KPMG

Review of Edmonton Fire Rescue Services

FINAL REPORT

CITY OF EDMONTON
REIMAGINE SERVICES

FEBRUARY 2021

Let's do this.

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Executive Summary

The City of Edmonton (the City) initiated a review of Edmonton Fire Rescue Services (EFRS) as a part of its ongoing efforts to have City services that are relevant, effective, and efficient. The first phase of this review was completed in 2019 by The City, and identified two primary focus areas for further analysis and improvement:

- Overall business model of EFRS Operations, and
- Level and degree of pre-hospital (medical) care provided by Fire Rescue Services.

KPMG was engaged to assist the City with analysis of these two focus areas and make recommendations for improvement. The review was conducted according to a Service Review Framework developed in conjunction with the City and approved at the outset of the project. The project, which began as a part of the City's Program and Service Review process, involved significant engagement and analysis in late 2019 and early 2020, before experiencing a delay related to the City's response to the COVID-19 pandemic. The project was resumed at the end of 2020 and has been completed under the City's *Reimagine Services* review process.

The review of EFRS operations and pre-hospital medical care identified a number of potential opportunities for improvement. Working closely with the City, these opportunities were prioritized, and the highest-priority areas were further analyzed in order to generate and assess future state options. In particular, analysis was focused on:

- Deployment of EFRS personnel and vehicles;
- Approach to pre-hospital medical care;
- Levels of staffing; and
- Service levels.

RECOMMENDATIONS

A total of eight recommendations for improvement were identified, as summarized below. These can be understood or implemented individually, but the Review also recognizes that there are interconnections across the suite of recommendations.

RECOMMENDATION 1

Reduce the scope of medical calls that EFRS responds to

EFRS should review the medical event types that are being responded to, and work closely with Alberta Health Services to focus on event types where the presence of EFRS has the greatest potential for lifesaving interventions.

In particular, EFRS should reduce or eliminate response to non-urgent medical calls (coded Alpha and Beta). In addition, a process to review event types can identify locations and call types (among those coded Charlie or Delta level of urgency) where response may not be necessary – for example, EFRS may not choose to deploy to medical calls at seniors' supportive living sites that have AED equipment and trained nursing personnel on site. Further detail on Recommendation 1 can be found beginning on page 31.

RECOMMENDATION 2

Implement specialized Medical Response Units to replace pumper crews at select stations

EFRS should replace pumper trucks (and their four-person crews) with two-person Medical Response Units at Station #1 (Headquarters) and Station #5 (Norwood).

Medical Response Units would consist of a Sport Utility Vehicle or similar vehicle, staffed by two firefighters and equipped with medical supplies necessary to support the current First Medical Responder level of pre-hospital medical care. Further detail on Recommendation 2 can be found beginning on page 33.

RECOMMENDATION 3

Reduce the crew size for ladder units from four to two firefighters

Each ladder (or aerial) vehicle is currently operated by EFRS with a minimum of four firefighters, which could be reduced to two firefighters at each. There are currently nine aerial units deployed at all times across the city. Further detail on Recommendation 3 can be found beginning on page 36.

RECOMMENDATION 4

Adjust staffing levels overnight to reflect the lower volume of calls

This would see a reduction in staffing at four specific EFRS stations that see a large drop in calls during the overnight period from midnight to 6:00 AM.

At these four stations, EFRS currently staffs both a four-person pumper unit and a four-person rescue unit on a 14-hour overnight shift from 6:00 PM to 8:00 AM.

The change would reduce this staffing to one crew that could respond in either unit during the latter portion of the overnight shift – which assumes that the crew is trained for both rescue and pumper deployment. A specific shift schedule is not proposed, as there are a number of factors to consider in implementation. Further detail on Recommendation 4 can be found beginning on page 39.

RECOMMENDATION 5

Reduce the EFRS staffing maintenance factor from 1.25 to 1.22

Staffing levels for EFRS include a “staffing maintenance factor”. A maintenance factor is a staffing modifier ensuring more firefighters are employed than the number required to operate all shifts; this enables backfill to occur due to non-operational demands on firefighter time as well as different kinds of absences. Further detail on Recommendation 5 can be found beginning on page 43.

RECOMMENDATION 6

Establish criteria to guide decisions about capital investments in new stations and heavy vehicles

The City should develop criteria that help to determine when investment of capital in a new station is required, and also criteria for investment in new heavy fleet, so that decisions can become more consistent beyond individual business cases. Further detail on Recommendation 6 can be found beginning on page 47.

RECOMMENDATION 7

Strengthen measurement of performance and outcomes for EFRS

EFRS should strengthen its performance measurement and in particular, the City should partner with Alberta Health Services to be able to assess the effectiveness and value of pre-hospital medical care. Further detail on Recommendation 7 can be found beginning on page 51.

RECOMMENDATION 8

Maintain the current scope of practice for pre-hospital medical care

The current “First Medical Responder” scope of practice for EFRS should be maintained. Further detail on Recommendation 8 can be found beginning on page 54.

ASSESSMENT OF RISK

EFRS provides emergency services, and any change to an emergency service entails risk. Analysis included indications of the scope and probability of risks to be considered for each recommendation. The table below summarizes the risk profile of the suite of recommended changes, with more detail available in the body of the report.[1]

[1] Analysis of risk throughout the Report considers both probability and magnitude of potential increases to risk. For the purposes of this summary table these are combined into a single assessment.

Table 1: Summary of Risk Assessment for Recommended Changes

Risk Type	Assessment	Highlights
Mortality Risk	Very Low Risk	➢ Available research and evidence suggests little to no impact on mortality. ➢ Service changes impacting the speed of response could slightly increase mortality risk for a small subset of EFRS calls, but the magnitude of change in survival rates is likely to be very small.
Risk to Property	Very Low Risk	➢ Small, incremental increases to property damage could be observed if response times increase for fire suppression events. ➢ Insurance ratings are unlikely to be impacted, and any impact could be mitigated before a potential downgrade.
Risk to Service Quality	Low Risk	➢ No current stations or units would be deactivated, and no changes would be made to service targets or types of service available. ➢ Recommended changes to deployment could potentially result in small increases to response times as a result of more or units being required to respond to large or complex events. A very small minority of service calls could be impacted.
Financial Risk	Very Low Risk	➢ The recommendations are projected to provide significant savings (over $10 million per year in salary costs) as well as increasing the long-term sustainability of the service. ➢ Shifts in staffing could potentially impact overtime costs, at a much smaller magnitude than projected savings. ➢ The cost of new investments (in new light fleet for Medical Response Units) are recovered very quickly, within a month.
Public/ Political Risk	Low Risk	➢ Any change to an emergency service could impact public perception of safety. ➢ EFRS would not respond to certain non-urgent medical calls. This could mean that some Edmontonians have to wait longer for EMS service.

MOVING FORWARD

In order to position the City for success in making recommended changes, implementation strategies and advice are provided, including the following:

- Each recommendation (except maintaining current scope of pre-hospital care) requires planning and resources to complete.
- Changes to the operating model represent a good opportunity to update the Fire Rescue Master Plan and related City Policy (C523A).
- Staffing levels can be adjusted over time through different means, including deferring recruitment, attrition through retirements, and reassignment, among other options available.
- Carefully plan and assess impact on fire rescue operations and fire ground activities.
- Actively monitor and evaluate changes.
- Collective bargaining between the City and the Edmonton Fire Fighters' Union is an important backdrop for changes proposed to shifts, crew sizes, or unit types.

Overall, the purpose of this Review has been to strengthen the relevance, effectiveness and efficiency of the service, with a focus on its operations and pre-hospital medical care. Recommended changes to EFRS operations are designed to streamline the service, while strengthening the City's capacity for measurement, informed resource decisions, and accountability. In addition, concrete changes to pre-hospital medical care are designed to help manage the volume and growth of medical calls so that the service can be more sustainable. **The recommended changes are projected to result in an estimated $10.43 million in annual salary cost savings**, while increasing the long-term sustainability of the service.

Introduction

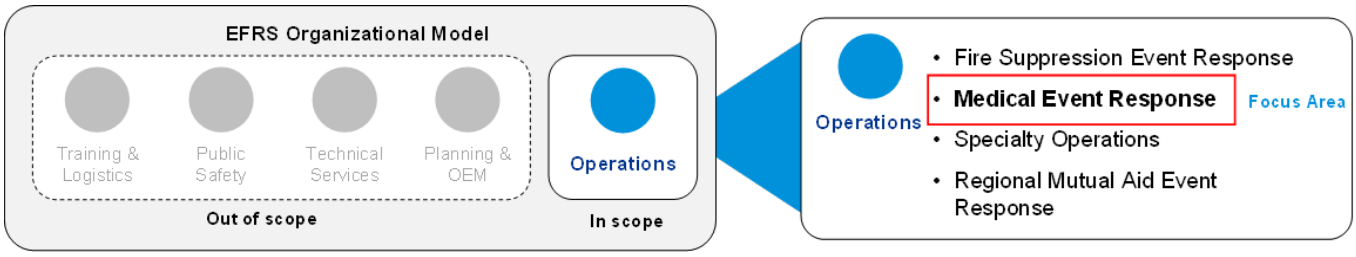
The City of Edmonton (City) initiated a review of Edmonton Fire Rescue Services (EFRS) as a part of its efforts to have City services that are relevant, effective, and efficient. The first phase of this review was completed in 2019, and identified two primary focus areas for further analysis and improvement:

- Overall business model of EFRS Operations, and
- Level and degree of pre-hospital (medical) care provided by Fire Rescue Services.

KPMG was engaged to assist the City with analysis of these two focus areas and make recommendations for improvement. The project, which began as a part of the City's Program and Service Review process, involved significant engagement and analysis in late 2019 and early 2020, before experiencing a delay related to the City's response to the COVID-19 pandemic. The project was resumed at the end of 2020 and has been completed under the City's *Reimagine Services* review process.

AREAS OF FOCUS

This Report outlines recommendations for improvement that address relevance, effectiveness, and efficiency within the two areas of focus for the review.



EFRS OPERATIONS

EFRS operates as a branch of the City's Citizen Services department. The branch is divided into five functional areas: Operations, Training and Logistics, Public Safety, Technical Services, and Planning and Office of Emergency Management. Only Operations and direct supports for EFRS operations fall within the scope of this review.

Within Operations, the primary service functions are as follows:

- **Fire Suppression Event Response** – Front-line firefighter response to fire events such as structure fires, non-structure fires, industrial fires, vehicle fires, and wildland interface fires.
- **Medical Event Response** – Emergency response to life-threatening medical events in a Medical First Responder role. This function is described further on the next page.
- **Specialty Operations** – Response to emergency events requiring specialized skills and equipment such as:
  - **Hazardous Materials Event Response** – Response to emergencies involving high hazard rail, industrial and commercial events, as well as response to chemical, biological, radiological, nuclear and explosives events.

- **Rescue Event Response** – Technical rescue response to emergencies requiring water and ice rescue, confined space rescue, rope rescue, trench and excavation rescue, or vehicle and machinery rescue.

- **Regional Mutual Aid Event Response** – Supporting emergency events within the jurisdictions of surrounding municipalities as requested, according to Mutual Aid Agreement(s).

PRE-HOSPITAL MEDICAL CARE

Within EFRS operations, one of the services provided by the City is pre-hospital medical care. Province-wide, Alberta Health Services has responsibility for delivering emergency health services (EHS), including ambulance services (EMS), on behalf of Alberta Health. The City along with a number of other municipalities in Alberta chooses to support Alberta Health Services in this work by providing Medical First Response service via EFRS. This means that EFRS units may provide basic care and comfort to patients until the arrival of EMS or when requested by Alberta Health Services.

Edmonton's Medical First Responder service operates within Alberta's province-wide Medical First Responder Framework and must meet the standards of care set out in Medical Control Protocols. The level of Medical First Responder care in a community is determined by the level of training of the Medical First Responder providers, and general program standards. There are five levels of pre-hospital care as defined by Alberta Health Services, listed from least to most intensive:[2]

1. Standard First Aid (least intensive)
2. First Medical Responder
3. Emergency Medical Responder
4. Primary Care Paramedic
5. Advanced Care Paramedic (most intensive).

Edmonton's current scope of practice allows them to provide the First Medical Responder level of service[3] (also known as "Advanced First Aid") and related services in response to high-risk medical events. These services include "technical rescue" and assistance with vehicle accidents.

SCOPE OF REVIEW

SERVICE REVIEW FRAMEWORK

The review of EFRS operations and pre-hospital medical care was conducted according to a Service Review Framework developed in conjunction with the City and approved at the outset of the project. This Framework is summarized in the table below (the detailed Framework is included in Appendix A).

[2] Alberta Health Services. *MFR Level of Service Comparison Chart*. Retrieved from Alberta Medical First Response web site. Accessed December 2019.
[3] EFRS documents show that Edmonton's service includes several other services approved by Alberta Health Services that increase the scope of First Medical Responder level of care, such as service to address nasopharyngeal airway, triage, tourniquet, hemostatic agent, chest seal, traction splint, temperature / blood-glucose level, EpiPen, and glucose / dextrose.

Table 2: Service Review Framework

Lines of Inquiry	Sub-Questions
What is the existing business model of EFRS Operations?	— What programs and services does EFRS Operations deliver and how does it deliver them? — What are the dependencies on other departments or partners? — What key measures are used by EFRS Operations? — What are the economics of EFRS Operations? — What technology supports EFRS Operations? — What is the organization and governance model for EFRS Operations?
How is the service performing today?	— How does the current level of service measure against / align with existing targets, City Policy, the Fire Rescue Master Plan, and existing business model? — What are the current strengths and challenges in achieving the desired level of service performance? — How does the level of service compare with other jurisdictions?
What changes, if any, to the service's current business model, including event response and deployment, are required to improve the level of service efficiency / effectiveness / relevance?	— How does the current business model compare to other municipalities or leading practice? — What changes are required to increase efficiency and effectiveness? — What are the financial implications to both the City and citizens or business based on any changes to the operating model?
What is the appropriateness of the level and degree of pre-hospital (medical) care provided by the service?	— What is the current scope of practice for pre-hospital medical care by Firefighters? — What are the current metrics for medical events? — What is the appropriateness given the legislation and mandate of existing partners? — What are the costs/benefits for increased/decreased pre-hospital care by Firefighters?

Source: Prepared by KPMG

OUT OF SCOPE

EFRS operations and pre-hospital medical care are complex emergency service areas with many potential lines of inquiry. Several areas were outside the scope of this review:

- Collective bargaining issues were excluded, such as compensation levels, promotion and advancement, and job descriptions for EFRS staff.
- EFRS training has been reviewed separately by the City. The content and suitability of training for EFRS staff was not reviewed, though the amount of staff time / resources dedicated to training was deemed to be in scope.
- Firefighting practice and fire ground activities were out of scope, meaning that how firefighters operate once on scene was not reviewed.
- A review of how EFRS classifies different types of emergency events was out of scope, along with how this determines which vehicles and personnel should be dispatched.

REVIEW PROCESS

The review of EFRS operations and pre-hospital medical care was conducted in alignment with the City's principles and approach for a Program and Service Review.

Relevant documentation provided by the City was reviewed, along with relevant legislation, policy, reports, and information from earlier work completed by the City.

KPMG reviewed industry benchmarks and standards, including resources from the National Fire Protection Association and the Commission on Fire Accreditation International accreditation process. The Review also included firefighting and fire services experience as a part of the KPMG team.

Data on EFRS was requested and reviewed, including:

- Financial information;
- Performance metrics and data;
- Deployment and event response data; and
- Staffing information.

Based on data provided, spatial analysis of multiple factors was completed including deployment ranges and timing, population factors, call data, and risk factors.

Stakeholders from within EFRS and the City were engaged to understand the current operating model. Stakeholders were identified by EFRS, approved by the City, and engaged in individual and small group interviews.

Four Canadian municipal fire services (Calgary, Winnipeg, Vancouver, and Ottawa) were compared against EFRS, with a focus on the scope of pre-hospital medical care, as well as general performance of their operating models. Data was obtained through desktop research as well as interviews. Desktop research was conducted to collect and review leading practices relevant to the EFRS operational model and to medical first response.

The City, EFRS, and Alberta Health Services validated the findings and analysis conducted through the project. Based on findings and analysis, a number of potential areas for improvement were identified. The City validated and endorsed the highest-priority opportunities, in order to focus the supplemental analysis. A series of potential options to address these improvement opportunities were created.

These options were analyzed, including financial and operational variables, and supplemental data was requested where required. A high-level risk analysis was also completed to consider areas of risk that were relevant to the options for EFRS. EFRS, City, and external resources were enlisted to support analysis of operational impacts for several specific options under consideration. This was undertaken in large part because of the complexity of analyzing impacts on EFRS' deployment and response times outside of the software already used by the City.

As a result of the above work, recommended changes to the City to improve relevance, effectiveness, and efficiency of EFRS have been made in this report.

LIMITATIONS

This Report and the recommendations made for EFRS are subject to the following limitations:

- The completion of the latter phases of this Review experienced significant delays related to the COVID-19 pandemic. As a result, the recency of data is impacted. The Review assessed operations including deployment and staffing models in place in late 2019, at which point the bulk of data collection was complete. In addition, financial and operational data was current through 2018 or 2019, depending on the source.

Modelling and simulation conducted by the City in late 2020 was based on more recent data, and has been referenced in this report. As a result, there are some discrepancies in the time periods referenced.

- The analysis relied on data sets, summary data outputs, and documentation provided by the City. Some findings reflect information stakeholders have communicated or what documents described about how the response operates.
- Jurisdictional comparisons are based on publicly available information supplemented by an interview with each of the comparator jurisdictions. As such, there are limits on the extent to which Edmonton's service can be compared with fire rescue services in other municipalities.
- Modelling and simulation of potential changes to deployment is complex. EFRS worked with a third-party provider to support modelling efforts using proprietary software that is licensed by the City. Modelling was guided by lines of inquiry identified from the Review and refined in collaboration with the City. This permitted estimates of response time impacts for some specific scenarios related to recommendations of this Review.
- It was not possible to assess the impacts or outcomes related to EFRS' provision of pre-hospital medical care. Data from Alberta Health Services could not be combined with data from the City to support analysis during this Review.
- The costs of pre-hospital medical care could not be isolated using available data from the City. Some estimates were possible for incremental costs associated with this service.
- Formal agreements between the City and other parties (such as Alberta Health Services) were not available. As a result, formal commitments and cost-sharing provisions could not be fully assessed.
- Procurement and equipment costs were not assessed against market costs or the range of options available, including costs incurred related to capital projects, heavy fleet, medical supplies, and firefighting equipment.

Current Situation

The recommendations and opportunities for improvement presented in this Report reflect an analysis of the current state of EFRS' operations at the time of data gathering. It is important to establish this foundation of how the service currently operates as context and rationale for changes proposed.

With this in mind, this section outlines highlights of the analysis of the service, informed by data, stakeholders, as well as a comparison with practices in other jurisdictions. In doing so, **no attempt has been made to reproduce the entirety of findings and analysis** completed. Instead, the most salient insights have been summarized to provide the reader with relevant context regarding the operating, service, and financial situation. In addition, comparisons between EFRS and similar services in other jurisdictions are included.

The reader should bear in mind that **the time period in which this data was collected was from late 2019 and early 2020**; findings were developed at that time, could not be updated to reflect newer data and research based on the project's scope.

OPERATING CONTEXT

EFRS operates within the Citizen Services department, under the authority of City Council as articulated by two key documents: *City Policy C523A – Fire Rescue Service Delivery*, and the 2012 *Fire Rescue Master Plan*.

City Policy C523A – Fire Rescue Service Delivery (2012)

This Policy outlines four goals and 17 accompanying principles that guide decision making for EFRS. It commits to upholding National Fire Protection Association (NFPA) standards, and maintain accredited agency status through the CFAI, subject to budget approval.

Goals in the current policy are as follows:

1. We will provide service excellence to make Edmonton a safe and secure community where people choose to live, work and play.
2. We will value employee growth, involvement, and development.
3. We will continue to strengthen, develop and enhance stakeholder partnerships.
4. We will ensure that services are comprehensive, effectively integrated and sustainable

Fire Rescue Master Plan (2012)

The Master Plan Includes goals, principles, and service level targets, in alignment with *City Policy C523A*, Edmonton's Strategic Plan, and the National Fire Protection Association service standards. It is approved directly by Council.

