <p>Water Bylaw gives the Town the power to manage water use during drought.</p>	<p>No plan to provide potable water to residents if the main water source is lost.</p>
Transportation	<p>Town has identified high school buses which could be used during an evacuation, in addition to resident carpooling.</p> <p>The Town has a strong interest in electric vehicles, including trucks, golf carts, and a zamboni.</p> <p>Solar car park can be used as hail protection.</p> <p>Measures are in place to make problematic road areas safer.</p>	<p>Limited communication/coordination with health facilities and handi-bus society in town for emergency response/evacuations.</p> <p>No reduced speed limits for areas where hazardous materials are transported. Fire department not aware of type/quantity of material transported.</p>

There are no active railways in the area.

There is more than one transportation corridor in/out of the city.

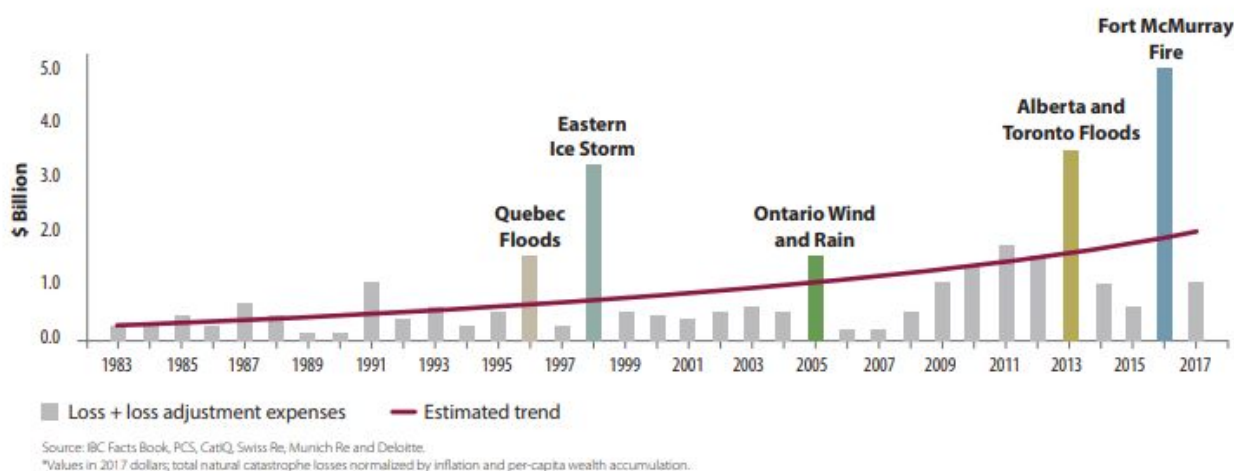
Trucking hazardous materials is restricted through the Town's Transportation Bylaw.

1.0 Introduction and Project Presentation

1.1. Climate Changes and Catastrophic Losses in Canada

Municipalities across Canada are already faced with climate change impacts, such as extreme winds, ice storms, flooding, droughts and forest fires. According to the Insurance Bureau of Canada (IBC), the costs associated with damages to property and infrastructure are rising¹. Risk exposure may increase with climate change, if greenhouse gas (GHG) emissions continue to rise globally unabated. This will inevitably require municipalities to adapt.

Figure 2: Catastrophic Losses in Canada over time



Source: Insurance Bureau of Canada

At the same time, nearly 90% of Canadian energy utilities have been significantly impacted by an extreme weather event in the past decade². Both municipal systems and energy distribution systems are essential, interconnected and must work together to maintain the resilience of a community. Reliable energy supply is needed to maintain the essential functions of municipal infrastructure and services such as:

- water and wastewater treatment,
- heating and cooling of buildings,
- operating vehicle fleets and maintaining street lighting,
- powering emergency shelters,
- health services,
- communications and transportation infrastructure,
- food production, and
- financial systems.

¹ Several IBC studies assess the increased claims frequency and severity resulting from severe weather and natural disasters. For more information, visit IBC webpage on : <http://www.ibc.ca/ns/resources/studies>.

² QUEST's [Resilient Pipes and Wires](#) report

When energy supply is interrupted, especially for prolonged periods, this has a cumulative impact on a community, from impacts on business, to public health and safety, to property and infrastructure.

There is a need to develop and utilize Canadian methods and tools in order for municipalities and utilities to adapt their systems.

1.2. The Project

This report is part of the “**Planning for Resilient Smart Energy Communities in Alberta**” project (2020) led by QUEST with funding from the Commission for Environmental Cooperation. The project supports four municipalities; Town of Black Diamond, Ponoka County, Big Lakes County and Town of Raymond, across Alberta to develop a climate risk and vulnerability assessment, using a combination of validated tools and methods.

This project refers to **community resilience** in terms of what is in place and what may be needed for a community to mitigate risk from prolonged interruptions to energy supply on essential community services and bounce back from climate impacts or extreme weather.

Each community receives an assessment (this report) in 2020 and a set of recommendations for improving community resilience and adapting to climate change, tailored to the local context (second report in 2020). See Figure 1 for visual timeline. All lessons learned will be compiled by QUEST into a final Primer on Extreme Weather Events on Energy Infrastructure report in 2020, to be shared with other municipalities across Canada.

1.3. Methodology and Data Collection

1.3.1. Data Collection

A Baseline Survey was conducted to gather information about community policy, plans and operational processes. The survey was circulated to municipal staff as well as utility contacts, to gather an accurate representation of all the departments and services. The purpose was to determine potential strengths and areas of improvement in each municipality, including energy-dependent municipal services. Focus areas included: organization, communication, planning/land use, energy infrastructure (electricity and oil & gas), water/wastewater, transportation and vegetation management. Information collected included the municipality’s and utility’s current state of resilience, consideration of climate change, and policies/measures in place to reduce risk.

Desktop research was also conducted to create a profile on community demographics and climate threats. QUEST compiled climate data projections for each municipal area, including indicators for

temperature, precipitation, freeze-thaw, heating degree days and cooling degree days. This includes projections for 2020, 2050, 2080-2100, using a business as usual (RCP 8.5³) scenario, where GHG emissions continue to rise at the current rate. Data sources included Statistics Canada, Climate Data Canada, and the Climate Atlas of Canada. Geospatial data from federal, provincial and municipal open data portals was also collected in order to prepare maps of each community, showing land use, flood risk (where available) and key infrastructure. All of this information was used to provide context during virtual Workshop 1.

An Engagement Survey was also conducted with the municipal staff and local utilities to complete two activities involving the federally endorsed tool from the UN International Strategy for Disaster Reduction 10 Essentials for Making Cities Resilient. A Local Resilience Exercise was used to identify hazards, vulnerabilities, strengths/assets, areas for improvement, land use restrictions and transportation enhancements within the community.

The results of the surveys provided context during Workshop 1. Results were shared with all participants, which led to interactive knowledge sharing and additional information gathering which was captured in this report. Please contact QUEST for a copy of the surveys.

1.3.2. Workshop 1

Once the above data were collected and analysed, QUEST prepared and facilitated a half-day virtual workshop in each community, engaging municipal staff and elected officials, energy utilities, and other key local stakeholders. This session was originally designed for in-person delivery, but the COVID-19 pandemic necessitated an adaptation to a virtual delivery. The workshop included context-setting presentations on climate change, resilience, emergency preparedness, energy utilities, and insurance trends. Collaborative discussions followed based on Community Baseline Survey and Engagement Survey results. The session ended with an Action Planning Exercise.

- Results from the Community Baseline and Engagement Surveys served as the starting point for collaborative discussion. Participants were asked to evaluate the preliminary results and provide feedback based on the self-assessed strengths and weaknesses, hazards and vulnerabilities within the community. Compiled scores for the 10 Essentials were also discussed. Areas of focus included: organization and coordination, assigning budget for risk reduction, conducting hazard risk and vulnerability assessment, investing in infrastructure adaptation, assessing the safety of schools and hospitals, applying risk compliant building codes and land use planning principles, ensuring training is in place, protecting ecosystems, developing emergency management capacity, and building back better post-disaster. The results were then updated and finalized accordingly.

³Representative Concentration Pathways (RCPs) are used to model future climate change. These use plausible human greenhouse gas emissions patterns (low, medium, high). RCP 8.5 is the “business as usual” scenario where emissions are high and continue at the current rate.

- The facilitated Action Planning Exercise allowed participants to identify key outcomes and takeaways from the session, along with the community's needs, goals, and corresponding actions.

1.3.3. Analysis, Communication and Feedback

All these results were then used to prepare an analysis of the strengths and gaps in each community, in relation to each natural hazard (e.g. atmospheric, hydrological, forest fire, etc.), with assistance from the Rural Disaster Resilience Portal of Justice Institute of British Columbia. Based on this analysis, QUEST prepared and tailored this report to the local context of each participating community. Included is a summary of levels of risk and resilience to each natural hazard, and a summary of strengths and areas of improvement. A draft of this report was sent to the municipal lead for internal circulation and review, prior to its finalization.

1.3.4. Dissemination of Results

QUEST conducted an orientation webinar and monthly calls with the municipal lead of each of the four participating municipalities, as well as with project partners and local utilities. This allowed for project coordination, knowledge exchange, discussion of key challenges and opportunities, and review of materials on an ongoing basis.

This Climate Risk and Resilience Assessment Report will be shared with the Town of Raymond for internal use. Findings from this report will be used in Part 2 of the project, focused on recommendations for resilience improvements and action planning. Part 2 findings will be available in a report released at the end of 2020.

2.0 Community Profile

2.1 Geography/Location

The Town of Raymond is located in Southern Alberta, 30 minutes southwest of Lethbridge.



Source: Raymond, Alberta, Wikipedia

2.2 Population Characteristics / Trends

Municipal staff size: 20

Population Size: 4,241

Trend: Population experiencing increase in past years. Population percentage change from 2011 to 2019: 13.4% (Town census recognized by the Government of Alberta).

Total - Distribution (%) of the population by broad age groups

Age Group	% of population
0 to 14 years	27.3
15 to 64 years	57.0
65 years and over	15.9
85 years and over	2.3

Average age of the population 36.3

Median age of the population 34.2

Sources: Statistics Canada, 2016 Census

Median income:

Median Income	\$
Median after-tax income of one-person households in 2015	33,664
Median after-tax income of two-or-more-person households in 2015	75,922

Sources: Statistics Canada, 2016 Census

Education:

Highest Certificate, Diploma, or Degree (population 25 to 64)	# of people
No certificate; diploma or degree	185
Secondary (high) school diploma or equivalency certificate	470
Postsecondary certificate; diploma or degree	910
Apprenticeship or trades certificate or diploma	200

Trades certificate or diploma	70
Certificate of Apprenticeship or Certificate of Qualification	135
College; CEGEP or other non-university certificate or diploma	430
University certificate or diploma below bachelor level	50
University certificate; diploma or degree at bachelor level or above	225
Bachelor's degree	170
University certificate or diploma above bachelor level	0
Degree in medicine; dentistry; veterinary medicine or optometry	10
Master's degree	30
Earned doctorate	15

Sources: Statistics Canada, 2016 Census

Type of dwellings:

Type of Dwellings	# of dwellings
Single-detached house	1,050
Semi-detached house	20
Row house	15
Apartment or flat in a duplex	20
Apartment in a building that has fewer than five storeys	0
Apartment in a building that has more than five storeys	0
Other single-attached house	0
Movable dwelling	30

Sources: Statistics Canada, 2016 Census

Age of dwellings:

Age of Dwellings	# of dwellings
1960 or before	310

1961 to 1980	325
1981 to 1990	110
1991 to 2000	120
2001 to 2005	65
2006 to 2010	135
2011 to 2016	70
Major repairs needed	120

Sources: Statistics Canada, 2016 Census

2.3 Environmental Characteristics / Trends

Trend: The Town always irrigates its greenspaces and the amount depends on if the community is in a dry or wet year. Having experience with both dry and wet years is normal for Raymond, and patterns in fluctuation have not been identified. The most recent years of 2018 and 2019 were very dry and, to date, 2020 has been relatively wet. The Town has not seen new maximum temperatures recorded in the last 3 years, nor have there been heatwaves. No new minimum temperatures have been recorded in the last 3 years. Raymond does not regularly check with weather and storm forecasting agencies.

2.4 Economic Characteristics / Trends

Raymond is a small town in the heart of several agricultural communities, although agriculture is no longer a key part of the economy. The Town is trying to increase limited tourism by hosting activities and events to bring more people to town (e.g. live concerts, etc). Currently, there are no seasonal swings in population.

The health and education sectors are the largest employers in the community. The Raymond hospital continues to see expanded use, as does the extended care facility. Raymond is a health hub for rural communities in southern Alberta, including Lethbridge where there are long wait times.

There is high enrolment in elementary, junior and senior grades, which is indicative of many young families making Raymond their home (ages 13-31 is the largest demographic). The Town is waiting for provincial funding to build a new high school.

2.5 Energy Characteristics

The Town of Raymond is grid connected and is a solar powered net-zero community, as all of the municipal operational electricity needs are met via the solar PV installations on municipal infrastructure. Fortis AB supplies electricity and ATCO is the Distribution Facility Operator for natural gas. The Town is not a member of a Rural Electrification Association. There is no oil and gas development near the community, nor are there any refineries.

3.0 Key Hazards and Climate Projections

3.1 Introduction

To help with our assessment, QUEST compiled baseline climate information (for today's climate) and prepared a forecast of climate indicators specific to the community/region.

The forecast is based on the assimilation of climate data from Environment Canada, weather stations in the area, and 40 global climate models, grouped into three GHG concentration pathways (low, medium, and high/business as usual), with projections for 2020, 2050, 2080 to 2100. These have also been compared against available provincial data for future climate conditions. See details of modeling method in the Annex.

In this section we present a summary of the climate indicators and projections, for the business as usual scenario (where GHG emissions continue to rise at their current rate).

3.2 Current Climate

The annual average temperature in Raymond is 5.34°C. The warmest month, on average, is July with an average temperature of 17.8°C. The coolest month on average is January, with an average temperature of -7.9°C. The highest recorded temperature in Raymond is 37.8°C, while the lowest recorded temperature in Raymond is -42.7°C.

The annual average amount of precipitation for the year in Raymond is 438 mm. The month with the most precipitation on average is June with 99 mm of precipitation. The month with the least precipitation on average is November with an average of 16 mm.

