ORH/CGS/1

February 2, 2022

Emergency Service Planning

City of Greater Sudbury

Station Location Review

Final Report

PLAN. PREPARE. PERFORM.

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This document is intended to be printed double-sided. As a result, some of the pages in the document are intentionally left blank.

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Accreditations

Other than data provided by City of Greater Sudbury, this report also contains data from the following sources:

Contents

1 INTRODUCTION

Report Overview

1.1 The City of Greater Sudbury (CGS) engaged Operational Research in Health Limited (ORH) to deliver a comprehensive Station Location Review, taking account of requirements of both Greater Sudbury Fire Services (GSFS) and Greater Sudbury Paramedic Services (GSPS). The main objective was to determine the ideal number and distribution of emergency service stations.

1.2 This is the Final Report for the review and encompasses a ten-year time period from 2022 to 2032.

1.3 The scope of the work for this review included:

- Analyzing the current service profile
- Producing demand projections for the next ten years
- Identifying the ideal locations using a 'blank canvas' approach and then refining to develop feasible options
- Identifying the number and type of paramedic services vehicles to be deployed at each location in order to achieve the most effective response times through simulation modelling
- Developing a phased plan of recommendations for the next ten years

1.4 A description of current and historical GSFS operations is provided in Section 2, followed by GSFS-specific modelling outcomes in Section 4. A similar analysis of GSPS operations is presented in Section 5, with GSPS-specific projection and modelling outcomes given in Section 6.

1.5 The combined key recommendations for both GSFS and GSPS are summarized in Section 6. A glossary of terms is provided in Appendix **G**.

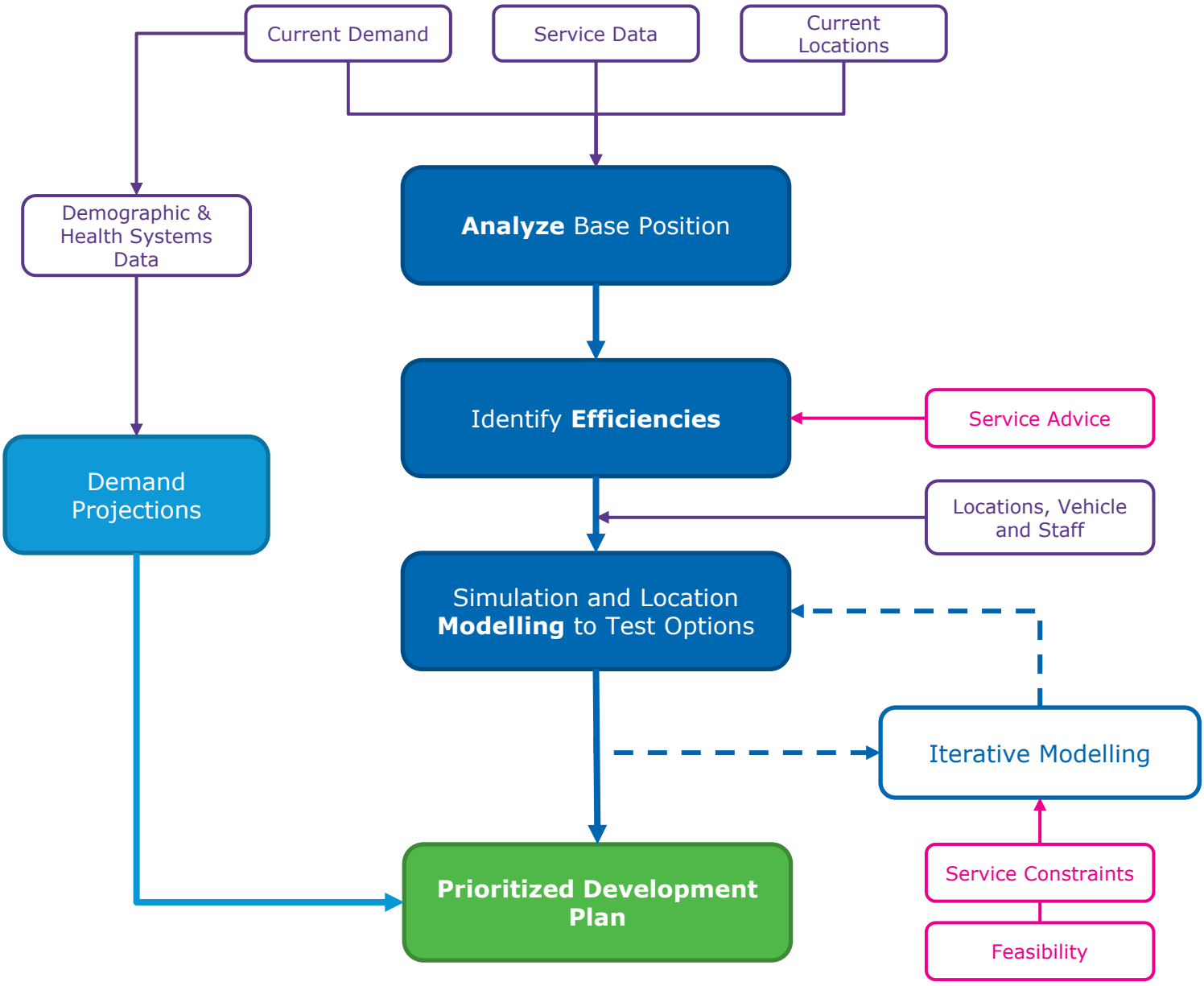
Background and Scope

ORH

1.6 ORH helps emergency services around the world to identify the ideal use of resources to respond in the most effective and efficient way.

1.7 We have set the benchmark for emergency service planning, with a proven approach combining rigorous scientific analysis with experienced, insightful consultancy. Our expert team uses sophisticated modelling techniques to identify opportunities for improvement and uncover hidden capacity.

