Burnaby Fire Department

# 2019 NEEDS ASSESSMENT STUDY

March 11, 2020

DARKHORSE ANALYTICS

# TABLE OF CONTENT


01 **EXECUTIVE SUMMARY** 04

02 **BACKGROUND**

City Profile 07
Department Profile 08

03 **APPROACH**

Current State Analysis 10
Benchmarking and Best Practice Analysis 12
Predictive Modelling 13
Themes & Recommendations 14

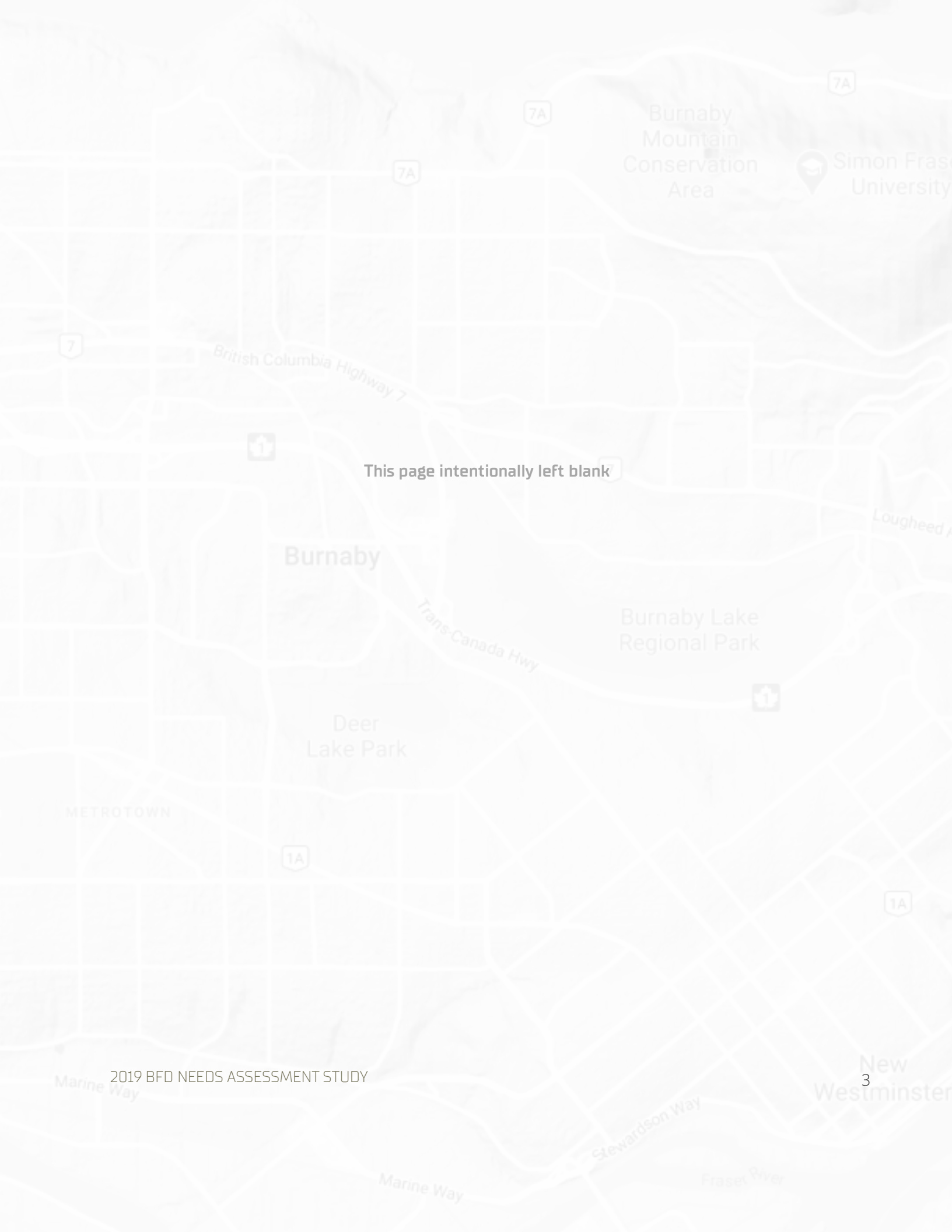
04 **RECOMMENDATIONS**

Immediate recommendations 15
- Organizational Effectiveness 16
- Organizational Health & Wellness 20
- Resource Deployment & Coverage 24
- Community Risk Reduction 36

Mid-term & Long-term recommendations 41

05 **APPENDIX**

Phase Summary & Details 43
Industry Standards 102
Analysis Methods 106
Additional Resources 113
Project Team and Governance 114

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# EXECUTIVE SUMMARY

Darkhorse Analytics was contracted by the City of Burnaby in September 2019 to conduct a comprehensive needs assessment of the Burnaby Fire Department (BFD). The work was guided by a steering committee consisting of City and fire department officials and labour representatives. The work considered all previous reports, current policies and procedures, proven research, and industry best practices. The recommendations from this assessment are aimed to be pragmatic, value-adding and adaptable.

The objectives of the assessment were to:

- Complete a qualitative and quantitative analysis of the current state of the Burnaby Fire Department;
- Identify demand drivers, service gaps, and develop probable future state scenario(s);
- Forecast the fire service need based on the expected growth plans undertaken by the City of Burnaby and by the socio-economic conditions that have/will impact the population and density of the city;
- Identify resource requirements and service needs to mitigate risks now (2020), in five years (2025), and 10 years (2030); and
- Recommendations for current gaps in the service provided and the resources required to execute those services sustainably.

The assessment does not include a specific risk analysis of the Trans Mountain Expansion Project (TMEP). The specific needs required for appropriate risk mitigation at the terminal and tank farm expansions have yet to be determined. However, it is anticipated that significant operating and capital resources will be required by the department in order to provide the appropriate level of service to address the TMEP risks on the City.

Darkhorse used a four-phase approach, including a variety of analytical and management techniques in completing this study. We gathered and examined all of the data received, including historical reports and computer-aided dispatch (CAD) call data. We conducted a stakeholder engagement study, consisting of interviews and workshops. We examined BFD through a comparative benchmarking study and against industry best practices. Finally, we analyzed factors that impact operational performance, forecasted future call demand, and optimized station location and resource deployment scenarios.

It is Darkhorse's observation that BFD lacks valuable resource updates and maintenance that would allow for the organization's ability to execute both effectively and meaningfully. The leadership and members of the department put their utmost into the work of delivering fire and emergency protection and education to the community. However, due to a scarcity in resources, technology, and strategy, their ability to serve effectively is at risk. There is a balance between maintaining adequate response and controlling expenditures, and an investment is required to maintain the level of service required by the growing city.

Findings ranged from leadership and organizational structure, to resource needs, to the unique and changing risks in the city. Four key themes of focus emerged from the findings: organizational effectiveness, organizational health and wellness, resource deployment and coverage, and community risk reduction. Darkhorse designed the assessment's immediate recommendations around these themes.

**Organizational effectiveness** addresses how well the organization can achieve the outcomes it intends to produce. Highly effective organizations exhibit strengths across five areas: leadership, people, decision-making structure, work processes and systems, and culture. BFD has a strong culture and well-trained people, however, leadership structure (appropriate resources), and work processes all need to be invested in. All divisions are affected by these items.

1.1 Increase executive staff to lead department improvement initiatives.
1.2 Invest in IT infrastructure and analytics support to develop a proactive, innovative, and data-driven culture.
1.3 Develop and communicate a 24-month Strategic Plan.

These recommendations are designed to empower the department to repair divisional inefficiencies and create a continuous improvement paradigm, enabling BFD to effectively execute its mission.

**Organizational health and wellness** refers to the overall quality of the environment in which department staff serve. Research continues to reveal that a positive, healthy environment can increase the well-being of its members as well as organizational robustness. The very nature of the fire department's work is high-risk/high trauma, and so organizational health should be considered crucial to maintaining the departments effectiveness.

2.1 Provide new positions to develop, implement, and oversee department initiatives in occupational health, safety, and wellness.

2.2 Provide new positions to champion and increase workplace diversity to reflect the community the department serves.

2.3 Replace Fire Station 4.

These recommendations address the expressed needs of the stakeholders, aligned to the City's Corporate Strategic Plan, to maintain and improve the working environment and culture of BFD for the benefit of its citizens.

**Resource deployment and coverage** addresses the response effectiveness of the Operations Division. The locations and availability of apparatus and firefighters greatly effects the ability of the department to succeed in its mission. The City of Burnaby has a unique risk profile, which has been highlighted in previous reports but has yet to be addressed sufficiently. This analysis identified current coverage gaps and future demand scenarios and prescribes solutions to address them.

3.1 Improve emergency response times.

3.2 Staff Ladder companies to NFPA 1710 standard – 1 FF per Ladder (20 FTE).

3.3 Build a Fire Station on Burnaby Mountain – 4 FF (20 FTE).

3.4 Build a Fire Station at Big Bend – 4 FF (20 FTE).

3.5 Complete a Fire Station Location Strategy to address future growth.

These resource recommendations resolve the current coverage gaps within the city and gives focus to the forecasted call demand and vertical growth of the city.

**Community risk reduction** addresses the need to be proactive in identifying and mitigating the changing risks in a growing urban environment. The fire department has been involved in fire prevention for many years through public education, building inspections, plan checking, and issuing permits. However, the lack of strategy and investment into the division has led to low morale, redundant workflows, and unclear objectives. An overhaul of the Prevention and Public Education Division is needed as the city continues to grow.

4.1 Rebrand the Prevention Division to Community Risk Reduction.

4.2 Develop a comprehensive Burnaby Mountain strategy to address changing risks.

In summary, the assessment exposed a variety of immediate concerns for the department and community. The recommendations are not prioritized one to thirteen, as most are equally pressing, but were organized into the themes that emerged and loosely prioritized within those themes. Many of these recommendations can be executed simultaneously.

# BACKGROUND

The City of Burnaby requested a comprehensive needs assessment for Burnaby Fire Department (BFD), to give current and future state evaluation of the organization, that will assist staff in ensuring that it continues to efficiently and effectively deliver fire protection and related emergency services to the community.

Key components of the engagement included a qualitative and quantitative analysis of current state; forecasting the fire service need based on the expected growth plans undertaken by the City of Burnaby and by the unique socio-economic conditions that have/will impact the population and density of the city; identifying demand drivers, service gaps, and develop probable future state scenario(s); identifying resource requirements and service needs to mitigate risks now (2020), in five years (2025), and 10 years (2030); and the identification and recommendation for current gaps in the service provided and the resources required to sustainably execute those services.

## City Profile

The City of Burnaby has grown significantly. It has changed from a rural community to a dynamic urban city with four vibrant town centres, a large commercial and industrial base, and many unique neighbourhoods with distinct characters. Burnaby also has diverse features for an urban environment, including Burnaby Mountain, 25% green space, the Trans Mountain tank farm, the upcoming Trans Mountain Expansion Project (TMEP), and significant vertical growth, current and forecasted, in the town centres.

| Population (2016*) | Area (km2) | Density (pop/km2) | Elevation (m) |
|---|---|---|---|
| **232,755** | **99** | **2,568** | **0 – 370m** |

* as per the RFP, Darkhorse used the 2016 census population data in this assessment. However, according to population estimates provided by the BC gov't, it could be closer to **248,476** (+6.7%).

The City of Burnaby recently adopted a new Corporate Strategic Plan (CSP) with a vision to become a world-class city and is committed to creating and sustaining the best quality of life for the entire community. The CSP outlined six primary goals to assist with the prioritization of work and resources:

1. A Safe Community
2. A Connected Community
3. An Inclusive Community
4. A Healthy Community
5. A Dynamic Community
6. A Thriving Organization

The recommendations derived from the assessment were required to support the goals and values identified in the CSP.

In 2016, the city created the Public Safety and Community Services Department (PSCS). PSCS provides direction for five divisions, including; the RCMP, Fire, License Office, Risk Management & Emergency Planning, and Realty & Lands. Regrouping these functions under one department allows the City to provide better service integration, greater strategic focus, and improved community response.

## Department Profile

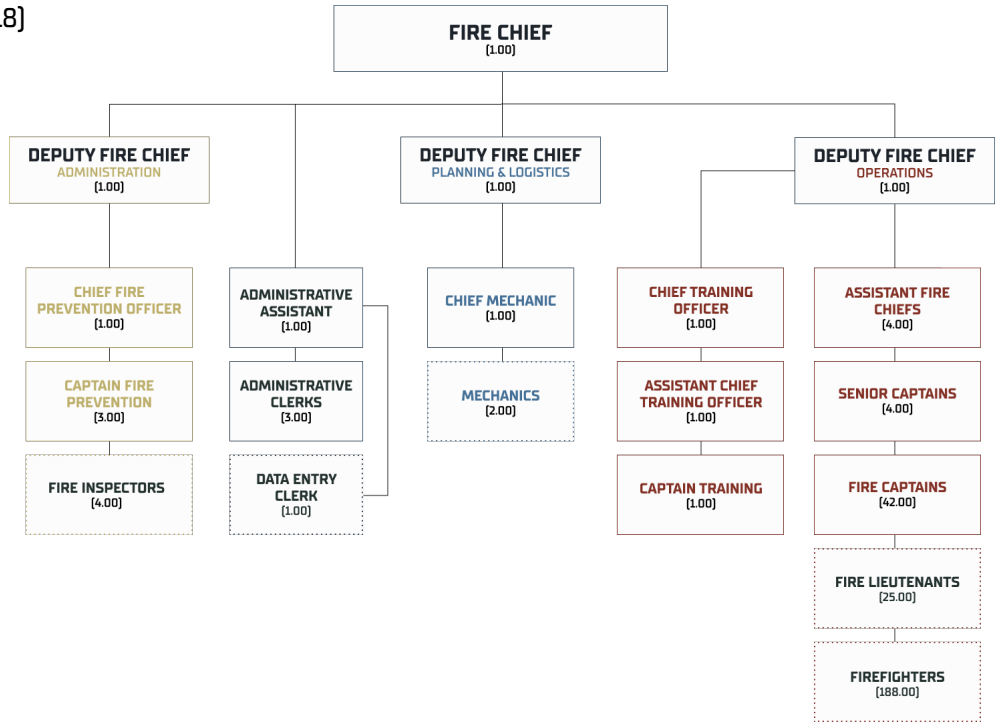
Under the direction of the Fire Chief, the Burnaby Fire Department is responsible for ensuring the protection of life, property, safety, and well-being of people living in the community. These high-level functions include comprehensive fire prevention, enforcement and education, fire suppression, hazardous materials, technical rescue services on land and water, as well as first response emergency medical care.

Operational Budget (2018)

**$42,927,883**

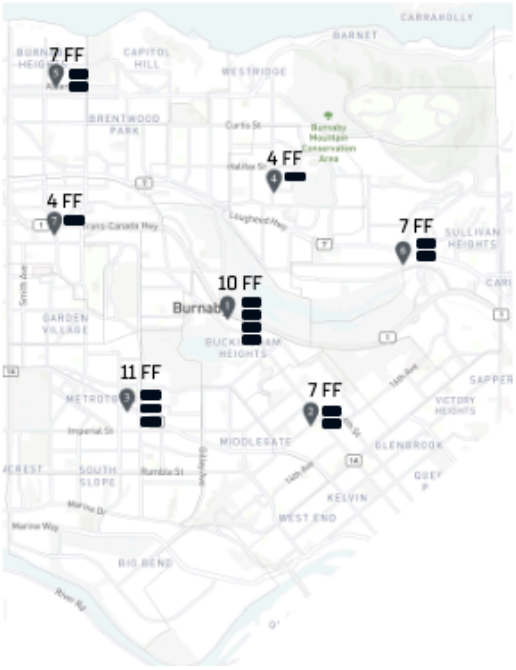
Organization Chart

**288 employees**



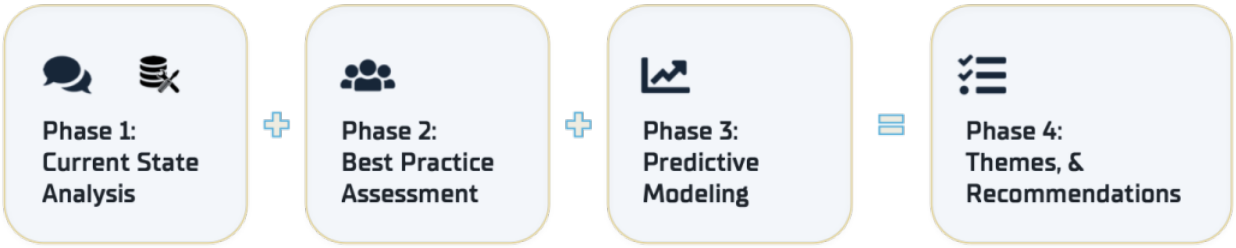
## Apparatus and Shift Staffing

| STATION | DISPATCH STAFF | OPERATIONS STAFF | STAFFED APPARATUS | CROSSOVER APPARATUS | RESERVE APPARATUS |
|---|---|---|---|---|---|
| 1 | 2 | 10 | ENGINE 1<br>RESCUE 1<br>RESCUE 2<br>COMMAND 1 | | ENGINE 21<br>RESCUE 24<br>RESCUE 22<br>LADDER 4<br>CARS |
| 2 | | 7 | ENGINE 2<br>LADDER 2 | HAZMAT 1 | |
| 3 | | 11 | ENGINE 31<br>ENGINE 32<br>LADDER 3 | | |
| 4 | | 4 | ENGINE 4 | WATERCRAFT 1 | |
| 5 | | 7 | ENGINE 5<br>LADDER 5 | TECH RESCUE 1 | |
| 6 | | 7 | ENGINE 6<br>LADDER 6 | | |
| 7 | | 4 | ENGINE 7 | WILDLAND 1<br>WILDLAND UTV | ENGINE 25 |
| | 2 | 50 | 15 | 5 | 5 |




# Approach

The project aimed to paint a clear picture of the landscape and context in which the department is operating. We developed a four-part approach to achieving the deliverable:




Phase 1

## Current State Analysis

This first phase gave Darkhorse (and the steering committee) valuable insight into BFD's organizational culture and an evidence-based view of its day-to-day services. Darkhorse executed a qualitative gap analysis to examine stakeholder engagement. Next, Darkhorse performed a quantitative root cause analysis, looking at the historical and diagnostic analysis.

### Stakeholder Engagement

The stakeholder engagement involved 12 interviews and two workshops with BFD team members. The interviews provided a confidential environment for individuals to express their views and perspectives on the organization. The working sessions also provided individuals with the opportunity to hear perspectives from a variety of members. Through this interaction, the interviewees came forward with new insights and ideas.

The interviewees consisted of the Deputy Fire Chiefs, the Director of PSCS, union representatives, the mayor, the city manager, and several others. The workshops were primarily made up of service members, selected by the fire department representing all areas of the department, with a few city representatives.

### Key questions;

- How well is BFD currently meeting its obligations to the community?
- How well is BFD working with internal and external stakeholders and vice versa?
- Does BFD currently have adequate training, certifications and specialized teams at the appropriate locations to carry out its mission?
- Are training standards and certifications being maintained?
- Is BFD currently meeting its minimum performance levels?
    - What internal factors are influencing its ability to meet minimum service levels?
    - What external factors are influencing its ability to meet minimum service levels?
- What are the key issues that are currently impacting BFD's ability to carry out its mission?
- What are the current gaps in the services provided?

All information from the stakeholder engagement is a direct reflection of what the interviewees and workshop participants stated.

## Historical & Diagnostic Analysis

The purpose of the historical analysis was to give the department an understanding of how Darkhorse analyzes CAD and RMS data, to provide insight and error checking into the service from a qualitative perspective, and to provide the groundwork for the upcoming diagnostic and predictive analysis. The primary focus was on the operations (suppression) division due to the availability of data. Ideally, exploring data related to training, prevention, and mechanical, would have added value had the data been more readily available.

This phase also included reviewing the provided historical reports:

**2002 Needs Assessment Study**
SMG/Columbia Consulting

**2019 COB Fire Insurance Classification**
Fire Underwriters Survey

**2019 Fire Hydrant Augmentation Plan**
Burnaby Fire Department

**2013 Fire Suppression Levels of Service**
Burnaby Fire Department

**2015 Response Capabilities Analysis**
IAFF

**BFDs 2017 & 2018 Annual Reports**
Burnaby Fire Department

**2015 Industrial Fire Protection Cost Report**
Burnaby Fire Department

The purpose of the diagnostic analysis was to investigate the findings of the historical analysis further. A detailed analysis of response effectiveness and coverage was conducted for First Due and Effective Response Force (ERF) calls, responses, and response time intervals. Resulting in a clear understanding of where and why coverage risks are occurring.

Phase 2

# Benchmarking & Best Practise Assessment

## Benchmarking

Peer Benchmarking is a tool to help understand how well the organization is resourced. When used well, it helps to clarify aspects of the system that need attention and will support internal improvement efforts. Benchmarks provide the big picture view while the measuring and modelling work can fill out details.

BFD selected three cohorts to compare against, Vancouver Fire Rescue Service, Surrey Fire Service, and Richmond Fire Department. Due to some data constraints, Darkhorse included Edmonton Fire Rescue Service and Toronto Fire Service, which helped provide a greater perspective on the department.

| SERVICE | POPULATION | AREA (km2) | DENSITY (pop/km2) | ELEVATION (m) | UNIQUE FEATURES |
|---|---|---|---|---|---|
| **Burnaby** | 233,000 | 99 | 2,353 | 0 - 370 | Burnaby Mountain, TMEP, hydrocarbon facilities, 4 town centres, 25% green space, increasing vertical growth |
| **Richmond** | 227,000 | 130 | 1,746 | 0 - 12 | 130,194 jobs within city, 25million visitors through airport annually, 4,768 hotel rooms |
| **Surrey** | 518,000 | 316 | 1,639 | 0 - 134 | Large metro city, from high rises and heavy industry to rural farmland |
| **Vancouver** | 715,000 (incl. university) | 133 | 5,375 | 0 -152 | High pop density, downtown east side challenges, vertical growth challenges |
| **Edmonton** | 932,546 | 767 | 1,332 | 645 | Generally flat to gently rolling, with ravines and deep river valleys. Large wildland urban interface along river valley |
| **Toronto** | 2,731,571 | 631 | 4,332 | 77 - 209 | Most populous city in Canada. Advanced community risk reduction process |

## Best Practice Assessment

The purpose of the best practice assessment was to examine current organizational practices against the city's strategic goals, the department's infrastructure, and accepted industry standards. Darkhorse primarily used NFPA and CPSE as industry-standard references as well as our expertise and experience in the public safety domain.

Darkhorse examined each division as well as organizational sub-components, including governance and administration, assessment and planning, goals and objectives, programs, physical resources, human resources, training and competency, essential resources (IT, water supply, office systems), and external systems relationships (City, RCMP, BCEHS).

Phase 3

# Predictive Modelling

The predictive modelling phase included modelling Burnaby's road network and historical apparatus travel times with call demand forecasting to examine station locations and resource deployment as they relate to expected population level, population age, historical calls, and land use (commercial, residential, or industrial). In examining the data at a granular level, including drive time and road network development, Darkhorse was able to provide "what if" analysis in various scenarios. For example, the impact of moving Fire Station 4 to Burnaby Mountain.

### Key questions;

- What are the most material demand drivers?
- What does the future state look like over the next one, five, and 10 years in terms of demand drivers?
- What are the confidence levels of the projections?
- Are the facilities currently in the appropriate locations?
- What is the optimal station location deployment, considering costs?
- What are the minimum resources needed to satisfy response times at each proposed station?
- What is the predicted effect on response performance if stations are relocation or added?
- What is the priority list of relocations/ new locations?
- What are the current and future call risks to BFD?

Phase 4

## Themes & Recommendations

In this final phase, Darkhorse synthesized the key findings from each of the prior phases and consolidated them into a series of general recommendations to address the gaps and risks facing BFD. We then worked with the BFD team to distill and prioritize these recommendations down to a succinct list of high-value recommendations prioritized by need and appropriate timing.

**The following is the detailed recommendations derived from the key findings of the project phases.**

# Themes & Recommendations

Four primary areas of focus emerged as Darkhorse worked through each of the phases: organizational effectiveness, organizational health and wellness, resource deployment and coverage, and community risk reduction. With the key findings and the City's Corporate Strategic Plan, Darkhorse designed the assessment's immediate recommendations around these themes. The aim was to address these concerns as well as increase department resilience and effectiveness for the future.

2020 - 2022

# Immediate Recommendations

## 1.0 Organizational Effectiveness

1.1 Increase executive staff to lead department improvement initiatives.

1.2 Invest in IT infrastructure and analytics support to develop a proactive, innovative, and data-driven culture.

1.3 Develop and communicate a 24-month Strategic Plan.

## 2.0 Organizational Health & Wellness

2.1 Provide new positions to develop, implement, and oversee department initiatives in occupational health, safety, and wellness.

2.2 Provide new positions to champion and increase workplace diversity to reflect the community the department serves.

2.3 Replace Fire Station 4.

## 3.0 Resource Deployment and Coverage

3.1 Improve emergency response times.

3.2 Staff Ladder companies to NFPA 1710 standard – 1 FF per Ladder (20 FTE).

3.3 Build a Fire Station on Burnaby Mountain – 4 FF (20 FTE).

3.4 Build a Fire Station at Big Bend – 4 FF (20 FTE).

3.5 Complete a Fire Station Location Strategy to address future growth.

## 4.0 Community Risk Reduction

4.1 Rebrand Prevention Division to Community Risk Reduction.

4.2 Develop a comprehensive Burnaby Mountain strategy to address changing risks.

Immediate Recommendations

# Organizational Effectiveness

Darkhorse's recommendations can be summarized into three priorities. Without an immediate improvement in the following areas, the organizational infrastructure will not be able to support new firefighters effectively. This puts the city at greater risk in several areas including, strategic effectiveness, response effectiveness, prevention and education, and department morale.

### Key Findings

BFD needs stable and proactive leadership to guide the organization forward. [Stakeholder engagement]

BFD requires a vision and plan shared and understood by BFD members and partners. Goals and objectives need to be clear and communicated throughout the organization. [Stakeholder engagement]

Partners and members perceive BFD being at a critical point with their resource requirements, and there is a need for a Resource Plan (across all areas) to maintain and improve performance standards. [Stakeholder engagement]

The department has done a good job of identifying operational deficiencies but has been slow to resolve them. This is primarily due to a lack of investment but also because of ongoing organizational inefficiencies. [Darkhorse observation]

The Administration Division (command, management, HR, organizational performance, etc.) is understaffed compared to the benchmarking cohort. This has led to increased roles and stress on the remaining command staff, decreasing leadership effectiveness. [Best practice assessment]

Lack of IT and technology-enabled services is one of the major hindrances to BFD's success. The current IT infrastructure and culture puts a drag on the system instead of supporting it. Under the current practice, setting and measuring goals will continue to be difficult and will likely not be adopted; redundant workflows in prevention activities will be unresolved; organizational communication will continue to be a challenge. [Darkhorse observation]

Data gathering and data quality need improvement across all divisions.
(Best practice assessment)

There is a lack of a performance management / continuous improvement paradigm.
(Darkhorse observation)

The quality of CAD and RMS data was better than expected, with room for improvement through better dispatch policies and clearer call categorization.
(Darkhorse observation)

More effective communication is needed.
(Stakeholder engagement)

BFD's training program is rigorous and thorough, utilizing all training resources effectively and maximizing on-shift training. Surrounding communities recognize this to the degree that other departments often poach recruits before hiring can occur.
(Best practice assessment)

Training would benefit from a technology update in both scheduling and certificate tracking. This would lead to the additional benefit of analyzing the resource availability cost due to the on-shift training.
(Best practice assessment)

## Recommendations

1.1 Increase executive staff to lead department divisions and initiatives effectively.

1.2 Invest in IT infrastructure and analytics support to develop a proactive, innovative, and data-driven culture.

1.3 Develop and communicate a 24-month Strategic Plan.

# 1.1

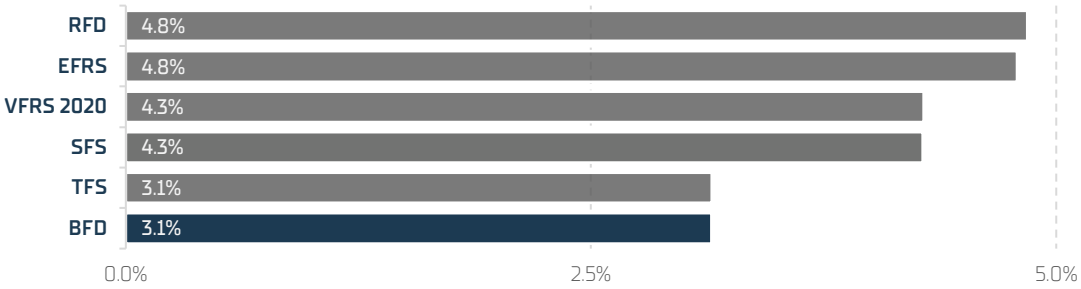
## Increase executive staff to lead department divisions and initiatives effectively.

BFD's Administration Division staffing needs to keep pace with organizational change and growth. The Administration Division lacks adequate staff to lead effectively, execute strategic initiatives, and to support the requirements of the other divisions. With the current absence of the fire chief, the department leadership is maintained by the three deputy chiefs. They divide additional responsibilities between themselves, but the level of duties required is unsustainable. As well, management and technical resources are lagging in executing strategic initiatives.

Along with the present leadership and management challenges, succession planning is at extreme risk. Department members have observed the stress and extraordinary burden on the leadership group and are not motivated to move up. Overall, the situation is harming department morale.

Compared to the peer cohort, BFD had the lowest administration staff totals in the group. This evidence supplemented what was revealed in the stakeholder engagement phase.

**Current Administration staff as a % of total staff.**
Including: Command, Management, Technology Support, and Organizational Performance staff




Using the benchmarking cohort, a reasonable target of **4.5%** of admin staff to total staff is reasonable (due to Toronto's size, 99 admin staff to 3,143 total staff, there is some economy of scale in effect)

BFD currently has nine administrative staff (four command and five support staff), which is 3.1% of total staff. If 20 additional firefighters (FF) are added, admin staff drops to 2.9%, and if 60 additional firefighters are added it will drop to 2.6%. These are unreasonable levels to support the organization. To approach the 4.5% benchmark:

- Additional 20FF - 14 total Admin. Staff (+5) = 4.5% of total
- Additional 60FF – 15 total Admin. Staff (+6) = 4.3% of total

## 1.2

### Invest in IT infrastructure and analytics support to develop a proactive, innovative, and data-driven culture.

Investment in IT - infrastructure, communication, analytics, and human support, is critical to the organizational success of BFD. The objective is to optimize each division's effectiveness in support of public safety. Currently, BFD's technological state is inadequate in reducing process inefficiencies, measuring key performance indicators, and mitigating community risks.

The city's IT department currently provides BFD with one full-time resource. In order to reduce inefficient and redundant workflows, BFD should add two internal IT positions in addition to the city IT position. As well, BFD should investigate and update appropriate technology enabled services to increase efficiency.

Examples:

- Training scheduling and certificate tracking application
- Adequate equipment for Prevention (laptops, iPad, etc.)
- Mobile inspection application
- Vehicle maintenance application
- Consistent display and communication of key performance indicators

## 1.3

### Develop and communicate a 24-month Strategic Plan.

The stakeholder engagement process identified the need of a Vision and Plan for the department and its partners. Darkhorse recommends BFD implement a continuous improvement model, using a shorter time cycle (two years) for executing initiatives and setting measurable goals. This will help enable positive change at a quicker pace and break the current inertia. It is important that this plan is clearly communicated to all stakeholders and members.

The first strategic cycle needs to address the immediate resource and process deficiencies and to establish a baseline measurement for key performance indicators in each division. In the second 24-month strategic cycle, BFD should aim towards achieving the highest level of Public Fire Protection Classification determined by the 2018 Fire Underwriters Survey.

Immediate Recommendations

# Organizational Health & Wellness

The following recommendations refer to the overall quality of the environment in which department staff serve. Research continues to reveal that a positive environment can increase the well-being of its members as well as organizational strength. Darkhorse's recommendations look to build upon the health and wellness momentum the department has started and to establish BFD has an environment that attracts and retains competent individuals representing the community it serves.

