Whitby Fire and Emergency Services

Master Fire Plan

2016-2025

1 Executive Summary

This is the first Master Fire Plan (MFP) presented to the Town of Whitby Council. It identifies the current and future emergency services needs of the Whitby community, along with changes that must be implemented to meet them. The recommended changes are needs, not wants, that are designed to fill service level voids.

The Fire Chief has been directed to initiate this MFP internally, in order to guide the delivery of fire and emergency services from 2016 through to 2025.

The MFP has been developed exclusively by internal staff utilizing a committee structure. The Working Committee, comprised of WFES personnel from all Divisions has worked with the MFP Coordinator (Seconded Platoon Chief), and a Durham College Co-op student to collect, compile, and analyze the required data. The Steering Committee, comprised of the Chief and the two Deputies has overseen the MFP development process, developed the recommendations, and has approved this final version.

Throughout the almost year-long process, WFES personnel, and the Whitby Professional Firefighters Association Local 2036 Executive Group have been kept up to date on the progress of the plan, and have been asked for their comments and input. The MFP has been developed following the MFP planning process outlined within the Office of The Fire Marshal, Ontario, Shaping Fire Safe Communities Initiative.

The MFP is composed of four primary components: Strategic Plan, Review of Current Operations, Analysis, and Operational Plan Recommendations.

1) Strategic Plan

The strategic plan is comprised of the WFES strategic purpose, and its strategic priorities for the life of this MFP. Each strategic priority has been chosen in order to help realize specific goals of the current term of Council, thereby contributing to the Whitby community in a manner consistent with Council's direction.

2) Review of Current Operations

The Review is an audit of the needs of the Whitby community, the services currently provided to the community by WFES, and the legislation/agreements/bylaws that govern these services.

3) Analysis

The Analysis utilizes several tools or lenses to help identify any gaps in the current service levels currently provided by WFES compared to the tool/lens.

4) Operational Recommendations

The Operational Recommendations are designed to fill service level voids identified in the analysis. They are quantifiable and measurable, and are used to accomplish the strategic priorities of WFES and Whitby Council.

2 Strategic Plan

The strategic plan of WFES is grounded in its Value Statements:

WFES Value Statements

Vision Statement

Creating a culture of community safety

Mission Statement

Through innovation, leadership, and education we are dedicated to protecting lives and property

Core Values

Compassion – caring for our community as if they were our family

Integrity – being honest and trustworthy, and doing the right thing

Excellence – striving for excellence in every aspect of the service we provide to our community

These value statements guide the daily decision making and behaviour of WFES. A closer look at some of the key value words, explains how this is done:

I) Innovation

a. Maximize employee safety, improve service levels, and gain efficiencies by being on the leading edge of innovation in the areas of equipment, technology, processes, and organizational models

II) Leadership

a. Develop leaders
b. Recognize and celebrate successes and achievements
c. Hold everyone accountable to a level of excellence from the Chief to the Probationer

d. Foster an internal culture of respect, professionalism, cohesion, and engagement

III) Education

a. Internal – maximize employee safety
b. Internal – provide a consistent, high level of service
c. External – pro-actively reduce the occurrence of emergencies

IV) Compassion

Go the extra mile to add value to the Community

V) Integrity

At all times, behave in a manner that is conducive with the reputation that has been established by those that have come before us.

VI) Excellence

Never be satisfied. Always improve.

These value statements form the foundation of WFES' strategic purpose and help to describe the manner in which it is accomplished.

WFES Strategic Purpose

The strategic purpose of WFES is to protect lives and property as per the needs of the Whitby community to the level of service approved by Whitby Town Council. Council determines the level of service that WFES provides to the community consistent with their goals for their existing term.

WFES Strategic Priorities to Support Council Goals

Council Goals (Appendix A)

Council Goal #3) To continue the Whitby tradition of responsible financial management and respect for taxpayers; and to understand the importance of affordability to a healthy, balanced community.

Council Goal #4) To strive to continuously improve the effectiveness and efficiency of service delivery

WFES Strategic Priority #1) Invest in pro-active efforts, and maximize the use of every Town of Whitby resource:

WFES Goals to accomplish Strategic Priority #1:

1a) Place a priority on preventing fires and other emergencies by improving fire prevention and public education efforts designed specifically to reduce Whitby's emergency risks, and address its aging demographic profile.

1b) Improve internal processes, administration, technology, and systems to maximize efficiencies, to improve service levels and to maintain operational costs.

1c) Maintain physical assets to improve their life spans, and to maintain operational costs.

1d) Improve training levels in order to maximize service level effectiveness geared to Whitby's emergency risk profile,

1e) Invest in WFES personnel in support of succession planning, mental health and overall wellness.

Council Goal #6) Enhance the safety of local streets and neighbourhoods….

WFES Strategic Priority #2) Build WFES services to address challenges related to community growth and development:

WFES Goal to accomplish Strategic Priority #2:

2a) Increase the capacity needed to effectively respond to new emergency needs including Highway 407, Highway 412, 401 on/off ramps at Lakeridge Road, growth in West Whitby and Brooklin, increasing residential densities, an aging/growing population, etc.

Implementation Chart

The following Implementation Chart identifies Council's goals, WFES' strategic priorities and goals, and how the objectives and recommendations identified throughout this MFP help to realize them.

3 Implementation Chart

Council Goals	WFES Strategic Priorities	WFES Goals	Objectives	Action Plan/Recommendations	Implementation	Operating Costs	Capital Costs	Outcomes
Council Goals #3, #4	#1 Maximize the use of all WFES and TOW resources, and invest in pro-active efforts to reduce community risk	1a) Place a priority on preventing fires and other emergencies by improving fire prevention and public education efforts designed specifically to reduce Whitby's emergency risks, and address its demographic profile.	Conduct community fire risk analysis to determine root causes Conduct pro-active inspections of greatest fire risk occupancies. Design Public Education programs to reduce fire risk	Hire 1 additional FPO/Pub Ed to expand Pub Ed and meet workload shortfall Add an additional FP vehicle to the fleet Hire an additional FPO to conduct pro-active inspections Add an additional vehicle to the fleet Hire FP Captain to maximize inspection quality Hire additional FPO to further expand pro-active inspection program Add an additional vehicle to the fleet Hire additional FPO to keep up with workload from growth Add an additional vehicle to the fleet	2017 2017 2017 2017 2017 2020 2020 2025 2025	$119,000 $119,000 $137,000 $119,000 $119,000	 $30,000 $30,000 $30,000 $30,000	Public education and fire prevention programs are designed to specifically address the Whitby community and its fire risks. Inspections are pro-actively conducted. The frequency of fires declines relative to the population
		1b) Improve internal processes, administration, technology, and systems to maximize efficiencies, to improve service levels and to maintain operational costs.	Conduct core services review, and process mapping Identify and create projects to improve efficiencies and raise level of service	Hire Project Manager Business Analyst: Develop and implement formal Performance Feedback system Improve SOG development and approval process Create modified duty program Create attendance management program Improve Departmental communications Implement projects from approved MFP Track multiple false alarms and begin to bill per By-law Part-time Administration Clerk to full-time	2018 2019	130,000 -$30,000 $35,000		Improved efficiencies, reduced absenteeism, increased use of modified duties, increased input from all staff, MFP projects implemented on time and on budget
		1c) Maintain physical assets to improve their life spans, and to maintain operational costs.	Keep fire apparatus and equipment in service improving service levels and lowering repair costs	Move additional asset mgmt in-house, greater control/efficiency Improve Mechanic's knowledge (EVTs), and improve service delivery Introduce preventative and predictive maintenance programs Replace Fire Hall #2 with a new Hall on the same site	2016 2019	-$40,000 -$50,000 	 $6,500,000	Costs reduced, increased efficiencies, downtime of assets reduced Hall will meet the needs of the Department
		1d) Improve training levels in order to maximize service level effectiveness geared to Whitby's emergency risk profile,	Provide practical, hands-on training to improve quality of service delivery	Build new training compound in South West Brooklin, industrial lands	2017/2018		$10,000,000	Compound is used by community partners, including Durham College - shared operating costs/source of revenue. Deliver of hands-on practical training, including live fire ground, driver training, rope, water, motor vehicle collisions, specialty rescues, safety, fire investigations, fire prevention technical training, etc. Improved quality of service delivery.
			Stay up to date on modern equipment and techniques and introduce as needed	Hire additional Training Officer to handle additional staff from West Whitby Fire Hall #6, increasing call volumes, and to improve quality of service levels Add an additional Training vehicle to the fleet	2016 2016	$137,000 	 $35,000	Recruit class of 20 firefighters are professionally and thoroughly trained and placed in service 6 weeks after hire date. Additional hands-on training is provided to crews
			Provide training to re-inforce consistency	Hire additional Training Officer to maximize use of training compound Add an additional Training vehicle to the fleet	2018 	$137,000 	 $35,000	Training compound used every day to improve quality of service Practical hands-on training provided on an ongoing basis
		1e) Invest in WFES personnel to build a Department of excellence from within	Invest in well being and development of personnel	Create and provide leadership development training Develop succession planning program Invest in mental health and overall wellness	2017	$20,000		Build a Department of fire service leaders with staff well prepared for internal advancement. New ideas and changes being continuously implemented being the department for best practices Mental health of first responders is addressed

Council Goals	WFES Strategic Priorities	WFES Goals	Objectives	Action Plan/Recommendations	Implementation	Operating Costs	Capital Costs	Outcomes
Council Goal #6	#2) Build WFES services to address challenges related to community growth and development:	2a) Increase the response capacity needed to effectively respond to new emergency needs including Highway 407, Highway 412, 401 on/off ramps at Lakeridge Road, growth in West Whitby and Brooklin, increasing residential densities, an aging/growing population, etc.	Design Department to respond to greatest, most frequent risks: Improve medical service levels Add resources to respond safely and effectively to 407/412 Add resources necessary to provide effective services to West Whitby and Brooklin developments Arrive on emergency scenes quickly, work efficiently and effectively, and limit loss of life and property: Strive to meet NFPA 1710 - 4 ffs within 4 minutes, and 15 ffs within 8 minutes throughout the community	Expand medical services to include symptom relief Build new fire station #6 in West Whitby Add an additional pumper/aerial to run out of fire station #6 Hire additional 20 ffs to operate pumper/aerial #6 Build additional fire station #7 in South/West Brooklin Add an additional pumper to run out of station #7 Hire an additional 20 ffs to operate pumper #7 Upgrade Fire Rescue vehicle Improve response times/AVL's Rural firefighting improvements Retrofit Station 5 for temporary use by 20 firefighters	2016 2018 2016 2016 2021 2021 2021 2018 2016 2017 2016	$5,000 $2,400,000 $2,400,000	 $6,500,000 $1,400,000 $4,500,000 $850,000 $850,000 $120,000 $10,000 $50,000	Initial travel times to West Whitby reduced to 4 minutes Depth of coverage (15 ffs in 8 minutes to center area of Town) Reduced travel times to Highway 412 and 407 Initial travel times to South and West Brooklin reduced to 4 minutes Depth of coverage (15 ffs in 8 minutes provided to majority of Town) Provision of two apparatus in service to protect remainder of Town during structure fires

4 Summary of Recommendations

There are 10 recommendations within the MFP that require Council approval. They have been listed here in the order that they appear in the Plan. Anticipated costs and implementation years have been included. Staffing costs are inclusive of benefits.

Recommendation #1 – Improve Pro-active Service Levels to Reduce Community Risk - Public Education and Fire Prevention

It is recommended that Public Education and Fire Prevention staff be added to the WFES Fire Prevention Division as follows:

One Fire Prevention/Public Education Officer (Operating $119,000, Capital $30,000/Vehicle) (2017) to:

- Develop and pro-actively deliver fire safety public education to the Seniors demographic with the aim of reducing the number of fires that occur in this age group. (Section 8 – Risk Analysis)
- Develop and pro-actively deliver Public Education Programs geared to preventing fires in residential structures and high risk occupancies. (Section 8 – Risk Analysis)
- Meet the existing re-active workload deficit, ensuring that inspections are being conducted to community and municipal expectations. (Section 12 – Fire Prevention Inspections)

One Fire Prevention/Public Education Officer (Operating $119,000, Capital $30,000/Vehicle) (2018) to:

- Develop and introduce a partial proactive fire safety inspection program that will ensure vulnerable and high risk properties, including schools, apartment buildings, restaurants, theaters, industrial buildings, hotels, motels, etc. are inspected on an ongoing basis to maximize their level of fire safety. Without this program, these occupancies will not be inspected unless complaints or requests are received. (Section 12 – Fire Prevention Inspections)

One Fire Prevention Captain/Training Officer (Operating $137,000) (2018) to:

- Provide daily supervision to an expanded Fire Prevention Division, accompany FPOs on inspections to verify consistent, high quality service levels, and provide ongoing technical training. In addition, this position will provide the time required for the Chief Fire Prevention Officer to function in a strategic capacity ensuring inspection quality, effective program delivery and the identification and delivery of training programs. (Section 12 – Fire Prevention Inspections)

One Fire Prevention/Public Education Officer (Operating $119,000, Capital $30,000/Vehicle) (2020) to:

- Expand the pro-active inspection program to include inspections of additional high risk properties and to respond to the growing fire inspection re-active needs of the municipality. (Section 12 - Fire Prevention Inspections)

One Fire Prevention/Public Education Officer (Operating $119,000, Capital $30,000/Vehicle) (2025) to:

- Fully expand the pro-active inspection program to encompass all high risk properties, and to maintain fire inspection public education and re-active service levels to meet the needs of a growing Brooklin community. (Section 12 – Fire Prevention Inspections)

Recommendation #2 – Improve Reactive Response Service Levels Geared to Whitby's Needs – Medical, Technical Rescue, Highway Vehicle Collisions

It is recommended that, based upon the evidence that an aging population corresponds to an increase in medical calls, WFES expand its medical symptom relief service level to include additional services signed off by Base Hospital. (2016). (Operating. $5,000). (Section 8 – Risk Analysis)

It is recommended that WFES train all Suppression personnel to NFPA 1006 (2018/19) to prepare them for Awareness Level training in Trench Rescue, Confined Space Rescue, Building Collapes, and Rope Rescue, for Level 2 in Vehicle Rescue, and for Operations Level in Rope/Slope Training (2019), and that WFES enter into a service agreement with Oshawa Fire Services to provide Operations and Technician Level rescue services in the aforementioned disciplines. This will require the addition of a Training Officer per recommendation #5. As the population of Whitby continues to grow and the building stock changes, as a result of legislated increased intensification, WFES may need to expand speciality rescue level training to meet the changing response requirements. (2017) (Operating #7,000) (Section 13 – Fire Suppression) (Section 14 – Training Division)

It is recommended that the Fire Chief be instructed by Council to approach Pickering, Oshawa, and Ajax to request that they enter into Automatic Aid Agreements with Whitby to provide emergency response coverage for the relevant sections of Highways 407 and 412. These agreements will require that WFES provide response coverage to Pickering's and Oshawa's portions of Highway 407, in the same manner that they will be providing coverage to Whitby's portions.(2016)

Recommendation #3 – Maintain both Pro-active and Re-active Service Levels to Meet Whitby's Current and Future Emergency Response Needs - Suppression Division - Staffing, Apparatus

It is recommended that an additional 20 fire fighters be hired immediately to staff an additional fire apparatus in order to adequately meet the current needs of the Whitby community. (2016) (Operating $2,400,000. Capital $1,400,000) (Section 8 – Risk Analysis)

It is recommended that the fire apparatus and the 20 additional firefighters operate from Fire Station #5 until such time as the new West Whitby Station #6 is ready for occupancy. Fire Station #5 is being used by one Fire Suppression crew. Minor renovations will be required to temporarily house a second crew until such time that Station #6 is constructed in West Whitby. This renovation can be completed without expanding the building footprint and will provide a needed dedicated female dorm area. (Capital $50,000) (2016) (Section 13 – Fire Suppression) (2017) (Section 8 – Risk Analysis)

It is recommended that an additional 20 fire fighters be hired in 2021 to correspond to the emergency services needs of the expanded Brooklin area. These fire fighters will respond on an additional fire apparatus from a new fire station, Station #7, to be built on the lands acquired for the WFES training compound. (2021) (Operating $2,400,000. Capital $4,500,000 – fire station, $850,000 – fire apparatus) (Section 8 – Risk Analysis)

Needs met:

Acceptable response times for Highways 412 and 407

Availability of sufficient numbers of firefighters to lower the initial response time in line with other comparators, and closer to the NFPA 170 90th percentile best practice. (Section 13 – Fire Suppression)

Availability of sufficient numbers of firefighters to provide depth of coverage.

Availability of sufficient number of firefighters to safely and quickly respond to emergency calls that occur throughout the remainder of the Town concurrently during a house fire. (Section 13 – Fire Suppression)

Availability of sufficient number of firefighters to safely and quickly respond to a house fire that occurs while crews are engaged in one motor vehicle collision on Highways 401, 412, or 407. (Section 13 – Fire Suppression)

Reduced reliance on mutual aid, thereby ensuring availability of resources, and reduced response times. (Section 9 – Legislation)

Improvement of initial response times, and depth of coverage times (Section 13 – Fire Suppression)

Delivery of public education programs to new residential areas by Fire Suppression staff in order to help prevent fires in homes.

Adherence to NFPA 1710, NIST, and OFMEM best practices for residential structure fireground staffing: 4 firefighters on scene within 4 minutes, 15 firefighters on scene within 8 minutes. WFES will be able to send 4 trucks with 17 firefighters to all single family residential structure fires, leaving two trucks with 8 firefighters to respond to any concurrent emergency calls in the remainder of the Town.

Recommendation #4 – Improve Re-active Service Levels - Additional Fire Stations – West Whitby #6, North West Whitby #7

It is recommended that a new fire station, Station #6, be constructed in the West Whitby area to provide 4 minute initial travel coverage to West Whitby, and depth of coverage to the remainder of the Town. (2018). (Capital $6,500,000) (Section 8 – Risk Analysis)

There is a deferred 412 interchange planned at Rossland Road. Once this interchange is constructed, this new West Whitby Station will have quick access to the 412, 401, and 407 Highways. Additional traffic volume, and MVCs (motor vehicle collisions) will be experienced on Lakeridge road upon the opening of 401 on/off ramps. Station #6 will have a response time of under 4 minutes to a large stretch of Lakeridge Road. (Section 8 – Risk Analysis)

Implementation of this recommendation will result in the following improvements: (Section 8(f))

- Improve initial and two truck response times for two trucks on scene to Highway 412 Southbound emergency responses:

  Initial travel time to 412 Southbound at Taunton will improve by 33% from 7.9 minutes to 5.3 minutes
  Time for two fire trucks on scene at 412 Southbound at Taunton will improve by 16% from 9.4 minutes to 7.9 minutes

  Initial travel time to 412 Southbound at the 401 will remain at 6.9 minutes.
  Time for two fire trucks on scene to 412 Southbound at the 401 will improve by 37% from 10.9 minutes to 6.9 minutes

  Once the deferred 412 interchange at Rossland Road is open, Initial travel times to 412 Southbound at the 401 will improve further by an additional 41% from 6.9 minutes to 4.1 minutes.
  Time for two trucks on scene will also improve further by an additional 13% from 6.9 minutes to 6 minutes.

- Provide a safe working environment for Fire Crews by ensuring a blocker vehicle (2^{nd} vehicle) is on scene faster.
- Maintain the 4 minute initial response time for people living in the Station#1 response area (Brooklin) when there are emergency response calls on Highway 412, by keeping the Station #1 pumper in its Station.
- Maintain the 4 minute initial response time for people living in the Station #5 response area when there are emergency response calls on Highway 407, by keeping the Station #5 pumper in its Station.

It is recommended that a new fire station, Station #7, be constructed on the WFES Training Compound site in the North West Whitby area. The timing of the Station's construction will correspond to the growth of the West Brooklin area and will provide 4 minute initial travel coverage, depth of coverage to the Brooklin and North Whitby areas, and effective response capabilities to the anticipated growing 407 traffic volumes.

WFES Fire Station #1 is well positioned to serve the existing residents of Brooklin. However, future growth will be beyond the existing Brooklin Secondary Plan Boundary, and Fire Station #1's four minute initial response coverage area. There will be a need to provide an additional fire station and apparatus in the area West of Brooklin to meet 4 minute travel time targets, as times will increase by up to an additional 3 minutes for a total of 7 minutes. In addition, as emergency responses increase with increasing the increasing and aging population, Brooklin will remain unprotected for concurrent emergency calls.

Recommendation #5 – Improve Pro-active Services - Training Division – Staff, Compound

It is recommended that an additional Training Officer be hired to address the annual deficit in training hours that currently exists. (2016) (Operating $137,000. Capital $35,000 – vehicle) (Section 14 – Training Division)

It is recommended that Council approve in principle the creation of a multi-purpose, multi-agency Training Compound, contingent upon receipt, and approval by Council of a comprehensive business case from staff. Ideally, the site will consist of 13 acres north of 407. It will be used primarily to improve the quality of the services WFES provides to the community, and will also be used by other agencies, and corporations to generate revenue.

Considerations include:

Use by WWD as a satellite sand and salt compound (Staff in agreement)

Use by the Durham College Pre-Fire Service Program (letter of intent received)

Use by DRPS to train front-line staff (email from DRP Chief in support)

Use by Durham Region Volunteer Fire Departments (support received)

Use by WFES staff to improve the quality of services

Potential use by TOW and Durham Region staff, MTO, RDPS, private agencies

Potential use to conduct Fire Fighter Candidate Practical Assessment Testing (CPAT).

Lands to be acquired and developed in the area designated as industrial near Cochrane and Winchester, north of the 407.(2017) (Capital. $3,300,000) (Section 14 – Training Division)

Construction of the Training Compound on the acquired lands. (2018) (Capital $6,700,000. Costs to be shared with other End User Agencies) (Section 14 – Training Division)

It is recommended that an additional Training Officer be hired to develop, coordinate and deliver the training that will be developed and delivered with the construction of the Training Compound. (2018) (Operating $137,000. Capital $35,000 – vehicle) (Section 14 – Training Division)

Recommendation #6 – Improving Efficiencies - Administration Staffing- Project Manager/Information Analyst, Administration Clerk

It is recommended that a Project Management/Information Analyst position be created and added to the Management group in WFES to work with the Chief and Deputies, and with Administration staff to coordinate projects, conduct information process reviews, improve efficiencies, establish and measure performance measures, lower costs, and increase revenues.(2018) (Operating $130,000) (Section 10 – Administration)

It is recommended that the Part-time Administration Clerk position become full-time in order to provide the administrative capacity necessary to support the additional staff, additional call volume, and additional process and programs that will be developed as the Whitby community grows. (2019) (Operating $35,000) (Section 10 – Administration)

Recommendation #7 – Provide Mental Health Services to Staff.

It is recommended that the Town establish and develop a service agreement with an experienced mental health professional who is easily accessible for staff and who can provide immediate and ongoing advanced mental health counselling to staff who are suffering acute and prolonged exposure to traumatic events.(2017) (Operating $20,000) (Section 10 – Administration)

Recommendation #8 – Existing Asset Management – Fire Station #2, Rescue Apparatus

It is recommended, given the age of the building and its limitations, that Station #2 be removed from its current site and replaced with a new fire station that meets the current needs of WFES, including the housing of both the Aerial and the Pumper Rescue, the safe storage of structural fire fighting bunker gear, and the provision of facilities for female fire fighters. Additional costs will be incurred due to the temporary relocation of the Fire Crew and trucks during construction. (2019) (Capital $6,500,000)

It is further recommended that this recommendation be approved, contingent upon further analysis from staff, and a subsequent report to Council outlining a plan to continue emergency response operations during the period of demolition and construction. (Section 13 – Fire Suppression)

It is recommended that when WFES replaces its Specialty Rescue vehicle in 2018, that an upgraded Rescue/Rehab vehicle be purchased to be dispatched to all larger scale incidents. (2018) (Capital $850,000). (Existing funding totals $250,000. This recommendation is requesting an additional $600,000) (Section 13 – Fire Suppression).

Alternatively, Pumper 35 could be retrofitted as a Rescue truck when it is replaced in 2016. Retrofit costs would be within the original $250,000, forgoing the additional $600,000 necessary to purchase a new Rescue/Rehab vehicle.

Recommendation #9 – Improve Rural Firefighting Response Effectiveness

It is recommended that Council approve the amendment of Whitby's addressing bylaw #2263-87 to mandate the installation of reflective addressing signs in rural locations. (2017) (Section 13 – Fire Suppression)

It is recommended that Council direct the Fire Chief to approach Scugog Township, and Durham Region about the installation of a dry hydrant connection at Mud Lake in order to provide a source of water for use during fire suppression activities in North Whitby and in Scugog (2017). (Capital $10,000) (Section 13 – Fire Suppression)

Recommendation #10– Improve Emergency Turn Out Times, Travel Times

It is recommended that WFES continue to take steps to improve turn out times in an effort to meet NFPA best practices. The installation of turnout time clocks in each Station will enable responding firefighters to monitor their turnout times. The procurement of Automatic Vehicle Locators (AVLs) and integrated computer GPS mapping in front line fire apparatus will improve travel times and accuracy in locating incident addresses. (2016) (Capital $120,000) (Section 13 – Fire Suppression)

WFES Action Items – No Costs

There are 26 Actions identified within the MFP that will lower costs, improve efficiencies, increase service levels, or increase revenues. They have no associated additional costs, and they can be implemented strictly by WFES personnel.

WFES Action - A

It is recommended that the Fire Prevention Division conduct a fire profile analysis to determine the root causes of all emergency calls. (2016) This analysis should be conducted biennially, and public education programs should be designed to target and reduce the occurrence of emergency calls. (Section 8 – Risk Analysis)

WFES Action - B

It is recommended that the Operations Level of training for Hazardous Materials emergency calls be maintained, and that the model of equipping each front-line fire apparatus as a pumper-rescue, equipped with auto-extrication equipment be maintained. (2016) (Section 8 – Risk Analysis)

WFES Action - C

It is recommended that the JIQs of Administration staff be revised to reflect current duties and resubmitted to the JIQ Committee for re-evaluation. (2016) (Section 10 – Administration)

WFES Action - D

It is recommended that WFES add a Chaplain with critical incident training and experience to provide spiritual and mental health services to WFES personnel as necessary. This position would not be salaried, but would receive an annual stipend. The Chaplain would be available to the Corporation for formal occasions. (2016) (Section 10 – Administration)

WFES Action - E

It recommended that a comprehensive demographic analysis be conducted for the community to help determine the direction of fire safety public education. (2016) (Section 12 – Fire Prevention Inspections)

WFES Action - F

It is recommended that a preventative maintenance schedule be developed in conjunction with Facilities to ensure the operational effectiveness of each fire station. (2016) (Section 13 – Fire Suppression)

WFES Action - G

It is recommended that WFES develop a formal Succession Program with cross training, and Officer development components to help prepare staff for future leadership positions. The Program must include both education and experience components. (2016) (Section 14 – Training Division)

WFES Action - H

It is recommended that WFES work with Whitby Works Department (WWD) to investigate the feasibility of taking on the additional workload necessary to commit to a preventative and predictive maintenance program for WFES fleet, and the transferring of work traditionally performed by external contractors. (2016) (Section 15 – Apparatus & Equipment/Fleet Review)

WFES Action - I

It is recommended that WWD be requested to require its mechanics to obtain the EVT designation to allow the transfer of workload from exterior contractors. (2017) (Section 15 – Apparatus & Equipment/Fleet Review)

WFES Action - J

It is recommended that WFES and MIS identify tools for the Fire Prevention Division to access mobile technology to assist in the access and collection of data, documents and photographs to support the efficacy of the delivery model. (2016) (Section 16 – Information Technology)

WFES Action - K

It is recommended that an internal information mapping process be conducted to analyze information flow throughout WFES to identify the necessity of the existing committees and whether there are any unmet information needs. (2017) (Section 10 – Administration)

WFES Action - L

It is recommended that an internal information mapping process be conducted to review information flow throughout the Department and to help identify responsibilities of Administration staff. (2017) (Section 10 – Administration)

WFES Action - M

It is recommended that a Fire Chiefs' Community Advisory Committee consisting of representatives from community stakeholder groups be created to provide feedback to WFES regarding its performance in the community and any recommendations for improvement. It is recommended that the committee meet at least semi-annually on an ongoing basis (2017) (Section 10 – Administration)

WFES Action - N

It is recommended that WFES research and pursue wellness and mental health pro-active education to help equip WFES personnel to more effectively deal with their emotional and mental health. (2017) (Section 10 – Administration)

WFES Action - O

It is recommended that the 600 hours required to develop and deliver NFPA courses be realized through the expansion of the shift instructor training model.

In addition, NFPA courses will still have to be received by WFES staff whether they are delivered in-house or at an external location. However, it is preferable that they are delivered in-house as WFES can deliver the course to more staff over a period of months instead of years, at a much lower cost. (2017) (Section 14 – Training Division)

WFES Action - P

It is recommended that WFES continue to deliver on-line training in balance with practical, hands-on training. To this end, it is recommended that MIS and WFES continue to work in collaboration to establish hardware and software to support on-line and interactive training. (2017) (Section 16 – Information Technology)

WFES Action - Q

It is recommended that the implementation of web-based training mechanisms for the Training Division be adopted through web conferencing / webinars to support the delivery of training in a demonstrative manner to prevent Fire Crews from leaving their

initial response areas to attend Headquarters. By doing so, effective coverage of fire crews will be maintained through the Town while training objectives and goals are met. (2017) (Section 16 – Information Technology)

WFES Action - R

It is recommended that WFES and TOW Corporate Communications develop a short and long term media and marketing strategy that will promote the role of WFES and its public education message in the community. (2017) (Section 16 – Information Technology)

WFES Action - S

It is recommended that WFES develop a continuity of operations plan to prepare WFES for situations that may involve a reduction in resources and equipment below minimum levels. (2018) (Section 10 – Administration)

WFES Action - T

It is recommended that WFES develop a formal emergency management public education program that will better prepare the community for emergency incidents. This program can be delivered concurrently with other fire safety education programs. (2018) (Section 12 – Fire Prevention Inspections)

WFES Action - U

It is recommended that WFES incorporate the Comprehensive Fire Safety and Effectiveness Model to assist the CFPO, FP Capt. and Senior Management team in the evaluation of their current delivery model and to identify future opportunities. (2018) (Section 12 – Fire Prevention Inspections)

WFES Action - V

It is recommended that WFES management continue to evaluate the effectiveness of the community-based fire protection model and consider locating additional FPOs from HQ into Whitby Fire Stations throughout the community. (2018) (Section 12 – Fire Prevention Inspections)

WFES Action - W

It is recommended that WFES pursue the extension of the shift instructor model to other disciplines in an effort to create additional Training Division capacity of approximately 600 hours per year. (2018) (Section 14 – Training Division)

WFES Action - X

It is recommended that WFES work with Durham Emergency Management (DEMO) to develop appendices to the Emergency Management Plan to help prepare for emergencies that are most likely to warrant activation of the EOC. (2019) (Section 10 – Administration)

WFES Action - Y

It is recommended that WFES works with all Durham Regional Fire Services to assess the effectiveness of the CriSys dispatching and records keeping system, to determine if a more in depth analysis should be undertaken. It is also recommended that WFES continue to expand the work done in developing the IntraFireNet through the Town's M.I.S. Department. (2019) (Section 13 – Fire Suppression)

WFES Action - Z

It is recommended that the Training Division, and WFES Administration continue to work closely with M.I.S. to develop and expand the My/Whitby IntraFireNet program to meet future needs. (2019) (Section 14 – Training Division)

Summary of Plan Costs

The following Summary of Plan Costs provides a breakdown of the costs of the MFP recommendations including both Operating and Capital, and implementation year.

5 Summary of Plan Costs

	Operating			Operating Budget			Capital		
				$17,571,700	2015				
2016	Expansion of medical services		$5,000			2016	Aerial/Pumper		$1,400,000
	(4th Quarter Hire) Suppression - 20 ffs to staff Aerial/Pumper		$610,501				Hall 5 Renovations		$50,000
	Training Officer		$137,000				Training Vehicle		$35,000
		Subtotal	$752,501	$18,324,201	2016		Improve response times/AVLs		$120,000
								Subtotal	$1,605,000
2017	Mental Health Professional		$20,000			2017	2 FP Vehicles		$60,000
	1 Public Education/Fire Prevention Officers		$119,000				Acquire Training property		$3,300,000
	Suppression Rank Adjustment 4th Class		$1,759,224				Mud Lake connection		$10,000
	Upgrade Technical Rescue Services		$7,000					Subtotal	$3.370,000
		Subtotal	$1,905,224	$20,229,425	2017				
2018	Training Officer		$137,000			2018	Fire Training Complex		$6,700,000
	Project Coordinator/Business Analyst		$130,000				Rescue Apparatus Replacement		$850,000
	1 Fire Prevention Captain		$137,000				Fire Hall #6 West Whitby		$6,500,000
	1 Public Education/Fire Prevention Officers		$119,000				Training Vehicle		$35,000
	Suppression Rank Adjustment 3rd Class		$234,572						
		Subtotal	$757,572	$20,986,997	2018			Subtotal	$14,085,000
2019	P/T Admin Clerk to Full Time		$35,000			2019	Replace Fire Hall 2		$6,500,000
	Suppression Rank Adjustment 2nd Class		$234,572						
		Subtotal	$269,572	$21,256,569	2019			Subtotal	$6,500,000
2020	Fire Prevention Officer		$119,000			2020	FP Vehicle		$30,000
	Suppression Rank Adjustment 1st Class		$234,572						
		Subtotal	$353,572	$21,610,141	2020			Subtotal	$30,000

	Operating			Operating Budget		Capital		
2021	(4th Quarter Hire) Suppression - 20 ffs to staff Aerial/Pumper		$610,501		2021	South Brooklin Fire Hall #7		$4,500,000
		Subtotal	$610,501	$22,220,642	2021	South Brooklin Pumper Truck		$850,000
							Subtotal	$5,350,000
2022	Suppression Rank Adjustment 4th Class		$1,759,224					
		Subtotal	$1,759,224	$23,979,866				
2023	Suppression Rank Adjustment 3rd Class		$234,572					
		Subtotal	$234,572	$24,214,438				
2024	Suppression Rank Adjustment 2nd Class		$234,572					
		Subtotal	$234,572	$24,449,010				
2025	Fire Prevention Officer		$119,000		2025	Fire Prevention Vehicle		$30,000
	Suppression Rank Adjustment 1st Class		$234,572					
		Subtotal	$353,572	$24,802,582	2025		Subtotal	$30,000
		Total	$7,230,882	$24,802,582			Total	$30,970,000
	Annual Average increase over 10 years		$723,088					

6 Department Background

WFES is an organization that has a profound history within its community. Dating back to the early 1800's the fire department grew to meet the community it served. During this time the fire department expanded from the traditional horse drawn fire apparatus to its first motorized apparatus in the early 1920's. Not unlike in today, the fire department worked closely with its neighbouring fire departments providing assets and firefighters when called upon.

Growth within the municipality resulted in Fire Stations being constructed along with the annexing of Brooklin and Garrard Fire Departments to become Whitby Fire Department in 1968. The next big step for the Town of Whitby began with the hiring of its first full-time firefighter. In 1969, Chief Ed Crouch started in the Whitby Fire Department and 5 full-time firefighters were hired the following year. This was the end of the 120 years of completely volunteer service.

Whitby has always been a leader in developing and delivering fire education programs. In 1972 Whitby Fire developed its Jr. Fire Department program for youths age 11 and 12. The program is designed to educate youth with fire safe behavior and continues to run through the summer months over 40 years later. In the eighties Whitby developed a co-operative program with the Toronto Blue Jay MLB team and distributed baseball cards with fire safety tips on them. In addition to developing their own programs Whitby delivers a number of programs developed by the OFMEM (Office of the Fire Marshal and Emergency Management)). These programs include the Arson Prevention Program for Children, the Learn Not to Burn Program, and the Ever Alert Program.

In 2015, WFES continues to deliver a wide range of public services through five (5) strategically positioned Fire Stations throughout the municipality and 120 staff operating in various capacities that support the delivery model as a whole. WFES remains steadfast in their resolve to help make Whitby liveable, by delivering a high level of community service to those that have chosen Whitby as their home, place of work, or place to visit.

7 Community Background

Whitby Township (now the Town of Whitby) was originally surveyed in 1792. It was not until the mid-1830s that a downtown core settlement was established. In the 1840s a road was built from Whitby Harbour to Lake Simcoe and Georgian Bay, to bring trade

and settlement through the natural harbour to the communities to the north. The Town of Whitby was chosen as the seat of government for the newly formed County of Ontario in 1852, and incorporated in 1855. The village of Brooklin settlement origins date back to the 1840s. It grew rapidly and by 1846 the population totaled 300 persons. A Post Office was established in 1847 along with the name Brooklin. By 1850 approximately 550 persons lived in the thriving settlement community that had hoped to be named the County Seat for the County of Whitby. In 1968, the Town of Whitby, village of Brooklin and Township of Whitby amalgamated to form the current municipality. Municipal boundaries were not changed during the 1974 formation of Durham Region.

Whitby is bordered by Lake Ontario to the south, Oshawa to the east, Ajax and Pickering to the west and the Township of Scugog to the north. Whitby is comprised of urban and rural area with a variety of land uses. These include commercial, industrial, high, medium and low density residential, agricultural, institutional and assembly occupancies. The Towns transportation network includes a busy section of Hwy. 401 and will soon include an extension of Highway 407 and a link Highway 412 joining the two. The transportation network also includes CP and CN rail lines.

Public transportation is available from the provincially operated Go Transit System (Trains and Buses) as well as the Durham Region Transit (DRT) System via bus service.

8 Risk Analysis

Fire Risk Analysis

Assessing fire risk within a community is one of the seven components that comprise the Comprehensive Fire Safety Effectiveness Model. The Model is used to examine and analyze the relative factors that characterize the community and apply this information to identify potential fire risk scenarios that may be encountered. The assessment includes an analysis of the likelihood of these scenarios occurring and their subsequent consequences. In essence, fire risk assessment attempts to answer the following questions.

- What could happen?
- When could this happen?
- Where could this happen?
- Who could this happen to?
- Why could this happen?
- How likely is it to happen?
- How bad would it be if it did happen?

This information serves as the basis for formulating and prioritizing fire risk management decisions to reduce the likelihood of these events from occurring and to mitigate the impact of these events when they occur.

Fire risk has been assessed for Whitby using this Model (Appendix B). The following sections provide an overview of the findings and therefore the needs of the Whitby community:

a) Fire profile,
b) HIRA,
c) Demographics,
d) Building stock,
e) Growth,
f) Transportation,
g) Public consultation

a) Fire Profile

A fire profile analysis was conducted for the Town of Whitby in 2008. It was completed internally in the WFES Fire Prevention Division and utilized 2006 Census data.

While it has been some time since this analysis has been conducted, findings are consistent with Ontario's findings; and, therefore, suspected that today's fire profile for the Town of Whitby remains relatively unchanged:

Most fires in Whitby occur:

- In residential structures (56% of all fires)
- Between the months of May through September, with spikes in May and July
- Within the hours of 4:00 pm and 8:00 pm
- As a result of the misuse of cooking equipment
- Due to people leaving cooking unattended
- Most often involving age groups between 50-59, and 30-39

This information has been used in the past to help provide the targets and content for WFES Public Education programs, including Ever Alert, and Junior Fire.

Analysis:

The fire profile analysis is 7 years old and deals primarily with emergency fire calls.

It is unclear whether this profile has been used to review all Public Education programs to determine if they could be more effective in accomplishing the Department's Vision and Mission.

It is recommended that the Fire Prevention Division conduct a fire profile analysis to determine the root causes of all emergency calls. This analysis should be conducted biennially, and public education programs should be designed to target and reduce the occurrence of emergency calls. (2016)
(WFES Action – A)

b) HIRA – Hazard Identification Risk Assessment

DEMO (Durham Emergency Management Office), with input from WFES completed the most recent HIRA in February 2015. The HIRA identifies hazards that can occur within the municipality, the likelihood of them occurring, and the associated consequences. In Whitby, the hazards that are most likely to occur combined with the greatest consequences to the public are shown on DEMO's risk/consequence table (Appendix C). The following hazards top the list:

8.1 Figure 1 – HIRA List

Hazard	Consequence Grid Score
Energy Supply, Transportation Emergency	25
Snowstorm/Blizzards, Hazardous Material Spill	24
Freezing Rain/Ice Storm, Floods, Explosions/Fire	20
Lightning, Extreme Temperatures	18
Tornado, Hurricane, Human Health Emergency	16
Critical Infrastructure	15
Nuclear, Radiological, Windstorms	12

Analysis:

The most likely hazards to occur in Whitby with the greatest consequences are related to transportation, energy supply, snowstorms, and hazardous materials.

WFES has designed each of its first response fire apparatus as pumper/rescues, each fully equipped with auto-extrication equipment. By doing so, WFES can respond quickly to a transportation/vehicle emergency, fully equipped to handle vehicle extrication.

WFES is currently trained and equipped to the Operations level designation for Hazardous Materials response. Under NFPA 472 operations level includes the identification of hazards involved, development of isolation zones and the performance of rescues. For hazardous materials emergencies that require Technician level training and that may potentially impact life, WFES can request the use of Oshawa Fire Services Hazardous Materials Technicians. However, this service is not part of the existing Mutual Aid agreement as it is not a reciprocal service. There currently is no formal service agreement in place between OFS and WFES. For hazardous materials emergencies with no life impact, Technician level services can be accessed through third party private contractors at the expense of the property owner.

WFES receives training on an ongoing basis from energy supply and rail transportation organizations to remain current with response techniques and knowledge involving rail and energy supply infrastructure.

WFES has established an Emergency Management Plan under the Emergency Management and Civil Protection Act, and is prepared to handle weather-related emergencies.

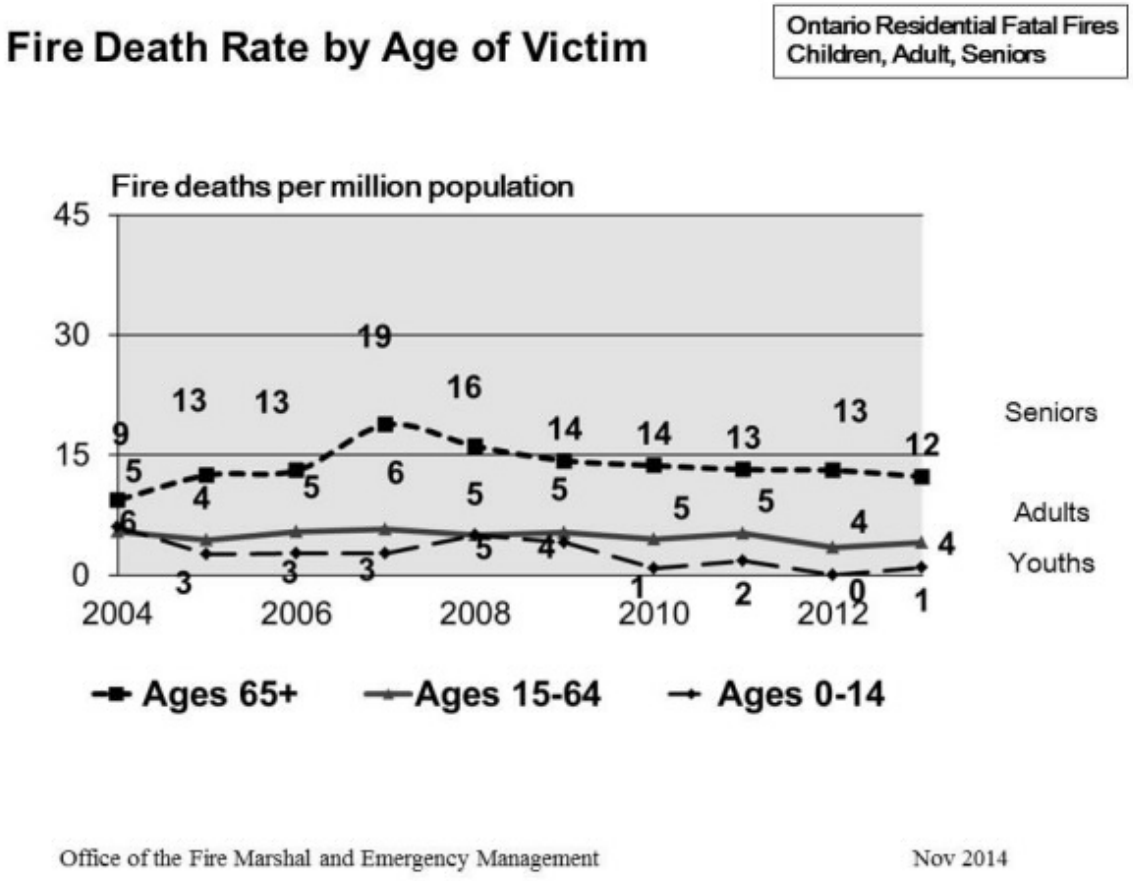
It is recommended that the Operations level designation of training for Hazardous Materials emergency calls be maintained, and that the model of equipping each front-line fire apparatus as a pumper-rescue, equipped with auto-extrication equipment be maintained. (2016) (WFES Action – B)

c) Demographics

Population Age

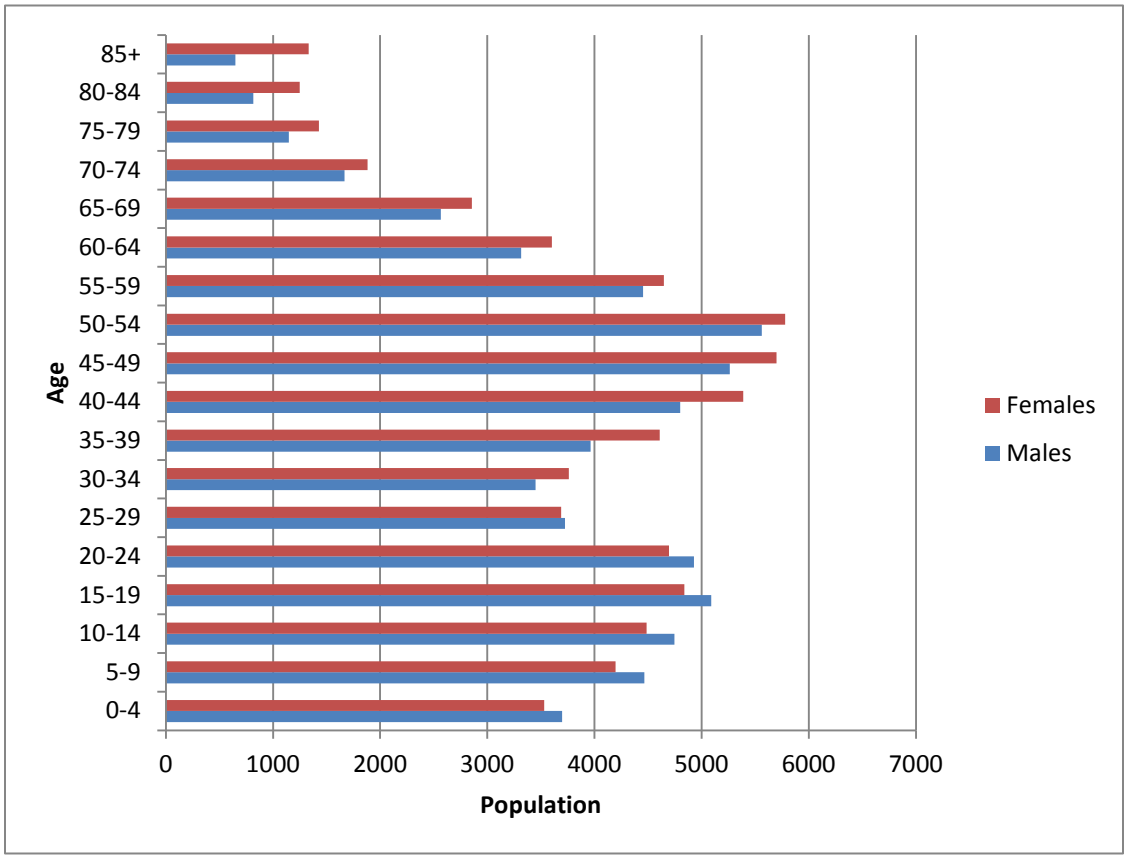
One of the demographic trends in Canada today is the aging of the general population. In 2001, one in eight Canadians was aged 65 years or over. By 2026, one in every five Canadians will have reached age 65. Older adults represents the highest fire risk target group in Ontario. The aging process is linked to the decline in an individual's physical and cognitive ability, which reduces their reaction time during a fire emergency. The effects of aging may often be compounded due to illness, disabilities, hearing/sight impairments, and the effects of prescription medication. Physiologically, older adults are more susceptible to injury and death when exposed to fire or smoke. All of these factors result in the decreased likelihood that an older adult will survive a fire if involved in one.

8.2 Figure 2 – Fire Death Rate Graph



Whitby's demographics show that 32.6% of the population is over the age of 55 and 11.81% is over the age of 65. This represents a high percentage of the population that is at increased risk of fire, and fire injury. Currently there are few fire safety education programs in Whitby specifically geared to Seniors, to help reduce the occurrence and the impact of fires within this demographic.

8.3 Figure 3 – Age and Gender Distribution Whitby 2014

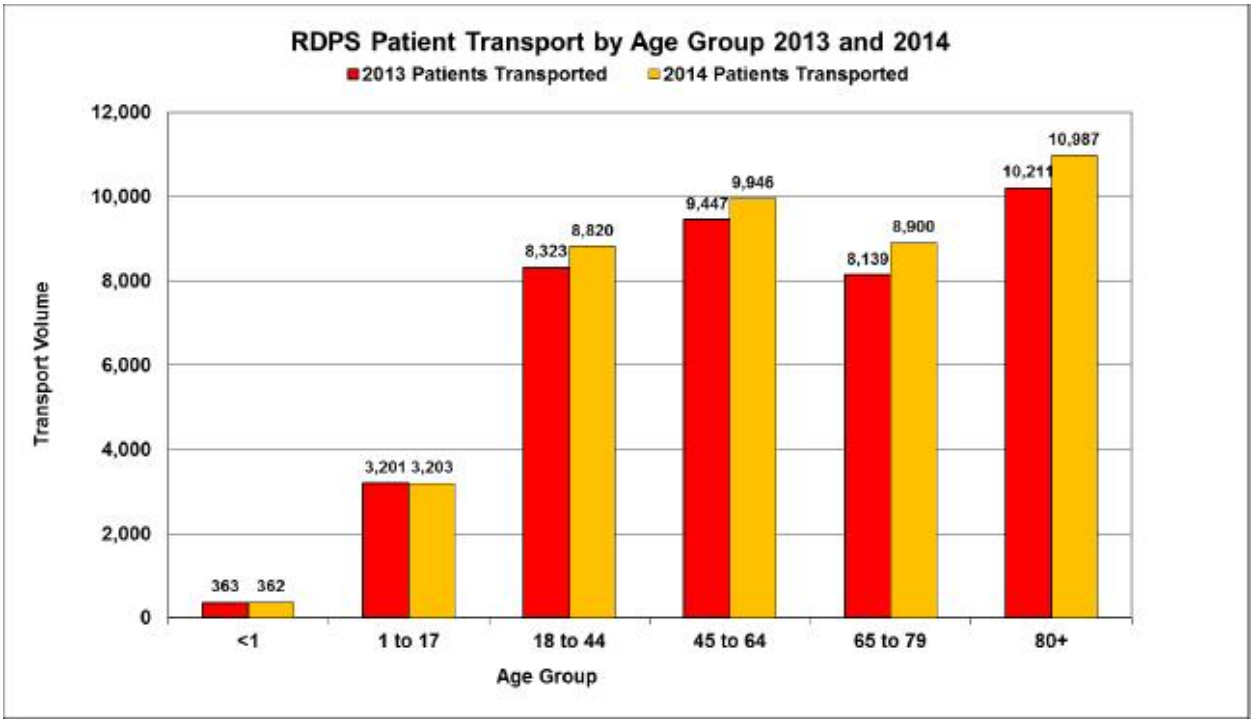


According to Durham Assessment information and projections, between 2016 and 2031 the 65+ age group in Durham Region will experience more growth than any other, increasing 97% from 95,973 in 2016 to 189,324 in 2031.

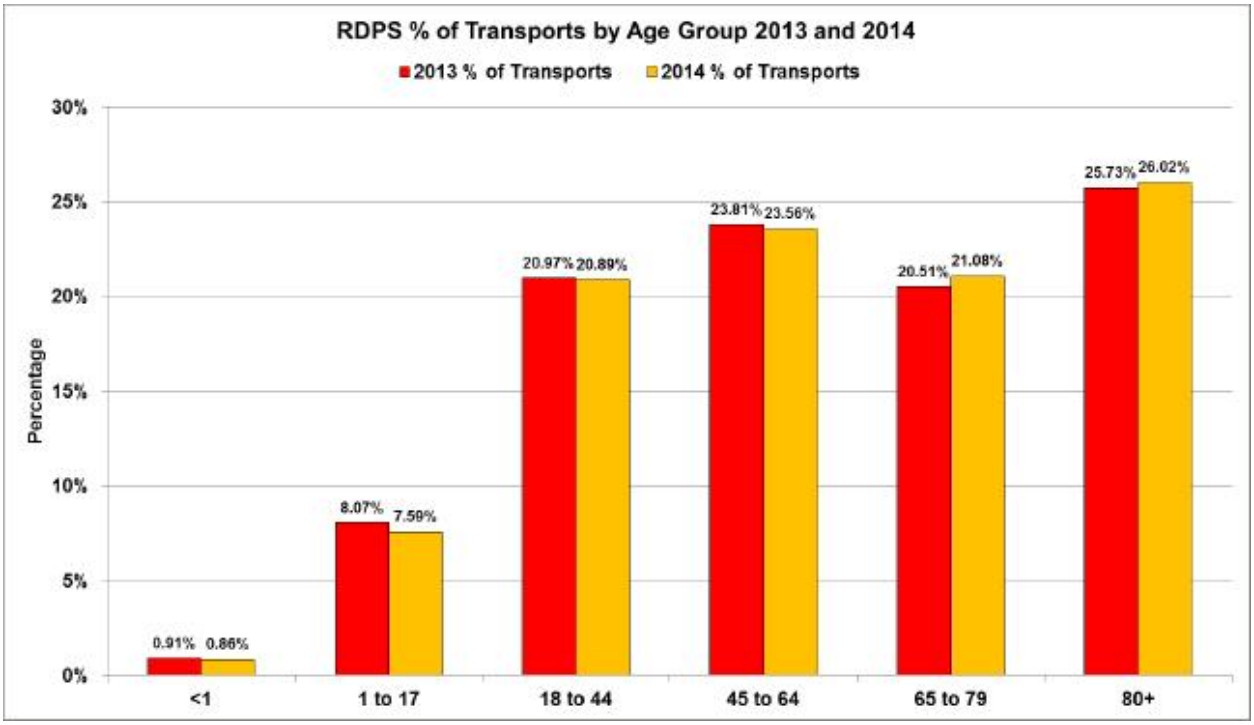
The second largest increase in Durham Region will be in the 35-44 age group increasing 30% from 87,697 in 2016 to 113,958 in 2031.

Not only will Whitby's aging population have an impact on fire safety, but it will also have an impact on medical emergency calls. People in the 65+ age group are more likely to be involved in medical emergencies requiring transport than any other group, and they are disproportionally involved when compared to other age groups.

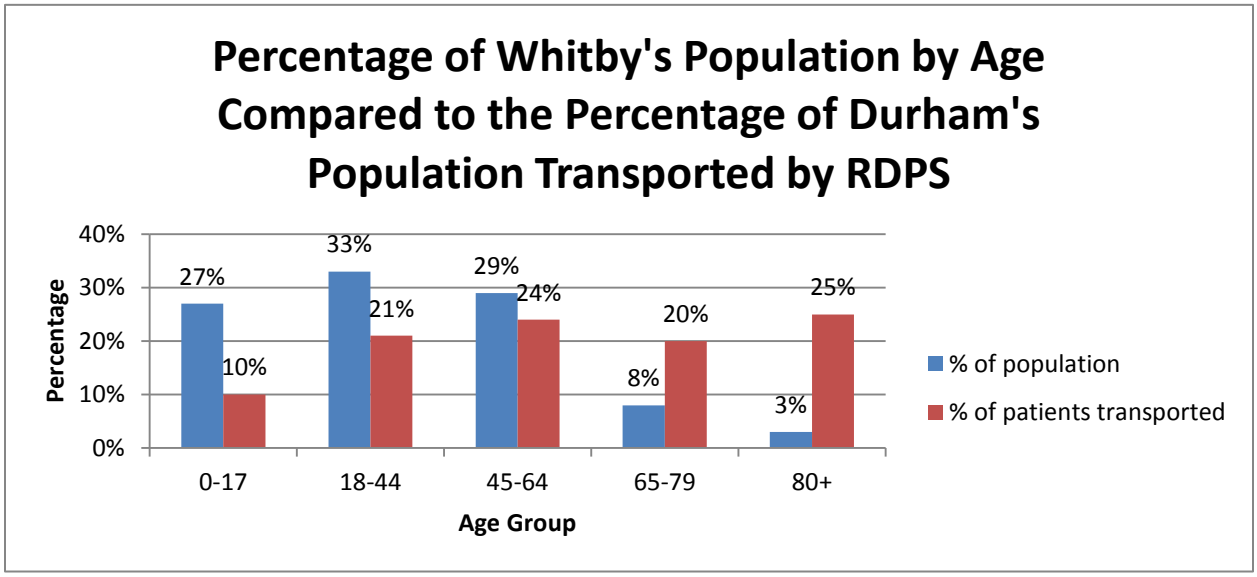
8.4 Figure 4 – Number of People in Durham Region Transported by RDPS by Age Group



8.5 Figure 5 – Percentage of People in Durham Region Transported by RDPS by Age Group



8.6 Figure 6 – Comparison Chart by Age and Transported



Analysis:

Based upon the WFES Fire Profile analysis, the people most often involved in fires in the Town of Whitby are in the 50-59 age group. With the aging population in Whitby, the risk of fire death/injury will increase.

It is also probable due to Whitby's aging population, that the number of medical calls will increase.

It is recommended that Public Education and Fire Prevention programs be developed and pro-actively delivered to the Seniors demographic with the aim of reducing the number of fires that occur in this age group, and that an additional Fire Prevention Public Education Officer be hired to spend .25 of his/her time to develop and deliver these programs on a continual basis. A biennial review of the effectiveness of these programs should be conducted. (2017) (Recommendation #1)

It is recommended that, based upon the evidence that an aging population corresponds to an increase in medical calls, WFES expand its medical symptom relief service level to include additional services signed off by Base Hospital. (2016) (Recommendation #2)

Population Growth

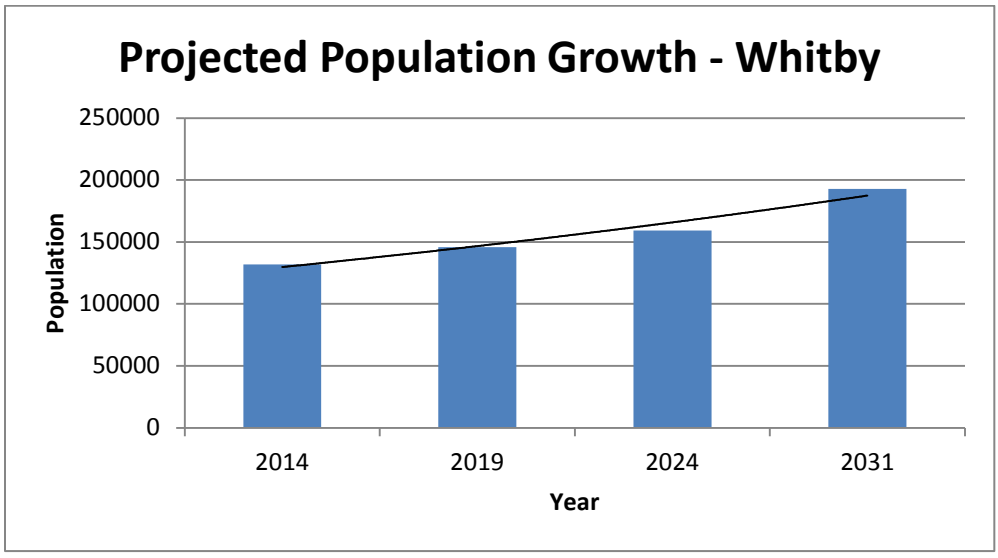
The Region of Durham's Official Growth Plan Amendment 128 (ROPA 128) is intended to implement the growth Plan and provides for the development of 34,375 new dwelling units in the Town of Whitby between 2006 and 2031. This translates into an anticipated population of 192,860 in 2031 which equals an approximate increase of 46% between 2015 and 2031.

Analysis:

This increase in population will place a greater demand on WFES for service delivery from all WFES Divisions:

- Increase in emergency responses in existing, intensified areas
- Increase in emergency responses in soon to be developed areas
- Increase in all types of emergencies including technical calls (rescues)
- Increase in Fire Prevention inspections and tasks (complaints, requests, accessory apartments, permits, vulnerable occupancy inspections, etc.)
- Increase in fire safety education (fire truck and fire prevention presentation requests, public education program expansion, communication demands, etc.)
- Increase in Training tasks to maintain competencies
- Increase in Administration tasks to coordinate project management, and to support and facilitate an expanding Departmental workload.

8.7 Figure 7 – Projected Population Growth

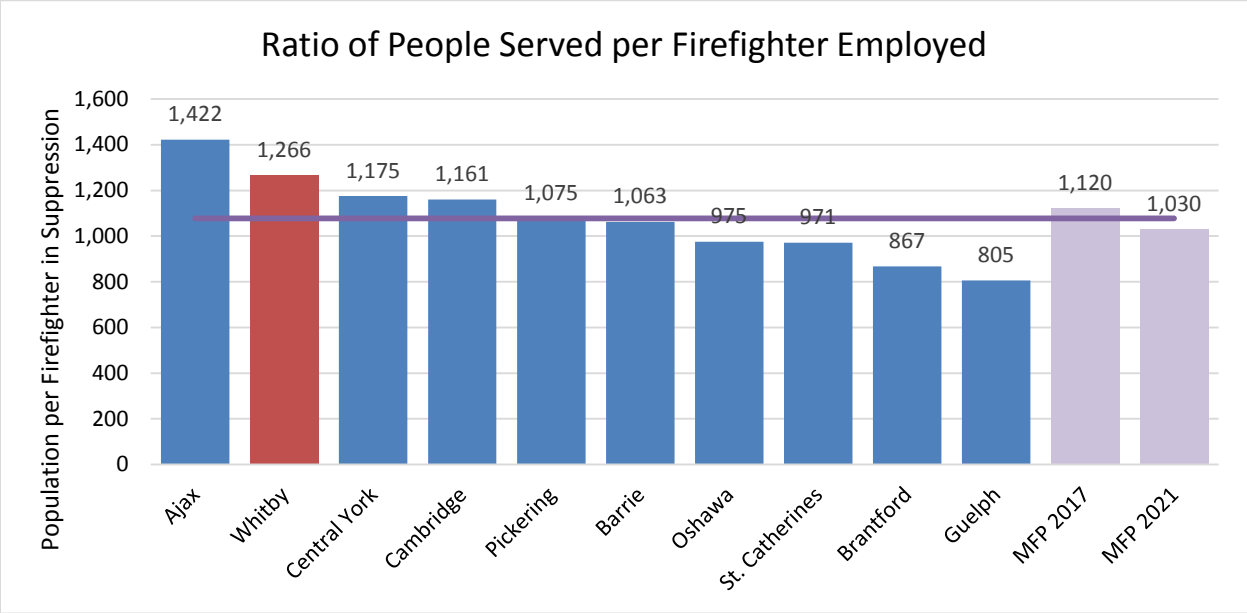


As the Corporation of the Town of Whitby continues to plan for and respond to this growth, it is important to evaluate the level of fire services it provides to the community today in comparison to other communities. The following charts demonstrate the level of fire protection services other Municipalities have established and where Whitby fits in.

The Town of Whitby currently employs 1 firefighter for every 1,266 Whitby residents, equating to 17% fewer firefighters per population than the comparator average. Should

the staffing recommendations from this Master Fire Plan be approved, this ratio would change from 1266:1 in 2015 to 1,120:1 in 2017, and 1,030:1 in 2021, resulting in Whitby having a staffing ratio 4.5% better than the comparator average.

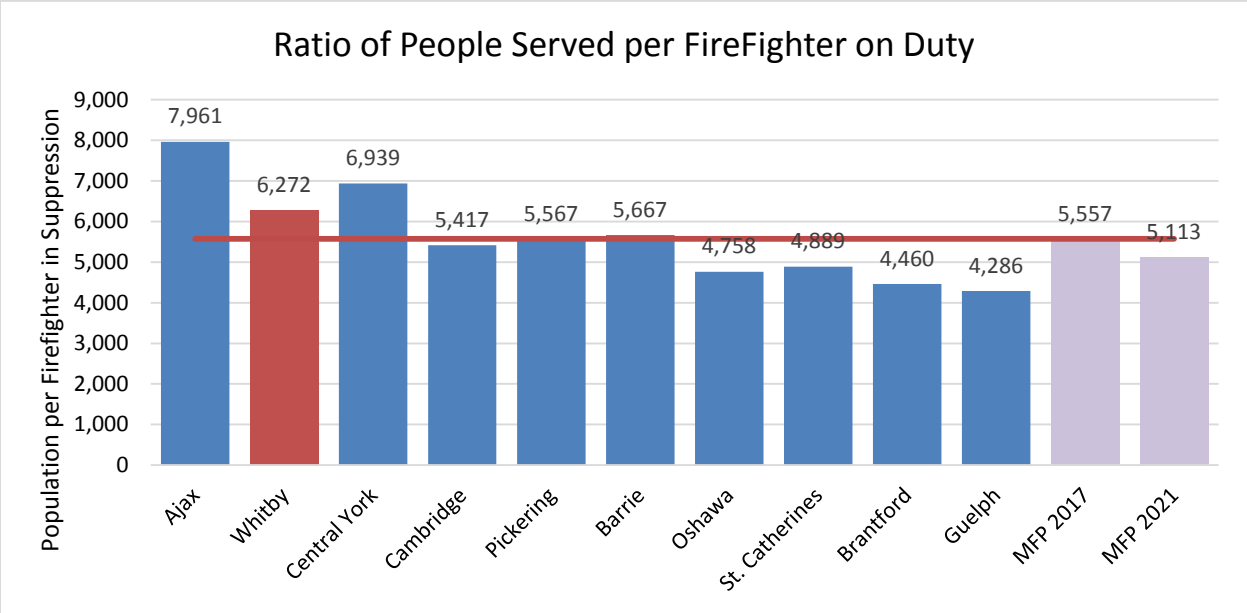
8.8 Figure 8 – Ratio of People Served per Firefighter Employed



In the NFPA 2012 Report on Fire Departments in Canada (Appendix D), it is noted that Fire Departments serving municipalities with a population ranging between 100,000 and 249,000 employ 1 firefighter for a median rate of every 890 people.

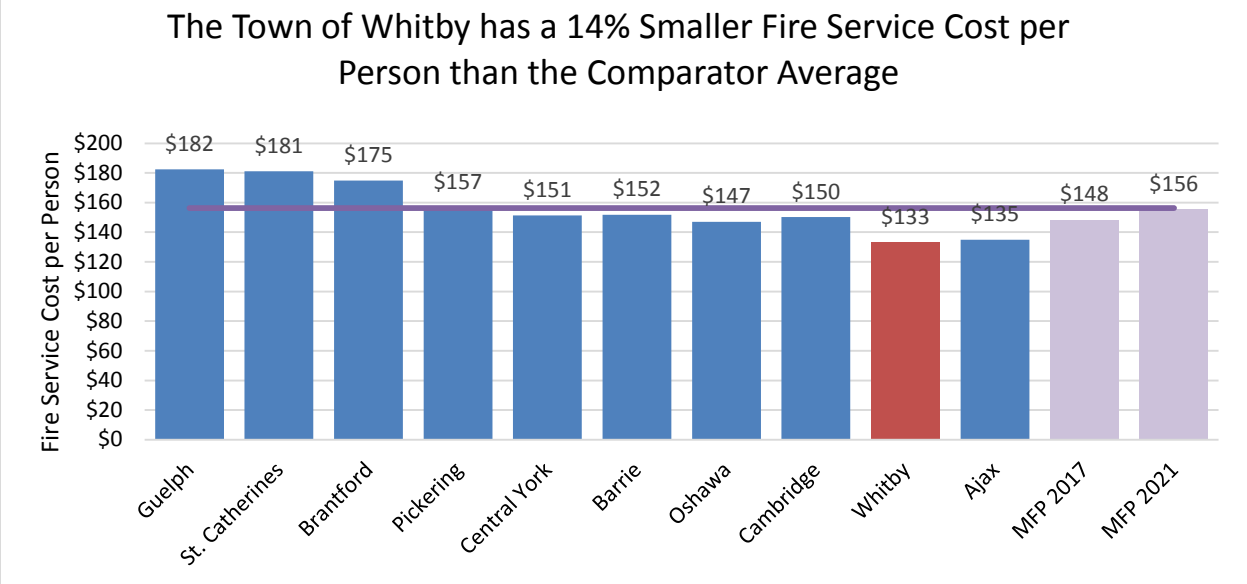
The Town of Whitby staffs 5 fire trucks running from 5 fire stations, and requires minimum staffing of 21 fire fighters to provide service 24 hours per day. This minimum staffing level of 21 equates to a ratio of 1 firefighter on duty for every 6,271 people residing in Whitby, 12.5% less than the comparator average. Should the staffing recommendations from this Master Fire Plan be approved, this ratio will improve to 5,557:1 in 2017, and 5,113:1 in 2021, resulting in Whitby having a minimum staffing ratio 6% better than the comparator average.