Figure 1-1: ORH Methodology



Simulating future scenarios ensures that solutions are objective, evidence-based and quantified.

1.8 ORH has been continuously active in undertaking emergency services reviews across the world over more than 30 years. The process of applying our modelling and analysis techniques to varied jurisdictions has given ORH unrivalled international emergency services consultancy experience. It has also ensured that our approach is flexible and can encompass the wide range of factors encountered in working with clients and their stakeholders.

Methodology

1.9 ORH's approach to strategic planning is centred on consultancy, extensive data analysis, and uses a suite of modelling packages developed in-house:

- **Analysis** of demand, performance and resource use to enable the model of the service area to be populated and validated, and to inform an appraisal of potential options for change.
- Identifying and **modelling** options that aim to improve the effectiveness, efficiency and equity of service provision.
- Delivering sustainable solutions in a timely manner through a tried and tested **consultancy** process with a range of stakeholders.

1.10 The specific methodology for this review (see Figure **1-1**) encompassed the following tasks:

(a) Data Review: collecting and checking technical data (see Appendix **A1a** for an overview of the data collected)

(b) Data Analysis: ensuring correct interpretation of technical data and providing a full review of operations (see Appendix **A1b** for a full analysis framework)

(c) Demand Projections: producing population-based projections which incorporate any known infrastructure changes

(d) Model Setup: creating and customizing simulation and location models (see Appendix **A1c** for the benefits of modelling)

(e) Scenario Modelling: evaluating potential station configurations and performance impacts for the future (see Appendix **A1d** for ORH's general modelling approach)

(f) Phasing: providing a feasible phasing of recommendations

1.11 ORH's unique simulation and location models (see Appendix **A2**) help our clients to understand the complex relationships between demand, performance and resources.

1.12 OGRE is a powerful model that can be used to assess the configuration of existing station locations and identify how this could be improved currently and in the future. It uses a sophisticated genetic algorithm to assess millions of options, quickly identifying ideal solutions. The modelling criteria were carefully agreed with CGS to ensure that solutions met their needs. Options generated by OGRE are fully evaluated in FireSim or AmbSim to check that ideal solutions deliver service improvements.

1.13 FireSim and AmbSim are sophisticated models that simulate operational service delivery. Once validated, they can provide evidence-based answers to a wide range of 'what if' questions. The models can assess the impact of changes to a number of factors, such as station locations and resource deployments, dispatch protocols and resource use, or changes to demand levels. They report operational performance in terms of response times, resource workload and utilization.

1.14 FireSim and AmbSim use the actual geographical distributions of demand and resources together with a wide range of other operational parameters, and incorporates travel times between locations (for example, station, scene, hospital). These elements are not reflected accurately in alternative probabilistic or algorithmic approaches. Once loaded with appropriate data that reflects current operations, the models can be considered a 'virtual replica' of GSFS or GSPS operations.

1.15 Travel times between points on the road network are a key input to ORH's models. These times are initially assigned based on road types that differentiate achievable speeds in 'average' traffic conditions and are then calibrated to reflect actual GSFS/GSPS journey times from Automatic Vehicle Location data. ORH uses sophisticated HERE travel time data and RouteFinder routing software for analyzing travel times. This provides a comprehensive and customizable resource for determining journey times and distances.

2 FIRE SERVICE HISTORICAL ANALYSIS

ORH analyzed five years of historical data to build a quantitative profile of GSFS and generate inputs for the modelling phase of the study.

There has been variation in demand during this period, associated with underlying trends, operational changes and the COVID-19 pandemic. Alarm Ringing and Fires were the most frequent demand types, however medical demand represents a growing focus in the city core, particularly for Van Horne station.

There are several components that form the response to demand, and ORH analyzed each of these in turn. The assembly time for career units is, as expected, much quicker than for volunteer units and, when combined with shorter distances to travel to calls, means that that response times in the city core are significantly quicker than elsewhere in Greater Sudbury.

Data Collection

2.1 GSFS provided ORH with five years (January 1, 2016 to December 31, 2020) of call and response data, which included all mobilizations to calls in Greater Sudbury and any calls in other jurisdictions to which at least one GSFS unit was mobilized. ORH consulted with GSFS on a few minor issues and cleansed the data where appropriate.

2.2 In addition, GSFS provided ORH with relevant information for:

- **Historical Data**: Overviews of historic demand and performance data, plus information on station changes during the sample period.
- **Geographical Data**: Including station locations and boundaries for fire beats. AVL data was not available for fire responses, however the GSPS data provided a suitable proxy for variation in speeds by road type.
- **Vehicle Availability Data**: No data is available in terms of the number of firefighters and/or units available by time of day. Agreed to work on assumption that career vehicles are 100% available and GSFS provided summaries of historical volunteer response.

2.3 ORH used this data to build a quantitative understanding of GSFS operations. This included analyzing incident demand, vehicle workload and response performance.

2.4 In analyzing GSFS data, ORH applied the following definitions and assumptions:

Figure 2-1: Demand Profile by Category

Jan 2016 to Dec 2020

Category	2016	2017	2018	2019	2020	5-Year Average	5-Year Total
Fire	795	760	848	755	927	817	4,085
Non-Fire	656	808	840	800	598	740	3,702
Medical	583	648	685	842	608	673	3,366
Alarm Ringing	1,139	1,173	1,131	1,095	975	1,103	5,513
Vehicle Collision	662	855	956	659	474	721	3,606
Total	**3,835**	**4,244**	**4,460**	**4,151**	**3,582**	**4,054**	**20,272**

- **Demand** = Any call to which at least one GSFS unit arrived at the scene during the five-year sample
- **Units** = Focus on responses from engines and pumpers
- **Availability** = The average number of volunteer responders per call (by station)
- **Workload** = Number of responses by unit
- **Response Time** = The analysis provides a breakdown of various call components; modelling focused on the crew response time (combination of assembly time and travel time to scene)
- **Exclusions**: For measures of response time, any records where this was less than 30 seconds or greater than 30 minutes was excluded (based on GSFS methodology). The analysis focused on the first responding engine or pumper (unless otherwise specified) and included all response codes.