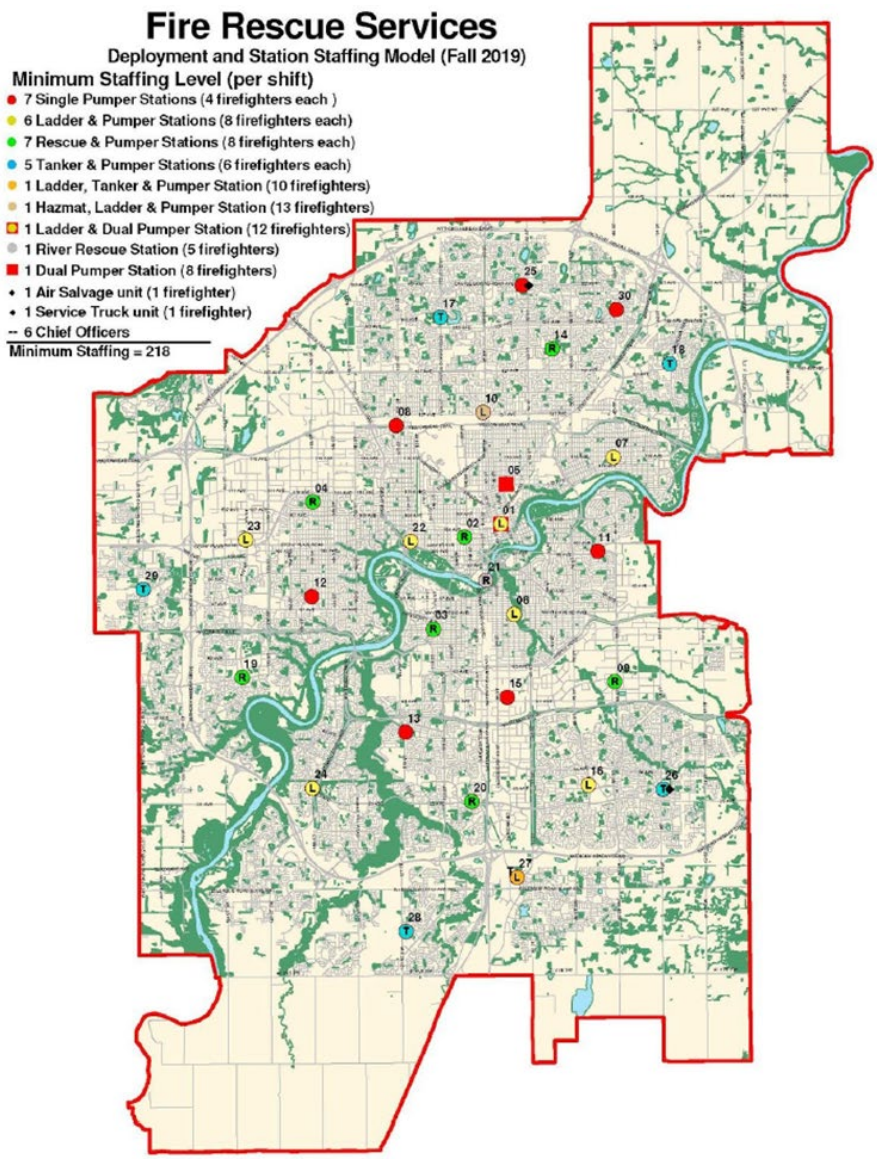
The Master Plan describes the four goals for the service as outlined in the policy, providing the detail within the seventeen more specific principles and measurable targets, standards and guidelines. *The Master Plan* also includes supporting rationale and references to applicable legal statutes and relevant City Council Policies and Bylaws.

The City Policy (C523A) is intended to be updated every five years, in order to reflect changes in: Council priorities or direction, City strategic plans, legislative requirements, industry standards, and community expectations. **Both the City Policy and Fire Rescue Master Plan were most recently updated in 2012**. A draft update to the Master Plan was developed in 2018, but was not approved.

EFRS is one of 270 fire agencies worldwide and 9 Canadian fire services to be accredited through the Commission on Fire Accreditation International (CFAI).

CFAI is an entity of the Center for Public Safety Excellence (CPSE), a not-for profit organization that supports and encourages agencies and personnel to meet international performance standards. CFAI Accreditation for EFRS is voluntary, and provides a systematic procedure to assist and assess departmental capabilities against a set of recognized standards of acceptable practices.

Figure 1: EFRS Station Deployment Model



Source: EFRS

DEPLOYMENT

EFRS' deployment is based around stations, which are located based on a number of factors and intended to minimize the travel time of responding units.

There are 30 active fire stations across Edmonton as of late 2019, with a new station under construction in Windermere. As Figure 1 illustrates, fire rescue crews and heavy vehicles are distributed across these stations, with a standard configuration that is updated periodically. Each crew is staffed with four firefighters at all times (except specialized units staffed: tanker units, the Hazardous Materials unit, and the River Rescue unit), and each station includes a minimum of one Pumper Truck[4] (except the Rossdale station, where the river rescue crew is stationed). Other heavy vehicle types include:

- Ladder (or aerial) units;
- Rescue units (specialized vehicles used in technical rescue events); and
- Tanker units (can bring water, which is especially important in non-hydrant zones on the outskirts of the city).

The EFRS crews comprise a minimum of 218 staff operating across five designated Fire Districts at any given time. In order to facilitate this, EFRS operates with a system of four shifts (or "platoons"). The shifts are structured so that a firefighter will work one rotation of four days on, two days off, then four days on, six days off. A rotation

[4] The Pumper Truck is a fire engine equipped to pump water at the scene of a fire.

consists of two 10-hour day shifts followed by two 14-hour overnight shifts. This equates to 2,190 hours per FTE per year.

EFRS generally serves the area within the City's boundaries, as pictured. In addition, however, the City maintains several mutual aid agreements with municipalities in the Edmonton Metropolitan Region, wherein EFRS can provide support and recover costs for doing so. These agreements are in place in part because the City maintains specialized and technical capacity (such as a Hazardous Materials unit) that surrounding municipalities do not have.

STAKEHOLDER ENVIRONMENT

Stakeholder interviews and survey data suggest that the service provided by EFRS is highly valued by Edmontonians, as well as partners such as Alberta Health Services. According to a 2014 citizen perception survey, 72% of residents were satisfied with EFRS, and 97% felt that fire rescue services were important.

The EFRS workforce is engaged and stable. The City's 2018 Employee Engagement survey results show a significantly higher engagement score within EFRS (86%) when compared with the City's Citizen Services department (75%) and City staff as a whole (67%). EFRS Operations' engagement score is higher still, at almost 89%.

In addition, more than 75% of turnover in 2017 and 2018 was a result of retirement, as opposed to resignation. In 2019, 6% of EFRS Operations staff (63 out of the 1,105 staff) were aged 55 or over. Surveys conducted by the City showed that EFRS staff were highly satisfied with overall operations, public service provided to citizens, staffing levels on scene, Incident Command System, fire station placement and apparatus deployment, and the dispatch system.

Within the City, EFRS is seen by some as an isolated or "siloed" department. EFRS' operational needs can be in tension with other traffic or urban design priorities of the City – for example, development priorities such as walkable communities, LRT expansion, and high-rise buildings in the downtown core create operational challenges for fire rescue services. Stakeholder interviewees suggested that limited data was sometimes available to support technical requirements for EFRS in city planning and design. This can result in challenges balancing the City's strategic goals and outcomes (such as Vision Zero) with EFRS' goals and outcomes (such as safety and speed of response).

Outside of the City, there are a number of other stakeholder perspectives relevant to EFRS operations and pre-hospital medical care as per Table 3.

Table 3: External Stakeholder Expectations of EFRS

External Stakeholders	Stakeholder Expectations
Business / property owners	Business and property owners expect EFRS to provide timely and effective response to emergency events, and input to ensure required infrastructure is in place to respond to emergency events. Business and property owners can also be impacted by EFRS capacity to respond to fires in both hydranted and non-hydranted areas through insurance grading classification (and fire insurance rates), as impacted by the Fire Underwriters Survey (see the page 27 more information).
Developers	Developers are the primary audience for which the City's Design Standards are written. They require clarity in these standards and expect EFRS to provide input that is evidence-based and follows industry best practice.

External Stakeholders	Stakeholder Expectations
Industry	Industrial areas have unique needs around fire protection and emergency preparedness. Industry representatives participate in mutual aid emergency response associations (e.g., the Northeast Region Community Awareness Emergency Response) along with municipalities to create emergency response plans that include unified command structures and shared equipment and personnel. They can also be impacted by the Fire Underwriters Survey and insurance grading classification that is determined by EFRS response capacity and infrastructure.
Edmonton Airports	The Edmonton International Airport has its own emergency response services on site that include airport firefighters, emergency medical responders, and dangerous goods response. They also have an RCMP detachment on site. The City does not provide fire response at the airport unless requested. However, the City's recent annexation of land up to the airport's boundary has brought the two jurisdictions into closer working relationship that requires a higher level of collaboration than they had previously.
Alberta Health Services	Alberta Health Services manages the Medical First Response program through which EFRS agrees to provide pre-hospital medical care. Alberta Health Services also provides EMS services in Edmonton. As such: – Alberta Health Services expects EFRS to provide timely emergency medical response to the highest risk medical events (e.g., cardiac arrest and airway obstruction) until an ambulance crew arrives on scene. Stakeholders from Alberta Health Services identified this as an area in which EFRS consistently demonstrates value. – EMS crews require a record of the patient care provided by EFRS prior to ambulance arrival on scene. EFRS and EMS use different patient care records systems, and stakeholders from both organizations identified information sharing regarding patient care as an ongoing challenge.
Edmonton Police Service	The Edmonton Police Service is one of three teams in the City – along with EFRS and Alberta Health Services – responsible for evaluating emergency calls and dispatching emergency services. Currently, a central 911 service directs emergency calls to the dispatching centre of one of these three services in Edmonton. – For some calls, more than one service is dispatched (e.g., medical calls with a risk of violence dispatch fire, EMS and EPS). Stakeholders noted that in these instances, having separate dispatching functions creates information sharing challenges.
Edmonton Fire Fighters Union	The Edmonton Fire Fighters' Union represents the vast majority of operational EFRS personnel. Union interviewees reported a strong relationship with EFRS management that has enabled a high level of service, improvements in firefighter safety, and collaborative problem solving – as in past efforts to address overtime costs, for instance. The union expects that the service continues to adapt to safety and mental health challenges, as well as operational challenges such as new building materials and high-rise buildings.

Sources: Stakeholder interviews, and documents provided by The City.

SERVICE DELIVERY

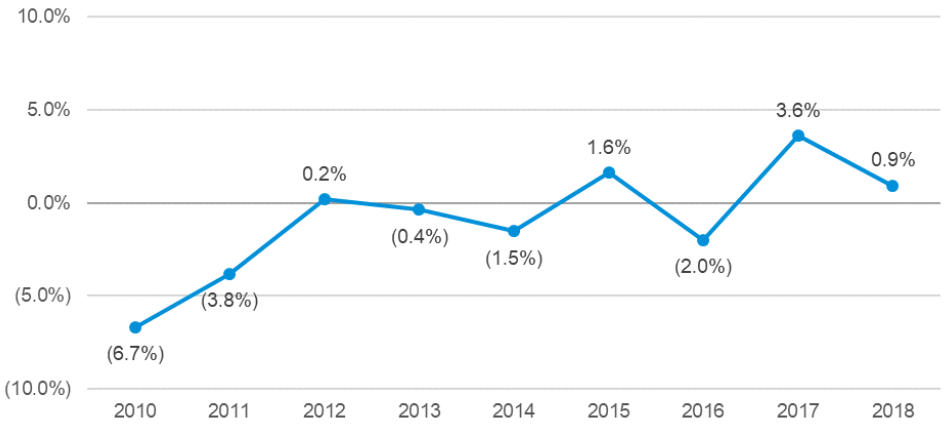
DEMAND FOR SERVICE

The **total volume of service calls to EFRS is growing**, at a rate of approximately 6.0% per year since 2010, which is outpacing population growth during the same time frame of 2.2% per year. Understanding demand, however, requires a closer look.

When looking at only "fire events" – meaning service calls classified as "structure fires," "non-structure fires," and "alarms", the trend is a small growth in calls, representing about 2% per year since 2010.[5] Further, the growth in fire event" calls has been driven almost entirely by increasing alarm calls (where a smoke, carbon monoxide, or hazmat alarm is triggered but no fire is discovered on scene).

When adjusted for changes to population,[6] the **demand related to fire events in Edmonton has remained relatively flat since 2010**, as shown in Figure 2.

Figure 2: Real Fire Event Growth per year (2010 to 2018)

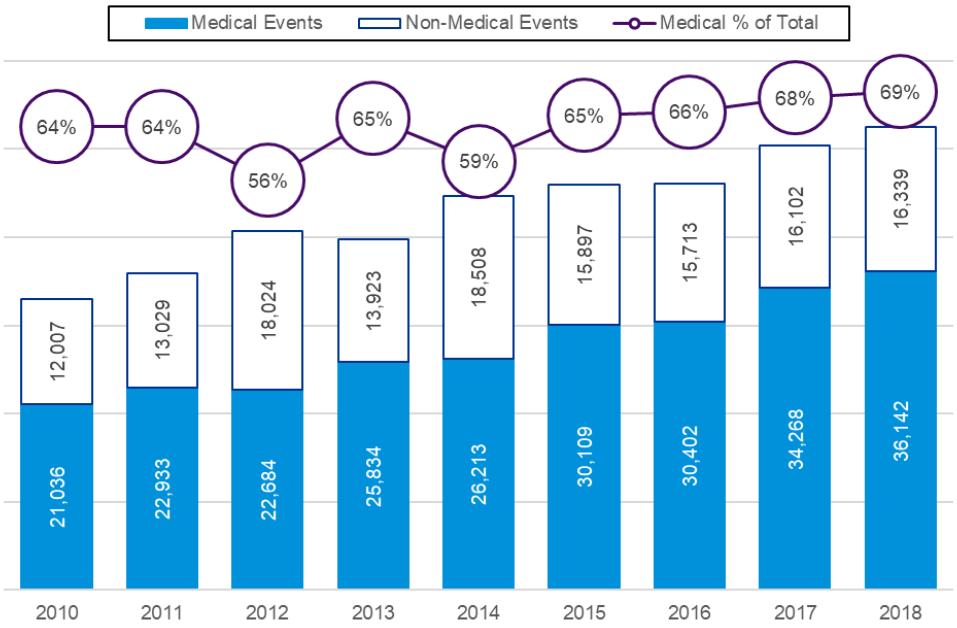


Source: Event data provided by EFRS. Population from Statistics Canada.

As shown in Figure 3, the largest and fastest growing demand for service – by far – is in medical calls. **Calls to EFRS for pre-hospital medical care (or "medical calls") are growing 3.5 times faster** than other calls, at a rate of about 7% per year.[7] The growth in medical calls is responsible for the vast majority of increased demand for the service. In 2018, a four-person fire rescue services crew responded to an average of 196 medical calls and 86 non-medical calls throughout the year.

[5] A "smoothed growth rate" or Compound Annual Growth Rate of 2.0% was calculated for fire events from 2010 through 2018.
[6] The City of Edmonton. (2019). 2019 Municipal Census Results. Accessed online December 2019.
[7] A "smoothed growth rate" or Compound Annual Growth Rate of 7.0% was calculated for Medical First Response events from 2010 through 2018. This rate was calculated using figures from EFRS performance reporting.

Figure 3: Number of Medical vs. Non-Medical Events (2010 to 2018)



Source: Event data provided by EFRS.

PRE-HOSPITAL MEDICAL CARE

Medical call volume has increased almost every year since 2010. **Medical calls now represent more than two-thirds of all service calls** responded to by EFRS. There are a number of factors that are relevant to understanding the scope and growth of this service, outlined as follows:

- The City's firefighters are trained to respond to medical calls and provide an "advanced first aid" level of care. EFRS equips all pumper trucks with basic medical equipment such as an automated external defibrillator.
- EMS, provided by Alberta Health Services, responds to all emergency medical calls in Edmonton. For many of these events, EFRS is also dispatched, but **the response by a fire rescue crew does not replace or cancel the response by the EMS ambulance**.
- The City chooses to provide pre-hospital medical care in order to provide first aid and potentially life-saving interventions to Edmontonians as quickly as possible. **EFRS is often able to respond faster than EMS to a call** (see page 19 for further details).
- Some deployment standards (such as the use of lights and sirens) are determined by Alberta Health Services. Others, such as crew size, are up to the Medical First Response agency to determine. The EFRS deployment model requires a full 4-person crew to respond in a pumper truck to any medical event, so that the unit and apparatus are not split up.
- EFRS is automatically dispatched to the most urgent medical events via the Computer Assisted Dispatch system, and may also be dispatched to other events based on the type and severity of the call, and how far away an EMS unit is at that time. For example, EFRS may be dispatched to traffic accidents or to provide patient lift assists when the situation is not life threatening.
- Medical calls are classified when received according to the level of severity. From least to most severe, these levels are Alpha, Bravo, Charlie, Delta, and Echo. **The severity level of the call determines whether EFRS responds**, as summarized in Table 4.

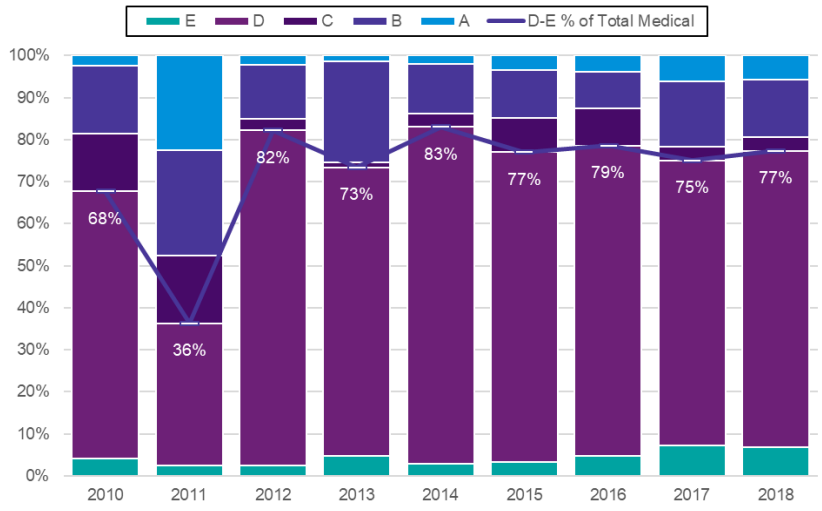
Table 4: EFRS Response Level Based on Determinant Code

Response Code	Medical Event Type	EFRS Response
Alpha (A)	Non-Emergency	None
Bravo (B)	Emergency, Non-life Threatening	Traffic accidents only
Charlie (C)	Potential Life Threatening	EMS is more than 6 minutes away
Delta (D)	Emergency, Life Threatening	All events
Echo (E)	Emergency, Life Threatening (Immediate)	All events

Source: Determinant code and response levels provided by EFRS.

- It is not always possible to determine whether EFRS response is urgently required or likely to save lives based on the code of the call and the information available at dispatch – this means that not all Delta and Echo calls may require an EFRS response, but also that calls initially given less severe codes may have complex or life threatening medical circumstances arise.
- The scope of Medical First Responder service agreed to with Alberta Health Services is that EFRS will respond to Delta and Echo calls, as well as to calls coded Charlie when an EMS unit is more than 6 minutes away. **While most EFRS responses are for Delta or Echo calls, approximately 20 to 25% fall outside the stated scope of service,** as per Figure 4.

Figure 4: Proportion of Medical Calls by Response Code (2010 to 2018)



Source: Event data provided by EFRS.

- Despite medical call volume being twice the volume of non-medical calls, the total time spent is approximately equal between the two types of calls, due to non-medical events taking more time on average. Based on fleet utilization data, voluntary Medical First Responder services approximately double the wear on vehicles due to deployment based on hours utilized.

TARGETS AND PERFORMANCE

There are currently no federal or provincial regulations that mandate the level of fire rescue services that a municipality must provide, nor are there universal standards that all Canadian or Albertan municipalities adhere to. **Service levels and targets for EFRS are set by the City** and approved by Council via the Fire Rescue Master Plan.

EFRS' service level targets are informed by industry standards, benchmarks and leading practice. In Edmonton, as in many other North American municipalities, service level targets are primarily influenced by the National Fire Protection Association (NFPA). The NFPA is a self-funded, not-for-profit organization based in the United States that delivers codes and standards, with the mission of eliminating death, injury, property and economic loss from fire, electrical and other hazards.

