CITY OF VANCOUVER

CITY CLERK'S DEPARTMENT
Access to Information & Privacy Division

File No.: 04-1000-20-2021-360

August 24, 2021

s.22(1)

Dear s.22(1)

Re: **Request for Access to Records under the Freedom of Information and Protection of Privacy Act (the "Act")**

I am responding to your request of July 5, 2021 for:

> **Vancouver Fire and Rescue Services needs analysis conducted in late 2018 by Darkhorse Analytics.**

All responsive records are attached.

Under section 52 of the Act, and within 30 business days of receipt of this letter, you may ask the Information & Privacy Commissioner to review any matter related to the City's response to your FOI request by writing to: Office of the Information & Privacy Commissioner, info@oipc.bc.ca or by phoning 250-387-5629.

If you request a review, please provide the Commissioner's office with: 1) the request number (#04-1000-20-2021-360); 2) a copy of this letter; 3) a copy of your original request; and 4) detailed reasons why you are seeking the review.

Yours truly,

[Signature on file]

Barbara J. Van Fraassen, BA
Director, Access to Information & Privacy
Barbara.vanfraassen@vancouver.ca
453 W. 12th Avenue Vancouver BC V5Y 1V4

*If you have any questions, please email us at foi@vancouver.ca and we will respond to you as soon as possible. Or you can call the FOI Case Manager at 604.871.6584.

Encl.

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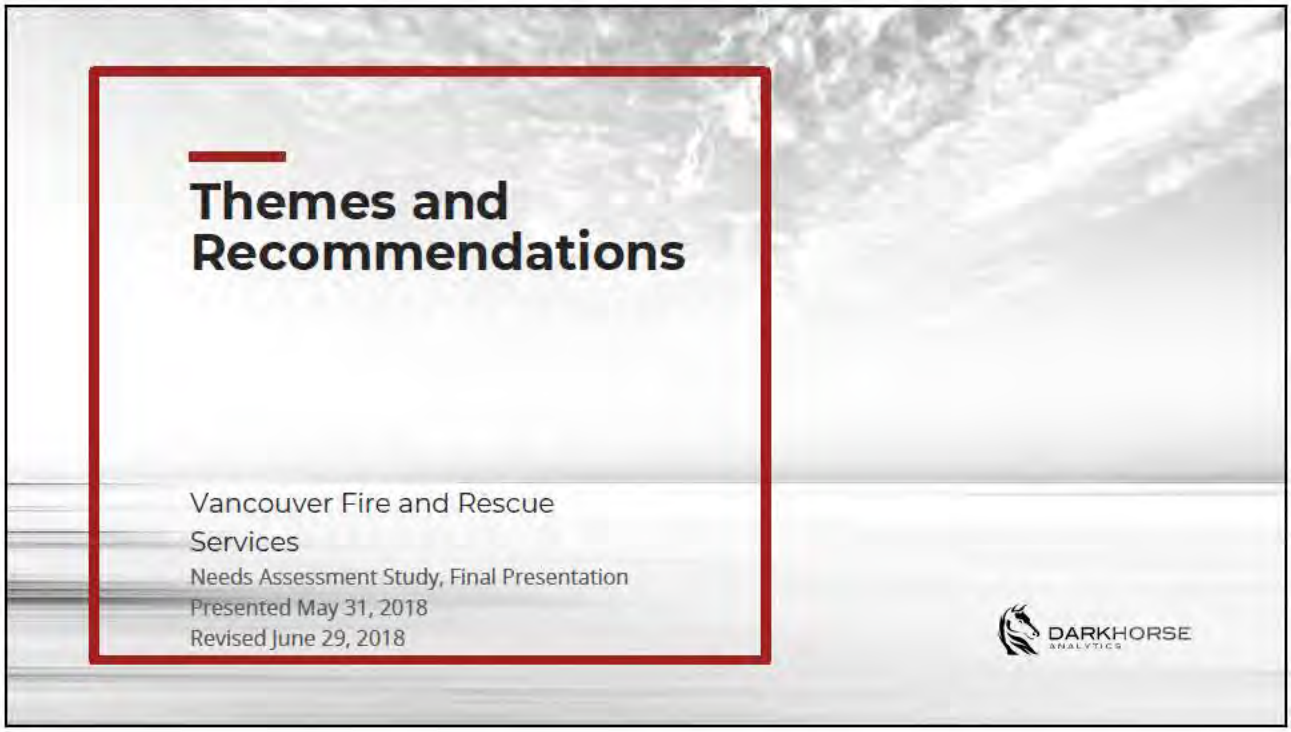

This is the final presentation for the Needs Assessment Study performed for Vancouver Fire and Rescue Services (VFRS) by Darkhorse Analytics. It was commissioned to understand the risk profile and resource requirements of VFRS both today and into the future, and inform the Strategic Plan that will be developed by VFRS in 2018. The project began in February and concluded in May 2018.

Executive Summary

Vancouver Fire and Rescue Services (VFRS) engaged Darkhorse Analytics to perform a Needs Assessment Study between February and May of 2018. The goal was to understand their risk profile, current and future resource requirements, and to inform the Strategic Plan that VFRS will be developing in the latter half of 2018. We approached this from three directions: (1) understanding the perceptions of people within and outside the organization, (2) understanding where VFRS stands when compared to its peers, and (3) using data analytics to create objective measures and recommendations. We discovered that VFRS is running a very lean and efficient operation, but is reaching a breaking point in the face of unprecedented call growth.

In the first phase of the project, we conducted interviews and workshops to engage a broad group of stakeholders. They were selected to be representative of all levels and areas of VFRS and included stakeholders within the City of Vancouver, Vancouver Police, E-Comm, BCEHS, and UBC. At a high level, the stakeholder engagement paints the picture of a high-performing, professional and respected department that has been able to adapt to significant challenges and constraints.

It is clear, however, that VFRS is stretched to its limits. The opioid crisis and overall rising

call rates have taken a toll. Staff are feeling burnt out and experiencing empathy fatigue. The top priority identified is that VFRS does not have sufficient resources and equipment to handle challenges such as increased building heights, densification, new building materials and road impedances such as bike lanes.

Besides resourcing, some other themes came up in the stakeholder engagement.

- **Training** across all areas is perceived as lacking, particularly with hands-on and specialty unit training.
- **Health and wellness** is in need of attention. There is a concern about maintaining physical fitness and mitigating longer-term health risks.
- Although the culture is becoming more supportive of mental wellbeing, staff desire better access to external support systems.
- There is new found confidence and **optimism around the leadership team**. The factors for improving this are transparency, open communications, accountability and greater involvement in decision-making.
- There is a **keen interest in data analytics**, evidence-based decision-making, measuring to and achieving NFPA 1710 standards, and seeking CPSE accreditation.
- VFRS has a good relationship with most of its external stakeholders, although there is room to **improve coordination** with various City departments and clarify roles, responsibilities and accountabilities with BCEHS.
- The community-at-large has a positive and supportive view of VFRS, but when it comes to recruitment, **VFRS struggles to attract a diverse group of candidates**. To have a department that genuinely represents Vancouver, it must work to improve its image as an employer-of-choice within the diverse communities across the city.

How does VFRS compare to its industry peers? We compared broadly to publicly available statistics for 45 North American cities and conducted in-depth interviews and surveys with 4 Canadian fire services (Toronto, Edmonton, Calgary, Ottawa) and two American integrated (Fire & EMS) services (San Diego, Seattle). The benchmarks supported much of what we heard in the stakeholder engagement phase - namely that Vancouver is busy, works efficiently, but is nearing a tipping point.
To provide a clearer perspective, in 2017, VFRS saw 94 incidents per 1000 residents, while Canadian services ranged between 26 and 53. The average VFRS hall responded to 3,342 incidents, while most other Canadian cities were in the 1,500 range. The average firefighter in Vancouver responds to twice as many incidents as the average firefighter in any other Canadian city. They also have the highest injury rate and the fewest trainers per operations staff.

Vancouver's budget for the fire service (dollars per incident) is in the bottom 20% across North America while the non-operational staff is proportionally the smallest in the Canadian cohort. In addition, VFRS is increasingly busy. Emergency incidents have increased 10% each year since 2014. In the two years between 2015 and 2017, overdose incidents across the city have almost tripled while medical demand doubled at Hall 2 in the Downtown East Side, the busiest hall in the city. In terms of outcome measures, the

result is predictably poor. Within-target-time responses dropped from 74% in 2015 to 66% in 2017. For comparison, other Canadian services we were able to get numbers from range between 69% and 92%, while the NFPA target is 90%.

Most of the growth has occurred downtown, with smaller pockets around the periphery. Unfortunately, although the City is well-covered with fire halls, each hall has relatively minimal staffing, and VFRS is not set up well to quickly handle high-risk responses which require a larger crew. The most significant drivers of poor response performance are slow turnout times and low unit availability (units busy on other calls). The mathematical analysis suggests that focusing efforts on improving turnout times and increasing staffing on existing apparatus is the most efficient path to increasing response performance and reducing risk.

Our final recommendations focus mainly on the short and medium term and attempt to find the highest leverage opportunities to reduce risk and improve response performance.

In 2018, we recommend the following:

- **Pursue CPSE accreditation** to guide the transition to a high performing, evidence-based service.
- **Develop a data-driven culture** by building an analytics team to support education and decision-making
- **Improve coordination with BCEHS** to address dispatch, transfer of care, and joint planning
- **Continue to build connections with stakeholders** particularly those departments in the City where duplication of efforts can be reduced (for example, building inspections)
- **Bolster physical and mental health, wellness and safety** by adding appropriate safety and personal wellness and developing a comprehensive wellness plan.
- **Continue to build culture and diversity** by adding outreach programs and personnel
- **Complete development of a comprehensive training program** to reach training levels comparable to peer services.

Through the medium term (until 2022), we recommend that VFRS continue to improve operations through faster turnout and alarm handling times while adding resources where they will have the most benefit to the service. In particular, we recommend:

- **Reduce turnout times to 1m45s, 90% of the time** by setting station-specific targets and engaging all staff in accurately tracking and improving times.
- **Achieve NFPA alarm handling targets** through streamlined call evaluation and dispatch processes.
- **Bolster training staff** to ensure adequate opportunities are available for operational staff.
- **Add prevention and public education resources** to reduce volume and severity of fire calls through targeted community risk reduction activities.

- **Add firefighters to improve response performance** and address risk exposure in under-served parts of the city.
- **Develop station plans for the long term** by continuing the firehall renewal capital plan, planning to replace poorly located halls, and increasing capacity in the downtown and the Cambie corridor areas.

These five-year recommendation create a total 122 FTE positions comprised of firefighters (100), prevention and public education (10), community outreach, inclusion and diversity (2), analytics (3), training (1), safety officer (4), mental health professional (1), and accreditation manager (1).

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OVERVIEW

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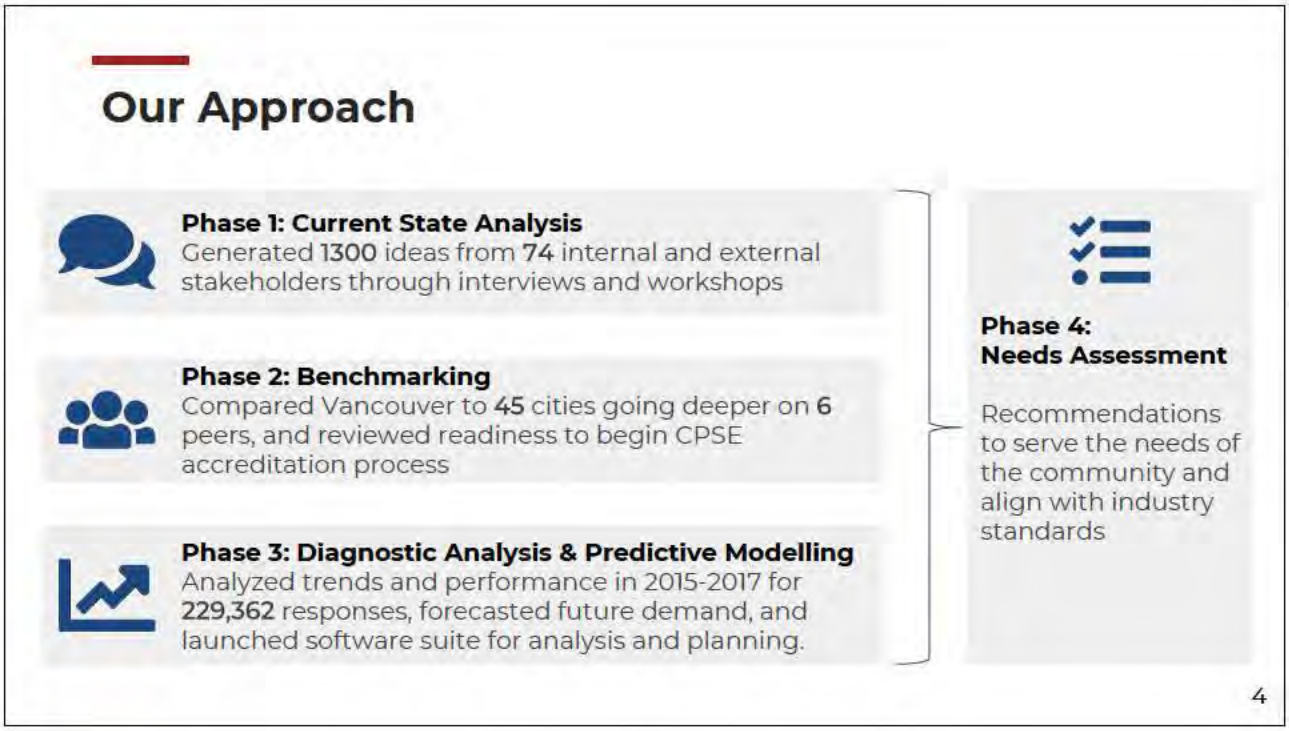


Phase 1: Stakeholder engagement: interviews, workshops
Phase 2a: Accreditation
Phase 2b: Benchmarking
Phase 3a: Diagnostics: data cleansing (spatial/temporal outliers, calculating time intervals), performance calculation, overgoal analysis, ERF analysis
Phase 3b: Diagnostics: hot spot analysis, ERF overgoal analysis, forecast method (derive population growth, apply call rate per event category), units busy analysis, diagnostics tool
Phase 3c: ERF Performance, call forecasting, coverage analysis, hall modelling, specialty unit deployment, station locator tool, crewing analysis
Phase 4: Consolidation of findings
Phase 5: This report

Phase Alignment

Each phase confirmed findings from the others, without conflict

Phase 1: Current State Analysis

Examples:
Need for training, identified staff burnout, lack of resources. No mention of more halls.

+

Phase 2: Benchmarking

Examples:
Low trainer to ops ratio, high injury rate, high calls per firefighter, good hall density.

+

Phase 3: Diagnostic Analysis

Examples:
Poor turnout times, high call volumes, unit availability problems, new halls not urgent

=

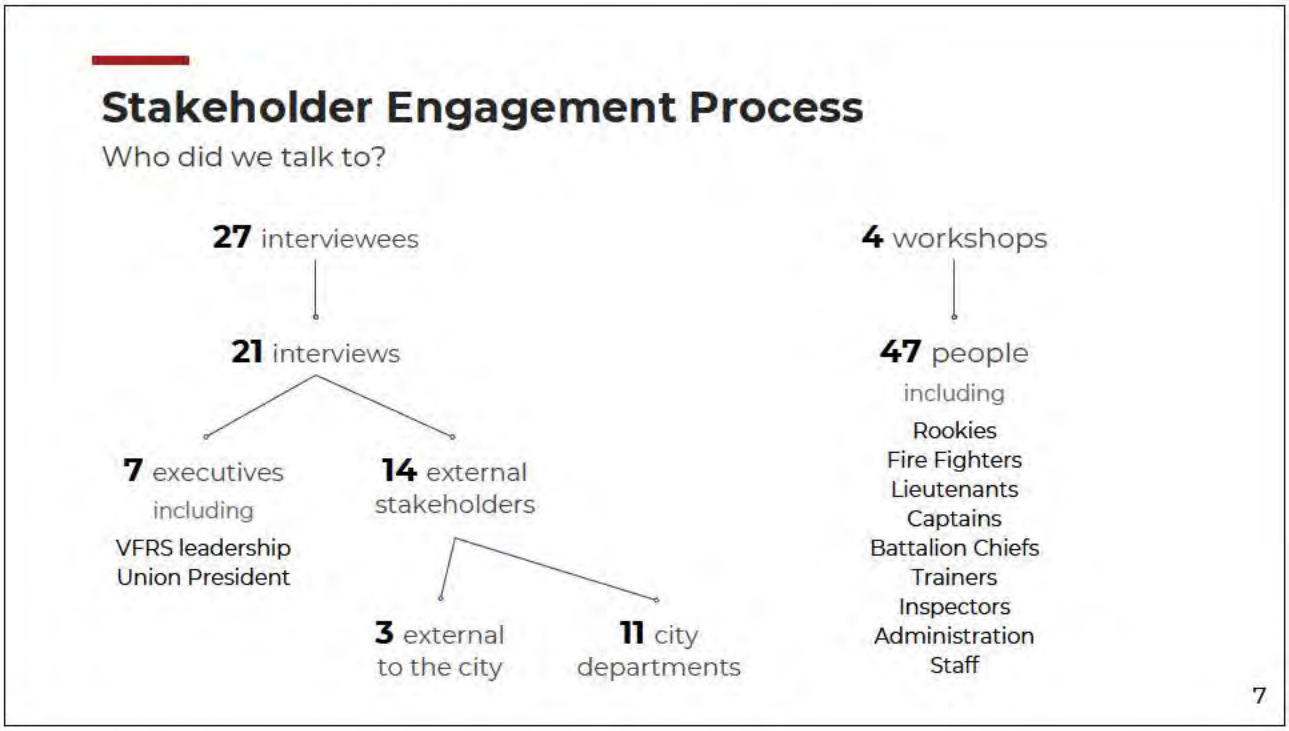
Agreement

5

In these types of engagements, complete agreement is actually somewhat unusual. Often, opposing perspectives come to light with different inverview groups. Impressions may not always match objective facts. What is seen as unique to one organization may actually be the case across the industry.

We did not encounter these issues. The feedback received in interviews and workshops was very consistent across all the different groups of participants. Benchmarks against other departments supported what we heard from stakeholders. The operational data told the same story.


PHASE
SUMMARY
Permissions
Participation
Respect
Listening
Fun!
PRIORITIES
1. Increase Resources
2. TRAINING
3. HEALTH & WELLNESS
4. HARD SCHEDULE
5. SICK PLAN
6. Recruitment
7. Release from routine calls
6



In the first phase of the project we engaged a broad group of stakeholders that were representative of all levels of areas of VFRS, as well as various departments within the City of Vancouver, BCEHS, E-Comm and UBC.

The interviews were designed to answer guiding questions such as:

- How well is VFRS currently meeting its obligations to the community?
- How well is VFRS working with internal and external stakeholders and vice versa?
- Does VFRS currently have the adequate training, certifications and specialized teams at the appropriate locations to carry out its mission?
- Is VFRS currently meeting its minimum performance levels?
- What are the key issues that are currently impacting VFRS' ability to carry out its mission?

We received an incredible breadth of information and very constructive feedback regarding VFRS strengths and opportunities.

These were the general themes around which interview findings were grouped. Key findings around these themes are in the following slides, but additional details can also be found in the Appendix.

Comments/feedback on each priority can be found in the Stakeholder Engagement Study

Key Findings from Interviews

Topic: **Performance**

WORKING WELL / IMPROVING

Able to adapt to resource constraints
Severity of fires is well controlled when VFRS arrives

TO BE IMPROVED

Accountability & trust
Communication & transparency
Greater focus on prevention and education
Acquisition of resources/assets process
Development of standards

RISKS

Lack of resources, staff, and budget
Expanding mandate
Lack of standards (eg: NFPA 1710)
Dispatch inefficiencies
Reactive mentality

CHALLENGES

Use and allocation of resources to meet VFRS's mission
Opioid Crisis
Access to sites
Increasing Workload
Burnout / Compassion fatigue

EXTERNAL FACTORS

Densification
Verticality is increasing
Opioid Crisis
Access to sites
Increasing call volumes

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Key Findings from Interviews

Topic: **Training**

WORKING WELL / IMPROVING

- Specialty teams training
- Increased focus on certifications
- Seniority based promotions
- Willingness of staff for all forms of training

TO BE IMPROVED

- Strategy
- Resources
- Scheduling
- Responsibility and accountability
- Certifications / Accredited programs
- Training in some specialties (marine, special ops, etc)
- Need to develop metrics to monitor the effectiveness of training being provided

RISKS

- Lack of training

CHALLENGES

- Managing overtime hours with union to support training is difficult
- The frequent movement of people resources often negatively impacts training

EXTERNAL FACTORS

- Increasing call volumes

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Key Findings from Interviews

Topic: **Health & Wellness**

WORKING WELL / IMPROVING

'Resilient Minds' has been well received
Reinstituting team fitness in the fire halls

TO BE IMPROVED

Overall health plan
Using data more effectively
Identify benchmarks to monitor and measure against
Need to do more medical, fitness, mental health, and resilience screening in the recruitment process
Combating compassion/empathy fatigue in firefighters
Investment into physical health equipment

RISKS

Long term health impacts due to industrialization and building materials
Cancer
Substance abuse

CHALLENGES

Promotion and maintenance of physical and mental health

EXTERNAL FACTORS

Opioid Crisis

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Key Findings from Interviews

Topic: **Culture**

WORKING WELL / IMPROVING

Teamwork, professionalism and commitment to getting the job done
Recently improved communication
Trust in leadership
Optimism with the leaderships vision
There is a strong sense of pride in VFRS

TO BE IMPROVED

Community outreach, diversity and inclusion
Methods and mechanisms of communication (eg: use of social media)
The unique paramilitary system that VFRS employs is a point of difference that is not well reconciled by external stakeholders

RISKS

Low morale and staff complacency

CHALLENGES

Budget restrictions impacting manpower, equipment, real estate for fire halls
Low morale and staff complacency

EXTERNAL FACTORS

Increasing cost of living in Vancouver

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Key Findings from Interviews

Topic: **External Stakeholders & Partners**

WORKING WELL / IMPROVING	TO BE IMPROVED
Confidence in the new leadership of VFRS	Relationship with BCEHS
The relationship with VPD	Communication processes
Coordination of large events	Definition of mandate and core services
	VFRS involvement in city planning
	Evidence based decision making

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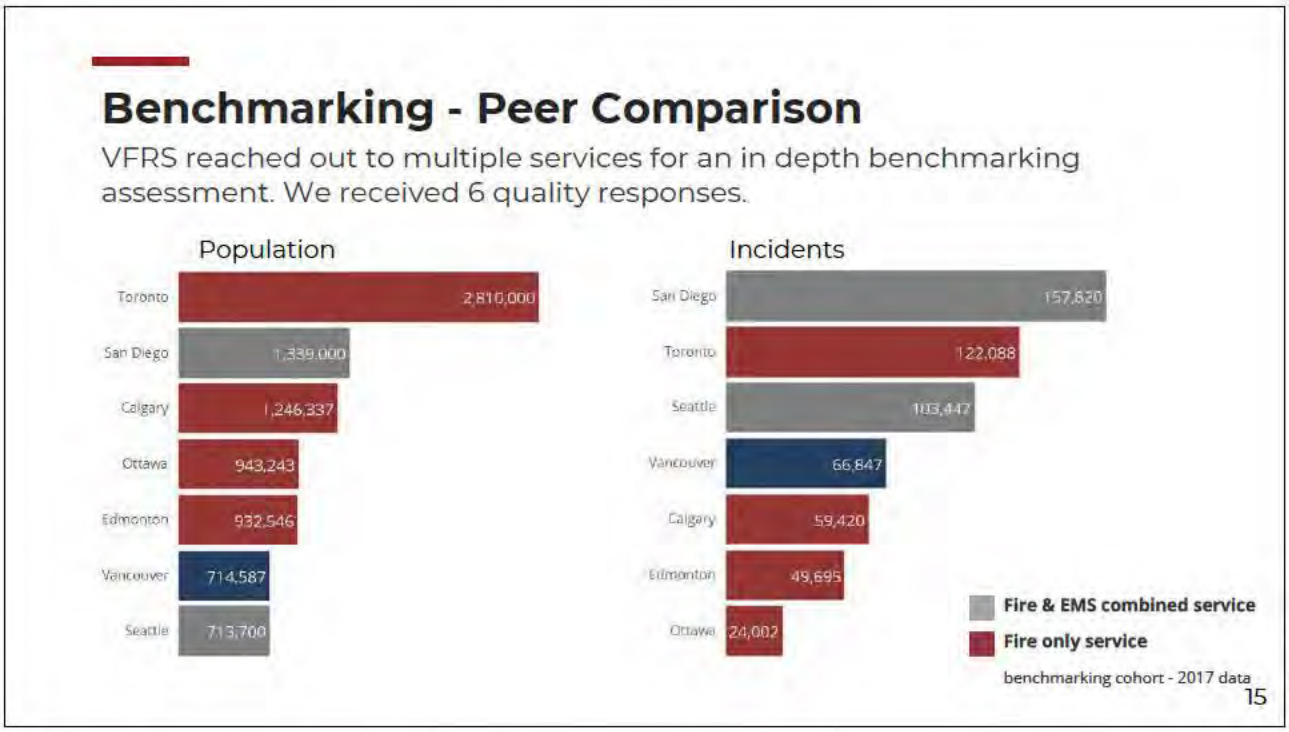


In this phase of the project, VFRS identified 9 cities that they wanted to compare against. In the end, we had 6 quality responses from Toronto, Edmonton, Calgary, Ottawa, San Diego, and Seattle. We pursued Portland as well, who agreed to participate but later had to disengage.