3.3 Key Hazards of Concern

Hazards of most concern identified in survey and Workshop 1, include:

- Atmospheric (e.g. wind events, blizzards, ice storms, heat events, hailstorms, freeze-thaw cycles, growing season)
- Hydrological (e.g. ice jam flooding, rain storm flooding, snow melt flooding, flash flooding, and droughts)
- Power Outage/Fuel Shortage

In 2013, the Town nearly experienced an extreme overland flood event. As a result, Raymond received \$2 million from the Government of Alberta to invest in flood mitigation infrastructure. The Town sees annual high intensity winds from the Pincher Creek area. The financial and non-financial impact of these events has not been documented, but could involve damage to public infrastructure, private property, and injuries.

Other examples of recent events in Alberta, from the National Disaster Database, include:



Fort McMurray AB, April 30 to June 1, 2016. Wildfires broke out in northern Alberta resulting in the most expensive natural disaster in Canadian history. In total, the Fort McMurray fires burned approximately 579,767 hectares of land causing the evacuation of over 90,000 people and destroying 2,400 homes and businesses, as well as 530 additional buildings. At its peak, there were over 2,000 firefighters battling the fires daily, including helicopters and water bombers. In addition, 200 firefighters from the United States, 60 from Mexico and

298 from South Africa provided support. Estimated total cost: \$4,068,678,000. Two fatalities, 90,000 evacuated.



Southern Alberta, June 19-28, 2013. A massive storm system crept through Alberta causing significant flooding throughout the Southern part of the province. As of 2013, this event was responsible for the largest evacuation due to a natural disaster in Alberta's history. Heavy rain spanning a region from Canmore to Calgary produced an average of 75 to 150 mm during a three-day period. Twenty-nine local states of emergency were declared throughout the province and one provincial state of emergency. This is the first time a provincial state of emergency has ever been issued in Alberta. Four

deaths were attributed to the floods, which caused significant disruptions to power, telecommunications, water treatment and transportation corridors across the province. Over 4,000 businesses were affected and 3,000 buildings were flooded, including the Saddledome and the Calgary Zoo. In total, flooding forced the evacuations of approximately 100,000 Albertans. Insurance payments are estimated at \$1.2 billion. It's estimated to have reduced GDP in Southern Alberta by \$550 million (2013 dollars).

Source: National Disaster Database

3.4 Climate Projections

The general warming of the climate can increase the probability and frequency of extreme weather, including high winds, floods, hail, lightning, tornadoes, drought and wildfires. Municipalities can strengthen their resilience to extreme events by striving to improve their planning and engineering, emergency preparedness and water management plans.

These weather patterns may threaten the integrity of infrastructure such as roads, bridges, water supply, and telecommunications, most of which have not been built to withstand future extremes. Emergency preparedness, planning and construction practices for retrofits and new development that take into account the new climate reality can increase adaptive capacity. Acting now will reduce economic risk and save on the rapidly increasing long-term damages and costs associated with climate change.

The data below is based on current climate models and projections. A more detailed description on climate change modelling methods and indicators used in this report is included in the Annex.

Table 3: Summary of Climate Variables for the Town of Raymond

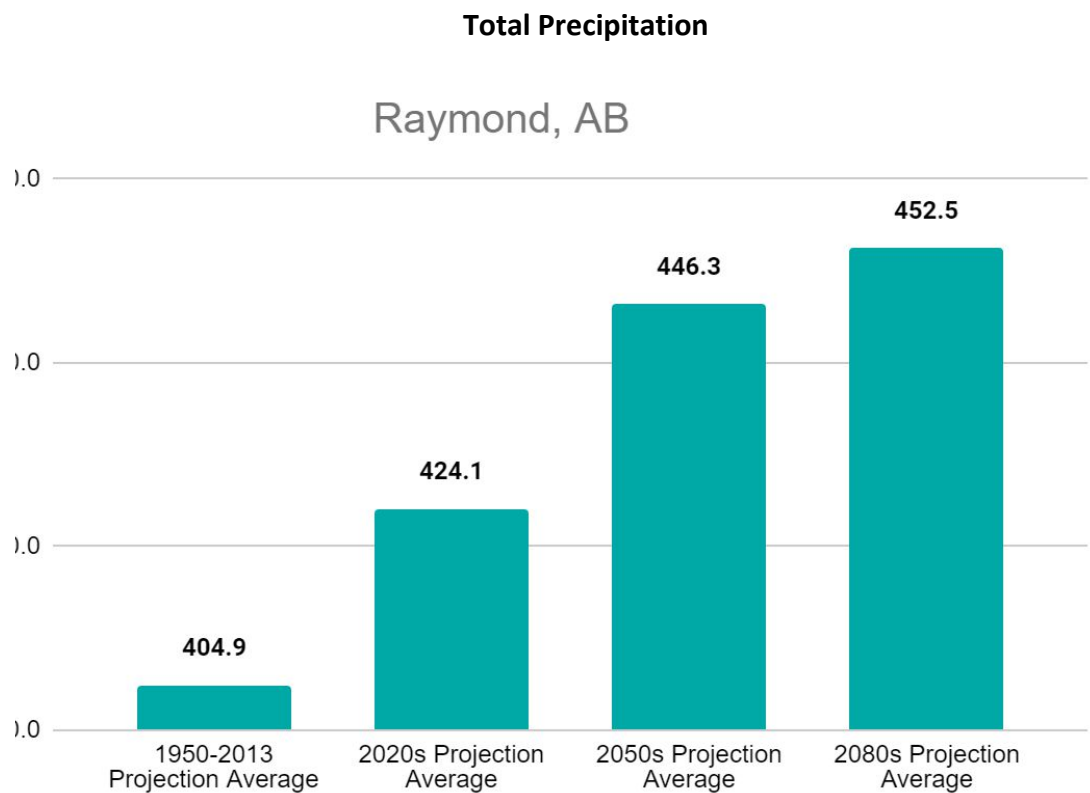
	1950-2013 Average	2020s Projection Average	2050s Projection Average	2080s Projection Average
Mean Temperature (°C)	5.6	7.7	9.6	11.6
Max Temperature (°C)	12.1	14.1	16.0	18.0
Min Temperature (°C)	-0.8	1.3	3.3	5.2
TMin < -24 C	10.5	4.7	1.3	0.0
TMax > 29 C	21.3	39.2	61.1	84.0
Total Precipitation (mm)	404.9	424.1	446.3	452.5
Precipitation Days > 20 mm	1.7	2.1	2.3	2.4
Annual Frost Days/Year	164.4	147.1	119.5	100.7
Heating Degree Days	4289.3	3690.8	3182.8	2751.4
Cooling Degree Days	105.6	239.4	439.4	673.6
Freeze-Thaw Cycle Count (Days)	105.5	89.6	72.9	61.7

See Annex for data sources and methodology.

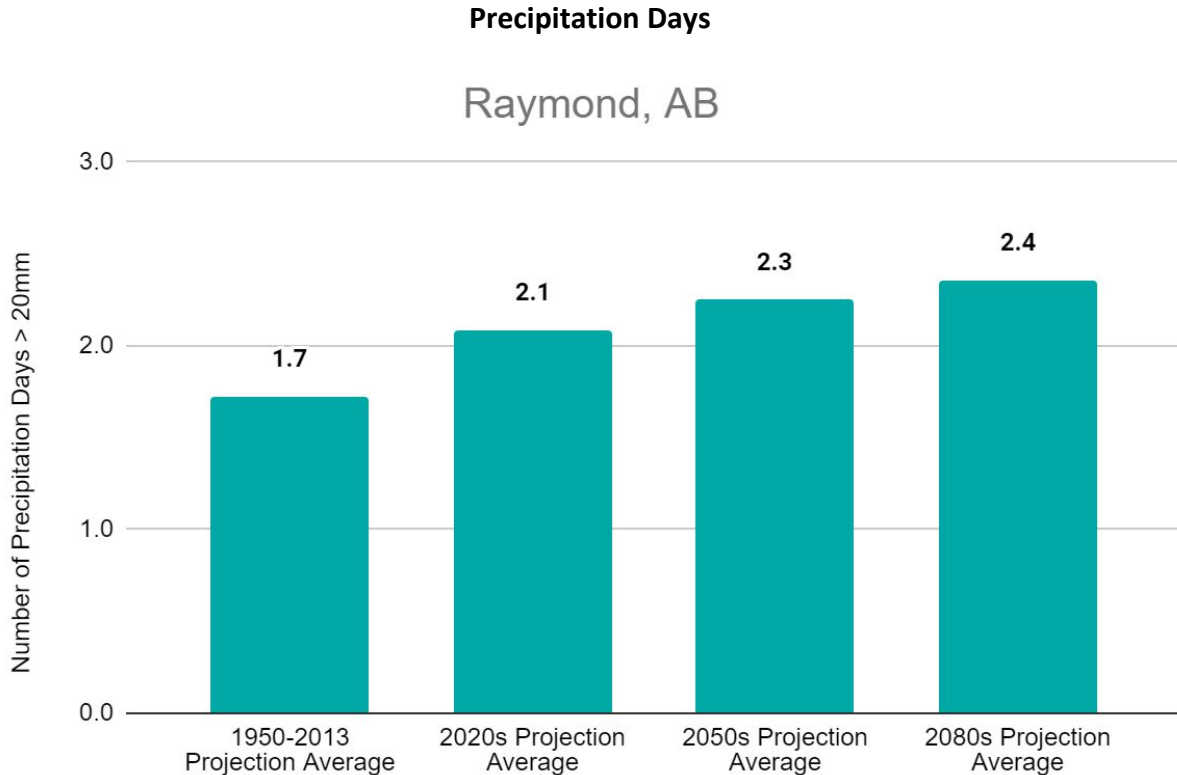
3.4.1 Precipitation and Flood Risk

Climate variables are presented showing values and trends in total and maximum precipitation. As the charts and maps below demonstrate, the Town of Raymond will experience an increase in total annual precipitation by about 48 mm.

It should also be noted that climate change is expected to increase the severity and frequency of extreme rain events, with increased total accumulations over 24 to 48 hours⁴. These events are difficult to model due to complex weather and climate factors and this should be considered in future planning decisions.



⁴ A prediction identified through analysis of historic and projected data and maps from Climate Data Canada and the Climate Atlas of Canada.



In 2013, the Town of Raymond experienced severe flooding similar to the Calgary area. A significant amount of water accumulated south of town, due to heavy precipitation that caused the High River to flood. As a result of this concerning event, the Town received \$2 million from the Government of Alberta to build water diversion infrastructure (berms). The municipal golf course is used as a floodway and flood waters are diverted to the course in extreme events. Most often, excess water is collected in an irrigation system.

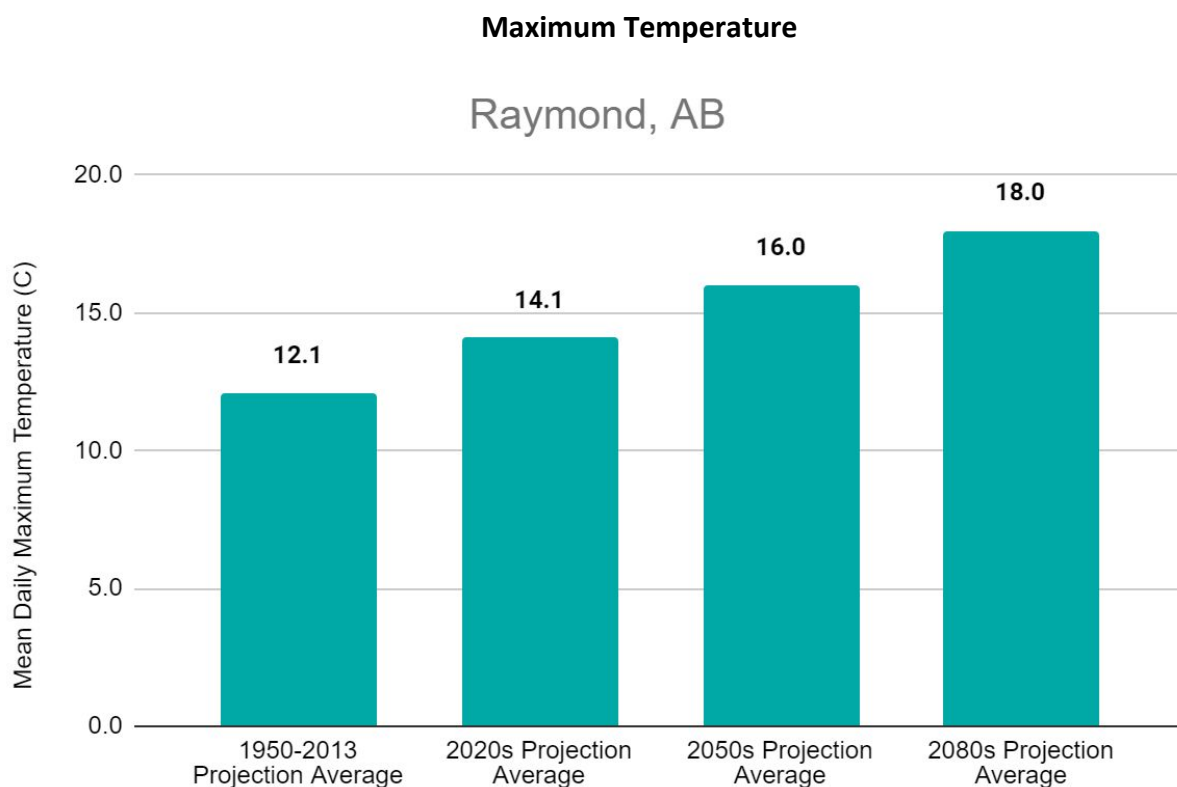
Flood plains within the community boundary have been identified because the province has mapped floodplains and risk areas on a 1:100 year flood level. There is no key infrastructure or municipal buildings located near water bodies or in floodplains throughout the town. Residences that are near the floodplain are elevated. The Town works with new and existing developments to reduce their flood risk (i.e. raising properties above flood level). The Town's current Land Use Plan does not take into account flood risk. Due to the variety of flood-related risks which may increase with climate change, it is prudent for municipalities to continue to better understand local flood risks, and develop risk reduction policies and actions. Such measures should be part of future land use planning, asset management, infrastructure development and climate adaptation, emergency preparedness, relocation and rebuild efforts.