This Review did not identify any Canadian municipality that has adopted NFPA standards entirely (see page 24 for additional details). **Municipalities make choices about targets** informed by their desired levels of service and appetite for risk. In Edmonton, for example, the target response time[8] is 7 minutes for the first arriving unit; the NFPA recommends targets of 6 minutes and 20 seconds for an EMS / medical call, and 6 minutes and 40 seconds for a fire call.

EFRS currently reports on 24 key performance indicators (KPI) on a quarterly basis. Many of these indicators are descriptive outputs, including:

- Measures of demand or activity, such as counts of events by type, numbers of "Second Alarm" fires, and number of investigated structure and non-structure fires.
- Negative consequences as assessed by Fire Investigators, including civilian injuries, deaths, and an estimated value of losses due to fire.
- Occupational health and safety measures such as lost time of staff due to work-related incidents, and exposures to body fluids or needle stick injuries.

These descriptive measures can provide trend information related to emergency events and their negative impacts. However, there is only a partial linkage between these measures and performance. **The most direct measure available for EFRS' performance is speed**. EFRS closely measures and monitors how fast the service is responding to calls, as well as the related measure of how many fires are able to be contained within their room of origin, as highlighted in Figure 5. Speed is tracked for different phases of responding to a call, and monitored in terms of how often (as a percentage of calls) the service meets the target.

When it comes to the speed of response, available data supports the following findings:

- **EFRS units are dispatched very quickly** once a call is received via the Public Safety Answering Point (which receives 911 calls) or via alert / request from Alberta Health Services for a medical response. The time to dispatch after receiving these calls at the Emergency Response Communication Centre consistently exceeds targets (less than 90 seconds, 90% of the time). However, **dispatch for medical calls is slower overall by about 82 seconds**, due to the fact that medical calls do not come directly to EFRS, but are dispatched via Alberta Health Services.[9]
- Target "turnout time" for units to leave the station after being dispatched is achieved only about 70% of the time. Travel time targets achieved about 75% of the time, against a goal of 90% for each.

[8] Response time (as defined by EFRS) is the time interval from when dispatch receives the call until the first unit arrives on scene. This is consistent with the intervals used by the NFPA in the targets referenced, though terminology differs.
[9] "Call handling time" (call evaluation time plus call dispatch time) was analyzed since 2012. Median call handling time for medical events during this period was 125 seconds, compared with 43 seconds for non-medical events.

- **The urgency of a call impacts the speed of response**. For fire suppression, response times were, on average, 24% faster for events coded as High-risk compared to Low-risk events, and 8% faster for High-risk events compared to Moderate-risk events. Similarly, statistical analysis shows that the response code for medical calls was the most important factor underlying differences in the speed of response – i.e., calls with more severe codes showed faster response times.[10]
- Statistical analysis showed no significant impact on response times for calls related to the time of day, neighbourhood, or responding station**.** This shows that EFRS delivers a **consistent speed of response across Edmonton, and at all times of day**.
- For non-medical calls, the most significant factor for the speed of response is a smaller distance between the event and the responding fire station. This underscores the importance of station locations within the City's station-based deployment model.

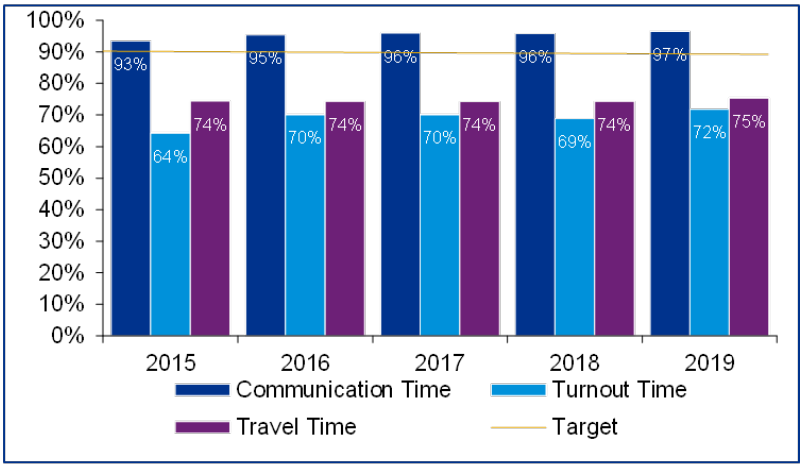
Figure 5: EFRS Five-year Performance Against Targets (2015 to 2019)

Response Time by Phase

Communication Time
Time from when a call arrives at the Emergency Response Communication Centre until units have been dispatched.
- Target is less than 90 seconds, 90% of the time.

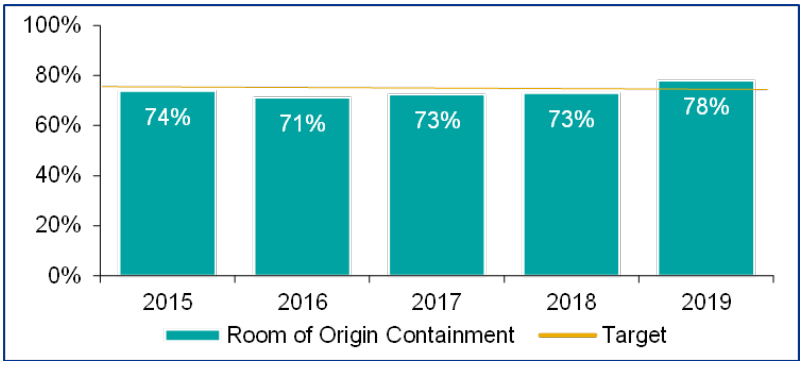
Turnout Time
Time from when the station is notified until the unit leaves the station.
- Target is less than 90 seconds, 90% of the time.

Travel Time
Time from when the unit leaves the station until the first unit arrives on scene.
- Target is less than 240 seconds, 90% of the time.



Fires Contained in Room of Origin

How often the crews are able to contain the fire to the room of origin.
- Target is fire contained to room of origin 75% of the time.



Source: Annual Performance Reporting provided by EFRS.

EFRS performance measures are, generally speaking, in line with those of similar Canadian municipalities. In Edmonton as in other jurisdictions, measures are limited in several areas:

- Outcomes: It is difficult to show a direct connection between service levels and outcomes, even where a related measure is tracked, such as civilian deaths or containing fires to their room of origin. Other than responding quickly, there is no way to make a connection between service and results. This gap is evident in

[10] Statistical analysis was conducted on event data provided by EFRS that spanned from 2009 to fall of 2019. Regression analysis and related statistical techniques were applied to identify which variables had a significant relationship with response time, and the relative importance of those variables.

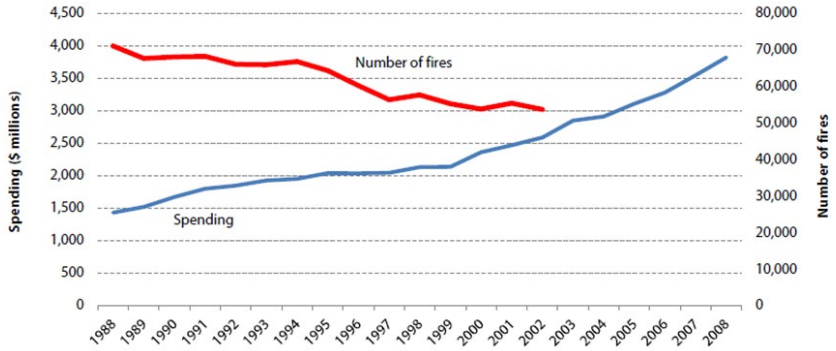
particular when it comes to pre-hospital medical care; it is not currently possible to assess the impact of this service.

- Efficiency: The financial efficiency of the service is not measured or reported on regularly.
- Quality: The City is not currently measuring client satisfaction after services are delivered, only general satisfaction with the service overall. Measures of practice quality are not available – we cannot currently assess the quality or effectiveness of firefighting techniques, or first aid services, for instance.
- Industry Standards: Performance targets such as response time are informed by but do not meet NFPA standards. For example, In Edmonton and Calgary, the target response time to fire events is 7 minutes while the NFPA recommended target is 6 minutes and 40 seconds. The municipalities compared as part of this Review have not been able to achieve NFPA benchmarks for response time.[11]

FINANCIAL ANALYSIS

Spending on fire services has been rising for some time across Canada. A study of municipal fire services across Canada published in 2015 examined the trend in firefighter resources, firefighter expenditures and fire incidents. The analysis found that **firefighting spending has grown while fire incidence has fallen** over the years, as demonstrated in Figure 6.[12]

Figure 6: Firefighting Spending versus Number of Fires, Canada (1988 to 2008)



Source: Statistics Canada, 2009; Council of Canadian Fire Marshals and Fire Commissioners (CCFM/FC), various year.

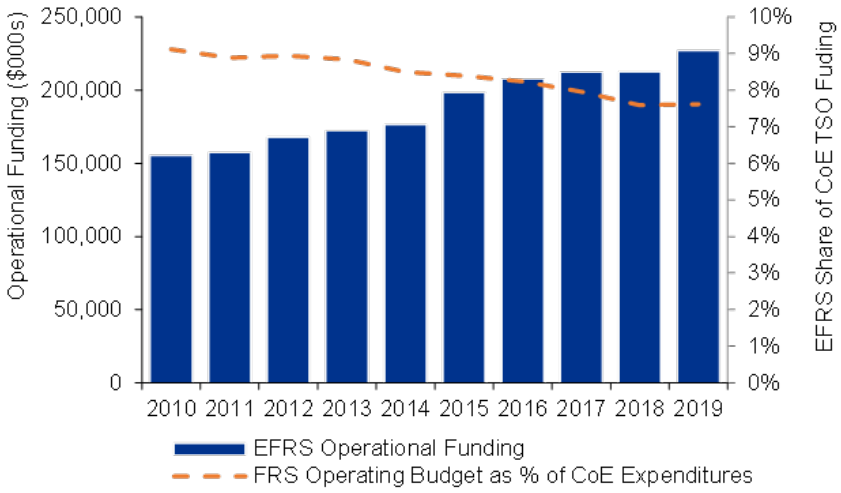
For instance, the authors noted that the number of firefighters in Canada rose by 25% between 1997 and 2012, while fire incidents between 1988 and 2002 fell by 24.5%. This was attributed by the authors mainly to non-fire related responses provided by firefighters to medical calls, motor vehicles incidents and other rescues. A more recent comparison of these figures was not identified.

In Edmonton, the number of fire events is increasing slower than the growth of population, with the increase being driven by alarm calls and not more fires. Costs have increased in recent years, however:

[11] Publicly available reporting shows response times above NFPA targets for all municipalities with available response time data.
[12] Lammam, C., Palacios, M., & Ren, F. (2015, May). *Municipal Fire Services in Canada: A Preliminary Analysis.* The figure "Firefighting Spending versus Number of Fires, Canada, 1988 to 2008" is reproduced from this source.

– **EFRS annual operational funding has increased** from $155M in 2010 to $226M in 2019, or **about 4.3% per year** over the last 10 years.[13] This rate exceeds CPI inflation in Canada (1.7%) and population growth in Edmonton (2.3%) over this period. City **spending on EFRS as a proportion of the overall budget has decreased** during the same time period, as shown in Figure 7. City budget for all Tax Supported Operations[14] has increased by 6.4% per year for the last 10 years.

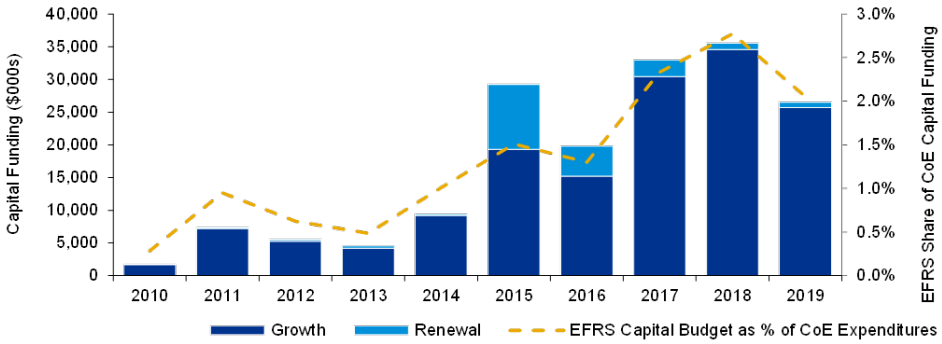
Figure 7: EFRS Operational Funding vs. City Budget (2010 to 2019)



Source: Annual Financial Reports for P70000 FRS provided by EFRS; City of Edmonton Annual Approved Operating Budgets.

– **Capital funding for EFRS has grown substantially**, both in volume and as a proportion of City capital spending. Since 2010, EFRS has spent $172M on Capital projects. A total of 89% (or $152M) has been spent on growth projects while 11% or $20M has been spent on renewal, as shown in Figure 8.[15]

Figure 8: EFRS Capital Funding (2010 to 2019)



Source: City of Edmonton Annual Reports; City of Edmonton Open Data Capital Details.

[13] A "smoothed growth rate" or Compound Annual Growth Rate of 4.3% was calculated for fire operational budget from 2010 through 2019.

[14] Tax Supported Operations includes all operating activities provided through Civic Programs, Corporate Programs, and Boards & Commissions. These programs are primarily supported by a combination of property taxation, user fees, return on investment, and grants from other orders of government.

[15] According to City definitions: *Growth* projects are investments in new assets and projects that add to or enhance existing infrastructure and improves the type of service provided and/or functionality. Examples of EFRS Growth projects include fleet growth, and fire stations. *Renewal* projects are investments in existing infrastructure to restore it to its former condition and extend its service life. Examples include the reactivation of the Rossdale Fire Station, and the Dispatch System Radio Replacement.

COSTS

From 2014 to 2018, **personnel costs account for an average of 83% of total expenditures at EFRS**. Table 4 shows a breakdown of overall personnel costs by category within EFRS.

Table 5: EFRS Personnel Costs and Growth Rates

Category	2014 Cost	2018 Cost	5-Year CAGR
Wages	$116.2M	$140.6M	4.9%
Benefits	$37.9M	$30.3M	-5.4%
Allowances	$1.9M	$2.7M	9.2%
Overtime	$1.3M	$2.0M	11.4%

Source: Annual Financial Reports for P70000 FRS provided by EFRS.

Other highlights related to costs are as follows, and are itemized in Table 5:

- **Overtime costs are low**, accounting for only 1.1% of personnel costs for EFRS Operations in 2018; however, the trend shows that overtime costs have increased by more than 11% per year during the period from 2014-2018.
- **Allowances** (for things like uniforms, work boots and relocation) **have increased significantly.**
- Within non-personnel costs, the biggest proportional increases have been seen in **Fire Support Equipment, Fleet, and Technology**.

Table 6: EFRS Non-Personnel Costs and Growth Rates

Category	2014 Cost	2018 Cost	5-Year CAGR
General Services	$11.1M	$11.5M	0.9%
Fleet	$10.4M	$12.7M	5.1%
Direct Materials	$3.7M	$4.0M	2.4%
Other Indirect Costs	$2.2M	$2.2M	-1.0%
Fire Support Equipment	$1.9M	$3.1M	13.8%
Interdepartmental Services	$1.2M	$1.1M	-0.6%
Technology	$0.9M	$1.1M	5.4%

Source: Annual Financial Reports for P70000 FRS provided by EFRS.

The specific cost of the pre-hospital medical care could not be isolated from data available from the City, however, an estimate of the cost of training, materials, and fleet associated with this portion of the current service was developed through the Review as per the below:

- It is estimated that $610,000 - $735,000 per year is spent on training and certification costs. To provide a First Medical Responder level of care, all new recruit firefighters attend 80 hours of training to become certified. In addition, firefighters have to re-certify every three years, which takes 20 hours.[16]
- Medical supplies cost of around $300,000 per year.
- Half of the EFRS vehicle deployment time is for medical calls.

EDMONTON'S SERVICE IN CONTEXT

A comparison of Edmonton's EFRS to the municipal fire services in Calgary, Winnipeg, Vancouver, and Ottawa was completed. The focus of this comparison was on the scope of pre-hospital medical care provided, as well the differences between their operating models. Some of the summary observations from this comparison included:

- Different municipalities operate fire rescue services under significantly different models, making direct comparisons misleading in some cases. Winnipeg operates a semi-integrated fire and paramedic model; Ottawa on the other hand combines volunteer and career firefighters to cover a large land area. Calgary offers the most applicable comparisons to Edmonton.
- Different jurisdictions have different crew sizes for their units. In particular, variation was observed in crew size for ladder (aerial) units and rescue units.
- Jurisdictions have established different performance targets, including response time targets for different events. There are no universally accepted benchmarks for performance.
- Different approaches were observed for serving new development areas, including differentiated response times and different options for adding fire stations.
- Scope and volume of medical calls vary substantially across the jurisdictions. Several of the fire rescue services reviewed operate small units specifically to respond to medical calls, in addition to responding with heavy vehicles and full fire crews.

Table 7 presents a summary view of select comparative findings, drawn from interviews as well as publicly available information which illustrate some of the operational differences.

Table 7: Operational Differences between EFRS and other Municipal Fire Services

	Edmonton	Calgary	Winnipeg	Ottawa	Vancouver
Deployment Model[17]	Station-based	Dynamic	Dynamic	Risk-based	Risk-based
Medical Response Required	No	No	Yes	No	No

[16] Training figures drawn from:
City of Edmonton. (2019). EFRS Advanced First Aid Certification. Edmonton Fire Rescue Services document.
Edmonton Firefighters Union. Collective Agreements. Accessed online December 2019.
St. John Ambulance. Emergency, Standard and Advanced First Aid Courses. Accessed online December 2019.
[17] Station-based deployment dispatches units based on assigned "first due zones" around station locations, and does not frequently adjust base deployment. A risk-based deployment model dispatches resources based on the risk-profile of the area surrounding an event, which results in more frequent shifts in the deployment model. A dynamic deployment model dispatches units based on their physical location in real-time. All three models make use of units "based" at stations; the main difference is how and how often deployment shifts.

	Edmonton	Calgary	Winnipeg	Ottawa	Vancouver
Level of Pre-Hospital Care	Basic Life Support 4-person pumper unit	Basic Life Support 4-person pumper unit	Basic Life Support One PCP on 4-person pumper unit	Basic Life Support 4 person-pumper unit	Unknown One medic on 4-person pumper unit
In-scope Medical Call Acuity	Alpha through Echo	Alpha through Echo	Alpha through Echo	Delta through Echo	Charlie through Echo
Effective Response Force (ERF) staffing for standard fire rescue events	16	12	16	n/a	15[18]
CFAI Accreditation	Yes	Yes	No	Yes	No

Source: Municipal Annual Reports, supplemented and confirmed by stakeholder interviews.

BENCHMARK RATIOS

In developing the benchmark ratios[19] in Table 8 and Table 9, it is important to recognize that differences in operating models underpin some of the differences observed in the table below – for instance, Winnipeg operates a semi-integrated fire and medical first response model, and Ottawa makes use of both staff and volunteer firefighters to cover its service area.

Table 8: Comparison of Operating Models

	Edmonton	Calgary	Winnipeg	Ottawa	Vancouver
Number of firefighters (2019 FTE)	1,090	1,298	865	1,300	760
Number of stations	30	41	27	45	20
Total Volume (2018)	53,126	63,561	81,459	26,080	~60,000[20]
Medical Call Volume (2018, %)	68%	48%	77%	17%	72%
Population (2016 census)	932,546	1,239,220	705,244	932,243	631,486
Service area (km^2)	767.8	825.5	464.1	2,790.3	114.9

Source: Municipal Annual Reports, supplemented and confirmed by stakeholder interviews; Population from Statistics Canada.

[18] This is the Effective Response Force for a "low hazard" First Full Alarm.
[19] Ratio figures drawn from publicly available annual reports for each jurisdiction and validated, where possible, through jurisdictional interviews.
[20] Exact figures were not publicly available for this time period.

Table 9: Comparison of Operating Ratios

	Edmonton	Calgary	Winnipeg	Ottawa	Vancouver
Coverage Ratios					
Firefighters per Station	37.3	31.7	32.0	28.9	38.0
Population per Firefighter	834.1	954.7	815.3	717.1	830.9
Population per Station	31,085	30,225	26,120	20,717	31,574
Service Area per Station (km^2)	25.6	20.1	17.2	62.0	5.7
Cost Ratios					
Funding per Event	$3,999	$4,890	$2,375	$6,142	$2,166
Funding per Capita	$224	$245	$257	$162	$193
Service Ratios					
Medical Events per 1,000 Population	38.1	23.9	79.6	4.5	13.9
Non-medical Events per 1,000 Population	17.9	26.2	28.5	21.1	35.8

Source: Municipal Annual Reports, supplemented and confirmed by stakeholder interviews; Population from Statistics Canada.