Though the city Vancouver has the smaller population amongst the selected cohort, VFRS incident volume is above Calgary, Edmonton,and Ottawa
As well, Darkhorse gathered public data on 45 other cities for a broader look. Boston Fire Department was identified as a close comparable to VFRS.

See Benchmarking report for further depth.

Vancouver's population number is based on:

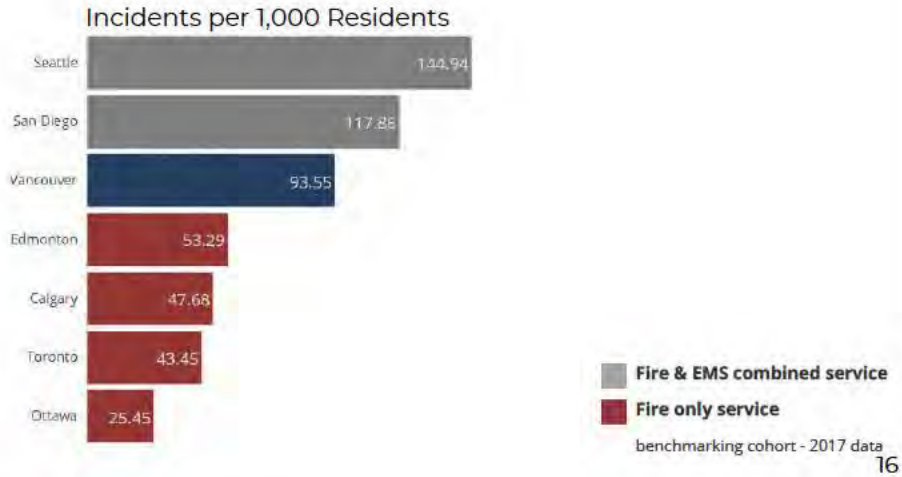
1. **City of Vancouver** (* Information located in 2016 Census) - **631,486 people**
2. **University of Endowment Lands** (* Information located in 2016 Census) - **16,133 people**
3. **University of British Columbia** (* Sourced by IAFF Local 18 from a representative at University of British Columbia Planning and Institutional Research Representative) – **66,968 people**

Total census population: **714,587** People

It is also worth noting that Vancouver has a significant daytime population exceeding Census estimates. These are commuters, tourists, visitors, and homeless people. The IAFF Local 18 estimate daytime population is **818,824** people.

Vancouver has a high rate of incidents per resident

More than double than the other Canadian Fire-only services



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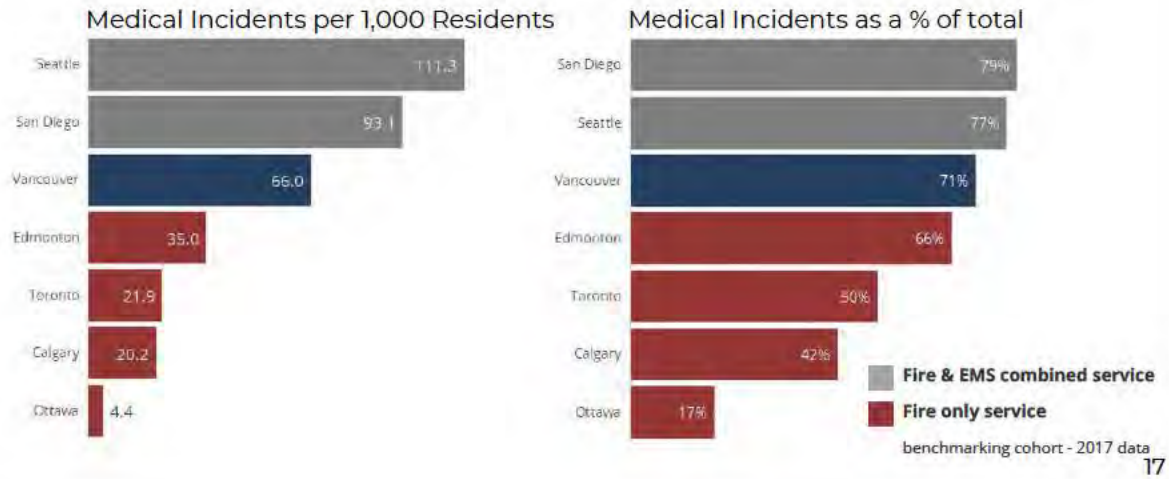
Comparing Incidents per 1,000 residents, we see that Vancouver has the highest rate compared to the other Canadian Fire-only services by almost double.
VFRS looks like a combined Fire and EMS service.

High volumes are mostly driven by medical calls

Making VFRS look like a combined Fire-EMS service.



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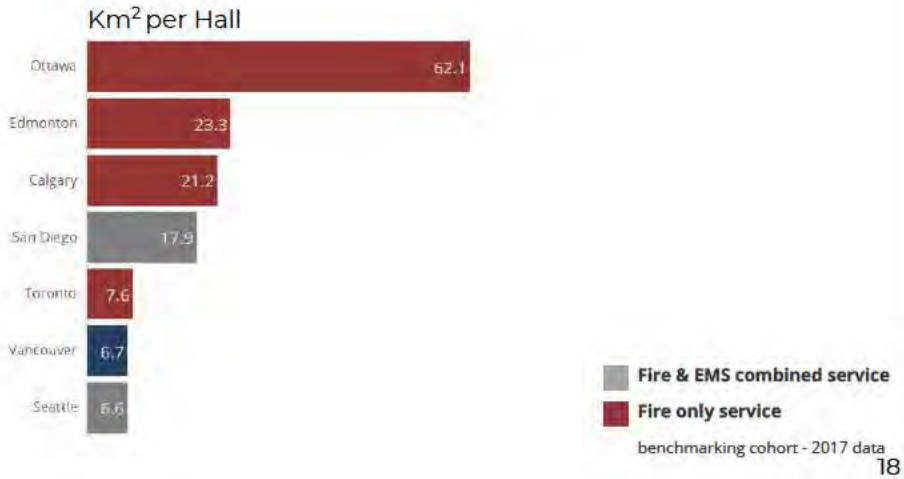
Looking at only medical incidents, again VFRS deals with an relatively high volume for a Fire-only service.

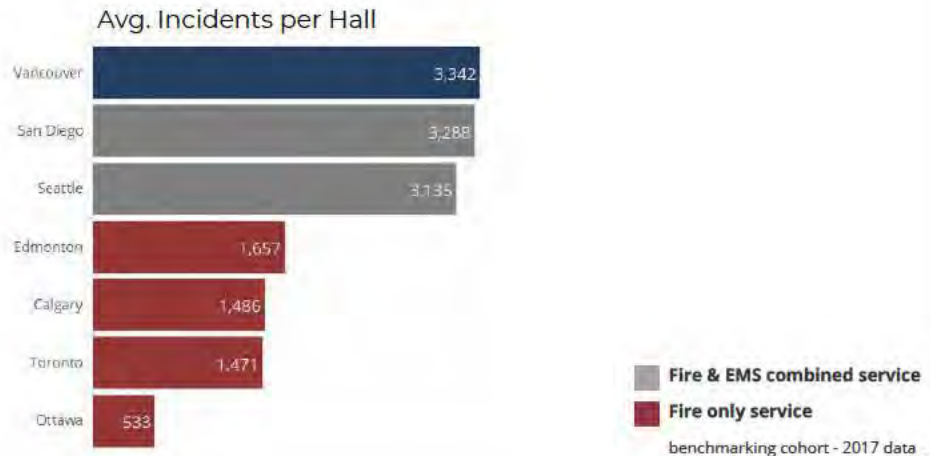
Vancouver is well covered compared to its peers

Station density is high, however, given the population density and the incident volume this is necessary.



However, VFRS halls on average are the busiest

More than double that of the Canadian Fire-only cohort



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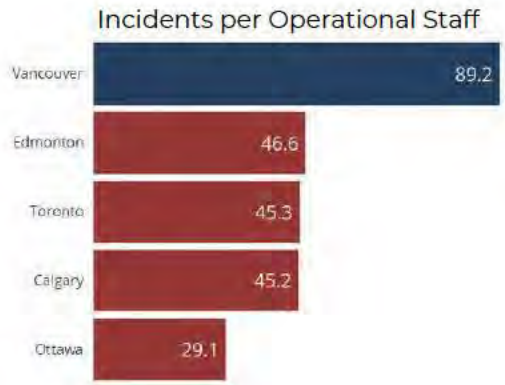
Station busyness is the highest amongst the cohort, despite the high station density. Worrisome, especially when looked at compared to Canadian Fire-only services.

Vancouver is doing more with less

As expected, VFRS ops staff is much busier compared to the Fire-only service cohort



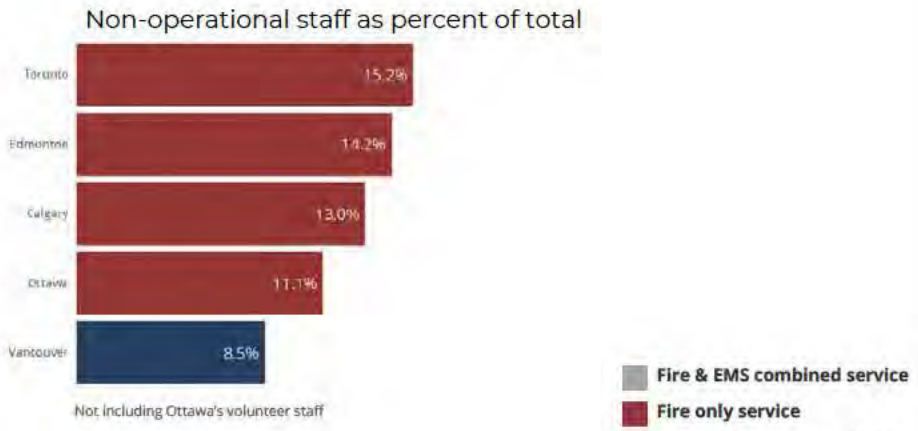
Fire & EMS combined service

Fire only service

benchmarking cohort - 2017 data

And, with a relatively small non-operational staff

Lean management team, prevention team, training staff, etc



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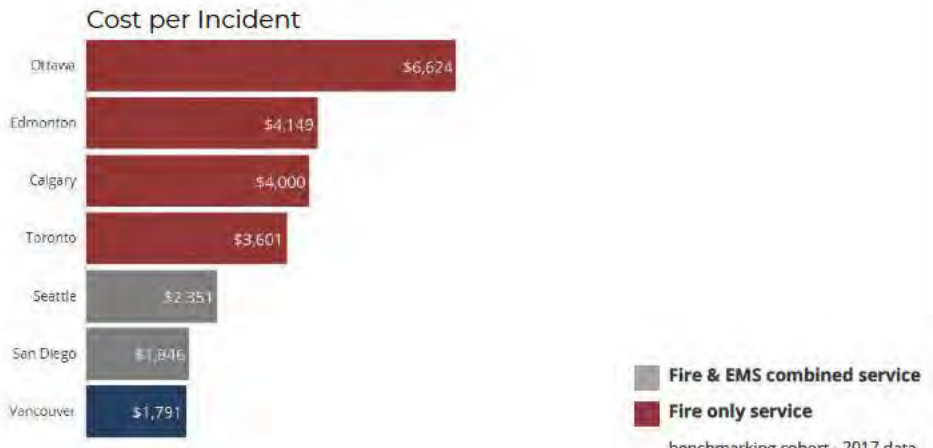
Lean management team and other staff.
VFRS is performing at a higher level. Churn of work is significantly higher than peers.
E.g. Each inspector is doing 4x more inspections than some of the peers, but there's only 12 of them as opposed to 100+.

VFRS is low cost compared to peers



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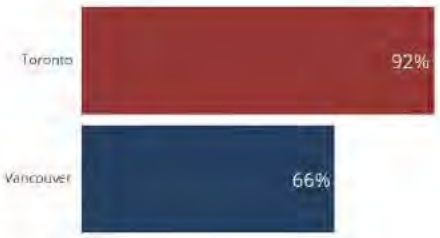
Operating budget seems to be relatively aligned with population, as seen in the benchmarking report.
Given VFRS high incident volume, its cost per incident is much lower compared to other Fire-only services

An increase in cost per incident is not necessarily a bad thing.
As a city improves it's prevention and education and/or policies to medical responses for example, it should see a decrease in incidents and hence an increase in cost per incident.

Toronto South Command - Direct Comparison

First Due performance based on NFPA 1710



Department	Land Area - km2	Halls	Km2 / hall	Incidents / km2
Vancouver	**133**	**20**	**6.7**	**503**
Toronto - South Command	**90**	**21**	**4.3**	**429**

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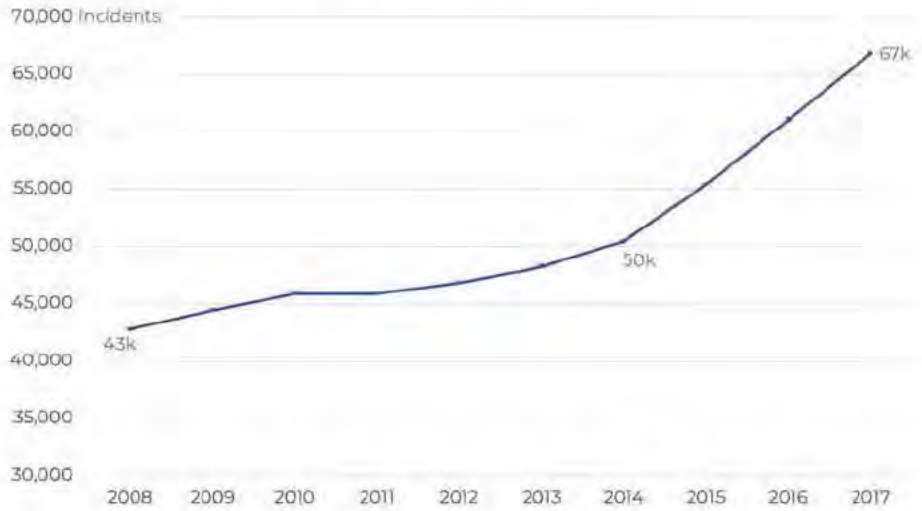
If we compare VFRS to TFS South Command we see that it is a close comparable in area, densification, and verticality.
Unfortunately, VFRS response performance is quite low compared to TFS South Command

Photo credit: Edna Winti, flickr.com/photos/ednawinti/33879890576, License: Attribution 2.0 Generic (CC BY 2.0)

Incident volume has increased 56%

in the last decade, and 10% annually since 2014



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Incidents to which VFRS has responded have grown more than 10% per year in the last 3 years.

Operating in Crisis Mode

"Heading to a tipping point – One more thing is one less for the next call"

With the opioid crisis, staff have been stretched to the limit and have done really well, but this is not sustainable. Performance is slipping, and burnout is happening.

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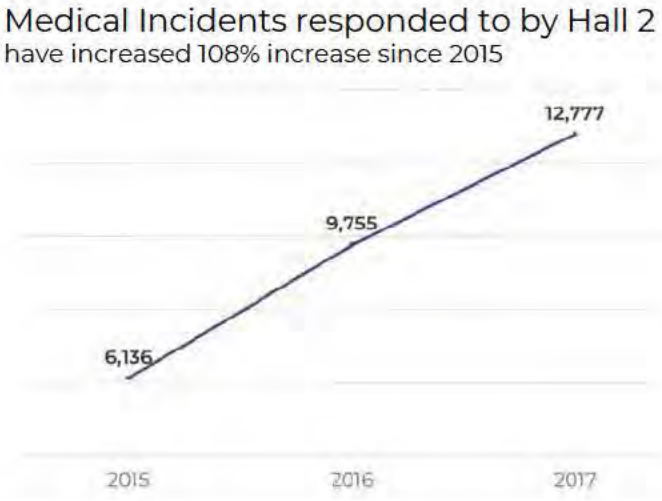
Although it is not the only reason, the opioid crisis is seen as a leading factor of this unprecedented call growth. Staff are feeling burnt out and are struggling to perform at the level they have in the past.

Operating in Crisis Mode



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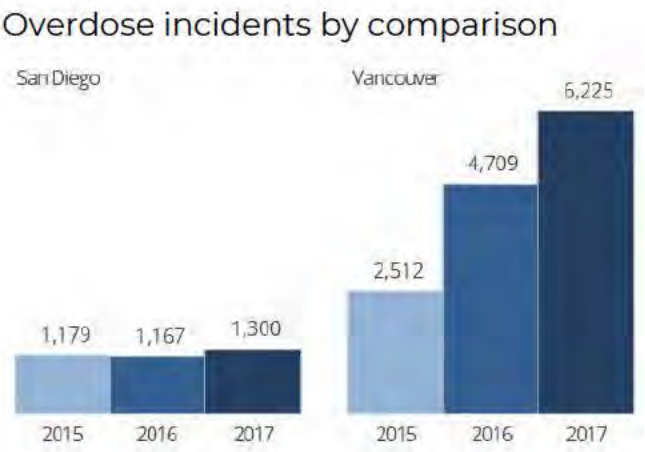
In Hall 2, we see the crisis at its extreme.

Operating in Crisis Mode



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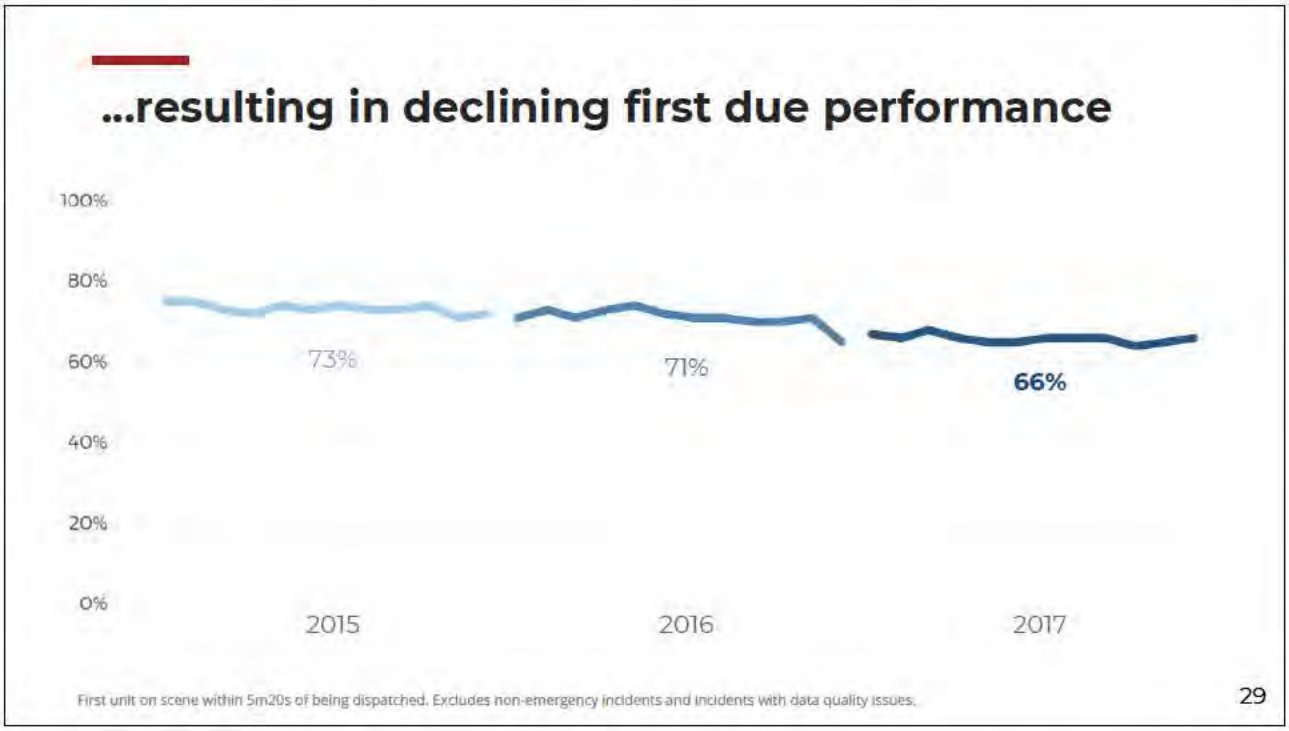
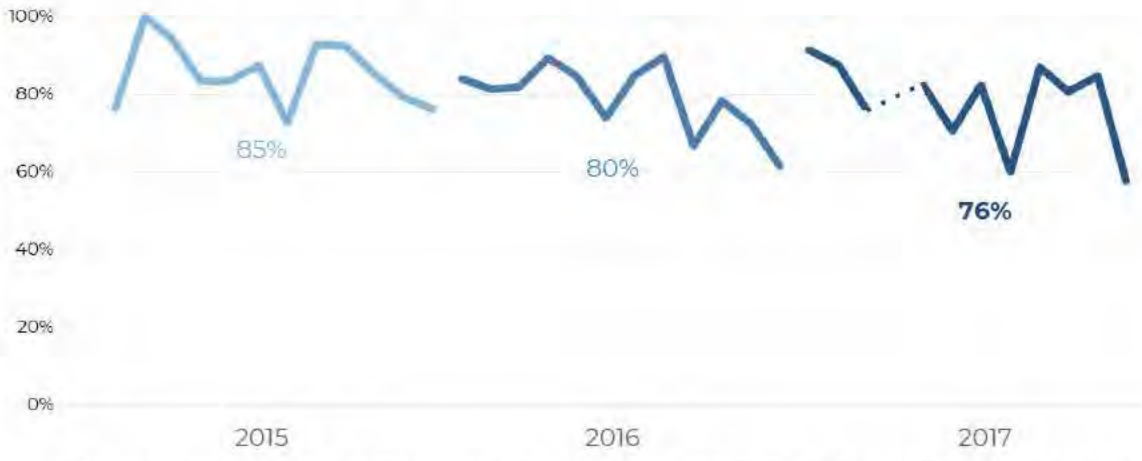
Compared to the only service from which we received data (San Diego), it is clear that Vancouver is still in the midst of and opioid crisis.



In city the size of Vancouver, a 1% change could be considered very significant, as it represents over 500 incidents to which response was below the target time. This drop from 73% to 66% means that VFRS is currently responding late to 3,500 more incidents per year than it did three years ago.

For comparison, Toronto Fire Services improved from 82% to 84% over the same time period.

And declining ERF performance.



Estimated by 4th fire suppression apparatus to arrive on scene within 10m24s from 911 call answered. Excludes incidents which were initially entered as a lesser call type and later upgraded, non-emergency incidents, incidents with less than the specified number of apparatus.
April 2017 was excluded from the line chart due to data quality issues.

30

ERF refers to Effective Response Force, also known as the initial full first alarm assignment. This is the minimum staffing level of 15 firefighters required by the National Fire Protection Association (NFPA) to a structure fire in a typical 2000 ft^2, two-story, single-family dwelling without a basement and with no exposures.

It is worth noting, that a majority of structures in Vancouver belong to a higher hazard classification, and would likely require a higher staffing for effective response. However, we do not currently have sufficient data on building types to make this assessment.

NFPA 1710: *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments, 2016*

VFRS struggles to deal with high downtown volumes

First due overgoal calls at locations with 25+ calls per year.