## Key Findings

BFD's readiness for change is high. It is a good time to make an impact. Members are optimistic, given the perceived support from the new mayor, council and city departments. [Stakeholder engagement]

Management and external partners want to see strategies and actions to expand the diversity within the department. [Stakeholder engagement]

BFD is highly regarded for having programs such as Fortius, Resilient Minds, and Mental Health Support. The programs are being accepted and there is momentum within the current initiatives. BFD should continue to make health and wellness a priority. [Stakeholder engagement]

Recruit retention is more challenging than increasing diversity due to the high cost of living and other economic factors. [Stakeholder engagement]

There is a desire to re-introduce group activities and socials among team members. [Stakeholder engagement]

Members have expressed concerns about the increasing use of personal technology. What is appropriate? What are the health impacts? [Stakeholder engagement]

Stakeholders agree that BFD needs to continue to deliver and expand on the health and wellness programs. [Stakeholder engagement]

The peer counselling initiative is positive with a desire for expansion. [Stakeholder engagement]

An increase in the EAP and benefits program is needed, especially in mental health services. Allow for individual selection of personal counsellors. [Stakeholder engagement]

| |
|---|
| Address long-term health concerns (e.g.: cancer, suicide). [Stakeholder engagement] |
| Address exposure to hazardous materials with emphasis on decontamination equipment and protocols. [Stakeholder engagement, Best Practice Assessment] |
| Succession planning requires development. [Best Practice Assessment] |
| Fire Station 4 and 1 are in need of replacement/renovation. [Stakeholder engagement, Historical review] |

### Recommendations

| | |
|---|---|
| 2.1 | Provide new positions to develop, implement, and oversee department initiatives in occupational health, safety, and wellness. |
| 2.2 | Provide new positions to champion and increase workplace diversity to reflect the community the department serves. |
| 2.3 | Replace Fire Station 4. |

## 2.1

### Provide new positions to develop, implement, and oversee department initiatives in occupational health, safety, and wellness.

Department leadership has recognized that supporting health, safety, and wellness initiatives increases performance and moral. The current programs in place (Fortius, Resilient Minds Peer Support, Mental Health Self-Assessment Tool, Burnaby Mental Health Support) have been well received and momentum needs to continue.

This will require focused leadership to develop and implement a measurable strategy, as well as handling the day-to-day health requirements and challenges of the staff. Darkhorse recommends one to two FTEs.

BFD should continue:

- Improving upon current mental health initiatives.
- Education on long term health effects of service.

- Addressing exposure and contamination hazards through education, adequate equipment, and clear procedures.

BFD should develop:

- Measurable health and wellness goals.
- Protocols and education around the usage of personal technology.
- Department engagement activities such as group/team sports and activities.

## 2.2

### Provide new positions to champion and increase workplace diversity to reflect the community the department serves.

Leadership and municipal partners recognize the need for increased diversity in the organization. The workshop participants added that employee attraction and retention is an equally pressing challenge that affects the ability to provide a diverse workforce. This initiative will require one to two people, a strategy, and a partnership with the City's communication's group.

Some considerations:

- Develop and execute a strategy to increase diversity without compromising on competence.
- Recognize the challenge is not just increasing diversity, but overall employee retention.
- Consider a communication and marketing campaign aimed at attracting the best candidates.
- Create a public recruitment campaign with the city's partnership.
- There is a higher cost of living in Burnaby and should be considered an external factor that affects retention.

In addressing the need to increase diversity, the department's facilities will need to be upgraded. In most stations, the living quarters and washrooms are not adequately suited to support the needs of a diverse workforce.

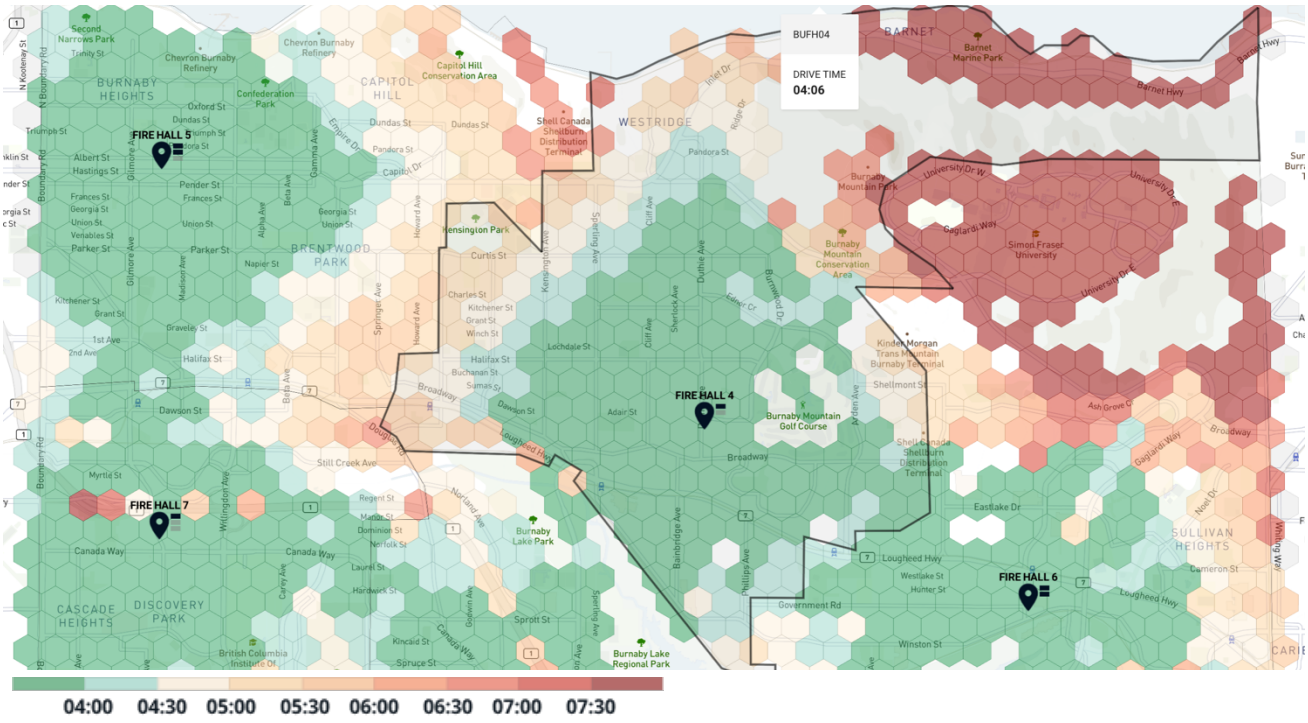
## 2.3
## Replace Fire Station 4

The key findings and recommendation made in the 2002 Needs Assessment Study holds true today, plus 18 years - Station 4 is barely adequate, and Station 1 is in need of renovations.

The priority is fire station 4. The expectations to provide **a safe, inclusive**, and **dynamic** environment cannot be met with the current building's design, equipment, and age. Increasing diversity, attracting staff, improving morale, and maintaining strong public relations is all the more challenging at this location.

In considering a rebuild, Darkhorse examined the need to relocate the station. Expected response time gains/losses were minimal for any other mathematically optimized location in the area. The current location is ideal.


Station 4 - First Due expected 90th percentile drive times – 2031 forecast



Immediate Recommendations

# Resource Deployment and Coverage

The following recommendations address the response effectiveness of the Operations Division. The City of Burnaby has a unique risk profile, which has been highlighted in previous reports but has yet to be addressed sufficiently. The analysis identified current coverage gaps and future demand scenarios.

## Key Findings

Analysis of response timestamps in the CAD data reveals longer than appropriate response times. Likely due to a combination of data collection issues and lack of consistent measuring. The primary driver is long turnout times. [Historical & Diagnostic Analysis]

BFD has not and is not currently measuring response times. [Stakeholder Engagement, Historical Analysis, Best Practice Assessment]

BFD has recently adopted the NFPA 1710 standard as its goal. Darkhorse used the NFPA 1710 standard as the targets for response intervals. [Historical & Diagnostic Analysis]

BC Emergency Health Services (BCEHS) implemented a three-year policy change in mid-2018 that has decreased Medical First Responses (MFR) by BFD. This change gave BFD a much need respite, as incidents had been increasing substantially. MFR makes up approximately 60% of all incidents. Concerningly, total response times have been increasing despite the decrease in medical incidents. Department leadership expects that after the three years, medical response demand will increase by 20-25%. [Historical & Diagnostic Analysis]

Response coverage to two major high-risk areas (Burnaby Mountain and Big Bend) is inadequate. As well, previous reports have consistently identified them as high-risk and vulnerable. [Historical & Diagnostic Analysis, Predictive Modelling]

First Due response is marginal (69% target attainment), primarily due to turnout times. [Historical & Diagnostic Analysis]

Effective Response Force capabilities are poor (52% target attainment using the NFPA 1710 standard). This is primarily due to the resource deployment and coverage gaps identified. However, there are potential improvements to be made in dispatch policies and measuring response time intervals. [Historical & Diagnostic Analysis]

Based on information received from the city planning department, the population and call demand forecasts are reasonable for future planning. [Predictive Modelling]

Optimizing fire station locations has a greater effect on both first due and ERF target attainment than adding more apparatus to existing fire stations. [Predictive Modelling]

Compared to the peer cohort, BFD has a higher than average call demand, based on a incidents per population analysis. [Best Practice Assessment]

Due to BFD's population density and forecasted call demand, the amount of area covered by each station (station coverage) could be smaller, reducing travel time. [Best Practice Assessment]

61% of all incidents are medical in nature, but BFD does not track more specific subcategories. As a result, it is unclear exactly which incidents were affected by the BCEHS policy change. [Historical & Diagnostic Analysis]

Non-medical incident volume remains stable. [Historical & Diagnostic Analysis]

The Simon Fraser University (SFU) and UniverCity areas have a high comparable demand to other areas within the city boundaries (also identified in previous reports). [Historical & Diagnostic Analysis]

Vertical response time (time from curbside to client side in high-rise structures) is not currently being tracked or measured by BFD. [Historical & Diagnostic Analysis, Best Practice Assessment]

## Recommendations

3.1 Improve emergency response times

3.2 Staff ladder companies to NFPA 1710 standard – 1 FF per ladder (20 FTE)

3.3 Build a Fire Station on Burnaby Mountain – 4 FF (20 FTE)

3.4 Build a Fire Station at Big Bend – 4 FF (20 FTE)

3.5 Complete a Fire Station Location Strategy to address future growth

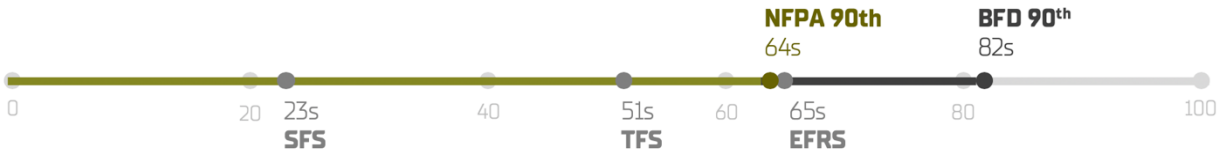
# 3.1
## Improve emergency response times

Historically, BFD has not targeted, measured and reported on response times intervals. The department has recognized the importance of moving towards a performance management paradigm.

The diagnostic analysis identified that alarm handling and turnout times are higher than industry standards and other peer cohorts.

Improving these times will have the most dramatic effect on improving both first due and ERF response performance. BFD will arrive at ~1,500 more incidents within the standard response targets.

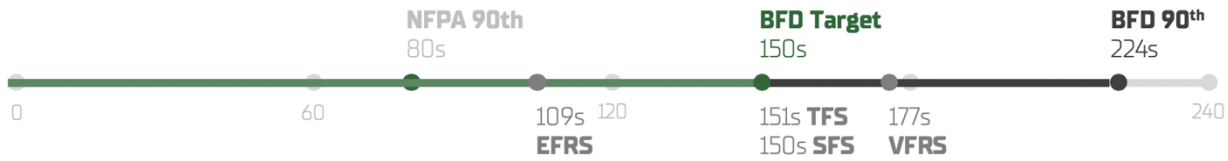
### Alarm Handling




BFD has agreed to use the NFPA 1710 standard of 64 seconds (90% of the time) as its target. This will require improving dispatch protocols and procedures and reviewing performance at regular intervals (monthly).

A review of existing policies and procedures would be highly recommended given the move to a new dispatch location.

### Turnout




Turnout times are particularly long, likely due to a variety of reasons—no targets set or measured, low morale, button-press issues. As recommended during the course of the assessment, BFD has set station-specific turnout targets with an overall service target of 150 seconds (90% of the time).

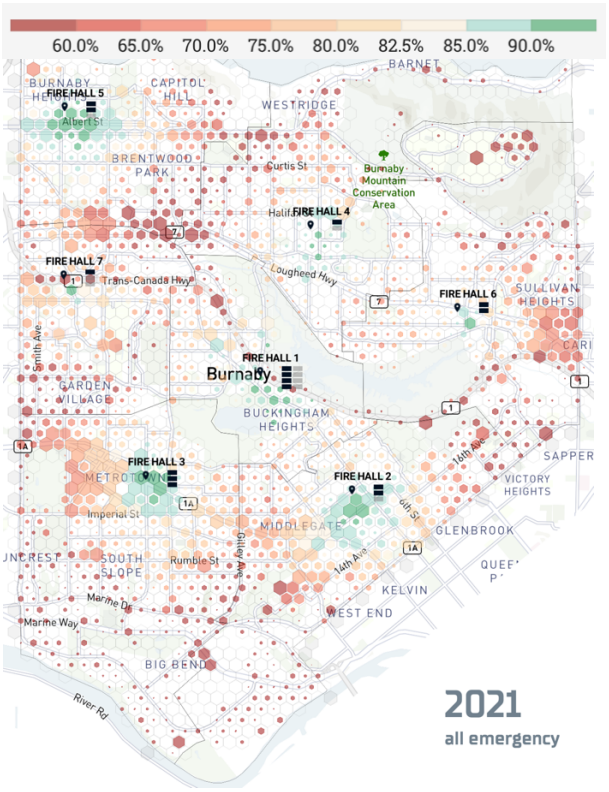
### Travel

Travel times from stations are reasonable, with the exception of Burnaby Mountain and the Big Bend area. These are addressed in the following recommendations.

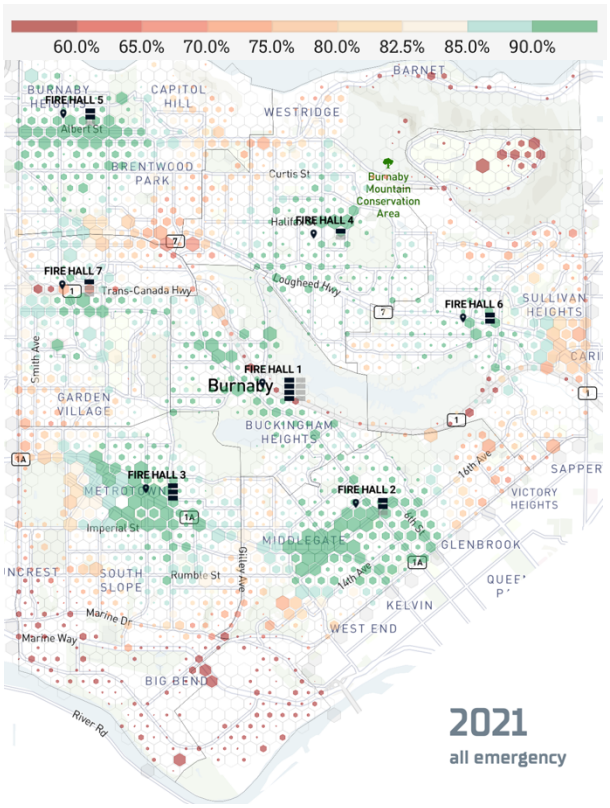
## Expected effects on First Due

Currently, BFD is attaining the NFPS 1710 First Due total response target **~70%** of the time and can expect similar performance over the next few years if nothing changes. If BFD can achieve these targets, they can expect to see an increase of **~13%,** which is equivalent to arriving at **~1,500 more** incidents on time.

Current total response time target attainment **~70%**




If alarm handling (64s) and turnout (150s) targets are met, then total response attainment will increase by **~13%**




## Expected effect on the assembly of an ERF

Currently, BFD can expect to achieve ERF total response targets **~58%** of the time. If BFD can achieve these targets, they can expect to see an ERF target attainment increase of **~12%,** which is equivalent to arriving at **~350 more** fire events (including alarms).

Overall, achieving the alarm handling and turnout targets will substantially improve BFD's overall response performance, however, it also reveals where the proximity risk areas are.

## 3.2
## Staff ladder companies to NFPA 1710 standard – 1 FF per ladder (20 FTE)

Trucks and truck company operations are critical for successful outcomes. Appropriate staffing greatly affects the ability of the department to perform functions properly and at the right time.

According to NFPA 1710, personnel assigned to the initial arriving company (first due) shall have the capability to implement an initial rapid intervention crew. BFD has determined that a minimum crew of four personnel is necessary for the majority of first due emergency incidents and for all fire incidents, which is based on industry standard criteria.

Currently, BFD ladders are staff with three-person crews which is insufficient from both staffing and public safety perspectives. Increasing ladders from three to four-person crews increases the effectiveness of the initial intervention, which decreases the risk and potential consequences to the public. As well, the increases will improve BFD's ability to assemble an effective response force for multi-alarm events more rapidly.

Low hazard effective response force target attainment will increase overall by ~2.5% (arriving within targeted time to ~70 potential major events per year). Primarily improving response effectiveness around Metrotown and Edmonds Town Centres.

**Effect of 4FF Ladders on ERF across ESZ's**

| ESZ | FF | Current % | +1FF to Ladders |
|---|---|---|---|
| 19 | 0 | 6.7% | **+2.2%** |
| 17 | 0 | 26.0% | **+5.9%** |
| 3 | 0 | 32.4% | **+6.2%** |
| 11 | 8 (+1) | 37.1% | **+4.4%** |
| 12 | 0 | 46.7% | **+8.3%** |
| 2 | 0 | 48.8% | +0.5% |
| 1 | 8 (+1) | 51.3% | +0.9% |
| 14 | 0 | 55.7% | **+7.9%** |
| 20 | 4 | 56.2% | +1.2% |
| 7 | 0 | 57.0% | +0.7% |
| 9 | 4 | 62.5% | +0.8% |
| 6 | 12 (+1) | 68.2% | +1.7% |
| 21 | 0 | 68.4% | +1.3% |
| 16 | 4 | 70.9% | **+4.6%** |
| 5 | 0 | 79.3% | +0.5% |
| 13 | 10 | 79.9% | +0.6% |
| 15 | 8 (+1) | 81.4% | +0.7% |
| 10 | 0 | 83.4% | +0.3% |
| 4 | 0 | 87.1% | +0.3% |
| 8 | 0 | 100.0% | |

# 3.3
## Build a Fire Station on Burnaby Mountain – 4 FF (20 FTE)

Studies have been identifying Burnaby Mountain as a high-risk area for the department for many years. It has varied and changing risks, including institutional, industrial, multi-family residential, and wildland interface.

Darkhorse's analysis echoes what previous reports have identified. Proximity is a major concern and access is limited.

### Risk Profile

Land use zones can be used as a high-level proxy for community risk.

#### Moderate risk

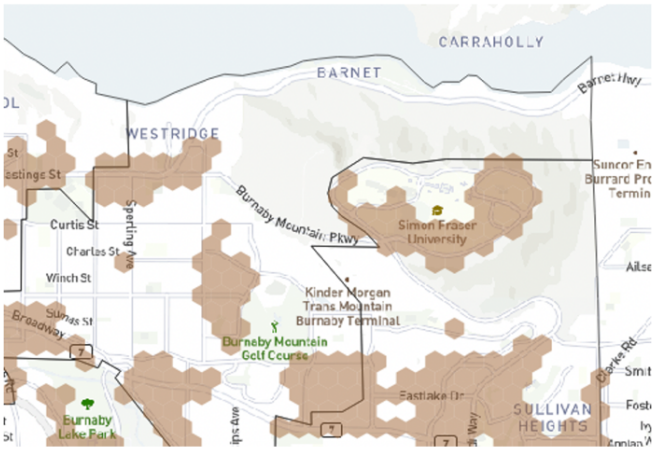
- Commercial buildings
- Low-rise apartments
- Medium density mixed-use
- Business Centre districts
- Community institutional
- Multifamily residential

#### High risk

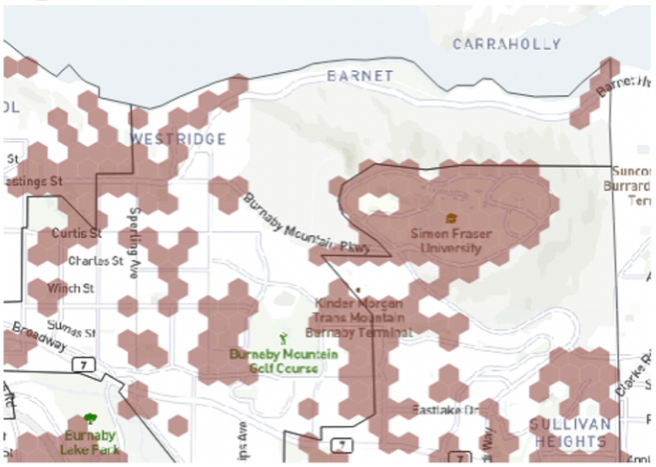
- Industrial
- Petro-chemical
- Institutional
- Institutional Housing
- High-Density Multifamily residential
- Schools

As visualized, the city has complex and various risk around Burnaby Mountain, including significant wildland urban interface (not colored). As well, the extreme risk concerns of the hydrocarbon facilities and TMEP will require specific mitigation strategies (see recommendation 4.2).

**Moderate Risk**

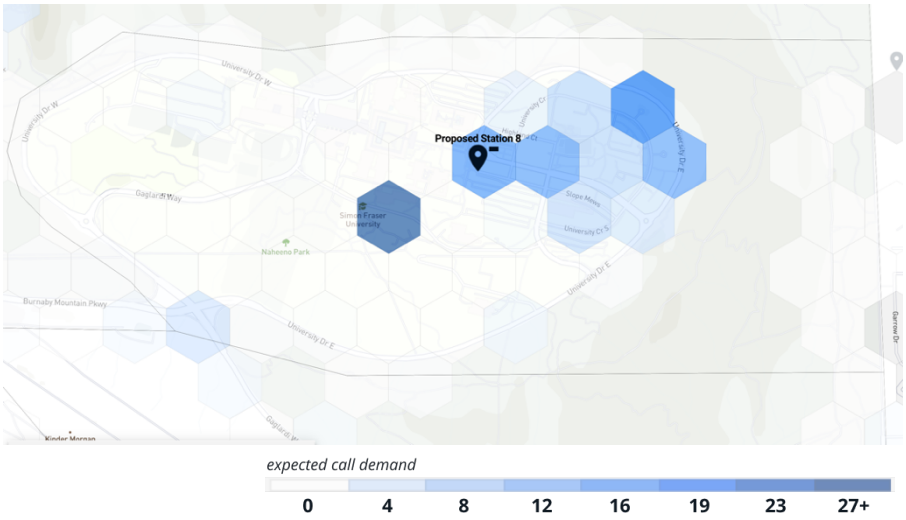



**High Risk**



The optimized location for a Burnaby Mountain station is within the UniverCity community, ideally on the west side and closer to Tower Rd.

This location dramatically improves the first due response capabilities for the community.

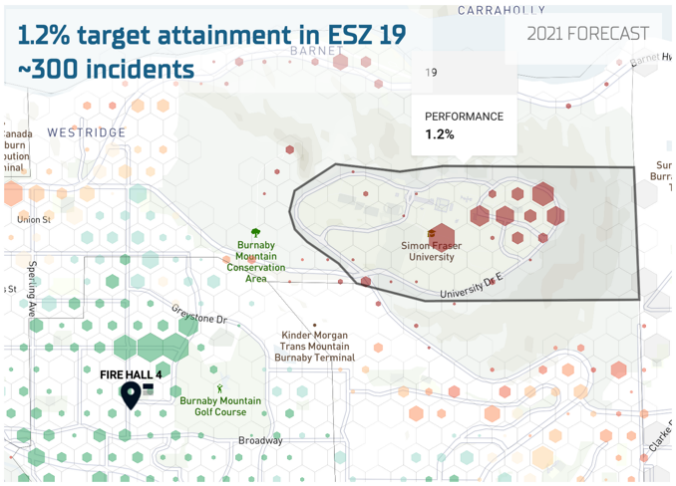



## Effects on First Due

Current first due target attainment is ~1% on ~300 incidents annually. Three responses are expected to arrive within the targeted time. This is assuming that BFD meets its alarm handling and turnout targets. Given the level and complexity of the area's risk, this should not be acceptable.

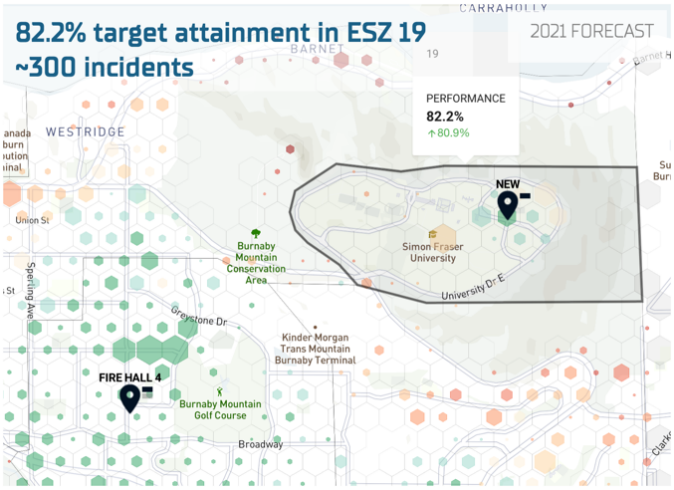
The optimal placement for a new station is within the UniverCity community. This increases BFD's expected target attainment by ~80%.

Without a station




*Assuming alarm handling and turnout targets are met*

With a station



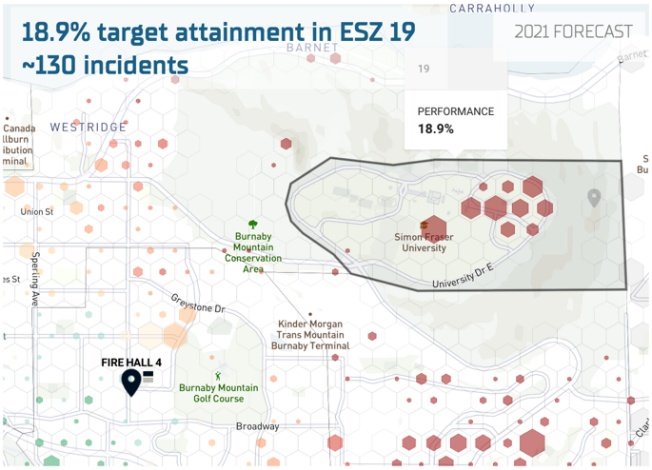

*Assuming alarm handling and turnout targets are met*

Should a major event occur within the area the probability of assembling an ERF in the appropriate time is still low. A more diverse strategic plan will need to be developed for Burnaby Mountain and the risks identified (recommendation 4.2).

### Effects on assembly of an Effective Response Force.

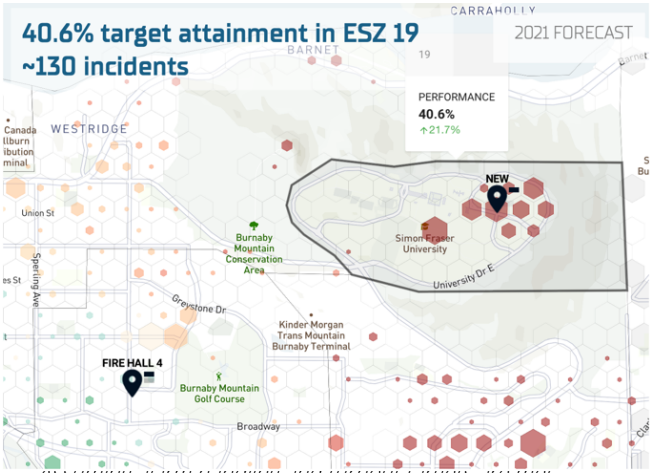
The expected improvement on low risk ERF (15 FF in 10:24) target attainment is not as great as first due, but it is still substantial with an increase of ~40% on an expected annual demand of ~130 fire and alarm incidents.

**Without a station**




*Assuming alarm handling and turnout targets are met*

**With a station**




*Assuming alarm handling and turnout targets are met*

### Concerns regarding the Trans Mountain tank farm and terminal.

Due to confidentiality, Darkhorse was not given specific details regarding future developments of the area. However, from a response effectiveness perspective, BFD is currently unable to meet any of the industry standard response targets (low, moderate, high, or extreme risk) on the Mountain. The tank farm and terminal are determined to be extreme risk areas due to the potential consequences of a significant incident.

A station located in the area would help to mitigate the industrial risk in the area, but not entirely. The risk levels require an effective response force to be assembled within an appropriate time, from 26FF (moderate risk) and up (39+ for high and extreme risk), depending on the nature of the incident. Adding a station in the UniverCity community would critically support the required response by arriving the

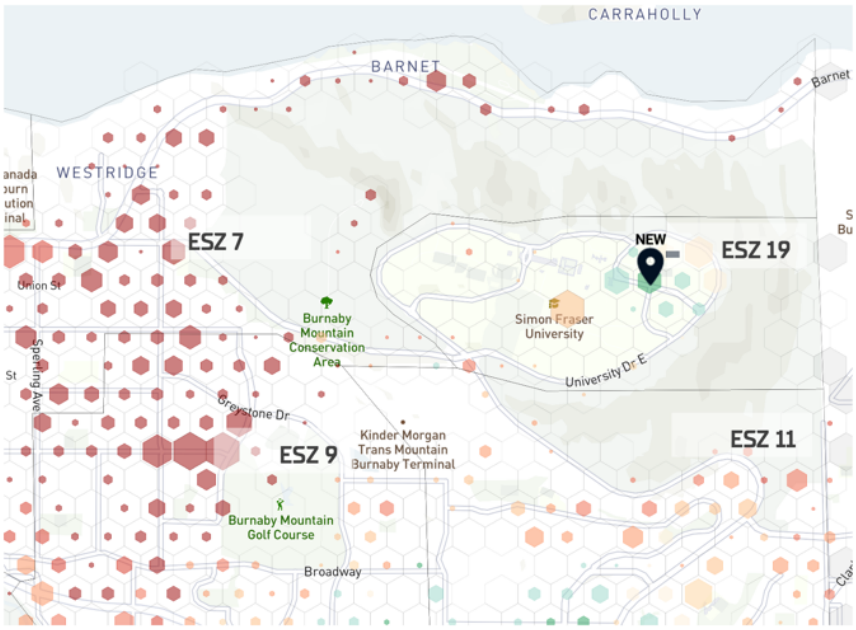
first Engine Company from the Burnaby Mountain Fire Station to the tactically crucial SFU cross-roads of Gaglardi & BBY Mtn Pkwy within **4 minutes.**

For thorough risk mitigation, partnership with federal resources is likely required with additional specific response and risk reduction strategies.

### Should Station 4 be moved to Burnaby Mountain?

When optimizing locations and determining if a station could be re-located rather than a new station added, Darkhorse tested moving Station 4 to Burnaby Mountain.

It is recommended that **Station 4 should not be moved** to the mountain. Although there are positive impacts for ESZ 19, the coverage that the current station 4 location provides to ESZs 7 & 9 would decline significantly.




ASSUMING TARGETED RESPONSE TIMES ARE MAINTAINED

| | BEFORE | AFTER | CHANGE | INCIDENTS |
|---|---|---|---|---|
| ESZ 19 | 1.2% | 81.6% | +80.4% | ~260 |
| ESZ 7 | 77.1% | 53.7% | -23.3% | ~500 |
| ESZ 9 | 92.7% | 49.3% | -43.4% | ~420 |
| ESZ 11 | 81.9% | 82.0% | +0.1% | ~1,000 |

# 3.4
## Build a Fire Station at Big Bend – 4 FF (20 FTE)

The Big Bend area is the other high-risk area that has coverage issues. Historical studies have identified this as well. Although the risk at Big Bend is not as varied as Burnaby Mountain, it is still a concern, particularly with the commercial and industrial businesses in the area.

Due to the level of risk, current coverage capabilities, and economic impact, Darkhorse recommends building a new station in the area.