Recommendations

The review of EFRS operations and pre-hospital medical care identified a number of potential opportunities for improvement. Working closely with the City, these opportunities were prioritized, and the highest-priority areas were further analyzed in order to generate and assess future state options. In particular, analysis was focused on:

- **Deployment** of EFRS personnel and vehicles;
- Approach to **pre-hospital medical care;**
- Levels of **staffing; and**
- **Service levels.**

This section outlines recommendations, options, and the impact analysis for the improvement areas prioritized. **Appendix B: Data Analysis Notes** includes explanation regarding the modelling, data analysis and financial analysis conducted in support of these recommendations; only summary results are included in this section. Overall, the reader should note that:

- EFRS provided both modelling (i.e., estimates for future events) and simulation (estimates based on past deployment data) analysis to help determine impacts of several different options on response time to events.
- Assumptions have been made and documented about staffing costs that use average salary figures.
- While each recommendation has been analyzed individually, it is also recognized that the impacts of the full scope of recommended changes needs to be understood as well as the City determines which it plans to implement.

UNDERSTANDING RISK

EFRS provides emergency services, and **any change to an emergency service entails risk**. It is important to understand some of the risk tradeoffs that are common across the opportunities outlined below; in this way, City decisions about the recommendations of this review can be informed by what is known about the balance of risk and benefits.

LOSS OF LIFE: WHEN DO SECONDS MATTER?

The idea of changing or reducing fire rescue services can raise concerns about a slower response, and questions about whether a loss of life from emergencies will occur at a higher rate than they do with an existing level of service. These are serious considerations for the City; after all, it makes sense intuitively that there are some emergencies when “seconds count” – where a faster response can save a life. **The relationship between service levels, speed, and preventing a loss of life is not straightforward**, however.

When it comes to fires, there is limited evidence showing how response speed directly impacts mortality.

- In the UK, it was reported[21] that there was a 3.8 per 100 fires probability of loss of life for fire response times less than 5 minutes. This increases to 4.2 per hundred fires if response times were between 6 and 10 minutes.

[21] The Fire Brigades Union. (n.d). It’s about time - Why emergency response times matter to firefighters and the public.

- In Edmonton, no average, median, or target response times are below the 5-minute threshold cited in this UK study; most calls are responded to within the 6 to 10-minute range described. At the same time, fire-related fatalities have been reported at a much lower rate than this UK example. In 2018, EFRS responded to 3,412 fire suppression events, with 7 civilian fatalities recorded due to fire. This translated to a maximum rate of 0.21 per 100 fires with a loss of life.[22] Similarly in 2017, EFRS responded to 2,969 fire suppression events, with 8 civilian fatalities recorded due to fire and a maximum rate of 0.27 per 100 fires with a loss of life. By comparison, Calgary experienced even lower fatality levels, with 5 fatalities recorded in 2018 and 2 in 2017.
- Therefore, although there is likely a relationship between fire rescue service response time and fatalities, the evidence does not support concrete estimates. At the same time, **Edmonton experiences very few fatalities related to fire, and an incremental increase in response times would not appear likely to substantially increase the rate of fatalities base on the example above**.

For medical events, a greater body of evidence was available to link the speed of response and mortality. Highlights include:

- Current NFPA standards for prehospital response times are rooted in a study conducted in the 1970s[23] which showed lower mortality rates in patients who received prehospital care within 8 minutes or less. More recently, an NFPA-sponsored study and other research has concluded that there is no empirical data to back up an 8-minute benchmark for all prehospital calls.[24]
- Various studies show that a 4 to 5-minute response benchmark is impactful for life-threatening and time-sensitive medical events like cardiac arrests, overdose / allergic reaction and diabetic emergencies. One study reported a 1.9% increase in risk of mortality when response times are above four minutes.[25]
- One research report found that patients who received care within 4 minutes were 0.7 times as likely to die compared to patients who received care in greater than 4 minutes.[26]
- Another research report estimated that out-of-hospital cardiac arrest patients are 1% less likely to survive for every minute above the threshold of a 4-minute response.[27]
- The American Heart Association[8] found that a patient's brain ages 30,000 times faster than normal for every minute a stroke is unattended to. A patient can sustain permanent brain damage if oxygen does not reach the brain after 4 minutes.
- All of these conclusions relate specifically to time-sensitive critical medical interventions like cardiac arrests, which are a very small subset of medical calls responded to by EFRS. For less time-sensitive medical events which make up the bulk of Edmonton's medical calls, slower response times have not been linked to increased mortality risk.

Taken together, this research suggests that it is only for a small subset of medical calls for which there is evidence that speed saves lives – and there is no reliable way to identify these particular types of calls, either at

[22] Figures were drawn from EFRS performance reporting. Event counts differ slightly from the raw event data received. A "maximum" rate of fires resulting in death assumes that only one death is recorded per event; if some events resulted in multiple deaths this rate would be lower.
[23] Haden, D. (2012, February 14). Retrieved from firefightingincanad.com: https://www.firefightingincanada.com/realistic-response-times-10985/
[24] Upson, R., & Notarianni, K. A. (2012). Quantitative evaluation of fire and EMS mobilization times. Springer Science & Business Media.
[25] Blanchard, I. E., Doig, C. J., Hagel, B. E., Anton, A. R., Zygun, D. A., Kortbeek, J. B., ... & Innes, G. D. (2012). Emergency medical services response time and mortality in an urban setting. Prehospital Emergency Care, 16(1), 142-151.
[26] Pons, P. T., Haukoos, J. S., Bludworth, W., Cribley, T., Pons, K. A., & Markovchick, V. J. (2005). Paramedic response time: does it affect patient survival? Academic Emergency Medicine, 12(7), 594-600
[27] Karch, SB. Graff, J. Young, S. Ho, CH. (1998), Response times and outcomes for cardiac arrests in Las Vegas casinos. Am J Emerg Med, 16(3), 249-53.

the time of dispatch or in event data.[28] Available data **does not permit an estimate of how many these calls where "seconds count" have been experienced** in Edmonton. Further, the impact of changes in response time cannot be reliably modeled. It is clear, however, that average and median **response times for EFRS are well above the critical threshold of four minutes** that appears most relevant in these cases.

While it is not possible to quantify the impact of changes in response time on loss of life, available data and research suggests that **service changes impacting the speed of response may affect a small subset of EFRS' medical calls, and the magnitude of change in survival rates is likely to be very small**, especially since EFRS responses are longer than 4 minutes on average.

It is also important to recognize that the response time target for Alberta Health Services, which is responsible for emergency medical services, is to respond in an urban area within twelve minutes, 90% of the time.[29] This means that **the response time standard for EMS is already significantly higher** both than EFRS targets as well as the critical four-minute threshold.

PROPERTY DAMAGE

Property damage risk does not have a well-established link with response times. It stands to reason that the longer a fire burns the more damage there is likely to be, but evidence is limited regarding how to accurately estimate the impact of response time on the value of damage caused. Some relevant evidence was identified, however:

- One estimate made by a 2019 research paper was that building fires grow at about 20% per minute, resulting in property damage between $4,000 and $6,000 per minute. [30]
- A Boston Globe Study was also cited that projected a $7,000 increase in property damage for every two-minute delay in fire response times. [31]
- In Edmonton, a 2017 Impact Assessment by the University of Alberta found that EFRS intervention was timely in preventing fire spread and further property damage.[32] Using fire spread modelling, the report stated that the EFRS had a "save rate" of 96% for qualifying sample events analyzed. For those events, this represented $120 million in building value-at-risk and content value that was not destroyed as a result of timely intervention.

INSURANCE

Changes in variables such as staffing levels, number of fire stations, and the size of a fire fleet could lead to changes in property insurance rates for citizens due to lower ratings from the Fire Underwriters Survey (FUS). **However, this risk is low as FUS ratings are applied infrequently and a municipality is given time to put measures in place before a potential rating change is published**. The impact of these ratings on insurance rates offered by individual companies is also not clear.

- EFRS fire services can impact the insurance industry and the insurance rates that property owners pay. In Canada, the FUS assesses, evaluates and grades the quality of municipal fire defences and communicates this through a 10-point grading system. Insurance companies use these classifications to understand property

[28] EFRS interviewees suggested that the event and condition coding at dispatch are not always reliable indicators of the seriousness of the actual call once on scene.
[29] Alberta Health Services. *Quarterly Emergency Medical Services Dashboard.* Retrieved from: https://www.albertahealthservices.ca/assets/info/ems/if-ems-dashboard.pdf
[30] Leven, J. (2019, May 6). RapidSOS. Retrieved from www.RapidSOS.com: https://rapidsos.com/blog/category/resource/white-paper/
[31] Current State of Turnout Times. (2019, November 24). Retrieved from https://www.purvis.com/current-state-of-turnout-times/
[32] University of Alberta. (2017, September). Economic Impact Assessment for Edmonton Fire Rescue Services. University of Alberta, Edmonton.

risks and price property insurance policies accordingly. Each company interprets the FUS scores independently, however; it is not possible to estimate the impact of a rating downgrade.

- The FUS most recently assigned the City the following Public Fire Protection Classifications (1 is the highest or best protection score and 10 is lowest):[33]
  - Class 2 for hydrant protected areas
  - Class 9 for non-hydrant protected areas
- If the FUS calculates a Public Fire Protection Classification that is a downgrade, they will notify the community. However, at that stage, FUS will not publish the information to the insurance industry to use for premium calculations. FUS will identify for the community the features that affect the classification. If the community then wishes to maintain its current classification, it will be given a reasonable timeframe (up to a maximum of 12 months) to implement and report on an agreeable action plan. During that time, the previous classification will remain as published.
- Evidence suggests that a change in FUS rating is to some extent a consultative process; it may be possible to engage with the FUS in advance of changes to assess potential impacts as well.
- No recent examples were identified of Edmonton or comparator municipalities experiencing a downgrade in FUS classification.

RISK IS DYNAMIC

The City is constantly managing risks when it comes to fire rescue services. There is no simple formula or shared benchmark about how much risk and what levels of service are optimal; instead, risk is impacted incrementally through a range of actions and decisions by The City and others. For instance, stakeholder interviews during the present Review identified multiple factors outside of the scope of recommendations that impact levels of risk, including:

- Development decisions, such as addition of high-rise towers, and location of industrial and hazardous materials;
- Changes in building codes and materials;
- Planning and design of roadways and traffic patterns;
- Increased understanding of health and mental health impacts of firefighting;
- Scope and timing of adding fire hydrants to neighbourhoods;
- Investments in fire prevention; and
- EMS service levels and response times.

[33] These scores are determined through an assessment of major features and conditions in communities such as water supply, fire department (including assessment of staffing levels, number and location of fire stations, and fleet), fire service communications, fire prevention and building code enforcement and conditions. The grading reflects the ability of the community to combat major fires that may be expected to occur in commercial, industrial, institutional, and multi-family residential properties.

RECOMMENDATION 1

Reduce the scope of medical calls that EFRS responds to

EFRS should review the medical event types that are being responded to, and work closely with Alberta Health Services to focus on event types where the presence of EFRS has the greatest potential for lifesaving interventions.

In particular, EFRS should reduce or eliminate response to non-urgent medical calls (coded Alpha and Beta). In addition, a process to review event types can identify locations and call types (among those coded Charlie or Delta level of urgency) where response may not be necessary – for example, EFRS may not choose to deploy to medical calls at seniors' supportive living sites that have AED equipment and trained nursing personnel on site.

ISSUE ANALYSIS LEADING TO THE RECOMMENDATION

Pre-hospital medical care is a voluntary service that now makes up almost 70% of the calls responded to by EFRS.

- Medical call volume is growing at about 7% per year, which is much faster than population growth in Edmonton and 3.5x faster than non-medical calls. This **creates a sustainability issue for the service**.
- Notably, 20% to 25% of medical events responded to by EFRS are not dispatched as "emergency, life threatening" calls (which would be coded as Delta or Echo), and therefore are **outside of the stated scope of service**.[34]

A jurisdictional comparison demonstrates that the growth of medical calls is an issue that other Canadian cities are facing as well. Other jurisdictions have reviewed and adjusted their scope of response. Differences in service models are also partly responsible for substantial variation across the country in the proportion of medical service calls:

- Calgary is the closest comparator in terms of level of service, size, and provincial context. In 2018, **48% of calls responded to in Calgary were medical, compared with Edmonton's 68%**. Interviewees from the Calgary Fire Department and from Alberta Health Services noted that **Calgary implemented a new approach that nuanced their response to medical calls and eliminated some lower-priority calls**. This has reportedly helped to manage the volume of medical calls, which are increasing at a comparable level to those in Edmonton (e.g., a 6.8% increase from 2017 to 2018). The process involved working with Alberta Health Services and reviewing response across some 1,400 event types (often called "event cards" or event card types).
- Ottawa has a much lower medical event proportion – 17%. The Ottawa Fire Service responds to a ratio about 4.5 medical events per 1,000 population, compared with 38.1 per 1,000 population in Edmonton. interviewees reported that **Ottawa has consciously shifted to tiered deployment that results in the fire service responding only to life threatening incidents**. Ottawa also deploys a mix of career and volunteer firefighters and serves a much larger land area than Edmonton.
- Winnipeg operates a semi-integrated service model for fire rescue and EMS services. In this context, minimum staffing includes one Primary Care Paramedic per front-line apparatus (with the exception of aerials

[34] Data was not available to assess whether the response to calls coded as "Charlie" have complied with stated scope of service – namely that EFRS only responds when an EMS unit is 6 minutes or more away. EMS positions at time of a call were not known.

/ ladders) – in other words, **Winnipeg has added a paramedic to each fire crew**. Under this model, 73% of Winnipeg Fire and Paramedic Service event responses in 2018 were medical calls. Winnipeg's integrated service responds to a ratio about 79.6 medical events per 1,000 population, more than double the 38.1 per 1,000 population in Edmonton.

- Available information suggests that Vancouver Fire and Rescue Services responds to around 60,000 events per year, with 70% of these being medical calls. This is a similar proportion to Edmonton.

OPTIONS ANALYSIS THAT INFORMED THE RECOMMENDATION

There are a several potential options for addressing the pressure on EFRS capacity and sustainability created as medical calls grow rapidly in volume and proportion. Managing the inflow of calls is a timely priority, but involves making choices about what types of calls EFRS should be responding to in order to remain sustainable. Highlights of analysis include:

- Both the Calgary Fire Department and Alberta Health Services interviewees spoke positively about the process in Calgary to review event cards and reduce deployment to lower-risk events where the fire department's presence had less perceived impact. Alberta Health Services participants suggested there are events that could be identified where EFRS response is not required.
- Edmonton is responding above its agreed scope of service with Alberta Health Services, however EFRS interviewees suggested that there are sometimes events not coded as life-threatening (i.e., not coded at Delta or Echo urgency levels) where the fire service response provides value, or where more serious circumstances may present on-scene. Motor vehicle accidents were cited as one example. This is one reason that a more detailed review of "event cards" would be beneficial for the City.
- Outside of an integrated service model such as Winnipeg's, adding paramedic or medical personnel to existing fire crews makes little sense; this would be an expensive and inefficient addition to the model in Edmonton.
- The model in use in Ottawa is not directly comparable to Edmonton's, and it was judged to be unrealistic for Edmonton to target a decrease to pre-hospital medical care service levels evidenced in that jurisdiction.
- Several jurisdictions have developed specialized resources or units for medical calls. Options related to different configuration of staffing and units are considered in the recommendation that follows this one.
- The current scope of information and analysis does not permit specific recommendations about event types to be included / excluded by EFRS in future. A significant effort involving EFRS and Alberta Health Services operational expertise would be required to complete this detailed work.

IMPACT OF THE RECOMMENDATION

Reducing the scope of medical calls does not create savings in the form of reduced staff or deployed units. Instead, **the primary benefit is in terms of increased capacity for the service** via reduced pressure on demand for firefighter deployment.

When EFRS crews are deployed to medical calls, they are not available to respond to fires or other events, meaning that increasing medical calls can stretch the City's ability to respond quickly. Thus, the benefits of reducing the scope of calls are that the system can maintain or improve its speed of response overall, and reduce pressure on staff and wear on vehicles. It is important to note that **these are not one-time benefits, but will be compounded over time** with the growth in population and overall demand for pre-hospital medical care.

RISK OF THE RECOMMENDATION

The primary risk of this recommendation is discomfort of citizens who may wait longer for first aid service in non-life-threatening situations. EMS would continue to respond to all medical calls, meaning that no one will be left

without service as a result. Given the focus on reducing lower-urgency call types, there should be **little to no impact on mortality**. The impact on other health outcomes for citizens cannot be assessed with available data.

RECOMMENDATION 2

Implement specialized Medical Response Units to replace pumper crews at select stations

EFRS should replace pumper trucks (and their four-person crews) with two-person Medical Response Units at the following stations:

- Station #1 (Headquarters)
- Station #5 (Norwood)

Medical Response Units would consist of a Sport Utility Vehicle or similar vehicle, staffed by two firefighters and equipped with medical supplies necessary to support the current First Medical Responder level of pre-hospital medical care.

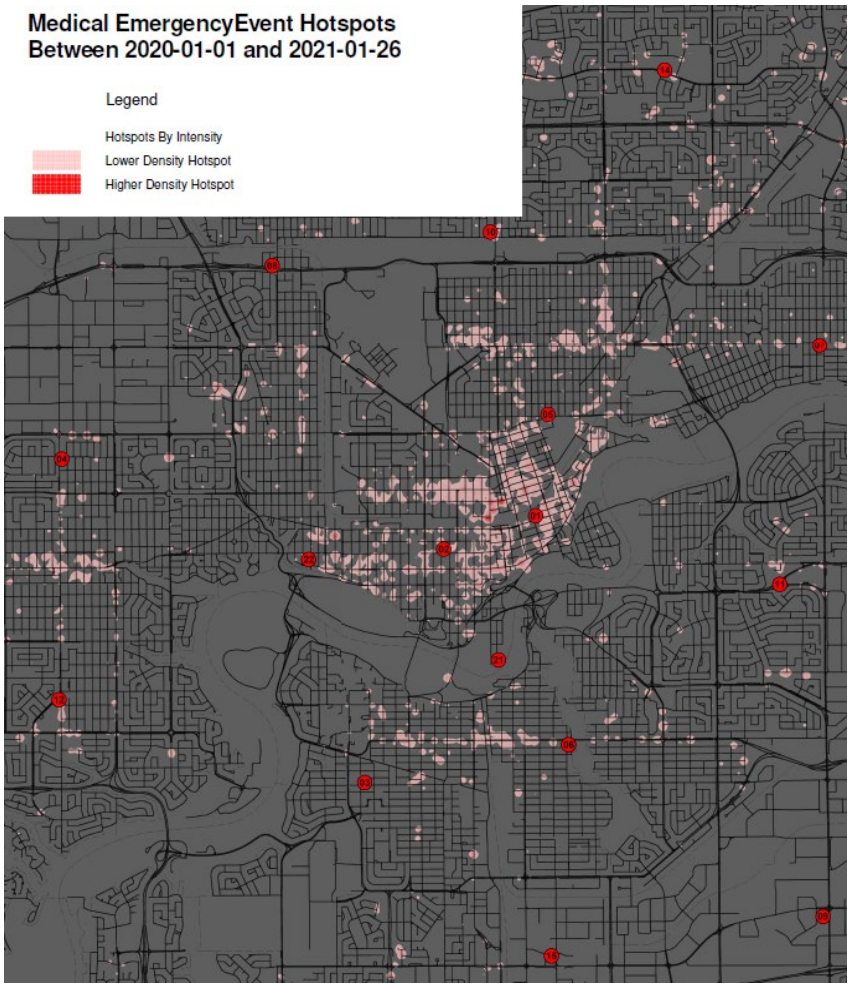
ISSUE ANALYSIS LEADING TO THE RECOMMENDATION

A full four-person crew along with a pumper truck and fire equipment are not required for medical calls. While it was reported by EFRS that extra staff on hand can be valuable (e.g., in controlling a scene or speaking with families), a two-person response should be sufficient, based on the crew size for EMS. With medical calls now accounting for more than two thirds of all emergency events for EFRS, more targeted medical response capability is a viable consideration. **Benchmarking suggests that stations with a high volume of medical calls could replace an active fire rescue unit with a smaller medical response unit**.