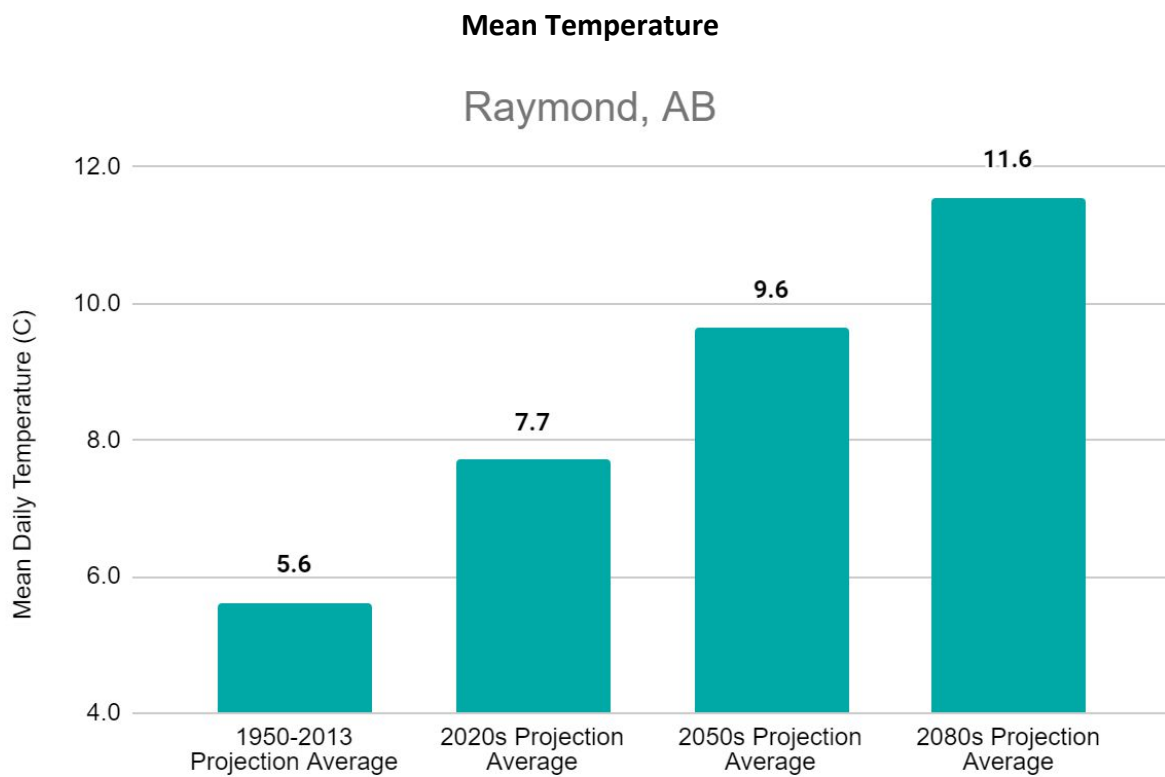
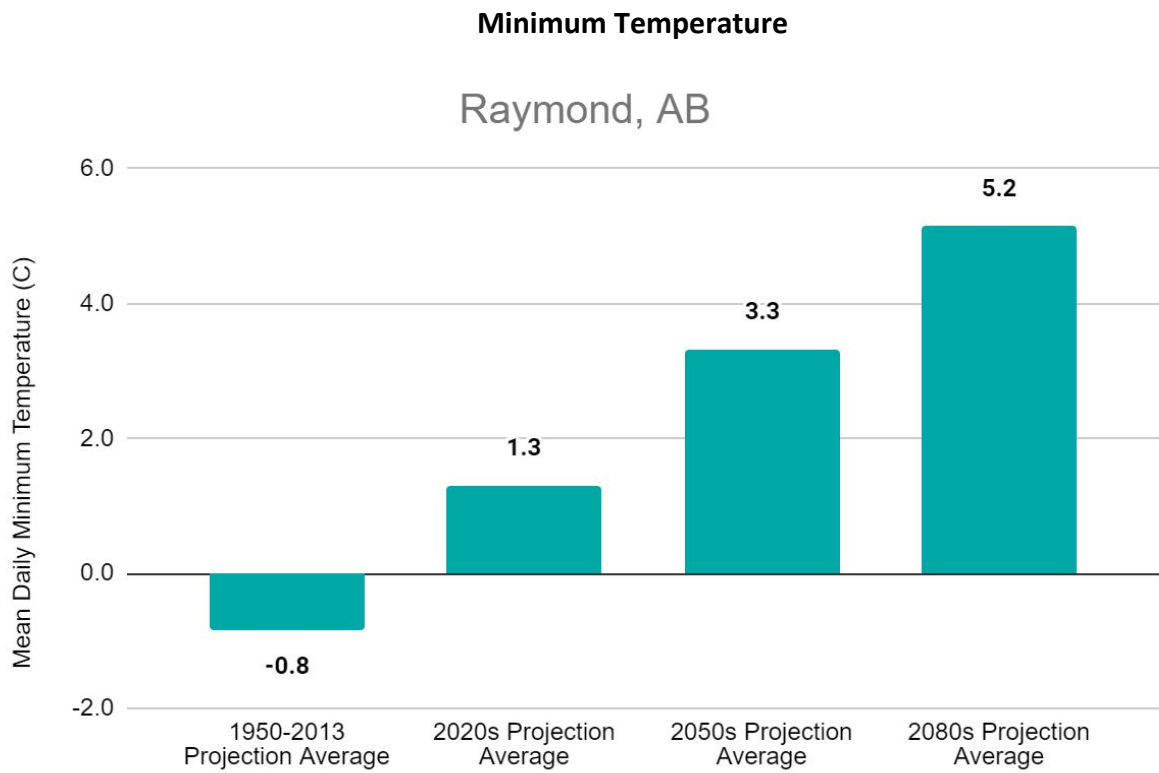
3.4.2 Temperature

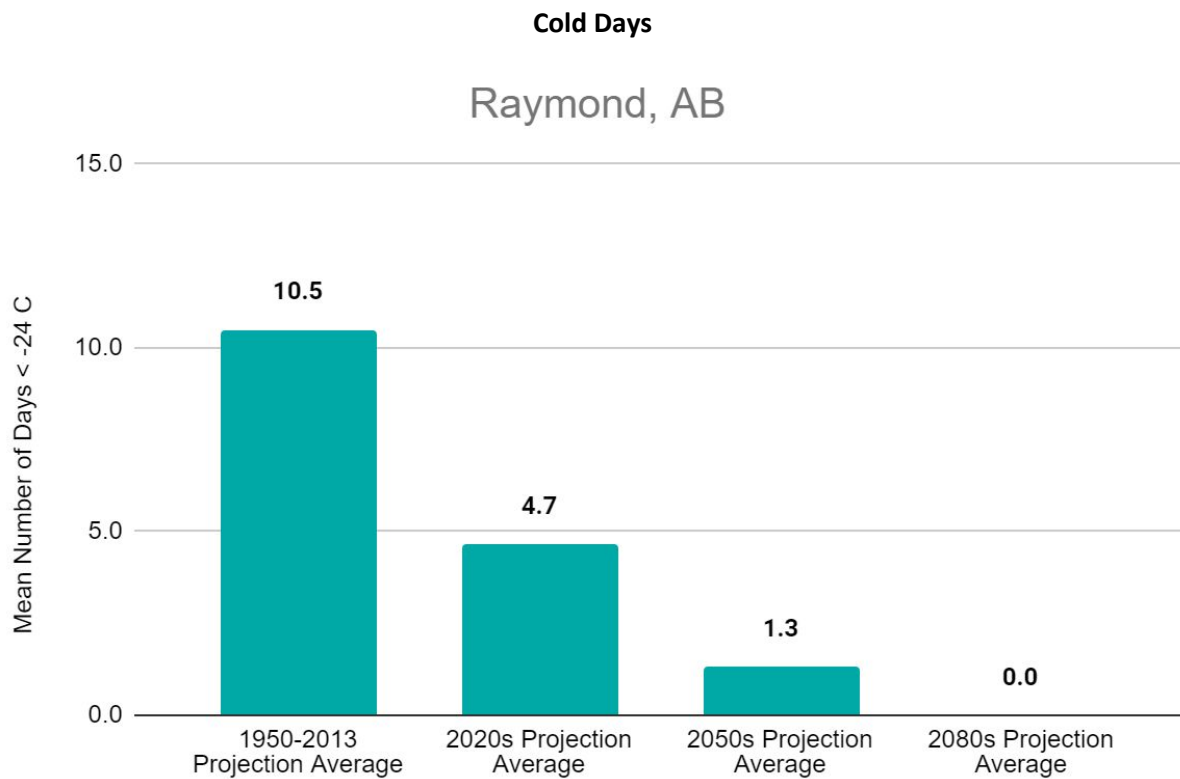
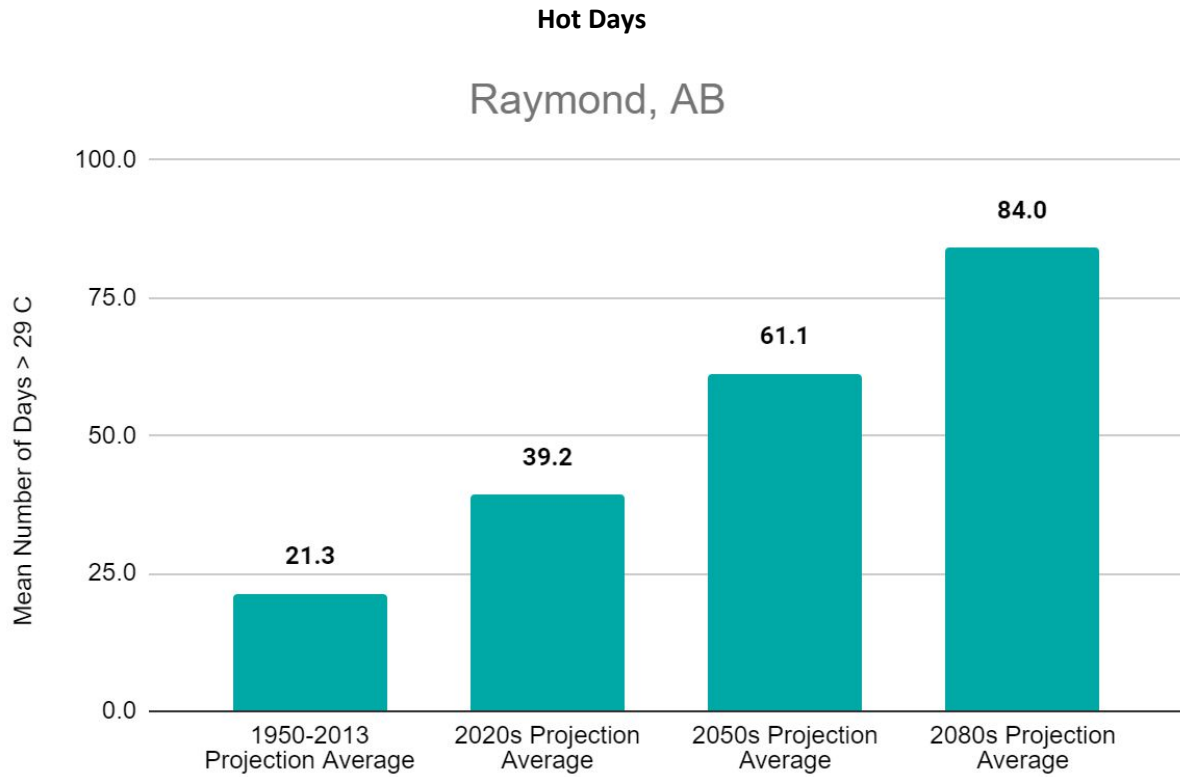
For temperature, climate variables are presented showing values and trends in maximum, minimum and mean temperature. As demonstrated in the charts below, mean maximum and mean minimum temperatures are expected to increase by 5 to 6 degrees Celsius by 2100 based on business as usual climate projections. In addition, it is expected that the number of days above 30°C and heat waves during the summer will increase, and may lead to more freeze-thaw events in the winter.

Extreme high temperatures can be hazardous, especially for the elderly, the chronically ill, and those without air conditioning. High and prolonged heat can also impact air quality, facilitate the spread of harmful diseases, inhibit outdoor activities, and cause stress and anxiety. Adaptation measures related to high temperatures include:

- increasing shaded areas;
- installing green roofs;
- designating cooling centres; and,
- checking in vulnerable populations and providing water and/or transportation to air conditioned facilities as needed during a heat wave.