### Risk Profile

#### Moderate risk

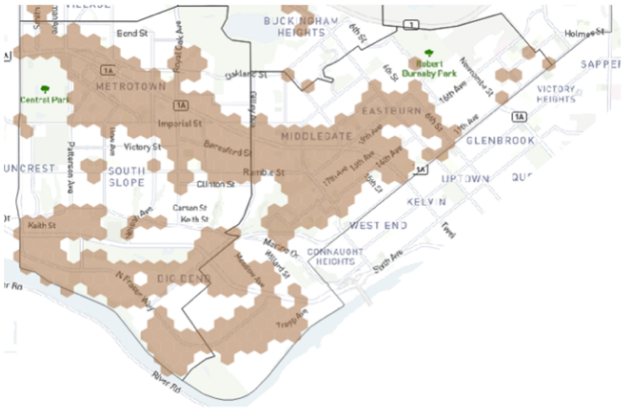
- Big Bend Business Centre
- Commercial buildings
- Low-rise apartments
- Medium density mixed-use
- Business Centre districts
- Community institutional
- Multifamily residential

#### High risk

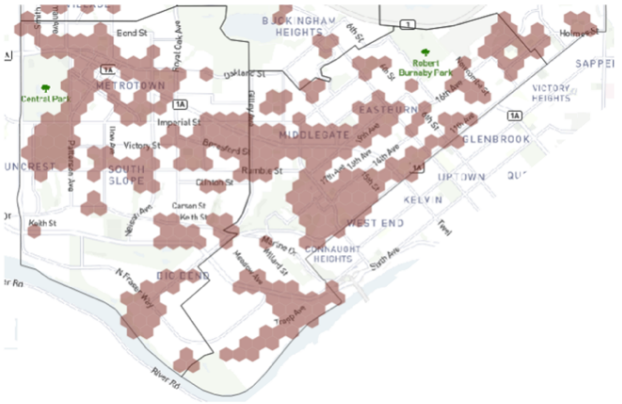
- Industrial
- Petro-chemical
- Institutional
- Institutional Housing
- High-Density Multifamily residential
- Schools

The risk at Big Bend is not as diverse as on Burnaby Mountain, but there are significant commercial and industrial values at risk in the area that must be protected appropriately.

Moderate Risk




High Risk

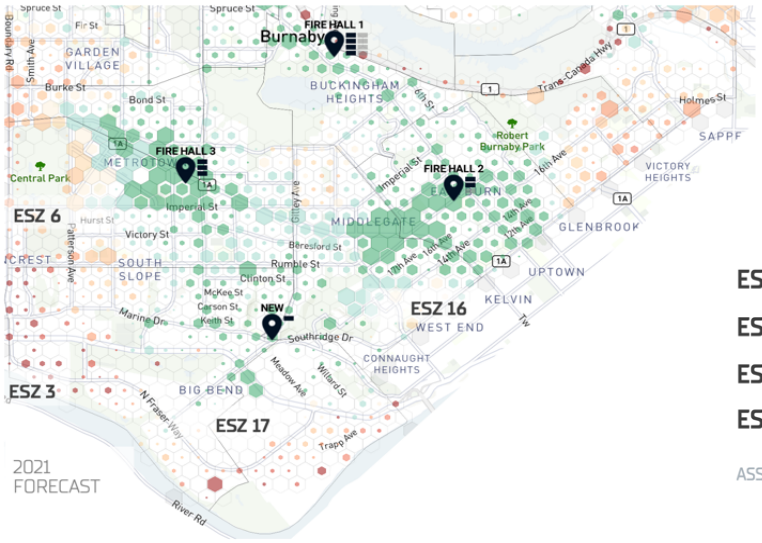



### Commercial and other industry effects

According to the 2018 Fire Underwriter's Survey, the City of Burnaby's current Public Fire Protection Classification (PFPC) rating is class 3 (Class 1 represents the "ideal" or highest level of public fire protection). However, the grading for fire station protected area is rated at 9, due to Big Bend and Burnaby Mountain. Improving response proximity to these areas will improve ratings and have a positive effect on insurance rates (see appendix E for more info).

## Effects on First Due

Adding a station around Marine Drive and Byrne Road has the most positive impacts on response coverage. This station would be able to support the busy and growing town centres of Metrotown and Edmonds and provide an appropriate first due response should an event happen further south.

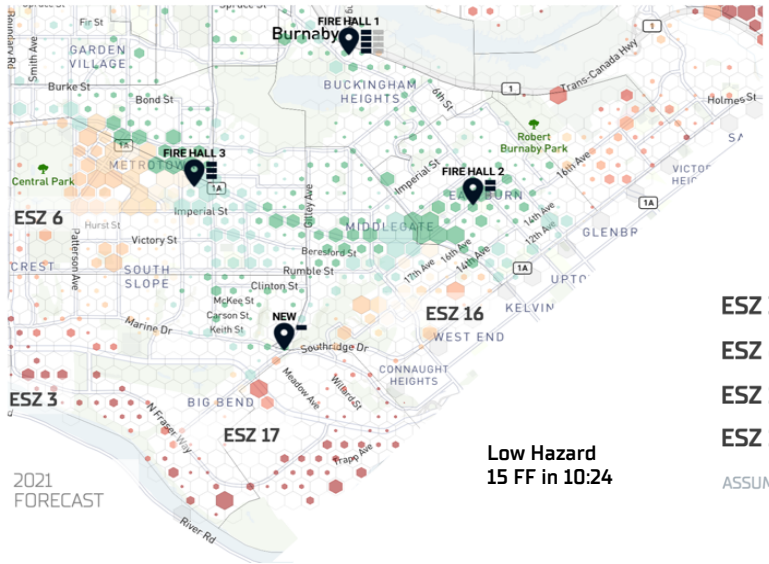



| | Current | Incidents | New Station | |
|---|---|---|---|---|
| ESZ 3 | 57.1% | ~400 | 79.4% | +22.3% |
| ESZ 6 | 88.0% | ~2,200 | 88.1% | +0.1% |
| ESZ 16 | 87.6% | ~1,100 | 90.0% | +2.4% |
| ESZ 17 | 36.6% | ~150 | 81.2% | +44.6% |

ASSUMING TARGETED RESPONSE TIMES ARE MAINTAINED

## Effect on assembly of an Effective Response Force

Similar to adding a new station to Burnaby Mountain, the impact on the time to assemble an ERF is better and much needed, but other risk mitigation strategies will need to be put in place.




**Low Hazard**
**15 FF in 10:24**

| | Current | Incidents | New Station | |
|---|---|---|---|---|
| ESZ 3 | 47.7% | ~100 | 66.5% | +18.8% |
| ESZ 6 | 79.2% | ~650 | 82.8% | +3.6% |
| ESZ 16 | 82.3% | ~250 | 85.8% | +3.5% |
| ESZ 17 | 35.8% | ~60 | 51.5% | +15.7% |

ASSUMING TARGETED RESPONSE TIMES ARE MAINTAINED

## 3.5

## Complete a Fire Station Location & Renewal Strategy to address future growth

The City of Burnaby has continued to grow up (high-rise construction) over the last number of years, with substantial vertical growth planned for the future. This primarily increases population density in the four town centres. The amount of vertical growth adds another layer of risk to the city and complexity to BFD's ability to respond effectively.

Darkhorse has identified the optimal locations to be considered for future stations, however there are many other factors to be considered such as, land procurement, fire station design, function, and programming. As well, a strategic framework is needed for renewing facility infrastructure, Station 4 has been addressed but Station 1 and 6 will also require attention.

Items to be included:

- Station 4 rebuild (if recommendation 2.3 is not addressed)
- Station 1 location and requirements
    - Does not meet the current need for space (station and headquarters)
    - Does not meet requirements for a diverse workforce
    - Does not meet requirements for training
- Training facility location and requirements
- Potential Station 6 relocation (Lougheed Town Centre)
    - Current location is not proximally optimal to respond to current and future call demand
- Optimal location & design for future Brentwood station;
- Optimal location & design for future 2nd station in Metrotown;
- Education on the effects of vertical growth (high-rises) and how it will affect the departments level of service.

Immediate Recommendations

# Community Risk Reduction

This theme addresses the need to identify and mitigate the changing risks in an urban environment. The fire department has been actively involved in fire prevention for many years through public education, building inspections and other activities. However, the lack of strategy and investment into the division has led to low morale, redundant workflows, and unclear objectives.

## Key Findings

Prevention is in decline. The division is neglected organizationally and technologically.

- Lack of strategic planning and goals [Stakeholder Engagement]
- Low staffing [Stakeholder Engagement, Best Practice Assessment]
- Low morale [Stakeholder Engagement]
- Data not easily available [Historical & Diagnostic Analysis]
- Redundant workflows [Stakeholder Engagement, Best Practice Assessment]
- Poor data capture technology [Stakeholder Engagement]

Public Education has ceased to be a priority due to a lack of resources, strategy, and technology. [Stakeholder Engagement, Best Practice Assessment]

BFD's Prevention data was not easily accessible or discernable. [Historical & Diagnostic Analysis]

Community Risk Reduction (CRR) is increasingly being recognized as necessary for the modern fire service. [Best Practice Assessment]

BFD does not have a Community Risk Assessment (as per the CFAI industry standard). [Historical & Diagnostic Analysis, Best Practice Assessment]

A risk mitigation plan needs to be developed in association with the expanding Hydrocarbon Facility. [Stakeholder Engagement, Best Practice Assessment]

Predicting emergency incident locations by risk factors is not currently possible for BFD. [Predictive Modelling]

## Recommendations

4.1 Rebrand Prevention Division to Community Risk Reduction.

4.2 Develop a comprehensive Burnaby Mountain strategy to address current and changing risks.

# 4.1
## Rebrand Prevention Division to Community Risk Reduction

The fire department has been involved in fire prevention for many years through public education, building inspections, plan checking, and issuing permits. However, the lack of strategy and investment into the division has led to low morale, redundant workflows, and unclear objectives. An overhaul of the Prevention and Public Education Division is needed as the city continues to grow.

The Prevention Division is in need of immediate attention, due to a **lack of strategy, resources**, and **appropriate technology**. It has degraded to be nearly ineffective. Darkhorse proposes that, along with the necessary resources, a rebrand would be appropriate given the findings.

Community Risk Reduction (CRR) is the identification and prioritization of risks, threats and hazards followed by the implementation and evaluation of strategies to lessen their impact. Traditionally, fire services focused on a rapid and effective response capability. It is now recognized that while necessary, that focus is no longer sufficient. Risk mitigation requires being proactive, collaborating with the community, and working with other service areas. It is the proactive "yin" to the operation divisions reactionary "yang". Both are necessary for the modern fire service to be successful.


More information can be found here: https://strategicfire.org/wp-content/uploads/2015/04/V2020-CRR-Review-Model-8-12-14.pdf (and in appendix E)

Rebranding, with some investment, has the potential to ignite life into the division, to educate all stakeholders (including the citizens of Burnaby) on the importance, challenges, and benefits of implementing a CRR approach to the fire department.

## 4.2

## Develop a comprehensive Burnaby Mountain strategy to address changing risks

Due to the various, complex, and changing risks at Burnaby Mountain, Darkhorse recommends that BFD immediately develop and communicate a Burnaby Mountain strategy to its stakeholders. Some of the work has already been completed, and the information needs to be consolidated into one place.

- **2019 COB Fire Insurance Classification**
  Fire Underwriters Survey
- **2019 Fire Hydrant Augmentation Plan**
  Burnaby Fire Department

### Risks identified

| Type | Risk Level | Targets | Probability of target attainment | Predicted Drive time for ERF | Response Plan / Critical Task List | BFD Training & Equipment |
|---|---|---|---|---|---|---|
| Standard industrial risk | High | 39FF in 12:34 | 1.4% | 19:57 | Yes | appropriate |
| Hydrocarbon Facilities | Extreme | 39FF in 12:34 | 1.4% | 19:57 | Unclear | insufficient |
| TMEP | Extreme | 39FF in 12:34 | 1.4% | 19:57 | Unclear | insufficient |
| Institutions | High | 39FF in 12:34 | 1.4% | 19:57 | Yes | appropriate |
| Isolated Community | Moderate / High | 26FF in 10:24<br>39FF in 12:34 | 2.4%<br>1.4% | 18:19<br>19:57 | Yes | appropriate |
| Wildland Urban Interface | High | Varies – Rapid intervention – 4FF in 6:24 | 0.6% | 13:34 | Yes | Being addressed |

The stakeholder engagement revealed unanimous recognition and concern regarding the risks at Burnaby Mountain. The diagnostic analysis and modelling confirmed that BFD's response capabilities to the area are inadequate. Even with the immediate resources recommended, the risks will not be fully mitigated.

Specific incident response plans, appropriate equipment and training will be needed, as well as partnerships with municipal, provincial, and federal organizations, for the extreme risk presented by the hydrocarbon facilities and TMEP.

**The strategy should include:**

- Consolidation of completed documents addressing the area;
- Current response capabilities and response plans for potential high and extreme risk incidents;
- Critical Task Study – detailed firefighting requirements (people and equipment) for each type of potential incident;
- Training gaps;
- Resource gaps;
- Risk mitigation plans in collaboration with other city departments, local organizations, and the federal government;
- Plans for continuous public engagement.

Immediate Recommendations

# Proposed Position Summary

| | # of Positions added | | | | | |
|---|---|---|---|---|---|---|
| Position Type | 2020 | 2021 | 2022 | 2023 | 2024 | Total |
| Firefighters | 4 (x5) Rec 3.2 | 4 (x5) Rec 3.3 | 4 (x5) Rec 3.4 | | | 60 |
| Prevention and Public Education Staff | 2 | 2 | 2 | | | 6 |
| Community Outreach, Inclusion, and Diversity | | 2 | | | | 2 |
| IT, Analytics | 2 | 2 | | | | 4 |
| FTE Trainer | 1 | 1 | | | | 2 |
| Safety Officer (Health & Wellness) | 1 | 1 | | | | 2 |
| Management/Admin | 2 | 2 | 2 | | | 6 |
| Total by Year | 28 | 30 | 24 | 0 | 0 | 82 |

## Additional Firefighters locations

Recommendation 3.2 - Staffing Ladder Trucks from 3FF to 4FF. (L2 x5, L3 x5, L5 x5, L6 x5)

Recommendation 3.3 - Staffing 4FF Engine for Burnaby Mountain station (x20)

Recommendation 3.4 - Staffing 4FF Engine for Big Bend station (x20)

# Future Recommendations

Darkhorse's future recommendations are not prioritized. The mid-term (2025) primarily focuses on the evaluation of the investments made and goals set from this recommendation. Decisions will have to be determined and prioritized post-evaluation. By 2025, if not sooner, training resources will need to be addressed, hiring an additional two trainers and scoping the requirements for the necessary training facility are recommended.

The long term (2030) is a less clear, but given the current population forecast, completing the initiatives of the recommended station location strategy and continuing to monitor divisional performance are clear choices. It is also recommended that the department attain CFAI/CPSE accreditation by 2030, which is a vigorous self and peer assessment program geared toward helping departments continuously improve.

## Mid-term - 2025

- Evaluate effectiveness of investments from 2020-2022
- Re-adjust key performance indicators as appropriate based on divisional strategic goals (from recommendation 1.3: Develop a 24-month Strategic Plan)
- Evaluate response effectiveness – have alarm handling and turnout targets been met? Have travel times remained consistent?
- Reset station specific turnout targets
- Evaluate the department's diversity initiative
- Evaluate the effectiveness of Community Risk Reduction Division
- Evaluate the Burnaby Mountain Strategy
- Evaluate CPSE accreditation
- Update call demand forecasts
- Hire two FTE Trainers (aim to keep ops staff to trainers' ratio between 70-80)
- Invest in Training Facility ("world class", define requirements, investigate options for revenue generation, determine optimal location)

## Long-Term - 2030

- Complete implementation of fire station location strategy
- Performance review for all divisions based on strategic plan, appropriate key performance indicators, and a stakeholder engagement.
- Update population, development, and call demand forecasts to evaluate station locations and effects of vertical growth.
- Attain CFAI/CPSE accreditation or undertake a 2030 Needs Assessment Study (10-year outlook)

# APPENDIX

Appendix A

**Phase Details**

Appendix B

**Industry Standards**

Appendix C

**Analysis Methods**

Appendix D

**Additional Resources**

Appendix E

**Project Team & Governance**

Appendix A

# Phase Details

Phase 1.1

**Stakeholder Engagement**

Phase 1.2

**Historical & Diagnostic Analysis**

Phase 2.1

**Benchmarking**

Phase 2.2

**Best Practice Assessment**

Phase 3.0

**Predictive Modelling**

Phase 1.1 - Current State Analysis

# Stakeholder Engagement

## Background

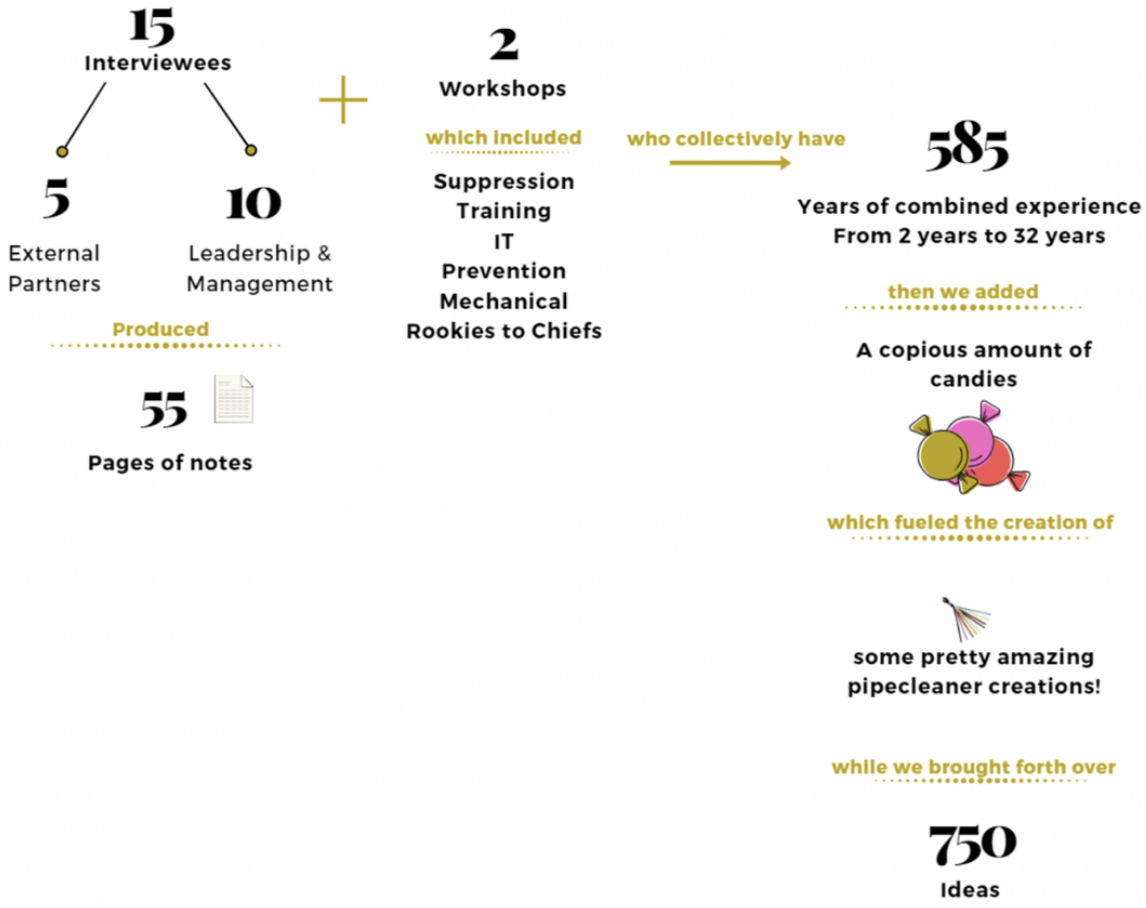
1.1 Who did we talk to?

1.2 What did we talk about?

1.3 What process did we follow?

1.4 How did we organize the findings?

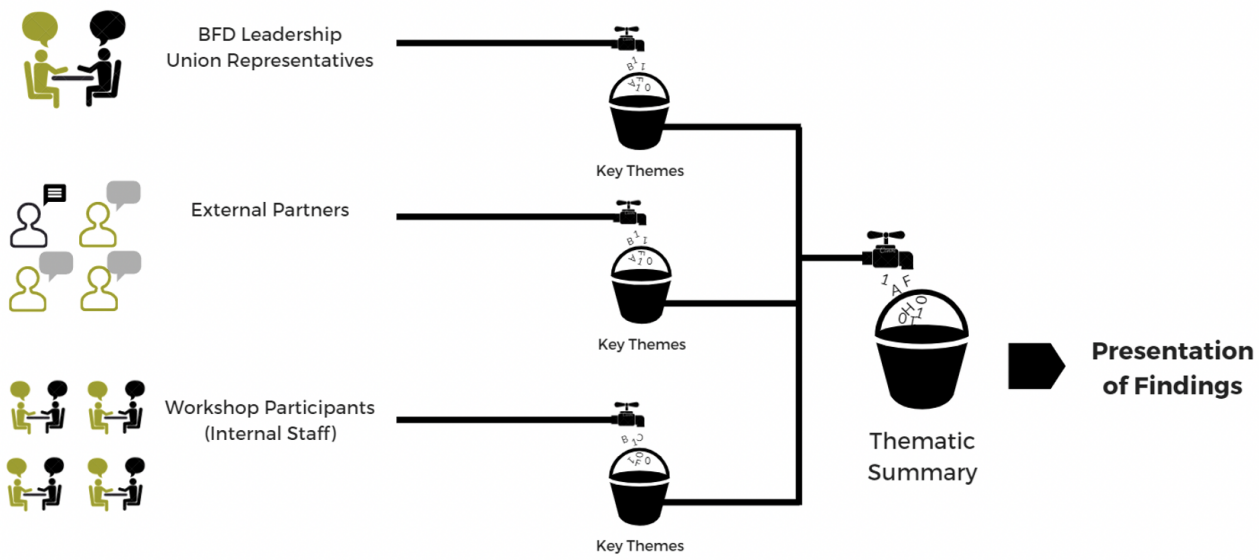
### Who did we talk to?



## What did we talk about?

| | |
|---|---|
| **Public Perception** | How well is BFD meeting its obligations to the community? |
| | How well does BFD understand the public's perception of BFD meeting its obligations to the community? |
| **Health & Wellness** | How well does BFD support the health & wellness of the staff? |
| **Performance** | Is BFD meeting its minimum performance standards? |
| **Training** | Is BFD providing adequate training, certification, and maintenance of certifications? |
| **Culture** | How does BFD rate the current culture (values, communication, behavior, attitudes, happiness)? |
| **Stakeholders & Partners** | How well does BFD work with its stakeholders/partners? |
| **External Factors** | What external factors are impacting BFD? |
| **Risks & Challenges** | What risks and challenges will BFD face going forward? |
| **Priorities** | What are the priorities for BFD going forward? |

## What process did we follow?




## How did we organize the findings?

### Guiding Question 1

| GROUP | SCALE | WORKING WELL | TO BE IMPROVED |
|---|---|---|---|
| SMT | ... | ... | ... |
| ES | ... | ... | ... |
| I | ... | ... | ... |

**Guiding Question 2**

**Guiding Question ...**

**Thematic observations and summary**

**NOTE**

Information presented in this report will be a direct reflection of what interviewees and workshop participants stated.

**ACRONYMS**

**SMT**
Senior Management Team, Union President

**ES**
External Stakeholders

**I**
Interviewees

# Perceptions & Perspectives

| SELF ASSESSMENT SCALE<br>10 = EXCELLENT, 1 = POOR | LEADERSHIP & MANAGEMENT | EXTERNAL PARTNERS | WORKSHOP PARTICIPANTS |
|---|---|---|---|
| Public Perceptions<br>How we think we're perceived | 8 | 9 | 8 |
| Public Perceptions<br>How we think we are doing | 5 | 7 | 8 |
| External Partners | 7.2 | 7 | 6 |
| Training | 8 | No insight | 6.9 |
| Performance | Acknowledged / no grade | Acknowledged / no grade | 7.2 |
| Culture | 6 | 6 | 7.2 |
| Health & Wellness | 9 | 8 | 7.2 |

The organizational "self-assessment" on each of these elements gives a sense of the overall well-being of the service from those that are in closest contact with it.

## Observations

While BFD continues to be engaged in the community through volunteering and community events, public education is on the decline. The public is not fully aware of key services such as prevention, education, investigations and licensing thus creating a disconnect between how BFD feels it is doing in the community versus how the public views BFD is in the community.

There is motivation on behalf of BFD, RCMP and the City to continue to build stronger relationships and develop more effective ways of working with each other to the benefit of the community. While not unanimous, BFD enjoys a strong on-the-ground working relationship with its operational partners such as RCMP, BCAS, and the City. The relationship with BCAS, in particular, has some challenges: there is a perceived lack of clear roles and responsibilities, especially first responding, dispatching between the variety of services, and communication.

There is a strong commitment to training and a belief by all partners and staff that training is effective and delivers what is required to meet minimal standards. Members perceive BFD's training is of higher quality than management and external partners but are in agreement that there is an insufficient number of

resources dedicated for training in BFD. There is too much "borrowed" training expertise which is done over and above the current workload. Keeping up to date with certifications, re-certifications, and new training requirements based on expansion of services, is difficult to track and maintain with the current staffing balance and technology provided. There is concern that due to the increasing complexity of services, the current training facility does not meet the current and future needs of BFD.

Management, partners and workshop participants feel BFD is currently meeting its minimum performance level. There is uncertainty regarding if this can be maintained. Increase of human resources is identified as the primary requirement from the stakeholder engagement review. Infrastructure changes and additions were also identified as a key requirement, though not as prevalent. Technology and analytics is considered to be integral to BFD and are increasing as a critical support system now, and in the future. There was a recognition that investment into technology, data analysis, and human support is needed to meet performance requirements. There is a strong perception of the risks and challenges of densification, increased population, hydrocarbon facility expansion, and the changing nature of BFD's responsibilities will present a significant risk to service delivery if not addressed.

Culturally, the members have a strong commitment to getting the job done, however, they don't expect support from the organization's partners. The past political environment negatively impacted BFD. With recent political changes in the City, morale is improving and there is an optimism and openness to change. Leadership, partners and members believe there is a need for clear leadership, a vision, a plan, and transparency. Leadership, management and external partners are aware and concerned with the insufficient amount of diversity in BFD.

BFD has a strong focus on health and wellness. Programs are perceived to be very positive. In particular, the Fortius program, mental health awareness, resilience training, and open communication are all considered major contributors. There is a strong desire to build on this momentum, to continue to invest in BFD's health and wellness programs. Being aware of the growing needs and complexities of BFD will also require an increase in health and wellness resources.

# Public Perceptions

## LEADERSHIP & MANAGEMENT

### Reflections

Public perception is believed to be more positive than the current state due to:
- The community doesn't understand everything we do
- Members are heavily involved in the community – volunteering and charitable work – there is a positive presence in the community

Behind the scenes:
- BFD's supporting logistics are starting to fail to meet public obligations,
- Resources are stretched
- Assets are aging
- The work is more complex
- Areas of Burnaby have reduced access to BFD - all which the public is unaware of

How well is BFD meeting its obligations to the community? **5.0**

How is BFD perceived as meeting its obligation to the community? **8.0**

## MUNICIPAL PARTNERS

### Reflections

Public perception is higher because:
- Members are well-known to the public through their volunteering and charitable work
- The public sees BFD doing their job in a positive way

Behind the scenes, BFD's supporting logistics are failing such as:
- prevention, licensing, investigations, public education, challenges with BCAS

How well is BFD meeting its obligations to the community? **7.0**

How is BFD perceived as meeting its obligation to the community? **9.0**

## WORKSHOP PARTICIPANTS

### Reflections

Despite resource shortages, members feel they are meeting their obligations to the community.

Continuing to meet community obligations is increasingly difficult given Burnaby's growth, shortage of resources and aging assets.

How well is BFD meeting its obligations to the community? **8.0**

How is BFD perceived as meeting its obligation to the community? **8.0**

## Municipal (External) Partners

### LEADERSHIP & MANAGEMENT

**7.2**

#### Working Well

RCMP – 8
City Departments – 7.2
BCAS – 6.5

Relationship with RCMP is very positive

The working relationship with BCAS at point of incident is professional and effective

#### Needs Improvement

The relationship between the city and BFD is good but needs more organization, coordination and leadership

The relationship with BCAS needs to be improved to clear up unclear responsibilities and confusion with dispatch system calls managed by BCAS

There needs to be more consistency in the working relationships with city departments

### MUNICIPAL PARTNERS

**7.0**

#### Working Well

RCMP – 9
City Departments – 7.2
BCAS – 5

Relationship with RCMP is effective

Overall the relationship with the various city departments is effective and improving

#### Needs Improvement

The relationship with BCAS needs to be addressed as it continues to be a challenge due to a lack of alignment and cooperation in some areas

There needs to be an increase of resources to build on relationships with external partners

### WORKSHOP PARTICIPANTS

**7.0**

#### Working Well

There is generally a positive relationship with external partners

There are shared common goals and professionalism with partners

Members have a strong desire to improve relationships with BCAS despite the broader issues between the province and the municipality

#### Needs Improvement

All workshop participants stated the need for additional and more effective communication

More interagency training is required

Need to continue to build on our relationships with partners so there is an increase of trust and accountability

## Training

### LEADERSHIP & MANAGEMENT

**7.2**

#### Working Well

Overall positive perception

BFD members involved in training are working hard to provide high-quality training

#### Needs Improvement

Need to increase the number of resources in training – reduce the gaps that exist, especially on the training load required

Need a way to track, monitor and make sure certification and recertification is being done appropriately

Need to prepare staff for the increasing complexity and challenges facing BFD - such as the hydrocarbon facility and other new services being introduced

### MUNICIPAL PARTNERS

**7.0**

#### Working Well

Overall positive view of BFD's training and certifications

#### Needs Improvement

An increase of resources is required to meet training expectations as roles become more complex.

### WORKSHOP PARTICIPANTS

**6.9**

#### Working Well

There is a high degree of buy-in from members of BFD to the training program

BFD members feel the training provided gives them a high level of skill and variety of expertise

Driver training and knowledgeable mentorship are both highlighted as positive aspects of BFD's training

#### Needs Improvement

All workshop participants stated the need for additional and more effective communication

More interagency training is required

Need to continue to build on our relationships with partners so there is an increase of trust and accountability

# Performance

## LEADERSHIP & MANAGEMENT

### Working Well

The determination and dedication of the members within BFD are making it possible to meet and exceed minimum performance levels

### Needs Improvement

A careful watch is required on performance levels. Minimum performance levels are dangerously close to not being met

Review and determine where appropriate resources are required. There is a systemic shortage of resources (human, equipment, gear)

Resourcing in Prevention (licensing and investigations) and Education

Monitor and plan for the densification and increased population situations in Burnaby

Measure and quantify performance

Information technology support for BFD

## MUNICIPAL PARTNERS

### Working Well

Perception is BFD is meeting its minimum performance level

### Needs Improvement

BFD's environment is changing, roles are expanding, and new requirements need to be clearly identified (i.e. facilities, staff, equipment, etc.)