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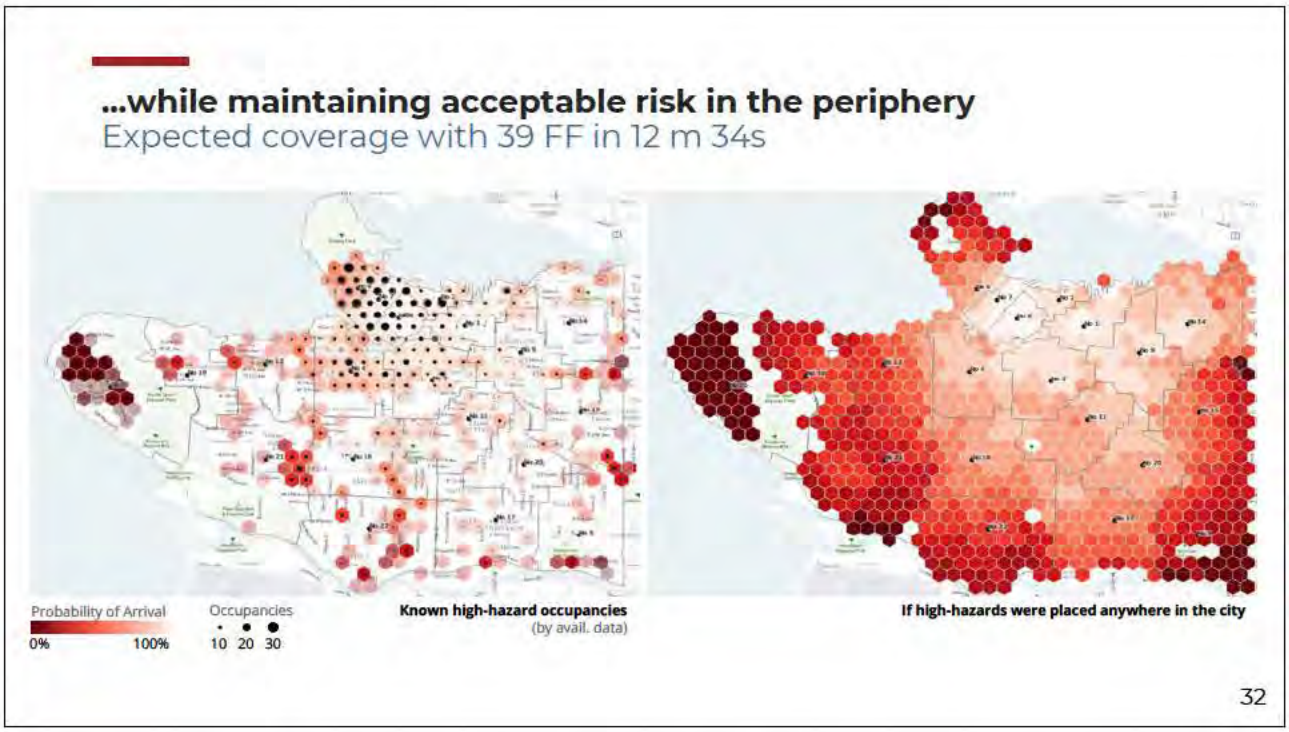
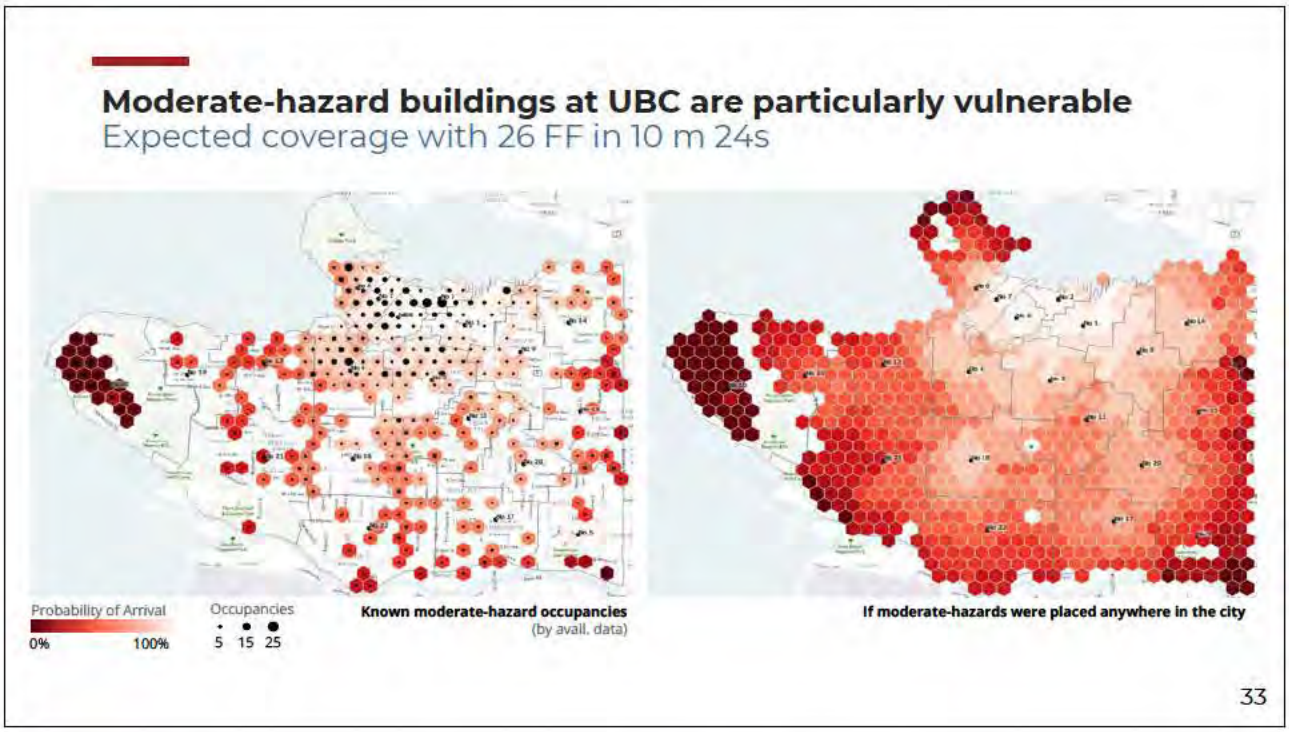
Each emergency call that VFRS did not arrive within the 6m24s first-due target time was joined to the nearest intersection. Intersections with 25 or more overgoal calls are shown. These are considered "hotspots".



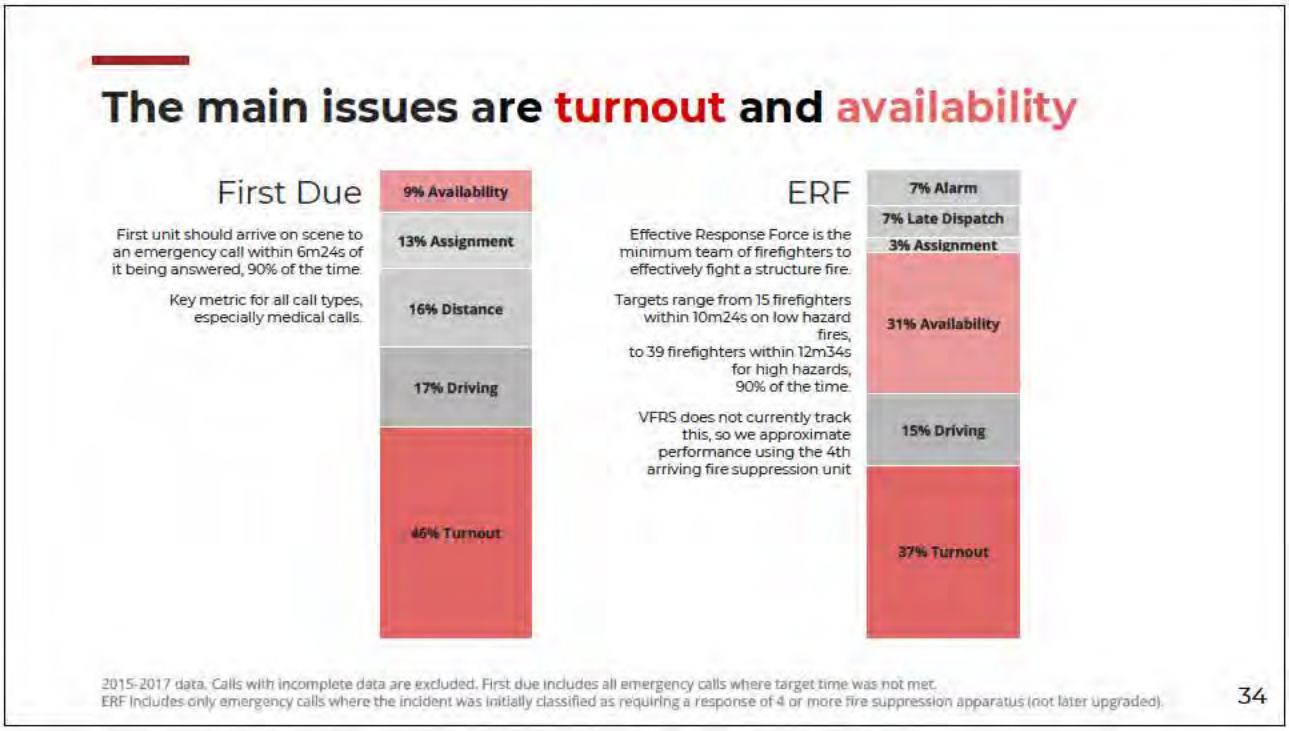
Risk data was provided by IAFF Local 18 based on a 2016 study, which was in turn based on limited data acquired from the City of Vancouver. The structures mapped here and on the next slide are not all moderate/high-hazard occupancies, rather, only those available in the data.

VFRS does not currently dispatch to this standard. Looking at the 254 incidents in 2015-17 where 10 or more apparatus were dispatched, the 10m 24s second target has **never** been met by the 10th unit to arrive.



Although we are measuring targets based on low-hazard, moderate-hazard structures likely represent a majority of structures in the City of Vancouver.

Throughout this report, we generally measure ERF to the Low-risk building target, where we need 15 members attending. In reality, most buildings in Vancouver are Moderate- and High-risk, where the effective response is 26 or 39 members.



The final piece of our diagnostic analysis attempts to answer "why" response performance is struggling. We use a logic model to assign every overgoal call to a primary root cause.

These definitions are based on analysis of every overgoal call (those where the 6m24s / 10m24s target time was not met). While there are often multiple causes, we assign a reason to the factor which contributed the most.

Alarm: The alarm handling time at the call taking / dispatch centre exceeded the target 64s by enough to be unable to reach the scene on time. *Note: This is currently only measured for ERF (Fire) calls, because these are handled start to finish at E-Comm. Medical calls, which make up a majority of first-due incidents, are received at BC Emergency Health Services (BCEHS) and transferred to E-Comm for dispatching. BCEHS does not provide VFRS with data, and so we are unable to measure the entire alarm handling time.*

Dispatched Late: There was a longer than usual period of time between the first and fourth units being dispatched.

Assignment: A unit from the nearest hall was available but not dispatched. This does not necessarily imply any error on the part of the dispatcher. This may be a strategic choice based on factors that are not obvious in the data, such as prioritizing incidents in the busy Hall 2 zone. There may also be data quality issues (a unit appearing to be available when in reality it was not), as well as differences in the algorithms used to determine the closest unit.

Busy (Availability): Units from the nearest hall(s) are responding to another call, requiring

responses from further-away halls.

Distance: The incident location is so far from any hall that an average response could not arrive in time.

Driving: The hall was expected to reach the incident in time but was late. This is usually attributed to road issues (weather, traffic, construction, etc.) but can also be influenced by poor data collection (forgetting to change their status when arriving on scene).

Turnout: The time from being dispatched to leaving the hall was over target by enough to not reach the incident on time.

ERF = Effective Response Force. Two perspectives to be evaluated. Availability of sufficient resources to respond to an initially defined ERF incident and secondly how long it took to get what you define as an effective resource including units and trained staff to a confirmed incident with an ERF definition.
First due applies to the same logic as above but evaluates how long it took to get the First unit do a defined ERF incident

Cost and Value of Performance

Scenario	First Due Performance	ERF Performance
Improve Alarm Handling time **or** Turnout time **or** Travel time	+1.0% per 3.5 s improvement	+1.0% per 25s improvement
Add 1 Position	N/A	+0.4%
Add 1 Apparatus	+0.3%	+1.1%
Add 1 Hall	+0.2%	+0.5%
Move 1 Hall	+0.2%	
Reduce incidents	+1.0% per 5000 calls	

1% first-due performance improvement **equals** **~500** fewer overgoal calls per year

1% ERF performance improvement **equals** **~7** fewer overgoal fire incidents per year

Based on analysis of 2015-2017 incident data. Supporting data included in the appendix.
Because performance is calculated based on current demand, the value of adding a hall will change in the future due to the increase in call volume (+1.2% by 2042).

35

The hall performance increase here is based on 2015-2017 demand. The value of new halls grows substantially more in the future, as demand increases in different areas throughout the city, so while a new hall may only be worth 0.2% today, it will be worth 1.2% in 25 years.

These small percentage improvements can feel inconsequential, however, it is important to recognize that every performance increase means lives saved, injuries prevented, property saved, and maintaining a positive culture. It should also be noted that these are city-wide numbers. A 1% improvement to the City often means a 25% or 30% improvement in some local areas.

These numbers are stark in context to the staggering 7% drop in performance VFRS has seen over the last 3 years. It demonstrates that the drop in performance cannot be attributed to a single factor. Calls did not grow by 35,000, nor did VFRS lose 23 trucks.

Action on these recommendations should begin today. Some of these are quick wins, but most are just the beginnings of ongoing efforts.

Photo credit: Roland Tanglao, flickr.com/photos/roland/5962013074, License: Attribution 2.0 Generic (CC BY 2.0)

Immediate Recommendations (2018)

1. Pursue CPSE Accreditation
2. Develop a data-driven culture
3. Improve coordination with BCEHS
4. Continue to build connections with stakeholders
5. Bolster physical and mental health, wellness and safety
6. Continue to build culture and diversity
7. Complete development of a comprehensive training program

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Immediate Recommendation

1. Pursue CPSE accreditation

Create new position for Accreditation Manager (2019)

Determine how to integrate staff to support accreditation work

The accreditation process will include:

- Adopting NFPA as a baseline for comparison
- Developing targets for Training, Prevention, Wellness, etc.
- Educating staff on the importance of accurate data capture
- Developing a continuous improvement model for data quality

38

Adopt a Performance Management Paradigm

from Stakeholder Engagement:

- Management, staff and stakeholders perceive VFRS is a high performing organization meeting the perceived expectations of the public
- Management and staff perceive they are stretched too far with the resources they have, and it is starting to affect their performance

from Darkhorse:

- Despite the challenges and costs, the accountability and awareness gained by pursuing accreditation will be worth it.

Recommendations:

- Develop and justify a resource plan (budget, staffing, apparatus, etc) that is in line with VFRS's mandate and core services
- Optimize performance wherever possible with existing resources
- Become an "evidence-based decision making" organization by establishing targets (such as the NFPA 1710 standards), put in place accurate and timely data analytics, constantly monitor performance -> assess-adjust to improve

Data capture is things like recording timestamps properly when changing status, for example, arriving on scene.

Hiring an Accreditation Manager is recommended by CPSE and something that every service seeking CPSE accreditation does. This is a large effort, touching all aspects of the

organization,.

NFPA standards are a high goal, and no service meets every NFPA standard. However, this is something to strive towards, and allows benchmarking against other services.

Immediate Recommendation

2. Develop data-driven culture

Build an analytics team to manage data quality, reporting tools, and to provide predictive insights, championed by the newly hired Assistant Chief, Analytics & Decision Support:

- ➢ Create two analyst positions (2019) to perform data management, mathematical/statistical analysis, data visualization and automation
- ➢ Create administrative position (2022) to ensure data quality

Study how opioid crisis drives call volumes and possible demand mitigation strategies

Assess data quality and develop improvement plan

Educate wider team on how to use data and deliver using appropriate medium

39

from Stakeholder Engagement:

- Management, staff and stakeholders perceive VFRS is a high performing organization meeting the perceived expectations of the public
- Management and staff perceive they are stretched too far with the resources they have, and it is starting to affect their performance

from Benchmarking:

- All the services in cohort are measuring against NFPA 1710, in some form, even if they have not fully adopted it
- All the services are spending time and money to become more data driven in order to make clear evidence based decisions.

from Darkhorse:

- For some further insights on the different roles on an analytical team, see darkhorseanalytics.com/blog/five-faces-analytics
- One of the first things your analytics team may want to dive into is figuring out what is driving the call volume and how it relates to opioids or not. This can lead to more effective demand mitigation.
- Data quality [and availability] is good timestamp CAD data from Ecomm and [anything from] BCEHS, and it's also tools to access the data that everyone knows what it means, etc.
- Also getting quality building data. This is not only for analysis (e.g. mid/high risk analysis), but also to assist E-Comm dispatchers in evaluating incidents more quickly and appropriately.
- Start tracking ERF, and ERF on upgrade calls, and ERF for different hazard levels

Recommendations:

- Develop and justify a resource plan (budget, staffing, apparatus, etc) that is in line with VFRS's mandate and core services
- Optimize performance wherever possible with existing resources
- Become an "evidence-based decision making" organization by establishing targets such as the NFPA 1710 standards), putt in place accurate and timely data analytics, constantly monitor performance-assess-adjust to improve
- Periodic updates in call forecast -- our forecast is conservative
- Improve data quality
- Getting better timestamps from Ecomm
- Coordination of Information with BCEHS
- Creation of exception and audit reporting for performance measures and standard metrics.
- Initiate call processing review process in order to monitor performance and accommodate continuous improvement. Initial areas of focus should include:
    - Alarm calls
    - ERF determination
    - Active Fires
    - Life threatening incidents.

Immediate Recommendation

3. Improve coordination with BCEHS

Working with mayor, city management and Ministry of Health:

- Streamline dispatch processes to ensure closest and most appropriate emergency response resources are used
- Streamline transfer of care / patient release
- Engage in discussions to better understand joint challenges and opportunities
- Identify options for engagement and planning

40

Work with BCEHS to identify options and develop a business case for greater engagement and joint planning going forward
Implement medical response services that optimize both VFRS and BCEHS resources

Recommendations:

- Streamline dispatch processes (dispatching closest and most appropriate emergency response resources)
- Streamline transfer of care / patient release (sitting on scene with non-serious patients for hours sometimes)
- Mayor, city management, dealing with ministry of health

from Stakeholder Engagement:

- VFRS relationship with BCEHS is effective on the scene but is not seen as being efficient and effective from a strategic perspective

from Darkhorse:

- City Manager may need justification from VFRS as to whether or not they have the capacity to respond and the training to support it outside of basic First response.
- VFRS has the option to modify their default response.

Immediate Recommendation

4. Continue to build connections with stakeholders

Develop a strong internal communications program

Increase collaboration with City departments on strategic and development planning, and integrate services such as building inspections

Clarify and communicate VFRS's mandate to staff and stakeholders, including mission, vision and strategic plan

41

from Stakeholder Engagement:

- Generally speaking most stakeholders and partners want to work more closely and effectively with VFRS
- Most city departments would like to have a closer more integrated planning process with VFRS
- VFRS relationship with BCEHS is effective on the scene but is not seen as being efficient and effective from a strategic perspective
- The city has multiple building inspections taking place by different departments, without coordination.

Recommendations:

- Identify options for greater engagement and planning with BCEHS going forward
- Increase communication and collaboration with other city departments on strategic and development planning activities
- Clarify and communicate VFRS's mandate and cores services to all staff and stakeholders to better set and manage expectations

Immediate Recommendation

5. Bolster physical and mental health, wellness and safety

Develop a health plan that addresses:

- Pre-cancer screening and physicals
- Confidential counseling and coaching
- Health program, similar to IAFC/IAFF Wellness Fitness Initiative (WFI) used in Edmonton and Calgary

Hire a mental health professional to be part of the mental health team (2019)

Address lost time injury levels by creating a Health, Wellness and Safety Officer position for each shift (2022)

Develop comprehensive decontamination policies and procedures

Implement strategy for action-ready, clean gear

42

from Stakeholder Engagement:

- Some initial steps have been recently taken to improve the overall wellbeing of staff – such as re-instituting sports in the Fire Hall and the "resilient minds" program
- Both management and staff are concerned about the support being provided to staff from a physical, mental and resilience perspective
- Increasing burnout and compassion fatigue amongst staff

from Benchmarking:

- High lost time injury levels

from Darkhorse:

- Safety officers are standard practices in both large and small fire services. They can perform both emergency work at incidents, as well other duties to ensure the wellbeing of staff.

Recommendations:

- Develop and implement a health plan for VFRS taking into consideration components such as:
  - Regular pre-cancer screening
  - Annual physicals
  - Confidential counseling/coaching support
  - Health programs
  - Personal and organizational accountabilities
  - Two sets of safety gear, washing facilities (in fire halls) for both clothing

    - and personnel, or suitable alternatives for decontamination
- Rise in the importance of building awareness and acceptance in mental health, coupled with burnout and compassion fatigue amongst staff – justification for a mental health professional

Immediate Recommendation

6. Continue to build culture and diversity

Continue and expand efforts to attract and maintain a workforce that represents Vancouver

- ➢ create two positions for Community Outreach, Inclusion and Diversity (2019)

Explore opportunities to learn from other fire departments as well as partners such as VPD

Culture is perceived to be improving significantly due to increased communication and engagement.

Build on VFRS strengths such as community engagement, sense of pride, mentorship, teamwork, values.

43

from Stakeholder Engagement:

- There is an overall awareness that the VFRS lacks both gender and ethnic diversity and needs to address this
  - Achieving this requires a constant, full time presence working in the community to establish VFRS as an employer of choice and an option for those who would otherwise not consider it

Recommendations:

- Establish a program to intentionally seek out and encourage individuals who meet the existing high standards for acceptance and are of varied gender identities and ethnicities to seek careers with VFRS

Immediate Recommendation

7. Complete development of a comprehensive training program

Incorporate inter-agency training

Utilize accredited programs, certifications and live practice

Ensure strong competency management programs for all specialties

Monitor training effectiveness

44

from Stakeholder Engagement:

- There is an increased focus on the importance of training and certification
- There is a strong desire and willingness of staff for all forms of training, from mentorship to new methods of training
- Management and staff view training provided as being minimum and lacking in most areas
- Vancouver has one of the most complex environments for training requirements, with lots of high-risk structures, the port, earthquake and tsunami risk, etc.

from Benchmarking:

- Operations staff per trainer is high in comparison
- FF lost time injuries are high

Recommendations:

- Develop and implement a comprehensive training program taking into consideration elements such as:
  - scheduling and staffing constraints
  - incorporates interagency training opportunities
  - live practice
  - accredited training programs
  - metrics to monitor effectiveness, and
  - accountability by the individual and the leadership.
  - Development of recruitment screening process
  - Develop training for a wider range of specialities – eg: boats
- Focus on certifications and accreditation

- Develop transparency in the training program
    - What questions need to be answered?
    - How quickly (when) can I get those answers?
    - Who needs to get the answers?

Mid-term (~3-5) Recommendations

Mid-term recommendations make up the core of this plan. Planning for these should begin immediately, with various implementation steps made over the 3 to 5 year timeframe.

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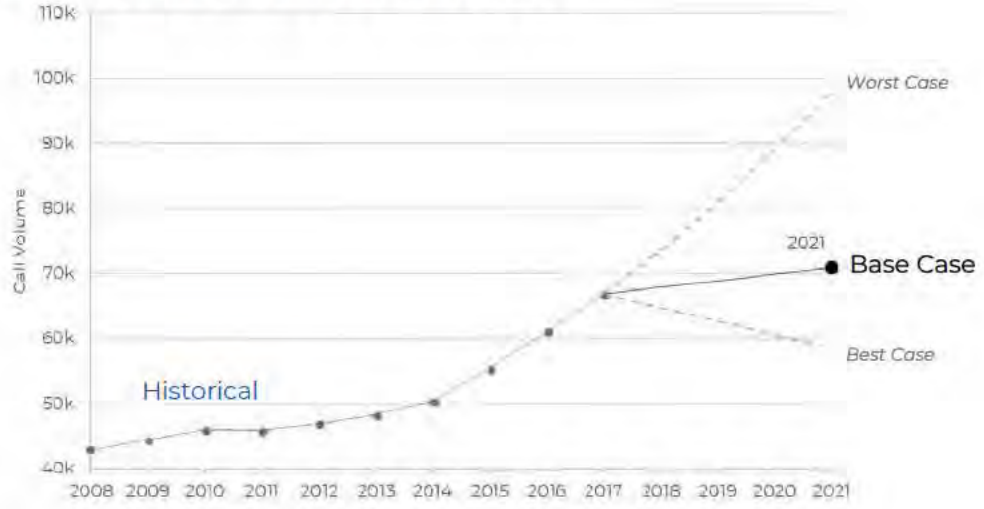
Incident growth forecast



Incident volume is predicted using projected population growth. Base Case assumes incidents per population continues at the 2017 rate. Worst Case assumes 10% annual demand growth until 2021. Best Case assumes that demand returns to a 2015 level by 2021.

