DILLON CONSULTING

City of Brantford

Community Risk Assessment

Final Report

June 2019 - 187634

Table of Contents

Figures

Tables

1.0 Introduction

The process of assessing community risk is receiving increased attention within the fire protection industry in North America. A Community Risk Assessment (C.R.A.) is fundamental to the development of a strategic Master Fire Plan (M.F.P.). Assessing community risk informs the understanding of local needs and circumstances, which can then be aligned to the service levels established by the municipality. The results of a C.R.A. directly inform the recommendations within the M.F.P. and are used to identify existing service gaps across divisions, with particular connections to fire prevention, training and emergency response (e.g. suppression).

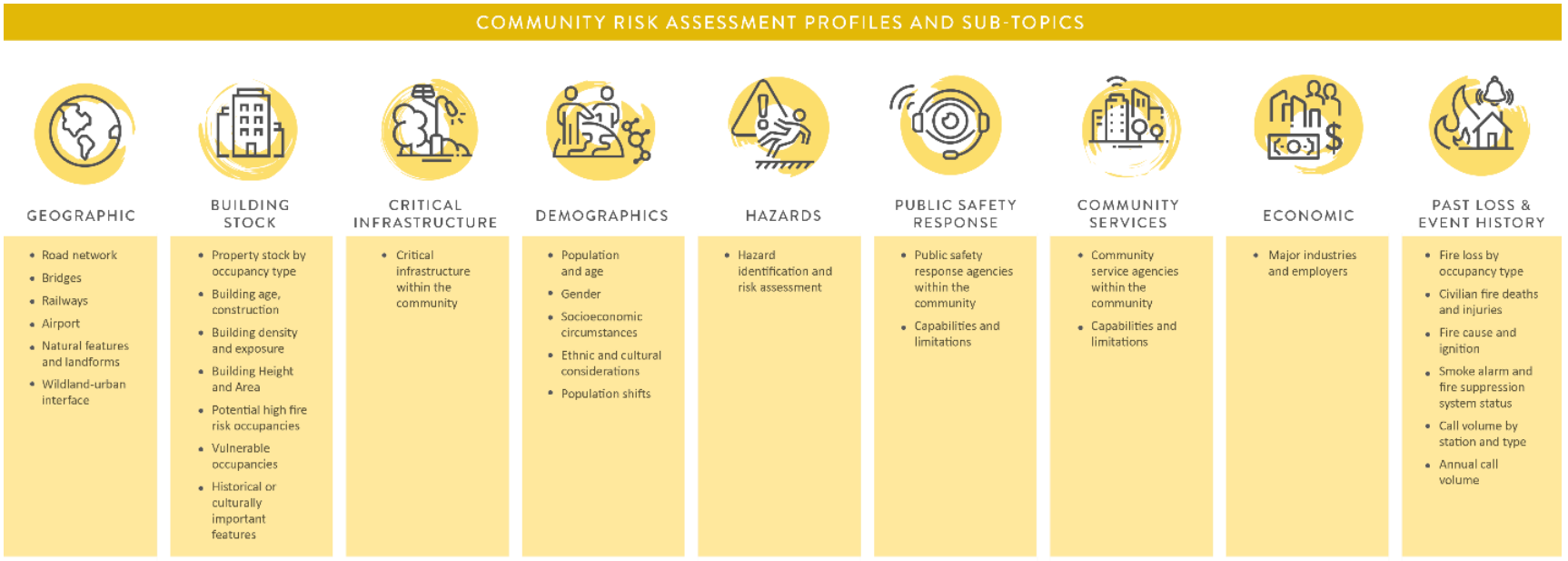
This appendix to the M.F.P. outlines the methodology and sources of information used to assess community risk in the City of Brantford. The analysis and results of the assessment are described based on three primary report sections: profile assessments; Geographic Information System (G.I.S) risk model; and future growth considerations.

In May 2018, the Ministry of Community Safety and Correctional Services (M.C.S.C.S.) adopted *Ontario Regulation 378/18: Community Risk Assessments* under the Fire Protection and Prevention Act (F.P.P.A), which requires every fire department to complete a Community Risk Assessment (C.R.A.). The C.R.A. is intended to inform decisions about the provision of fire protection services within a community. The mandatory community risk assessment includes consideration of the following nine profiles:

1. Geographic Profile
2. Building Stock Profile
3. Critical infrastructure Profile
4. Demographic Profile
5. Hazard Profile
6. Public Safety Response Profile
7. Community Services Profile
8. Economic Profile
9. Past Loss and Event History Profile

Within each of the nine profiles, there are a number of sub-topics examined. These sub-topics are illustrated in **Figure 1** below.

Figure 1: Community Risk Assessment Profile and Sub-Topics



A C.R.A. must be conducted at least every five years, with annual reviews. Ontario Regulation 378/18: Community Risk Assessments comes into force on July 1, 2019 and allows jurisdictions until July 1, 2024 to complete a C.R.A. The new regulation has expanded and enhanced the depth at which risk is considered by jurisdictions, providing a more thorough analysis of the risks within a community.

In order to complete this C.R.A., data was collected and analyzed to identify risks from the perspective of each of the nine profiles. Key data sources included: Statistics Canada, Municipal Property Assessment Corporation (M.P.A.C.) data, O.F.M.E.M. Standard Incident Reporting, data provided by the Brantford Fire Department (B.F.D.) and desktop research. The lens for this risk assessment is focused on fire risk or how a risk outcome relates to a fire department.

By completing a C.R.A. now, the City of Brantford is well positioned to be in compliance with Ontario Regulation 378/18: Community Risk Assessments.

2.0 Risk Assessment Methodology

A Community Risk Assessment paints a picture about local needs and circumstances which can be used to inform decision-making including establishing service levels for a fire department. This C.R.A. is structured to directly inform the Master Fire Plan for the City of Brantford.

As outlined in **Figure 2,** the C.R.A. can be broken down into three broad stages and begins with data collection (Stage 1). This is followed by stage 2 which includes analyses within the context of the nine profiles and related sub-topics (Stage 2a). The analyses results and conclusions are identified as either a Key Risk or a Key Finding (Stage 2b). Within the context of this C.R.A., a **Key Risk** is an analysis outcome for which there is sufficient and appropriate information to inform an assessment of risk based on probability and consequence. The analyses and information available provides the opportunity to quantify the risk through a risk assignment process that concludes there is an existing fire related risk to the community. This is referred to as a risk assignment process where a risk level of high, moderate, or low is assigned. In simple terms, risk is defined as:

Risk = Probability x Consequence

Similar to a key risk, a **Key Finding** is a risk related conclusion of the analysis that will inform service levels and other strategies. However, it is not put through the risk assignment process, in part because there is not sufficient quantitative data to do so.

The third and final stage of the C.R.A. takes the risk analysis outcomes and sets them up so that they can be directly applied within the Fire Master Plan. This includes three steps:

1. Key Risk prioritization through the assignment of risk level (low, moderate, high) based on probability and consequence;
2. Categorization of Key Risks and Key Findings, based on the three lines of defence; and
3. Development of a Risk Map.

Further information on the three lines of defence is presented in the following section.

2.1 Three Lines of Defence

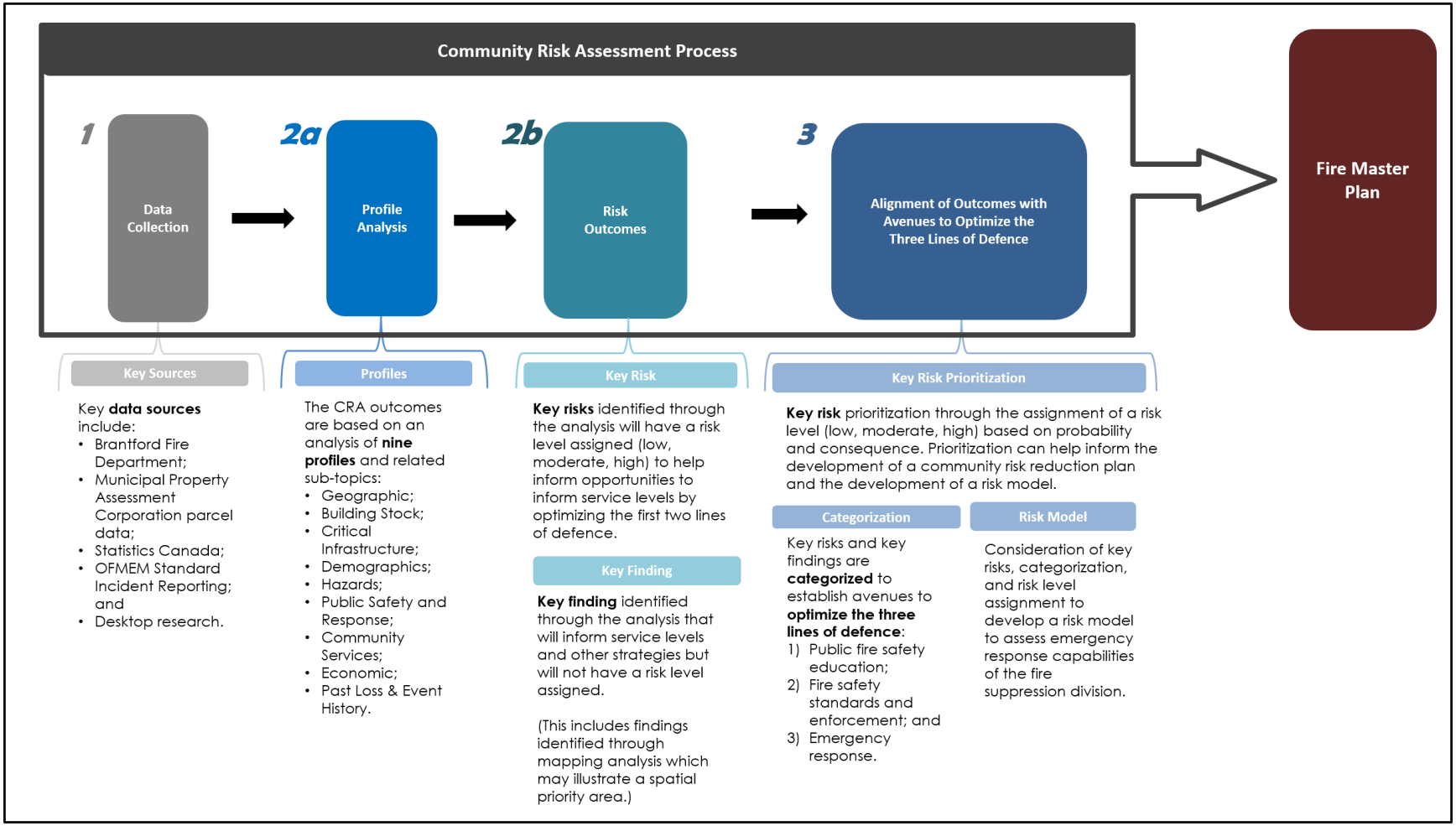
The O.F.M.E.M. Comprehensive Fire Safety Effectiveness Model identifies a fire protection planning strategy known as the **"Three Lines of Defence".** The application of this strategy highlights the importance of recognizing that there are options to developing an effective community fire safety plan. Although emergency response (fire suppression) may be needed, there are other strategies that can be applied as elements of a broader community risk reduction strategy that can have a positive impact on reducing the need for emergency response and optimizing public safety within the community. The **"Three Lines of Defence"** model is summarized in **Table 1**.

Table 1: Overview of O.F.M.E.M. Three Lines of Defence Model

Line	Description
I. Public Education and Prevention	Educating residents of the community on means for them to fulfill their responsibilities for their own fire safety is a proven method of reducing the incidence of fire. Only by educating residents can fires be prevented and can those affected by fires respond properly to save lives, reduce injury and reduce the impact of fires.
II. Fire Safety Standards and Enforcement	Ensuring that buildings have the required fire protection systems, safety features, including fire safety plans, and that these systems are maintained, so that the severity of fires may be minimized;
III. Emergency Response	Providing well trained and equipped firefighters directed by capable officers to stop the spread of fires once they occur and to assist in protecting the lives and safety of residents. This is the failsafe for those times when fires occur despite prevention efforts.

The model also recognizes that developing programs and providing resources to implement the first line of defence (a proactive public education and fire prevention program) can be the most effective strategy to reduce and potentially minimize the need for the other lines of defence. The C.R.A. process is designed to inform the M.F.P., incorporating strategies and recommendations based on all three lines of defence.

Figure 2: Community Risk Assessment Process



2.2 Risk Assignment Methodology

Once the risk outcomes have been identified, a risk assignment methodology is applied to inform the prioritization of risks for community risk reduction strategies as well as to develop a risk model to assess emergency response coverage. This section provides an overview of the risk assignment methodology.

The O.F.M.E.M. Fire Risk Sub-model defines risk **"as a measure of the probability and consequence of an adverse effect to health, property, organization, environment, or community as a result of an event, activity or operation. For the purposes of the Fire Risk Sub-model, such an event refers to a fire incident along with the effects of heat, smoke and toxicity threats generated from an incident".**[1]

The O.F.M.E.M. model develops an overall risk assessment by **"assigning probability and consequence levels to potential adverse events or scenarios due to fire and combining the two to arrive at an overall risk level."** The Sub-model also provides a matrix as one option in arriving at the level of risk for a range of scenarios.

At a high level, there are four steps included in the risk assignment exercise used for this study:

1. Determine a probability level to assign to each event;
2. Determine a consequence level to assign to each event;
3. Establish the risk level (e.g., numerical value / location on the matrix) and risk category (e.g., low, moderate or high) for each based on the identified probability and consequence for each event; and
4. Develop a G.I.S. risk model based on the Risk Level/Category.

Further detail is presented in the subsequent sections.

[1]Source: "Comprehensive Fire Safety Effectiveness Model." O.F.M.E.M., Last Modified: February 8, 2016: https://www.M.C.S.C.S..jus.gov.on.ca/english/FireMarshal/FireServiceResources/ComprehensiveFireSafetyEffectivenessModel/FireRiskSub-Model/Fire_risk_submodel.html

2.2.1 Probability Levels

The first step to identifying a risk level is to assign probability. The probability of a fire or emergency event occurring can be estimated in part based on historical experience of the community, similar communities, and that of the province as a whole. The application of broader risk management industry best practices is also a key element in assigning probability levels.

The O.F.M.E.M. Fire Risk Sub-model categorizes the probability of an event occurring into five levels of likelihood, and provides descriptions for each probability level. These are shown in **Table 2.** The numerical weighted value assigned to the probability level has been adjusted from the O.F.M.E.M. values to reflect broader risk management industry best practices. Similarly, the descriptions for each probability level reflect the basis of O.F.M.E.M. descriptions; however they have been adjusted based on risk management industry best practices and definition of the adjusted probability values presented.

Table 2: Probability Levels

Likelihood Category	Value (O.F.M.E.M.)	Value (Adjusted)	Description (Adjusted from O.F.M.E.M.)
Rare	1	1	• May occur in exceptional circumstances • No incidents in past 25 years
Unlikely	2	10	• Could occur at some time, especially if circumstances change • At least one incident in past 10 years
Possible	3	100	• Might occur under current circumstances • Occurs annually on average (1 to 5 incidents in past year)
Likely	4	1,000	• Will probably occur at some time under current circumstances • Multiple or reoccurring incidents in the past year • May occur monthly (10 to 50 incidents per year)

Likelihood Category	Value (O.F.M.E.M.)	Value (Adjusted)	Description (Adjusted from O.F.M.E.M.)
Almost Certain	5	10,000	• Expected to occur in most circumstances unless circumstances change • Multiple or reoccurring incidents in the past year • May occur weekly or daily (more than 50 per year)

2.2.2 Consequence Levels

The second step to identifying risk levels is to assign a consequence level. The consequences as a result of an emergency event relates to the potential losses or negative outcomes associated with the incident. The Fire Risk Sub-model identifies four components that should be evaluated in terms of assessing consequence. These include:

1. **Life Safety:** Injuries or loss of life due to occupant and firefighter exposure to life threatening fire or other situations.
2. **Property Loss:** Monetary losses relating to private and public buildings, property content, irreplaceable assets, significant historic/symbolic landmarks and critical infrastructure due to fire.
3. **Economic Impact:** Monetary losses associated with property income, business closures, downturn in tourism, tax assessment value and employment layoffs due to fire.
4. **Environmental Impact:** Harm to human and non-human (i.e. wildlife, fish and vegetation) species of life and general decline in quality of life within the community due to air/water/soil contamination as a result of fire or fire suppression activities.

The O.F.M.E.M. Fire Risk Sub-model evaluates the consequences of an event based on five levels of severity. The description and definition of each consequence level from the Fire Risk Sub-model are shown in **Table 3**. Similar to the probability levels, the numerical weighted value assigned to the identified consequence levels have been revised from the O.F.M.E.M. values to reflect broader risk management industry

practices for assigning risk levels. The O.F.M.E.M. definitions are used for each consequence level.

Table 3: Consequence Levels

Consequence Category	Value (O.F.M.E.M.)	Value (Adjusted)	Description (O.F.M.E.M.)
Insignificant	1	1	• No life safety issue • Limited valued or no property loss • No impact to local economy and/or • No effect on general living conditions
Minor	2	10	• Potential risk to life safety of occupants • Minor property loss • Minimal disruption to business activity and/or • Minimal impact on general living conditions
Moderate	3	100	• Threat to life safety of occupants • Moderate property loss • Poses threat to small local businesses and/or • Could pose threat to quality of the environment
Major	4	1,000	• Potential for large loss of life • Would result in significant property damage • Significant threat to businesses, local economy, and tourism and/or • Impact to environment would result in a short term, partial evacuation of local residents and businesses
Catastrophic	5	10,000	• Significant loss of life • Multiple property damage to significant portion of the municipality • Long term disruption of businesses, local employment, and tourism and/or • Environmental damage that would result in long-term evacuation of local residents and businesses

2.3 Risk Matrix and Risk Levels

Once probability and consequence are determined for each major occupancy classification the level of risk is calculated by multiplying the numerical values for probability and consequence. The risk level is then attributed to a risk category.

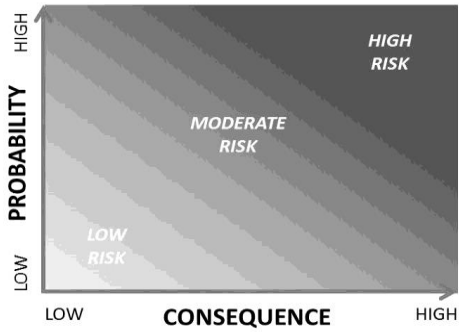


Figure 3: Generic Risk Matrix

The relationship between probability and consequence as it pertains to risk levels can be illustrated in a risk matrix. Risk matrices typically demarcate different levels of risk along a 45-degree angle, as Figure 3 illustrates. Probability and consequence are each defined on separate scales with varying descriptors providing direction on how to assign the probability and consequence of an event. While these descriptors will vary, probability and consequence must use the same logarithmic numeric scale, to reflect the fact that they are equally important. It is human tendency to place a higher weight on consequence than on probability, but robust risk analysis methods value probability and consequence equally.

Table 4: Risk Matrix

Consequence / Probability		Insignificant	Minor	Moderate	Major	Catastrophic
		1	10	100	1,000	10,000
Almost Certain	10,000	10,000	100,000	1,000,000	10,000,000	100,000,000
Likely	1,000	1,000	10,000	100,000	1,000,000	10,000,000
Possible	100	100	1,000	10,000	100,000	1,000,000
Unlikely	10	10	100	1,000	10,000	100,000
Rare	1	1	10	100	1,000	10,000

Consequence / Probability	Insignificant	Minor	Moderate	Major	Catastrophic
	1	10	100	1,000	10,000
Risk Category	**Definition (O.F.M.E.M.)**				
Low Risk	• Manage by routine programs and procedures • Maintain risk monitoring				
Moderate Risk	• Requires specific allocation of management responsibility including monitoring and response procedures				
High Risk*	• Community threat, senior management attention needed • Serious threat, detailed research and management planning required at senior levels				

* Note: The O.F.M.E.M. descriptions for High Risk and Extreme Risk have been combined. N.F.P.A. 1730 does not use the Extreme Risk category.

N.F.P.A. 1730 identifies three risk categories (low, moderate, and high), while the O.F.M.E.M. Fire Risk Sub-Model identifies four risk categories (low, moderate, high, and extreme). This study makes use of the risk categories identified in N.F.P.A. 1730 and the descriptions for each risk category provided in the O.F.M.E.M. Fire Risk Sub-Model. **Table 4** shows the risk matrix for this C.R.A. As mentioned, the numerical values have been adjusted from those proposed in the O.F.M.E.M. Fire Risk Sub-Model to reflect industry best practices.

3.0 Geographic Profile

As referenced in Ontario Regulation 378/18: Community Risk Assessments, the geographic profile assessment includes analysis of the physical features of the community, including the nature and placement of features such as highways, waterways, railways, canyons, bridges, landforms and wildland-urban interfaces. These physical features may present inherent risks or potentially have an impact on fire department access or response time. The following sections consider these geographic characteristics within the City of Brantford.

3.1 Geographic Snapshot of Brantford

The City covers 102.4 square kilometers with new boundary lands as of January 2017. The City is geographically large with a combination of urban and rural uses, which is not uncommon in Ontario. The rural area includes 2,444 hectares (33% more land) that was transferred from the County to the City as of January 2017, known as the Northern Expansion Lands and Tutela Heights. In terms of emergency response, rural areas of the City may experience extended emergency response times.

Key Finding: The geographical layout and size of the City, which includes the recent boundary adjustment of 33%more land, may result in extended emergency response times to some of locations within the B.F.D.'s coverage area.

3.2 Road Network

Road networks within a municipality are important from a risk and emergency response perspective since vehicle related incidents are a common source of call volume for a municipality. The road network is also how fire apparatus travel through a municipality; thus it is valuable to consider where there may be a lack of connectivity due to natural (e.g. river) or human-made barriers (e.g. rail line with no crossing, road network design, cemeteries and golf courses).

Brantford is serviced by a number of provincial highways, major and minor arterial roads, major and minor collector roads, and local roads. As identified in the City's Official Plan, there are two provincial highways located within the City namely: Highway

403 and Highway 24. The City is currently undertaking a Transportation Master Plan, with public consultation expected in the first quarter of 2019.

It is common within a municipality for road networks to be a contributor to emergency call volume due to motor vehicle collisions. A road network may also impact emergency response travel times due to congestion. The B.F.D. identified that during peak hours there is traffic congestion experienced along major roadways including access to Highway 403 and Brant Avenue, however the Fire Department has traffic pre-emption at most intersections allowing them the right-of-way in certain areas to reduce response time.

3.2.1 City Transit

City transit in Brantford is provided by Brantford Transit operated by the Transportation Services department of the municipality. Bus routes operate Monday to Sunday and are fully accessible.

In order to further fulfill the transit needs of the community, a number of additional transit services are available to Brantford residents and visitors, including Greyhound and Go Transit buses, which operate out of the Brantford Bus Terminal. Grand River Cab and Limo is also an alternative transportation option. Brantford Lift is a transportation option that uses small, wheelchair – accessible buses to serve people in the community with disabilities who are unable to access the conventional transit service.

3.3 Bridges

The primary water feature within the City includes the Grand River that feeds into a number of tributaries and streams. Consequently, there are bridges in the municipality that are part of the current road network. It is important to consider bridges when assessing community risk because of a few key factors. These include: the potential for crossing restrictions due to weight; and potential for impact on network connectivity if a bridge were to be out of service. These factors can impact the response capabilities of a community. There is currently a seasonal load posting of 30 tonnes from November 1 to March 31 each year for the Lorne Bridge (Colborne Street West from Gilkison Street to

Brant Avenue/Icomm Drive).[2] Colborne Street West is a part of the truck route. Heavy vehicles that would normally travel on Colborne Street West are detoured during this period with heavy vehicle operators being directed to the Veterans Memorial Parkway Bridge.

There are four bridges within city boundaries or crossing city boundaries including:

- Veterans Memorial Parkway;
- Cockshutt Bridge;
- Lorne Bridge; and
- Highway 403.

Key Risk: The City of Brantford is intersected by the Grand River, which is crossed by a number of bridges as well as Highway 403. Should an incident impact a bridge or multiple bridges, access to the other side of the bridge may be restricted.

3.4 Rail Lines

Rail Lines are considered in this Community Risk Assessment for a few key reasons related to emergency services. The potential for a rail-based transport incident is a major consideration as a derailment or accident involving the goods being transported (hazardous materials) could occur, requiring hazardous materials response. Also, sometimes the physical barrier created by the rail infrastructure itself, such as a rail yard and the placement of rail infrastructure within and throughout a municipality can slow down emergency response.

Rail Services in Brantford are provided by three corporations: VIA Rail Canada, C.N. Rail and Canadian Pacific (C.P.). C.N. has a stop at the Brantford train station. The closest C.P. trans-loading facility that connects Brantford to the C.P. network is located in

[2] Source: "Lorne Bridge Structural Analysis and Seasonal Load Posting." City of Brantford Public Works Commission, December 21, 2015: http://www.brantford.ca/pdfs/12.2%20PW2015-095%20Lorne%20Bridge%20Structural%20Analysis%20and%20Seasonal%20Load%20Posting.pdf

Hamilton.[3] In addition to freight services, VIA Rail provides passenger service out of the Brantford train station.

At-grade rail crossings (an intersection at which a road crosses a rail line at the same level) can create delays in emergency response by inhibiting emergency response vehicles and apparatus from accessing a road. Three at-grade rail crossings were identified throughout the City through visual assessment. At-grade rail crossings can be found in the following areas:

- Hardy Road;
- Johnson Road;
- Garden Avenue;
- Stanley Street;
- Mohawk Street;
- Cayuga Street;
- Port Street;
- Eagle Avenue;
- Greenwich Street;
- Colborne Street;
- Dalhousie Street;
- Darling Street;
- Wellington Street;
- Nelson Street;
- Chatham Street;
- Sheridan Street;
- Marlborough Street; and
- Grey Street.

Several rail-crossings within the urban area of the City are at-grade, which may prevent traffic from flowing freely during times of train activity and therefore have the potential to impact fire department response times. The rail crossing at the Hardy Road and Paris

[3] Source: "Community Profile". City of Brantford, 2016: http://www.brantford.ca/Projects%20%20Initiatives%20%20Economic%20Development%20Strate/Brantford%20Community%20Profile-2016-FINAL%20DRAFT.pdf

Road intersection presents a potential risk due to train activity blocking fire response to the industrial corridor.

Key Finding: There are several at-grade crossings within the City which have the potential to delay fire response to key areas of the City.

3.5 Airport

Airports can be a vital component of a municipality as they provide the movement of goods and services as well as provide a mode of transportation for people. They present unique hazards with special considerations to aircraft accidents and incidents, hazardous materials and fuel load concerns. Brantford and its surrounding area are serviced by the Brantford Municipal Airport, which is owned and operated by the Corporation of the City of Brantford. The airport features a variety of services currently geared towards commercial flights with provisions towards commercial hanger and warehouse leasing, aircraft maintenance services and fueling and repair. Brantford Airport is also a certified Canada Customs Airport of Entry, accommodating domestic and international passenger and cargo aircraft as well as corporate, recreational and charter flights. To address any safety concerns, Brantford Airport has established a Safety Management System (S.M.S.) as required by Transport Canada[4] to help minimize the risks inherent to aircraft operations.