2.5 The majority of the analysis is based on the full five-year sample, but occasionally is based on 2019 only (individual appendices specify whether the data is for 2019 or the entire sample).

Data Analysis

Demand

2.6 There were 20,272 calls in Greater Sudbury from January 1, 2016 to December 31, 2020 (this five-year sample period is used in all following analysis). The daily demand typically varied between 5 and 20 calls on any given day (see Appendix **B1a**).

2.7 GSFS specified that five demand types should be used for categorizing demand (see Figure **2-1**):

- Fire = 20% of all demand
- Non Fire (Assist Other Agency, Hazards, Leaks and Rescues) = 18%
- Medical = 17%
- Alarm Ringing = 27%
- Vehicle Collision = 18%

2.8 There is clear seasonality in Fire demand, which peaks during the summer months in all five years of the sample, however the pattern is less clear for other demand types (see Appendix **B1b**). For Fires, the daily demand peaks at 4 to 5 per day, which in relative terms is much greater than the winter months (1 to 2 per day), however this is only a small difference in absolute measure.

2.9 Demand has fluctuated across the sample period, increasing between 2016 and 2018 before declining in the next two years (see Appendix **B1c**). The following points are noted:

- **Fires** were relatively stable between 2016 and 2019 but increased in 2020; there is insufficient evidence to determine if this is a significant trend.
- **Non Fires** decreased in 2020, having been at a consistent level in the previous three years; the fall is associated with the COVID-19 pandemic.
- **Medical** demand increased each year from 2016 to 2019, before a decrease in 2020 (due to the pandemic).
- **Alarm Ringing** demand also decreased in 2020, however this was a continuation of the trend from previous years.
- **Vehicle Collisions** decreased in 2019 and 2020 as a result of changes to the operational procedure for supporting police response.

2.10 The hourly profile of demand reveals a peak for all demand between 15:00 and 18:00 (see Appendix **B2a**). Fires are highest between 20:00 and 22:00, while vehicle collisions have a morning and evening peak.

2.11 On average there are fewer calls on weekends than on weekdays, except for late at night (21:00 to 02:00, see Appendix **B2b**); weekdays are busier than weekends during the morning (07:00 to 11:00) and the afternoon (14:00 to 18:00).

2.12 The call data included coordinates for the locations of demand, which ORH used to analyze the geographical pattern of demand in Greater Sudbury. Demand is heavily focused in the city core, with nearly three-quarters of demand occurring Fire District 1 (see Appendix **B3a**).

2.13 ORH mapped the geographical pattern for each demand type (see Appendices **B3b** to **B3f**). The following points are noted:

- **Alarm Ringing** demand is more concentrated in the city core than Fires, which reflects the building profile.
- **Medical** demand is almost exclusively in the city core and the Valley area.
- **Vehicle Collisions** are distributed across the road network in Greater Sudbury, highlighting key roads.

Volunteer Availability

2.14 GSFS provided ORH with annual summaries for the average number of volunteer firefighters:

- Assigned to each station during the year
- Responding to demand by station and by fire beat
- Standing by at station by fire beat

2.15 The ideal for data collection would be a log of the number of firefighters available by station for every hour of the day, for all days of a year. Without this information, ORH's analysis focused on the average number of volunteer responders per call as a proxy for availability of staff.

2.16 There is an expectation that four firefighters should respond on an engine unit. Based on the 2020 data, there are several stations where this is regularly not achievable (see Appendix **B4a**):

- Beaver Lake (average of 1 firefighter per response)
- Skead (1)
- Falconbridge (2)
- Val Caron (2)
- Levack (3)
- Dowling (3)

2.17 There was no volunteer capability from Vermillion Lake in 2020, and this station was excluded from the modelling on this basis.