46

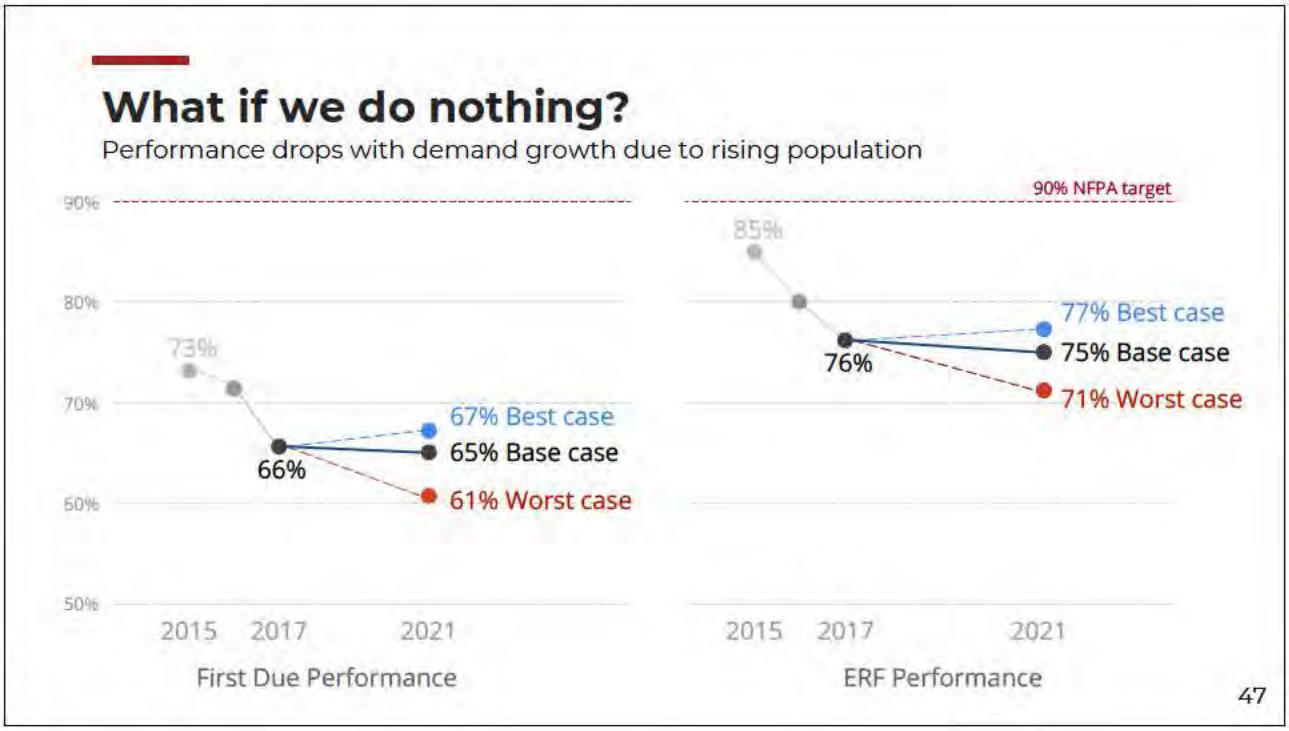
Incident growth is difficult to predict, as it is driven by complex factors. Our assumption is that the recent spike in growth is attributable to the opioid crisis. This does not, however, mean that these are all medical calls to treat overdoses. There are complicated demand drivers some correlated and others independent of this crisis. We see, for example, an increased risk of structure fires in single room occupancy (SRO) housing, but also increased calls related to an aging population.

Just as no one could have predicted the impact of the opioid crisis a few years ago, we cannot accurately predict what will happen in a few years.

In order to create our **Base Case** estimate of future demand, we assume that incidents will continue to occur at the same rate per population into the future as the 2017 rates. Essentially, this method applies the City of Vancouver's projected population growth in each area of the city, and applies the current demand to the changing population.

The **Worst Case** assumes that the current rate of growth, 10% per year, continues until 2021. The **Best Case** assumes that incident rates will return to 2015 levels by 2021.

One of our recommendations to the analytics team (immediate recommendation #1) is to keep this forecast up to date. Doing so regularly is essential to good planning. Not only is overall demand difficult to predict, a majority of VFRS demand is linked to BCEHS. Increased resourcing or dispatch policy changes at BCEHS could greatly impact which calls VFRS attends.



First Due Performance refers to achieving the NFPA 1710 target for the first arriving unit within 6m24s of a call being answered.
ERF Performance refers to the minimum staffing level of 15 firefighters at a low-hazard fire incident within 10m24s of a call being answered.

There are higher standards for moderate- and high-hazard incidents, but current data collection methods do not allow for accurate reporting of these metrics. In this report, we treat all historical fire incidents as low-hazard, and approximate 15 firefighters by measuring the 4th fire suppression unit to arrive.

The standard to achieve these goals for **90%** of calls. This is a difficult target to achieve, however, it is reasonable for Vancouver Fire to plan to achieve 80-85% in both metrics.

Mid-term Recommendations

1. Reduce turnout times to 1m45s, 90% of the time
2. Achieve NFPA alarm handling targets
3. Bolster training staff
4. Add prevention and public education resources
5. Add firefighters to improve response performance
6. Develop station plans for long term

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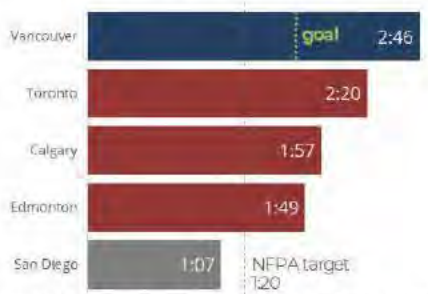
Mid-term Recommendation

1. Reduce turnout times to 1m45s, 90% of the time

Set realistic, hall-specific targets recognizing unique hall layouts

Track performance at hall-shift level



Peer Comparison: First Due 90th percentile Turnout time

Improvement Metrics

First due
+8.0% performance
3,700 fewer overgoal calls per year

ERF
+3.4% performance
22 fewer overgoal fire incidents per year

49

Turnout times are the top priority, because there is the most performance to gain with the lowest associated cost.

These recommendations are in line with peer benchmarks. Toronto, for instance, has also publicly stated their goal of 1m45s (105s) as an interim turnout target.

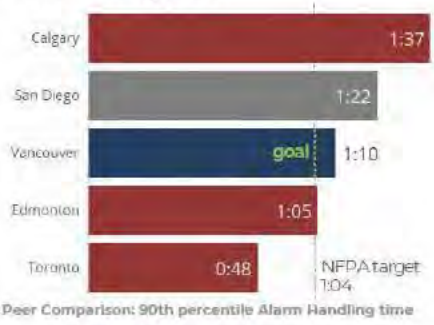
Initial walkthrough analysis confirms that 1m45s is a realistic number for service level target, and some improvements can be had simply through awareness.

Mid-term Recommendation

2. Achieve NFPA alarm handling targets

1m4s for 90% of fire incidents

Acquire data from E-Comm and BCEHS to understand total alarm handling time for all incident types



Peer Comparison: 90th percentile Alarm Handling time

Improvement Metrics

First due
+2.0%* performance
1,000 fewer overgoal calls per year

ERF
+1.2% performance
8 fewer overgoal fire incidents per year

Alarm handling for first due is not included in baseline performance due to data availability. +2% assumes this is added, and reduced by 7 seconds for all call types.

50

Alarm handling time is unknown for calls which are initially handled by BCEHS, so this additional time is not currently being tracked.
Call start is tracked at E-Comm but not provided to VFRS in the same recordset as other data.

Recommendations:
Begin tracking alarm handling for Medical incidents - getting appropriate data from BCEHS
Begin tracking from call start for Fire incidents - getting appropriate data from Ecomm
Achieve 1m4s for Fire incident alarm handling (NFPA target). While the dispatch centre is very close to meeting NFPA targets and has done so in the past, interviews and benchmarks suggest further improvements are achievable.

Mid-term Recommendation

3. Bolster training staff

In addition to 2 staff planned for 2018, add 1 more in 2021

Training was identified as #2 priority by stakeholders

VFRS has the highest staff to trainer ratio of cohort

Lost time injuries are relatively high

51

from Stakeholder Engagement:

- There is an increased focus on the importance of training and certification
- There is a strong desire and willingness of staff for all forms of training, from mentorship to new methods of training
- Management and staff view training provided as being minimum and lacking in most areas
- High incident volume makes it challenging to schedule time for training.

from Darkhorse:

- Lack of data/transparency with training program - not easy to see where training is really happening.

Mid-term Recommendation

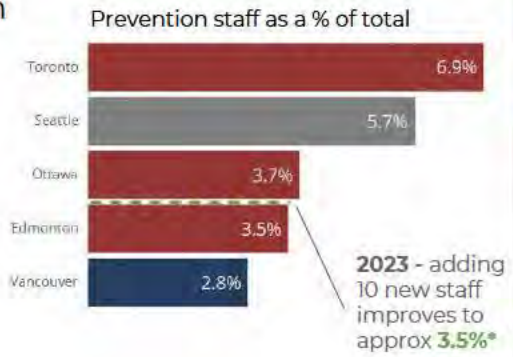
4. Add prevention and public education resources

Add 2 prevention staff every year for five years: 8 inspectors and 2 public education staff

Investigate targeted community risk reduction

With inspections, gather more data and monitor effectively
(use Portland example from benchmarks)

Key need identified in stakeholder interviews



*Assumes a total of 122 FTEs are added

52

from Stakeholder Engagement:

- Identified as a key need

from Benchmarking:

- Prevention staff as % of total is low. VFRS would need to add 10 new positions to increase to 3.5%
- Fire Incidents are quite high in comparison to peers
- San Diego – separate inspections bureau

Mid-term Recommendation

5. Add 20 firefighter positions on shift 24/7 to reduce burnout and improve performance

Balance the needs of First-due and levels of ERF response

Add 3 to 5 firefighter positions per year over the next five years:

- Convert crossovers to fully-staffed medics in Halls 2, 3, 8 and 17
- Add personnel to existing units in Halls 4, 9 and 12
- Staff additional heavy unit at Hall 5

Improvement Metrics

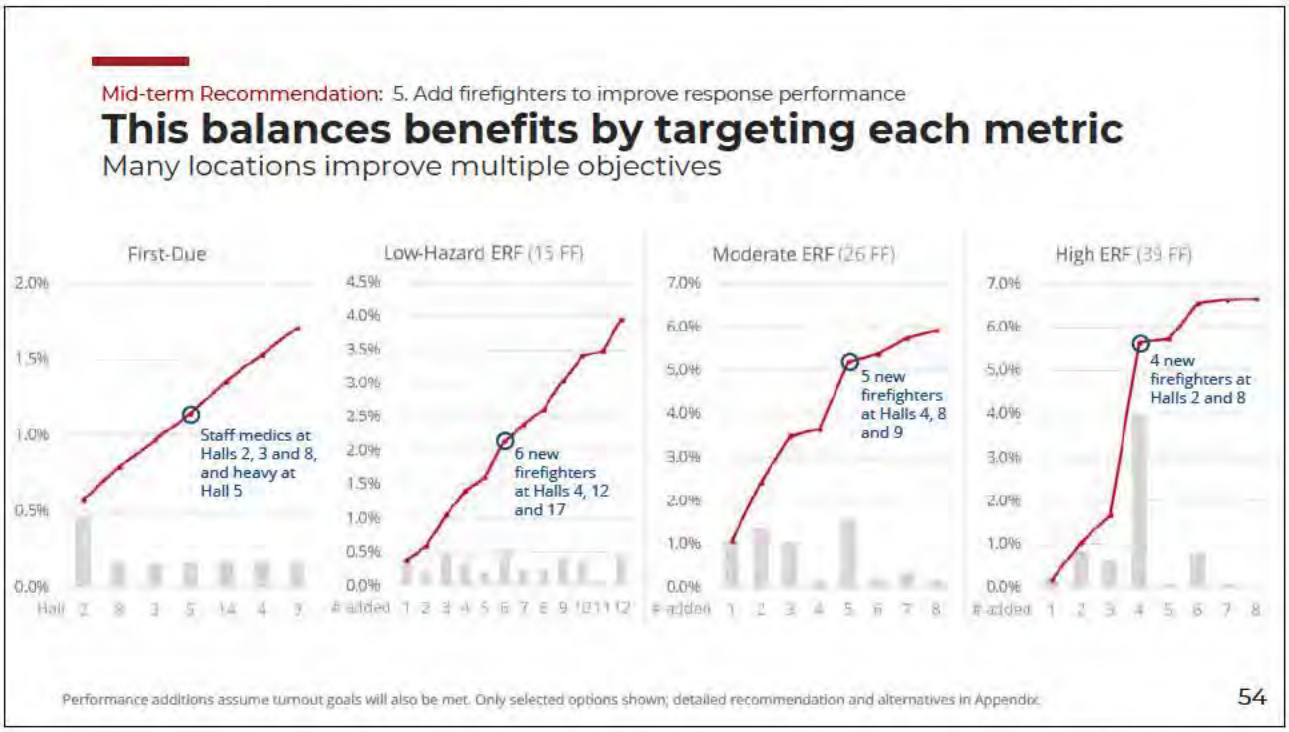
First due
+1.2% performance
600 fewer overgoal calls per year

ERF
34 fewer overgoal fire incidents per year
+4.9% low,
+6.4% moderate,
+7.3% high hazard performance

53

The key issues this addresses are:

- Certain areas of the City are not easily reached by Effective Response Force (ERF).
- Other areas are frequently busy and require responders from further stations to fill in



The charts above show % improvement expected from optimal additions to halls. (e.g. best place to add 1 firefighter, best place to add 2 firefighters, etc). The red line show cumulative %, the grey bars are the marginal gain from the change.

We selected the recommended scenario from among many options using the following criteria:

- Bay space
- Existing crossover apparatus
- Space for additional crew in hall
- Projected growth
- Commonality across metrics (e.g. hall 8 shows up as a high-value option for 3 of the 4 metrics above)
- Decreasing marginal benefits

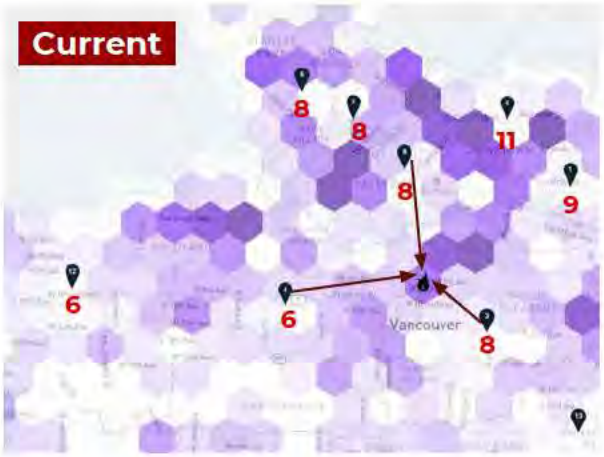
The steep curves for First-Due and Low-Hazard ERF suggest that these additional personnel are a minimal number. Significant marginal improvements would be continue if adding far more resources than we are able to recommend at this time.

Additional options are listed in the Appendix. Many combinations result in similar performance gains. High-demand halls not listed above include 6, 7, 9, 10, 14, 15, and 19

Mid-term Recommendation: 5. Add firefighters to improve response performance

Example 1: 3-person Medic in Hall 4 improves ERF response

Hall 4 - responding with **Halls 3, 7, or 8** currently provides 14 members, requiring <u>three</u> halls to respond.



Map is coloured based on total call volume in each area – darker purple means more calls.

55

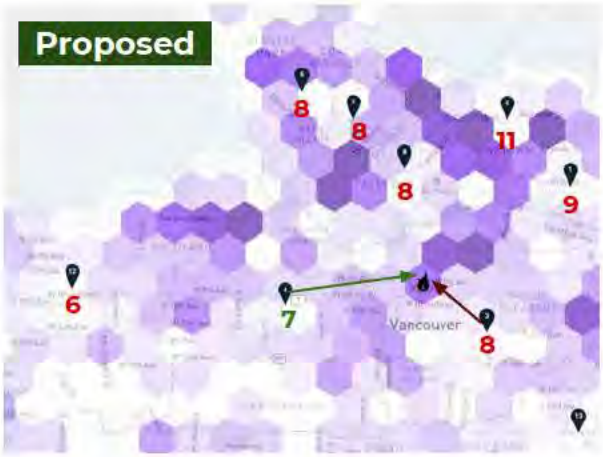
This illustrative example shows why adding a single person to Hall 4, one of the highest-performing recommendations, can have a tremendous improvement to ERF response. Hall 4 currently has a 2-person Medic and a 4-person Rescue engine.

Mid-term Recommendation: 5. Add firefighters to improve response performance

Example 1: 3-person Medic in Hall 4 improves ERF response

One new position at **Hall 4** allows <u>two</u> halls to meet ERF target of 15

ERF Improvement:
0.4% (3 overgoal calls)



Based on 2015-17 calls where 4 or more fire suppression apparatus responded. Assumes members are at hall available to respond.
Map is coloured based on total call volume in each area – darker purple means more calls.

56

By changing the 2-person Medic to a 3-person medic, the 15 firefighter ERF assignment can be achieved from two halls responding rather than three. Removing the drivetime from that 3rd hall improves the expected city-wide ERF performance by 0.4%.

Mid-term Recommendation: 5. Add firefighters to improve response performance

Example 2: Full-time Medic 2 reduces extreme workload

Convert crossover Medic 2 to be fully staffed with 3 firefighters to reduce responses from Halls 1 and 8.

First-due improvement:
0.5% (250 overgoal calls)

ERF Improvement:
(15 FF) 0.8% (5 overgoal calls)
(26 FF) 2.3%*
(39 FF) 1.0%*

Daily responses per crew in Hall 2 drop from **15** to **11**

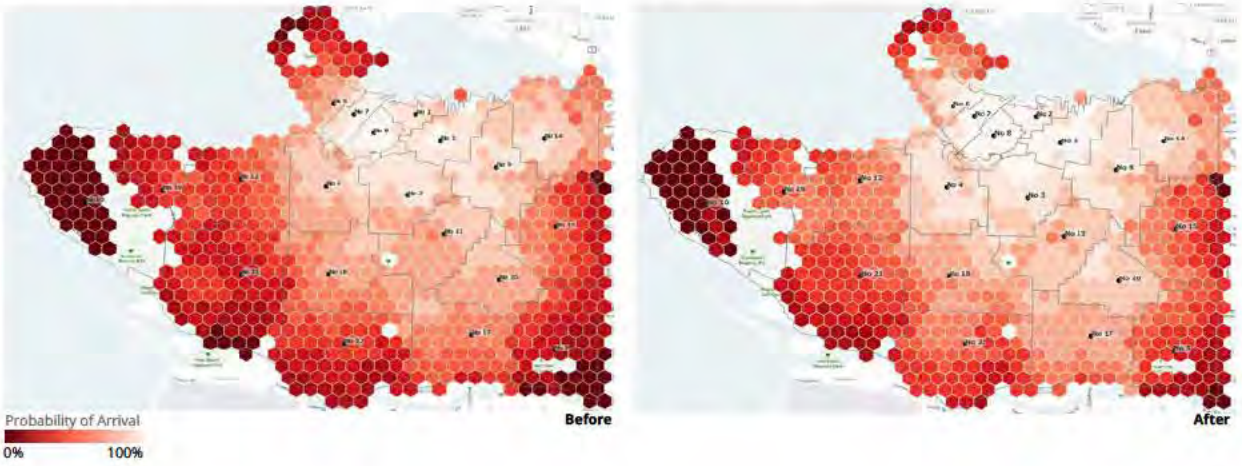
* Modelled probabilities. Current actual moderate and high risk incidents do not have a full ERF assigned to them and are not tracked separately.
Map bubbles show the number of overgoal calls where the root cause can be attributed to availabi ity.

57

Another example, this time focusing on availability (busy) problems. Hall 2 is understaffed and relies on Hall 1 and 8 for many of its responses. Relieving this pressure means fewer incidents that require a further unit to respond. This would likely also have some cascading benefits to busy problems in zones 1 and 8 (not included in expected gain). Furthermore, it would go a long way to reducing staff workload and burnout issues, reducing the workload of each firefighter by over 25%.

Mid-term Recommendation: 5. Add firefighters to improve response performance

Improved high-hazard ERF coverage (39 firefighters in 12 m 34s)

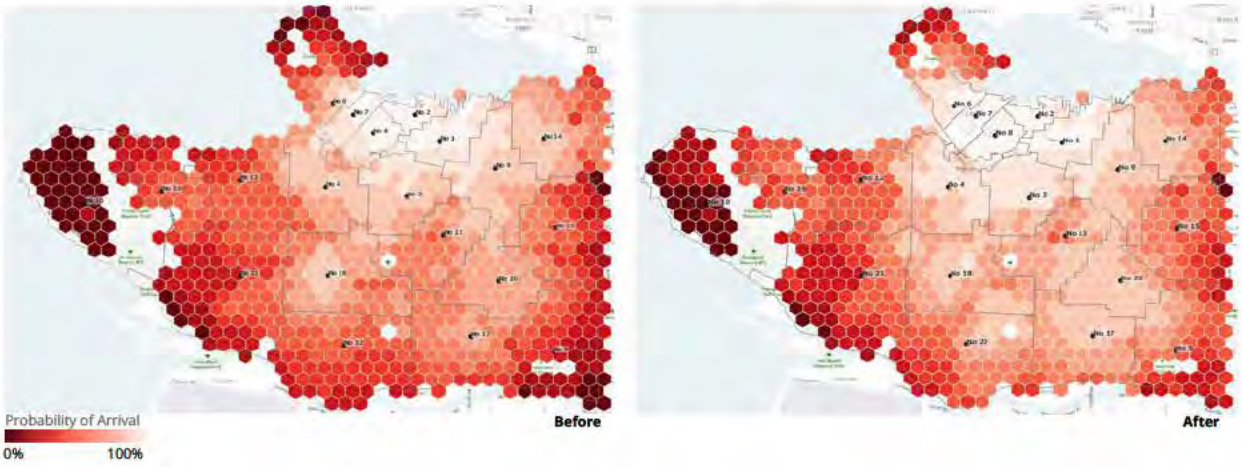


58

While there are still large areas of the city that are not well covered, we see substantial improvements in the downtown core and surrounding areas, with a slight overall coverage improvement across the city.

Mid-term Recommendation: 5. Add firefighters to improve response performance

Improved moderate-hazard ERF coverage (26 firefighters in 10 m 24s)



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Mid-term Recommendation

6. Develop station plans for long term

Continue firehall renewal capital plan

Incorporate growth forecasts

Replace poorly located halls

Sequence dependant on opportunity and timing of new developments

Optimal 2042 Hall Placements
(see details in Appendix)

Map shows green for good performance, red for bad performance. Size of hex represents call volume.

60

Some moves may be triggered by business opportunities for the city. In particular, land around halls 6, 7 and 8 is valuable, and opportunities to replace standalone halls with storefronts facilities should be considered.

The sequence and speed with which planned developments take place will have an impact on the optimum sequence of achieving this plan. This should be monitored and re-evaluated as opportunities come up and demand patterns change.

Long-term (2028+) Recommended Hall Plan

The long-term recommendations are about planning for hall locations. While we show one potential scenario, the goal of these plans is mainly to spark conversations. Adding or moving halls is not the main priority for VFRS at this time. However, understanding the general needs in this area is important as real estate opportunities and maintenance requirements come up. Specific decisions should be made on an individual basis as different City of Vancouver growth plans become reality and new demand trends emerge.

Additional potential scenarios and optimizations were provided to VFRS in a web-based analytical software tool as part of this project.

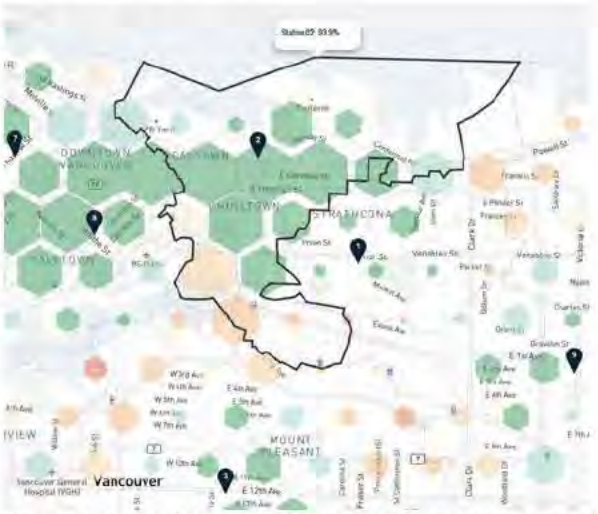
Photo credit: Harshil Shah, flickr.com/photos/harshilshah/14918512522, License: Attribution-NoDerivs 2.0 Generic (CC BY-ND 2.0)

Long-term Hall Recommendations

Hall 2 is ideally located, but too small

It covers its service area well, but is severely lacking capacity

Expand or rebuild at or near current site



Hexagon size = call demand. Colour = expected first-due performance

62

Hall 2 is one of the busiest halls in Canada and is ideally located to serve it's high-demand zone. If it had the capacity to serve all its' demand, it would be able to arrive at 94% of calls within the NFPA targets. Unfortunately, this is not the case, because demand far exceeds supply. While renovations at the current hall will allow 3 additional firefighters to be staffed there as per midterm recommendation #5, this will be very crowded accomodations, and the ideal scenario to serve the demand would likely require at least two more crews. VFRS should strongly consider any options to expand the existing facility, or build a new facility at or near the current site.