The fire suppression needs of the Brantford Municipal Airport are met by Brant County Fire Station # 2, located at 3 Airport Road, which is staffed by volunteer firefighters.

B.F.D. Policy No. 2.14 identifies the steps and actions that are to be taken in the event of an aircraft emergency at the Brantford Airport including the responsibilities of the Brantford Fire Communications Centre. The policy indicates there is an agreement for Mutual Aid Fire Services with the County of Brant regarding fires at the municipal airport.

[4] Source: "Safety Management Systems." Government of Canada Website, Date modified: 2012-10-10: http://www.tc.gc.ca/eng/civilaviation/standards/sms-menu-618.htm/Safety-Management-Systems-SMS-Transport-Canada

3.6 Water Features and Landforms

Waterways and landforms are important from a risk perspective in part due to recreational activities that take place and the natural hazards that they present (e.g., flooding). The primary waterway within the City of Brantford is the Grand River, which runs northwest to southeast through the City. The Grand draws residents and non-residents alike each year to its shores, providing tourists with a range of recreational activities including but not limited to fishing, canoeing, kayaking, and swimming. Emergency incidents experienced in these types of natural settings could require specialty technical rescues.

Brantford has one major conservation area within its municipal boundaries – the Brant Conservation Area. Activities permitted within the Conservation Area include camping, canoeing, fishing, hiking, cycling, swimming, picnicking and other events and activities.[5] During summer months, flooding and/or faster currents may occur and there is potential for swift water rescue. During winter months, the frozen streams and rivers pose a risk due to potential ice jams and incidents could include ice rescue.

Key Risk: The Grand River presents a water and ice risk which may require specialty rescue.

Landforms covering a large area have the potential to impact emergency response times as they do not permit emergency vehicles (or any traffic) through them. Large open spaces such as cemeteries, golf courses and rural areas in general should be taken into consideration when considering possible emergency response routes. Some of the City's cemeteries and golf courses which span large area are listed in **Table 5**.

[5] Source: Grand River Conservation Authority website: https://www.grandriver.ca/en/outdoor-recreation/Brant.aspx

Table 5: Cemeteries and Golf Courses in Brantford

Cemetery/Golf Course	Location
Cemetery	
Oakhill Cemetery	17 Jennings Rd.
Mount Hope Cemetery	169 Charing Cross St.
Greenwood Cemetery	West Street at George Street
Farrington Burial Ground	287 Mt Pleasant St.
Golf Course	
Brantford Gold and Country Club	60 Ava Rd.
Arrowdale Public Golf Course	282 Stanley St.
Northridge Public Golf Course	320 Balmoral Dr.

Key Finding: Large open spaces within the City's boundaries may impact emergency response travel times.

3.7 Wildland-Urban Interface

N.F.P.A. 1730 identifies wildland-urban interface as geography-based risk for consideration. This interface refers to the area of transition between unoccupied land and human development. This transition area can be comprised of a mix of woodlots, bush or grass.

The City of Brantford has agricultural lands and natural features and therefore does possess an element of risk related to wildland and grass fires. Recently, the City has obtained rural, mostly undeveloped lands from the County of Brant. The boundary adjustment which added 33% more land to the City's total land area of 102.46 square kilometres has increased the B.F.D.'s response area significantly. Based on this risk, the B.F.D. should consider appropriate training of personnel and the potential challenges faced by emergency vehicles, equipment and personnel accessing this type of fire. Fire

prevention policies including enforcement and public education can be used to manage and mitigate this risk through open air burning permit systems.

Key Finding: The City of Brantford's acquisition of undeveloped lands from the County of Brant has increased the overall response area of the B.F.D. and potential of fires related to a mix of wood lots, brush and grass, barn fires and rural urban interface.

4.0 Building Stock Profile

As referenced in Ontario Regulation 378/18: Community Risk Assessments, the building stock profile assessment includes analysis of the types and uses of the building stock of the municipality. Important considerations include the number of buildings of each type, the number of buildings of each use and any building-related risks known to the fire department. There are potential fire risks associated with different types or uses of buildings given the presence or absence of fire safety systems and equipment at time of construction and maintenance thereafter. This section considers these building characteristics within the City of Brantford.

4.1 Ontario Building Code Occupancy Classifications

Buildings are categorized by their major occupancy classifications according to the Ontario Building Code (O.B.C.). Each classification has definitions that distinguish it from other occupancy classifications. Utilizing the O.B.C. as the source for defining the occupancy classifications provides a recognized definition and baseline for developing the community risk profile. The O.B.C. defines six major building occupancy classifications (groups). Within each group, the occupancies are furthered defined by division. The O.B.C. major classification groups and divisions are presented in **Table 6**.

Table 6: O.B.C. Major Occupancy Classification

Group	Division	Description of Major Occupancies
Group A	1	Assembly occupancies intended for the production and viewing of the performing arts
	2	Assembly occupancies not elsewhere classified in Group A
	3	Assembly occupancies of the arena type
	4	Assembly occupancies in which occupants are gathered in the open air
	1	Detention occupancies

Group	Division	Description of Major Occupancies
Group B	2	Care and treatment occupancies
	3	Care occupancies
Group C	---	Residential occupancies
Group D	---	Business and personal services occupancies
Group E	---	Mercantile occupancies
Group F	1	High-hazard industrial occupancies
	2	Medium-hazard industrial occupancies
	3	Low-hazard industrial occupancies

The Fire Risk Sub-model developed by the Office of the Fire Marshal and Emergency Management utilizes the major group classifications (i.e. Group A, B, C, D, E, F), but does not use the detailed division classifications provided for the respective occupancy groups. This strategy provides the ability to assess property stock within a community comparatively by major occupancy groups, thus providing a consistent and recognized definition for each major occupancy type. Where necessary, this strategy provides the opportunity for further analysis of a specific occupancy group. Subject to any site specific hazards or concerns, occupancies within this group can be assessed individually and then included where required within the scope of the broader Community Risk Assessment.

Table 7 and the discussion that follows describe the major occupancy groups used within this Community Risk Assessment. Definitions of the major occupancies from the Ontario Building Code are provided. The typical type of risk related to these occupancies and the potential proactive measures to reduce risk are also introduced.

All occupancies have unique risks based on their occupancy classification group. Within the groups, the buildings themselves can also be very different. There are a variety of buildings that can be classified as Group C - Residential occupancies, presenting their own unique risks - for example, mobile homes/travel trailers versus a single-detached

dwelling. Consideration also needs to be given to high-rise residential occupancies which represent unique risk and operational challenges. Group D – Business and Personal Services occupancies can also be located in different types of buildings, such as remodeled single-family dwellings, low-rise and high-rise buildings. Each of these building types can present different risks, including egress for firefighting operations and evacuation by occupants. Group E – Mercantile occupancies also present varied risks depending on the type of building which houses them. They range in size and potential risk from smaller neighbourhood corner stores to the large "big box" industrial style buildings. Large volumes of combustibles may be present in all forms of mercantile and business and personal services occupancies. Within the fire service, these two occupancy types are often considered together as "commercial uses."

While building variation applies within Group B – Care or Detention occupancies, the important consideration in this case is the nature of the occupancy. Such occupancies are for individuals that require special care or treatment due to cognitive or physical limitations. These occupancies could also be for individuals who are incapable of self-preservation because of security measures. Regardless of the type of building Group B – Care or Detention occupancies inhabit, this critical aspect of risk remains the same.

Table 7: OBC Major Occupancy Classification

OBC Major Occupancy Classification	Division	Description of Major Occupancies	OBC Definition	Occupancy Risks	Proactive Measures for Reducing Risk
Group A - Assembly	1	Assembly occupancies intended for the production and viewing of the performing arts	The occupancy or the use of a building or part of a building by a gathering of persons for civic, political, travel, religious, social, educational, recreational or similar purposes or for the consumption of food or drink.	• Overcrowding by patrons • Lack of patron familiarity with emergency exit locations and procedures • Insufficient staff training in emergency procedures • Large quantities of combustible furnishings and decorations • Where alcohol is served, possibility of impairment which could slow exit • Loud performances may lead to delayed notification in the event of fire alarm	• Regular fire prevention inspection cycles • Automatic fire detection and monitoring systems • Approved fire safety plan and staff training • Pre-planning by fire suppression staff
	2	Assembly occupancies not elsewhere classified in Group A			
	3	Assembly occupancies of the arena type			
	4	Assembly occupancies in which occupants are gathered in the open air			
Group B - Care or Detention	1	Detention occupancies	The occupancy or use of a building or part thereof by persons who; are dependent on others to release security devices to permit exit; receive special care and treatment; or receive supervisory care.	• Inability to evacuate or relocate patients • Presence of flammable/combustible gases (ie. Oxygen) • Insufficient staff • Insufficient staff training • Vulnerable occupants using overnight accommodations (sleeping) • Vulnerable occupants may be unable to evacuate without assistance • Evacuation may be delayed due to cognitive, physical limitations or the use of sleep aids • Combustible furnishings	• Regular fire prevention inspection cycles • Automatic fire detection and monitoring systems • Approved Fire Safety Plan and staff training • Pre-planning by fire suppression staff
	2	Care and treatment occupancies			
	3	Care occupancies			
Group C - Residential	-	Residential occupancies	An occupancy that is used by persons for whom sleeping accommodation is provided but who are not harboured or	• Overnight accommodation (sleeping) • Combustible furnishings • Secondary units (basement apartments) • High population density	• Home smoke alarm programs • Public education programming including home escape planning

OBC Major Occupancy Classification	Division	Description of Major Occupancies	OBC Definition	Occupancy Risks	Proactive Measures for Reducing Risk
			detained there to receive medical care or treatment or who are not involuntarily detained there.	• Human behaviour (cooking, use of candles, smoking, alcohol, hoarding, etc.) • Delayed detection due to improper placement, lack of maintenance or missing smoke alarms	• Retro-fit and compliance inspection cycles for OFC compliance • Pre-planning by fire suppression staff
Group D - Business and Personal Services	-	Business and personal services occupancies	An occupancy that is used for the transaction of business or the provision of professional or personal services.	• High volume of occupants • High combustible loading • Specialized equipment utilizing high risk substances such as radiation • Consumers unfamiliar with emergency exits and procedures	• Regular fire prevention inspection cycles to maintain OFC compliance • Targeted fire prevention inspections for OFC retro-fit compliance • Staff training in fire prevention and evacuation procedures • Public education programs • Pre-planning by fire suppression staff
Group E - Mercantile	-	Mercantile occupancies	An occupancy that is used for the displaying or selling of retail goods, wares, and merchandise.	• High volume of occupants/staff • High volume of combustible loading/high rack storage • Exit facilities blocked with merchandise • Lack of occupant familiarity with emergency exit locations and procedures • Size of building	• Regular fire prevention inspection cycles • Automatic fire detection and monitoring systems • Approved Fire Safety Plan and staff training • Pre-planning by fire suppression staff
Group F- Industrial	1	High-hazard industrial occupancies	An occupancy that is used for the assembly, fabrication, manufacturing, processing, repairing or storing of goods and materials	• Large dollar loss as a result of a major fire • Economic loss in the event of plant shut downs and job loss • Environmental impacts • Presence of ignition sources related to processing activities • Poor housekeeping and maintenance of equipment • Insufficient staff training • Improper use of equipment	Regular fire prevention inspection cycles Staff training in fire prevention and evacuation Public education Pre-planning by fire suppression staff Installation of early detection systems (smoke alarms, heat detectors) Installation of automatic sprinkler systems
	2	Medium-hazard industrial occupancies			
	3	Low-hazard industrial occupancies			

As shown in **Table 7,** the Group F – Industrial occupancy group is divided into low-hazard (Division 3), medium-hazard (Division 2) and high-hazard (Division 1) based on the combustible content and potential for rapid fire growth. The potential for major fires within this occupancy type is related to the high levels of combustibles utilized in the manufacturing process and present in storage. This can include highly flammable and corrosive products. In addition to the six major occupancy classifications, there are other occupancies and features that should be considered as part of developing the Community Risk Assessment. These include occupancies that may not be regulated or classified under the Ontario Building Code and the Ontario Fire Code or they may fall under federal jurisdiction. Farm buildings, for example are regulated by the National Farm Building Code of Canada (N.F.B.C.) 1995, in conjunction with the Ontario Fire Code.

4.2 City of Brantford Property Stock by Major Occupancy Classification

Table 8 below provides a summary of the property stock within the City of Brantford. This data was provided by the City based on Municipal Property Assessment Corporation (M.P.A.C.) property parcel data. The majority of the City's property stock is classified as Group C – residential occupancies (95.4%) with 28,458 residential dwellings. The second largest proportion of occupancy class within the City is Group F – Industrial occupancies, accounting for 1.6% of the City's total property stock. The City has 464 industrial occupancies.

Table 8: City of Brantford Building Stock

Occupancy Classification (O.B.C.)	Occupancy Definition Fire Risk Sub-model (O.F.M.E.M.)	Number of Occupancies	Percentage of Occupancies
Group A	Assembly Occupancies	249	0.8%
Group B	Care or Detention Occupancies	21	0.1%

Occupancy Classification (O.B.C.)	Occupancy Definition Fire Risk Sub-model (O.F.M.E.M.)	Number of Occupancies	Percentage of Occupancies
Group C	Single Family, Multi-unit Residential, Hotel/Motel, Mobile Homes & Trailers and Other Residential Occupancies	28,458	95.4%
Group D	Business and Personal Services Occupancies	281	0.9%
Group E	Mercantile Occupancies	260	0.9%
Group F	Industrial Occupancies	464	1.6%
Other	Not Classified within OBC	86	0.3%
Total		**29,819**	**100%**
Source: M.P.A.C Parcel Data			

Given the proportion of fire loss, fire related injuries and fatalities within Group C – residential occupancies; the prominence of this occupancy classification presents a greater fire risk. Implementing programming and initiatives related to the first two lines of defence – public education and prevention and fire safety standards and enforcement will assist in mitigate fire risk within residential occupancies. This entails implementing smoke alarm and carbon monoxide detector programs, home escape planning, the identification of vulnerable groups specific to each municipality, regular fire inspection cycles and programs specific to each occupancy type, as well as implementing stricter enforcement measures related to licencing and prosecutions for fire violations.

Key Risk: Group C – Residential occupancies account for the 95.4% of the City's building stock.

Key Finding: Group D &E- Business & Mercantile occupancies combined represent 1.8% of Brantford's total building stock.

Key Finding: Group F – Industrial occupancies represent 1.6% of the City's total building stock.

4.3 Building Age and Construction

The O.B.C. was adopted in 1975, and the Ontario Fire Code (O.F.C.) was adopted in 1981. Together these two codes have provided the foundation for eliminating many of the inconsistencies in building construction and maintenance that were present before their adoption.

The O.B.C. and the O.F.C. were developed to ensure that uniform building construction and maintenance standards are applied for all new building construction. The codes also provide for specific fire safety measures depending on the use of the building. Examples of the fire safety considerations that are addressed include:

- Occupancy;
- Exits/means of egress including signs and lighting;
- Fire alarm and detection equipment;
- Fire department access; and
- Inspection, testing, and maintenance.

In 1983, the O.F.C. was further expanded to include retrofit requirements for many of the buildings constructed prior to adoption of the Code. Retrofit requirements were established to ensure that a minimum acceptable level of life safety is present. A number of occupancy types are included within the retrofit requirements including assembly, boarding, lodging and rooming houses, health care facilities, multi-unit residential, two-unit residential, and hotels. More recent amendments to the O.F.C. include Ontario Regulation 150/13, which came into force on January 1, 2014. This regulation is intended to enhance fire safety in Retirement Homes, regulated under the *Retirement Homes Act*, care occupancies and care and treatment occupancies by including requirements for mandatory sprinklers, staff training, annual fire drill scenarios and fire safety inspections.

Linked to age of a building are the methods and materials used to construct it. During the late 19th century and early 20th century, balloon frame construction was a common framing technique used in both residential and small commercial construction. This technique permitted the spread of fire and smoke to move rapidly from the lower floors to upper floors and the roof level. Understanding the age of construction of occupancies (both residential and non-residential) can assist in determining if balloon framing may have been utilized.

Modern construction techniques have introduced the use of platform construction whereby each level is built as a component of the overall structure. This technique, in addition to the use of fire stops, has reduced the extension of fire and smoke by creating horizontal barriers. However, modern construction materials have also resulted in changes to fire growth rates that are defined by the Society of Fire Protection Engineers as slow, medium and fast. In addition to building construction, fire growth rate depends on the flammability of the materials and contents within the building which introduces variances into the growth rates presented above. The impact of increasing fire growth rates is directly related to the time lapse from ignition to flashover when the combustible items within a given space reach a temperature that is sufficiently high for them to auto-ignite. Listed in **Table 9,** are fire growth rates measured by the time it takes for a fire to reach a one megawatt (M.W.) fire. Fire growth rate depends on the flammability of the materials and contents within the building which introduces variances into the growth rates presented below.

Table 9: Time to Reach 1 M.W. and 2 M.W. Fire Growth Rates in the Absence of Fire Suppression

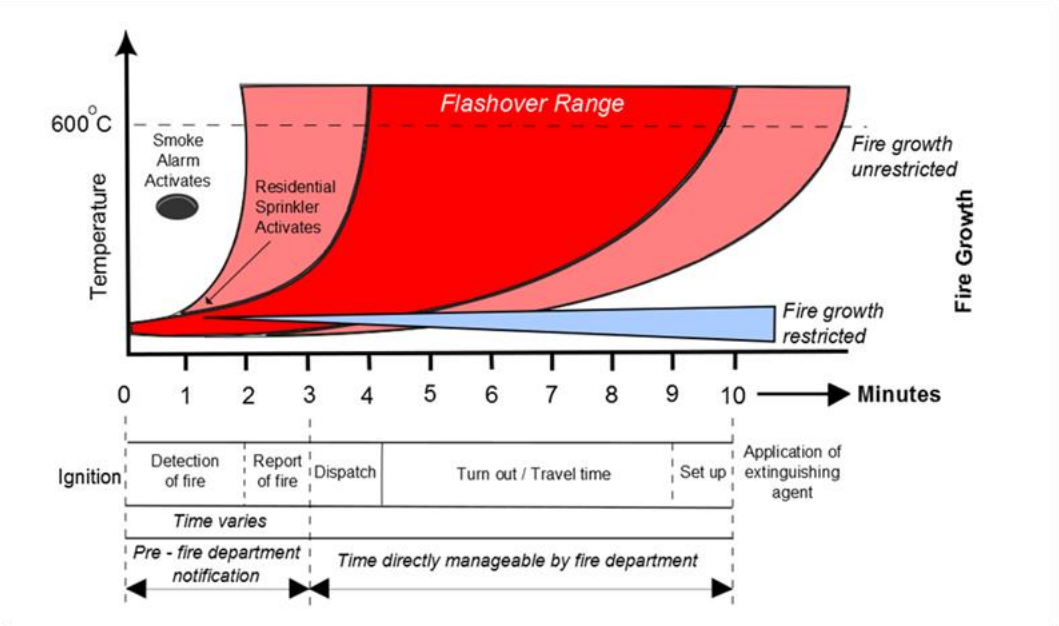
Fire Growth Rate	Time in Seconds to Reach 1MW	Time in Seconds to Reach 2 MW
Slow	600 seconds	848 seconds
Medium	300 seconds	424 seconds
Fast	**150 seconds**	**212 seconds**

Fire Growth Rate	Time in Seconds to Reach 1MW	Time in Seconds to Reach 2 MW

Source: "Operational Planning: An Official Guide to Matching Resource Deployment and Risk", Office of the Fire Marshal and Emergency Management, January 24, 2011, p. 4.

In addition to building construction, fire growth rate depends on the flammability of the materials and contents within the building which introduces variances into the growth rates presented above. The impact of increasing fire growth rates is directly related to the time lapse from ignition to flashover when the combustible items within a given space reach a temperature that is sufficient high for them to auto-ignite. The graph in **Figure 4** (below) highlights the exponential increase in fire temperature and the potential for loss of property/loss of life with the progression of time.

Figure 4: Example Fire Propagation Curve



Reference: Fire Underwriters Survey "Alternative Water Supplies for Public Fire Protection: An Informative Reference Guide for Use in Fire Insurance Grading"(May 2009) and NFPA "Fire Protection Handbook" (2001)

Understanding the age and construction of a community's residential building stock is an important component of developing a Community Risk Assessment. Historic O.F.M.E.M. data indicates that in recent years, residential fires account for the majority

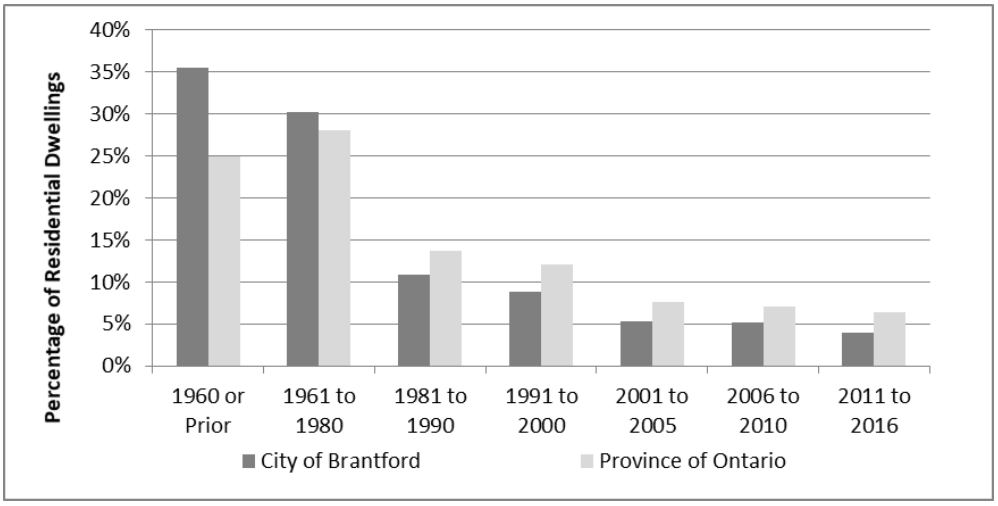
of all structure fire losses and fire fatalities.6 Therefore, this section explores the age and construction of residential and non-residential buildings in the City. The ages of residential buildings for the City of Brantford are summarized in Table 10 and illustrated in **Figure 5.**

Table 10: Age of Construction of Residential Dwellings in Brantford

Period of Construction	City of Brantford	% of Units	Ontario	% of Units
Prior to 1960	13,950	36%	1,293,135	25%
1961 to 1980	11,835	30%	1,449,585	28%
1981 to 1990	4,280	11%	709,135	14%
1991 to 2000	3,485	9%	622,565	12%
2001 to 2005	2,065	5%	396,130	8%
2006 to 2010	2,050	5%	368,235	7%
2011 to 2016	1,560	4%	330,390	6%
Total	**39,225**	**100%**	**5,169,175**	**100%**
Source: 2016 Census, Statistics Canada				

[6] Source: "Ontario Fatal Fires: Summary." Ministry of Community Safety and Correctional Services. 8 Dec. 2014: https://www.M.C.S.C.S..jus.gov.on.ca/english/FireMarshal/MediaRelationsandResources/FireStatistics/OntarioFatalities/FatalFiresSummary/stats_fatal_summary.html

Figure 5: Period of Construction of Residential Dwellings – City of Brantford



(Source: 2016 Census, Statistics Canada)

An important component of this analysis is the percentage of residential buildings built prior to the adoption of the Ontario Fire Code in 1981. **Table 10** indicates that 66% of the City's residential buildings were built prior to 1981. In comparison, 53% of all dwellings in Ontario were built prior to 1981, identifying that Brantford has a relatively older building stock when compared to the province, with fewer buildings built after the adoption of the O.F.C.

Key Risk: 66% of the City's residential building stock was built prior to the adoption of the Ontario Fire Code.

4.4 Building Density and Exposure

N.F.P.A. 1730 lists building density as a key factor for understanding potential fire risk with particular consideration given to core areas (downtowns). Closely spaced buildings, typical of historic downtown core areas and newer infill construction, have a higher risk of a fire spreading to an adjacent exposed building. A fire originating in one building could easily be transferred to neighbouring structures due to the close proximity. The close proximity of buildings can also impede firefighting operations due to the limited access for firefighters and equipment. The adoption of the O.B.C. and the O.F.C. has introduced the requirement for fire separations, and the use of fire retardant materials and constructions methods to reduce the fire risks. In addition to the construction and

planning requirements within the respective codes, basic firefighting practices consider the protection of exposures as a primary function and consideration in the event of a response by the fire and emergency services.

As outlined in **Section 11.0**, historical data provided by O.F.M.E.M. indicates that residential fires represent the majority of structure fire losses and fire fatalities. Understanding the breakdown by residential type can provide some indication of exposure risk. Residential structure dwelling types for Brantford and the Province are listed in **Table 11**.

Table 11: Residential Structural Dwelling Types

Structural Dwelling Type	City of Brantford		Ontario	
	Total Dwellings	Total % Dwellings	Total Dwellings	Total % Dwellings
Single-detached house	24,070	61%	2,807,380	54%
Apartment in a building that has five or more storeys	3,825	10%	886,705	17%
Movable dwelling	15	0%	14,890	0%
Other attached dwellings	11,310	29%	1,460,200	28%
Semi-detached house	1,940	5%	289,975	6%
Row house	3,715	9%	460,425	9%
Apartment or flat in a duplex	1,465	4%	176,080	3%
Apartment in a building that has fewer than five storeys	4,110	10%	522,810	10%
Other single-attached house	90	0%	10,910	0%

Structural Dwelling Type	City of Brantford		Ontario	
	Total Dwellings	Total % Dwellings	Total Dwellings	Total % Dwellings
Total	**39,220**	**100%**	**5,169,175**	**100%**
Source: 2016 Census Statistics Canada				

Residential structural dwelling type data from the 2016 Census reveals that Brantford's structural dwellings consist mainly of single-detached houses (61%), which is higher than the provincial total number of single-detached dwellings (54%).

The proportion of apartments that have five or more storeys within Brantford is much lower than that of the Province (10% versus 17%). These figures reflect a lower residential building density for the City in comparison to the Province and therefore a lower exposure to risk. However, 29% of the City's property stock does consist of other types of attached dwellings including semi-detached houses, row housing, apartments or flats in a duplex and apartments in a building with fewer than five storeys. Due to the limited fire safety inspection authority granted to fire departments under the F.P.P.A for residential dwelling units, there is considerable value of programming relating to home escape planning in addition to smoke alarm and carbon monoxide detector initiatives. The use of proactive strategies to reduce the risk to residential properties is discussed in greater detail in the City's Master Fire Plan.

The term "retrofit" is defined by the Office of the Fire Marshal and Emergency Management as "the minimum performance requirements for life safety for existing buildings."[7] Ontario Fire Code Part 9 addresses the retrofit of certain residential occupancies through the process of updating existing buildings with appropriate containment, means of egress, fire alarm and detection and suppression, in keeping with prior editions of the Ontario Building Code. The process of upgrading a building under Part 9 is the responsibility of the owner. Fire departments across the Province have enforced retrofit legislation differently. Some jurisdictions have systematically

[7] Office of the Fire Marshal and Emergency Management: https://www.mcscs.jus.gov.on.ca/english Accessed: December 1, 2018.

prioritized care facilities, rooming houses and certain assembly occupancies before beginning to work through multi residential occupancies, while other jurisdictions have left the onus on the owners affected by retrofit requirements. The Brantford Fire Department has included Part 9 retrofit inspections into its fire safety inspection schedule, which is discussed in greater detail in the Master Fire Plan.