- The EFRS deployment model maintains **a minimum of one pumper truck at every station** (except for the Rossdale station where river rescue is based). This pumper unit is the primary engine for fighting fires, and the assumption is that all parts of Edmonton should have quick response from a pumper crew if required. For this reason, the stations selected for Medical Response Units are those that currently have two pumper units – one pumper crew would be replaced at each without leaving either station with no active pumper unit.
- Calgary is an example of a jurisdiction whose fire service deployed two-person medical units with smaller vehicles as a way to address the volume of medical calls being responded to by full fire rescue crews and trucks. Although this pilot was ended due to budget reductions (it was piloted as an add-on, not a substitution of a unit), the **Calgary Fire Department reported it was an efficient and cost-effective way to address the high volume of medical demand**.
- **Other Canadian cities have deployed two-person medical units** as well. Winnipeg Fire and Paramedic Service maintains three small “squads” of two-person crews that respond in vans to lower-acuity medical calls. Similarly, Vancouver currently deploys seven small (two-person) units that respond only to medical calls.

– **The EFRS stations selected for this recommendation respond to a high volume of medical calls**, especially in the downtown core. As per Figure 9,[35] the "hotspots" for medical calls in Edmonton are particularly concentrated in the downtown and 118 avenue areas, near Stations #1 and #5. **The "first due zones" around these two stations show the highest concentrations of medical events across all stations citywide**.[36]

Figure 9: Medical Call "Hotspots" in Edmonton



Source: Figure provided by EFRS based on historical event data

OPTIONS ANALYSIS THAT INFORMED THE RECOMMENDATION

Several related options and alternate approaches were reviewed, and are summarized as follows:

– Medical Response Units could be piloted as an "add on" to existing service, as was done in Calgary. While adding a dedicated Medical Response Unit would reduce the pressure of medical calls on other units, it **would only achieve cost efficiencies if it replaces an existing unit**. Savings would be achieved primarily through reducing the number of staff required for the unit as it deals with medical calls. Further, a service that is added on or in pilot format is more vulnerable to budget reductions at a later date.

– The option of splitting existing, four-person fire rescue crews was explored as well in order to staff smaller vehicles for medical response. This was not preferred, as it has no real benefit when compared with reducing the crew to two people. If half of a four-person crew was deployed as a Medical Response Unit, it is not the case that the other two members would then be available to respond to a different call, even if an extra heavy vehicle was available for them to do so. Within current operating and practice standards, a split crew would simply mean that the remainder of the crew was rendered unavailable.

– Large fires and complex emergencies require multiple EFRS crews to respond, so the question of whether Medical Response Units could join in for larger events was considered. While this may be possible in the future, EFRS suggested that there are operational and equipment factors to be considered – in other words, it is not simply a matter of adding any two firefighters in any vehicle to get closer to the Effective Response Force for a given emergency. At present, it is **assumed that Medical Response Units would not respond to non-medical calls**.[37]

[35] Graphic and hotspot analysis provided by EFRS, based on 2020 data (through January 26, 2021) to support review of Medical Response Units options.
[36] A first due zone is the geographical area in proximity to a fire station and normally served by the personnel and apparatus from that station in the event of a fire or other emergency.
[37] On-scene firefighting practice is not within the scope of the current analysis, and the potential contribution of Medical Response Units crews to a fire rescue event could not be assessed.

IMPACT OF THE RECOMMENDATION

RESPONSE TIME

EFRS estimates that Medical Response Units at Stations #1 and #5 could respond to 22.3% of all medical events in Edmonton within 4 minutes of travel time. Substituting a Medical Response Unit for a pumper unit at Stations #1 and #5 is **projected to have virtually no impact on response times**.

- Modelling conducted by EFRS estimated differences of less than 1% in the success rates of the first unit reaching medical and non-medical events within 4 minutes.
- Similarly, the modelling conducted by the City showed no significant difference in EFRS response times for larger or more complex fire rescue events.[38]

FINANCIAL IMPACT

Cost / benefit analysis of the shift to Medical Response Units must balance the cost to outfit a new vehicle for this purpose against the savings of reduced staffing, based on having a two-person crew in place of a previous four-person unit.

- Two new Medical Response Units would be an estimated investment of $130,000 in fleet. The City has estimated that it would cost up to $65,000 to acquire and outfit a new vehicle for use as a Medical Response Unit. This is based on a new SUV plus the cost of adding lights, sirens, and the medical equipment that is available on a pumper truck.
- Savings can be calculated as follows, assuming that EFRS reduces firefighter positions to capture the savings of the smaller crew:
  - Reduction of two staff per crew, on two crews, which equates to 20 fewer FTE required overall.[39]
  - The reductions in personnel are estimated to save approximately **$1.93 million per year, or $160,000 per month**.
  - Based on the savings from fewer personnel, **the City could recover the cost of adding both new Medical Response Unit vehicles in less than a month**.
- EFRS would have two extra pumper units for rotation and deployment as part of the overall heavy vehicle fleet. Overall wear on pumper trucks would also be reduced as the smaller Medical Response Units would be deployed to calls that would otherwise have required heavy vehicles.

RISK OF THE RECOMMENDATION

Identified risks for this recommendation are minimal, as response time and medical service are not likely to be meaningfully impacted. Replacing these pumper units does not mean that fire rescue units will be slower or unavailable to respond to non-medical calls. Financial risks are also minor given the short span of time to recover costs of new units.

Operationally, the introduction of a new unit type may create a risk of confusion among members of the public between EFRS and EMS, however, this is unlikely to impact the service delivered.

[38] Models were created to test differences in events requiring 16 firefighters as the Effective Response Force on scene, as well as events requiring 24 firefighters.
[39] This is based on four fewer FTE per platoon, multiplied by four platoons, multiplied by the current EFRS staffing maintenance factor of 1.25.

RECOMMENDATION 3

Reduce the crew size for ladder units from four to two firefighters

Each ladder (or aerial) vehicle is currently operated by EFRS with a minimum of four firefighters, which could be reduced to two firefighters at each. There are currently nine aerial units deployed at all times, based at the following stations:

- #1 Headquarters
- #6 Mill Creek
- #7 Highlands
- #10 Lauderdale
- #16 Mill Woods
- #22 Oliver
- #23 Morin
- #24 Terwilliger
- #27 Ellerslie

ISSUE ANALYSIS LEADING TO THE RECOMMENDATION

The jurisdictional comparison identified several other Canadian cities (along with other jurisdictions in the United States and globally) that operate two-person ladder units, demonstrating that it is operationally feasible to reconfigure units in this way. For example:

- Calgary staffs both aerial and rescue units with two firefighters each.
- In Winnipeg, staffing for rescue units and pumper trucks is four personnel, while aerial units are staffed with two firefighters.
- Ottawa Fire Service staffs aerial units with a minimum of three firefighters.

The crew size for EFRS units are related to how many units are needed to respond to an event.

For most events, a single unit (whether 2-person or 4-person) is sufficient to respond.

For larger or more complex emergencies, EFRS has different standards for how many firefighters are required on scene; some events have an Effective Response Force of 16 or 24 firefighters, requiring deployment of multiple units to the event. For these events, two-person ladder units would mean an extra unit was needed in order to reach the required number of firefighters on scene. This could impact response time for the Full First Alarm.

OPTIONS ANALYSIS THAT INFORMED THE RECOMMENDATION

No reason was identified to consider a change in the crew size for only some and not all ladder units. As such, this option was not pursued.

In addition to two-person ladder units, the option of two-person rescue units was considered. A similar change for rescue units could be viable,[40] but was not recommended because:

- If both unit types are staffed as two-person crews and this would necessitate an additional (eighth) unit deployed to complex events with an Effective Response Force of 24 firefighters – currently six units are needed, and two-person ladders would require a seventh.
- Cumulatively, the reductions in required firefighters for two-person ladder and rescue units would total 16% of the current operational staffing levels.
- There are a several instances in the current EFRS deployment where the reduction of a rescue crew would require deeper consideration of the operational impacts. One such instance is the river rescue crew; anecdotally EFRS suggested that reducing this 5-person crew would increase the time to launch the unit. The other is the rescue crew based at Station #3, which forms a part of the EFRS' specialized Technical Rescue Unit.
- EFRS modelling estimated a small compounding effect on response time for a Full First Alarm of 16 firefighters.[41]

IMPACT OF THE RECOMMENDATION

RESPONSE TIME

EFRS' modeling estimated **no significant impact on travel time for the first arriving unit to any call for service**.

For fire rescue events requiring multiple responding units (i.e., a "Full First Alarm" of 16 firefighters), a small decrease was projected in the success rate for assembling the Full First Alarm on scene in under 8 minutes (estimated change from 89.9% success to 86.1%). This represents a **very small projected increase of 16 seconds in the overall speed of response**[42] that may affect **approximately 1% of the total calls for service from EFRS.**[43]

FINANCIAL IMPACT

A change for all ladder crews from four firefighters to two would result in a reduction in EFRS' minimum deployment from 218 to 200. Overall, the staffing impact (across all platoons, and accounting for the staffing Maintenance Factor) could be up to **90 fewer FTEs being required**. The **potential savings from this staffing reduction were estimated at a minimum of $8.70 million per year.**[44]

RISK OF THE RECOMMENDATION

The level and probability of increased risk associated with this recommendation are minimal. A two-person crew does not prevent utilizing the aerial capabilities of the unit. Smaller ladder crews could change the number of crews necessary to respond to infrequent, high-risk emergencies that have large Effective Response Force

[40] EFRS modelling suggests little increased impact on response time even when combined with two-person ladder units.
[41] It was estimated that if both units were staffed with two firefighters, 4.6% fewer responses would reach Full First Alarm in under eight minutes, with a 25 second impact on the 90th percentile response time. Based on 2018 data, 4.6% of fire suppression and alarm events would translate to about 496 events over the course of the year. This is compared to impacts of 3.8% and 16 seconds, respectively, for only ladder units shifting to two-person staffing.
[42] The 90th percentile response time was projected to increase by 16 seconds.
[43] The number of fire suppression calls estimated to stretch Full First Alarm arrival times over 8 minutes under this model would be approximately 500; there are over 50,000 calls for service in a year.
[44] Staffing costs are estimated based on the salary for a fifth-year firefighter, per the most recent collective bargaining agreement. Other related costs, such as benefits and administrative overhead, are not included.

requirements. However, the impact on speed to respond is projected to be very small, and the vast majority of service calls would not be impacted – only calls requiring a Full First Alarm would potentially be impacted.

One of the other ways that risk levels could be impacted is through an increase to the “coverage gap” created by a response to any fire suppression event. When multiple units are deployed as part of the Full First Alarm for one event, these units are not available to respond to any simultaneous event, and so it may take the service longer to respond to a second event because units will be farther away. Thus, requiring an extra unit for a Full First Alarm response may increase the size of the “coverage gap” left behind.

The City conducted analysis and simulated the impact of this coverage gap on event response times based on 2019 data. Median response time for a Full First Alarm was estimated to increase by just over a minute, for about 3,650 events throughout the year.

One of the ways to potentially mitigate risks to response time would be for EFRS to explore alternate response models to achieve an Effective Response Force for a given event. Currently, a Full First Alarm for fire suppression events consists of two pumper units, one aerial unit, and one rescue unit. There may be events for which an aerial unit is not required, and where a Full First Alarm could then be achieved without increasing the number of units responding. Impact on operations and on fire ground activities would have to be understood in detail in order to assess the feasibility of alternate models; this falls outside the scope of the current review.

RECOMMENDATION 4

Adjust staffing levels overnight to reflect the lower volume of calls

This would see a reduction in staffing at four specific EFRS stations that see a large drop in calls during the overnight period from midnight to 6:00 AM. These stations would include:

- #4 Jasper Place
- #9 Roper
- #14 Londonderry
- #20 Kaskitayo

At these four stations, EFRS currently staffs both a four-person pumper unit and a four-person rescue unit on a 14-hour overnight shift from 6:00 PM to 8:00 AM.

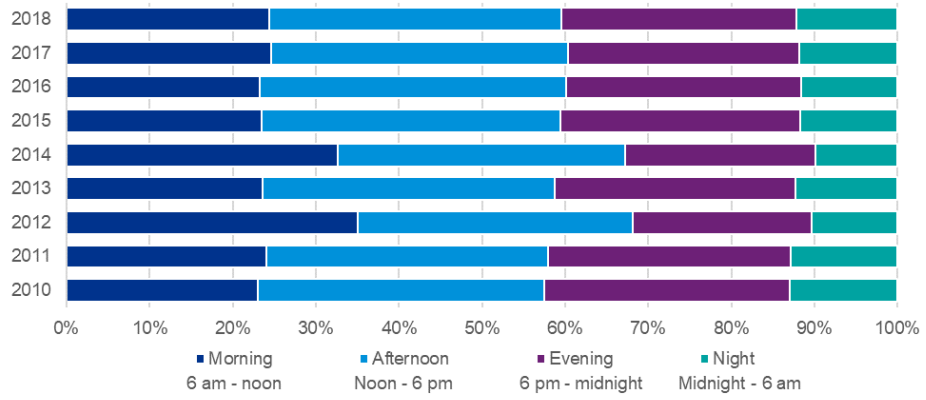
The change would reduce this staffing to one crew that could respond in either unit during the latter portion of the overnight shift – which assumes that the crew is trained for both rescue and pumper deployment. **A specific shift schedule is not proposed**, as there are a number of factors to consider in implementation.

One approach for this change could be to implement a "half shift" for one crew at the station overnight; meaning that staffing would be reduced from 1:00 AM to 8:00 AM.

ISSUE ANALYSIS LEADING TO THE RECOMMENDATION

The **volume of calls received by EFRS reduces significantly overnight, however staffing levels and deployment are consistent at all times**. As illustrated in Figure 10, there is a statistically significant and consistent decrease in call volume during the period from midnight to 6:00 AM – **there are about half as many calls during this overnight period**.

Figure 10: Fire Call Volume by Time of Day (2010 to 2018)



Source: Event data provided by EFRS.

Call volume and vehicle utilization also vary in different locations, with certain stations seeing a substantial decrease in calls received overnight. The stations identified within this recommendation each see substantial

reductions in utilization between the “afternoon” period (from noon to 6:00 PM, when the highest volume of calls occurs) and the “overnight” period (from midnight to 6:00 AM):[45]

- At Station #4 (Jasper Place) utilization is **60% lower** overnight.
- At Station #9 (Roper) utilization is **70% lower** overnight.
- At Station #14 (Londonderry) utilization is **57% lower** overnight.
- At Station #20 (Kaskitayo) utilization is **69% lower** overnight.

These stations were identified as potential options for reduced overnight staffing due in part to the reductions in call volumes / crew utilization from midnight to 6:00 AM; however other factors were considered as well:

- It was assumed that **no station should be deactivated** or left without an active unit overnight, even where call volumes are low. The stations selected each have multiple units, such that a decrease in staffing would keep the station active.
- With multiple vehicles / units on site, it was assumed that either unit may be required, depending on the type of call required. For this reason, it was not recommended to simply deactivate either the pumper unit (which may be required for a fire suppression response) or the rescue unit (which may respond to rescue calls with specialized equipment).
- It is likely that this shift may require a change in how rescue units are deployed to a small portion of fire suppression events, in order to mitigate potential impacts on response time.

OPTIONS ANALYSIS THAT INFORMED THE RECOMMENDATION

A range of options were considered for potential adjustments to staffing levels to reflect reduced risk overnight through substantially fewer calls for service.

The City provided analysis the potential impact of one related scenario: moving from two crews to one crew from 1:00 AM to 8:00 AM, across seven different stations where both a rescue and pumper unit are currently deployed (i.e., the four stations identified above plus Stations #2, #3, and #19). Estimates of impact on response time for events that require a First Full Alarm (16 firefighters) is outlined in Table 10, below. Modelling was conducted across a greater number of stations than what is recommended, so estimated response time impacts are higher than what would actually be expected.

Overall, the most applicable estimate of impact for a First Full Alarm suggests that response time could be increased by just over a minute (using historical data). Modelling also suggests this impact could be less (an increase of 40 seconds if a rescue unit is not included) or more (increase by as much as four and a half minutes) depending how EFRS chooses to manage deployment to these events.[46]

[45] The reductions cited are drawn from actual event data for the first three quarters of 2019 (the fourth quarter was not available at time of analysis). Utilization is a measure of the time that a unit is deployed to events, including “on-air time” and travel time to and from the station, compared with total time on shift.

[46] One model suggested an increase to median response time for a Full First Alarm by 4 minutes and 38 seconds. However, this model included three additional stations in addition to the four recommended. Also, this figure was based on the assumption that deployment should send a pumper unit from the affected stations, and bring the next closest rescue unit from farther away. Sending the rescue unit from the cross-staffed station would be faster, but might result in the first unit on scene being unable to begin pumping activities.

Table 10: Estimated Impact Scenarios for Cross-staffing Rescue and Pumper Units from 1:00 AM to 8:00 AM

	Cross-staffing at Seven Stations	**Historical Data[47] (most applicable estimate)**	Alternate Full First Alarm[48]
Impact of cross-staffing on First Full Alarm Deployment	Pumper unit is dispatched from the cross-staffed station. The next-closest rescue unit is dispatched.		Rescue unit is not required
Estimated change in average response time	Increase by 4:38[49]	Increase by 1:07	Increase by 0:40

Source: City of Edmonton.

Current EFRS shift scheduling means it is difficult to reduce staff or shifts for only the period of lowest call volume – midnight to 6:00 AM. One option that could be considered is adjusting overall shift schedules, such that the kind of shorter overnight shift discussed above could be applied more directly to the time period in question.

This could also make it possible to adjust overnight shifts in other areas of the deployment model in future, as call volumes shift over time. As an example, the shift schedule could be redrawn as per Table 11, while retaining the breakdown between a 10-hour "day" shift and a 14-hour "night" shift as the basic structure:

Table 11: Illustrative Revised Shift Schedule

	Day Shift (10-hour)	Night Shift (14-hour)	Potential Reduced Night Shift for Certain Crews
Current Model	8:00 AM – 6:00 PM	6:00 PM – 8:00 AM	6:00 PM – 1:00 AM (7 Hours)
Example: Revised Shifts	6:00 AM – 4:00 PM	4:00 PM – 6:00 AM	4:00 PM – Midnight (8 Hours)

Source: Example Prepared by KPMG. Current shift schedules provided by EFRS.

Another option could be to reduce staffing for the entire night shift (6:00 PM to 8:00 AM), but call volume data does not support this change.[50]

A specific shift schedule change has not been proposed based on available information; it is recognized that a range of human resource, health and wellness, and collective bargaining factors would have a bearing on any change in the established schedule.

[47] The simulation based on 2019 event data included events from Stations #4, #9, #14, #19, and #20 (i.e., only one additional station to the four recommended). This analysis identified 538 events that would have been impacted, or about 1% of annual service calls.

[48] Given that the increases projected for response time owed mainly to the need to bring a rescue unit from further away, modelling also considered an "Alternate Full First Alarm", wherein an additional pumper unit would be dispatched in lieu of bringing a rescue unit from further away. Research did not identify the makeup in terms of heavy vehicles in a Full First Alarm for the comparator municipalities, so it is not known how an alternate configuration in Edmonton might compare.

[49] This increase was shown within the model for both median response times as well as 90th percentile response times. Analysis suggests that this impact would be concentrated in neighbourhoods outside a central area bounded by Whitemud Drive, 156 Street, Yellowhead Drive, and 75 Street.

[50] The City also provided modelling that reduced from two crews to one crew for the entire night shift (from 6:00 PM to 8:00 AM) at the same seven stations where both a rescue and a pumper unit are deployed. For this scenario, the impact projected on response times increased by almost a full minute when compared to a reduction to only half the shift. Response times for the Full First Alarm were estimated to increase by 5 minutes and 25 seconds compared to the current deployment. This increase was shown within the model for both median as well as 90th percentile response times.

IMPACT OF THE RECOMMENDATION

REDUCTION DURING LOW-VOLUME TIMES

The impact of this change depends to some extent on the exact shift adjustments that are made by the City. The recommended reductions would impact crews that have historically responded to a very small proportion of EFRS service calls. In 2019, the stations selected (#4, #9, #14, and #20) collectively responded to only 2,068 calls between 1:00 AM and 8:00 AM, with only about a quarter of those (523) involving an "overlap" where both units were deployed.

Thus, if crews were reduced as described during this time period, **approximately 1% of EFRS' service calls would have been impacted**.

RESPONSE TIME

The impact on response time cannot be estimated with accuracy, however estimates were generated for the potential impact if staffing was reduced during the 1:00 AM to 8:00 AM period.

Analysis by the City based on actual call responses during 2019 estimated an **increase in median response time of one minute and seven seconds**. It could be expected that the actual impact would be less than this, as one additional station (Station #19) was included in this estimate compared to the four proposed.