8.9 Figure 9 – Ratio of People Served per Firefighter on Duty



WFES' operating costs are $133 per resident per year, or $.36 cents per day. Should the MFP staffing recommendations be approved, this will increase to $148 by 2017, and $156 by 2021, resulting in Whitby being 1% below the comparator average.

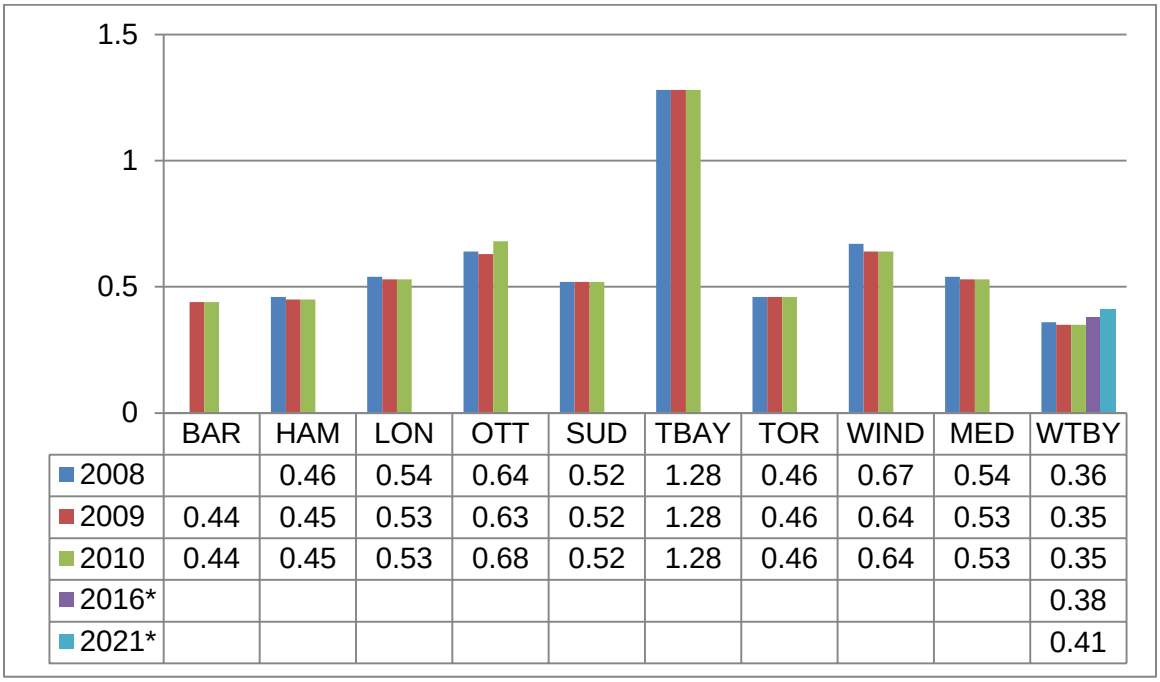
8.10 Figure 10 – Fire Service Cost Per Person



WFES responds to more emergency calls each year than any other Fire Service in Durham Region despite having the lowest cost per person ratio.

The Town of Whitby has significantly fewer staffed apparatus per Capita than OMBI comparators. Should the suppression staffing recommendations from this MFP be approved, Whitby will still remain lower than every OMBI comparator.

8.11 Figure 11 – OMBI – Number of Hours Staffed Apparatus are Available to Respond to Emergencies Per Capita



	BAR	HAM	LON	OTT	SUD	TBAY	TOR	WIND	MED	WTBY
2008		0.46	0.54	0.64	0.52	1.28	0.46	0.67	0.54	0.36
2009	0.44	0.45	0.53	0.63	0.52	1.28	0.46	0.64	0.53	0.35
2010	0.44	0.45	0.53	0.68	0.52	1.28	0.46	0.64	0.53	0.35
2016*										0.38
2021*										0.41

* if MFP recommendations for additional suppression staffing are approved

Source of 08,09,10 population numbers:

https://www.durham.ca/departments/health/health_statistics/popAtAGlance.pdf

8.12 Figure 12 - Total Emergency Responses within each Municipality

Year	Pickering	Ajax	Whitby	Oshawa	Clarington
2009		4213	5163	5127	3324
2010		4071	5077	4924	3273
2011	3631	4328	5377	4637	3489
2012	3905	4307	5220	4608	3410
2013	4092	4563	5164	4518	3403
2014	3974	4528	5253	4367	3483
Total	**15602**	**26010**	**31254**	**28181**	**20382**

It is recommended that an additional apparatus, staffed fulltime with an additional 20 firefighters be added to WFES to adequately meet the needs of Whitby's growing community. (2016) (Recommendation #3)

d) Building Stock

It is important to develop a community property stock profile to establish a detailed inventory of potential property related risks. This involves building stock totals on occupancy classification as well as other non-building properties that could pose a risk to the community. The Ontario Code (OBC Building) categorizes buildings under the following major occupancy classifications, each of which has inherent hazards that distinguish it from others.

8.13 Figure 13 – Whitby's Building Stock

Building Classification	#	Comments
A – Assembly	233	Churches, Schools, etc.
B – Care	39	Hospital, Retirement Homes, Group Homes
C – Residential	38,755	Includes multiple residential units
D – Business & Personal Services	135	Dentist, Lawyers, etc.
E – Mercantile	248	Stores
F – Industrial	432	Factory, warehouse, storage, etc.
Farms	135	

Modern Residential Fires in Whitby

Residential occupancy comprise 96.9% of Whitby's building stock and as such represents Whitby's greatest fire risk.

Underwriters Laboratories US (UL) has determined that fires today are more dangerous and pose more risks than in the past. Fire propagation is faster, and time to flashover, escape times and collapse times are all shorter. 93% of Whitby Building stock has been constructed since 1971, utilizing modern construction.

UL's research scientists and engineers have conducted a number of innovative tests and evaluated their results, and have identified that the modern home fire is a "perfect storm" of conditions and outcomes: larger homes + open house geometries + increased fuel loads + new construction materials = faster fire propagation, shorter time to flashover, rapid changes in fire dynamics, shorter escape times and shorter structural collapse times.

UL's first-of-its-kind testing also identified collapse implications. Specifically, in the modern fire environment, if firefighters arrive in eight minutes, collapse is possible as soon as 90 seconds later. Firefighters may not be in the house yet or may be just entering to search for occupants. In contrast, research showed in the legacy home (pre-1971) fire collapse begins 40 minutes after the arrival of firefighters. In a legacy home,

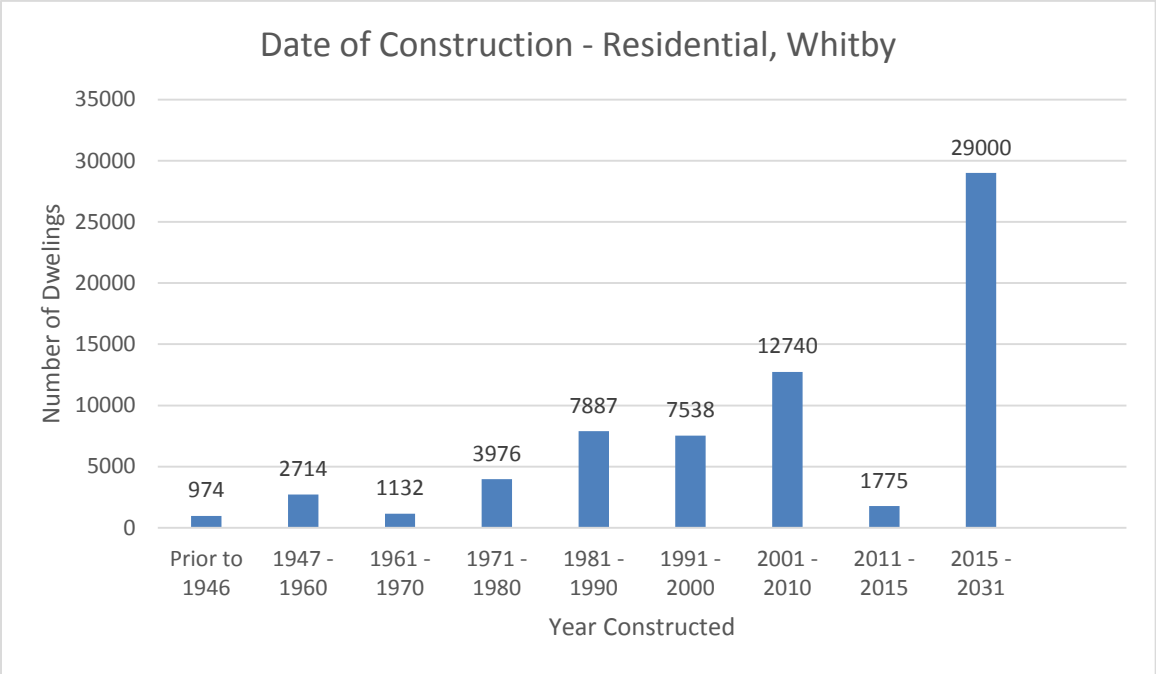
the extra time before collapse allows for a significant number of fire operations to take place while firefighters are reading the safety of the structure.

The overall finding of UL's fire testing is that the changes in the modern home create fires that reach flashover more than eight times faster than homes built 50 years ago. This rapid progression to flashover gives residents, firefighters and other first responders much less time to react, creating significant hazards to health and property. Staffing required to safely and quickly rescue a firefighter caught in a building collapse is extensive. As many a 12 additional bodies can be required.

The findings concerning modern home fires highlights that the conditions that occupants and firefighters face today and will face in the future are very different than those faced by prior generations.

ROPA 128 estimates that there will be 34,375 new housing units in Whitby between 2006 and 2031. From 2006 to 2015 there were 5,472 new units.

8.14 Figure 14 – Residential Structures



Source – MPAC Data via Amanda.

As can been seen by Figure 13 the chart, ninety three percent (93%) of the residential structures in Whitby have been constructed since 1971, when modern platform construction became the norm. These stats clearly show that the majority of the residential building stock in Whitby falls into a category in which occupant safety is at risk and interior structural firefighting is dangerous.

Fire Growth Rates:

Time to reach 1 MW (Megawatt) and 2MW Fire Growth Rates in the Absence of Fire Suppression – 1 MW (Small content fire eg. Couch) – 2 MW (Growing to consume other materials)

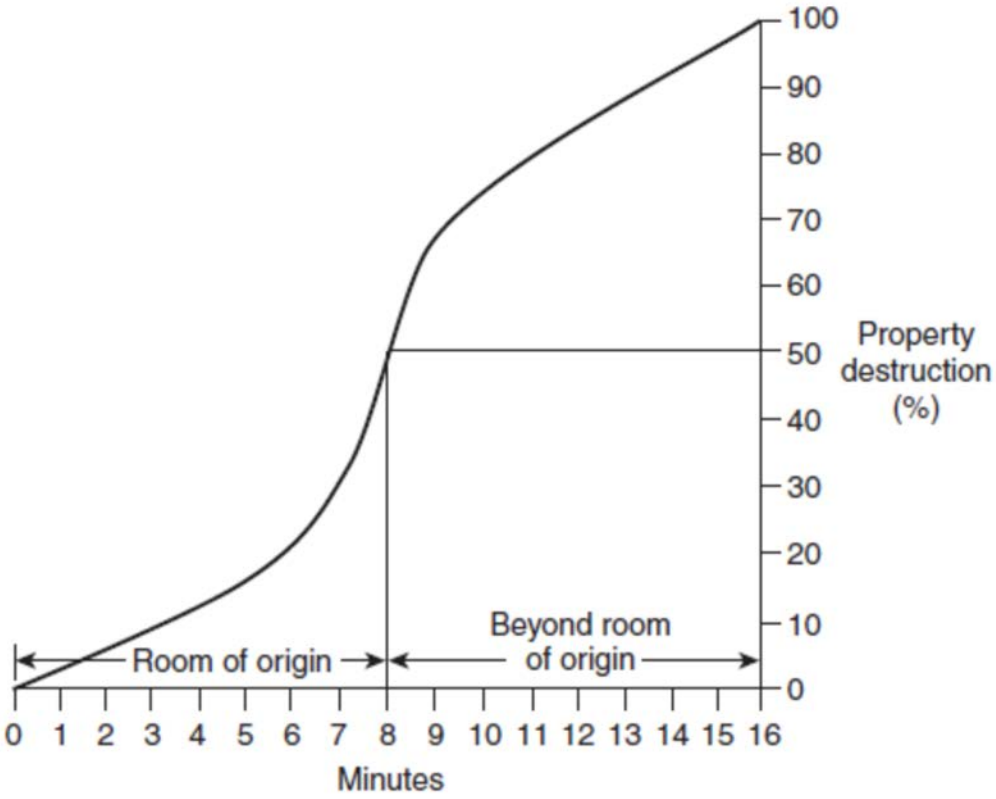
8.15 Figure 15 – Fire Growth Rate

Fire Growth Rate	Time is Seconds to Reach 1MW	Time in Seconds to Reach 2MW
Slow	10 minutes (600 seconds)	14.1 minutes (848 seconds)
Medium	5 minutes (300 seconds)	7.1 minutes (424 seconds)
Fast	2.5 minutes (150 seconds)	3.5 minutes (212 seconds)

Source: Office of the Fire Marshal Ontario, Operational Planning: An Official Guide to Matching Resource Deployment and Risk, January 7, 2011 (www.ofm.gov.on.ca)

Within a ten minute time period flashover conditions can occur; the combustible items reach a temperature that is sufficiently high for them to auto-ignite. Figure 15 highlights the importance of early firefighting intervention given the exponential increase in the fire temperature, and the potential for loss of property/loss of life with the progression of time.

8.16 Figure 16 – Fire Growth Chart (NFPA 1710)



The use of engineered wood products has grown significantly in recent decades. According to APA–The Engineered Wood Products Association, engineered wood components saw their first commercialization in the 1960s but didn't enjoy widespread use until the 1980s. Since then, production has increased more than ten-fold, with the U.S. and Canada combining for 1.28 billion linear feet of engineered components in 2004, at the peak of the housing boom.

APA estimates that engineered I-joists comprised 4 to 6 percent of the market in the 1980s. By 2002, surveys showed that I-joists had achieved 44 percent of single-family floors. APA estimates that 58 percent of I-joists are used in new residential floors, 24 percent are used in non-residential building construction, and 18 percent are used in repair and remodeling projects.

These engineered wood products contribute to early failure times making residential fire environments unsafe for occupants and firefighters.

High Risk Properties

Attention should also be given to other property types, particularly those that contain large quantities of combustible materials, and those that house vulnerable occupants. Propane storage facilities, outdoor tire storage yards, grasslands/forests, plastic recycling depots are examples of properties that could severely impact a community and its environment if involved in fire. Major highways and railways lines used to transport high volumes of traffic and large quantities of hazardous chemicals also warrant serious consideration.

WFES has a number of large risk properties, 2 major Railway Systems CNR (Canadian National Railway) and CPR (Canadian Pacific Railway), the TransCanada and Enbridge pipelines, as well as Highway 401 and the soon to be completed Highway 407 and 412 link with hazardous shipments running daily through these transportation systems. It is; therefore, imperative that WFES maintain and continually improve its response training and capabilities for hazardous materials situations in order to mitigate the effects these types of incidents have on the environment and the community.

Whitby has a Marina with 420 slips operating at 90-95% occupancy through the summer as well as 60 boats on land year round. In the winter there are over 400 boats in the yard. These boats present access problems due to long piers and close proximity to one another, in addition to the environmental factor of being on the water. Whitby Yacht club poses similar challenges with 220 boats in the water and another 50 on land for a total of 270 on land through the winter. Several of these boats are occupied as dwellings unit throughout the year.

Whitby also contains a number of buildings housing vulnerable occupants including long term care, retirement homes, group homes, a large mental health facility, and a hospital.

Analysis:

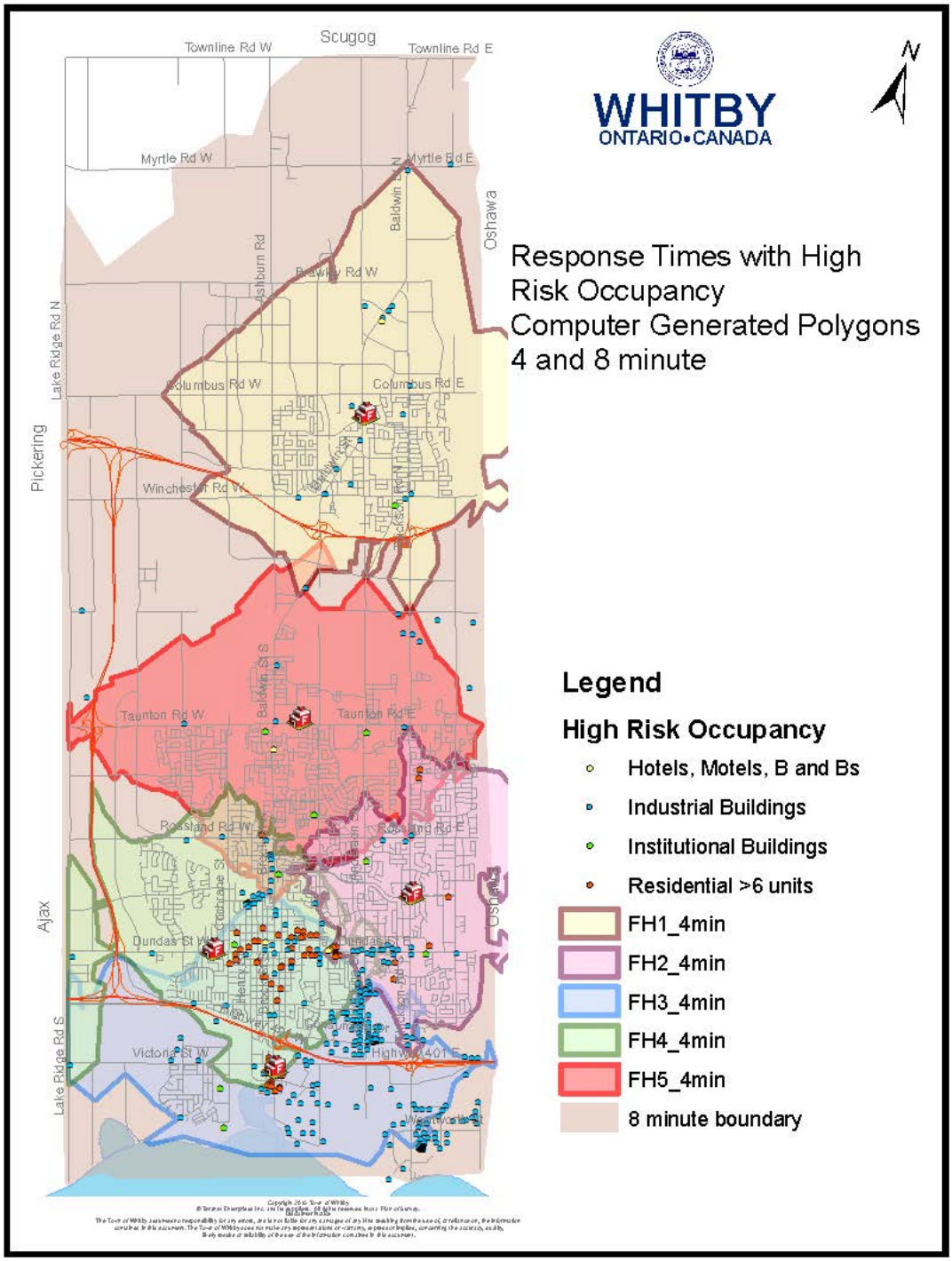
Today's residential structure fires are more dangerous than fires of previous generations. Structures fail sooner, fires grow faster and burn hotter, occupants have less time to escape, and firefighters have a smaller window of opportunity to protect life and property.

It is; therefore, logical that WFES:

- work to prevent structure fires from occurring, and educate people on how to react should they occur, and
- respond to structure fires as quickly as possible, and be highly trained in order to efficiently and effectively conduct rescue, and contain and extinguish fires.

An analysis of these locations indicates that the majority of the properties are within WFES' initial 4 minute travel zones. NFPA 1710 has a best practice requiring 4 firefighters within a 4 minute travel time. Fires in high risk properties occur infrequently and require additional resources beyond WFES' resource levels. These resources are available as needed through Mutual Aid agreements.

8.17 Figure 17 – Response Times with High Risk Occupancy



It is recommended that an additional Fire Prevention/Public Education Officer position be added to WFES to spend .25 of his/her time to develop and deliver pro-active Public Education Programs geared to preventing fires in residential structures and high risk occupancies. (2017) (Recommendation #1)

e) Growth

Whitby Intensification Strategy

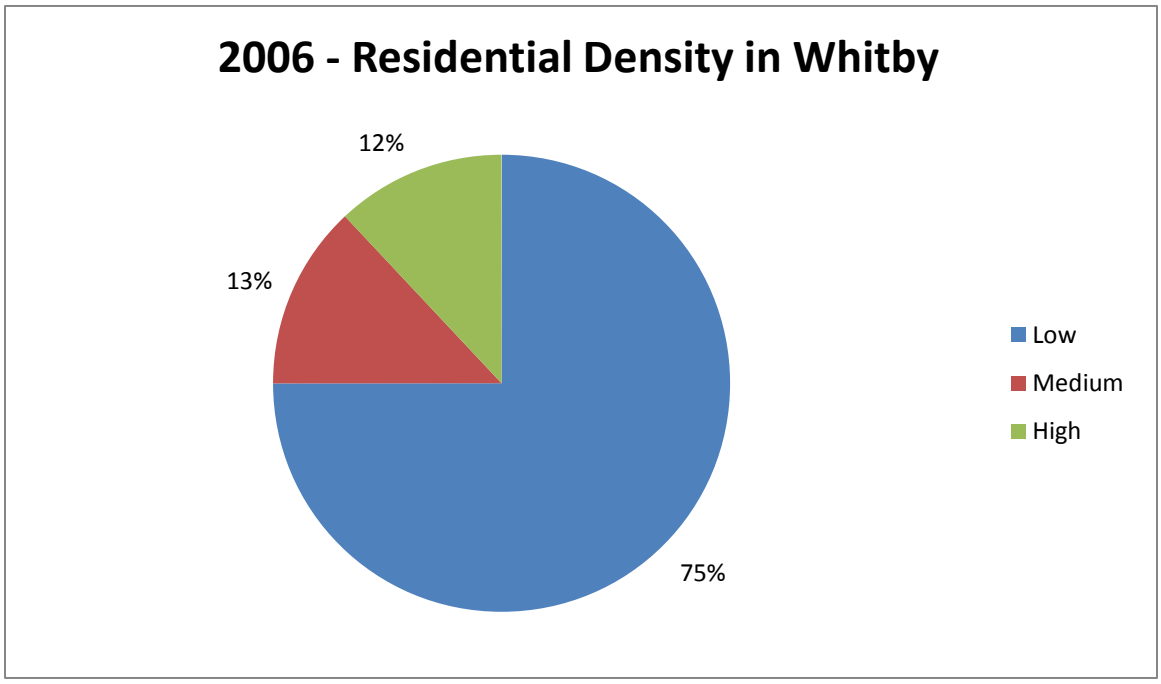
Ontario's new Growth Plan for the Greater Golden Horseshoe requires that a minimum of 40% of all new dwelling units between 2015 and 2031 be built within the already built-up areas of cities and towns across the region. The remaining 60% can be accommodated within greenfield areas.

The Region of Durham Official Plan Amendment 128 (ROPA 128) is intended to implement the Growth Plan and provide for the development of 34,375 new dwelling units between 2006 and 2031 in Whitby.

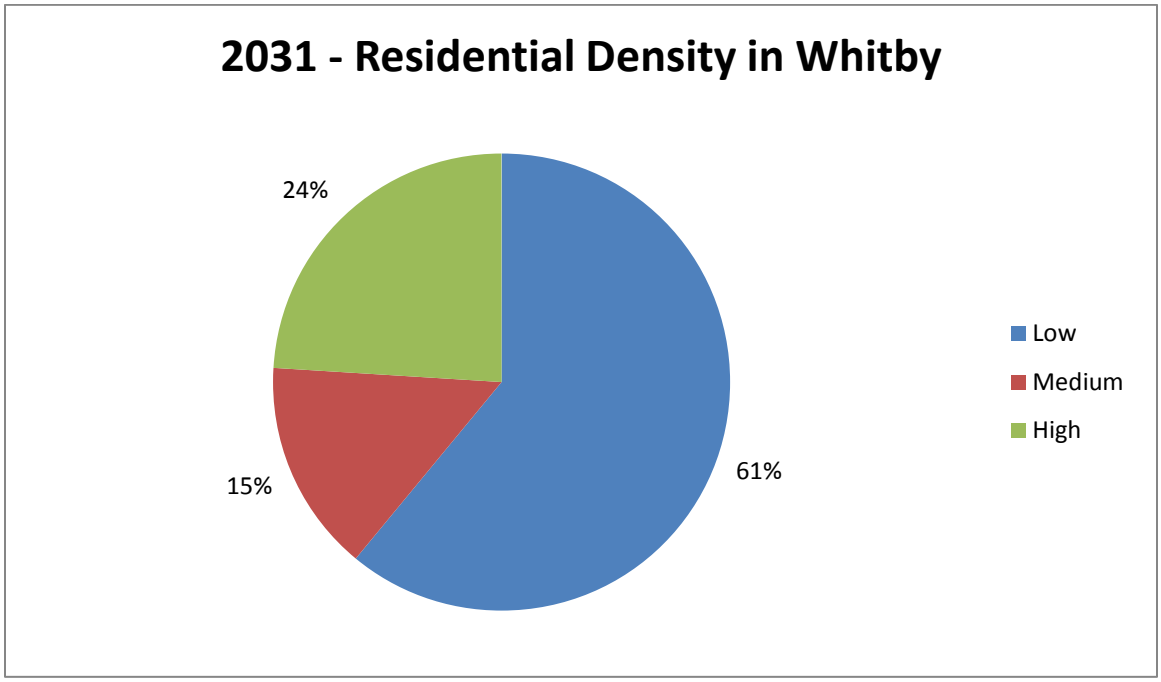
Given that there were 37,260 dwelling units in Whitby in 2006, the effect of ROPA 128 is to almost double the number of dwelling units and population in the Town by 2031.

In 2006, it was estimated that 75% of dwellings within Whitby were low density, 13% were medium density, and 12% were high density. ROPA 128 anticipates that by 2031 these ratios will be 61%, 15%, and 24% respectively. The higher the density, the more challenging a structure fire is for WFES. Issues relating to subdivision access, structure access, fire ground deployment, fire containment, and fire fighter safety become challenges, and can cause deployment delays. As well, there is a requirement for additional resources compared to lower density, and the possibility of increased property damage, and loss of life.

8.18 Figure 18 – 2006 Residential Density in Whitby



8.19 Figure 19 – 2031 Residential Density in Whitby



West Whitby Secondary Plan

The majority of the West Whitby Secondary Plan Study Area was designated as Major Open Space in the 1993 Durham Regional Official Plan. It has since been revised as part of the West Whitby Secondary Plan as one component of the Town's comprehensive Official Plan review, designed to bring the Town's Official Plan in line with ROPA 128.

Key arterial and collector roads have been identified for West Whitby:

Desmond G. Newman Boulevard from Dundas Street to north of Taunton (Existing Coronation Road)

Bonacord Avenue from east of Lynde Creek to Lake Ridge Road

Twin Streams Road from east of Lynde Creek to Lake Ridge Road

There are seven subdivision applications that represent the majority of the lands within the Plan area and collectively will see approximately 3,500 new housing units constructed, with up to 12,000 people living in the area.

A key transportation issue in the Plan is the development of Highway 412, linking the 401 to the 407.

The Plan emphasizes a linear pattern of mixed-use development along key corridors, including the east-west regional corridors on Taunton Road and Dundas Street, and the north-south corridors located on the realigned Coronation Road. The central focus of the Plan is on Rossland Road with the predominant land use being retail, along with

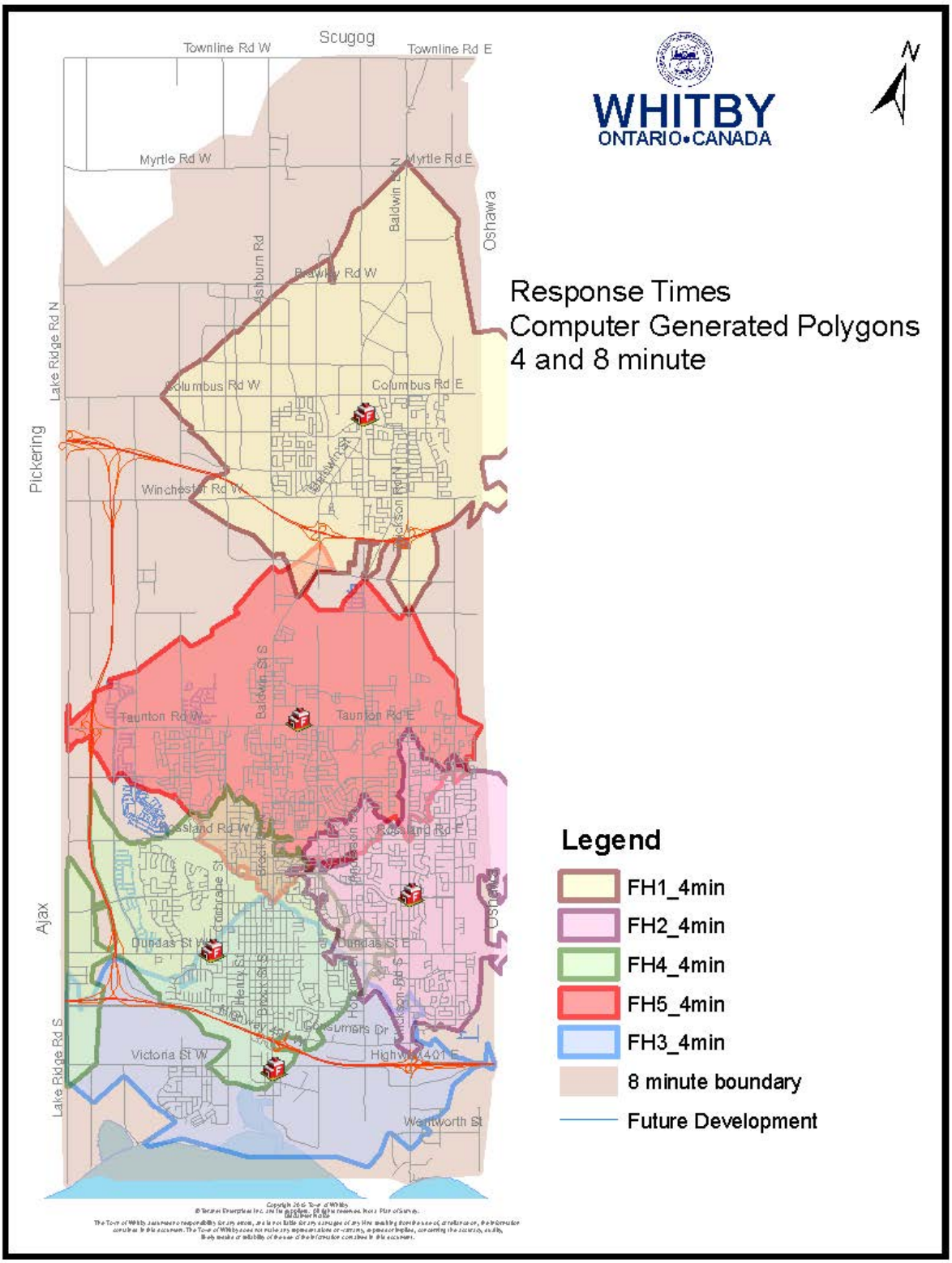
provision for higher density development over time. The focus of density adjacent to the corridors supports transit and encourages walkability. Low density forms of housing in the form of singles will not be permitted in these mixed-use areas.

Occupancy in West Whitby is expected to begin in late 2017.

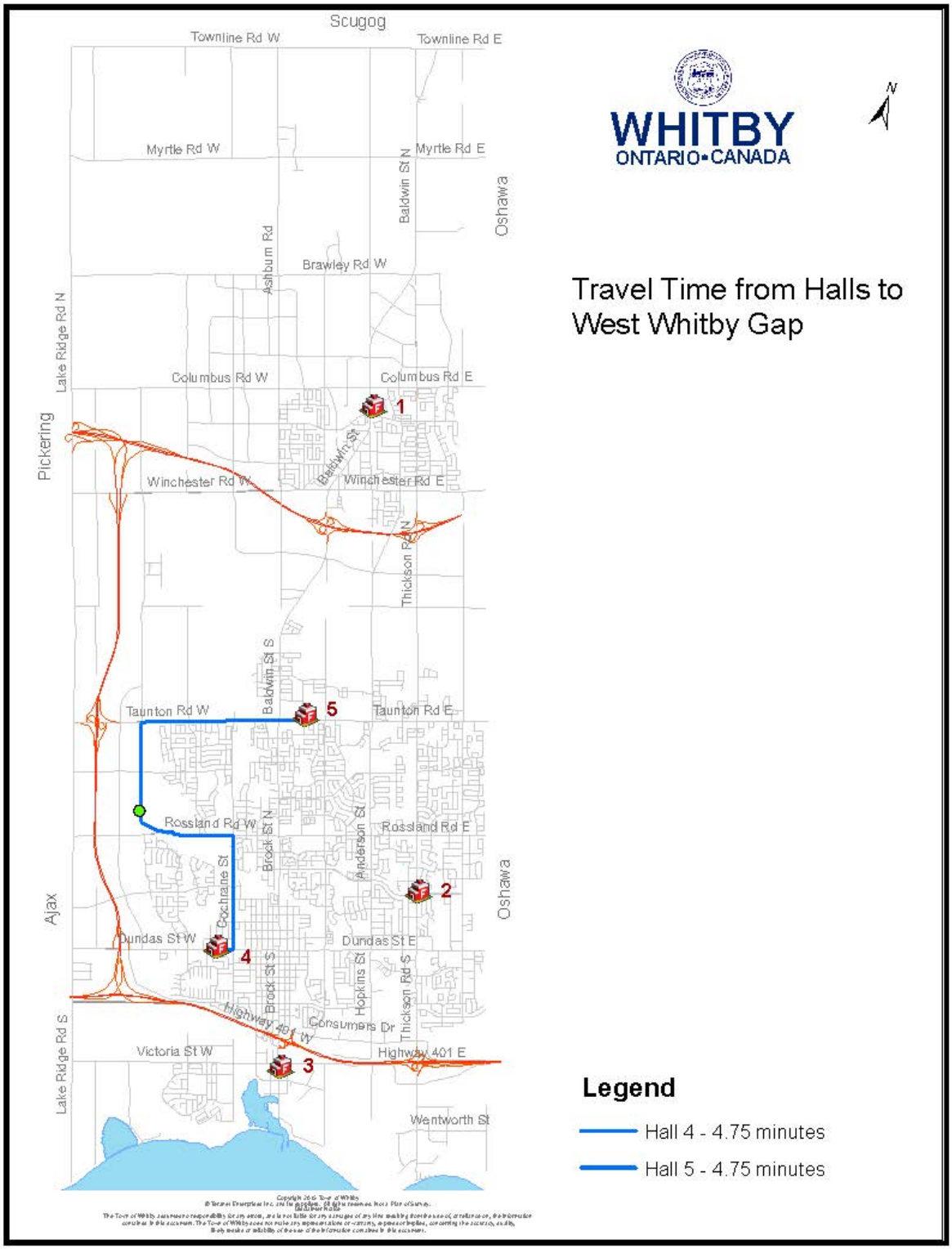
Analysis:

Part of the West Whitby future residential development will be outside of WFES' initial 4 minute travel time boundary as recommended as an industry standard in NFPA 1710 – Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments. This will be discussed later in subsequent sections.

8.20 Figure 20 – Response Times



8.21 Figure 21 – Travel Time from Stations to West Whitby Gap



Fire trucks from Stations 4 and 5 will be able to theoretically travel to this area within 4:45 seconds.

As referenced in the National Institute of Standards and Technology (NIST) Report on residential fire ground experiments (Appendix E) having the first arriving Fire Crew of four firefighters on scene in a travel time of 4 minutes is an important component in determining the success of the fire fighting outcome. The only way to reduce travel time to this area is by positioning a fire truck closer to West Whitby. The only way to do this is to build a fire station within 4 minutes. An analysis of options was conducted to determine if there was a viable way to accomplish this.

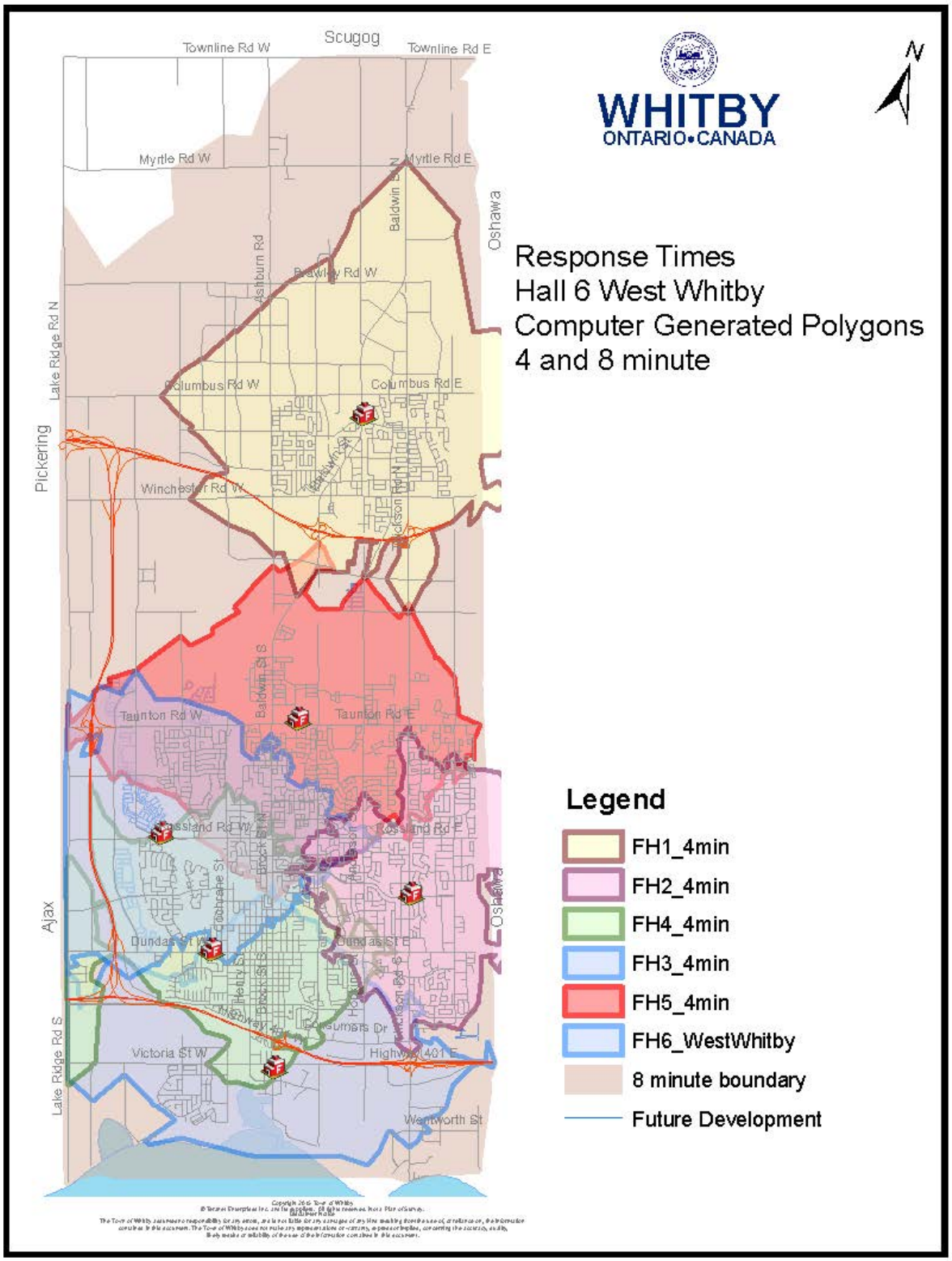
As part of this analysis, Whitby GIS worked with WFES to electronically model the relocation of fire stations in an attempt to identify the most viable option. Appendix F includes those options that were assessed.

Existing fire stations are positioned well for existing and future demand with the exception of West Whitby and its corresponding growth and increasing emergency call volume.

It is recommended that a new fire station, Station #6, be constructed in the West Whitby area to provide 4 minute initial travel coverage to West Whitby, and depth of coverage to the remainder of the Town. (2018). (Recommendation #4)

There is a deferred 412 interchange planned at Rossland Road. Once this interchange is constructed, this new West Whitby Station will have quick access to the 412, 401, and 407 Highways. Additional traffic volume, and MVCs (motor vehicle collisions) will be experienced on Lakeridge road upon the opening of 401 on/off ramps. Station #6 will have a response time of under 4 minutes to a large stretch of Lakeridge Road. (Recommendation #4)

8.22 Figure 22 – Response Times Station 6 West Whitby



In addition to providing improved initial travel times of less than four minutes to West Whitby, fire station #6 will provide needed depth of coverage resources to the area of Town that experiences the largest emergency call volume.

It is recommended that the apparatus and the 20 firefighters required to staff the pumper/aerial for the West Whitby Fire Station be acquired immediately in order to provide the depth of coverage that is currently required. This truck and Crew will operate from Fire Station #5 until such time that the new West Whitby Station is ready. (2016) (Recommendation #3)

Brooklin Secondary Plan

The population in the existing Brooklin Secondary Plan area is expected to increase from approximately 20,000 to approximately 28,000 in the long term. An additional 52,000 people are expected in the expanded urban area (including the new urban lands north and west of existing Brooklin, the Conlin/Anderson residential area and lands that remain deferred in the Regional Official Plan). This would result in a total population for the new Brooklin Secondary Plan area of approximately 80,000 people at full build-out with a population of about 56,000 occurring by 2031.

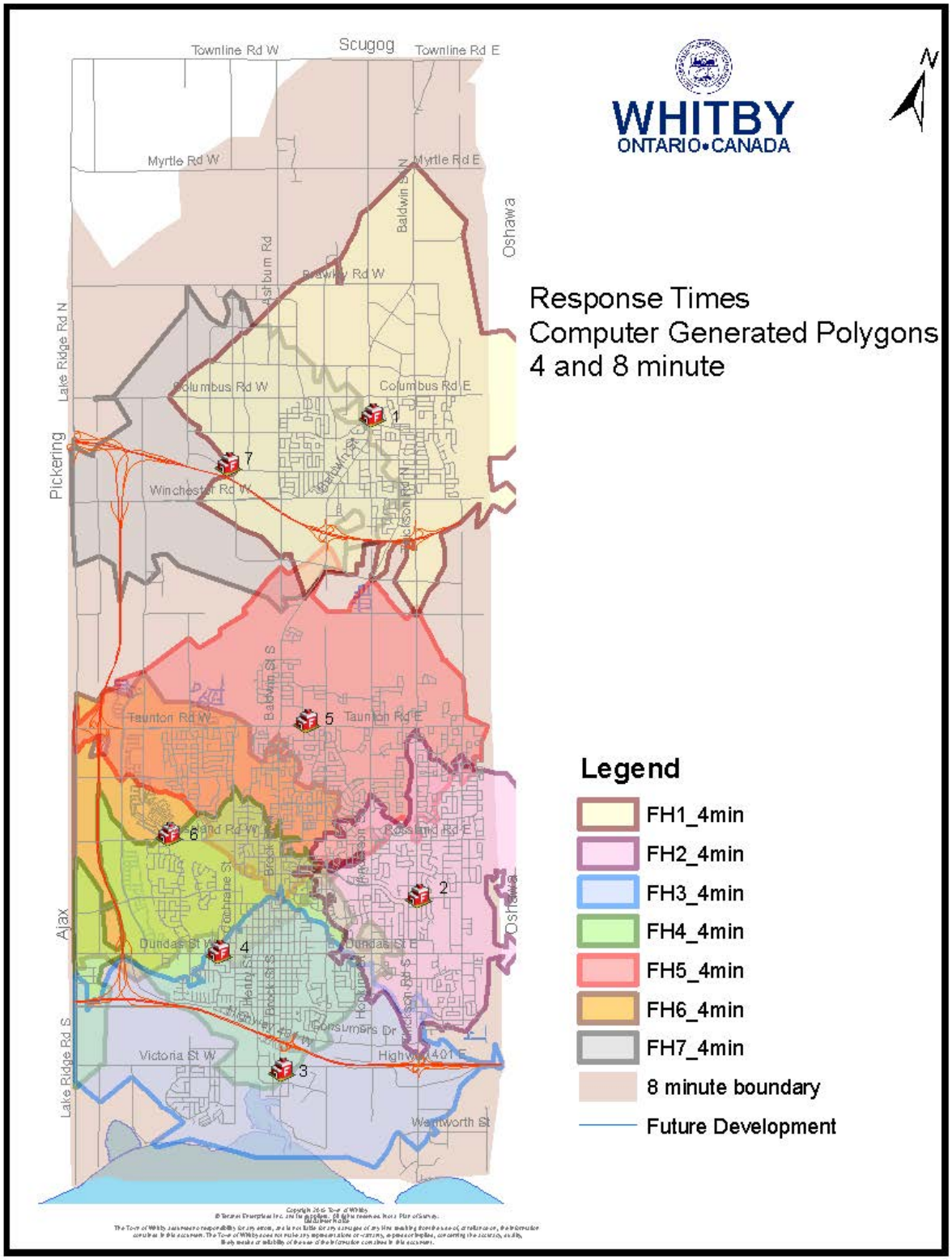
Analysis:

WFES Fire Station #1 is well positioned to serve the existing residents of Brooklin as demonstrated by the initial response coverage area map. However, future growth will be beyond the existing Brooklin Secondary Plan Boundary, and Fire Station #1 four minute initial response coverage area. There will be a need to provide an additional fire station and apparatus in the area West of Brooklin to meet 4 minute travel time targets, as times will increase by up to an additional 3 minutes for a total of 7 minutes. In addition, as emergency responses continue to increase, Brooklin will remain unprotected for concurrent emergency calls.

It is recommended that lands be acquired in the area designated as industrial near Cochrane and Winchester, north of the 407. (2017) (Recommendation #5)

It is recommended that an additional fire station, Station #7, be built on these acquired lands and staffed with 20 additional fire fighters responding on an additional fire apparatus. (2021) (Recommendation #4)

8.23 Figure 23 – Response Times



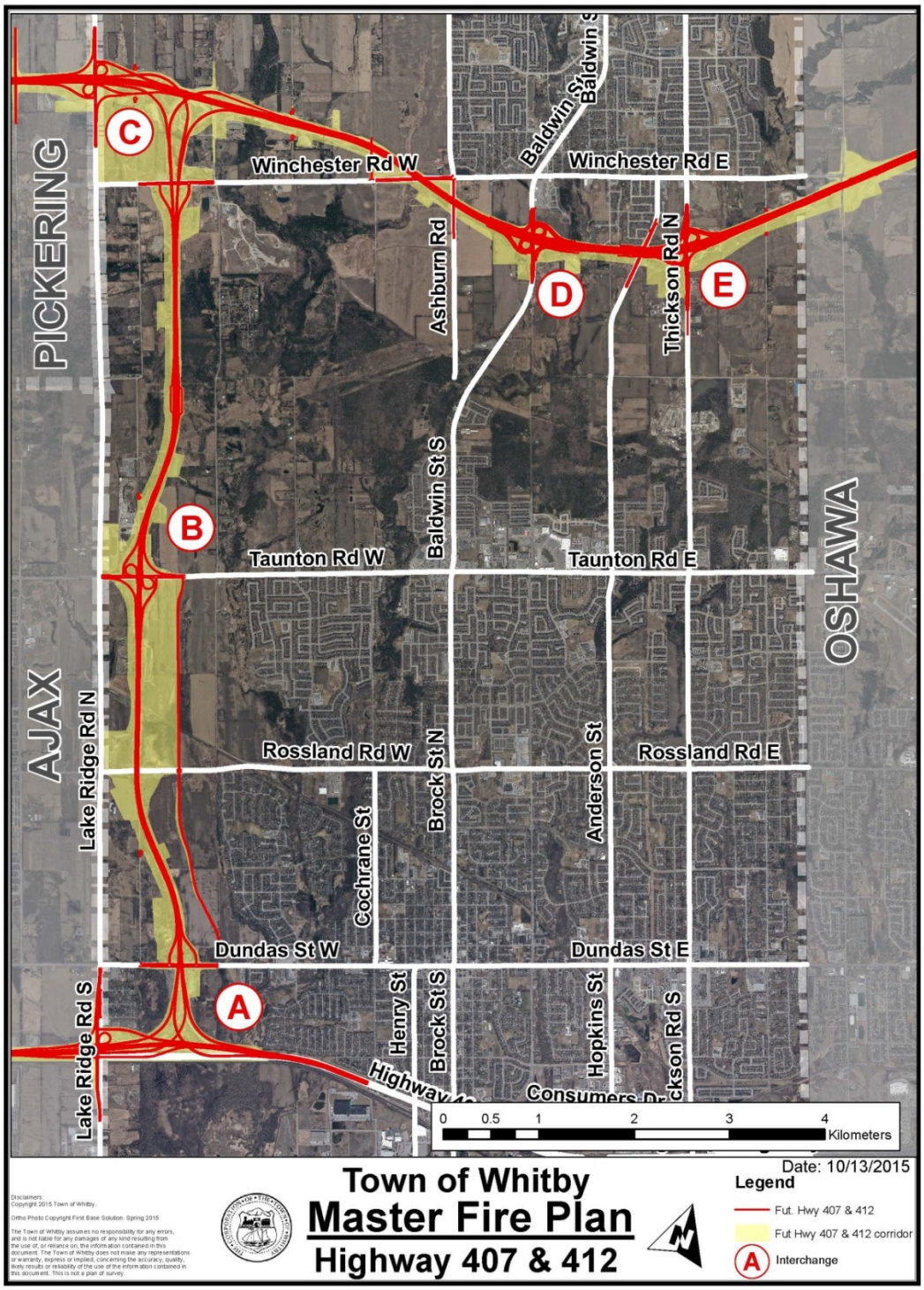
f) Transportation

As the population continues to grow, traffic volume on local streets continues to increase. Over the past 3 years, this additional volume has delayed WFES travel times by an average of 1% per year, with the Brooklin area experiencing the greatest delay at 2.5% per year. As intensification and growth continues WFES' four minute initial travel time zones will shrink reducing the number of houses that can be reached with four minutes.

Highway 407, Highway 412 and Lakeridge Road

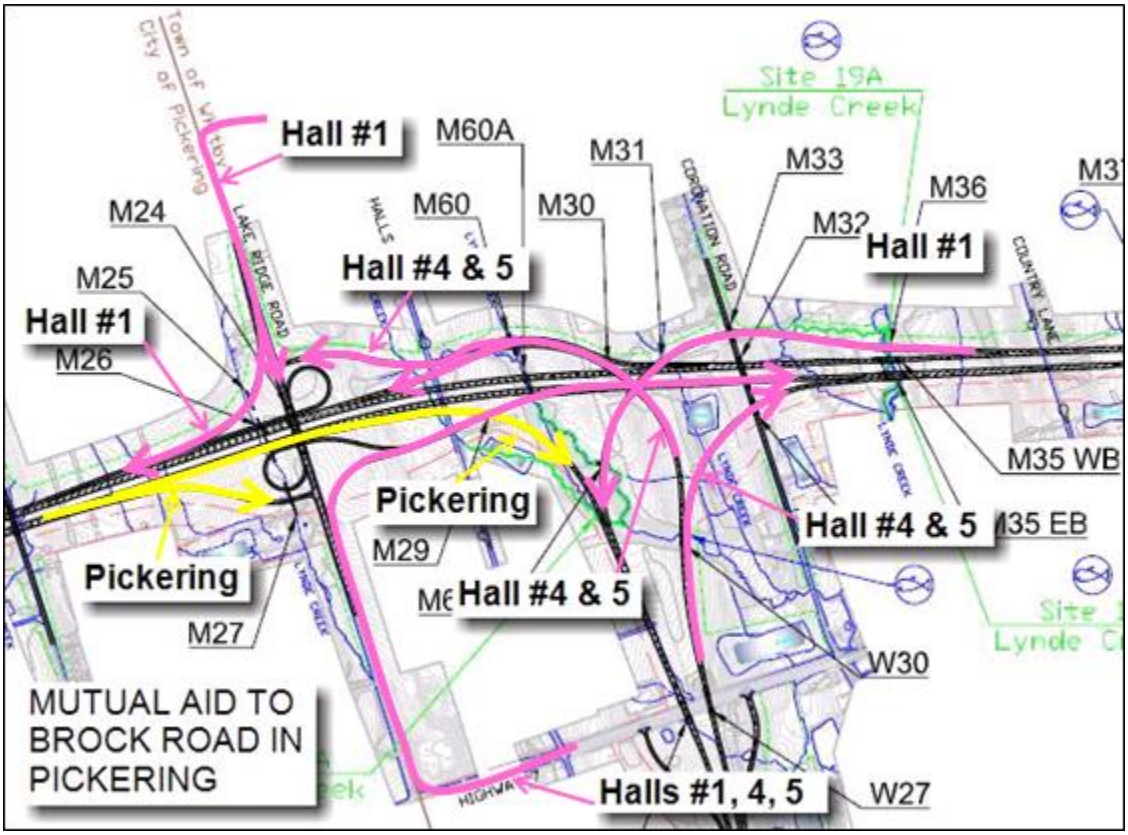
Highways 407 and 412 are expected to open in Spring 2016, along with 401 on and off ramps at Lakeridge Road. The following map illustrates these changes:

8.24 Figure 24 – Highway 412/407

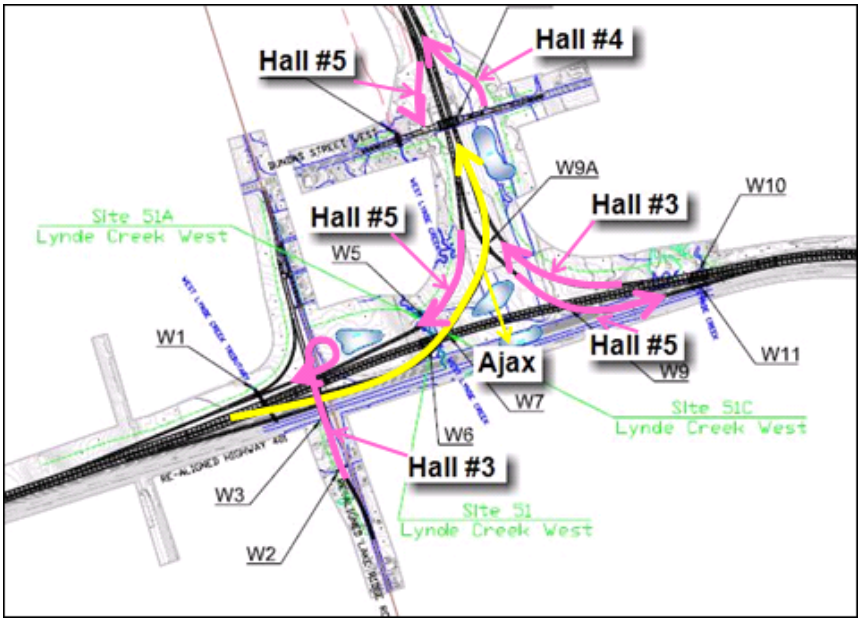


The new on/off interchanges are sizeable structures consisting of numerous ramps, and confusing configurations. It will be necessary for neighbouring Fire Departments to respond to emergency calls on certain sections of these interchanges as WFES will be unable to access them from within Whitby. The following maps illustrate a few of these new interchanges:

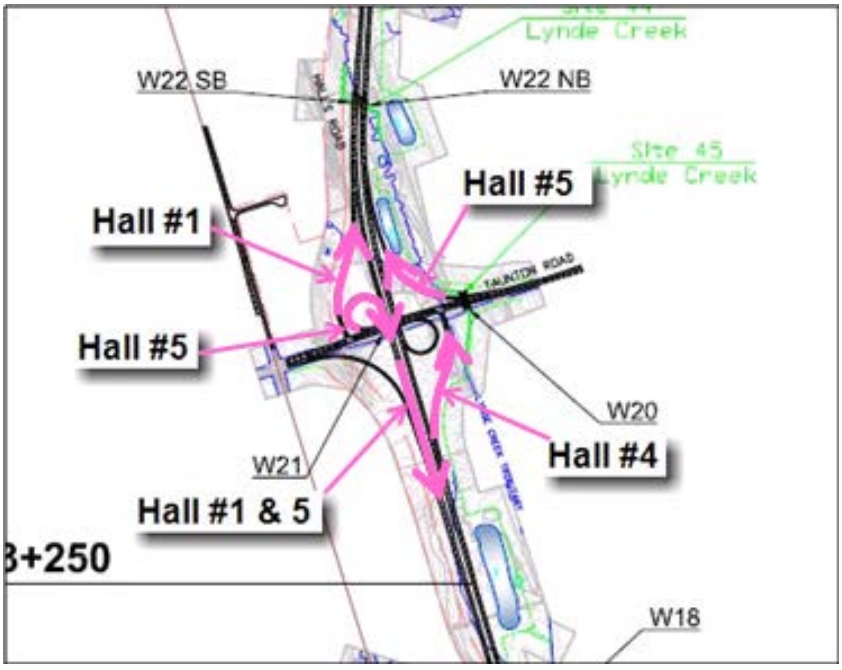
8.25 Figure 25 - Lakeridge/Highway 407 – Highway 412/Highway 407



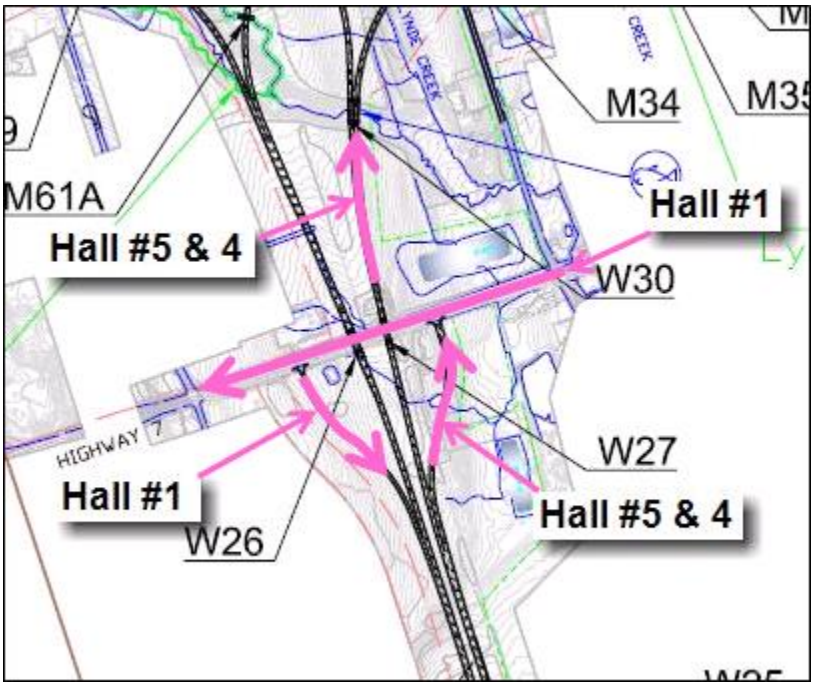
8.26 Figure 26 - Highway 401/412 – Lakeridge/Highway 401 – Highway 2/Highway 412



8.27 Figure 27 - Highway 412/Taunton Road

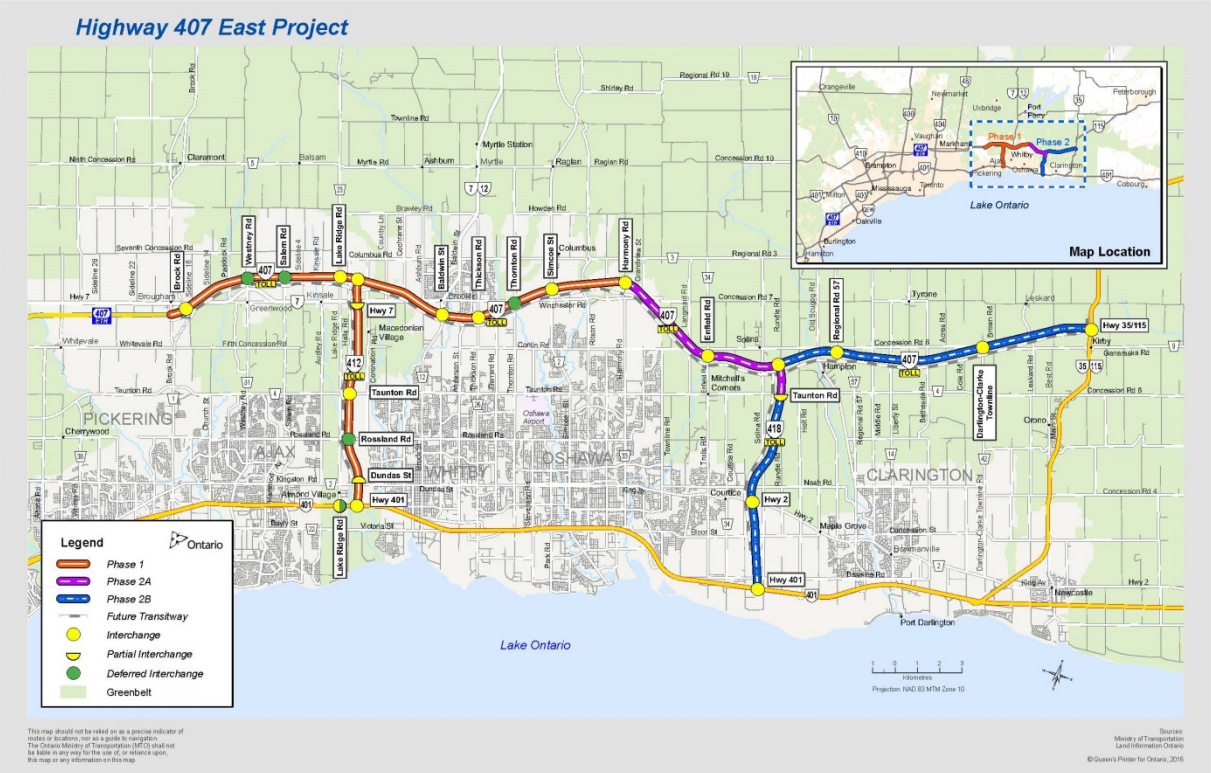


8.28 Figure 28 - Highway 412/Highway 7



WFES will also be required, through a new Automatic Aid Agreement, to respond to the 7 kms of 407 Westbound lanes in Pickering, as it is not possible for Pickering Fire Services to access this stretch of highway from within Pickering. Pickering Fire Services will have to travel into Whitby to access 407 Westbound.

8.29 Figure 29 – Highway 407 East Project



Analysis:

There are significant access limitations that are going to have an impact on WFES response capabilities and times:

- Emergency calls (motor vehicle collisions, hazardous material incidents, medical calls, fires, pedestrians struck, etc.) occurring on Highway 407 Eastbound from Whitby's West border to Baldwin street will not be accessible to WFES vehicles unless they travel to Brock Road in Pickering and enter onto the 407 Eastbound into Whitby.
- This will also be the case for emergency calls occurring on Highway 407 Westbound lanes from Whitby's East border to Thickson Road, with WFES vehicles entering into Oshawa and accessing the 407 West bound at Simcoe Street.
- For WFES crews to respond to emergency calls occurring on Highway 412 Northbound from the 401 Eastbound lanes, WFES will have to travel into Ajax to Salem Road, enter onto the 401 East, and then exit onto the 412 Northbound.
- To respond to emergency calls occurring in Highway 412 Southbound lanes, WFES Crews can only respond via Taunton Road, Highway 407, or Highway 7. This severely restricts response options including long travel times, resulting in long response times, unsafe working conditions for WFES personnel (first arriving apparatus will be working without a blocker vehicle for several minutes), and the removal of a 4 minute initial response time for concurrent emergency calls for all people living north of Rossland Road up to the Northern Town

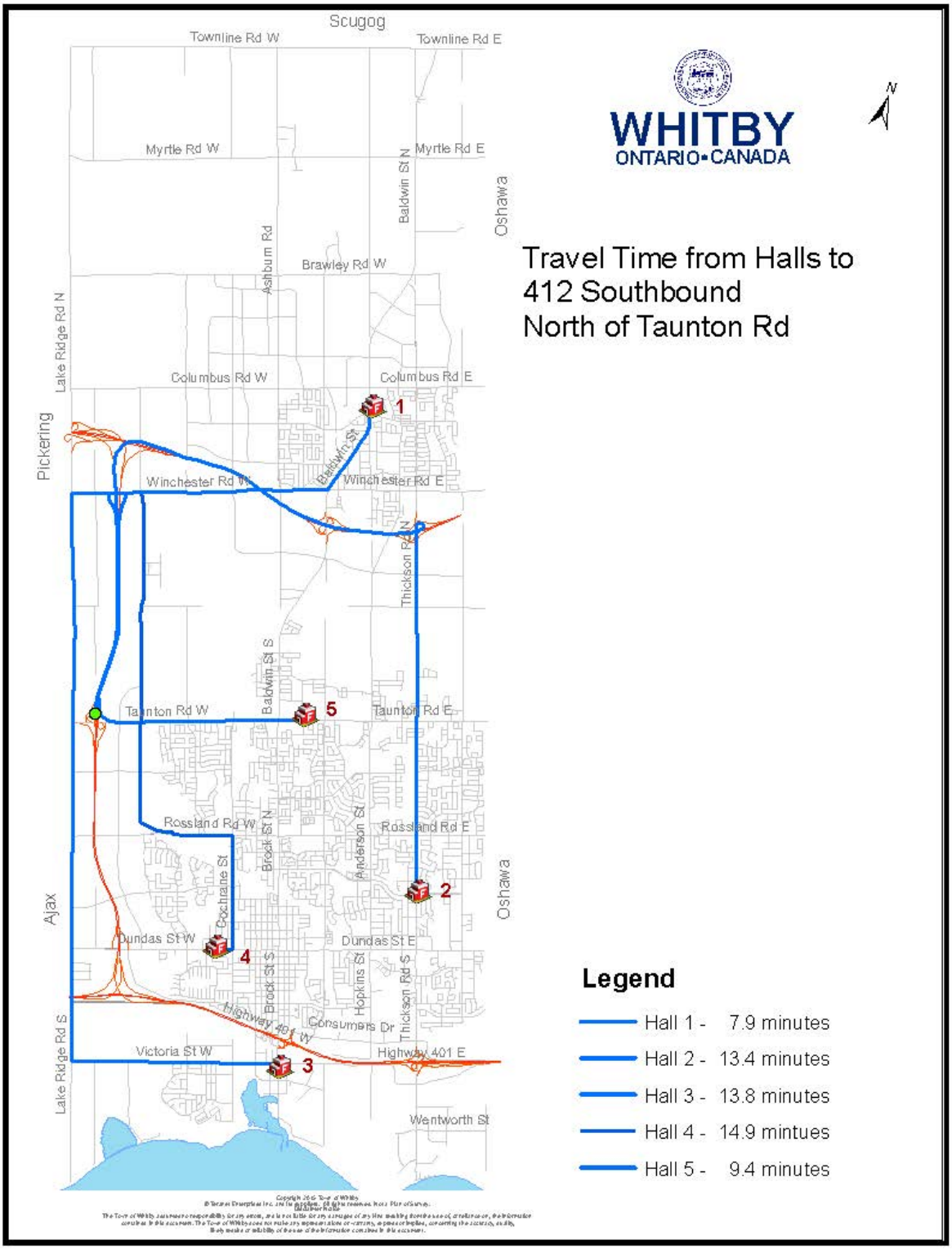
boundary. Initial travel times to Brooklin for all emergency calls each time there is an incident on the 412 will increase from 4 minutes to 8 minutes.