Long-term Hall Recommendations

New hall needed near Cambie corridor

Opportunity at Main & 46 St is a good location

First-due performance gain expected:
0.4%

Hexagon size = call demand. Colour = expected first-due performance

The ideal location, at Cambie & 41 Street, would offer 0.5%, however, it is unlikely that this land would become available.

63

The need for a hall in the Cambie corridor is growing as development continues. However, this real estate is unlikely to be available. A location on Main street near 41 St. was being considered at the time of this report, and it appears to be almost as good.

Long-term Hall Recommendations

Potential recommended state for Vancouver 2042

Net 3 new halls
(details in Appendix)

Net first-due performance gains in

2021: **1.9%**

2028: **2.1%**

2042: **3.2%**

64

Hexagon size = call demand. Colour = expected first-due performance

The scenario shown here suggests relocating the existing Halls 8 and 1, adding two new halls downtown, and one at Main & 41st. This is only one of many potential scenarios, but is shown to give a sense of the kinds of opportunities that VFRS should explore when they come up. This should be re-evaluated when a concrete option is on the table.

Photo credit: flightlog, flickr.com/photos/flightlog/5939140444, License: Attribution 2.0 Generic (CC BY 2.0)

Immediate and Mid-term Recommendations

Recommended Positions Summary

	# of Positions added					
Position Type	2019	2020	2021	2022	2023	Total
Firefighters	**3 (x5)** Hall 2	**5 (x5)** 2 in Hall 4 3 in Hall 8	**4 (x5)** 1 in Hall 12 3 in Hall 3	**4 (x5)** 1 in Hall 9 3 in Hall 17	**4 (x5)** Hall 5	**100**
Prevention and Public Education Staff	**2**	**2**	**2**	**2**	**2**	**10**
Community Outreach, Inclusion, and Diversity	**1**		**1**			**2**
Analytics Staff	**2**			**1**		**3**
FTE Trainer			**1**			**1**
Safety Officer (Health and Wellness)				**1 (x4)**		**4**
Mental Health Professional (Health and Wellness)	**1**					**1**
Accreditation Manager (Management)	**1**					**1**
Total by Year	**22**	**27**	**24**	**27**	**22**	**122**

66

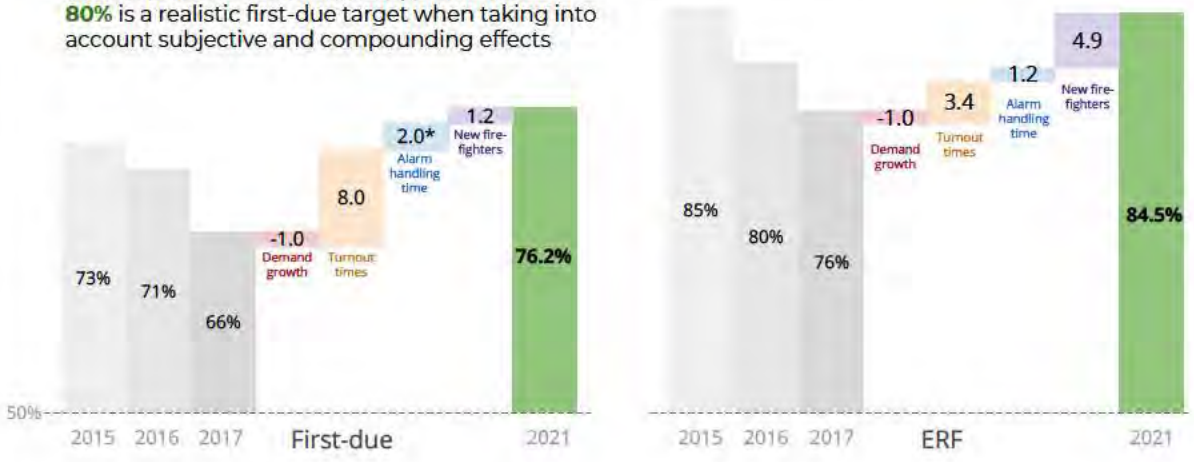
In total, our recommendations create 122 new FTE positions over the course of 5 years. These recommendations are sequenced to address the most pressing needs first.

One thing to note in this table, is that the previously used ratio of 5.5 FTEs per 24/7/365 firefighter position has been revised downwards to 5 FTEs for the time-being. VFRS feels that at the present point in time this level of staffing will be sufficient with good management.

Mid-term Recommendations

Performance Improvement Summary

This view shows a conservative prediction:
80% is a realistic first-due target when taking into account subjective and compounding effects



*Alarm handling for first due is not included in baseline performance metric due to data availability

67

While we can point to this as a roadmap to achieving 76.2% performance in the next 4 years, **we recommend setting the realistic target above 80%.**
This waterfall improvement model uses conservative estimates for both improvements as well as call growth.
It isolates specific causes for late arrivals, but does not take into consideration potential synergies and cascading effects such as:

- **Reduced burnout** can lead to faster turnout times,
- **Reduced busy problems** means that units who frequently cover into other zones are more likely to be available themselves,
- **Improved coordination with BCEHS** reducing scene times and response numbers
- **Improved data collection** may uncover that current performance is underreported due to radio issues and MDT usage.

Immediate and Mid-term Recommendations

Benchmarking Revised

Based on total recommended positions, using 2017 as the baseline

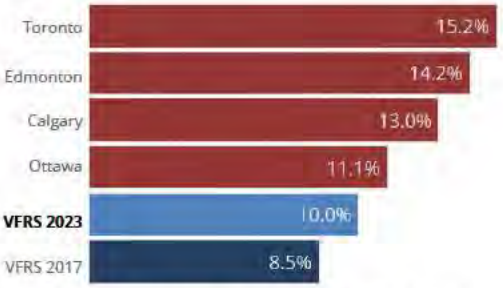
Incidents per Operational Staff

Now vs future

Based on 100 additional FF added over 5 years, and a forecasted increase of 5,752 incidents

Non-operational staff as percent of total

Now vs future



Based on 122 additional positions added over 5 years

68

Ultimately, increasing operational and non-operational staff by the proposed levels does not have a significant impact on VFRS in relation to its peers. Of the Canadian services we benchmarked, Vancouver remains at almost double the next closest city in terms of incidents per operational staff, and the lowest ratio of non-operational to operational staff.


DARKHORSE
ANALYTICS
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APPENDIX

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Demand Analysis
Appendix

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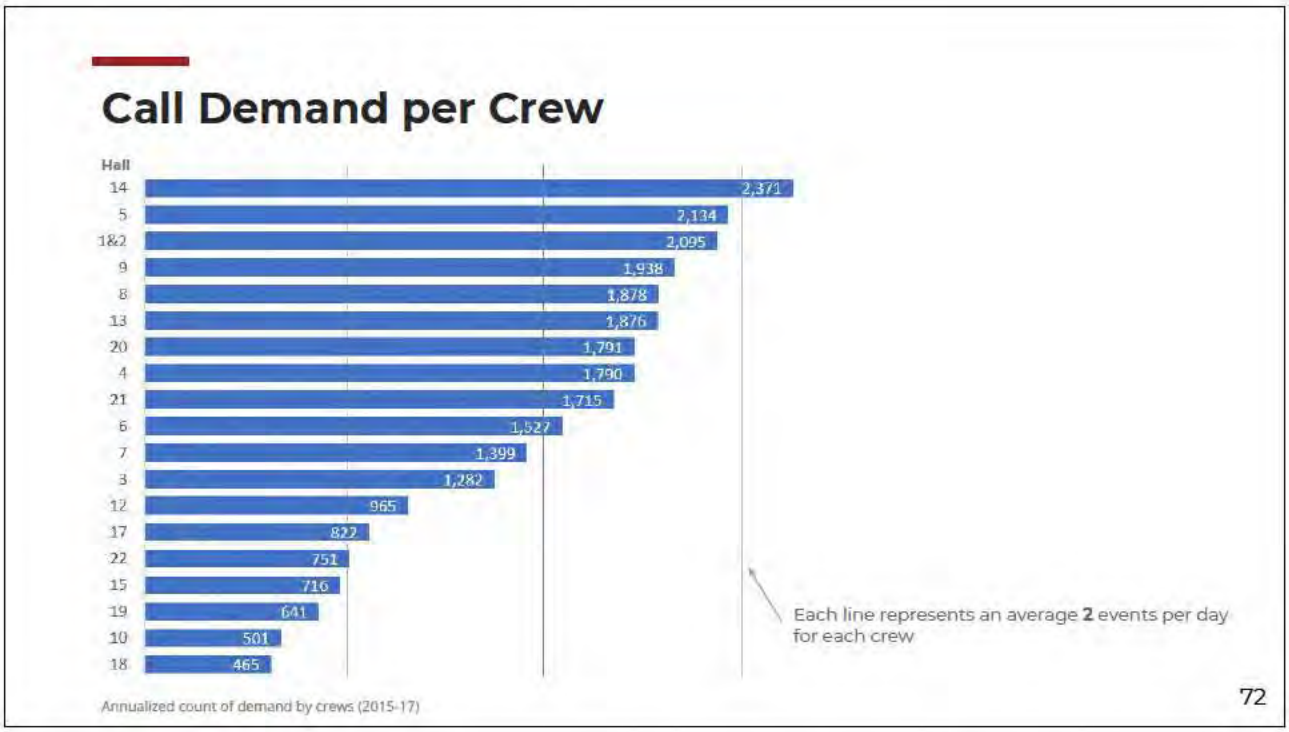
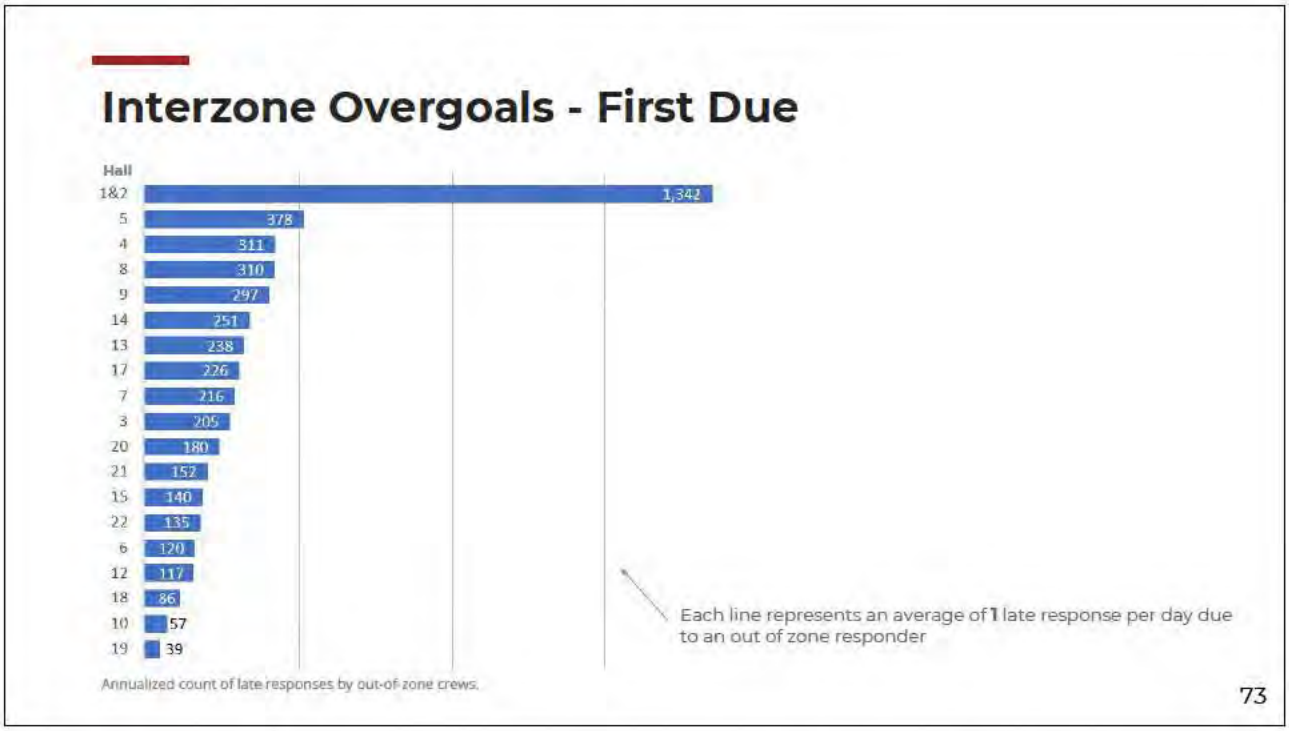
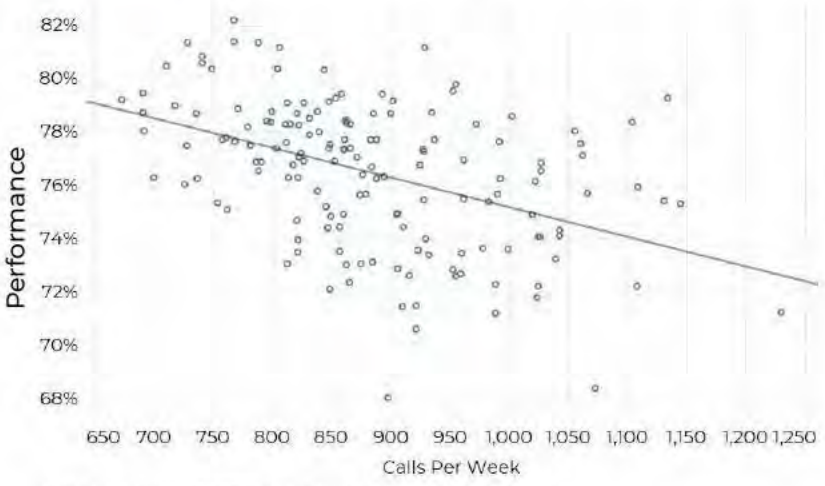


Hall 1 and 2 are grouped together in this analysis because they serve the same demand for certain call types



Hall 1 and 2 are grouped together in this analysis because they serve the same demand for certain call types

What is the cost of new demand?



First due. 3 years (2015-2017). Turnout times have been capped at 105 seconds. Emergency calls only.

Extra 5,200 Calls/Year equals 1.11% performance drop

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What is the cost of new demand?

	Calls Per Year	Expected Performance	Change From 2017
2017	54,014	65.9%	
2021	57,317	65.2%	-0.7%
2028	62,122	64.1%	-1.7%
2041	83,446	59.6%	-6.3%

First due. Turnout times have been capped at 105 seconds.
Emergency calls only. Analysis based on 3 years of data (2015-17)

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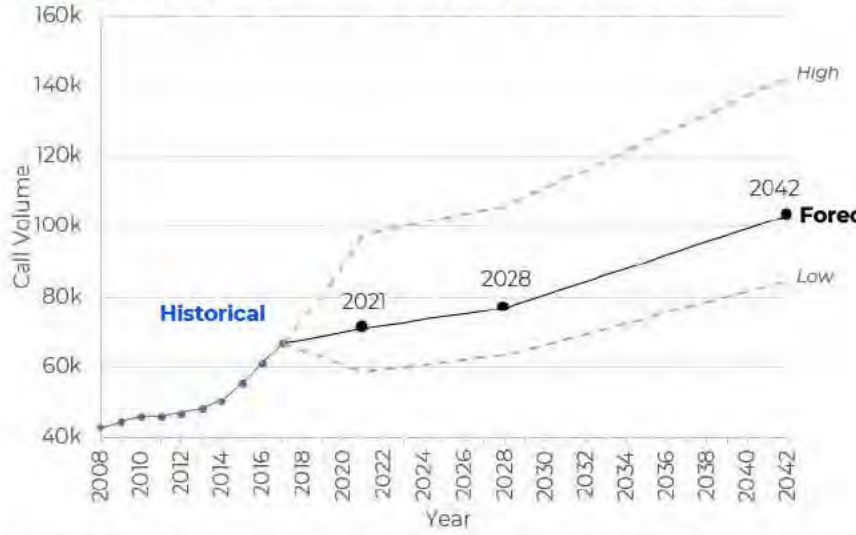
Long Term Call Growth Forecast



This growth forecast is **conservative.**

It should be updated every couple of years.

Current Forecast - Call volume was assigned using compound annual growth formula at 4, 10, and 25 years. The points in between were extrapolated using straight line. High = Grow for at 10%/yr until 2021, then grow at rate of population. Low = Call rate returns to a 2015 level by 2021.

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Response Performance
Appendix

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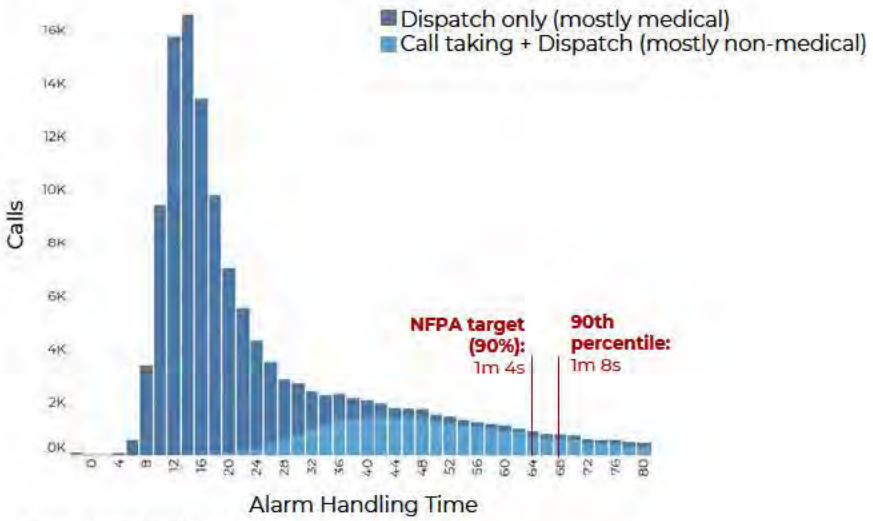
Alarm Handling Times



2015-2017, priority 1-3 calls

78

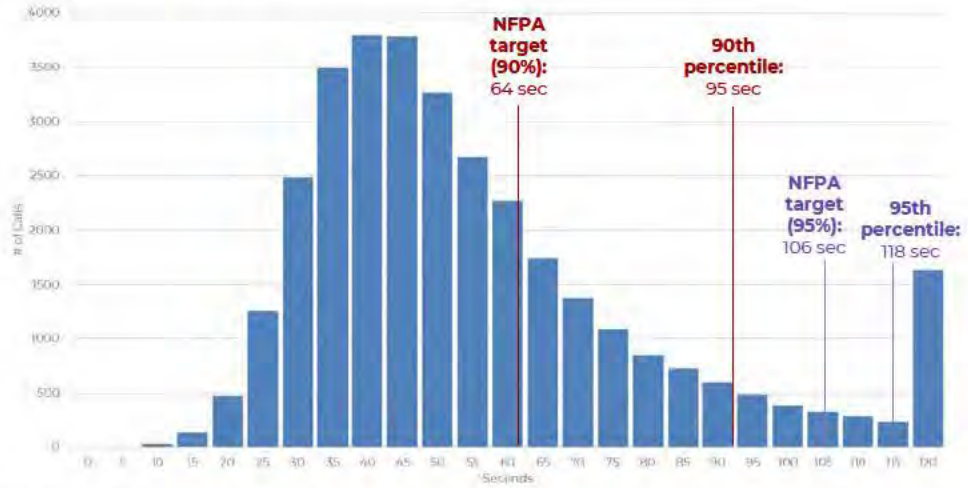
Note that the source of this data is from the CAD system and not the telephony system, and therefore not 100% accurate.

"Call taking + Dispatch (mostly non-medical)" is where incident type is not in the "F9A9" format from BCEHS.
Alarm handling time = Unit dispatched time – EComm first record created

One potential improvement could be to incorporate building risk information into the CAD system

Non-EHS Alarm Handling Times

On calls that are not Combined Response



2015-2017, priority 1-3 calls where Record created time ≠ transferred to dispatch, and type not F9A9 format from BCEHS
Alarm handling time = first unit dispatched - EComm first record created

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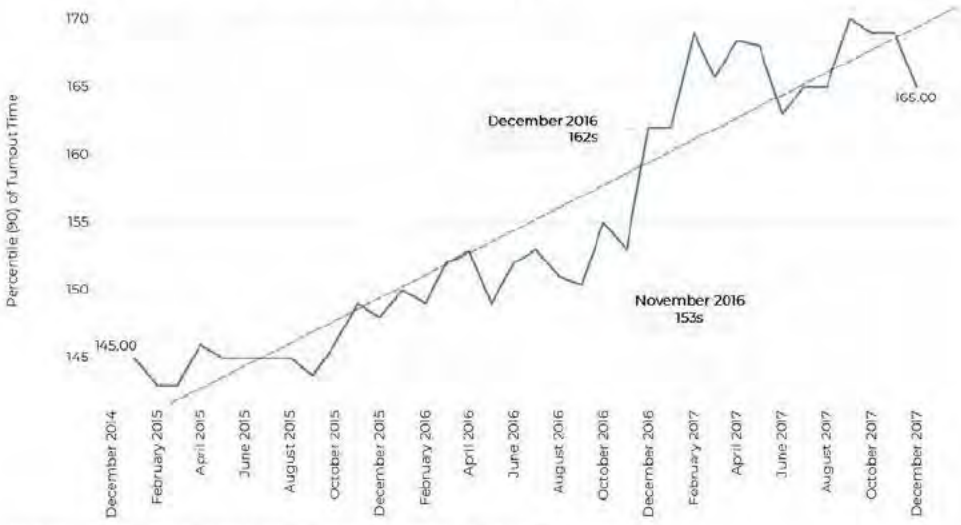
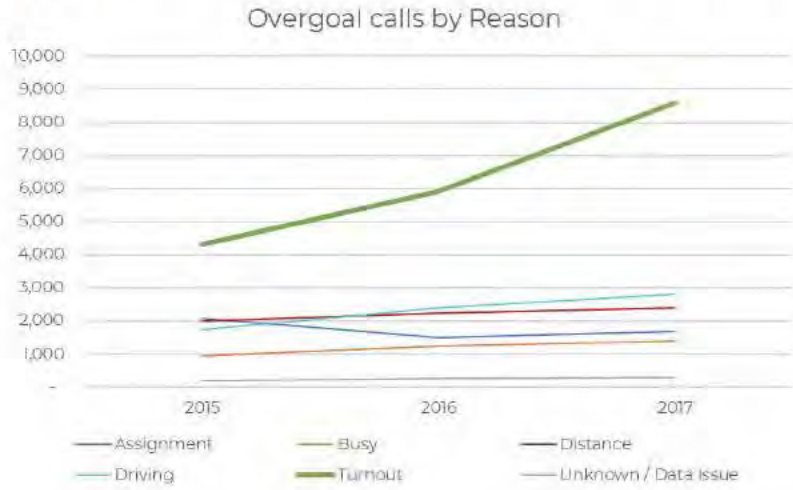
Increasing turnout times



Includes only First Due on Emergency incidents. Excludes incidents without valid timestamps.

Turnout is overshadowing all other reasons for late arrivals



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Appendix - Response Performance

Definitions

First Due:
First unit should arrive on scene to an emergency call within 6m24s of it being answered, 90% of the time.

Key metric for all call types, especially medical calls.

ERF:
Effective Response Force is the minimum team of firefighters to effectively fight a structure fire.

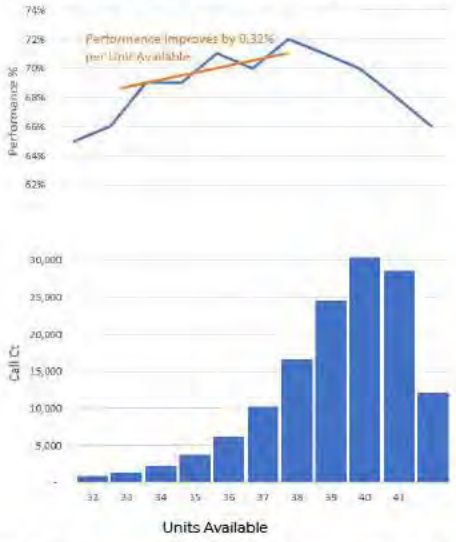
Low hazard:
15 firefighters within **10m24s** on low hazard fires, 90% of the time.

Moderate hazard:
26 firefighters within **10m24s** for high hazards, 90% of the time.

High hazard:
39 firefighters within **12m34s** for high hazards, 90% of the time.

VFRS does not currently track this, so we approximate performance using the 4th arriving fire suppression unit

First Due Performance by Units Available



First on Scene calls and performance. Emergency calls only. Number of units available considers all apparatus except for Cars.