Close the gap on resources requirements in order to effectively continue meeting the minimum performance levels

Planning for the impact of the expanding hydrocarbon facility is required

## WORKSHOP PARTICIPANTS

**7.2**

### Working Well

There is a strong commitment and dedication to meeting BFD's mandate and doing what is best for the public

Members take pride in the quality of the membership and professionalism

Members feel they are well trained

### Needs Improvement

Improve performance by looking into overall:

- Staffing
- Training facility
- Equipment
- Fire stations

# Culture

## LEADERSHIP & MANAGEMENT

### Working Well

Although culture has been perceived to be declining, there is a positive foundation to build from; ready for a new start; and, there is a desire to change for the better

There is a strong focus on the values of trust and pride

BFD has a strong and rich history

### Needs Improvement

**6.0**

There is a need for clear leadership (Chief) who will espouse the values of BFD and set a path going forward

'We are ready for change - members and our history is strong"

Need to develop strategies to move from the existing inertia in order to enact change

Need to develop strategies and a plan to increase diversity within BFD

## MUNICIPAL PARTNERS

### Working Well

Strong work ethic and values in the membership

Increased level of support from the Mayor's office is a positive impact on the culture

### Needs Improvement

**6.0**

Leadership is the biggest internal challenge to be addressed

Improving the diversity of BFD's workforce is needed

Continue to work on relationships with the City to increase trust

## WORKSHOP PARTICIPANTS

### Working Well

The culture of BFD is stabilizing and improving

There is trust and a strong sense of community and peer support

Strong traditions and participation reinforce a positive culture

### Needs Improvement

**7.2**

Consistent leadership is needed

Need to develop a vision and plan, now and for the future

Increase group/team activities to strengthen morale – go back to some of the traditions

Establish protocols around the usage of personal technology

Increase transparency of communication – face-to-face is the preferred choice of communication before email

Continue to engage the membership so they feel they have a voice

## Health & Wellness

### LEADERSHIP & MANAGEMENT

**9.0**

#### Working Well

A strong emphasis on programs, resources, planning, and peer support has resulted in a higher level of performance

Overall there is very positive attitude towards BFD's health and wellness

Programs such as Fortius, Resilient Minds Peer Support, Mental Health Self-Assessment Tool, Burnaby Mental Health Support, are valuable and well received

#### Needs Improvement

Identify and secure the appropriate number of resources required to continue to deliver on the health and wellness programs

### MUNICIPAL PARTNERS

**8.0**

#### Working Well

BFD's focus on the health and wellness of its personnel is well respected and noticed

Some great programs in place and should be continued

#### Needs Improvement

Address exposure to hazardous materials and decontamination

Look into where there may be a lack of resources

Increase the ability to do cancer screenings

### WORKSHOP PARTICIPANTS

**7.2**

#### Working Well

The resilient minds program is strongly identified as a positive aspect of BFD's health and wellness program

Infrastructure and programs such as Fortius to support the physical wellbeing of staff

Peer counselling initiative

#### Needs Improvement

Health and wellness education and training needs to continue to be a priority

An increase in the EAP and benefits program is needed; especially in mental health services. Allow for individual selection of personal counsellors

Increase group/team motivated physical activities

Consider access to other member local physical fitness facilities – would increase physical activity

## External Factors

Densification, increasing population and the changing nature of BFD's responsibilities, such as the increase in first responder and medical-related calls, are considered significant factors impacting BFD.

The majority of interviewees and workshop participants identified the expansion of the hydrocarbon facility and impact on the surrounding community, including the Simon Fraser University area as a major factor impacting BFD. Communication and understanding of the risk and mitigation strategies are not well understood or consistent.

The cost of living in Burnaby, travel time, and family commitments of members are impacting the work environment.

### Leadership & Management

Densification

Hydrocarbon expansion and associated risks

High cost of living in Burnaby for members

Long travel times to work

### Municipal Partners

The changing nature and risks of BFD's mandate like the hydrocarbon facility

Densification and increased population

### Workshop Participants

Members expressed a wide variety of concerns around external factors impacting BFD

A desire for a well thought out vision and plan for the future

Working in a high cost of living environment

Densification and an increase in complexity of the services of BFD

Hydrocarbon facility and increased risk of supporting the Simon Fraser area and Burnaby Mountain

## Risks & Challenges

The primary risk from all interviewees and workshop participants was a lack of resources (staffing, equipment – including cleaning equipment, infrastructure - ageing fire stations and the need for new stations)

Effective leadership. The absence of the Fire Chief is hurting the department.

The hydrocarbon facility expansion and its impacts with regards to the expectations on BFD and the skill sets required to address the new environment effectively.

Keeping up with training requirements and demands based on the expansion of services (an increase of water services, investigation services, search and rescue, hydrocarbons and hazmat

### Leadership & Management

General physical and mental health & wellness of members

Densification and increasing population

Prevention and education chronically understaffed

Leadership

Hydrocarbon facility expansion

Increased complexity of services with insufficient resources to support them

### Municipal Partners

Changing nature of risks and the variety of responsibilities facing BFD

Overall lack of resources to support the services BFD provides

Leadership

### Workshop Participants

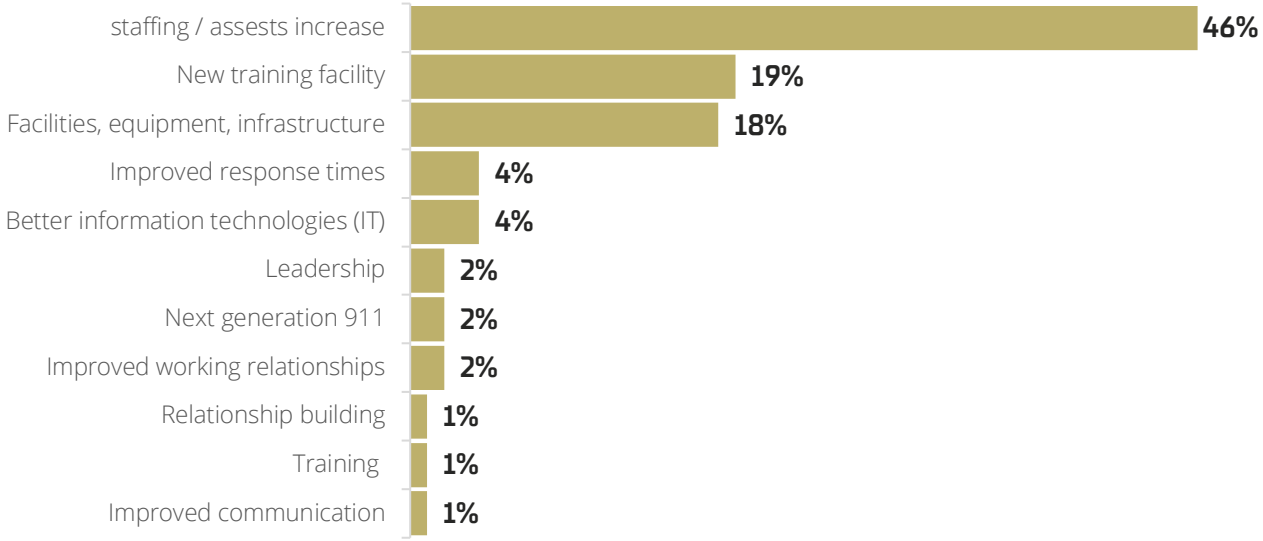
Keeping up with the growth and densification of Burnaby

Lack of resources

Hydrocarbon facility expansion

Older and failing equipment

## Priorities from Workshops




### Why the strong emphasis on increasing staff?

Interviewees and workshop participants believe there is a chronic shortage of staff across all support service areas: Prevention, Training, Mechanics, IT, Admin, Management, Public Education.
As a result, the workload is ***just*** being managed, backlogging, or not being done at all – as is the case with Public Education.

Management and workshop participants believe suppression staff are only able to meet current performance levels through their determination, dedication and passion.
They feel they are walking a thin line and believe it is only a matter of time before one too many priority calls will occur, and they will not be able to respond effectively.

## Final Observations

BFD is in need of stable and proactive Leadership to guide the organization forward

BFD requires a Vision and Plan shared and understood by BFD members and partners

Partners and members perceive BFD being at a critical point with their resource requirements and there is a need for a Resource Plan (across all areas) to maintain and improve performance standards

BFD needs to make Prevention more of a priority committing additional resources with a measurable plan

BFD readiness for Change is high. BFD management and members are optimistic given the perceived support from the new Mayor, Council and City departments

Management and external partners want to see strategies and actions to expand the Diversity of the members

Continue to make Health and Wellness a priority. All highly regard BFD for having programs in place such as Fortius, Resilient Minds, Mental Health Support

A risk mitigation plan needs to be developed to create strategies and actions for the risks associated with the expanding Hydrocarbon Facility and surrounding areas including Simon Fraser University

### Interviewees

| | | |
|---|---|---|
| **Mike Hurley**<br>Mayor | **Dave Samson**<br>Deputy Fire Chief | **Jeff Clark**<br>Union President |
| **Sav Dhaliwal**<br>City Councillor | **Darcey O'Riordan**<br>Deputy Fire Chief | **Scott Allen**<br>Union Vice President |
| **Lambert Chu**<br>City Manager | **Chris Bowcock**<br>Deputy Fire Chief | **Paul Rushton**<br>Union Treasurer |
| **Dave Critchley**<br>Director of PSCS | **Perry Talkkari**<br>Prevention | **Miles Ritchie**<br>Union Secretary |
| **Deanne Burleigh**<br>RCMP OIC | **Bob Rossignol**<br>Training Officer | **Sharon Caughlin**<br>Administrative Assistant |

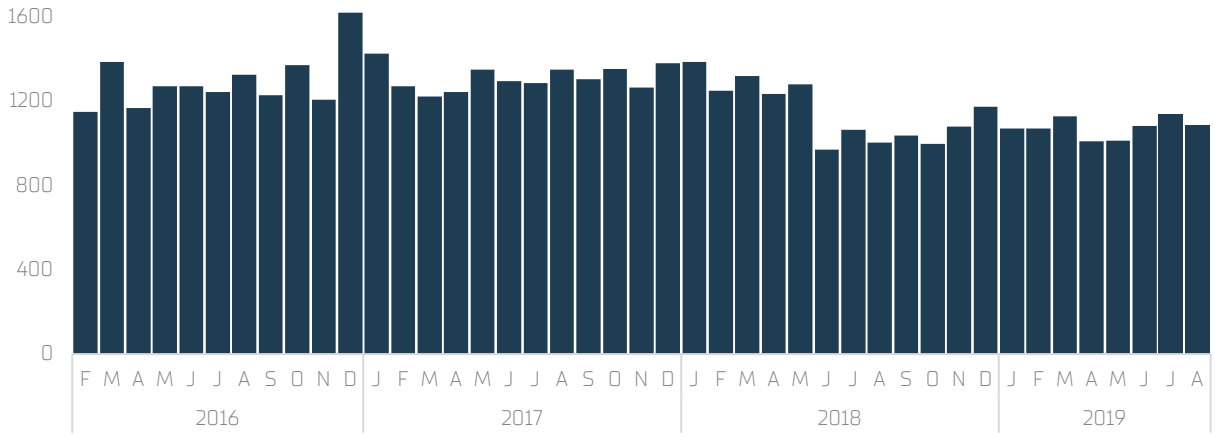
Phase 1.2 - Current State Analysis

# Historical & Diagnostic Analysis

The purpose of the historical analysis was to give the Burnaby Fire Department an understanding of how Darkhorse analyzes CAD and RMS data, to provide insight and error checking into the service from a qualitative perspective, and to provide the groundwork for the diagnostic and predictive phases.

## Dataset

The first step was to establish a clean dataset for consistent analysis. The final dataset that Darkhorse used was from February 2016 to August 2019.




**86,244** APPARATUS RECORDS *representing* **52,389** INCIDENTS

*Removed duplicates*

**933** APPARATUS RECORDS

**1,058** INCIDENTS

*~450 responses to duplicate incidents, the remaining are Darkhorse identified*

*Location issues*

**3,138** RESPONSES WITH NO LOCATION

**59** INCIDENTS WITH INVALID LOCATION

*Timestamp issues, removed*

**1,612** MISSING ENROUTE TIMESTAMP, BUT ARRIVED ON SCENE

**706** MISSING IN SERVICE AND IN QUARTERS TIMESTAMPS

**2,103** MISSING ARRIVAL TIMESTAMP
*(With 10+ min between enroute and service timestamps.)*

## Call Categories

**FIRE**

- Building Fire
- Fire Misc.
- Wildland
- Alarms
  - False
  - Accidental
  - Needless
- Rubbish
- Vehicle
- Chimney

**MEDICAL**

- Medical Emergency
  - Medical Misc.
- Cardiac Emergencies
- Med Emergency / Assault
- Overdose
- Home Accidents
- Sports Accidents
- Industrial Accidents
- Assist Incapacitated Persons – NON EMERGENCY

**MVI**

- MVI with injuries
- MVI without injuries

**OTHER**

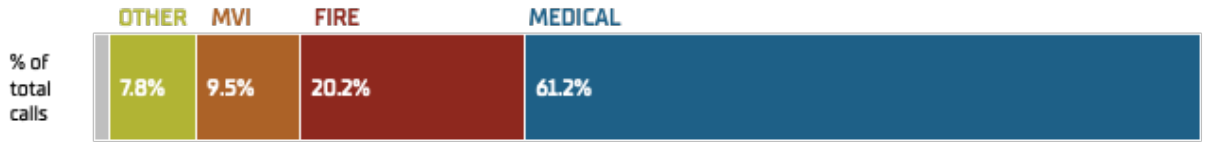
- Hazmat / CO2
- Public Service / Follow-up
- Technical Rescues
- Assisting Persons / Agencies
- Marine

- Cancelled

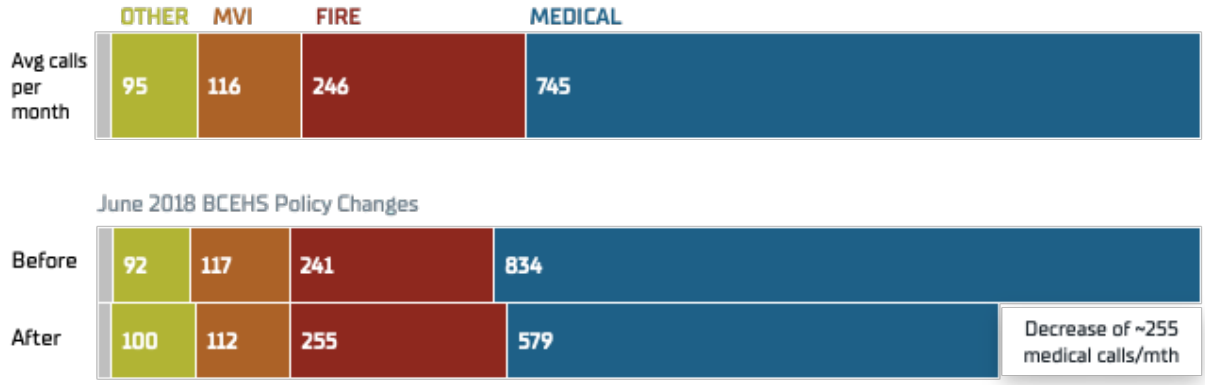
Feb 2016- Aug 2019

## Incident Mix

By Percent of calls

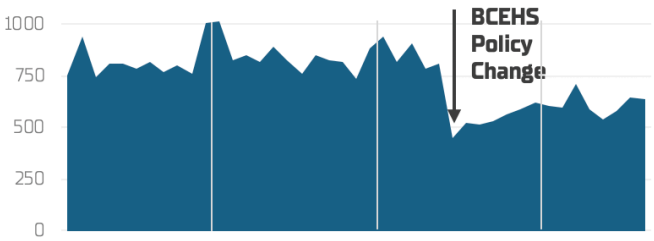



Examining the effects of the June 2018 BCEHS Policy changes:

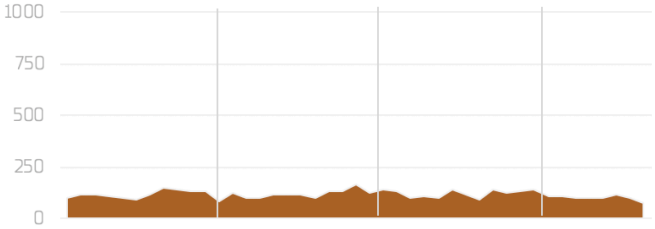


## Incident Mix

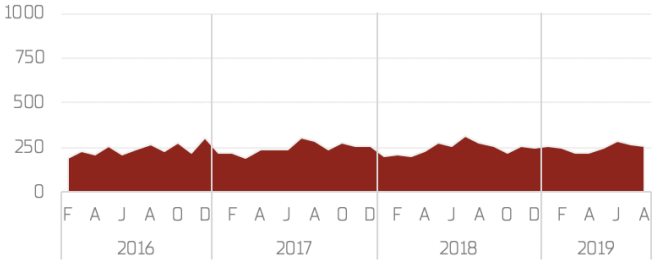
### ALL MEDICAL



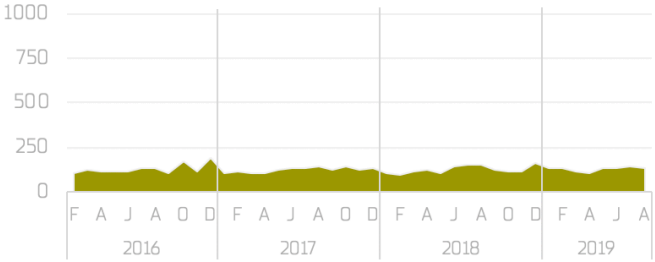

### ALL MVI




### ALL FIRE



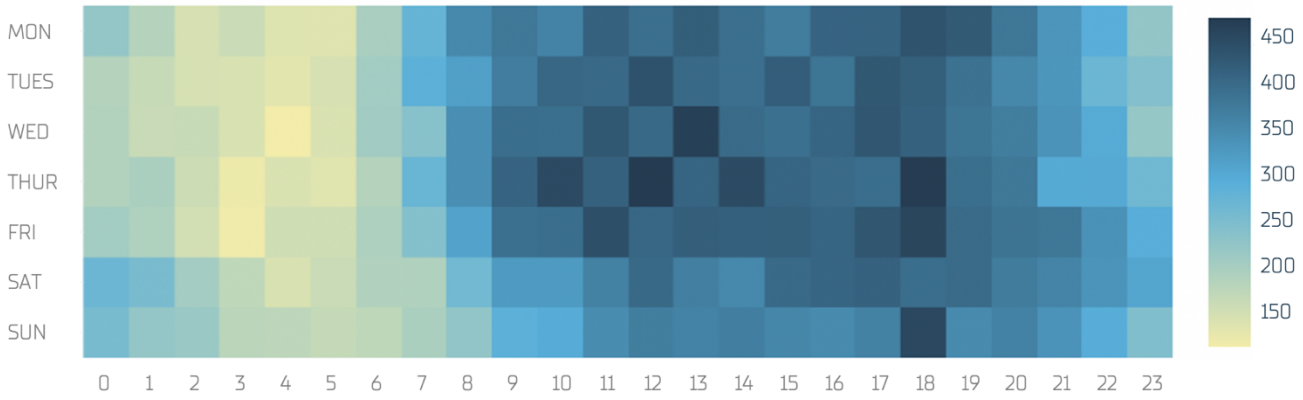

### ALL OTHER




Feb 2016- Aug 2019

## All incidents - Time of Day analysis

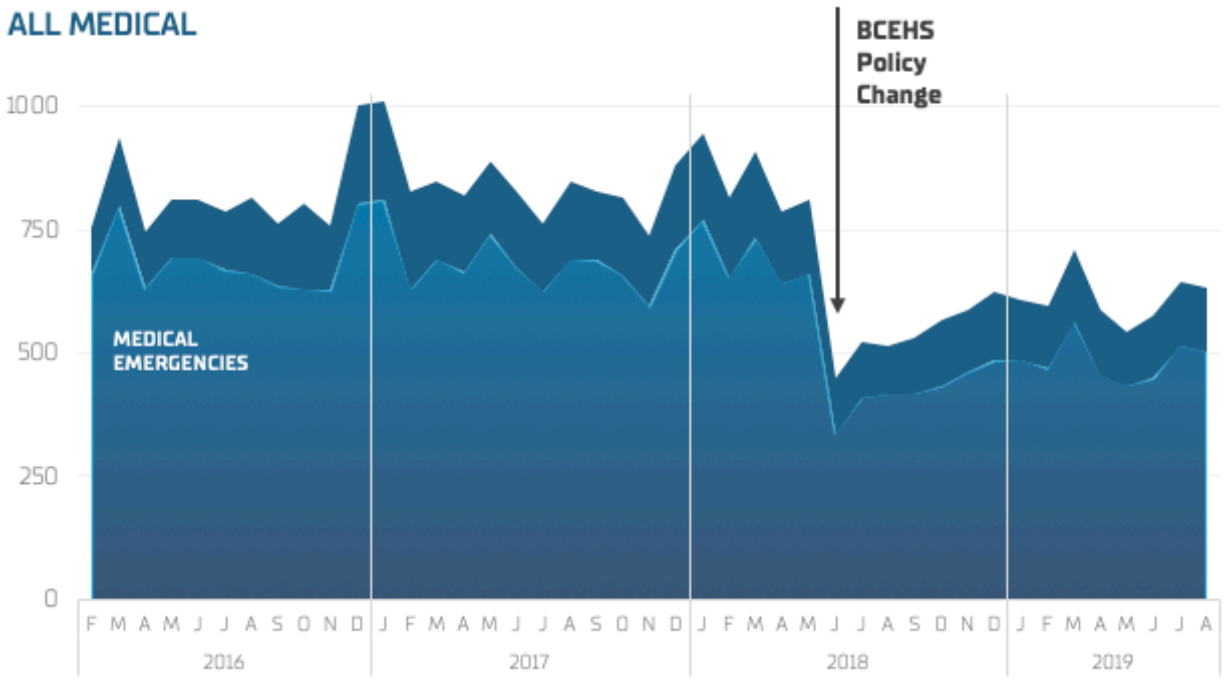
### NUMBER OF INCIDENTS BY WEEKDAY & HOUR

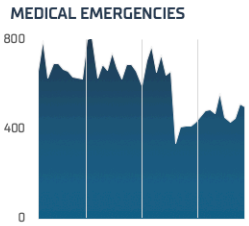



No major story here, typical pattern. Busy during the days, quieter at night.

6pm is busy throughout the week. What is happening on Sunday nights?

## Medical Incidents



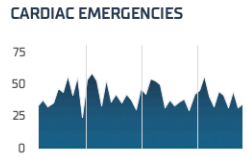



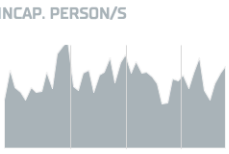

Emergency Incidents

Non-emergency Incidents

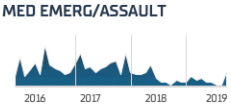
Majority of medical calls are documented as "medical emergencies"

Medical categories need to be better defined for greater clarity in analysis.



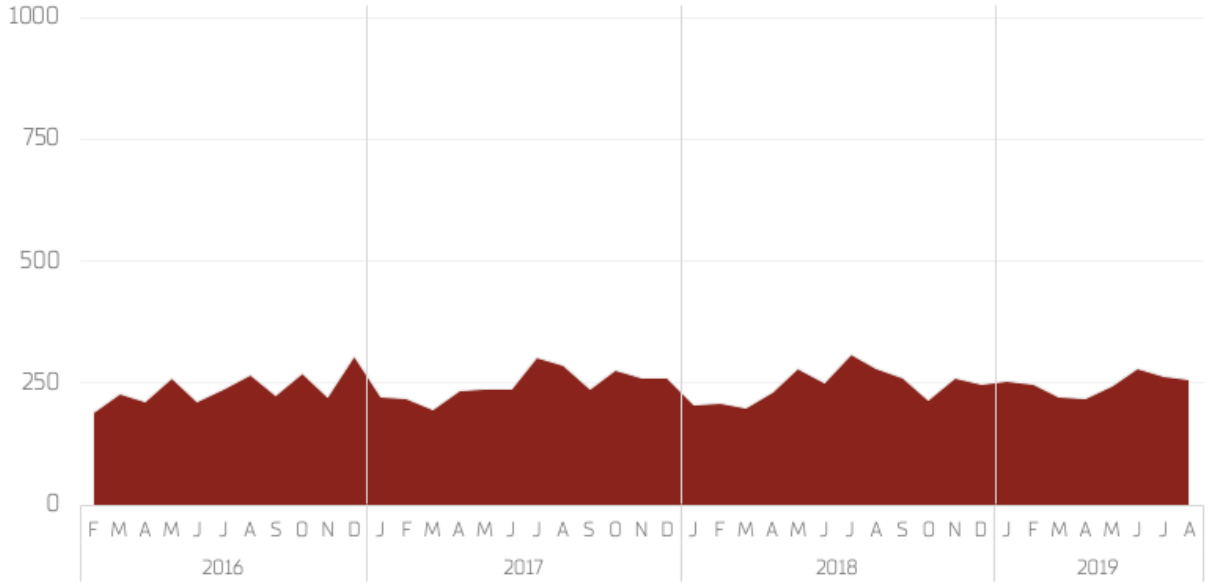




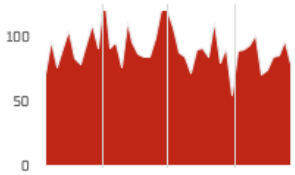



## Fire Incidents

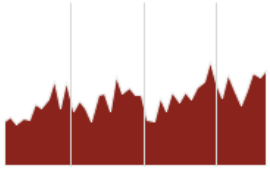
### ALL FIRE



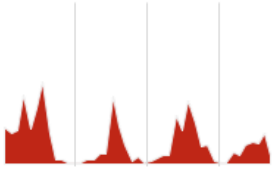

### ACCIDENTAL



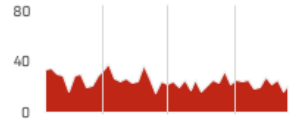

### FALSE ALARM



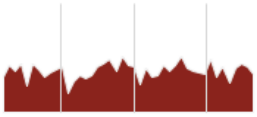
### BUSH AND GRASS



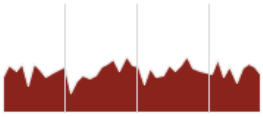
### BUILDING FIRE



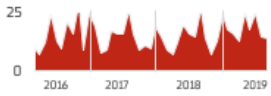

### ALARM/UNKNOWN



### NEEDLESS ALARM



### FIRE MISCELLANEOUS

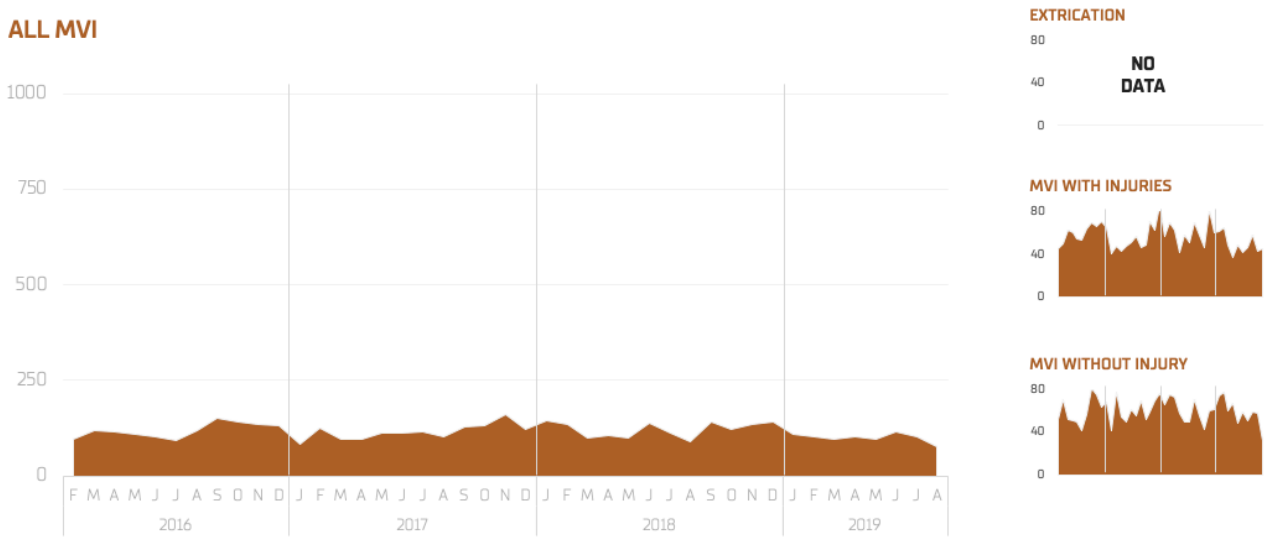



### RUBBISH

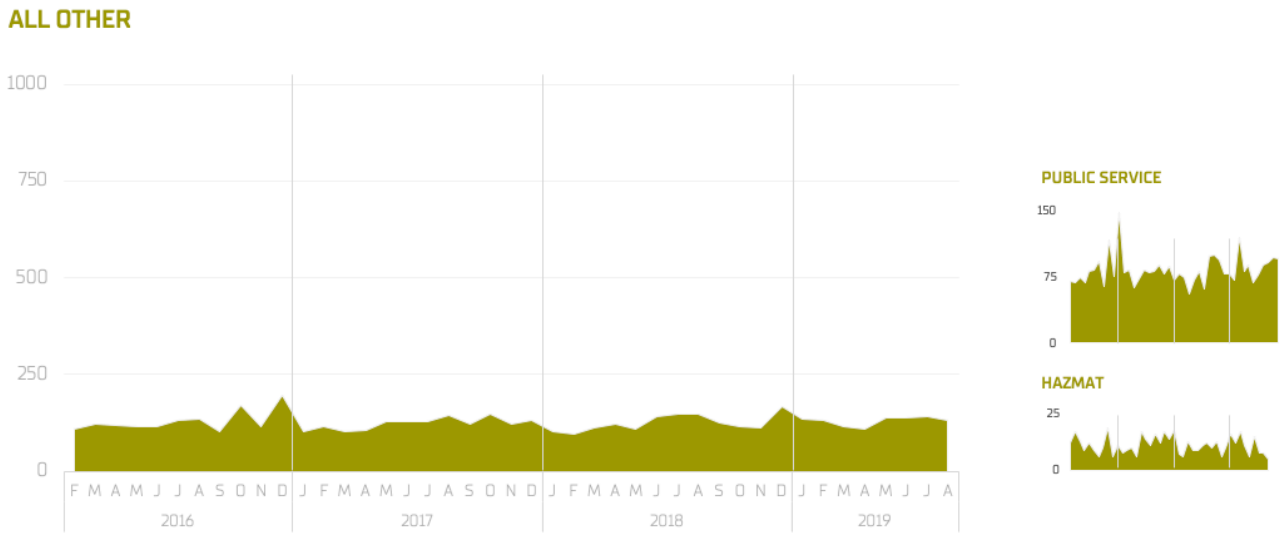

### VEHICLE


### CHIMNEY

## Motor Vehicle Incidents




## All Other Incidents



## Medical Responses

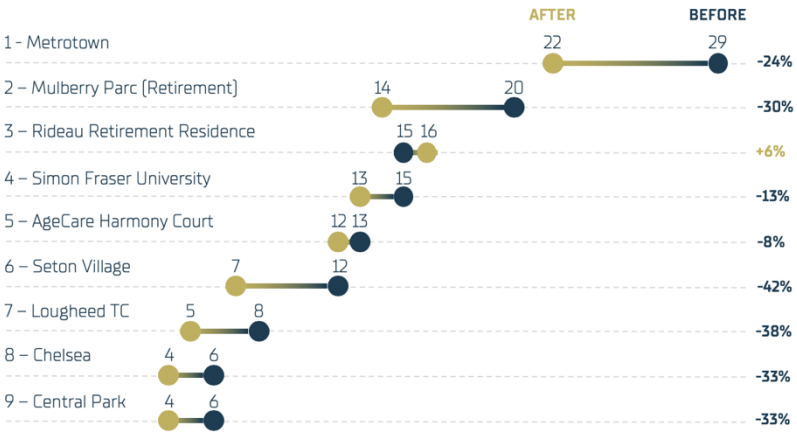
Medical responses have declined since June 2018 due to the BCEHS policy change. This is policy is funded for 3-years (ending May 2021) and has allowed BFD to respond less frequently to low acuity medical incidents. It is unknown at this time if it will continue or revert to pre-June 2018 response demand.