FINANCIAL IMPACT

The financial benefit to the City is through reducing crews at these stations, resulting in fewer hours through 16 shorter overnight shifts (4 crews of 4 firefighters each). One way of estimating the value of this change is to calculate the value of hours not worked – over the course of a year, **over $1.8 million in staff time** could be avoided.[51] The hours and costs that could be reduced translate to approximately 19 FTE.

However, **the only way to capture this value as savings would be to reduce staffing levels or compensation**. Staffing requirements for deployment at most times of day would not change.

Without staffing reductions, this recommendation would reduce pressure on existing staffing levels, and in particular on the "maintenance factor" of FTEs employed over and above the requirement for minimum deployment (see Recommendation 5 for additional information).

RISK OF THE RECOMMENDATION

It is important to emphasize that the **recommendation is designed to keep all current stations operating at all hours**, and not to change the types of units available to respond to events, or the areas of Edmonton that are served. As outlined above, the recommended change would **potentially impact speed of response for a small minority of EFRS service calls (estimated at approximately 1%)**. Analysis by the City suggests that this impact is more likely to be experienced away from the center of Edmonton,[52] in areas where stations and units are farther apart.

It is more **difficult to precisely estimate how much slower responses might be** for these calls. The most applicable estimate (median time one minute and seven seconds slower) comes from a simulation completed by the City using 2019 response data. Modelling completed by the City suggests that the impact of response time increases for fire suppression events could be mitigated by adopting an "Alternate Full First Alarm" and dispatching a pumper truck from the station in question in lieu of drawing a rescue unit in from farther away.

[51] Calculation employs the hourly wage average for a fifth-year firefighter per the most recent collective agreement: $44.09.
[52] Increases are estimated to be largest outside a central area bounded by Whitemud Drive, 156 Street, Yellowhead Drive, and 75 Street.

During the course of the review, EFRS staff have suggested that overnight they can encounter service calls that are larger or more complex, even though there are fewer of them. EFRS call data shows decreased volume of calls overnight, including fire suppression calls requiring dispatch of a First Full Alarm. Available data does not adequately show the "seriousness" or complexity of calls such that this feedback can be tested.

The recommended change does increase the potential risk that the overall rescue unit capacity of EFRS could become stretched overnight. If situations were to arise requiring rescue units where they were no longer available (because a crew at the closest station was already deployed on a pumper unit), this could result in a slower rescue response for a very small proportion of calls.

Any shift schedule changes have labour and Collective Bargaining Agreement implications that fall outside the current scope of this Review.

RECOMMENDATION 5

Reduce the EFRS staffing maintenance factor from 1.25 to 1.22

Staffing levels for EFRS include a "staffing maintenance factor". A **maintenance factor** is a staffing modifier ensuring more firefighters are employed than the number required to operate all shifts; this enables backfill to occur due to non-operational demands on firefighter time as well as different kinds of absences.

The current maintenance factor is 1.25, meaning that for every firefighter required to meet minimum deployment, the City maintains 1.25 FTE. It is recommended that the City reduce the staffing maintenance factor from its current level of 1.25 to 1.22.

ISSUE ANALYSIS LEADING TO THE RECOMMENDATION

Staffing is the primary driver of cost for EFRS, and so the sufficiency of the staffing maintenance factor was an important area of analysis for this Review.

The maintenance factor is not about how utilized firefighters are while on shift; it reflects **the demand for non-operational shifts on staff time**. This includes shifts where staff are unavailable for active deployment because of absence, vacation, training shifts (as opposed to training while on shift), or leave.

At present, EFRS requires 218 staff for each operational shift, and maintains four platoons of firefighters to fulfill this minimum through rotating shift schedules. A total of 1,090 FTE are funded to provide the service, which reflects 218 staff across four platoons with a staffing maintenance factor of 1.25.

Anecdotal feedback provided by interviewees suggested that EFRS' firefighters are facing growing pressures on their time, due in part to increasing training requirements. In order to assess the sufficiency of the staffing maintenance factor, data from EFRS on non-operational shifts during 2019 was reviewed.[53]

Based on the actual non-operational shifts recorded (about 44,500, including more than 1,500 shifts categorized as staffing "vacancies"), non-operational shifts represent 22.4% of the shifts available. Although this is not a

[53] EFRS provided summary data on the non-operational shifts incurred during 2019 by firefighters, including: vacation, sick time, leave, training, WCB and LTD shifts, training shifts (by type), and other leaves. The unit of analysis for maintenance factor analysis was "shifts", meaning 12-hour shifts that are devoted to a given activity. This is an average that reflects the fact that half of the shifts worked are 10 hours and half are 14 hours. Summary shift totals and categories of time were provided by EFRS, and not the raw data outputs.

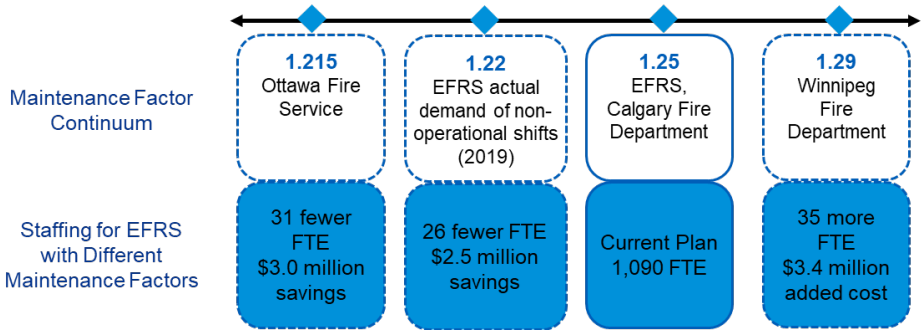
perfect calculation of maintenance factor requirements,[54] it represents a reasonable estimate that **current non-operational demands on firefighter time could be met through a maintenance factor of 1.22**.[55]

OPTIONS ANALYSIS THAT INFORMED THE RECOMMENDATION

Analysis considered the potential for increasing or decreasing the staffing maintenance factor. Relevant considerations included:

- Small shifts in the maintenance factor can have significant FTE and financial impacts, given the size of the Department. A change of 0.01 in the maintenance factor would translate to approximately 8.7 FTE or $843,000 annually in salary costs.
- As shown Figure 11, jurisdictional comparison demonstrates a range of "maintenance factors" applied. **Calgary Fire Department operates with a maintenance factor of 1.25; in Ottawa this figure is 1.215 and in Winnipeg it is 1.29.**

Figure 11: Staffing Maintenance Factor Options



Source: Prepared by KPMG based on Maintenance Factor information provided through Stakeholder Interviews.

- Work had previously been completed by the City on an update to the Fire Rescue Master Plan. The draft material proposed an increase to the maintenance factor, from 1.25 to 1.32. If implemented within the current minimum deployment requirements, this increase would add 61 FTE to EFRS, at an annual cost of approximately $5.9 million.

IMPACT OF THE RECOMMENDATION

This recommendation would have no impact on EFRS' deployment, response time, or service delivery. The primary impact is financial: **a decrease of the staffing maintenance factor from 1.25 to 1.22 represents 26 fewer FTE required and salary cost savings of $2.5 million**.

[54] The summary data provided recorded how many non-operational shifts were recorded across the existing 1090 FTE. This may or may not scale directly to the non-operational requirements required of the base 872 FTE, which would be a more direct measure of the maintenance factor.
[55] KPMG analysis of the summary data differed from the analysis provided by EFRS. EFRS had compared the 44,500 non-operational shifts against the shifts that would be available for 872 FTE and determined that the current demand was about 28% of the shifts available. KPMG revised this estimate based on the fact that the 44,500 shifts were in fact incurred by more than 872 FTE (the full 1090).

RISK OF THE RECOMMENDATION

STAFF OVERTIME

The primary risk of the recommendation is a potential increase in the need for overtime shifts. The relationship between maintenance factor and overtime costs is not clear; however when firefighters are not available within the regular rotation it can generate overtime shifts. EFRS currently has low overtime costs ($2.0 million in 2018, representing only 0.6% of personnel costs), though these costs have been rising rapidly since 2014 (at a rate of around 11% per year). EFRS notes that the current maintenance factor allows backfilling of staff elsewhere, which can save on overtime costs in other areas. In particular, backfilling for Fire Investigations was identified as a benefit of current staffing levels.

Interviewees from the Ottawa Fire Service suggested that a reduced maintenance factor has impacted their overtime costs; the interviewees suggested that these overtime costs have grown from $1.8 million per year to $4 million.

MITIGATING RISKS

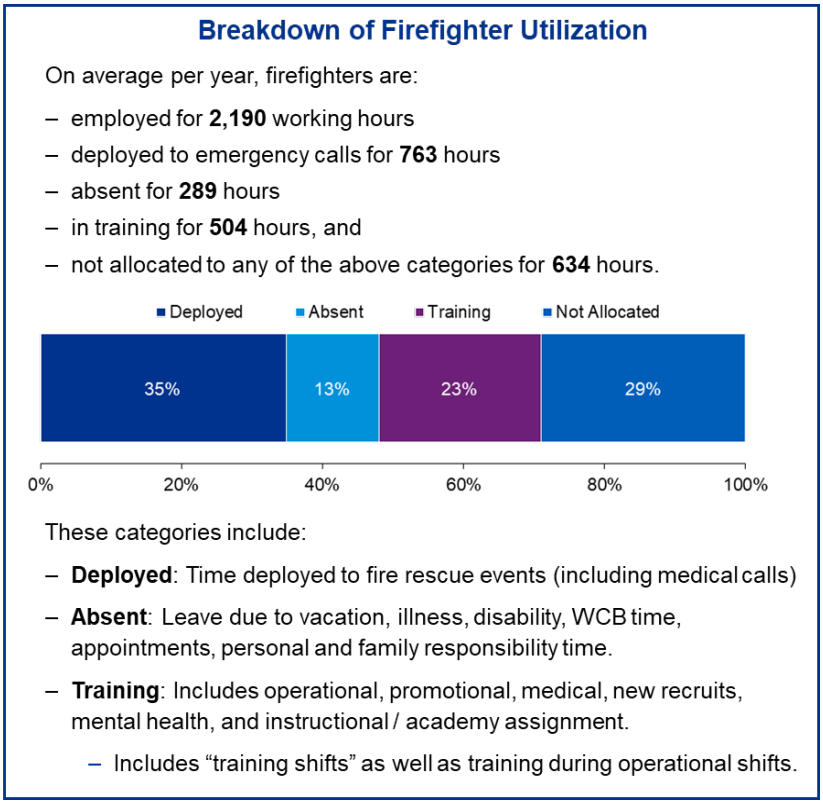
The Review identified several potential options to mitigate the pressure of non-operational shifts on staff.

One option was identified in Recommendation 4 (i.e., to reduce overnight shifts at certain stations). By freeing up whole shifts or “half-shifts”, EFRS would create more capacity for non-operational commitments to fill this time. In particular, there may be opportunities for training shifts (or half shifts) to take the place of the impacted overnight shifts.

For example, consider the scenario described in Recommendation 4, where at four stations there is one crew that works the full 14-hour shift and another that works a “half shift”, from 6:00 PM to 1:00 AM. Over the course of a year, this would free up 5,840 “half shifts” or the equivalent of 2,920 full shifts of time.

If the current non-operational demands on firefighter time required a maintenance factor of 1.22, freeing up these shifts would reduce this burden to an estimated factor of 1.21.

Figure 12: Breakdown of Firefighter Utilization



Source: Event, Training, and Absence data provided by EFRS.

Although training courses, requirements, and content are out of scope for this Review, there may be opportunities to reduce training time (an average of 23% of a firefighter's available time) or free up non-operational shifts if some aspects of training could be delivered "on shift". Some training is reportedly already completed this way, depending on the content and format.

For example, if more mandatory City training or other training could be completed as time permits on shift, this would help mitigate risks of a decreased staffing maintenance factor. Without a detailed review of training or staff utilization, it is not clear what opportunities may or may not exist in this space. A high-level analysis of time as per Figure 12,[56] however, suggests that there is a significant portion of firefighters' time where they are not deployed, and thus available for other duties at the station.

[56] This breakdown reflects a weighted average based on the ongoing training requirements for all Firefighters at their positions as of October 2019. The average also reflects the total first year training requirements for recruits weighted as a proportion of the total staff.

RECOMMENDATION 6

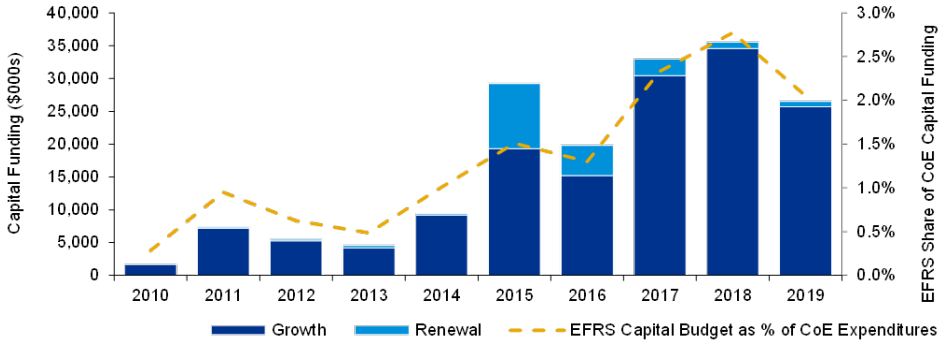
Establish criteria to guide decisions about capital investments in new stations and heavy vehicles

The City should develop criteria that help to determine when investment of capital in a new station is required, and also criteria for investment in new heavy fleet, so that decisions can become more consistent beyond individual business cases.

ISSUE ANALYSIS LEADING TO THE RECOMMENDATION

As per Figure 13, the five-year span from 2015 to 2019 saw a marked increase in capital expenditures for EFRS when compared to the previous five years.

Figure 13: EFRS Capital Funding (2010 to 2019)



Source: City of Edmonton Annual Reports; City of Edmonton Open Data Capital Details.

NEW STATIONS

A **new fire station represents a substantial capital investment**, though the costs of different stations vary according to their intended uses and capacity. Capital costs for acquiring land, design, construction and new heavy vehicles can exceed $30 million, as in the case of the most recent station added (Station #31 – Windermere).[57] The addition of a new station and new crews also carries an ongoing operational cost increase.

Ultimately, Council determines what coverage and service levels are desired for EFRS, and makes decisions through the budget process about when new capital investment is warranted. It was observed, however, that individual business cases are the vehicle for this approval, within an overall plan for future stations created by EFRS. EFRS priorities for adding stations appear to be based primarily on achieving target response times for all areas of the City.

- For each station, EFRS identifies first-due response zones (i.e., areas in which their units are expected to be the first to arrive at an event). When identifying potential future station locations, EFRS reviews its response time capability based on existing and future road networks, traffic patterns, roadways, bridges, access across the river and any other permanent traffic obstructions such as railroad tracks or high-speed roadways.
- EFRS suggested that the goal when locating a new station is to maximize service efficiency and effectiveness and to minimize overlap of first due response zones.
- It was also suggested that population levels can play a role (for example when a new neighbourhood reaches 20,000 people), however no consistent or evidence-based population thresholds have been identified.

[57] At the time of analysis, the Windermere station was not yet complete and operational. Therefore, this station and its added equipment and personnel are not included in deployment figures within this Report.

At present, there are no consistent criteria to guide decisions about when a new station is needed. **There is no clearly recognized standard for balancing the different variables that must be weighed in timing investments in new stations**. Other jurisdictions have begun to increase attention on factors impacting these major capital decisions:

- One interviewee noted that their municipality monitors an adjusted response time metric for new development areas. This is not a situation of setting a lower standard for service, but rather a recognition that new developments on the outskirts of a city are sparsely populated initially, with limited means for the property tax base to fund a new station. An expanding municipality will often stretch response times for existing fire rescue service, but this differentiated metric recognizes that slower response times in new developments can be expected.
- Ottawa has identified a range of "development triggers" that inform new station planning. Triggers consider not only response time, but development progress, unique risks in the area, and changes in land use.
- In 2018, Calgary City Council debated and voted to reject a recommendation from Administration that would've increased the response time target to ten minutes for new development areas.[58]
- The 2020 Winnipeg Fire and Paramedic Service Master Plan recommends that it can maintain or improve their level of service if they reduce the number of physical stations from the current 27 stations and 3 additional EMS facilities to 23 combined facilities. Note that Winnipeg operates a semi-integrated model of Fire and EMS service.

FLEET

Fleet is a significant area of spending for EFRS that has experienced recent growth. Costs for EFRS Fleet have grown by an average of 5.1% per year from 2014 to 2018, with 12% of budgeted funds unspent over that period.

In 2018, the City's Fleet Services conducted a lifecycle analysis for heavy fire vehicles to determine the optimal length of service that balances capital costs with ongoing maintenance time and costs, which tends to increase with the age of the vehicle. While the optimal length of life has now been established, there are several areas in which there did not appear to be a clear decision making process, criteria, or guidelines for capital decisions regarding fleet.

The models of units selected do not appear to be subject to significant options analysis. Specifically, some interviewees noted that smaller units with smaller turning radiuses could help to meet the City's goal for more walkable communities and reduce the need for wide thoroughfares, but that these units are not considered. EFRS expressed a preference for larger units and larger streets in order to maximize access to all areas of Edmonton, especially in winter months when snow becomes an obstacle. Calgary is one jurisdiction that has reportedly reduced the size of its new pumper trucks.

[58] March 19, 2018 Council meeting minutes. Retrieved from: Combined Meeting of Council - March 19, 2018 (escribemeetings.com).

The size of fleet in reserve to allow for maintenance of units is especially relevant as new stations are added or new heavy vehicles are requested. It is not clear how the City determines whether the existing fleet can address the need or when more vehicles are required. At the time of analysis, it was determined that the City has 26 of 81 heavy fire units that are not active at a given time (for maintenance or reserve), and 13 units beyond their recommended lifecycle. No standard was identified to assess this level of reserve, whereby EFRS maintains a reserve equal to 47% of the number of vehicles required for deployment.

Table 12: EFRS Fleet Count by Asset Status

	Pumpers	Ladders	Rescues	Tankers	**Total Heavy Fleet**	Speciality	Water	Trailers	Light	**Total Fleet**
In-Service	35	13	12	8	**68**	14	3	13	32	**130**
Retained Fleet	11	-	1	-	**12**	2	-	2	10	**26**
Consider for Disposal	1	-	-	-	**1**	-	-	-	1	**2**
Total	**47**	**13**	**13**	**8**	**81**	**16**	**3**	**15**	**43**	**158**
Deployed Minimum	**32**	**9**	**8**	**6**	**55**	-	-	-	-	-
Reserve	**15**	**4**	**5**	**2**	**26**	-	-	-	-	-

- **Consider for Disposal**: Units that have exceeded their recommended lifecycle, have been replaced and could be taken out of service.
- **Retained Fleet**: Units that have exceeded their recommended lifecycle and have been replaced with a new unit, but the existing unit has been kept in the fleet and not yet decommissioned. It was noted in our interviews that this approach ensures EFRS maintains more vehicles than the minimum required.
- **Deployed Minimum**: Number of units that are required to be active in order to meet the EFRS deployment model.
- **Reserve**: Total Units minus the Deployed Minimum. These are the total units in service in addition to the standards defined by the current EFRS Station Deployment Model.

Source: Fleet data provided by the City of Edmonton.

OPTIONS ANALYSIS THAT INFORMED THE RECOMMENDATION

USE OF CRITERIA

Ottawa's approach to decision criteria for new stations illustrates some of the factors that Edmonton could choose to weigh in making similar decisions. Ottawa's "developmental triggers" are in the following areas:

- Construction: Completed construction in a growth area meets or exceeds 50% of its forecasted development.
- Risk: Risk value of future development identifies a change in service level.
- Land Use: When a significant area of Ottawa experiences a major, permanent change to land use that results in a significant change to the level of risk inherent.
- Response Level: Response performance falls below the acceptable standard level of response over 15% of the time due to incident volume.
- Growth: New growth and/or development causes a response time to exceed the current standard.

Other considerations for Edmonton might include population or land area thresholds for a station, whether fire hydrants are present, rate of increase in demand, and whether mobile or semi-permanent stations should be considered.

STATION TYPES

Other jurisdictions have implemented alternatives to traditional "brick and mortar" fire stations, partly due to the difficulty of locating stations in a spot that will remain optimal for a full 30 to 50-year lifespan. For example:

- A number of municipalities have implemented combined stations for both EMS and fire services units, recognizing that locations and infrastructure for optimal emergency coverage are frequently shared between

these services. Edmonton currently has very few combined stations; by comparison Calgary has 17 stations co-located with Alberta Health Services.