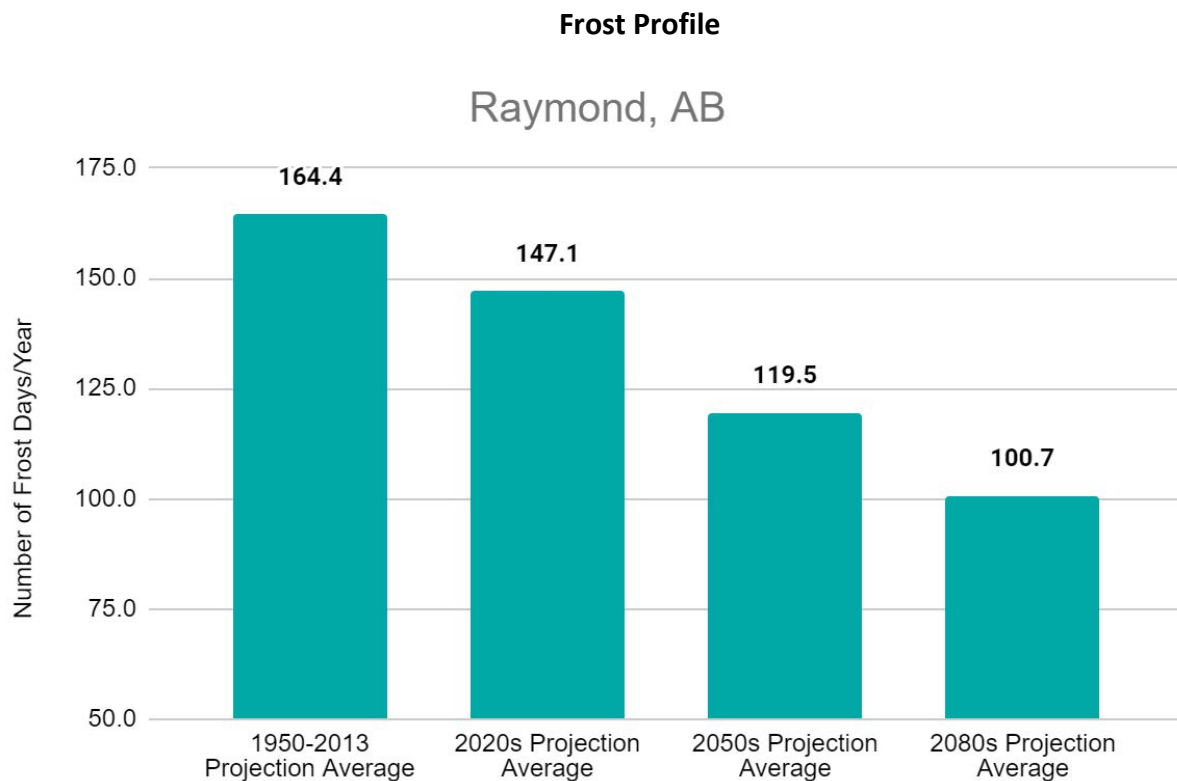






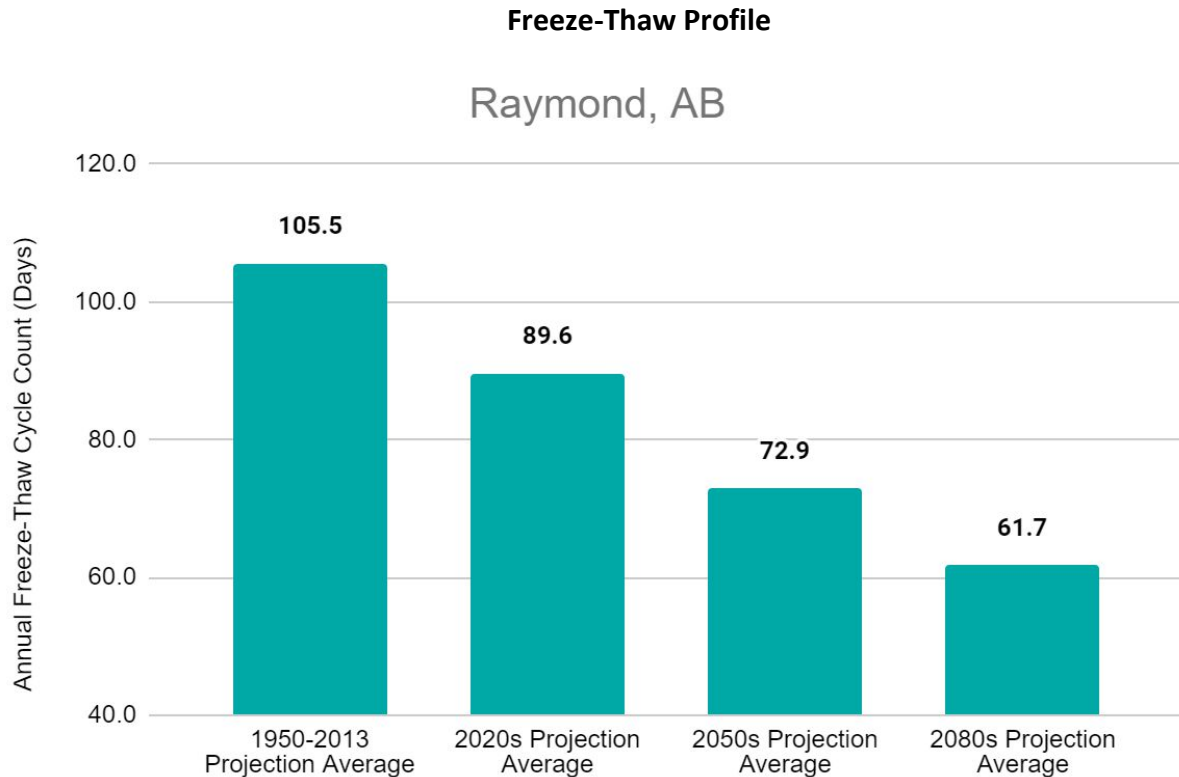
3.4.3 Frost Profile

For the frost profile, climate variables are presented showing the values and trends in the total number of frost days. As the graph indicates below, The Town of Raymond will experience an decrease of 64 frost days by 2100, for a total of 100 frost days.



3.4.4 Freeze-Thaw Profile

For the freeze-thaw profile, climate variables are presented showing the total number of freeze-thaw days over an annual period. As the graphs demonstrate below, the Town of Raymond will experience a 40% decrease in annual freeze-thaw days. This has important implications for adaptation in the winter time. This can be a precursor for winter flooding, ice storms, and extreme weather. Freeze-thaw cycles also have an impact on infrastructure including roads.



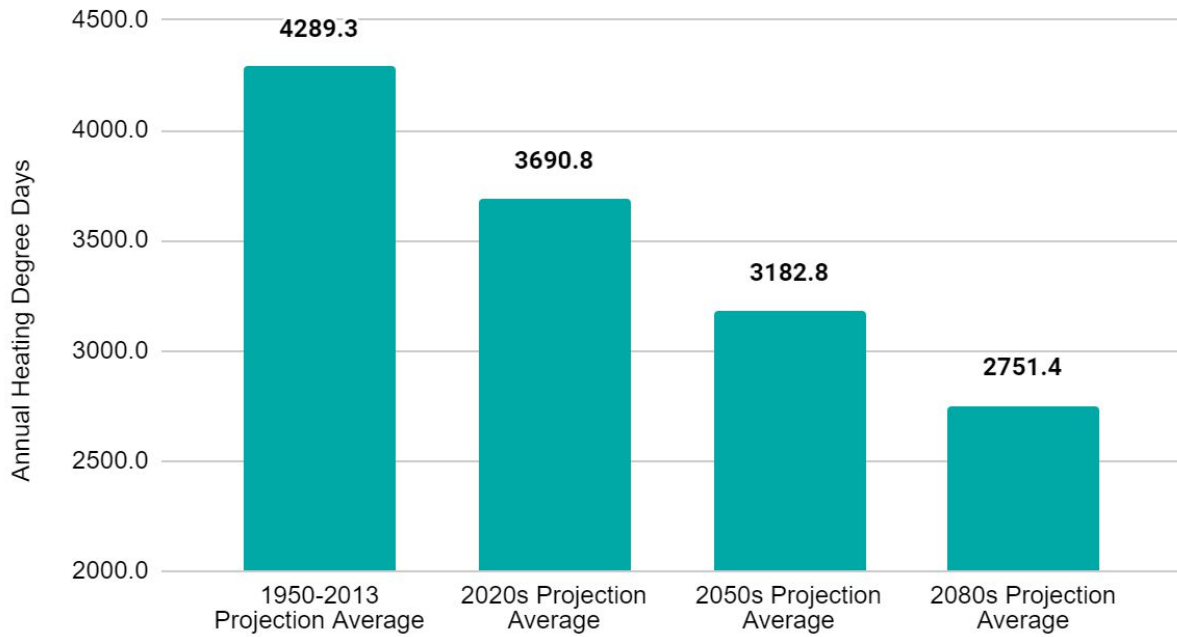
3.4.5 Heating / Cooling Degree Days

For the heating/cooling degree days profile, climate variables are presented showing the total number of heating days and cooling days by each projection period. As the charts demonstrate below, the Town of Raymond will experience a decrease in the number of heating degree days, and an increase in the number of cooling degree days. This has important implications for agriculture, electricity production, and provision of shelters for heating/cooling vulnerable populations during prolonged outages.

Degree days are the accumulated departures of temperature above or below a particular threshold. A threshold temperature of 18°C is used as an indication of space heating or cooling requirements. Any day with temperatures below 18°C is considered a heating degree day, and any day above 18°C is a cooling degree day. Data is presented in the thousands because this measure sums the number of degrees above or below 18°C annually, not just the number of days a temperature occurs. See Annex 2 for more details.

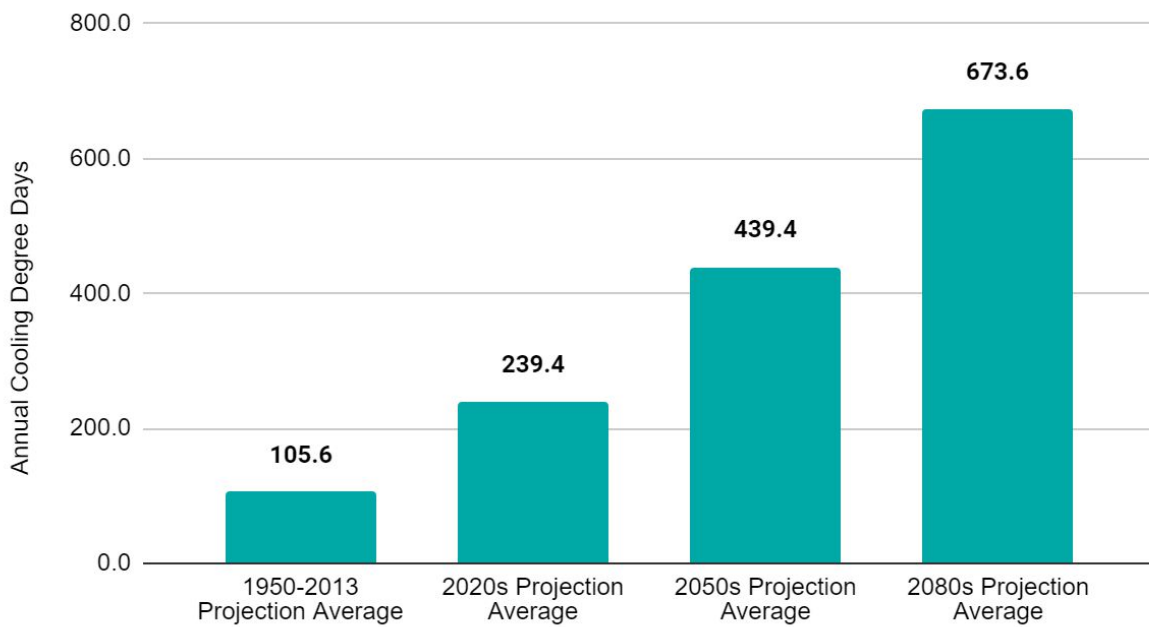
Heating Degree Days

Raymond, AB



Cooling Degree Days

Raymond, AB



4.0 Community Baseline Survey Results

A Community Baseline Survey was conducted with the municipal lead of each department prior to Workshop 1. The purpose was to determine where the municipality sees its strengths and potential areas for improvement across a variety of energy-dependent services in their community.

4.1 Resilience

According to the survey for the Town of Raymond, resilience means improving energy self-sufficiency by generating their own electricity and being less dependent on external sources and utilities.

The level of climate change awareness was ranked as low in the community.

4.1.1 Key Drivers

Survey respondents indicated that the key drivers to advance resiliency in the community are:

- a) Reduce local vulnerabilities and increase reliability (i.e. lower risk to energy infrastructure, supply, etc.)
- b) Decrease reliance on the main grid/Increase energy independence
- c) Decrease greenhouse gas emissions

4.2 Strengths and Areas for Improvement

Area	Strength	May Need Improvement
Vegetation & Wildlife	<p>Raymond has a Fire Prevention Plan and Evacuation Plan.</p> <p>Fortis (electricity utility) completes tree trimming to protect power lines and prevent outages.</p> <p>Power lines in new subdivisions/developments are put underground.</p>	<p>The Town does not undertake brush clearing for maintenance of buffer zones.</p> <p>Some power lines are above ground. If funding is available, put these underground.</p>

	<p>The Town of Raymond and surrounding County have a partnership for volunteer firefighters (Mutual Aid Agreement).</p> <p>Fire crew is set up to use small pumper trucks rather than large fire trucks. This allows for rapid response and low capital cost.</p> <p>No key infrastructure near forest or areas of high risk for fire. Town mows down grass.</p>	
Planning	<p>The Town has a strong ERP in place.</p> <p>Communications Plan is in place.</p> <p>Town has copies of emergency plans for health care facilities and schools (these are regional and slightly dated).</p> <p>The Town informs the public about what to do to prepare for emergencies and storm safety.</p> <p>Have created an Environmental Strategic Plan which briefly touches on climate change. It primarily looks at areas of improvement in the environmental area. This may be the only municipal Environmental Strategy in southern Alberta (other than Lethbridge).</p> <p>Land Use Plan is in place with an up to date Geographic Information System (GIS) mapping.</p> <p>Building Code in place</p>	<p>ERP does not consider climate risk.</p> <p>Limited coordination of emergency plans between the town and local health facilities/schools.</p> <p>No Asset Management Plan, although development is underway. Still need to complete study (\$70k) to catalogue all assets, including deep assets. It seems likely that the province will make these plans a requirement.</p> <p>No Climate Change Adaptation Strategy (although Environmental Strategic Plan in place which indirectly considers climate change).</p> <p>Land Use Plan does not discourage development in flood risk areas.</p> <p>Municipality does not ensure disaster risk assessment is completed in all local development decisions.</p> <p>No Resilience Plan or Strategy. No Community Energy Plan or Local Action Plan.</p> <p>No inventory of skills and resources.</p> <p>No tourist evacuation plan (as tourism rates are low at the moment).</p>

	<p>The Town has a standalone Net Zero Solar Plan and received a Federation of Canadian Municipalities (FCM) Sustainability award for their solar work.</p> <p>The Town has a Contact Tree.</p> <p>There is regular annual contact with local utilities. Currently no need to meet more frequently than that. Municipal staff aware of who to contact if there are any issues.</p> <p>Alliances with local industry and neighbouring communities regarding emergency response and fire service.</p> <p>Agreements with churches to assist if there is an emergency or evacuation required.</p> <p>The Town has small fuel reserves for the municipal fleet in the event of an emergency. Agreements in-place with gas stations to ensure stations will not run out of fuel and the Town can access supplies if needed (e.g. if they need gas for fire trucks). Agreement with gas stations addresses the issue of limited fuel storage.</p> <p>The Emergency Management Committee is in charge of planning for resilience. This includes both Council and administrative representatives.</p> <p>The Town is gradually building up a stockpile of emergency supplies.</p>	
Communications	Agreement with the Southern Alberta HAM radio organization to	There has been no public education on climate change so far. Community members

	<p>enhance communication during times of emergency/evacuation (one with the fire hall and another with the volunteer evacuation group). Regional Emergency Operations Centre for Communications is completely mobile and under development. It was noted that this set up is cutting edge. Raymond provides some funding for development and upkeep.</p> <p>The Town informs residents about what to do and what not to do during an outage.</p> <p>Communications tower in town. Radio station and transmitter/tv station nearby in Lethbridge.</p> <p>Fire department is connected with provincial emergency radio. There is also a backup local emergency channel with enough coverage for the whole Town.</p> <p>EOC (located in Town Hall) has backup power (although this still needs to be exercised). The Town has portable generators which could be used to support other communications infrastructure.</p>	<p>have differing views on climate change and the Town has yet to take a firm position on the topic.</p> <p>The Town previously had a system to warn residents about emergencies and extreme weather events. Staff are in the process of looking for an alternative provider.</p>
Electricity Infrastructure	<p>The Town of Raymond is working on implementing a solar and backup battery storage unit. This will be particularly useful in town admin buildings and the EMO.</p> <p>Electricity is received via the grid and local renewables (solar net zero community).</p> <p>The hospital has backup power.</p> <p>Exercises for prolonged outages</p>	<p>The number of buildings in the Town with backup generators/the capability for backup generators is not formally documented.</p> <p>No municipal energy usage/monitoring system to analyze demand and energy usage.</p> <p>No list of priority areas for restoration during a power outage has been provided to Fortis. However, the Town does communicate with the utility if there is an outage.</p> <p>The Town does not encourage residents to</p>