- To respond to Highway 407 emergency calls, the fire apparatus from Station#1 and Station#5 will respond, thereby increasing the initial travel time for all people living north of Taunton Road from 4 minutes, to 8 minutes.
- Should an MVC occur on the West bound lanes under the overpass on Brock Road in Pickering, WFES crews will respond and will have to travel into York Region in order to exit the highway to turn around and proceed back into Whitby. This is a very significant change, as these two committed WFES vehicles will be approximately 13 kms outside of Whitby's borders and unable to respond to Whitby emergencies for an extended period of time.
- Should an MVC occur in the Eastbound lanes of the 407 under the overpass at Simcoe Road in Oshawa, WFES crews will have to travel to Harmony road to be able to turn around and return to Whitby. This is another significant change as WFES vehicles will be unavailable for Whitby emergency calls for an extended period of time.

The following travel time analysis scenarios illustrate this response problem:

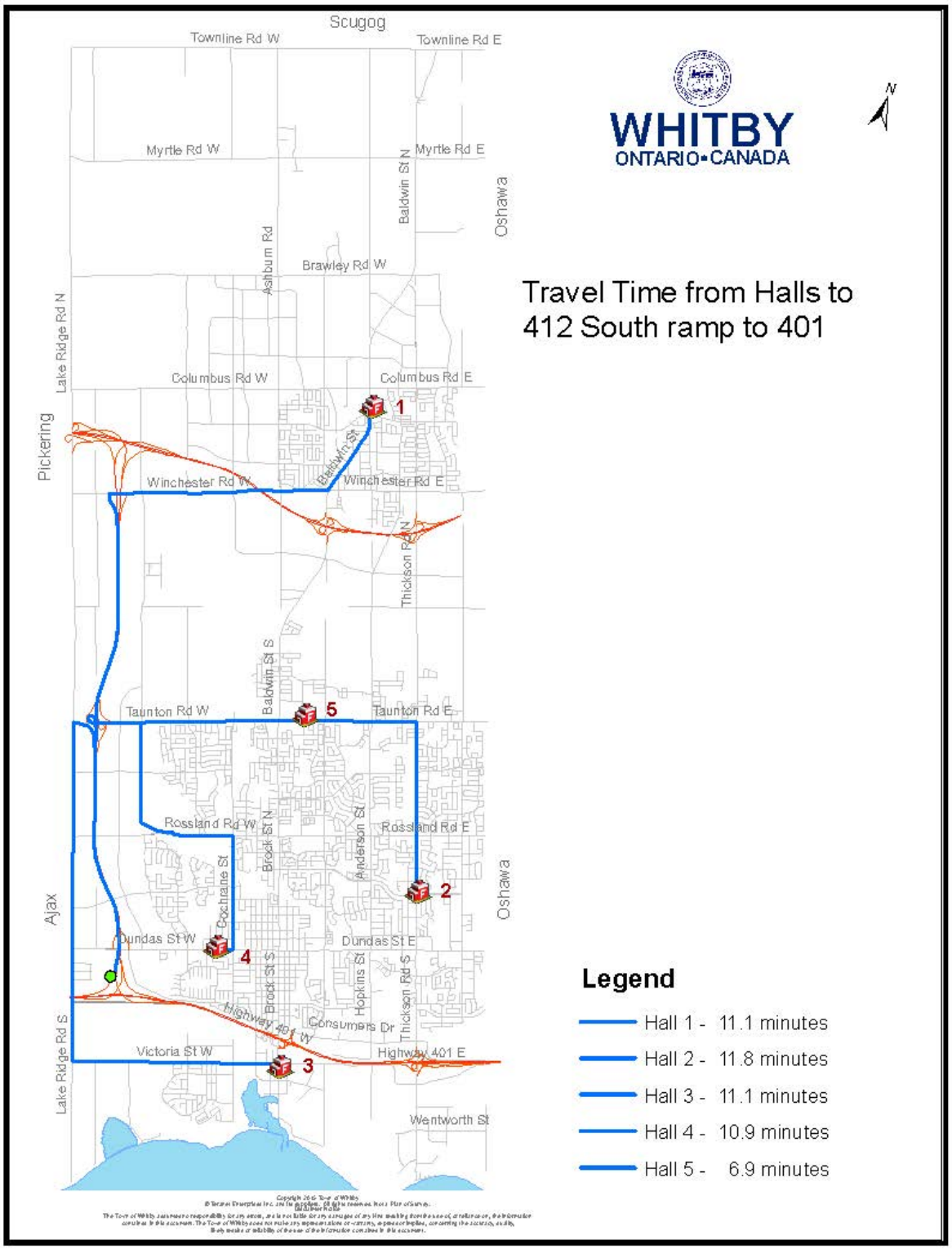
In order to respond to an emergency in the Southbound lanes of Highway 412, North of Taunton, WFES is currently capable of the travel times on the following maps. Station 1 is geographically much further away than Station 5, but is able to arrive 1.5 minutes faster. In this example, fire trucks from Stations 1 and 5 will respond to an MVC in this location, leaving no fire protection to the remainder of the Town north of Taunton Road.

8.30 Figure 30 – Travel Time for Stations to 412 Southbound



Another example to demonstrate this new reality is a response to the Southbound lanes of Highway 412, North of the 401. Station 4 is the geographically closest fire station but is beaten to the emergency scene by over 4 minutes by Station 5.

8.31 Figure 31 – Travel Time from Stations to 412 South Ramp to 401 – Station 1 to 5



It is recommended that the Fire Chief be instructed by Council to approach Pickering, Oshawa, and Ajax to request that they enter into Automatic Aid Agreements with Whitby to provide emergency response coverage for the relevant sections of Highways 407 and 412. With the exception of the agreement with Ajax, these agreements will require that WFES provide response coverage to Pickering's and Oshawa's portions of Highway 407, in the same manner that they will be providing coverage to Whitby's portions. (2016) (Recommendation #2)

With the approval of recommendation #3, an additional apparatus and fire crew will be available to respond from Hall #5 in the short term, and Hall #6 in 2018 to all Highway 412 and 407 emergency responses (2016). (Recommendation #3)

Implementation of this recommendation will result in the following improvements:

- **Improve initial and two truck response times for two trucks on scene to Highway 412 Southbound emergency responses:**

  Initial travel time to 412 Southbound at Taunton will improve by 33% from 7.9 minutes to 5.3 minutes
  Time for two fire trucks on scene at 412 Southbound at Taunton will improve by 16% from 9.4 minutes to 7.9 minutes

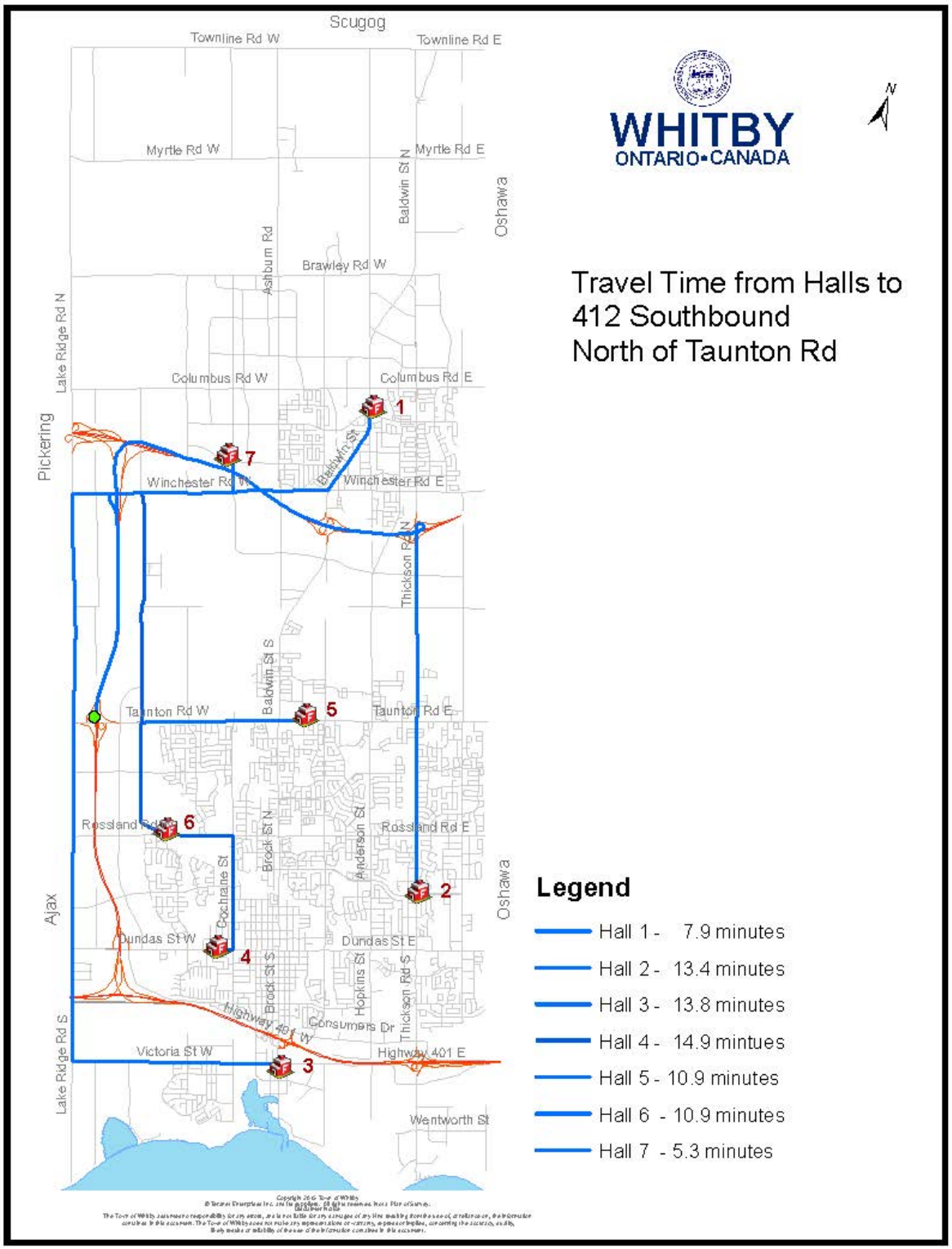
  Initial travel time to 412 Southbound at the 401 will remain at 6.9 minutes.

  Time for two fire trucks on scene to 412 Southbound at the 401 will improve by 37% from 10.9 minutes to 6.9 minutes

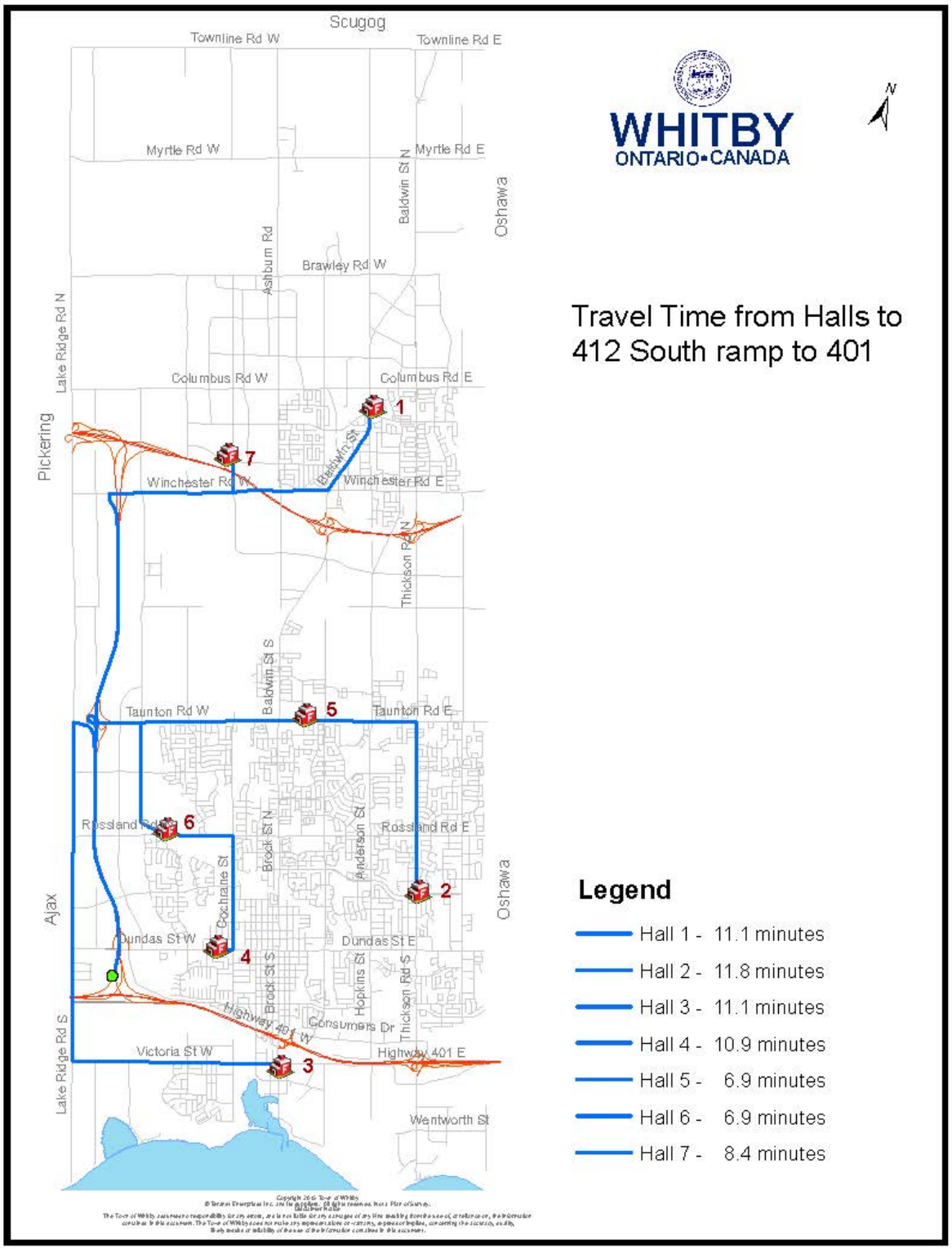
  Once the deferred 412 interchange at Rossland Road is open, Initial travel times to 412 Southbound at the 401 will improve further by an additional 41% from 6.9 minutes to 4.1 minutes.

  Time for two trucks on scene will also improve further by an additional 13% from 6.9 minutes to 6 minutes.

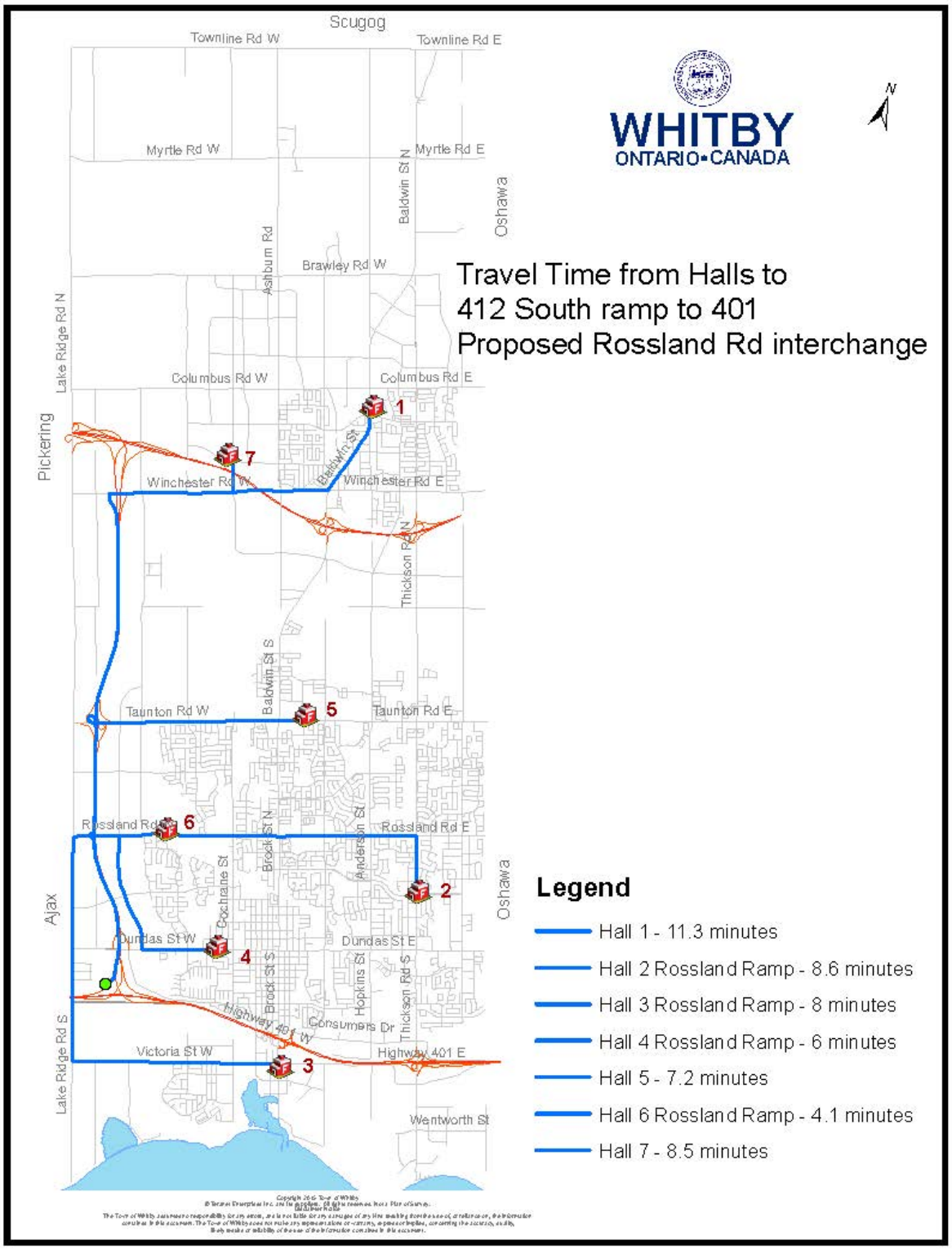
8.32 Figure 32 – Travel Time from Stations to 412 Southbound North of Taunton Road



8.33 Figure 33 – Travel Time from Stations to 412 South Ramp to 401 – Stations 1 to 7



8.34 Figure 34 – Travel Time from Stations to 412 South Ramp to 401 Proposed Rossland Rd Interchange



Further improvements from this recommendation include:

- **Provide a safe working environment for Fire Crews by ensuring a blocker vehicle (2nd vehicle) is on scene faster.**
- **Maintain the 4 minute initial response time for people living in the Station#1 response area (Brooklin) when there are emergency response calls on Highway 412, by keeping the Station #1 pumper in its Station.**
- **Maintain the 4 minute initial response time for people living in the Station #5 response area when there are emergency response calls on Highway 407, by keeping the Station #5 pumper in its Station.**

g) Public Consultation

Public surveys were conducted by MMM Group in July 2011 to solicit input about WFES and the level of services provided. Following is a summary of the significant findings:

Agree or disagree that Whitby is well-served by WFES.

46% agreed

31% strongly agreed

8% were neutral

4% strongly disagreed

3% were not sure

Identify any community changes that may necessitate WFES improvements. (Top three answers):

74% growth

68% transportation

53% aging population

Identify which elements of the Fire Service could benefit from improvement:

38% identified increasing the number of firefighters responding to emergency calls

30% identified public education efforts

Additional suggestions for improvement:

More school programs, greater focus on senior citizens

Improve access to Fire Prevention Officers for follow up questions

More fire hall open houses

More information on fire pits/chimneas

More education on road rules for approaching emergency vehicles

Better education on carbon monoxide

Check fire hydrants during winter months to ensure they are free of snow

Specialized firefighters trained as paramedics

EMS based in fire halls

Section 8 Analysis Summary:

- Increasing residential population = increase in emergency response calls
- Aging, vulnerable population = increase in medical calls
- Modern, lightweight construction = faster developing fires, faster building collapse, increased risk for occupants and firefighters, increased demand for pro-active public education and fire prevention programs
- Increasing subdivision density = increase in fire exposures and fire spread
- Growth in road network = increase in motor vehicle collisions
- Geographically expanding urban development = longer emergency response times
- Increase in industrial building stock = need for more specialized training
- Top two HIRA risks are hazmat and transportation emergencies = need for more specialized training
- Increased demand for WFES services
- Response challenges with 407/412 = response delays, town left vulnerable

Whitby's residential population will increase by 46% by 2031 from 131,976 to 192,860. The number of residential units will increase by 29,000 units in this same period of time. New subdivisions will be high density and will utilize lightweight construction. 40% of this new construction will occur within existing built up areas, while 60% will occur in greenfield space.

For WFES, this means that there will be more emergency response calls of all kinds. Medical calls will continue to increase as the population ages. Fires will be fought within higher density neighbourhoods, in lightweight structures, and in areas beyond Fire's initial four minute response time. There will be 29,000 more residential structures which will generate greater demand for emergency services.

The 407 and 412 will result in more MVCs for WFES to respond to, preventing resources from being available for other calls in the Town. Access challenges will cause long response times to emergency calls.

West Whitby and North Brooklin residential developments are outside of the 4 minute initial response times, resulting in a lack of initial response coverage for all emergencies in these areas.

The HIRA identifies transportation and hazmat emergencies as two of the calls that represent the greatest risk to the Whitby community. This HIRA was developed without

the 407 and 412 in mind. Inclusion of these highways will further underline the risk of these transportation/hazmat emergencies.

9 Legislation

The development and delivery of fire protection services is a responsibly that lies with Municipal Council as a whole. The Fire Protection and Prevention Act, 1997 (FPPA), is the statute that governs fire protection services within the Province. This Act provides parameters for municipal governments in identifying their fire protection requirements.

The Act further outlines the powers and duties of the Fire Marshal. Powers such as the ability to monitor and review municipalities on the delivery of fire protection services and the issuance of Fire Marshal Directives and Public Fire Safety Guidelines are examples of direction and oversight by the Fire Marshal.

In exercising these duties and powers, the Office of the Fire Marshal and Emergency Management (OFMEM) acts as the principal adviser to both municipalities and fire departments on various aspects of fire protection services. In doing so, the OFMEM has established a basic principal as guidance:

The Three Lines of Defence (in order of priority):

i- Public Education and Prevention;
ii- Fire Safety Standards and Code Enforcement
iii- Emergency Response

As support, the Fire Marshal may appoint member(s) of the fire service as Assistants to the Fire Marshal to apply provisions of the Act and regulations relating to public fire safety. In WFES, there are seventeen (17) staff members that have received such appointment. The Fire Chief and members of the Fire Prevention Division, given their roles in the fire department are appointed Assistants by way of statute. Other members include the two Deputy Fire Chiefs, four Platoon Chiefs and four Acting Platoon Chiefs as per the recommendation of the Fire Chief.

In addition, the Fire Marshal has the authority to issue Directives to be followed by Assistants to the Fire Marshal while executing their authority under the Act.

At a municipal level, Council has enacted Bylaw 6834-14, A By-law to Establish and Provide for the Management of Whitby Fire and Emergency Services which outlines the service levels to be provided within the Municipality.

Notwithstanding the statutory requirements of the FPPA, WFES must also comply and adhere to other statues which require ongoing attention and require speciality skill sets from staff to ensure ongoing compliance. The following legislation has an impact on WFES on an ongoing basis;

- Ontario Fire Code
- Occupational Health and Safety Act

- Emergency Management and Civil Protection Act (EMCPA)
- Ontario Building Code Act and Regulations
- Accessibility for Ontarians with Disability Act
- Municipal Act
- Dangerous Goods Transportation Act
- Building Code Act
- Highway Traffic Act
- Provincial Offences Act
- Coroners Act
- Day Nurseries Act
- Employment Standards Act
- Fire Protection and Prevention Act (F.P.P.A.)
- Labour Relations Act
- Municipal Freedom of Information and Protection of Privacy Act
- Pesticides Act
- Development Charges Act

9.1 Statutory Requirements

Following is a more detailed look at some of the Acts and Regulations with which WFES must comply.

Fire Protection and Prevention Act

In exercising their authority to interpret the Fire Protection and Prevention Act (FPPA), the Office of the Fire Marshal and Emergency Management (OFMEM) has identified four minimum requirements that Fire Departments must do as part of delivering fire protection services.

- Public Education
- Fire Prevention / Inspections upon complaint or request
- Simplified Risk Assessment
- Smoke Alarm program

Vulnerable Occupancies (O/Reg 364/13)

Fire services must conduct annual inspections of Vulnerable Occupancies as defined in the Regulation. As part of the inspection procedure, a review of the fire safety plan and participation in a fire drill is required.

Mandatory Assessment of Complaints and Requests for Approval (O/Reg 365/13)

The Chief Fire Official must assess all fire safety related complaints and requests to evaluate if a fire safety inspection is warranted.

Fire Marshal Directives

2014 – 01 – Registry of Vulnerable Occupancies

Upon inspection of a Vulnerable Occupancy as defined by the Ontario Fire Code, the Assistant to the Fire Marshal must register the inspection with the OFMEM

2014 – 02 – Vulnerable Occupancies – Fire Drill Scenarios, Fire Drill Observations, Fire Safety Inspections

An Assistant to the Fire Marshal must review the annual fire drill scenario

2014 – 03 - Inspection of Buildings

The Chief Fire Official must assess all fire safety complaints/requests for Fire Code compliance.

Occupational Health and Safety Act – Section 25

As employers, the Town of Whitby, and as an extension, WFES, must provide a safe working environment. This is accomplished in part through:

- the development of and adherence to Operational Guidelines,
- sound training practices and programs, including a Respiratory Protection Program,
- creation and participation in a Joint Health and Safety Committee
- daily inspections of equipment and vehicles, along with a reporting system to identify and remove from service anything found to be unsafe.

Emergency Management and Civil Protection Act – (EMCPA)

Section 3 of the EMCPA requires every municipality to formulate an emergency program and plan governing the provision of necessary services during an emergency and the procedures under and the manner in which employees of the municipality and other persons will respond to the emergency. The Council of the municipality shall by by-law adopt the emergency plan

Furthermore, each municipality shall designated a co-ordinator (CEMC) and review their plan on an annual basis.

Ontario Building Code Act

The Fire Prevention Division staff act as Building Inspectors for the Town as per Bylaw 5951-07. Fire Prevention Officers have completed the two required courses mandated by the Provincial Government and are issued a BCIN number which allows them to review and approve building plans. The areas the Fire Prevention Division looks after on the Building Permit process includes:

- Fire Alarm systems
- Sprinkler and Standpipe Systems
- Fire Hydrants
- Special Fire Extinguishing systems
- Kitchen Hood and Fire Suppression Systems.

Once received by the Building Department, plans are required to be reviewed and approved so that the Building Department can issue the permit according to the Building Code Act.

As per S.O.G 1507, the following review times are allotted based on OBC timelines.

OBC	**FIRE REVIEW**
10 days	3 days from receipt of plans
15 days	5 days from receipt of plans
20 days	7 days from receipt of plans
30 days	12 days from receipt of plans

Analysis:

WFES is meeting the minimum provisions of required legislation. However, due to increasing demands, including requirements added in 2013 and 2014 to perform inspections based on complaint and request, and to conduct inspections of vulnerable occupancies and associated fire drills and fire safety plan reviews, the Fire Prevention Division has had to place pro-active inspections in abeyance (including schools, industrial buildings, residential high rise buildings, large assembly occupancies, hotels, motels, and others). These occupancies will only have fire safety inspections conducted re-actively upon receipt of complaints and requests.

Application of the Occupational Health and Safety Act is fluid and requires daily measurement and evaluation. The Act touches all aspects of daily activities within WFES. One requirement is to have a Respiratory Protection Program to govern the use of breathing air from when it is condensed and captured through to how it is used during a fire emergency. The current Program is currently under review as it is due to be updated.

9.2 Municipal By-laws and Agreements

By-law 6834-14 establishes the level of service WFES provides to the community. The by-law provides the authority to the Fire Chief to take all proper measures for the prevention, control and extinguishment of fires, for performing auto extrication and ice/water rescues, for attending hazardous material incidents, for the protection of life and property, and for enforcing all Municipal by-laws imposed on him by the Fire and Prevention Act, the Fire Code and any other relevant legislation.

Council has also provided the authority for WFES to participate in the Durham Region Mutual Aid program. Mutual Aid plans allow a participating fire department to request assistance from a neighbouring fire department authorized to participate in a plan approved by the Fire Marshal. Mutual Aid may be requested when a Fire Department's resources have been depleted. Assistance is reciprocal with no fees involved for Mutual Aid. WFES, through by-law 3461-94, participates in the Durham region Mutual Aid program.

Council has also authorized WFES to participate in Automatic Aid. Automatic aid is generally considered as a program designed to automatically provide and/or receive assistance from the closest available resource, irrespective of municipal boundaries, on a day-to-day basis. Automatic aid, unlike Mutual Aid, is not intended to be provided at no charge to the municipality receiving the assistance. Currently, WFES has two Automatic Aid agreements with the City of Oshawa and Town of Ajax to serve the Eastbound and Westbound lanes of the 401. These are reciprocal agreements with no charges to any of the municipalities.

By-law 6990-15, Emergency Management Program and Plan has been adopted by Council to meet requirements of EMCPA. The Emergency Management Plan also encompasses the Durham Region Nuclear Management Response protocol. The Emergency Management Plan also takes into consideration business continuity and evacuation protocols. In respect to continuity of operations; an alternate operations centre at the Brooklin Community and Library has been established. Furthermore, to accommodate displaced residents, an MOA has been established with the Abilities Centre of Durham Region to accommodate, on a short term measure, displaced residents.

9.3 Figure 35 - Additional by-laws impacting WFES include:

Accessory Apartment Bylaw	#6312-10
Administration of the Building Code Act	#5718-05
Business License	#5545-04
Fire Routes	#4084-97
Fireworks	#6339-10
Fortification	#5870-06
Outdoor Burning	#51-74
Preconsultation	#5967-07
Site Plan control	#5846-06

Interagency Agreements are contracts between participating municipalities, clearly defining the responsibilities, terms, conditions, and all other aspects of the services provided and/or required. Whitby currently has the following Council approved Agreements:

- Durham Regional Medical Tiered Response agreement (May 2008). WFES responds to respiratory arrest, cardiac arrest, unconsciousness, motor vehicle collision and profuse and uncontrolled bleeds incidents.
- Fire Dispatch (February 2013). Oshawa Fire Services provides fire dispatch services to the Town of Whitby through a centralized communication system.
- Propane Fire Trainer (January 2008). A propane-fueled live fire training device located at Oshawa Airport was jointly purchased and is maintained and operated by Oshawa, Whitby, Clarington and Durham College.
- Interoperable Radio System (July 2012). An interoperable radio system was jointly purchased and is maintained by Durham Region, DRPS, and all Municipalities in Durham Region.

Analysis:

Per the FPPA, the intent of Mutual Aid agreements is for use during extraordinary situations that require resources beyond what the department can provide. Recent examples of these situations include the Fairview Lodge fire and the Downtown Whitby fire. Due to its staffing levels, WFES is not using Mutual Aid in this manner. WFES uses it as part of its response to every residential structure fire. Response to a residential fire requires a minimum of four apparatus, leaving only one apparatus available to respond to all other emergency calls. Mutual Aid is activated to provide a second apparatus from Oshawa or Ajax to proceed to Whitby Fire Station #5 to standby in preparation for pairing with Whitby's remaining apparatus for any other emergency calls requiring multiple apparatus. Should WFES continue to utilize Mutual Aid for every structure fire, it is possible that Oshawa may refuse to standby at Whitby Hall #5, and only travel to Whitby in response to an emergency call. This change will result in delayed responses to Whitby calls.

There is no Agreement in place to have Oshawa provide Operations and/or Advanced response for Trench, Rope, Confined Space, and Building Collapse emergency responses. Whitby does not experience sufficient numbers of these types of emergency calls to justify the expense and time required to maintain the necessary skill and equipment to respond to them. Oshawa Fire Services does provide these services and will respond to them for a fee for service.

The live fire burn unit in Oshawa does not provide the quality or level of live fire training that is needed for today's fire fighting. In addition, apparatus and crews training at its location, respond to emergency call in Whitby from Oshawa, resulting in a delayed response.

The additional fire apparatus and Fire Crew will eliminate the need to activate Mutual Aid with Oshawa Fire for every residential structure fire in Whitby. (See Recommendation #3)

9.4 Council Approved Services provided by Whitby Fire and Emergency Services

WFES provides service levels under the authority of Town of Whitby By-law #4202-98, being a By-law to establish and provide for the management of Whitby Fire and Emergency Services. Under the by-law, WFES provides the following services:

- Performing automobile extrication
- Performing water/ice entry based rescue
- Attending hazardous materials incidents
- Preventing, controlling and extinguishing fires
- Protecting life and property

- Enforcing all Municipal by-laws respecting fire prevention

The by-law has been amended under By-law #6078-08 to change the title of “Assistant Chief” to “Deputy Chief”, and under By-law #6834-14 to change the wording of ‘land based water rescues’ to ‘water/ice entry based rescue’.

Analysis:

By-law #4202-98 does not provide enough detail about the type and level of service WFES provides to the community. “Protecting life and property” is a general term that should be expanded. There is no mention of responding to medical calls, nor to the type of medical calls and the level of service provided. Responses to hazardous materials incidents do not specify the level of response (Awareness, Operational, Technical). Extinguishing fires does not include a description of the level of service provided including interior, offensive fire ground operations, the Incident Command model, etc.. “Preventing fires” does not dictate the level of prevention that is expected, including whether or not WFES should be conducting pro-active inspections of higher risk properties.

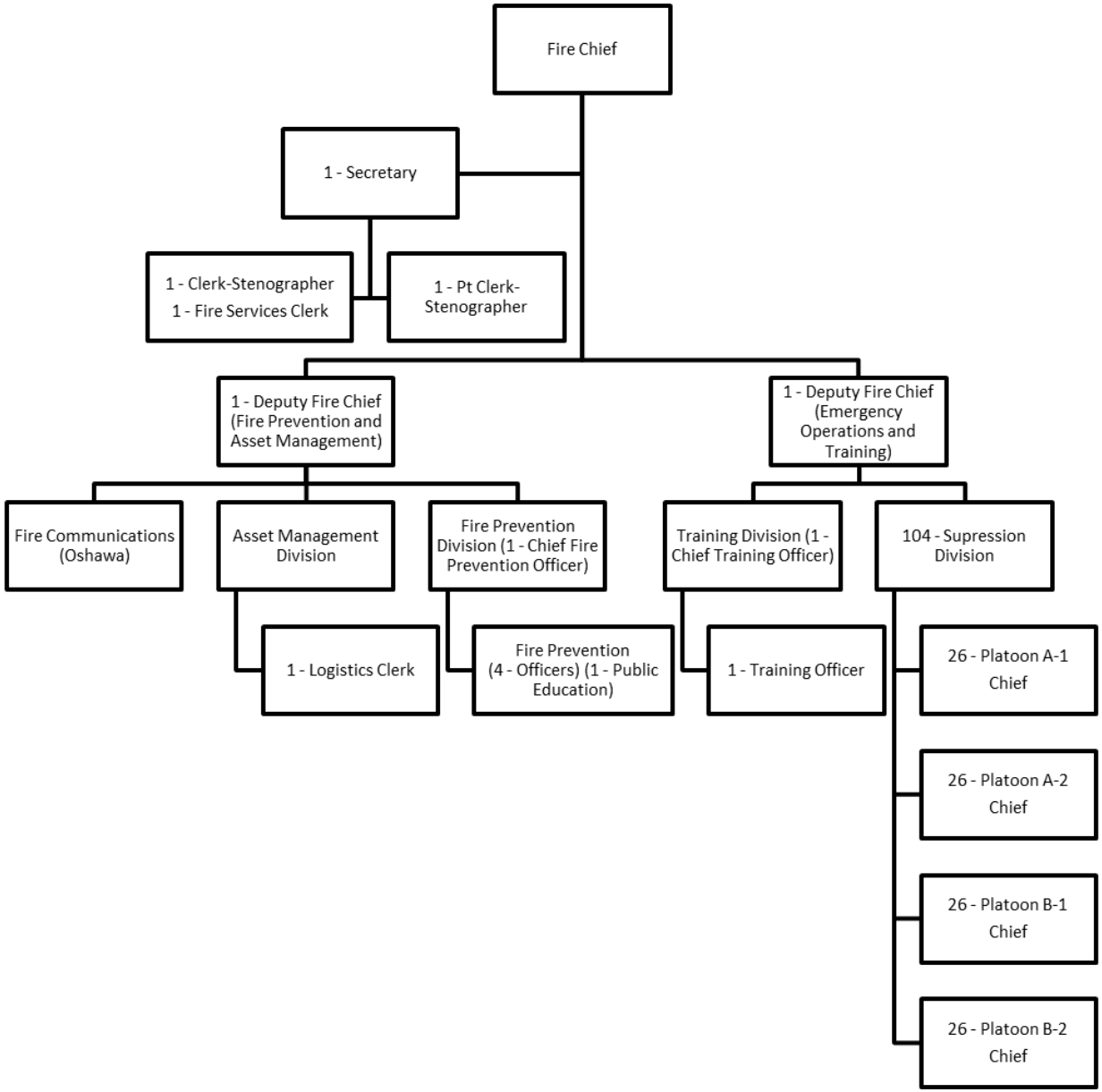
It is recommended that, following approval of this MFP, By-law #4202-98 be revised to include language that specifies in greater detail the level of service provided by WFES. (2016)

10 Administration

10.1 Divisions and Organizational Chart

As per By-law 4202-98 Whitby Fire and Emergency Services is divided into the following 4 Divisions.

- Administration
- Training and Maintenance
- Fire Prevention and Communication
- Firefighting


Fire Chief
1 - Secretary
1 - Clerk-Stenographer
1 - Fire Services Clerk
1 - Pt Clerk-Stenographer
1 - Deputy Fire Chief (Fire Prevention and Asset Management)
1 - Deputy Fire Chief (Emergency Operations and Training)
Fire Communications (Oshawa)
Asset Management Division
Fire Prevention Division (1 - Chief Fire Prevention Officer)
Training Division (1 - Chief Training Officer)
104 - Supression Division
1 - Logistics Clerk
Fire Prevention (4 - Officers) (1 - Public Education)
1 - Training Officer
26 - Platoon A-1 Chief
26 - Platoon A-2 Chief
26 - Platoon B-1 Chief
26 - Platoon B-2 Chief

10.2 Committees

Members from WFES participate in the following Departmental and Town Committees (* denotes mandatory)

- Joint Health and Safety *
- Labour Management *
- 24 hour *
- Emergency Management *
- Wellness*
- Research and Development
- Senior Management
- Fitness
- History
- Municipal Information Systems
- Amanda Working Group
- Corporate Asset Management
- Accessibility
- Sustainability

Analysis:

Not all existing committees are legislatively required. In some cases there is an excessive amount of time dedicated to committee work, which precludes staff from completing core duties, projects, and other priorities.

There is no project manager role that can be utilized to conduct the work that comes out of the committees. It is spread amongst existing employees whose workload does not allow them the capacity to complete it in a timely fashion, or it is completed utilizing overtime costs.

It is recommended that an internal information mapping process be conducted to analyze information flow throughout WFES to identify the necessity of the existing committees and whether there are any unmet information needs. (2017) (WFES Action – K)

10.3 Administrative Support

The Administrative Division is comprised of one full-time Secretary, two full-time Clerk Stenographers, and one part time Clerk Stenographer who report to the Fire Chief. There is also one full-time Logistics Clerk who reports directly to the Deputy Chief.

Analysis:

An increasingly growing portion of the administrative work involves the coordination of projects. Examples in the past 12 months include the transition to a 24 hour Suppression shift, re-design of the Emergency Management Plan, coordination of social media and website inputs, tracking and analyzing attendance patterns, working with MIS to design the IntraFireNet application for Fire, and participation on committees including the Vision/Mission Committee, Master Fire Plan Committee, MIS Committee, and Research and Development Committee. These projects are not found within the duties listed in the JIQs of Administration staff, however staff have traditionally agreed to take them on because there are no other positions with time available to do so. There is no position that deals specifically with the coordination and facilitation of projects, and without Administration staff, these projects would not be completed.

The position titles of Secretary, and Clerk Stenographer are outdated titles that no longer reflect the duties of the Administration positions.

It is recommended that an internal information mapping process be conducted to review information flow throughout the Department and to help identify responsibilities of Administration staff. (2016) (WFES Action – L)

It is recommended that a Project Management/Information Analyst position be created and added to the Management group in WFES to work with the Chief and Deputies, and with Administration staff to coordinate projects, conduct information process mapping reviews, improve efficiencies, and establish and measure Key Performance Indicators (KPI's) on an ongoing basis. (2017) (Recommendation #6)

It is recommended that the JIQs of Administration staff be revised to reflect current duties and resubmitted to the JIQ Committee for re-evaluation. (2016) (WFES Action – C)

It is further recommended that the Part-time Administration Clerk position become full-time in order to provide the administrative capacity necessary to support the additional staff, additional call volume, and additional process and programs that will developed. (2019) (Recommendation #6)

10.4 Communication and Information Processes

Whitby Fire & Emergency Services work is currently directed through Standard Operating Guidelines (SOGs) approved by the Fire Chief, Memorandums from Senior Management, and Training Notes and Memos from the Chief Fire Prevention and Chief Training Officers. These Memos and Notes are delivered electronically through the Town's email system. In addition, Suppression Platoon Chiefs and Captains provide daily verbal instruction in a face to face manner, and via an interoperable radio system both during and outside of emergency calls,

Whitby Fire and Emergency Services has a manual consisting of Standard Operating Guidelines (SOGs), a commonly used system in the fire service.

Standard Operating Guidelines provide a framework for operation within the Department to ensure personnel are adhering to safe consistent procedures. The SOGs have been developed to be consistent with the guidelines recommended by the various agencies of fire protection in the Province, including Occupational Health and Safety/Section 21 Guidance Notes. These procedures are reviewed and amended as necessary and approved by the Fire Chief.

Analysis:

Communication throughout the Department is done in a traditional manner via emails, SOGs, and face to face/radio instruction. The Training Division delivers certain training components remotely through Web Based Training to fire stations. WFES is looking to expand upon this method of training moving forward.

Messages do not always get through to everyone due to shift work, communication methods, and limited access to computers.

The Project Manager/Information Analyst will explore information and communication processes throughout the Department on an ongoing basis in order to improve efficiencies, lower costs, and improve service levels. (Recommendation #6)

10.5 Administrative Programs

There are a host of processes established to move information throughout the Department. Some of these processes include the requirement to complete hard copy forms and obtain signatures from multiple bodies. There are also a large number of electronic process to ensure legislative requirements are met.

WFES works with the Town's Municipal Information Services (MIS) Department to review processes and develop technology to improve process efficiencies. One such recent improvement has been the development of "IntraFireNet" to address the needs related to asset management, training, and personnel records.

Areas of improved efficiency include:

- Overtime tracking and reporting
- Vehicle, equipment, and medical inventories
- Daily and weekly inspections and checks
- Specialized reporting including radios and cylinders
- Repair entry, updates, tracking, and reporting from multiple users
- Training tracking and reporting
- Attendance reporting

Analysis:

These custom made programs have made the recording and tracking of information much easier, including the ability to generate reports. This approach of using IT to develop these programs has not just benefited the Fire Department; other departments within the Town have been looking at incorporating similar programs into their departments to improve efficiency. In addition, other Fire Departments within the Region, and DEMO have also expressed an interest in these programs and have visited Whitby to view them.

However, there is a balance between control/monitoring of information, and efficiency. Some of the existing processes are too controlling and inefficient, while others are very efficient, but without sufficient controls. Processes have evolved independently of each other over a long time, without being examined holistically to identify areas in need of change. A process mapping/service review has not been completed.

The Project Manager/Information Analyst will conduct information process mapping/service reviews on an ongoing basis. (Recommendation #6)

10.6 Quality Assurance

A) Departmental performance measures

Being able to reliably measure performance outcomes is an important component in determining service levels. One of the Core Values of WFES states that “We are dedicated to excellence in every aspect of the service we provide to the public”. Currently, there are limited performance measurement tools in place to define if this “excellence” threshold is met.

Existing measures:

Suppression

- Dispatch times, turn out times, travel times, response times, number of fire related injuries, fire dollar loss. These can be measured against National Fire Protection Standards and year over year numbers.

Fire Prevention

- The amount of time before an inspection complaint or request be addressed, and the amount of time before it can be closed due to compliance.
- Ability to meet legislative and by-law requirements, and community expectations.
- The number of fires in the community year over year

Training

- Results from skills assessment programs including: practical skills assessment for pre 1st Class firefighters, promotional exams, driver training results, EMR – medical training results

Administration

- Positive or negative feedback from those that are served both internally and externally

B) Individual Performance Measures

It would be difficult to achieve a standard of performance excellence as an organization without first ensuring individual performance excellence. It is important for people to receive feedback about their performance so they understand where their strengths and improvement areas lie. This is true for all positions at all levels of the organization including the Chief, Deputies, and other Senior Officers. Providing performance feedback is also important in order to prepare people for future leadership positions. Currently, there is no individual performance measurement/feedback system in place.

Analysis:

There are few measures in place to determine if the community's needs are being met. Without these measures, it is difficult to ascertain the effectiveness of the Department in realizing its vision and mission. This is not uncommon throughout the Fire Service.

There is also no internal performance development/feedback system in place to assist in staff development, and to help ensure crew safety and quality of service delivered. Without this system, it is difficult to determine the needs of individuals to help realize the Department's Vision and Mission, to help reinforce the Department's Core Values, and to prepare individuals for future leadership roles.

One such system is the Commission on Fire Accreditation International (CFAI). This system allows fire and emergency service agencies to compare their performance to industry best practices through accreditation. Accreditation is a comprehensive self-assessment and evaluation model that enables organizations to examine past, current, and future service levels and internal performance and compare them to industry best practices, thereby leading to improved service levels.

The Project Manager/Information Analyst will work with Senior Divisional Staff to identify Departmental Performance measures, and to create a system to monitor these measures, as well as implement improvements. Consideration should be given to becoming accredited through the CFAI accreditation process. (Recommendation #6)

The Project Manager/Information Analyst will be involved in the development of an internal individual performance appraisal system to help ensure that WFES is

providing the best possible service to the community, and to promote individual succession planning opportunities. (Recommendation #6)

10.7 Community Feedback

Internal measures and assessments are important in helping to ensure a level of service excellence. However, it is important to hear from the public about their needs and whether they are being met. Without public input, it is difficult to accurately gauge overall Departmental performance.

Analysis:

There is no formal community feedback mechanism in place. The Chief has invited people on the Town's website to email him directly with any feedback they have about WFES. Emails and letters are received from time to time to provide positive and constructive feedback, but these are received infrequently.

It is recommended that a Fire Chiefs' Community Advisory Committee consisting of representatives from community stakeholder groups be created to provide feedback to WFES regarding its performance in the community and any recommendations for improvement. It is recommended that the committee meet at least semi-annually on an ongoing basis (2017) (WFES Action – M)

10.8 Attendance Program

Whitby Fire and Emergency services currently does not have an attendance management program. Attendance is being tracked as part of the 24 hour shift three year trial.

Analysis:

Absenteeism has declined slightly to date in 2015 compared to a 3 year average (2011-2013). At this point in time it does not appear that there is a need to introduce a program.

Should absenteeism rates increase, the introduction of an attendance management program should be revisited.

The Project Manager/Information Analyst will work with WFES Senior Staff to develop an Attendance Management Program as warranted. (Recommendation #6)

10.9 Modified Duty Program

A modified duty program provides meaningful work for staff who are absent from work due to sickness or injury, but unable to return to their full regular duties. It is a transition stage to help people return to work, while also providing the Employer with value added labour.

Analysis:

There is very little in place to provide meaningful work for staff who are absent from work due to injury or sickness, and unable to return to their full regular duties. Currently staff are offered modified duties on a haphazard basis. There is no formal written procedure in place in the Town, or within WFES, and no mechanism in place to coordinate it.

The Project Manager/Information Analyst will work with WFES Senior Staff and Town of Whitby Human Resources Department to develop a Modified Duty Management Program. (Recommendation #6)

10.10 Mental Health

Whitby Fire and Emergency Services recognizes that due to the nature of emergency responses, the Mental Health of its' employees can be negatively affected. Currently there are two programs in place to deal with mental health issues for employees.

The Durham Region Critical Incident Stress Support Team (DRCISST) is a voluntary, free standing organization consisting of peers and mental health professionals; supported by police, fire, emergency medical services across Durham Region. Members are trained to provide a variety of crisis intervention services (individual, group) and pre incident education to emergency personnel and their families. Training adheres to internationally recognized standards. DRCISST is linked locally, provincially, nationally and internationally through the Ontario CISM Advisory Council, Canadian Critical Incident Stress Foundation; International Critical Incident Stress Foundation, and ICISF Team Hotline.

There are 3 types of Stress Reaction

- Acute - Response to a specific incident immediate reaction or within three days
- Delayed - out of the blue seem unconnected to any incident
- Accumulated - built up over a long period of time gradual erosion of coping resources

The second program is the Town of Whitby's Employee Assistance Program.

Issues the EAP covers include:

- Personal growth
- Job stress
- Relationship issues
- Grief and loss
- Separation or divorce
- Depressed or anxious mood
- Addictions
- Parenting concerns
- Family matters
- Youth issues
- Credit counselling
- Dispute resolution

Analysis:

There is no ongoing pro-active mental health training/awareness program in place. The two existing programs are designed to address mental health issues from a re-active place. The CIS program helps people in a group setting, and the EAP provides very limited, basic help.

In October 2015, Council approved a recommendation from the Fire Chief to provide $10,000 annually to fund pro-active wellness/mental health programs/education for WFES personnel. However, there are no advanced, ongoing reactive treatment options available for staff.

It is recommended that WFES utilize the Council approved funding to research and pursue wellness and mental health pro-active education to help equip WFES personnel to more effectively deal with their emotional and mental health (2017). (WFES Action – N)

It is recommended that the Town establish and develop a service agreement with an experienced mental health professional who is easily accessible for staff and who can provide immediate and ongoing advanced mental health counselling to staff who are suffering acute and prolonged exposure to traumatic events.(2017) (Recommendation #7)

It is recommended that WFES add a Chaplain with critical incident training and experience to provide spiritual and mental health services to WFES personnel as necessary. This position would not be salaried, but would receive an annual stipend. The Chaplain would be available to the Corporation for formal occasions. (2016) (WFES Action – D)

10.11 Corporate Emergency Planning

The Town of Whitby's Emergency Plan has recently undergone a major revision in order to be consistent with changes in legislation and IMS protocols. Changes included the creation of a Hazard Identification Risk Analysis, the development of an Emergency Management Program, the identification of an alternate EOC site, the introduction of EOC operating software developed by Whitby MIS, the redesign of EOC operations and procedures, the appointment and training of additional staff, and the revamping of the EOC communications plan. The Plan and Program were approved by Whitby Council in April 2015 under By-law 6990-15. Under the Plan, the Town conducts simulated emergency exercises at least annually to train the Municipal Control Group at the Emergency Operations Center.

The purpose of the emergency plan is to establish uniform policies and strategies and a concept of operations for a planned, coordinated, effective response to all natural and human-caused emergencies within the Town of Whitby that exceed the scope of everyday operations. The emergency plan is put in place to protect human health, property, and the environment during imminent or actual emergencies in or affecting Whitby. These emergencies may vary in size and severity and may affect localized business, residential areas, or the general welfare of residents of the Town of Whitby.

10.12 Community Emergency Management Coordinator

Every Municipality is required under the Emergency Management and Civil Protection Act (EMCPA) to appoint a Community Emergency Management Coordinator (CEMC). In the Town of Whitby, the CEMC is the Fire Chief, with both Deputy Chiefs identified as Alternate CEMCs. The CEMC is responsible for the development and implementation of the emergency management program consisting of an emergency management plan, training programs, exercises for Town employees and partner agencies, public education on risks to public safety and public preparedness for emergencies, and any other elements required as prescribed in the Emergency Management and Civil Protection Act, R.S.O., 1990 Chapter E.9. The CEMC reports to the Town CAO and Council.

In 2015, it was announced by the OFMEM that CEMCs throughout Ontario would be required to attend newly introduced training courses by the end of the calendar year to remain qualified as CEMCs.

Analysis:

The Town of Whitby appears to be in compliance with the requirements of the Emergency Management and Civil Protection Act. However, there are appendices/plans that could be developed to deal with the most likely emergencies that would warrant activation of the EOC.

There currently is no IMS training offered for members of the Municipal Control Group. This training is helpful to prepare people in the EOC to deal with an emergency.

It is recommended that WFES work with DEMO to develop appendices to the Emergency Management Plan to help plan for emergencies that are the most likely to warrant activation of the EOC. (2019) (WFES Action – X)

It is recommended that WFES develop a continuity of operations plan to prepare WFES for situations that may involve a reduction in resources and equipment below minimum levels. (2018) (WFES Action – S)

10.13 Records Management

File Classification and Retention By-Law No. 6309-10

The Records and Information Management is a systematic control of records from creation or receipt, through their processing, distribution, organization, storage and retrieval to their ultimate disposition. The goal of Records and Information Management is to get the right information to the right person with optimal accuracy and as quickly as possible and to ensure that: business needs are addressed/retained; required records retained by statute, regulation or contract are retained for appropriate and approved time periods; authorized users have access to business records (only as required); litigation; and procedures in place to ensure timely destruction of appropriate documents.

The Municipal Act and the Municipal Freedom of Information and Protection of Privacy Act (MFIPPA) say that the Town must: retain and preserve the records of the municipality and its local boards; secure and make accessible; ensure records can be retrieved within a reasonable time; ensure records are in a format so content can be inspected; provide access to records, subject to privacy and certain other exemptions. The Town establishes retention periods for records, subject to auditor approval. Records can be destroyed when established retention periods expire or record is a copy of an original record.

The retention period for Fire & Rescue Incidents is Active 2 years; Inactive 8 years. Every year the files are reviewed and recorded on the Town of Whitby Retention Form along with a Records Destruction Authorization form which is approved by the Fire Chief. The files are stored in boxes and then forwarded to the Clerk's Department for destruction.

Any Fire & Rescue Incidents (i.e. major dollar losses) are not destroyed and are set aside for archiving.

CriSys is used as one of the primary electronic storage systems for all written records/reports of emergency calls. Records include Officer notes, call details, names and phone numbers, site details etc. The system is also used by Oshawa Fire Services to dispatch Whitby trucks.

Analysis:

The CriSys system is unreliable when used to retrieve data or to run reports. There are multiple requirements to enter data, and it can be confusing for users to enter it correctly.

There has not been sufficient training on the use of CriSys in the past and; therefore, there is inconsistency in how it is used.

The Project Manager/Information Analyst will become a liaison between CriSys and WFES, and an internal expert to provide training to all staff to maximize the use of CriSys on a daily basis. (See Recommendation #6)

11 Fire Prevention & Public Safety

WFES provides public education and fire prevention services to the Town of Whitby under the authority of the Fire Protection and Prevention Act (FPPA). In accordance with the FPPA, Whitby must provide public education, and components of fire prevention in accordance with the needs of the community. All members of the Fire Prevention Division are Assistants to the Fire Marshal for the administration and enforcement of the Ontario Fire Code (OFC). Furthermore, Fire Prevention Officers (FPOs) function as Provincial Offences Officers while administrating the enforcement provisions of the FPPA.

Fire prevention and public education efforts form part of an overall strategy to reduce fire risk in a community. The Ontario Fire Marshal's Comprehensive Fire Safety Effectiveness model demonstrates how these prevention and public education fire safety efforts work together with other fire safety components.

11.1 Figure 36 – Comprehensive Fire Safety and Effectiveness Model

Each element of this model dovetails into the others and can be an effective performance measurement tool in evaluating a fire department's delivery of fire services. Moreover, this model can also be used as an effective tool in identifying the probabilities and consequences of a fire occurring within the municipal building stock of a community.

Fire Prevention and Public Education are key components of this model. Fire Prevention activities are easily measured based on the outputs of the division including number of inspections conducted, number of Inspection Orders issued, etc. However, the effectiveness of the outputs (the outcomes) can be challenging to measure in the absence of effective, objective measurement mechanisms.

Whitby recently experienced two large scale fires that provided an opportunity to objectively measure outcomes of Fire Prevention efforts:

- In October 2014, Fairview Lodge experienced a large scale fire involving the evacuation of 192 vulnerable occupants. For 3 years prior to this fire, Fire Prevention Officers with WFES worked with Fairview Lodge staff, Durham Region, and consultants to reduce resident evacuation times from 21 minutes to 3 minutes. Hundreds of hours of pro-active work by WFES staff involving analysis of staffing, emergency practices, fire separations, travel distances, occupant capabilities, evacuation strategies, etc. contributed to the successful evacuation of all 192 Fairview Lodge residents in October 2014.
- In April 2015, Whitby's downtown core experienced a large fire in the basement of one of its historic buildings that threatened to trap occupants in residential units on the upper floors, and to spread to other historically significant buildings.

In the 3 years leading up to this fire, WFES had conducted pro-active inspections throughout the downtown core. Two primary inspection principles were established for these inspections:

1) Ensure each building had sufficient, properly separated exit facilities from every floor level for the safe evacuation of all occupants,

2) Ensure that each building was fire separated from adjoining buildings so that a fire would not be able to spread from one building to another for a minimum of 1 hour.

During Fire Prevention inspections, exit stairwells were separated, fire doors and fire rated drywall was installed, fire separation penetrations were repaired, and fire alarm systems were restored to operation. These fire prevention efforts contributed to the fire being contained to the building of fire origin, and to the safe self-evacuation of all occupants.

These two large scale fires demonstrate the link between fire prevention pro-active inspections and positive outcomes. Without these two fire prevention efforts, the fire outcomes in these two fires may have been much different.

11.2 Fire Prevention Staffing

The Fire Prevention Division currently consists of 6 staff: 5 Fire Prevention Officers (FPOs) who work under the direction of 1 Chief Fire Prevention Officer (CFPO). The CFPO provides daily support to the Division through leadership, expertise, and mentorship. The 5 FPOs are responsible for public education, plans examination, inspections, fire investigations, and prosecution. Recently, WFES implemented a community based approach with 1 FPO working from Fire Station 4. This will be evaluated for future deployments but thus far has proven to be valuable from both an internal perspective, and from a customer service perspective.

The pendulum of professional expectations for FPOs has swung significantly over the past decade. These expectations are met with higher educational requirements to ensure technical knowledge is sufficient to evaluate fire detection systems, apply functional objectives of the OFC, and to review mathematical calculations that support complex fire protection systems. As a foundation, WFES FPOs have formal post-secondary education in these specialized areas and are continually required to meet industry standards to remain current in their respective fields.

11.3 Fire Prevention Inspections

Put simply, Fire Prevention is the act of preventing fires. In reality it is understanding complex codes and standards, applying them to the unique features of each building, and being mindful of construction dates in order to apply the relevant editions of each

code. It is also understanding human behaviour and trying to convince building owners to willingly comply with legislation rather than engage in enforcement and prosecution. When Fire Prevention is successful, fires are prevented, and there is a reduction in the loss of life and property, When Fire Prevention is not successful, fire occurrences can impact a community beyond the loss of life and property, including economic, social, and environmental consequences, as well as the impairment of critical infrastructure that in turn has a direct impact on a Municipality's ability to deliver service to the community.

Analysis:

WFES' current fire safety inspection program is designed to provide the minimum legislatively required services to the Whitby community. In only conducting the minimal requirements (reactive response to complaints and requests), pro-active inspections such as those conducted in the downtown core are no longer taking place.

Despite cancelling pro-active inspections, it is still a struggle for the Division to keep up with re-active workload demands. Increased Divisional workload has come in part from new statutory amendments to the FPPA and OFC to improve fire protection provisions for vulnerable occupancies, including nursing homes and retirement homes. In January 2014, legislated changes to the FPPA and the Fire Code mandated that Fire Prevention Officers had to conduct annual fire safety Inspections, evaluate fire drills, and assess fire safety plans for all retirement homes, care occupancies and care and treatment occupancies. This coupled with new legislation requiring Fire Prevention involvement in propane planning requirements, carbon monoxide, and more stringent complaint and request requirements, along with the growing demand for fire prevention and public education services that comes from a growing community has resulted in WFES struggling to be able to meet its minimum legislative requirements. The following chart illustrates the Divisional Re-active inspection workload.

11.4 Figure 37 - WFES Inspection History by Inspection Type

Inspection Type	2011	2012	2013	2014
Complaint	188	187	152	162
Request	69	82	128	80
Crew Referral	118	104	123	139
File/Fire Report	40	63	92	57
Fire Safety Plan	53	87	119	102
Staff Referral	103	54	136	112
Smoke Alarm	30	31	19	33
Target Inspection	0	0	11	1
Total	**604**	**617**	**784**	**698**

The CFPO leadership role is paramount to the successful prevention of fires throughout the Whitby community. The CFPO role is also important to develop FPOs for future Divisional growth and success. In order to accomplish these things, it is important that the CFPO works within a strategic capacity. However, due to the increasing FPO workload, the CFPO has been forced to fill in for FPOs and conduct inspections, review fire safety plans, follow up on inspection complaints, and other FPO tasks. This has prevented the CFPO from being able to engage in Divisional planning, deliver training, or accompany FPOs on inspections to provide mentorship. This impacts the quality of FPO work and lessens their impact on community fire safety.

Furthermore, in order to keep up with the growing reactive workload, the Division is forgoing training opportunities to enhance the professional qualifications of staff, overtime is being accrued to meet deadlines on files, and approvals for fire safety plans are being prolonged. Fire inspection files are remaining open longer, re-inspections to follow up on outstanding fire safety deficiencies are being delayed, and engagement with the public through fire safety programs and public service messaging is not being performed. In recent years, efforts were made to adopt a proactive inspection program in local schools, but unfortunately each year the program has been abandoned due to insufficient staff time. As can be seen in the following figure, WFES is running a deficit of 2,227 hours each year to be able to meet minimum legislative requirements.

The figure below is divided into two parts. The right side illustrates the minimum number of hours required for the Fire Prevention Division to effectively meet legislative requirements as part of its current Re-active program. The left side of the chart is the same as the right side, with the addition of the number of hours required to institute a pro-active inspection program.

Two constructs were used in helping to determine the data for this figure :

NFPA 1730, a Draft Guideline to Assist in Determining Fire Prevention Division Levels of Service, and

Communities of Practice for the Discipline of Fire Prevention Divisions in Ontario.

11.5 Figure 38 - Hours Required to Provide Fire Prevention Services

Proactive Inspections		**Regular Inspections**	
Hours Available	7480	Hours Available	7480
Training/Seminar	560	Training/Seminar	560
Regional Meetings	60	Regional Meetings	60
General Meeting	130	General Meeting	130
Training Provided	90	Training Provided	90
Legal Proceedings	80	Legal Proceedings	80
Plans Exams	2100	Plan Exams	2100
Administration	160	Administration	160
Reactive+Proactive Inspections	8441	Reactive Inspections	4186
Pub Ed Programs	1650	Pub Ed Programs	1650
Fire Safety Plans	561	Fire Safety Plans	561
File Searches	130	File Searches	130
Total Hours Required	13962	Total Hours Required	9707
Total Hours Available	7480	Total Hours Available	7480
Deficit	6482	Deficit	2227

The absence of a proactive fire safety inspection program increases Whitby's risk of fire and associated consequences. A public inquiry to examine fire safety in high rise buildings was held in 1983. A report authored by Justice Webber identified several key factors relating to fire prevention and education activities to preserve life and property from fire. Justice Webber stated in his recommendations *"There should be adequate fire protection for the citizens of Ontario commensurate with the needs of each municipality" and, substantial increase in public education regarding fire safety because I believe that through education, human behaviour can be modified, stress can be reduced, and our fire safety record thereby improved*." WFES is not dissimilar to other jurisdictions in Ontario who struggle to provide a minimum level of service that is commensurate with its needs. However, it is a long held position of the Fire Service that has been proven time and time again since this inquiry (Fairview Lodge and Downtown Whitby) that investing resources into pro-active fire prevention and public education efforts has a positive, albeit somewhat difficult to measure, impact on the safety of a community.

Not unlike the FPO's, a similar analysis of the hours required to effectively perform in the CFPO position was conducted and is reflected in the chart below:

11.6 Figure 39 – Chief Fire Prevention Officer Hours

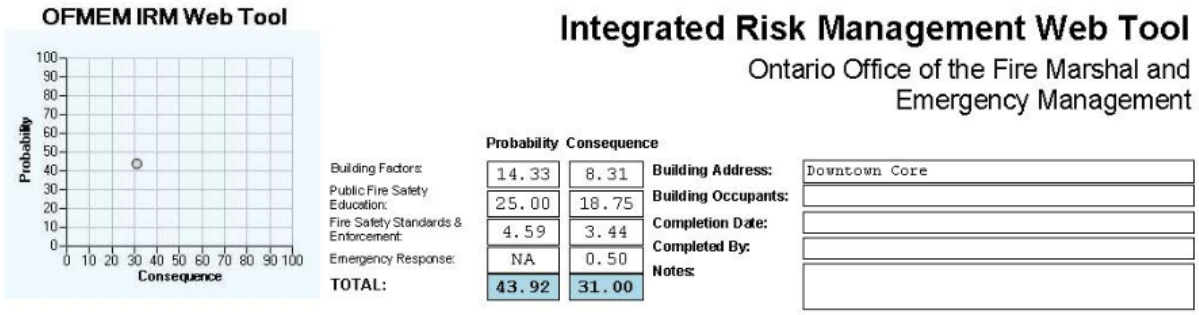
Hour Available	1525
Training/Seminar	160
Regional Meetings	40
General Meetings	130
Training Provided	120
Legal Proceedings	10
Administration/Planning	700
Leadership/Mentoring	700
Public Engagement	140
Assist re Tasks/Absences	140
Project Based Assignments	140
Total Hours Required	2280
Total Hours Available	1525
Deficit	755

Due to the annual deficit of 755 hours, the CFPO is unable to participate in Divisional planning, developing and delivering training, mentoring and leading staff, or projects from the Deputy Chief. This impacts the quality of inspections being conducted by the FPOs, and ultimately the level of fire safety in the community.

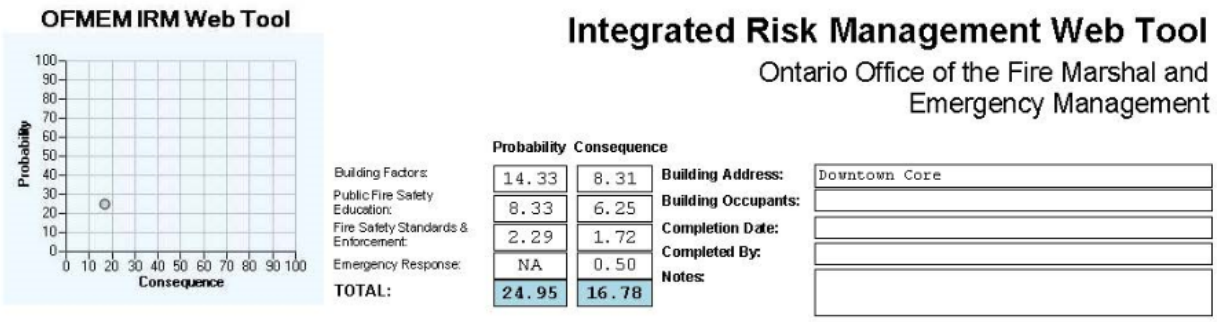
Analysis of a Pro-Active Fire Safety Model

Utilizing the OFMEM Integrated Risk Management tool (IRM), an analysis was conducted of WFES' current re-active fire prevention model compared to a pro-active fire prevention model. Three fire scenarios have been used: the Downtown core (mixture of residential and retail), a medium hazard industrial occupancy, and a single family dwelling. The IRM tool examines the probability and consequence of a fire using four major components: Building Factors, Public Education, Fire Inspections and Emergency Response.