- Calgary is exploring the use of temporary stations as a cheaper and more convenient alternative to brick and mortar stations. These structures have a lifespan of approximately 10 years and can be commissioned and decommissioned within three weeks.
- Calgary Fire Department also noted that it is pursuing leasing and conversion of an industrial multi-bay complex to house fire rescue teams.

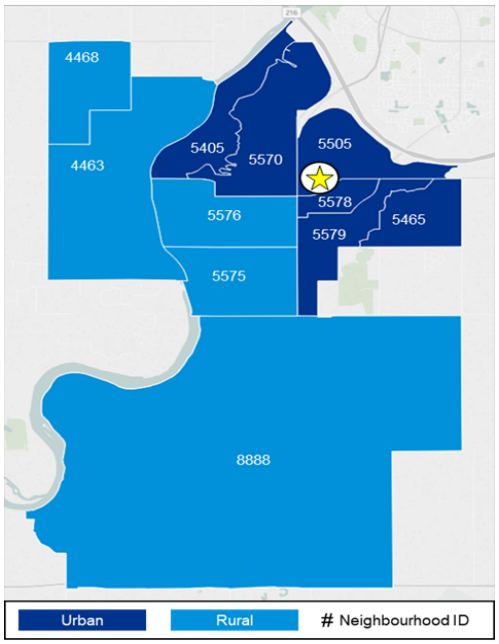
DIFFERENTIATED RESPONSE TIME

Considering different thresholds for response time in new development areas may create opportunities to defer investment in new stations until construction, development, and population are further advanced than otherwise. As an example, the Edmonton's investment in the new station in Windermere was considered:

- Call volume in the area to be served by the new Windermere station is low, on the order of 1 in every 100 calls for service in Edmonton.
- Calls are concentrated within the nearby areas that are further along in development – those illustrated in Figure 14 as "urban" zones. There are some municipalities (such as Ottawa) that have set differentiated response time targets for "rural" and or "suburban" zones.
- Compared against Edmonton's seven-minute response time target, 81% of responses in the area took longer than target time. Compared against a differential measure for new developing areas, however, such as eight and a half minutes, only about half of responses exceed the desired threshold.

Figure 14: Windermere Zone Response Time (2019)

Median Response Time	8:21
Responses longer than 7:00 target	81%
Responses longer than 8:30	49%



Source: Neighborhood Shapefiles provided by the City of Edmonton Open Data Portal; Event data provided by EFRS; Prepared by KPMG.

IMPACT OF THE RECOMMENDATION

The primary impacts of this recommendation are:

- Increased consistency of decisions regarding significant capital investments.
- Increased transparency and accountability, both for timing of fire rescue infrastructure to support new development, as well as for changes in EFRS' capital costs.
- The potential for better alignment between EFRS' capital planning and other City development goals per *The City Plan*.

RISK OF THE RECOMMENDATION

This recommendation is designed to balance risks, specifically the risk that a capital investment is made sooner or later than required. While there is no perfect formula for these decisions, increasing the consistency and transparency of these decisions reduces risk for the City.

There is a potential optics risk should the City choose to consider a different response time measure for new development areas, and/or rural areas. While this can be a helpful trigger for decision making about new capital, it is important to be very clear about whether the City is in fact setting a differentiated *target* or *service level* for those areas, as opposed to acknowledging that consistent coverage will lag development.

RECOMMENDATION 7

Strengthen measurement of performance and outcomes for EFRS

EFRS should strengthen its performance measurement and in particular, the City should partner with Alberta Health Services to be able to assess the effectiveness and value of pre-hospital medical care.

ISSUE ANALYSIS LEADING TO THE RECOMMENDATION

RESPONSE TIME MEASURES

For EFRS as with other jurisdictions, performance metrics are heavily focused on the speed of response. **When it comes to speed, EFRS targets and measures are generally in line with those of other Canadian cities**.

Service level targets vary by municipality and are ultimately determined by Councils based on community need and risk. This is true of "first-in" service level / response time targets (as per Table 11) as well other response targets (such as time to Full First Alarm).

Table 13: Comparator Service Level Targets (First-Due Response Time, 2019)

	Fire Rescue	Medical
Edmonton	7:00	7:00
Calgary	7:00	7:00
Ottawa	7:33 (urban) 8:39 (suburban) 12:06 (rural)	6:26 (urban) 7:40 (suburban) 11:46 (rural)
Winnipeg	7:13	8:23
Vancouver	6:24	6:24

Source: Municipal Annual Performance Reports, supplemented by stakeholder interviews.

Analysis completed for this Review has not identified any reason to adjust the City's response time targets. Edmonton is similar to comparable municipalities in that it has not been able to consistently achieve these targets 90% of the time as envisioned.[59] Moreover, adjusting these targets does not have a simple relationship to operational resourcing or cost. For instance, increasing response time targets only result in savings if:

- Existing stations or units are moved or decommissioned;
- A different staffing or deployment model is adopted; and / or
- Future station development is deferred or reduced.

PRE-HOSPITAL MEDICAL CARE

For a service that represents more than two thirds of calls responded to by EFRS, it is notable that there is currently no way to assess effectiveness of pre-hospital medical care, other than how fast units arrive.

Quality of practice, patient outcomes, and service satisfaction measures are not available to The City – **it is not even possible to demonstrate that EFRS saves lives** through pre-hospital medical care, though anecdotal feedback clearly suggests that this is the case.

This absence of measures is common among other fire departments in reporting related to medical calls. It is, however, an area for improved measurement, given the volume and growth in medical calls. In addition, it was observed that EMS services in different jurisdictions worldwide are shifting away from response time as a sole or a primary measure of effectiveness.[60] There are, however, challenges to be overcome:

- Data is held within different systems. Alberta Health Services maintains health and patient data in a separate system from where EFRS records data on calls answered and services performed. Partnership with Alberta Health Services is required to demonstrate the impact of the service on patients.
- Both EFRS and Alberta Health Services track data separately at the level of individual service calls, including GPS and timing information as well as interventions provided. Bringing together this event data can be challenging – for instance integration of data sets could not be completed even to assess differential response times for the purposes of this Review.
- Reporting on the outcomes of the service would be considered shared performance reporting. Alberta Health Services as the responsible entity for EMS services is in a better position to measure impact on patients, but is not necessarily in a position to observe or track interventions provided by EFRS.
- Outcomes reporting in this space can be complex, as emergency interventions can have immediate as well as longer-term "outcomes" for patients. It can also be difficult to measure what "would have happened" if an emergency intervention had been delayed, or unavailable.
- Sharing of data and common reporting must comply with privacy and health care legislation; for example, there would be privacy issues with sharing data on presenting health issues and outcomes in conjunction with data on locations or date/time of calls.

EFFICIENCY MEASURES

The experience of this Review suggests that regular measures are not available to monitor the efficiency of the service, and in particular to link resource levels to operational performance. Again, this is not to suggest that

[59] Available performance reporting for comparator municipalities does not identify any fire service achieving its response time targets 90% of the time. This "90%" style of metric is common across different municipalities.
[60] Even when it comes to measures of speed, paramedic services are becoming more nuanced, deploying metrics more directly connected to patient outcomes such as time to first defibrillation, time to first CPR, transport to Emergency Room, etc.

EFRS is lagging other jurisdictions in this area, but is identified as an area for improvement and to enhance ongoing monitoring and accountability for the service.

OPTIONS ANALYSIS THAT INFORMED THE RECOMMENDATION

As noted, **no options were pursued for changes to EFRS response time targets**, which represent the bulk of performance measurement for the service. This is because current targets are already aligned with benchmarks, but also because changes to response times are unlikely to achieve a change in quality or efficiency of the service.

When it comes to pre-hospital medical care, challenges to data sharing are significant but not insurmountable. EFRS and Alberta Health Services expressed a willingness to partner in analyzing shared data points within the bounds of privacy and confidentiality. It would be possible to build and automate data sharing or data integration mechanisms to enable better reporting on pre-hospital care, if agreed to by both organizations. However, this would require an investment by both sides to achieve.

The most likely scenario would be EFRS providing data to Alberta Health Services that could be linked with AHS call and patient data, and then receiving anonymized output data relevant to the service provided. Based on the discussions convened during the course of this review, some of the EFRS data relevant to share with Alberta Health Services in assessing outcomes could include the following:

- First-unit response times recorded for EFRS
- Vital signs documented by EFRS before EMS arrives
- Events where CPR was documents
- Events where an airway intervention was documented
- Events where use of an automated external defibrillator was documented
- Events where medication administration was documented
- Events where naloxone injection was documented
- Events where bleeding control was documented to address a serious hemorrhage
- Events where mobilization control was documented

There are no commonly accepted standards for the efficiency of fire rescue services. During the course of the Review, however, several potential measures were identified that could have value both for monitoring efficiency and making decisions about resources. These include:

- Spending per capita
- Funding per fire suppression event
- Utilization and “non-deployed” time for firefighters
- Ratios of non-operational to operational shifts (i.e., measures that monitor the suitability of the staffing maintenance factor)
- Change in overtime costs, overtime as a proportion of personnel costs
- Training costs per firefighter
- Equipment costs per firefighter
- Costs specific to pre-hospital care operations

IMPACT OF THE RECOMMENDATION

The impact of this recommendation is to strengthen performance measurement systems for the City. This is intended to:

- Increase transparency and public confidence in the service and in service levels;
- Demonstrate the value of pre-hospital medical care; and
- Enhance monitoring and decision making related to the efficiency of the service.

RISK OF THE RECOMMENDATION

The primary risk in implementation is the investment of time and resources that may be required to develop new partnerships, measures, and reporting mechanisms.

RECOMMENDATION 8

Maintain the current scope of practice for pre-hospital medical care

The current "First Medical Responder" scope of practice for EFRS should be maintained.

ISSUE ANALYSIS LEADING TO THE RECOMMENDATION

A key line of investigation for this Review is the appropriateness of pre-hospital care service delivered by EFRS, particularly as this service is voluntary but represents more than two-thirds of the events responded to.

There are five levels of service for pre-hospital medical care as defined by Alberta Health Services, listed in order of increasing scope of practice:

- Standard First Aid (least intensive)
- First Medical Responder (current level of service for EFRS)
- Emergency Medical Responder
- Primary Care Paramedic
- Advanced Care Paramedic (most intensive)

Fire rescue **services in almost all Alberta communities operate at the First Medical Responder level** (often referred to as "Advanced First Aid"), as does EFRS. Findings related to the level of pre-hospital medical care include:

- Alberta Health Services interviewees reported that the EFRS medical response is valued, particularly where EFRS is able to respond more quickly than EMS to a life-threatening situation. Alberta Health Services stakeholders reported no desire for the City to decrease the scope of practice (i.e., to Standard First Aid or to discontinue service), nor to increase it (e.g., a formal shift to Emergency Medical Responder level).
- Some EFRS stakeholders suggested that the level of care provided should increase; others preferred to maintain the current level. Stakeholders who advised an expanded scope of practice noted that EFRS responds to a large number of medical calls, and that there are established limits for what kinds of interventions they can deploy according to the agreement with Alberta Health Services. In addition, it was noted that EFRS training currently exceeds the minimum required for a First Medical Responder level.

- Within the First Medical Responder level of service, EFRS has in the past had small changes in scope of practice approved by Alberta Health Services. A recent example is the addition of services such as triage, tourniquet, and EpiPens by EFRS – collectively, these changes had a one-time cost of approximately $233,000 to implement.
- Although the cost of pre-hospital medical care cannot be estimated, there are some indications of related costs for the City:
  - It is estimated that the City spends $610,000 - $735,000 per year in training and certification costs.[61]
  - Per EFRS, medical supplies cost approximately $300,000 per year.
  - The wear on vehicles is increased, as half of the time vehicles spend deployed is for medical calls.[62]
- Cost sharing or cost recovery for pre-hospital medical care services with Alberta Health Services appears very unlikely. Some Alberta municipalities have pursued different arrangements to recover costs, but there is no indication that Alberta Health Services plans to subsidize this service by municipalities going forward.

OPTIONS ANALYSIS THAT INFORMED THE RECOMMENDATION

Changes to the level of pre-hospital medical care are likely not viable for EFRS.

- Reducing scope (i.e., to Standard First Aid or by discontinuing service entirely) would face significant risks related to public expectations, and would reduce the critical and lifesaving interventions that can be deployed by firefighters.
- Increasing the scope of practice beyond the First Medical Responder level would require a significant investment, with an unclear potential benefit in terms of saving more lives (the current benefits cannot yet be quantified either, as discussed in the previous Recommendation).
  - The next level up, the Emergency Medical Responder level, requires Alberta College of Paramedics training, and demands at least 50% more training hours. An average EFRS firefighter already spends around a quarter of their time (approximately 23%) in training.
  - Practice at the Primary Care Paramedic level requires completion of a one-year course.
  - Interviewees noted that higher levels of service would also bring ongoing requirements for clinical practice and clinical supervision that would be difficult for the service to accommodate.

IMPACT OF THE RECOMMENDATION

This recommendation is to maintain the status quo, meaning no new impacts are anticipated.

RISK OF THE RECOMMENDATION

The primary risk in maintaining the current level of care is the continued growth of medical calls increasing pressure on EFRS capacity. Other recommendations within this Report propose ways to help address this trajectory.

[61] Training costs were estimated based on the value of firefighters' time, using average wages as well as EFRS information on training and recertification requirements. These figures include medical training for new recruits. The estimate is a range because of two different data sources provided on training time: the numbers of "shifts" devoted to medical training, and activity (time) reporting showing how many hours were logged.

[62] This statement relies on EFRS call data, which was analyzed to determine how much time was spent deploying to medical and non-medical calls, including travel time and time on scene. Although more than 2/3 of service calls are medical events, these calls tend to be shorter, resulting in roughly equal time deployed to medical and non-medical calls.

Moving Forward

The recommendations of this Review can be understood or implemented individually; each stands on its own and is not dependent on the others. At the same time, it is important to recognize that there are interconnections and overlapping impacts across the suite of recommendations; they should also be understood in terms of their collective impacts.

Overall, the purpose of this Review was to strengthen the relevance, effectiveness and efficiency of EFRS, with a focus on its operations and pre-hospital medical care. The section below describes the future state impacts envisioned for these two areas of focus, taking into consideration the full range of changes recommended.

OPERATIONS

Changes to EFRS operations should streamline the service, while strengthening measurement and accountability.

- Deployment should feature two-person Medical Response Units in place of pumper units at two stations with a high volume of medical calls. In addition, ladder units should be staffed with crews of two instead of four. As a result, EFRS' minimum staff deployment for a given shift should decrease from 218 to 196. In addition, two existing pumper trucks would be added to the heavy fleet reserve for EFRS.
- The staffing maintenance factor should be reduced from 1.25 to 1.22 to reflect current estimates of non-operational demands on firefighter time. This reduction in maintenance factor would be offset by about half through reduced operational shifts overnight at four specific stations. This shift scheduling change would reduce the total number of operational shifts as one crew would deploy in either a rescue or pumper unit during the overnight hours with lowest call volumes.
- The combined impact of changes in deployment (Medical Response Units and two-person ladder units) with the reduction in staffing maintenance factor would result in less required staffing by approximately 107 FTEs, representing an estimated $10.43 million in annual salary costs.
- Organizationally, performance measurement should be supported by better data, and resource decisions guided by more consistent and transparent criteria. In particular, criteria for capital investment would reduce the reliance on individual business cases for approval, and future resource decisions for operations can be better informed by trends in efficiency metrics.

PRE-HOSPITAL MEDICAL CARE

The future state envisioned for EFRS involves concrete changes to help manage the large and rapidly growing proportion of the service that is made up of medical calls.

- The City should address capacity and long-term sustainability by curbing the volume of medical calls that it responds to. This should not reduce the kinds of help that EFRS provides, but would improve the choices about which service calls *not* to respond to. This should be accomplished through a focused review of medical events, and making informed choices in partnership with Alberta Health Services about where EFRS response adds the most and least value.
- With medical calls accounting for more than two-thirds of all EFRS events, the service could start to respond more efficiently by equipping and deploying two-person vehicles in place of heavy fleet staffed by a full crew of four.

- Going forward it will become more important for the City to assess quality and demonstrate impact for pre-hospital medical care as the primary demand (in terms of call volume and time) on EFRS capacity. An expanded partnership with Alberta Health Services will be required to navigate data sharing that can help both services to demonstrate value and optimize EFRS involvement in pre-hospital medical care.

STRATEGIES FOR IMPLEMENTATION

The recommendations in this Report represent substantial changes for the City in terms of scope and complexity. Building on discussions with the City about impact and successful implementation, the following strategies and advice are offered for consideration.

- **Each recommendation (except maintaining current scope of pre-hospital care) requires planning and resources to complete.** For this reason, The City should prioritize and sequence work as required in order to complete changes as quickly as possible.
- **This is a good opportunity to update the Fire Rescue Master Plan and City Policy C523A**. The City's policy framework for EFRS operations is set within these two documents, which are both out of date. In making recommended changes such as shifts to deployment and staffing maintenance factor, The City should take the opportunity to check that these foundational documents reflect the current direction from Council.
- **Staffing levels can be adjusted over time**. The City could adopt a multi-year strategy to reduce staffing to revised target levels, which considers deferring new recruitment, attrition through retirements, and reassignment to vacancies elsewhere in the department, among other options available.
- **Carefully plan and assess impact on fire rescue operations and fire ground activities**. Changes to deployment should be informed by planning and analysis of impact on fire ground activities – meaning how firefighters work to fight fires on scene. For example, if two-person ladder crews are adopted, and / or an extra unit is required to achieve Effective Response Force for a given event, how does that change the organization and division of tasks of firefighters on scene?
- **Actively monitor and evaluate changes**. When making operational changes to any emergency service, it is essential to closely monitor impacts. In this case the effect on response times should be monitored closely, particularly in first due areas around stations that are experiencing changes in staffing and vehicle deployment. In addition, other recommendations offer the opportunity to continue to evolve the pre-hospital medical care service based on stronger information about where EFRS involvement is showing the most impact.
- **Collective bargaining is an important backdrop**. It is important to be mindful that changes to shifts or crew sizes, or the addition of a new unit type (Medical Response Unit) may have implications for the collective agreement of the City and the Edmonton Fire Fighters' Union.

FURTHER OPPORTUNITIES

During the course of the Review, a number of other opportunities to improve the service beyond the scope of the recommendations were identified. These were not prioritized by the City for analysis, but may be worth future consideration:

- **Reviewing Effective Response Force levels that drive minimum required deployment to different event types.** Other cities such as Calgary and Vancouver deploy fewer than the 16 staff required by EFRS for a Full First Alarm, for some kinds of events. The relevant NFPA standard (#1710) was updated in 2020 and changed the benchmark staffing for some events, such as basic structure fires.
- **Updating the Fire Rescue Master Plan and related Policy C523A.** At present, The City is not compliant with the requirement to update this Plan every five years. In addition, the scope of the Plan should be

carefully considered – for instance, The City could explore questions such as whether the staffing maintenance factor should be enshrined at the level of Policy and approved by Council.

- **Addressing the growth in false alarm calls** that place added pressure on EFRS capacity.
- **Determining the optimal amount of training for firefighters**, and in particular what proportion of firefighter time should be devoted to training. There may be opportunities to streamline training to reduce the demands of non-operational time.
- **Exploring the use of different types of fire stations in Edmonton** (including semi-permanent stations and sites repurposed from other uses).
- **Exploring sharing capital costs for co-located stations with Alberta Health Services.** Other municipalities have more co-located stations, but the structure of capital investment and operating costs is not known. For example, 17 of the Calgary Fire Department's 41 fire stations are co-locations with Alberta Health Services EMS.
- **Pursuing greater integration of EFRS and EMS responses to medical events.** Currently there is structural duplication and inefficiency in the system – *both* EMS and EFRS respond to the same calls, with limited ability to share information and data. EFRS dispatch for medical calls is slower than for other calls, as medical dispatch is routed through Alberta Health Services. These and other inefficiencies cannot be addressed by either party independent of the other.
- **Exploring heavy vehicles with a smaller turning radius.**
- **Analyzing different crew configurations for the river rescue unit**, which currently operates with a minimum crew of five. Anecdotally, EFRS has suggested that the main impact of reducing crew size would be a longer turnout time (i.e., longer time to launch the boat).

Appendix A: Methodology

SERVICE REVIEW FRAMEWORK

The following Framework was approved by The City to guide engagement, research, and analysis. This Framework outlines primary lines of inquiry along with sub-questions, areas for analysis, and expected data sources.