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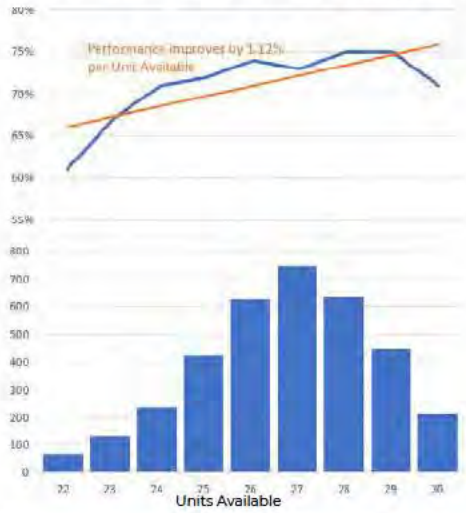
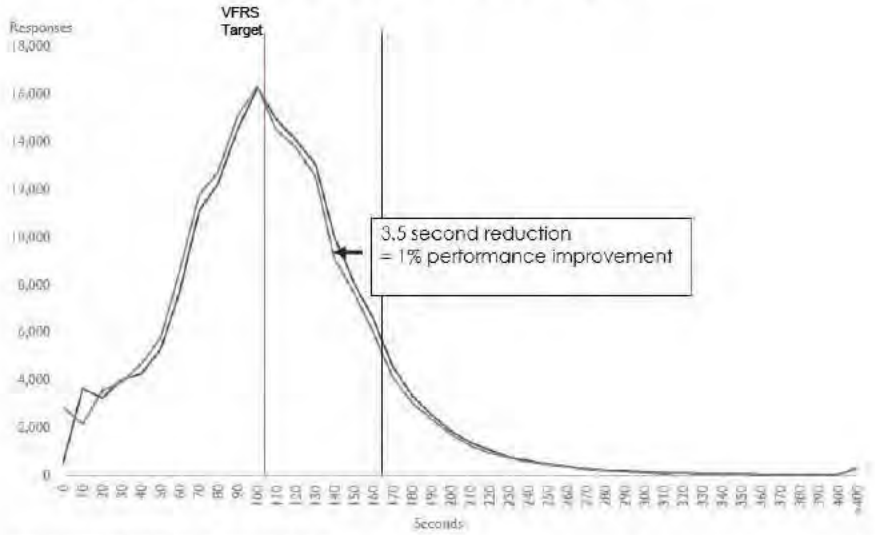
ERF Performance vs Units Available



X Axis: How many suppression units were available (not on a call already). Top: What was performance? Bottom: How many events were there? For emergency fire calls. Excludes calls with less than the specified number of apparatus. Only includes suppression units. 2015-2017 (3 years)

3.5sec = 1% performance gain



First on scene, All Call Types. 3 years (2015-2017).

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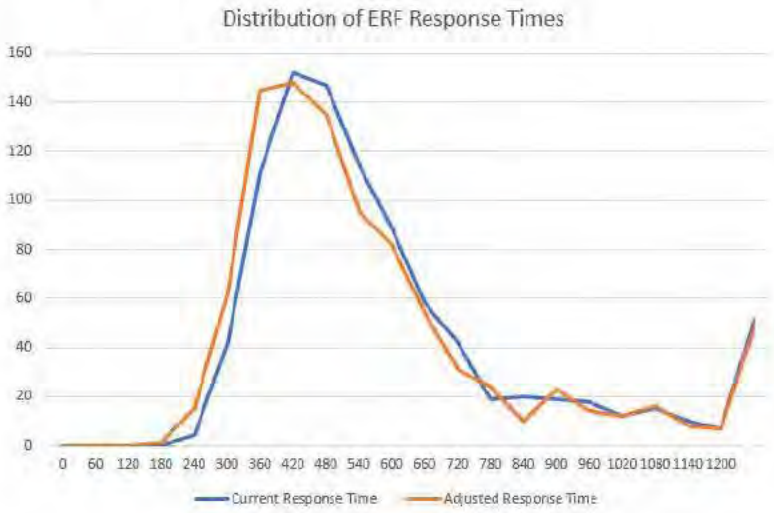
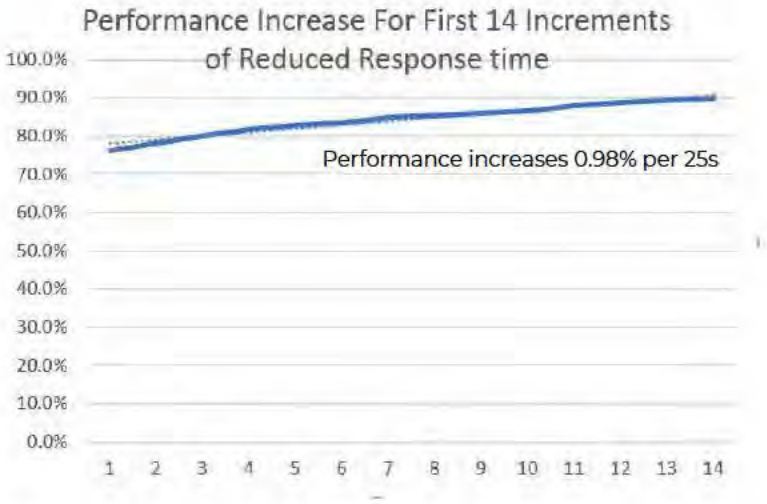
ERF Response Times

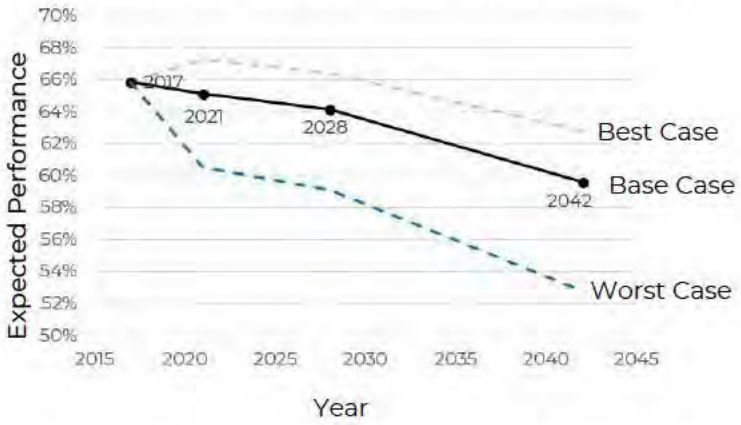


ERF Performance Improvements



What if we do nothing?

History shows first-due performance drops by ~1% for every additional 5,000 incidents/year, which at the current growth rate happens every 5 years.



First due. 3 years (2015-2017). Turnout times have been capped at 105 seconds. Emergency calls only

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Current Forecast – Call volume was assigned using compound annual growth formula at 4, 10, and 25 years. The points in between were extrapolated using straight line.
Worst Case= 10% annual growth until 2021, then grow at rate of population growth. Best Case = Call rate returns to a 2015 level by 2021.

Measure performance to NFPA standards

In the short-term, this standard is very aggressive.
Set reasonable, achievable targets for next 4 years:

- Raise overall first-due performance from **66%** to **80%**
- Raise overall low-risk ERF performance from **76%** to **84.5%**
- Reduce 90th-percentile turnout times to **105s** (vs 80s)

Adopting the standard allows benchmarking against peers.

Clearly-defined KPIs and baselines must be communicated effectively to those accountable.

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These recommendations are in line with peer benchmarks. Toronto, for instance, has also set 105s as an interim turnout target.
Achieving 90% performance may not be achievable in the short term, but an interim target of 80-85% is reasonable, given the potential improvements to turnout times, alarm handling times, and staffing.

Benchmarking
Appendix

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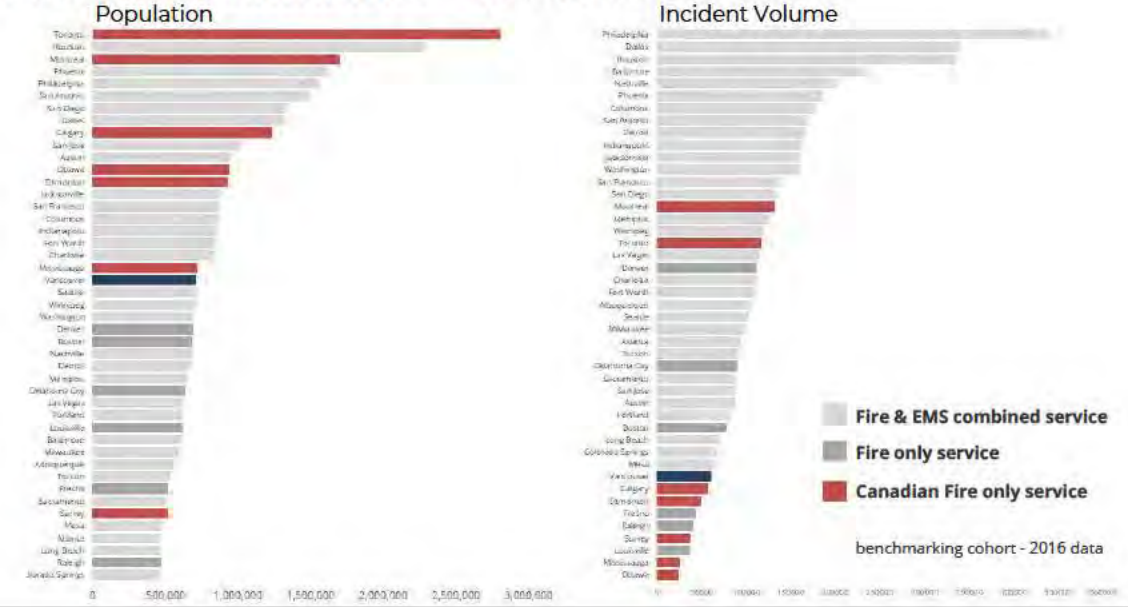
Broad Benchmarks - 45 Cities



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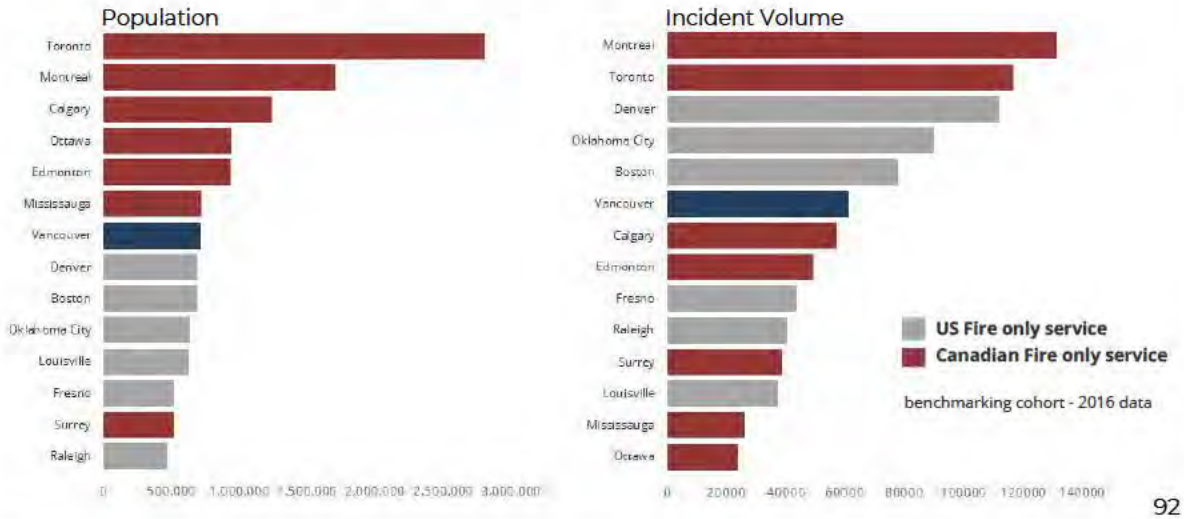
Broad Benchmarks

14 cities, Fire-only services



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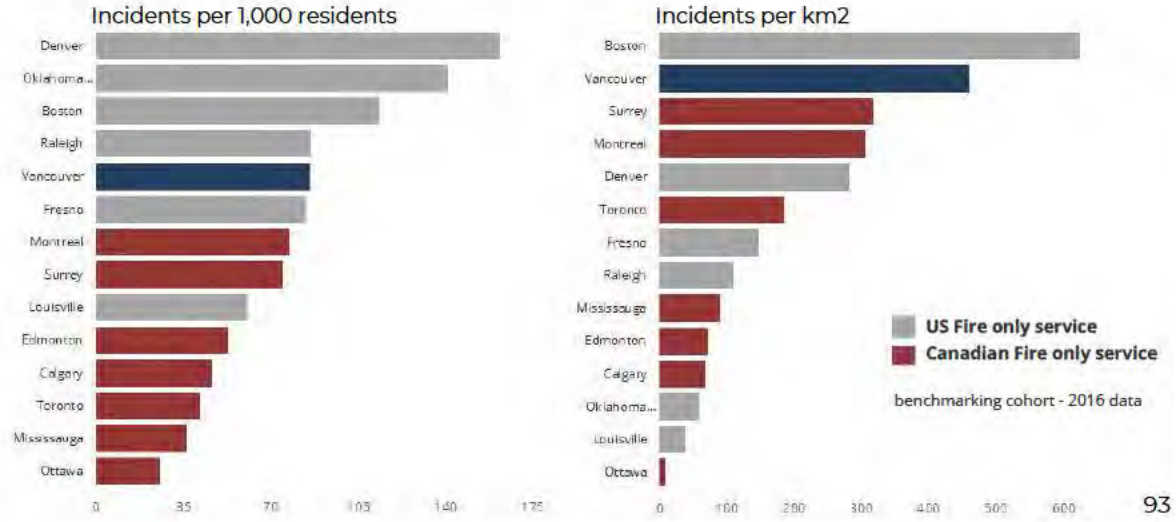
Broad Benchmarks

14 cities, Fire-only services

Incident volume and density



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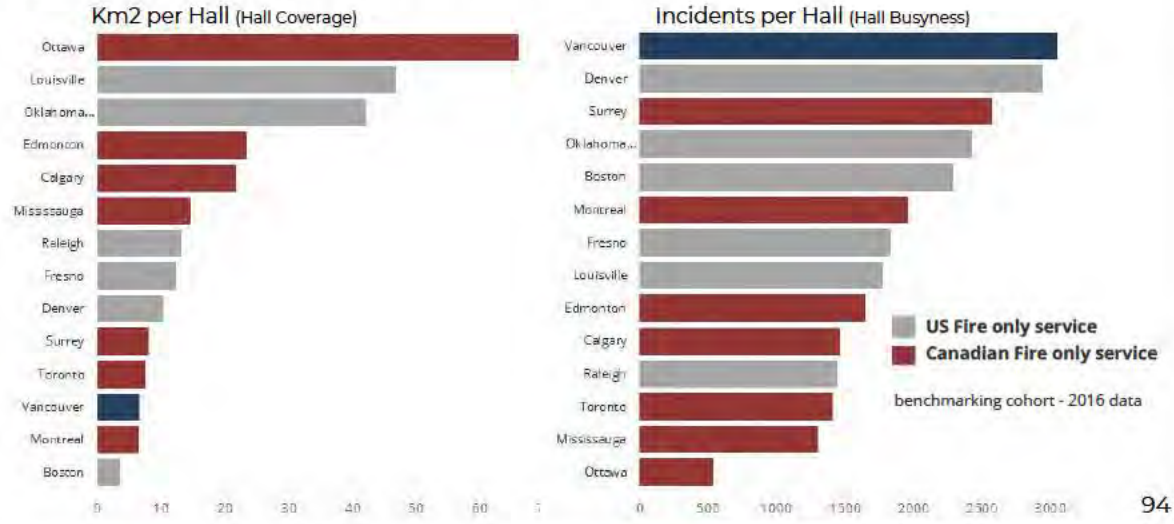
Broad Benchmarks

14 cities - Fire-only services

Hall Coverage and Busyness



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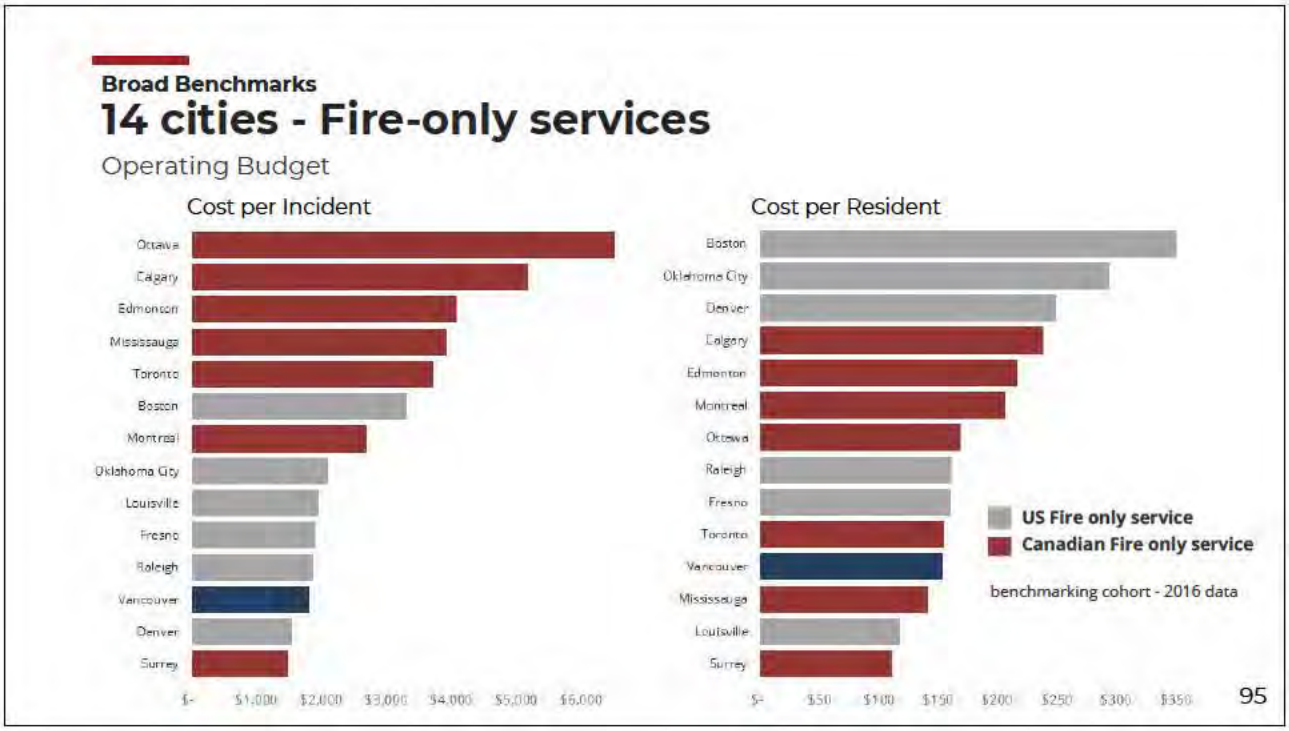
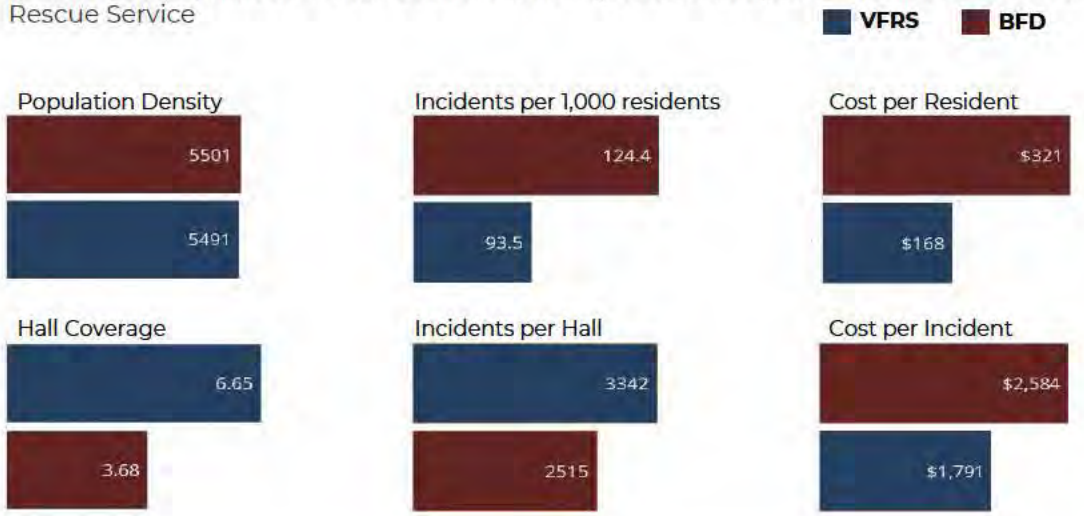


All US departments operating budgets have been adjusted to CAD (using an avg 2016 1,245 Canadian dollar)

Broad Benchmarks

Boston Comparison

Boston Fire Department was identified as being a close comparable to Vancouver Fire Rescue Service



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Boston Fire Department (BFD)
Service: **Fire-only**
Population: **687,584**
Land Area: **125 km2**
Density: **5,501**
Call Volume: **85,508**
Halls: **34**
km²/Hall: **3.7**
Operating Budget: **$220,990,371 USD**

Cohort Benchmarks

Profiles

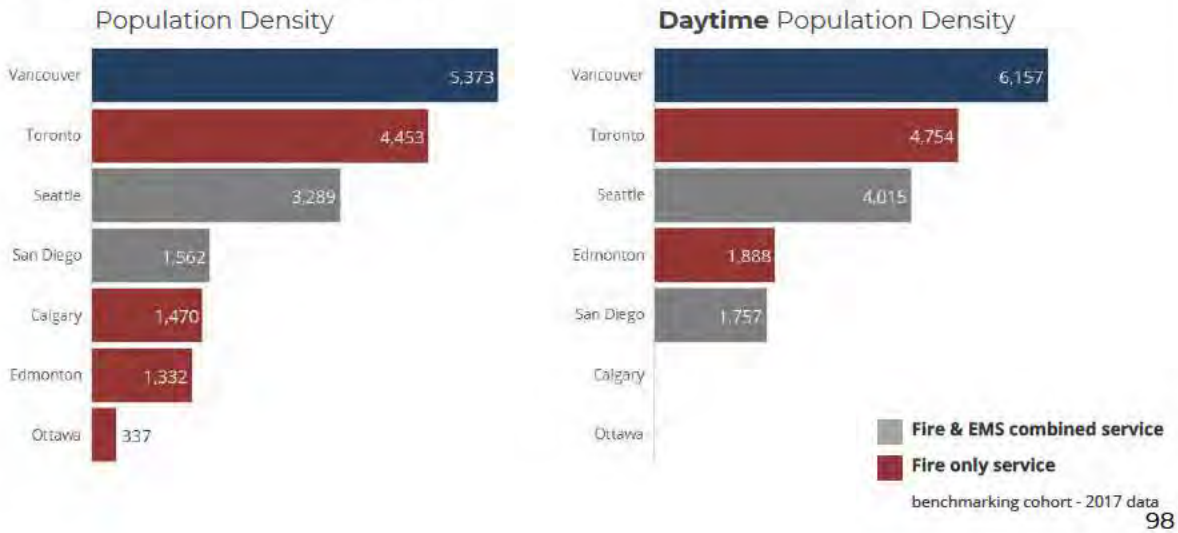
		Governance and Administration			Service		
	Accreditation Status	Gov't Policy statement	Mutual Aid agreements	Provide service to contract area	Level	Staffing	Geotype
Vancouver	Registered	N	Y	Y	Fire	Career	Urban
Edmonton	Accredited	Y	Y	Y	Fire	Career	Urban
Toronto	Applicant - 2018 goal to achieve	N	Y	N	Fire	Career	Urban
Calgary	Accredited	Y	Y	Y	Fire	Career	Urban
Ottawa	Accredited – 2019 renewal	Y	Y	Y	Fire	Career / Volunteer	Urban / Rural
San Diego	No, not pursuing	Y	Y	N	Fire & EMS	Career	Urban
Seattle	No, not pursuing	N	Y	N	Fire & EMS	Career	Urban

97

All US departments operating budgets have been adjusted to CAD (using an avg 2016 1,245 Canadian dollar)