Key Finding: 61% of the City's structural dwelling types are single-detached homes.

Key Risk: 29% of the City's total property stock consists of attached dwellings.

4.5 Building Height and Area

Buildings that are taller in height, or contain a large amount of square footage (footprint) can have a greater fire loss risk and life safety concern. One of the unique characteristics and risks of tall / multi-storey buildings is known as the "stack effect". This is characterized as vertical air movement occurring throughout the building, caused by air flowing into and out of the building, typically through open doors and windows. The resulting buoyancy caused by the differences between the indoor/outdoor temperature and elevation differences causes smoke and heat to rise within the building. This can have a dramatic effect on smoke permeation throughout the common areas and individual units within the building. This can be directly related to the high percentage of deaths that occur in high-rise buildings as a result of smoke inhalation.

Industry best practices and standards have also identified that fires in high-rise buildings can place significantly higher demands on fire suppression activities, resulting in greater firefighter depth of response deployments. This is commonly referred to as "vertical response" which can include the initial deployment of firefighters to establish water supplies to upper levels, maintain elevator controls, and manage ventilation systems, for example.

The nature of taller buildings also brings the presence of higher occupant loads and higher fuel loads due to the quantity of furnishings and building materials. Efficient evacuation can also be a challenging process due to a lack of direction, signage, knowledge, or familiarity of the occupants which may result in overcrowding of stairways and exit routes.

Ensuring all required life safety systems are in place and functioning is a priority for these occupancies. Taller buildings can experience extended rescue / suppression response times for firefighters to ascend to the upper levels. Options such as “shelter-in-place” whereby occupants are directed by the fire department to stay within their units can be an effective strategy. However, ensuring internal building communications systems are in place and functioning is critical to the success of this strategy. Additionally, targeted public education initiatives for those living in high rise buildings and routine fire safety inspections are components of a proactive risk reduction approach. Building area can cause comparable challenges as those present in taller buildings. Horizontal travel distances rather than vertical can mean extended response times by firefighters attempting rescue or fire suppression activities.

When it comes to defining “high-rise”, different sources use different terms. Some key definitions of high-rise are summarized in **Table 12**. This includes the Ontario Building Code which has detailed considerations to define a high-rise building based on the occupancy classification, floor area, occupant load, and what exactly is being measured. Within all occupancy classifications, when a building is 18 metres in height, additional O.B.C. requirements are in effect. The analysis within this C.R.A. is based on different sources so different height references may be used.

Table 12: High-Rise Definitions

Source	Simplified Definition
Ontario Building Code	18 metres in height or over
Ontario Fire Code	Greater than 6 storeys
N.F.P.A. 1710 (2016 Edition)	23 metres in height or over
Statistics Canada*	5 storeys or above
Note: Statistic Canada’s references to building height are not focused on a strict definition of building height consideration but to provide insight as to the overall built form of housing within a community.	

There are a number of high-rise occupancies that may pose a unique risk from a fire loss and emergency response perspective. Building height for various apartment complexes in the City of Brantford is summarized in **Table 13** below.

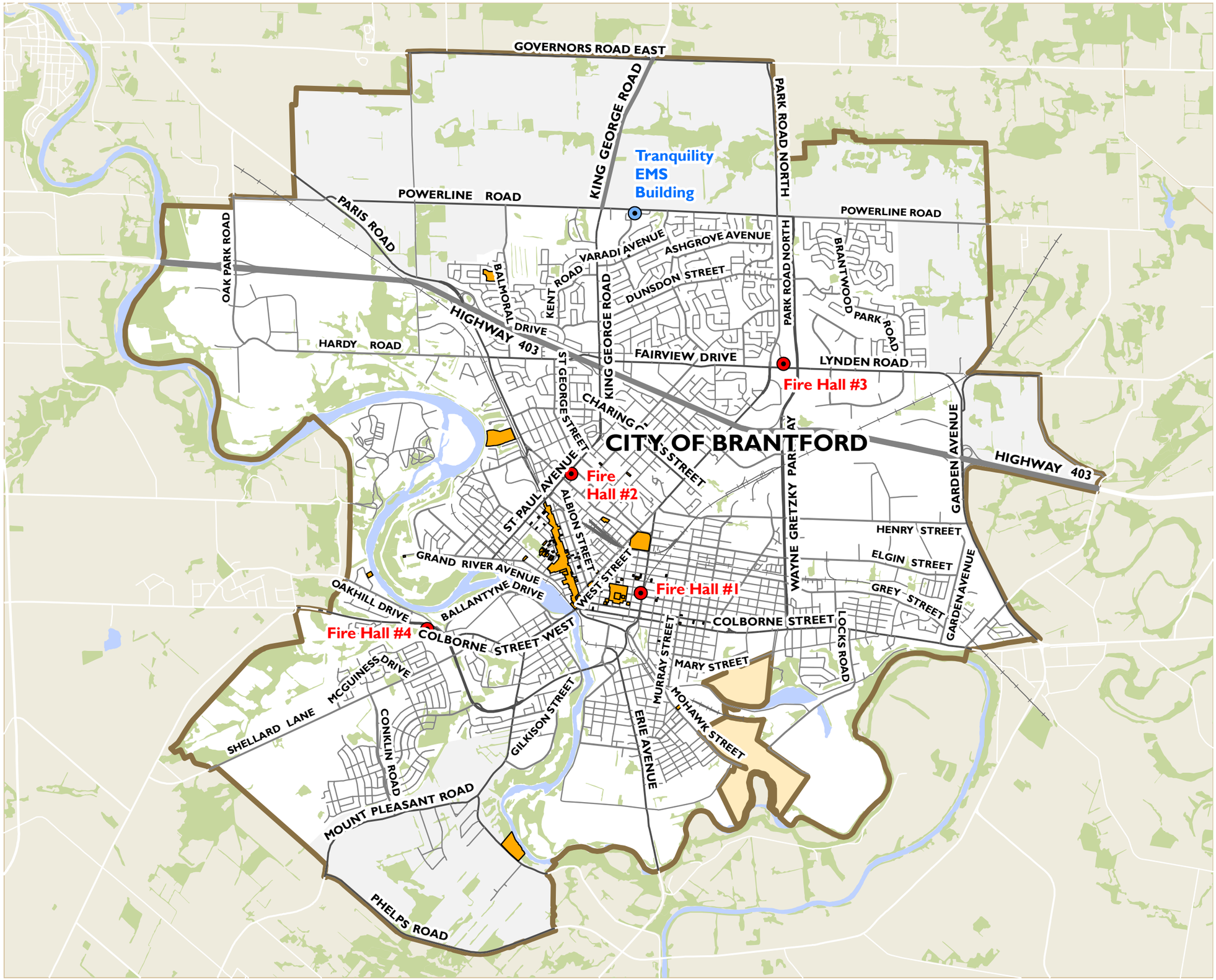
Table 13: Building Height – City of Brantford

Address	# of Floors	# of Units
7 Bain Street	8	63
9 Bonheur Court	9	141
291 Brant Avenue	7	68
24 Colborne Street West	9	159
150 Darling Street	13	130
335 Dunsdon Street	7	151
301 Fairview Drive	7	70
321 Fairview Drive	12	92
5 Fordview Court	11	201
33 Memorial Drive	10	118
47 Memorial Drive	10	119
50 Memorial Drive	9	61
325 North Park Street	7	48
8 Olivetree Road	7	53
555 Park Road North	7	153
129 Wellington Street	17	130
640 West Street	12	111

Address	# of Floors	# of Units

Source: Brantford Fire Department

The City has identified 17 buildings with a height in excess of 18 metres. These occupancies are further illustrated in **Figure 6**. As shown, these occupancies are scattered throughout the City's downtown area.



BRANTFORD FIRE

CITY OF BRANTFORD
HERITAGE PROPERTIES

Brantford Master Fire Plan
Figure 8

- Heritage Properties
- Fire Station
- Freeway
- Arterial
- Collector
- Local Street
- Ramp
- Railroads
- City of Brantford
- Reserve
- ProvincialParks
- Wooded Area
- Water
- Rural Area

MAP DRAWING INFORMATION:
DATA PROVIDED BY MNR

MAP CREATED BY: SW
MAP CHECKED BY: DK
MAP PROJECTION: NAD 1983 UTM Zone 17N

1:50,000

0 0.5 1 2 km

DILLON CONSULTING

PROJECT: 18-7634
STATUS: DRAFT
DATE: 2019-02-27

FILE LOCATION: I:\GIS\187634 - Brantford Master Fire Plan\MXD\Heritage.mxd

Key Risk: The City has identified 17 occupancies with a height in excess of 18 metres, which are defined as high-rise buildings according to the Ontario Building Code.

Key Finding: Buildings identified as high-rise buildings are located in the City's downtown area.

The gross area of a building can cause unique challenges to firefighting in a similar fashion to those presented in taller buildings. Horizontal travel distances rather than vertical can mean extended response times by firefighters attempting rescue or fire suppression activities. Large buildings, such as industrial plants and warehouses, department stores, and "big box" stores, can contain large volumes of combustible materials. In many of these occupancies the use of high rack storage is also present. Fires within this type of storage system can be difficult to access and cause additional risk to firefighter safety, due to collapse risks.

4.6 Potential High-Fire Risk Occupancies

As per N.F.P.A. 1730, potential high-fire risk occupancy is an important factor to consider within the building stock profile. This section of the Community Risk Assessment will focus primarily on fuel load for industrial occupancies. Fuel load typically refers to the amount and nature of combustible content and materials within a building. This can include combustible contents, interior finishes as well as structural materials. Combustible content tends to create the greatest potential fire loss risk which can include industrial materials, commercial materials or typical office furnishings. Higher fuel loads results in increased fire loss risk due to increased opportunity for ignition, propagation, and increased fire severity.

In many communities, large amounts of fuel load can be contained within a single occupancy such as a building supply business, within a large multi-unit residential building, or within a historic downtown core. As presented previously within this report, age and construction of a building can also have an impact on fuel load given that older buildings likely have a larger volume of combustible construction such as wood framing rather than newer construction utilizing concrete and steel products.

Buildings with fuel load concerns as identified by the B.F.D. are presented in **Table 14**. Many of the areas identified are used for industrial purposes for the manufacturing, processing and storage of combustible materials on site such as rubber, chemicals and plastics. In addition to ensuring compliance to the requirements of the O.B.C. and the O.F.C., there are operational strategies that a fire service can implement to address fuel load concerns. These include regular fire inspection cycles and pre-planning of buildings of this nature to provide an operational advantage in the event of fire. The B.F.D.'s proposed inspection schedule indicates that Group F – Industrial buildings classified as "high hazard" are to be inspected on an annual basis.

Table 14: Buildings with Site Specific Fuel Load Concerns

Address	Property Name	Building Use
150 Garden Ave	CRM	Processing and storage of tires
43 Plant Farm Road	Ideal Rubber	Processing and storage of tires
300 Henry Street	Evolve Recycling	Processing and storage of tires
148 Mohawk Street	Evolve Recycling	Processing and storage of tires
360 Brock Street	Evolve Recycling	Processing and storage of tires
71 Middleton Street	Mississauga Metals	Processing and storage of combustible metals
81 Sinclair Boulevard	ACIC Fine chemicals	Processing and storage of pharmaceutical products
34 Spalding Drive	Apotex Pharachem	Processing and storage of pharmaceutical products

Address	Property Name	Building Use
115 Sinclair Boulevard	Aryzta Canada	Processing and storage of food products
369 Elgin Street	Gates	Production and storage of rubber tubing
555 Greenwich Street	Brant InStore	Production and storage of signage material
59 Fen Ridge Court	Exel Canada	Warehousing of various materials
1 Ferrero Boulevard	Ferrero Canada	Processing and storage of food products
155 Adams Boulevard	Golden Miles Foods	Flour mill and bakery
58 Frank Street	Hartmann Canada	Production and storage of corrugated paper products
565 Greenwich Street	Ingenia Polymers	Processing and storage of plastics
159 Roy Boulevard	Keeprite Refrigeration	Production of refrigeration equipment
132 Adams Boulevard	Konstant	Design and production of racking equipment
10 Canning Street	Maple Leaf Foods	Processing and storage of food products
452 Hardy Road	Mott Manufacturing	Production of laboratory equipment
280 Henry Street	Patriot Forge	Metal processing
1 Webster Street	S.C. Johnson	Processing and storage of numerous products

Address	Property Name	Building Use
		including candles and aerosols
140 Garden Avenue	Sherwin Williams	Processing and storage of paints
145 Roy Boulevard	Slacan Industries	Production of electrical transmission and distribution equipment
470 Hardy Road	The Marco Corporation	Production and storage of marketing material
54 Morton Avenue East	Tigercat Industries	Production of heavy equipment
175 Savannah Oaks Drive	TreeHouse Foods	Processing and storage of food products
321 Henry Street	Northwest Rubber	Processing of rubber materials

Key Risk: There are a number of properties within the City that have fuel load concerns.

4.7 Vulnerable Occupancies (Occupancies with Potential High Life-Safety Risk)

The O.F.M.E.M. defines vulnerable occupancy as any care occupancy, care and treatment occupancy, or retirement home regulated under the *Retirement Homes Act*. These buildings are classified under either Group B or Group C occupancies within the Ontario Building Code. These occupancies contain vulnerable individuals who may require assistance to evacuate in the event of an emergency due to cognitive or physical limitations, representing a potential high-life safety risk.

Once a building has been classified to be a care occupancy, care and treatment occupancy by the Chief Building Official or Chief Fire Official, or is a retirement home regulated under the *Retirement Homes Act,* the fire department is responsible for ensuring an annual fire safety inspection (using the checklist which forms part of Fire Marshal's Directive 2014-001 as a minimum level of inspection) is performed, an approved fire drill scenario using the lowest staffing complement is witnessed, and certain information is filed with the Office of the Fire Marshal and Emergency Management, through its Vulnerable Occupancy Registry.

Although fire departments traditionally provide fire and rescue services in emergency situations, individuals should be reminded of the need to take responsibility for their own safety. That being said, in rental units and vulnerable occupancies, building owners have a duty of care to residents. It is important to note that unless otherwise specified, it is the owner's responsibility to comply with the provisions of the Ontario Fire Code (Div. A 1.2.1.1.). This includes providing fire safety measures for people and property, maintaining life safety systems, implementing a fire safety plan when applicable, and the installing and maintaining of smoke and carbon monoxide devices.

Table 15 provides a list of registered vulnerable occupancies for the City of Brantford.

Table 15: Registered Vulnerable Occupancies – City of Brantford

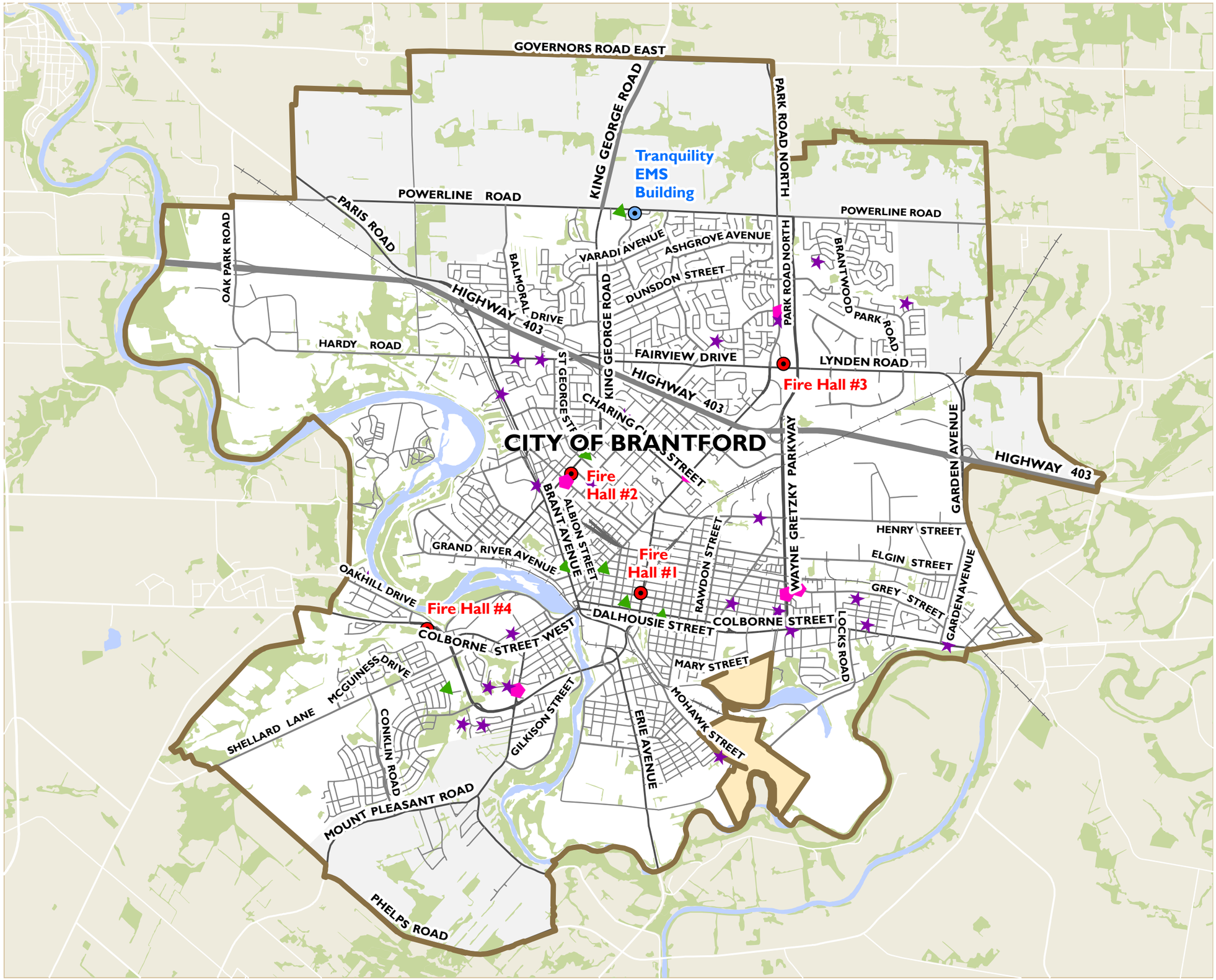
Property Name	Occupancy Type	Address
Amber Lea Place	Retirement Home	384 St. Paul Avenue
Brantford General Hospital	Care and Treatment Occupancy	200 Terrace Hill Street
Brantwood Group Home	Care Occupancy	47 Beckett Drive
		25 Bell Lane
		104 Dundas Street 21 Kerr-Shaver Terrace

Property Name	Occupancy Type	Address
		14 MacBride Court
		346 Nelson Street
		430 Nelson Street
		100 Paris Road
		485 St. Paul Avenue
		95 Tollgate Road
		129 Tollgate Road
		32 Cumberland Drive
		25 Bell Lane
Brierwood Gardens	Care and Treatment Occupancy	425 Park Road North
Charlotte Villa	Retirement Home	120 Darling Street
Community Living Brant	Care Occupancy	55 Beaver Crescent
		1016 Colborne Street
		2 Fairmount Street
		12 Hampton Street
		225 Mohawk Street
		394 Park Road North
		24 Riva Ridge
		45 Spartan Road

Property Name	Occupancy Type	Address
Fox Ridge Care Community	Care and Treatment Occupancy	389 West Street
Homes of Learning Development	Care Occupancy	96 Sherwood Drive
John Noble Home	Care and Treatment Occupancy	97 Mount Pleasant Street
Lions McInnes House	Care Occupancy	170 Henry Street
Parkview Retirement Home	Retirement Home	254 Dalhousie Street
Participation House	Care Occupancy	10 Bell Lane
Riverview Terrace	Retirement Home	104 Brant Avenue
Seasons Retirement Home	Retirement Home	55 Diana Avenue
Sheridan Lodge	Retirement Home	6 Sheridan Street
St. Joseph's Lifecare Centre	Care and Treatment Occupancy	99 Wayne Gretzky Parkway
Steadman Community Hospice	Care and Treatment Occupancy	445 Grey Street
Tranquility Place	Retirement Home	436 Powerline Road
W. Ross MacDonald School	Care Occupancy	350 Brant Avenue
Source: Brantford Fire Department		

There are a total of 38 vulnerable occupancies within the City of Brantford. As mentioned above, once a building is classified as a vulnerable occupancy, the fire department is responsible for conducting an annual fire safety inspection. As the

population continues to age, the demand for seniors' residences and health care facilities will increase. Vulnerable Occupancies are visually represented in **Figure 7**.



FILE LOCATION: I:\GIS\187634 - Brantford Master Fire Plan\MXD\Vulnerable Occupancie.mxd

BRANTFORD FIRE

CITY OF BRANTFORD

Intensification Areas
Brantford Master Fire Plan
Figure 7

Vulnerable Occupancies
- Care Occupancy
- Care and Treatment Occupancy
- Retirement Home
- City of Brantford

Facility
- Fire Station
- Tranquility EMS Building
- Railroads

Road Class
- Freeway
- Arterial
- Collector
- Local Street
- Ramp
- Reserve
- ProvincialParks
- Wooded Area
- Water
- Rural Area

MAP DRAWING INFORMATION:
DATA PROVIDED BY MNR

MAP CREATED BY: SW
MAP CHECKED BY: DK
MAP PROJECTION: NAD 1983 UTM Zone 17N

1:50,000

0 0.5 1 2 km

DILLON CONSULTING

PROJECT: 18-7634
STATUS: DRAFT
DATE: 2019-02-27

It is important that the fire department be aware of these vulnerable individuals and occupancies and optimizes the first two lines of defence. As this segment of the population continues to grow it will be important for Brantford Fire to commit the necessary staffing and resources to deliver appropriate fire prevention and education programs as needed. Ensuring public education messaging is available in accessible formats to address the needs of all residents is an important consideration.

Key Risk: The City has identified 38 registered vulnerable occupancies within Brantford.

Key Risk: W. Ross MacDonald School for the Blind presents unique life-fire safety risks.

4.8 High Fire Life-Safety Risk Occupancies

From the perspective of risk and for the purposes of the services provided by the fire service, including enhanced and targeted fire inspections and public education programming, it can be valuable for a department to identify additional potential high fire life-safety risk considerations. For example, this may include day care centres or schools, where due to their age; children would have cognitive or physical limitations to preventing or delaying self -evacuation in the event of an emergency.

For the purposes of this risk assessment, potential high life-safety risk occupancy considerations include schools and licenced day care facilities. B.F.D. has identified 49 schools, which are listed in **Table 16**.

Table 16: Schools located in the City of Brantford

School Name	Location	Enrollment
Ryerson Heights School	33 Dowden Avenue	605
Grand Erie Learning Alternatives	365 Rawdon Street	106
Lansdowne Children's Centre	39 Mount Pleasant Street	85
St. Gabriel School	14 Flanders Drive	275

School Name	Location	Enrollment
Braemar House School	36 Baxter Street	110
Banbury Heights School	141 Banbury Road	369
Bellview Public School	97 Tenth Avenue	100
Branlyn Community School	238 Brantwood Park Road	310
Brier Park Public School	10 Blackfriar Lane	326
Cedarland Public School	60 Ashgrove Avenue	278
Centennial-Grand Woodlands School	41 Ellenson Drive	203
Central Brantford Public School	135 George Street	205
Christ the King	165 Dufferin Avenue	120
Dufferin Public School	106 Chestnut Street	389
Echo Place School	723 Colborne Street	160
Graham Bell-Victoria Public School	56 Grand Street	148
Grandview Public School	68 North Park Street	201
Greenbrier Public School	33 White Oaks Avenue	241
Agnes G. Hodge Public School	52 Clench Street	450
Holy Cross	358 Marlborough Street	160
James Hillier Public School	62 Queensway Drive	302
King George School	265 Rawdon Street	285

School Name	Location	Enrollment
Lansdowne-Costain Public School	21 Preston Boulevard	248
Major Ballachey Public School	105 Rawdon Street	260
Notre Dame	238 Brantwood Park Road	224
Prince Charles Public School	40 Morton Avenue	187
Princess Elizabeth Public School	60 Tecumseh Street	200
Resurrection	17 Ravenwood Avenue	87
Russell Reid Public School	43 Cambridge Drive	284
St. Leo's	233 Memorial Drive	219
St. Peter's	175 Glenwood Drive	109
St. Patrick	320 Fairview Drive	99
St.Pius	127 Wood Street	198
École Sainte-Marguerite-Bourgeoys	60 Clench Avenue	191
Woodman-Cainsville School	51 Woodman Drive	337
Brantford Christian School	7 Calvin Street	259
Our Lady of Providence	55 Kent Road	212
Central Baptist Academy	300 Fairview Drive	111
Brantford Collegiate Institute	120 Brant Avenue	1200

School Name	Location	Enrollment
North Park Collegiate	280 North Park Street	1140
Pauline Johnson C & VS	627 Colborne Street	817
Tollgate Technological Skills Centre	112 Tollgate Road	320
Assumption College	257 Shellard Lane	1554
St. John's College	80 Paris Road	1081
Jean Vanier School	120 Ninth Avenue	236
Accelerated Christian Education	256 St. George Street	28
Walter Gretzky School	365 Blackburn Drive	679
St. Basil School	365 Blackburn Drive	300
Ecole Confederation	54 Ewing Drive	107

Source: Brantford Fire Department

Table 17 lists the licensed day care centres within the City of Brantford. There are currently a total of 29. There are additional day care centres in the City that are unlicensed, that have not been included in this Community Risk Assessment.

Table 17: Day Cares in Brantford

Day Care Centre Name	Location	Enrollment
Banbury Child Care Centre	141 Banbury Road	18
St. Basil/Walter Gretzky YMCA Child Care	365 Blackburn Drive	Up to 15
Brier Park YMCA Child Care	10 Blackfriar Lane	Up to 40
Blueridge Y Childcare	59 Blueridge Crescent	35
Three Bears Y Child Care	160 Brantwood Park Road	71
Russell Reid YMCA Child Care	43 Cambridge Drive	20
Montessori House of Children	85 Charlotte Street	40
Brantford Little School Community Child Care Centre	629 Colborne Street	45
A Child's Paradise Inc.	34 Dalkeith Drive	118
Ryerson Heights YMCA Child Care	33 Dowden Avenue	64
Kiddy Korner Daycare & Boys' & Girls' Club After School	2 Edge Street	Up to 110
Centennial-Grand Woodlands YMCA Child Care	41 Ellenson Drive	35
St. Gabriel YMCA Child Care	14 Flanders Drive	Up to 30
St. Peter YMCA Child Care	175 Glenwood Drive	13

Day Care Centre Name	Location	Enrollment
Graham Bell – Victoria Kids Can Fly	56 Grant Street	30
Kidsworld Y Downtown	8 Joseph Street	31
Our Lady of Providence YMCA Child Care	55 Kent Road	50
St. Leo's YMCA Child Care	233 Memorial Drive	Up to 30
A Child's Paradise Too	16 Morrell Street	63
Our Lady Queen of Peace Montessori School	128 Nelson Street	50
Grandview YMCA Child Care	68 North Park Street	15
Lansdowne – Costain YMCA Child	21 Preston Boulevard	35
Noah's Ark YMCA Child61 Sherwood Drivecare	267 Shellard Lane	41
Harmony Arts Daycare	61 Sherwood Drive	63
Christian Preschool	211 St. George Street	5
Bellview YMCA Child Care	97 Tenth Avenue	Up to 20
Creative Minds Day Care	5 Wade Avenue	114
St. Joseph's Y Childcare	99 Wayne Gretsky Parkway	48
St Pius YMCA Child Care	127 Wood Street	N/A
Source: Brantford Fire Department		

Within the City there are also a number of facilities/programs designed to support children with special needs. One such facility is the Lansdowne Children's Centre, which provides services for children and youth with physical, developmental and communication disabilities. Recognizing and accommodating the special needs of individuals accessing support through these, and other facilities in public education programs is an important function of the first line of defence. This may include incorporating materials and presentations in a variety of formats to accommodate those with cognitive or physical limitations and sensory issues.