11.7 Figure 40 – Downtown Core Reactive



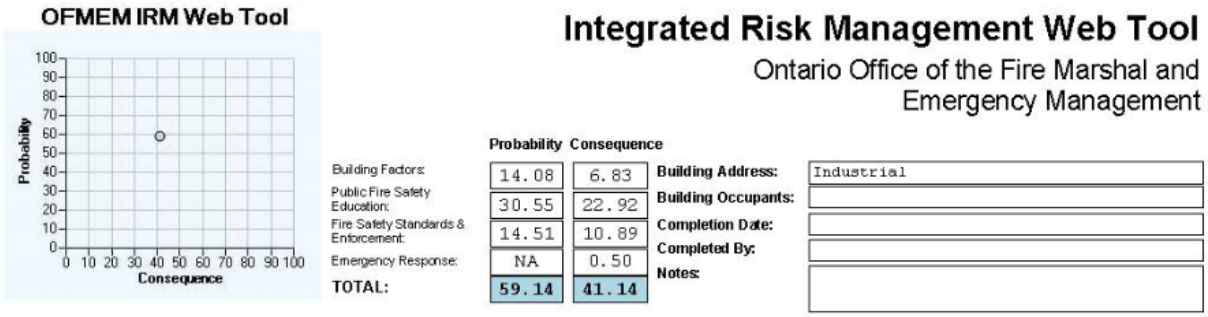
11.8 Figure 41 – Downtown Core Proactive



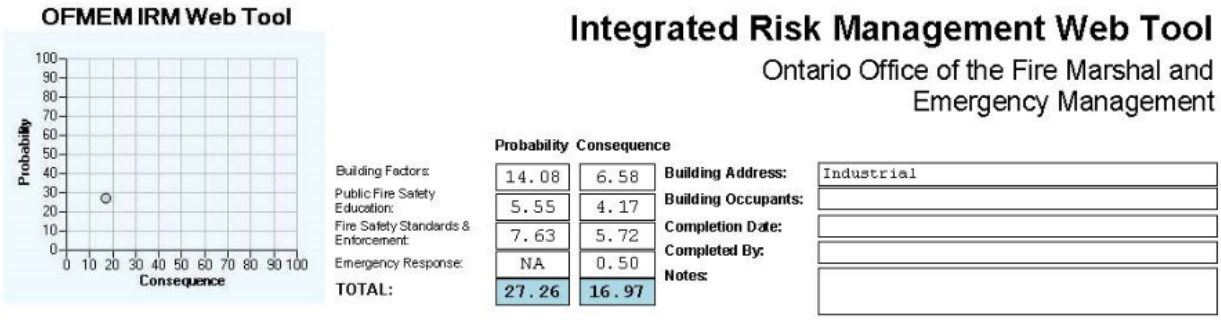
The introduction of a proactive public education and inspection program has the potential of reducing probability of fire up to 43% and consequence of fire by 45%.

Figures 40 and 41 examine a general occupancy similar to the Downtown core, older building construction coupled with a mixed occupancy of retail and residential. The application of the IRM for both scenarios illustrates two significantly different outcomes given fire prevention and education activities. Building construction and emergency response within the two models are the same. Figure 40 illustrates the current WFES Re-active delivery model: inspections are conducted based solely on complaints and requests, and public education consists of general activities not specifically geared to the downtown core. Figure 41 illustrates a pro-active delivery model with ongoing, annual inspections being conducted, along with public education programs geared specifically to occupants residing and working in these buildings.

11.9 Figure 42 – Industrial Reactive



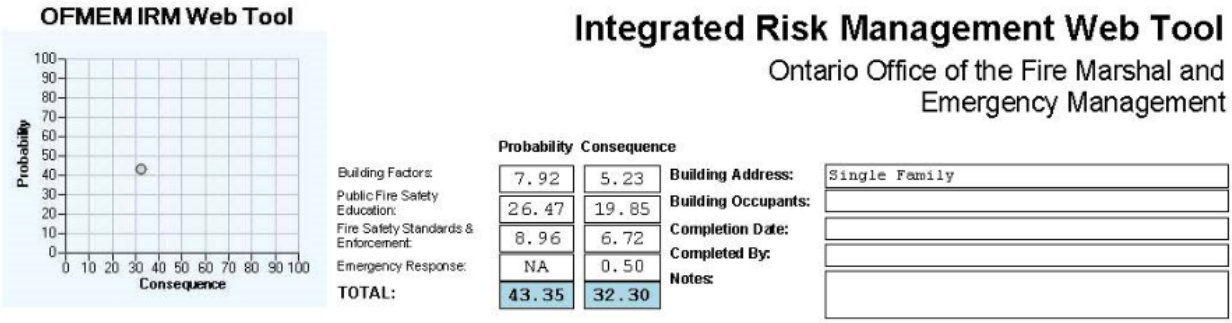
11.10 Figure 43 – Industrial Proactive



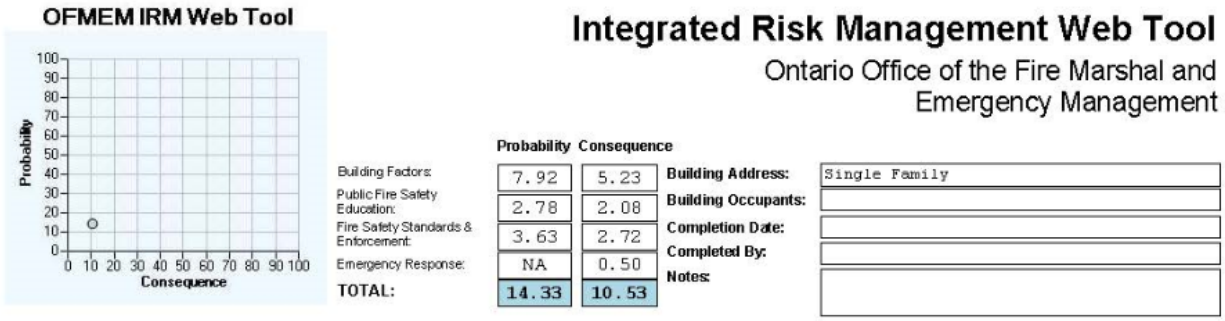
The introduction of a proactive public education and inspection program has the potential of reducing probability of fire up to 53% and consequence of fire by 58%.

Industry is a vital contributor to the economic viabilty of our community. Incidents of fire can, and may lead to the decline of production or the retraction of services directly affecting employment and municipal revenue. Given the nature of production in meduim or high hazard occupancies, the risk of fire, and so too the consequences, is always amplified. As illustrated, the implementation of a proactive inspection program for Industrial occupancies could reduce the probalility and consequence of fire almost 50%. A proactive inspection program will provide expertise and counsel to property managers on fire risk reduction measures, engineered solutions to enhance product protection and cost avoidance solutions that in the event of the fire would reduce operational down time.

11.11 Figure 44 – Single Family Reactive



11.12 Figure 45– Single Family Proactive



The introduction of a proactive public education and inspection program has the potential of reducing probability of fire up to 66% and consequence of fire by 67%.

Single family dwellings comprise the largest single occupancy in the Town. They also represent the greatest risk of injury or loss of life. With some exceptions, Ontario Fire Code requirements do not apply to single family dwellings, underscoring the importance of enhanced public education programs. As illustrated in figures five and six, public safety education is the single most important component to reduce the risk and consequence of fire in single family dwelling occupancies. WFES currently employs EVERALERT as a means to provide public education to home owners, however this program only reaches 5,000 homes in the municipality on an annual basis which represents a small percentage of Whitby residences.

NFPA 1710 has been referenced within this plan as it relates to emergency response. The primary discussion points for 1710 are the ability to provide effective emergency response using various constructs. ***" While NFPA 1710 is scoped strictly to focus on deployment, staffing and service levels, the realization is that this is one component of a total community fire protection planning process. An AHJ can determine that the other components could reduce the risks of fire and therefore adopt stronger building and prevention codes, enforce***

those more rigorously, and enhance their public life safety education components" Annex B, B1 NFPA 1710.

An analysis of Whitby's building stock along with an assessment of fire risks and consequences were used to determine the property types to be included in a WFES Pro-active Inspection Program, the frequency of inspections, and the hours required to operate it.

11.13 Figure 46 - Whitby's Proposed Pro-active Inspection Program

Occupancy classification	Occupancy Type	Hours required to conduct inspection	Frequency of inspection	# Occupancy	Hours Req'd/year
Class A- Assembly	Public Assembly Halls Arenas, Exhibition Halls, Restaurants, licensed Beverage Establishments Schools, Theatres, Churches	10 – based on average given the size and scope	Every 3 years, or upon request/complaint	218	726
Class B Institutional	Hospitals, Institutions, Nursing Homes, Homes for The Aged, residential Care Facilities, Special Needs Care	22 hours. Include fire safety plan review, fire drill, inspection	Annually **Mandatory**	39	858
Class C Residential	High- Rise, multi-unit	9 hours-average	Annually	21	189
	Low- Rise, multi-unit	5 hours	Tri-annual	65	108
	Senior Resident Facilities Retirement Homes (registered)	16 hours	Annually	4	64
	Two unit Residential	6 hours	5 years/ complaint	430	516
	Boarding Lodging and Rooming Homes	5 hours	upon request/ complaint		
	Group Homes	6 hours	Annually	22	132
	Hotels/Motels	10 hours	Annually	8	80
Class D / E Business and Personal Services	High-Rise office Buildings, Shopping Centres	8 hours average	Every 5 years, or upon request/ complaint	341	545
Class F1,F2,F3- Industrial	All	12 hours based on size and complexity	5 years	432	1037

Following is an excerpt of an analysis that was completed internally to show the occupancies in Whitby that are deemed a priority from a pro-active fire safety perspective, along with what actions WFES is currently engaged in, and what actions they will begin should they receive additional staffing resources.

11.14 Figure 47 – Priority Setting Worksheet

Priority Setting Worksheet					
Priority	**Status**	**Effectiveness, Goals/Objectives**			
Fire Safety Priority **List in order of priority**	**Current fire prevention / public education programs that address the fire safety priority**	**Existing programs adequately address the fire safety priority & ensure compliance with minimum FPPA requirements?**			
		If No, how would you reallocate resources and/or implement additional fire prevention or public education program / activities? Additional initiatives for consideration are listed in this area.			
	Fire Prevention (inspection) Activities	**Public Education Activities**	**Y/N**	**Fire Prevention (Inspection) Activities**	**Public Education Activities**
Vulnerable Occupancies	• Annual Inspections of all occupancies as required by Ontario Regulation • Review of all fire safety plans • Perform fire drills	• Fire prevention week activities at selected facilities	Y		• Develop fire safety education programs designed specifically for seniors • Develop education programs for staff at facilities
Residents – Single Family Dwellings	• EverAlert smoke alarm program • It happened on your street • Think Ahead –home visits families with special needs • Inspections by request • Accessory Apartment inspections	• Fire Prevention week activities • Open Houses • Junior Fire program • Station Tours • Community Events • Media events	Y	• Conduct proactive inspection in low, medium and high rise buildings	• Increase the number of homes in EverAlert program • Social media campaigns • APP based education programs for families • Interactive Fire web site

Priority Setting Worksheet

Priority	Status	Effectiveness, Goals/Objectives
Fire Safety Priority **List in order of priority**	**Current fire prevention / public education programs that address the fire safety priority**	**Existing programs adequately address the fire safety priority & ensure compliance with minimum FPPA requirements?**

	If No, how would you reallocate resources and/or implement additional fire prevention or public education program / activities? Additional initiatives for consideration are listed in this area.

	Fire Prevention (inspection) Activities	Public Education Activities	Y/N	Fire Prevention (Inspection) Activities	Public Education Activities
Schools	• Inspections conducted upon Complaint/Request	• Observance of annual fire drills • Committee meetings with senior board staff • Learn not to burn Co-op education program	Y	• Conduct pro-active school inspections • Review school fire safety plans	• Develop public education programs for school age children • Educate maintenance and custodial staff on fire code requirements • Deliver "Adopt a school program" with Suppression Crews • Web Conferences with students at predetermined intervals
Seniors (non-supervised care)	• Inspections conducted upon complaint/request	• Fire Prevention week activities as location specific	Y	• Develop program that would allow for seniors to have home visits by suppression crews to identify hazards • Evaluate fires in a seniors private residence	• Partnerships with community groups that host seniors • Develop senior home fire safety education programs • Identify communication/media methods directed towards seniors

Priority Setting Worksheet

Priority	Status	Effectiveness, Goals/Objectives
Fire Safety Priority **List in order of priority**	**Current fire prevention / public education programs that address the fire safety priority**	**Existing programs adequately address the fire safety priority & ensure compliance with minimum FPPA requirements?**

	If No, how would you reallocate resources and/or implement additional fire prevention or public education program / activities? Additional initiatives for consideration are listed in this area.

	Fire Prevention (inspection) Activities	Public Education Activities	Y/N	Fire Prevention (Inspection) Activities	Public Education Activities
Pro-Active Inspections -Downtown -Industrial	• Inspections based on complaint or request	• no specific education programs for industrial occupancies • Ever Alert for areas in downtown if identified	Y	• Conduct pro-active inspections of Industrial occupancies on a 5 year cycle • Conduct annual inspections in downtown core, identified areas with buildings of significant heritage or building prior to codes.	• Develop education programs for industrial maintenance and management on fire safety • Review fire safety plans with supervisors and managers • Educate on good housekeeping measures

A proactive program will primarily focus on occupancies that have a residential component (sleeping, cooking, etc.) in order to reduce risks to life. Buildings will be inspected to ensure that they meet all applicable codes and standards according to their design, ensuring that fires will be quickly detected, occupants alerted, fires contained, and lives preserved. A secondary focus will be on commercial and industrial occupancies. Should they be involved in fire, these occupancies may have a social, economic, and environmental community impact, as well as health effects on occupants and fire fighters.

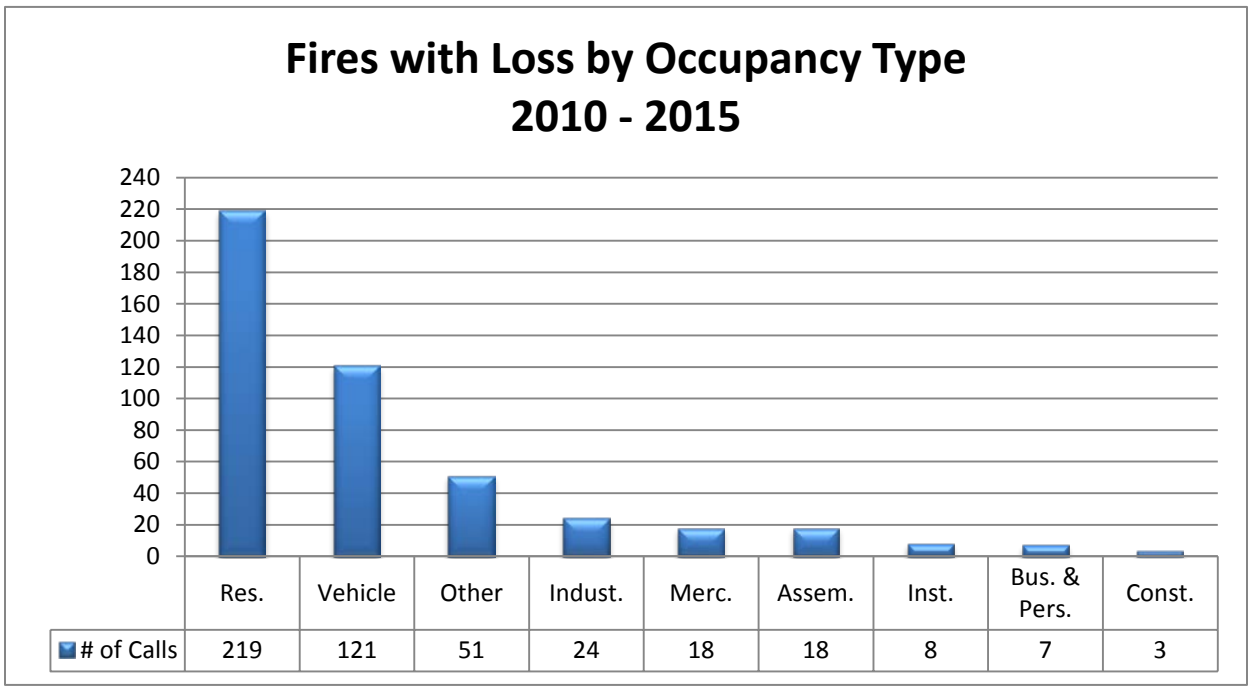
Comprehensive Fire Safety and Effectiveness Model Implementation

Identifying fire trends within the community allows for the strategic development of public education programs and pro-active inspection practices. There are several methods to evaluate fire trends, both quantitative and qualitative. A quantitative measure would be a review of local and provincial statistics. However, statistics alone do not provide an accurate lens into fire causes or trends. A qualitative measure would be to conduct an analysis of fire that occurred in the Whitby community applying the seven constructs of the Comprehensive Fire Safety and Effectiveness model. A process such as the aforementioned is a difficult task to achieve. In fact, there are very few fire departments that are able to conduct any form of analysis beyond reviewing statistics.

An intelligence based system would examine circumstances beyond the origin and causes of the fire. Incorporating the seven components of the Comprehensive Fire Safety and Effectiveness model coupled with the seven principals of life safety, Fire Prevention staff will examine circumstances leading up to the fire. The data garnered through such a process can be examined to develop a holistic prevention and education program based on both quantitative and qualitative data.

Residential Occupancies

11.15 Figure 48 – Fires with Loss by Occupancy Type 2010-2015



Residential occupancies are the most common in Whitby representing over 90% of the Town's building stock. They are also the most likely type to experience a fire and result in a serious injury or death. Single family dwellings also represent the greatest amount of fire dollar loss each year. With the exception of smoke alarm and carbon monoxide alarm requirements, the Ontario Fire Code is mostly silent in respect to individual dwelling units. The rate of serious injury and death in these occupancies and the fact that the majority of residential fires are caused by human behaviours such as unattended cooking, underscores the importance of promoting fire safety through public education.

Other occupancies such as mixed use of residential and mercantile have a dual consequential effect. Not unlike the aforementioned residential occupancies, fire exposure to commercial properties has an economic impact to both business owner(s) and the Municipality. A fire loss will ultimately create an economic impact to business owner(s) and, depending on the location, the economic viability of the area. A recent example of this is the fire that occurred in April 2015 in downtown Whitby. Local businesses were forced to close for weeks, and vehicle access was restricted resulting in fewer customers travelling to the store fronts.

Analysis:

Currently, WFES cannot provide a proactive inspection program due to insufficient staff Fire Services within other jurisdictions in Durham Region have varying degrees of proactive inspection programs targeting schools, student housing, and assembly occupancies

WFES identified public school inspections as a pro-active priority in 2015. However, these pro-active inspections had to be placed on hold as it was not feasible to complete them due to the remaining legislatively mandated workload. Schools in Whitby have not been pro-actively inspected since 2010 and will not be inspected again moving forward unless WFES receives an inspection complaint or request.

It is recommended that an additional Fire Prevention Officer/Public Education Officer be hired to spend .5 of his/her time to meet the re-active workload deficit ensuring that inspections are being conducted to community and municipal expectations. (2017) (Recommendation #1)

It is recommended that WFES develop and introduce a proactive fire safety inspection program that will ensure vulnerable and high risk properties, as well as schools, apartment buildings, restaurants, theaters, etc. are inspected on an ongoing basis to maximize their level of fire safety. Without this program, these

occupancies will not be inspected unless complaints or requests are received. As part of this recommendation, the following staffing will be required:

One FPO in 2017 to begin to implement a minimal pro-active program focusing on those occupancies representing the greatest fire risk (2017), (Recommendation #1)

One FPO in 2020 to expand the pro-active program to include inspections of additional high risk properties and to respond to the growing fire inspection needs of the municipality (2020), (Recommendation #1)

One FPO in 2025 to fully expand the pro-active program to encompass all properties, and to maintain fire inspection service levels to the growing Brooklin community (2025). (Recommendation #1)

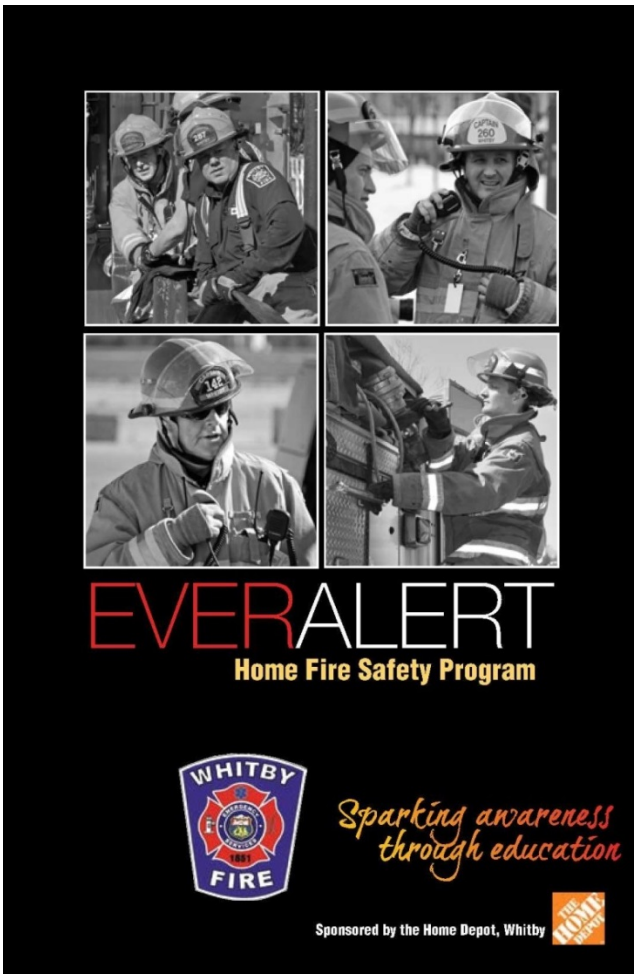
It is recommended that a Fire Prevention Captain/Training Officer is added to the Fire Prevention Division. In doing so, this will provide the time required for the Chief Fire Prevention Officer to function in a strategic capacity within the Division ensuring inspection quality, effective program delivery and the identification and delivery of training programs. The Captain position will provide daily supervision to an expanded Division, and will be used to accompany FPOs on inspections to verify consistent, high quality service levels, and to provide ongoing technical training. (2017) (Recommendation #1)

11.16 Public Education and Awareness Programs

The delivery of public fire safety messaging is the cornerstone of an effective fire prevention program. Mr. Justice Webber commented in his judicial inquiry that increased efforts in fire safety education will impact human behaviour. WFES acknowledges this as a priority in the Whitby community and as such has assigned the bulk of public education duties to one FTE. However, given the growing workload of the Fire Prevention Division, this FPO has recently been assigned inspections as well in order to ensure legislative compliance. The reallocation of time to duties other than public education has created a vacuum in the public education delivery model.

Like most fire departments, the majority of public education efforts in WFES have been centered on children. Children are open to receiving new information, are open to applying it, and are capable of influencing and changing family behaviours. Children are also an accessible audience when fire safety is delivered as part of school programs, social clubs, and family events. Programs such as Junior Firefighter, Learn not to Burn, TAPP-C, Think Ahead, and Junior Fire Chief are WFES programs geared to children that continue to effectively deliver fire safety messages in the community. A graduate of the WFES Junior Fire Firefighter program was recently acknowledged by the Fire Marshal's Public Fire Safety Council for lessons learned during the program and using them to save his home and his family.

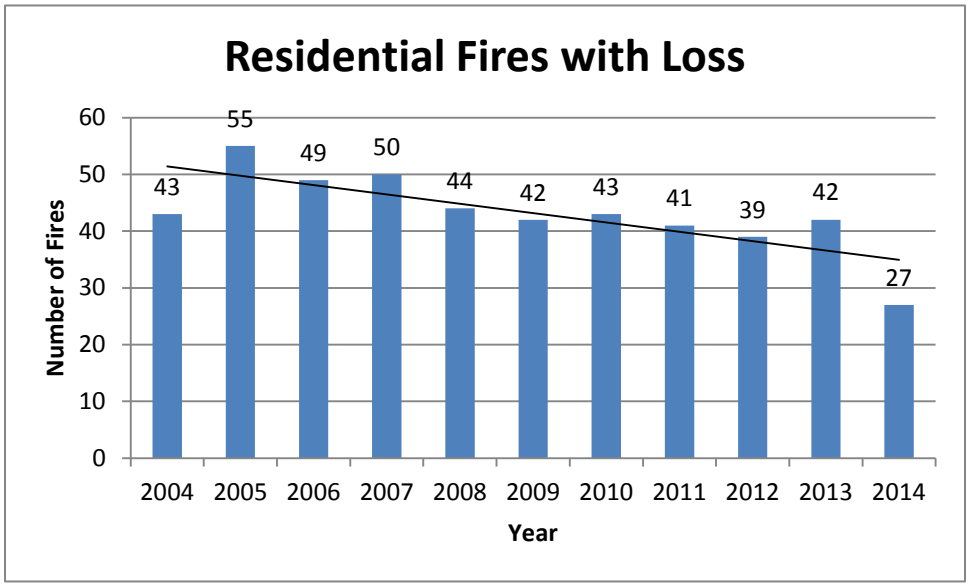
Notwithstanding the focus on younger generations, WFES recognizes that the aging demographic in Whitby warrants public education attention. At present time, there are no active WFES public education programs geared to older adults and this must be addressed in order to meet the fire safety needs of the Whitby community.



A cornerstone of the WFES public education program is EverAlert. On an annual basis, the Fire Prevention Division analyzes fire patterns and identifies areas of the Town at greatest risk. Fire causes are then reviewed to understand the leading causes of fires in the community and to determine the content of the EverAlert messaging. Fire Fighters are then assigned geographical areas to visit, providing fire safety and emergency management information. Each year, approximately 4000-5000 homes within Whitby are visited, following which the program results are measured to ascertain effectiveness. WFES has had great success with this program, as fires in areas visited decrease in subsequent years.

The following chart shows the number of residential structure fires with loss that have occurred each year in Whitby. This is a good measure of the effectiveness of WFES' public education programs that have been focused on residential occupancies.

11.17 Figure 49 – Residential Fires with Loss



In the past, WFES has hosted Community Safety Day. This event involved public safety partners in a large scale community event with the goal of providing fire safety and life safety lessons to the Whitby community in a fun, interactive way. It was designed to incorporate all demographics in our community and saw between 1500 and 4000 people attend each year depending upon the weather. In 2010 WFES suspended the event given the work load of the Fire Prevention Division and the lack of available staffing resources to continue to organize it.

Emergency events within the past decade have had a profound effect on residents of our community. Events such as the recent ice storm resulted in prolonged electrical outages directly affecting the ability to heat homes or cook meals. Emergency Planning education is another facet of WFES' public education program. Providing emergency management education to the public is a legislative requirement that is currently met by WFES. Whitby's Ever Alert program is used to provide emergency preparedness education and through Emergency Management week in May, WFES provides additional information. However, a more robust program could be developed to further educate the public.

The following chart lists all public education programs that are delivered by WFES within Whitby.

11.17.1 Figure 50 - WFES Public Education Programs

Activity Name	2011	2012	2013	2014
Adopt A School -suppression crews	17	0	0	0
Attend Event/Display	30	26	24	10
Fire Extinguisher Training	2	0	2	2
Home Fire Safety	6	1	3	3
Industrial/Commercial Safety	0	0	1	0
Lecture/Demo	6	2	3	6
Learn Not To Burn (Grade 2/7) **Co-Op students delivered**	49	60	58	62
Observe Fire Drill- suppression crews	45	44	0	47
Station Tours	11	19	7	0
TOTAL	166	152	98	130

WFES developed an Adopt a School program that was coordinated with local school boards in conjunction with the Fire Prevention Division and Suppression Crews. The purpose of the program was to initiate and maintain a fire safety relationship between WFES fire fighters and school children. As with other programs, Adopt a School was cancelled due in part to insufficient staffing resources.

The WFES Learn Not to Burn program is successfully delivered to elementary level students. The program focuses on fire safety in the home coupled with hazardous activities that could lead to fire and injury from fire. The success of this program is due to high school Co-Op students and their commitment to make a difference in the community. Although this can be viewed as an efficient delivery method, as it does not use many WFES staffing resources, the lack of WFES presence as part of the delivery team lessens the effectiveness and to some degree, the credibility of the program. However, in the absence of the CO-OP students this program could not be delivered within the Whitby community. Outside of the Learn not to Burn program, WFES has very little interaction or involvement with Whitby schools.

Analysis:

Continuous efforts are being made by WFES staff to pro-actively reach out to the community with fire safety education. However, the daily impact of other legislatively mandated operational tasks coupled with limited staffing is reducing the capacity of WFES to do so. Some of the community education programs including Adopt a School and Community Safety Day have been cancelled, while others such as Learn not to Burn is delivered without WFES staff.

Whitby is an aging community and WFES is not delivering education programs geared to this growing demographic segment. Current programs delivered by WFES have strong focus on young persons, but WFES must begin to develop and deliver fire safety education programs that focus on seniors.

The existence of public education programs that focus on preparing and planning for emergency events is minimal. The success of a municipality to effectively function seamlessly in large events is somewhat dependent on the community's ability to be self-sufficient. The current emergency management education programs being delivered by WFES appear to fall short of adequately preparing the public.

It is recommended and in conjunction with other Town of Whitby Departments, a comprehensive analysis be conducted for the municipality to help determine the direction of fire safety public education. (2016) (WFES Action – E)

It is recommended that WFES develop a formal emergency management public education program that will better prepare the community for emergency incidents. This program can be delivered concurrently with other fire safety education programs.(2018) (WFES Action – T)

It is recommended that WFES incorporate the Comprehensive Fire Safety and Effectiveness Model to assist the CFPO, FP Capt. and Senior Management team in the evaluation of their current delivery model and to identify future opportunities. (2018) (WFES Action – U)

It is recommended that should an addition Fire Prevention/Public Education position be approved from Recommendations #1, that WFES reinstate Community Safety Day to be held on an annual basis. (2017) (Recommendation #1)

11.18 Community-Based Fire Protection Model

The primary purpose of a Community Based Fire Protection Model is the co-location of Public Education/Fire Prevention Officers and Fire Fighters under one roof in various locations throughout the Town. This initiative is designed to achieve a consolidated team-based and customer-focused approach to managing fire risks within a particular area of the community.

1. Access to expertise from all areas of fire safety
   - Similar to “a one stop shop” the Community-Based Fire Protection Model offers the opportunity to contact a local station and receive fire prevention and public education information at the local level, with a wide range of expertise available from both Fire Prevention and Fire Suppression staff.
2. Local access to public education programs and learning opportunities.
   - Public education must become a greater priority within WFES. Access to programs at the community level through delivery at local stations will enhance the effectiveness of both the programs and the commitment to meet the needs of each community.
3. Targeted risk management designed to address specific local needs.
   - The opportunity for both Fire Suppression and Fire Prevention staff to work together in addressing community fire risks at the local level will enhance the coordination of proactive inspections and Suppression preplanning efforts.
4. Greater opportunity for input from stakeholders (i.e. residents)
   - A community-based program will provide local communities with an opportunity for enhanced input into specific programs, as well as provide direct feedback to the staff delivering them.
5. Improved visibility and openness of fire stations as public resource buildings
   - The use of fire stations as a local meeting place for groups such as Neighbourhood Watch, offers the opportunity to enhance the use of the existing resources within the community. It also enhances the ability for staff to become familiar with the needs of the community through partnerships.

6. Cross training opportunities.
- The opportunity for staff from different Fire Divisions to work together will provide opportunities for cross training, developing staff for future leadership positions.

Analysis:

Fire Prevention staff have traditionally worked from Headquarters. Recently, one FPO has been assigned to work from Station 4 while remaining staff continue to work from HQ. Community engagement begins with working in the community. The purpose of this community based delivery model is to develop ownership of areas within the municipality to build partnerships within the community and within WFES. With the traditional model, there was an element of separation between the Suppression and Fire Prevention Divisions. This model reduces the gap between to the two divisions allowing information and experience to be shared more seamlessly.

It is recommended that WFES management continue to evaluate the effectiveness of the community based fire protection model and consider locating additional FPOs from HQ into Whitby Fire Stations throughout the community. (2018) (WFES Action – V)

12 Fire Suppression

The Suppression Division is overseen by the Deputy Fire Chief of Emergency Operations and Training. Staff are assigned to four platoons: A1, A2, B1 and B2. Each Platoon is assigned a total complement of 26 personnel for a Divisional total of 104 Suppression staff, One Platoon Chief, five Captains and twenty firefighters. Minimum staffing per Platoon at any given time per the Collective Agreement is 21; this includes one Captain and three firefighters for each of the five front line apparatus. Each of the five Stations has one staffed fire apparatus. The compliment of staff between the minimum (21), and total Platoon assignment (26) accounts for vacation time, banked time, workers compensation injuries, and sick time. In the event staffing drops below the minimum level of (21), the overtime call back system is used to maintain staffing levels. The Platoon Chief is delegated direct responsibility for the overall supervision and accountability of the shift. Fire suppression staff are currently in the first year of a three year trial period for the 24 hour shift. Firefighters respond 24 hours per day, 365 days per year to:

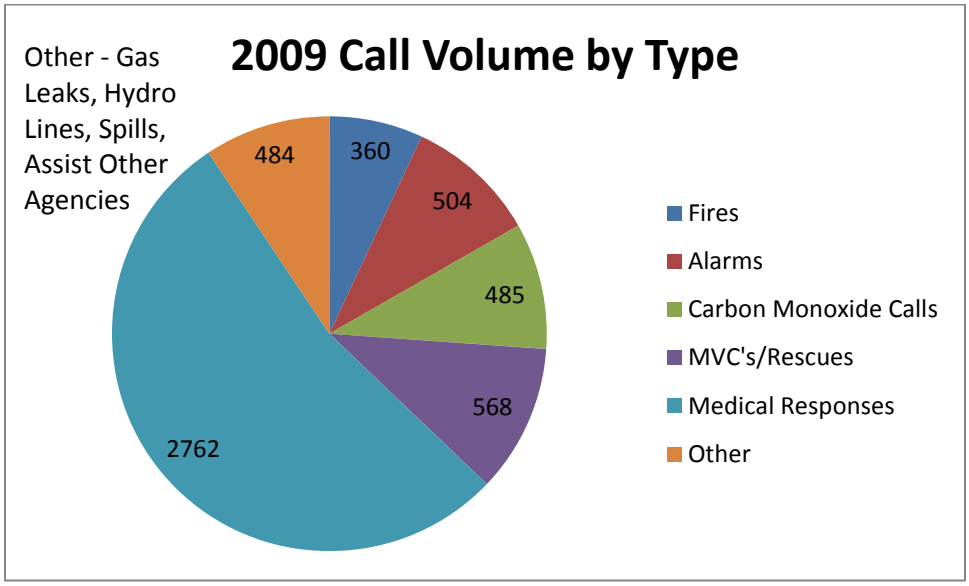
Response Types

- Medical calls
- Fires
- Motor vehicle collisions/extrication
- Fire alarm investigations
- Rescue of persons trapped or in danger including elevators and heavy machinery
- Electrical incidents
- 911 unknown calls

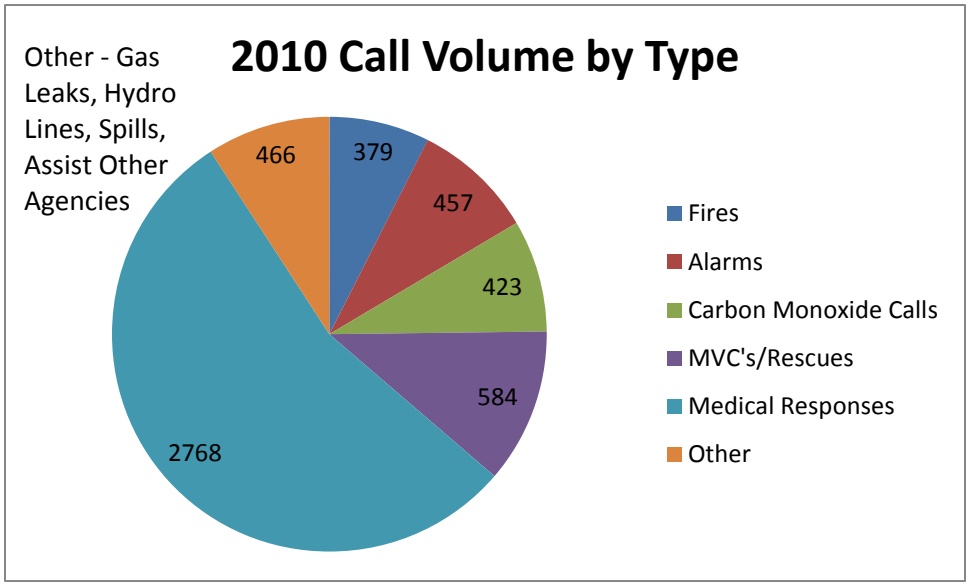
- Assist to police
- Mutual Aid and Automatic aid calls
- Fluid spills
- Gas leaks and broken gas lines
- Ruptured water lines and steam pipes
- Assistance to other agencies
- Carbon monoxide calls
- Public service calls
- Water Rescue
- Hazardous Materials Incidents
- Train derailments
- Large scale emergencies

The following figure shows the breakdown of emergency call types based on frequency in each of the past six years:

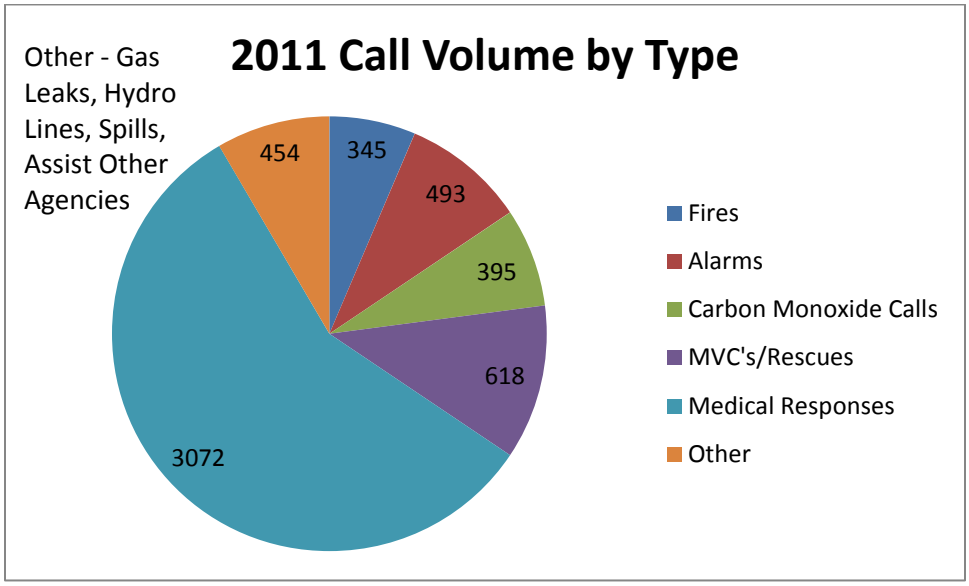
12.1 Figure 51 – 2009 Call Volume by Type



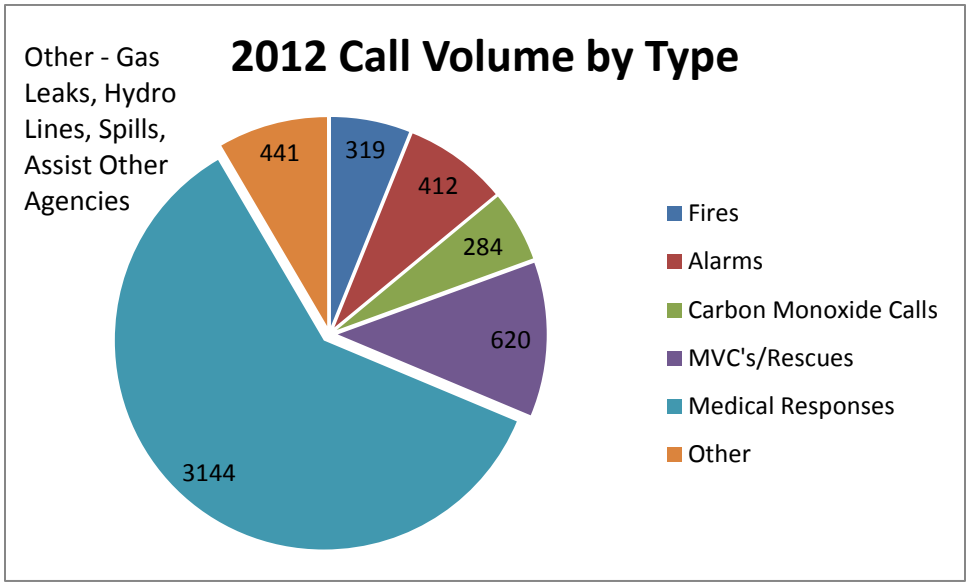
12.2 Figure 52 – 2010 Call Volume by Type



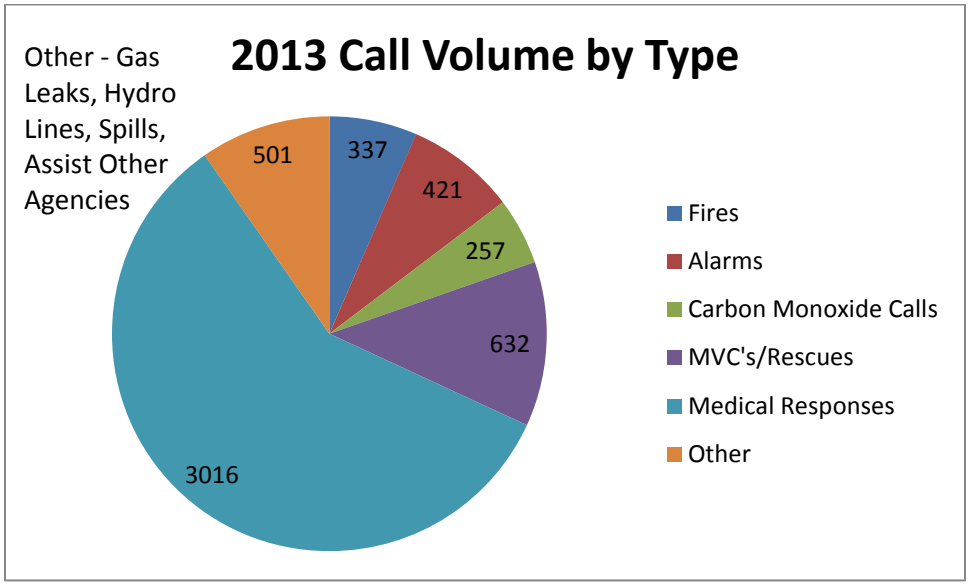
12.3 Figure 53 – 2011 Call Volume by Type



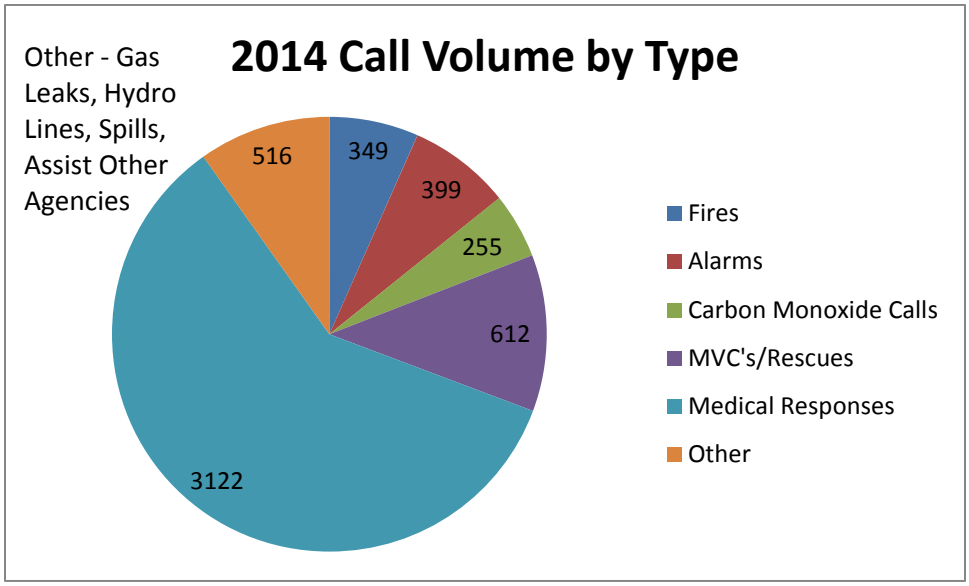
12.4 Figure 54 – 2012 Call Volume by Type



12.5 Figure 55 – 2013 Call Volume by Type



12.6 Figure 56 – 2014 Call Volume by Type



Further call volume information from 2005 to date is included in Appendix P.

Observations

Several observations can be drawn from these emergency call volume charts:

Increasing frequency trends:

Medical calls are growing faster in proportion to the other emergency calls,

Motor vehicle collisions (MVCs)/Rescues are increasing,

Static

Fire calls are neither increasing or decreasing

Other calls are neither increasing or decreasing

Decreasing frequency trends:

Carbon monoxide calls are decreasing, however, it is anticipated that there will be a dramatic increase in carbon monoxide calls based on the new legislative requirements requiring the installation of carbon monoxide alarms in all residential occupancies.

False alarms are decreasing.

12.7 Medical Tiered Response Agreement

Whitby Fire and Emergency Services participates in a Tiered Response Agreement with Durham Emergency Medical Services. As per the Agreement, WFES currently responds with Durham RDPS to the following types of calls:

- Absence of breathing/difficulty breathing
- Unconsciousness
- Sever uncontrolled bleed
- Motor vehicle accident with ambulance responding
- Heart attack where 1 or 2 above have not occurred

As of December 2015, WFES augmented its medical service levels by providing symptom assist techniques including EPI pen assistance.

Analysis:

WFES works well with RDPS in providing a tiered response level of service to the community of Whitby.

With increases in Whitby's population, its population age, and the number of vulnerable residents, along with the anticipated increase in the number of MVCs requiring extrication, it is reasonable to expect that medical calls will increase in number, and in complexity.

Whitby's current emergency medical call volume represents approximately half of its overall response call volume on an annual basis. Based upon an upward trend in medical calls year over year and Whitby's aging demographic, the medical call volume is likely to continue to increase.

At present, approximately 16 hours of third party delivered medical training is provided to WFES annually through Lakeridge Health's Base Hospital Program as part of the Pre-hospital Care Program. WFES staff are trained to the Emergency Medical Responder (EMR) level.

As can be seen in the following figure, WFES was on the scene of emergency medical calls before RDPS 99.4 % of the time (excluding emergency medical calls where WFES was cancelled by RDPS prior to arrival). In these instances, WFES was on scene for an average of 2 minutes and 44 seconds prior to the arrival of RDPS.

12.8 Figure 57 – Arrival Time by WFES versus RDPS

January 1, 2015 to August 30, 2015

Emergency Medical Calls	2082
Called off by RDPS prior to arrival	155 (7%)
WFES arrived on scene	1927 (93%)
Number of times RDPS on scene before WFES	13 (.6%)
Average amount of time WFES on scene prior to RDPS	2:44

These statistics identify an opportunity to improve Whitby's level of service by providing an enhanced level of medical service. With this in mind, WFES received training from Base Hospital on the use of EpiPens and began carrying them on all apparatus as of December 1st, 2015.

Additional service level opportunities should also be considered, including the use of nitroglycerin, Ventolin, ASA, glucose paste, etc., as long as their use is signed off, and training provided through the Base Hospital program.

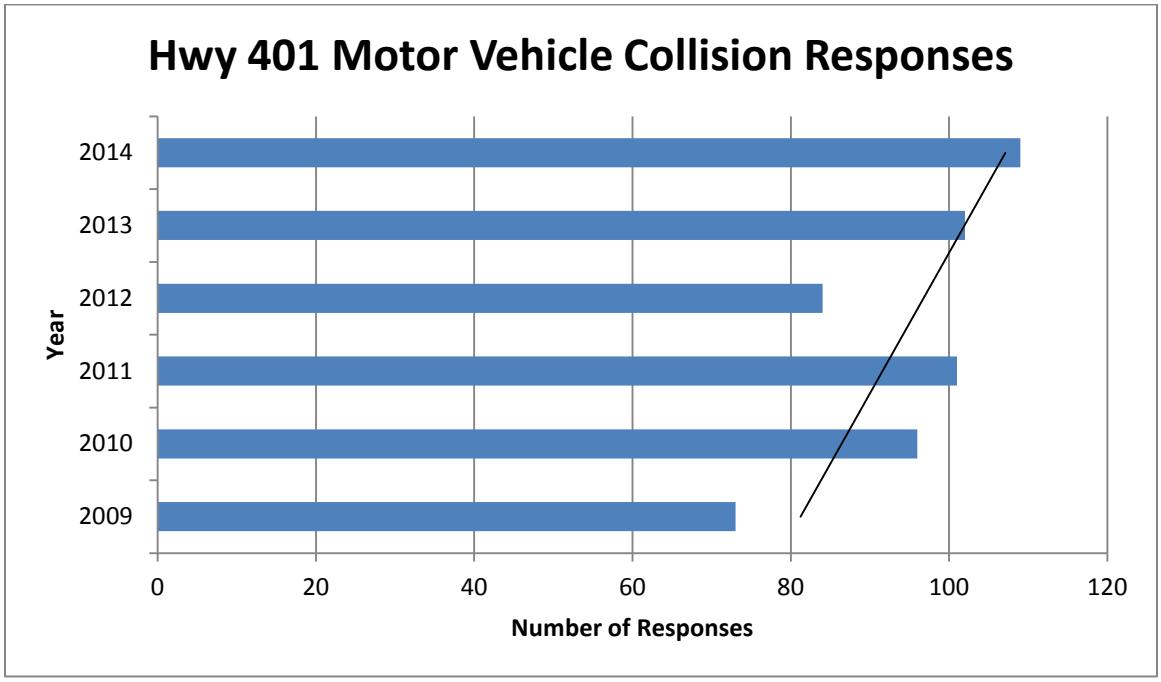
Should Recommendation #2 be approved, WFES will arrange with Base Hospital to increase the number of annual medical training hours received. (2016) (Recommendation #2)

It is recommended that Council endorse through a resolution, to have the Region of Durham solicit the Ministry of Health to implement simultaneous dispatch between Durham fire services and RDPS. (2016)

Responses to 400 Series Highways for motor vehicle collisions/extrication

The Town of Whitby's current stretch of 401 running from its borders from east to west over the past 6 years has yielded an average of 94.13 responses each year, with a rising trend over that period of time.

12.9 Figure 58 – Hwy 401 Motor Vehicle Collision Responses



12.10 Figure 59 – MVC Responses from 2005 – 2014

Type	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Located on 401	68	58	70	68	72	95	77	83	101	108
Lakeridge Rd #23	74	63	72	48	62	40	58	43	57	62
Other MVC's	545	537	469	497	424	421	469	489	458	431
Total	**687**	**658**	**611**	**613**	**558**	**556**	**604**	**615**	**616**	**601**

Analysis:

With the construction of the 407 and 412 in 2015, the length of 400 series highways in Whitby will increase by 2.5 times. Accurate vehicle traffic numbers are currently not available; however, the 407 and 412 will add significant additional traffic volume through the northern area of the municipality of Whitby as well as increased traffic patterns in a North / South direction from Highway 401 on a daily basis. It is reasonable to expect that the number of motor vehicle collisions, and therefore, the number of WFES responses will increase as well.

Once committed to a highway, the ability of WFES vehicles to respond to other emergencies throughout the Town is limited by highway exits and traffic.

Example: currently if committed to 401 westbound Fire vehicles have to travel to Salem Road and then return to Whitby to be available for another response.

WFES' standard response to an MVC on a highway is 2 Pumpers for staffing, one of which serves as a blocker vehicle per Section 21 Health and Safety guidelines (Appendix G), and Car 35 (Command vehicle). Staffing is necessary in the event fire suppression and /or extrication and patient care is required, and the blocker vehicle is used to warn vehicles entering the scene and to protect the workers and patients from cars entering the hazard zone.

The minimum length of time for Crews to respond to and clear a motor vehicle collision (MVC) on a highway is 20 minutes. Should extrication and patient care be required, the call duration can be much longer, sometimes up to an hour or more.

With one MVC underway on a 400 series highway, 40% of the compliment of Whitby Fire trucks and firefighters are unavailable for response to any other incident for the duration of the MVC. Should a house fire occur during the MVC, WFES would not be able to meet the NFPA 1710 Standard to provide 15 firefighters in less than 8 minutes. The sum of remaining resources available would be 12 firefighters. Mutual Aid would be required to be activated.

Should there be two MVCs on 400 series highways, 80% of WFES resources would be utilized, leaving one fire truck and 4 firefighters for any other emergency calls. In this instance, the one truck could respond to very little without enacting Mutual Aid.

Traffic volume on Lakeridge Road (Durham 23) will also see a dramatic increase in traffic volume because of the implementation of on and off ramps for the 401 and Lakeridge Road. The ramps are being constructed East bound on the 401 and west bound from Lakeridge Road.

The additional staffed truck will improve depth of coverage by ensuring that the municipality is not in a vulnerable situation when a second emergency call is received while apparatus are committed to a highway response. (2016) (Recommendation #1)

Fire Suppression is also involved in the following activities:

Suppression Activities

- Fire Station Public Tours
- Pre-planning residential, commercial and industrial sites
- Observing school Fire Drills
- Junior Fire Program
- Community Needs Assessment
- Equipment Checks and Truck Checks
- Daily Training
- Building Audits of commercial and industrial occupancies
- Honour Guard duties
- Industrial Education
- Presentations-Special needs groups upon request, general public such as Harvest Day, Harbour Days, Fairview Lodge Day, Brooklin Spring Fair, Christmas Tree Lighting, and the Santa Claus Parade

- Fire Prevention Week Open House
- Children's Safety Village Events
- Delivery of the Ever Alert Program
- Assistance with fire investigations
- TAPPC – Arson Prevention Program
- Think Ahead Program

Analysis:

WFES personnel respond to a wide range of response types and participate in a broad range of activities. Based on current staffing, WFES is struggling to meet the bare minimums in regard to response capabilities and delivery of programs. An additional area of concern and a potential gap may be found in WFES's response to specialty rescues, particularly in the areas of awareness level training for trench rescue, confined space rescue, building collapse and rope rescue.

It is recommended that WFES train all Suppression personnel to Awareness Level in Trench Rescue, Confined Space Rescue and Rope Rescue (2016), and that WFES enter into a service agreement with Oshawa Fire Services to provide Operations and Technician Level rescue services in the aforementioned disciplines. (2016) (Recommendation #2)

12.11 Fire Stations

Whitby Fire and Emergency Services deliver services to the community through five (5) fire stations that have been strategically located throughout the municipality. Fire Stations 1,3 and 4 are newer construction with similar floor plans. Fire Station 2 was originally constructed as a volunteer fire station and re-purposed when full time staffing was added. Fire Station 5 (Headquarters) was originally the Works Department and was repurposed in 1995 to its current use. The buildings are in the early stages of requiring capital investment in repairs and ongoing maintenance. WFES currently uses a hybrid maintenance model using Whitby Facilities for HVAC and electrical repairs and external agencies for all other repairs. The current maintenance model supports WFES needs but the use of external agencies results in increased operational expenses.

12.12 Figure 60 – Station Apparatus

Station #	Station Address	Apparatus	Minimum staffing
Station 1	6745 Baldwin St. N	Pumper 31	4
		Pumper 38 Support Pumper 39 Training	n/a n/a
Station 2	1600 Manning Rd	Pumper 32	4
		Aerial 32	**
Station 3	1601 Brock St. S.	Pumper 33	4
		Rescue 33	**
		Tanker 33	**
Station 4	734 Dundas St. W.	Pumper 34	4
		Pumper 37 Support	n/a
Station 5	111 McKinney Dr.	Pumper 35	4
		Aerial 35	**

** Aerial, Rescue and Tanker apparatus are not staffed. Crews staffing the pumpers switch over to these vehicles depending on the call type. They will respond with the Aerial, or the Pumper, but not both.

Pumpers 37 and 38 shown as Support are put into service when a front line vehicle has to be removed from service for maintenance. Due to ongoing breakdowns of front line vehicles, the Support pumpers are in service on a regular basis.

1. **Station 1**- 6745 Baldwin St. N. This station opened in September 2006. Station 1's primary response area is the northern portion of the municipality. Station 1 will also be the primary responder to incidents along the east and westbound lanes of Highway 407 and the southbound lanes of 412. This Station also acts in a supporting role for the storage and filling of SCBA cylinders.

Analysis:

Station 1 has been adequately maintained and is servicing and effectively housing the needs of WFES, allowing efficient response to the surrounding community.

2. **Station 2**- 1600 Manning Rd. This station was originally built in 1966 as a volunteer station, and was renovated in 1988 to facilitate the addition of full time fighters. An Aerial device is currently positioned at Station 2 along with the Pumper Rescue. Given the configuration of the Aerial, structural alterations have been made to the Station in order to house it.

Analysis:

The age and condition of the building has created service delivery challenges. The apparatus bay floor along the north side cannot be fully utilized due to a void in the substrate below the apparatus bay floor. Because of this, fire trucks cannot drive over it resulting in trucks having to back into the station instead of driving through it. Future capital funding will be required to ensure ongoing continuity of the apparatus bay floor given the size and weight of the apparatus.

Due to the Station's small size, there are no rooms available for storage of bunker gear. Forty sets of bunker gear are hung on the wall of the apparatus floor, continually exposed to vehicle exhaust. This is not the case with any other Whitby Fire station, as each one has a dedicated room physically separated from the apparatus floor. Section 21 Guidance Note #4-8 states that soiled or dirty elements on bunker gear may expose fire fighters to hazardous chemicals and may reduce the effectiveness of the protection it is intended to provide.

Station 2 is a two bay station, but only has one drive through bay, resulting in one of the two trucks being unable to drive through when returning from fire calls. Driving through is the preferred manner to enter into a station, as backing up a fire truck creates a situation that is more susceptible to accidents and injuries. Section 21 Guidance Note #1-3 was developed to help reduce accidents and injuries when backing up fire apparatus and states that backing up should be avoided whenever possible.

Discussion has taken place concerning the relocation of the Aerial to another fire station due to Station 2's limitations. However, running the Aerial from Station 2 is the best decision from a strategic deployment perspective, allowing the Aerial to be the second or third in vehicle at most structure fires.

There are no separate sleeping dorms or washrooms/showers for female fire fighters within Station 2. This has prompted the Chief to discontinue the practice of allowing females to work from this station until female facilities are added. The Station is the smallest fire station in Whitby and as such there is no room to create female facilities within the existing space. A costing estimate of $1,000,000 has been provided by TOW Facilities to expand the Station footprint to incorporate a new female area.

An assessment of the structural condition of Fire Station 2 has been conducted by TOW Facilities staff and it has been determined that it is at its half-life, not needing to be replaced for approximately 50 years. However, the building does not meet current or future needs.

The 10 year facility budget forecasts $165,000 in Capital expenditures for building repairs. Should the replacement of Hall 2 be approved these funds can be removed from the Capital budget. In light of, or a delay of approval, a decision will be required to address building repairs and maintenance.

It is recommended, given the age of the building and its limitations, that Station 2 be removed from its current site and replaced with a new fire station that meets the needs of today's Fire Department, capable of housing both the Aerial and the Pumper Rescue, and providing facilities for female fire fighters. Additional costs will be incurred due to the temporary relocation of the Fire Crew and trucks during construction. (2019) (Recommendation #8)

Figures 60 and 61 show the footprints of the other existing WFES fire stations, along with Station #4 superimposed on the Station 2 site. Based upon this preliminary review, it appears that the Station 2 site is capable of accommodating a new station.

12.13 Figure 61 – Existing Fire Stations

12.14 Figure 62 – Station 2 located with super imposed proposed station

Legend

Dimensions
Subject Parcel
Building Overlay
Parcel

It is further recommended that the Hall #2 replacement recommendation be contingent upon further analysis from staff, and a subsequent report to Council outlining a plan to continue emergency response operations during the period of demolition and construction. (See Recommendation #8)

3. **Station 3**- 1601 Brock St. S. This station opened in 2004, with its primary response area being the southern portion of the municipality, including the 401. This station is strategically located to provide depth of coverage response to Stations 4 and 2.

Analysis:

Station 3 has been adequately maintained and is servicing and effectively housing the needs of WFES, allowing efficient response to the surrounding community.

4. **Station 4**- 734 Dundas St. W. This station was opened in 2002, with it's primary response being the western and central portions of the municipality. There are several areas within this station are considered high fire risk or high response including White Oaks Court, Fairview Lodge and the Downtown core. Station 4 supports fire operations with the capacity to fill and store SCBA air cylinders. In addition to fire operations, Station 4 also currently houses a Fire Prevention Officer. This Station is strategically located to provide depth of coverage response to Stations 5, 2, and 3.

Analysis:

Station 4 has been adequately maintained and is servicing and effectively housing the needs of WFES, allowing efficient response to the surrounding community.

5. **Station 5**- 111 McKinney Dr. This station was originally built as the Whitby Works department in 1975 and was renovated in 1995 to accommodate the Fire Department Headquarters. The main floor of the building supports fire operations including fire command, with the second floor housing Administration, Fire Prevention, Training, and Logistics staff. This Station also contains a large training room, the Emergency Operations Centre, meeting rooms, and a public education resource room. In addition to the interior training room, the property includes an exterior compound that provides limited practical training equipment and space for all Fire Suppression staff.

Analysis:

Station 5 has been adequately maintained and is servicing and effectively housing the needs of WFES, allowing efficient response to the surrounding community

Station 5 is currently designed for the use of one Fire Suppression crew. Minor renovations to temporarily house a second crew will be required. This renovation can be completed without expanding the building footprint and will provide a dedicated female dorm area for future use. (2016) (Recommendation #3)

It is recommended that a preventative maintenance schedule with Facilities be developed for all fire stations to ensure operational effectiveness. (2016) (WFES Action – F)

Response Effectiveness Based Upon Existing Fire Station Locations

NFPA 1710 "Standard for the Organization and Deployment of Fire Suppression Operations" was developed to address the fire risks associated in responding with an initial full alarm assignment to a structure fire in a typical 2,000 square foot, two storey single family dwelling without a basement and exposures. The First response and Full Response/ depth of response performance measures for this basic fire are:

- First Response: The fire service's fire suppression resources shall be deployed to provide for the arrival of an engine company (minimum of four firefighters) within a 240 second (four minute) travel time to 90% of the incidents.
- Full Response/Depth of Response: The fire department shall have the capability to deploy an initial full alarm assignment (minimum of 14 firefighters, 15 if an aerial is sent) within a 480 second (eight minute) travel time to 90% of the incidents.

It is important to note that there is no legislative requirement to adhere to NFPA 1710. It is an internationally accepted best practice that many Fire Departments strive to achieve.

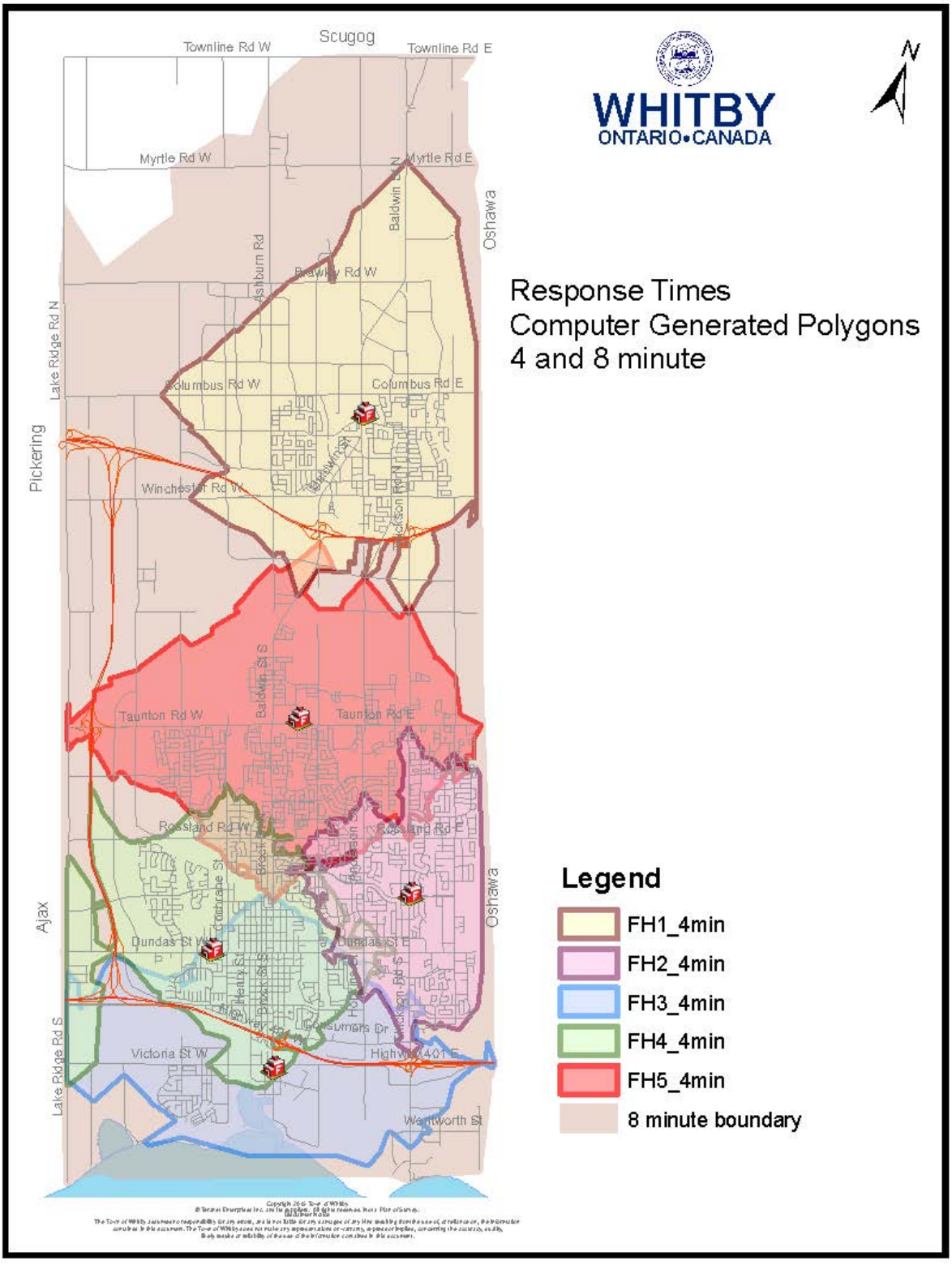
However, in an article from Municipal World, January 2006, Sean Tracy from NFPA explains, "In Canada, even though public officials can define policy, legal rulings have also required operations to meet common standards such as NFPA. Failure to meet any recognized standard exposes officials and the community to increased liability. Even though NFPA standards are not part of adopted legislation, past rulings have always used them as best practices and a measure of due diligence."