	<p>have been completed, including “Exercise Blackout” (~2 years ago). The Town feels comfortable with handling a long term blackout.</p> <p>There is a warning system in place to warn residents about outages.</p> <p>The Magrath Wind Farm is nearby.</p> <p>Council will approve \$40k investment for solar and battery storage.</p> <p>Expanding solar to other infrastructure (e.g. shelter) is a priority.</p>	<p>have backup power, although are in discussions with ENMAX (Utility) to create a community net-metering opportunity.</p> <p>Emergency shelters (churches) do not have permanent backup power, although the Town has portable generators which could be used. Shelters are also a top priority for solar battery storage.</p> <p>Cooling centres, schools/animal shelters, fueling stations, and grocery stores do not have backup power.</p>
Water and Sewage	<p>After the 2013 flooding event, the Town received \$2 million from the province to invest in flood diversion infrastructure. Substantial berm infrastructure has been built to divert water to the golf course (floodway going N to S on the East side of town).</p> <p>Most excess water is diverted into an irrigation system, except in extreme events when water is diverted to the golf course floodway.</p> <p>Development on the east side of the course is new and has been intentionally built significantly higher than the golf course. Any flooded properties that are rebuilt must be raised above the golf course.</p> <p>No key infrastructure is near the floodway.</p>	<p>No current plan/provisions for potable water distribution during heat events</p> <p>Sewage system lagoon is undersized (but an upgrade is underway).</p> <p>The Town has experience in sand bagging but supply of sand and bags is unclear.</p>

	<p>Municipality sizes culverts to account for future flood risk.</p> <p>The Town has mapped the floodplain after the overland flooding event in 2013.</p> <p>Development in flood prone areas requires engineers to sign off on mitigation.</p> <p>The Town works with current property owners in flood prone areas to reduce their risk.</p> <p>Raymond has a distributed water system with a separate stormwater system built above a 1:100 yr flood level. Sewage outflow and discharge systems are also built to this standard.</p> <p>The Town has partnered with nearby communities to build a Regional Water System. The water treatment plant is 10 years old and has solar power in addition to grid reliance (net-zero overall). It supplies three to four southern Alberta communities. The plant is high tech, almost fully automated and controlled with iPads.</p> <p>Working on a new process to rapidly move up the timeline for the lagoon expansion (AB Environment has approved a project that will not use as much land as previously thought).</p> <p>Lift stations are above predicted flood levels and potential infrastructure for backup power installation.</p> <p>While some municipal pipes are historic, they are gradually being replaced. Before repaving roads the Town considers upgrading</p>	
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	<p>pipng.</p> <p>The Town has a large water reservoir nearby, so there is no concern about running out of water. Participants communicated the likelihood of this to be incredibly low.</p> <p>Water Bylaw gives the Town the ability to limit water use during times of drought/schedule residents' non-essential water use.</p> <p>Town cooperates with other communities in the region for cooperative use of local water resources.</p>	
Transportation	<p>“Get Out” and “Return Home” evacuation exercises have been completed. This included resident carpooling and utilizing school buses as means of evacuation for residents.</p> <p>The Town is very interested in electric vehicles because they have a longer life span, require less maintenance, and can use electricity (solar), unlike conventional vehicles. Waiting for EV models of Ford F150s to replace municipal day-to-day fleet (e.g. tending to leaks, potholes). Also considering EV zamboni (Medicine Hat recently replaced theirs) and EV golf carts.</p> <p>The Town can use the solar car park (approximately the length of a football field) as hail protection for vehicles.</p> <p>Guard rails/safer intersections/wider roads in place for problematic areas (including</p>	<p>No lower speed limits in areas where hazardous materials are being transported.</p> <p>The fire department is not aware of the quantity/type of hazardous material being transported.</p> <p>No EVs (in progress).</p> <p>Evacuating people with disabilities is the greatest challenge with evacuations (e.g. logistics, securing enough specialized vehicles). While evacuation would be the responsibility of the care facilities, it would be good to increase communication and coordination (i.e. consider adding to Emergency Management Plan (EMP)).</p> <p>Limited communication/coordination with health facilities and handi-bus society in town for emergency response/evacuations.</p>

	<p>the 2 lane highways surrounding the town).</p> <p>There are no active rail lines in or around Raymond. The Town is working with CP Rail to secure the abandoned lines.</p> <p>There is more than 1 transportation route/corridor in and out of town.</p> <p>Restrictions for the transportation of dangerous goods are considered in the Transportation Bylaw.</p>	
Oil and Gas (O&G)	<p>Local emergency response was trained and has appropriate Personal Protective Equipment (PPE) for oil/gas leaks/explosions/contamination.</p> <p>No oil and gas drilling or refineries near the community. The only pipeline is for local distribution of natural gas.</p> <p>The Town has provisions in place to keep service stations open during events/outages and provisions for diesel supply (generators).</p>	<p>Unsure of utilities/O&G companies monitoring and updating of O&G distribution system (although ATCO confirmed low pressure and high pressure monitoring is completed).</p> <p>Unsure if there are closed circuit security cameras to monitor pipelines.</p> <p>No local distributors with storage tanks.</p>

5.0 Utility Information

Table 3: Risk reduction and monitoring measures identified for utilities in the Town of Raymond

Type	Company	Adaptation Measures in Place	Additional Measures to be Considered
Electricity	Fortis Alberta	<p>Tree trimming to prevent damage to power lines</p> <p>Works closely with the County during an emergency</p> <p>Power lines in new developments are placed underground</p>	<p>No standing list of municipal assets for priority restoration (although communicates with municipality during an outage)</p> <p>Put current above ground power lines underground, if funding allows</p>
Natural Gas	ATCO	<p>Real time monitoring on high pressure lines</p> <p>SCADA monitoring for low pressure distribution lines for disruption and leak detection</p>	<p>Communicating with municipality about ongoing monitoring procedures</p>

6.0 Workshop 1 Results

6.1 Workshop Overview

The Engagement Survey was completed independently and submitted to QUEST for analysis and compilation prior to Workshop 1 (see Figure 1 for visual timeline). There was one respondent (due to low staff capacity at the time) who is highly knowledgeable of the municipal context. These results were then presented and used as the foundation for discussion at Workshop 1. From there, the results of the survey were updated accordingly.

The goals of Workshop 1 were to engage municipal staff, utilities, and community stakeholders to discuss local climate risks and vulnerabilities, and identify areas for improvement. QUEST presented climate data and projections relevant to the Town of Raymond, and results of the Community Baseline Survey illustrated areas of strength and potential improvement related to the Town's resilience.

The QUEST facilitator also reviewed the "10 Essentials for Disaster Risk Reduction" tool that was part of the Engagement Survey. Preliminary results showing how the Town scored in each of the 10 areas, as well as respondent comments were presented. Workshop participants then participated in a facilitated discussion of the aforementioned results. Conversation focused on two questions:

1. Which scores do you agree with?
2. What scores require updating and why?

Results from the Local Resilience Exercise were also presented. This included a chart (see Section 5.3.2) illustrating the probability and level of consequence for each hazard, followed by sharing lists of assets, vulnerabilities, and opportunities respondents included in the Engagement Survey. Participants discussed the contents of the lists and whether changes were needed.

The session concluded with an Action Planning Exercise to find out what participants think are key needs and opportunities related to resilience. The QUEST facilitator also sought feedback in three areas:

1. What is your understanding of greatest needs/weaknesses?
2. What should be done?/What is the action?
3. What is your biggest takeaway from the session?

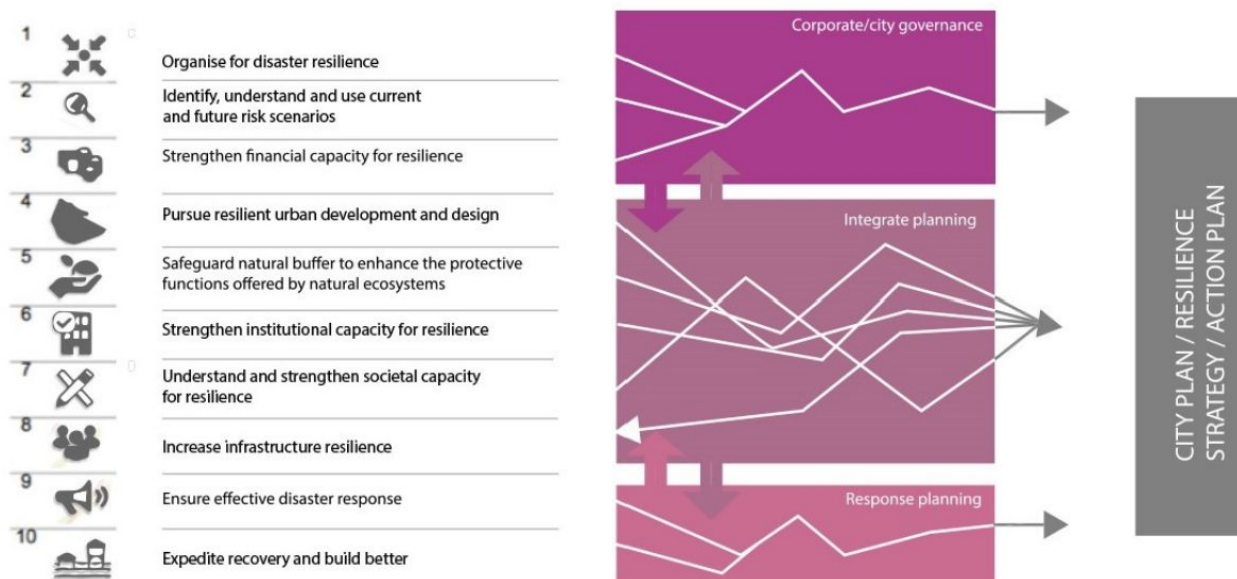
A total of five participants attended the virtual workshop held on October 6th, 2020, hosted via Zoom by QUEST (participant list in Annex). The results presented in this report reflect surveys results and the discussions/exercises that took place during the Engagement Session.

6.2 Results of Engagement Survey

6.2.1 The 10 Essentials Exercise

10 Essentials for Disaster Risk Reduction (also known as Making Cities Resilient), was developed by the UN ISDR (International Strategy for Disaster Reduction), and endorsed by the Government of Canada. It provides a high-level framework to determine the strengths and weaknesses in a community, to be able to better target efforts at improving resilience. The framework was tailored for use as an independent information gathering survey utilized for discussion in Workshop 1.

Figure 4: The Ten Essentials for Making Cities Resilient.



Sources: UN Office for Disaster Risk Reduction

Goal

Enable participants to identify community strengths and where improvements may be needed.

Overview

Participants completed the survey, giving their independent feedback and answering questions for each Essential, and then assigning a score. The scoring is:

Score: Description:

- 4 – Doing well – measures in place and functioning well
- 3 – Something in place, but can be improved.
- 2 – Nothing in place.
- 1 – Don't Know / Need more information.

After the presentation of the preliminary results the group discussed their perspectives around three questions:

- A. Where is the community strongest?
- B. Where is it doing well but needs improvement?
- C. Where is nothing in place and needs attention?

The Scores and Responses from the survey and the workshop discussion are summarized below.

Results

Table 4: Summary of Municipal Scores on the UN 10 Essentials.

Essential	Score	What it indicates
1- Organization and Communication	4.0	Measures are in place and working well, and there may be areas for improvement.
2- Budget, Funding sources	2.5	Minimal measures are in place and there are areas for improvement.
3- Consideration of hazards, vulnerabilities, use of risk assessments	3.0	Some measures are in place and working well, and there are areas for improvement
4- Adaptation Infrastructure	3.0	Some measures are in place and working well, and there are areas for improvement
5- Schools and health facilities	2.8	Some measures are in place and working well, and there are areas for improvement
6- Enforcing risk compliant building regulations and land use planning principles	3.0	Some measures are in place and working well, and there are areas for improvement
7- Education programs	2.7	Some measures are in place and working well, and there are areas for improvement.
8- Protect ecosystems and natural buffers	2.0	Minimal to no measures are in place, there is a lack of knowledge or areas for improvement.
9- Early warning systems	4.0	Measures are in place and working well, and there may be areas for improvement.
10- Rebuild with needs of survivors, social, services, recovery volunteers	2.3	Minimal measures are in place, and there are areas for improvement.

1. Put in place Organization and Coordination, clarify everyone's roles and responsibilities:

Score: The average score of all results is **4.0**, indicating measures are in place and working well, and there may be areas for improvement.

Comments:

- Town works with local organizations in times of emergency/disaster. The Department of Emergency Management works with RCMP detachment, Community Peace Officer, Raymond Volunteer Ambulance and Fire, the Church of Jesus Christ of Latter-Day Saints.
- Emergency Plan, Bylaws, and public emergency preparedness guide are online.
- Emergency Response Team understands that when there's an event they will be relied upon to make decisions. Some members have received response training (e.g. Director of EM, Fire Chief, RCMP/Peace Officer).
- The Town has previously housed evacuees from fires (particularly seniors).
- Agreements in place to cooperate with local churches (shelters) and the Ag Society (location for animals).
- Certified kitchens and town purchases emergency supplies annually (creating stockpile).
- Agreement with the Southern Alberta HAM radio organization to enhance communication during times of emergency/evacuation. Regional mobile Emergency Operations Centre for Communications is under development. Raymond provides some funding (This is unique to the province).
- All designated emergency centres are annually certified for certified kitchens
- Hosted food services safety course for EM purposes (lots of town members are qualified)
- Communication is key in everything we do
- Includes Southern AB communities to exercises
- People complete Food Safety Course/Certification to ensure safe preparation of food for evacuees

2. Assign budget for Disaster Risk Reduction:

Score: The average score of all results is **2.5**, indicating minimal measures are in place, and there are areas for improvement.