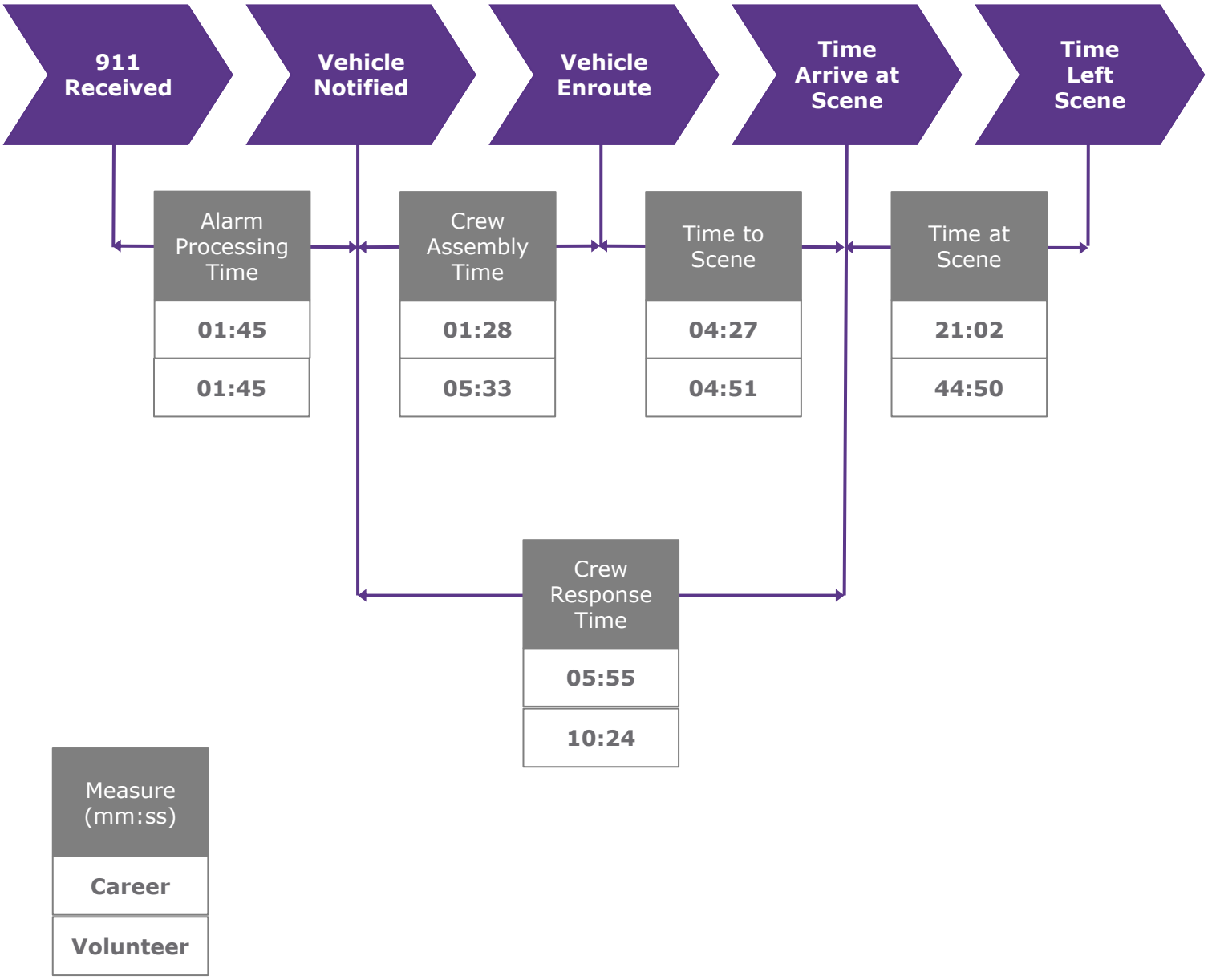
2.18 Between 2016 and 2020, most stations have seen an increase in the average number of volunteer firefighters responding to demand (see Appendix **B4b**). GSFS has reported that the total number has remained similar to 2020, even with variable recruitment and retirement during 2021. It was therefore appropriate to use the 2020 averages in the data presentation and modelling.

Workload

2.19 Station 1 (Van Horne) is by far the busiest station in GSFS; its units provided 10,649 responses across the five-year sample, equivalent to 35% of all GSFS responses, and more than the other three city core stations combined (see Appendix **B5**). The number of responses by Station 4 (Long Lake) doubled between 2016 and 2018, otherwise the response profile is similar by year across the other GSFS stations.

2.20 The response locations for the individual career engine units generally align to the fire beats, however Stations 3 and 4 (Leon and Long Lake) will often respond into Fire Beat 1 (see Appendix **B6a**). For volunteer units, response locations are typically tightly clustered around their home stations (see Appendix **B6b**). However, where 'twinning' takes place, it is noticeable that some stations will often respond into neighbouring fire beats, for example, at

Figure 2-2: Call Components (2019)



Stations 6 and 7 (Waters and Lively) and Stations 23 and 24 (Coniston and Wahnapitae). In the Valley East area, the career engine at Val Therese (Station 16) is the most frequent responding unit in Hanmer (Station 17) and Val Caron (Station 15) fire beats, as well as in Val Therese, even though there are volunteer units at all three stations.

2.21 ORH analyzed the number of responses by individual engine/pumper units into each of the fire beats across Greater Sudbury. For most stations, most responses are in their home fire beats (see Appendix **B6c**). The most notable outlier is Station 16 (Val Therese), where less than one-third of responses are to calls in its own fire beat as it provides cover to the other stations in the Valley.

2.22 The proportion of workload by demand category is similar for all career engines, with two exceptions (see Appendix **B7a**):

- E1 (Van Horne) is the only engine for which medical demand represents the largest proportion of its workload.
- E16 (Val Therese) has a much higher proportion of vehicle collisions than the other career units, reflecting the large area that it covers.

2.23 There is more variation in the workload profile for volunteer engines/pumpers, however this is mainly due to the low demand numbers (see Appendix **B7b**). For example, at Copper Cliff 55.6% of responses are to fires and only 5.6% to non-fires, whereas at Levack the corresponding figures are 33.3% for fires and 33.3% for non-fires. Compared to career units, volunteers typically respond to a higher proportion of fires than other demand types.

2.24 Just over two-thirds of demand is responded to a by a single engine unit (see Appendix **B8a**). Fires and alarm ringing demand are more likely to have had multiple units responding than other demand types. For Fires, 20% of demand received three or more units (see Appendix **B8b**).

Response

2.25 The response to an emergency call includes several components from the time that the 911 call is received to the vehicle returning to the station. For this study of GSFS, the focus was generally on crew response time (see Figure **2-2**), however the individual time components are all discussed in this section.

2.26 **Alarm Processing Time** is measured from 911 call received to when the vehicle is notified; this is independent of vehicle or crew type. The average time during the sample was 1m47s, with little variation by year or demand type (see Appendix **B9**).

2.27 **Assembly Time** measures the time taken for the vehicle to go enroute after it has been notified. As expected, there are stark differences in the times between career and volunteer units.

2.28 For career units, the average assembly time is 1m30s, with little variation by year or by demand type (see Appendix **B10a**). Assembly times for medical demand tends to be 5 to 10 seconds quicker than other demand types. All career units have longer assembly times at night than during the daytime, and this is particularly notable for unit E4 at Long Lake Station (see Appendix **B10b**).

2.29 For volunteer units, the average assembly time is 5m21s, with little variation by year or by demand type (see Appendix **B10c**). Vehicle collisions tend to have quicker assembly times than other demand types, but this is not significant.