In evaluating Whitby's current response capabilities, the TOW GIS Department used the following data assumptions:

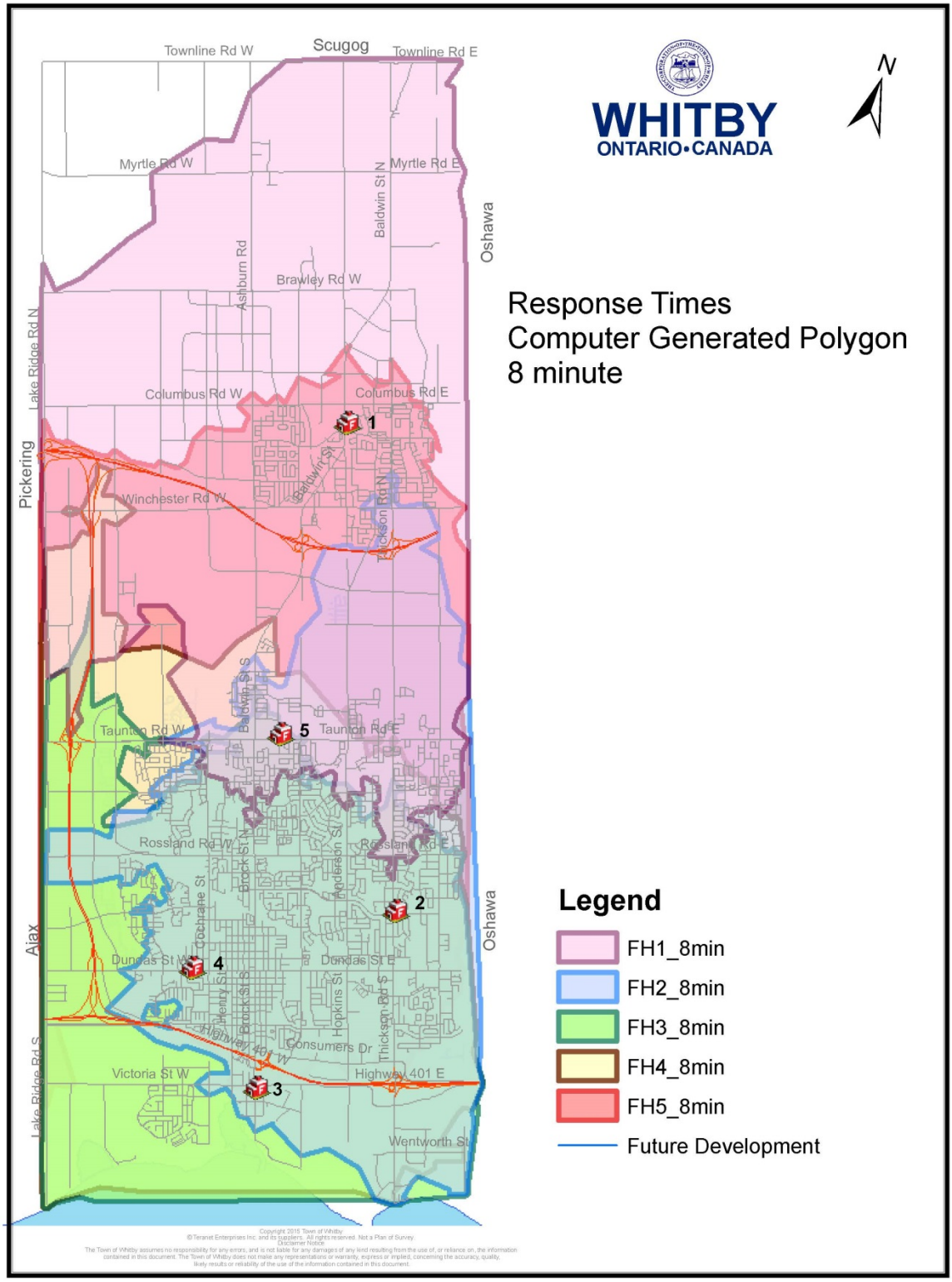
12.15 Figure 63 – Posted Speed Limits

Provincial and Regional Roads – posted speed limits		
	Arterial	60km
	Local	50km
	Freeway	100km
	Ramps	20km
Municipal Roads – posted speed limits		
	Arterial	50-80km
	Collector	40-50km
	Private	10km

12.16 Figure 64 – Response Times



12.17 Figure 64A – 8 Minute Depth of Coverage



Analysis:

Theoretically, WFES fire station locations currently meet the majority of the Town's initial response needs. Areas that are not within the NFPA standard 4 minute response time include:

- Thickson Road, South of Wentworth, West of Thickson, and East to the Oshawa border,
- Surrounding Eastbourne Beach over to Lakeridge Road
- West Whitby future development from Rossland Road to Taunton Road,
- Highway 412 in its entirety from Hwy 401 to Hwy 407,
- 407 from Lakeridge to Country Lane
- West of Brooklin from Country Lane to Lakeridge,
- North of Brooklin from Pickering to Oshawa
- Macedonian Village and surrounding areas,

The 8 minute response times (depth of coverage) are much different than the 4 minute response time zones. As can be seen in figure 64A, It is not possible for the Whitby community to have 15 personnel (4 trucks) arrive on scene within 8 minutes anywhere in the Town just north of Taunton Road. With the opening of the 407 in a few months, any calls to the highway will leave Brooklin without a fire apparatus for an extended period of time. In addition, WFES does not currently deploy 4 fire trucks to a fire emergency until it is confirmed by one of the 3 initially responding apparatus that there is a working fire. Deploying 4 trucks for every reported fire emergency prior to fire confirmation, leaves 1 fire truck available to respond to all other emergencies in the Town, compromising resident and fire fighter safety.

In January of 2011, the OFMEM released "Operational Planning: An Official Guide to Matching Resource Deployment and Risk" (Appendix H). The guide provides "information for Councils to make informed decisions in meeting their legislated responsibilities regarding the delivery of fire protection services". The guide moves beyond determining deployment of resources to a typical single family residential house fire, to include resources that would be required for additional, more complex risks. The guide also introduces the Critical Task Matrix to identify the tasks that must be conducted on a fire ground, and the number of personnel required to complete these tasks. Utilizing this guide, and the Critical Task Matrix, the minimum number of personnel that are required on a fireground to accomplish the critical tasks when responding to a Moderate Risk fire (including a typical Whitby house fire) is 16.

In the NIST 2010 Report on Residential Fire Ground Experiments (Appendix E), it was concluded that 4 person crews with a 4 minute response time had a significant impact on the success of the fireground operations when compared to 3 or 2 person crews, or when compared to arrival of crews after 4 minutes. The study also supported the NFPA 1710 standard of 15 personnel on scene within 8 minutes.

Currently, WFES initially responds to reported structure fires with 13 personnel, and upgrades to 17 personnel if the fire is confirmed. This leaves 4 personnel staffing one fire truck to protect the remainder of the Town. Having one staffed fire truck available to respond to all incoming emergency calls places a significant restriction on the ability of

WFES to provide an acceptable, safe level of service to the community while a fire is occurring. Appendix I shows the number of fire trucks required for each type of emergency call received. For example, WFES is not able to respond to motor vehicle collisions without activating Mutual Aid with either Ajax or Oshawa while 4 trucks are being used at a structure fire. As such, WFES activates Mutual Aid each time there is a structure fire in Whitby, so that there are two fully staffed trucks in Whitby fire stations (one from Oshawa Fire Services, and one from WFES) available to respond to multiple apparatus emergency calls. This is not the intent of Mutual Aid as designed by the OFMEM, and as understood in the Mutual Aid Agreements Whitby has with its neighbours.

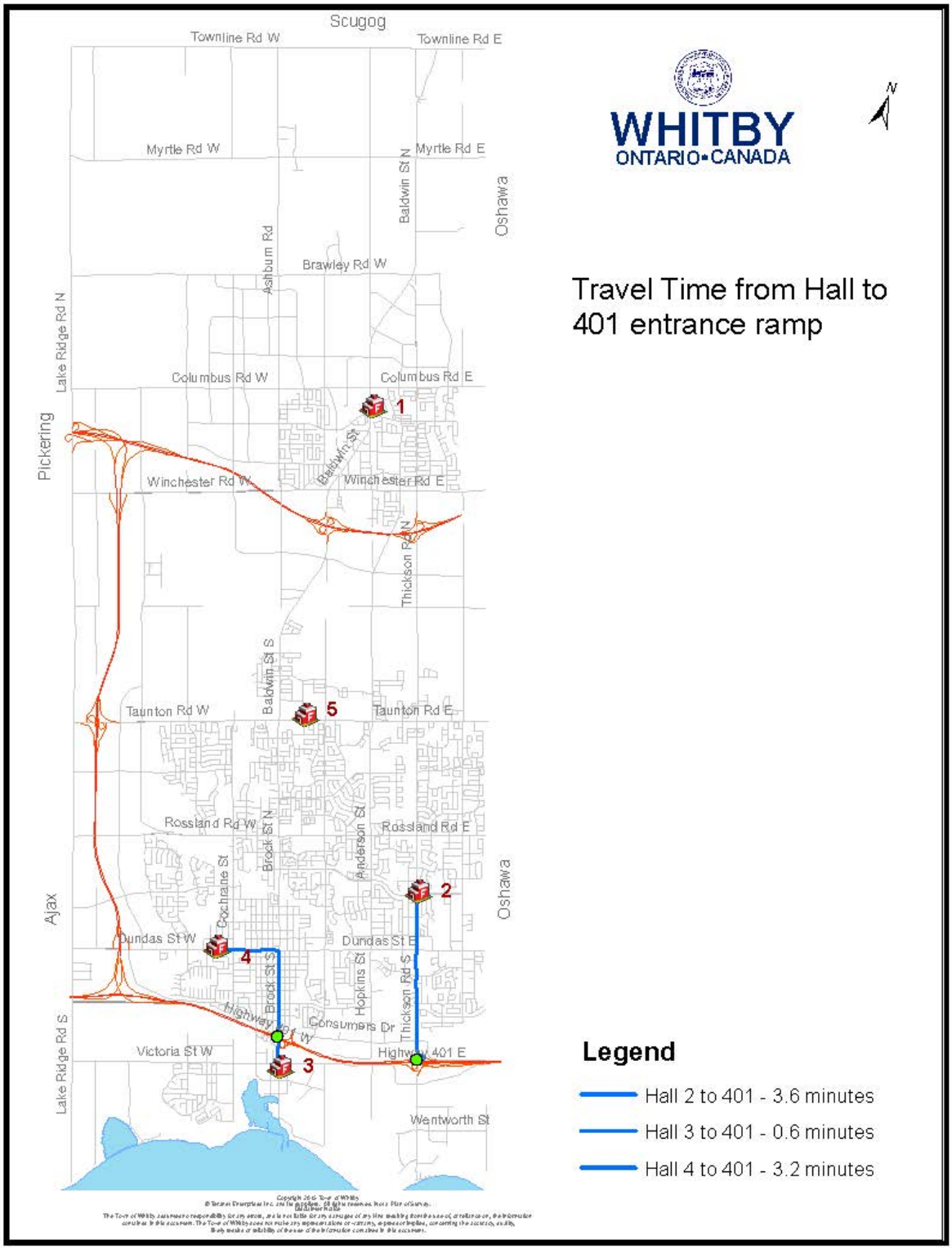
Figure 65 shows the number of times over the past 6 years that WFES has received emergency calls concurrently. On average, WFES receives a concurrent emergency call once every three calls. A closer look reveals that WFES receives a concurrent emergency call once every ten fire calls.

12.18 Figure 65 – Concurrent Calls

Year	# of Emergency Calls	# of Concurrent Calls	% of Concurrent Calls	# of Fires	# of Fires with Concurrent Calls	% of Fires with Calls
2015	4,153	1,332	32%	257	25	10%
2014	5,269	1,695	32%	351	34	10%
2013	5,172	1,709	33%	338	19	6%
2012	5,229	1,756	34%	322	30	9%
2011	5,399	1,809	34%	348	31	9%
2010	5,101	1,653	32%	388	47	12%

For an MVC, two trucks are required per Section 21 Guidance note #6-10 with one truck serving as a blocker vehicle to protect workers (Appendix G). Current service levels for WFES responses to highway 401 are between 3 and 4 minutes.

12.19 Figure 66 – Travel Time from Station to 401 Entrance Ramp



An aerial device is currently dispatched to all building related calls within the municipality. Because WFES does not have the personnel required to staff an aerial

device, on duty personnel assigned to a pumper must “jump” to the aerial when a building response is received outside of their area. WFES has two stations that currently share two aerial apparatus and respond in this manner to building responses. This procedure of having one crew respond on two different apparatus, depending on the type and location of the incident, causes elevated response times and potential issues if rerouted to another incident.

There is a trend amongst fire services because of their size, to dispatch aerial devices to all motor vehicle collisions to provide blocker apparatus to protect personnel working in motor vehicle hazard zones.

The additional apparatus will be stationed at the new West Whitby Station #6. The apparatus will address the gap created when WFES has four (4) apparatus committed to a structure fire, leaving the municipality dependant on Mutual Aid to backfill in the event of another response. It will also provide much needed coverage for motor vehicle collisions on highways 412 and 407, and Lakeridge Road. The new apparatus and firefighters will respond temporarily from Station #5 until the new West Whitby Fire Station #6 is constructed. (Recommendation #3)

12.20 Fire Suppression Operations

WFES utilizes the Incident Command System for all of their emergency responses. An Incident Command System (ICS) is an organizational model that applies to any type of emergency. It can be used at a single unit response that lasts only a few minutes, or a complex, week long incident involving multiple agencies and Mutual Aid units. It is also an OHSA Section 21 requirement.

At any incident, WFES works within the ICS under the overall command of the Incident Commander (IC). The IC assesses risk, determines an appropriate strategy, and assigns specific tactical objectives.

An Accountability system to keep track of personnel in an Immediately Dangerous to Life and Health (IDLH) environment is required by (OHSA section 21 requirement). Firefighters must check in with an Entry Control Officer and remove and give him their Personal Identification Tag or (PIT) pass. All personnel, their location and their functions are then relayed to an Accountability Officer and tracked on an Accountability Board in the command post. When firefighters leave the IDLH area, they check out with the entry control officer and the information be relayed to the accountability officer. In the absence of effective accountability system fire fighters are more prone to injuries and fatalities.

While the IC may take responsibility for overseeing all aspects of safety at small incidents, at larger, more complex incidents an Incident Safety Officer (ISO) should be appointed to ensure the safety of operations (OHSA Section 21 recommendation). The ISO is responsible for monitoring and identifying hazardous and unsafe situations and developing measures for ensuring personnel safety. The ISO must be trained to the

level and scope of operations conducted at the incident and is required to perform the following duties based on NFPA 1521: SEE Appendix J

OHSA Section 21 Guidance Note requires that a Rapid Intervention Team (RIT) be standing by whenever firefighters are in a hazard zone. RIT consists of three members who are prepared to rescue injured or trapped firefighters. They must be trained in firefighter rescue and equipped with the same Personal Protection Equipment (PPE) as the interior firefighting crew.

The International Fire Service Training Academy (IFSTA) manual issues a caution to not underestimate the time and personnel required to rescue a downed firefighter. Carrying one unconscious firefighter can require four rescuers, and fully removing the firefighter from the hazard zone can require up to twelve rescuers. This process can take as long as twenty minutes to complete.

12.20.1 Figure 67 - Mandatory Assignments and Operational Tasks for A Residential Structure Fire

Incident Commander	1	Section 21 OHSA
FIT/Scribe	1	
Rapid Intervention Team RIT	3	Section 21 OHSA
Entry Control Officer	1	Section 21 OHSA
Accountability Officer	1	Section 21 OHSA
Incident Safety Officer	1	Section 21 OHSA
Attack Line Entry Team 1	3	
Attack Line Backup Entry Team 2	3	
Search & Rescue	3	
Pump Operator	1	
Ventilation	2 to 3	
Water Supply	1	
Exposures	2 to 3	
Salvage & Overhaul	2 to 3	
Rehab/Staging	2	
Public Information Officer	1	

The table above shows the functions that are required for a response to a standard residential house fire with smoke showing. It illustrates how quickly all available personnel are assigned tasks. The key roles are supported under the Occupational Health and Safety Act Section 21 Guidance Notes.

Analysis:

Current staffing levels leaves WFES in a very precarious position to adequately provide enough staff to safely and effectively mitigate the most basic residential house fire. Time of year and ambient temperature have a strong bearing on whether WFES is able to handle a typical house fire with existing staffing.

This situation becomes a significant risk management issue because 80 % of Whitby's resources are exhausted for one typical house fire. Based on current staffing, WFES is

unable to adequately handle a second response that may come in while the initial call is underway. WFES has a reliance on neighbouring municipalities to assist through the use of Mutual Aid to deal with larger incidents, but it is not intended to be used for Town coverage every time WFES responds to a structure fire. WFES is also heavily reliant upon the use of Emergency Call Back to assist with multiple incidents and larger incidents. WFES personnel are not paid to be On Call, and come in on a voluntary basis (paid when they respond) to assist when called upon. Emergency Call backs that occur during holiday seasons and summer months pose challenges in ensuring that enough personnel respond back on their off time. WFES has recently developed a draft guideline that improves the current Emergency Call Back model, but this does not address the availability of staff. (Appendix H)

WFES current staffing requires the crews at Station 2 and Station 5 to jump between their regularly assigned Pump Rescue and the Aerial Trucks depending on the type of response. This type of arrangement impacts response times and poses response issues due to the fact that an Aerial device is not staffed full time.

Because the Tanker, Rescue/Rehab Units are not staffed, the Pumper Rescue Crew from Station 3 is required to jump between their regularly assigned Pumper Rescue and the Tanker, Rescue/Rehab Unit delaying their response capabilities.

At this stage, the Town of Whitby and its' Fire Service requires a fully staffed and first-run Aerial device. If the Pumper Rescue Crew from either Station 2 or 5 is out of their station or at another call, the Aerial Device cannot respond, unless another Crew from Station 3 or 4 drive to the station, switch gear and then continue to the response. This adds a considerable amount of valuable time to the response time of the Aerial and staffing. Furthermore, the crew that is bringing the Aerial to the fire scene is not the crew that is from the Station in which the Aerial is stationed. This crew has not checked the vehicle at the beginning of the shift, has not received the most up to date information on the vehicle and is not being provided an adequate amount of time to become comfortable in its operation. By the time the Aerial does arrive, the fire scene is often so congested with fire vehicles, emergency vehicles, hose lines etc. that it is not possible to position it properly for it to be fully utilized.

Mutual Aid

Through the FPPA, municipal fire services may participate in Mutual Aid. Mutual Aid agreements are predetermined plans that allow a participating fire department to request assistance from a neighbouring Fire Service once their resources have been depleted. Public Fire Safety Guideline (PFSG 04-05-12, Appendix K) provided by the OFMEM identifies the information required to develop and approve these agreements.

Whitby Fire and Emergency Services is an active participant in the" Regional Municipality of Durham Mutual Aid Plan". This includes the regular review and update of the plan and participation in providing assistance to a neighbouring municipality should it be requested. As outlined within the Mutual Aid By-Law, Whitby Fire and Emergency Services is authorized to leave the limits of the municipality of Whitby at the discretion of the Fire Chief, under the direction of the Region Fire Co-Ordinator, to respond to calls for assistance from other fire departments authorized to participate in the Durham

Region Mutual Aid Fire system or any other Regional Mutual Fire Aid System on a reciprocal basis. WFES may be called upon to participate in larger events outside of Durham Region.

Whitby Fire and Emergency Services has been dependant on Mutual Aid and Emergency Call Back for a working fire (smoke and flames showing) in an average residential home. With the adoption of the NFPA standards and in particular NFPA 1506 Rehabilitation, an area where WFES has been failing to meet the standard, there is an even greater requirement for staffing.

Mutual Aid was designed for large scale incidents such as the Fairview Lodge fire occurring in the Fall of 2014, or the Downtown Whitby fire occurring in the Spring of 2015, where the incident is well beyond the capabilities of the local fire department and seldom requires interior firefighting beyond the first 10-15 minutes of the call prior to the arrival of Mutual Aid. The 2016 edition of NFPA 1710 contains additional operation and deployment standards for fires in buildings larger than single family dwellings. Garden style apartment buildings, and shopping centers require a minimum of 27 personnel, and high rise buildings require 43 personnel. WFES is not staffed to fight a fire in these buildings and will activate Mutual Aid should one occur. WFES should; however, be able manage an average residential house fire without relying on Mutual Aid or Emergency Call Back.

There is no guarantee that this free source of staffing and resources is always going to be available.

Analysis:

Consequences to Mutual Aid partners for excessive use include loss of staffing resources, increased vehicle maintenance and fuel costs, increased risk of accidents during response, risk of injury and WSIB costs.

Fire Departments should utilize their own resources when conducting fire ground activities, and utilize Mutual Aid only when absolutely necessary.

Following are several reasons for this:

•**Fire Fatalities:** The majority of fire deaths occur in residential structures; from 2004-2013 there were 762 fatal fires in Ontario, 648 or 85% occurred in residential structures. There is no room for error or second guessing on the fireground. Crews from different Department do not train together and there is potential for a more ineffective response.

•**Safety:** Section 21 of OHSA states key roles that must be in place, Incident Commander, Incident Safety Officer, Entry Control, Accountability, Rapid Intervention Team. It is best to work with Crews that have all been trained to the same standards and utilize them in the same manner on the fire ground.

•**Time:** As illustrated in the article by Underwriters Laboratories of Canada, today's fires burn faster and hotter and fire crews are arriving to conditions such as flashover,

oxygen starved fires, and possible structural collapse. An efficient fast and coordinated attack is necessary to allow crews to perform search and rescue operations and contain fire to structure of origin.

•**Training:** Although key functions such as, Incident Command System, Accountability, Entry Control, and Rapid Intervention Teams are consistent across the Region there is no cross training between departments. When neighbouring departments respond the Incident Commander has no knowledge of their experience level which may cause the Incident Commander to be hesitant to assign them crucial roles such as Search and Rescue or RIT which can lead to a delays in the distribution of assignments.

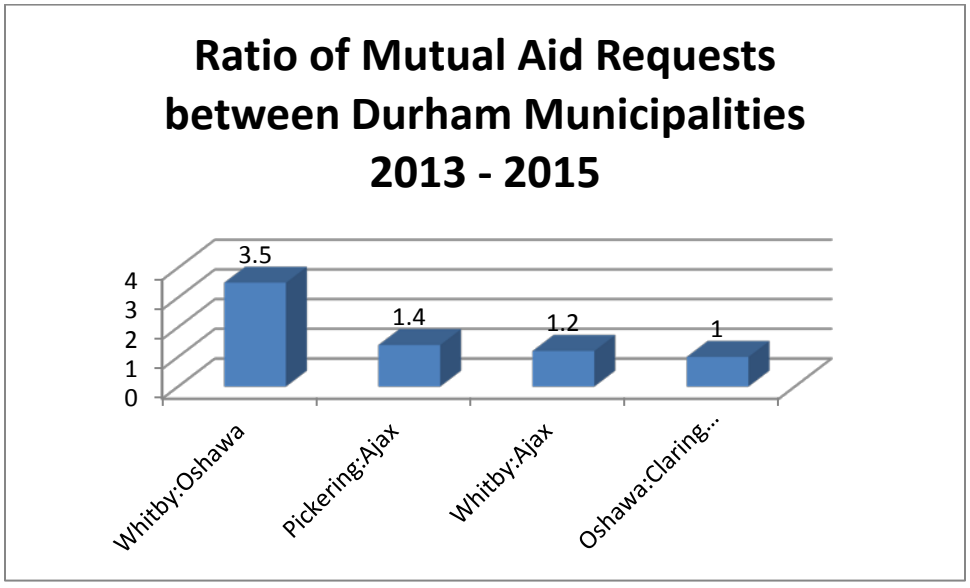
•**Fire Crew Familiarity:** Fire crews that train together on a regular basis, and become more familiar with the Incident Commanders' expectations and how to interact with their team, allowing them to operate more effectively in a coordinated manner.

•**Call Volume:** With the anticipated growth in West Whitby and Brooklin, as well as growth across the Region, WFES and surrounding departments will experience an increase in call volume. This will put an even greater strain on resources and possibly limit the ability of other departments to respond to Mutual Aid requests.

The following figure shows Whitby's reliance on Mutual Aid compared to the other Fire Departments in Durham Region. Ideally, Mutual Aid is cost neutral, with each Department responding to Mutual Aid request at the same ratio as they are making them. Over the past three years, Whitby relies on Oshawa to provide Mutual Aid 3.5 times more often than Oshawa relies on Whitby. This is the highest ratio within full-time Fire Departments in Durham Region.

In 2015, WFES has requested activated Mutual Aid from Oshawa Fire Services (OFS) thirteen (13) times, while OFS has requested WFES' assistance zero (0) times.

12.21 Figure 68 – Ratio of Mutual Aid Requests



Should Recommendation #3 be approved, the current strain being placed on Mutual Aid will be alleviated. The additional apparatus will greatly improve initial response capabilities, as well as the ability to respond effectively to a second incident occurring simultaneously with another response. (2016) (Recommendation #3)

12.22 Rural Firefighting Operations

Rural water supply is the process of providing a constant water supply to a fire scene in order to conduct safe, effective fire ground operations in non-hydranted areas. The process involves shuttling water by utilizing Tanker Apparatus. The Tanker responds to the scene with a full tank of water (approximately 2500 Gallons), dumps its water supply in a portable tank that a Pumper then draws from to conduct fireground operations. Once the Tanker has dumped its water supply, the Tanker proceeds to a water source, such as a pond or hydrant, to refill its tank, and returns to the fire scene to repeat this process. This water shuttle process is very time consuming and requires a number of Tankers to ensure an uninterrupted water supply for safe fire-ground operations.

WFES currently has one unstaffed Tanker positioned at Station 3 (Victoria St. and Brock St.). When a fire response is received in a non-hydranted area, outside of Station 3's response area, the crew at Station 3 must split their crew and have two personnel respond with the Tanker and the balance of the crew respond with the Pumper or the Rescue Unit to the fire scene. When a fire response is received to a non-hydranted location within Station 3's response area, a Pumper from anther Station must stop at Station 3 to pick up the Tanker and bring it to the fire scene. Mutual Aid is required at all working structure fires in non-hydranted areas where tanker water shuttle is required in order to maintain an uninterrupted water supply, as WFES is not capable of doing so with one Tanker.

WFES also has one Pumper Tanker in service stationed at Fire Station #1. This vehicle is fully staffed and operates as a pumper, responding to all emergency calls in its area. However, at 800 gallons it's water tank is larger than the other WFES Pumpers providing a greater initial water supply prior to the arrival of the Tanker and other Pumpers.

WFES' rural response times are hampered by lack of adequate address signage at rural properties. This problem is compounded during night time responses due to the lack of lighting in these areas.

Analysis:

Whitby's largest non-hydranted area lies from Columbus Rd north to Towline Rd. In this unprotected area there are large scale businesses such as: Greenwood Mushroom Farm, Royal Ashburn and Lakeridge Links Golf Clubs and some of the municipalities highest valued homes, yet WFES' current rural response delivers less water, in more time, to the scene than it did in the 1990's when it had two Tankers in its fleet.

As of 2015, assessed property values within 300 meters of a fire hydrant total $14,987,036,423. Assessed property values greater than 300 meters from a hydrant total $502,168,685. Therefore, 3.2% of the assessed property values in the Town of Whitby require a Tanker as part of the fire response.

The placement of the Tanker at Station #3 provides adequate coverage for all unprotected areas in the South and West sides of Whitby. It also provides a necessary supply of water to any large scale incidents on Highway 401 and the soon to be operational Hwy 412. It also provides coverage to the Northern areas of the Town as the fourth-in vehicle. However, Tanker response to the Northern areas is in excess of 15 minutes.

WFES has access to a large Regional water reservoir located on Duffs Road South of Brawley Road with a dry hydrant connection that can be used as needed to fill its Tanker during a fire call.

Mud lake, on the border between Scugog and Whitby, is a large water supply located within the area it would be needed for fire suppression use, helping to ensure a continual supply of water on a fire scene. However, a dry hydrant connection has not been installed, and therefore, it cannot be accessed.

Until the Northern areas of Whitby are serviced and have hydrants to provide a constant water supply, the areas to the North are more vulnerable to greater fire loss than those in hydranted areas. With the advent of Highway 412 and Highway 407, traffic volume will increase dramatically putting additional pressure on WFES in regard to motor vehicle collisions and car fires. The lands surrounding the two new 400 Series highways will attract more Industrial/Commercial occupancies, which will increase building call volume and place additional strain on the Department's ability to respond to this area in a timely manner. Because access to both new highways is limited, Whitby's ability to access incidents on the new 400 series highways will also pose response challenges.

The majority of the both highways will be in non hydranted areas, which will put pressure on WFES to adequately supply water for incidents on, or along the 400 Series corridors.

Recommendation # 37 (Council)

It is recommended that WFES consider relocating its Tanker from Station #3 to a Station that is more centrally located. The timing of this relocation will occur after West Whitby Fire Hall #6 is constructed. (WFES internal Action)

It is recommended that Council consider approving the amendment of Whitby's addressing Bylaw (2263-87) to mandate the installation of reflective addressing signs in rural locations. (2017) (Recommendation #9)

It is recommended that Council direct the Fire Chief to approach Scugog Township, and Durham Region about the installation of a dry hydrant connection

at Mud Lake in order to provide a source of water for use during fire suppression activities in North Whitby and in Scugog (2017). (Recommendation #9)

12.23 Figure 69 – Dry Hydrant

Design and Installation Criteria	Code Section
Dry hydrants shall be designed and installed accordance with NFPA 1142 and include calculations per Appendix I. A sample detail from A.8.3.2(b) is provided below for reference.	VSFPC B103.3 NFPA 1142, Ch.8

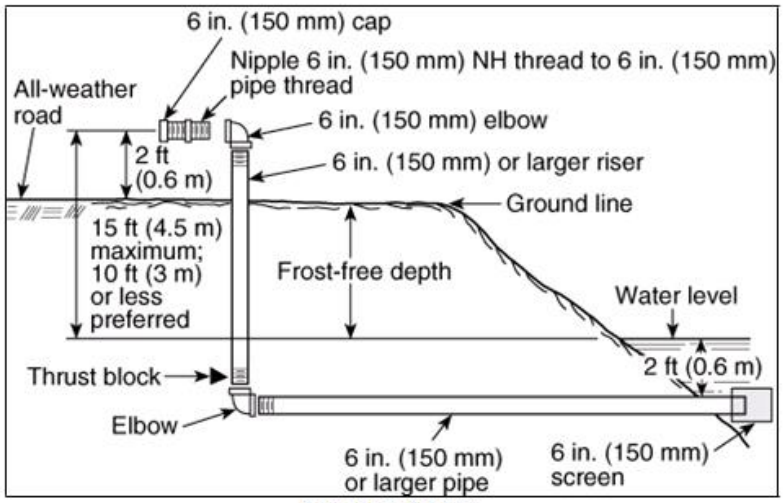
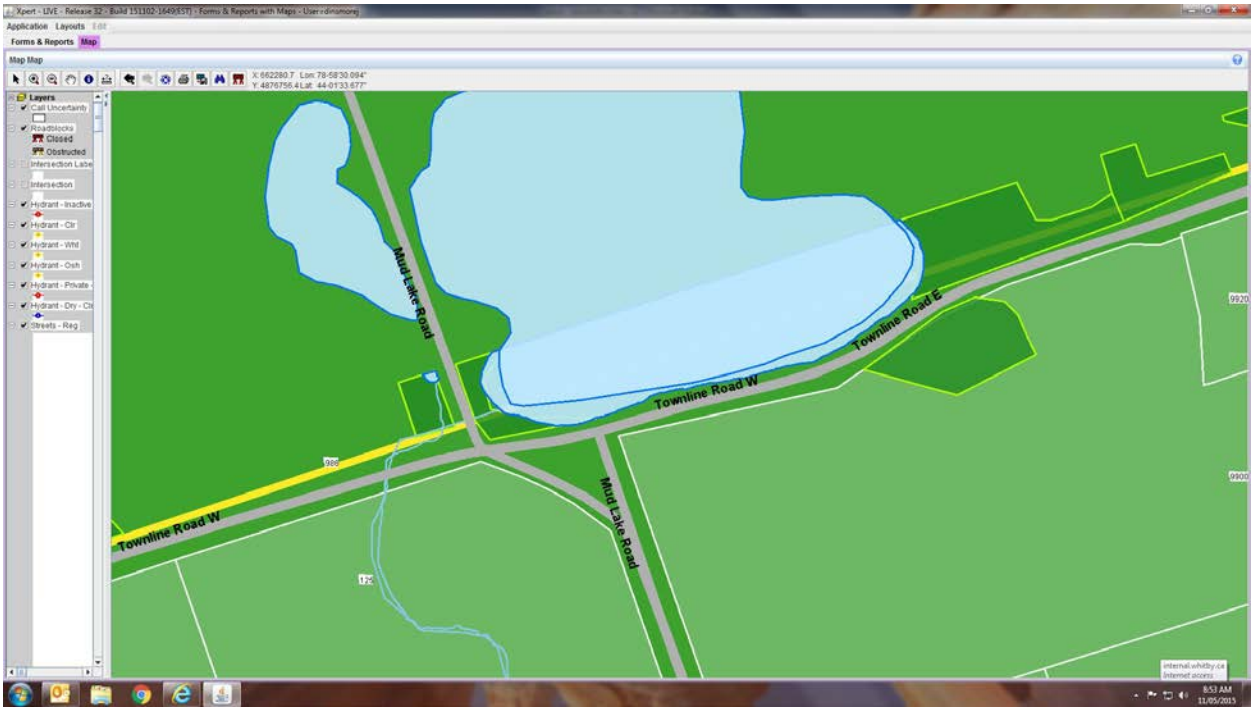


FIGURE A.8.3.2(b)

12.24 Figure 70 – Mud Lake Draft Port



12.25 Performance Measures for Suppression

Core components of evaluating the overall effectiveness of providing fire and emergency services include establishing a measurement-supported set of performance targets (i.e.: service standards) and setting clear goals and objectives. As identified in the Fire Prevention and Protection Act, 1997, the office of the Fire Marshall, Ontario (OFM) has the power to issue guidelines to municipalities with respect to fire protection services and related matters. These Public Fire Service Guidelines (PFSG) are to be used by local municipalities to determine the level of protection service they deem necessary, in accordance with their individual needs and circumstances.

The National Fire Protection Association (NFPA) has also developed specific standards for a wide range of the services that a municipal fire department provide, For example, NFPA 1710 describes the standard for the delivery of emergency response services by a full time fire service. Other standards, such as NFPA 1221 “Standard for the Installation. Maintenance, and Use of Emergency Services Communication Systems,” are also being utilized by municipalities to design and measure the effectiveness of their fire dispatching services.

The total response time to an emergency call can be separated into three components; dispatch time, turn out time, and travel time. Together these elements make up total response time required for a fire and emergency service to receive a call from someone at the scene, identify the location of the emergency and dispatch appropriate vehicles and staff, and travel to the scene of the incident. The common definitions of these three components are:

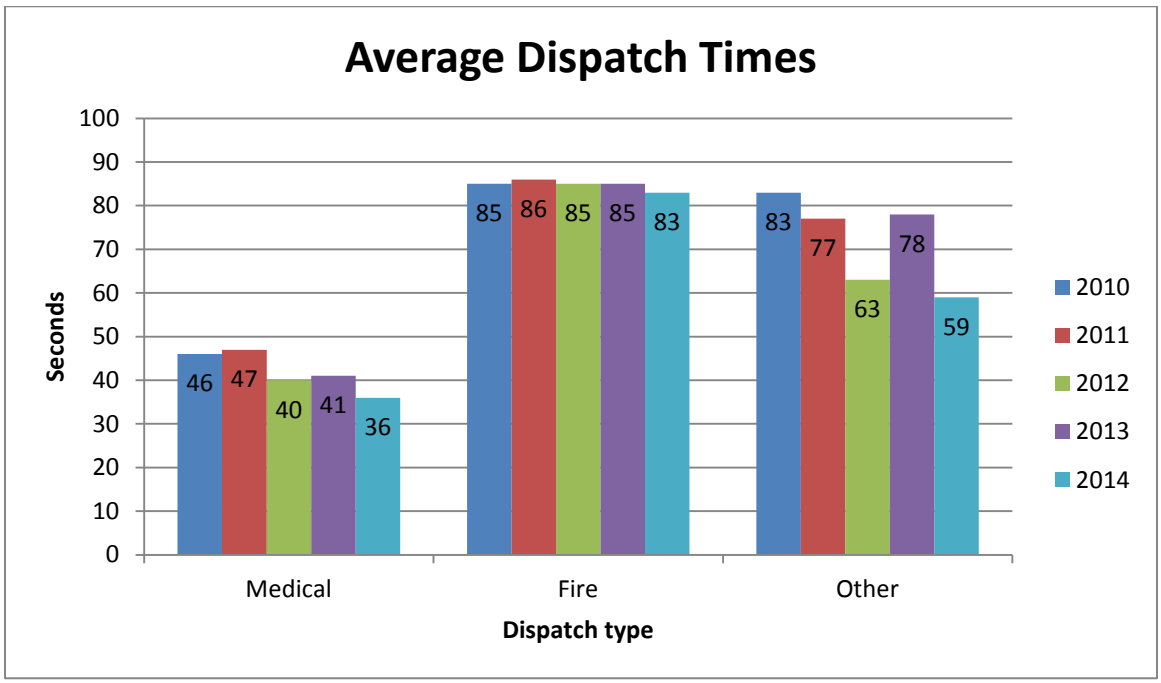
1. Alarm Processing/Dispatch Time: The time that it takes for the person responsible for the “alarm answering” and “alarm processing” to be able to dispatch the appropriate apparatus and staff to respond to the emergency.

2. Turn Out Time: The time interval that begins when the emergency response staff receives the required dispatch notification and ends at the beginning of travel time.

3. Travel Time: The travel time interval starts when the assigned emergency apparatus begins the enroute travel to the emergency and ends when the apparatus arrives at the scene.

Alarm Processing/Dispatch Times

12.26 Figure 71 - WFES Average Dispatch Times 2010-2014



NFPA 1221 requires the processing of the alarm call (dispatching) to be completed within 64 seconds for 90% of all calls, and within 106 seconds for 95 % of calls.

Analysis:

Through OFS Dispatch WFES is currently meeting the 95% threshold, but not the 90% mark.

It is recommended that WFES work with OFS to conduct further analysis to determine how to reduce dispatch alarm processing times. (2017) (WFES Internal Action)

Turn Out Times

12.27 Figure 72 - Average Turn Out Times 2009-2014

Year	P31	P32	P33	P34	P35	A32	A35	T33	R33	C35
2009	1:42	1:40	1:41	1:44	1:51			2:42		3:21
2010	1:49	1:44	1:46	1:47	1:49			3:45	3:02	3:20
2011	1:51	1:42	1:43	1:45	1:46			4:27	3:00	3:33
2012	1:50	1:42	1:44	1:40	1:49	2:34	2:47	3:50	4:15	3:38
2013	1:51	1:42	1:40	1:45	1:51	2:41	2:51	2:24	2:24	3:54
2014	1:55	1:53	1:44	1:51	1:50	2:39	2:45	3:08	3:08	3:54
Average	**1:49**	**1:43**	**1:43**	**1:45**	**1:49**	**2:38**	**2:47**	**3:22**	**3:09**	**3:36**

The average Turn Out time for all 5 stations over the above 5 year period is 1:45.8 seconds, or 105.8 seconds.

The objective set for NFPA 1710, for career departments, is to meet a turnout time of 80 seconds or less, 90% of the time for fire or special operations calls.

Analysis:

WFES is currently not meeting this standard and has already taken steps to improve Turn out Times. Whitby has recently installed a pre alert system which notifies the crew of an incoming emergency call while the dispatcher is still taking information from the caller. Since the installation of the Pre-Alert system in January 2015, Turn Out times for all 5 stations have dropped from an average of 105.8 seconds to 91 seconds. However, this is still above the NFPA standard of 80 seconds, 90% of the time. Additional analysis is required to further critique this number.

It is recommended that WFES continue to take steps to improve turn out times in an effort to meet NFPA best practices. The installation of turnout time clocks in each Station will enable responding firefighters to monitor their turnout times. The procurement of Automatic Vehicle Locators (AVLs) and integrated computer GPS mapping in front line fire apparatus is essential to improve response times and accuracy in locating incident addresses. An integrated AVL, GPS mapping system will allow crews to respond to incidents as soon as the pre alert is received. (2016) (Recommendation #10)

Travel Times

12.28 Figure 73 - WFES Average Travel Time by Station

Year	P31-Area 1	P32-Area 2	P33-Area 3	P34-Area 4	P35-Area 5	Average
2009	3:40	3:10	3:03	2:27	3:25	3:04
2010	3:39	3:14	3:01	2:32	3:20	3:03
2011	3:48	3:11	3:10	2:31	3:20	3:06
2012	3:46	3:09	3:15	2:32	3:18	3:05
2013	3:48	3:18	3:13	2:38	3:19	3:09
2014	4:01	3:11	3:15	2:36	3:22	3:14
Average	**3:47**	**3:12**	**3:09**	**2:32**	**3:20**	**6 Year Avg 3:07**

NFPA 1710 “Standard for the Organization and Deployment of Fire Suppression Operations” was developed to address the fire risks associated with responding with an initial full alarm assignment to a structure fire in a typical 2,000 square foot, two storey single family dwelling without a basement and exposures. The First response and Full Response/ depth of response performance measures for this basic fire are:

- First Response: The fire service’s fire suppression resources shall be deployed to provide for the arrival of first apparatus (minimum of four firefighters) within a 240 second (four minute) travel time to 90% of the incidents.
- Full Response/Depth of Response: The fire department shall have the capability to deploy an initial full alarm assignment (minimum of 14 firefighters, 15 if an aerial is sent) within a 480 second (eight minute) travel time to 90% of the incidents.

Analysis

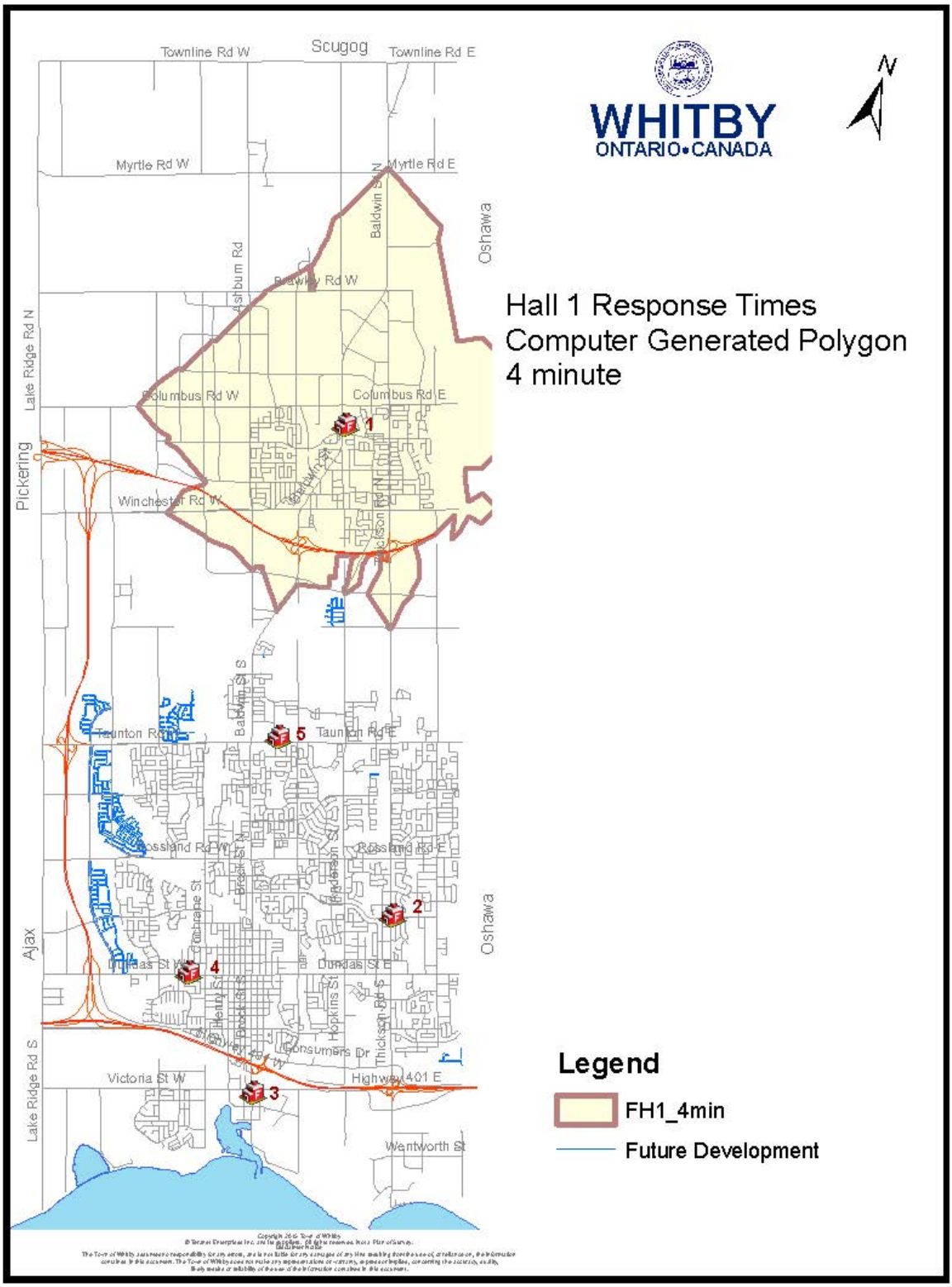
The fourth fire truck is not part of the initial response to a reported structure fire. Upon arrival on scene, the first arriving fire truck upon confirming a fire, will upgrade the call and request that a fourth truck respond. Therefore, the time for four trucks on scene is the travel time of the first arriving truck (3:47) plus the travel time of the fourth arriving truck (P34 – 10:00). WFES does not currently commit four trucks to a reported structure fire unless it is confirmed, as this will leave WFES with only one apparatus protecting the remainder of the Town.

12.29 Figure 74 - WFES Average Travel Times by Area – Station 1

Year	P31	P32	P33	P34	P35	A32	A35	T33	R33	C35
2009	3:40	8:05	11:48	8:27	6:46	6:58	7:55	18:36		6:20
2010	3:39	9:27	11:11	10:01	6:39	10:19	7:20	15:13		6:35
2011	3:48	10:37	7:30	10:15	6:36	9:21	8:19	23:51	11:07	7:30
2012	3:46	9:31	21:55	11:15	6:33	12:58	14:35	17:17	14:28	8:38
2013	3:48	8:32		10:06	6:50	8:12	8:35	22:45	25:57	7:15
2014	4:01	7:03		10:01	6:41	8:58			14:57	6:00
Total	**3:47**	**8:52**	**13:06**	**10:00**	**6:40**	**9:27**	**9:20**	**19:32**	**16:32**	**7:03**

Area 1

12.30 Figure 75 – Station 1 Response Times



Average initial response of 4 fire fighters in 4 minutes - WFES meets NFPA standard 1710 best practice.

✓ 3:47

Average depth of coverage of 15 fire fighters in 8 minutes - WFES does not meet the NFPA standard 1710 best practice.

12 fire fighters and the PC in 9:27

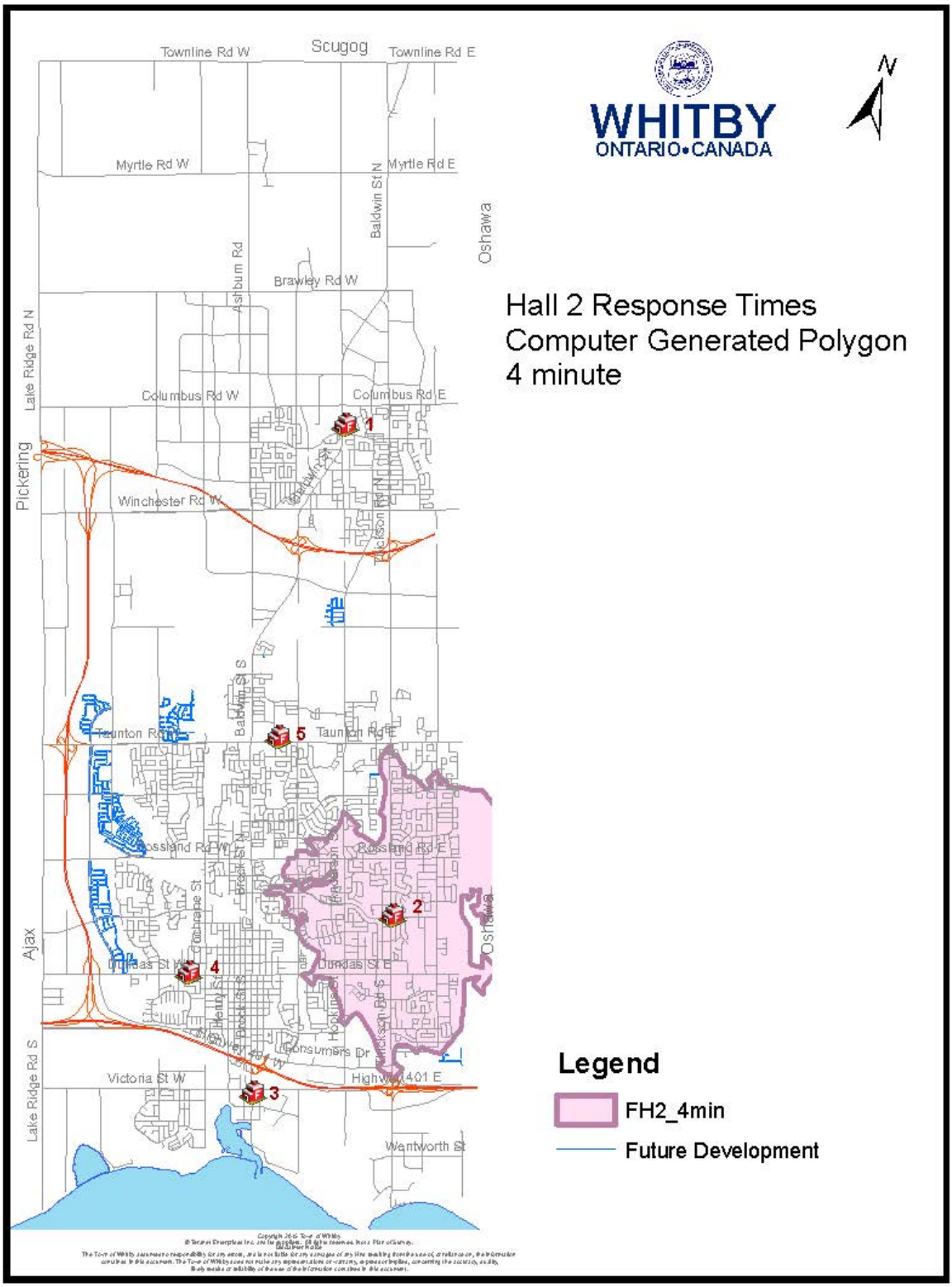
X 15 (16) fire fighters in 13:47

12.31 Figure 76 - WFES Average Travel Times by Area – Station 2

Year	P31	P32	P33	P34	P35	A32	A35	T33	R33	C35
2009	6:24	3:10	4:47	4:19	4:49	4:45	7:32		6:01	5:58
2010	4:55	3:14	4:52	4:22	4:42	4:19	7:13			4:35
2011	7:57	3:11	4:43	4:29	4:38	4:01	6:34			5:05
2012	8:06	3:09	5:10	4:35	4:30	3:40	6:39			4:49
2013	5:50	3:18	5:03	4:44	4:48	3:15	6:35		3:59	4:50
2014	8:29	3:11	5:27	4:35	4:48	3:27	6:23	5:40	5:40	4:39
Total	**6:56**	**3:12**	**5:00**	**4:30**	**4:42**	**3:54**	**6:49**	**5:40**	**5:13**	**4:59**

Area 2

12.32 Figure 77 – Station 2 Response Times



Average initial response of 4 fire fighters in 4 minutes – WFES meets NFPA standard 1710 best practice.

✓ 3:12

Average depth of coverage of 15 fire fighters in 8 minutes - WFES does not meet NFPA standard 1710 best practice.

12 fire fighters and the PC in 6:49

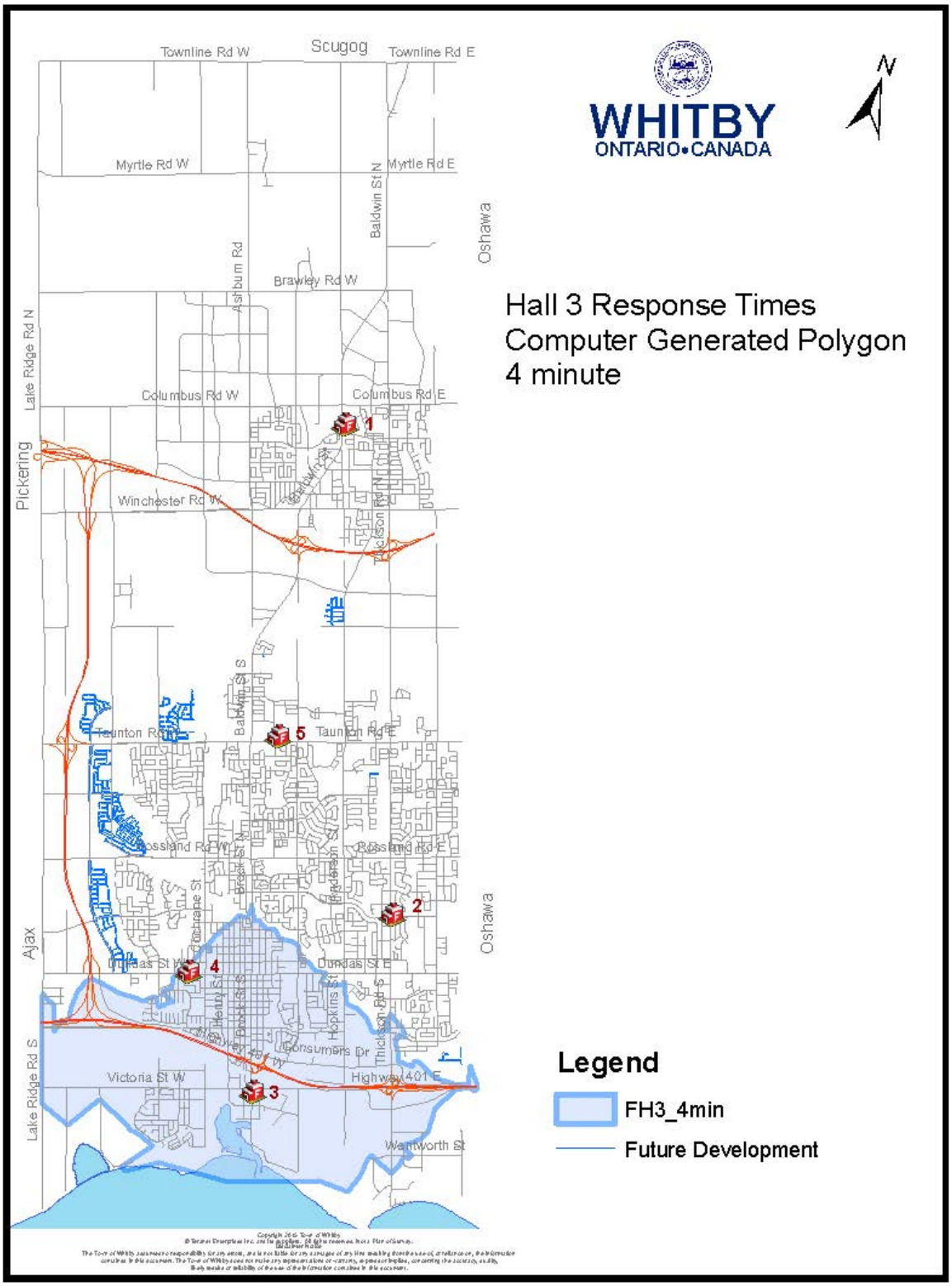
X 15 (16) fire fighters in 8:12

12.33 Figure 78 - WFES Average Travel Times by Area – Station 3

Year	P31	P32	P33	P34	P35	A32	A35	T33	R33	C35
2009	11:09	5:25	3:03	4:39	7:08	10:44	9:46		1:55	7:06
2010	11:30	5:23	3:01	4:59	7:38	9:26	8:15		3:18	7:41
2011	11:43	5:06	3:10	4:49	6:49	7:04	8:53		7:51	8:04
2012	10:12	4:58	3:15	5:01	7:42	7:26	8:56	4:53	3:35	7:26
2013		5:31	3:13	5:01	7:57	7:11	9:45	5:36	6:51	8:35
2014		5:19	3:15	5:04	7:59	5:56	9:55	5:38	4:03	7:23
Total	**11:08**	**5:17**	**3:09**	**4:55**	**7:32**	**7:57**	**9:15**	**5:22**	**4:35**	**7:42**

Area 3

12.34 Figure 79 – Station 3 Response Times



Average initial response of 4 fire fighters in 4 minutes - WFES meets NFPA standard 1710 best practice.

✓ 3:09

Average depth of coverage of 15 fire fighters in 8 minutes - WFES does not meet NFPA standard 1710 best practice.

12 fire fighters and the PC in 7:57

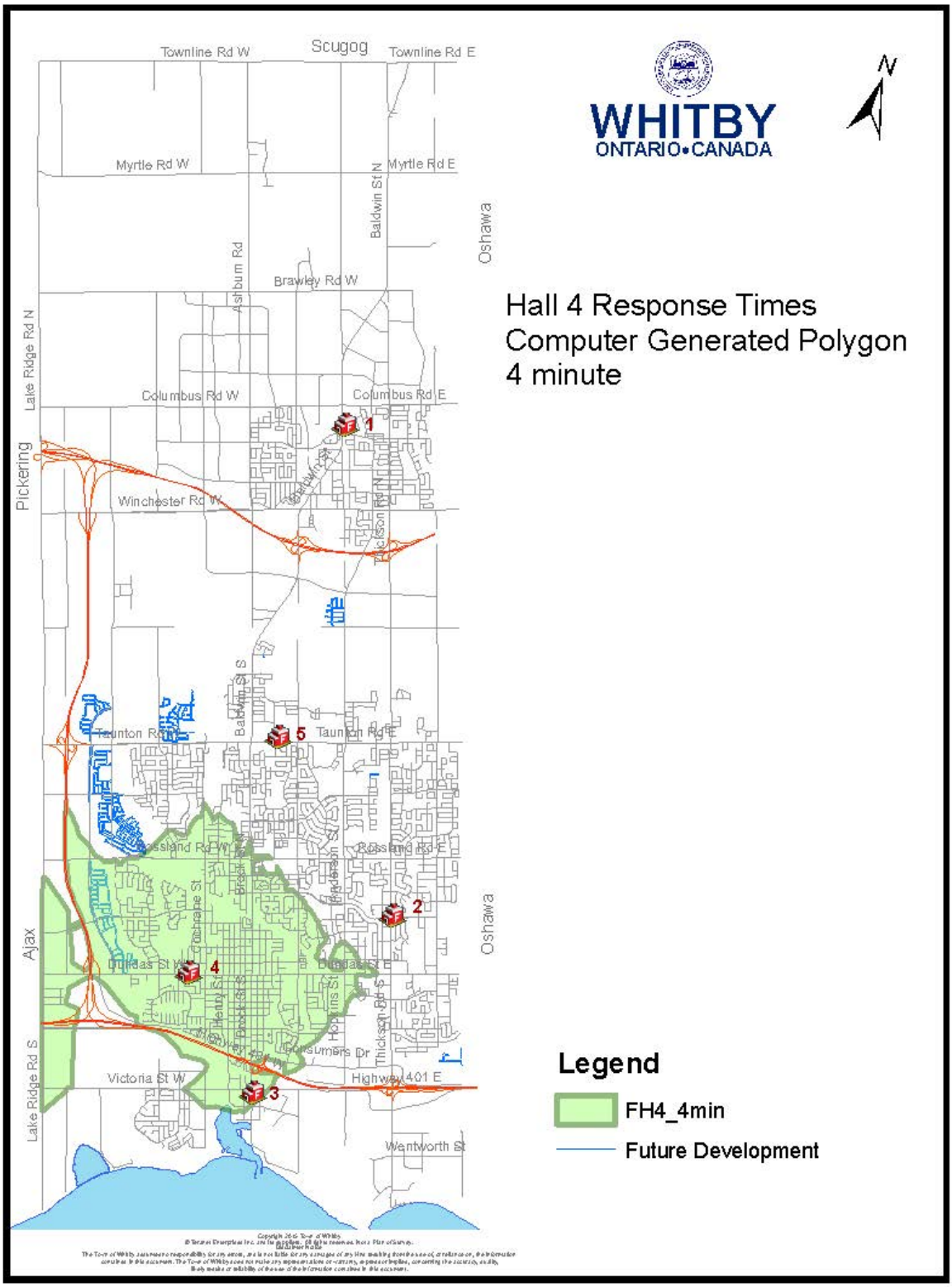
X 15 (16) fire fighters in 10:41

12.35 Figure 80 - WFES Average Travel Times by Area – Station 4

Year	P31	P32	P33	P34	P35	A32	A35	T33	R33	C35
2009	9:58	4:44	3:40	2:27	5:03	9:00	7:15			5:41
2010	9:55	4:40	3:44	2:32	4:34	7:11	6:56	5:05		5:14
2011	8:46	5:21	3:46	2:31	4:53	6:11	7:06	8:03	10:58	5:01
2012		5:18	4:03	2:32	5:03	5:51	6:21		4:47	5:12
2013	10:12	4:32	3:57	2:38	5:21	6:22	7:06		3:34	6:08
2014	9:57	4:05	3:53	2:36	4:43	6:07	6:55			5:02
Total	**9:45**	**4:46**	**3:50**	**2:32**	**4:56**	**6:47**	**6:56**	**6:34**	**6:26**	**5:23**

Area 4

12.36 Figure 81 – Station 4 Response Times



Average initial response of 4 fire fighters in 4 minutes - WFES meets NFPA standard 1710 best practice.

✓ 2:32

Average depth of coverage of 15 fire fighters in 8 minutes - WFES does meet NFPA standard 1710 best practice.

12 fire fighters and the PC in 6:47

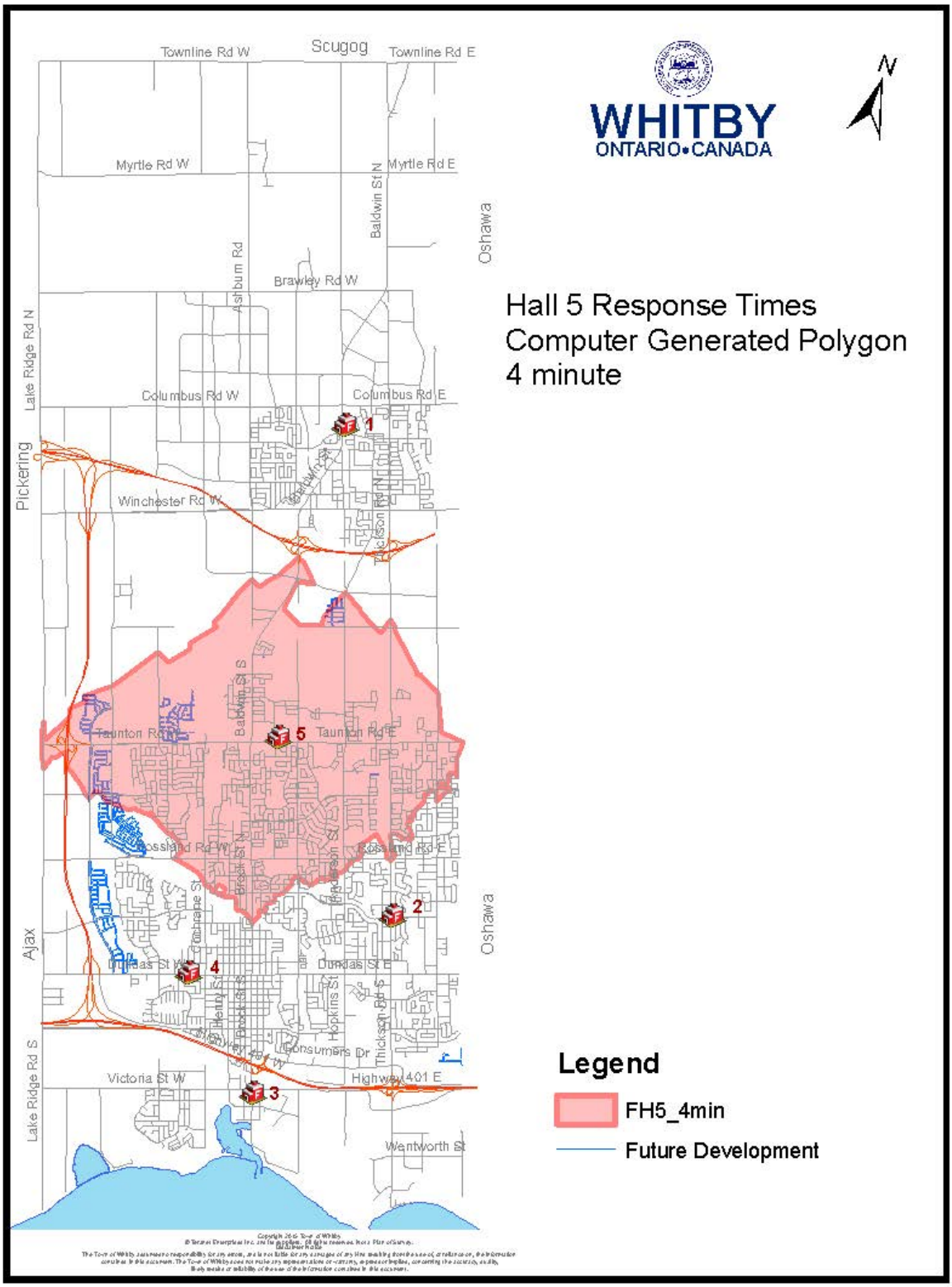
✓15 (16) fire fighters in 7:28

12.37 Figure 82 - WFES Average Travel Times by Area – Station 5

Year	P31	P32	P33	P34	P35	A32	A35	T33	R33	C35
2009	5:49	4:40	5:53	5:22	3:25		4:12			3:16
2010	5:51	4:34	5:43	5:14	3:20	9:57	4:13			3:24
2011	5:32	4:31	5:27	5:31	3:20	4:44	4:14			3:34
2012	6:00	4:25	5:54	5:44	3:18	5:42	4:03	11:06		3:16
2013	6:01	4:26	5:46	5:47	3:19	5:39	3:11			3:13
2014	6:26	4:23	5:59	5:20	3:22	6:20	3:46	13:30		3:38
Total	**5:56**	**4:29**	**5:47**	**5:29**	**3:20**	**6:28**	**3:56**	**12:18**		**3:23**

Area 5

12.38 Figure 83 – Station 5 Response Times



Average initial response of 4 fire fighters in 4 minutes - WFES meets NFPA standard 1710 best practice.

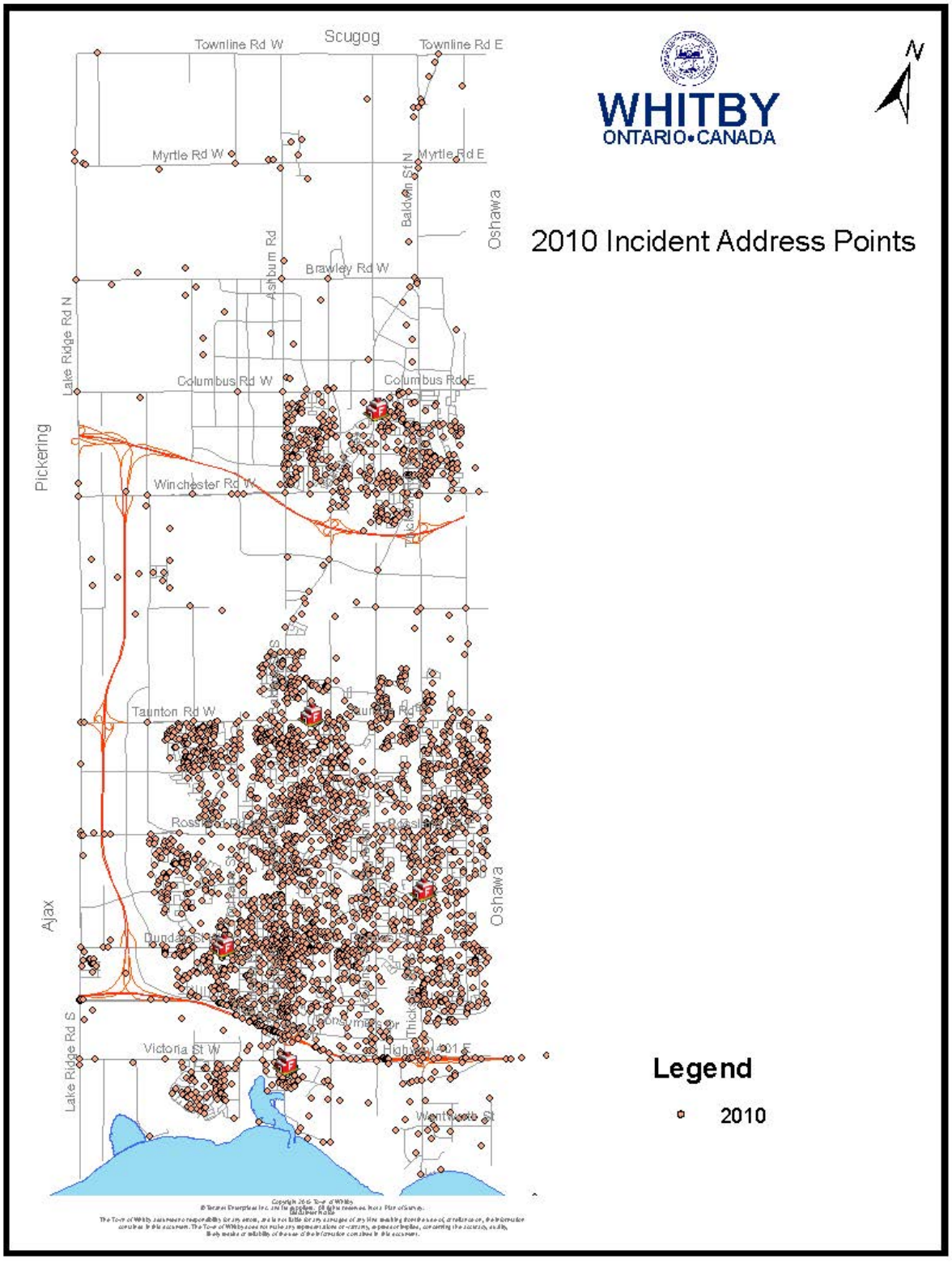
✓ 3:20

Average depth of coverage of 15 fire fighters in 8 minutes - WFES does not meet NFPA standard 1710 best practice.