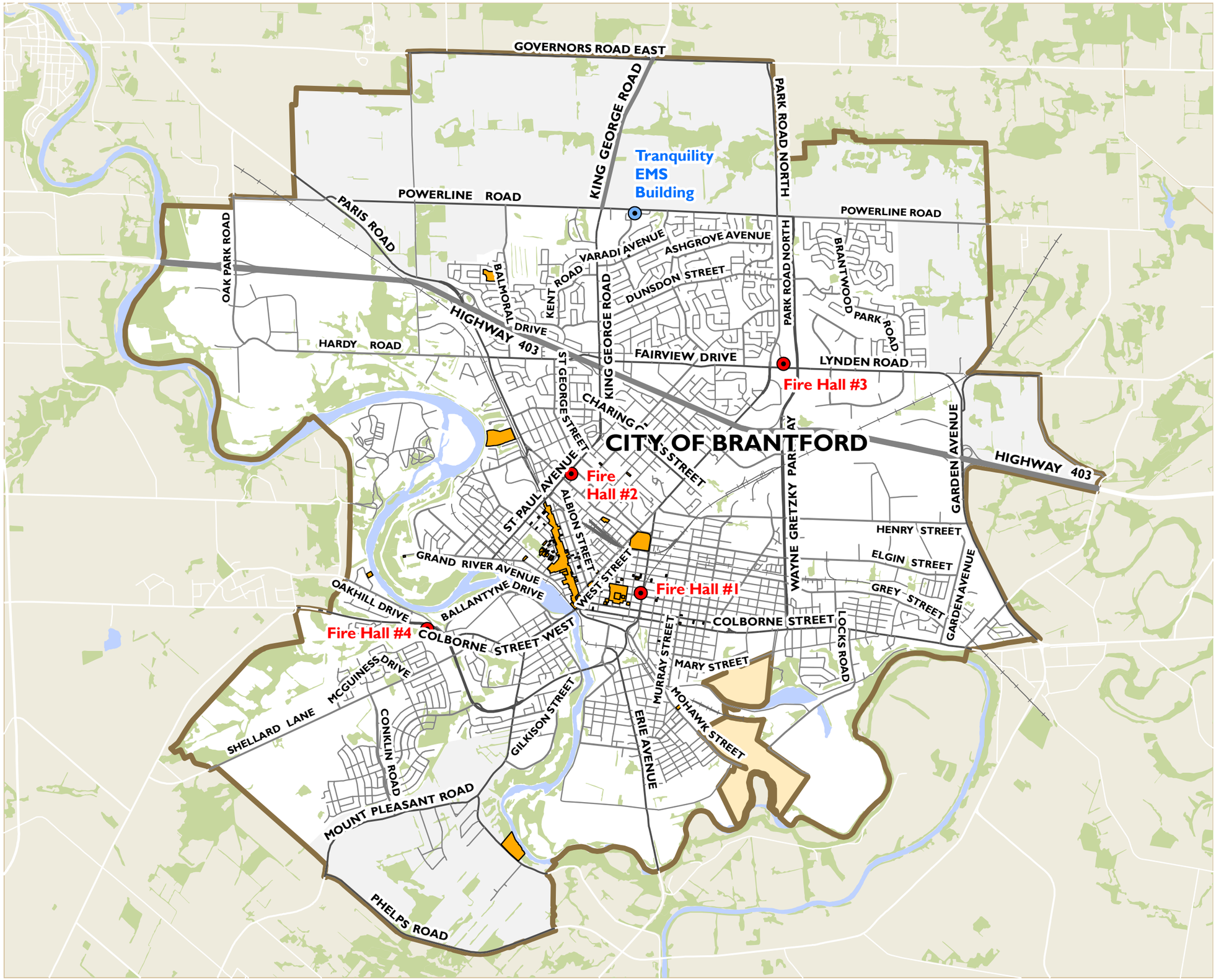
4.9 Historic or Culturally Significant Buildings

An understanding of the location of historic or culturally important buildings or facilities is an important consideration within the building stock profile of a Community Risk Assessment. Such buildings or facilities may be keystone features to the community that provide a sense of heritage, place, and pride and act as tourism destinations which could result in an economic impact in the case of their loss.

Historic areas can also present a high fire risk due to their age, the materials used to construct the buildings, the exposure to other buildings, and their importance to the community. Regular fire inspection cycles and strategies to enforce continued compliance with the O.F.C. are considered best practices to achieving the legislative responsibilities of the municipality and providing an effective fire protection program to address fuel load risks.

The Brantford Heritage Inventory includes 250 property records of historic significance, evidence of the City's heritage. Three notable properties included in the Inventory are the Bell Homestead National Historic Site, the Sanderson Centre for the Performing Arts and Her Majesty's Royal Chapel of the Mohawks. The Bell Homestead National Historic Site was the home of Alexander Graham Bell, the inventor responsible for the telephone. The Sanderson Centre for the Performing Arts, built in 1919 has auditorium seating for 1,125 persons. Thirdly, Her Majesty's Royal Chapel of the Mohawks is the final resting place of Captain Joseph Brant, for whom the City is named and the first protestant church built in Ontario[8].

Mapping of the City's heritage sites based on data sets from the Ministry of Natural Resources indicates that many of these sites are located in the City's downtown core along Brant Avenue. These heritage properties are illustrated in **Figure 8** below.



BRANTFORD FIRE

CITY OF BRANTFORD
HERITAGE PROPERTIES

Brantford Master Fire Plan
Figure 8

- Heritage Properties
- Fire Station
- Freeway
- Arterial
- Collector
- Local Street
- Ramp
- Railroads
- City of Brantford
- Reserve
- ProvincialParks
- Wooded Area
- Water
- Rural Area

MAP DRAWING INFORMATION:
DATA PROVIDED BY MNR

MAP CREATED BY: SW
MAP CHECKED BY: DK
MAP PROJECTION: NAD 1983 UTM Zone 17N

1:50,000

0 0.5 1 2 km

DILLON CONSULTING

PROJECT: 18-7634
STATUS: DRAFT
DATE: 2019-02-27

FILE LOCATION: I:\GIS\187634 - Brantford Master Fire Plan\MXD\Heritage.mxd

Key Finding: There are a number of identified heritage buildings within the Brantford, with many located in the downtown area along Brant Avenue.

5.0 Critical Infrastructure Profile

As referenced in Ontario Regulation 378/18: Community Risk Assessments, the critical infrastructure profile assessment includes analysis of the capabilities and limitations of critical infrastructure, including electrical distribution, water distribution, telecommunications, hospitals and airports. The presence and/or availability and capacity of infrastructure elements that could have a significant impact on such things as dispatch, communications, suppression operations, overall health care or transportation or the community if compromised, or that may present unique fire risks by virtue of their size or design. The following sections consider these critical infrastructure characteristics within the City of Brantford.

5.1 Critical Infrastructure in Ontario

The Office of the Fire Marshal and Emergency Management (O.F.M.E.M.) defines critical infrastructure as "interdependent, interactive, interconnected networks of institutions, services, systems and processes that meet vital human needs, sustain the economy, protect public health, safety and security, and maintain continuity of and confidence in government." The O.F.M.E.M. also sets out nine critical infrastructure sectors, namely: continuity of government, electricity, financial institutions, food and water, health, oil and natural gas, public safety and security, telecommunications and transportation networks. These nine sectors have further been recognized by the Ministry of Energy and Emergency Management Ontario, all of which are captured in **Table 18** below.

Table 18: Critical Infrastructure Sectors

Critical Infrastructure Sector	Sector components
Continuity of Government	municipal, provincial and federal governments
Electricity	nuclear, hydroelectric and fossil power generation; electricity transmission and distribution

Critical Infrastructure Sector	Sector components
Financial Institutions	Bank of Canada, banks and trust companies, credit unions, caisses populaires, Province of Ontario Savings Office, inter-institution computer systems, insurance companies, mutual fund companies, stock exchanges
Food and Water	water treatment, water storage, water monitoring, water distribution, waste water and sewage treatment, food production and harvesting, food processing and distribution, food inspection and monitoring
Health	hospitals, ambulance services, pharmaceuticals, blood services, and long-term care facilities
Oil and Natural Gas	oil refineries, distribution and retail operations; natural gas distribution
Public Safety and Security	firefighting, police and emergency medical services, emergency operations and evacuation centres, Centre of Forensic Sciences, Office of the Chief Coroner, military facilities, correctional facilities, search and rescue, flood and erosion control, pollution monitoring and public alerting, weather forecasting and public alerting
Telecommunications	9-1-1 communications, telephones, wireless telephones, pagers, television stations, radio stations, internet)
Transportation	highways and roads, snow removal services, rail-ways, public transit, airports, aviation communication and navigation, port facilities, canals and shipping locks, movable bridge systems, ferries, marine communication and navigation, border controls[8]

[8] Source: "Ontario Government Emergency Fuel Distribution Protocol." Ontario Ministry of Community Safety and Correctional Services. Last modified 25 May 2016: https://www.emergencymanagementontario.ca/english/emcommunity/ProvincialPrograms/ci/emergency_fuel_distribution_protocol.html

5.2 Critical Infrastructure in Brantford

5.2.1 Telecommunication

Brantford is known as the "Telephone City", as it was once home to Alexander Graham Bell, inventor of the telephone. Telecommunications are essential infrastructure which information is transmitted through a variety of mediums or channels including optical fibers, coaxial cables, and free space communications (e.g. radio waves). Telecommunication requires three basic elements to transmit information; these include the transmitter, a transmission medium and a receiver. In Brantford, free space communication towers which deliver mobile service are evenly spread across the built environment. Recently, the City of Brantford supported an application by Shared Network Canada for a new 60-meter free standing tower on Birkett Lane to improve telecommunication coverage in an area in the City that is currently underserviced.

Telecommunications providers include Bell, Fido, Wind, Rogers, Terago Networks, Xplornet Communications and Telus. A few towers that transmit television include C.B.C., C.T.V., and T.V. Cogeco. Switches, another important piece of infrastructure for cable internet and landline telephone is the interface which routes communications to and from transmitter to receiver and vice versa.

Towers and switches are essential for residents, Brantford Fire and other emergency agencies for a number of reasons. If a tower, station or switch is compromised, the ability to communicate with emergency personnel could be delayed. Similarly, the time of arrival on-scene may be compromised if emergency personnel receive delayed or have insufficient information. While incidents like this are rare, there is a higher probability of poor mobile service in rural areas of the City, including those lands that were recently annexed from the County of Brant.

5.2.2 Health Care

Health care is also an essential service from the perspective of fire and other emergencies. There are a number of facilities in that provide health care services in the City.

Within the Brant Community Health Care System, there are two hospitals, namely the Brantford General Hospital and Willett Hospital. Brantford General Hospital has 262 beds and nine operating rooms. The Willett Hospital provides urgent care and outpatient services.[9] Brant County Health Unit, St. Joseph's Hospital (clinic) and Avenue Medical Centre provide a variety of health care programs and services within the City. Brant County Ambulance is discussed in **Section 8.2** of this C.R.A.

5.2.3 Evacuation Centres/Reception Centres

Evacuation centres are those facilities which may provide safe, temporary shelter during an evacuation. Evacuation centres should include ample washroom and shower facilities, be equipped with back-up power, with space appropriate to accommodate sleeping and eating. These facilities should be inspected by the fire department and public health units in advance of an emergency to ensure compliance with adequacy from a life safety perspective.

Reception centres are facilities made available during an emergency that provide a place for to the public to receive information about the emergency. While a reception centre does not provide sleeping accommodations, it may provide light refreshments and a place to charge cell phones. Like evacuation centres, reception centres should be identified in advance of an emergency and inspected by the fire department and health unit, as appropriate. Reception centres and cooling centres may be co-located.

The facilities identified by the City as evacuation centres/reception centres are listed below:

- Branlyn Community Centre;
- North Park High School;
- The Rotary Boys and Girls Club;
- Brantford Civic Centre;
- Woodham Community Centre;
- Pauline Johnson Collegiate;
- Assumption College; and

[9] Source: Brant Community Health Care System Strategic Operation Review, May 2016 http://www.bchsys.org/files/5014/6279/7879/BCHS_Final_Report_May_6.16.pdf Accessed: October 5, 2018

- St. John's College.

An assessment as to the capacity and amenities available at these facilities is not included as part of this Community Risk Assessment. There would be value in compiling this information as an appendix to the City's Emergency Response Plan.

5.2.4 Utilities

Utilities are critical infrastructure which transport, store or convert electricity, oil, gas and water in Brantford.

5.2.4.1 Electricity, Oil and Gas

Electricity, oil and gas are the key components to a City's power supply and may also pose severe fire risks and consequences if a network or piece of infrastructure malfunction.

Brantford Power Inc. provides electricity to approximately 40,000 commercial and residential customers. Electricity is transmitted from a generating station (e.g. power plant, renewable sources etc.) and is conveyed through transmission lines to substations/transformers in Brantford (shown in blue). All pieces of infrastructure are important in conveying electricity, from a local context; transformers are an essential piece of infrastructure which transfers electrical energy between two or more circuits through electromagnetic induction. If compromised, a large portion of businesses and residents would be without power. Electrical malfunctions sometimes include high-voltage electrical arcs, fires and even oil ignition and dispersion which pose a special risk to nearby buildings and residents.

When responding to structural fires, power lines and electrical power supplies can present significant electrical hazards for firefighters. At incidents where emergency personnel work in close proximity to energized electrical equipment, the source of electricity is shut off at an electrical panel and therefore becomes "locked-out". B.F.D. Policy No. 2.32 outlines the requirements for the "lock out" of electrical equipment to ensure the safety of fire department personnel.

Union Gas Limited distributes natural gas to commercial and residential customers within the City of Brantford. Incidents involving a natural gas leak require specialized knowledge by first responders to mitigate the emergency. Training of fire department

personnel should include response protocols as well as environmental mitigation strategies and decontamination procedures. B.F.D. Policy No. 2.06 provides details as to the requirements for contacting Union Gas Company during incidents involving a threat of a natural gas leak, line rupture or equipment failure.

Ensuring there is a sufficient amount of fuel stored or available for use during a longer term power outage ensures preparedness, allowing for continuity of operations. Further, there would be value to maintaining a list of back-up generators and their capacity. This list could be added to the City's Emergency Response Plan.

Key Finding: The City's infrastructure including electricity, oil and gas provide unique fire risks that may pose special risks to residents, property, environment and firefighters

5.2.4.2 Water

Water infrastructure serves as an essential component to fire suppression and community well-being. In Brantford there are a number of pieces of infrastructure for wastewater and drinking water. The City is responsible for providing water and wastewater services within the City.

The City has recognized and is currently reviewing the existing water infrastructure within the Tutela Heights development area. Of concern to this C.R.A. is the available water flow requirement for firefighting. Municipalities have access to a number of different methodologies to assess water flow requirements for firefighting. In our experience one of the most commonly applied assessments is contained within the Fire Underwriters Survey™ (F.U.S.) methodology for assessing a municipal water systems capability for providing sufficient water flow for firefighting. The F.U.S. methodology places significant emphasis on the reliability of the water system to deliver adequate water to control major fires throughout the municipality.

Key Finding: The City is currently considering a Water Servicing Strategy for the Tutela Heights Development Area that considers the required water flow for firefighting.

5.2.5 Food Security

There are ten wholesale and groceries stores and one foodbank within the City. There are no special risks related to grocery vendors or donation centre, however; they are an essential resource for residents. Food security is a greater concern in areas without access to public transportation and areas farther away from grocery stores (rural areas). The B.F.D. may choose to consider pre-planning efforts for these facilities as large amounts of ammonia are often present, used as a component of refrigeration systems. First responders should be aware of dangers of an ammonia release and response protocols.

5.2.6 Financial Institutions

Financial institutions provide access to money which thereby enables residents to purchase goods and services. Each financial institution whether it is a global company, individual community bank or credit union has their own set of security needs, business continuity plans and resources available to them in the event of an emergency. Financial institutions provide access to credit, investment and insurance products and most importantly money, enabling residents to purchase goods and services. There are a number of banks within Brantford at which these services may be provided. The banks and credit unions below are some examples of financial institutions located within the City of Brantford:

- Bank of Montreal;
- R.B.C. Royal Bank;
- C.I.B.C.;
- T.D. Canada Trust;
- Scotiabank;
- Credit Union Central of Ontario; and
- Grand River Credit Union Limited.

6.0 Demographics Profile

As referenced in Ontario Regulation 378/18: Community Risk Assessments, the demographic profile assessment includes analysis of the composition of the community's population, respecting matters relevant to the community such as population size and dispersion, age, gender, cultural background, level of education, socioeconomic make-up and transient population. The following sections consider these demographic characteristics within the City of Brantford.

6.1 Population and Age

Population and age are important risk topics to understand given that people are the source of emergency calls and certain demographics are at greater risk to injury or death from fire than others. Over a fifteen year timeframe (2001-2016), the City has experienced varying levels of population growth. As shown in **Table 19**, Brantford's population increased 4.11% between 2011 and 2016. The highest increase in total private dwellings occurred between 2006 and 2011 by 6.58%.

Table 19: Historic Growth in Populations and Households

Year	Population	Change (%)	Total Private Dwellings*	Change (%)
2001	86,417	-	34,881	-
2006	90,192	4.37%	36,963	5.97%
2011	93,650	3.83%	39,397	6.58%
2016	97,496	4.11%	40,732	3.39%

*Includes dwellings that may not have a permanently residing person or group of persons.
Source: Statistics Canada, 2001, 2006, 2011 and 2016 Census.

Canada's aging population has been recognized as one of the most significant demographic trends in the nation. According to Statistics Canada, from 2011 to 2016 Canada experienced "the largest increase in the proportion of seniors since

Confederation" due to the baby boomer generation reaching the age of 65. There are now more Canadians over the age of 65 (16.9% of the population) than there were children aged 14 years and younger (16.6%).[10]

Identifying a community's population by age is a core component of developing the Community Risk Assessment and identifying specific measures to mitigate the risks associated with a specific age group, such as seniors. **Table 20** provides a comparison of the City's population by age group to that of the Province derived from 2016 Census data.

Table 20: Population by Age Group

	City of Brantford		Province of Ontario	
Age Group	**Population**	**% Total**	**Population**	**% Total**
0 to 4 years	5,615	5%	697,360	5%
5 to 9 years	5,985	6%	756,085	6%
10 to 14 years	5,700	6%	754,530	6%
15 to 19 years	5,865	6%	811,670	6%
20 to 24 years	5,900	6%	894,390	7%
25 to 44 years	24,710	25%	3,453,475	26%
45 to 54 years	13,425	14%	1,993,730	14%
55 to 64 years	13,525	14%	1,835,605	14%
65 to 74 years	9,335	10%	1,266,390	9%
75 to 84 years	4,975	5%	684,195	5%

[10] Source: "The Daily: Age and sex, and type of dwelling data: key results from the 2016 Census". Statistics Canada, date modified May 3, 2017 http://www.statcan.gc.ca/daily-quotidien/170503/dq170503a-eng.htm?HPA=1

	City of Brantford		Province of Ontario	
85 + years	2,455	3%	301,075	2%
Total	**97,490**	**100%**	**13,448,495**	**100%**
Median Age of the Population	41	-	41	-
Population aged 14 and under	**17,300**	**18%**	**2,207,975**	**17%**
Population aged 65 and over	**16,765**	**18%**	**2,251,660**	**16%**

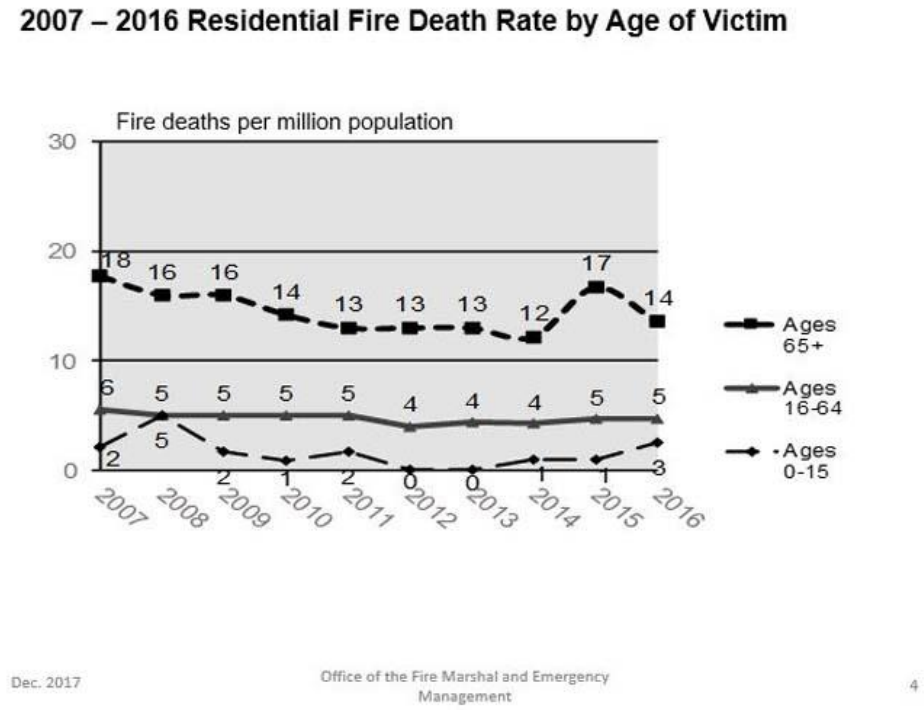
(Source: 2016 Census, Statistics Canada)

The 2016 census data above identified a total population of 97,495 for the City of Brantford. As a result of the 2017 boundary adjustment the 2018 total population of the City is currently 102,257, however, for the purposes of this assessment, 2016 Census data will be used for analysis. The data indicates a relatively even distribution of age for both the City and the Province with respect to their most junior and senior populations. The population aged 14 years and younger is slightly higher in Brantford than the Province (18% versus 17%) whereas the percentage of seniors in the City is relatively the same as the percentage of seniors in the Province.

Although the proportion of seniors does not exceed the number of youth within the City, the population of people 65 years and over in Brantford is similar to that of the Province. This is significant because seniors are considered to represent one of the highest fire risk groups across Ontario based on residential fire death rates (fire deaths per million of population). According to a report completed by O.F.M.E.M. in December 2016 (updated December 2017), seniors are at an increased risk of fatality in residential occupancies compared to other age groups.[11] **Figure 9** below illustrates this finding.

[11] Source: "Ontario Residential Fatal Fires." M.C.S.C.S. Website, Last Modified: May 7 2018: https://www.M.C.S.C.S..jus.gov.on.ca/english/FireMarshal/MediaRelationsandResources/FireStatistics/OntarioFatalities/HomeFireFatalitiesChildrenAdultsSeniors/stats_fatal_res.html

Figure 9: Residential Fire Death Rate by Age of Victim in Ontario (2007-2016)



Source: O.F.M.E.M.

While at a lower risk of fatality in residential occupancies overall when compared to seniors or adults, youth (aged 14 years and under) represent 18% of the City's total population and are naturally considered to be a vulnerable demographic due to their dependence on others, potential lack of physical or cognitive ability to make informed decisions about their well-being compared to an adult and their potential inability to respond effectively in an emergency situation. As a result, public education and prevention programs should be targeted to this demographic. Structured educational programs consistently provided to children and youth can help to engrain fire and life safety awareness and knowledge into future generations. This may assist in altering human behavior, potentially resulting in a future society that is more fire and life safety aware.

Key Risk: The 2016 Census data indicates that seniors including those people aged 65+ represent 18% of the City's total population.

Key Risk: The 2016 Census data indicates that children aged 14 and under represent 18% of the City's total population.

Key Risk: The 2016 Census data indicates that people between the ages of 45 and 64 who are aging towards the seniors demographic of 65+ represent 28% of the City's total population.

6.2 Gender

The gender distribution in the City is captured in **Table 21** below. In examining the proportion of males to females overall for Brantford, they are approximately evenly split at 48% male and 52% female. Due to the minor variations in the proportions, it may be challenging to target public education information without considering this information spatially. When specific age groups are reviewed, there is a more noticeable difference in the age group of 85 years and over where males account for 33% and females 67% of that population. However, based on these statistics, it is not anticipated that public education programming would be refined based on gender. The impact of gender distribution on public education programming would be more notable in a community with unique demographics such as those that have transient populations due to employment, for example.

Table 21: Gender Distribution by Age Group – City of Brantford

Age Group	Total Population	Male	%	Female	%
0 to 4 years	5,615	2,825	50%	2,790	50%
5 to 9 years	5,985	3,060	51%	2,925	49%
10 to 14 years	5,695	2,905	51%	2,790	49%
15 to 19 years	5,870	3,010	51%	2,860	49%
20 to 24 years	5,905	2,925	50%	2,980	50%
25 to 44 years	24,695	12,080	49%	12,615	51%
45 to 54 years	13,435	6,570	49%	6,865	51%

Age Group	Total Population	Male	%	Female	%
55 to 64 years	13,535	6,425	47%	7,110	53%
65 to 74 years	9,330	4,375	47%	4,955	53%
75 to 84 years	4,985	2,140	43%	2,845	57%
85 + years	2,450	815	33%	1635	67%
Total	97,500	47,130	48%	50,370	52%

Source: 2016 Census, Statistics Canada

6.3 Socioeconomic Circumstances

Socioeconomic circumstances of a community are known to have a significant impact on fire risk. Socioeconomic status is reflected in an individual's economic and social standing and is measured in a variety of ways accounting for a person's status in the labour force, their income, level of education and occupation. These factors can be reflected in the analysis of socioeconomic indicators such as labour force status, family structure, educational attainment and income as well as household tenure, occupancy, suitability, and cost.

Socioeconomic factors intersect in a number of ways and have a direct and indirect impact on fire risk. One such example is outlined in the Office of the Fire Marshal and Emergency Management's Fire Risk Sub-Model. The Sub-Model makes reference to the relationship between income and fire risk. As one consideration, households with less disposable income may be less likely to purchase fire safety products (e.g., smoke alarms, fire extinguishers, etc.), which puts them at higher risk of experiencing consequences from a fire. Another consideration is that households living below the poverty line may have a higher number of persons per bedroom in a household and/or children who are more likely to be at home alone. These circumstances would impact both the probability and consequence of a fire. While the complex relationships between socioeconomic circumstance and probability / consequence of a fire are not well understood within the fire service, this Community Risk Assessment seeks to explore these factors at a high level for the City of Brantford in comparison to the

Province of Ontario. It should be noted that, if viewed at a finer level of detail (e.g. census tract or neighbourhood level); consideration could be given to how these factors intersect and compound each other. For example, a neighbourhood that has a high proportion of seniors, immigrants, and unemployed residents may be a t higher risk than a neighbourhood with just a high proportion of seniors.