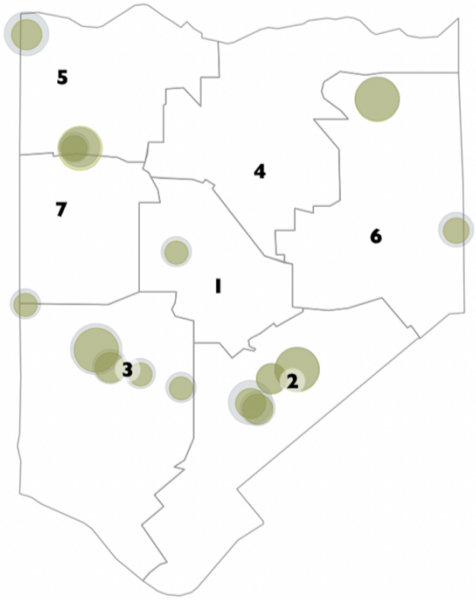
Call Demand, Feb 2016- Aug 2019

### High Demand Locations

**BEFORE & AFTER BCEHS POLICY CHANGE**

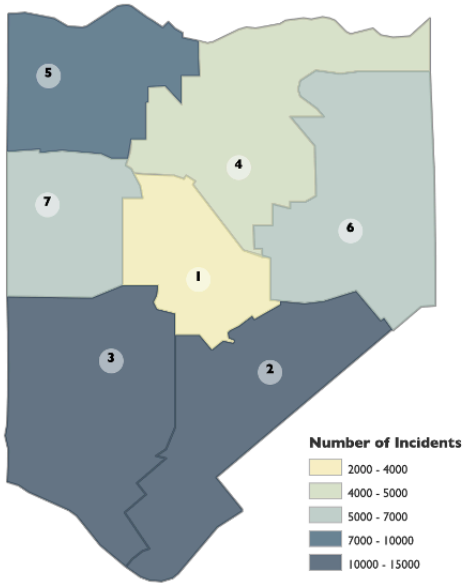
AVERAGE CALLS PER MONTH



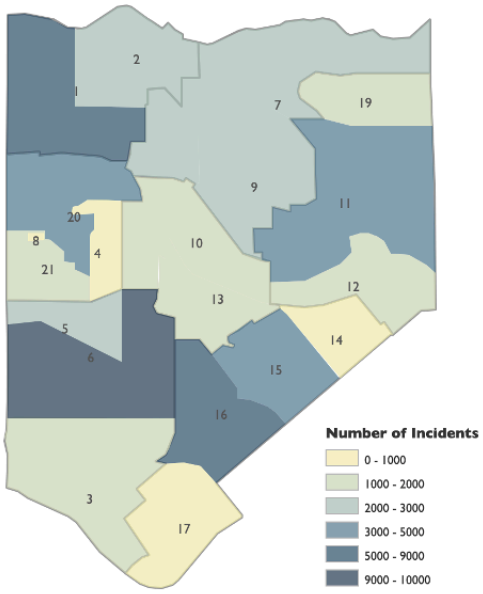



## All Incidents - Spatial Analysis Feb 2016- Aug 2019

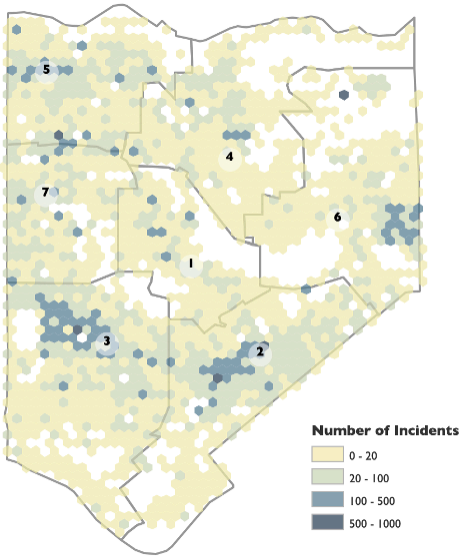
### By Response Zone




### By Emergency Service Zone (ESZ)

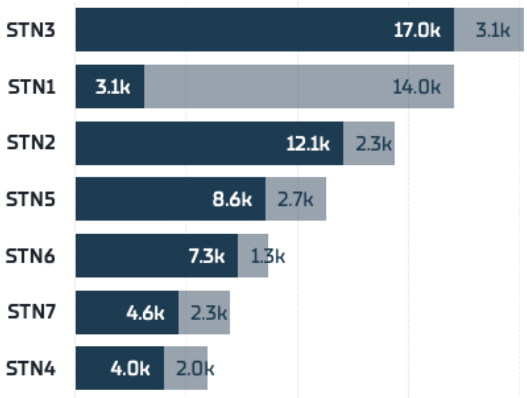



### By Hex



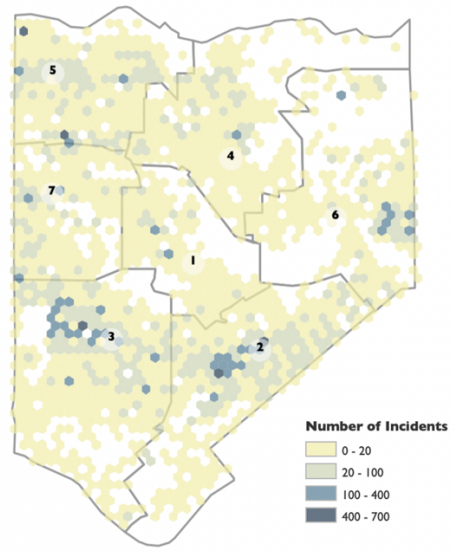

### All Incidents

by all responders, IN & *OUT OF ZONE* responses

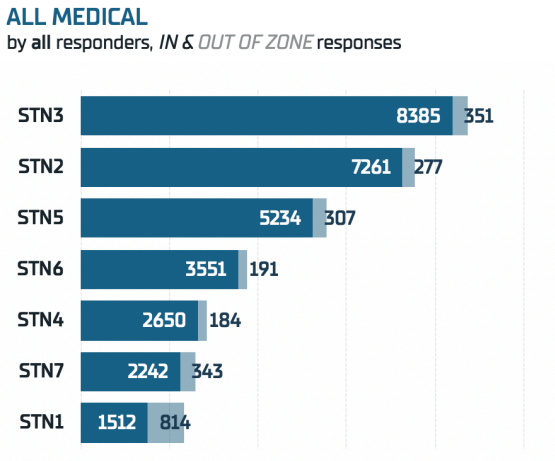


## Medical Incidents

### By Hex

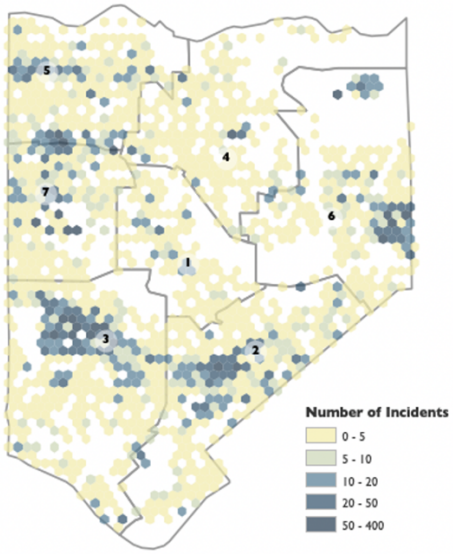



### By all responses

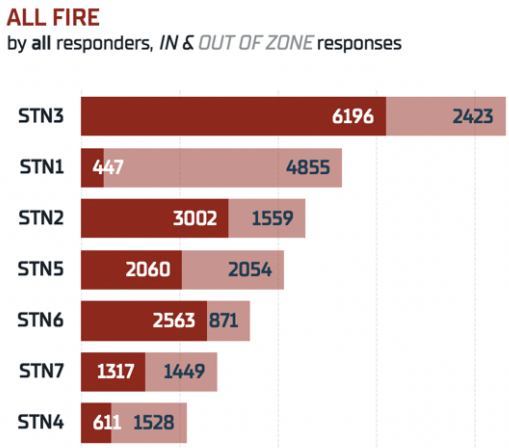



## Fire Incidents

### By Hex

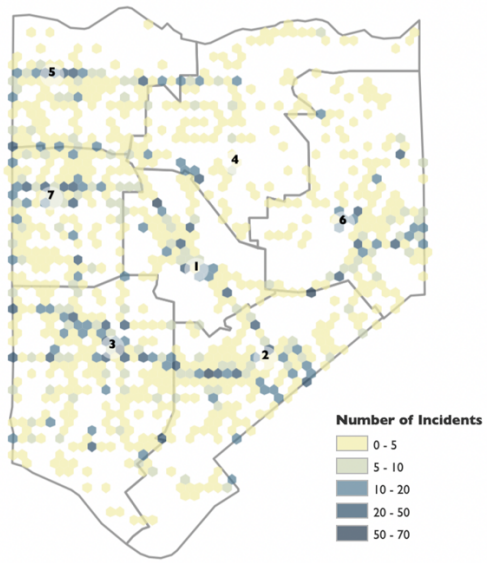



### By all responses

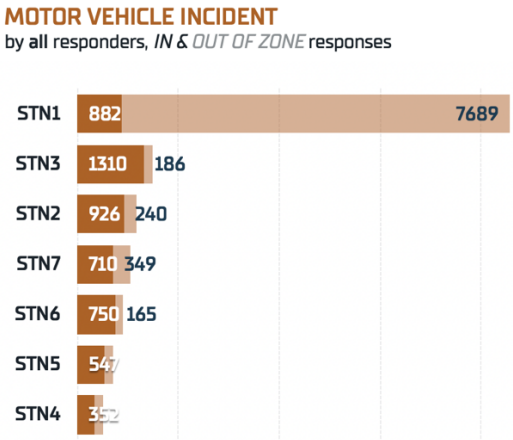


## Motor Vehicle Incidents

### By Hex

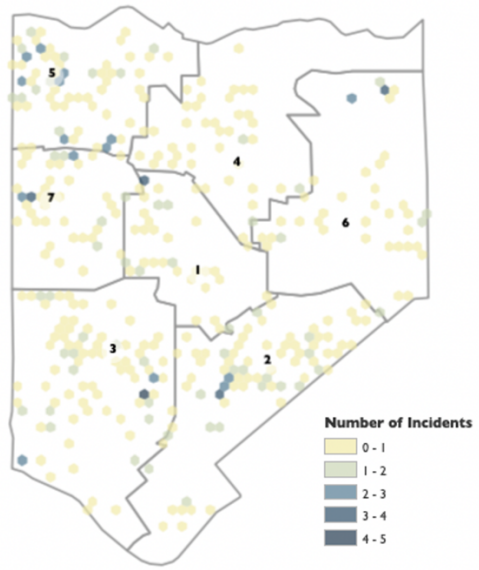



### By all responses

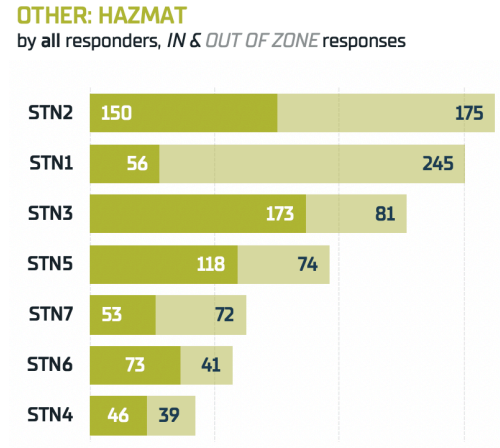



## HAZMAT Incidents

### By Hex




### By all responses



# Community Risk

Using land-use zones as a proxy for area risk

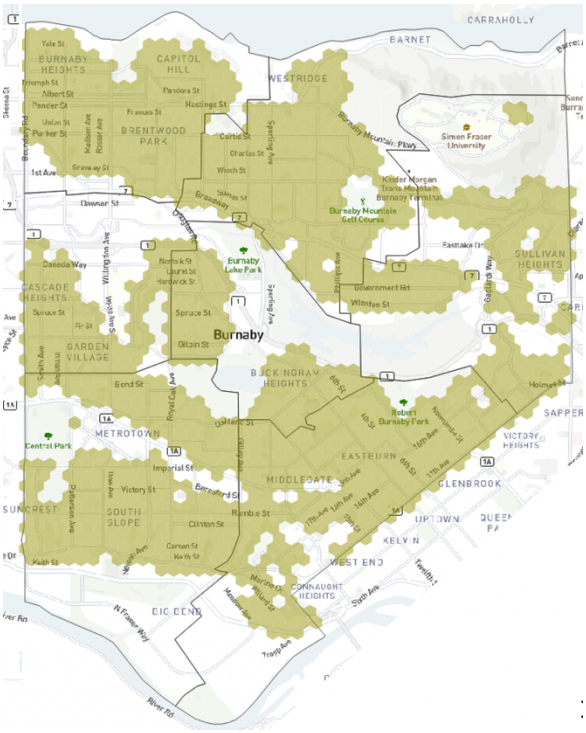
**GMA** (Generalized land use – Metro Van 2011)

**OCP** (Official community plan – Burnaby)

**CPA** (Community Plan boundaries and land use)

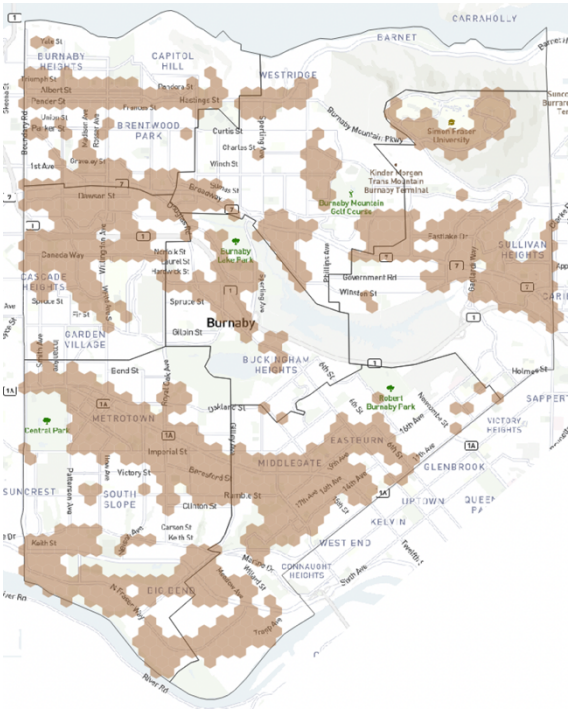
## Low Risk Profile

| Land Use Type | Source |
|---|---|
| Residential - Single Detached & Duplex | GMA |
| Semi-rural – Single Family | OCP |
| Low Density Multiple Family Residential | CPA |
| Recreational Vehicle Park | CPA |
| Single Family Suburban | OCP |
| Single / Two Family Urban | OCP |
| Residential - Townhouse | GMA |
| Single and Two Family Residential | CPA |
| Low/Medium Density Mixed Use | CPA |



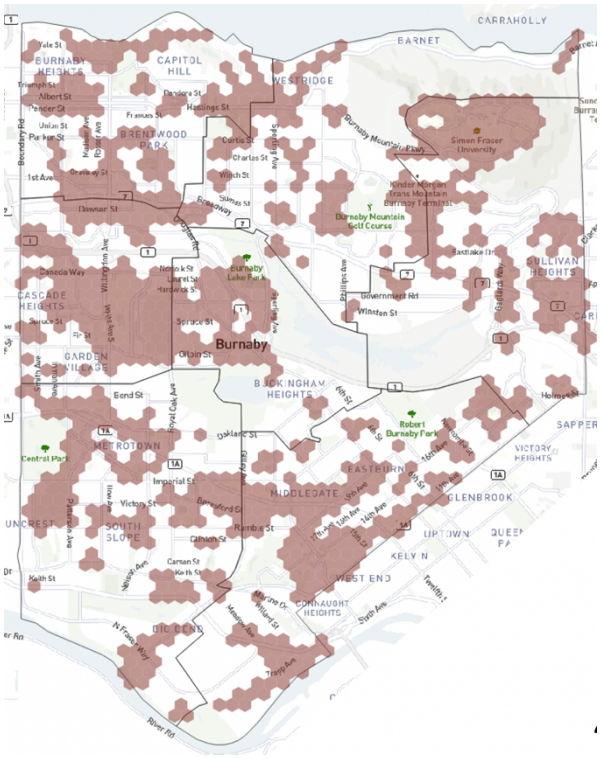

## Moderate Risk Profile

| Land Use Type | Source |
|---|---|
| Big Bend Business Centre | CPA |
| Commercial | CPA |
| Residential - Low-rise Apartment | GMV |
| Medium Density Mixed Use | CPA |
| Residential - Commercial/Mixed | GMV |
| Business Centre Districts | CPA |
| Community Institutional | CPA |
| Medium Density Multiple Family Residential | CPA |
| Commercial | GMV |



# High Risk Profile

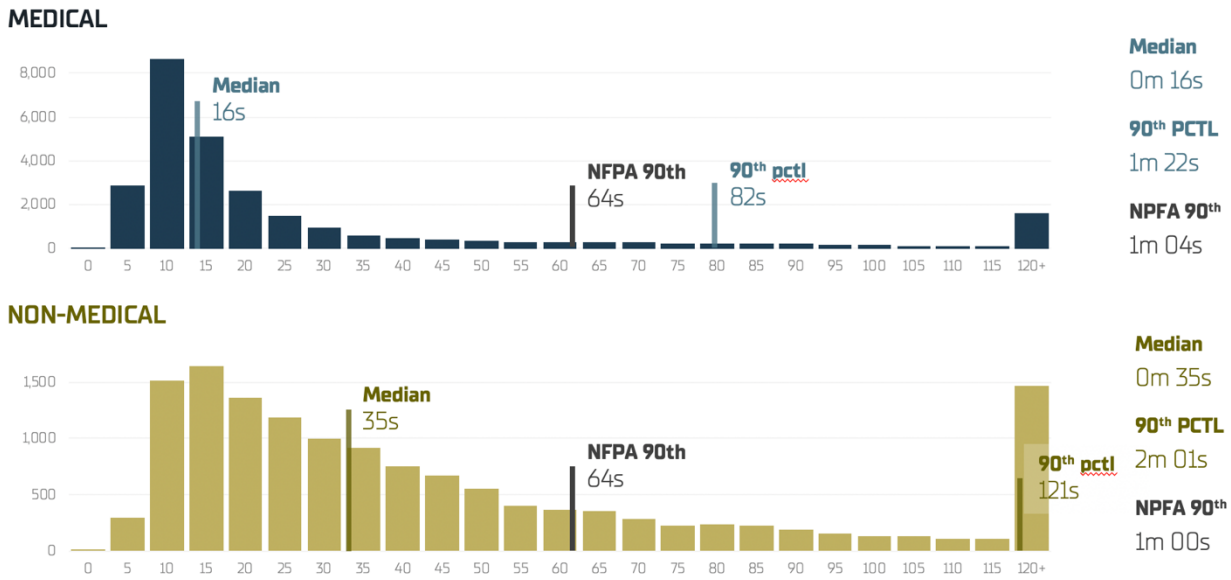
| Land Use Type | Source |
|---|---|
| Industrial | CPA |
| Residential - Institutional Housing | GMV |
| Institutional | CPA |
| Institutional | GMV |
| Institutional | OCP |
| High Density Multiple Family Residential - Brentwood Succession | CPA |
| High Density Multiple Family Residential | CPA |
| School | OCP |
| Petro Chemical | OCP |



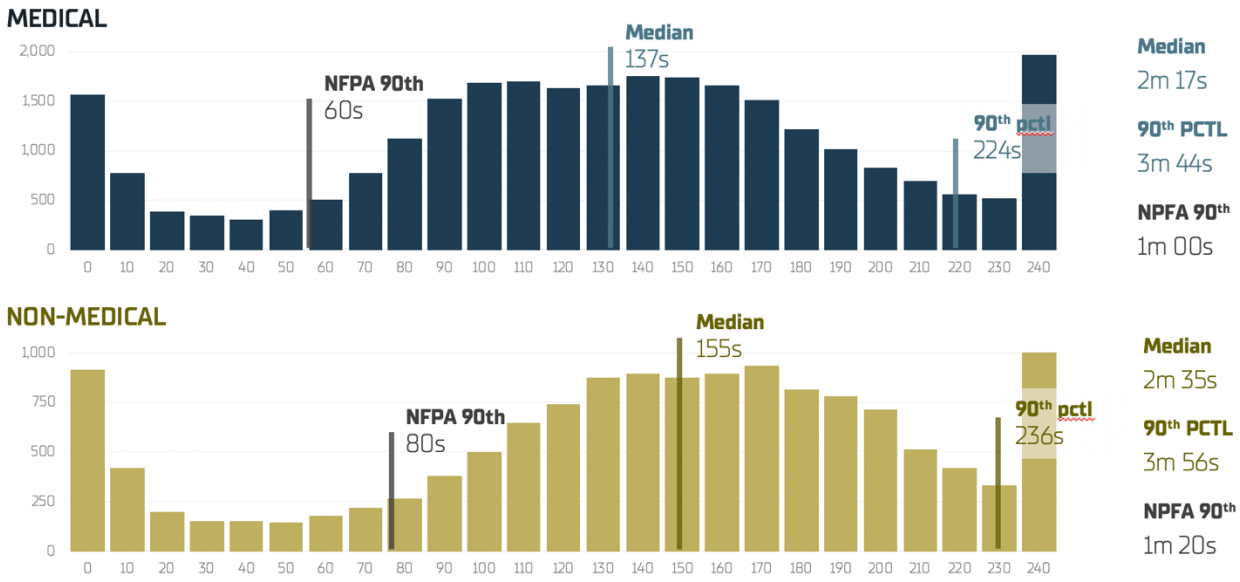
Feb 2016- Aug 2019

# Time Intervals

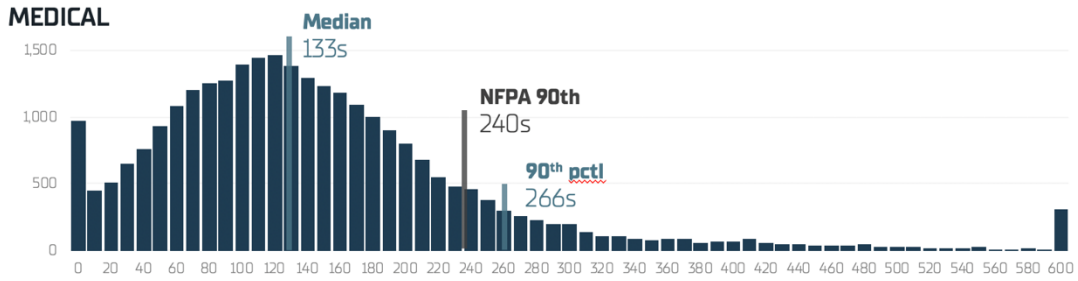
## Alarm Handling




## Turnout



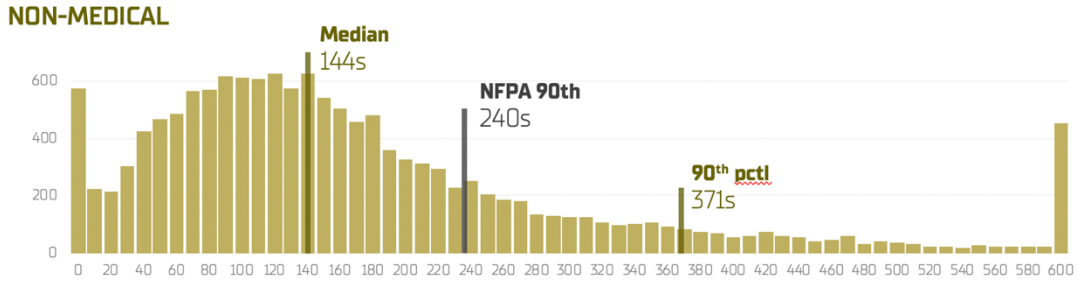
## Travel




**Median**
2m 13s

**90th PCTL**
4m 26s

**NPFA 90th**
4m 00s

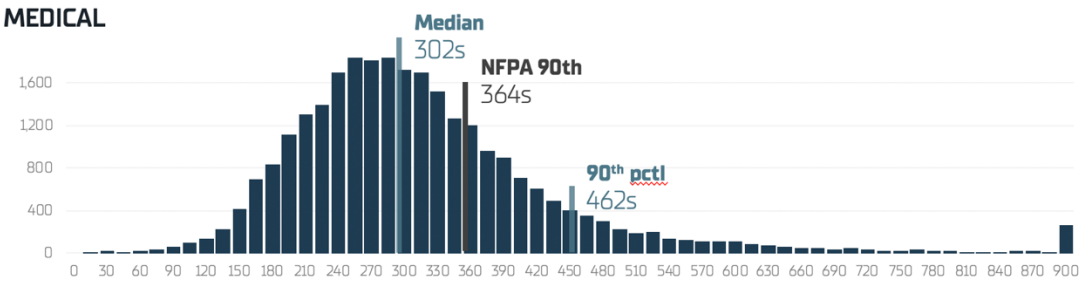



**Median**
2m 24s

**90th PCTL**
6m 11s

**NPFA 90th**
4m 00s

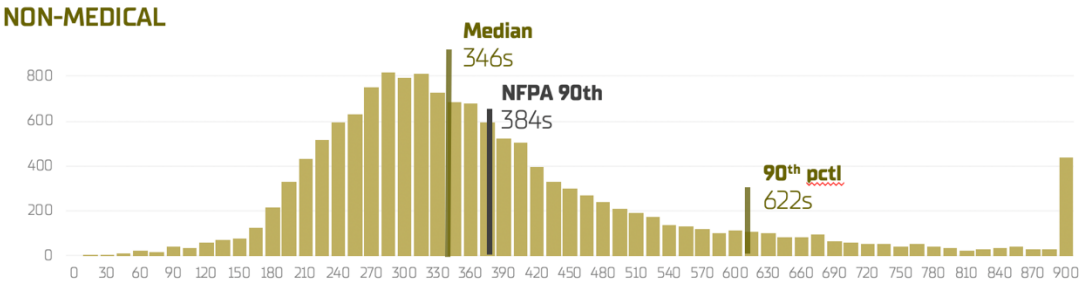
## Total Response Time




**Median**
5m 02s

**90th PCTL**
7m 42s

**NPFA 90th**
6m 04s

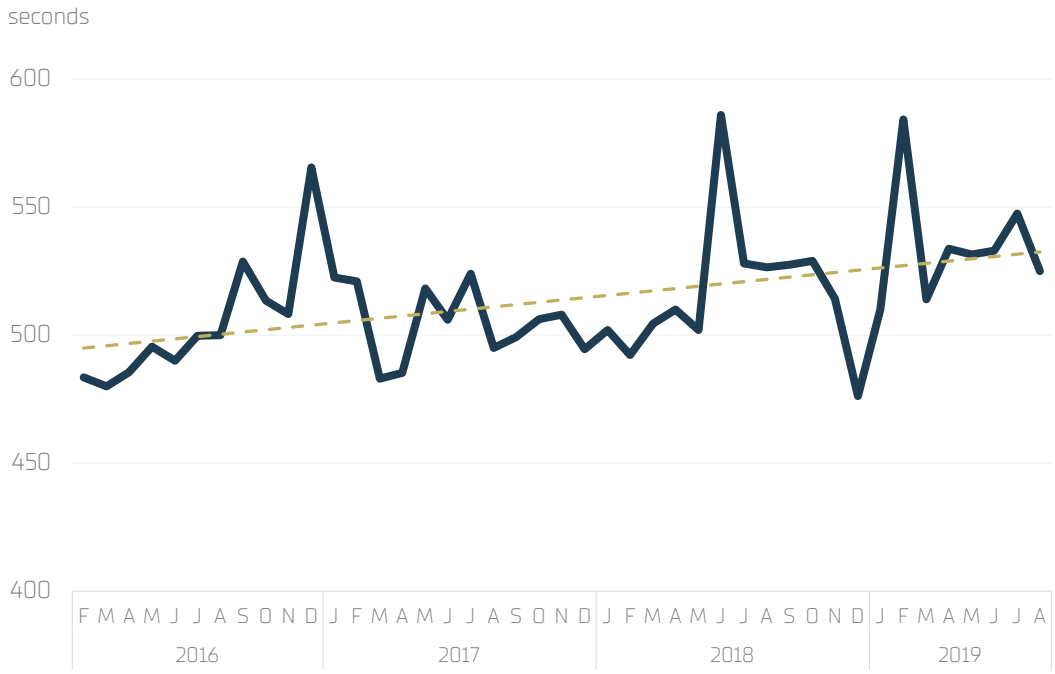



**Median**
5m 46s

**90th PCTL**
10m 22s

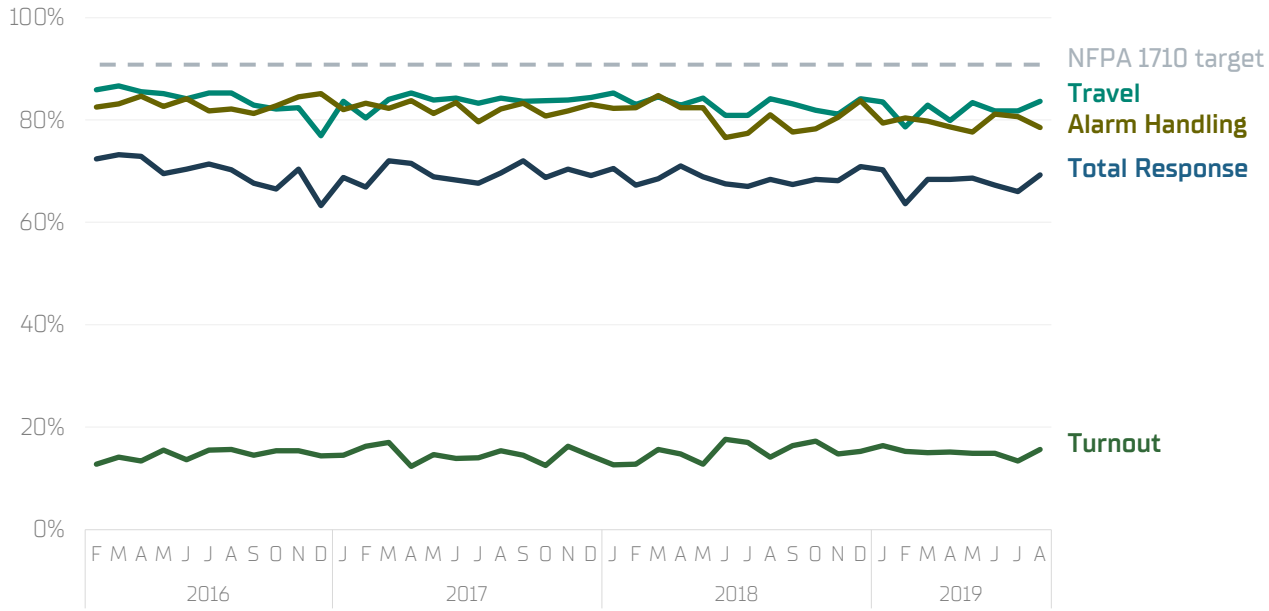
**NPFA 90th**
6m 24s

## First Due Response Time Intervals - Total Response Time



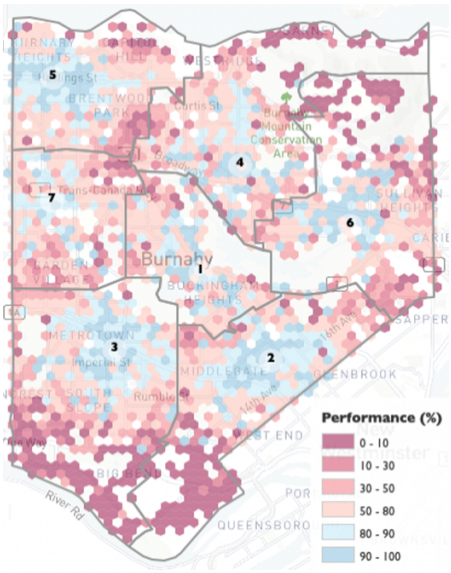

Total response times are increasing, despite the decrease in medical calls.