Cohort Benchmarks

Population Density



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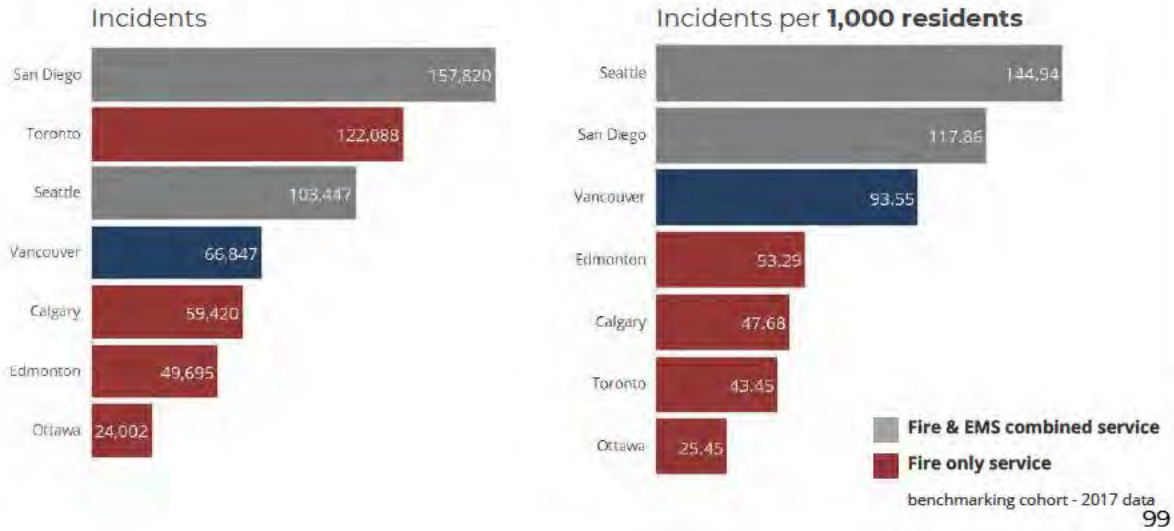
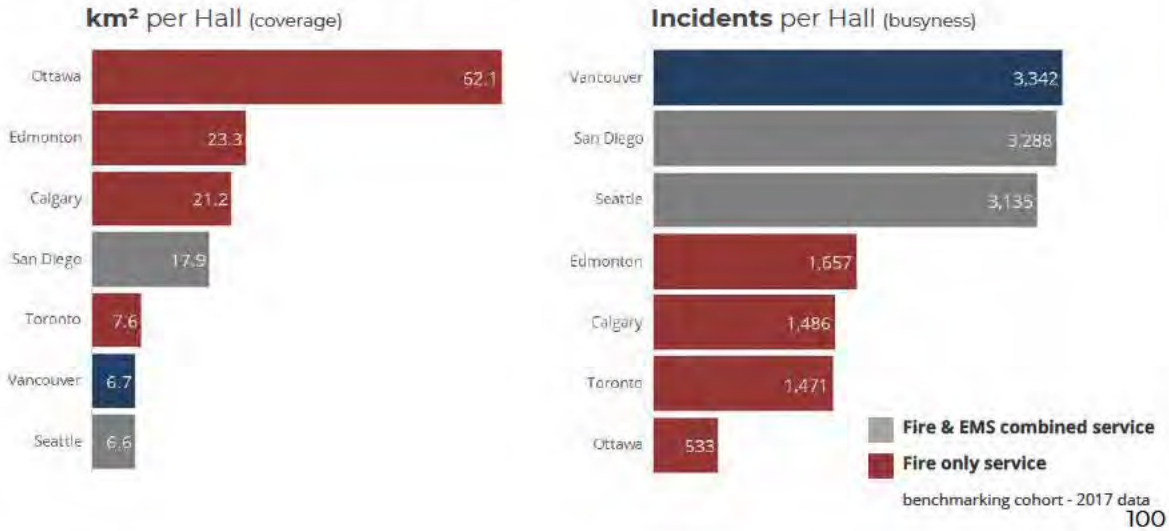
Cohort Benchmarks

Population and Incidents



Cohort Benchmarks

Coverage and Busyness



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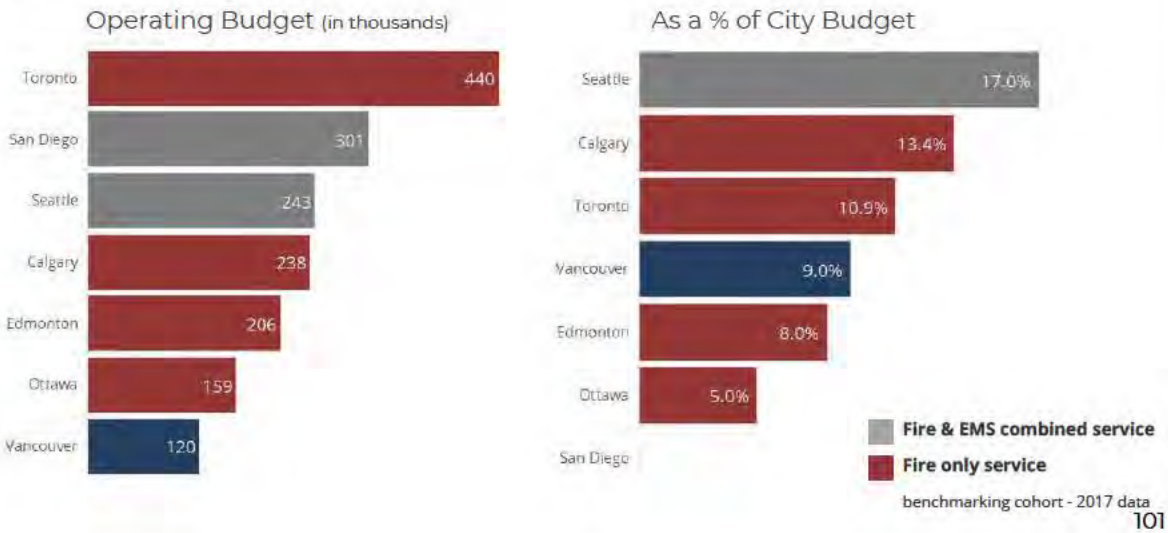
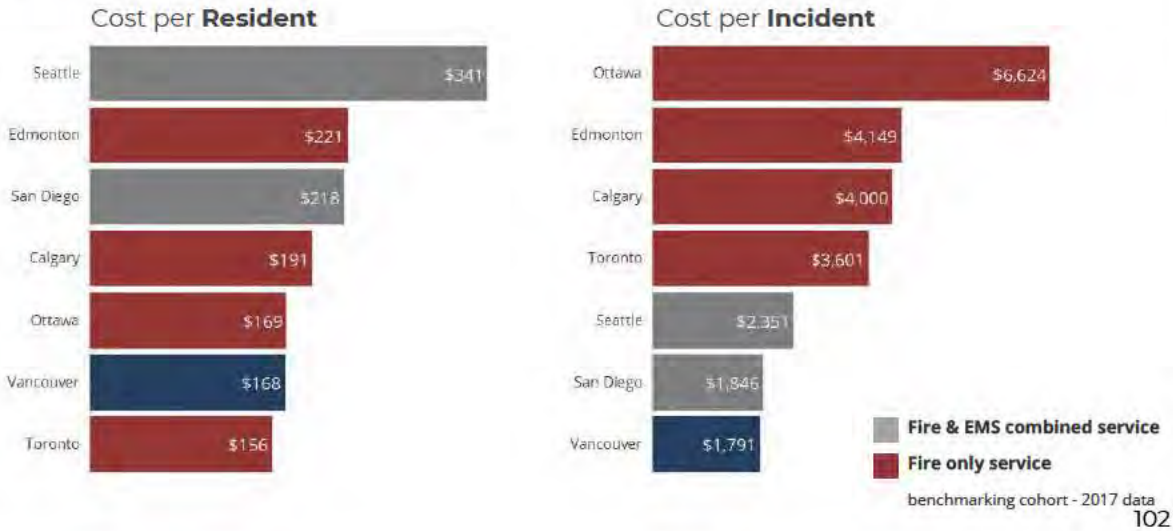
Cohort Benchmarks

Costs



Cohort Benchmarks

Costs



benchmarking cohort - 2017 data

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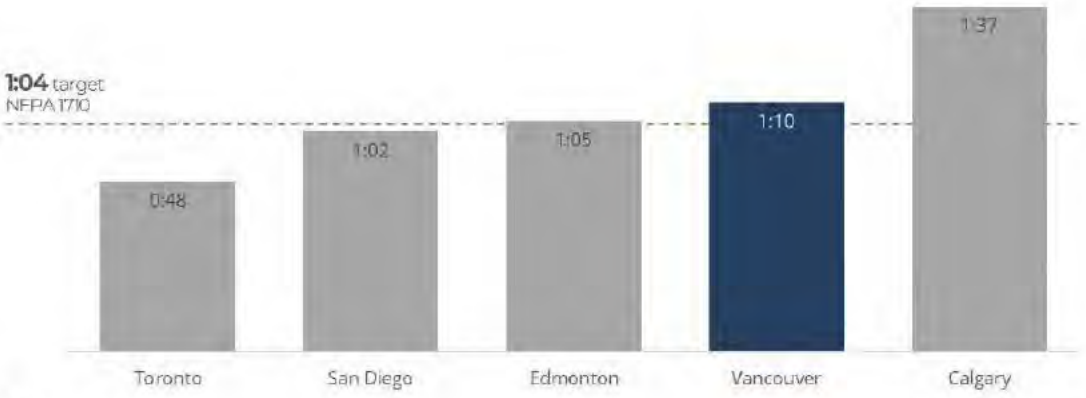
Response Performance

First Unit on Scene - Call Processing



90th percentile times

VFRS - non EHS alarm handling times

benchmarking cohort - 2017 data

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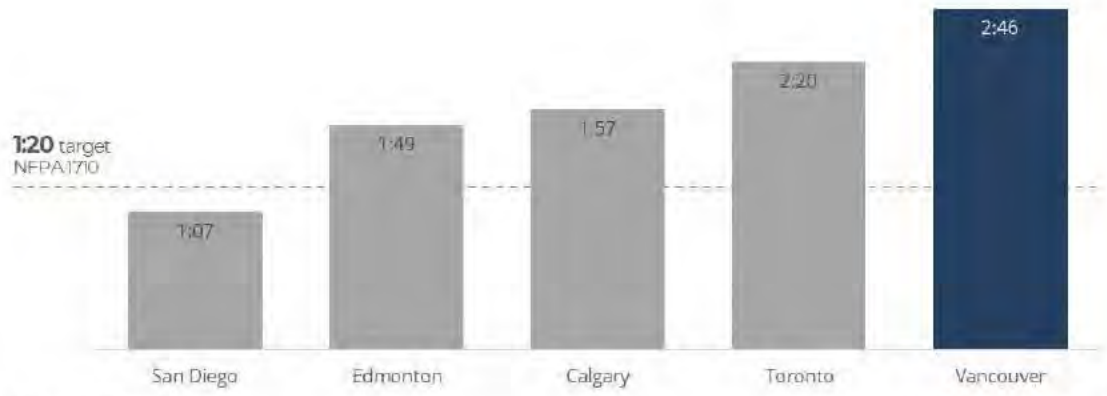
Response Performance

First Unit on Scene - Turnout

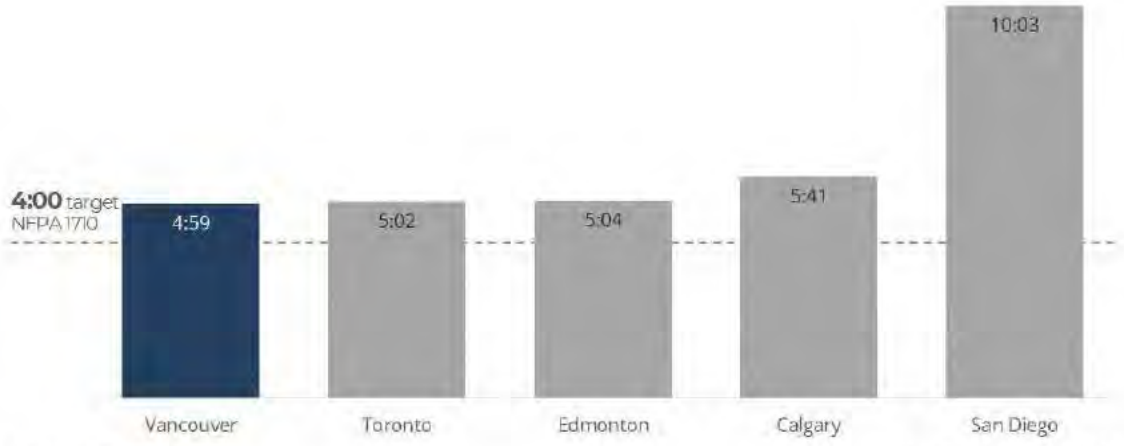


90th percentile times

benchmarking cohort - 2017 data

Response Performance

First Unit on Scene - Travel

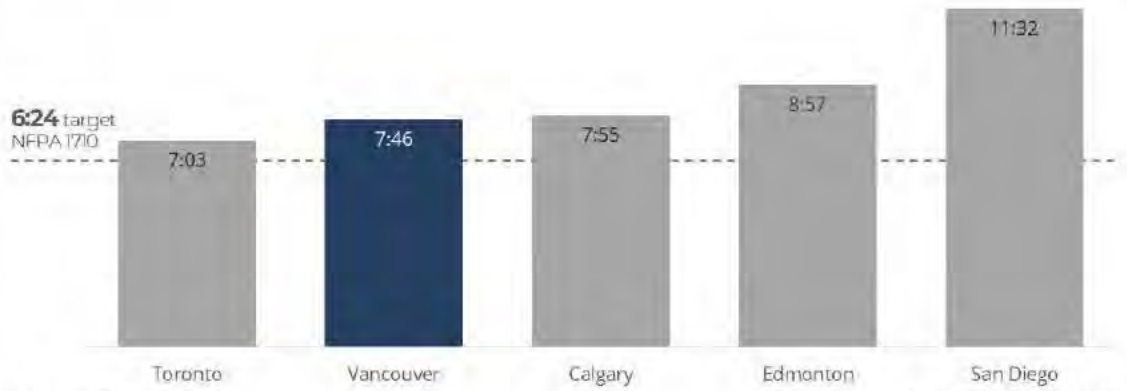


90th percentile times

benchmarking cohort - 2017 data

Response Performance

First Unit on Scene - Total Response Time



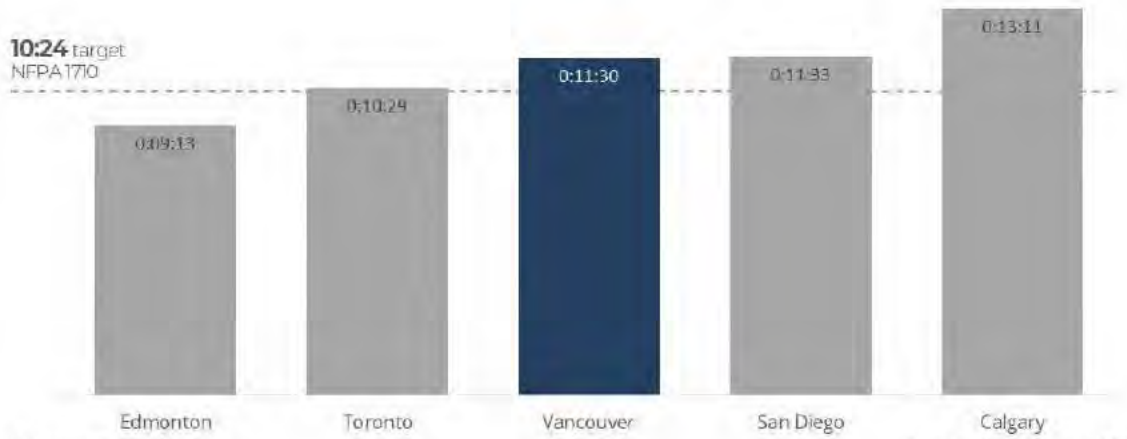
90th percentile times

benchmarking cohort - 2017 data

Response Performance

First Unit on Scene - Effective Response Force (ERF)

4 suppression units / 16 FF



90th percentile times

benchmarking cohort - 2017 data

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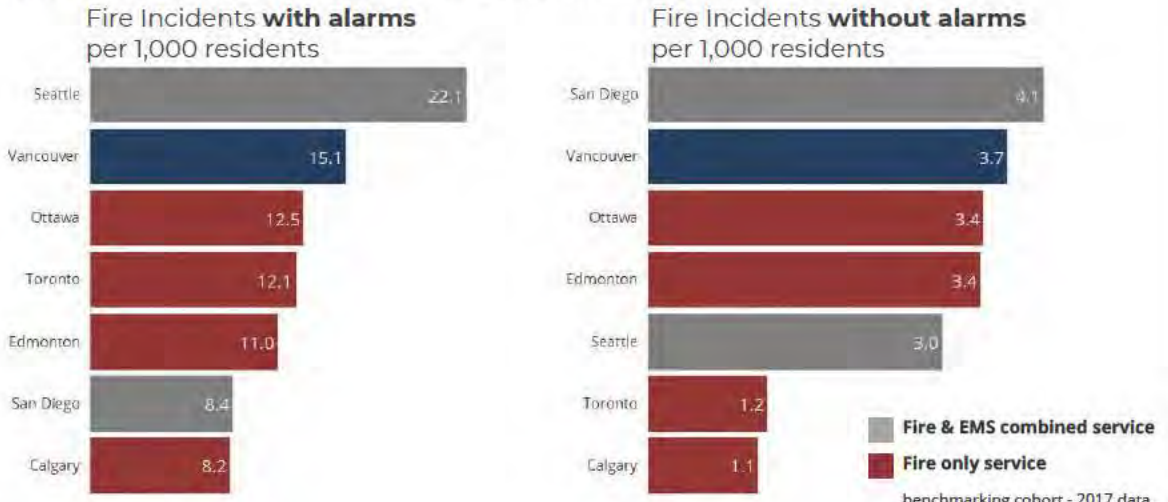
Fire Incidents

VFRS has a high number of fire events compared to peers.



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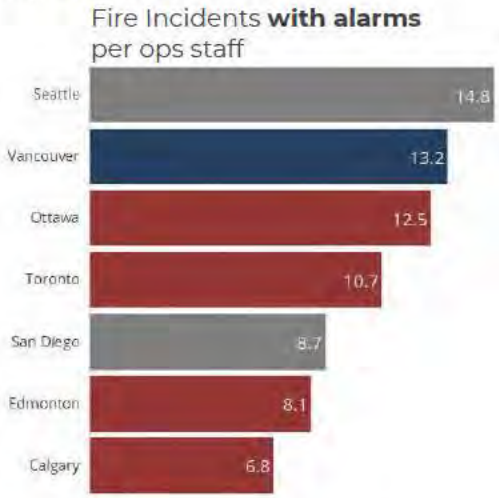
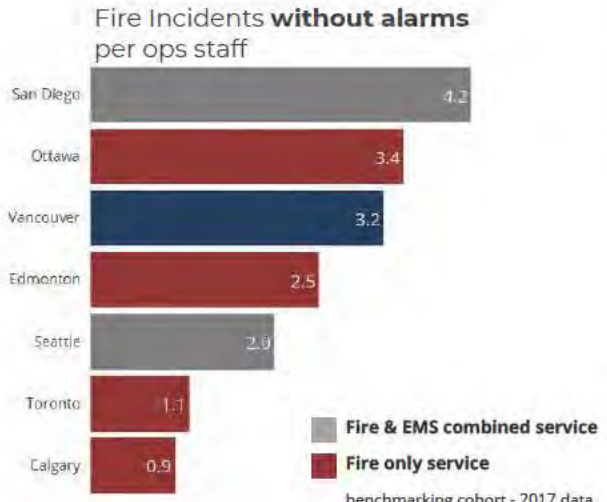
Fire Incidents

By operations staff





benchmarking cohort - 2017 data

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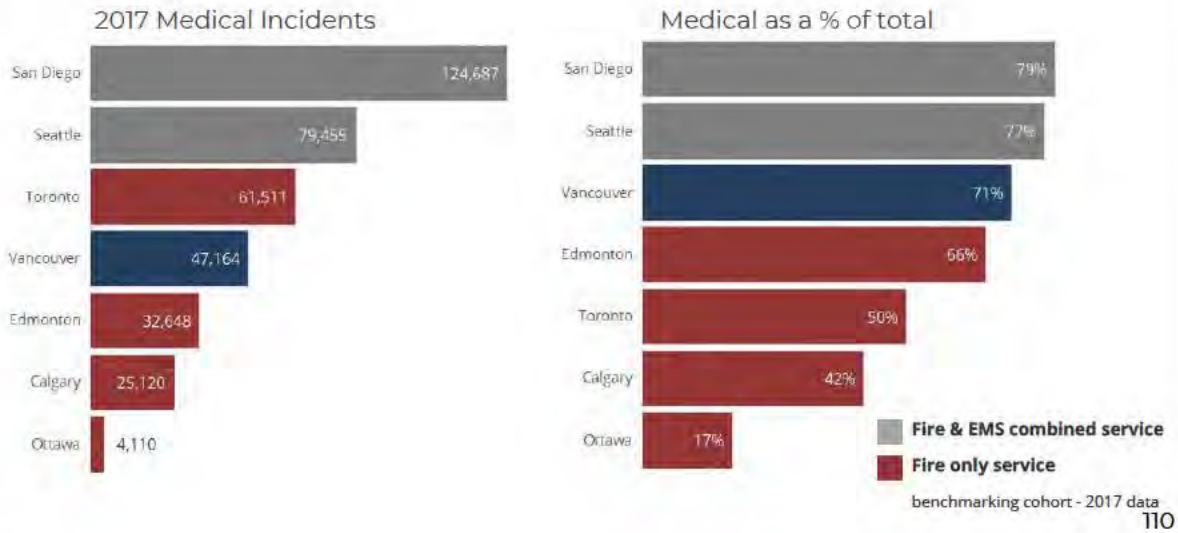
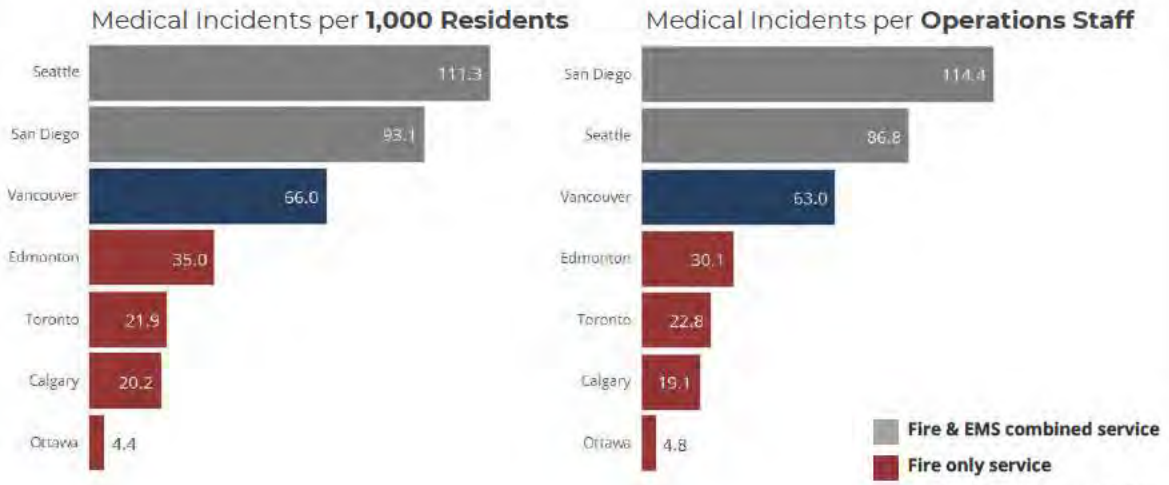
Medical Incidents



Looking at only medical incidents, again VFRS deals with a high volume for a Fire-only service and it's population. Looking more like an Fire-EMS combined service.

Medical Incidents



Rescue and Special Operations

Programs

	HAZMAT	Confined Space	High / Low Angle Rope Rescue	Structural Collapse Rescue	Trench Collapse Rescue	Swift Water Rescue	Adv. Vehicle & Machinery Extrication	Marine Rescue	Aircraft Rescue	Elevator Rescue	Wildland-Urban Interface firefighting
Vancouver	Y	Y	Y	Y	Y	N	Y	Y	N	Y	Y
Edmonton	Y	Y	Y	Y	Y	Y	Y	n/a	n/a	n/a	Y
Toronto	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N
Calgary	Y	Y	Y	Y	Y	Y	Y	n/a	n/a	Y	N
Ottawa	Y	Y	Y	Y	Y	Y	Y	n/a	N	Y	Y
San Diego	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Seattle	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y

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Fire Prevention & Public Education

Programs

	School fire safety	Home fire sprinkler education	Home safety visits	CPR instruction	wildfire safety program	Older adult fire safety program - Seniors	Fire Prevention Week activities	Free distribution of home smoke alarms	Free installation of home smoke alarms	Home fire sprinkler information at events
Vancouver	Y	N	Y	Y	N	Y	Y	Y	Y	N
Edmonton	Y	N	N	N	N	Y	Y	Y	Y	N
Toronto	Y	Y	Y	N	N	Y	Y	Y	Y	Y
Calgary	Y	N	Y	N	Y	Y	Y	Y	Y	Y
Ottawa	Y	N	Y	N	Y	Y	Y	Y	Y	Y
San Diego	Y	N	N	N	Y	N	Y	N	N	N
Seattle	Y	Y	N	Y	N	Y	Y	Y	Y	Y

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Edmonton reported a variety of other practices and events that they execute

Fire Prevention & Public Education

Prevention Stats

	Prevention staff	As % of total staff	Certified Inspectors (part of prevention staff total)	Fire Incidents / 1,000 - avg 2015-2017 (not incl. alarms)
Toronto	202	6.9%	159	1.2
Ottawa	74	3.7%	Not provided	3.4
Seattle	57	5.7%	Not provided	3.0
Edmonton	44	3.5%	Not provided	3.4
Vancouver	23	**2.8%**	12	**3.7**
Calgary	Not provided	Not provided	31	1.1

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San Diego is not included as it has a separate inspections bureau

Staffing

	Total Staff	Total Ops Staff	Minimum staff per shift	Shift Schedule
Vancouver	819	749	137	4 shifts (2d/2n). 4 off. Days-10hrs. Nights-14hrs
Edmonton	1264	1085	217	4 shifts (2d/2n). 2 off. 4 shifts (2d/2n). 6 off. Days-10hrs. Nights-14hrs
Toronto	3174	2693	633	24hr shifts
Calgary	1516	1316	246	4 shifts (2d/2n). 4 off. Days-10hrs. Nights-14hrs
Ottawa	1532	860 career 562 POC	261	24hr shifts 4 week rotation
San Diego	1300	1090		
Seattle	1065	915	211	24hr on, 2 off 24hr on, 4 off

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Human Resources

Physical Health

	Fitness & Health Program	Associated with IAFC	# of physicals documented in 2017	fitness assessment	Infection control program	Exposure control program
Vancouver	N	N	Initial survey - 39 (union-1349)	Optional	Y	Y
Edmonton	Y	Y	600	Optional	Y	Y
Toronto	N	N	101	N	Y	Y
Ottawa	Y	Y			Y	Y
San Diego	Y	N			Y	Y
Seattle	N	N			Y	Y
Calgary	No data provided					

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Human Resources

Behavioral and Mental Health

All of the Canadian services in the cohort are increasing mental health resiliency and literacy.