2.30 **Travel Time to Scene** is measured from vehicle enroute to vehicle arrived at scene. Across the five-year sample there is little change to these times, with an average of 4m36s, however there are some differences by demand type (see Appendix **B11a**):

- Fires have the longest time to scene (5m14s), a product of their geographic profile and a greater proportion of volunteer responses.
- Medical demand times (3m28s) are substantially quicker than all other demand types, due to their concentration in the city core.

2.31 There is little variation in travel time by year or by hour, which suggests that the typical pattern of traffic conditions does not significantly affect travel times to demand (see Appendix **B11b**).

2.32 **Crew Response Time** is measured from vehicle notified to vehicle arrived at scene and is effectively a sum of assembly time and travel time to scene. There are no formal reporting standards for crew response in GSFS, so the study has focused on average (mean) response times and the 90th percentile, that is the time within which 90% of responses are completed. The highlight figures are as follows:

- Career Units: Average = 5m59s; 90th percentile = 9m29s
- Volunteer Units: Average = 10m30s; 90th percentile = 16m02s

2.33 As with the individual call components, there is little variation by year. The profile by demand type tends to follow the patterns for assembly time and travel time, so the quickest crew response times are therefore for career units to medical demand; this is true for both the average and the 90th percentile measures (see Appendices **B12a** and **B12b**).

2.34 In addition to the 90th percentile and average measures, ORH analyzed the entire distribution of crew response times by demand type, with an additional separation for career units into career fire beats (see Appendix **B12c**). Medical demand stands out as the quickest response times for career units, followed by vehicle collisions. The aim of the model validation process (see below) is to match the entire response time distribution.

Figure 2-3: Response Time by District

Jan 2019 to Dec 2019

Average Crew Response Time by Category

District	Category					Overall
	Fire	Non-Fire	Medical	Alarm Ringing	Vehicle Collision	
1	06:15	06:05	04:34	06:14	05:29	05:42
2	11:10	10:38	-	10:06	09:55	10:23
3	11:09	10:55	-	10:01	10:39	10:38
4	08:56	08:24	07:11	08:17	07:08	08:02
5	09:32	09:47	-	09:21	09:22	09:26

Note: Average CRP dashed out where there were fewer than 10 responded incidents.

Crew Response Time 90th %ile by Category

District	Category					Overall
	Fire	Non-Fire	Medical	Alarm Ringing	Vehicle Collision	
1	10:02	09:41	06:26	10:05	08:19	09:06
2	15:42	18:57	-	15:19	14:18	16:07
3	16:37	14:46	-	12:35	14:16	14:33
4	14:32	12:55	12:16	11:38	10:53	12:47
5	13:35	13:19	-	13:54	13:51	13:41

Note: 90p CRP dashed out where there were fewer than 10 responded incidents.

2.35 ORH also analyzed crew response time by geography, mapping the profile across GSFS (see Appendix **B12d**) and by fire district (see Figure **2-3**). As expected, response times are quickest in the urban centres and closest to fire station locations.

2.36 **Time at Scene** is measured from the time the vehicle arrived to time it left the scene of the demand. As with all other measures, there is little variation by year, however time at scene does vary according to crew and demand type:

- On average, career units (22m42s) spend substantially less time at scene on average than volunteer units (40m48s); this is the case for all demand types.
- For career units (see Appendix **B13a**), fires (30 to 40 minutes on average by year) and vehicle collisions (30 to 36 minutes) have the longest times at scene. Medical and alarm ringing demand require less time at scene (15 to 18 minutes).
- There is more variation for volunteer units because of the lower demand volumes (see Appendix **B13b**). Non-fire demand has similar times to fires and vehicle collisions.

3 FIRE SERVICE MODELLING OUTCOMES

ORH populated its fire models with inputs derived from the historical analysis and travel times were calibrated against actual journeys. With a close alignment between modelled and analyzed positions, the next step was to set an appropriate base position from which to evaluate potential options.

ORH undertook an iterative series of modelling runs to consider the following:

- The ideal configuration of stations in the city core
- The potential for consolidating volunteer stations
- Evaluating the priority order for potential changes and the impacts by step for career and volunteer areas

Following consultation with GSFS and taking account of emerging results from the modelling of paramedic services, ORH produced a series of potential changes to the station locations. If all steps are implemented this would reduce the number of fire stations from 23 to 13; headquarters in Azilda would remain as a paramedic book-on location.

The proposed set of changes would lead to an improvement in the 90th percentile times across Greater Sudbury, both in career and volunteer areas. This is possible by relocating stations to ideal locations and by enhancing volunteer numbers at key stations through strategic consolidations.

Model Validation and Base Position

3.1 As described in Section 1, model validation is the process whereby the model is calibrated against known performance and unit workload. There are several stages involved in preparing a validated model. A detailed level of understanding around the way the department functions is required (gained through data analysis and consultation), and this is combined with a sophisticated travel time calibration process.

Validation Outcomes

3.2 The objective of the model validation was to check that the modelled outputs matched the analyzed figures as closely as possible.

3.3 The cumulative response profiles are very similar for actual and modelled responses for all demand (see Appendix **C1a**); the average and 90th percentile response times by fire district and across GSFS are also closely correlated (see Appendix **C1b**).

3.4 In addition to response times, the validation process was concerned with matching the workload of vehicles. For GSFS units there is a close match between the modelled and analyzed utilization, measured as the proportion of time that units are responding to demand (see Appendix **C1c**).

3.5 The model validation shows that there is a good match in terms of the distribution of response times by demand type and the workload of vehicles. The model could therefore be used with confidence to explore the effects of changes in controllable (for example, new station locations or vehicle deployments) and uncontrollable (for example, increased population) factors.

Base Position

3.6 The modelled base position was set against the demand profile from 2019 as this was deemed the most representative. This includes the reduction in vehicle collisions following the policy change but does not reflect changes to demand numbers associated with the pandemic.

3.7 From a deployment perspective, the modelled base position did not include any units located at Station 13 (Vermillion Lake) because of the low levels of volunteer crewing.