## First Due Response Time Intervals – Target Attainment

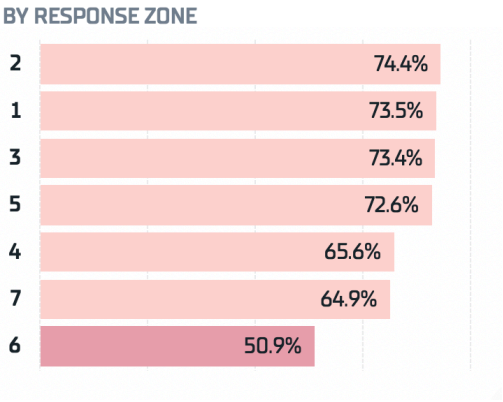


## First Due Response Time Intervals – Target Attainment

### By Hex

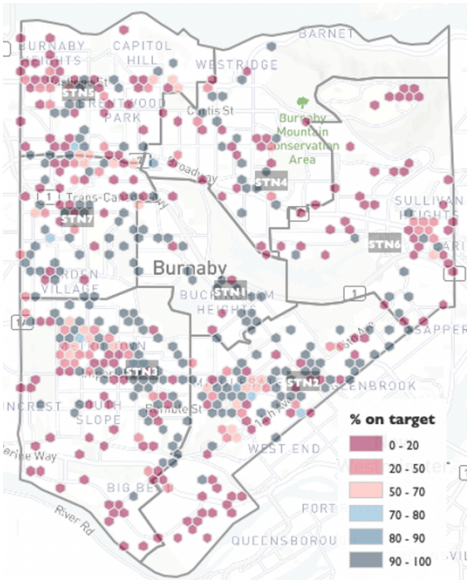



### By first responder

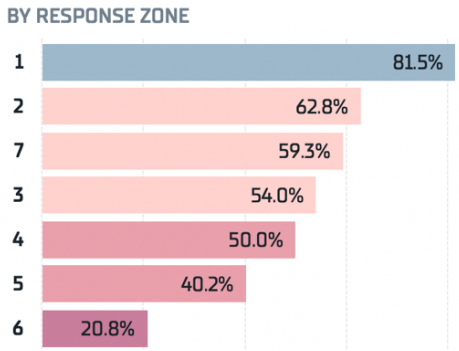



## ERF Response Time Intervals – Target Attainment

### By Hex




### By first responder

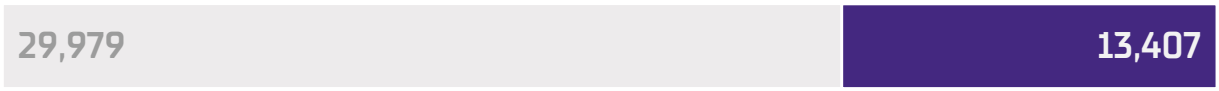


Feb 2016- Aug 2019

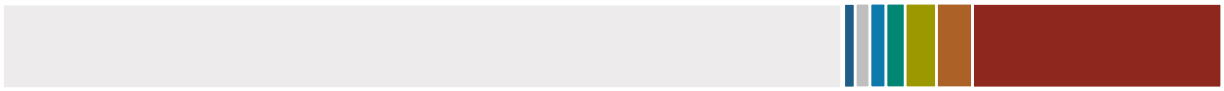
# First Due Diagnostics

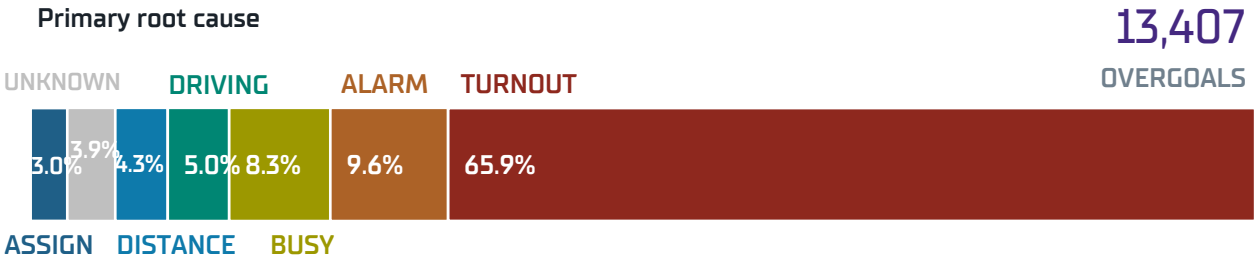
Examining responses to incidents that are over the targeted time can give us clarity into where there might be response challenges and opportunities to improve.


Darkhorse defines responses over the targeted 90th percentile time as overgoals




In diagnosing overgoals, Darkhorse assigns the cause that is primarily responsible for the response being over the target

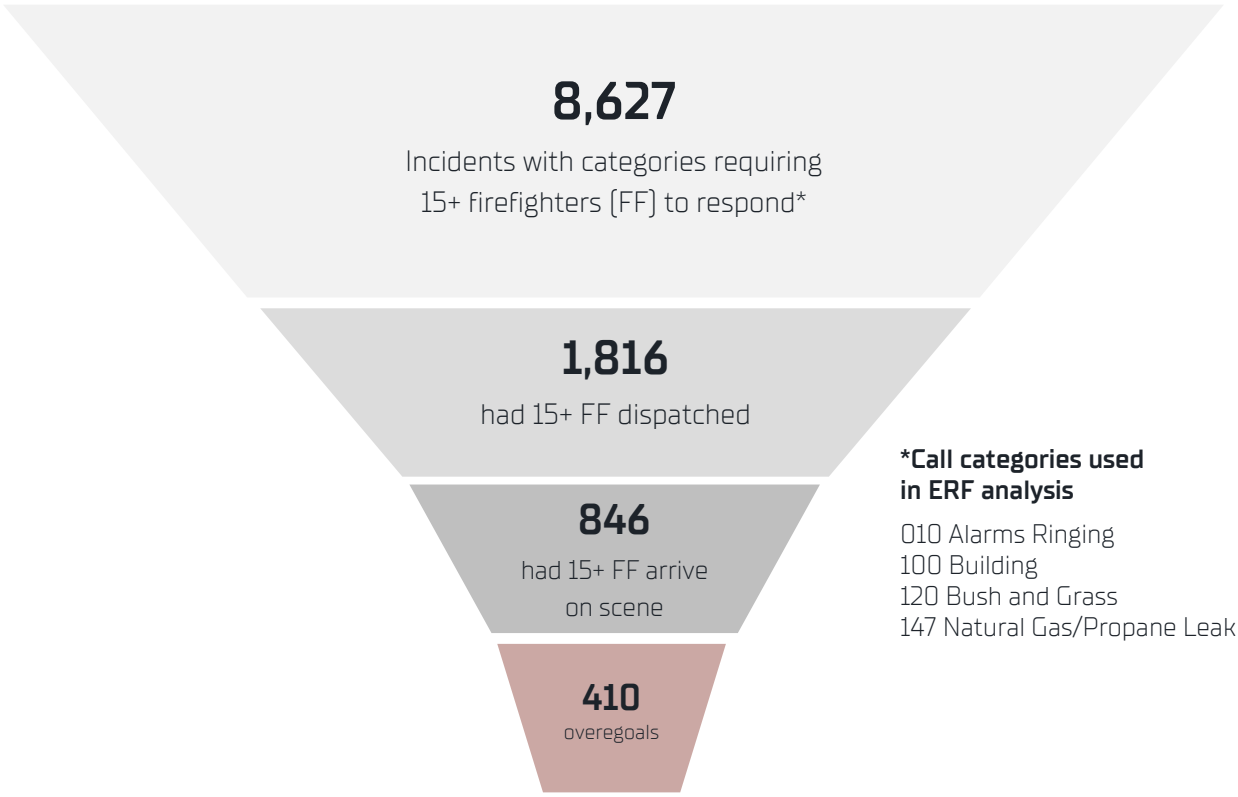




Feb 2016- Aug 2019

# ERF Diagnostics

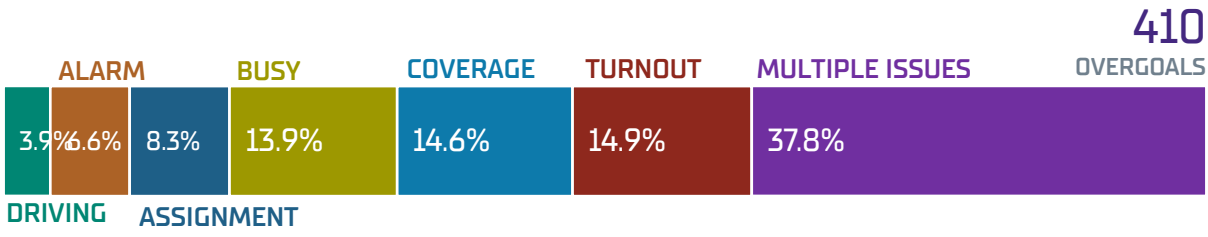
First we qualify calls that would meet the ERF criteria



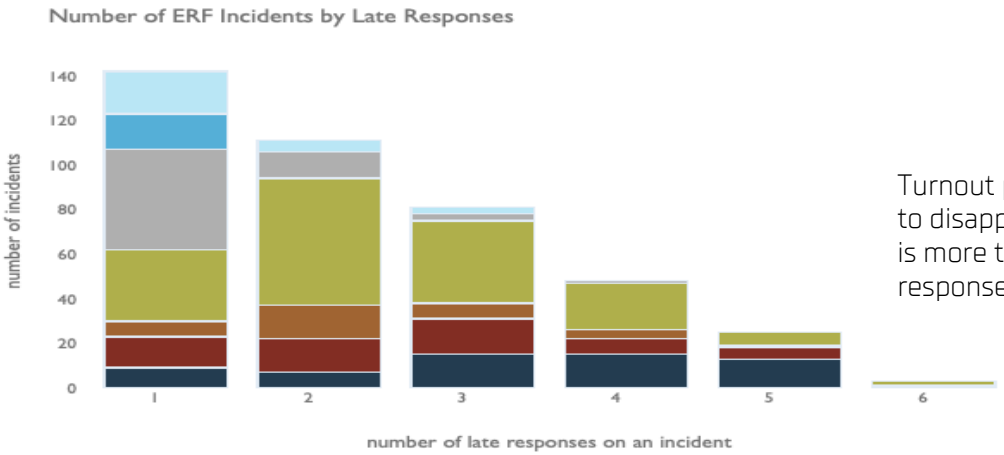

***Call categories used in ERF analysis**

010 Alarms Ringing
100 Building
120 Bush and Grass
147 Natural Gas/Propane Leak

In diagnosing ERF event overgoals, we assign a new root cause called coverage and there are many more multiple issue overgoals.

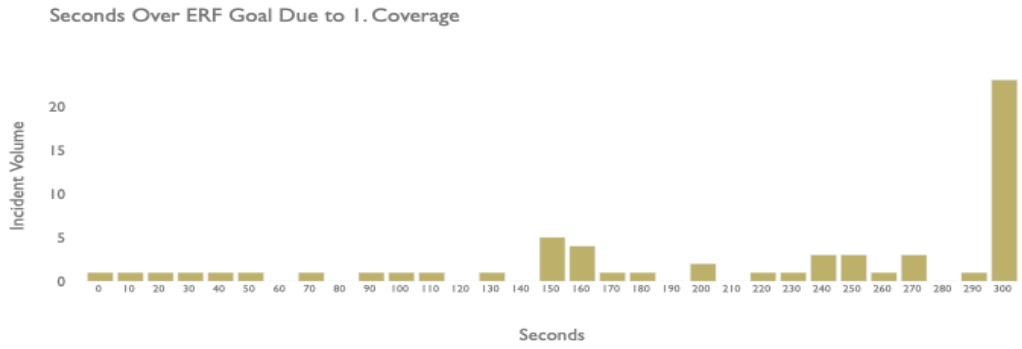


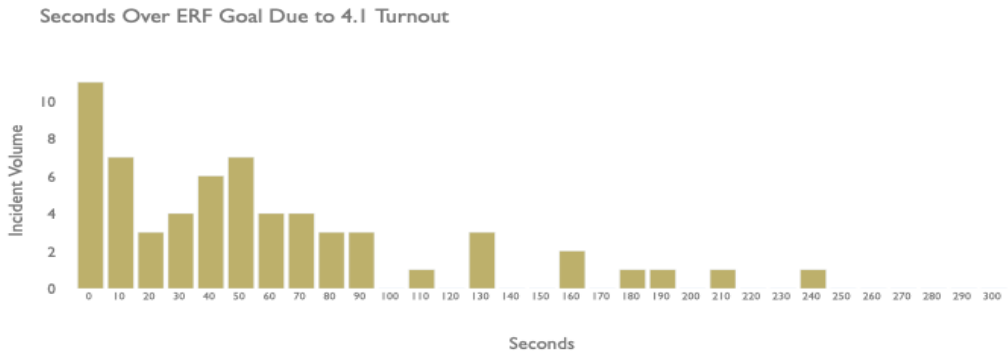
## ERF Late Responses with Overgoal type




Turnout problems start to disappear when there is more than one late response.

## ERF Coverage Issues are concerning



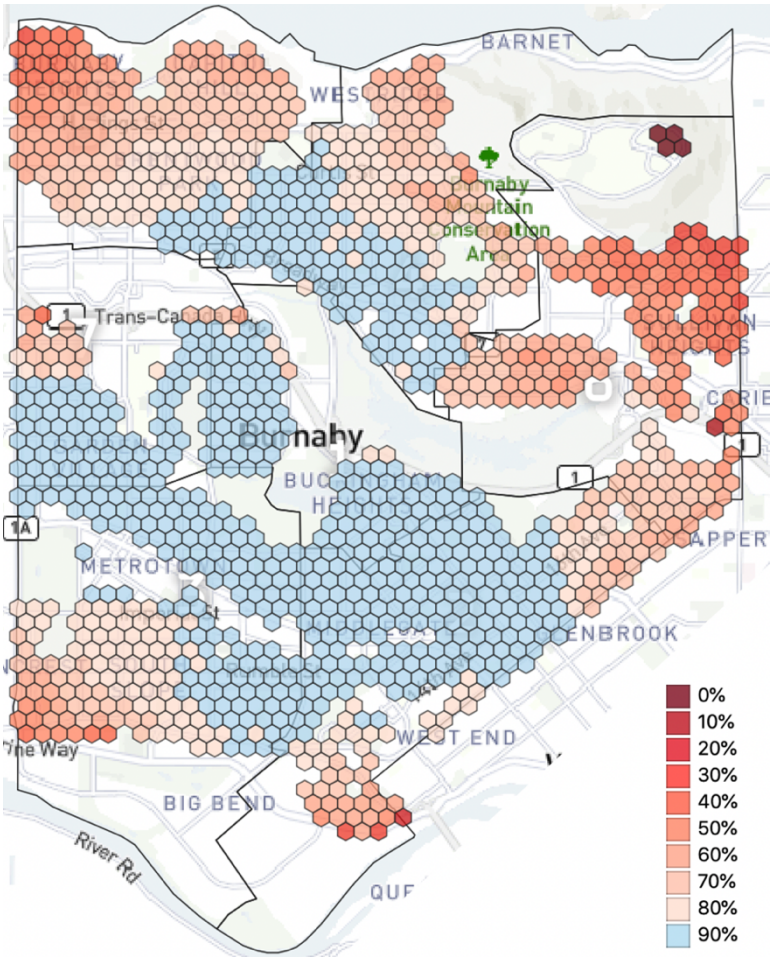



## ERF Coverage Challenges

### Probability of Arrival to **Low Risk** Land Use Zones

Expected response for
**15 FF** in **10:24**

| Land Use Type | Source |
|---|---|
| Residential - Single Detached & Duplex | GMA |
| Semi-rural – Single Family | OCP |
| Low Density Multiple Family Residential | CPA |
| Recreational Vehicle Park | CPA |
| Single Family Suburban | OCP |
| Single / Two Family Urban | OCP |
| Residential - Townhouse | GMA |
| Single and Two Family Residential | CPA |
| Low/Medium Density Mixed Use | CPA |

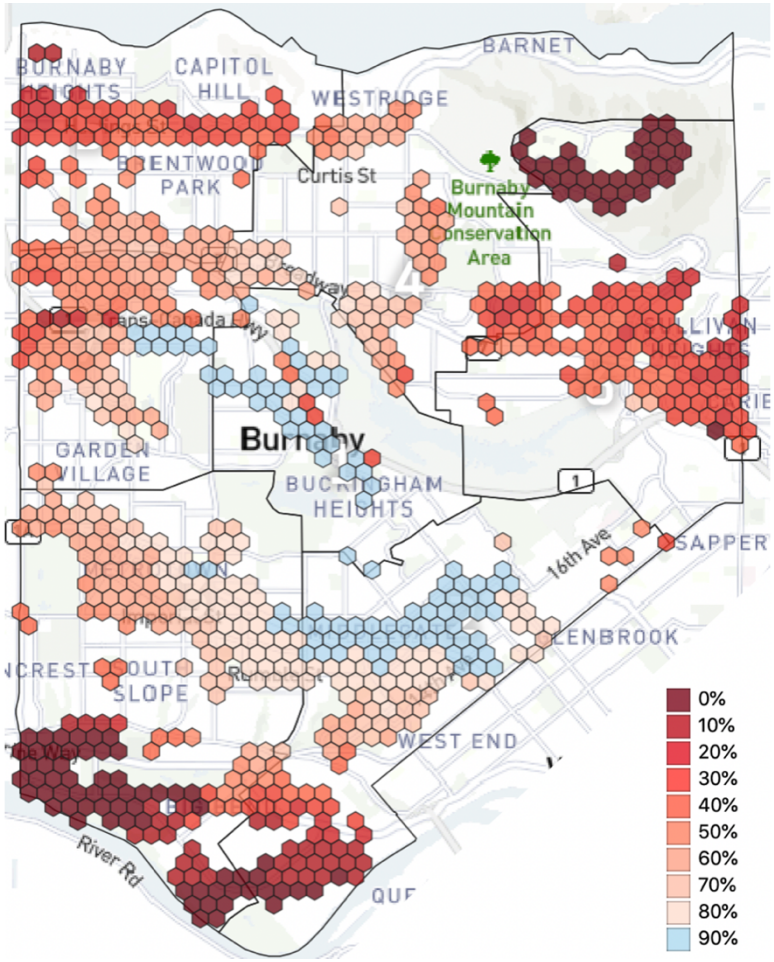


## ERF Coverage Challenges

### Probability of Arrival to **Moderate Risk** Land Use Zones

Expected response for
**26 FF** in **10:24**

| Land Use Type | Source |
|---|---|
| Big Bend Business Centre | CPA |
| Commercial | CPA |
| Residential - Low-rise Apartment | GMV |
| Medium Density Mixed Use | CPA |
| Residential - Commercial/Mixed | GMV |
| Business Centre Districts | CPA |
| Community Institutional | CPA |
| Medium Density Multiple Family Residential | CPA |
| Commercial | GMV |

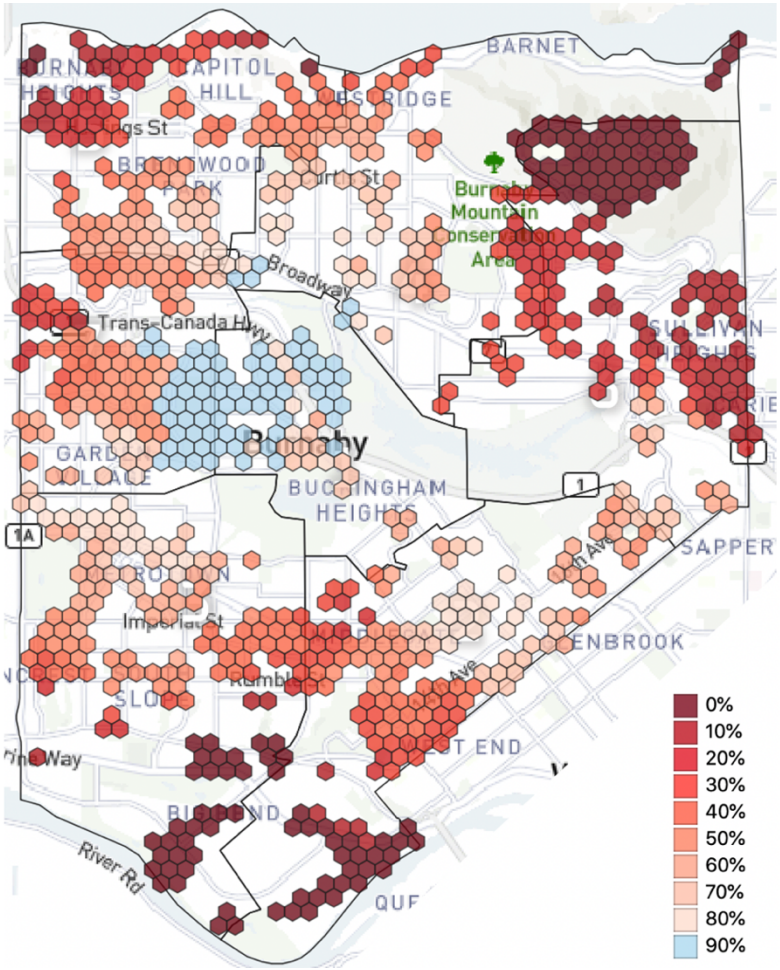


## ERF Coverage Challenges

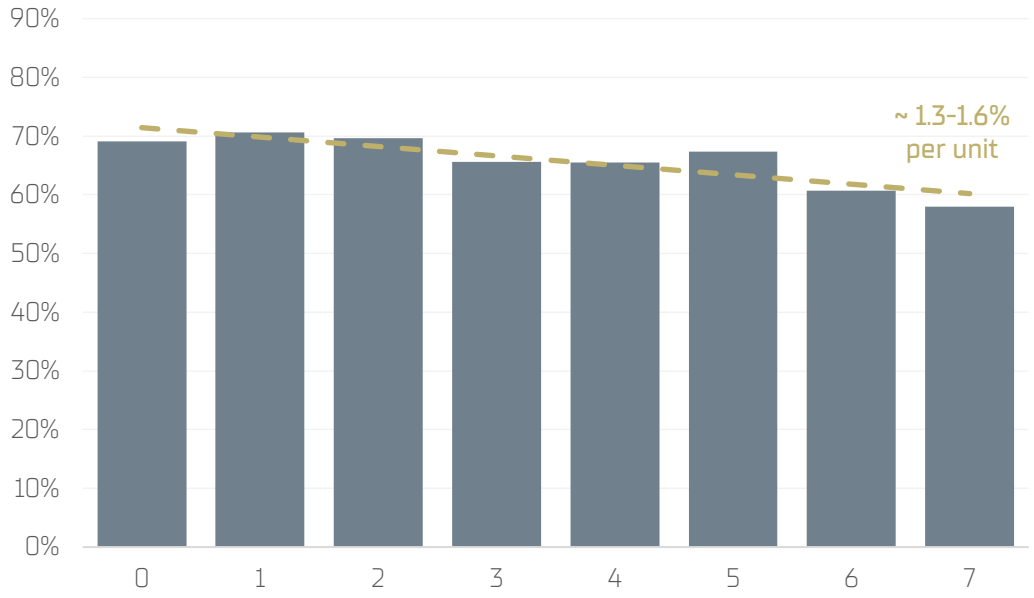
### Probability of Arrival to **High Risk** Land Use Zones

Expected response for
**39 FF** in **12:34**

| Land Use Type | Source |
|---|---|
| Industrial | CPA |
| Residential - Institutional Housing | GMV |
| Institutional | CPA |
| Institutional | GMV |
| Institutional | OCP |
| High Density Multiple Family Residential - Brentwood Succession | CPA |
| High Density Multiple Family Residential | CPA |
| School | OCP |
| Petro Chemical | OCP |



## First Due Target Met *vs* Number of Units Busy




This provides an estimate of the benefit of one additional apparatus.

Phase 2

# Benchmarking & Best Practice Assessment

## Benchmarking

### Why Benchmark?

Identification of opportunities for change to improve efficiency or effectiveness of the service.

Helps tell the communities "performance story"

Provides information for leadership to address questions from Council, staff, and the community on service efficiency and effectiveness

Encouragement of continuous improvement initiatives and a better understanding of the drivers that impact performance results

Formation of objective evidence that shows the differentiation between cities

Sets the stage for sharing knowledge and best practices among peer services

Understand the trends and challenges within each municipality

Awareness of the value of collaboration between municipalities.

### Caveats

Every department has its nuances and intricacies that cannot be captured in this style of analysis.

Careful consideration of each metric is advised before making decisions.

This report is to be digested with the other phases of the Needs Assessment Study.

# Cohort

| SERVICE | POPULATION | AREA (km2) | DENSITY (pop/km2) | MAX ELEVATION (m) | UNIQUE FEATURES |
|---|---|---|---|---|---|
| **Burnaby** | 233,000 | 99 | 2,353 | 370 | Burnaby Mountain, TMEP & hydrocarbon facility, increasing vertical growth |
| **Richmond** | 227,000 | 130 | 1,746 | 12 | 130, 194 jobs within the City, 25 million visitors move through the airport each year. 4,768 hotel rooms |
| **Surrey** | 518,000 | 316 | 1,639 | 134 | Large metro city with everything from high-rises and heavy industry through rural farmland. |
| **Vancouver** | 715,000 incl. university | 133 | 5,375 | 152 | High population density, downtown eastside challenges, vertical growth challenges |
| **Edmonton** | 932,546 | 767 | 1,332 | 645 | Terrain in and around Edmonton is generally flat to gently rolling, with ravines and deep river valleys. Large wildland interface along the river valley. |
| **Toronto** | 2,731,571 | 631 | 4,334 | 77 | Most populous city in Canada. Advanced community risk reduction processes |

| SERVICE | OPERATING BUDGET | STATIONS | FTE STAFF | STAFFED APPARATUS | TYPE OF SERVICE | MUTUAL AID AGREEMENTS |
|---|---|---|---|---|---|---|
| **Burnaby** | $42,927,883 | 7 | 286 | 15 | Career / Urban | Yes |
| **Richmond** | $35,473,300 | 7 | 227 | 10 | Career / Urban | Yes |
| **Surrey** | $64,669,000 | 15 | 425 | 21 | Career / Urban POC / Rural | Yes |
| **Vancouver** | $130,959,000 | 20 | 821 | 39 | Career / Urban | Yes |
| **Edmonton** | $206,200,000 | 30 | 1264 | 63 | Career / Urban | Yes |
| **Toronto** | $439,630,000 | 83 | 3214 | 129 | Career / Urban | Yes |

## Findings

Along with Vancouver and Surrey, Burnaby's incidents per 1,000 citizens are high for its population.

Burnaby, Surrey, and Vancouver all have a high avg. incident's per firehall.

Burnaby's operating budget is within an acceptable range compared to the cohort.

Burnaby's non-operational staff is comparatively low due to Administration* and Prevention resources

Administration staff below cohort

Training and Mechanical staffing are on par with the cohort.

Prevention staff below cohort (<3%).

Data collection for key performance indicators needs improvement in smaller departments

CPSE Accreditation is becoming increasingly valued by departments and municipal governments.

Departments have begun to invest in Community Risk Reduction (CRR)

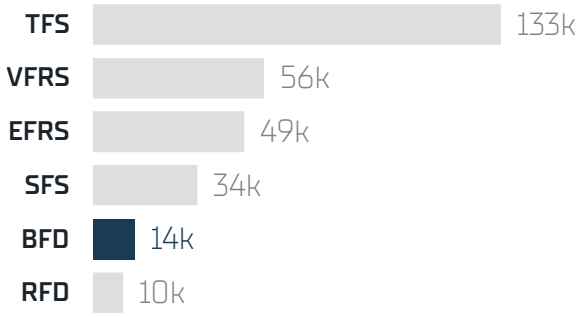
TFS has invested heavily into CRR in recent years.

Administration staff includes:

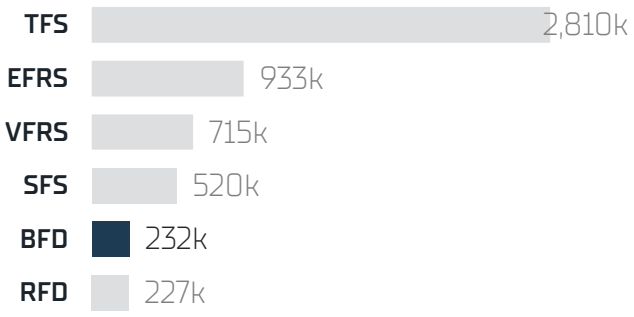
- Command
- Administrative
- Management
- Organizational Performance

## Comparisons

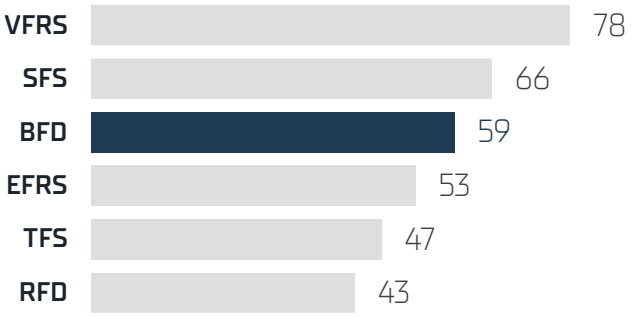
### 2018 INCIDENTS



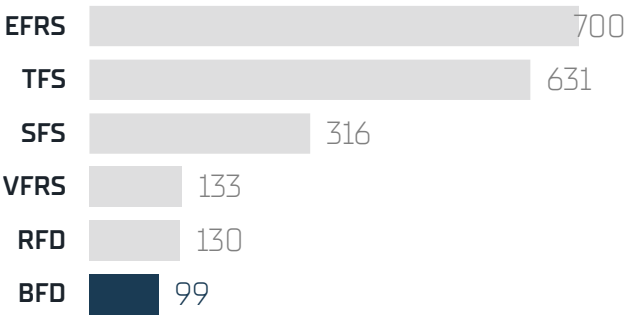

### POPULATION



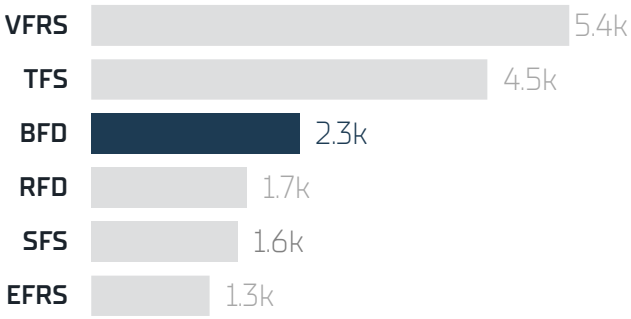

### INCIDENTS PER 1,000 CITIZENS



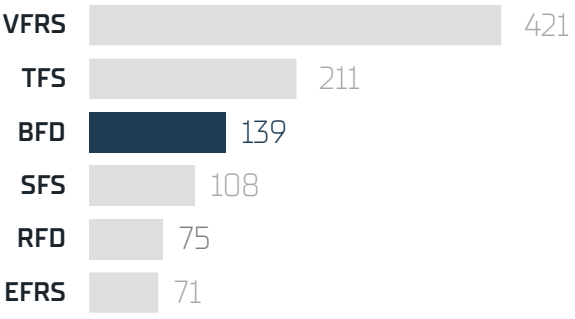

### AREA SERVED (KM²)




### POPULATION DENSITY (POP/KM²)

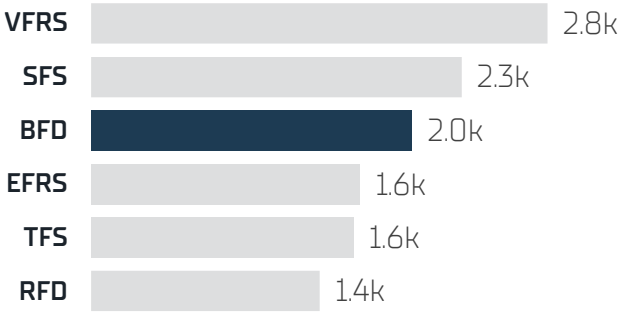



### INCIDENTS PER KM²

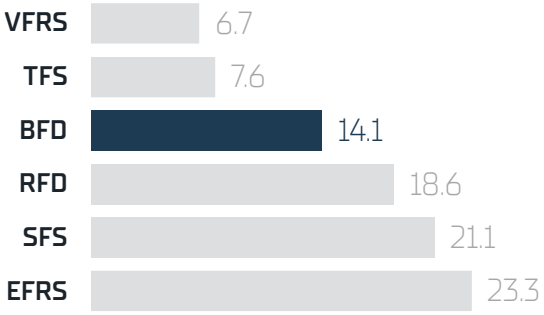


## Comparisons

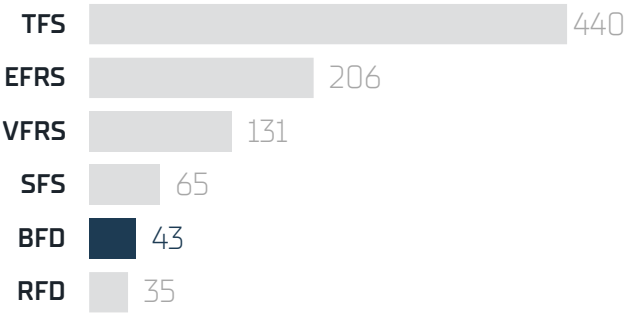
### AVG. INCIDENTS PER FIREHALL



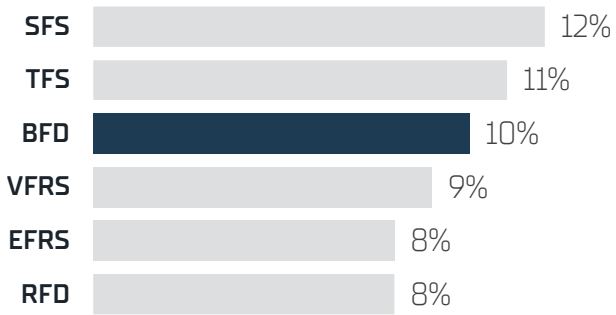

### KM² PER FIREHALL



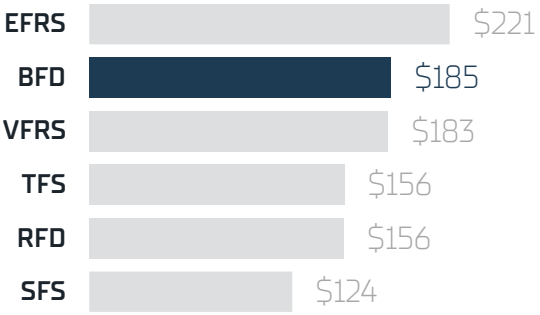

### 2018 OPERATING BUDGET (M)



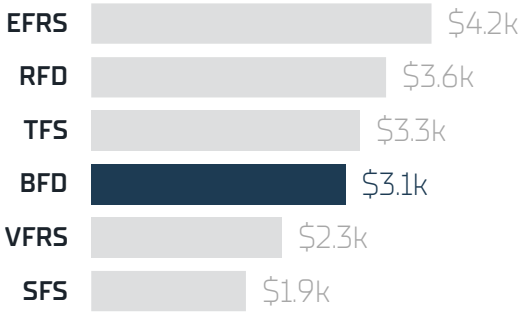

### AS A % OF CITY BUDGET




### COST PER CITIZEN

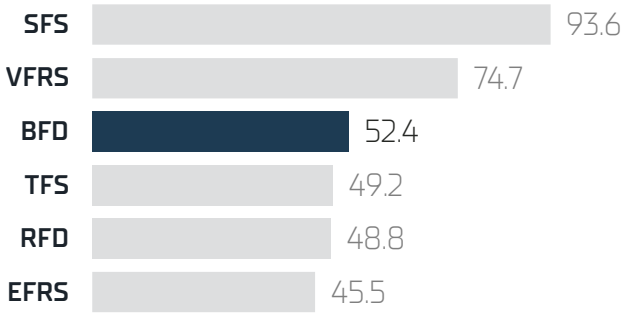



### COST PER INCIDENT

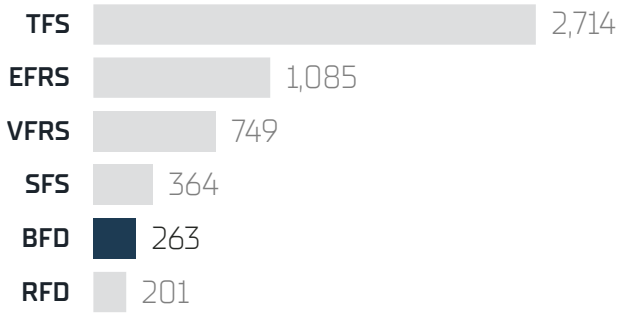


# Staffing Comparisons

### INCIDENTS PER OPS STAFF

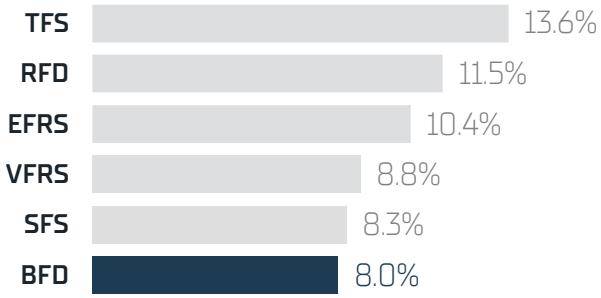



### OPERATIONAL STAFF (FF)




*Surrey has 23 POC staff, which are not included.
*Surrey has 14 FTE and 14 PT Dispatch personnel, which are not included