Table 14: Service Review Framework

Sub-Questions	Analysis	Data Sources
What is the existing business model of EFRS Operations?		
What is the context within which EFRS Operations operates?	– Public and Council expectations of EFRS – Fire Services Master Plan – Linkages to City Strategy	– Feedback from Council / Public on EFRS (prior surveys, interviews, other engagement) – Fire Services Master Plan – City strategic documents, including "ConnectEdmonton" – Edmonton Fire Rescue Services Core Values – CFAI Agency accreditation – Recognized International Standards / Best Practices (e.g., NFPA 1710, NIST High-rise study, Metropolitan Fire Chiefs Association white paper Deployment & Staffing)
What are the economics of EFRS Operations?	– Operating funding and expenditure over past 10 years – Capital funding and expenditures over past 10 years – Fully loaded cost / event type – Ratios to inflation, service levels, population, and scope of service, number of fires, level of fire risk	– Financial information / datasets (revenues, expenditures) for operating and capital costs for the previous ten years – Documentation outlining levels of service – Statistics Canada (inflation, population, etc.) – Municipal Census – City statistics on fire response – Interviews with Finance – Fire Rescue Services allocation of the City of Edmonton total municipal operating budget expenditures over past 10 years
What programs and services does EFRS Operations deliver and how does it deliver them?	– MRM program and service inventory for EFRS Operations and mapping to functions within the organizational structure – Scope of practice for EFRS Operations – Model for event response and deployment – Response performance data by event type (fire, medical, rescue, other) including the number and	– Business Plans – Interviews with Fire Services Leadership, Operational Leadership – Policies and procedures related to Operations – Fire Services 'Staffing' and deployment model & related documentation / standards, including deployment of resources (personnel, by credential) and equipment – 2019 EFRS Organizational Chart

Sub-Questions	Analysis	Data Sources
	types of rescue personnel and fire apparatus / vehicles available at and dispatched by each station.	
What is the organization and governance model for EFRS Operations?	– Alignment with City policy – Relationship to development and building standards – Organizational structure and model / key functions and roles – Staffing levels, including management and administration	– Fire Services Policy & procedures – Related other City Policies (Building & development standards) – 2019 EFRS Organizational Chart / Structure – Operations Fire Services Leadership, and supporting administration FTE data (past five years) by position type – Interviews with Planning & Development, Integrated Infrastructure Services, Urban Form, and other relevant City departments
What are the dependencies on other departments or partners?	– Impact of Fire Standards on the City's development practices – Assess the alignment of standards between Fire Rescue Services and Urban Form and Corporate Strategic Development – Assess the alignment of standards between Fire Rescue Services and Integrated Infrastructure Services – Dependencies with service delivery partners – Current role in service delivery from a greater Edmonton /regional perspective	– Interviews with Planning & Development, Integrated Infrastructure Services, Urban Form, and other relevant City departments – Policies / documentation (e.g., development standards, fire code) from Planning & Development, Integrated Infrastructure Services, Urban Form, other relevant City departments – Level of Service Agreements with Partners (Alberta Health Services, EMS, EPS) – Interviews with partners (Alberta Health Services, EMS, EPS)
What technology supports EFRS Operations?	– Dispatch, CAD technology, communications and analytics – IT and operational reporting – TeleStaff (utilized for rostering/scheduling)	– Interviews with operations personnel – Interviews with IT, data analysts within departments – Interviews with Chief of Emergency Communications – Reporting documents and dashboards
What is the infrastructure and locations of EFRS Operations?	– Equipment, stations and vehicles – Distribution of resources and coverage – Risk assessment model for station-based deployment	– Asset inventory & listing – GIS asset data – Data on resource distribution across station locations – Policies / procedures / standards or frameworks on risk assessment models for deployment
What key measures are used by EFRS Operations?	– Service level targets – NFPA Standards – Accreditation status – Appropriateness of measures	– Documentation that outlines service levels, (including City Policy, Fire Services Master Plan) – Key metrics / measures and data sources used to measure against level of service standards

Sub-Questions	Analysis	Data Sources
		– Documentation summarizing requirements for NPFA standards; key measures used by the City against these standards – Data dictionaries (describe how measures are calculated)
What people and skills are used by EFRS Operations?	– Resourcing / FTEs over past five years – Ratios to inflation, service levels, population, and scope of service, number of fires, level of fire risk – Skills / capabilities – Training pathways and standards	– Operations FTE data (past five years) including description of title / positions (including volunteer) and credentials – Statistics from Statistics Canada, City data – Job descriptions – Documentation / policies outlining training pathways and standards – Interviews with Fire Services leadership
How does the 2012 Fire Services Master Plan relate to City Policy?	– Purpose / contents of 2012 Fire Services Master plan – Purpose / contents of the City Policy – Identify gaps / overlaps of information and content	– Interviews with Fire Services leadership – Interviews with City Legal / Policy experts – Current Fire Services City Policy (C523A) – 2012 Fire Services Master Plan – Documentation / data as inputs for the updated Fire Services Master Plan – Logic models
How is the service performing today?		
How does the current level of service measure against / align with existing targets, City Policy, the Fire Rescue Master plan, and the existing business model?	– Current actual levels of service against service targets outlined in the City Policy, Fire Rescue Master Plan, and other documents – Analysis of resourcing levels against current level of service	– Current Fire Services City Policy (C523A) – 2012 Fire Services Master Plan – Performance metrics & data – Performance reporting documentation – FTE data – Costs of service to deliver current levels of service
What are the current strengths and challenges in achieving the desired level of service performance?	– Strengths and challenges (opportunities for improvement) of the model – Primary drivers / root cause of challenges in achieving desired performance	– Interviews with Fire Services Leadership, Operations Leadership – Survey with Operations personnel – SWOT workshop with Fire Services & Operational leadership
Through benchmarking, how does the level of service compare with other jurisdictions?	– Service level targets in other jurisdictions – Performance against service level targets by other jurisdictions – Comparison of the City against performance by other jurisdictions, contextualized by population, overall expenditures,	– Jurisdictional scan interviews – Jurisdictional benchmarking (publicly available statistics)

Sub-Questions	Analysis	Data Sources
	statistics around urban density and growth rate	
What changes, if any, to the service's current business model, including event response and deployment, are required to improve the level of service efficiency/effectiveness/relevance?		
How does the current business model compare to other municipalities or leading practice?	– Identification and comparison of the business models of other jurisdictions – SWOT analysis on current model – Leading practices research and trends – Risk analysis of current model vs. jurisdictional models	– Jurisdictional scan interviews – SWOT working session with Fire Services Leadership, Operations leadership (other personnel as required) – Leading practices research
What are the impacts on related departments / partners?	– Impact on development practices – Impact / changes to improve alignment of standards between Fire Services and Urban Form, Corporate Strategic Development, and Integrated Infrastructure Services – Role in service delivery from a greater Edmonton / regional perspective	– Interviews with Planning & Development, Integrated Infrastructure Services, Urban Form, Corporate Strategic Development, Integrated Infrastructure Services – Interviews with Alberta Health Services, other partners
What changes are required to increase efficiency and effectiveness?	– Current and future demands of services offered by Fire Rescue Operations – Risk associated with like structures and geographic areas – Required response (deployment, equipment, resources) to meet industry best practice targets for fire and rescue events – Opportunities for resource reallocation and revised staff deployment models – Future staffing requirements vs. future levels – Appropriate fire apparatus / vehicle for the business area given demand for service, event type, and risk	– Future municipal growth projections, including urban density and area – Interviews / working sessions with Fire Services Leadership, Operations Leadership, and Operations personnel as required – Data on response (station location, equipment / apparatus used, resources, etc.) by event type – Event type statistics by City geographic location, structures, density, etc. – Assumptions on staffing levels (projected growth)
Should our administration propose changes to the City Policy and / or the Fire Services Master Plan?	– Appropriateness of level of service – Alignment to Fire Services Master Plan – Appropriateness of existing business model (e.g., pre-hospital medical care)	– Based on changes to increase efficiency, effectiveness, and operating model – Interviews with Fire Services Leadership, Operations Leadership

Sub-Questions	Analysis	Data Sources
	– Flexibility of the Fire Services Master Plan (i.e., ability to change service level targets) – Risks to changing the Fire Services Master Plan – Risk to Public safety – Risks to Firefighter Safety – Risk to Public Confidence – Risk to capacity (equipment & staffing) to respond to GOA requests for large event support, regional Municipality Aid	
What are the financial implications to both the City and citizens or businesses based on any change to the business/operating model?	– Impact of deployment models on rate of insurance for businesses – Impact of changes to FRS pre-hospital (medical) care services – Budgetary impacts – Sources of funding	– Interviews with Finance – Jurisdictional Scan Interviews (assumptions from alternate models) – Expenditure data – External research studies and other municipal reviews, including but not limited to the Positive Economic Impact of Firefighting Study
What is the appropriateness of the level and degree of pre-hospital (medical) care provided by the service?		
What is the current scope of practice for pre-hospital care by Firefighters?	– Outline current scope & mandate to provide pre-hospital medical care – Levels of service / standards – Alignment with training, capability, and capacity of Firefighters	– Service level agreements – Policies and procedures – Business Plans – City Policy and Fire Services Master Plan 2012 – Training pathways / requirements
What are the current metrics for medical events?	– On call evaluation time / call dispatch time / turnout time – On scene arrival time for Fire / for EMS – % of hospital transports needed – % of cancelled calls for Fire enrooted	– Fire Services performance metrics for medical events, including by event type – Related EMS performance metrics (response times, % of time they arrive before / after Fire, number of resources) – Review Event Evaluation Dispatch & Travel time pre and post 2009 medical Response restructure
What is the appropriateness given the legislation and mandate of existing partners?	– Existing legislative and legal requirements – Jurisdiction of partners (Alberta Health Services, EMS)	– Interviews with City Legal department – Interviews with partners (Alberta Health Services, EMS) – Leading practices research on similar entities
What are leading practices for pre-hospital medical care, and what are	– Trends in metrics (fire vs. medical response) in other jurisdictions, and response to those trends	– Jurisdictional scan interviews – Literature / research on EMS / Firefighters as providers of pre-medical care

Sub-Questions	Analysis	Data Sources
other jurisdictions doing?	– Research / studies done on level of risk, effectiveness, and efficiency of Fire vs. EMS pre-medical care	
What changes to the level and degree of prehospital medical care could be considered by the City?	– Future demands / trends for pre-hospital medical care service in Edmonton and region – Service delivery by other entities – Collaboration with partners – Risk associated with level of care – Level of service provided – Required response & staff deployment	– Future municipal growth projections, including urban density and area – Data on response for Fire Services, EMS – Interviews / working sessions with Fire Services Leadership, Operations Leadership, and Operations personnel as required – Interviews with partners (Alberta Health Services, EMS)
What are the costs / benefits for increased / decreased pre-hospital care by Firefighters?	– Patients perspective – Health care system perspective – Taxpayer perspective – Service duplications / gaps – Process improvement – Impact on response times (e.g., proportion of time Fire Services arrives before EMS) – Risk borne by the City – Relationship with related stakeholders (e.g., Alberta Health Services) and their unions – Provincial funding	– Literature / research on EMS / Firefighters as providers of pre-medical care – Existing experience surveys from patients / the public – Performance metrics (Fire Services vs. EMS) – Interviews with Fire Services Leadership and Operations Leadership – Interviews with Operations personnel – Interviews with stakeholders & unions

Source: Prepared by KPMG.

BENCHMARKING

Benchmarking of relevant fire services was completed in order to better understand the fire operations landscape in Canada, identify examples of leading practices, and operational effectiveness / efficiency that might be applicable to Edmonton.

Desktop research was conducted to identify leading practice and relevant models for comparison and consideration as options. In addition, benchmarking against the following comparator jurisdictions was completed, as approved by the City: Calgary, Ottawa, Winnipeg, and Vancouver.

Jurisdictional comparison relied on publicly available information and telephone interviews with fire operations leadership. The results of this work were summarized in an interim deliverable and informed the development of options and recommendations.

The table below summarizes the interviews conducted as part of this work.

Table 15: Jurisdictional Comparators

Jurisdiction	Role	Area of Inquiry
Calgary	Deputy Chief of Operations Manager, Strategic Services	Operating Model
	Deputy Chief Deputy Chief, Fire Rescue Services Support Manager, Strategic Services	Pre-Hospital Medical Care
Ottawa	Fire Chief Deputy Chief of Training & Safety Program Manager, Operational Support Services Specialist, Strategic Programs and Project (CFAI accreditation)	Operating Model & Pre-Hospital Medical Care
Vancouver	Fire Chief / GM of Emergency Management Deputy Chief	Operating Model & Pre-Hospital Medical Care
Winnipeg	Assistant Fire Chief	Operating Model
	Fire Chief Medical Director	Pre-Hospital Medical Care

Source: Prepared by KPMG.

STAKEHOLDER ENGAGEMENT

Stakeholders from within EFRS and outside the service were engaged to understand the current operating model. Stakeholders were identified by EFRS and approved by the City as outlined below.

It is important to note that previous work completed by the City and provided at the start of this Review also included substantial stakeholder engagement, including direct engagement with frontline EFRS staff.

Table 16: City of Edmonton Stakeholder List

Stakeholder Group	Format
EFRS Stakeholders	
Fire Chief	One-on-one interview, 2 hours
Deputy Chiefs (5)	5 one-on-one interviews, 1 hour each
Platoon Chiefs (4)	4 one-on-one interviews, 1 hour each
District Chief (1)	One-on-one interview, 1 hour
Chief of Special Operations	One-on-one interview, 1 hour
Chief of Emergency Communications	One-on-one interview, 1 hour
Chief of Investigations	One-on-one interview, 1 hour

Stakeholder Group	Format
Chief Training Officer | Dean and Registrar of Training Academy (2)	Group interview, 1 hour
Fire Protection Engineer	One-on-one interview, 1 hour
Performance Reporting | Surveys | Data Analysis (4)	Group Interview, 1 hour
Property Administrator | Logistics Captain (2)	Group Interview, 1 hour
Emergency Systems | GIS Analysis (8)	Group Interview, 1 hour
EFFU Representatives (5)	Group Interview, 1 hour
Non-EFRS Stakeholders	
City of Edmonton Representatives	
Edmonton Policy Service Representatives (4)	1 One-on-one interview, 30 minutes 1 Group interview, 1 hour
Citizen Services Department Deputy City Manager	One-on-one interview, 1 hour
Citizens Services Department Representatives (2)	2 one-on-one interviews, 1 hour each
Representatives from Departments of Integrated Infrastructure Services and Urban Form and Corporate Strategic Development (8)	Group interview, 90 minutes
City Legal | Risk Management | Policy Subject Matter Experts (3)	1 One-on-one interview, 30 minutes 1 Group interview, 30 minutes
Representatives from City Operations Department (6)	1 One-on-one interview, 30 minutes 2 Group interviews, 30 minutes each
Representatives from Financial and Corporate Services Department (5)	2 Group interviews, 30 minutes each
External Stakeholders	
Alberta Health Services EMS Edmonton Zone Representatives and MFR Program Manager (6)	2 Group interviews, 1 hour each
EFRS Medical Director	One-on-one interview, 1 hour

Source: Prepared by KPMG.

Appendix B: Data Analysis Notes

EFRS CALL VOLUME AND EVENT DATA

- Populations statistics for the City of Edmonton are compiled via Municipal the Municipal Census for 2009, 2012, 2014, 2016 and 2019. A straight-line growth assumption was used for non-census years to compare growth rates with EFRS call volume growth rates.
- Call volume data in this report is based on the count of events from the event response time log. This number which totals 403,502 from 2009 to 2018 differs from the amounts reported in the 2018 Fire Rescue Master Plan. This discrepancy could be largely explained by the capture of medical events in the event log which dropped significantly in 2013, 2017, and 2018. It is assumed this drop is an error in reporting and thus the total number of medical events were replaced for these years with the amounts reported in quarterly KPI reporting. The number of events in event logs were kept as provided in the calculation of unit hours and average call handling and response times.
- Event response time and travel time for 2019 events appeared mislabeled in the dataset provided and so were switched prior to any data analysis.
- Statistical analysis used to identify significant factors impacting response time used regression trees to quantify the impact of each factor for response times.
- Discrepancies in baseline performance reporting for response times exist due to differences in total population size of events recorded. (e.g., First Unit response times for 20 staff Technical rescue events is ~2.5 minutes slower than the response time of the entire effective response force).
- Event response time in 2019 was calculated as on-air time plus travel time, while prior to 2019 the response time also included evaluation time and dispatch time.
- Fire suppression events from the event log provided are assumed to be calls coded as ST (structure fires) or NF (non-structure fires). This number which totals 31,986 events from 2009 to 2018 differs from the amounts reported in the 2018 Fire Rescue Master Plan which ranged from 42 to 54 suppressions events per 1,000 population per year, or 41k events per year on average.
- Some data anomalies were observed. For instance, calculating the percentile for 7 minute response times from the event log, including dispatch time, on air time, and travel time, for fire and medical events resulted in similar percentiles for fire events as presented in the Fire Rescue Service Focus Area Report (87% VS. 85% in 2017) but very different percentiles for medical events (95% vs. 69% in 2017). The difference cannot be explained but the response times for medical events are assumed to be correct.
- There was information for only 5,012 events between 2009 and 2019 on whether a fire was or was not contained in its room of origin. In comparison, there was over 15,000 structure fires alone during the same period, not including responses coded as alarms and non-structure fires, which may introduce sampling error.

UTILIZATION

- Crew utilization, used for calculating the difference in service volume based on time of day, was a measure generated using the EFRS event data described above.

- Crews were assumed to be utilized from the moment a call is received at the responding station until the crew has returned to the station. This calculation includes on-air time, travel time to the event, on-scene time, and travel time back to the station (assumed as equal to the travel time from the station to the event).
- The time of day for a call is based on the time the call was received. For example, a call received at 11:59 PM would be attributed to the evening time slot (6 pm – midnight) regardless of how long the event lasted.

TRAINING

- Training costs were estimated based on the value of firefighters' time, using average wages as well as EFRS information on training and recertification requirements. These figures include medical training for new recruits. The estimate is a range because of two different data sources provided on training time: the numbers of "shifts" devoted to medical training, and activity (time) reporting showing how many hours were logged.

STAFFING AND EQUIPMENT COSTS

- In the calculation of the financial impact of the various recommendations represented in this report, the average staff salary cost of $96,668.00 or $44.09/hr was used, based on the fifth-year firefighter wage from the most recent collective agreement (2016). Hours per FTE were assumed to be 2,190. The report denotes where hourly or annual salary figures are used.
- An appropriate dedicated medical response unit was assumed to be a Chevrolet Tahoe or a similar truck. The City provided an estimate of the cost of approximately $65,000 for this unit.
- The payback period was calculated by comparing implementation costs to the annual salary costs avoided through the reduction in FTE described. Within one month, the salary costs exceeded the costs of a new Medical Response Units unit.

GEOSPATIAL DATA AND ANALYSIS

- When analyzing the impact on service levels of the under-construction Windermere station, a listing of the neighbourhoods that would primarily be served by the Windermere station was required.
- Geospatial analysis was conducted to show each Edmonton neighbourhood for which the Euclidean distance of the centre of neighbourhood was closer to the Windermere station as compared to other Fire Stations.
- This was completed using shapefiles from the City of Edmonton's Open Data portal and highlighted a mix of 6 urban and 5 rural neighbourhoods in southwest Edmonton that should primarily be served by the Windermere station (upon completion).
- Once the service zone was identified, analysis of events and response times was aggregated by neighbourhood ID using the complete event response data provided by EFRS.

EFRS MODELING

Analysis on three potential options was completed by City staff in the EFRS Accreditation and Continuous Improvement Area and Analytics Centre for Excellence, with the support of a third-party contractor. The three options analyzed were Cross Staffing, Two-person Ladders and/or Rescues, and Medical Response Units. This analysis was used to estimate the impacts on response times. EFRS worked with KPMG to determine reasonable assumptions for both modelling (estimating future impact) and simulation (analysis of past event data). Overarching assumptions as provided by the analysis team are as follows:

- The analysis was done without operational staging/tactics, logistics and experiential considerations.

- The analysis used both modeling and simulation:
  - Models were used to predict the effects of different changes. They show both high-level city results and at the neighbourhood level. They are predictions based on projected data not absolutes. Useful for comparing different scenarios and understanding the magnitude of changes rather than the exact change.
  - Also used was simulation that looked at historical data to determine what would have happened if a change had been made. This shows where the impacts occur and more detail to the size of effect and can also show overall broad impact.

Let’s do this.

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