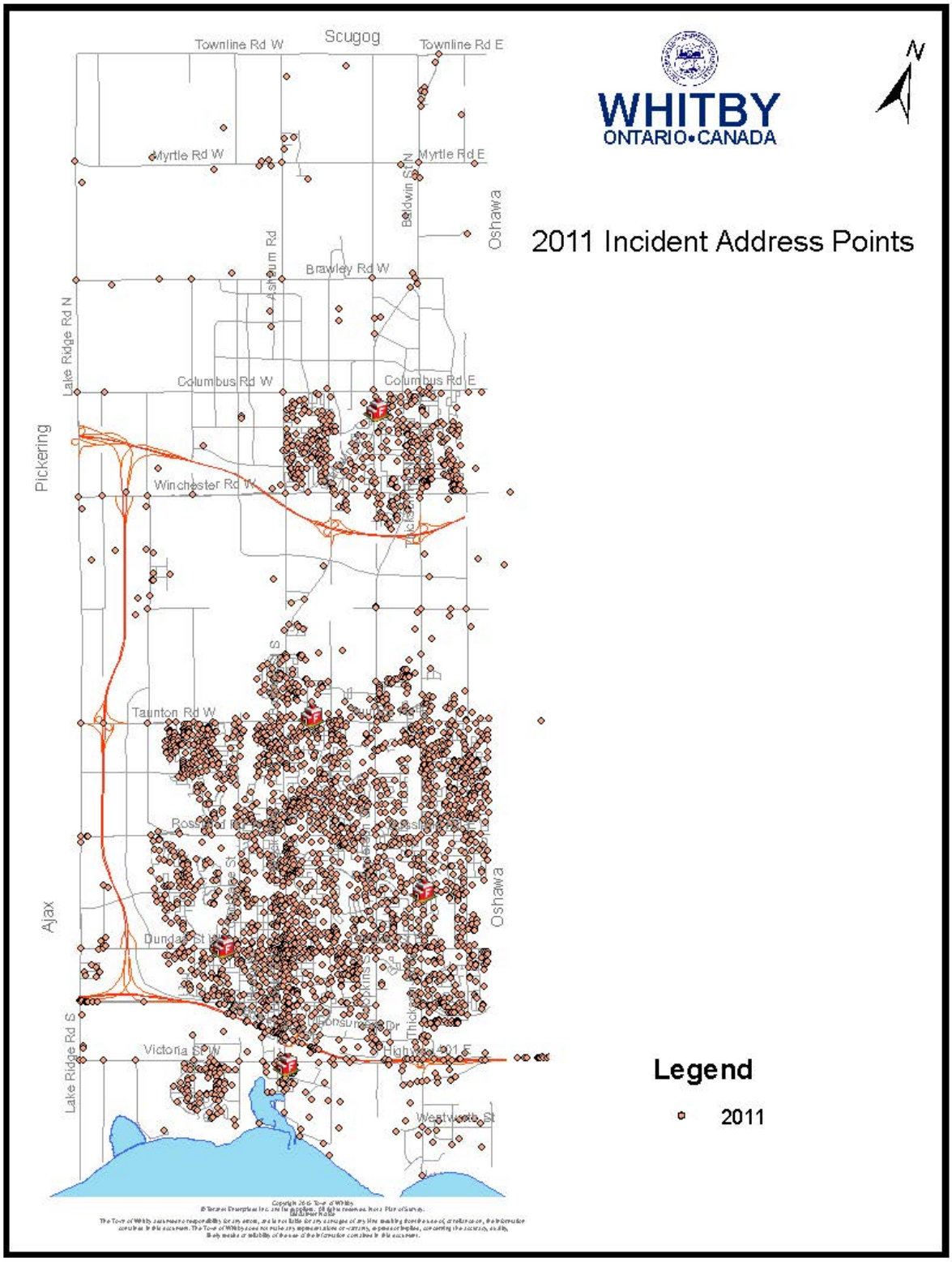
12 fire fighters and the PC in 6:28

X 15 (16) fire firefighters in 12:15

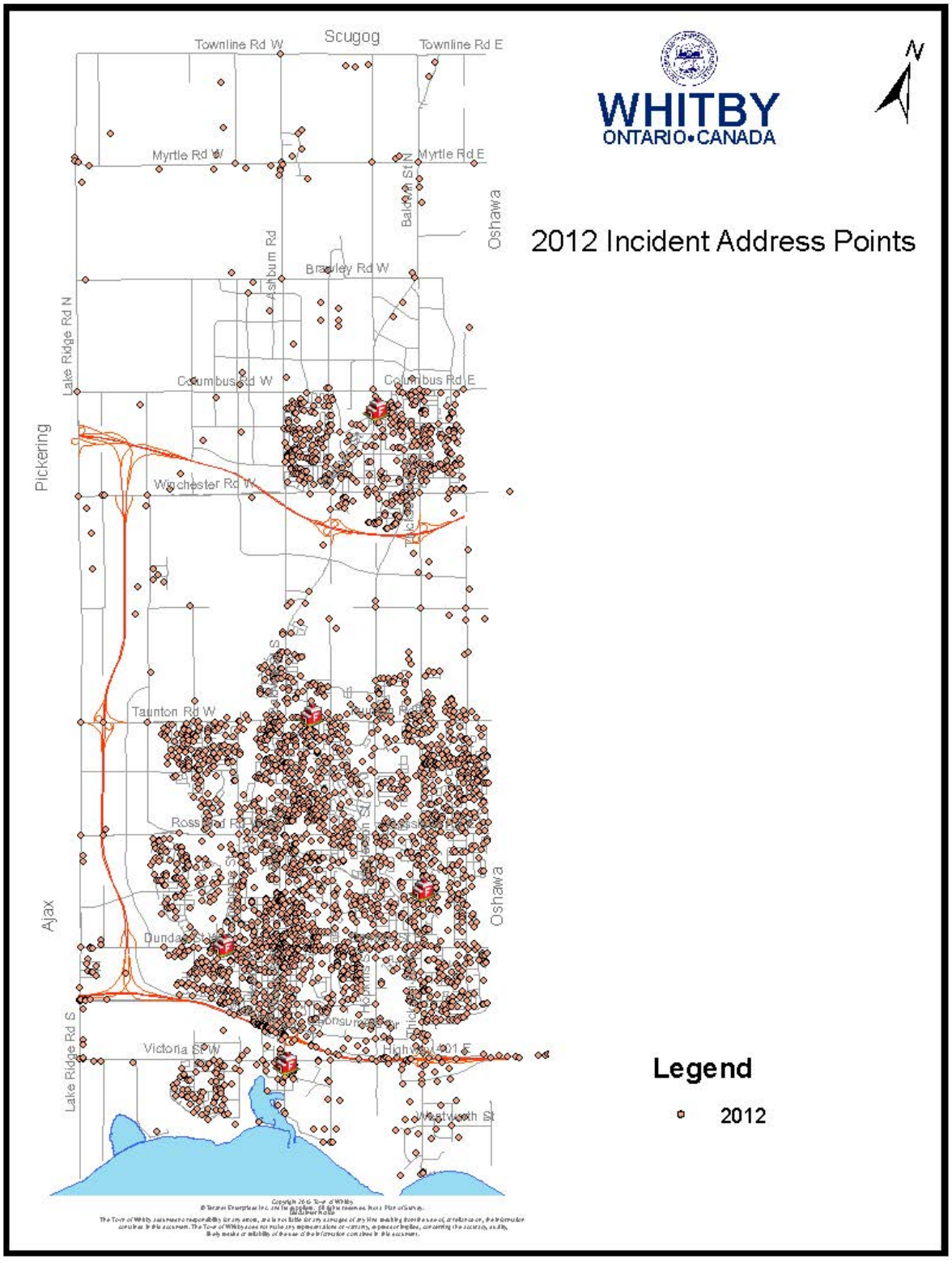
12.39 Figure 84 – 2010 Incident Address Points



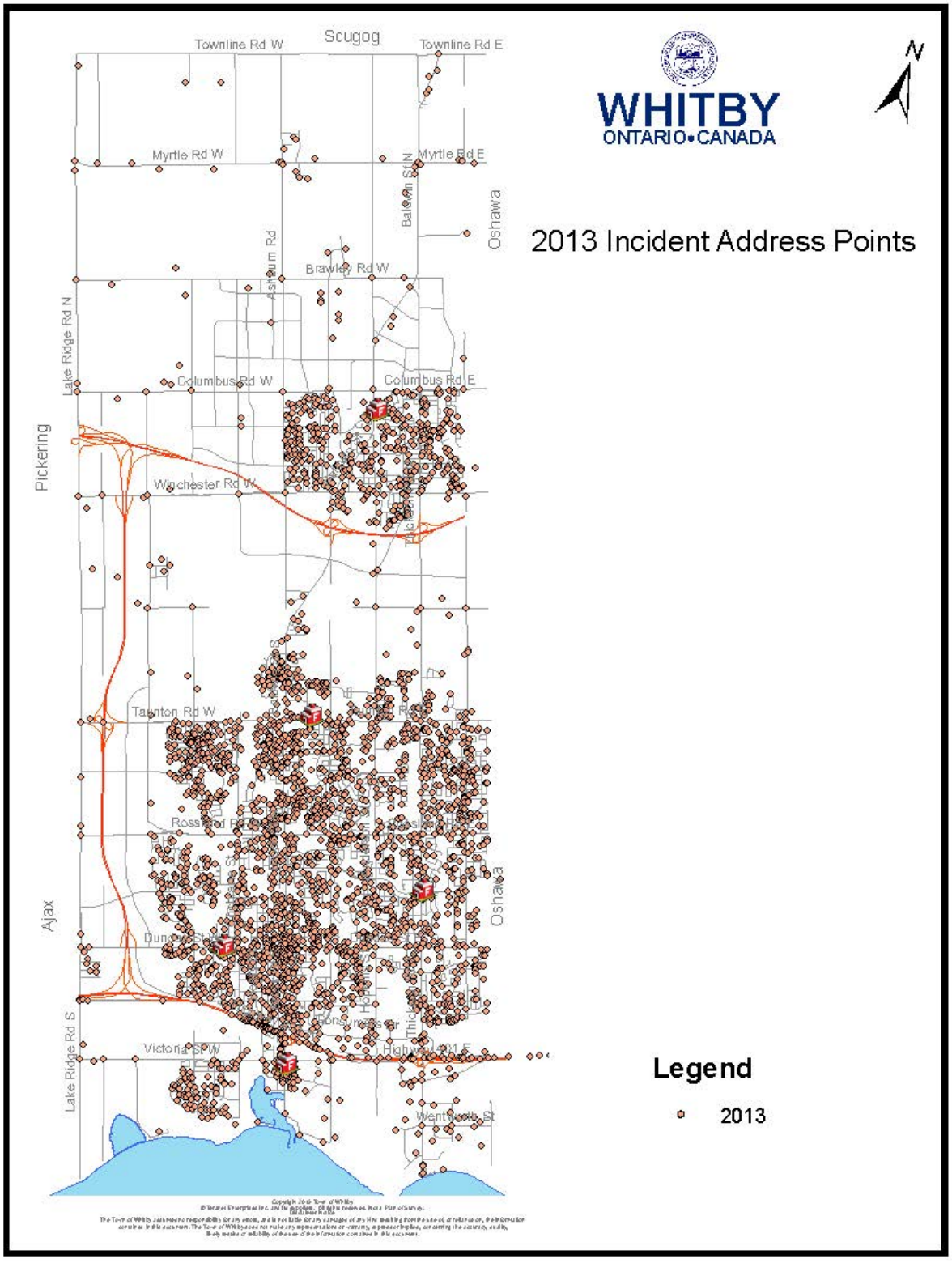
12.40 Figure 85 – 2011 Incident Address Points



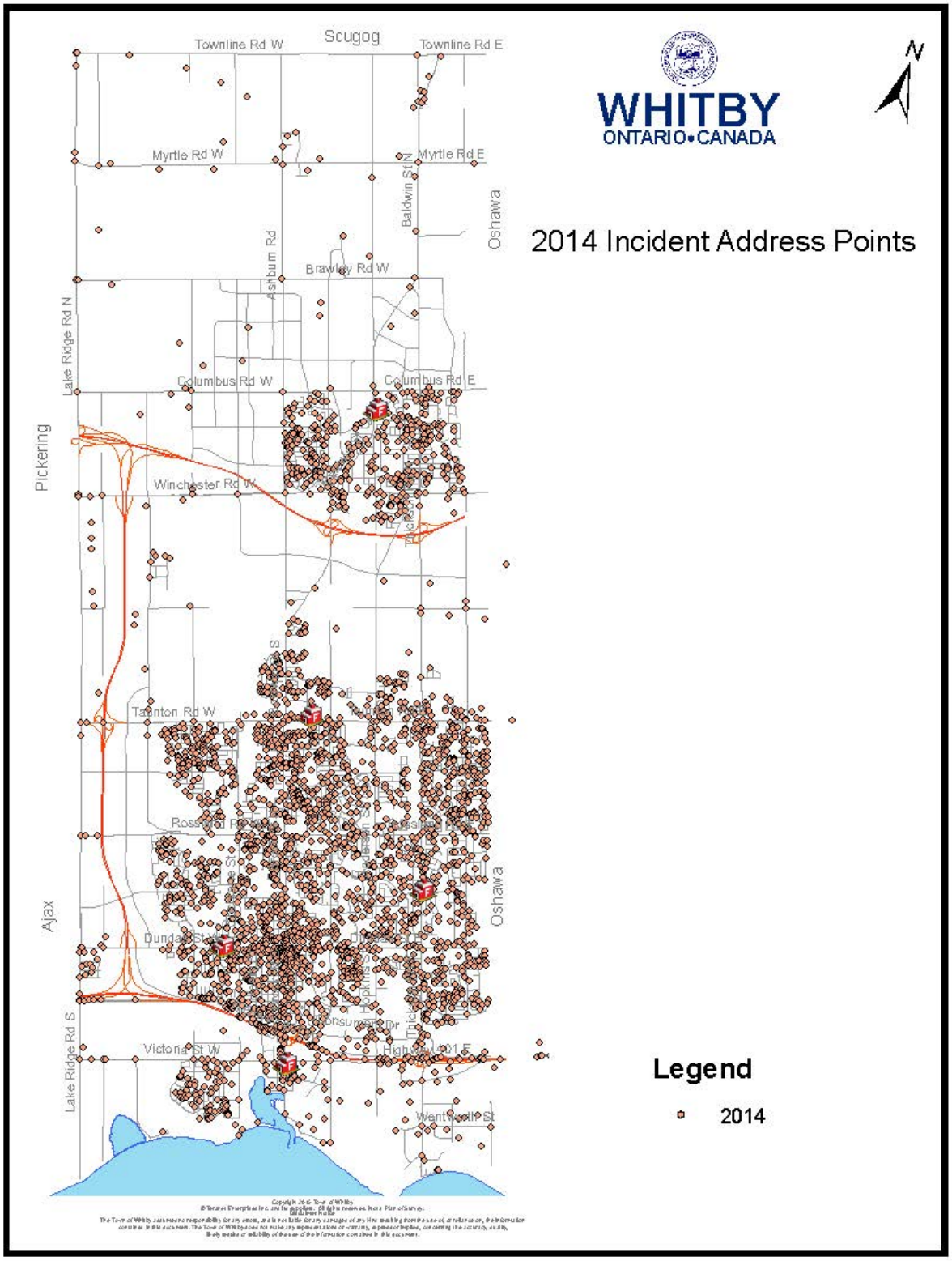
12.41 Figure 86 – 2012 Incident Address Points



12.42 Figure 87 – 2013 Incident Address Points



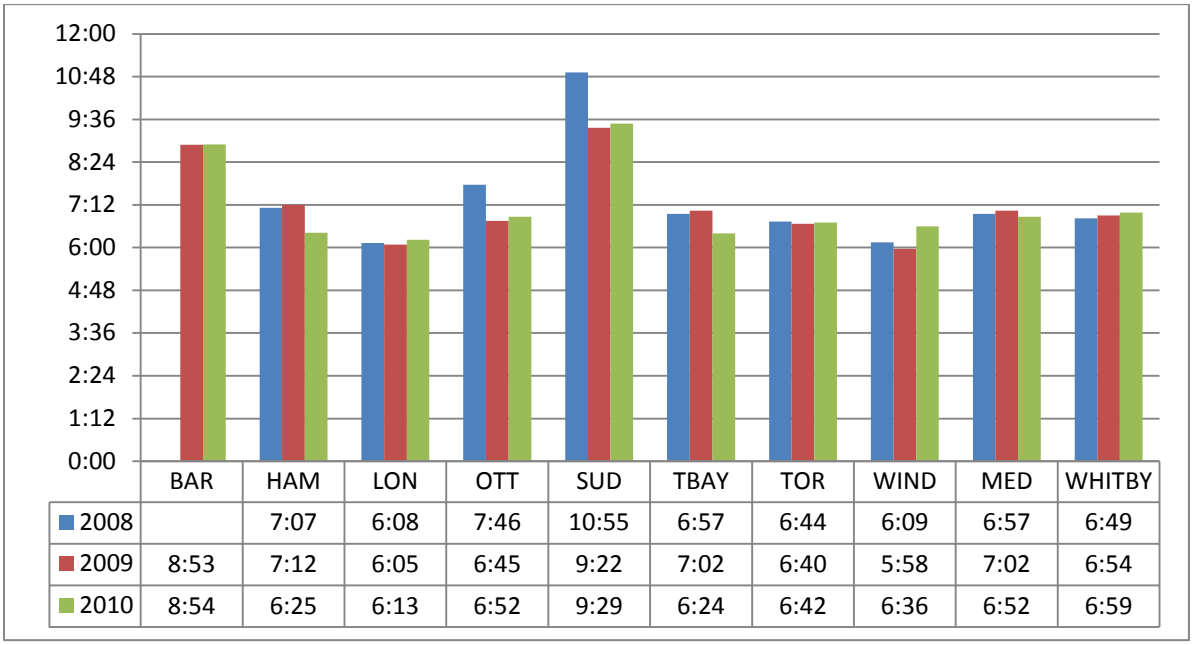
12.43 Figure 88 – 2014 Incident Address Points



Analysis:

WFES appears to be meeting initial travel times of 4 minutes or less on average. A closer look at the actual response numbers however, reveals the following 90th percentile numbers:

12.44 Figure 89 – OMBI – Initial Emergency Response Times – 90th Percentile



	BAR	HAM	LON	OTT	SUD	TBAY	TOR	WIND	MED	WHITBY
2008		7:07	6:08	7:46	10:55	6:57	6:44	6:09	6:57	6:49
2009	8:53	7:12	6:05	6:45	9:22	7:02	6:40	5:58	7:02	6:54
2010	8:54	6:25	6:13	6:52	9:29	6:24	6:42	6:36	6:52	6:59

Figure 89 reveals that from receipt of the notification of an emergency call in the Station, Whitby is able to arrive on scene within 6:54, 90% of the time. This is similar to OMBI comparators, but much higher than the NFPA Standard 1710 which sets a best practice of 1:20 for Turn Out time, and 4:00 minutes for Travel Time, for a total of 5:20.

With the upcoming growth in West Whitby, North West Whitby, intensification, and the introduction of Highways 407, 412, and 401 Lakeridge on/off ramps, this 90th percentile number will increase.

Whitby Fire and Emergency Services current initial response for a report of a residential structure fire is a three apparatus response: two pumpers, one aerial and the command vehicle (Platoon Chief). Minimum staffing on these apparatus is a compliment of 13 (9 firefighters), (3 Captains) and a Platoon Chief. This response assignment does not meet the standard set out in NFPA 1710 for a Full Response/ Depth of Response. If a fourth fire apparatus was dispatched at the time of the initial call, this would represent a compliment of 17 (12 firefighters, 4 Captains, and a Platoon Chief), and would meet NFPA 1710 if they all arrived within the 8 minute response time. However, this would leave the community with only 1 vehicle available to respond to all other emergency calls, necessitating the activation of Mutual Aid to provide a second vehicle.

It is recommended that WFES dispatch a fourth vehicle to all reported structure fires, thereby meeting NFPA 1710, while leaving two fully staffed apparatus available for all other emergency calls throughout the Town. (See Recommendation #3)

It is recommended that WFES hire additional suppression firefighters to reduce the response time 90th percentile number for the Whitby community.

12.45 Rehabilitation

NFPA 1584 Standard for Rehabilitation states that: The Fire Department shall develop Standard Operating Procedures/ Guidelines (SOP/G's) that outline a systematic approach for the rehabilitation of members operating at incidents and training exercises. The SOP/G shall include, but not be limited to, the following:

1. Relief from climatic conditions
2. Rest and recovery
3. Active and/or passive cooling or warming as needed for incident type and climate conditions
4. Rehydration (fluid replacement)
5. Calorie and electrolyte replacement
6. Medical monitoring
7. Emergency medical services (RDPS) treatment in accordance with local protocol
8. Member accountability
9. Release
10. Ensure post incident rehabilitation

The standard further states that: Company officers shall maintain an awareness of the physical and mental conditions of each member operating within their span of control and ensure adequate steps are taken to provide for each member's safety and health.

Rehabilitation has been lacking in the past and the new standard will put an increased demand on staff and require additional staff on scene to meet the standard.

WFES current Rehab program consists of each first run apparatus having a Rehab Kit with water, protein bars and electrolytes for routine incidents. For larger incidents Rescue Rehab 33 may be brought to an incident to provide shelter, nutrition, and emersion chairs to lower body core temperature.

Analysis:

Rehab at a fire scene is imperative, and given WFES' current staffing levels it is absolutely necessary to ensure crews undergo rehab prior to going back into an incident. Larger staffed departments have the ability to relieve crews from incidents and back fill with additional apparatus in order that staff do not become over-taxed and unable to respond to additional emergency calls as required. The Rehab sector is a

critical component of the Incident Command structure, ensuring firefighters are physical capable of continuing active fireground activities.

The existing rehab/rescue vehicle was originally designed to provide rehab services. It is two small to house fire fighters inside during extreme hot or cold conditions and is not big enough go carry all equipment needed for both rescue and rehab activities.

It is recommended that when WFES replaces its Specialty Rescue vehicle in 2018, that an upgraded Rescue/Rehab vehicle be purchased to be dispatched to all larger scale incidents. (2018) (See Recommendation #8)

Cost Reduction Option for Rescue 33

The capital budget forecasts the replacement of both Pump 35 ($750,000) and Rescue 33 ($260,000) in 2017. To achieve the objective of replacing Rescue 33 with a full size apparatus, approval to tender for the replacement of Pump 35 in early 2016 for delivery in January 2017 should be considered. During the decommissioning of Pump 35 as a pumper, it will undergo a retrofit to transform it into a Rescue apparatus.

Funds assigned for the replacement of Rescue 33($260,000) could be reallocated for the retrofit. Fixtures removed from Pump 35 such as the pump and tank could be sold to offset the expenditure. The life span of this refurbished vehicle, while functioning in the capacity of a Rescue apparatus would be 10 years, possibly longer. This option would also continue to be in line with the current apparatus replacement schedule.

This option would negate the budget submission of an additional $600,000 in the 2018 Capital budget and would utilize an apparatus that would otherwise be assigned to a support role or sold.

12.46 Records Management

Whitby Fire and Emergency Services Suppression Division currently uses the Crisys Xpert Fire program to record all information with regards to emergency responses. When Whitby receives an emergency call from Oshawa Dispatch an electronic report is generated with all the pertinent information; address of call, type of call, time of call, dispatch time, etc. Upon completion of the call and return to the station the Captain fills out the remaining information providing details on the call and what action was taken by WFES. Within the Crisys program there is an Ontario Fire Marshal Incident Report, which is also filled out. These reports are exported to the OFM on a quarterly basis for their data collection.

When a Suppression crew responds to an emergency and there is a deficiency in the fire alarm system/fire safety equipment, a form is filled out stating the deficiency and advising Fire Prevention will be following up to ensure compliance.

In addition to emergency reports, Captains and Fire fighters are required to fill out a number of daily and weekly equipment checks, repair slips and record their training

hours. As mentioned in the Administration section, Whitby's M.I.S. Division together with Administration Staff developed new electronic programs specifically for WFES that have greatly improved these processes.

Analysis:

Crisys has proven to have a number of significant deficiencies, particularly in the ability to extract required data in regard to response times, turn out times and specific call types. The data collection and dissemination component of the Crisys program does not provide the necessary reliability that is required in a modern fire department.

It is recommended that WFES works with all Durham Regional Fire Services to assess the effectiveness of the CriSys dispatching and records keeping system, to determine if a more in depth analysis should be undertaken. It is also recommended that WFES continue to expand the work done in developing the IntrafireNet through the Town's M.I.S. Department. (2019) (WFES Action – Y)

13 Training Division

The Training Division consists of two FTEs, one Chief Training Officer (CTO) and one Training Officer (TO). The Division's primary responsibilities are to develop, deliver, and coordinate all training activities and education programs for WFES.

The Chief Training Officer and Training Officer organize training programs, assist in developing guidelines, prioritize subjects and track employee training records. The Training Division is responsible for ensuring that all WFES personnel receive the

training necessary to meet the legislative requirements of the Occupational Health and Safety Act (OHSA) and Section 21 Guidance Notes. As a result of WFES's comprehensive training programs, in the last five years WFES has responded to over 25,000 emergency responses while sustaining only 8 minor firefighter injuries.

Training Division Delivered Training Subjects-Summary

The Training Division is a vital component of WFES. The framework from which fire services operates is strongly influenced by Section 21 Guidance Notes. As part of the Ontario Fire Service Health and Safety Advisory Committee, Section 21 Guidance Notes are prepared to assist departments in developing adequate training and standard operating guidelines in order to ensure firefighter safety. Section 21 Guidance Notes represent "best practice" in the fire service; therefore, the need to ensure compliance is imperative. The Training Division forms the framework to ensure that these Guidance Notes are being met by developing and delivering a myriad of subjects throughout the year. The following training subjects listed below represent the core subjects that firefighters must be proficient in, in order to do their job safely and effectively. The subjects listed below have a numerical value listed adjacent to each one representing the number of hours it takes the Training Division to schedule, organize and deliver the training each year.

13.1 Figure 90 - Training Division Delivered Training

IAPD Driver training (2)	200 hrs (this total includes prep time and makeup training for 4 crews)
Water rescue (2)	200 hrs
Ice Rescue (2)	200 hrs
Roof Prop	60 hrs
Forcible Entry	60 hrs
RIT/Survival	100 hrs
Auto Ex	100 hrs
Hazmat	100 hrs
Search & Rescue	60 hrs
Live Fire (2)	580 hrs
Note taking	60 hrs
Rural Water	60 hrs
Incident Command	60 hrs
Accountability	60 hr
Pump Op's	60 hrs
New Pumper training	60 hrs
Total	2020 hrs

13.2 Figure 91 - Captain Delivered/Training Division Required Administration

Building tours	10 hrs
Building Audits/pre plans	20 hrs
IFSTA Action Training	60 hrs
Quarterly Fire Video training	10 hrs
Pumper Training	10 hrs
Aerial training	10 hrs
Tanker training	10 hrs
Quarterly IFSTA Practical	20 hrs
Total	150 hrs

13.3 Figure 92 - Quarterly Training Notice Formation

Quarterly H&S minutes	5 hrs
Quarterly Section 21 review	5 hrs
Quarterly SOG review	5 hrs
Miscellaneous	15 hrs
Total	30 hrs

13.4 Figure 93 - Duties of Training Division

Weekly Training of crews	
Additional Theory/Practical Testing	100 hrs
Program Development and Maintenance (Respiratory, Hearing, Rehab, Driver Training, Ladder, etc.)	100 hrs
New Mentorship Program (will require development, implementation, maintenance, evaluation)	30 hrs
Recruitment of new firefighters	82 hrs (for each recruitment)
Recruit Training	300 hrs (1 recruit class)
Fit Testing (Fire/Tow staff)	100 hrs
Printing of P.I.T. Passes – all departments	20 hrs
Printing of TOW I.D. Cards	20 hrs
Streamlining Inventories	10 hrs
Procurement and Training	50 hrs
Creating/Running Class Exams for firefighters	50 hrs
Creating/Running Officer Promotional Exams	50 hrs
Provide information sessions for Promotional Exams	10 hrs
SOG Development/Revisions	50 hrs
Manage/Support Hazmat and Auto Ex Shift Trainers	40 hrs
Research/Development for new Training Programs	100 hrs
Additional Staffing on an Emergency Scene (ISO, Accountability, F.I.T., Rehab Sector Officer)	60 hrs
Prep/Research/Meetings – Tendering/Purchasing of Fire Apparatus	50 hrs
Training Staff on new equipment	100 hrs
Organizing Educational Programs - Ontario Fire College	10 hrs
Operation of Drager Live Fire Training (requires 2 Training Officers)	580 hrs
Research online web based training for crews	25 hrs
Setup web based training for crews	25 hrs
Administer web based training	25 hrs
Repair 4 & 5 Gas MSA Air Monitoring Devices	25 hrs
Organize/facilitate departmental PIAR's	40 hrs
Evaluate ongoing training programs	30 hrs
Perform public relations activities as required	10 hrs
Printing/preparing training materials	20 hrs
Re-stock training supplies	40 hrs
Liaison w/DRPS, OPP, RDPS – cross training	10 hrs
Maintain professional competency	100 hrs
Provide leadership/guidance to Training Officer	20 hrs
Attend Provincial/Regional Training Officer meetings	100 hrs
Driver assessments	50 hrs
Firefighter assessments	50 hrs
QAPC assessments	50 hrs
QAC assessments	50 hrs

Weekly Training of crews	
Hazmat Level A Suit Testing	10 hrs
Committee Meetings	100 hrs
Shift Instructor administration	100 hrs
TOTAL – Ongoing Duties of Training Division	2,212 hrs per year needed

Summary	
Training Division Delivered	2,020
Captain Delivered Administration	150
Training Notice Formation	30
Ongoing Duties of Training Division	2,212
Total Hours Required	4,412 hrs per year needed
Total Training Division Hours Available	2,992
Existing Training Hours Balance	(1,420 hrs annually)

13.5 Staff Resources

WFES' Training Division utilizes 5 types of delivery methods.

1. Training Division delivered
2. Captain delivered
3. Shift Instructor delivered
4. Independent study, electronic learning
5. Third party delivered

In addition to the Chief Training Officer(CTO) and Training Officer(TO), WFES utilizes staff from the Fire Suppression Division assigned as Shift Instructors. Shift Instructors receive specialized third party training in order to be qualified to deliver training. The specialized training required to become a Shift Instructor involves taking a Technician Level course in the required discipline. Shift Instructors (firefighters) provide assistance in delivering on duty training in specific areas such as in auto extrication and hazardous material responses. Third party instructors are utilized for certain speciality areas such as Medical Training, Mental Health Training, Critical Incident Stress Training, Natural Gas Emergency, Emergency Rail Response and Emergency Hydro Responses.

The CTO and TO conduct ongoing reviews of WFES' training needs through consultation with shift instructors, and through attendance at training sessions. The role of ongoing monitoring and evaluation by the CTO and TO is critical in ensuring the

13.6 Training Requirements

Annual Requirements

- Tanker: Rural Water Supply
- SCBA Familiarization
- Water Rescue Training Delivered (TD)
- WHMIS (Feb)
- Hydrant and Pumping Exercise

Biannual Requirements

- Live Fire (May/Oct) (TD)
- Continuing Medical Education (Feb/Oct)

Biennial Requirements

- IAPD Driver Training (TD) 2015
- Ice Rescue (TD) 2015
- Accountability (TD) 2015
- FP Training Prop (Sprinkler/Standpipe) 2016
- Nuclear Decon 2016
- Critical Incident Stress Management

Regular Quarterly

- IFSTA Review (PP, Video, Quiz)
- SOG Review
- Section 21 Guidance Notes Review
- Joint Health and Safety Committee Meetings
- Quarterly Video (I Drive)

Revised – June 2015

13.7 Shift Trainer Instructor Delivered Programs

- Hazmat
- Auto Extrication

13.8 Figure 94 - WFES 2009-2013 Training Hours Received

	2009	2010	2011	2012	2013
Practical	13,694	14,471	13,392	13,956	15,931
Theory	10,192	12,116	11,107	12,996	12,073
Total	23,886	26,587	24,599	26,952	28,004

As shown in table 20, the number of training hours being received has steadily increased each year over the past five years. This is due in large part to an increasing emphasis on fire fighter safety in all types of emergency calls.

Analysis:

The Training Division is working beyond available capacity, running an annual deficit of 1,420 hours each year. To make up for this deficit, the CTO and TO have been working overtime, and have been unable to pursue certain training initiatives/responsibilities.

In 2015 live fire training was cancelled (580 hrs) due to the live fire prop being unavailable, professional competency was not pursued(100 hrs), research/development of new programs (100 hrs) did not take place, program development and maintenance (100 hrs) was cancelled, committee work was reduced from 100 hours to 50 as the TO was pulled off of committees (50 hrs), the mentorship program was cancelled(30 hrs), additional theory (100 hrs) did not occur, and evaluation of programs (30 hrs) was not done.

The current workload cannot be sustained, and reducing workload by eliminating training programs/responsibilities will have a negative impact on the level and quality of service delivered to the public.

The shift instructor model works well for the Hazmat and Auto Ex disciplines. This model could be extended to water and ice rescue, forcible entry, and driver training.

It is recommended that an additional Training Officer (1492 hours) be hired to address the annual deficit in training hours (1420 hours) that currently exists. (2017) (Recommendation #5)

It is recommended that WFES pursue the extension of the shift instructor model to other disciplines in an effort to create additional Training Division capacity of approximately 600 hours per year. (2018) (See WFES Action – W)

NFPA Transition

In 2014, the Office of the Fire Marshal &Emergency Management announced that they were leaving the existing Firefighter Curriculum/Company Officer education model in favour of the NFPA Standards education model. The transition to the NFPA education model has required stringent compliance to NFPA standards by the Ontario Fire College. The transition to the NFPA Standard has created a dramatic increase in workload for the Training Division as they are required to develop training programs that meet the new NFPA Standard. There will be increased pressure of becoming NFPA accredited through the professionalization process.

Analysis:

In order to develop and deliver NFPA Fire Officer 1, Fire Officer 2, and Fire Instructor 1, a total time commitment of approximately 604 hrs is required (Appendix L).The Training Division does not currently have the capacity available to accomplish this.

It is recommended that, should an additional Training Officer be hired the 600 hours required to develop and deliver NFPA courses be realized through the expansion of the shift instructor training model. If the additional Training Officer is not hired, the NFPA courses will not be developed/delivered in-house, as the additional 600 hours of found time will be applied to live fire training, program development, and other core training duties that are not currently taking place. (See Recommendation #5)

In addition, NFPA courses will still have to be received by WFES staff whether they are delivered in-house or at an external location. However, it is preferable that they are delivered in-house as WFES can deliver the course to more staff over a period of months instead of years, at a much lower cost. (See WFES Action – O)

13.9 Technical Rescue Services Provided by WFES

WFES currently provides the following services to the following levels:

Water and Ice Rescue – Operations Level
Hazardous Materials – Operations Level
Trench Rescue – Awareness Level
Auto Extrication – Operations Level

NFPA 1006, "Standard for Technical Rescuer Professional Qualifications" lists 14 recognized technical rescue disciplines:

1. Rope Rescue
2. Confined Space Rescue
3. Trench Rescue
4. Structural Collapse
5. Vehicle Rescue
6. Surface Water Rescue
7. Swift water Rescue
8. Dive Rescue
9. Ice Water Rescue
10. Surf Rescue
11. Wilderness Rescue
12. Mine and Tunnel Rescue
13. Cave Rescue
14. Machinery Rescue

Whitby's Technical Response history reveals that WFES responded to 2,592 Rescue emergency calls over the past 6 years, broken down as follows:

13.10 Figure 95 - 2009-2014 Whitby Rescue Calls By Type of Rescue

Type of Rescue	# of Incidents 2592	% of calls
Animal Recue	4	0%
Building Collapse	1	0%
Commercial/Industrial Accidents	6	0%
High Angle Rescue No Fire	2	0%
Home/Residential Accident	9	0%
Low Angle Rescue No Fire	1	0%
Other Rescue	33	1%
Persons Trapped in Elevator	81	3%
Rescue False Alarm	8	0%
Rescue No Action Required	29	1%
Trench Rescue	1	0%
Vehicle Collision	2310	89%
Vehicle Extrication	102	4%
Water Ice rescue	1	1%
Water Rescue	4	1%

Analysis:

Whitby's technical rescue response history indicates that providing training to meet the operational requirements of additional disciplines would not be a reasonable use of resources. However, due to the fact that WFES has responded to a limited number of these types of rescues, they should be trained to the Awareness Level in the following:

- Confined Space
- Trench
- Building Collapse
- Rope Rescue

Further analysis of the relevant NFPA standards (Appendix M) reveals that WFES is falling short in the following:

- Providing additional training on heavy commercial vehicles in order to meet the requirement for Vehicle Rescue Level 2.
- Providing training to Shift Instructors to meet NFPA 1041
- Ensuring driver/operators meet Sections 5.1, 5.2, 6.1, and 6.2 of NFPA 1002

Should there be a requirement to provide technical rescue services above the Awareness Level in Trench, Confined Space, Building Collapse, or Rope Rescue,

WFES is not in a position to do so. Oshawa Fire Services provides rescue services to these levels, but the Town of Whitby does not have an agreement with Oshawa to supply these services to Whitby.

It is recommended that Oshawa Fire Services provide operations/technician level rescue response to the Town of Whitby for the following (2016). There is no cost for this service unless it is used. (Recommendation #2)

- **Rope Rescue,**
- **Confined Space Rescue**
- **Trench Rescue**
- **Building Collapse**

It is recommended that should the Training Officer be hired, NFPA 1006 training be delivered to all staff as a strong foundation for additional Awareness and Operational level rescue training. The 1006 course is 40 hours in total and can be delivered in-house at no cost to the Corporation over the span of two years. (2018/19) (Recommendation #2)

It is recommended that WFES upgrade its level of service to the public as follows (2019): (Recommendation #2)

Awareness – Confined Space, Trench, Building Collapse, Rope

Level 2 – Vehicle Rescue

Rope – Slope Rescue

13.11 Training Facilities

WFES does not have a training facility to meet the needs of its fire Suppression Division. Over the past ten years there have been minor improvements to the facilities available for the Training Division to utilize. The Department has not; however, kept up with the growing demands of training today's firefighter.

Currently, in order for WFES to conduct professional training, the Training Division would be required to schedule training outside of the municipality at locations that have adequate facilities available such as Ajax Fire, Ontario Power Generating Fire Training site in Wesleyville or the Norwood Training facility. The costs associated with offsite training are a minimum of $196,000 per year. Daily training facility user fees and overtime requirements for three (3) fire apparatus staffed with twelve (12) firefighters per session make this model unfeasible. WFES does not have three (3) additional fire apparatus available that could be taken out of service to attend a training facility in an outside municipality. Whitby Fire and Emergency Services has a Joint Ownership and Usage Agreement with Oshawa Fire, Clarington Fire and Durham College for a Live

Fire Propane Training Unit. The Live Fire Training Unit is located at the Oshawa Airport and is jointly utilized by the aforementioned stakeholders. The Live Fire Training Unit is a modified shipping container that has been outfitted with two fire propane props and moveable walls to provide firefighters with a safe environment to train on basic firefighting techniques and search and rescue skills. WFES has a scheduled period to use the training unit twice annually, in the spring and fall. The training unit provides a very limited, basic training structure to practice partial firefighting skill sets. Its location also results in delayed response of WFES vehicles to emergency calls as units have to travel from Oshawa.

WFES has a co-operative agreement with Gerdau Steel on Hopkins St S. to provide cars and an area to work on auto extrication techniques. Gerdau is able to provide large numbers of vehicles which is extremely beneficial for practical hands on training allowing each firefighter to practise vehicle extrication techniques. There is a slight delay in response times due to the geographic location of Gerdau and the location of the training on the property.

Another community partner is Exopak located at 201 South Blair St., Exopak allows WFES to utilize their property for Hazardous Material training scenarios. This site is located in the south end of Town but has better access ensuring more timely responses.

Certain firefighting disciplines require specialized equipment in order to properly train firefighters. Without this equipment the Training Division must role play, improvise, or in some cases just show video’s on how to effectively and safely bring an emergency to a satisfactory conclusion. Should a fire crew have to deal with these types of emergencies, they rely on this video-based training to properly and effectively mitigate a given situation. This type of training is sufficient when coupled with a practical session; however, when used as a standalone could lead to inefficient, and possible ineffective service levels, which in turn could lead to fire fighter and/or civilian injuries.

WFES have a training area at the rear of Station 5. This area contains 2 portable buildings, one utilized for search and rescue scenarios, ventilation exercises and practising the incident command system. The second portable is set up for firefighter survival drills, wire entanglement, wall breaching, and removal from confined space. The building has only one floor level. Most buildings that firefighters enter for emergency calls have 2 or more floors. The area itself is not large enough to conduct driver training or many other disciplines currently trained on, (i.e. Hazmat, water/ice rescue). There is a roof ventilation prop and a forcible entry prop as well as an area for extrication training. A private hydrant is available for pump operator and hydrant training. The parking lot area is the only Town owned property that is used for training suppression crews.

Analysis:

As Whitby continues to grow, the need to train recruit firefighters and current firefighters is going to increase which will put added pressure on the need for an adequate training facility. As cited previously in this MFP, current building construction materials and residential contents/furnishings burn more quickly than in the past requiring firefighters to be prepared to meet these added challenges.

A training facility is important to ensure that skills are not lost. Skills are practiced to ensure muscle memory and revert back to their training in a stressful environment.

At present, WFES only can only attain a basic level of training for Suppression crews due to limited facilities, staffing, and equipment. If provided with these resources, WFES firefighters will receive an improved level of training which in turn will improve the quality of service provided to the public, and improve emergency scene safety. Section 21 Guidance Notes and legislative pressures require firefighters to be trained to the highest possible levels. With fewer fires occurring in Whitby than in the past, today's firefighter needs to be competent, diligent, professionally trained, and have the ability to train consistently at the highest level. Without access to continual, practical training, this is an unrealistic goal.

Live Fire Training

Although the live fire training unit provides a basic structure to practice firefighting skills, there are a number of limitations and associated problems relating to the training unit.

The location of the unit is problematic in that WFES apparatus and personnel have to leave the boundaries of Whitby to participate in training, leaving areas unprotected during the training time period. Because of limited staffing, WFES is unable to take crews out of service for a specified period of time to participate in scheduled training. This poses a significant problem to conduct proper training because crews must be ready to respond immediately from the Oshawa Airport site as they are still in active service. Because the training unit is located outside of the municipality, the Training Division is limited to the number of apparatus that can participate in Training at any given time. Two pumpers is the maximum number of apparatus that can participate in training at the Oshawa site at one time because of reduced response times and the risk of leaving areas of the municipality unprotected. Response times from the Oshawa Airport are dramatically increased while crews have to terminate their training, reload their fire apparatus and prepare to redeploy to the assigned response.

- Due to the size constraints of the shipping container, the live fire training unit does not have the capabilities to provide adequate training to ensure the correct use of fire streams, and a suitable site for proper search and rescue skill development.
- There is no training tower connected with the training unit to enable suppression personnel to train on high-rise firefighting skills.
- There are no capabilities to conduct ladder drills or rescue from elevated windows or rooftops.

- The unit lacks the infrastructure to train on ventilation techniques which is also a significant deficiency given the early flashover conditions associated with residential contents/furnishings and modern construction techniques.
- The size of the training unit provides inadequate space to effectively train on search and rescue techniques.
- The live fire training unit does not meet the needs of a career fire department in regard to providing an adequate site to conduct required training.
- The training unit is shared, which limits when training can be scheduled and is unusable during the winter months which places considerable restrictions on the ability to schedule training as required.
- This situation is compounded during recruit training, as a recruit class can occur at any time of the year, often not allowing the Training Division the ability to schedule recruit classes for live fire training during the winter months or during periods of time when the training unit is be used by one of the partner agencies.

Below is a list of WFES current training topics along with a brief analysis of the existing training resources:

Live Fire- As previously indicated, a live multi story fire propane training unit is required to safely train on firefighting techniques and search and rescue skills. The current facility is inadequate and not located in Whitby.

Water/ice Rescue- WFES currently utilizes Lake Ontario to train on water/ice rescue. An on-site pond will allow personnel to train year round in a safe controlled setting.

Auto Extrication- Auto extrication training currently takes place at Gerdau Steel and in the WFES area. The availability of Gerdau as a training site, is uncertain. WFES needs to be self-sufficient with a controlled site to conduct auto extrication training. A training compound with streets, traffic lights, rail crossing, hydro poles and barriers is required to better simulate a motor vehicle collision.

Forcible Entry- Currently, WFES uses a prop located within the Station 5 Area. The prop is very basic and needs to be incorporated into a building. The current prop is subject to weather conditions which will lessen the lifespan of the unit.

Roof ventilation- A roof ventilation prop is currently located in the parking lot of Station 5 and meets the needs.

Search & Rescue- Search and rescue training is currently conducted in the fire stations or in the training portables. A multi-story facility with smoke, fire and heat is required to effectively conduct search and rescue evolutions.

RIT Training- Rapid Intervention Team (RIT) Training is currently conducted in the fire stations or in the training portables. A multi-story facility with smoke, fire and heat is required to effectively conduct RIT training evolutions.

Survival training- Firefighter survival Training is currently conducted in the fire stations or in the training portables. A multi-story facility with smoke, fire and heat is required to properly conduct firefighter survival training evolutions.

Driver Training- Driver training is currently conducted in the parking lot at Iroquois Park. A proper driver training track that can be jointly utilized by the Operations Department is required.

Pump operations- Training on pump operations is currently conducted at the fire stations. The sites are inadequate and too small to conduct rural water evolutions or to conduct pump operations courses. A larger training compound is required for these operations.

Ladder training- Ladder training is currently conducted at the fire stations. A training building in which various window heights and roof tops can be used to train on ladder evolutions and rescue techniques is essential.

IMS training- WFES currently uses the portables in the Area at Station 5 to conduct Incident Management System (IMS) training. The current facilities are inadequate for conducting this training. A proper training tower will allow staff to conduct a complete "sizeup" and practise IMS skills, utilizing a multi story structure in which fire conditions can be safely simulated.

Self Contained Breathing Apparatus (SCBA) training- A structure is required to conduct search and rescue and live fire training evolutions in a controlled environment. Proficient skills sets in the proper use of SCBA is one of the most important requirements of a firefighter and having the facilities to hone effective skill sets is imperative.

Hazmat training – WFES currently has no hazardous materials training site. Training is currently completed off site at privately owned or Town owned properties. A training tower with Hazmat props is required in order to safely train on hazardous materials in a controlled environment in which spills can be simulated to provide the most realistic scenarios.

Classroom theory training- WFES requires a classroom located at a training facility in order that the theory component of training can be completed on site, with the ability to use the classroom for breakout sessions and debriefing sessions as training is being delivered.

Ventilation training- WFES currently does not have a suitable location to complete ventilation training. A multi story facility that can be filled with smoke and systematically ventilated is required to teach proper ventilation techniques.

Firefighter assessments- A training facility with a training tower is required to conduct on going firefighter assessments as firefighters progress the through the classes; currently adequate facilities are not available.

Drafting operations- In order to complete on going rural water training, a training complex is required with municipal fire hydrants and a pond in order to train personnel in drafting and rural water supply scenarios.

Aerial training- WFES requires a multi story facility in order to conduct aerial operations, including rescue from windows. Aerial operation training is currently

conducted at multi story facilities throughout the municipality. Actual rescue operation training cannot be conducted at these facilities.

Portable pump training- A training facility with a pond is required to conduct portable pump operation training. WFES currently does not have a safe controlled site available to conduct this type of training.

Future Rope Rescue Program- A multi story training tower, with engineered anchor points, is required to meet the future needs in regard to an advanced rope rescue program.

Confined Space awareness- A training facility with confined space props is required in order that fire suppression staff can train on confined space rescue in a controlled safe environment. A site is currently not available.

Foam training- A training facility that the Training Division can conduct foam training utilizing props that simulates hydrocarbon fires is required.

Salvage & Overhaul- A training tower is required to teach the skills required to effectively conduct salvage and overhaul operations.

Hydrant Training- A training facility with adequate space to connect to a municipal water supply in a safe controlled setting is required.

Car Fire Prop- WFES regularly responds to car fires. There is currently no car fire training prop or area to conduct practical training evolutions on these types of emergencies. WFES uses videos for training.

Trench rescue prop- Currently WFES can only provide Awareness level training. There is no location for this type of training nor does WFES carry any equipment to deal with this kind of emergency.

Live Fire propane fired props- Firefighters respond to a large variety of potential fires in a variety of circumstances. They can range from propane tanks, fuel spills, highway tanker, fuel storage containers, transformer fires, etc. Currently WFES cannot train on any of these types of fires (other than video's) as the facilities are not available to house the props.- Tanker fire prop, Propane tanker fire prop, fuel spill fire prop, fuel storage container prop, electrical transformer fire prop, car fire prop.

Training facilities such as those that have been constructed in Ajax, Brampton, Mississauga, Oakville, Richmond Hill and the GTAA are examples of facilities that have been designed and constructed to meet evolving firefighting training needs. Whitby cannot afford to go outside of the Municipality to use Training facilities because of inadequate staffing and the potential for reduced response times.

13.12 Figure 96 – GTA Training Towers

13.13 Figure 97 – Oakville Fire Training Facility

13.14 Figure 98 – Oakville Training Facility

Firefighter safety is of the upmost importance. Having professional training facilities ensures that the best training is available for the safety of WFES suppression personnel and the public served. Properly trained personnel ensures that WFES is adequately prepared to mitigate emergency situations throughout the community ensuring a high standard of service delivery.

It is recommended that a Training Compound that meets the needs of a modern, professional Fire Department be constructed on the 13 acres of property purchased per Recommendation #9. Discussions have occurred with the Town of Whitby Operations Department to jointly acquire lands large enough to allow 2 acres on this same site for the Whitby Operations Department to construct a satellite site for sand and salt as well as shared classrooms for training. The training facility would have a paved driver training track that could be jointly used for training firefighters as well as Operations staff and other Town and Regional employees. (Recommendation #5)

Whitby Fire has a letter of intent from Durham College to enter into an agreement to share, purchase and operate a joint Training Facility. Durham College would use the training facility to train their Prefire Service students. (Appendix N) (Recommendation #5)

A joint training facility could also be available to other organizations and agencies through the pursuit of public private partnerships. (Recommendation #5)

The Fire Training facility will require a training tower with 4 floors that have the Survival / RIT/ Search and rescue / forcible entry / rope rescue, and roof props incorporated into the tower. The search and rescue maze needs to be easily adjustable so it can be re-organized to different configurations with little effort. A separate Class A /Propane combination "Live Fire" training module (2 story minimum) used specifically for live fire training, as well as a propane generated car fire prop is also recommended. The facility should have props for Hazardous materials training, Confined Space training as well as Trench Rescue training. It is recommended that the training facility have paved streets, Rail crossing, traffic lights and must be suitable for IAPD Driver training, Incident Command training, and Auto Extrication training. It will also require a pond for Water/Ice Rescue training, pump operations, and rural drafting. (2018) (Recommendation #5)

It is recommended that an additional Training Officer be hired to develop, coordinate and deliver the additional training that will be provided with the construction of the Training Facility. (2018) (Recommendation #5)

13.15 Succession Planning

There is no formal succession planning process in place to develop future leaders within WFES. There are existing procedures within the Collective Agreement that dictate how a person is promoted from one rank to the next, and any changes to this process would have to be negotiated between the Corporation of the Town of Whitby and the Firefighters Association.

Having said this, it is recognized that succession planning is a worthwhile practice to prepare staff for future positions regardless of the process of acquiring them. Currently, staff are prepared for future positions primarily through shadowing, with some limited exposure to internal training opportunities.

It is important for leaders to be well-rounded with exposure to multiple areas of the fire service. Over time, each Division in WFES has become increasingly specialized, requiring extensive schooling in a select number of focused courses. While there is some overlap between the education required for careers in Suppression and Fire Prevention, most of the content is distinct.

13.16 Figure 99 - Educational Courses for Suppression and Fire Prevention

Suppression Courses at Community College	Prevention Courses at Community College
Fire Ground Operations	Algebra
Fire Fighting Fitness Training	Chemistry
Specialized Rescue	English
Fire Apparatus Operations	Plans Examination
Fire Fighter Emergency Patient Care	Sprinkler Design
Live Fire Evolutions	Building and Fire Codes
WHMIS/Hazardous materials awareness	Computer Assisted Drafting
Fire Fighter Mechanical Aptitude	Electricity, Electronics, and Fire Alarm Systems
	Public Education
	Flammable and Combustible Liquids
	Project Management

WFES employees face challenges when trying to transfer from one division to another. Lack of experience in a variety of Divisions and a lack of management training leaves staff ill prepared for senior leadership positions. The last Deputy Chief and the past two Chiefs were hired from outside of the organization.

Seconding people from one Division to another to work on short term projects is also not common. While this would help to prepare people for future leadership roles, it is also costly, as usually involves paying overtime to backfill positions. The Master Fire Plan Project Coordinator position was recently created and filled by a Platoon Chief on secondment from Fire Suppression.

Currently, the majority of training and resources are dedicated to providing training of a technical nature. The Training Division develops and delivers training topics to address operational needs and duties. There has traditionally been very little leadership development training throughout the fire service and WFES is no different.

The gap seems to expand the higher up in the organization one goes. Division Chiefs do not receive any formal leadership training internally and very limited externally, and any exposure a person receives to the Deputy or Chief role is pursued by them on their time, usually via external courses.

Analysis:

In the next ten (10) years, WFES has thirty five (35) personnel that will be eligible to retire. This fact highlights the importance of establishing a formal succession program. The amount of time required to develop, coordinate, deliver and maintain a succession planning program will be challenging with the existing Training Division staffing resources.

It is difficult for people to move from one division to another in order to prepare for future positions. The skill sets required to be effective in all divisions of the fire service have changed dramatically in recent years. Education and job specific courses are now

required in order to be effective in Suppression, Training, Fire Prevention and Administration. Succession planning is a vital component of any organization and the fire service is no exception.

It is recommended that WFES develop a formal Succession Program with cross training, and Officer development components to help prepare staff for future leadership positions. The Program must include both education and experience components. (2016) (WFES Action – G)

13.17 Records Management

The Training Division is responsible for tracking and monitoring training performed by staff to ensure all legislative requirements are being met. Records are being recorded in the internally developed MyWhitby / IntraFireNet. WFES Training and Administration Divisions have worked very closely with MIS in developing a comprehensive program to document, track and monitor training records. This has ensured more complete and accurate monitoring of training hours and training reports.

Analysis:

The working relationship that exists between WFES and MIS is constructive and positive. Training record keeping and management is accurate and easy to access.

It is recommended that the Training Division, and WFES Administration continue to work closely with M.I.S. to develop and expand the My/Whitby IntraFireNet program to meet future needs. (WFES Action – Z)

14 Apparatus & Equipment / Fleet Review

14.1 Asset Management

The Division of Asset Management is overseen by the Deputy Chief of Fire Prevention and Assets. The Logistics Clerk is responsible for the daily administration of purchasing and logistical support for facility and vehicle maintenance. The Division is responsible for assessing, evaluating and purchasing all equipment and clothing for the fire service.

14.2 Fleet Services

The Whitby Works Department performs the majority of maintenance and repairs on WFES' fleet and associated equipment. Due to the need for specialized vehicle expertise, and in some cases the lack of available staffing resources, it is necessary to contract out some of the fleet repair work to external agencies.

14.3 Figure 100 - WFES Vehicle Fleet

	VEHICLE #	YEAR	MAKE/MODEL	Replacement Schedule	Gallons
1	Pumper 31 Pumper 38 Pumper 39	2008 2001 1990	Seagrave Marauder II Pumper Spartan Gladiator (Refurbished) Pierce	2018 2018 2016 – used for Training new Recruits	895
2	Pumper 32 Aerial 32	2012 2009	Spartan E-One Platform	2022 2023	495 277
3	Pumper 33 Rescue 33 Tanker 33	2005 1999 1999	E-One Custom Pumper Ford Freightliner	2015 2018 2016	575 1500
5	Aerial 35 Pumper 35	1991 2007	Pierce 100 Seagrave Marauder II Pumper	not to be replaced 2017	220 642
4	Pumper 34 Pumper 37	2012 2002	Spartan Spartan (refurbished)	2022 2020	495

14.4 Figure 101 – WFES Passenger Vehicles

STATION	VEHICLE #	EMPLOYEE/ DIVISION	YEAR	MAKE/MODEL	Replacement Schedule
5	Car 31 Car 32 Car 33 Car 34 Car 35 Car 36 Car 37 Car 38 Car 39 Car 310 Car 311 Car 312	Fire Chief Deputy Chief Ops Deputy Chief FP & Asset Training P/C CFPO Training FPO FPO FPO FPO FPO	2013 2009 2009 2006 2013 2006 2006 2012 2009 2007 2007 2007	Ford Edge Chev Impala Chev Impala Chev Suburban (Tahoe) Mercedes Sprinter Chev Impala Chev Silverado Crew Cab Pickup Ford Escape Chev Silverado Pick-up Chev Uplander Chev Uplander Chev Impala	2023 2019 2019 2016 2019 2016 2015 2022 2019 2017 2017 2017
5			1999	Fire Safety House (Trailer) Model SA-3200	2018
5	Antique		1872	Merry Weather Steam Engine (Silsby)	
5	Antique		1924	REO	

14.5 Pumper Rescue Trucks

Pumper Rescues are the primary front line vehicles used by WFES. They are designed as multi-purpose vehicles, able to respond to any emergency within the scope and mandate of WFES. Their ability to carry various pieces of equipment to address specific circumstances, and to transport and apply water makes them extremely versatile. As front line apparatus, Pumper Rescues respond to over 5,000 emergency calls each year, resulting in a high level of mechanical maintenance and repair. The TOW Works Department operates a basic preventative maintenance program for the mechanical components of the Pumper Rescues, but does this does not include the specialized fire components such as fire pumps, foam systems, ladders, elevating devices, etc.

The reliability of WFES' front line Pumper Rescues is a critical component in WFES' ability to provide timely, effective fire protection services. In order to help ensure this reliability, a fleet replacement schedule has been developed in accordance with NFPA and comparator best practices; WFES Pumper Rescues are maintained as front line vehicles for 10 years, and then placed into a supporting role for a maximum of 5 additional years. As support vehicles, the Pumper Rescues play an integral role in WFES' continuity of operations, and as such are maintained in the same manner as front line Pumper Rescues. In the absence of these support Pumper Rescue vehicles, WFES' Aerials are run as front-line Pumpers, increasing the 'wear and tear' on these large vehicles.

14.6 Aerial Devices

WFES utilizes two (2) Aerial Platform vehicles within its fleet. These Aerials are strategically located at Station 5 and Station 2 and are deployed based on a specific criteria. Aerials are vital for effective fire ground operations in urban environments. Their ability to provide a large, elevated source of water is important during both offensive and defensive operations to help contain fire spread, and to protect exposures. They are also used to support occupant rescue, firefighter egress, and fire ventilation. They are specialized pieces of equipment often times requiring the expertise of external companies to maintain and repair. They represent a significant capital investment, and as such warrant an effective preventative maintenance program.

14.7 Tanker

WFES has a single tanker within its fleet. The role of the tanker is to transport large quantities of water to the rural areas of Whitby or to areas where a pressurized water system is not available in order to be used by Pumper Rescues to combat fires. A tanker is maintained within the fleet and may be called upon for Mutual Aid.

14.8 Rescue

WFES' Rescue vehicle is a multi-faceted apparatus. The vehicle is constructed on a 5-ton chassis with a commercially constructed box. This apparatus is for hazardous materials, water rescue, and ice rescue emergency calls, and has recently been equipped as the Department's Rehabilitation apparatus. The Rescue apparatus is

insufficient for the needs of WFES. It is not big enough to carry all the necessary equipment, and as such, some of the equipment is stored in the fire station and loaded on as needed during a call, resulting in delayed response times.

14.9 Passenger Vehicles

WFES operates several passenger vehicles ranging from four door sedans to pick-up trucks. These vehicles are used primarily by Administration, Fire Prevention, Logistics, and Training Divisions. In addition, these vehicles are used during large scale emergencies, and during shift changes to transport firefighters to and from scenes.

14.10 Mechanical Repair

WFES apparatus are maintained and repaired both internally through the TOW Works Department (WWD), and externally through mechanical contractors. The WWD is conveniently located next to Fire Headquarters, allowing for either WFES staff or WWD staff to drop off or pick up apparatus for repair. In addition to maintaining WFES' vehicles, WWD provides expertise in support of vehicle tenders, and acts as a technical liaison with third party contractors. As well, WWD maintains and repairs additional equipment including generators, lawn movers, snow blowers, chainsaws, fuel fired cutters, etc.

WWD is also responsible for the remainder of Whitby's fleet, and in order to meet these service demands, smaller repairs to WFES apparatus accumulate until it becomes feasible to take apparatus out of service. The smaller repairs, such as lights, broken handles and alike may appear to be minor, however; each repair is important and is usually safety or service related.

Repairs performed on WFES apparatus are recovered through an internal financial recovery process. The costs associated with hourly repairs is charged back to WFES at a flat rate of $55.13 per hour. Contracted external repair facilities charge an hourly rate of $95-$110 per hour with a minimum of two hours for travel time at $80-$90 per hour. Furthermore, parts ordered by WWD are charged at the true cost verses an inflated rate (by approximately 30%) by third party agencies. It is also not uncommon to experience lengthy delays when dealing with contractors who are not always able to place existing commitments aside to work on WFES' vehicle repairs. This has caused challenges for WFES occasionally resulting in all Support vehicles being placed into service, with no vehicles in reserve.

The use of external contractors fluctuates somewhat from year to year depending upon the number of repairs experienced. In 2014, WFES contracted out 231 hours of labour at a cost of $25,214, plus $4683.00 in travel costs, and $41,311 in parts. By comparison, the same 231 hours of labour performed by WWD would have cost $12,735, for a labour savings of $12,479. Travel costs of $4,683 would have been totally eliminated, and parts savings would have totalled approximately $12,393.30. Savings to the Town of Whitby in 2014 had all WFES fleet repairs been conducted in

house would have totalled $29,555.30. During the first two quarters of 2015, contracted hours have already exceeded these 2014 totals. The following chart provide additional information:

14.11 Figure 102 – Fleet Repair Costs

Year	Agency	Labour Hours	Labour Dollar	Travel	Parts	Total
2012	External	219.64	$21,884.01	$3,156.17	$14,649.65	$25,040.18
	WWD	1174.55	$64,751.90	0	$38,131.27	$64,751.90
2013	External	98.85	$9,650.59	$877.50	$41,311.89	$10,528.09
	WWD	1303.98	$71,888.42	0	$74,725.17	$71,888.42
2014	External	231.52	$25,214.00	$4,683.00	$11,539.73	$29,897.00
	WWD	1290.62	$75,941.54	0	$69,762.68	$75,941.54
2015 End of Q2	External WWD	241.1	$26,770	$4186		$30,956

Fire apparatus are becoming increasingly complex, often requiring the specialized knowledge of an Emergency Vehicle Technician (EVT). To receive an EVT designation, a mechanic must complete additional fire apparatus training in compliance with NFPA 1071, and 1911. Should WWD mechanics become designated as EVTs, they would be capable of these specialized repairs. However, it is unknown at this point if there is the capacity to commit to this additional workload.

In addition to third party vehicle repairs, WFES uses external agencies to maintain and repair fire station generators. Generator services would equate to a savings of approximately $15,000 per year, to perform annual ladder testing, Aerial servicing, and pump tests. These tasks represent additional savings for the Town should they too be taken on by WWD staff.

Analysis

A preventative and predictive maintenance program for WFES' fleet is needed to help keep WFES emergency vehicles in service. The current program addresses basic mechanical needs, but it is not enough. The removal of a fire apparatus from service requires the Suppression Crew to transport it out of its response area, transfer equipment to the Support vehicle, and travel back to the Station. This process can take upwards of 1 hour to complete. Having a WWD mobile mechanic available to conduct vehicle repairs in the Fire Station would reduce this down time.

There is no existing preventative maintenance program for fire apparatus. When vehicles require repair they are taken out of service and repaired/replaced. By doing so, WFES relies heavily on the availability of mechanical staff at either WWD or third

party agencies. A predictive maintenance program would include the identification of wear indicators that could be used to repair/service equipment prior to a significant failure. This type of program focuses on finding the root causes of all failures and putting measures in place to correct or eliminate what is causing the failures (Koop, 2014). On the flip side, the long-term benefits realized from initiating some predictive maintenance strategy can include reduced catastrophic repair costs, reduced vehicle down time, and higher customer satisfaction. Past studies have placed the savings from predictive maintenance in the 8% to 12% range over using preventive maintenance alone. (Howe, 2007)

Whitby Works Department provides a high quality of mechanical service to WFES. However, the specialized nature of fire apparatus requires an element of expertise which is not currently available within WWD. By adding EVTs to their staff, and creating capacity to take on additional workload, WWD could significantly reduce WFES annual fleet maintenance costs while reducing the amount of time Fire vehicles are out of service.

It is recommended that WFES work with WWD to investigate the feasibility of taking on the additional workload necessary to commit to a preventative and predictive maintenance program for WFES fleet, and the transferring of work traditionally performed by external contractors.(2016) (WFES Action – H)

It is recommended that WWD be requested to require WWD mechanics to obtain the EVT designation to allow the transfer of workload from exterior contractors. (2017)

14.12 Self-Contained Breathing (SCBA)

Self-Contained breathing air is divided into two key components, breathing air packs and breathing air cylinders. Each component, although independent in their design, function together as one unit while in use on the fire ground. Currently, each fire apparatus is fitted with one SCBA pack per seat for a total of five per vehicle. There are also spare SCBA packs located in Station 5 that can be utilized as replacements when repairs are being performed or when additional packs are needed. WFES has 68 SCBA packs in total.

WFES uses two sizes of air cylinders, 45 minute and 60 minute. There are 165 of the 45 minute cylinders that are used as the standard sized cylinder in IDLH (Immediately Dangerous to Life and Health) environments at emergency calls. There are an additional 15 of the 60 minute cylinders that are used should the WFES RIT (Rapid Intervention Team) be deployed during an emergency to rescue the first-in WFES interior team. The industry accepted best practice is to maintain a ratio of three (3) cylinders per SCBA pack to ensure efficient quantity of breathable air during large scale emergencies.

The life span of an air cylinder is fifteen (15) years, and they must be hydrostatically tested every five (5) years to ensure they will continue to operate under pressure.

Analysis

WFES' current stock of SCBA cylinders is adequate to support fire ground activities for small and medium sized fire incidents. However, with recent NFPA changes, the rate of consumption of air cylinders on the fire ground will increase, as will the number of staff required to refill them.

WFES does not meet the industry best practice ratio of three cylinders per SCBA pack. An alternative to purchasing additional cylinders would be to refill cylinders on site using an air fill vehicle.

The maintenance, repair, and testing of SCBA units is performed by an external third party company. In the past, WFES staff were trained to do this, but due to liability reasons it was decided to stop this practice. SCBA units are one of the most important pieces of equipment that a firefighter uses, and failure of any component can have dire consequences.

15 Information Technology

The use of technology is beginning to have an impact on Whitby's fire service delivery model. The training and education of WFES staff is shifting quickly from a classroom setting to a hybrid model incorporating independent, technology-based learning. Furthermore, communication with the Whitby community increasingly involves social media, something that WFES has not traditionally been involved in.