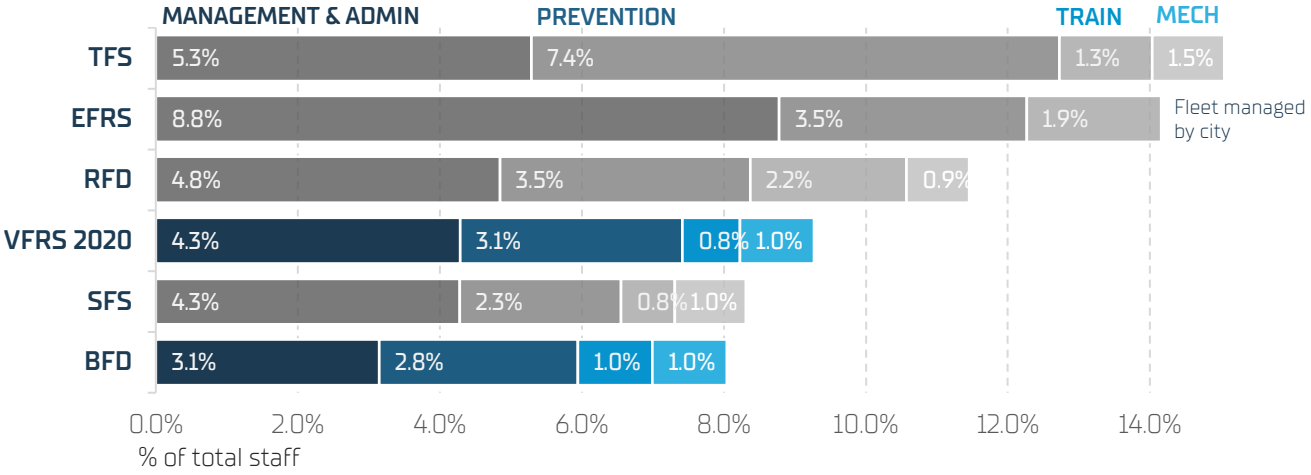
### NON-OPS STAFF AS % OF TOTAL




Non-operational staff include:

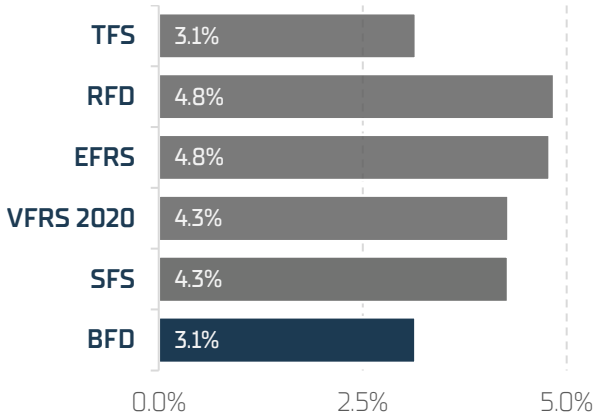
- Command
- Administration
- Management
- Prevention
- Training & Professional Development
- Mechanical
- Organizational Performance

### Non-operational staff mix




*VFRS 2020 including +35 FF, +4 Admin, +4 Prevention
*Surrey has 14 FTE and 14 PT Dispatch personnel, which are not included

## Administrative staff comparisons




*VFRS 2020 including +35 FF, +4 Admin, +4 Prevention

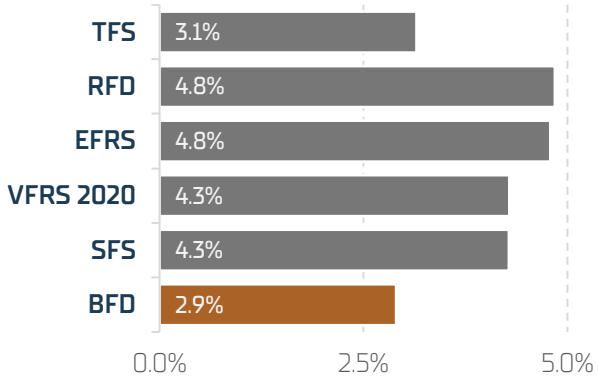
Administrative staff include:

- Command
- Administration
- Management
- Organizational Performance

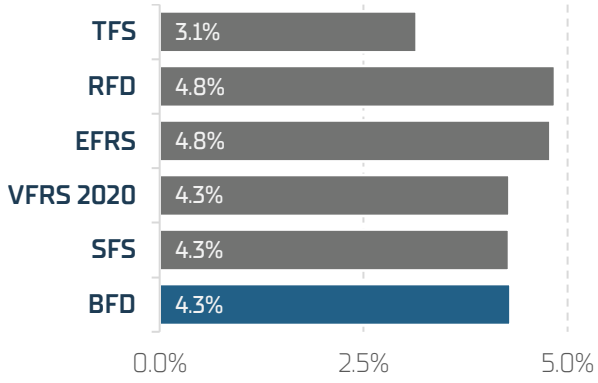
**It is reasonable to target 4.5% admin staff to total staff**

### If an additional 20FFs are added...

**9 administrative staff = 2.9% of overall staff**

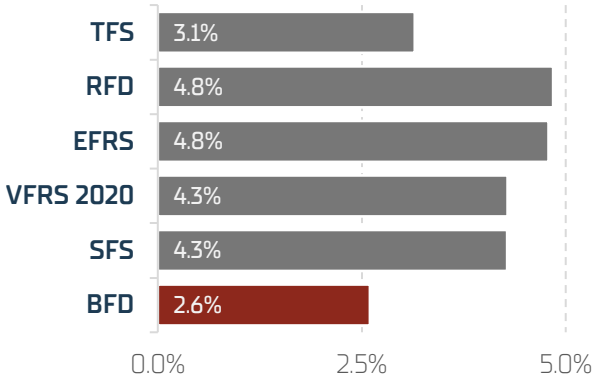



**+4 FTE (13 total) = 4.3% of overall staff**

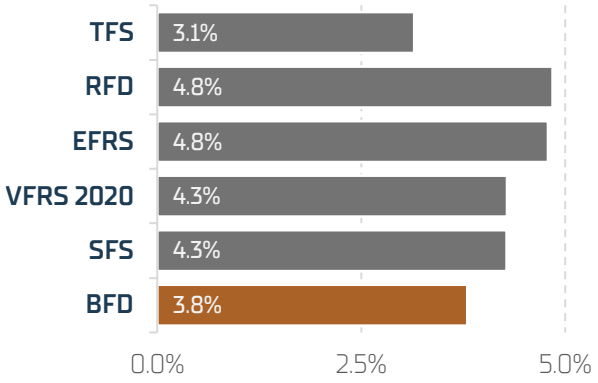



### If an additional 60FFs are added...

**9 administrative staff = 2.9% of overall staff**




**+4 FTE (13 total) = 3.8% of overall staff**



# Best Practice Assessment

The purpose of the best practice assessment was to summarize the findings from the qualitative and quantitative phases against industry standards. Gaps were identified against CPSE's departmental self-assessment categories with perspective of the city's strategic goals and the departments current state. Findings were reported by the departments 5 divisions in a summary of observations and SWOT tables.

The Centre for Public Safety Excellence (CPSE) has developed a thorough peer-reviewed accreditation program. Accredited agencies are often described as being community-focused, data-driven, outcome-focused, strategic-minded, well organized, properly equipped, and properly staffed and trained. Darkhorse used the self-assessment categories as best practice markers.

## CPSE Self Assessment Categories

1. Governance and Administration
2. Assessment and Planning
3. Goals and Objectives
4. Financial Resources
5. Programs
6. Physical Resources
7. Human Resources
8. Training and Competency
9. Essential Resources
10. External Systems Relationships

Category 5 covers all intervention, suppression, and community risk reduction activities.

## Observations

| | |
|---|---|
| Overall system health is poor and at risk of degrading further. | Travel times are within target, except for Burnaby Mountain and Big Bend. Proximity challenges. |
| Organizational infrastructure (HR, physical, IT) is weak. | Vertical growth adds complexity to response abilities. Need to measure vertical response times. |
| Investment is needed to align Department abilities with City's values and strategic goals | Training program is thorough with resources given. Respected among other departments. Investment in technology is needed. |
| Facilities are unprepared for diversified workforce | Recruitment program is excellent. Retaining recruits is challenging. |
| Lack of a continuous improvement paradigm – measure and monitor key performance metrics for change management. | Prevention division is in decline. Strategy, resources, and technology need investment. |
| Understaffed Administration division | Mechanical division reported as very busy. Lack of data gathering and key performance indicators. |
| No succession plan in place | Unique risk challenges have been addressed in historical reports, sustainable strategy to address these risks have yet to be implemented. |
| Administration has maintained a high level of service, despite weakening infrastructure, unlikely to maintain level in growing service demand. | Response capabilities are weak to high risk areas of Burnaby Mountain and Big Bend – unable to assemble an Effective Response Force within appropriate time should an event occur. |
| Lack of a continuous improvement paradigm – measure and monitor key performance metrics for change management. | |
| Operations total response times are increasing | |
| Turnout times are very high | |

# SWOT analysis

## Operations

### STRENGTHS

- Getting the job done
- Pride and passion to serve the community well. Attitude of "We don't have the support we need, but we'll get it done anyway".
- Standards of Cover up to date
- Mental Health initiatives

### WEAKNESSES

- Slow turnout times
- Physical resources need upgrading
- Health & Wellness concerns – exposure/contamination, digital device policies, etc.
- Proximity challenges to Burnaby Mountain and Big Bend
- Not measuring vertical response times

### OPPORTUNITES

- Adopt a continuous improvement paradigm
- Motivated to adapt
- Initiate team activities again (engagement opportunity)
- Open to diversifying the workforce

### THREATS

- Not measuring performance
- Declining total response times
- Unable to meet Effective Response Force response standards with current resources.
- Unable to meet First Due response standards at Burnaby Mountain and Big Bend
- Vertical growth

## Training

### STRENGTHS

- Training is thorough considering the times and resources given.
- Highly respected recruitment process
- On-shift training is a fiscally responsible practice

### WEAKNESSES

- Training is thorough considering the times and resources given.
- Highly respected recruitment process
- On-shift training is a fiscally responsible practice

### OPPORTUNITES

- Invest in appropriate software to track effectiveness and efficiency

### THREATS

- On-shift training concerns affecting availability of resources
- Lack of scheduling software
- Hard to analyze certifications and training gaps
- Poaching of new recruits
- Hard to retain top candidates

## Prevention

### STRENGTHS

- Staff are motivated to change

### WEAKNESSES

- Strategy, infrastructure, and resources are lacking for prevention and public education
- Inefficient and ineffective processes due to technology deficits – eg: FPO's should be capturing data once

### OPPORTUNITES

- Consider divisional name change: Community Risk Reduction
- Implement a community risk assessment
- Invest in technology to improve and increase workflow

### THREATS

- Public Education in decline
- Lack of effective analysis in community risk, due to resourcing and technology

## Mechanical

### STRENGTHS

### WEAKNESSES

- Reported as under resourced
- Lack of measurable data (currently written or PDF's)

### OPPORTUNITES

- Performance review with goals and KPI's to measure against

### THREATS

- Delay's on standard maintenance
- Uncertainty on performance

## Administration

### STRENGTHS

- Have maintained a high standard of service, despite being understaffed.

### WEAKNESSES

- Infrastructure is failing
- Understaffed
- Unable to measure performance targets
- No succession plan in place

### OPPORTUNITES

- Develop 24-month strategic initiatives based on findings
- Invest in technology to improve workflow and measure effectiveness

### THREATS

- Infrastructure cannot withstand any growth in service delivery
- High stress environment, without proper resourcing to address concerns.

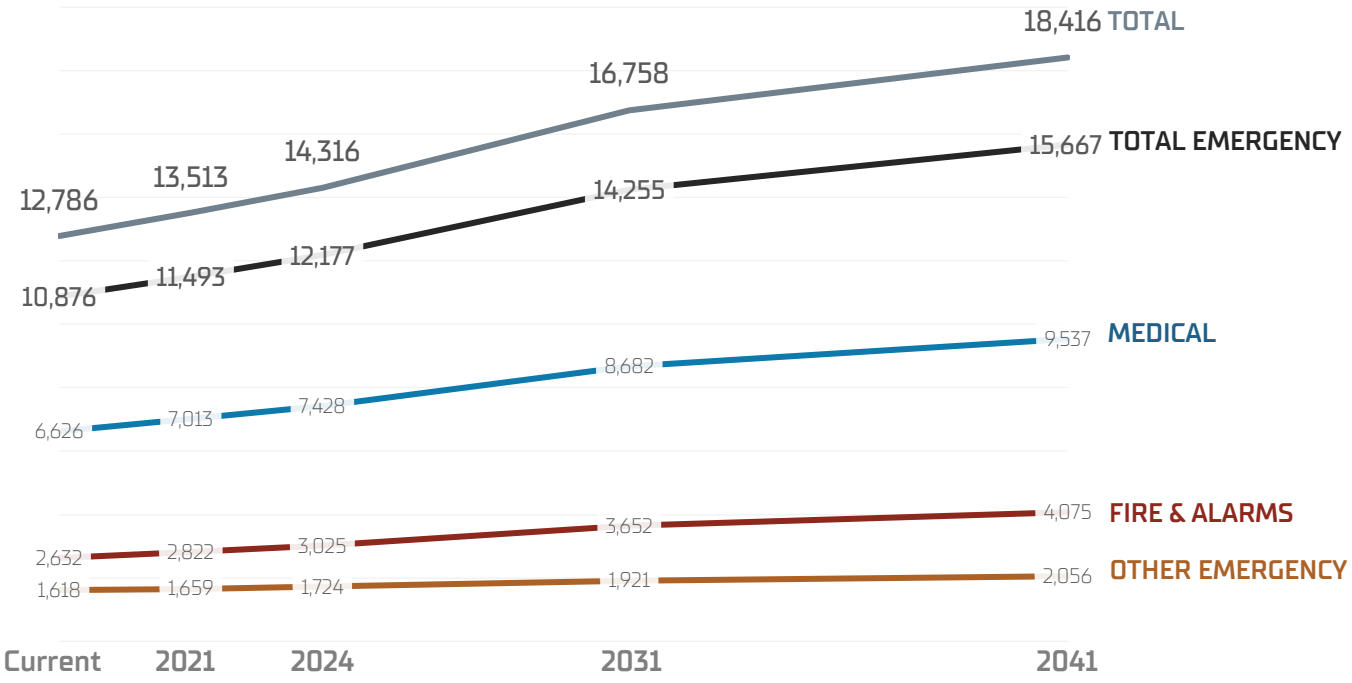
Phase 3 – Predictive Modelling

# Station Location & Deployment Analysis

## Call demand forecasting

Burnaby's incident volumes and locations are predicted to increase in accordance with the current demand locations and the population growth forecast.

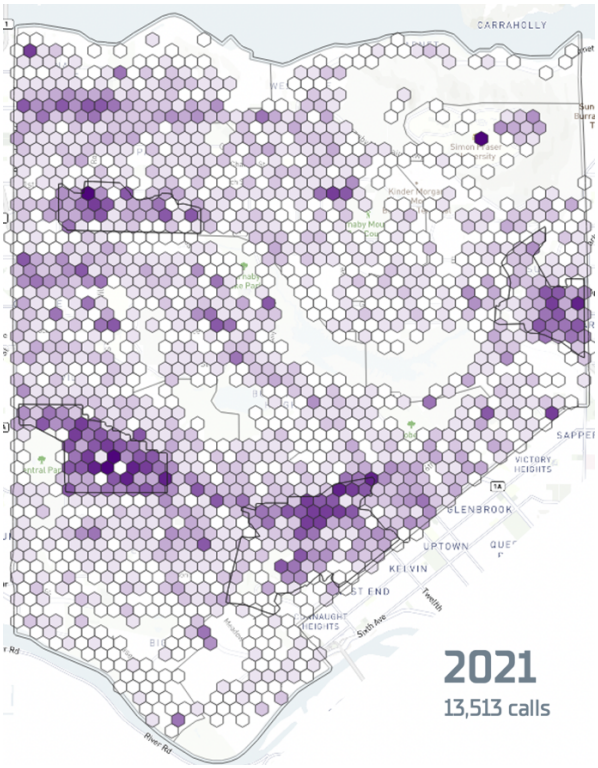
Total population is expected to increase by nearly 100,000 people over the next 20 years.



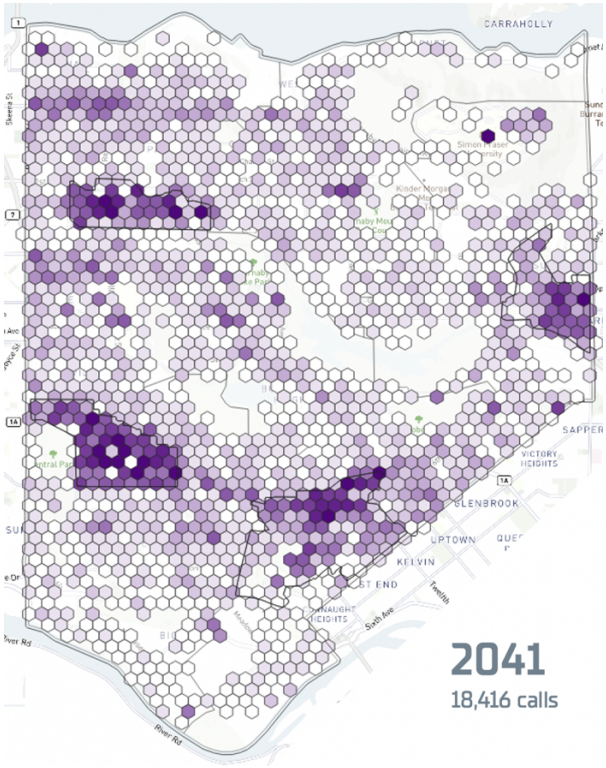

Medical incidents could increase by ~25% if BCEHS reverts to pre-June 2018 policies

# Call demand forecasts – Spatial

2021




2041




A large increase in population is expected in the four town centers, continuing through to 2041.

The rest of Burnaby is expected to have very little population fluctuations.

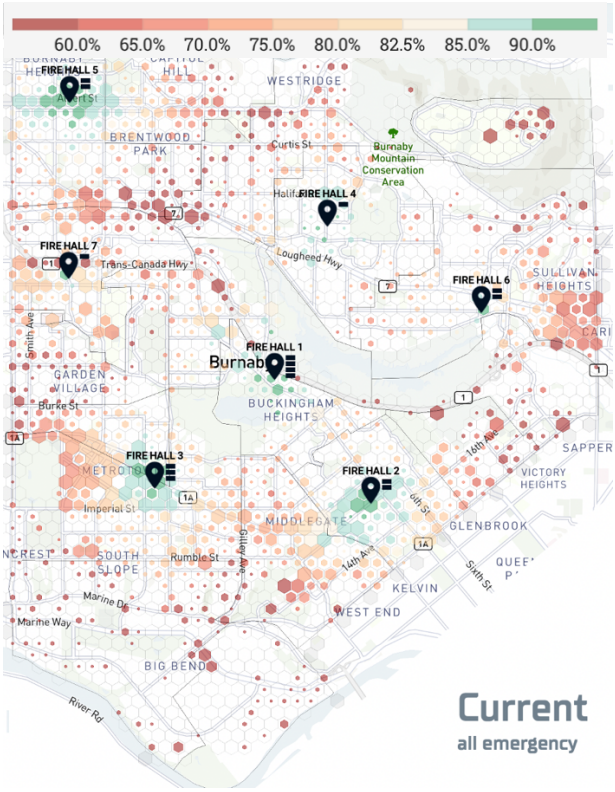
# What if we add nothing?

Measured against First Due and 15FF ERF NFPA 1710 targets

## First Due - Current

**70.9%**

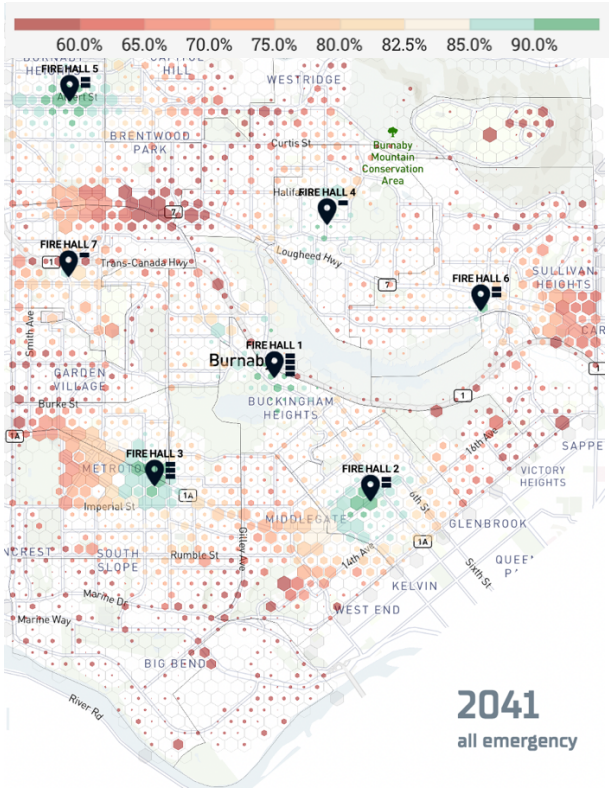
probability of target attainment, using current dispatch and turnout times




## 2041

**70.8%**

probability of target attainment, using current dispatch and turnout times




### Why isn't there a decrease in first due response, given the 20+ year change?

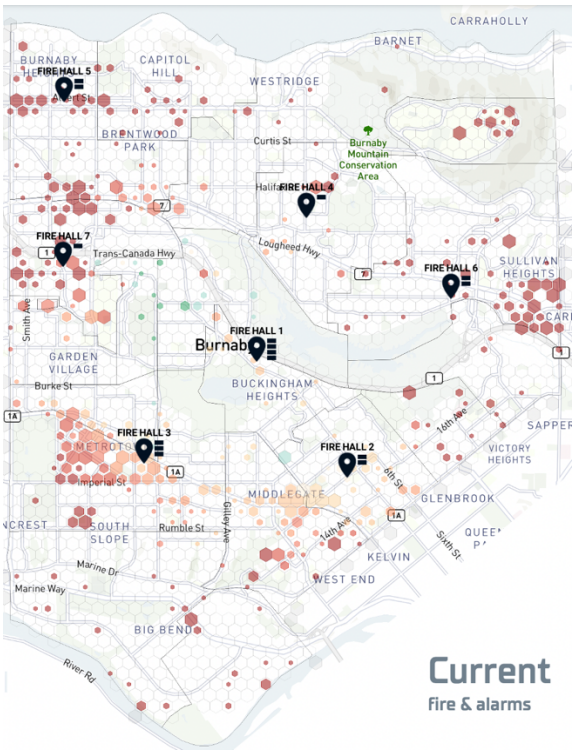
When measuring the first arriving unit, we primarily look at proximity.

Proximity is not affected by densification.There is proportionally more growth happening in areas near stations (e.g. Metrotown) than far away (e.g. Big Bend)

## ERF - Current

**57.4%**

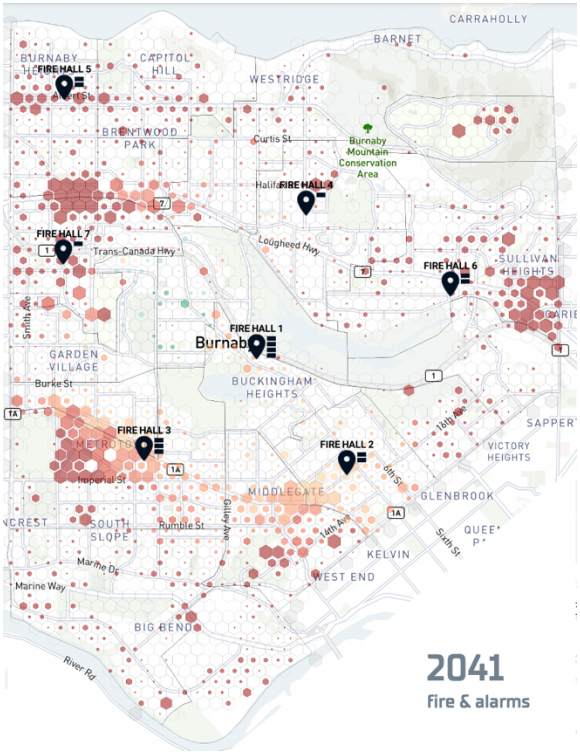
probability of target attainment, using current dispatch and turnout times




## 2041

**55.9%**

probability of target attainment, using current dispatch and turnout times




ERF performance would continue to remain incredibly low. These probabilities do not account for the substantial increase in vertical (high rise) call demand.

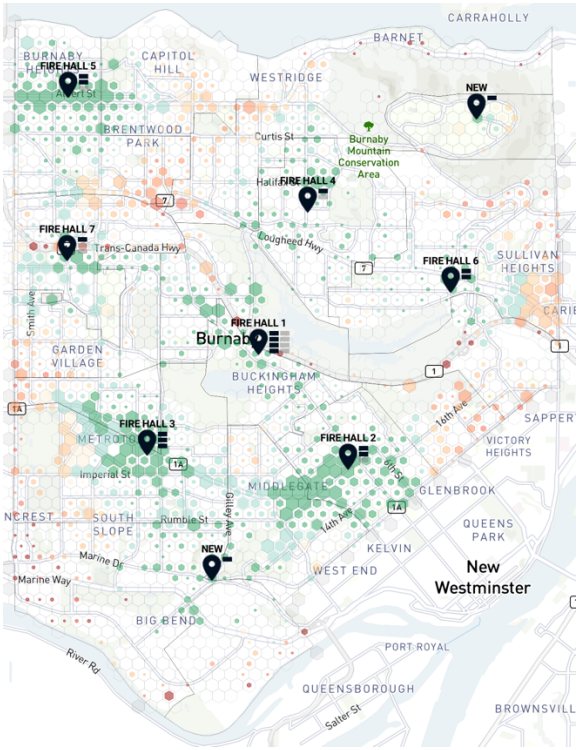
# Adding Fire Stations to Burnaby Mountain & Big Bend

Measured against First Due and 15FF ERF NFPA 1710 targets

## First Due - 2021

**86.8%**

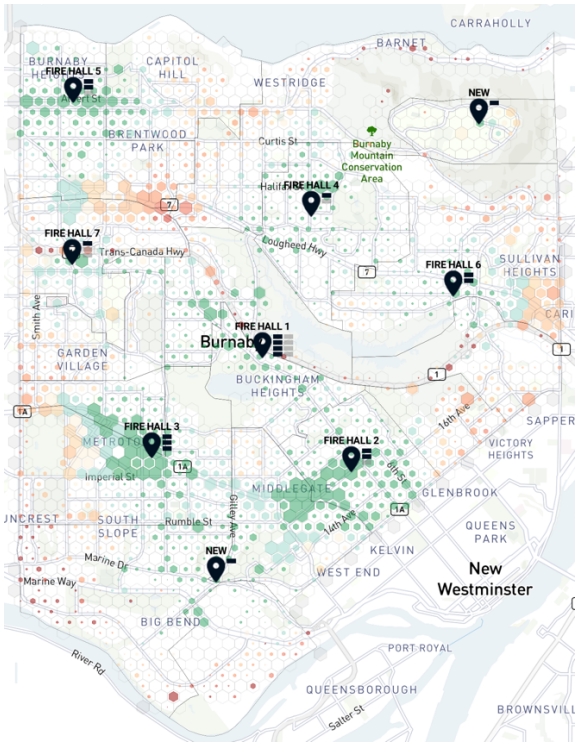
probability of target attainment, using targeted dispatch and turnout times




## 2041

**86.3%**

probability of target attainment, using targeted dispatch and turnout times




These stations are needed within there areas primarily due to risk, however there is still a substantial increase in First Due performance.