Career Stations

Approach

3.8 As described in Section 1, ORH's modelling process involved a combination of location modelling (to identify the ideal sites) and simulation modelling to fully appraise the potential impacts on response times.

3.9 For finding the ideal locations of fire stations, ORH ran modelling options to minimize 1st response time against:

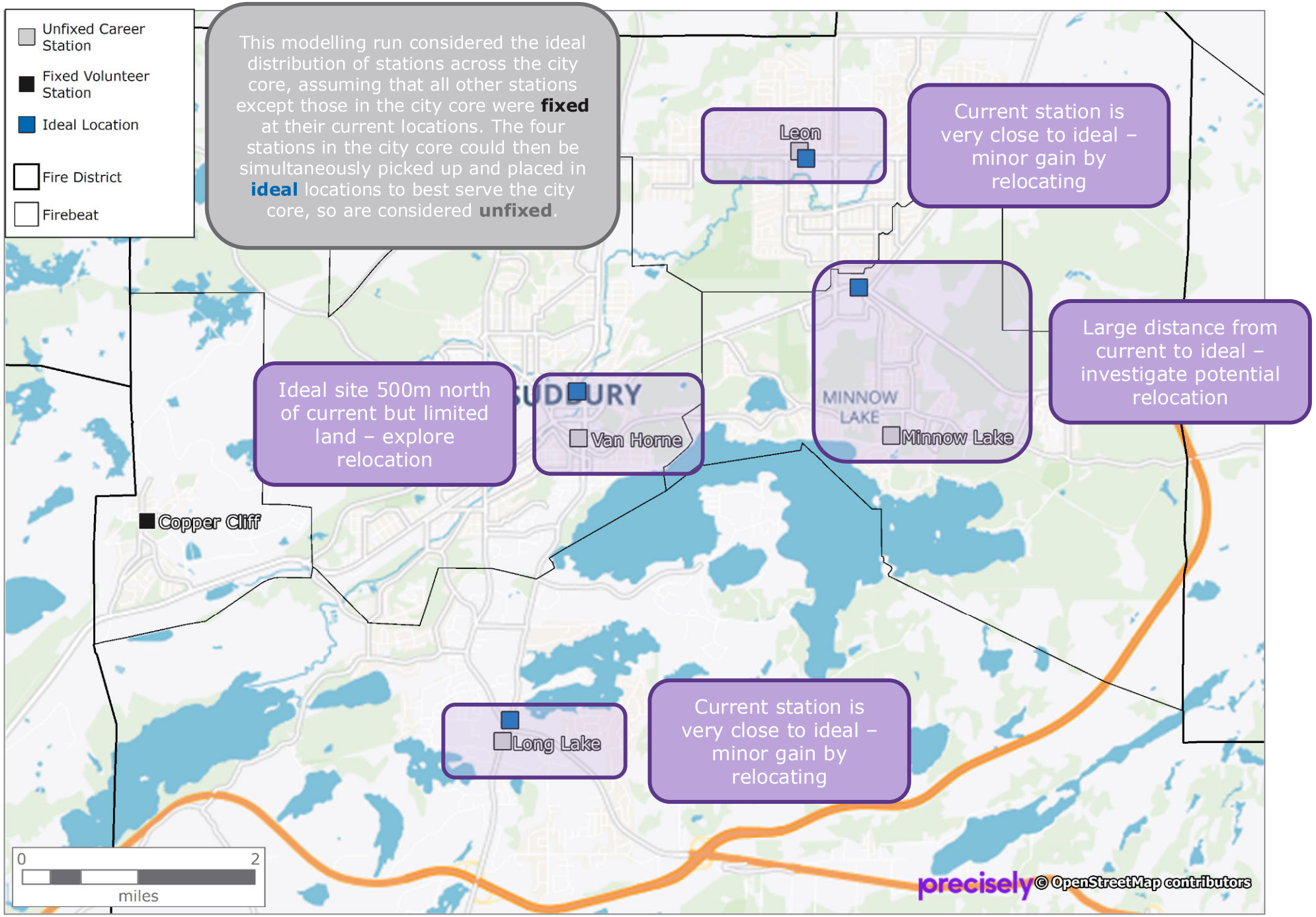
- Demand (excluding medical and alarm ringing)
- All Properties
- High Risk Properties (as specified by GSFS)

3.10 Following discussion with GSFS, it was agreed to focus on demand for locating stations as this was based on historical evidence of response locations and initial outputs matched expectations given professional knowledge. This was undertaken using all demand and before repeating with medical and alarm ringing excluded; the outcomes were very similar in both scenarios.

Ideal City Core Distribution of Stations

3.11 The first series of location modelling runs considered the ideal distribution of stations across the city core, assuming that all other stations except those in

Figure 3-1: Career Modelling in City Core



the city core were fixed at their current locations. In these runs, ORH's models assess millions of options before narrowing in on a preferred configuration. This takes the approach that all four stations could be simultaneously picked up and then placed in ideal locations to best serve the city core.

3.12 With four locations, the ideal sites are generally close to current stations (see Figure **3-1**):

- **Van Horne**: the ideal site is at Paris and Lloyd, 500m north of the current location. There would be challenges in finding available land in this area.
- **Minnow Lake**: the ideal site is 2km north of the current location, close to the junction of Kingsway and Falconbridge Rd. ORH therefore examined alternative options for locating this station (see below).
- **Leon** and **Long Lake**: the current stations are very close to the ideal sites, so there would be limited gain in relocating the stations.

3.13 Adopting this configuration, with all four stations relocated to the ideal sites, would improve 90th percentile response times by 48 seconds across career areas (see Appendix **C2**).