Comments:

- External funding (grants) needed to support risk reduction activities.
- Significant flood mitigation infrastructure funded via grant. Risk reduction would not have happened without it.
- Financials and Budget:
 - 2020 - \$30k for backup generator for Town Office; \$40k for arena energy retrofit
 - 2021 - \$30k (endorsed) for Emergency Operations Centre (EOC) backup generator; \$100k (endorsed) for arena energy retrofit
 - 2022 - \$40k (endorsed) for solar pedestrian street lights
- Nothing designated in the budget for risk reduction activities. However, Town is agile and does move money around to respond to extreme events as they arise (e.g. COVID).

- No specific programs or economic incentives for homeowners/businesses to reduce risk.
- Environmental Strategic Plan does have the possibility for incentive programs (currently before council)
- Have kicked around ideas for incentives (e.g. funding for solar projects, etc). Score is accurate, things are under development/appetite for improving

3. Update Hazard/risk assessment to inform plans:

Score: The average score of all results is **3.0**, indicating some measures are in place and working well,, and there are areas for improvement.

Comments:

- Integrated Community Sustainability Plan does not include climate change (however, it is indirectly considered). Climate is not mentioned in Emergency Plan or Development Plan.
- No formal process to consider climate in development decisions, although “risk” is often considered. Would be useful to have a formal process or staff to ensure climate projections are incorporated.
- Emergency Plan considers consequences of power outages and has identified response actions and responsible persons. Town has backup generators and solar installations to be self-sufficient.
- Hazards posted on Town website (e.g. June 30, wastewater system impacted by heavy rains.)
- More could be done to link local risk assessments with hazards assessments identified by other entities (e.g. hospitals, schools.)
- Being a small community, people wear multiple hats and human resources are stretched.

4. Invest in and maintain infrastructure to cope with climate change:

Score: The average score of all results is **3.0**, indicating some measures are in place and working well, and there are areas for improvement.

Comments:

- New residential development applications consider energy efficiency and require an Engineering Site & Drainage Plan. Disasters and climate projections are not included.
- Current regulations meet our needs/standards but do not exceed them. We need to do more to identify risks.
- Measures to protect critical public facilities during disasters are adequate for current known risks. Better understanding the risks would improve this.

5. Assessing safety of schools and health facilities:

Score: The average score of all results is **2.8**, indicating some measures are in place and working well, and there are areas for improvement.

Comments:

- I'm not sure, but I think our DEM likely received an 'all hazard' risk assessment plan from schools.
- Hospital has backup power. Unsure about schools.
- Assessment of compliance with building codes, safety, and weather-related risk for schools/health facilities is likely carried out by school boards/Alberta Health Services. The Director of Emergency Management has coordinated a plan/effort.
- DEM has coordinated with schools and health facilities
- Annual risk assessment completed for the town
- Hospital has backup power. The Town's portable generators can be used elsewhere.
- Have a copy of the (regional, somewhat out of date) plan for all the schools, hospitals, senior centres. Coordinated more with hospitals than the schools (Boards more independent)

6. Apply risk compliant building regulations and land use planning principles:

Score: The average score of all results is **3.0**, indicating some measures are in place and working well, and there are areas for improvement.

Comments:

- Development officer capabilities to enforce Land Use Bylaw (LUB) restrictions/mitigations (in LUB).
- LUB/permitting has floodplain and land subsidence restrictions (engineer sign off, etc)
- Flood hazard is the main focus.
- Unsure of how LUB is actually enforced.
- Development officer sometimes does community tours, but inspections are largely complaint based.
- All new developments need permits and approvals

7. Ensure education programmes and training in place on disaster risk reduction:

Score: The average score of all results is **2.7**, indicating some measures are in place and working well, and there are areas for improvement.

Comments:

- Public Emergency Plan has training plan/outline for drills/exercises, list of evacuation procedures. Some information has been redacted from public docs to protect assets.
- The town has previously done training for emergency response. This included community leaders and what their role would be during an emergency.
- DEM knows the roles and responsibilities for everyone and would communicate this info.
- Town has Emergency Preparedness guide on its website for residents (plain-text doc). Town has done some public engagement but there is not much interest from residents.

8. Protect ecosystems and natural buffers to mitigate floods, fires, and other hazards:

Score: The average score of all results is **2.0**, indicating minimal to no measures are in place, there is a lack of knowledge or areas for improvement.

Comments:

- Not considered in Municipal Development Plan or Land Use Bylaw.
- The golf course is considered to be the only local ecosystem.
- There are 2 bodies of water, but both are a part of the irrigation corridor
- Town is fairly flat. We created and utilized natural buffers via the golf course drainage

9. Develop Emergency Management (EM) capacity / early warning:

Score: The average score of all results is **4.0**, indicating measures are in place and working well and there may be areas for improvement.

Comments:

- Utilize Alberta Emergency Alert (AEA). DEM trained in AEA operation.
- Responders communicate with DEM (outlined in Emergency Management Plan (EMP)).
- 2021 - \$30k (endorsed) for EOC backup generator. EOC is based out of town hall; don't have backup power yet but working on it.
- Training drills completed annually and planned for the next 5 years (in EMP). All involve muni staff, EM staff and other interested parties. Good participation. Carried out as planned.
- The EMP has information on how to support the evacuation of health facilities and schools during an evacuation. Roles and responsibilities identified. Evacuation routes identified.
- Partnerships with neighbouring communities regarding housing evacuees. Several years ago residents from Milk River evacuated to Raymond; this went well.
- Churches can be used as shelters. Ag Society can house animals during an emergency.
- Communication Agreement with a southern Alberta HAM radio organization to enhance communication during times of emergency/evacuation (one with fire hall, one with volunteer evac group). Have regional EOC for communication (under development) which would be a mobile command centre. (Community advised that this Communications set up is novel and cutting edge)
- DEM in the process of outlining the training plan for the next 5 years. Insights from this assessment can be included.

10. Place needs of survivors at centre of re-build, Build back better:

Score: The average score of all results is **2.3**, indicating minimal measures are in place, and there are areas for improvement.

Comments:

- Disaster Recovery Plan (in EMP) lays out process for establishing a Disaster Victims Assistance Centre and steps to establishing a Disaster Recovery Program (temporary).
- No permanent, in-house program to support victims of disasters.
- Provincial Disaster Relief Fund is in place.
- Overall this is a gap for the town because we rely on external health units for assistance or the City of Lethbridge (if they have the capacity).
- Nothing in the bylaws re. disaster risk reduction being integrated into post disaster recovery and rehabilitation

Table 5: Municipality's standing in 3 key areas.

Essential	Where is the community the strongest?	Where is the community doing well, but needs improvement?	Where is there nothing in place/needs attention?
1- Organization and Communication	✓		
2- Budget, Funding sources		✓	
3- Consideration of hazards, vulnerabilities, use of risk assessments	✓		
4- Adaptation Infrastructure	✓		
5- Schools and health facilities		✓	
6- Enforcing risk compliant building regulations and land use planning principles	✓		
7- Education programs		✓	
8- Protect ecosystems and natural buffers			✓
9- Early warning systems	✓		
10- Rebuild with needs of survivors, social, services, recovery volunteers		✓	

The Town of Raymond is very strong in emergency planning and response training. Disaster response exercises are regularly completed, with one participant discussing completion of "Exercise Blackout" for prolonged outages and "Get Out" and "Return Home" evacuation drills. Throughout the workshop, the critical importance of communication and coordination was emphasized. The Town has Mutual Aid

Agreements for fire response and shares a water treatment system with other municipalities in southern Alberta. These neighbours are also included in emergency exercises and are collaborating to establish a HAM radio organization and Regional Mobile Emergency Operations Centre for communications in the area (identified as being cutting edge). The town receives (regional) emergency plans from schools/the hospital and participants expressed the importance of continuing this coordination to ensure an understanding of measures undertaken.

The town devotes a budget for investment in renewable energy, energy efficiency retrofits, and backup generators. Workshop participants discussed that there is no budget for disaster risk reduction, and the initiatives they have done in the area (i.e. golf course flood way) were the result of post-disaster grant funding. The Environmental Strategic Plan has the flexibility to include incentives programs (one participant said funding for solar projects may be an option) for residents and businesses to be more sustainable. It was expressed that both Council and administration have an appetite to improve in the area.

Protection of ecosystems/natural buffers scored the lowest on the 10 Essentials, primarily because they are not considered in the LUB (an important consideration given the risk of flooding). Participants said there are two bodies of water in the Town, but the risks of these are reduced by connecting them to the municipal irrigation system. The municipality hired an arborist to create a tree inventory, and this information can be used in the future (see Section 6.3.2). Another potential area for improvement was having a process to “build back better” post-disaster and creating a more permanent, in-house program to support victims of disasters.

6.3.2 Local Resilience Exercise

Goal

Gathering information and opinions from participants in order to provide a collaborative resilience-building experience. Participants are able to share knowledge, discuss resilience in their local area, apply basic techniques for identifying risks and vulnerabilities in a spatial context, as well as plan local adaptation and resilience measures.

Overview

Participants discussed the probability (**P**) and consequence (**C**) of various types of hazards - both climate hazards and those that may be influenced or impacted by climate events. This exercise enabled participants to discuss different stakeholder perspectives and identify opportunities to improve resilience.

Summary of Results

1. Key Hazards of Concerns

of tables selecting high, medium or low risk

Risk level:	High		Medium		Low		
	P	C	P	C	P	C	Result
1. Atmospheric hazards			5	5			Consensus on medium probability and medium consequence
2. Hydrological hazards	5			5			Consensus on high probability and medium consequence
3. Power and Water Outages, Fuel Shortages	5			5			Consensus on high probability and medium consequence
4. Forest/Grass Fires	5			5			Consensus on high probability and medium consequence
5. Geological hazards (e.g. erosion, landslides, land subsidence)					5	5	Consensus on low probability and low consequence
6. Dam Failure and Structural Collapse					5	5	Consensus on low probability and low consequence
7. Other hazards e.g. Hazardous Material Spills					5	5	Consensus on low probability and low consequence

The results in the previous table can also be visualized as follows, in order to prioritize areas for climate adaptation and resilience building.

		Consequences		
		Low	Medium	High
Probability	High		Hydrological Power & Water Outages Forest/Grass Fire	
	Medium		Atmospheric	
	Low	Geological Hazards Structural Failure Contamination		

2. Community Assets

The participants identified what they consider to be local assets or things that are considered to be of value to them and the community. **These are listed here:**

- Victoria Sports Park (pool, ice arena)
- Historic buildings/points of interest (haven't always been preserved and these are increasingly important)
- Town hall (with solar PV)
- Golf course
- Senior centre (social building)
- Ag buildings
- Rodeo grounds with grandstands
- Schools
- Hospital/health centre
- Community centre
- Churches (For coordination)
- Fibre infrastructure (Community public wifi)- Current plans to enhance
- Overall Solar PV concept for the town
- Fire department equipment and personnel

3. Vulnerabilities

Thinking of the higher risk hazards, the participants identified potential local vulnerabilities. **These are listed here:**

- Seniors lodge
- Extended care facility
- Many people at hospital
- Elderly population (seniors would be dependent on evacuation process, maybe 100-200 people)
- Neighbourhood near floodway (if sign. flood event)

- Electricity infrastructure (reliant on Fortis)
- Fire department (the physical building may be vulnerable, but the fire department can operate without it)
- RCMP detachment (the physical building may be vulnerable, but the RCMP can operate without it)
- Hospital (has backup power)

4. Strengths

The participants identified local assets that serve as strengths in terms of resilience. **These are listed here:**

- Churches (can be used for evacuations/muster points)
- Emergency supplies stockpile
- Floodway/golf course
- Town hall with solar PV array
- People! (including our DEM)
- Fire department (well trained and ready to respond)
- Emergency Plans
- Town solar PV infrastructure
- Fire department equipment and training
- Really good neighbors (regional agreements/partnerships)
- Mutual Aid Agreements
- Ability to communicate (internally and with greater region/key stakeholders)

5. Possible Improvements

The participants identified areas of improvement in terms of resilience. **These are listed here:**

- Building up lagoon infrastructure to protect from flooding
- Develop an Emergency Resilience Plan that isn't necessarily directed at local states of emergency. Rather, make it focused on key infrastructure and potential impacts of hazards
- Expanding underground stormwater capacity as the opportunity arises (improving/upgrading infrastructure)

6. Alternate Sources of Power/Heat

Participants identified **potential** sources of renewable heat and power for back-up, for use in key facilities to improve their resilience. Direct Energy opportunities were also identified. **These are listed here:**

- Lots of solar already (microgeneration)
- Have approached ENMAX for a community solar project where residents could switch their utility and rely entirely on solar (slowed down to staffing changes/scheduling)
- Always open to new technology - e.g. CHP
- Sustainable housing project (in discussion with Enmax). CHP may be an option for this.
- The ENMAX solar project won't take residents off grid entirely, but will just allow them to be net-zero at the end of the year (still reliant on external utility)

7. Bio-Retention and Green Infrastructure improvements

Participants identified potential improvements to local green infrastructure. **These are listed here:**

- Prioritizing green space in new developments through Sugar City Development Corporation (Municipal Development Entity)

- Utilizing irrigation water to flow through water features
- Urban forestry (lots of old growth trees, not many new ones). Consider and upkeep the long-term urban canopy. There will be small changes and investment in forestry over time (i.e. several thousand year after year, rather than a significant expenditure at once).
- The Town had a professional arborist do an assessment and give feedback/recommendations regarding the local forested areas. Looking to formalize a plan to implement recommendations.
- Developers do not prioritize greenspace because it is not as profitable. It is challenging to mandate greenspace while also promoting development. Need to find a balance.

8. Zones to discourage development, or apply minimum build requirements

Participants identified areas to discourage development. **These are listed here:**

- Near floodways
- Look at the Environmental Strategic Plan. There is lots of undeveloped green space, but this is concentrated in one area. Re-prioritize/re-distributed greenspace more evenly throughout the community. Find a balance between developing near green space and preserving those areas.

9. Zones to encourage development or 'Build back better':

Participants identified areas to encourage development and build back better. **These are listed here:**

- Away from flood zones/hazards
- Near potential sources of renewable energy (power or heat)
- Near accessible shelters/services
- Establishing a relative standard of appropriate amount of green space per neighborhood and density (make sure it is usable).
- Add water features to communities to establish natural drainages for new developments. Water from the irrigation system can be used in these features. This can be a tension with developers because it is not always as profitable.
- Raw water can be used throughout the community. This saves on potable water use.

10. Community Engagement and Muster Points

Participants identified potential muster points and places to engage the community to build awareness.