Training

Information technology has a significant impact on fire fighter training, including how fire fighters access and share information. In-service training is strongly supported through independent, self-directed on-line programs. The benefits of on-line training include the ability to quickly and efficiently communicate with the entire department, thereby minimizing multiple delivery sessions. Recently, MIS has improved wireless internet speed, and has helped to acquire additional mobile devices to further facilitate more effective training. For the most part, this delivery model has been accepted and has been successful.

The training delivery model can be further augmented with the use of web based teleconferencing and file sharing. Much of WFES' training requires crews to attend headquarters. When this happens, other fire crews must be relocated in order to provide effective emergency response to the remainder of the Town. It is not possible for all crews to gather in one location to receive training, so each training session must be conducted a minimum of two times. The use of teleconferencing would allow training to be delivered once, and emergency response coverage to be maximized. Furthermore in circumstances where a post incident analysis review (PIAR) of a fire call is warranted, the review can occur with the entire crew versus the current method of splitting the crews to ensure effective coverage. This process of PIARs would enhance the

experience for all staff as they would be able to participate first hand with all crew members.

Fire Service Branding/ Marketing

As previously noted in this MFP, Public Education is the first line of defense, and as such is a fundamental component of WFES' fire risk management strategy.

It becomes imperative that the manner in which information is distributed is reflective of the manner in which it is consumed. Currently, WFES' manner of fire service marketing / branding consists of fire station message boards along with general web site information. It is acknowledged that the Town has recently adopted a social media policy, and it is anticipated that this will support future opportunities to profile the fire service and further public education efforts.

Fire Prevention / Public Education

Fire Prevention Officers are currently utilizing laptops in the field to assist in the inspection process. These lap tops have been deployed since 2009 and have surpassed end of life. The Fire Prevention Division uses the AMANDA software (version 6) consistent with other Town Departments. It requires significant user input by the Fire Prevention Officer which in turn reduces their potential output. As well, its use is hampered by the ability to connect wirelessly in the field.

It has become incumbent on the WFES Public Education Division to assess the Town's target audience for specific fire risks, and to determine the most appropriate communication medium for fire safety information. This has become a time consuming ongoing process, and it therefore becomes important to strategically leverage technology, and to monitor and evaluate the effectiveness of its use.

Fire Suppression

There have been many steps as of late introducing new technologies to the Fire Suppression Division. In early 2015 station pre-alerting was installed to notify each first response fire station of a pending call for service; this has reduced turn out times by an average of 15 seconds per call. The system is also augmented with a digital map showing the location of the emergency call, along with any location hazards. The pre-alerting system has its limitations as fire crews still rely on laminated map books in the apparatus in order to proceed to a call. These hardcopy map books are maintained by the Administrative Division who must update the index each time there is a mapping change in Whitby, laminate any amended pages, and distribute for all WFES vehicles.

The current emergency call dispatching system relies on verbal communication between the OFS Communications Division and the WFES fire crew. The system does not provide the dispatcher or the Platoon Chief with the ability to identify each fire apparatus' location or status. In addition, important emergency call benchmarks such as 'enroute' and 'on scene' must be verbally identified over the radio system and entered by Oshawa Communications during the emergency call. This consumes valuable radio air time as these benchmarks must be identified by every fire apparatus

responding to each call. At a fire scene, where the Platoon Chief and the first arriving crews are establishing size-up and strategic plans over the radio, identification of these ‘en route’ and ‘on scene’ benchmarks inhibits this vital size-up component.

Through its building audit program, WFES has endeavored to collect data on properties within the municipality to identify hazards, and establish pre plans in order to strategically aid WFES and its customer service levels. However, this information is not easily accessed when apparatus are not connected to the wireless service within the fire stations.

Asset Management

WFES has endeavored to work within the Corporation, leveraging resources and advancements that other Departments can provide. In conjunction with MIS, MyWhitby was expanded to include a module to assist fire crews in reporting vehicle, building and equipment deficiencies, recording daily vehicle checks and training. The use of this program allows the WFES management team to implement performance measurement indicators and to streamline Departmental processes. The expansion of MyWhitby has continued to evolve and now includes interaction between WFES and the TOW Facilities, and the TOW Works Department.

Analysis

The roles and functions of The Training and Suppression Division dovetail with each other. Improvements have been made in the implementation of electronic training materials to support self-directed training. Some infrastructure is required moving forward to support the full implementation as designed. Each fire station is currently equipped with a desktop computer and a mobile tablet device, each equipped with the Microsoft operating system and licensed software. Being mindful of the fiscal requirements for licensing agreements, it would behoove the fire service to explore both hardware and software alternatives to allow each member of the shift (4) to have access to a device that would support internet training without the need for licensed Microsoft products.

Many of WFES traditional training programs require fire crews to circulate through headquarters. In some instances, due to the training requirements, this will continue to be the only appropriate method. However, there are other situations where this process can be achieved through a web-based conference system that allows the instructor to deliver instruction in a demonstrative manner without having crews cycle through headquarters.

The marketing and branding of any organization enhances its community and corporate profile. WFES is no different. It is imperative for WFES to develop mechanisms to demonstrate its contribution to the community utilizing more interactive methods.

The use of laptops for the Fire Prevention Officers has proven to be valuable in the past six years. However, they have surpassed their end of life and effectiveness in the field. In the current environment of fire code enforcement, having a device that can issue

Inspection Orders, take photographs, record notes, and create documents in the field will dramatically improve the inspection process.

The delivery of public education is becoming more complex. Much of the educational material directed towards younger generations is APP based. WFES' current platform of both hardware and software does not support this method of education. In order to be effective in its education methods, WFES should tap into this APP world.

After departing the fire station, fire crews are no longer connected to the corporate network. In the absence of this technical support, fire crews are not able to easily access building pre-plans, hazards or additional information. This information is important for the Incident Commander to have on a fire scene, enabling him to make informed decisions early in each emergency call. In larger scale events or multi-unit dispatches, air time is at a premium and rapid dissemination of information is imperative. The current system does not allow for "live" vehicle location. The use of mobile data terminals in the apparatus coupled with Automatic Vehicle Locators (AVL) would provide the fire crew with "live", updated information from OFS Communications on circumstances related to the call. As the information is "live" there will no longer be a requirement for Crews to wait for a hard copy of the emergency call information from the printer in the station prior to responding. The use of AVL's is twofold; They will allow OFS Communications staff to dispatch the closest apparatus based on GPS location versus the closest station. Secondly, they will provide road mapping for fire crews not only to travel to the scene but to assist in fire ground tactics.

Technology has been embraced by members of WFES and the support provided to WFES by the MIS team has been instrumental in this success. In order to maintain this direction and to increase capacity moving forward, WFES will continue to lean on the support of MIS moving forward.

It is recommended that WFES continue to deliver on-line training in balance with practical, hands-on training. To this end, it is recommended that MIS and WFES continue to work in collaboration to establish hardware and software to support on-line and, interactive training. (2017) (WFES Action – P)

It is recommended that the implementation of web based training mechanisms for the Training Division be adopted through web conferencing / webinars to support the delivery of training in a demonstrative manner to prevent Fire Crews from leaving their initial response areas to attend Headquarters. By doing so, effective coverage of fire crews will be maintained through the Town while training objectives and goals are met. (2017) (WFES Action – Q)

It is recommended that WFES and TOW Corporate Communications develop a short and long term media and marketing strategy that will promote the role of WFES and its public education message in the community. (2017) (WFES Action – R)

It is recommended that WFES and MIS identify tools for the Fire Prevention Division to access mobile technology to assist in the access and collection of data, documents and photographs to support the efficacy of the delivery model. (2016) (WFES Action – J)

Mobile data terminals and AVLs will be installed in all responding apparatus. The use of this technology will reduce response times as information will be provided in a "live" format rather than relying on hard copy print outs and hard copy map pages. In addition, the closest emergency vehicle will be dispatched based on "live" location of apparatus, information updates will be provided electronically reducing radio traffic, and access to property information and hazards will be quickly available. (2017) (Recommendation #10)

16 Communication

Oshawa Fire Services provides centralized dispatch services for Oshawa Fire, Whitby Fire, Clarington Fire and emergency altering for Uxbridge Fire, Scugog and Brock Fire. All emergency responses are dispatched through Oshawa Communications as well as all radio transmissions. The costs for these services are shared amongst the user groups. The Oshawa Communications Centre has four communicators assigned per shift to provide dispatch services to the aforementioned municipalities, with a minimum staffing level of three dispatchers per shift.

In 2015 a new Regional Radio System (Harris) was installed to serve the fire departments within the Region of Durham as well as Durham Regional Police Services, and most Municipal Works Departments. The new radio system was the first of its kind in North America, utilizing Phase 2 radio technology, with twenty seven radio towers strategically located throughout the Region to maximize radio coverage. Costs for the Regional radio system are shared by all of the stakeholders involved. The system is interoperable, allowing Police and Fire Departments to speak to each other on the same radio system as needed at large scale emergencies.

Analysis:

The Communications/Dispatch agreement that WFES enjoys with Oshawa Fire Services is working well. There is no need to make any changes to the agreement.

17 Financial Component

WFES charges user fees as per TOW By-law 6632-12, "Being a By-law to Impose Fees for Certain Services Provided By or Done By Whitby Fire and Emergency Services". (Appendix O)

User fee rates are based upon Ministry of Transportation rates as they are used in part to recuperate costs for WFES' responses to provincial highways. Current response

rates are $205 per vehicle per every 30 minutes or part thereof, and $410 for the first hour or part thereof.

As of November 1st, 2015, MTO rates have increased to $450 per hour.

It is recommended that the Fire Services User Fee By-law be amended to increase user fee rates equal to the November 1st, 2015 MTO rates (2016)

Appendices

A Council Goals – 2014
B Comprehensive Fire Safety Effectiveness Model
C HIRA Table
D NFPA Study on Canadian FD
E NIST Report – Residential Fire Ground Experiments
F Fire Response Mapping
G Section 21 Guideline – Response to Motor Vehicle Collisions
H Operational Planning: An Official Guide to Matching Resources Deployment & Risk
I WFES Apparatus Initial Deployment per Call Type
J Incident Safety Officer – Instructional Procedure 208
K PFSG 04-05-12 – Mutual Aid
L NFPA Education Standard Transition
M Review of NFPA Technical Standard
N Durham College Letter
O By-Law 6632-1
P Fire Response Stats
Q NIST Report – High-Rise Fireground Field Experiments

Town of Whitby

Whitby Council 2014-18 Goals

1. To build a strong, respectful Council team with a positive, shared vision and four-year action plan; to ensure all municipal affairs are conducted with professionalism and integrity; and to enhance the transparency and accessibility of Town Hall and support effective public consultation and engagement

2. To make workplace morale a priority by building a collaborative and creative work environment that engages the abilities of all staff members to solve problems, accomplish new things and deliver the best outcomes to residents

3. To continue the Whitby tradition of responsible financial management and respect for taxpayers; and to understand the importance of affordability to a healthy, balanced community

4. To ensure Whitby is clearly seen by all stakeholders to be business- and investment-friendly and supportive; and to strive to continuously improve the effectiveness and efficiency of service delivery

5. To build downtowns that are pedestrian-focused destinations; to leverage municipal tools and resources to generate local jobs and prosperity; to facilitate a major, multifaceted, downtown- supportive investment on the lands on and around the fire station site; and to gain local ownership of Baldwin Street through downtown Brooklin

6. To enhance the safety of our local streets and neighbourhoods by reducing traffic speeds and impacts through design standards that support traffic-calming and safe speeds across the community; to increase citizen involvement in building safe streets; to effectively manage parking on residential streets and in our downtowns; and to reduce the traffic impact of new developments on existing neighbourhoods

7. To remain the community of choice for families and become the community of choice for seniors and job creators; and to focus new growth around the principles of strong, walkable and complete neighbourhoods that offer mobility choices

8. To become the destination of choice for visitors from across Durham Region and the Greater Toronto Area; to realize the economic and social potential of our downtowns, waterfront and green spaces in developing local tourism; and to create more things to do and places to enjoy

For more information: Mayor Don Mitchell 905.430.4300 x2203 mayor@whitby.ca

COMPREHENSIVE FIRE SAFETY EFFECTIVENESS MODEL

Fire Risk Sub-Model

Introduction

Assessing fire risk within a community is one of the seven components that comprise the Comprehensive Fire Safety Effectiveness Model. It is the process of examining and analyzing the relative factors that characterize the community and applying this information to identify potential fire risk scenarios that may be encountered. The assessment includes an analysis of the likelihood of these scenarios occurring and their subsequent consequences. In essence, fire risk assessment attempts to answer the following questions.

1. What could happen?
2. When could this happen?
3. Where could this happen?
4. Who could this happen to?
5. Why could this happen?
6. How likely is it to happen?
7. How bad would it be if it did happen?

This information serves as the basis for the formulating and prioritizing fire risk management decisions to reduce the likelihood of these events from occurring and to mitigate the impact of these events when they occur.

Risk

- **Definition**

Risk is defined as a measure of 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 purpose 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 the incident.

- **Probability Levels**

The probability or likelihood of a fire within a community is often based on the frequency of previous experiences. A review of past events may involve extracting relevant historical fire loss data, learning from the experiences of other municipalities, and consulting members of the community with extensive historical knowledge. Professional judgement based on experience should also be exercised in combination with historical information to estimate probability levels. An evaluation of the probability of an event can be categorized into 5 levels of likelihood:

- **Table 1: Likelihood Levels**

Description	Level	Specifies
Rare	1	-May occur in exceptional circumstances -No incident in past 15 years
Unlikely	2	-Could occur at some time, especially if circumstances change -5-15 years since last incident
Possible	3	-Might occur under current circumstances -1 incident in past 5 years
Likely	4	-Will probably occur at some time under current circumstances -multiple or reoccurring incidents in last 5 years
Almost Certain	5	-expected to occur in most circumstances unless circumstances change -multiple or reoccurring incidents in past year

Note: The frequency of incidents provided should only be used as a general guide when determining this value. It should be complemented with consideration of events that occur within other communities. Events that have not taken place for a long time in your community may occur more frequently elsewhere. This may serve as an indicator that there is a stronger likelihood than the data indicates.

- **Consequence Levels**

The consequences as the result of a fire are the potential losses or negative outcomes associated with the event. The application of professional judgement and reviews of past occurrences are important methods used for quantifying consequence levels. Estimating the consequence level due to a fire involves an evaluation of four components.

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

An evaluation of the consequences due to fore can be categorized into 5 levels based on severity:

- **Table 2: Consequence Levels**

Description	Level	Specifics
Insignificant	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	-potential risk to life safety of occupants -minor property loss -minimum disruption to business activity and/or -minimal impact on living conditions
Moderate	3	-threat to life and safety of occupants -moderate property loss -poses threat to small local business and/or -could pose threat to quality of the environment
Major	4	-potential for large loss of life -would result in significant property damage -significant threat to large business, local economy and tourism and/or --impact to the environment would result in a sort term, partial evacuation of local residents and businesses
Catastrophic	5	-significant loss of life -multiple property damage to significant portion of the municipality - long term disruption of business, local employment, and tourism and/or -environmental damage that would result in long term evacuation of local residents and businesses.

- **Overall Level of Risk and Priority**

The overall risk assessment is completed 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 Risk Analysis Matrix is an analytical tool that can be used for this purpose. The highest overall risk levels are located in the bottom right corner of the matrix and the lowest levels are at the top left corner. This tool allows the analyst to rank and classify the scenarios for the purpose of prioritizing risk reduction measures.

- **Table 3: Risk Analysis Matrix**

Probability	Consequence 1 Insignificant	Consequence 2 Minor	Consequence 3 Moderate	Consequence 4 Major	Consequence 5 Catastrophic
1 (Rare)	L(L1)	L(L1)	M(L2)	H(L3)	H(L3)
2 (Unlikely)	L(L1)	L(L1)	M(L2)	H(L3)	E(L4)
3 (Moderate)	L(L1)	M(L2)	H(L3)	E(L4)	E(L4)
4 (Likely)	M(L2)	H(L3)	H(L3)	E(L4)	E(L4)
5 (Almost Certain)	H(L3)	H(L3)	E(L4)	E(L4)	E(L4)

The risk and priority levels are defined as follows:

- L = Low Risk
  Priority level 1 (L1) - manage by routine programs and procedures, maintain risk monitoring
- M = Moderate Risk
  Priority Level 2 (L2)-Requires specific allocation of management responsibility including monitoring and response procedures
- H = High Risk
  Priority Level 3 (L3)-Community threat, senior management attention needed
- E=Extreme Risk
  Priority Level 4 (L4)-serious threat, detailed research and management planning required at senior levels

Community Fire Risk Factors

These types of fire risks that a community may be expected to encounter are influenced by its defining characteristics. For example, a “bedroom community” presents a different risk set of circumstances over one that is characterized as an “industrial town”. Communities that are distinguished by older buildings will pose a different set of concerns over those that are comprised of newer buildings constructed to modern codes. Communities populated by a high percentage of senior citizens present a different challenge over ones with a younger population base.

Assessing fire risk should begin with a review of all available and relevant information that defines and characterizes your community. Eight key factors have been identified that contribute to the community’s your community’s inherent characteristics and circumstances. These factors influence events that shape potential fire scenarios along with the severity of their outcomes:

1. Property Stock
2. Building Height and Area
3. Building Age and Construction
4. Building Exposures
5. Demographic Profile
6. Geography/Topography/Road Infrastructure
7. Fuel Load

The review should consider these factors independently as well as in a combination with each other to identify potential fire related concerns within the community.

- **Property Stock**

It is important to develop a community property stock profile to establish a detailed inventory of potential property related risks. This involves building stock totals on occupancy classification as well as other non-building properties that could pose a risk to the community. The Ontario Code (OBC Building) categorizes buildings under the following major occupancy classifications, each of which has inherent hazards that distinguish it from others.

- **Table: 4 Property Stock Profile Town of Whitby**

Source: Amanda

Building Classification	#	Comments
A - Assembly	233	Churches, Schools, etc.
B – Care,	39	Hospital, Retirement Homes, Group Homes
C - Residential	38.755	Includes multiple residential units
D – Business & Personal Services	135	Dentist, Lawyers, etc.
E – Mercantile	248	Stores
F – Industrial	432	Factory, warehouse, storage, etc.
Farms	135	

*430 Registered Basement apartments are included in Residential Units.

- **Assembly Occupancies**

An assembly occupation is defined as one that is used by a gathering of persons for civic, political, travel, religious, social, educational, recreational or like purposes or for consumption of food and drink.

Assembly buildings are often occupied by a large number of people and may contain high quantities of combustible furnishings and decorations. Occupants are generally unfamiliar with building exit locations and may not know how to react in the event of an emergence. Low light conditions are inherent to some of these occupancies and can contribute to occupant confusion during an evacuation. Numerous examples exist of disastrous events that have occurred throughout the world. Therefore, these facilities warrant special attention. Accordingly, it is paramount to ensure that maximum

occupant load limits are not exceeded, detection is available, an approved fire safety plan is in place and adequate unobstructed exits/means of egress are readily available.

From 2009-2013 there were 38,532 structures fires with loss in Ontario reported to the OFMEM . Fires in Assembly Occupancies accounted for only 5% of these. In Whitby from 2009-2013 there were 292 structures fires with loss reported. Class A Assembly accounted for 13 or 4.5%. Although these fires are rare they can have a financial, environmental and emotional impact on a community as witnessed by the fire in 2009 in the All Saints Anglican Church.

- **Care or Detention Occupancies**

A care or detention occupancy means the occupancy or use of a building or part thereof by people who:

a) Are dependant on others to release security devices to permit egress
b) Receive special care and treatment, or
c) Receive supervisory care

In addition to the presence of vulnerable occupants, these occupancies may contain quantities of various flammable/combustible liquids and gases, oxidizers and combustible furnishings that will impact the intensity of the fire if one should occur. The evacuation or relocation of patients, residents or inmates to an area of refuge during an emergency poses additional challenges in these facilities. It is essential to ensure that properly trained staff are available and prepared to quickly respond accordingly to the facility's approved fire safety plan.

From 2009-2013 there were 38,532 structures fires with loss in Ontario reported by the OFMEM . Class B Care and Detention occupancies accounted for only 1%. In Whitby from 2009-2013 there were 292 structures fires with loss reported. Class B occupancies accounted for 3%.

In 2014 Whitby experienced the Fairview Lodge fire. All 192 residents were safely evacuated and were transferred to 21 other Long Term Care facilities throughout Ontario, including 3 Regional homes. Over the next 17 days residents were relocated from those emergency beds to 44 Long Term Care homes mostly over the GTA, but as far away as Niagara on the Lake and Peterborough. Four congregate sites were staffed by Fairview Lodge at Hillsdale Estates, Hillsdale Terraces, Ontario Shores and Lakeridge Health Whitby which housed 80 residents in total. At both Hillsdale locations residents were set up in activity rooms with 4-6 residents to a room depending on the size. Ontario Shores and LHW residents used part of a wing.

In all 14 different agencies were involved at the fire, one school was evacuated and closed the following day and a large portion of the surrounding residences were evacuated for several hours.

- **Residential Occupancies**

A residential occupancy is defined as one that is used by persons for whom sleeping accommodation is provided but who are not harboured or detained to receive care or treatment or are not involuntary detained.

In Ontario, residential occupancies account for 70% of all structural fires and 90% of all fire deaths. Residential units that are located in multi unit buildings, including secondary units in a house, pose additional risks due to egress and firefighting accessibility challenges.

- **Table: 5 Residential Structural Dwelling Type**

Structural Dwelling Type	**Town of Whitby**	**% of Units**	**Ontario**	**% of Units**
Single Detached House	29,255	71.30%	2,718,880	55.60%
Semi-Detached House	1,305	3.20%	279,470	5.70%
Row House (Units)	4,855	11.80%	415,225	8.50%
Apartment Duplex (Units)	725	1.80%	160,460	3.30%
Apartment Units (More than 5 Stories)	2,675	6.50%	789,970	16.20%
Apartment Units (Less than 5 Stories)	2,125	5.20%	498,160	10.20%
Other Single-Attached House	25	0.10%	9,540	0.20%
Moveable Dwelling	50	0.10%	15,800	0.30%
Total (Units)	**41,015**	**100.00%**	**4,887,505**	**100.00%**

Statistics Canada. 2012. Whitby, Ontario (Code 3518009) and Ontario (Code 35) (table). Census Profile, 2011 Census. Statistics Canada Catalogue no. 98-316-XWE. Ottawa. Released October 24, 2012. http://www12.statcan.gc.ca/census-recensement/2011/dp-pd/prof/index.cfm?Lang=E

(Accessed April 14, 2015)

The priority of addressing residential fire risk is supported by the data provided by the Ontario Fire Marshal. From 2009 to 2013, there were 59,353 fires with loss in Ontario reported to the OFMEM, of which 72% occurred in residential occupancies. From 2004-2013, 85 % of fire deaths have occurred in residential occupancies of which 34 % did not have a working smoke alarm.

In Whitby from 2009-201, residential fires accounted for 71.2 % of structure fires and 64.6% of total estimated fire loss, as well as 100% of fire deaths (4). WFES needs to find new ways to reach the public to promote the concept that fire safety is their responsibility.

- **Business and Personal Services Occupancies**

A Business and Personal Services occupancy is defined as one that is used for the transaction of business or the rendering or receiving of professional or personal services.

Many office buildings are occupied by a large number of people during business hours and contain high combustible content in the form of furnishings, paper, books, computers and other office and equipment/supplies. Those that are located in a high-rise buildings pose additional risks due to egress and firefighting challenges.

Historically Business and Personal Service occupancies have not posed a significant risk accounting for only 3% of the 59,353 structure fires reported to the OFM from 2009-2013. Whitby had similar statistics with business and personal services making up only 2.2% of structures and 3.2% of estimated dollar loss, during the same period.

- **Mercantile Occupancies**

A mercantile occupancy is defined as one that is used for the displaying or selling of retail goods, wares or merchandise.

Larger mercantile occupancies such as department stores are generally occupied by a large number of people and contain high quantities of combustibles in the form of merchandise, furnishings and decorations. Customers may be unfamiliar with the building's exit locations and not know how to react in the event of an emergency. Additional hazards will be present in "big box" type stores that sell and store large volumes of combustible materials in bulk. These stores generally have similar properties to industrial warehouses with the additional hazard of a higher number of occupants.

Whitby has had a significant increase in the number of Big Box type stores over the past decade. Fortunately these stores have been built to code and have modern fire alarm and suppression systems. Inspections are still required to ensure these systems are being maintained and that the large volumes of combustibles are being managed properly. Although fire incidents are low in these types of occupancies they would have an economic and environmental impact on the community should they occur.

- **High/Medium/Low Hazard Industrial Occupancies**

An industrial occupancy is defined as one for the assembling, fabricating, manufacturing, processing, repairing or storing of goods and materials. This category is divided into low hazard (F3), medium hazard (F2) and high hazard (F1) based on its combustible content and the potential for rapid fire growth.

These occupancies constitute a special fire hazard due to their high levels of combustible, flammable or explosive content and the possible presence of oxidizing chemicals and gases. Processing and other activities that involve ignition sources often occur in these occupancies. The lack of security during non operating hours also makes them susceptible to incendiary type fires. Industrial fires generally involve large quantities of combustible materials and potentially result in large financial losses and significant damage to the community's environment and economic well being.

- **Table: 6 2009-2013 Fires in OBC Group F in Whitby**

Source Crisys OFMEM report

		2009	2010	2011	2012	2013
Total	Loss Fires	58	64	53	57	60
	Injuries	12	5	8	0	12
	Fatalities	0	1	0	3	0
	Est. $Loss	$14,879,966	$2,700,230	$2,863,475	$3,800,380	$3,247,829
	No Loss fires	4	4	1	2	1
Group F	Loss fires	2	10	2	2	4
Industrial	% of Loss	3%	16%	4%	4%	7%
	Injuries	0	1	2	0	0
	% of Injuries	0%	20%	25%	0%	0%
	Fatalities	0	0	0	0	0
	% of Fatalities	0%	0%	0%	0%	0%
	Est.$Loss	$10,035,000	$205,605	$100,750	$1,540,000	$72,000
	% of Est.Loss	67%	8%	4%	41%	2%
	No Loss Fires	1	1	0	0	0

From 2009-2013 Industrial Occupancy's made up 7% of structure fires reported to the OFMEM and accounted for 7% of estimated loss. During the same period Industrial fires made up 6.8% of structure fires in Whitby but accounted for 43.4% of the estimated dollar loss. Despite the low frequency of incidents it is clear these types of fires can have a devastating economic and environmental impact on a community. It is vital that the higher hazard occupancy's in this class be continually monitored by a pro active inspection program.

- **Other Properties**

In addition to gathering information on building related risks, attention should also be given to other property types, particularly those that contain large quantities of combustible materials. Propane storage facilities, outdoor tire storage yards, grasslands/forests., plastic recycling depots are examples of properties that could severely impact a community and its environment if involved in fire. Major highways and railways lines used to transport high volumes of traffic perhaps large quantities of hazardous chemicals also warrant serious consideration.

WFES has a number occupancy types listed above including Superior propane, Matheson Gas, Arts Auto Wreckers, Durham Recycling, etc. Whitby also has 2 major Railway Systems CNR and CPR as well as Highway 401 and the soon to be completed Highways 407 and 412 with hazardous shipments running daily through these transportation systems. It is therefore imperative that WFES be continually trained to

respond to Hazardous Materials situations to mitigate the effects these types of incidents have on the environment and the community.

Whitby also has Enbridge natural gas, and TransCanada oil pipelines running across the municipality.

In addition to hazardous material highway shipments, Highways 401, 407, and 412 present access problems due to limited on and off ramps, significantly delaying WFES' response times.

Whitby has a Marina with 420 slips operating at 90-95% occupancy through the summer as well as 60 boats on land year round. In the winter there are over 400 boats in the yard. These boats present access problems due to long peers and close proximity to one another, in addition to the environmental factor of being on the water. Whitby Yacht club poses similar challenges with 220 boats in the water and another 50 on land and 270 on land through the winter.

Building Height and Area

- **Building Height**

Taller structures pose unique fire safety concerns and have the potential for significantly greater fire losses over shorter buildings of the same area due to their inherent physical features. The following challenges attributed to taller buildings demonstrate the important role sprinkler protection plays within these structures.

a) **Higher Population**
   Adding additional floors to a building increases the building population, placing more occupants at risk in the event of a fire.

b) **Longer evacuation times**
   The potential for longer evacuation time exists because egress travel distances from the upper floors increases with building height. The higher number of occupants associated with taller buildings further impacts evacuation time due to the increasing effects of overcrowding and bottlenecking as one descends further down the stairwell. Implementing procedures for occupants that require evacuation assistance or measures for protect-in-place are also considerations for tall buildings.

c) **Communication with building occupants**
   When an emergency arises, occupants throughout the building need to be notified so that they can take appropriate measures in response to the situation. The importance of timely communications is critical due to the large population base and the need for longer evacuation times.

d) **Higher fuel loads**
   The greater number of floors and higher number of occupants in taller buildings is associated with an increase in the building's overall fuel load and ignition sources.

e) Accessing higher floors for firefighting and rescue

Taller buildings pose additional challenges for firefighter access and rescue operations. Travel distances and response times increase, as firefighters need to ascend to higher levels using either the stairwell or elevator. Travel time up the stairs can be further impacted with having to share a crowded stairwell with descending building occupants. Additional challenges also exist for exterior access as fire department aerial apparatus can generally only reach 6 or 7 storeys above ground level.

f) Stack effect

The stack effect is characterized by the vertical movement of air into and out of buildings due to buoyancy caused by indoor/outdoor temperatures and elevation differences. During the winter heating season, the warmer indoor air rises up the building and escapes through openings in upper storeys. This reduces the pressure at the bottom of the building resulting in cold air infiltration through openings at the base. This effect is reversed during the summer air conditioning season. The stack effect is directly proportional to the structure height. Hence, the taller the building, the higher the smoke distribution rate throughout. A high percentage of deaths that occur within high-rise buildings are attributed to toxic smoke inhalation along egress routes.

Whitby has a number of High Rise and low rise residential buildings spread throughout the town. In addition to the problems listed above, many of these buildings have a high population of senior residents as well as new Canadians. WFES has had a number of incidents in these buildings where residents who have had a problem are reluctant to identify themselves for fear of being charged. This problem needs to be addressed through education of these residents.

Fires in high rise buildings (above 6 stories) immediately tax the resources of WFES and require immediate activation of Mutual Aid and Emergency Call Back.

In the NIST Report on High-Rise Fireground Field Experiments (Appendix P), numbers of firefighters required to safely and effectively operate at a high rise fire range from a minimum of between 28 and 36 depending upon the size of the building and nature of the fire, up to in excess of 100.

- **Building Area**

Depending on the occupancy type, some of the aforementioned challenges associated with taller buildings may also be applicable to a sprawling low-rise complex (i.e. higher population, longer evacuation times, communication, higher fuel loads). Large industrial plants/warehouses, greenhouses, farm buildings, department stores/malls, commercial complexes, and care/detention occupancies, to list a few, are often associated with this type of building configuration.

The large areas associated with these buildings pose a different type of challenge for firefighting/rescue operations and occupant evacuation. In this case, high horizontal travel distances to gain access to and evacuate the building are a concern similar to the

vertical travel distances associated with high-rises. Further, more complicated building layouts can be found in large complexes due to the space allowance for intricate corridor systems, a large number of interior rooms/other spaces, and multiple tenancies/occupancies.

Even large industrial warehouses that are generally constructed as open concept space can present a concern. The presence of large quantities of combustible piled storage may present a physical hindrance to gaining interior access for firefighting/rescue operations as well as contributing to a significant fuel load.

Whitby has a number of Industrial occupancies which encompass very large areas: Gerdau Ameristeel, Atlantic Packaging, LCBO Warehouse, as well as a 36,000m2 Metro Linxs Train Facility to be completed in 2017. These as well as other large buildings require pre planning as well as familiarization tours to help Fire crews overcome the obstacles presented. Large buildings of this nature may require multiple entry points requiring multiple entry control officers. Longer hose lays and the logistics of moving staffing and equipment, which quickly exhaust available resources. A fire in this type of structure requires the immediate activation of Mutual Aid and an emergency call back of personnel. Meetings with maintenance staff and current Fire Safety Plans give direction to staff on appropriate actions during emergencies.

- **Building Age and Construction**

A review of the community's building inventory should be conducted to identify those buildings that may pose a risk due to their age and construction. Generally, older buildings pose a different set of problems than those that have been built to modern construction standards.

- **Table:7 Residential Dwellings Age of Construction**

Source: Amanda

Year	Number of residential buildings in Whitby	% of Units	Ontario	% of Units
Prior to 1946	974	2.6%	677,870	14.9%
1946 to 1960	2714	7.1%	690,150	15.2%
1961 to 1970	1132	3.0%	640,660	14.1%
1971 to 1980	3976	10.4%	776,745	17.1%
1981 to 1985	2556	6.7%	338,575	7.4%
1986 to 1990	5331	14.0%	410,155	9.0%
1991 to 1995	3097	8.1%	291,480	6.4%
1996 to 2000	4441	11.6%	312,215	6.9%
2001 to 2005	9043	23.7%	417,170	9.2%

Year	Number of residential buildings in Whitby	% of Units	Ontario	% of Units
2006 to 2010	3697	9.7%	N/A	N/A
2011 to 2015	1775	4.7%	N/A	N/A
Total	38,136	100%	4,555,025	100%

An important component of this analysis is the percentage of residential buildings built prior to the adoption of the Ontario Building Code 1975. The table above shows that approximately 17.7% of the Town's residential buildings were built prior to 1975 in comparison to approximately 53% of those in Ontario. Although Whitby's has a low percentage of residential buildings built prior to 1975 we have our downtown core. The downtown core presents a number of challenges due to its age. These buildings were built prior to adaptation of the Fire Code and Building code and over the years have been renovated many times. The closely spaced buildings of the downtown core have a higher risk of fire spreading to an adjacent exposed building. The close proximity of buildings can impede firefighting operations due to limited access for firefighters and equipment. The recent fire at 121 Brock St. S. is an example of the economic impact this type of fire has on a community. The article below by Underwriters Laboratories illustrates the dangers of firefighting in modern day construction (post 1975).

Modern Residential Fires

UL determined that fires today are more dangerous and pose more risks than in the past. Fire propagation is faster, and time to flashover, escape times and collapse times are all shorter.

CONTEXT

UL's research scientists and engineers have conducted a number of innovative tests and evaluated their results, and have identified that the modern home fire is a "perfect storm" of conditions and outcomes: larger homes + open house geometries + increased fuel loads + new construction materials = faster fire propagation, shorter time to flashover, rapid changes in fire dynamics, shorter escape times and shorter structural collapse times.

WHAT DID UL DO?

UL has conducted hundreds of analytical studies to understand individual aspects of home fires over the years. In 2012 UL brought its cumulative insights together in a series of unique tests to advance the science of residential fires. In order to understand the full implications of modern home fires, UL scientists conducted a series of experiments that took into account key changes to the modern home. These changes cover differences in the size and geometry of modern homes as well as the furnishings and construction materials used.

In the experiments, three modern home configurations were tested against three "legacy" configurations, defined as having furnishings from the mid-20th century and building materials from between 1950 and 1970. The tests showed a consistency of results among the three modern rooms and the three legacy rooms that we examined.

All of the modern rooms transitioned to flashover — flashover occurs when the majority of exposed surfaces in a space are heated to their autoignition temperature and emit flammable gases — in less than five minutes, while the fastest legacy room to achieve flashover did so in just over 29 minutes. In the three sets of experiments, legacy-furnished rooms took at least 700 percent longer to reach flashover.1

The experiments revealed that the natural materials in the legacy rooms released energy more slowly than did the fast-burning, synthetic-furnished modern rooms, which leaves significantly less time for occupants to escape the fire. The experiments also demonstrate to firefighters that in most cases, the fire has either transitioned to flashover prior to their arrival or has become ventilation-limited and is waiting for a ventilation opening to increase its burning rate. This difference has a substantial impact on occupant and firefighter safety and leads to faster fire propagation, shorter time to flashover, rapid changes in fire dynamics and shorter escape times.2

Our advanced testing also examined four types of new construction materials: wall linings, structural components, windows and interior doors. The change in modern wall linings now allows for more content fires to become structural fires by penetrating the wall linings and involving the void spaces. This shift causes faster fire propagation and shorter times to collapse. Structural components have generally been made lighter by removing mass, which causes them to collapse significantly faster.4

In these experiments, an engineered I-joist floor system collapsed in less than one-third the time than did the dimensional-lumber floor system. Modern windows and interior doors fail faster than do their legacy counterparts. The windows failed in half the time, and the doors failed in approximately five minutes. If a fire in a closed room is able to access air to burn from a failed window, then it can burn through a door and extend to the rest of the house. As with the previous experiments, it was discovered that the use of new construction materials also leads to faster fire propagation, rapid changes in fire dynamics and shorter escape times for occupants and firefighters.5

The findings about modern home fires highlight that the conditions firefighters face today and will face in the future are very different than those faced by prior generations.

UL’s first-of-its-kind testing also identified collapse implications. Specifically, in the modern fire environment, if firefighters arrive at eight minutes, collapse is possible as soon as 90 seconds later. Firefighters may not be in the house yet or may be just entering to search for occupants. In contrast, our research showed the legacy fire collapse begins 40 minutes after the arrival of firefighters. In a legacy home, the extra time before collapse would allow for a significant number of fire operations to take place while firefighters were reading the safety of the structure.6 UL is working today to make improvements in these systems, working closely with manufacturers and other important stakeholders.

WHY IT MATTERS

The overall finding of UL’s fire testing is that the changes in the modern home create fires that reach flashover more than eight times faster than homes built 50 years ago. This much more rapid progression to flashover gives residents, firefighters and other first responders much less time to react, creating significant hazards to health and property.

IMPACT

The findings about modern home fires highlight that the conditions firefighters face today and will face in the future are very different than those faced by prior generations. Because of these changes, firefighting tactics need to change or be re evaluated to help assure they are effective. UL is working closely with the fire community to further examine and consider new methods and operational practices to advance safety.

Source: http://newscience.ul.com/articles/modern-residential-fires

. A fire in a single family residence requires a fast and coordinated attack in order to bring it under control and quickly exhausts all resources available and requires activation of Mutual Aid and Emergency Call Back.

- **Building/Fire Code Application**

Prior to the adoption of the OBC in 1975 and the Ontario Fire Code (OFC) in 1981, there were many inconsistencies with how new buildings were constructed and how existing buildings were maintained. Municipalities used their own bylaws to regulate building construction or simply relied on the expertise of architects, engineers and contractors to design and construct safe buildings. After the introduction of the National Building Code (NBC) some municipalities adopted it either in whole or in part. The Office of the Fire Marshal (OFM) also administered construction standards for certain occupancy types between 1958 and 1975.

Current building and fire codes have been developed to provide a uniform and higher level of protection for the Province. Modern codes contain building construction and maintenance standards and requirements that address various fire safety issues including:

- Occupancy
- Building area/height
- Construction materials (combustible vs. non-combustible) for structural and containment
- Exits/means of egress including signs and lighting
- Interior finish flame spread
- Fire protection equipment
- Fire alarm and detection equipment
- Fire department access
- Spatial separations from neighbouring buildings
- Storage arrangements
- Control of ignition sources and combustibles
- Inspection, testing, and maintenance
- Emergency planning

With the introduction of retrofit requirements being first enacted in the OFC beginning in 1983, various types of occupancies including assembly; boarding, lodging and rooming houses; health care facilities; multi-unit residential; two unit residential; and hotel establishments were required to be upgraded to a minimum acceptable level of fire

safety, over a period of time. Hence a review of the community's involvement with a retrofit inspection program or specifically a building's retrofit history in addition to its original construction date is an important consideration.

The Building and Fire Code are only as strong as the Inspection Program used to monitor and enforce there application. Financial costs of maintaining fire alarms systems and ensuring all work is performed to Building Code can become a burden and lead to gaps in the codes. A Pro Active Inspection Program can identify and eliminate these gaps.

- **Residential Buildings**

Historically, residential occupancies have accounted for approximately 70% of all structural fires and 90% of total fire deaths within Ontario. Single-family dwellings (detached, semi-detached and attached homes) combined with multi-unit dwellings (low-rise and high-rise buildings) account for over 85% of total residential fires and deaths. Due to the significant fire losses attributed to this occupancy class, the following focuses on construction features relevant to older and newer residential multi-unit buildings and single-family dwellings that may contribute to some of these losses.

- **Multi-unit Low-rise and High-rise Buildings**

The OBC and OFC classify residential low-rise buildings as those that are up to and including six storeys in building height, whereas high-rise buildings are as those that exceed six storeys. However, Statistics Canada classifies residential low-rise buildings as being less than 5 storeys in height and high-rise buildings as 5 storeys or higher. Due to the availability of Statistics Canada building stock data for these classifications, their definition of high-rise and low-rise buildings will be used for the purposes of this section only.

A comparison of Ontario fire loss statistics between residential low-rise and high-rise buildings indicates that low-rises have a significantly higher fire loss rate.

- **Table:8 2009-2013 Average Fire Rates in Residential; Multi-Unit Dwellings in Ontario:**

Note: Rates based on 658,620 (<5storeys) dwelling units and 789,9070 high-rise

(5+storeys) multi-unit dwellings in Ontario (Source: 2011 statistics Canada Census)

Height of Multi-unit Dwelling	Loss Fire Rate per 100,00 units	Fire Injury Rate per 100,000 units	Fire Death Rate per 100,000 units
Low-rise < 5 storeys	91	16.9	1.3
High-rise 5+ storeys	81	12.1	.5

There are many factors that contribute to this disparity, one of which may be the difference in construction standards between the two. Despite higher residential low-rise fire loss rates, code writers generally perceive high-rise buildings to be the greater risk due to their unique fire safety challenges, as previously discussed. These inherent features can potentially lead to significantly more severe fire losses than other types of residential buildings. As a result, both the OBC and OFC contain more stringent construction and retrofit requirements for high-rise buildings.

The difference in age between Ontario's low-rise and high-rise building stock is another factor that should be taken into consideration. A review of residential multi-unit dwellings by age of construction reveals that low-rise buildings are generally older than high-rise buildings. As of 2001, almost 25% of the province's low-rise (less than 5 storeys) dwelling units were constructed "pre-1946", when little if any building construction standards existed. In comparison, only 2.6% of high-rise dwelling units were constructed during this period. Conversely, almost 90% of total high-rise dwelling units were constructed after 1960, when building code legislation was at least in its early developmental stages. In comparison, only 55% of current low-rise dwelling units were constructed during this period.

- **Table: 9 Fires in Multi-unit Dwellings 2010-2014 in Whitby**

Source: Crisys OFMEM report

# of dwelling units	# of fires	% of Fires
Multi-unit dwellings 2-6 units	12	35%
Multi-unit dwellings 7-12 units	3	9%
Multi-unit dwellings 12+ units	19	56%
Multi-unit dwellings	34	100%

In Whitby over the past five years, of the 34 fire incidents in multi unit dwellings 13 (38%) have been in High-rise (5+ storeys) buildings. 10 of these 13 incidents have occurred at White Oaks Court, representing 77% of high rise fires.

- **Single-Family Dwellings**

Fires in single-family dwellings have been responsible for nearly two thirds of all residential fires in Whitby. From 2009-2013 detached homes account for 34% of all single-family dwelling fires, semi-detached accounted for 37% and attached homes the remaining 29%.

- **Table: 10 2009-2013 Average Fire Loss Rates in Residential Single Family Dwellings**

Note: Rates based on 2,718,880 detached dwellings, 279475 semi detached dwellings, and 424,770 attached dwellings in Ontario (Source: 2011 Statistics Canada Census)

Type of Dwelling	Fire Loss Rate per 100,000 units	Fire Injury Rate per 100,000 units	Fire Death Rate per 100,000 units
Detached	108	11	1.3
Semi Detached	117	15.1	1.2
Attached	91	13	0.7

- **Table: 11 2010-2014 Fires in Single Family Dwellings in Whitby**

Source: Crisys OFMEM Report

Type of dwelling	# of Fire Incidents	% of Fire Incidents
Single Family	147	100%
Detached	111	75.5%
Semi Detached	9	6%
Attached	27	18.5%

Changes in construction features over the years have resulted in improvements from a fire safety perspective. With the introduction of the OBC in 1975, one of the significant changes was the requirement for newly constructed single-family dwellings to be equipped with hard-wired smoke alarms outside all sleeping areas. Smoke alarm requirements have become even more stringent with the OBC requiring them to be installed on all storeys and interconnected with each other. The OFC now requires homeowners to ensure that working smoke alarms are installed on each storey of the home and outside all sleeping areas.

A fire safety concern associated with older single-family residential buildings is the use of balloon frame construction, which was a common framing technique used back in the late 19th and early 20th centuries. This method involved the use of long continuous wood studs to erect walls from the foundation up to the roofline, which created long, concealed, and unobstructed vertical channels. Floor joists were subsequently hung from the wall studs. This type of construction permits fire and smoke to spread rapidly from the lower floors up to the roof level, which also increases the risk of structural collapse. Modern platform framing construction involves constructing wall and floor systems one level at a time. It is an improvement over balloon construction as it provides a horizontal barrier to ensure concealed wall voids do not extend for more than one floor.

In the older downtown sections of some municipalities it is common to find long rows of attached residential/commercial buildings constructed with their attic spaces interconnected with each other. These common attic spaces are often not adequately fire separated from the floor area below within the respective buildings. Hence, this type of configuration allows a fire that originates in one building to rapidly spread to the adjacent ones and potentially impacting an entire city block. Current building code regulations address this concern by requiring the construction of a firewall or party wall between attached buildings to provide a continuous vertical separation from the foundation footings up to at least the underside of the roof deck.

The interior walls and ceilings in older homes are often finished with combustible materials such as wood paneling and plastic acoustic ceiling tiles. These contribute to rapid horizontal and vertical fire spread and can be a major factor contributing to flashover and the speed with which exit pathways become unusable. The use of drywall for interior wall and ceiling construction is more common in newer construction. Although acoustic ceiling tiles are still found in many newer homes, particularly in finished basements, many current manufacturers incorporate fire retardant features into these products.

Other fire safety improvements associated with current building construction practices include the use of flame retardant chemicals on cellulose insulation, more stringent chimney construction standards, and improved electrical wiring systems to support the electrical loads of modern appliances.

- **Building Exposures**

High building density within the community, such as those that are typically found in older downtown sections and areas where there has been “infill construction” are particularly at risk to exposure fires involving multiple buildings due to their close proximity to each other. Further, the limited distances between buildings may hinder fire department access, as only the side(s) of the buildings facing streets may be accessible by firefighting apparatus.

An exposure fire is one in which a fire originating in the building creates an external fire hazard to neighbouring structures by exposing them to heat and flames. Heat can be transferred by radiation and convection through wall openings, direct flame impingement or flying embers. The smaller the separation distance between buildings, the higher the potential for risk of an exposure fire. Past experience has demonstrated that exposure fires can occur despite separation distances of up to 30 m from the exposing fire.

As these are existing structures, there is very little that can be done with respect to physically increasing the separation distances between them. However, an understanding of the factors that influence the severity of an exposure fire may assist with identifying appropriate measures that can mitigate its impact if one should occur. With respect to the originating or exposing building fire, these factors include:

- Temperature and duration of exposing fire
- Type of exposing and exposed exterior wall and roof construction
- Width and height of exposing fire

- Percentage of openings in exposing and exposed wall area
- Protection of openings
- Exterior wall surface areas and orientation with respect to each other
- Exposer of interior finish and combustibles to exposing fire
- Burning room characteristics (ventilation, fuel, size, geometry)
- Interior finish and building content thermal properties in both buildings
- Sprinkler protection availability
- Early detection and fire department notification

Some of the means of providing building protection to mitigate the effects of exposure fires include:

- Providing automatic sprinkler protection
- Constructing firewalls between buildings
- Installing automatic exterior water curtains for windows and combustible walls
- Closing or providing protection for wall openings (i.e. glass block panels, wired glass, automatic fire shutters/fire doors/dampers)

Residential dwellings pose the greater risk for exposure fires due to the fact they account for the largest percentage of fire incidents in the past. In addition over 80% of residential dwellings in Whitby were built after 1975 when Lot sizes became smaller and distance between dwellings began to decrease. It not uncommon for homes built after 2000 to have less then 2 meters between dwellings (38% of residential dwellings in Whitby all into this category).

- **Demographics Profile**

Different demographic groups can pose unique fire safety challenges. Community population and population shifts throughout the day or year will also introduce varying demand for fire protection services. Developing a community demographic profile is essential to gaining insight on the population being protected. Demographic information to be identified includes:

- Population Distribution by Age
- Population Shifts
- Vulnerable Individuals or Occupancies
- Language Barriers to Public Education
- Income Levels

- **Population Distribution by Age**

Establishing a population profile based on age distribution can assist in identifying the extent of vulnerable residents within a community.

The risk of fire deaths associated with a particular age segment can be determined by calculating and comparing the fire death rates for various age segments associated with a particular location.

- **Table 12: Population of Whitby by Age**

Age Characteristics of the Population (Both genders)	Whitby Total	Whitby % Total	Ontario Total	Ontario % Total
Total estimated population	131,976	100%	12,851,820	100%
Age 0-4	7,229	5.48%	704,260	5.48%
Age 5-9	8,663	6.56%	712,755	5.55%
Age 10-14	9,231	6.99%	763,755	5.94%
Age 15-19	9,927	7.52%	863,635	6.72%
Age 20-24	9,625	7.29%	852,905	6.64%
Age 25-29	7,412	5.62%	815,120	6.34%
Age 30-34	7,210	5.46%	800,365	6.23%
Age 35-39	8,572	6.50%	844,330	6.57%
Age 40-44	10,188	7.72%	924,075	7.19%
Age 45-49	10,962	8.31%	1,055,880	8.22%
Age 50-54	11,341	8.59%	1,006,140	7.83%
Age 55-59	9,192	6.96%	864,620	6.73%
Age 60-64	6,919	5.24%	765,655	5.96%
Age 65-69	5,421	4.11%	563,485	4.38%
Age 70-74	3,548	2.69%	440,780	3.43%
Age 75-79	2,577	1.95%	356,150	2.77%
Age 80-84	2,063	1.56%	271,510	2.11%
Age 85+	1,985	1.50%	246,400	1.92%
Median age of the population			40.4	
Population aged 14 and under	25,123	19%	2,180,770	16.97%
Population aged 65 and over	15,594	12%	1,878,325	14.62%

- **Table 13: 2009-2013Average Fire death Rate by Age:**

Source OFMEM

Notes: Rates based on Ontario population by age group (Source:2011 Statistics Canada Census)

Age Range	**Fire Deaths per Million Population 5 Year Average (excludes Federal First Nations Fatalities)**	**Fire Death Risk Index**
All Ages	6.3	
85+	29.2	4.6
75-84	21.0	3.3
65-74	10.2	1.6
50-64	7.7	1.2
35-49	5.9	0.9
20-34	3.1	0.5
15-19	4.4	0.7
10-14	0.3	0.0
5-9	0.3	0.0
Under 5	3.1	0.5

As identified in the chart, at the age category 50 to 64, the fire death rate begins to climb above the overall population's risk level of 6.3 deaths per million population and continues to rise to a rate of 29.2 at age 85 and over.

- **Table 14: Provincial fire fatalities by age group 2004-2013**

Age Characteristics of the Population	**% of Age Group**
0 to 10 years	5% **(38)**
10 to 19 years	6% **(45)**
20 to 29 years	6% **(45)**
30 to 39 years	8% **(60)**
40 to 49 years	19% **(143)**
50 to 59 years	15% **(112)**
60 to 69 years	14% **(99)**
70 to 79 years	14% **(101)**
80+ years	13% **(99)**

Source: OFMEM Fatal Fires Summary

- **Older Adults**

One of the most significant demographic trends in Canada today is the aging of the general population. In 2001, one in eight Canadians was aged 65 years or over. By 2026, one in every five Canadians will have reached age 65. The reasons for this trend are complex but include factors such as the impact of the “baby boomer” generation and increases in life expectancy due to medical advances.

As seen in the above statistics, older adults represent one of the highest fire risk target groups in Ontario. The aging process is linked to the decline in an individual’s physical and cognitive ability, which reduces their reaction time during a fire emergency. The effects of aging may often be compounded due to illness, disabilities, hearing/sight impairments, and the effects of prescription medication. Physiologically, they are more susceptible to injury and death when exposed to fire or smoke. All of these factors result in the decreased likelihood that an older adult will survive a fire if involved in one.

Between 2000 and 2004 the leading causes of senior (aged 65 and over) fire deaths were attributed to “open flame tools/smoker’s articles” and “cooking equipment”. These ignition sources were responsible for 35% and 10% respectively of fire deaths for this age category during this period. It is believed that the decline in cognitive and physical abilities contributes to the frequency of fire incidents relating to the careless use of these ignition sources.

Unless measures are taken to mitigate risks associated with this target group, fire deaths associated with older adults will continue to increase in proportion to their rapidly growing population.

Whitby’s demographics show that 32.6% of the population is over the age of 55 and 11.81% are over the age of 65. This represents a high percentage of the population that are at increased risk and should be addressed proportionally with educational programs targeted at this demographic.

- **Children**

Fire death statistics for children under the age of 10 indicates that this group has a relative risk similar to that of the general population. Despite this, it is generally recognized that children, particularly those that are under the age of 5, are one of the most vulnerable groups within the general population. This is because they are dependent on adults for their safety due to their undeveloped cognitive and physical abilities and general lack of maturity. They are unable to recognize a hazardous situation and take the necessary actions to escape on their own. Physiologically, they are more susceptible to injury and death when exposed to fire or smoke.

It is also recognized that children are a risk with respect to initiating fires. Younger children are naturally curious and will often touch and amuse themselves with items that are within their reach. This includes playing with ignition sources such as matches, lighters, candles, stoves and fireworks, without understanding the consequences. Between 2000 and 2004, “Open flame tools/smoker’s articles” were determined to be responsible for 28% of fire deaths related to children under the age of 10. Incendiary fire incidents are often linked to older children. It is estimated that over 50% of incendiary

fires investigated by the OFM are motivated by mischief or vandalism and started by young people.

Education aimed at reducing the risk for this vulnerable age group will target the parents of these individuals. Social media provides an inexpensive way of reaching large groups and would be an appropriate method for reaching this younger demographic.

- **Population Shifts**

The population of the community can vary significantly throughout the year, which can impact the demand for fire protection services. A tourist or cottage community that attracts many vacationers during the summer will have inflated populations during this period. Some communities may host large annual events that may draw a sudden influx of visitors for a short period of time. In contrast, university/college towns may have a higher population base during the school months than during the summer months.

The population within the community may also vary significantly throughout the day due to its residential and employment characteristics. One that is characterized as a “bedroom community”, in which the vast majority of the residents leave town to go to work, will have a reduced population level during the daytime as compared to the evenings. In contrast, an “industrial town” that employs a high number of people during daytime work hours but is home to only a few during the evening hours, will have the opposite effect.

Whitby is not prone to seasonal population shifts but does have a high percentage of commuters travelling into Toronto on a daily basis. In addition Whitby now has some college campuses as a part of Oshawa’s much larger Durham College and University of Ontario Institute of Technology presence. With the presence of these campuses and the increase in student population, Whitby needs to monitor rental housing to ensure that students are kept safe. Education of students on what safety standards they should be looking for in temporary housing would be an effective method of achieving this goal.

The Region of Durham’s Official Growth Plan Amendment 128 (ROPA 128) is intended to implement the growth Plan and provides for the development of 34,375 new dwelling units in the Town between 2006 and 2031. This translates into an anticipated population of 192,860 in 2031. Ontario’s new Growth Plan for the Greater Horseshoe requires that a minimum of 40% of all new dwellings be built within the already built up area within cities and towns across the region. In response to the policies of the Province and the region of Durham, the Town of Whitby has a plan to accommodate a minimum of 14,488 new dwelling units within Whitby’s built boundary, with a large majority of these units located within medium and high density developments. The remainder of the expected dwelling units shall be developed on lands that are outside of the Built Boundary, on lands including those set aside for development in West Whitby Secondary Plan Study and in the Brooklin area. The community of Brooklin is expected to accommodate a significant portion of the Town of Whitby’s growth. The population is expected to increase from the existing population of 20,000 people to a population of approximately 56,000 people by the year 2031. This represents an increase of approximately 36,000 people by 2031. An estimated 95% of this growth is expected to occur outside of the existing Brooklin Secondary Plan Boundary.

- **Vulnerable Individuals or Occupancies**

Determining the extent and location of vulnerable and non-ambulatory occupants within the community should be given a high priority. Occupants with vulnerabilities due to age related limitations were discussed earlier. However, it is also recognized that there are occupants with vulnerabilities associated with physical/cognitive limitations, disabilities, drug or alcohol use, that require evacuation assistance in the event of a fire emergency. Special consideration should be given to identifying locations such as hospitals, senior's apartments, group homes, rooming houses, residential care, long-term care homes, and children's daycares and student dormitories.

- **Table 15: Vulnerable Occupancies in Whitby**

Complex Name	**Address**	**Occupants**
Sunny Crest Nursing Home (C&T)	1635 Dundas Street East, Whitby, On L1N 2K9	136
Fairview Lodge (C&T)	632 Dundas W, Whitby ON L1N 2N2	198
The Village At Taunton Mills (C&T)	3800 Brock St N, Whitby, ON L1R 3A5	276
Lakeridge Health Whitby (C&T)	300 Gordon St S, Whitby, ON L1N 5T2	
Ontario Shores Centre for Mental Health Sciences (C&T)	700 Gordon Street, Whitby, ON, L1N 5S9	400 Beds 600 staff
Stonehaven Manor Senior Retirement Residence (C)	737 Anderson, Whitby, ON L1N 5R5	8
Amica at Whitby (C)	200 Kenneth Hobbs Ave. Whitby, ON L1R 0G6	190
Lynde Creek Manor (C)	50 Paul Burns Way, 308, Whitby, ON L1R 2Y9	120
Colonial Retirement Home (C)	101 Manning Rd, Whitby, ON L1N 9M2	105
Group Home	88 Wyndfield Cres Whitby, ON, L1N 8K9	3
Group Home	134 Hickory Street N Whitby, ON, L1N 3X7	14
Group Home	90 Kirby Cres Whitby, ON, L1N 6Z7	3
Group Home	60 Elizabeth Cres South Whitby, ON, L1N 3R7	6
Group Home	204 Cochrane Street Whitby, ON, L1N 5J1	4
Group Home	78 Applewood Cres Whitby, ON, L1N 2E8	4

- **Language Barriers to Public Education**

Ontario is an ethnically diverse province with 54% of the population reporting origins other than British, French or Canadian. A 1996 Canadian Heritage Multiculturalism report identified 15 different languages, other than English and French that are commonly spoken in Ontario homes.

This language diversity issue can present challenges with respect to effectively providing public education information and programs to the community through the media, written materials, telephone inquiries and seminars. A review of the community's ethnic profile is necessary to determine whether language barriers to public education exist. If so, it will be necessary to develop communication strategies to ensure public safety messages are effectively passed on to the target audience.

- **Table 16: Languages spoken in Whitby**

Language	Whitby Total	Whitby % Total
Total Population	131,976	100%
English Only	121,024	91.7%
French Only	68	0.05%
English and French	10,148	7.68%
Neither English nor French	736	0.55%

A Demographics study of Whitby from March of 2015 indicated that 91.7% speaks English only, 7.68% speaks English and French, and less then 1% speaks neither English nor French. Although the study indicates that less then 1% of the population does not speak English, written educational material may need to be provided in alternative languages in the near future.

- **Income Levels**

The "2005-2006 Ontario Stovetop Fire Survey" conducted by the OFM on cooking fires revealed that the stovetop fire incidents rate in subsidized residential dwellings was three times higher than non-subsidized dwellings. This finding suggests that there is a correlation between income levels and fire risk.

In Ontario, 14.5% of the population earn below Statistics Canada's "Low Income Cut-Off after Tax" measure, which is a widely accepted poverty benchmark. In the U.S., the study of socioeconomic factors is recognized as being among the best-known predictors of fire rates at the community level. In particular, the 1997 Federal Emergency Management Agency (FEMA) report, "Socioeconomic Factors and the Incidence of Fire" and the 1989 NFPA Journal article, "How Being Poor Affects Fire Risk" have shown that there is a close link between income levels and fire risk. These reports demonstrate this relationship by identifying 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.
- Single parent families are 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.
- 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 instructions manuals and warning labels are less likely to grasp fire safety messages.

Whitby Fire could investigate the possibility of creating a partnership with Children’s Aid Services and Durham Social Services to create programs to address the patterns indicated by these statistics.

- **Geography/Topography/Road Infrastructure**

The geography, topography, and transportation infrastructure that exist within the community can impact the fire department’s ability to promptly respond to an emergency. Areas that are prone to severe weather conditions can further compound any concerns. These need to be evaluated to identify what factors can potentially impede responses to various locations so that measures can be taken to address these obstacles. The goal is to ensure that the fire department is capable of responding to an emergency anywhere within the community at anytime within a reasonable time.

- **Roads and Access Routes**

Consideration needs to be given to the road conditions and private property access routes within the community. Are they properly maintained and accessible throughout the year? Are they wide enough and constructed well enough to support the width and weight of a fire department vehicle? How are “unassumed” roads within new residential subdivisions, that are in poor condition and obstructed by construction vehicles/materials, dealt with? Are there railway crossings and drawbridges along response routes that can potentially result in lengthy delays? Which roads have reduced lanes or are closed due to construction? How will severe weather, particularly during the winter season, impact these travel routes?

- **Responses to High Speed Highways**

This is to highlight the impact of the 407 and 412 link will have on the current compliment of Whitby Fire vehicles, the ability to respond to calls on the highways as a whole and the ability to provide coverage for the rest of the town once vehicles are committed to 401/407/412 highways.

The Town of Whitby’s current stretch of 401 running from our borders from east to west over the past 6 years has yielded an average of 94.13 responses each year.

2009-73

2010-96

2011-101 average 94.13 per year

2012-84

2013-102

2014-109

The trend is generally rising in number.

With the introduction of the 407 and 412, the length of highways in Whitby will triple. It is expected that the number of highway incidents requiring WFES response will increase accordingly.

Once committed to a highway, Fire vehicles are limited by the exits on the highways to respond to other emergencies in the town if required.

Example: currently if committed to 401 westbound, Fire vehicles have to travel to Salem Road and then return to Whitby to be available for another response.

Standard minimum response to any MVC is 2 Pumpers for staffing and a blocker vehicle. WFES Standard Operating Guidelines (SOG’s) and Section 21 notes that a blocker vehicle be utilized at motor vehicle collisions (MVC’s). This is for scene safety. A blocker vehicle generally parks on an angle several meters back from the scene of an accident to warn on-coming vehicles and to protect the scene from cars entering the working area.

One MVC on any of the highways generates a minimum response of Car 35 and two Whitby Fire pumpers

Typically, the average length of time an MVC response takes is 20 minutes. With extrication involved it is much longer.

With one MVC on the highway, 40% of the compliment of Whitby Fire trucks are unavailable for response to any other incident for the duration of the MVC as well as travel time to get back to Whitby's borders

If the second incident was a house fire, WFES could not meet NFPA 1710 standard fire ground staffing requirements.

This happens 94 times a year on average with the current stretch of highway 401. The addition of 407 and 412 translates to the potential possibility of Whitby Fire Vehicles to be busy on the highways and unable to protect the rest of the Town sufficiently.

The potential for multiple MVCs on the same or different stretches of highways in the near future greatly increases as well. Two separate MVC's would generate 2- 2 pumper responses and utilizing 80% of WFES' Fire Pumper compliment, severely restricting the ability to provide fire protection for the Town of Whitby.

WFES has a number of rural properties with limited access and long laneways. These properties have been pre planned to overcome the challenges they present. Rural addressing poses another challenge for the fire service. There are still a large number of rural properties that are not properly identified by address signs despite an addressing By-Law.

Grass and bush fires along railway lines due to trains having mechanical problems and creating sparks have created access problems in the past. Farm properties without buildings have also created access problems in the past.

- **Traffic Pattern**

Variations in traffic patterns, particularly in an urban community will impact response times. Is the community prone to traffic congestion during the morning and afternoon rush hour periods? How do traffic conditions vary during the course of the year due to weather, road construction or population fluctuations? A review of normal traffic patterns and street design can reveal strategic information on what are the most efficient routes to take during these peak demand periods.

Whitby has a large population that commutes on a daily basis into Toronto. This causes traffic congestion on major arteries: Highway 401, Taunton Rd. and Rossland Rd. eastbound in the mornings (6:00am-8:00am) and westbound in the evenings (4:00pm-600pm). With the anticipated growth in West Whitby and Brooklin as well as the proposed development along Dundas St, Rossland Rd. and Taunton Rd. corridors, increased traffic will slow down response times to emergencies.

This can be compounded by bad weather and minor traffic accidents. In addition Whitby has a large rural area, and Lakeridge Road that can be prone to blowing and drifting snow during the winter months.

- **Natural Terrain**

The natural geography and topography inherent to the community may impact response times to certain areas of the population. How would the terrain be characterized within the community? Are there any difficult to access areas such as those located on hilly or low-lying flood susceptible terrains? Are there any remote properties that are isolated by a watercourse (i.e. islands) or forests/wild land? Consideration must be given to these secluded and potentially difficult to access areas to ensure that adequate resources are in place to protect them.

- **Past Fire Loss Statistics**

A historical review of the number and types of fire losses that have occurred over the past number of years can highlight the risks, trends and patterns that have been prevalent within the community.

- **Table 17: 2009-2013 Whitby Fire Loss by Occupancy Classification Source OFMEM**

Occupancy Classification (OBC)	**Occupancy Definition Fire Risk Sub-model (OFM)**	**Number of incidents**	**Town of Whitby Fire Loss by Occupancy Classification**	**% of Fire Loss by Occupancy**
Group A – Assembly	Assembly occupancies	13	$2,019,400	7%
Group B – Institutional	Care or Detention occupancies	8	$22,550	<1%
Group C – Residential	Residential occupancies	208	$11,879,625	43%
Group D – Business	Business and Personal Services Occupancies	6	$555,900	2%
Group E – Mercantile	Mercantile occupancies	13	$108,000	< 1%
Group F – Industrial	Industrial occupancies	20	$11,953,355	44%
Other occupancies	Not classified within the Ontario Building Code (i.e. farm buildings)	24	$953,050	3.5%
TOTAL		**292**	**$27,491,880**	**100%**

- **Table 18: Provincial Fire Loss by Occupancy Classification Period 2009 to 2013**

Occupancy Classification (OBC)	Occupancy Definition Fire Risk Sub-model (OFM)	Ontario Fire Loss by Occupancy Classification
Group A—Assembly	Assembly occupancies	5%
Group B—Institutional	Care or Detention occupancies	1%
Group C—Residential	Residential occupancies	72%
Group D—Business	Business and Personal Services Occupancies	3%
Group E—Mercantile	Mercantile occupancies	4%
Group F—Industrial	Industrial occupancies	7%
Other occupancies	Not classified within the Ontario Building Code (i.e. farm buildings)	8%
Reported Fires	Reported Structure Fires	38,532

When comparing Whitby's loss by occupancy classification to Provincial statistics in Group F Industrial there were 2 large incidents. A $10,000,000 fire in a Gas Turbine engine, as well as a $1,500,000 fire at a car dealership. By removing these 2 major incidents, residential fires account for 74% of fire loss over the past 5 years.