# Optimized Station locations based on 2041 call demand

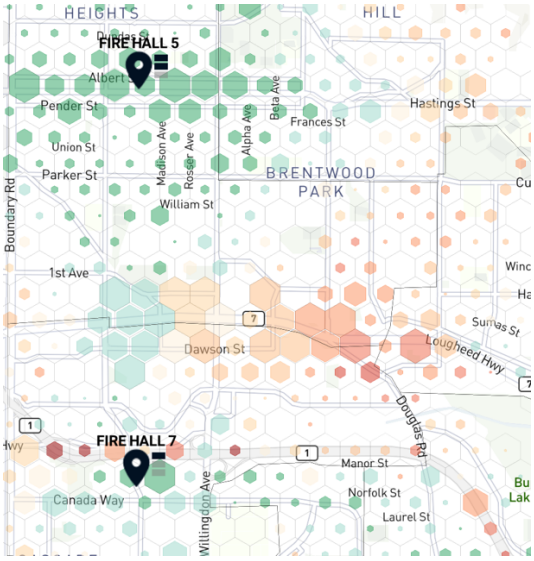
Measured against First Due and 15FF ERF NFPA 1710 targets

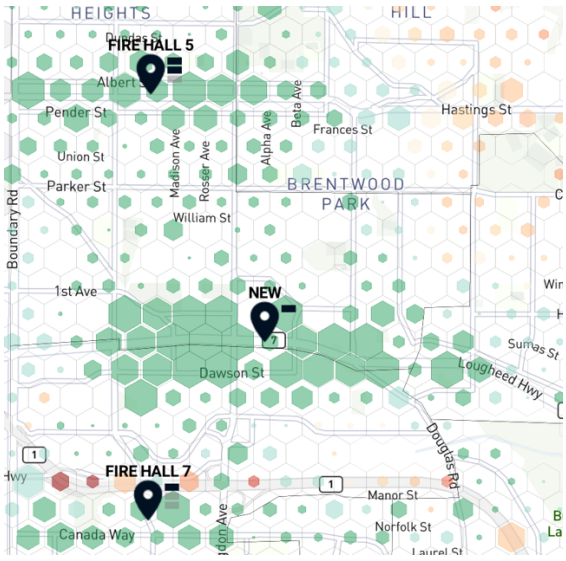
**First Due Effects – 2041** (without new station)

**2041** (with new station)

1. Add Station to Brentwood

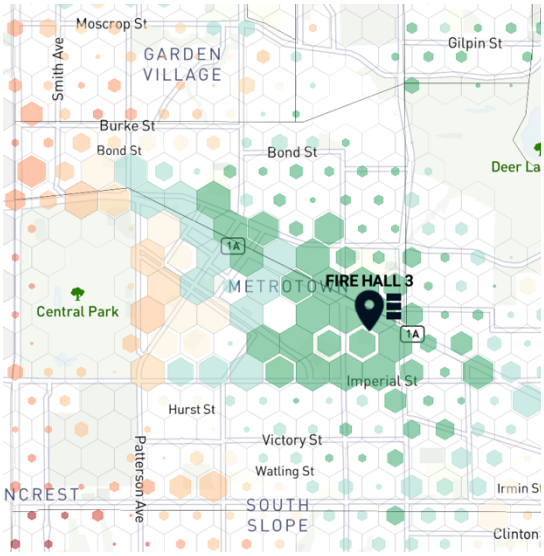
**+2.6% to First Due (+3.7% to ERF)**

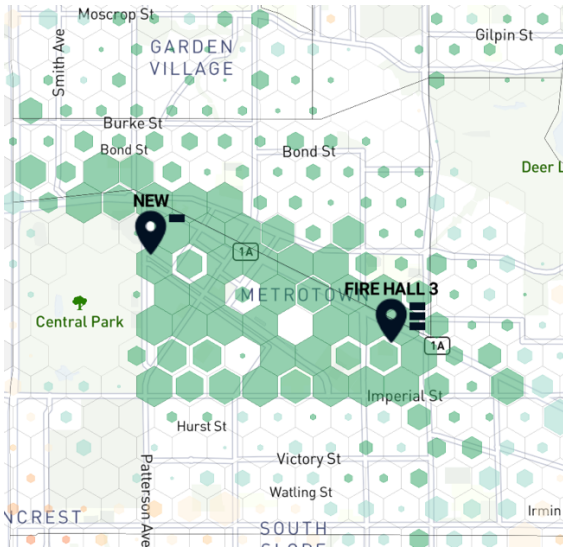


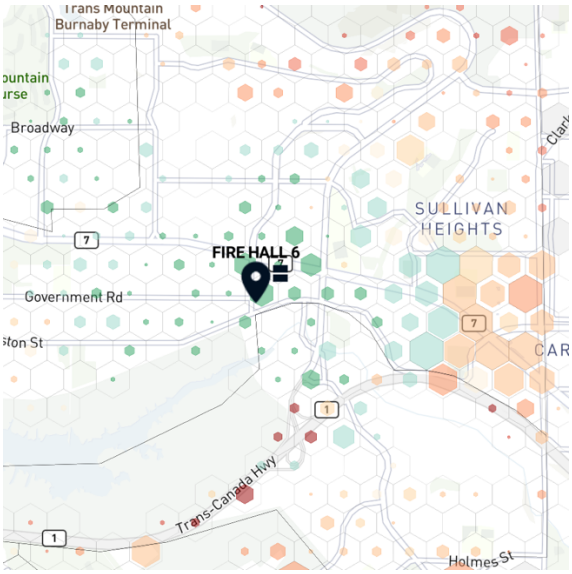

2. Add Station to Metrotown

**+1.5% to First Due (+3.2% to ERF)**

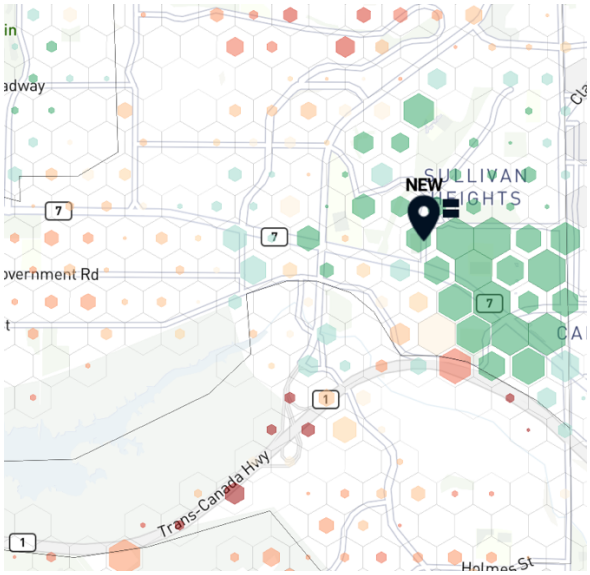


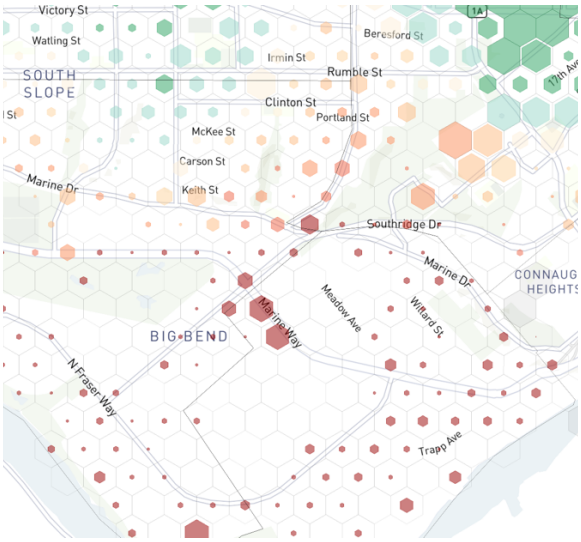
### 3. Move FH6 to Loughheed, +1 unit

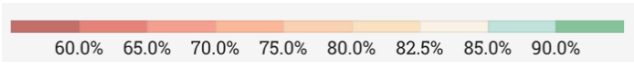



### 0% to First Due (+2.6% to ERF)

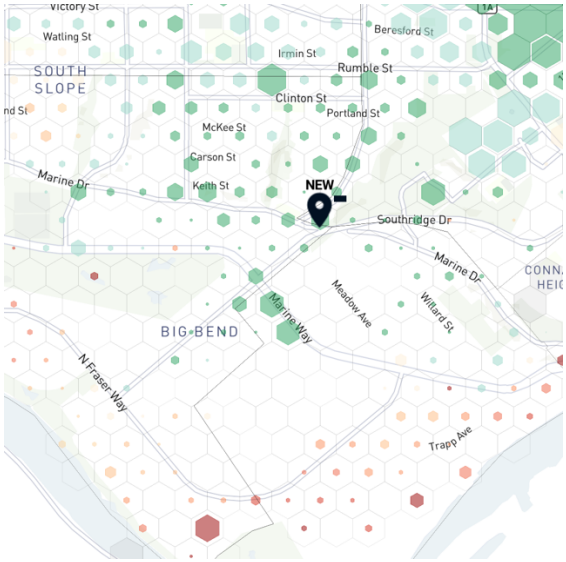



### 4. Add Station to Big Bend




### +1.2% to First Due (+1.3% to ERF)



# Optimizing Resources based on 2021 call demand

Measured against First Due and 15FF ERF NFPA 1710 targets

| STARTING SCENARIO | DEPLOYMENT CHANGES | 2021 BASE MEASURE | | 2021 PREDICTED EFFECT |
|---|---|---|---|---|
| Existing<br>7 Firehalls, 16 Units, 54 FF | +4FF to FH7 or FH4 | 83.4%<br>72.7% | First Due<br>ERF Low | +0.1%<br>**+4.0%** |
| +1 FH<br>7 Firehalls, 17 Units, 58 FF | +4FF to FH3 | 85.0%<br>75.9% | First Due<br>ERF Low | +0.0%<br>**+3.6%** |
| +1 FH<br>7 Firehalls, 17 Units, 58 FF | +4FF to FH4 | 85.0%<br>75.9% | First Due<br>ERF Low | +0.0%<br>**+3.5%** |
| +2 FH<br>7 Firehalls, 18 Units, 62 FF | +4FF to FH4 | 86.3%<br>78.6% | First Due<br>ERF Low | +0.1%<br>**+3.3%** |
| +2 FH<br>7 Firehalls, 18 Units, 62 FF | +4FF to FH8 | 86.3%<br>80.0% | First Due<br>ERF Low | +0.1%<br>**+2.4%** |

Assuming new targets are maintained, and Ladders are staffed with 4.

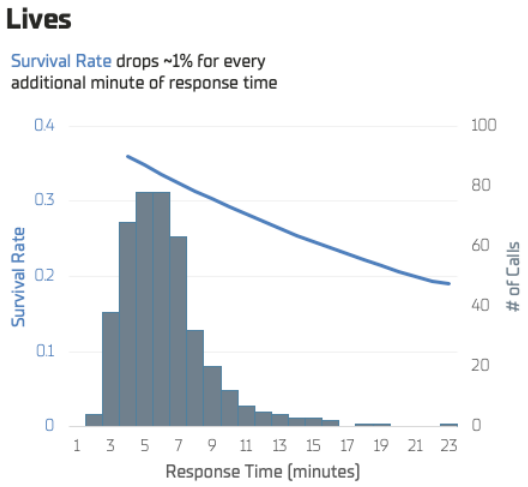
Appendix B

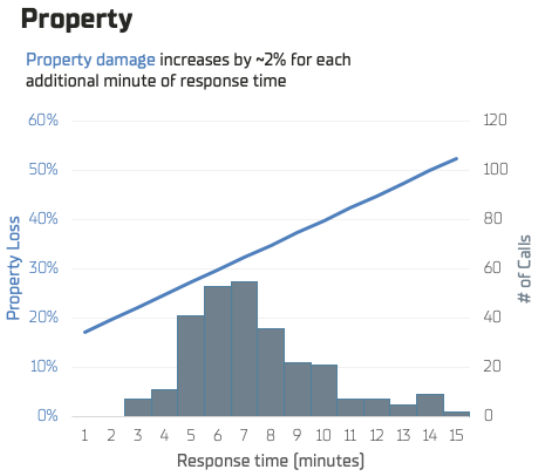
# Industry Standards

City managers and municipal decision-makers expect efficient and effective operations. The National Fire Protection Association (NFPA) has developed a standard (NFPA 1710) that specifies requirements for organization and deployment of fire suppression operations, emergency medical operations, and special operations to the public by career fire departments to protect citizens and the occupational safety and health of fire department employees.[1]

### Why focus on response times?

Lives and property. Research has continually shown that the quicker a first responder or an effective response force can arrive on scene, the costs of the incident decreases.




[1] NFPA 1710: Standard for the Organization and Deployment of .... https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=1710

## NFPA 1710 Response Time Targets

### ALARM HANDLING (PROCESSING)

**64s** 90% of the time

**106s** 95% of the time

### NFPA 1710 - 1st ENGINE OBJECTIVES

| TURNOUT | TRAVEL | TOTAL RESPONSE |
|---|---|---|
| **80s** | **240s** | **320s** |
| 90% of the time | 90% of the time | 90% of the time |

### NFPA 1710 - 1st EMS ARRIVAL OBJECTIVES

| TURNOUT | TRAVEL | TOTAL RESPONSE |
|---|---|---|
| **60s** | **240s** | **300s** |
| 90% of the time | 90% of the time | 90% of the time |

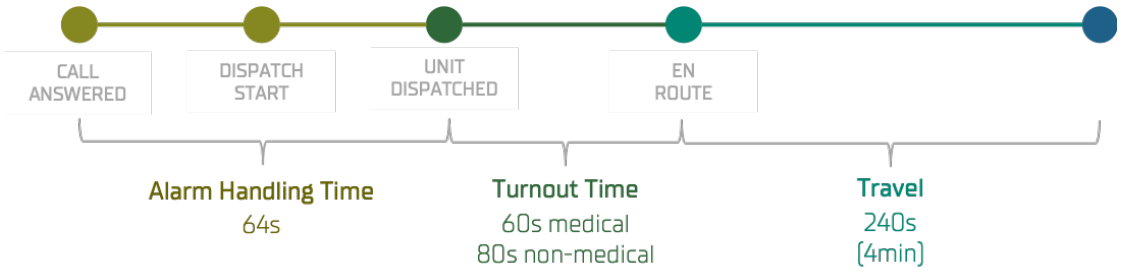
### NFPA 1710 – FULL ALARM ASSIGNMENT OBJECTIVES

| TURNOUT | TRAVEL | TOTAL RESPONSE |
|---|---|---|
| **80s** | **480s** | **560s** |
| 90% of the time | 90% of the time | 90% of the time |

# Response Time Intervals

## First Due

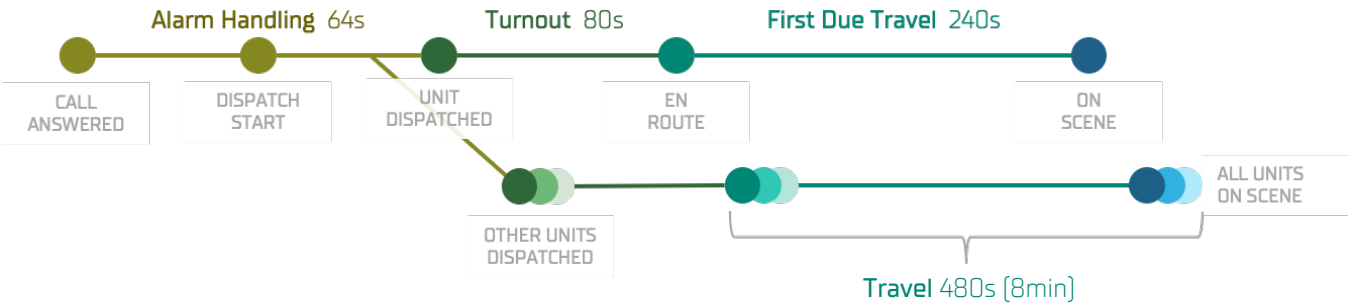
A first due response is defined as the first apparatus to arrive on scene to an emergency incident.




| TOTAL RESPONSE - MEDICAL | TOTAL RESPONSE – NON-MEDICAL |
|---|---|
| **364s** | **384s** |
| 90% of the time | 90% of the time |

## Effective Response Force

An effective response force is defined as the minimum number of firefighters and equipment that must reach a specific emergency incident location within a maximum prescribed total response time.




| TOTAL RESPONSE – 15FF EFFECTIVE RESPONSE FORCE |
|---|
| **624s** |
| 90% of the time |

# BFD Targets

## First Due

90TH PERCENTILE TARGETS

| | NFPA | BFD | |
|---|---|---|---|
| Alarm Handling | 64s | 64s | 1m04s |
| Turnout - Medical | 60s | 130s | 2m10s |
| Turnout - Non Medical | 80s | 150s | 2m30s |
| Travel | 240s | 150s | 2m30s |
| Total Response - Med | 364s | 364s | 6m04s |
| Total Response – Non Med | 384s | 384s | 6m24s |

The NPFA standard is to hit these targets 90% of the time.

The goal is to still attain the NFPA standard. Increasing the turnout target means decreasing travel time targets.

## Effective Response Force

90TH PERCENTILE TARGETS

| | | |
|---|---|---|
| Alarm Handling | 64s | 1m04s |
| Turnout | 150s | 2m30s |

| | NFPA ERF | | | BFD Standards of Cover | | |
|---|---|---|---|---|---|---|
| | Low 15FF | Med 26FF | High 39FF | 1st Alarm 19FF | 2nd Alarm 31FF | 3rd Alarm 43FF |
| Travel | 410s | 410s | 540s | 410s | 410s | 540s |
| Total Response | 624s | 624s | 754s | 624s | 624s | 754s |

Appendix C

# Analysis Methods

## Qualitative Analysis Process

### Interview Approach

The individual interview is a valuable method of gaining insight into people's perceptions, understandings and experiences of a given phenomenon and can contribute to in-depth data collection. However, the interview is more than a conversational interaction between two people and requires considerable knowledge and skill on behalf of the interviewer.

Panel interviews are conducted on a cross section of management, union representatives, and stakeholders, in order to inform and provide input to the Needs Assessment. Interviewees are asked to numerically rate their perceptions, and are asked one or more guiding questions in each of the selected categories such as Performance, Culture, etc. Interviews are conducted dynamically with the guiding questions intended to explore perceptions and fully understand the individual's input.

The perceptions and responses are themed and summarized across the various categories of participant. Those results are then themed again for commonalities and to obtain key conclusions that are strongly supported. All results and findings are a direct reflection of the participants input and are supported across multiple sources.

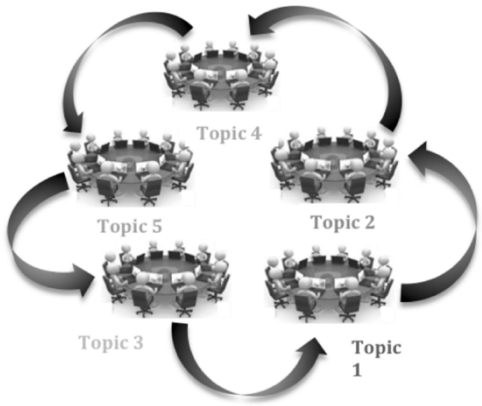
The output from this process is gathered and organized in theme summary documents which inform the final Needs Assessment presentation.

### Workshop Facilitation Approach

The following is a standard approach we have used when seeking input from a larger group of stakeholders within a constrained period. This approach ensures that regardless of format, the session will be effective in obtaining the required input from stakeholders. Steps include:

- Invitations with a project overview and agenda will be sent out ahead of time;
- Discussion topics will be identified and will be used in the engagement to gather consistent data;
- Depending on the number of participants in a session will determine whether there will be multi-group or a full group approach;

- Participants will be put in groups using an objective process (if mixed groups, it will be important to have a mix of perspectives within a group (colored dots, suits in a deck of cards, colored dice, etc can be used to assign individuals to groups);
- Each group will have an opportunity to discuss a specific topic, theme, or question;
- Approximately 4-8 people are anticipated per group/table;
- A facilitator will be present for each table to help guide the discussion;
- All participants will be encouraged to provide their perspective;




- Each session will range from 45-60 minutes – depending on the number of topics;
- Each group of participants (as per their assigned group) will rotate accordingly - all stakeholders participate in every discussion topic; and,
- If time is available, each group will theme and report out to the whole group their findings.

# Quantitative Analysis Process

## Historical & Diagnostic analysis

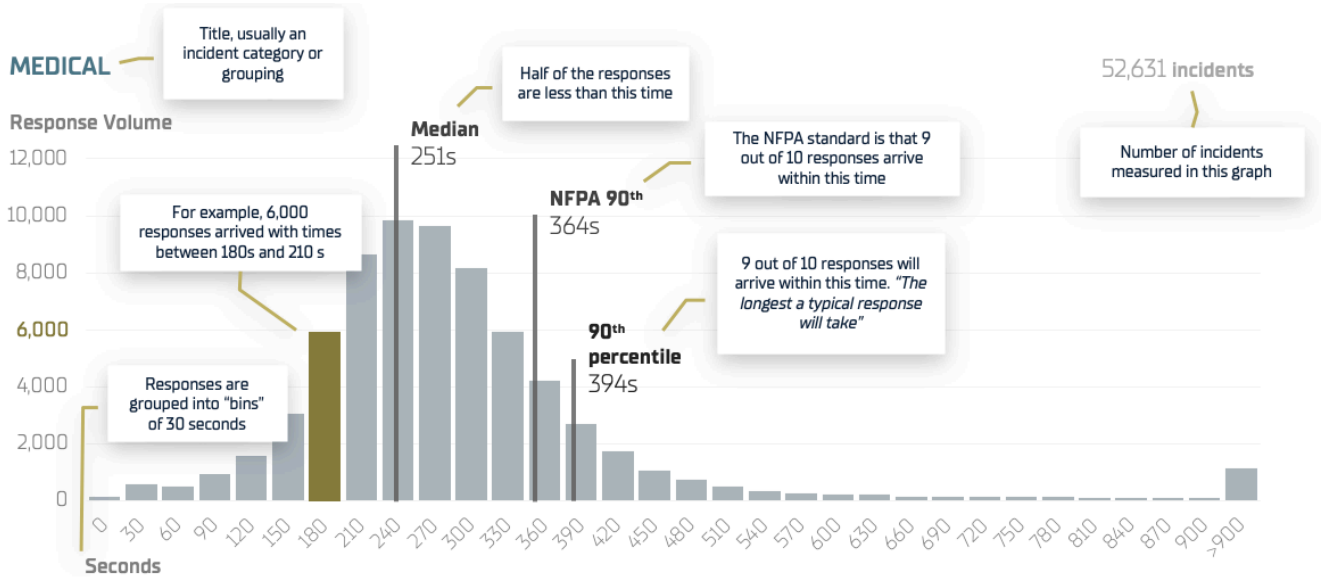
1. Collect data
    a. Submit detailed data request at project start
    b. Review, evaluate and confirm received data
    c. Verify data questions and assumptions
    d. Consolidate data
    e. Inspect and clean data, outliers, etc
    f. Verify data cleaning process and assumptions with BFD
    g. Geospatial preparation
2. Prepare base-map nodes / hex bins for aggregating calls
    a. Prepare road network file for travel time estimation
    b. Define spatial aggregation levels
    c. Join incidents to spatial aggregation levels
    d. Create matrix of driving distances and times between locations
3. Root cause analysis
    a. Explore and visualize incident data
    b. Compare units busy against units scheduled
    c. Identify additional key variables/metrics/KPIs
    d. Overgoal call analysis
    e. Interim presentation

## Distributions

It is important to consider various ways data could be collected incorrectly. The following are some examples of how data could be compromised and why Darkhorse reports in percentiles:

- Some response times are unusually short because of happenstance. For example: responding to a car accident witnessed while driving.
- Some response times are unusually long because of remote locations.
- Some data is just bad data.

We don't want these atypical responses in the data to skew our results, but we need to account for the data. So, we use a distribution to view the data and use percentiles to help make decisions. Typically, we look at the median and 90$^{th}$ percentile times, against industry 90$^{th}$ percentile targets.

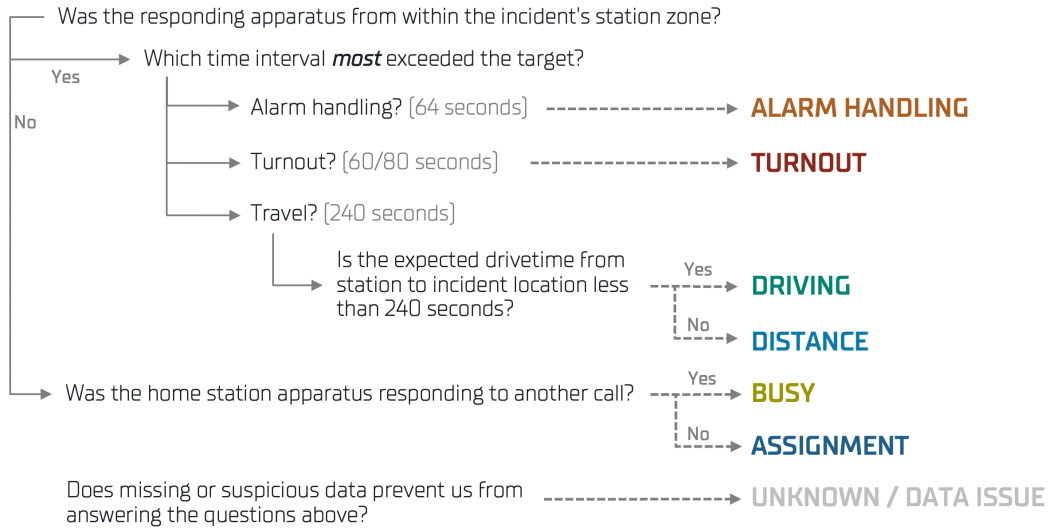


## Determining the Root Cause

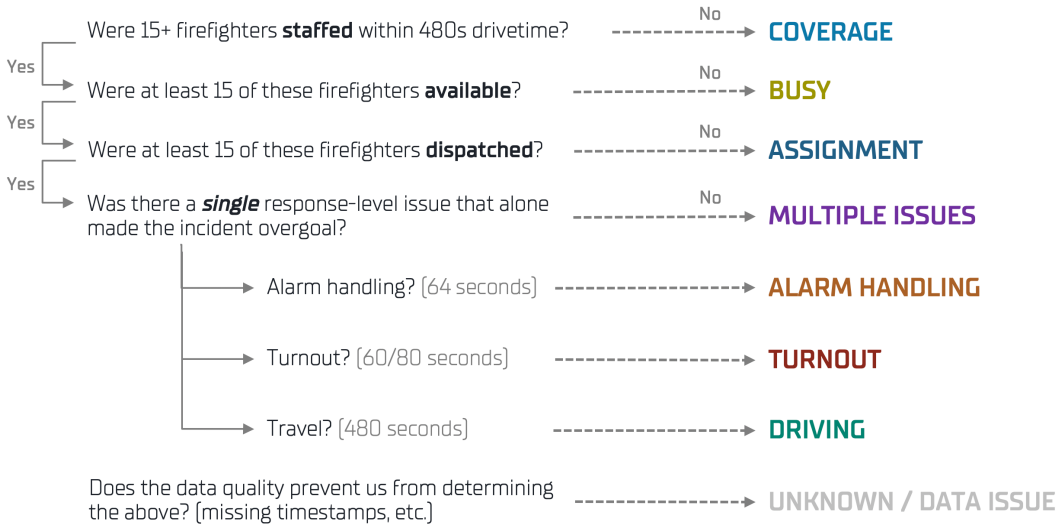
By examining responses to incidents that are over the targeted time can give BFD clarity into where there might be response challenges and opportunities to improve. Darkhorse defines "overgoals" as responses over the targeted time.

In diagnosing the root cause of an overgoal call, Darkhorse assigns a reason that is primarily responsible for the response being over the target.

### First Due Root Cause




### Effective Response Force Root Cause



# Best Practice Assessment Process

## Peer Benchmarking

1. Identify peer cohort (BFD's responsibility)
2. Determine topics and key metrics.
3. Prepare questions for cohort organizations.
4. Determine collection methods.
5. Contact peer organizations and collect responses.
6. Standardize dataset
7. Explore data and comparisons using standard metrics
8. Present findings

## Best Practice Analysis

1. Identify industry best practices for service levels, personnel training, and resource planning from,
    - Peer research
    - Industry organizations (e.g. NFPA, CPSE)
2. Identify BFD's current practices through the qualitative and quantitative analysis
3. Identify best practice gaps based on organizational divisions and industry standard categories.
4. Present findings

# Predictive Modelling

Darkhorse response modelling is probabilistic approach of determining response drive times and performance both now – what happens if we close 1 station? And in the future – what will our response performance be in 10-years?

We determine the **most likely route** travelled for all emergency responses in the dataset using standard routing methods

1. Model **average travel time** as a function of distance using historical actuals in each ESZ.
2. Model **variability** as a function of average travel time in each ESZ.

## A traditional approach

Expected drivetime is estimated along a road network, and results in a binary "coverage". This can lead to suboptimal decisions.

**50%**
TARGET ATTAINMENT

| Distance | 1000m | 2000m | 3000m | 4000m |
|---|---|---|---|---|
| Average drivetime | 99s | 171s | 243s | 314s |
| Covered in 240s? | Yes | Yes | No | No |

## Darkhorse approach

We model the probability of arriving within the target time

**65%**
TARGET ATTAINMENT

| Distance | 1000m | 2000m | 3000m | 4000m |
|---|---|---|---|---|
| Average drivetime | 99s | 171s | 243s | 314s |
| Probability of arriving in 240s | 95% | 83% | 56% | 24% |

## Forecasting methodology

- Received population of each Town Centre (TC) for 2016/2041 (2016 based on spatial overlap of 2016 census areas)
- Received population of Burnaby for 2016/2031/2041
- Interpolate the population of each TC and non-TC area (5 growth sectors) in 2031 from the percentage of growth expected to occur in Burnaby by 2031
- Calculate and apply annual growth rate to generate annual forecasts for each year/growth sector between 2016 and 2031
- Calculate and apply annual growth rate to generate annual forecasts for each year/growth sector between 2031 and 2041
- "Current" population: average of 2016-2019 population for all Burnaby, and each of the growth sectors
- "Current" call volume: medical calls between 2018-09 and 2019-09, all other calls: annual average between 2016-09 and 2019-09: calculated spatially per 'hex'
- Apply % change in population in each growth sector to the annual call volume in the overlapping hexes (portion of area) for each forecast period: 2021, 2024, 2031 and 2041.

Appendix D

# Additional Resources

## Darkhorse Resources

https://darkhorseemergency.com/blog/

## Centre for Public Safety Excellence

The Center for Public Safety Excellence (CPSE) is a not-for-profit 501(c) (3) corporation. We are an international technical organization that works with the most progressive fire and emergency service agencies and most active fire professionals. Our mission is to lead the fire and emergency service to excellence through the continuous quality improvement process of accreditation, credentialing, and education.

https://cpse.org/

## NFPA 1710

This standard specifies requirements for effective and efficient organization and deployment of fire suppression operations, emergency medical operations, and special operations to the public by career fire departments to protect citizens and the occupational safety and health of fire department employees.

https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=1710

## Vision 20/20

The Vision 20/20 Project has been helping communities across the nation implement Community Risk Reduction (CRR) programs to help make communities safer. Community Risk Reduction (CRR) is a process to identify and prioritize local risks, followed by the integrated and strategic investment of resources (emergency response and prevention) to reduce their occurrence and impact.

https://strategicfire.org/community-risk-reduction/crr-an-overview/

Appendix D

# Project Team & Governance

| Decider | Accountable | Responsible | Consulted | Informed |
|---|---|---|---|---|
| *Holds the ultimate power concerning the project* | *Person fully accountable for making the project happen* | *Those responsible for doing the project work* | *Those from whom input will be solicited* | *Those to be kept apprised of relevant developments* |
| **Director Public Safety** | **Steering Committee** | **Working Group** | **City Manager**<br>**City Council** | **City Leadership Team** |

The Steering Committee met after each phase of the project to review, discuss and to provide clarity.

| Steering Committee | Position |
|---|---|
| **Dave Critchley**<br>City of Burnaby | Director Public Safety, Project Sponsor.<br>Sets goals and objectives, scope decisions, deliverables sign-off. |
| **Dave Samson**<br>Burnaby Fire Department | Deputy Fire Chief, Operations |
| **Darcey O'Riordan**<br>Burnaby Fire Department | Deputy Fire Chief, Administration |
| **Chris Bowcock**<br>Burnaby Fire Department | Deputy Fire Chief, Planning & Logistics |
| **Jeff Clark**<br>IAFF Local 323 | Union President |

The Working Group was responsible for the delivery of the project.

| Working Group | Position |
|---|---|
| **Chris Hoang**<br>City of Burnaby | **City Project Manager / Financial Analyst**.<br>Key point of contact for any matters dealing with the city |
| **Dave Samson**<br>Burnaby Fire Department | **Deputy Fire Chief, Operations** |
| **Darcey O'Riordan**<br>Burnaby Fire Department | **Deputy Fire Chief, Administration** |
| **Chris Bowcock**<br>Burnaby Fire Department | **Deputy Fire Chief, Planning & Logistics** |
| **Vivek Sharma**<br>City of Burnaby | **IT**<br>All data gathering from BFD |
| **Maciej Bukczynski**<br>Darkhorse Analytics | **Consultant Project Manager / Senior Analyst**.<br>Key contact, liaison with City. Overall project management, report writing, client communication. Direct project analytical work. |
| **Maryna Goncharenko**<br>Darkhorse Analytics | **Analyst**<br>Current state qualitative analysis, Future demand scenario modelling, needs assessment |
| **Rob Korzan**<br>Darkhorse Analytics | **Consultant, Best Practice Lead, Analyst**<br>Presentations. Lead the best practices phase, provide post-project support. |
| **Steve Shields**<br>Elevate Consulting | **Senior Consultant**<br>Stakeholder engagement, interviews, workshops, current state analysis, identify key themes and recommendations. |
| **Fran Shields**<br>Elevate Consulting | **Senior Consultant**<br>Stakeholder engagement, interviews, workshops, current state analysis, identify key themes and recommendations. |