The factors reviewed at a high level have been selected based on the data available from Statistics Canada (both the Census and the National Household Survey). Factors that are highlighted in this section include:

- Labour force status;
- Immigrant status;
- Family structure;
- Educational attainment;
- Household tenure;
- Household occupancy;
- Household suitability; and
- Household costs.

6.3.1 Labour Force Status

Individuals with lower incomes, including low-income families, the homeless and perhaps those living alone, may experience a higher fire risk. The O.F.M.E.M.'s Fire Risk Sub-Model (described in **Section 2.0** of this document) references a number of reports that suggest there is a correlation between income levels and fire risk. The reports identify the following factors:

- The higher number of vacant buildings found in low-income neighborhoods attract the homeless. This introduces risks such as careless smoking, drinking and unsafe heating practices.
- Building owners are less likely to repair building systems (electrical, mechanical) due to affordability, increasing fire risk from improper maintenance.
- Households with lower disposable income are less likely to purchase fire safety products (i.e. smoke alarms, extinguishers, cigarette ignition resistant furniture, etc.) due to affordability.

- Households with lower disposable income are more likely to have their utilities shut off due to non-payment, leading to increased risks related to unsafe heating, lighting and cooking practices.
- The 1981 report, "Fire-Cause Patterns for Different Socioeconomic Neighborhoods in Toledo, Ohio" determined that the incendiary fire rate in low-income neighbourhoods is 14.4 times higher compared to areas with the highest median income. Further, fires caused by smoking and children playing occurred at rates 8.5 and 14.2 times higher, respectively.
- Studies have shown that cigarette smoking is inversely related to income. In Canada, findings by the Centre for Chronic Disease Prevention and Control through the National Population Health Survey established that there were nearly twice as many smokers in the lowest income group when compared against the highest (38% vs. 21% respectively).
- Those with low education and literacy levels are inhibited in their ability to read instruction manuals and warning labels and less likely to grasp fire safety messages.[12]

Labour force status is a possible indicator of income levels which directly influence fire risk (e.g. lower income, increased fire risk). The participation rate (i.e. the proportion of residents in the labour force) can also be an indicator of income and can be considered alongside unemployment rates (e.g. lower participation rate and higher unemployment could mean lower income, higher fire risk).

Table 22 captures the City's labour force status. Brantford has a slightly lower participation rate than the Province (64% versus 65%). The City has an unemployment rate of 4%, which is lower than the Province's 5%, suggesting a slightly lower amount of fire risk in comparison to the Province from the perspective of labour force status.

[12] Source: "Comprehensive Fire Safety Effectiveness Model." M.C.S.C.S. Website, - Last Modified: February 8, 2016: https://www.M.C.S.C.S..jus.gov.on.ca/english/FireMarshal/FireServiceResources/ComprehensiveFireSafetyEffectivenessModel/FireRiskSub-Model/Fire_risk_submodel.html#P190_7337 (See section 3.5.5)

Table 22: Labour Force Status – City of Brantford and Province of Ontario (2016 Census)

	City of Brantford	%	Province of Ontario	%
In the labour force	49,965	64%	7,141,675	65%
Employed	46,540	60%	6,612,150	60%
Unemployed	3,430	4%	529,525	5%
Not in the labour force	28,530	36%	3,896,765	35%
Total	78,495	100%	11,038,440	100%

Source: 2016 Census, Statistics Canada

For the population aged 15 years and older in private households, 69% received employment income in 2015 whereas 71% received employment income for the Province (see **Table 23**). This suggests that the City of Brantford faces a slightly higher fire risk in comparison to the Province from the perspective of employment income status.

Table 23: Employment Income Status in 2015 – City of Brantford and Province of Ontario (2016 Census)

	City of Brantford	%	Province of Ontario	%
Without Employment Income (2015)	24,215	31%	3,247,760	29%
With Employment Income (2015)	54,280	69%	7,790,680	71%
Total	78,495	100%	11,038,440	100%

Source: Census 2016, Statistics Canada

6.3.2 Family Structure

Family structure is another indicator of socioeconomic status and level of income. For example, single parent families are often more economically challenged due to the fact that there is only one income. These households also have fewer resources to arrange childcare, increasing the likelihood of fires caused by unsupervised children.[13] For example, a higher proportion of lone-parent families could reflect lower household income and therefore a higher fire risk. A higher proportion of lone-parent families also have the possible increased likelihood of a child being home alone or unsupervised leading to an increased fire risk. **Table 24** identifies the percentage of lone-parent families in the City account for 21%, compared to 17% for the Province. This is suggestive of a slightly higher fire risk from the perspective of lone-parent families for Brantford in comparison to the Province.

Table 24: Family Structure – City of Brantford and Province of Ontario (2016 Census)

	City of Brantford	%	Province of Ontario	%
Couple-Only	10,505	38%	1,428,575	38%
Couple Families (with children)	11,315	41%	1,708,995	45%
Lone-Parent Families	5,945	21%	644,975	17%
Total	27,765	100%	3,782,540	100%
Source: Statistics Canada, 2016 Census				

Key Finding: The percentage of lone-parent families is slightly higher in the City compared to the Province (21% versus 17%).

6.3.3 Educational Attainment and Income

The relationship between educational attainment and income is complex. An analysis conducted by Statistics Canada has found that high-income Canadians are generally more likely to be highly educated. Over two thirds (67.1%) of the top 1% had attained a

[13] Ibid.

university degree compared to 20.9% of all Canadians aged 15 and over.[14] Based on this national trend and for the purposes of this Community Risk Assessment it is assumed that a higher education leads to more disposable income and a lower fire risk. It is also assumed that households with more disposable income are more likely to invest in fire life safety products such as fire extinguishers and smoke alarms reducing the fire risk.

As shown in **Table 25**, 46% of residents in Brantford have a postsecondary Certificate, Diploma or Degree, which is 9% lower when compared to the Province. A higher proportion of the City's population does not possess a certificate, diploma or degree of any sort compared to the Province (22% versus 18%). However, there are a higher number of Brantford residents (32%) who have gained a high school diploma or equivalent compared to the Province (27%). This level of educational attainment could be linked to lower median household income. The median total income of households in 2015 for the City of Brantford is $62,640, below the Provincial median total income per household of $68,741 (2016 Census). This suggests that the City as a whole may have a higher fire risk from the perspective of income using educational attainment as an indicator.

[14]Source: "Education and occupation of high-income Canadians." Statistics Canada, Date modified: 2018-07-25: https://www12.statcan.gc.ca/nhs-enm/2011/as-sa/99-014-x/99-014-x2011003_2-eng.cfm Accessed June 20th

Table 25: Educational Attainment of Peoples ages 15+ - City of Brantford

Educational Attainment	City of Brantford	%	Province of Ontario	%
No Certificate; Diploma or Degree	17,020	22%	1,935,355	18%
High School Diploma or Equivalent	25,420	32%	3,026,100	27%
Postsecondary Certificate; Diploma Or Degree	36,055	46%	6,076,985	55%
Total	78,495	100%	11,038,440	100%
Source: 2016 Census, Statistics Canada				

Key Finding: The 2016 Census data of educational attainment of people aged 15+ the City may have a higher degree of fire risk related to the disposal income available to purchase and maintain fire safety items such as smoke alarms.

Another way to analyze income is through income decile groups. As stated by Statistics Canada, a "decile group provides a rough ranking of the economic situation of a person based on his or her relative position in the Canadian distribution of the adjusted after-tax income of economic families". The income by population category and decile group is presented in **Table 26** and **Figure 10.**

Table 26: Economic Family Income Decile Group for the Population in Private Households - City of Brantford and Province of Ontario (2016 Census)

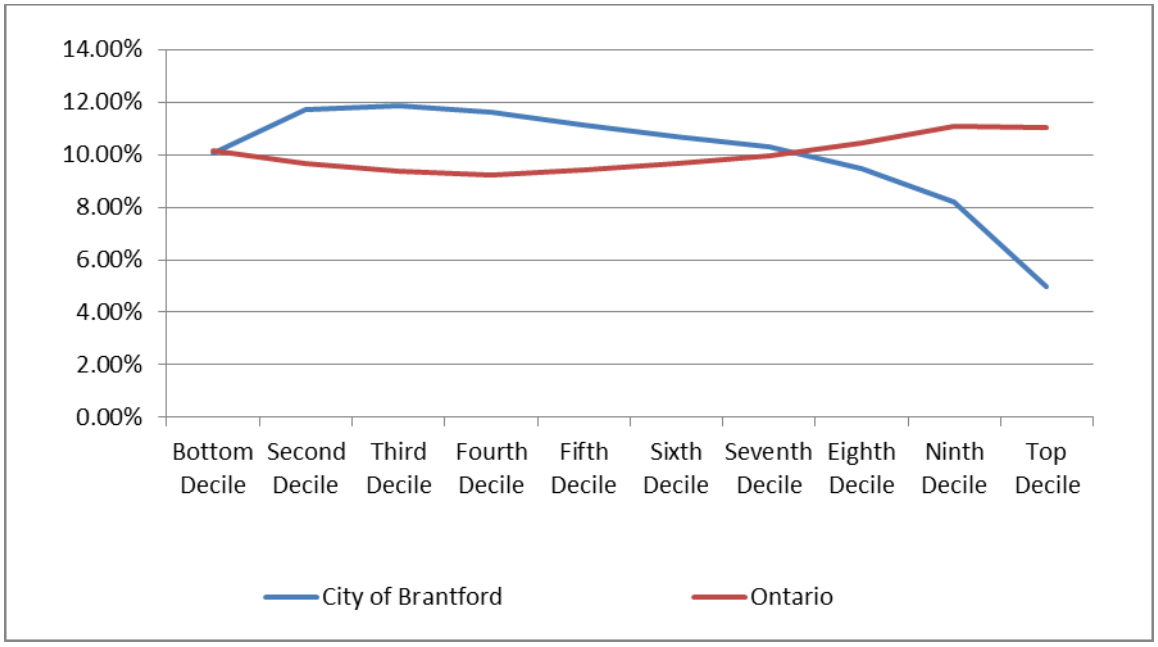
Income Decile Group	City of Brantford		Province of Ontario		
	Population	%	Population	%	
Bottom Decile	9,645	10.07%	1,346,645	10.17%	-0.10%
Second Decile	11,210	11.70%	1,280,675	9.67%	2.03%
Third Decile	11,360	11.86%	1,237,415	9.34%	2.52%

Income Decile Group	City of Brantford		Province of Ontario		
	Population	%	Population	%	
Fourth Decile	11,105	11.59%	1,223,510	9.24%	2.35%
Fifth Decile	10,670	11.14%	1,246,925	9.42%	1.72%
Sixth Decile	10,230	10.68%	1,279,095	9.66%	1.02%
Seventh Decile	9,860	10.30%	1,321,220	9.98%	0.32%
Eighth Decile	9,085	9.49%	1,382,795	10.44%	-0.96%
Ninth Decile	7,860	8.21%	1,464,415	11.06%	-2.85%
Top Decile	4,750	4.96%	1,459,465	11.02%	-6.06%
Total	95,775	100.00%	13,242,160	100.00%	-

Source: Statistics Canada, 2016 Census

Both illustrate that a higher portion of the population in Brantford falls within the bottom decile groups, while a lower amount of the population falls within the top decile groups in comparison to the Province. These statistics are helpful to understand because the more disposable income a family generates the higher likelihood that the family will purchase fire safety equipment.

Figure 10: Percentage of Population by Income Decile Group in City of Brantford and Ontario



(Source: 2016 Census, Statistics Canada)

Key Finding*: The 2016 Census data of decile groups indicates that the City may have a higher degree of fire risk related to the disposable income available to purchase and maintain fire safety items such as smoke alarms.*

6.3.4 Household Tenure, Occupancy, Suitability, and Costs

Table 27 summarizes household statistics for the City of Brantford and the Province of Ontario including tenure, occupancy, suitability and costs.

Housing tenure reflects socioeconomic status whereby a low home ownership rate may reflect lower incomes in the community and a higher overall fire risk. The City of Brantford has a lower proportion of dwellings that are owned when compared to the Province (67% owned in Brantford versus 70% in the province) suggesting that from a housing tenure perspective, the City has a higher fire risk than the Province.

A higher proportion of multiple persons per household can result in an increased fire loss (consequence) resulting in a higher risk. In the City, 1% of the households have more than one person per room compared to the Province which has 2% of households

with more than one person per room, suggesting a lower fire risk compared to the Province.

Similarly, housing suitability which refers to whether a private household is living in suitable accommodations according to the National Occupancy Standard is another indicator of fire risk. Suitable accommodations are defined by whether the dwelling has enough bedrooms based on the age and relationships among household members. Based on this measure, 4% (or 1,475) of households within Brantford are not suitable compared to 6% for the Province as a whole (resulting in nearly 311,005 “not suitable” households across the province). From the perspective of housing suitability, Brantford has a lower fire risk compared to the Province.

Shelter costs further provide some indication of the amount of disposable income within a household. Households with less disposable income have fewer funds to purchase household fire life safety items resulting in a higher risk. In Brantford, 26% of households spend 30% or more of the household total income on shelter costs. This is 2% lower than the Province, where 28% of households spend 30% or more of income on shelter costs. Looking closer at shelter costs, the median value of dwellings in Brantford is $279,494 ($121,002 less than the Province). The City also has a lower median monthly shelter costs for owned and rented dwellings than the Province. This analysis suggests that from the perspective of shelter costs and the impact on income, the fire risk within the City of Brantford may overall be lower than that of the Province as a whole.

Table 27: Household Tenure, Occupancy, Suitability, and Costs – City of Brantford and Province of Ontario (2016 Census)

	City of Brantford	%	Province of Ontario	%
Household Tenure				
Owner	26,455	67%	3,601,825	70%
Renter	12,765	33%	1,559,720	30%
Total Households	39,220	100%	5,169,175	100%
Household Occupancy				
One person or fewer per room	38,920	99%	5,046,810	98%
More than one person per room	295	1%	122,360	2%
Total Households	39,215	100%	5,169,175	100%
Housing Suitability				
Suitable	37,740	96%	4,858,170	94%
Not suitable	1,475	4%	311,005	6%
Total Households	39,215	100%	5,169,175	100%
Shelter Costs				
Spending less than 30% of household total income on shelter costs	29,160	74%	3,694,385	72%
Spending 30% or more of household total income on shelter costs	10,040	26%	1,411,900	28%
Total Households	39,200	100%	5,106,290	100%
Median value of dwellings	$279,178		$400,496	

	City of Brantford	%	Province of Ontario	%
Median monthly shelter costs for owned dwellings	$1,144		$1,299	
Median monthly shelter costs for rented dwellings	$895		$1,045	
(Source: Statistics Canada, 2016 Census)				

6.4 Ethnic and Cultural Considerations

Cultural diversity and ethnic background can be factors for fire service providers to consider in developing and delivering programs related to fire prevention and public education. For example, there may be familiarity challenges related to fire safety standards within recent immigrant populations which can be addressed with the delivery of fire education materials in multiple languages.

A high proportion of immigrants could demonstrate a higher fire risk due to a large population that may have the potential for lack of familiarity and/or experience with local fire life safety practices or possible language barriers. **Table 28** presents the overall immigration status of the population in Brantford. The City has a much lower proportion of immigrants (14%) compared to Ontario as a whole (29%). When looking at the data by year of immigration, lower levels of immigration in the City compared to the Province is a consistent trend.

Table 28: Immigration Status – City of Brantford and Province of Ontario (2016 Census)

	City of Brantford	%	Province of Ontario	%
Non-immigrants	82,515	86%	9,188,815	69%
Immigrants	12,945	14%	3,852,145	29%
Before 1981	5,950	6%	1,077,745	8%
1981 to 1990	1,770	2%	513,995	4%
1991 to 2000	2,085	2%	834,510	6%
2001 to 2010	2,160	2%	953,730	7%
2001 to 2005	1,060	1%	490,560	4%
2006 to 2010	1,095	1%	463,170	3%
2011 to 2016	985	1%	472,170	4%
Non-permanent residents	320	0%	201,200	2%
Total	95,780	100%	13,242,160	100%

Source: 2016 Census, Statistics Canada

Cultural diversity and ethnic background can be factors for fire departments to consider in developing and delivering programs related to fire prevention and public education. For example, the 2016 Census shows that 6,380 individuals or 7% of Brantford's total population identify as having "North American Aboriginal Origin". Therefore, delivering programs that take into account the cultural diversity of the City can address the language and cultural needs of the community and enhance the effectiveness of fire prevention and education. Communication barriers in terms of language and the ability to read written material can have an impact of the success of these programs. **Table 29** provides a breakdown of the knowledge of official languages based on the 2016 Statistics Canada census information for the City.

Table 29: Knowledge of Official Languages – City of Brantford and Province of Ontario

Language	City of Brantford		Ontario	
	Total	% Total	Total	% Total
Total population (non-institutional)	96,560	-	13,312,865	-
English Only	91,225	94%	11,455,500	86%
French Only	35	0%	40,040	0%
English and French	4,575	5%	1,490,390	11%
Neither English nor French	725	1%	326,935	2%
Source: 2016 Census, Statistics Canada				

English is the predominant language of the City's population with 94% speaking English only, 5% with knowledge of both English and French and 1% of the total population having no knowledge of English or French. Individuals without knowledge of English French account for 725 individuals within Brantford. Language barriers experienced by the residents of Brantford are therefore expected to be relatively infrequent, though consideration could be given to considering language barriers at a census tract or neighbourhood level. Further, the potential for communication barriers should be considered and monitored, especially as the community continues to grow.

Key Finding: English is the predominate language within the City representing 94% of the population followed by English/French representing 5% of the total population.

6.5 Population Shift

The population within a community can shift at various times during the day or week and throughout the year. Population shift can be a result of a number of factors including employment, tourism, and education. In some municipalities, residents regularly leave the community for employment. Other communities may be major tourist and vacation destinations resulting in large population shifts related to the seasonal availability of tourism activities. This can result in an increased risk due to

overnight tourism accommodation (sleeping) which can impact the demand for fire protection services. Another impact of population shift is an increase in traffic resulting in an increase in the number of motor vehicle calls and potentially emergency response times, often attributed to commuter traffic.

6.5.1 Tourism

There are several events each year and attractions that draw residents and non-residents to the City of Brantford and area. The B.F.D. has identified a number of these key events in **Table 30** and key attractions (**Table 31**). The top three events that attract the highest number of attendees throughout the year include the Brantford International Village Festival, the Brantford Kinsmen Ribfest and Brantford's Canada Day Celebration. While these features and seasonal properties may contribute to some seasonal population shift, overall, these venues do not contribute to a significant shift in population in terms of tourism accommodation; however they may provide opportunities for the B.F.D. to distribute fire and life safety information to large numbers of people.

Table 30: Key Events in the City of Brantford

Event	Address	Date	Attendees
Brantford International Buskers Festival	Mohawk Park – 51 Lynnwood Drive	Fourth weekend in September (Saturday and Sunday)	5,000
Brantford International Jazz Festival	Harmony Square – 89 Dalhousie Street	Third weekend in September (Saturday and Sunday)	22,000
Brantford International Villages Festival	Various community hall locations	First Wednesday through Saturday in July	142,000
Brantford Kinsmen Ribfest	Cockshutt Park – 35 Sherwood Drive	Second weekend in August (Saturday and Sunday)	26,000

Event	Address	Date	Attendees
Brantford's Canada Day Celebration	Steve Brown Sports Complex at Lions Park – 20 Edge Street	July 1	25,000
Chili Cook-Off	Harmony Square – 89 Dalhousie Street	Last Sunday in February	4,000
Community Charity Airshow	Brantford Municipal Airport - 110 Aviation Avenue	Last Wednesday in August	13,000
Frosty Fest	Harmony Square – 89 Dalhousie Street	Family Day weekend in February	15,000
JCI Brantford Santa Claus Parade (and Santa Claus Parade After Party)	Streets in Downtown Harmony Square	Last Saturday in November	10,000 (2,000)

Source: City of Brantford Economic Development and Tourism Department; City of Brantford Parks and Recreation Department, 2018.

Table 31: Key Attractions in the City of Brantford Year Round

Attraction	Address	Attendees
Bell Homestead National Historic Site	94 Tutela Heights Road	16,000
Glenhyrst Art Gallery of Brant	20 Ava Road	41,721
Sanderson Centre for the Performing Arts	88 Dalhousie Street	83, 814
Source: City of Brantford Economic Development and Tourism Department; City of Brantford Parks and Recreation Department, 2018.		

6.5.2 Education and Employment

Educational institutions are a key source for population shift in larger communities as they attract people from outside of the typical community. They are important to consider since they may have school-based residences, or contribute to a population that is not captured through the census. In Brantford, there are a number of post-secondary institutions, including: Wilfred Laurier University, and Conestoga College. The B.F.D.'s Simplified Risk Assessment (2017) indicates that there is a small fluctuation in population as a result of students temporarily living in the City of Brantford to attend these institutions. Wilfred Laurier makes the largest impact whereby only 14.6% of the student body are from the Brantford/Brant area.[15] This suggests a need for targeted education programs geared towards a transient student population to address fire safety concerns and fire prevention within student housing.

The City's proximity to numerous large job markets and convenient access by way of Highways 24 and 403 (connecting to the 400 series) suggests that there is potential for a day time population shift outside of the City to nearby municipalities for employment purposes. In terms of employment, the most recent City of Brantford Community Profile

[15] Laurieer Brantford Fact Sheet, Wilfred Laurier website: https://www.wlu.ca/media/assets/resources/brantford-fact-sheet.html

(2016) reveals that the majority of the Brantford resident labour force works within the community. However, 32.66% of the resident labour force declares a place of work outside of Brantford (the majority of which commute to Brant, Hamilton and Cambridge).[16] Additionally, 31.43% of Brantford workers are from neighbouring communities. These figures are important from a fire suppression standpoint as large numbers of person commuting to and from work could increase the number of vehicle collision calls to which the Fire Department responds.

Key Finding: There are shifts in student and commuter populations throughout the year; this population shift may impact the demand for fire protection services.

[16] Source: "Community Profile." City of Brantford, 2016: http://www.brantford.ca/Projects%20%20Initiatives%20%20Economic%20Development%20Strate/Brantford%20Community%20Profile-2016-FINAL%20DRAFT.pdf

7.0 Hazard Profile

As referenced in the Ontario Regulation 378/18: Community Risk Assessments, the hazard profile assessment includes analysis of the hazards within the community, including natural hazards, hazards caused by humans, and technological hazards to which fire departments may be expected to respond, that may have a significant impact on the community. Section 7 considers these hazards within the City of Brantford.

7.1 Hazard Identification and Risk Assessment in Ontario

A hazard is defined as a phenomenon, substance, human activity or condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage.[17] Hazards can be natural, human-caused or technological. It is important to identify and consider these hazards from a fire risk, emergency response and overall public safety perspective in order to assist local emergency response personnel prepare the risks within their communities, allowing for the creation of exercise, training programs and plans based on these scenarios.

Under the *Emergency Management and Civil Protection Act* (E.M.C.P.A.), municipalities are required to 'identify and assess the various hazards and risks to public safety that could give rise to emergencies and identify the facilities and other elements of the infrastructure that are at risk of being affected by emergencies' 2002, c.14, s.4.[18] To assist municipalities in identifying their own risks and hazards that have occurred, and therefore have the potential to impact their community, the Province of Ontario has provided guidance through the Ontario Provincial HIRA to assist municipalities in preparing for, mitigating, responding to and recovering from emergency incidents.

[17] Source: "English-French Emergency Management Glossary of Terms." M.C.S.C.S. Website, - Last Modified: May 25, 2016 "https://www.emergencymanagementontario.ca/english/emcommunity/response_resources/GlossaryOfTerms/glossary_of_terms.html

[18] Source: "Hazard Identification and Risk Assessment for the Province of Ontario.: M.C.S.C.S. Website, Last Modified: August 27, 2018: https://www.emergencymanagementontario.ca/english/emcommunity/ProvincialPrograms/hira/hira_2012.html#P3751_343357

The first step of a municipal H.I.R.A. process is to identify which events could occur in the local municipality, based on historical review of the municipality's hazards or in using the provincial list of natural, human-caused and technological hazards as a guide. Next, a risk assessment is undertaken, which considers the frequency of the identified hazards occurring within certain timeframes and the overall consequence level of an event occurring. The hazard risk assessment results are used to categorize the hazards into risk levels with the ultimate goal of aiding the municipality in its emergency management efforts and programming. The H.I.R.A. is to be reviewed annually based on current legislative requirements.

7.1.1 City of Brantford Hazard Identification Risk Assessment (H.I.R.A.) 2018

In compliance with legislative requirements, the City of Brantford completed its last H.I.R.A. in 2018. Through the risk assessment and risk analysis process, the top risks in Brantford (assigned a risk level of high, very high or extreme) were identified and are listed in **Table 32** below with their corresponding assigned risk levels. The H.I.R.A. assigns consequence levels and probability factors to hazards based on the potential for fatalities, injuries and evacuations, property damage, economic or environmental loss and impact on critical infrastructure.

Table 32: Top Hazard-Related Risks (City of Brantford H.I.R.A., 2018)

Hazard	City H.I.R.A. Risk Level
Tornado	Extreme
Freezing Rain/Ice Storm	Extreme
Windstorm	Extreme
Snowstorm/Blizzard	Extreme
Flood – River	Extreme
Critical Infrastructure Failure	Very High

Hazard	City H.I.R.A. Risk Level
Hazardous Materials Incidents/Spills – Fixed Site Incident	High
Transportation Emergency – Rail	High
Lightning	High
Energy Emergency (Supply)	High
Transportation Emergency - Road	High
Hazardous Materials Incidents/Spills – Transportation Incident	High
Drinking Water Emergency	High

Although many risks were identified as almost certain to occur, the consequence of that hazard occurring was slight or minimal and therefore the overall risk for that hazard was quite low or very low. Hazards listed as **almost certain to occur** included:

- Tornado
- Freezing Rain/Ice Storm
- Windstorm
- Critical Infrastructure Failure
- Lightning
- Energy Emergency (Supply)
- Transportation Emergency – Road
- Human Health Emergency – Epidemic
- Cyber Attack
- Flood – River
- Oil/natural gas emergency
- Extreme Temperatures – Heat Wave
- Extreme Temperatures – Cold Wave

- Fog
- Forest Fires/Wildfires
- Hail

As required by the E.M.C.P.A. and the City's Emergency Plan, the H.I.R.A. is to be reviewed annually as the identified hazards are subject to change over time. The Master Fire Plan, of which this Community Risk Assessment informs, includes a discussion on the emergency management programs and operational approaches to such hazards.

Key Finding: Top hazards for the City of Brantford as identified through the annual Hazard Identification and Risk Assessment Process include: tornado, freezing rain/ice storm, windstorm, snowstorm/blizzard, flood – river.