Ideal Locations for Career Stations

3.14 ORH used then used location modelling to determine the ideal location for each of the five current GSFS career stations independently from one another. In this case, each run assumed that all other GSFS stations were fixed in their current locations. For example, with Stations 2, 3, and 16, plus all volunteer stations, at their existing sites, where would be the ideal site for Station 1?

3.15 For the four stations in the city core, the ideal sites are very similar to the locations identified in the city core location modelling run described above. The ideal site for Station 16 (Val Therese) is 1km north of the current site at the bend in Old Highway 69.

3.16 Having identified the ideal locations, ORH then used simulation modelling to determine the impacts on response times (see Appendix **C3**). The modelled improvements to 90th percentile response times for the local fire beat, and across all career areas, are as follows:

- Station 1 (Van Horne): 42 seconds in Fire Beat 1; 22 seconds overall
- Station 2 (Minnow Lake): 6 seconds in Fire Beat 2; 20 seconds overall
- Station 3 (Leon): 6 seconds in Fire Beat 3; 1 seconds overall
- Station 4 (Long Lake): 6 seconds in Fire Beat 4; 1 second overall
- Station 16 (Val Therese): 6 seconds in Fire Beat 16; no change overall

3.17 Although there might not be funding or appetite for relocating all the career stations, the modelling outcomes provide a useful guide in considering potential future investment in emergency service stations.

Minnow Lake Station

3.18 Minnow Lake station is the only career station where the ideal site is a significant distance from the current station location, and this is also apparent in the ideal configuration of all career stations in the city core. As such, ORH undertook additional modelling runs to evaluate the potential for relocating the station.

3.19 In addition to modelling the relocation to the ideal site, ORH simulated the effects of moving the engine unit out of Minnow Lake to Van Horne station (see Appendix **C4**). This would have a detrimental impact on response times in the local area and GSFS-wide. While some of the increase to response times can be offset by having an additional engine at Van Horne, there is still a decline across the career response area.

Volunteer Stations

3.20 To demonstrate the potential value of each volunteer station, from a response time perspective, ORH modelled individually closing each station. This removes the response capability from the volunteer station, without enhancing volunteer numbers at other stations.

3.21 The intention here was to compare the relative impacts that each closure would have on response times, rather than making any recommendations to close stations. These outputs were used to understand the relative value of existing volunteer stations and to inform priorities for GSFS.

3.22 In practice, if GSFS opted to close a volunteer station, this would be driven by the aim to consolidate staff – the firefighters would then be able to respond as part of the neighbouring station's response complement. The combined options described below take account of such changes, and how future volunteer numbers may affect response.

Combined Options

3.23 Following consultation with GSFS, and taking account of emerging results from the modelling of paramedic services, ORH produced a series of potential changes to the station locations (see Appendix **C5a** and Figure **3-2**), including the following:

- Relocating Minnow Lake to the ideal site
- Consolidating Skead and Falconbridge into the ideal site for Garson

Figure 3-2: Fire Modelling: Step Changes

90th Percentile Impacts (Individual Changes)

Step	Description	Impact of Step Change	
		Across **Volunteer** Areas	Across **Career** Areas
1	Relocate Minnow Lake to the ideal location	-00:04	-00:13
2	Consolidate Skead and Falconbridge into ideal site for Garson	-00:06	00:00
3	Consolidate Val Caron and Hanmer at current site for Val Therese	-00:02	-00:01
4	Consolidate Vermillion Lake into Dowling	00:00	00:00
5	Consolidate Beaver Lake into Whitefish	00:00	00:00
6	Consolidate Wahnapitae and Coniston at ideal site	00:04	00:00
7	Consolidate Waters, Lively and Copper Cliff at Anderson Drive	00:06	00:00
8	Consolidate Azilda at Chelmsford	00:11	00:00

- Consolidating Val Caron and Hanmer at the current site for Val Therese
- Further consolidations, for individual stations or pairs of stations

3.24 Although the modelling for career stations has shown that there are potential response time improvements by relocating Van Horne station, there are no identifiable properties at the ideal sites to build a new Main Station. This option has therefore been excluded from the final modelling runs presented here.

3.25 If all steps are implemented this would reduce the number of stations from 23 to 13.

3.26 The proposed set of changes would lead to an improvement in the 90th percentile times across Greater Sudbury (see Appendix **C5b**). This is possible by relocating stations to ideal locations and by enhancing volunteer numbers at key stations through strategic consolidations.

3.27 Although the overall impact is positive, there are some fire beats that would be adversely affected, for example, Azilda and Falconbridge where the volunteers are consolidated at a nearby station. The set of potential changes includes ideal locations for Minnow Lake, Van Horne, Garson and Wahnapitae; if these sites are not available in practice, then the positive effects would be reduced.

3.28 The consolidation of Val Caron and Hanmer at the current site for Val Therese provides a small improvement to response times, which at first may appear counterintuitive. In evaluating this outcome, it is first important to note that the majority of first responses into the Val Caron and Hanmer fire beats are currently from Val Therese (see Appendices **B6a**, **B6b** and **B6b**). This is because the shorter assembly time for career units (1.5 minutes compared to 5.5 minutes) means that Val Therese can often reach an incident in these fire beats ahead of the volunteer units.

3.29 For example, if an incident occurs near Hanmer, the first responding unit on scene is typically from Val Therese, even though it must travel further, therefore the response time is unaffected by the proposed change (see Appendix **C5c**).

3.30 Furthermore, by consolidating the volunteer units at one location, this provides greater resilience in terms of the availability of volunteer firefighters to respond. Volunteers who live in Val Caron and Hanmer may need to travel to Val Therese to ride an engine, but there would now be a larger pool of volunteers to draw from at Val Therese.

3.31 Given the latest information from GSFS on volunteer firefighters, average numbers are similar in 2021 to 2020. With the proposed consolidations, the expected profile would have increased availability across the busies volunteer stations, therefore providing a more robust response (see Appendix **C5d**).