These are listed here:

- Victoria Sports Park - large facility to accommodate lots of people (outdoors)
- Community theatre (200 seats) or Ag buildings could be used for indoor events
- School and church gymnasiums, although the town does not own or control these spaces

Key takeaways: Participants were all in agreement with the list of assets, and were pleased to have a condensed list written down. Based on the discussion, it appears that there is great confidence in the emergency response planning that has been completed (including establishing regional partnerships, identifying local emergency shelters and certifying kitchens annually, and having trained first responders). The Town's extensive solar array was also considered an asset and strength, and participants expressed enthusiasm to continue solar development as well as explore new technologies, like Combined Heat and Power (CHP) in a new sustainable housing development.

Elderly populations, people with disabilities and those in the hospital were deemed to be vulnerable to hazards. Continuing communication and coordination with local stakeholders (including hospitals and the handi-bus society) as well as neighbouring municipalities is important in addressing this risk. The Town of

Raymond understands the importance of urban forestry and the benefits of green spaces to residents (including aesthetic value and cooling). Hiring an arborist to do an assessment of urban trees is an important first step in developing more green infrastructure, with the next being turning recommendations into action items.

Disclaimer: This exercise was originally developed by Spatial Quest, to support municipalities in New Brunswick in understanding local hazards, risks, vulnerabilities, strengths, and opportunities for improving resilience or climate adaptation, in a spatial context. Adapted for use by QUEST, for the Municipalities and Utilities Partnering for Resilience project. Maps were produced with best available data at the time. Decisions based on map information should be taken into context - and QUEST will not take responsibility for any damages caused by decisions made based on these maps.

6.3.3 Action Planning Exercise

Goal

Provide participants with an opportunity to discuss the most significant findings of the day, and present their ideas for key areas for improvement, related needs, and potential actions.

Overview

At the end of Workshop 1, participants were asked a series of questions. The responses are summarized in the sections below.

Summary of Results

1. After today's exercise, what is your understanding of the greatest needs/weaknesses?

- Raymonds infrastructure has been categorized (Critical/Key/Important), but nothing has been done to improve and secure these critical/key locations (So what?! Take actions)
- This assessment/conversation can help us improve coordination and justify programming and secure funding. Just need to bring everything together into a specific strategy.

What we heard: Participants identified steps the municipality has taken to document their infrastructure and needs. Translating that information into programs/initiatives or formal plans will help mobilize action in these areas.

2. What should be done? What is the action?

- "Exercise Blackout" (or similar) should be completed in the new Town Hall building. This was scheduled for Fall but COVID interrupted that plan.
- Identify actionable items to improve resilience of the Raymond infrastructure inventory which has been categorized.
- Utilize this Assessment and future Recommendations to chart a course forward and potentially make a Plan which can be used to justify decisions/secure funding.

What we heard: The Town needs to clearly identify action items, timelines, and budgets for priority areas. Use of this workshop discussion and assessment could be useful in justifying decisions made in the

Town (e.g. further investment in solar; decision to plant a certain number of trees each year) and securing funding.

3. Biggest take-away from Workshop

- Communication is key. It all comes back to communication.
- The value of these reviews isn't to know what we're best at, it's to know where our weaknesses are. Have to find out where the gaps are. Will incorporate this into the new five year training plan. Will develop and implement exercises based on this information as well.
- Having an outside perspective to help assess is good.
- Creating the Environmental Strategic Plan was pulling a lot of projects/initiatives together. This is an opportunity to have bigger picture coordination (lots of decentralized plans/processes based on need/opportunity). Assessments like this will help us justify the decisions we make and can be important when applying for future grants. Having a plan allows the Town/Council to pull off low hanging fruit.
- Feel a lot more informed about where we are at. I see opportunities to encourage individual actions on some of these items (incentives, development requirements, programs, etc.) Residents doing more would mean less dependence on town's response and empower residents to act on their own.
- Raymond is already a leader in a lot of ways (e.g. solar) so could be a leader in climate change adaptation and risk reduction. Having this assessment will help Council move forward on leading in this area.
- Loved all the assets laid out in front of us, it was a comprehensive list. What hit me is that we have assets that range across organizations and in order to capitalize on this, need to make sure we coordinate with non-public assets.

What we heard: *As one participant put it, "communication is key." It is important to communicate with external partners to coordinate assets and resources, and it is also beneficial to have internal knowledge sharing to have a larger picture of the Town's strengths and weaknesses. Compiling all of this information into a usable Plan or Strategy will support the municipality in securing future funding and implementing relevant programming for residents. Raymond is already a leader in solar energy and the community has the potential to be a leader in climate change risk reduction as well.*

7.0 Rural Disaster Resilience Planning (RDRP) - Hazards, Risk, Resilience

Following Workshop 1, QUEST used the Justice Institute of British Columbia's (JIBC) Disaster Resilience Portal to dive deeper into climate risk and resilience assessment for each hazard type identified in the exercises' high risk/consequence. For each hazard type, the team examined aspects of risk, strengths of the community, and any gaps identified, using a detailed set of questions.

This analysis uncovered areas of high risk and low resilience, which are summarized in the table below. Note - even though the community may be highly resilient to certain hazards, there may still be specific opportunities for improvement. Section 8.0 outlines ways the Town of Raymond can reduce risk and increase resilience.

Category	Hazard	Low risk	Mid Risk	High Risk	Low Resilience	Mid Resilience	High Resilience
Atmospheric	Blizzards		✓				✓
	Snow Storms		✓				✓
	Heat Waves		✓			✓	
	Hurricanes						
	Ice Storms	✓					✓
	Sea Storms & Surges						
	Wind Storms			✓			✓
	Hail Storms			✓			✓
Hydrological	Sea Level Rise						
	Flash Flood			✓		✓	
	Ice Jam		✓			✓	
	Local Flood			✓		✓	
	Rain Storm		✓			✓	
	Snowmelt flood		✓			✓	
Contamination / Spills	Gas leaks and explosions	✓					✓

	Oil leaks	✓					✓
	Other explosions						✓
	Hazardous material spills (on site, on land, road, rail and marine)	✓			✓		
Power, Water, and Food Shortages	Power Outages		✓			✓	
	Water Outages		✓			✓	
Fires	Brush, Bush and Grass Fires			✓		✓	
	Forest Fires / Wildfires	✓				✓	
	Wildland / Urban Interface fires		✓			✓	

8.0 Summary of Results

8.1. Summary of Key Hazards

Based on the climate projections and community discussion above, we found strong consensus on medium to high probability and medium consequence for **Hydrological hazards, power/water outages, and grass and forest fires**. **Atmospheric hazards** are considered to have medium probability and consequence. The Town has also identified risks around water supply shortage, drought, and wildfire/grass fire risk that need more immediate action. The level of risk for each hazard sub-type was further assessed using the JIBC's Disaster Resilience tools.

- **Hydrological hazards:** Overland flooding is of high concern. In 2013 the Town was very close to experiencing an extreme event caused by heavy rainfall, flooding the High River. Climate projections indicate that Raymond will see an increase in precipitation, which may result in increased frequency and intensity of floods. The Town is used to experiencing dry and wet seasons. However, projected increased temperature and precipitation will make these dry and wet periods more intense.
- **Atmospheric hazards:** Annual high intensity winds from the nearby Pincher Creek area can damage infrastructure and cause injuries. Climate change will increase the frequency and intensity of extreme events, so wind storms may be more common in the future. The Town has not seen new maximum temperatures in the past 3 years, nor have there been heatwaves. However, climate projections indicate average and maximum temperatures will increase, with the number of hot days quadrupling (days over 29 celcius). The Town has observed a longer winter season, with snow lasting approximately 5 months in the past year.
- **Power & Water Outages:** Water outages and drought in the summer and fall may become an increased risk to the Town. Climate projections indicate an increase in mean and maximum temperatures, as well as a quadrupling of hot days (days over 29 celcius). These future temperatures will pose threats to water supply. Power outages have not been frequent in the area and the Town has improved self-sufficiency through solar installations. However, climate change will increase extreme events like flooding, wildfires, and wind storms, all of which pose threats to above ground electricity infrastructure.
- **Grass Fire, Brush Fire, Forest Fire or Wildland-Urban interface fires:** Possible, with dryer summer and fall conditions and increased frequency of extreme weather (e.g. lightning, drought). The Town is surrounded by agricultural land which may be at risk of grass/brush fire. The province has experienced some large and out-of-control grass, brush, and forest fires over the last few years.

8.2. Summary of Key Strengths / Things in Place

Based on the information contained in this report, below is a bullet-point summary of the key areas of strength in the community. This includes all the inputs gathered through the Community Baseline Survey, climate projections, Engagement Survey, Action Planning Exercise, as well as the RDRP analysis. More detailed aspects of risk and community strengths/weaknesses, for each hazard type, are included in a separate annex.

Vegetation & Wildlife
A Fire Prevention Plan and Evacuation Plan is in place.
Fortis completes tree trimming to protect power lines and prevent outages.
Powerlines for new subdivisions/developments are put underground.
No key local facilities are located directly adjacent to forested areas. The Town mows down grass.
The Town of Raymond and surrounding County have a partnership for volunteer firefighters (Mutual Aid Agreement). Fire crew is set up to use small pumper trucks rather than large fire trucks- allows for rapid response and low capital cost.

Water & Sewage
The Town received \$2 million from the Government of Alberta to invest in flood diversion infrastructure. Substantial berm infrastructure has been built to divert flood waters to the golf course floodway (usually most water is diverted into the irrigation system; extreme events are diverted to the golf course). Development on the east side of the course is new and has been intentionally built significantly higher than the golf course. Any flooded properties that rebuild must be raised above the golf course.
Municipality sizes culverts to account for future flood risk.
The Town has mapped the floodplain after the 2013 flood event (likely used provincial funding). No key infrastructure is near the floodway. Development in flood prone areas requires engineers to sign off on mitigation. The Town works with current property owners in flood prone areas to reduce their risk.
Raymond has a distributed water system with a separate stormwater system built above a 1:100 flood level. Sewage outflow and discharge systems are also built to this standard. Lift stations are above predicted flood levels.
The Town has partnered with nearby communities to build a Regional Water System. The plant is 10 years old and has solar power which makes it net-zero (although still reliant on the grid). It supplies three to four southern Alberta communities. The plant is high tech and almost fully automated and controlled with iPads.
Sewer system is a gravity system, so loss of power is not a concern. While some municipal pipes are historic, they are gradually being replaced. Before repaving roads the Town considers upgrading piping.
Working on a new process to rapidly move up the timeline for the lagoon expansion (AB Environment has approved a project that won't use as much land as previously thought).
The Town has a large water reservoir nearby, so there is no concern about running out of water. Participants explained that if the community runs out of water it would have to be a near "apocalyptic

event". Town cooperates with other communities in the region for cooperative use of local water resources.

Water Bylaw gives the Town the ability to limit water use during times of drought/schedule residents' non-essential water use.

Planning, Organization & Coordination

The Town has an ERP and Communications Plan in place.

Land Use Plan in place with up to date GIS mapping system. Building Code in place. Current regulations meet our needs/standards but do not exceed them. We need to do more to identify risks.

Raymond has an Environmental Strategic Plan but climate is not strongly worded in the document (although it touches on climate change and GHG reductions somewhat). Town is trying to figure out their position on climate change. Strategy mostly looks at areas of opportunity/improvement in the environmental area. This may be the only municipal Environmental Strategic Plan in Alberta (other than Lethbridge).

No Community Energy plan, although there is a Net Zero Solar Plan that stands alone. Received 25% grant to encourage the project and targeted major electric users (e.g. ice arena). Originally could not find a way to make it address street lights (biggest electricity user). Rules changed with the new government and they were able to collect for offset usage which facilitated the net zero action.

The Town has a Contact Tree and annual communication with ATCO and Fortis. There is currently no need to meet with the utility more regularly than that. Municipal staff know who to contact if there are issues.

Town works with local organizations in times of emergency/disaster, including the Department of Emergency Management works with RCMP detachment, Community Peace Officer, Raymond Volunteer Ambulance and Fire, the Church of Jesus Christ of Latter-Day Saints. Alliances made with local industry and neighbouring communities regarding emergency response and fire service (Mutual Aid Agreement). Also have agreements with churches to assist with housing evacuees and the Ag Society as a location for animals, if required.

Partnerships with neighbouring communities regarding housing evacuees. Several years ago residents from Milk River evacuated to Raymond due to fire (particularly the elderly population); this went well.

The Town has small fuel reserves for the municipal fleet in the event of an emergency. Agreements in-place with gas stations to ensure stations won't run out of fuel and the Town can access supplies if needed (e.g. if they need gas for fire trucks). Agreement with gas stations addresses the issue of limited fuel storage.

DEM Management previously worked in the Armed Forces, so lots of local expertise. DEM knows the roles and responsibilities for everyone and would communicate this info.

The Emergency Management Committee is in charge of planning for resilience (includes a mix of Councillors and administrative staff). The Emergency Response Team understands that when there is

an event they will be relied upon to make decisions. Some members have received response training (e.g. Director of EM, Fire Chief, RCMP).
Ensures kitchens at emergency shelters are certified annually. Food safety course hosted for emergency management purposes, and now many town members are certified to prepare food. Town purchases emergency supplies annually (creating stockpiles).
<p>The Town has budgeted for energy related projects:</p> <ul style="list-style-type: none"> • 2020 - \$30k for backup generator for Town Office; \$40k for arena energy retrofit • 2021 - \$30k (endorsed) for EOC backup generator; \$100k (endorsed) for arena energy retrofit • 2022 - \$40k (endorsed) for solar pedestrian street lights
Town is agile and able to move money around to respond during extreme events (e.g. COVID).
The Emergency Plan considers consequences of power outages and has identified response actions and responsible persons. Exercises for prolonged outages have been completed including “Exercise Blackout” (~2 years ago). The Town feels comfortable with handling a long term blackout.
Measures to protect critical public facilities during disasters are adequate for current known risks. New residential development applications consider energy efficiency and require an Engineering Site & Drainage Plan.
Regional emergency response plans have been given to the Town (somewhat out of date). Assessment of compliance with building codes, safety, and weather-related risk for schools/health facilities is likely carried out by school boards/AHS. The DEM has coordinated a plan/effort.
Land Use Bylaw/permitting process has floodplain and land subsidence restrictions (engineer sign off, etc.). Enforcement officer capabilities to enforce Land Use Bylaw (LUB) restrictions/mitigations (in LUB). Flood hazard is the main focus.
Public Emergency Plan has a training plan/outline for drills/exercises, list of evacuation procedures. “Get Out” and “Return Home” evacuation exercises have been completed. This included resident carpooling and looking at school buses that can be used. Neighbouring communities included in exercises. All involve municipal staff, Emergency Management Team and other interested parties. Good participation. Carried out as planned.
Currently in the process of updating the five year training plan located in the EMP (results of this assessment may be included). Some information has been redacted from public docs to protect assets.
Town has an Emergency Preparedness guide on its website for residents (plain-text doc). Town has done some public engagement but there is not much interest from residents.
The EMP has some information on how to support the evacuation of health facilities and schools during an evacuation. Roles and responsibilities as well as evacuation routes have been identified, although there are opportunities for greater communication.