8.0 Public Safety Response Profile

As referenced in Ontario Regulation 378/18: Community Risk Assessments, the public safety response profile assessment includes analysis of the types of incidents responded to by other entities in the community, and those entities' responsibilities. These entities could include police, ambulance or fire for example that may be tasked with or able to assist in some capacity the collective response to an emergency situation. The following sections consider these public safety response characteristics within the City of Brantford.

8.1 Brantford Police Service

The B.F.D. has identified the Brantford Police Service (B.P.S.) as a public safety response entity within the City. The Brantford Police Service's mission is "to enhance the quality of life for all citizens and respond to their changing needs by ensuring and promoting public safety in partnership with our community." It operates out of one police station in close proximity to Wayne Gretzky Parkway and Elgin Street.

There are five core branches of the B.P.S. including administrative support, investigative support, operations, operational support and quality assurance, each of which is comprised of a variety of programs and initiatives to address the needs of the community and public safety. The Chief of Police is supported by a Deputy Chief who assists in the oversight of five inspectors responsible for each branch within the service. In addition to the various services provided, the Brantford Police Service holds Memorandums of Understanding with neighbouring municipalities, should they require support or specialized services.[19]

The B.P.S. Operations branch is responsible for the overall emergency preparedness of the Service. The 2016 Annual report indicates that in 2016, all officers were trained in Incident Management Systems (I.M.S.) 100 and all Supervisors were required to complete I.M.S. 200.

[19] Source: Brantford Police website: http://www.brantfordpolice.ca/upload/editor/BrantfordPoliceAnnualReport2016-8.5x11-PROOF.pdf

The B.P.S. has identified that it has several partnerships with community organizations and agencies that assist police in providing services to residents of Brantford. These local partners and resources available to the B.P.S. include:

- Brant-Brantford Crime Stoppers;
- Brant Community Healthcare System;
- Brant County Health Unit;
- The Canadian Centre for Information on Missing Adults (C.C.I.M.A.);
- Connex Ontario (Resources for: Drugs/Alcohol, Mental Health, Gambling);
- Children's Aid Society;
- Children's Safety Village-Brantford;
- The Chill Zone-Norfolk Health Unit;
- Collision Reporting Center;
- Dalhousie Place;
- Mothers Against Drunk Driving (M.A.D.D.)
- Nova Vita;
- St Leonard's Society of Brant;
- Teaching Intelligent Choices to Kids (T.I.C.K); and
- Victim Services of Brant.

8.2 County of Brant Ambulance Services

The County of Brant Ambulance Services (C.B.A.S.) is comprised of a team of 115 primary and advanced care paramedics and support staff providing first response paramedical services to approximately 130,000 citizens in the County of Brant and City of Brantford area. C.B.A.S. follows a tiered response model and is dispatched through the Hamilton Central Ambulance Communication Centre. Operating from three stations in Brantford, and one in Paris, C.B.A.S. responded to over 20,935 calls in 2016, noting that annual call volume has increased by 55% in the past two decades.[20] The County of Brant Ambulance Service has recognized Ontario's aging population as a contributing factor for consideration to future call volume demands on the Service.

[20] Source: County of Brant Ambulance Service website: https://www.brant.ca/en/resident-services/Ambulance.aspx?_mid_=1779

The C.B.A.S. has noted that it faces significant challenges providing a level of service that will meet current response demands to service a growing and also aging community. In 2015 for example, Brant County experienced occurrences of “zero available units” 1,192 times. This is the equivalent of 9 business days. C.B.A.S. has acknowledged that this issue occurs at a significantly higher rate than experienced by other municipalities within the Province. A Land Ambulance Action Plan prepared by Performance Concepts Consulting Inc. has made the following key recommendations to address this challenge:

1. In fall 2016, redeploy a 12-hour ambulance shift from the relatively low system busyness overnight period to the high system busyness mid-day period (12:00 pm - 12:00 am). This will reduce mid-day system busyness levels, and cut down on occurrences of "zero unit availability".
2. In 2017, fund and then deploy a new 12-hour ambulance to the high system busyness mid-day period (10:00 am - 10:00 pm). In combination with the 2016 redeployment, the combined impact should be a significant reduction in mid-day peak system busyness and an estimated 40% reduction in "zero unit" occurrences.[21]

The City of Brantford Fire Department and the Brant County Ambulance Service share a Tiered Response Agreement whereby the City of Brantford Fire Department has agreed to respond to medical emergencies within the City of Brantford when tiered by the Hamilton Central Ambulance Communications Centre. The agreement states that the Brantford Fire Department is always to be tiered for all motor collisions (where E.M.S. responds Code 4) or if the call reports that there is fire, a fuel spill, entrapment or multiple patients at the scene of the collision. For non-collision calls the Brantford Fire Department is to be notified immediately whenever there is an indication that there may be fire, hazardous materials present, any entrapment, structural hazard or rescue needs. The agreement is renewed automatically on an annual basis unless terminated in writing thirty days from the date of receipt of official notice and acknowledges that fire emergencies or emergencies declared under the City of Brantford Municipal Emergency Response Plan takes precedence over the tiered call.

[21] Source: County of Brant Ambulance Service website: https://www.brant.ca/en/resident-services/Ambulance.aspx?_mid_=1779

Medical response by the B.F.D. is discussed further in Past Loss and Event History profile of this C.R.A. Further details relating to impact of the changes to the Tiered Response Agreement will be presented in the Master Fire Plan.

Key Finding: Analysis of the existing Public Safety Response Profile indicates the availability of an integrated emergency response, including police, fire, and ambulance resources.

9.0 Community Services Profile

As referenced in Ontario Regulations 378/18: Community Risk Assessments, the community service profile assessment includes analysis of the types of services provided by other entities in the community, and those entities' service capabilities. This includes the presence or absence and potential abilities of other agencies, organizations or associations to provide services that may assist in mitigating the impacts of emergencies to which the fire department responds. The following sections consider these community service characteristics within the City of Brantford.

9.1 Community Services Identified by the City of Brantford and the Brantford Fire Department

Local community partners are critical to effective and complete municipal emergency response in the event of an emergency or disaster. The City's Emergency Plan includes a number of partner agencies that may assist in responding to local emergencies. These agencies may be called upon to provide services or technical advice in order to respond to and recover from an incident. Some of the partners have been listed generally in the Plan and include (but are not limited to):

- Utility Companies;
- Non-governmental organizations;
- School Boards;
- Post-secondary institutions; and,
- Technical Experts.

Desktop research has revealed a number of community services that pertain to the general list of partners listed above that operate within the Brantford community. It is recognized that the City is already involved in collaborative efforts with many of the local partners which comprise the general list above. A next step may involve developing a database that inventories both human and physical resources that could be made available in the event of an emergency. **Table 33** provides a list of potential local partners.

Table 33: Potential Local Community Partners

Local Partner	Description
St. John's Ambulance	St. John's Ambulance offers first aid and C.P.R. services at public recreational events within the City, as well as a base of volunteers capable of providing first aid, C.P.R. and health care services in the event of a disaster within the community.
The Salvation Army	The Salvation Army food bank in Brantford offers food and support to individuals and families in need. The Salvation Army may be able to provide clothing in the event of an emergency as well.
St. Leonard's Community Services	St. Leonard's Community Services provide addictions and mental health counselling services both individually and in group sessions. These services could be accessed by individuals affected by an emergency.
School Boards and Post-secondary Institutions	The various school boards and post-secondary institutions that operate in and around the Brantford area may be able to provide schools for the use of evacuation or reception centres in the event of an emergency.

9.2 Other Community Partners

The B.F.D. has further identified community service entities that would potentially assist in mitigating the impacts of emergencies to which the fire department may respond. Those agencies identified specifically include Victim Services, Red Cross and the Brant County Health Unit.

9.2.1 Victim Services of Brant

Victim Services of Brant provides assistance to emergency services within the community in support of individuals who are experiencing personal tragic circumstances or disaster. All programs and their respective services provided by Victim Services are highlighted in **Table 34**.

Table 34: Programs and Services offered by Victim Services of Brant

Program	Services Provided
Victim Crisis Assistance Ontario	• 24/7 on-scene crisis intervention • Addressing immediate safety concerns • Community information sessions • Practical assistance • Needs assessment • Development of a personalized referral form or service plan • Safety planning • Information provision • Referrals to counselling and relevant community and government support services • Enhanced support • Follow-up • Assist with Victim Impact Statements and Criminal Injuries Compensation forms
Victim Quick Response Program	• Emergency home repairs to secure premises for the immediate safety of victims • Cell phones to prevent re-victimization • Emergency accommodation and meals where there are no secure housing options available • Emergency personal care items, such as diapers, clothing • Replacement of eyeglasses/contact lenses damaged or destroyed during the commission of a crime • Transportation and emergency child/dependent care costs to identify a homicide victim or support a seriously injured relative • Removal of hate crime graffiti from home property and/or vehicle • Crime scene cleanup requiring specialized services • Contribution towards funeral expenses to assist families of homicide victims • Counselling to provide short-term, early intervention support to help victims of serious crime • Assist with Victim Impact Statements and Criminal Injuries Compensation forms
Safety Planning	• Assistance to develop a personal safety plan (including safety at home, travelling and at work) • Ongoing follow-up and update safety plan as required

Program	Services Provided
	• Additional safety supports are available for eligible clients
Court Assistance	• Explain the Bail Court process to the victim • Provide the victim with information related to their case • Act as a liaison with victim on behalf of the Crown Attorney and Police Services • Advise the victim of the outcome of Bail Court • Facilitate the victim accessing appropriate support services • Educate and promote victim assistance in our community
Source: Victim Services of Brant Website	

9.2.2 Red Cross Brantford Branch

The Brantford Branch Emergency and Disaster Services are responsible for collaborating with community volunteer organizations, first responders, emergency managers and public officials in the event of an emergency. The branch has the capability to provide emergency food, shelter, clothing personal services and family reunification. These capabilities are described further in **Table 35**.

Table 35: Services Provided by the Canadian Red Cross

Service	Description
Family reunification	The chaos and confusion that accompany emergencies and natural disasters can separate families when they need each other most. Red Cross helps people re-establish contact with immediate family members after separation due to natural disasters and other humanitarian crises.
Emergency lodging	After a disaster or emergency, safe, temporary lodging is provided to persons who cannot return home and cannot find alternate accommodations.
Reception and information	The purpose of the reception and information services is to greet evacuees, provide information regarding services provided within the centre and provide access control to the facility.

Service	Description
Emergency food	Food is provided to evacuees, emergency workers and disaster volunteers through various means which may include vouchers, meals at a shelter, or referral to another agency.
Emergency clothing	We provide evacuees access to basic clothing through various means which may include purchasing, providing vouchers or referral to other agencies.
Personal services	Personal services offers first aid, temporary care for unattended children and dependent elderly, provides or arranges for provision of material assistance, and offers emotional support to people with needs created or aggravated by a disaster.
Source: Canadian Red Cross	

Additional services offered at the Brantford branch include:

- First Aid and C.P.R.;
- Meals on Wheels;
- Swimming Lessons;
- Transportation; and
- Violence, Bullying and Abuse Prevention.

9.2.3 Brant County Health Unit

The B.F.D. has identified the Brant County Health Unit (B.C.H.U.) as a public safety response agency within the community. In the event of a public health emergency, such as an outbreak of the H.1.N.1. Flu (also known as Swine Flu), or Severe Acute Respiratory Syndrome (S.A.R.S.), the B.C.H.U. would be the lead agency in terms of response. Where emergency situations contain a component of concern regarding public health the B.C.H.U. would assume a support or advisory role. For non-medical, or health related emergencies, the B.C.H.U. would provide support to social services in the provision of information related to food safety or sanitation.

The B.C.H.U. does have flexible working hours of operation and could be available for extended hours during an emergency situation and possesses an evacuation trailer that has the capability of transporting 100 evacuees.

9.2.4 Mutual Aid Agreement

The Brantford Fire Department is an active participant in the Brant County Mutual Aid Plan. This mutual aid plan forms an integral component of the province wide fire service mutual aid system. The current mutual aid plan by-law is dated August 27, 2012. The other parties to the current mutual aid agreement include the Brant County and Six Nations of the Grand River.

Key Finding: Analysis of the existing Community Services Partners Profile indicates the availability of a wide range of community partners to support the community in response to a major incident.

10.0 Economic Profile

As referenced in Ontario Regulation 378/18: Community Risk Assessments, the economic profile assessment includes analysis of the economic sectors affecting the community that are critical to its financial sustainability. This involves economic drivers in the community that have significant influence on the ability of the community to provide or maintain service levels. The following sections consider these economic characteristics within the City of Brantford.

10.1 Key Industries in Brantford

Certain industries, employers and events contribute to the economic vitality and well-being of a community. If these facilities, employers or events are impacted through a fire or other emergency, it could have a negative effect on the overall financial stability and/or vitality of a municipality. The City of Brantford's Economic Development and Tourism Department has identified six key industries within the community. Collectively, these industries represent a signification portion of the local economy and employment base and are centred on:

- Food Manufacturing;
- Plastics and Rubber Products;
- Chemical Manufacturing;
- Machinery Manufacturing;
- Warehouse and Distribution; and
- Clean Technology.

The City's top employers can be found in **Table 36**. The top employer in the private sector with the highest number of employees was Ferrero Canada Limited with 800 total employees. Other top employers with total number of employees exceeding 400 include Apotex Pharmachem Inc., D.H.L. and TreeHouse Foods.

Table 36 shows that the manufacturing industry represents a large employment base for the City. According to the 2016 Brantford Community Profile, the employment base is also heavily reliant on government related jobs including public administration, health

and educational services.[22] While tourism is not a major sector of the economy, there are unique features and attractions in the City which draw tourists to the area year round, contributing to the local economy.

Table 36: Top Ten Employers by Number of Employees in the City of Brantford

Employer	Address	Number of Employees
Ferrero Canada Ltd. / Food Manufacturing	1 Ferrero Boulevard	800
Apotex Pharmachem Inc. / Pharmaceutical	34-54 Spalding Drive	450
DHL / Warehouse Distribution	59 Fen Ridge Court	410
TreeHouse Foods / Food Manufacturing	175 Savannah Oaks Dr.	404
ARYZTA Canada Co. / Food Manufacturing	115 Sinclair Blvd	385
Mott Manufacturing Limited / Manufacturing	452 Hardy Road	320
S. C. Johnson and Son, Limited / Consumer Products	1 Webster Street	300

[22]Source: Brantford Community Profile, 2016: http://www.brantford.ca/Projects%20%20Initiatives%20%20Economic%20Development%20Strate/Brantford%20Community%20Profile-2016-FINAL%20DRAFT.pdf

Employer	Address	Number of Employees
Tigercat Industries Inc. / Manufacturing	54 Morton Ave. E.	289
The Marco Corporation / Warehouse Distribution	470 Hardy Road	267
Brant InStore / Manufacturing	555 Greenwich Street	225
Source: Brantford Industrial Directory, City of Brantford Economic Development and Tourism Department		

Key Finding: The City has identified six key industry groups that if impacted by a fire or other impact on sustained employment would have a negative impact on the City's economy.

11.0 Past Loss and Event History Profile

As referenced in Ontario Regulation 378/18: Community Risk Assessments, the past loss and event history profile assessment includes analysis of the community's past emergency response experience, including an analysis of the number and types of emergency responses, injuries, deaths and dollar losses, and a comparison of the community's fire loss statistics with provincial fire loss statistics. Evaluation of previous response data will inform decisions on fire protection services delivery including public fire safety education and inspection programs. The following sections consider these past loss and event history characteristics within the City of Brantford.

11.1 Past Loss

Analysis of historical data provides valuable insight into understanding the specific trends within a community. Assessing the key factors of life safety risk and fire risk in relation to provincial statistics provides a foundation for evaluating where specific programs or services may be necessary. The analysis provided within this profile is based on historical fire loss for the period 2013-2017. Fire loss data for 2018 is provided where possible in a separate table or column based on preliminary 2018 municipal reporting submitted to the O.F.M.E.M. with limited information that is subject to change and unverified. Where municipal data is compared to provincial data, only 2013-2017 data is used and 2018 data is provided for reference in a separate column or table.

11.1.1 Overall Fire Loss

In terms of overall property loss as a result of fires**, Table 37** shows the total number of fires, and property loss for the City of Brantford for the period 2013 to 2017. The overall property loss as a result of structure, outdoor and vehicle fires experienced by Brantford during this five year period totalled 752 fires, resulting in $26,613,641 in property loss. Structure fires account for 59% of all fires within the City and 91% of fire loss. Vehicle fires account for 24% of all fires while outdoor fires account for 17%.

Table 37: City of Brantford total Fire Loss (2013-2017)

Year	Structures		Outdoor		Vehicle		TOTAL	
	# of Fires	Loss ($)	# of Fires	Loss ($)	# of Fires	Loss ($)	# of Fires	Loss ($)
2013	108	$5,797,105	18	$7,340	34	$434,950	160	$6,239,395
2014	74	$4,243,139	18	$6,667	34	$206,059	126	$4,455,865
2015	100	$3,532,998	39	$25,110	38	$257,900	177	$3,816,008
2016	74	$3,809,900	36	$41,954	36	$260,199	146	$4,112,053
2017	87	$6,881,855	17	$8,090	39	$1,100,375	143	$7,990,320
Total	443	$24,264,997	128	$89,161	181	$2,259,483	752	26,613,641

(Source: O.F.M.E.M. Standard Incident Reporting)

When looking at structure fires specifically **Table 38** shows the proportion of structure fires and property loss for the period of 2013-2017 based on total number of fires and total property loss for all fires (structures, outdoor and vehicle). Structure fires accounted for 59% of all fires and 91% of total dollar ($) loss. For the period of 2013-2017 there were 35,342 structure fires in Ontario representing 66% of all fires. Structure fires accounted for 90% of total property loss or total dollar ($) loss in the Province. The proportion of structure fires in the City is lower when compared to the province (59% versus 66%), although this table also indicates that structure fires account for the majority of all property loss within the City and within the Province (91% and 90%). With such a high proportion of dollar loss attributed to this type of fire, the value of proactive fire and life safety programming including public education, inspections and enforcement initiatives is clear.

Unverified O.F.M.E.M. summary reports for 2018 fire loss data show that there were a total of 75 structure fires, 54 vehicle fires and 47 structure/property fires not classified by the O.B.C. in Brantford totalling 176 with a loss or injury in 2018. Outdoor fires were

not included in this summary report. Structure fires account for a large portion of the total fires (43%) with a loss or injury, followed by vehicle fires (31%), consistent with 2013-2017 whereby structure fires account for the majority of fires during that time frame. Fires and fire loss based on occupancy type for 2018 are shown in **Table 40**.

Table 38: City of Brantford and Province of Ontario Structure Fires and Property Loss (2013-2017)

	City of Brantford				Province of Ontario			
Year	**Structure Fires**	**Property Loss ($)**	**% ALL Fires**	**% ALL Property Loss**	**Structure Fires**	**Property Loss ($)**	**% ALL Fires**	**% ALL Property Loss**
2013	108	$5,797,105	14%	22%	7,191	$576,249,175	13%	16%
2014	74	$4,243,139	10%	16%	7,063	$784,681,080	13%	21%
2015	100	$3,532,998	13%	13%	7,240	$658,957,595	14%	18%
2016	74	$3,809,900	10%	14%	7,169	$654,514,771	13%	18%
2017	87	$6,881,855	12%	26%	6,679	$657,580,390	12%	18%
Total for Structure Fires	443	$24,264,997	59%	91%	**35,342**	**$3,331,983,011**	**66%**	**90%**
Total for All Loss Fires	752	$26,613,641	-	-	**53,459**	**$3,704,697,486**	**-**	**-**

Source: O.F.M.E.M. Standard Incident Reporting

Key Finding: The proportion of structure fires within the City during the years 2013-2017 is lower when compared against provincial statistics during the same time period (59% vs 66%).

11.1.2 Fires by Occupancy Type

The analysis of historical fires by occupancy type highlights the occupancies which may be more vulnerable to fires than others. To assess the fire loss by occupancy classification, data accessed by the Office of the Fire Marshall and Emergency Management's standard Incident Reporting was analyzed. This data is illustrated in **Table 39** for a five year period from 2013 to 2017.

Analysis indicates that of the total structure fires which occurred in Brantford between this time period, 271 fires or 61% occurred in Group C – Residential Occupancies. Group F – Industrial occupancies accounted for 74 fires or 17% of all fires (higher than the Province by 9%). Other occupancies not classified within the O.B.C. accounted for 45 fires or 10% of all fires, also higher than the Province by approximately 5%.

From the perspective of property loss, Group C – Residential occupancies account for roughly 50% of fire loss. For this same period, 62% of the fires with a loss in Ontario occurred within Group C – Residential occupancies, 12% higher than Brantford. The second highest source of property loss occurred within Group E – Mercantile occupancies representing 20% of all property loss, suggesting a need for a targeted public education, fire prevention and enforcement strategies, which will be discussed in greater detail in the City's Master Fire Plan.

Table 39: City of Brantford Fires and Fire Loss by Occupancy Classification (2013-2017)

Group	Occupancy Classification	Fires	% Fires	Property Loss	% Loss	Ontario % of Structure Fires	Ontario % of Structure Fire Property Loss
Group A	Assembly occupancies	16	4%	$1,476,285	6%	4%	4%
Group B	Care or Detention occupancies	7	2%	$1,014,030	4%	1%	1%
Group C	Residential occupancies	271	61%	$12,032,544	50%	73%	62%

Group	Occupancy Classification	Fires	% Fires	Property Loss	% Loss	Ontario % of Structure Fires	Ontario % of Structure Fire Property Loss
Group D	Business and Personal Services Occupancies	12	3%	$330,250	1%	3%	2%
Group E	Mercantile occupancies	18	4%	$4,760,300	20%	3%	5%
Group F	Industrial occupancies	74	17%	$4,263,588	18%	8%	19%
Other	Not classified within the Ontario Building Code	45	10%	$388,000	2%	5%	1%
	Classified under National Farm Building Code	0	0%	$0	0%	3%	6%
Total		**443**	**100%**	**$24,264,997**	**100%**	**35,342**	**$3,331,983,011**

Source: O.F.M.E.M. Standard Incident Reporting

Key Risk: Group C – Residential occupancies account for 61% of structure fires within the City.

Key Risk: Group F – Industrial occupancies account for 17% of structure fires within the City.

Key Finding: Other occupancies not classified within the O.B.C. account for 10% of structure fires within the City.

Table 40 shows historical fires and fire loss by occupancy type for the year 2018. Results are consistent with the findings from previous years whereby Group C – Residential

Occupancies account or the majority of structure fires within the City (67%), followed by Group C – Industrial Occupancies at 16%.

Table 40: City of Brantford Fires and Fire Loss by Occupancy Type – Structure Fires (2018)

Group	Occupancy Classification	Fires	% Fires	Property Loss	% Loss
Group A	Assembly occupancies	2	3%	$5,500	0%
Group B	Care or Detention occupancies	1	1%	$10,000	1%
Group C	Residential occupancies	50	67%	$975,550	77%
Group D	Business and Personal Services Occupancies	-	-	-	-
Group E	Mercantile occupancies	3	4%	$1,001	0%
Group F	Industrial occupancies	12	16%	$251,550	20%
Other - Not classified within the Ontario Building Code		7	*9%*	$28,750	2%
Total Structure Fires		**75**	**100%**	**$1,272,351**	**100%**
Source: Unverified 2018 OFMEM Preliminary Municipal Summary of Emergency Responses and Fire Loss					

11.1.3 Civilian Fire Fatalities and Injuries

Reviewing historic fire deaths or injuries by age and gender of victims can provide insight for the purposes of targeted community risk reduction programs. These trends can be used to inform programming. As explored in the Demographic Profile, seniors represent the highest proportion of fire fatalities in the Province of Ontario and males are more likely to be injured from a fire or lose their life in a fire.

The Office of the Fire Marshal and Emergency Management does not provide information regarding fire injuries or fatalities based on gender or age. However, it does

provide a breakdown of this information by occupancy classification. **Table 41** indicates that during the period of 2013 to 2017 there were a total of 52 fire related injuries and five fatalities. All fire fatalities occurred within Group C – Residential occupancies, highlighting the importance of ongoing public education efforts including smoke alarm and carbon monoxide detectors and home escape planning. Table 41 also highlights that based on the unverified summary reports for 2018 there were 3 injuries recorded in Group F – Industrial occupancies.

Table 41: City of Brantford Reported Civilian Injuries and Fire Fatalities (2013-2018)

		2013-2017		2018
Occupancy Classification (OBC)	**Occupancy Definition Fire Risk Sub-model (O.F.M.E.M.)**	**Injuries**	**Fatalities**	**Injuries**
Group A – Assembly	Assembly occupancies	0	0	0
Group B – Care or Detention	Care or Detention occupancies	1	0	0
Group C - Residential	Residential occupancies	40	5	0
Group D - Business	Business and Personal Services Occupancies	1	0	0
Group E - Mercantile	Mercantile occupancies	7	0	0
Group F - Industrial	Industrial occupancies	6	0	3
Other occupancies	Not classified within the Ontario Building Code (i.e. farm buildings)	0	0	0
	Classified Under National Farm Building Code	0	0	0
Total		**52**	**5**	**3**
Source: O.F.M.E.M. Standard Incident Reporting				

Key Risk: The majority of fatalities and injuries between the period of 2013-2017 occurred within Group C – residential occupancies.

11.1.4 Reported Fire Cause

Assessing the possible cause of the fires reported is an important factor in identifying potential trends, or areas that may be considered for introducing additional public education or fire prevention initiatives as part of the community risk reduction plan. Within O.F.M.E.M. fire loss reporting, there are four categories of cause utilized to classify the cause of a fire. These include intentional, unintentional, other, and undetermined.

The “intentional” category recognizes the cause of a fire to be started for a specific reason. These are typically classified as arson fires, and for example can be related to acts of vandalism, or to achieve personal gain through insurance payment. As indicated in **Table 42,** 9% of the fires reported for the 2013 to 2017 period were due to vandalism (higher than the Provincial percentage of 2%). It is recommended that the B.F.D. continue to collaborate with local law enforcement agencies and other City departments in order to reduce the risk of fire setting within the community.

The “unintentional” category recognizes a number of the common causes of a fire that represent both human behavioural causes (e.g., playing with matches) and equipment failures (e.g., mechanical failure). A total of 68% of fires reported for 2013-2017 were classified as “unintentional” with misuse of ignition source representing 31% of this fire cause category. This suggests a need for targeted educational programs about fire causes and prevention.

Table 42: City of Brantford Reported Fire Cause (2013-2017)

Nature	Fire Cause	City of Brantford		Province of Ontario		City of Brantford 2018	
		# of Fires	% of Cause	# of Fires	% of Cause	# of Fires	% of Cause
Intentional	Arson	26	6%	2,106	6%	12	16%
	Vandalism	40	9%	696	2%	3	4%
	Other Intentional	0	0%	12	0%	-	-
Unintentional	Children Playing	4	1%	155	0%	-	-
	Design/Construction/Maintenance deficiency	52	12%	2,745	8%	4	5%
	Mechanical /Electrical failure	55	12%	5,409	15%	11	15%
	Misuse of ignition source	137	31%	10,566	30%	24	32%
	Other unintentional	17	4%	2,499	7%	3	4%
	Undetermined	34	8%	2,718	8%	-	-
	Vehicle Collision	1	0%	24	0%	-	-
Other	Other	33	7%	1,793	5%	1	1%
Undetermined	Undetermined	44	10%	6,585	19%	17	23%
Unknown, not reported	Unknown, not reported	-	-	34	0%	-	-
Total		**443**	**100%**	**35,342**	**100%**	**75**	**100%**

(Source: O.F.M.E.M.)