- **Table 19: Whitby Property Fire Loss (Dollars)**

Year	Fire Loss
2009	$15,083,966
2010	$2,996,067
2011	$2,976,284
2012	$4,572,157
2013	$3,496,234

- **Table 20: 2009-2013 Smoke Alarm Presence and Operation in Residential Fires in Whitby**

Sour***c***e OFMEM
https://www.ofm.ca/SIRstats/pmstats/fileList.asp?region=Durham%20Regional%20Municipality-18

Smoke alarm presence and operation On floor of origin	**Total: Residential fires 2009-2013**
	205 - 100%
Floor/suite of fire origin: Smoke alarm present and operated	98 - 48 %
Floor/suite of fire origin: Smoke alarm present, operation undetermined	13 - 6%
Floor/suite of fire origin: Smoke alarm present, did not operate	47- 23%
Floor/suite of fire origin: No smoke alarm	23 - 11%
Floor/suite of fire origin: Smoke alarm presence undetermined	13 - 6%
Floor/suite of fire origin: Unknown, not reported	11 - 5%

- **Table 21: 2009-2013 Whitby Structure Fires by Possible Cause:**

Source OFMEM
https://www.ofm.ca/SIRstats/pmstats/fileList.asp?region=Durham%20Regional%20Municipality-18

	2009	**2010**	**2011**	**2012**	**2013**	**Total**
Loss Fires	58	64	53	57	60	292
Intentional Arson	4 7%	4 6%	3 6%	0 0%	4 7%	15 5%
Intentional Vandalism	5 9%	3 5%	3 6%	2 4%	3 5%	16 5.5%
Unintentional Children Playing	1 2%	0 0%	0 0%	0 0%	0 0%	1 <1%
Unintentional Design/Construction/Maintenance	2 3%	7 11%	4 8%	6 11%	4 7%	23 8%

	2009	2010	2011	2012	2013	Total
Deficiency						
Unintentional Mechanical/Electrical Failure	3 5%	7 11%	7 13%	10 18%	10 17%	37 12.5%
Unintentional Misuse of Ignition Source/Material First Ignited	21 36%	14 22%	18 34%	23 40%	22 37%	98 33.5%
Other Unintentional	9 16%	7 11%	3 6%	2 4%	2 3%	23 8%
Unintentional Undetermined	3 5%	5 8%	2 4%	3 5%	4 7%	17 6%
Other	1 2%	4 6%	4 8%	0 0%	4 7%	13 4.5%
Unknown, Not Reported	1 2%	2 3%	0 0%	0 0	0 0%	3 1%

The historical review should include data such as the number of fire incidents, casualties (injuries and fatalities), and monetary property losses associated with the various reporting fields within the OFM's Standard Incident Report and Casualty Report. Some categories that may be useful for analysis may include losses associated with:

- Occupancy type
- Casualty age
- Casualty action
- Ignition source
- Cause of fire
- Area of origin
- Presence/operation of detection and suppression devices
- Fire frequency based on area/sub-area to determine local patterns
- Time of occurrence
- Response times

More often than not, a combination of the above categories will yield the most useful information.

Analyzing this data based on general population or a specific vulnerable segment of the population can provide more meaningful results for comparison purposes. For example, annual fire/death/dollar loss data provides general information on the community. However, this information is less relevant when compared to statistics from a municipality that has a vastly different population. If this data is expressed based on a population rate, this becomes more practical for comparison purposes. Comparing fire loss rates based on a specific segment of the population can provide even further insight. Property stock and population data will assist with this exercise. This type of analysis can form the basis for establishing the likelihood levels of certain types of events.

- **Table 22: 2009-2014 Whitby Rescue Calls By Type of Rescue**

Source OFMEM report generated by Crisys Fire

Type of Rescue	**# of Incidents 2592**	**% of calls**
Animal Recue	4	0%
Building Collapse	1	0%
Commercial/Industrial Accidents	6	0%
High Angle Rescue No Fire	2	0%
Home/Residential Accident	9	0%
Low Angle Rescue No Fire	1	0%
Other Rescue	33	1%
Persons Trapped in Elevator	81	3%
Rescue False Alarm	8	0%
Rescue No Action Required	29	1%
Trench Rescue	1	0%
Vehicle Collision	2310	89%
Vehicle Extrication	102	4%
Water Ice rescue	1	0%
Water Rescue	4	0%

Determining the nature of the fire problem in the community is the first step in identifying the most effective remedy. Once established, the appropriate resources and programs can be specifically targeted to address these concerns.

- **Table 23: 2010-2004 WFES Public Hazard Calls**

Source OFMEM report generated by Crisys Fire

# of Responses	Response Type
171	Gas Leak Natural gas
19	Gas Leak Propane
3	Gas Leak refrigeration
13	Gas Leak Miscellaneous
79	Spill Gas or Fuel
4	Spill Toxic Chemical
133	Spill Miscellaneous
76	Ruptured Water or Steam Pipe
148	Power Lines Down, Arcing
4	Bomb, Explosive Removal, Standby
122	CO, CO Present
7	Suspicious Substance
56	Public Hazard No Action Required
58	Public Hazard, False Alarm
130	Other Public hazard

- **Fuel Load**

The quantity and chemical nature of combustible fuel load within a compartment in combination with the availability of oxygen/air influences the rate at which a fire burns and the total amount of energy released. This in turn establishes the fire's potential intensity and duration prior to the fuel being depleted.

In a typical building the fuel load includes its combustible content, interior finish, floor finish and structural elements. Generally, it is the combustible content within the building that creates the fire problem. Typical fuel load found in most buildings include paper, clothing, furniture, window coverings, office equipment, wall/floor finishes, decorative items, combustible gases and flammable/combustible liquid based products. The quantity levels and types of combustible content will vary based on building occupancy type and its population.

The burning rate of a given fuel is dependant on its chemical makeup and physical geometry. In general, petrochemical based products such as those manufactured from plastics and flammable/combustible liquids release heat at a higher rate than cellulosic materials such as wood, paper, cotton, and fabric. Petrochemical based products also generate more toxic and smokier combustion products. The physical geometry of the fuel based on its surface area to mass ratio will influence how well it burns.

Although all buildings contain a fuel load in one form or another, those that store or manufacture large quantities of combustible products that emit toxic combustion products when ignited are of particular concern. Examples are industrial properties such

as wastes transfer/recycling facilities, plastic storage warehouses, and manufacturers of flammable/combustible liquids based products. Large fires involving these facilities can result in significant impact to the local environment.

Buildings with exceptionally high fuel content are not limited to industrial occupancies. Mercantile occupancies such as malls and “big box” warehouse type stores carry significant quantities of combustible merchandise. Assembly occupancies such as nightclubs and bars can have a significant amount of combustible furniture, decorative materials on walls/ceilings and alcohol (flammable liquid) within a relatively small area. Office buildings are generally associated with considerable fuel loads in the form of combustible furniture, office equipment and supplies.

In general, buildings with higher fuel loads are at greater risk due to the increased opportunity for ignition and higher potential for a more severe fire. Providing sprinkler protection is an effective means of mitigating the effects of fire in these locations.

Buildings representing risk due to high fire loads are best managed with a Pro Active Inspection Program. Ensuring that all detection, suppression and alarm systems are maintained, and that combustible material are stored and managed properly. Environmental and financial impact of these types of fires can have on a community can be reduced or eliminated with a strong inspection program.

Summary

Assessing a community to determine its inherent fire risks is a fundamental exercise for establishing the types of scenarios that may be encountered. The outcomes derived by the exercise serve as the basis for formulating and prioritizing fire risk management decisions to reduce the likelihood and adverse impact of these events.

In summary, assessing the fire risk within a community consists of:

1. Defining the community boundaries.
2. Assessing how the 8 key factors contribute to a community’s inherent characteristics and circumstances.
3. Compiling a list of potential fire risk scenarios.
4. Assigning probability and consequence levels to each scenario.
5. Applying the Risk Analysis Matrix to establish overall risk levels for each scenario to prioritize management decisions.

References

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- AS/NZS 4360: 1999-Risk Management
- OFM PFSG 01-02-01: Comprehensive Fire Safety Effectiveness Model Considerations For Fire Protection & Prevention In Your Community
- OFM PFSG 02-02-12: Risk Assessment
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- OFM PFSG 04-40A-12: Simplified Risk Assessment
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- NFPA 550-Guide to the Fire Safety Concepts Tree
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- FEMA: Topical Fire Research Series: High-rise Fires
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- Report of the Public Inquiry into Fire Safety in High-rise Buildings
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- FEMA: Socioeconomic Factors and the Incidence of Fire
- Fire Journal (1989): “How Being Poor Affects Fire Risk”
- OFM: 2005-2006 Ontario Stovetop Fire Survey
- A Poverty Reduction Strategy for Ontario (Ontario Campaign 2000 Discussion Paper-July 2007)
- Public Health Agency of Canada-Centre for Chronic Disease Prevention and Control “National Population Health Survey Highlights”
- European Journal of Epidemiology-“Health Behaviours and Socioeconomic Status in Ontario, Canada

Appendix C – HIRA Table

6 Almost Certain	Heavy Rain Fog 6	Windstorm 12	Lighting Extreme Temps 18	Snowstorm/Blizzard 24	30	36
5 Likely	Special Event Hail 5	10	Critical Infrastructure Failure 15	Freezing Rain/Ice Storm Flood 20	Energy Emergency Transportation Emergency 25	30
4 Probable	4	8	12	Tornado Human Health Emergency Hurricane 16	Explosion/Fire 20	Hazardous Material Spill 24
3 Unlikely	Drought/Low Water Erosion Agriculture and Food 3	Civil Disorder Earthquake Forest/Wildland Fire 6	Oil/Gas Emergency 9	12	15	18
2 Very Likely	Cyber Attack Land Subsidence Landslide 2	Drinking Water Emergency 4	Dam Failure 6	8	Building/Structural Collapse 10	Nuclear Radiological 12
1 Rare	Natural Space Object Crash War and International Emergency 1	Sabotage Human Made Space Object Crash 2	Geomagnetic Storms 3	Terrorism/CBRNE 4	5	6
	1 Minor	2 Slight	3 Moderate	4 Severe	5 Very Severe	6 Catastrophic

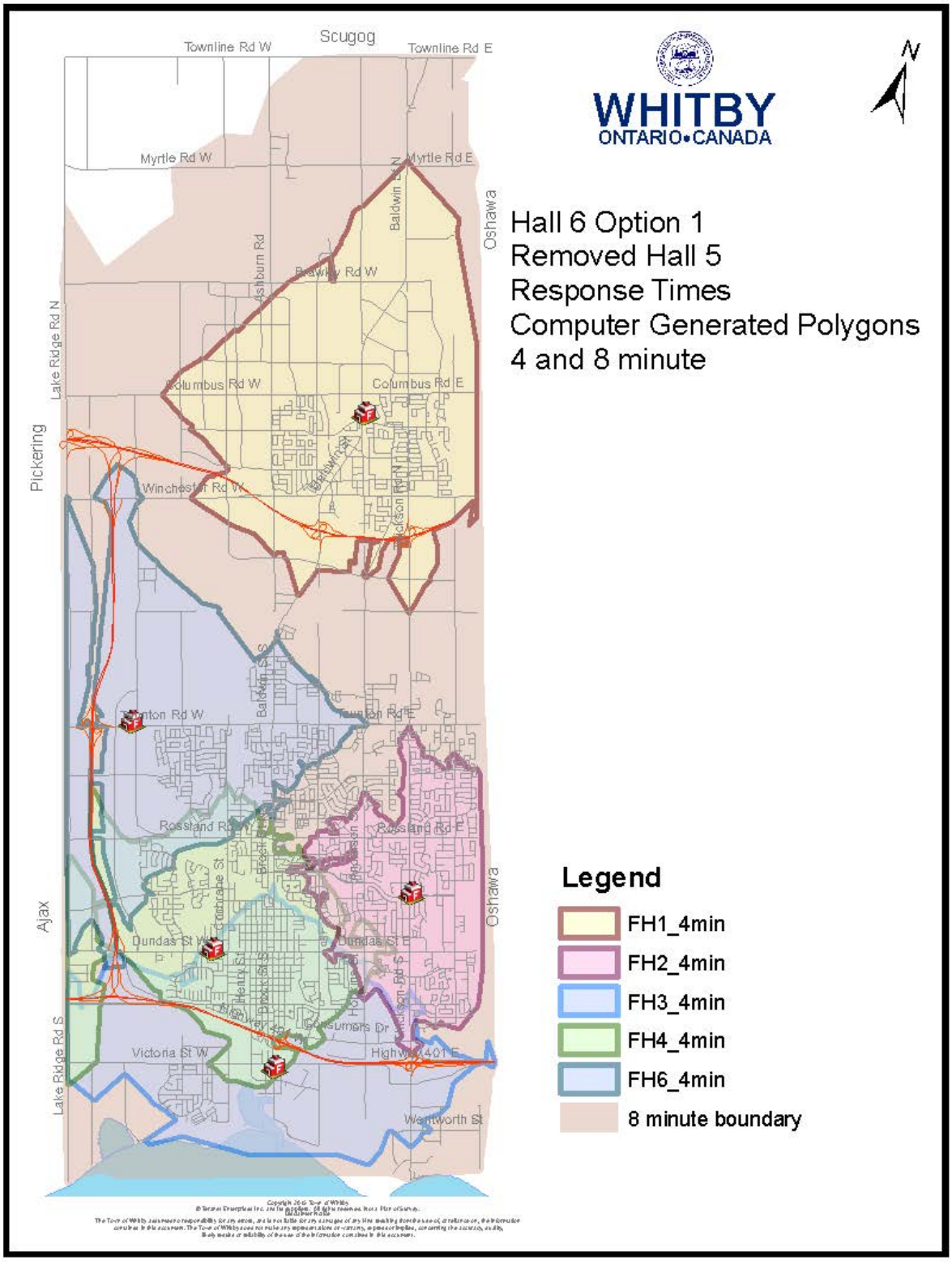
Appendix D – NFPA Study on Canadian FD

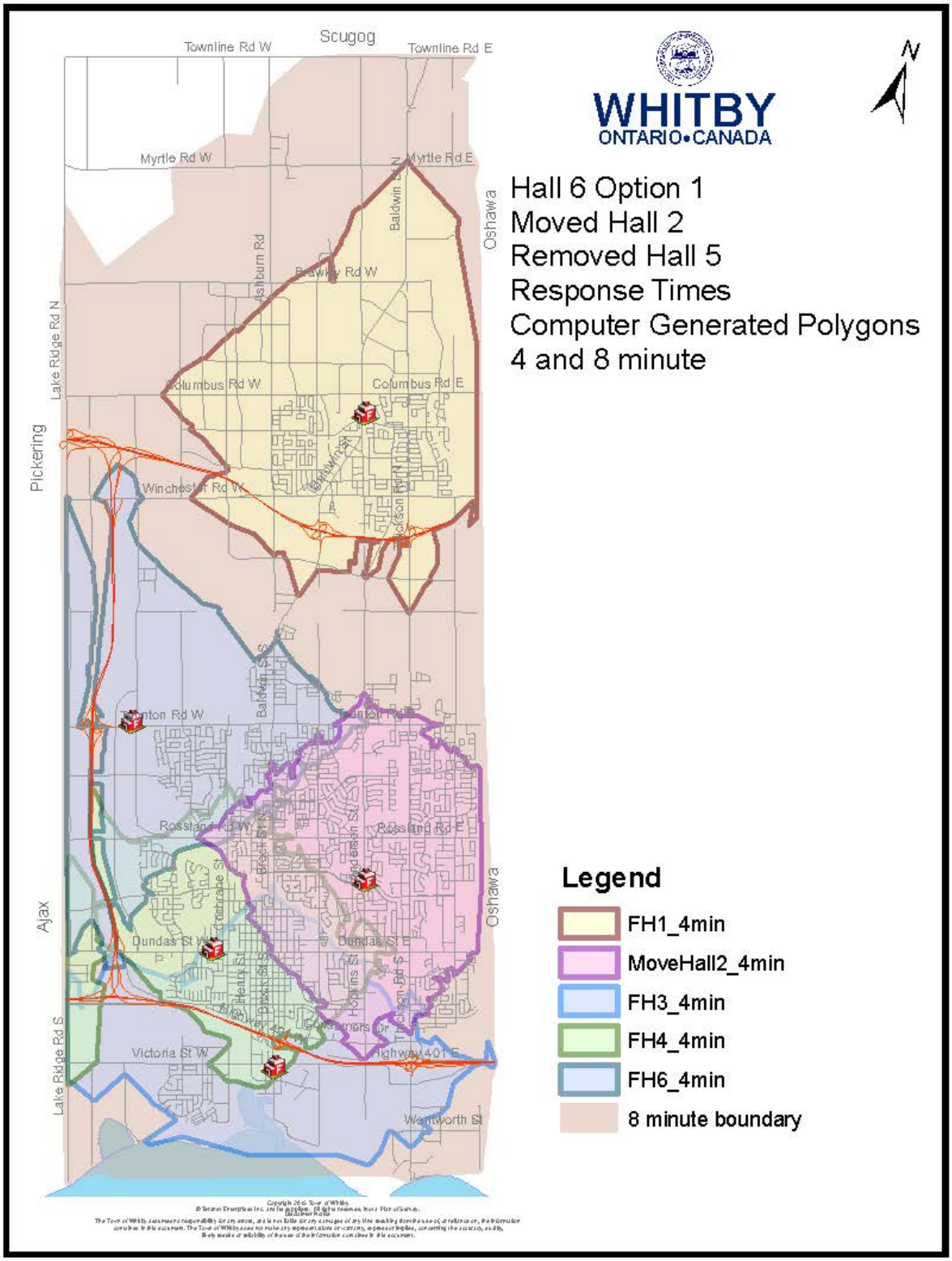
http://www.nfpa.org/research/reports-and-statistics/the-fire-service/administration/fire-departments-in-canada

Appendix E - NIST Report – Residential Fire Ground Experiments

http://www.nist.gov/customcf/get_pdf.cfm?pub_id=904607

Appendix F – Fire Response Mapping Scenarios

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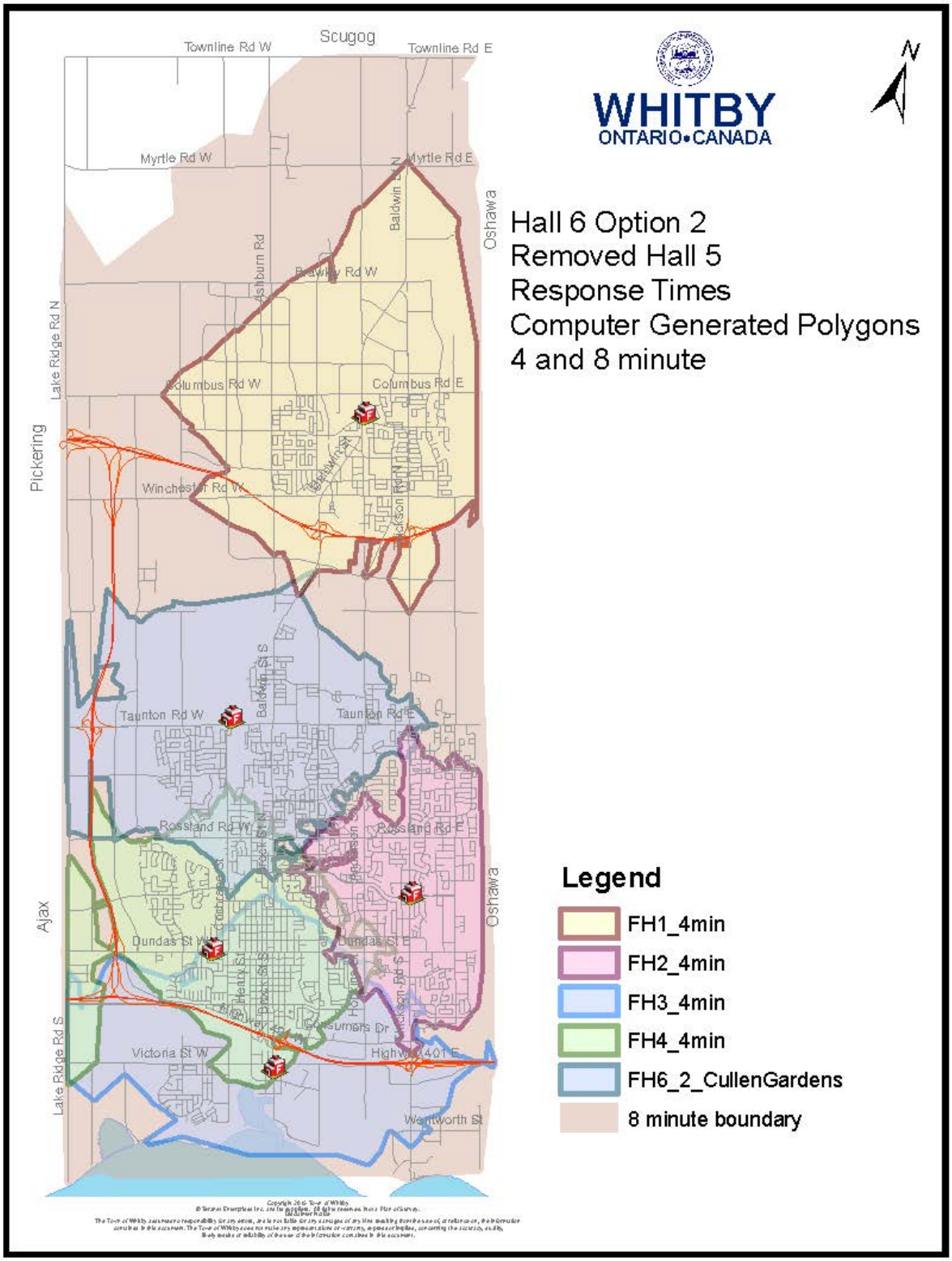
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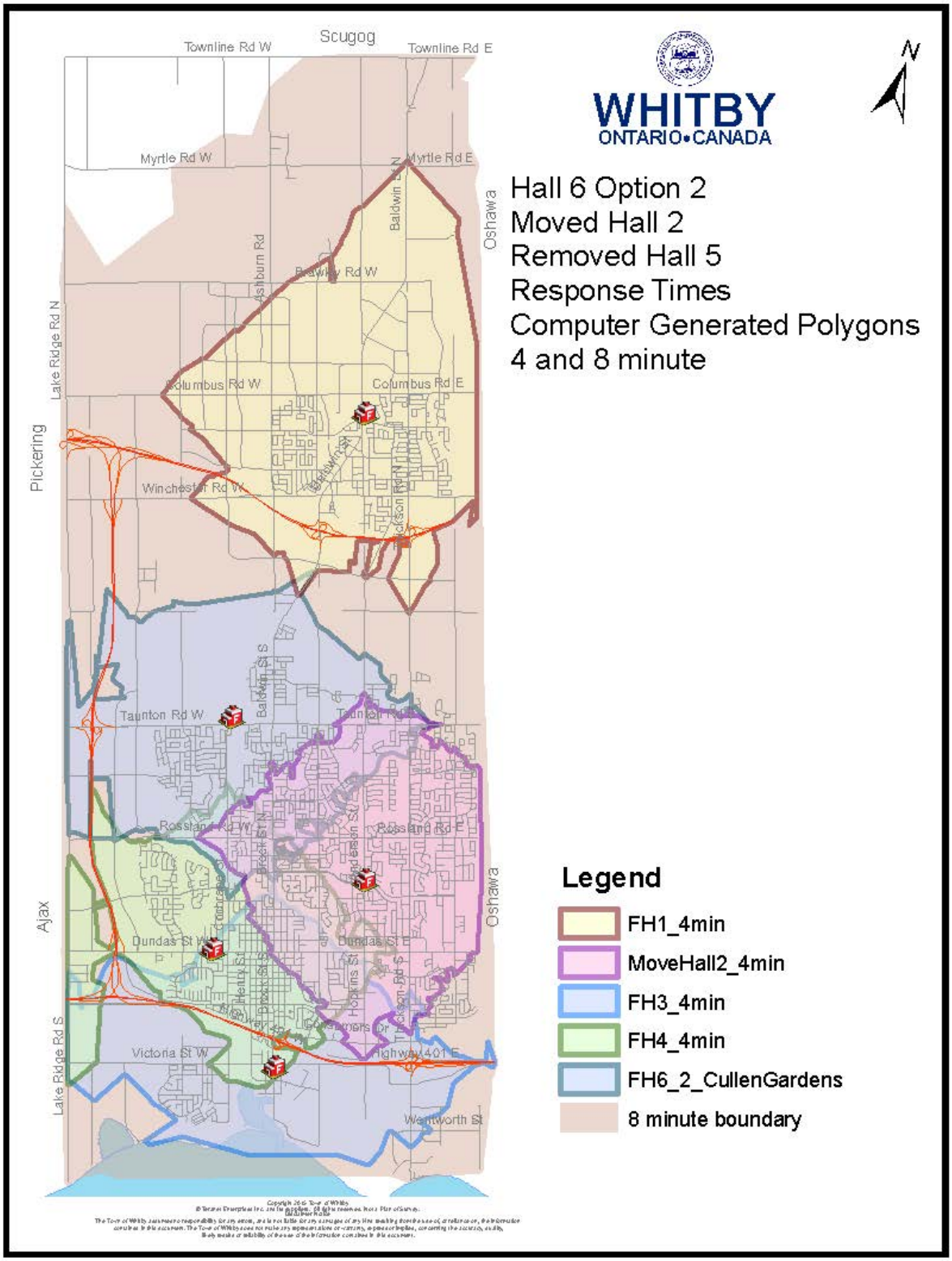
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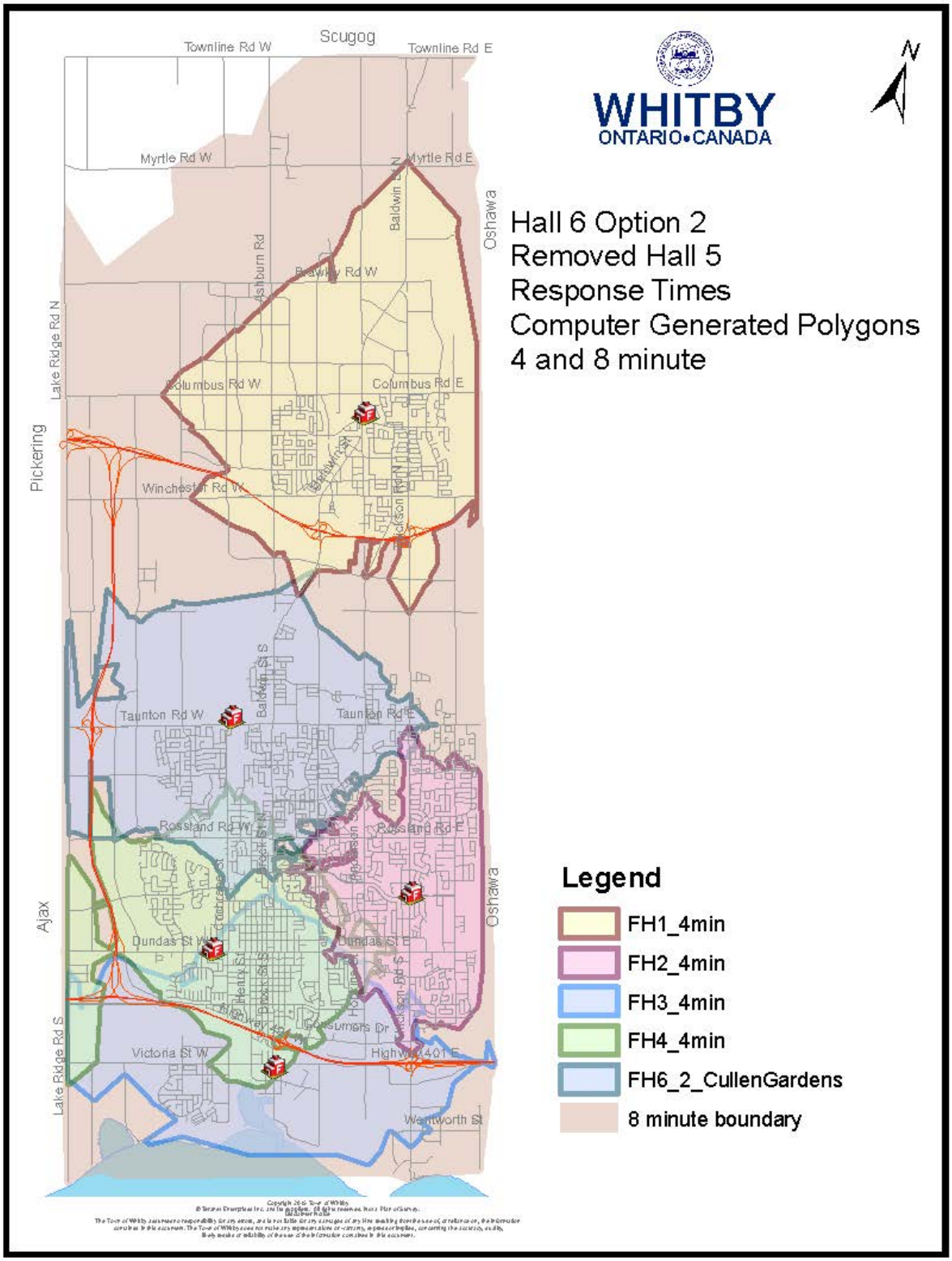
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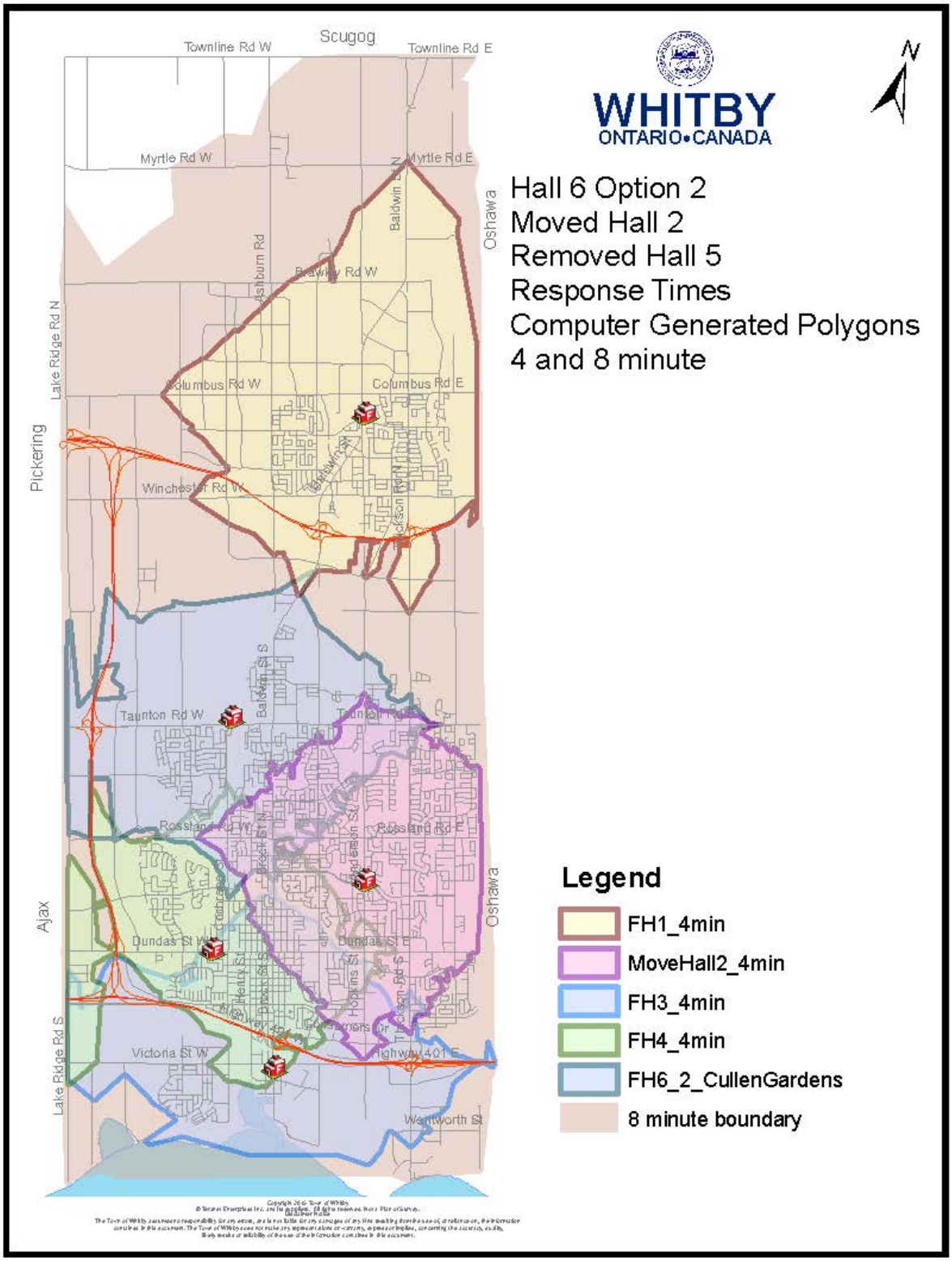
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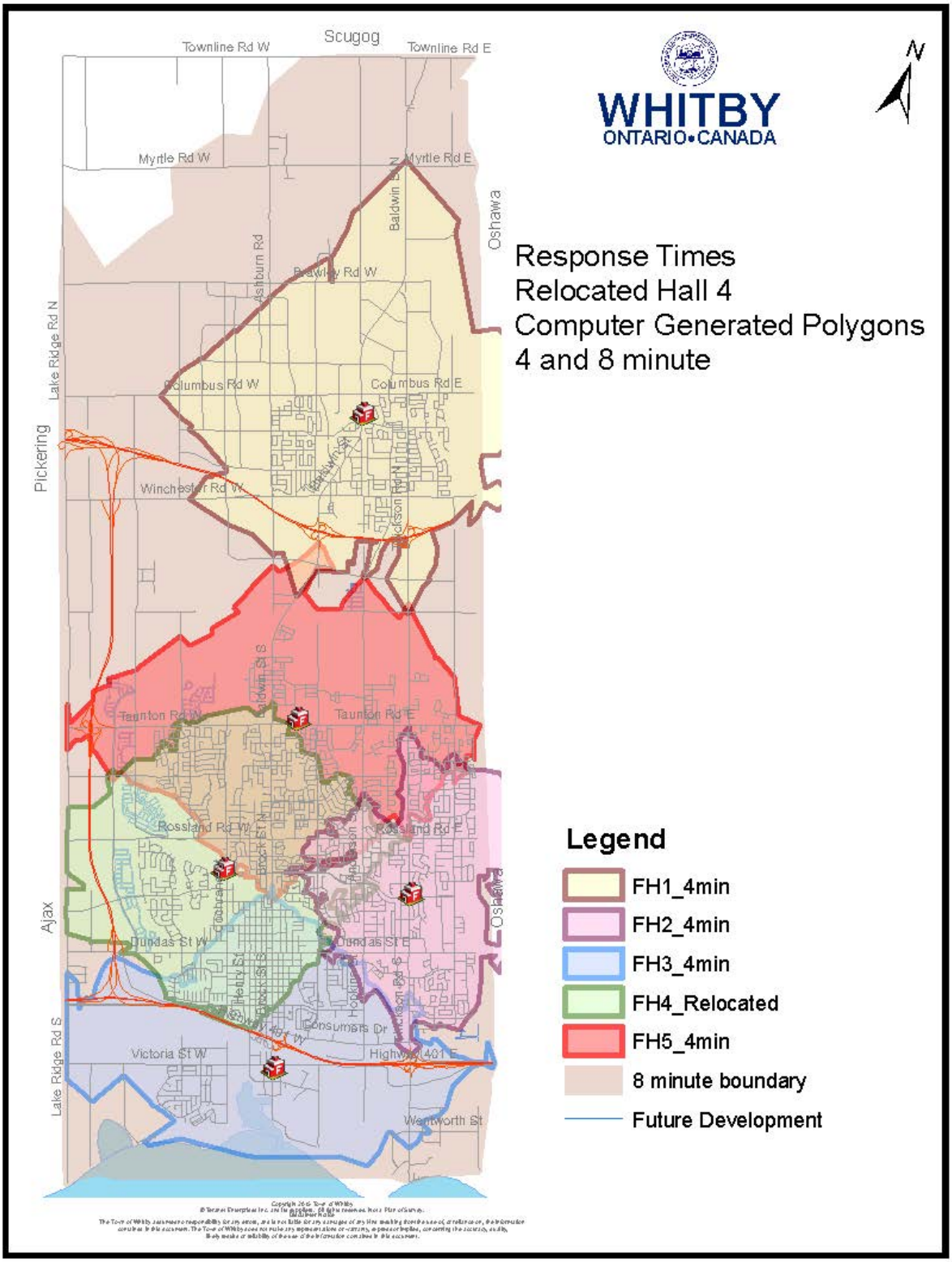
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Lake Ridge Rd S
Wentworth St
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FH3_4min
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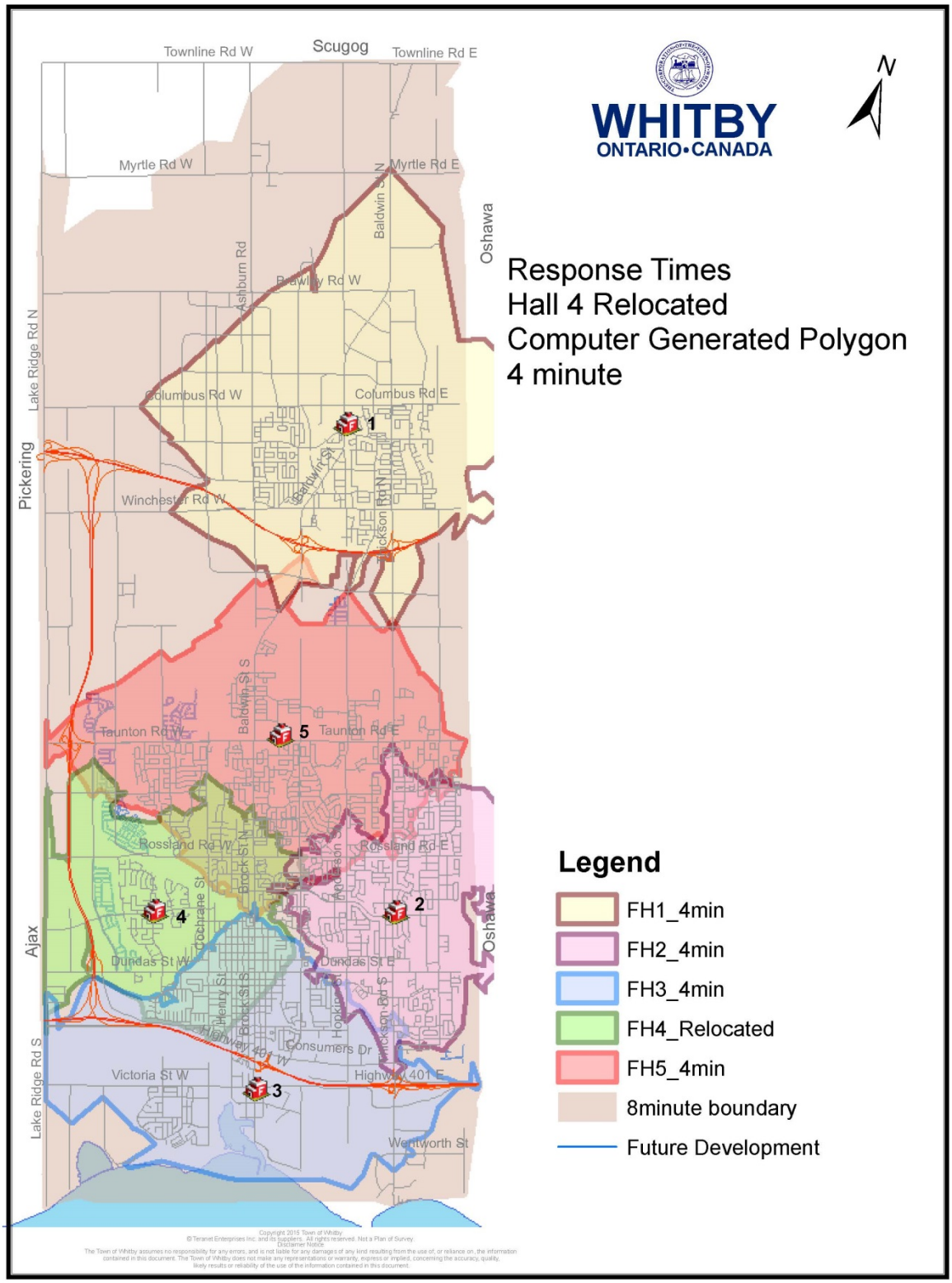
FH5_4min
8 minute boundary
Future Development


WHITBY
ONTARIO•CANADA
N
Response Times
Hall 4 Relocated
Computer Generated Polygon
4 minute
Townline Rd W
Scugog
Townline Rd E
Myrtle Rd W
Myrtle Rd E
Baldwin St N
Oshawa
Ashburn Rd
Brawley Rd W
Lake Ridge Rd N
Columbus Rd W
Columbus Rd E
1
Pickering
Winchester Rd W
Baldwin St
Jackson Rd N
Baldwin St S
Taunton Rd W
5
Taunton Rd E
Rossland Rd W
Rossland Rd E
Brock St N
Cochrane St
Ajax
4
2
Oshawa
Dundas St W
Dundas St E
Henry St
Brock St S
Highway 401 W
Consumers Dr
Jackson Rd S
Victoria St W
Highway 401 E
3
Lake Ridge Rd S
Wentworth St
Legend
FH1_4min
FH2_4min
FH3_4min
FH4_Relocated
FH5_4min
8minute boundary
Future Development

Appendix G – Section 21 Guideline – Response to Motor Vehicle Collisions

http://www.oafc.on.ca/sites/default/files/uploads/documents/Section21/Section21-6/GN-6-10%20Highway%20Traffic%20Ctrl.pdf

Appendix H - Managed Risk is More than Response: Response to Office of the Fire Marshal's 'Operational Planning: An Official Guide to Matching Resource Deployment & Risk'

http://www.oafc.on.ca/sites/default/files/uploads/documents/Reports/12-01-25%20OAFC%20Position%20Paper%20-%20OFM%20Risk%20Guideline%20FINAL.pdf

Appendix I – WFES Apparatus Initial Deployment per Call Type

Response Type		**Fire Units**
Structure Fire	All Types	2-Pumps/1-Aerial/Car 35
	High Rise	3-Pumps/1-Aerial/Car 35
Non-Structure Fire	All Types	1-Pump
Non-Structure Fire – MVA		2-Pumps/Car 35
MVA	Aircraft	3-Pumps/Car 35
	Marine	2-Pumps/1-Rescue/Car 35
	Rail	3-Pumps/Car 35
	Vehicle	2-Pumps/Car 35
Public Hazard		2-Pumps/Car 35
Hazmat Spill	Major	2-Pumps/1-Rescue/Car 35
	Radioactive	2-Pumps/1-Rescue/Car 35
Alarms	Commercial	2-Pumps/1-Aerial/Car 35
	Industrial	2-Pumps/1-Aerial/Car 35
	Institutional	2-Pumps/1-Aerial/Car 35
	Residential	2-Pumps/1-Aerial/Car 35
	Residential – High-rise	2-Pumps/1-Aerial/Car 35
	School/Church	2-Pumps/1-Aerial/Car 35
911 Unknown		1-Pump
Medical Assist		1-Pump
Other Response		As required/Car 35
Rescue	Entrapment	2-Pumps/Car 35
	Confined Space	2-Pumps/Car 35
	Elevator	1-Pump
	High Angle	2-Pumps/1-Aerial/Car 35
	Structure Collapse	3-Pumps/Car 35
	Ice/Water	2-Pumps/1-Rescue/Car 35
	Lockout	2-Pumps/Car 35/DRPS (Note: WFS responds only if child or disable person or potential Emergency present)
Pedestrian Hit		2-Pumps/Car 35
List Assist		1-Pump/AMB

Appendix J – Incident Safety Officer – Instructional Procedures 208

Date Issued: March 26, 2014
Section: Personnel Safety

Incident Safety Officer

1.0 Purpose

To establish instructional procedures for the Incident Safety Officer.

2.0 Scope

These procedures are to be followed by all WFES personnel.

3.0 Procedure

Scene Monitoring

Monitoring is the constant surveillance of an incident scene by visual observation, and listening to detect, recognize or identify problems or dangerous situations. This monitoring process starts when the ISO is dispatched or one is assigned at the scene.

In general the ISO will be monitoring buildings, structures, vehicles, time, weather, surroundings and staffing (including other Emergency Personnel), environment, special operations and rehab.

The following section - FIRE GROUND DUTIES will go into further specifics.

Fire Ground Duties

Close observation should be given to:

- proper use of protective clothing
- structure/vehicle/environmental condition and stability
- prevention of freelancing
- rapid intervention crews
- safety zones
- rehabilitation

Other functions that are part of the ISO duties include:

- risk evaluation/management
- reconnaissance - environmental and operational
- resource evaluation/management
- action plan review
- safety briefing
- collapse zoning

3.0 Procedure – Cont'd….

On Arrival or Assignment

- Report to Incident Commander, don identification vest
- Obtain briefing from I.C.
- READ ENTIRE CHECKLIST
- Prioritize Safety Officer Duties:
  - Risk review/management
  - Reconnaissance
  - Resource Evaluation
  - Reporting/Planning
  - Determine need for additional Safety Officers

Risk Review/Management

- Define risk level for Action Plan
  - life at risk
  - property at risk
  - mitigation only
- Determine frequency and severity values
- Prioritize hazard control recommendations
- Address unacceptable risk situations
  - stop or alter if life threatening
  - immediately inform I.C.

Reconnaissance - Environmental

- Perform 360 degree scene survey
- define principle hazard(s) and location
- Evaluate integrity of environment
  - stable - not likely to change
  - stable - may change
  - starting to change
  - rapidly changing

- Classify structures involved
  - construction type
  - materials used
  - loads imposed

- Evaluate collapse potential
  - structural degradation
  - excessive loads
  - scope of collapse
  - stability profile after collapse

3.0 Procedure – Cont'd….

- Define scope of utility involvement
- Evaluate effects of weather on incident
- Identify access/egress routes and deficiencies
- Define traffic hazards

Reconnaissance - Operational

- Observe tactical assignments, tactical effectiveness, team effectiveness, tool application/effectiveness and action plan compatibility
- Check exposure of teams, correct PPE, aware of hazard, appropriate risk level and escape routes
- Determine injury potential
- Evaluate apparatus placement/exposure
- Monitor radio communications
- Ensure adherence to 2 bottle rule
- Check scene attendance - too few/too many, plans for additional
- Determine rapid intervention status
- Determine number of crews at risk
- Check effectiveness of accountability system
- Start time-pacing incident, anticipate total on-scene time
- Evaluate rehab process.

Report/Planning

- Communicate concerns to I.C.
- Develop contingencies
- Attend planning meetings
- Review action plan revisions/updates
- Prepare hazard awareness and safety briefs for arriving crews

After the Incident

- Prepare a report of still-existing hazards
- Document Safety Officer action
- If required participate in:
- Accident Investigation
- Post-incident evaluation
- Health and Safety Committee

3.0 Procedure – Cont'd….

Note: A word of caution:

The Incident Safety Officer must guard against becoming dependent on a checklist and forget to use common sense and experience to look at the big picture. He should not become so captivated into completing the checklist and have the building falling down or other safety problems existing without being recognized or addressed.

WFES-221 Safety Officer Check List

☐ Report to Incident Command, don identification vest
☐ Obtain situation briefing from I.C. including Action Plan and known hazards or concerns
☐ READ ENTIRE CHECKLIST
☐ Assess situation
☐ Risk Review
☐ Reconnaissance
☐ Resource Evaluation
☐ Reporting/Planning
☐ Determine need for additional I.S.O.s,
☐ Identify existing and potential hazardous situations
☐ Keep personnel informed of existing and impending hazards
☐ Exercise emergency authority to stop and prevent unsafe actions
☐ Investigate accidents occurring in the area
☐ Continually survey the scene for dangerous situations

RIT Team in Place, Prepared and Equipped

	Personnel - ppe		**Risk review**
☐	Helmets	☐	Define risk level for action plan
☐	nomex hoods	☐	Determine frequency and severity values
☐	bunker gear worn correctly	☐	Prioritize hazard control recommendations
☐	gloves	☐	Address unacceptable risk situations
☐	eye protection		
☐	scba		**Reconnaissance – environmental**
☐	pass device activated	☐	Perform 360 degree scene survey
		☐	Define principle hazard and location
☐	f.f. in pairs for entry	☐	Evaluate collapse potential
☐	no one alone in building	☐	Classify structure(s) involved
☐	monitor for freelancing	☐	Evaluate collapse potential
		☐	Define scope of utility involvement
	Roof ventilation	☐	Evaluate effects of weather
☐	Ladder at correct angle & butted	☐	Identify access/egress routes
☐	Roof ladder if needed	☐	Access traffic hazards
☐	Personnel have proper p.p.e.		
☐	Scba being used		**Reconnaissance – operational**
☐	Charged line	☐	Observe tactical assignments
☐	Second egress	☐	Check exposure of teams
		☐	Determine injury potential
	Primary assessment	☐	Monitor radio communications
☐	Gas shut off time:		
☐	Hydro shut off time:		**Resources**
☐	Overhead wires	☐	Check scene attendance
☐	Check exposures	☐	Monitor accountability
		☐	Evaluate rehab process (2 bottle rule)
	Check fall hazards		
☐	Ice		**Report/planning**
☐	Hose	☐	Communicate concerns to i.c.
☐	Wires	☐	Develop contingencies
☐	Structural	☐	Attend planning meetings
☐	holes	☐	Review action plan, revision/updates

Appendix K – PFSG 04-05-12 – Mutual Aid

http://www.mcscs.jus.gov.on.ca/english/firemarshal/fireserviceresources/publicfiresafetyguidelines/04-05-12.html

Appendix L - NFPA Education Standards Transition

With the Ontario Fire College move to NFPA standards, WFES will have to create the curriculum and design the courses for the following OFM courses.

NFPA 1021 -Fire Officer 1

NFPA 1021 - Fire Officer 2

NFPA 1041- Fire Instructor 1

Whitby Fire Suppression staff will be required to take these courses as per a Collective Agreement MOU.

In order to get the required staff through the courses in a timely manner, the WFES Training Division will have to develop and deliver the courses listed above. Below is a breakdown of the approximate time needed for course development and course delivery.

NFPA Fire Officer 1 (**Development of course**) - This course is a very comprehensive course dealing with a wide variety of learning outcomes. Each student must complete 15 skills sheets outlined in the course description. The Ontario Fire College currently teaches this course over a 10 day period (2 weeks). Once the student leaves the college they will be given 2 weeks to complete the skill sheets required.

Development of the course will take between 3-4 months for the Training Division to put together, as the division has limited time due to crew training needs and various other tasks the division is responsible for. It is difficult to estimate the total hours for course development as we can only work on it in our spare time. I would guestimate the hours at around 40-50, please keep in mind this is only a guestimate.

Once the course curriculum is completed it must be submitted to the Ontario Fire College for approval. It is unknown how long it will take them to review and approve. If they require any changes or adjustments, it will add more time to the development time frame. The whole process will take approximately 6-7 months for development and approval to take place.

NFPA 1021 Fire Officer 1 (**Delivery of course**)- The OFC schedules 10 days to deliver this course. The WFES Training Division will need the same, 10 days (80 hrs) for delivery of this course. On top of this delivery time the Instructor would need prep time for each day, as well we will need time after the course is completed for the skill sheets the students are required to finish 2 weeks after the course is completed. The total hours needed for this program to be properly delivered is- Approximately 100 hrs for 2 Instructors. This would total 200 hours altogether for the course to be delivered.

TOTAL HOURS FOR Fire Officer 1 (Development and Delivery) - Approx. - 250 hours of work

NFPA 1021 Fire Officer 2 (**Development of course**) - This course is a very comprehensive course dealing with a wide variety of learning outcomes. Each student must complete 11 Practical skills sheets outlined in the course description. The Ontario Fire College currently teaches this course over a 10 day period (2 weeks). Once the student leaves the college they will be given 2 weeks to complete the skill sheets required.

Development of the course will take between 3-4 months for the Training Division to put together, as the division has limited time due to crew training needs and various other tasks the division is responsible for.

Once the course curriculum is completed it must be submitted to the Ontario Fire College for approval. If they require any changes or adjustments, it will add more time to the development time frame. The whole process will take approximately 6-7 months for development and approval to take place.

NFPA 1021 Fire Officer 2 (**Delivery of course**)- The OFC schedules 10 days to deliver this course. The WFES Training Division will need the same 10 days (80 hrs) for delivery of this course. On top of this delivery time the Instructor would need prep time for each day, as well we will need time after the course is completed for the skill sheets the students are required to finish 2 weeks after the course is completed. The total hours needed for this program to be properly delivered is approximately 100 hrs for 2 Instructors. This would total 200 hours altogether for the course to be delivered.

TOTAL HOURS FOR NFPA 1021 Fire Officer 2 (Development and Delivery) - Approx. - 250 hours of work

NFPA 1041 Fire Instructor 1 (**Development of course**) - This course is a very comprehensive course dealing with a wide variety of learning outcomes. Each student must complete 3 skills sheets outlined in the course description. The Ontario Fire College currently teaches this course over a 5 day period (1 week).

Development of the course will take between 2-3 months for the Training Division to put together, as the division has limited time due to crew training needs and various other tasks the division is responsible for. It is difficult to estimate the total hours for course development as we can only work on it in our spare time.

Once the course curriculum is completed it must be submitted to the Ontario Fire College for approval. If they require any changes or adjustments, it will add more time to the development time frame. The whole process will take approximately 3-4 months for development and approval to take place.

NFPA 1041 Fire Instructor 1 (**Delivery of course**) - The OFC schedules 5 days to deliver this course. The WFES Training Division will need 4 days (32 hrs) for delivery of this course. On top of this delivery time the Instructor would need prep time for each day, as well we will need time after the course is completed for the skill sheets the students are required to finish 2 weeks after the course is completed. The total hours

needed for this program to be properly delivered is- Approximately 40 hrs for 2 Instructors. This would total 80 hours altogether for the course to be delivered.

TOTAL HOURS FOR NFPA 1041 Fire Instructor 1 (Development and Delivery) - Approx. - 104 hours of work

Appendix M - Review of NFPA Technical Rescue Standards compared to WFES Service Levels

Establish “scene” safety zones so that action hot, warm and cold safety zones are designated, zone perimeters are consistent with incident requirements, perimeter markings can be recognized and understood by others

WFES meets the standard for Surface Water Rescue Level 1 and 2 and Ice Rescue Level 1

To meet the requirement for Vehicle Rescue Level 2 WFES would require theory and practical training on heavy commercial vehicles.

Ice Rescue Level 2 requires SCUBA certification

WFES does not meet the training requirements for Rope Rescue, Confined Space Rescue, Trench Rescue, Structural Collapse, Swift Water Rescue and Machinery Rescue.

Dive Rescue would be a Durham Regional Police Services response. Surf Rescue, Wilderness Rescue, Mine/Tunnel Rescue and Cave Rescue do not apply to Whitby.

NFPA 1021 Standard for Fire Officer Professional Qualifications.

There are four levels to this standard, Fire Officer 1, 2, 3 and 4.

Level1: Currently WFES Officers meet the Level 1 standard with the exception of budget preparation.

Level 2: This level addresses a number of areas that WFES Officers currently are not involved with such as: developing a news release, developing divisional budgets, and fire cause and determination.

Level 3 and 4 : These levels require more depth of responsibilities that are currently management responsibilities within the Town of Whitby such as: developing a plan for providing employee accommodation, appraising the department’s human resource demographics given appropriate community demographic data so that the recruitment, selection and placement of human resources is effective and consistent with law and current best practices.

NFPA 1026 Standard for Incident Management Personnel Professional Qualifications

This standard has been divided into 31 different positions within the Incident Management System.

WFES officers currently meet the Incident Commander standard.

WFES personnel have been trained in Incident Safety Officer for fire responses.

Incident Safety Officer for specialized rescue would be a requirement of the shift trainers, trained to the Technician Level in Hazmat Response or Vehicle Extrication.

WFES personnel are well trained and efficient at operating within the Incident Management System for fire responses for small to average size incidents. This standard is designed for very large scale incidents and includes positions WFES would never utilize (Air operations, support and tactical groups). An assessment would be required to determine how in depth the department should train to achieve the standard, given the number of times we would respond to incidents large enough to involve the number of positions within this standard.

NFPA 1041 Standard for Fire Service Instructor Professional Qualifications

This standard is divided in to two levels Instructor 1 and Instructor 2.

Instructor I: WFES Officers are trained to a Level 1 instructor

Instructor II: Currently, WFES Training Officer is qualified as a Level 2 instructor and the Chief Training Officer although not currently qualified would meet the qualifications

1041 - WFES currently utilize firefighters on shift as shift instructor for auto extrication and hazardous material response training. WFES needs to ensure these shift trainers are properly trained and their certifications in these disciplines remain current.

NFPA 1521 Standard for Fire Department Safety Officer Professional Qualifications

This standard is divided into two disciplines, Health and Safety Officer and Incident Safety Officer.

Health and Safety Officer

Section 3.3.47.1 –notes that each department needs to identify the individual assigned as the manager of health and safety program and is authorized by the fire chief.

Section 4.8.5(B) states the health and safety officer has the ability to identify safety-related features on fire and emergency vehicles and verify whether they are in compliance with NFPA Standards (NFPA 1901 and 1911)

Section 4.10.1-Health and Maintenance- The health and safety officer –analyze the fire dept. health maintenance program and the medical and physical requirements of Chapter 10 NFPA 1500, so that the program includes medical, physical performance and health and fitness requirements, as well as a health database, infection control procedures a fire department physician, and fitness for duty evaluations and recommendations are made to correct any noted deficiencies

WFES personnel have all received Incident Safety Officer training and the current SOG states any first class firefighter with Acting Captain privileges can assume the role of Incident Safety Officer.

The standard states that the fire department Incident Safety Officer (ISO) shall meet the requirements of Fire Officer Level 1 specified in NFPA 1021.

A comprehensive knowledge of heat and cold assessment criteria, rehabilitation strategies, including NFPA 1584, Standard on the Rehabilitation Process for members during Emergency Operations and Training Exercises. The ISO shall determine the need for a Rescue Technician-trained ISO or ISO assistant given a Technical Rescue. The ISO shall prepare a safety plan that identifies corrective or preventive actions given a technical rescue. The ISO shall prepare a written post incident analysis (PIA) from the ISO perspective.

NFPA 1002 Standard for Fire Apparatus Driver/Operator Professional Qualifications

Section 4.2.1 states all driver/operators perform routine tests, inspections on the systems and components specified in the following list if they are given a fire department vehicle and its manufacturer's specs.

Batteries, braking systems, coolant systems, electrical system, fuel, hydraulic fluids, oil, tires, steering system, belts, tools appliances and equipment. WFES driver/operators currently do routine checks with varying degrees of expertise and ability.

NFPA 1002 Chapter 5-Apparatus Equipped with a Fire Pump

Section 5.1 –The requirements of Firefighter 1 as specified in NFPA 1001 and the job performance requirements defined in Sections 5.1 and 5.2 shall be met prior to qualifying as a fire department driver/operator.

NFPA 1002 Chapter 6-Apparatus Equipped with an Aerial Device

Section 6.1-The requirements of Firefighter 1 as specified in NFPA 1001 and the job performance requirements defined in Sections 6.1 and 6.2 shall be met prior to qualifying as a fire dept. driver/operator-aerial

NFPA 472 and 1001.

NFPA 472, with deals with Competence of Responders to Hazardous Materials/ Weapons of Mass Destruction Incidents. WFES does not meet competence levels in the area of the Weapons of Mass Destruction (WMD). WFES personnel are trained to an enhanced Operations Level for Hazardous Materials Response. WFES has eight (8) Hazardous Materials Technicians who serve as Shift Instructors for the department, assisting the Training Division in the delivery of Hazardous Materials training and assist the Incident Commander at Hazardous Materials incidents.

NFPA 1001 which deals with the Standard for Firefighters Professional Qualifications was also reviewed and found that WFES meets both Level 1 and Level 2 of the Professional Standards.

Appendix N – Durham College Letter

DURHAM COLLEGE
SUCCESS MATTERS

November 20, 2015

Chief Dave Speed
Whitby Fire and Emergency Services
111 McKinney Drive
Whitby, ON L1R 3M2

Dear Chief Speed,

I am writing to you today to confirm support from Durham College as you develop your plans for a new training facility. I am pleased to provide this letter as Whitby Fire and Emergency Services has been a great supporter of Durham College, and in particular our Pre-Service Fire Education and Training Program and its students. This partnership and support are also a big reason why Pre-service Fire Education and Training is one of our most in-demand programs and why we are often told how well prepared our students are post-graduation as they begin to pursue professional postings.

We were pleased to learn of your plans for the new training facility, as they build naturally on the conversations our faculty and college leadership have had with your leadership team about finding new opportunities to collaborate and share resources. In addition, our students currently travel to obtain some of the training for their program so having a new facility closer to our campus and available for their use would be a much better option for our students and cut down on travel and other costs that come with accessing state-of-the-art training and equipment.

I realize there are many details still to be discussed as you develop your plans, however I'm looking forward to having our School of Justice and Emergency Services work with you to see how we can partner with you in this important project. Good luck with your planning.

Sincerely,

Don Lovisa
President

Oshawa Campus
2000 Simcoe Street North
Oshawa, Ontario, Canada L1H 7K4
T: 905.721.2000
www.durhamcollege.ca

Appendix O – By-Law 6632-12

THE CORPORATION OF THE TOWN OF WHITBY

BY-LAW NO. 6632-12

BEING A BY-LAW TO IMPOSE FEES FOR CERTAIN SERVICES AND ACTIVITIES PROVIDED BY, OR DONE BY, WHITBY FIRE AND EMERGENCY SERVICES

WHEREAS, Subsection 391 (1) of the Municipal Act, R.S.O. 2001 provides that a municipality may pass by-laws imposing fees or charges on any class of persons for services or activities provided or done by or on behalf of it;

AND WHEREAS, the Council of the Corporation of the Town of Whitby enacted By-law No. 6387-10 to impose fees for certain service and activities provided by Whitby Fire and Emergency Services;

AND WHEREAS, the Council of the Corporation of the Town of Whitby considers it desirable to amend the fees to By-law No. 6387-10;

NOW THEREFORE, the Council of the Corporation of the Town of Whitby enacts as follows:

REPLACEMENT OF FEES SCHEDULE

That Schedule A of By-law No. 6387-10 be deleted in its entirety and be replaced with Schedule A of this By-law.

EFFECTIVE DATE

This by-law come into force and take effect on the date of the final passing of the by-law

BY-LAW READ A FIRST, SECOND AND THIRD TIME AND FINALLY PASSED THE 25th DAY OF JUNE, 2012

_____ _____

Debi A. Wilcox, Town Clerk Patricia Perkins, Mayor

WHITBY FIRE & EMERGENCY SERVICES - SERVICE FEE SCHEDULE

Schedule "A" TO BY-LAW 6632-12

(Fees prescribed in this schedule are subject to the Harmonized Services Tax (HST) @ 13%, unless noted (*) as exempt)

SERVICE	Fees (Excluding Applicable Taxes)
Inquiry Fees	
Copy of Emergency Response Report	$75.00
File Searches	$75.00
Commercial Multi Unit Buildings (Up to 3 Units)	$75.00/Unit
Commercial Multi Unit Buildings (More than 4 Units)	$225.00 + $20.00/Unit
Specific Inspection Fees	
Boarding/lodging/Rooming house	$75.00/hour
Educational Institutions	$75.00/hour
Foster Care	$75.00/hour
Group Home	$75.00/hour
Institutional	$75.00/hour
Licensed Day Care Centre	$75.00/hour
Private Home Day Care	$75.00/hour
Liquor Licensing Requests	$75.00/hour
Residential Occupancies	$75.00/hour
Open Air Burning Request	$75.00
Two Unit Residential Retrofit	$75.00/hour
Fire Safety Plan Development/ Approval	$75.00/hour
Miscellaneous Inspections Not Otherwise Specified	$75.00/hour
Fire Safety Presentations	N/C
Fire Extinguisher Training	$10.00/person at HQ
	$15.00/person on site
Discharging Fire Works - Consumer grade (family)	N/C
Discharging Fire Works - Display grade	$200.00
Discharging Fire Works - Pyrotechnics	$200.00
Requests by Residential Home Owner	N/C
Fire Access Route Applications	N/C
Inspections Initiated by Whitby Fire & Emergency Services	N/C
Emergency Services	
Standby Requests (by private companies, developers, industry, provincial or regional government, other than Emergency Response)	
~ Per Vehicle for every ½ hour or part thereafter	$205.00
Emergency Response to Motor Vehicle Accidents on Ministry of Transportation Highways as per the Province of Ontario's Rates (Cost recovery through MTO)	
~ Per Vehicle for first hour or part thereof	
~ Per Vehicle for every ½ hour or part thereafter	$410.00*
*Plus any additional clean-up costs**	$205.00*
Emergency Response to transportation of dangerous goods incidents (cost recovery *as per Transportation of Dangerous Goods Act.)*	Actual Costs
~ Per Vehicle for every ½ hour or part thereafter	$205.00
Emergency Response to a Hazardous Material Spill	
~ Per Vehicle for every ½ hour or part thereafter	$205.00
Plus any additional clean-up costs	
Emergency Response to a Natural Gas Leak caused by a ruptured gas line.	
~ Per Vehicle for every ½ hour or part thereafter	$205.00
Plus any additional clean-up costs	
Additional Expenses - to retain a private contractor or rent equipment not	Actual Costs

SERVICE	Fees (Excluding Applicable Taxes)
carried on fire apparatus in order to suppress a fire, preserve property, prevent fire spread, remove materials creating a hazard, secure property for investigation, determine fire cause, conduct a fire watch, or otherwise eliminate an emergency or hazard.	
Preventable Fires or Preventable Alarms	
More than one (1) emergency response to unapproved open air burning	$205.00
~ Per Vehicle for every1/2 hour or part thereof	
Fires on or beside rail lines, caused by rail equipment, and failure to attempt to extinguish those fires that impinge on private or public properties	
~ Per Vehicle for every ½ hour or part thereafter	$205.00
More than two (2) preventable (malicious or false) alarms in a 12 month period	
~ Per Vehicle for every 1/2 hour or part thereafter	$205.00

Appendix P – Fire Response Stats

Rescues

Rescue Type	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Elevator	17	23	27	17	18	20	19	9	17	10
Ice/Water	3	0	1	3	0	4	2	6	1	4
Entrapment	0	2	2	2	4	3	2	1	1	0
Lockout	3	5	9	5	2	9	7	5	4	7
Structural Collapse	0	0	0	0	0	1	1	0	0	0
Rope	1	0	0	1	1	0	0	0	2	1
Total	**24**	**30**	**39**	**28**	**25**	**37**	**31**	**21**	**25**	**22**

Alarms

Alarm Type	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Commercial/Industrial	**222**	**169**	**184**	**196**	**189**	**172**	**177**	**151**	**155**	**135**

Alarm Type	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
School/Church	56	67	62	49	62	53	67	50	41	45
Nursing Home/Hospital	32	39	27	38	26	27	31	29	37	34
Institutional Alarm Total	**88**	**106**	**89**	**87**	**88**	**80**	**98**	**79**	**78**	**79**

Alarm Type	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
House	146	169	162	197	141	131	152	119	135	129
High-rise	43	27	57	37	44	36	38	32	31	26
Apartment/Townhouse	47	39	42	53	42	38	28	31	22	30
Residential Alarm Total	**236**	**235**	**261**	**287**	**227**	**205**	**218**	**182**	**188**	**185**

Fires

Fire Type	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
House	123	111	121	119	103	119	105	83	78	78
Highrise	3	6	8	10	9	4	11	3	10	4
Apartment/Townhouse	17	18	15	16	14	16	10	13	14	12
Other	48	30	30	25	25	18	19	22	25	16
Institutional	8	5	4	7	7	14	2	5	7	6
Industrial	4	4	4	4	7	4	4	3	4	5
Commercial	33	36	39	35	29	33	20	27	14	27
Marine/Harbour	0	1	0	0	3	1	0	0	0	0
Vehicle	61	47	52	40	26	37	38	38	43	55
Illegal Burn	24	53	69	70	74	68	72	61	68	93
Grass/Tree/Bush	136	74	89	45	43	52	41	43	34	33
Garbage Bin	21	19	16	9	16	13	12	12	6	7
Electrical /Transformer	8	6	9	9	4	0	11	9	34	13
Total	**486**	**410**	**456**	**389**	**360**	**379**	**345**	**319**	**337**	**349**

Medical

Incident Type	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Emergencies	2303	2430	2545	2657	2708	2727	3033	3114	2982	3087
Assist	36	40	84	53	54	41	39	30	34	35
Institutional Alarm Total	**2339**	**2470**	**2629**	**2710**	**2762**	**2768**	**3072**	**3144**	**3016**	**3122**

Public hazards

Hazard Type	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Wires Down	16	21	26	13	36	14	14	19	52	17
Trees Down	0	5	3	0	5	1	1	2	2	0
Flooding	22	15	8	50	13	12	13	12	17	19
Gas	52	50	64	43	43	56	59	55	62	63
Hazmat Spill	35	34	25	25	22	24	17	10	16	17
Carbon Monoxide	429	442	521	464	485	423	395	284	257	255
Check Call	125	109	118	122	99	101	136	130	129	123
Bomb Threat	1	2	1	0	0	1	1	1	1	0
Total	**680**	**678**	**766**	**717**	**703**	**632**	**636**	**513**	**536**	**494**

Appendix Q – NIST Report – High-Rise Fireground Field Experiments

http://nvlpubs.nist.gov/nistpubs/TechnicalNotes/NIST.TN.1797.pdf