Disaster Recovery Plan (in EMP) lays out the process for establishing a Disaster Victims Assistance Centre and steps to establishing a Disaster Recovery Program (temporary). Provincial Disaster Relief Fund is in place.

Communications & Awareness

The Town informs the public about what to do to prepare for emergencies and storm safety, as well as what to do and not do during an outage. Emergency Plan, Bylaws, and public emergency preparedness guide are online. Hazards posted on the Town website (e.g. June 30, wastewater system impacted by heavy rains).

Communications Tower in town. Radio station and transmitter/tv station in Lethbridge.

Agreement with the Southern Alberta HAM radio organization to enhance communication during times of emergency/evacuation. Regional mobile Emergency Operations Centre for Communications is under development. Raymond provides some funding for development and upkeep. Participants advised that this is novel.

Utilize Alberta Emergency Alert (AEA). DEM trained in AEA operation. Fire department is connected with provincial emergency radio. There is also a local emergency channel as a backup with enough coverage for the whole town. Trunk mobile radio for first responders. Responders communicate with DEM (in EMP).

EOC is based out of town hall which has some backup power in place. 2021 - \$30k (endorsed) for specific EOC backup generator.

Electricity Infrastructure

Electricity is received via the grid and some renewables (solar net zero community). Solar projects partially funded by MCCAC. Raymond is viewed as a leader in this field and received an FCM Sustainability Award for their work. The Magrath Wind Farm is nearby.

The Town of Raymond is working on implementing a solar and backup battery storage unit (particularly useful in town admin buildings and EMO). Solar is preferred over diesel because it is less reliant on outside energy sources.

There are several backup generators in the Town, including:

- Hospital has backup generator
- Ridge and Good Sams Care Facilities (automatic backup power)
- Town Hall has a large generator (have not exercised this yet (however, did this at previous building and it worked well) but is a priority in the near future)
- Regional Water Treatment Plant has backup generator

<ul style="list-style-type: none"> • Sewer System is a gravity system, so power not a big concern (although a few lift stations require power; Town is doing upgrades to wastewater systems so adding backup power to lift stations could be an improvement) • Emergency shelters (churches) do not have permanent backup power, although the town can provide portable generators. <p>Funds are budgeted for renewable energy, energy efficiency retrofits, and backup generators. Council is generally supportive.</p>
There is a warning system in place to warn residents about outages.
Expanding solar to other infrastructure (e.g. churches used as emergency shelters) has been identified as a priority.

Oil & Gas
Local Emergency Response personnel are properly trained and have appropriate personal protective equipment (PPE) for oil/gas leaks/explosions.
There is no active drilling or refining in the immediate community area. The only pipeline is for local distribution of natural gas.
The Town has provisions in place to keep service stations open during events/outages as well as diesel supply for the generators.

Transportation
The Town has interest in electric vehicles to make use of local solar electricity production. Electric Ford 150s, golf carts, and zambonis are of particular focus. Longer life span of the vehicle, less maintenance, and electric use are all motivating municipal interest.
Can use the solar car park (approximately the length of a football field) as hail protection for vehicles.
Problem areas on roadways have mitigations such as wider shoulders and guard rails.
There is no railway in the community area, so risks associated with rail transit are not present. The Town is working with CP to secure the abandoned lines.
The Town has more than one main transportation corridor to enter/exit the community and these roads are not frequently blocked due to weather or other conditions.

8.3. Summary of Areas for Improvement

Based on the information contained in this report, below is a bullet-point summary of the areas where things may be improved, are missing or needed. This includes all the inputs gathered through the

Community Baseline Survey, climate projections, Engagement Survey, Action Planning Exercise, as well as the RDRP analysis. More detailed aspects of risk and community strengths/weaknesses, for each hazard type, are included in a separate annex. Recommendations will be made based on these findings at a second workshop in 2020 - participants will then discuss actions and strategies suitable to the community and determine priorities.

Vegetation & Wildlife
Some existing power lines are above ground. If funding is available, consider putting underground.
Ecosystem protection/natural buffers are not considered in the Municipal Development Plan or LUB.
The golf course is considered to be the only local ecosystem/area of green infrastructure.

Water & Sewage
No current plan/provisions for potable water distribution during heat events.
Two water bodies in Town feed into the irrigation system. No natural retention beyond this and the golf course floodway.
Sewage system lagoon is undersized (but an upgrade is underway).
The Town has experience in sand bagging but supply of sand and bags is unclear.
Some lift stations require power and do not have backups in place. As the Town is upgrading the wastewater system, adding backup power could be done.

Planning, Organization & Coordination
The Town's ERP and Municipal Development Plan do not consider climate risk or impact of prolonged outages. Disasters and climate projections are not included in new residential development applications.
No Asset Management Plan (although development is underway). Need to complete study (\$70k) to catalogue all assets, including deep assets. The province will likely make these Plans a requirement.
No Climate Change Adaptation Strategy (although Environmental Strategic Plan in place which indirectly considers climate). No Community Energy Plan or Local Action Plan (although there is a Solar Net Zero Plan). No Resilience Plan or Strategy.
The Land Use Plan does not discourage development in flood risk areas. Municipality does not ensure disaster risk assessment is completed in all local development decisions.
No inventory of skills and resources.

Some supplies stockpiled in the event there are evacuees, although could be expanded. No tourist evacuation plan (because of lack of tourism).
External funding (grants) are needed to support risk reduction activities. Significant flood mitigation infrastructure funded via grant. Risk reduction would not have happened without it. Nothing designated in the budget for risk reduction activities.
No specific programs or economic incentives for homeowners/businesses to reduce risk. However, there is opportunity in the Environmental Strategic Plan to create incentives/programs.
No formal process to consider climate in development decisions, although “risk” is often considered. Would be useful to have a formal process or staff to ensure climate projections are incorporated.
More could be done to link local risk assessments with hazards assessments identified by other entities (e.g. hospitals, schools). Town has the plans but could expand coordination.
Being a small community, people wear multiple hats and human resources are stretched.
Measures to protect critical public facilities during disasters are adequate for current known risks. More can be done to understand risks and their impacts, and create regulations to address future hazards.
The Land Use Bylaw Enforcement Officer usually only does complaint-based enforcement.
No permanent, in-house program to support victims of disasters. Overall this is a gap for the town because we rely on external health units for assistance or the City of Lethbridge (if they have the capacity).
Nothing in the bylaws regarding disaster risk reduction being integrated into post disaster recovery and rehabilitation.

Communications & Awareness
No public education on climate change up to this point. Community members have differing views on climate change and the Town has yet to take a firm position on the topic.
No backup power for Communications Tower and trunk mobile radio (although establishment of Mobile Regional Communications Centre is underway and will have backup power). No backup power for radio/tv station in Lethbridge.

Electricity Infrastructure
The number of buildings in the Town with backup generators/capability for backup generators is not formally documented.
Emergency shelters (churches) do not have permanent backup power, although the Town’s portable

generators can be used. There is currently no backup supply of heat. These facilities are a top priority for solar battery storage.
The Town has not exercised the large generator at the new Town hall. However, a similar system was in place at the previous building and it worked well.
The Town does not have an online monitoring system for municipal facilities or other municipal assets
No list of priority areas for restoration during a power outage has been provided to Fortis. However, the Town communicates with the utility if there is an outage.
The Town does not encourage residents to have backup power. However, the town is in discussions with ENMAX to create a program for residents to participate in net-zero solar.
Cooling centres, schools, animal shelters, fueling stations, and grocery stores do not have backup power.
No plans to reach vulnerable populations (homeless, low income, etc.).

Oil & Gas
Unsure of utilities/O&G companies monitoring and updating of O&G distribution system (although ATCO confirmed low and high pressure monitoring is completed). More communication may be needed.
Unsure if there are closed circuit security cameras to monitor pipelines.
No local distributors with storage tanks .

Transportation
No lower speed limits in areas hazardous materials are being transported. The fire department is not aware of quantity/type of material being transported.
No EVs (consideration in progress).
Evacuating people with disabilities is the greatest challenge with evacuations (e.g. logistics, securing enough specialized vehicles). While evacuation would be the responsibility of the care facilities, it would be good to increase communication and coordination (i.e. consider adding to EMP). It is important for the Town to understand health facilities emergency plans. While no written agreements in place with extended care facilities regarding evacuation/emergency management, those facilities are a priority for the fire department to go and check on during an emergency.
Limited communication/coordination with health facilities and handi-bus society in town for emergency response/evacuations.

9.0 Conclusion

This report highlights that the Town of Raymond is exposed to several hazards. Weather-related hazards are expected to increase due to climate change. This requires the Town to adapt its planning processes and documents to adapt to climate change, build resilient infrastructure and amenities, and develop sound climate-specific emergency responses.

The assessment of policies and procedures in place stresses that the Town of Raymond is doing very well in terms of emergency preparedness and response, as well as solar energy production and flood adaptation. The Town has strong alliances with local stakeholders and neighbouring municipalities related to fire and emergency response. Annual training drills allow these groups to come together to exercise disaster management. The Town of Raymond should build off their strong emergency response and coordination experience to consider and implement policies that address climate risk and vulnerabilities, land use planning, as well as resilience and adaptation measures. As the Town of Raymond looks to expand its tourism sector and secure grants, these considerations will be increasingly important.

Based on feedback received, the process of engaging municipal staff, energy utilities, and other community stakeholders was well received and proved to be effective. It also helped inform a comprehensive assessment (this document), but does not include engineering assessment of specific projects. If that is necessary, it will be among the recommendations to consider.

Climate-induced weather events can pose serious threats to infrastructure, most of which has not been built to withstand future extremes. Emergency preparedness, proactive risk reduction, and sound communication and collaboration can increase a community's resilience. Action now will reduce economic risk and save on increasingly long-term costs associated with climate change.

The results of this Climate Risk and Resilience Assessment, will be used by QUEST to generate recommendations tailored for the community, which will be presented at a second workshop in Fall 2020. The results can also be used by the community in planning and prioritizing future initiatives to improve resilience and climate change adaptation.

10.0 Annexes

1. Definitions of Resilience

At its simplest level - Resilience is being empowered by being aware of your situation, your risks, vulnerabilities and current capabilities to deal with them, and being able to make informed tactical and strategic decisions.

Climate Resilience can be generally defined as the capacity for a socio-ecological system to:

- (1) Absorb stresses and maintain function in the face of external stresses imposed upon it by climate change
- (2) Adapt, reorganize, and evolve into more desirable configurations that improve the sustainability of the system, leaving it better prepared for future climate change impacts.

Organizational Resilience:

The ability of a system to withstand changes in its environment and still maintain the same essential functions, structures, systems, and identity.

Urban Resilience:

The measurable ability of any urban system, with its inhabitants, to maintain continuity through all shocks and stresses, while positively adapting and transforming towards sustainability. Therefore, a resilient city is one that assesses, plans and acts to prepare for and respond to hazards.

Energy Resilience:

The ability to adjust to interruptions in the supply of energy (1982).

source: wikipedia

2. Climate Data

Below are the historical and future trends of relevant temperature, precipitation and complex climate variables. This climate analytics information was used by QUEST as input to the risk and resilience assessment phase of the project and as part of the final report.

Historic and projected climate data and maps for this report were extracted from Climate Data Canada (<https://climatedata.ca/about/>) and the Climate Atlas of Canada (<https://climateatlas.ca/>) information portals. These publicly available climate data information portals are a collaboration between Environment and Climate Change Canada (ECCC), the Computer Research Institute of Montréal (CRIM), Ouranos, the Pacific Climate Impacts Consortium (PCIC), the Prairie Climate Centre (PCC), and

HabitatSeven. The climate data and projections for each participating community was extracted into spreadsheets and relevant data was used to develop the climate data summaries for each community.

Climate Data Canada and the Climate Atlas of Canada provide climate and climate change outputs based on geographical area, sector, theme and timeframe of interest. The information portal draws on data from thousands of locations and multiple sources to provide information such as: temperature and precipitation normals and extremes; trends and frequencies of temperature and precipitation at relevant thresholds; key statistics on other extreme weather; and climate change projections from international and domestic government sources.

Climate statistics

Frost profile

The probability of frost profile is the daily probability of the occurrence of frost, i.e. when minimum temperature is less than 0°C, averaged over the 30-year period. It is expressed as the percentage of the number of days during the period when minimum temperature is less than 0°C and for plotting purposes, a five-day running mean has been applied to the data. An indication of the length of the freeze-free season is also given, i.e. the number of days during the year when the daily mean temperature is greater than 0°C.

Cooling and heating degree days

Degree days are the accumulated departures of temperature above or below a particular threshold value, with these values selected to be of relevance to particular sectors, e.g. energy and agriculture. For example, a threshold temperature of 18°C is used as an indication of space heating or cooling requirements. For space heating, if the mean temperature is below 18°C then the departure from this threshold value is calculated and summed for all days on which the mean temperature is below the threshold value. For space cooling, the temperature departures are accumulated if the mean temperature on a particular day is above the 18°C threshold value.

Freeze-thaw cycle (monthly)

Freeze-thaw cycles represent the average number of days per period indicated when the daily maximum temperature equals or exceeds 0°C AND the daily minimum temperature is less than 0°C. The freeze-thaw cycle and its associated effects on water/ice formation can have significant effects on built environment deterioration.

Accumulated precipitation

The accumulated precipitation profile (in mm) indicates the progression of precipitation over a calendar year. Snow is converted to mm of water equivalent. The mean accumulation, maximum and minimum years for the period are shown as coloured lines. In addition, as an indication of extremes, diamonds indicate the progression of precipitation if either the maximum or minimum values of each month are summed for the period in question.

3. List of workshop participants (5)*

Name	Organization	Role
Abe Tinney	Town of Raymond	Legislative Services
Kurtis Pratt	Town of Raymond	Chief Administrative Officer
Stewart Foss	Town of Raymond	Town Councillor
Greg Robinson	Town of Raymond	Director of Community Development and Human Resources
Ken Steed	Town of Raymond	Director of Emergency Management

*Fortis and ATCO were invited to the workshop, but were unable to attend. Utility information in this report was identified through individual correspondence with the local utility contacts.

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