Reported fire cause data based on the 2018 preliminary reports confirms that misuse of ignition source is the leading cause of fire within Brantford, similar to the findings of the 2013-2017 data. There were twelve reported arson fires for 2018 which suggests a need to collaborate with local law enforcement agencies and other City departments to reduce the number of intentionally caused fires in the City.

Key Risk: Of the fires occurring in the City between 2013 and 2017, the leading cause of intentionally set fires was due to acts of vandalism at 9%, higher than the province by 7%.

Key Risk: 31% of reported fires for the period of 2013-2017 were attributed to the misuse of an ignition source.

11.1.5 Ignition Source

Table 43 illustrates the fire loss by source of ignition based on an analysis of the data provided from 2013 to 2017 from the O.F.M.E.M. for the City of Brantford and the Province. The most common source of ignition for fires within the City is open flame tools/smokers articles at 23%, above the provincial average of 14%.

The second most common source of ignition is due to cooking equipment at 21% suggesting the need for targeted public education campaigns related to cooking equipment safety. In 18% of all fire instances, the source of ignition was undetermined.

Similar to 2013-2017 ignition source data, 2018 data shows that cooking equipment and open flame tools/smokers' articles are the two leading known sources of ignition.

Table 43: City of Brantford and the Province of Ontario Fire Loss Reported Source of Ignition (2013-2018)

Reported Ignition Source	City of Brantford 2013-2017		Province of Ontario		City of Brantford 2018	
	Number of Fires	% of Fires	Number of Fires	% of Fires	Number of Fires	% of Fires
Appliances	17	4%	1,644	5%	2	3%
Cooking equipment	95	21%	6,367	18%	20	27%
Electrical distribution	26	6%	3,136	9%	6	8%
Heating equipment,	15	3%	2,833	8%	1	1%
Lighting equipment	14	3%	1,128	3%	2	3%
Open flame	100	23%	4,772	14%	8	10%
Other	13	3%	1,626	5%	2	3%
Processing equipment	29	7%	440	1%	3	4%
Miscellaneous	21	5%	3,525	10%	7	9%
Exposure	33	7%	1,504	4%	5	7%

Reported Ignition Source	City of Brantford 2013-2017		Province of Ontario		City of Brantford 2018	
	Number of Fires	% of Fires	Number of Fires	% of Fires	Number of Fires	% of Fires
Undetermined	80	18%	8,334	24%	19	25%
Unknown, not	-	-	33	0%	-	-
Total	**443**	**100%**	**35,342**	**100%**	**75**	**100%**
Source: O.F.M.E.M. Standard Incident Reporting						

Key Risk: The most common known source of ignition for fires within the City is due to open flame tools/smokers articles at 23%.

Key Risk: The second most common source of ignition for fires within the City is due to cooking equipment at 21%.

11.1.6 Smoke Alarm Status

Smoke alarms are required on every storey of a dwelling in the Province of Ontario. Smoke alarm programs are also one of the required services to be provided by a fire department per the F.P.P.A. As a result, smoke alarm programs and compliance are a key component of public education and fire prevention activities provided by the municipal fire departments across the Province.

Currently the B.F.D. provides reporting on the smoke alarm status presence and activation with the fire call data to the O.F.M.E.M. In regards to smoke alarms in a typical residential dwelling, **Table 44** highlights whether a smoke alarm was present and operating on the floor or in the suite of fire origin for the period of 2013-2017.

Table 44: City of Brantford and the Province of Ontario Smoke Alarm Operations (2013-2017)

Smoke Alarm Status on Floor of Origin	City of Brantford Residential Occupancies							Province of Ontario (Group C - Residential)
	2013	2014	2015	2016	2017	Total	%	2013-2017
No smoke alarm	12	2	12	5	8	39	15%	17%
Smoke alarm present and operated	29	23	24	17	21	114	44%	45%
Smoke alarm present, did not operate	9	8	15	8	10	50	19%	14%
Smoke alarm present, operation undetermined	6	3	2	5	5	21	8%	8%
Smoke alarm presence undetermined	9	4	8	7	5	33	13%	16%
Grand Total						**257**	**100%**	**100%**

Source: O.F.M.E.M. Standard Incident Reporting, and O.F.M.E.M. website, https://www.M.C.S.C.S..jus.gov.on.ca/english/FireMarshal/MediaRelationsandResources/FireStatistics/OntarioFires/SmokeAlarmStatusinHomeFires/stats_sa_status.html

Over this five year period, a smoke alarm was not present for 15% of occurrences. In 19% of occurrences a smoke alarm was present but did not operate. Provincial and local statistics support having a targeted and proactive smoke alarm program in place.

Key Risk: During the period from 2013-2017 there were smoke alarms present but did not operate in 19% of the incidents the B.F.D. responded to in Group C-Residential Occupancies.

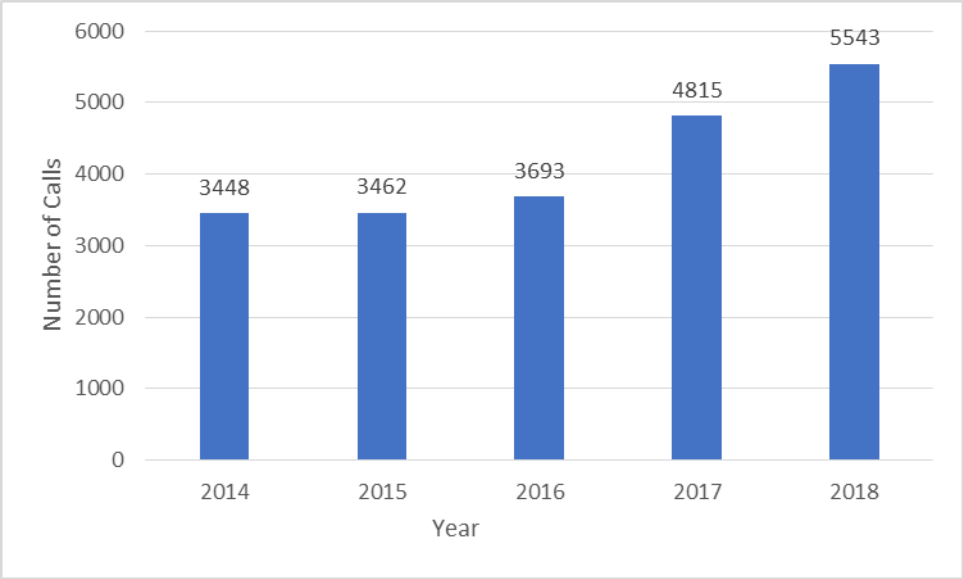
11.2 Event History

Event history seeks to apply the historic call data to develop an understanding of community risks. The analysis provided within this profile is based on all historical calls responded to by the B.F.D. for the period 2014-2018 based on the B.F.D.'s call data. Where call data by O.F.M.E.M. response type is compared to provincial data, only 2013-2017 data is used. A breakdown of call data by O.F.M.E.M. response type is provided for 2018, however, these values are included in the report for reference only and based on unverified preliminary summary reports. This section provides a statistical assessment of historic call volumes for the City as a whole by different time segments (e.g. annual calls, weekly calls, and daily calls). It also provides a detailed breakdown of calls by type and corresponding volumes. The call volume by type is compared to the Province of Ontario's call volume by type to determine Brantford specific risks. The volume and frequency of historic calls informs the understanding of response probability. The types of calls inform the potential consequences of the B.F.D. responses and calls for service. The combined consideration of these elements provides an understanding of community risk, based on past calls for service.

11.2.1 Annual Call Volume – All Incidents

The annual call volume provides a high level understanding of the probability of incidents occurring within Brantford. A summary of the total number of calls within the City from 2014-2018 is shown in **Figure 11**. Overall, the number of calls responded to by the B.F.D. has increased substantially throughout the five year timeframe, with the lowest number of calls received in 2014 and the highest in 2018. The most dramatic increase in call volume occurred between 2016 and 2017. O.F.M.E.M. summary reports indicate the increase in volume between 2016 and 2017 is due to an increase in medical calls as a result of the department's tiered response agreement. The average annual call volume based on this five year timeframe is 4,192 calls per year.

Figure 11: Annual Call Volume (2014-2018)

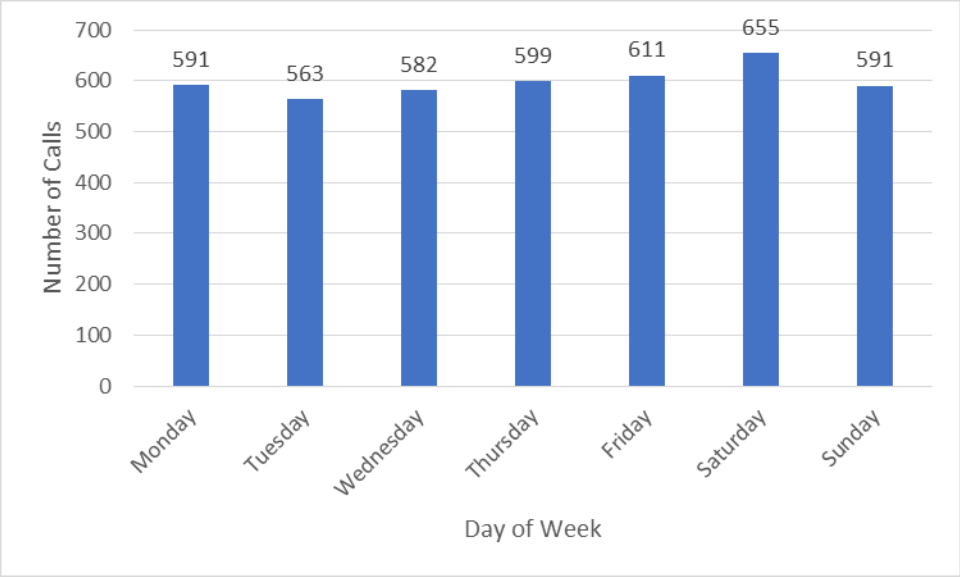


Key Finding: The annual emergency call volume for the period 2014-2018 indicates an average of 4,192 emergency calls per year.

11.2.1.1 Average Call Volume by Day of Week

Average call volume by day of week is shown in **Figure 12** for the period of 2014-2018. Over this period, the B.F.D. experienced consistent call levels throughout the week with the highest average call volume occurring on Saturdays, and the lowest average call volume occurring on Tuesdays. The difference between the highest and lowest average call volumes is 92 calls.

Figure 12: Call Volume by Day of Week (2014-2018)

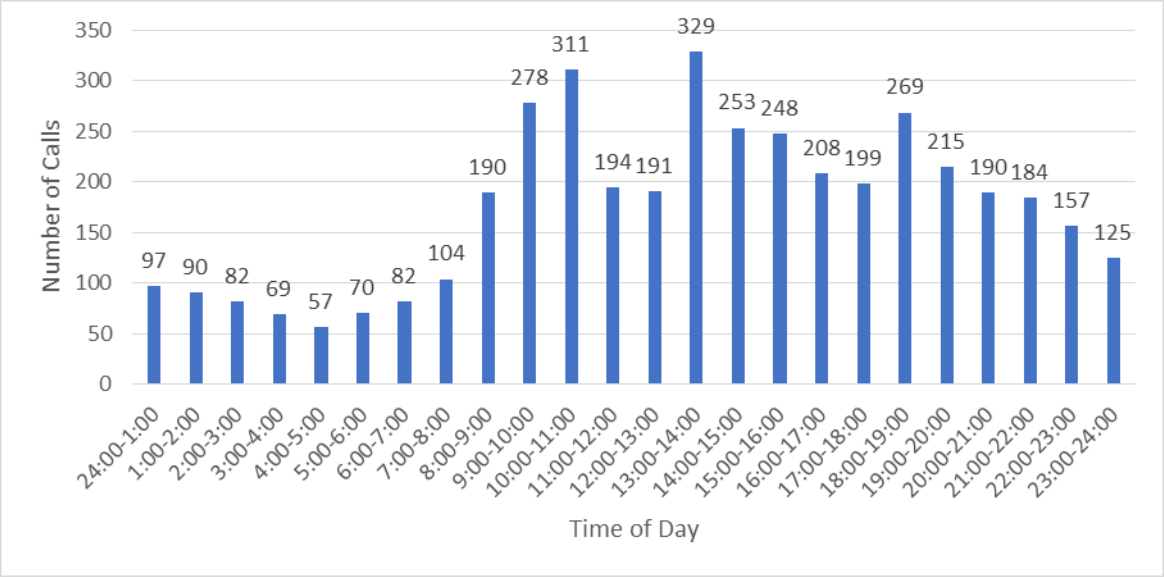


Key Finding: Analysis of call volume by day of week for the period of 2014-2018 indicates that the highest proportion of calls occurs on Saturdays, while the lowest average call volume occurs on Tuesdays.

11.2.1.2 Average Call Volume by Time of Day

Figure 13 indicates that on average, there is a lower occurrence of calls between midnight and 7am. This trend of low call volume takes place when the majority of the population is typically asleep. Call volume is higher between the hours of 9a.m. and 11a.m. and from 1p.m. to 6p.m.

Figure 13: Call Volume by Time of Day (2014-2018)

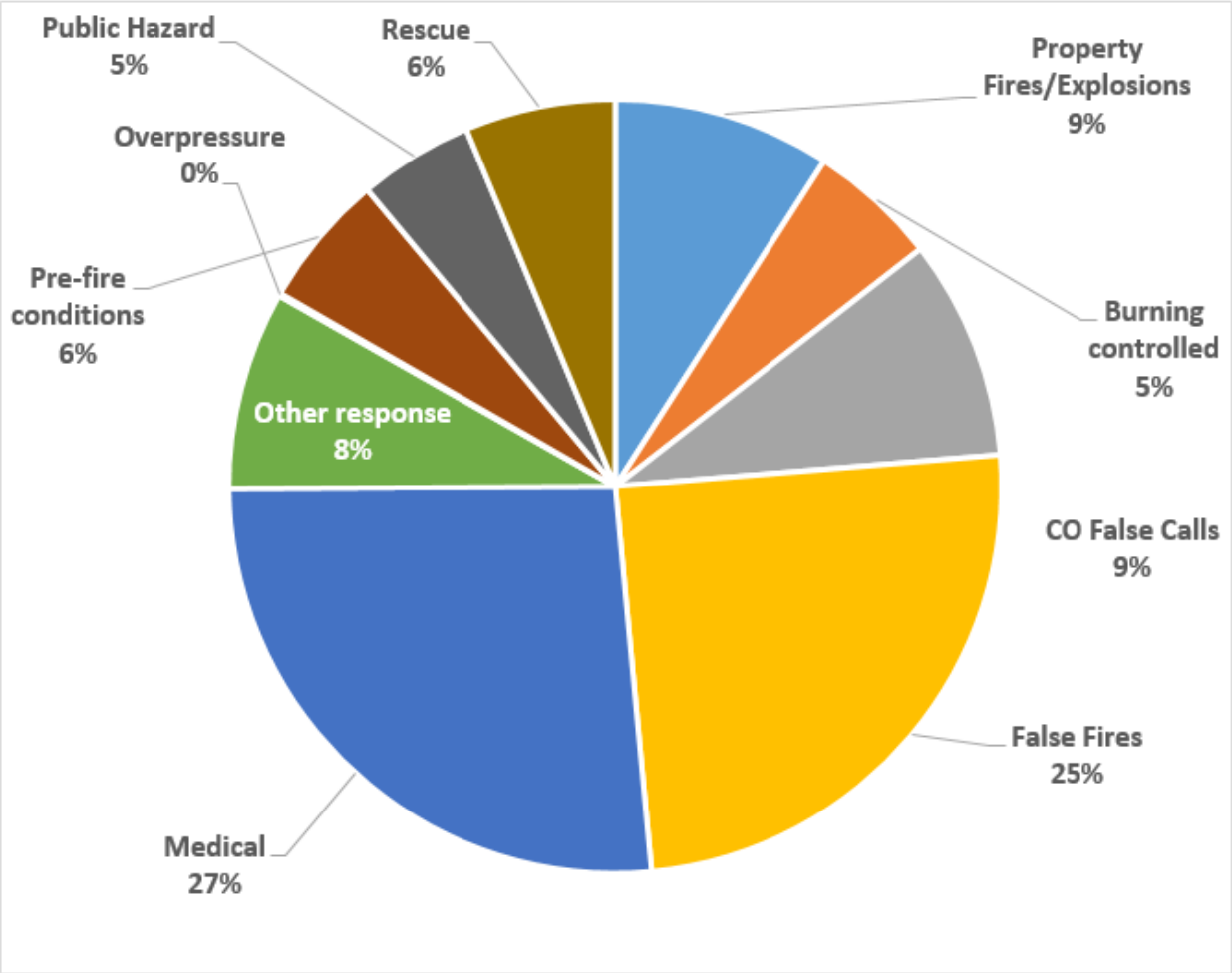


Key Finding: Analysis of average call volume by time of day for the period of 2014-2018 indicates that the highest call volume occurs between 9a.m. and 11a.m. and 1p.m. and 6p.m.

11.2.1.3 Calls by O.F.M.E.M. Emergency Response Type

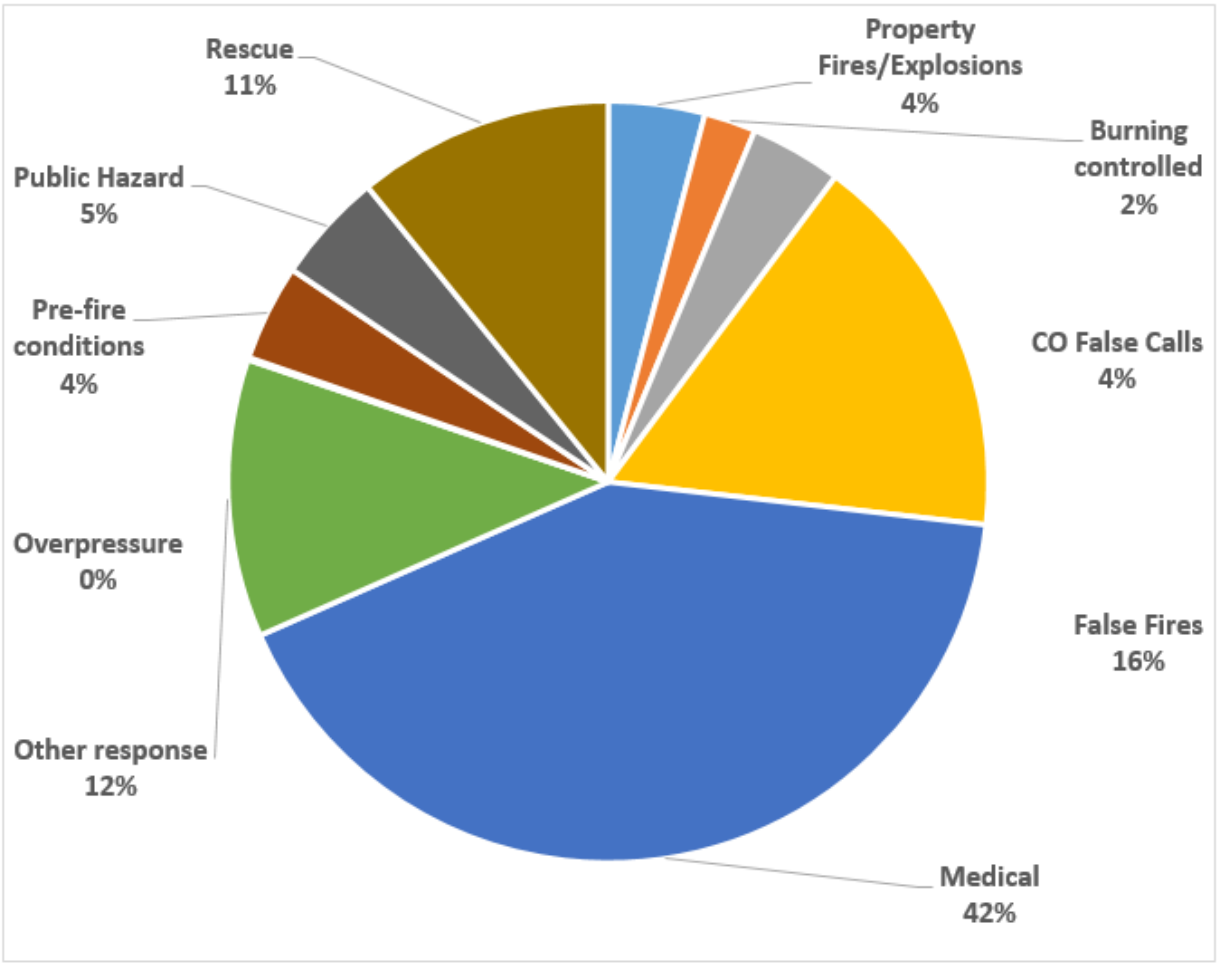
Calls responded to by the B.F.D. are shown in **Figure 14** based on the O.F.M.E.M. Emergency Response Type. **Figure 15** shows the proportion of calls across the province based on O.F.M.E.M. Response Type for 2013-2017 (based on data provided by the O.F.M.E.M.). A comparison of calls by emergency response type was complete between the City and the Province using the O.F.M.E.M. response types.

Figure 14: Percentage of B.F.D. Calls by O.F.M.E.M. Response Type (B.F.D. Response data – 2013-2017)



Source: Brantford Fire Department

Figure 15: Percentage of Provincial Calls by O.F.M.E.M. Response Type (O.F.M.E.M. Data – 2013-2017)

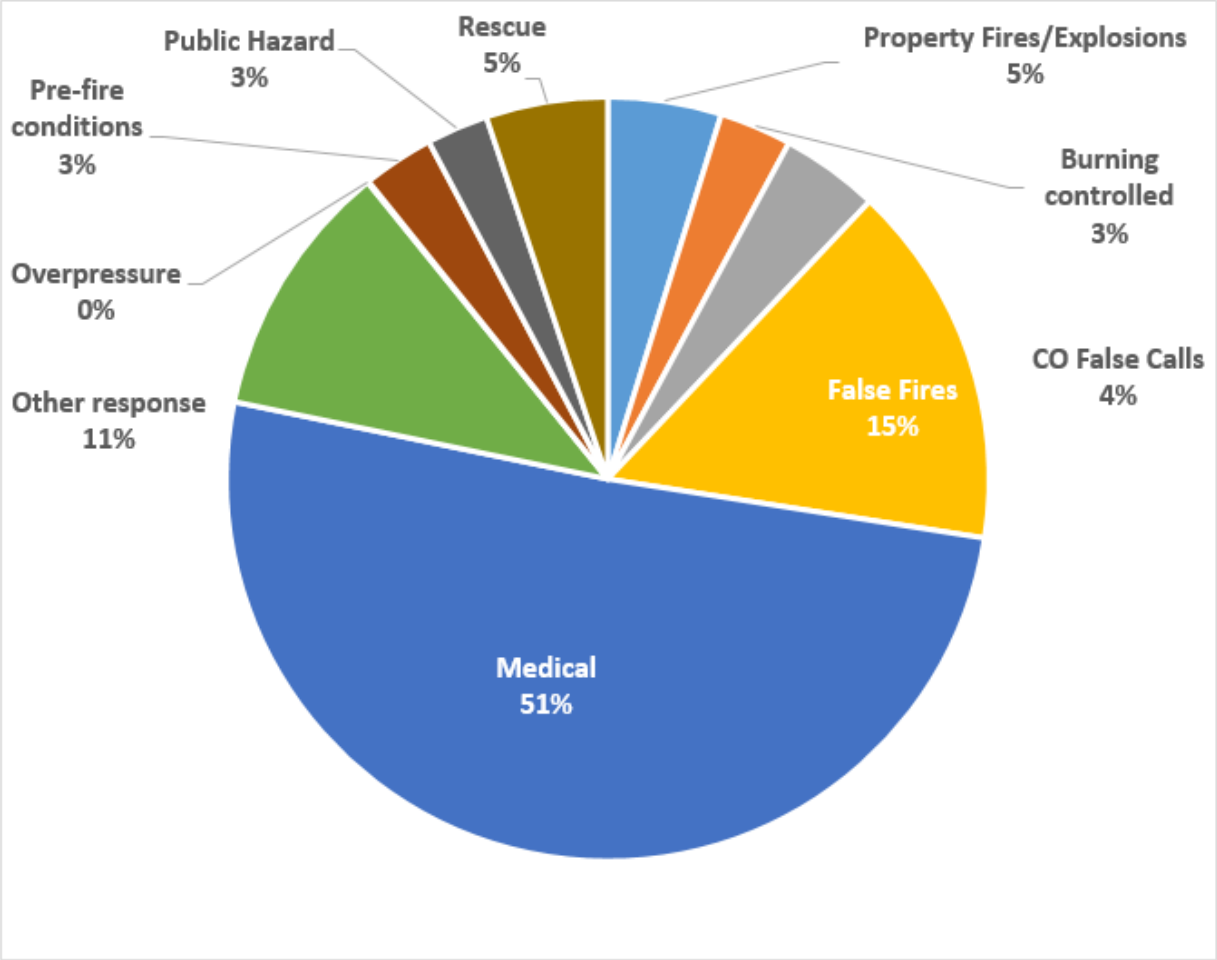


Source: O.F.M.E.M.

Medical calls are the most common response type on the provincial level (42%), followed by false fire calls (16%) and other calls (12%). Only 4% of provincial calls are fire calls. The call volume by O.F.M.E.M. Response Type observed in Brantford varies in comparison to the province. The majority of call volume is comprised of medical calls (27%) followed by false fire calls (25%). Property fires account for 9% of call volume, 5% higher than the provincial average. CO false calls are also higher than the province at 9%.

Figure 16 below shows calls responded to by the B.F.D. for the year 2018. Based on preliminary reporting data, medical calls have increased while false fires calls have decreased.

Figure 16: Percentage of Calls for Brantford by O.F.M.E.M. Response Type (Preliminary Reports – 2018)



Source: Preliminary OFMEM Municipal Summary

Key Finding: Based on O.F.M.E.M. Response Types, B.F.D. call volumes are comprised of 9% more false fire calls, 5% more C.O. false calls, and 5% more property fires/explosions call than the Province.

Key Finding: The B.F.D. responds to 15% fewer medical calls than the Province.

11.2.2 Rescue Calls

The rescue call response type includes several sub-types as shown in **Table 45**. For the period 2013-2017, the majority of rescue calls relate to vehicle collisions (73% of rescue calls) followed by persons trapped in an elevator (7%) and vehicle extrication (6%).

A closer examination of technical rescues can assist the department in aligning its services to community risk. Technical rescues are those types of calls that require specific skillset and include: vehicle extrication, water and water ice rescues, low angle rescue, high angle rescue, trench rescue, and confined space rescue calls. Of these calls, vehicle extrication is the most common type of technical rescue at an average annual call volume of 12. This is followed by water rescue with a total of 20 calls over the five year period, or four calls annually on average.