- Vancouver has started to implement the **Resilient Minds** program.
- The other services are implementing the **Road to Mental Readiness** (R2MR) program.
- R2MR is currently being implemented in all but Ottawa, who are awaiting funding.

Seattle and San Diego have a critical incident stress management program in place.

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Dispatch

benchmarking cohort - 2017 data

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Training

Management and staff view training to be the bare minimum and are open to new delivery methods to increase proficiency in all areas of operation.

Compared to its Canadian peers, VFRS staff respond to the most incidents, have the most injuries, and the fewest trainers.

Staff busyness is suspect in debilitating training - people just haven't had the time.

VFRS has a high lost time injuries rate.

Operations staff per training officer was highest amongst the cohort - training staff is busy as well.

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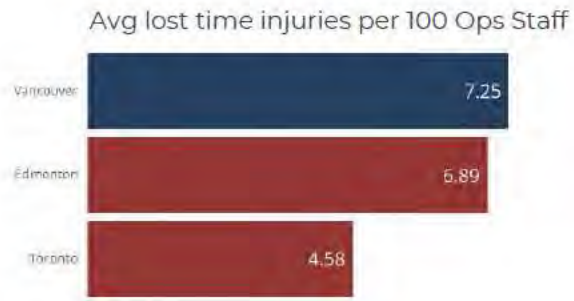
HR & Training

Lost time injuries from 2015-2017



benchmarking cohort - 2017 data

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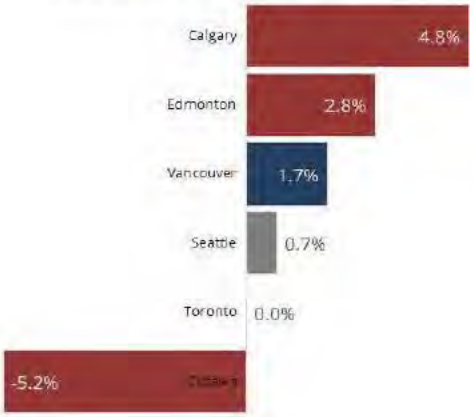
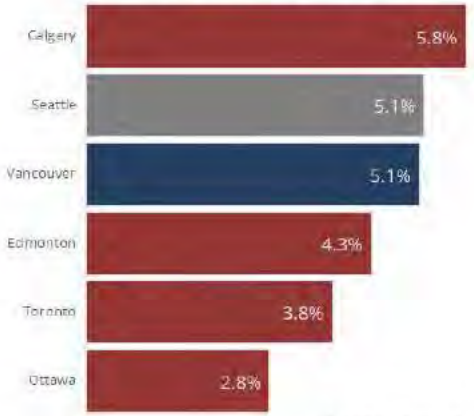
Training

Staff growth and new recruits

Operations staff change over 3 years



2017 New Recruits as % of total ops staff



benchmarking cohort - 2017 data

Culture
Appendix

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Working with stakeholders and partners

Generally speaking most stakeholders and partners want to work more closely and effectively with VFRS

Most city departments would like to have a closer more integrated planning process with VFRS

VFRS relationship with BCEHS is effective on the scene but is not seen as being efficient and effective from a strategic perspective

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Additional specific ideas regarding BCEHS:

- Update and formalize response agreements as well as performance standards to be monitored.
- Conditional response of units based on capability and proximity to calls should be explored as part of improvements to dispatching and the CAD system.
- Engage staff in determining options for health delivery and in working with EHS to determine practice.
- Rationalize the use of Fire resources with the EMALB and EHS Medical oversight
- Develop new cross training based on determination of roles

Cultural Diversity

Continue and expand efforts to attract a diverse workforce.

Explore opportunities to learn from other fire departments as well as partners such as Vancouver Police.

Culture is perceived to be improving significantly in the last year, particularly through increased communication and engagement.

Build on VFRS strengths such as community engagement, sense of pride, mentorship, teamwork, values.

The culture towards physical health such as healthy (nutritional) eating, physical exercise including sports is positive

Re-instituting sports into the Fire Halls has significantly helped with teamwork, camaraderie, physical and mental health

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Recent community engagement has been effective in improving VFRS's reputation.

Analytics Capability

Periodic updates in call forecast -- our forecast is conservative

Improve data quality

- Getting better timestamps from Ecomm
- Coordination of Information with BCEHS
- Creation of exception and audit reporting for performance measures and standard metrics.

Initiate call processing review process in order to monitor performance and accommodate continuous improvement. Initial areas of focus should include:

- Alarm calls
- ERF determination
- Active Fires
- Life threatening incidents.

VFRS needs to continue shifting towards analysis and decision making that is based on data analytics and evidence

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CPSE Accreditation
Appendix

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Pursue CPSE Accreditation

Resources

https://cpse.org/

https://www.nfpa.org/

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Pursue CPSE Accreditation

Benefits

- Effective improvements through the use of peer reviewed factual data.
- Creates a mechanism for developing concurrent documents to include strategic and program action plans
- Facilitates improved strategic and business planning.
- Opportunity to improve employee engagement.
- Promotes excellence within the Service and improves abilities to recognize and better understand potential risks and hazards
- Using evidence based information will elicit greater trust and understanding from elected officials and administrators.
- Demonstrates that the service is committed to continuous improvement.
- Creates methods or systems for addressing deficiencies while building organizational success
- Opportunity to improve fire insurance ratings through recognized standards.
- Creates methods or systems for addressing deficiencies while building organizational success
- Encouraging professional growth in addition to its personnel involved in the self-assessment process
- Promotes excellence within the Service and improves abilities to recognize and better understand potential risks and hazards

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Challenges:

- Time and Labour - its an intensive difficult process
- Costs - Extra time, annual fees, training, textbooks, external analysis, etc
- Requires buy-in from members at all levels
- Skepticism with the concept and process.
- Potential disappointment in peer analysis - often difficult to hear that we are not doing as well as we think we are

Mid-term Recommendation #5: Add 20 firefighters

Appendix

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Mid-term Recommendation: 5. Add firefighters to improve response performance

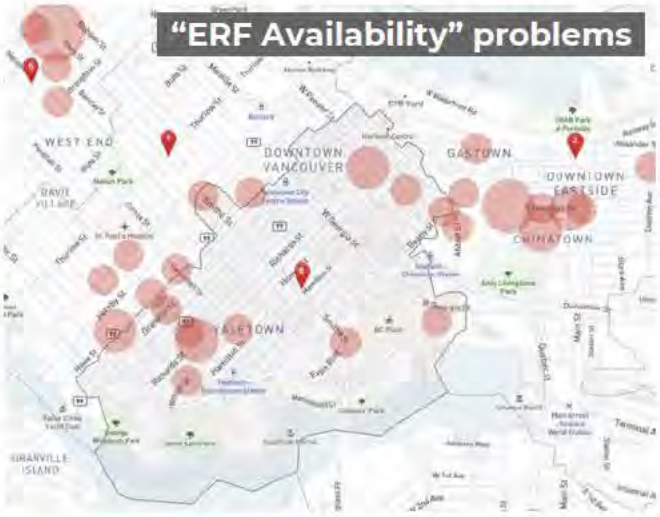
Example 3: Full-time Medic 8 targets ERF availability

Staffing Medic 8 has a more modest effect on first-due, but greater ERF benefits.

First-due improvement:
0.2% (100 overgoal calls)

ERF Improvement:
(15 FF) **1.0%** (7 overgoal calls)
(26 FF) **3.3%***
(39 FF) **5.2%***

Daily responses per crew in Hall 8 drop from **8** to **6**



* Modelled probabilities. Current actual moderate and high risk incidents do not have a full ERF assigned to them and are not tracked separately

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Hall 8 is frequently responding to calls outside of its zone, mostly being pulled into the Hall 2 zone.

Mid-term Recommendation: 5. Add firefighters to improve response performance

Optimal staff additions for Low-Hazard ERF

Positions ERF % Gain	Hall placements (+ equivalent options)
One 0.4%	4
Two 0.6%	4,12/19/21
Three 1.0 - 1.1%	4,4/12,12 10/19,10/19,19 8,8,8 17,17,17
Four 1.3 - 1.4%	4,17,17,17 4,10/19,10/19,19 4,8,8,8
Five 1.6%	4,17,17,17,12/19/21 4,4/12,12,15,15 4,19,19,19,19 2,2,2,2,4 4,20,20,20,20 8,8,8,15,15
Six **2.1 - 2.2%**	**4,12,12,19,19,19** **4,4/12,12,17,17,17** **8,8,8,17,17,17**
Seven / Eight 2.4 - 2.6%	4,4/12,12,19,19,19,19 4,4,12,15,15,17,17,17 2,2,2,2,4,17,17,17 8,8,8,15,15,17,17,17
Nine 3.0%	8,8,8,17,17,17,10/19,10/19,19 3,3,3,8,8,8,17,17,17 4,8,8,8,12,12,19,19,19
Ten / Eleven 3.4 - 3.5%	4,4,12,17,17,17,19,19,19,19 4,4,8,8,8,12,15,15,17,17,17 4,4,9,12,17,17,17,19,19,19,19
Twelve 4.0%	4,4,12,15,15,17,17,17,19,19,19,19

Based on 2015-17 calls where 15 or more members responded. Assumes members are at hall available to respond.
Note: only a selection of best options is shown. Comparable alternatives are available in the Appendix.

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Low Hazard ERF Optimization Options

#	ERF Gain Halls
1	0.39% 4
2	0.59% 4,12
2	0.59% 4,19
2	0.59% 4,21
2	0.54% 15,15
2	0.53% 18,21
2	0.53% 21,21
3	1.06% 4,4,12
3	1.06% 4,12,12
3	1.03% 8,8,8
3	1.02% 17,17,17
3	0.98% 10,10,19
3	0.98% 10,19,19
3	0.98% 19,19,19
3	0.97% 3,3,3
4	1.41% 4,17,17,17
4	1.37% 4,10,10,19
4	1.37% 4,10,19,19
4	1.37% 4,19,19,19
4	1.25% 4,8,8,8
4	1.22% 3,3,3,4
4	1.17% 3,3,3,12
4	1.17% 3,3,3,19
4	1.17% 3,3,3,21
5	1.61% 4,12,17,17,17
5	1.61% 4,17,17,17,19
5	1.61% 4,17,17,17,21
5	1.60% 4,4,12,15,15
5	1.60% 4,12,12,15,15
5	1.60% 4,19,19,19,19
5	1.59% 2,2,2,2,4
5	1.59% 4,20,20,20,20
5	1.58% 8,8,8,15,15
5	1.56% 15,15,17,17,17
5	1.56% 8,8,8,18,21
5	1.56% 8,8,8,21,21
5	1.55% 17,17,17,18,21
5	1.55% 17,17,17,21,21
5	1.52% 3,3,3,15,15
5	1.50% 3,3,3,18,21
5	1.50% 3,3,3,21,21
6	2.16% 4,12,12,19,19,19
6	2.08% 4,4,12,17,17,17
6	2.08% 4,12,12,17,17,17
6	2.05% 8,8,8,17,17,17
6	2.01% 3,3,3,8,8,8
6	2.00% 3,3,3,17,17,17
6	1.96% 3,3,3,10,10,19
6	1.96% 3,3,3,10,19,19
6	1.96% 3,3,3,19,19,19
7	2.38% 4,12,12,19,19,19,19
7	2.38% 4,4,12,19,19,19,19
7	2.27% 4,8,8,8,17,17,17
7	2.26% 2,2,2,2,4,4,12
7	2.26% 2,2,2,2,4,12,12
7	2.25% 8,8,8,12,17,17,17
7	2.25% 8,8,8,17,17,17,19
7	2.25% 8,8,8,17,17,17,21
7	2.24% 3,3,3,4,17,17,17
7	2.21% 3,3,3,8,8,8,12
7	2.21% 3,3,3,8,8,8,19
7	2.21% 3,3,3,8,8,8,21
7	2.20% 3,3,3,4,10,10,19
7	2.20% 3,3,3,4,10,19,19
7	2.20% 3,3,3,4,19,19,19
7	2.19% 3,3,3,12,17,17,17
7	2.19% 3,3,3,17,17,17,19
7	2.19% 3,3,3,17,17,17,21
7	2.18% 3,3,3,19,19,19,19
8	2.62% 4,4,12,15,15,17,17,17
8	2.62% 2,2,2,2,4,17,17,17
8	2.60% 8,8,8,15,15,17,17,17
8	2.58% 8,8,8,17,17,17,18,21
8	2.58% 8,8,8,17,17,17,21,21
8	2.58% 2,2,2,2,4,10,10,19
8	2.58% 2,2,2,2,4,10,19,19
8	2.58% 2,2,2,2,4,19,19,19
8	2.56% 8,8,8,12,19,19,19,19
8	2.56% 8,8,8,19,19,19,19,19
8	2.56% 8,8,8,10,10,15,15,19
8	2.56% 8,8,8,10,15,15,19,19
8	2.56% 8,8,8,15,15,19,19,19
8	2.55% 3,3,3,8,8,8,15,15
8	2.55% 3,3,3,8,8,8,15,15
8	2.54% 3,3,3,15,15,17,17,17
8	2.54% 3,3,3,8,8,8,18,21
8	2.54% 3,3,3,8,8,8,21,21
8	2.52% 3,3,3,17,17,17,18,21
8	2.52% 3,3,3,17,17,17,21,21
8	2.50% 3,3,3,12,19,19,19,19
8	2.50% 3,3,3,19,19,19,19,19
8	2.50% 3,3,3,10,10,15,15,19
8	2.50% 3,3,3,10,15,15,19,19
8	2.50% 3,3,3,15,15,19,19,19
9	3.04% 8,8,8,10,10,17,17,17,19
9	3.04% 8,8,8,10,17,17,17,19,19
9	3.04% 8,8,8,17,17,17,19,19,19
9	3.03% 3,3,3,8,8,8,17,17,17
9	3.03% 3,3,3,8,8,8,17,17,17
9	3.02% 4,8,8,8,12,12,19,19,19
9	2.99% 3,3,3,4,12,12,19,19,19
9	2.99% 3,3,3,8,8,8,10,10,19
9	2.99% 3,3,3,8,8,8,10,19,19
9	2.99% 3,3,3,8,8,8,19,19,19
9	2.99% 3,3,3,8,8,8,10,10,19
9	2.99% 3,3,3,8,8,8,10,19,19
9	2.99% 3,3,3,8,8,8,19,19,19
9	2.98% 3,3,3,10,10,17,17,17,19
9	2.98% 3,3,3,10,17,17,17,19,19
9	2.98% 3,3,3,17,17,17,19,19,19
9	2.94% 4,4,8,8,8,12,17,17,17
10	3.41% 4,4,12,17,17,17,19,19,19,19
10	3.28% 2,2,2,2,4,4,12,17,17,17
11	3.48% 4,4,8,8,8,12,15,15,17,17,17
11	3.47% 4,4,9,12,17,17,17,19,19,19
11	3.45% 3,3,3,4,4,12,15,15,17,17,17
12	3.95% 4,4,12,15,15,17,17,17,19,19,19,19
12	3.83% 2,2,2,2,4,4,12,15,15,17,17,17
12	3.79% 4,4,8,8,8,12,15,15,15,17,17,17
12	3.77% 3,3,3,4,4,8,8,8,12,17,17,17
12	3.77% 3,3,3,4,4,12,15,15,15,17,17,17
12	3.75% 1,1,1,4,4,8,8,8,12,17,17,17
12	3.75% 1,1,1,4,4,12,15,15,15,17,17,17
13	4.26% 4,4,12,15,15,15,17,17,17,19,19,19,19
13	4.14% 2,2,2,2,4,4,12,15,15,15,15,17,17,17
14	4.34% 4,4,12,15,15,17,17,17,18,18,19,19,19,19
14	4.33% 4,4,9,12,15,15,15,17,17,17,19,19,19,19
14	4.31% 3,3,3,4,4,8,8,8,12,15,15,15,17,17,17
14	4.30% 4,4,12,13,15,15,15,15,17,17,17,19,19,19,19
14	4.30% 4,4,12,15,15,15,17,17,17,19,19,19,19,20
14	4.29% 1,1,1,4,4,8,8,8,12,15,15,17,17,17
14	4.29% 3,4,4,12,15,15,15,17,17,17,19,19,19,19
14	4.28% 4,4,12,15,15,17,17,17,18,19,19,19,19,21
14	4.28% 4,4,12,15,15,17,17,17,19,19,19,19,21,21
14	4.27% 1,1,1,3,3,3,4,4,12,15,15,17,17,17
16	4.92% 2,2,2,2,4,4,10,10,12,15,15,15,17,17,17,19
16	4.92% 2,2,2,2,4,4,10,12,15,15,15,17,17,17,19,19
16	4.92% 2,2,2,2,4,4,10,10,12,15,15,15,17,17,17,19
16	4.92% 2,2,2,2,4,4,10,12,15,15,15,17,17,17,19,19

Collection of gains and placement locations for each new firefighter positions. Note that there are a wide range of options to achieve similar or identical results. The results that were included in the primary recommendation are based on commonalities between different scenarios so as to maximize overall benefit to different metrics, as well as take advantage of existing resources.

Mid-term Recommendation: 5. Add firefighters to improve response performance

Optimal staff additions for First-Due

Positions First Due % Gain*	Hall placements
Three 0.4 - 0.6%	2,2,2 (Medic)
Six 0.5 - 0.8%	+ 8,8,8 (Medic)
Nine 0.6 - 1.0%	+ 3,3,3 (Medic)
Thirteen 0.7 - 1.2%	+ 5,5,5,5
Seventeen 0.9 - 1.4%	+ 14,14,14,14

* Lower values represent pure "Availability" problems. Higher values represent "Turnout+Availability" problems, and can be achieved if Turnout time targets are also met

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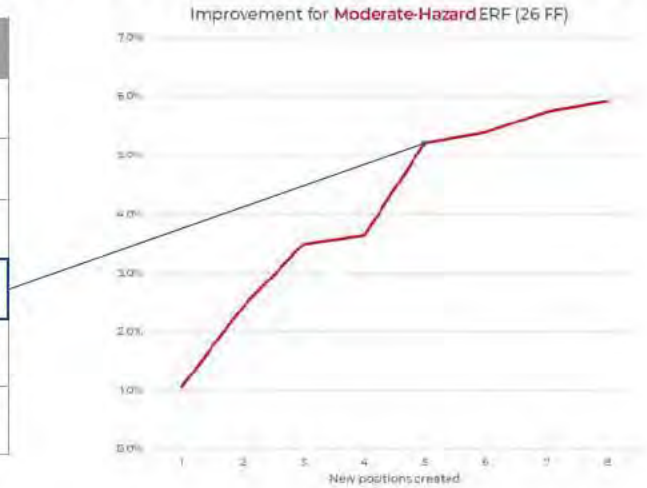
Mid-term Recommendation: 5. Add firefighters to improve response performance

Optimal staff additions for Moderate-Hazard ERF

Positions ERF % Gain	Hall placements (/ equivalent options)
One 1.1%	18
Two 2.4%	7/6/8,7/6/8
Three 3.5%	7/6/8,7/6/8,9/18
Five 5.2%	4,4,7/6/8,7/6/8,9/18
Seven 5.7%	4,4,4,7/6/8,7/6/8,12,9/18
Eight 5.9%	4,4,7/6/8,7/6/8,12,12,15/ 17/20,9/18



Based on coverage of structures deemed as moderate hazard, assuming equal likelihood of incident

Mid-term Recommendation: 5. Add firefighters to improve response performance

Optimal staff additions for High-Hazard ERF

Positions ERF % Gain	Hall placements (/ equivalent options)
One 0.1%	8
Two 0.3%	8, 4/8/12
Three 1.6%	8, 4/8/12, 4/8/12
Four **5.6%**	**2/6/7/8,6/7/8,8,8**
Five 5.7%	3/4,8,7/8,7/8,7
Six 6.5%	2,4,4,7/8,7/8,7/8

Based on coverage of structures deemed as high hazard, assuming equal likelihood of incident.

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Mid-term Recommendation: 5. Add firefighters to improve response performance

Balance First-Due and ERF Objectives

Low-Hazard ERF	
Six 2.1 - 2.2%	4,12,12,19,19,19 4,4/12,12,17,17,17 8,8,8,17,17,17
Moderate-Hazard ERF	
Five 5.2%	4,4,7/6/8,7/6/8,9/18
High-Hazard ERF	
Four 5.6%	2/6/7/8,6/7/8,8,8
First Due	
Thirteen 0.9 - 1.2%	2,2,2,3,3,3,5,5,5,5,8,8,8

Twenty new positions	
Staff crossover medics: **2,2,2 3,3,3** **8,8,8** **17,17,17**	First Due **1.2%** (600 calls)
	ERF-Low **4.9%** (34 calls)
Relocate and staff spare truck: **5,5,5,5**	ERF-Mod **6.4%**
Extra on existing units: **4,4** **9** **12**	ERF-High **7.3%**

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The selected recommendation of 20 new positions balances the needs of the 4 metrics. By including overlapping recommendations we can reduce the total new positions required from 28 to 20 to achieve the same gains.

Long-term (2028+) Recommended Hall Plan
Appendix

These are modelled scenarios that appear optimal at the time of this study, intended to inform general areas around which opportunities could be identified. However, it is incomplete. Hall planning should be done with a more complete scenario analysis.

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Long-term Recommendation Develop station plans for long term

Ideal East Downtown without net new halls

If rebuilding Halls 1 and 8, idea locations would bring them closer each slightly northeast.

Performance gains in

2021: **0.5%**

2028: **0.6%**

2042: **1.7%**

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Most (1.4 of 1.7%) of this improvement comes from Hall 1 relocation, as this not only has high current demand, it is planned as a high-growth area in the future.
The Hall 8 relocation benefits Gastown and Coal Harbor areas, at the cost of Yaletown.

Long-term Recommendation Develop station plans for long term

Ideal East Downtown with 1 net new hall

A new hall at East False Creek fills a gap, and moves the ideal hall 8 near current location.

Performance gains in

2021: **0.9%**

2028: **1.1%**

2042: **2.3%**

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If we could replace Hall 1 and 8 with **three** halls, the optimal locations are shown in blue.

Long-term Recommendation Develop station plans for long term

Ideal East Downtown with 2 net new halls

Improved coverage in Gastown area offers additional gains.

Performance gains in

2021: **1.6%**

2028: **1.7%**

2042: **2.9%**

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If we could replace Hall 1 and 8 with **four** halls, the optimal locations are shown in blue.

Consulting Team
Appendix

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Consulting Team

Darkhorse Emergency

Darkhorse offers proven, evidence-based solutions to the critical issues faced by emergency services professionals. Our focus is to improve your response performance and unit utilization. We help you make intelligent, intuitive, data driven decisions. Darkhorse Emergency is a division of Darkhorse Analytics.

Darkhorse oversaw all phases of the assessment and delivered presentations on accreditation, benchmarking, diagnostics, call forecasting, station location, and deployment analysis.

darkhorseemergency.com
darkhorseanalytics.com

Elevate Consulting

Elevate is a business management consulting firm, we help organizations manage themselves better.

Elevate lead the stakeholder engagement phase of the assessment.

elevateconsulting.ca

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Darkhorse Analytics is an analytical consulting firm focused on improving the decision-making in the emergency services sector. Spun out of a research institute (the Centre for Excellence in Operations) at the University of Alberta in 2008, Darkhorse uses the leading academic approaches to problem-solving in the most demanding, complex applications.


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