Rescue call data for 2018 is also provided within Table 45 indicating percentages similar to the trends shown for 2013-2017.

Table 45: Rescue Response Calls (2013-2018)

Rescue Response Sub-Type	Total Calls (from 2013-2017)	Average Annual Call Volume	Percentage of Rescue Calls	Percentage of Rescue Calls 2018
Animal Rescue	3	1	0%	2%
Commercial/industrial accident	3	1	0%	1%
High angle rescue (non-fire)	6	1	1%	-
Home/residential accident	9	2	1%	0%
Low angle rescue (non-fire)	3	1	0%	-
Other rescue	43	9	5%	3%

Rescue Response Sub-Type	Total Calls (from 2013-2017)	Average Annual Call Volume	Percentage of Rescue Calls	Percentage of Rescue Calls 2018
Persons trapped in elevator	63	13	7%	6%
Rescue false alarm	7	1	1%	1%
Rescue no action required	31	6	3%	3%
Vehicle collision	688	138	73%	77%
Vehicle extrication	59	12	6%	4%
Water ice rescue	7	1	1%	1%
Water rescue	20	4	2%	2%
Total	**942**	**188**	**100%**	**100%**

Source: O.F.M.E.M. Summary Reports

Key Risk: Vehicle collisions account for 73% of rescue calls within the City of Brantford or 138 calls per year on average.

Key Finding: The second most prevalent rescue call relates to persons trapped in an elevator.

Key Risk: Of the technical rescue type services, vehicle extrication is the most common type with a total of 59 calls over the five year period (2013-2017) or about 12 calls annually on average.

12.0 Risk Assessment Outcomes

This C.R.A. and F.M.P. are complementary documents. The findings of this report help to define local needs and circumstances and inform the recommendations identified within the Master Fire Plan – and ultimately the service levels provided by a fire department. This section of the C.R.A. brings together all the risk assessment outcomes and frames how they can be used to inform the Master Fire Plan. This is accomplished by applying the risk outcomes in three layers:

1. Determine a probability level to assign to each event;
2. Determine a consequence level to assign to each event; and
3. Establish the risk level (e.g., numerical value / location on the matrix) and risk category (e.g., low, moderate or high) for each based on the identified probability and consequence for each event.
4. Develop a G.I.S. risk model based on the Risk Level/Risk Category.

12.1 Risk Prioritization – Key Risks

Risk is defined as the product of probability and consequence. Of the risk analysis outcomes presented throughout this C.R.A., some have been labelled as a **Key Risk**. This means that the analysis and information available provides the opportunity to quantify the risk through a risk assignment process. This process will inform the M.F.P. in two ways: first, it will help guide the prioritization of the risk analysis outcomes when it comes to the development of and implementation of the Master Fire Plan; and second, it will inform the risk model developed for assessing emergency response capabilities (see **Section 2.0** of this C.R.A.).

The methodology is described in further detail in **Section 2.0** with the risk assignment matrix shown for reference purposes in **Table 46**.

Table 46: Risk Matrix

Consequence / Probability		Insignificant	Minor	Moderate	Major	Catastrophic
		1	10	100	1,000	10,000
Almost Certain	10,000	10,000	100,000	1,000,000	10,000,000	100,000,000
Likely	1,000	1,000	10,000	100,000	1,000,000	10,000,000
Possible	100	100	1,000	10,000	100,000	1,000,000
Unlikely	10	10	100	1,000	10,000	100,000
Rare	1	1	10	100	1,000	10,000

Risk Category	Definition (OFMEM)
Low Risk	• Manage by routine programs and procedures • Maintain risk monitoring
Moderate Risk	• Requires specific allocation of management responsibility including monitoring and response procedures
High Risk*	• Community threat, senior management attention needed • Serious threat, detailed research and management planning required at senior levels

The assignment of risk for the key risks within each profile, including a rationale for the probability and consequence is presented in **Table 47.**

Table 47: Risk Prioritization – Key Risks

Key Risk	Probability	Rationale	Consequence	Rationale	Assigned Risk Level
Geographic Profile					
The Grand River presents a water and ice risk which may require specialty rescue.	Possible	Might occur under current circumstances Occurs annually (1 to 5 incidents in past year)	Minor	Potential risk to life safety of occupants, Minor property loss, Minimal disruption to business activity, Minimal impact on general living conditions	**Moderate**
The City of Brantford is intersected by the Grand River, which is crossed by a number of bridges as well as Highway 403. Should an incident impact a bridge or multiple bridges, access to the other side of the bridge may be restricted.	Possible	Might occur under current circumstances Occurs annually (1 to 5 incidents in past year)	Minor	Potential risk to life safety of occupants, Minor property loss, Minimal disruption to business activity, Minimal impact on general living conditions	**Moderate**
Building Stock Profile					
Group C – Residential occupancies account for the 95.4% of the City's building stock.	Likely	In considering the proportion of property stock comprised of Group C - residential occupancies as well as historic fire loss, the probability is likely.	Moderate	Threat to life safety of occupants, moderate property loss, poses threat to small local businesses and/or could pose threat to quality of the environment	**Moderate**
29% of the City's total property stock consists of attached dwellings.	Likely	An incident is likely to occur under current circumstances	Moderate	Potential for threat to life safety of occupants, moderate property loss, threat to small local businesses and/or to quality of environment.	**Moderate**
66% of the City's building stock was built prior to the adoption of the Ontario Fire Code.	Almost Certain	More than 50% of the City's building stock was constructed prior to any provincial codes being in effect.	Moderate	Threat to life safety of occupants, moderate property loss, poses threat to small local businesses and/or could pose threat to quality of the environment	**High**

Key Risk	Probability	Rationale	Consequence	Rationale	Assigned Risk Level
W. Ross MacDonald School for the Blind presents unique high fire life-safety risks.	Possible	An incident at this facility might occur under the current circumstances	Catastrophic	Significant loss of life, multiple property damage to significant portion of the municipality, long term disruption of businesses, local employment, and tourism and/or environmental damage that would result in long-term evacuation of local residents and businesses	**High**
There are a number of properties within the City that have fuel load concerns.	Possible	Might occur under current circumstances, occurs annually (1 to 5 incidents in past year).	Major	Potential for large loss of life, would result in significant property damage, significant threat to businesses, local economy, and tourism and/or, impact to environment would result in a short term, partial evacuation of local residents and businesses	**Moderate**
The City has identified 38 registered vulnerable occupancies within Brantford.	Possible	An incident at any of these facilities might occur under the current circumstances	Catastrophic	Significant loss of life, multiple property damage to significant portion of the municipality, long term disruption of businesses, local employment, and tourism and/or environmental damage that would result in long-term evacuation of local residents and businesses	**High**
The City has identified 17 occupancies with a height in excess of 18 metres, which are defined as high-rise buildings according to the Ontario Building Code.	Likely	In considering the proportion of property stock comprised of Group C - residential occupancies as well as historic fire loss, the probability is likely.	Major	Potential for large loss of life and significant property damage due to density.	**High**
Demographic Profile					
The 2016 Census data indicates that seniors including those people aged 65+ represent 18% of the City's total population.	Almost Certain	Almost certain based on the proportion of the population and known through OFMEM data that seniors are at greater risk of experiencing a fatality in a residential fire.	Moderate	Threat to life safety of occupants, moderate property loss, poses threat to small local businesses and/or could pose threat to quality of the environment	**High**

Key Risk	Probability	Rationale	Consequence	Rationale	Assigned Risk Level
The 2016 Census data indicates that children aged 14 and under represent 18% of the City's total population.	Likely	Will probably occur at some time under current circumstances.	Moderate	Potential for threat to life safety of occupants, moderate property loss, threat to small local businesses and/or to quality of the environment.	**Moderate**
The 2016 Census data indicates that people between the ages of 45 and 64 who are aging towards the seniors demographic of 65+ represent 28% of the City's total population.	Likely	Will probably occur at some time under current circumstances. Known through OFMEM data that seniors are at a greater risk of experiencing a fatality in a residential fire.	Moderate	Threat to life safety of occupants, moderate property loss, poses threat to small local businesses and/or could pose threat to quality of the environment	**Moderate**
Past Loss and Event History Profile					
Group C – Residential occupancies account for 61% of structure fires within the City.	Likely	Will probably occur at some time under current circumstances.	Moderate	Potential for threat to life safety of occupants, moderate property loss, threat to small local businesses and/or to quality of the environment.	**Moderate**
Group F – Industrial occupancies account for 17% of structure fires within the City.	Possible	Might occur under current circumstances.	Catastrophic	Potential for significant loss of life, long term disruption of businesses, local employment and tourism, and/or environmental damage that would result in long-term evacuation within Group F - industrial occupancies.	**High**
The majority of fatalities and injuries between the period of 2013-2017 occurred within Group C – residential occupancies.	Possible	Might occur under current circumstances.	Moderate	Potential for threat to life safety of occupants.	**Moderate**
Of the fires occurring in the City between 2013 and 2017, the leading cause of intentionally set fires was due to acts of vandalism at 9%, higher than the province by 7%	Likely	Will probably occur at some time under current circumstances	Moderate	Potential for threat to life safety of occupants, moderate property loss, threat to small local businesses and/or to quality of the environment.	**Moderate**

Key Risk	Probability	Rationale	Consequence	Rationale	Assigned Risk Level
31% of reported fires for the period of 2013-2017 were attributed to the misuse of an ignition source.	Likely	Will probably occur at some time under current circumstances	Moderate	Potential for threat to life safety of occupants, moderate property loss, threat to small local businesses and/or to quality of the environment.	**Moderate**
The most common known source of ignition for fires within the City is due to open flame tools/smokers articles at 23%.	Likely	Will probably occur at some time under current circumstances	Moderate	Potential for threat to life safety of occupants, moderate property loss, threat to small local businesses and/or to quality of the environment.	**Moderate**
The second most common source of ignition for fires within the City is due to cooking equipment at 21%.	Likely	Will probably occur at some time under current circumstances	Moderate	Potential for threat to life safety of occupants, moderate property loss, threat to small local businesses and/or to quality of the environment.	**Moderate**
During the period from 2013-2017 there were smoke alarms present but did not operate in 19% of the incidents the B.F.D. responded to in Group C-Residential Occupancies.	Likely	Will probably occur at some time under current circumstances	Moderate	Potential for threat to life safety of occupants, moderate property loss, threat to small local businesses and/or to quality of the environment.	**Moderate**
Vehicle collisions account for 73% of rescue calls within the City of Brantford or 138 calls per year on average.	Likely	Will probably occur at some time under current circumstances	Moderate	Potential for threat to life safety of occupants, moderate property loss, threat to small local businesses and/or to quality of the environment.	**Moderate**
Of the technical rescue type services, vehicle extrication is the most common type with a total of 59 calls over the five year period (2013-2017) or about 12 calls annually on average.	Likely	Will probably occur at some time under current circumstances	Moderate	Potential for threat to life safety of occupants, moderate property loss, threat to small local businesses and/or to quality of the environment.	**Moderate**

12.2 Risk Categorization

When it comes to aligning service levels with risks that define local needs and circumstances, it is important to recognize that not all risk analysis outcomes align with the services provided by a fire department in the same way. For this reason, the risk outcomes - Key Findings and Key Risks - are categorized based on how they can be used to inform the activities, strategies, and services provided by the B.F.D. This categorization is then directly used within the Master Fire Plan.

The categories used for this process are based on the three lines of defence: Public Fire Safety Education; Fire Safety Standards and Enforcement, and Emergency Response as shown in **Table 48**.

Table 48: Risk Analysis Outcome Categorization

Category	Overview	Purpose
Line 1 Public Fire Safety Education	Education is the first line of defence. As a proactive approach to mitigating fire risk, the identified risk outcome can and should be considered as part of informing a Community Risk Reduction Plan including public education programming.	For consideration within the proposed Public Education Program
Line 2 Fire Safety Standards and Enforcement	Inspection/Enforcement is the second line of defence. As a proactive approach to mitigating fire risk, the identified risk outcome can and should be considered as part of informing a	For consideration within the proposed Inspection/Enforcement Program

Category	Overview	Purpose
	Community Risk Reduction Plan including inspection cycles, and enforcement strategies.	
Line 3 Emergency Response	Emergency response is the third line of defence. The identified risk outcomes can and should be considered as part of assessing emergency response coverage aligned with local needs and circumstances, as well as the level of service provided by the municipality.	For consideration within the proposed Emergency Response Deployment Options

The risk outcomes from each profile that inform local needs and circumstances are aligned with the three lines of defence. **Table 49** presents the Key Findings and **Table 50** presents the Key Risks in a matrix format indicate the ways in which the risks can be addressed by the fire department and ultimately considered within the Master Fire Plan analysis and recommendations.

Table 49: Categorization of Key Findings

Profile	CRA Key Findings Analysis Outcomes	FIRST LINE OF DEFENCE For consideration within the proposed Public Education Program	SECOND LINE OF DEFENCE For consideration within the proposed Enforcement Program	THIRD LINE OF DEFENCE For consideration within the proposed Emergency Response Program
Building Stock	Group D &E- Business & Mercantile occupancies represent 1.8% of Brantford's total building stock.		✓	✓
	Group F – Industrial occupancies represent 1.6% of the City's total building stock.		✓	✓
	61% of the City's structural dwelling types are single-detached homes.	✓	✓	✓
	Buildings identified as high-rise buildings are distributed throughout the City's downtown area.	✓	✓	✓
	There are a number of identified heritage buildings within Brantford, with many located in the downtown area along Brant Avenue.	✓		✓
Past Loss and Event History	The proportion of structure fires within the City during the years 2013-2017 is lower when compared against provincial statistics during the same time period (59% vs 66%).	✓	✓	✓
	Other occupancies not classified within the O.B.C. account for 10% of structure fires within the City.	✓	✓	
	The annual emergency call volume for the period 2014-2018 indicates an average of 4,192 emergency calls per year.		✓	✓
	Analysis of call volume by day of week for the period of 2014-2018 indicates that the highest proportion of calls occurs on Saturdays, while the lowest average call volume occurs on Tuesdays.		✓	✓
	Analysis of average call volume by time of day for the period of 2014-2018 indicates that the highest call volume occurs between 9a.m. and 11a.m. and 1p.m. and 6p.m.		✓	✓

Profile	CRA Key Findings Analysis Outcomes	FIRST LINE OF DEFENCE For consideration within the proposed Public Education Program	SECOND LINE OF DEFENCE For consideration within the proposed Enforcement Program	THIRD LINE OF DEFENCE For consideration within the proposed Emergency Response Program
	Based on O.F.M.E.M. Response Types, B.F.D. call volumes are comprised of 9% more false fire calls, 5% more C.O. false calls, and 5% more property fires/explosions call than the Province.	✓	✓	✓
	The B.F.D. responds to 15% fewer medical calls than the Province.			✓
	The second most prevalent rescue call relates to persons trapped in an elevator.			✓
Demographics	The percentage of lone-parent families is slightly higher in the City compared to the Province (21% versus 17%).	✓	✓	✓
	The 2016 Census data of educational attainment of people aged 15+ the City may have a higher degree of fire risk related to the disposable income available to purchase and maintain fire safety items such as smoke alarms.	✓	✓	✓
	The 2016 Census data of decile groups indicates that the City may have a higher degree of fire risk related to the disposal income available to purchase and maintain fire safety items such as smoke alarms.	✓	✓	✓
	English is the predominate language within the City representing 94% of the population followed by English/French representing 5% of the total population.	✓		
Geographic	There are shifts in student and commuter populations throughout the year; this population shift may impact the demand for fire protection services.			✓
	The geographical layout and size of the City, which includes the recent boundary adjustment of 33%more land, may result in extended emergency response times to some of locations within the B.F.D.'s coverage area.			✓
	There are several at-grade crossings within the City which have the potential to delay fire response to key areas of the City.			✓

Profile	CRA Key Findings Analysis Outcomes	FIRST LINE OF DEFENCE For consideration within the proposed Public Education Program	SECOND LINE OF DEFENCE For consideration within the proposed Enforcement Program	THIRD LINE OF DEFENCE For consideration within the proposed Emergency Response Program
	The City of Brantford's acquisition of undeveloped lands from the County of Brant has increased the overall response area of the B.F.D. and potential of fires related to a mix of wood lots, brush and grass, barn fires, and rural urban interface.			✓
	Large open spaces within the City's boundaries may impact emergency response travel times.			✓
Hazard	Top hazards for the City of Brantford as identified through the annual Hazard Identification and Risk Assessment Process include: tornado, freezing rain/ice storm, windstorm, snowstorm/blizzard, flood – river.			✓
Economic	The City has identified six key industry groups that if impacted by a fire, or other impact on sustained employment would have a negative impact on the City's economy.	✓	✓	
Community Services	Analysis of the existing Community Services Partners Profile indicates the availability of a wide range of community partners to support the community in response to a major incident.			✓
Critical Infrastructure	The City's infrastructure including electricity, oil and gas provide unique fire risks that may pose special risks to residents, property, environment and firefighters The City is currently considering a Water Servicing Strategy for the Tutela Heights Development Area that considers the required water flow for firefighting.			✓ ✓
Public Safety Response	Analysis of the existing Public Safety Response Profile indicates the availability of an integrated emergency response including police, fire, and ambulance resources.			✓

Table 50: Categorization of Key Risks

Profile	CRA Key Risks Analysis Outcomes	Risk Level	FIRST LINE OF DEFENCE For consideration within the proposed Education Program	SECOND LINE OF DEFENCE For consideration within the proposed Enforcement Program	THIRD LINE OF DEFENCE For consideration within the proposed Emergency Response Program
Geographic	The Grand River presents a water and ice risk which may require specialty rescue.	Moderate			✓
	The City of Brantford is intersected by the Grand River, which is crossed by a number of bridges as well as Highway 403. Should an incident impact a bridge or multiple bridges, access to the other side of the bridge may be restricted.	Moderate			✓
Building Stock	29% of the City's total property stock consists of attached dwellings.	Moderate	✓	✓	✓
	Group C – Residential occupancies account for the 95.4% of the City's building stock.	Moderate	✓	✓	✓
	66% of the City's building stock was built prior to the adoption of the Ontario Fire Code.	High	✓		
	W. Ross MacDonald School for the Blind presents unique high fire life-safety risks.	High	✓	✓	✓
	There are a number of properties within the City that have fuel load concerns.	Moderate		✓	
	The City has identified 38 registered vulnerable occupancies within Brantford.	High	✓	✓	✓
	The City has identified 17 occupancies with a height in excess of 18m, which are defined as high-rise buildings according to the Ontario Building Code.	High	✓	✓	✓
Demographic Profile	The 2016 Census data indicates that seniors including those people aged 65+ represent 18% of the City's total population.	High	✓		
	The 2016 Census data indicates that children aged 14 and under represent 18% of the City's total population.	Moderate	✓		
	The 2016 Census data indicates that people between the ages of 45 and 64 who are aging towards the seniors demographic of 65+ represent 28% of the City's total population.	Moderate	✓		
Past Loss and Event History	Group C – Residential occupancies account for 61% of structure fires within the City.	Moderate		✓	✓
	Group F – Industrial occupancies account for 17% of structure fires within the City.	High		✓	✓

Profile	CRA Key Risks Analysis Outcomes	Risk Level	FIRST LINE OF DEFENCE For consideration within the proposed Education Program	SECOND LINE OF DEFENCE For consideration within the proposed Enforcement Program	THIRD LINE OF DEFENCE For consideration within the proposed Emergency Response Program
	The majority of fatalities and injuries between the period of 2013-2017 occurred within Group C – residential occupancies.	Moderate	✓	✓	✓
	The most common source of ignition for fires within the City is due to open flame tools/smokers articles at 23%.	Moderate	✓	✓	
	The second most common source of ignition for fires within the City is due to cooking equipment at 21%.	Moderate	✓	✓	
	During the period from 2013-2017 there were smoke alarms present but did not operate in 19% of the incidents the B.F.D. responded to in Group C-Residential Occupancies.	Moderate	✓	✓	✓
	Of the fires occurring in the City between 2013 and 2017, the leading cause of intentionally set fires was due to acts of vandalism at 9%, higher than the province by 7%.	Moderate			✓
	Of the technical rescue type services, vehicle extrication is the most common type with a total of 59 calls over the five year period (2013-2017) or about 12 calls annually on average.	Moderate			✓
	During the period from 2013-2017 there were smoke alarms present but did not operate in 19% of the incidents the B.F.D. responded to in Group C-Residential Occupancies.	Moderate			✓
	Vehicle collisions account for 73% of rescue calls within the City of Brantford or 138 calls per year on average.	Moderate			✓

12.3 City of Brantford Risk Model

This section provides a brief outline of the scope and methodology used in order to provide insight into the modelling procedures adopted to assess risk that will be used to develop appropriate risk reduction strategies for each line of defence as defined by the O.F.M.E.M. Strategies that affect the third line of defense, including emergency response is dependent on the building occupancy type that, for this C.R.A., is based on Municipal Property Assessment Corporation (M.P.A.C.) data and existing zoning information provided by the City of Brantford.

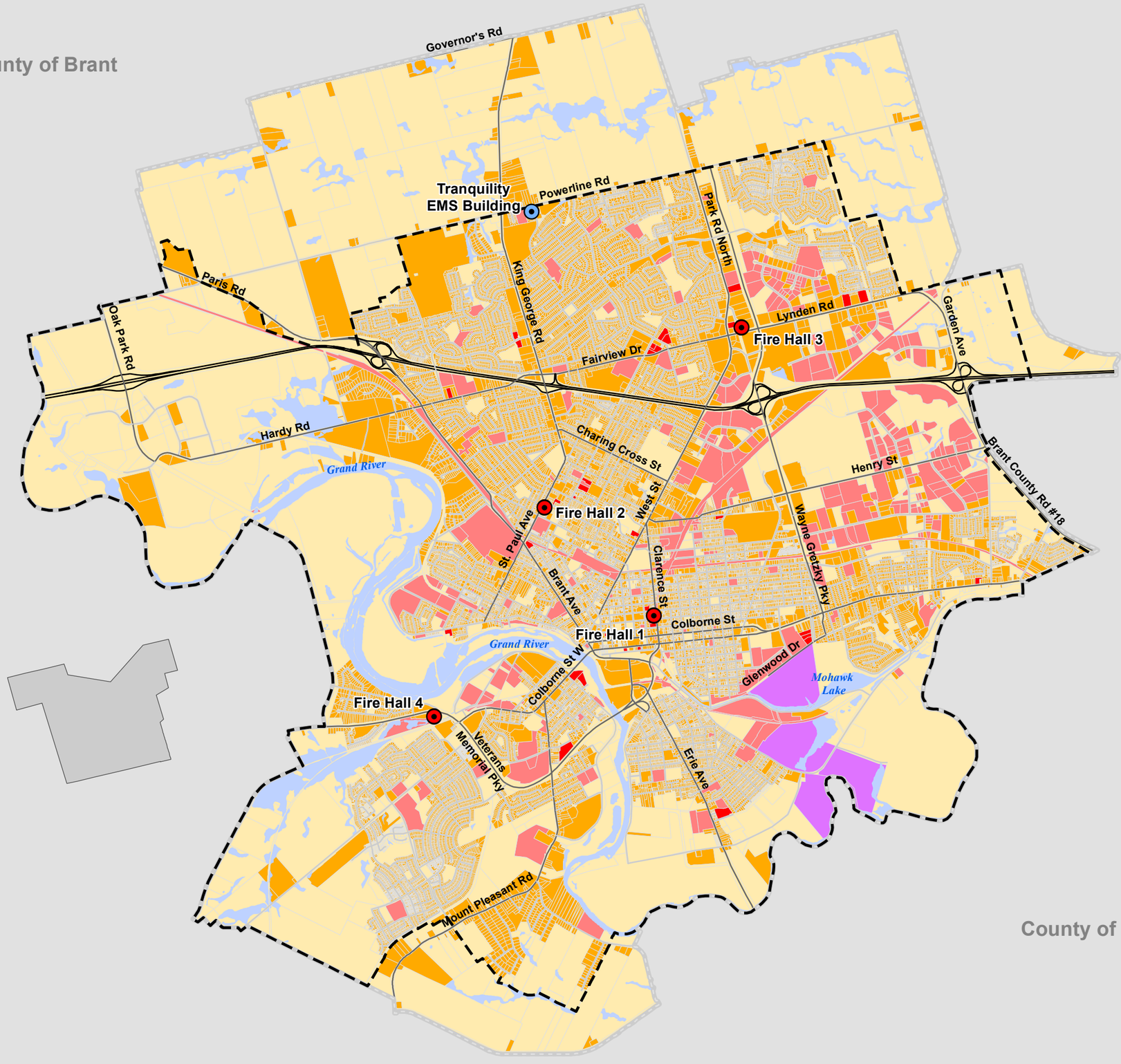
This C.R.A. assigns a relative risk level (high, moderate, low) to land uses in Brantford that are defined by the Ontario Building Code (O.B.C.) occupancy classification for existing risk. Existing risk was mapped for each parcel based on the dataset of building and parcels provided by the Ministry of Natural Resources and Forestry (M.N.R.F.) and associated risk code assigned by the O.B.C. The assignment of O.B.C. risk based on occupancy class can be found in **Table 51**.

The G.I.S. risk model was constructed by linking these occupancy categories with respective risk levels, with parcel data or larger zone data to produce a map of current risk in the City. High rise and high risk buildings are identified on the fire risk map that were defined as residential buildings of greater than six storeys, as well as hospitals, schools, nursing homes, and high hazard industrial occupancies. The current risk is shown in **Figure 17**.

Table 51: O.B.C. Risk Assignment based on Occupancy Classification

Occupancy Classification (O.B.C.)	Occupancy Definition Fire Risk Sub-model (O.F.M.E.M.)	Base Risk Zone Category Assigned
Group A – Assembly	Assembly occupancies	Moderate
Group B - Institutional	Care or Detention occupancies	High

Occupancy Classification (O.B.C.)	Occupancy Definition Fire Risk Sub-model (O.F.M.E.M.)	Base Risk Zone Category Assigned
Group C - Residential	Residential occupancies	Moderate
Group D - Business	Business and Personal Services Occupancies	Moderate
Group E - Mercantile	Mercantile occupancies	Moderate
Group F1 - Industrial	Industrial occupancies	High
Group F2 - Industrial		Moderate
Group F3 - Industrial		Low
Other occupancies	Not classified within the Ontario Building Code (i.e. farm buildings)	Low



CITY OF BRANTFORD COMMUNITY RISK ASSESSMENT

Existing Community Fire Risk Model
Figure #17

- Local Roads
- Arterial Roads
- Highway
- Waterbodies
- Asserted Traditional Territory andTreaty Lands of the 6 Nations of the Grand River
- Brantford
- Settlement Boundary
- Municipal Boundaries
- County Boundaries

Community Fire Risk

- High Rise/High Risk
- High
- Moderate
- Low

0 500 1,000 m

SCALE 1:7,250

N W E S

MAP DRAWING INFORMATION:
CITY OF BRANTFORD, MNRF

MAP CREATED BY: SFG
MAP CHECKED BY: JP
MAP PROJECTION: NAD 1983 UTM Zone 17N

FILE LOCATION:
G:\cad\GIS\187634\MXD\Existing Community Fire Risk Model.mxd

DILLON CONSULTING

PROJECT: 187634

STATUS: DRAFT

DATE: 2019-02-28