4 PARAMEDIC SERVICES HISTORICAL ANALYSIS

During the five-year sample period (January 1, 2016 to December 31, 2020) GSPS responded to an average of 73 calls per day. Demand increased steadily throughout the sample, by an average of 3.1% per year, except for 2020 which was at similar levels to 2019 due to the impacts of COVID-19.

Across the five-year sample GSPS were meeting their response time performance plan approved by the Council. Between 2016 and 2019 there were slight increases in time at scene and time at hospital, increasing again slightly in 2020 likely due to COVID-19.

GSPS plan to deploy 288 vehicle hours per day, or 2,016 vehicle hours per week. Based on analyzed responses, around 60% of responses by GSPS crews involved an ACP-staffed vehicle.

Overall utilization for GSPS ambulances was 29.5%, increasing to 38.8% when including time spent on P8 standby moves. This varies throughout the day, mirroring the peaks and troughs in demand. This also varies considerably by station and for day vs night.

Data Collection

4.1 GSPS provided ORH with five years (January 1, 2016 to December 31, 2020) of call and response data, which included all mobilizations to calls undertaken by GSPS vehicles. In a similar manner to the fire data, ORH used this data (see Appendix **A1a** for more detail) to build a quantitative understanding of GSPS operations.

4.2 The data fed into five main areas of data analysis:

- **Demand** = any call to which at least one unit has arrived at the scene (received a 'response') for the five-year sample
- **Response Performance** = measures the percentage of demand that receives a response within the target time frame (for example, 6, 8 or 10 minutes)
- **Call Components** = measures each 'component' of the call cycle separately (for example, time on scene and time at scene)
- **Resourcing** = the planned and actual vehicle deployments
- **Utilization** = the proportion of a vehicle's planned shift time that is spent responding and dealing with patient care + on Priority 8 standby moves (measured from time mobilized to posting clear)

Figure 4-1: Average Daily Demand by Area and Year

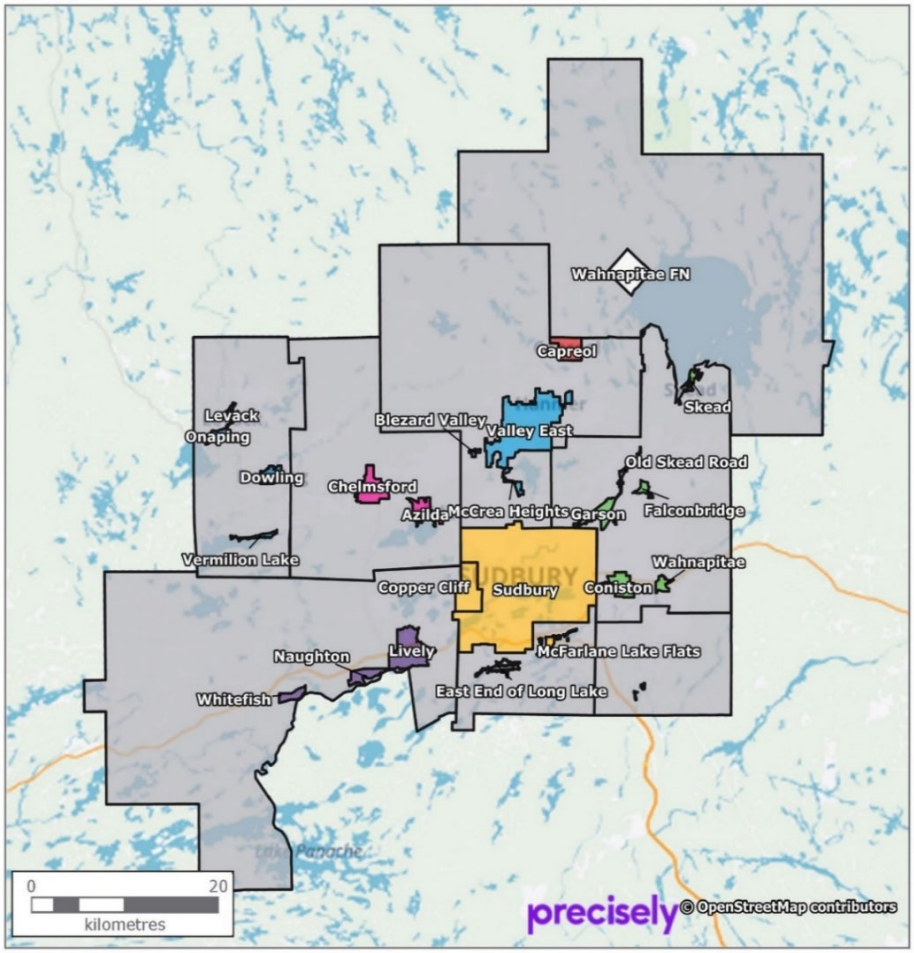
Jan 2016 to Dec 2020

Area	Average Daily Demand by Year (P1 to P4)					% of Total Demand	Avg Annual % Change (excl 2020)
	2016	2017	2018	2019	2020		
Sudbury	48.2	51.8	52.4	54.0	53.6	71.3%	3.8%
Rural	5.4	4.9	5.2	4.9	4.9	6.9%	-3.2%
Valley East	4.4	4.5	4.8	4.9	4.5	6.3%	3.7%
Rayside-Balfour	3.5	3.7	3.7	4.1	3.9	5.2%	5.5%
Nickel Centre	2.4	2.5	2.6	2.5	2.7	3.5%	0.8%
Walden	1.8	1.8	1.9	2.0	2.1	2.6%	3.3%
Onaping Falls	1.1	1.1	1.3	1.3	1.2	1.6%	7.3%
Capreol	1.1	1.0	1.2	1.0	1.0	1.5%	-2.5%
Out of Area	0.7	0.7	0.8	0.6	0.8	1.0%	-5.7%
Total	**68.9**	**72.1**	**74.0**	**75.5**	**74.8**	**100.0%**	**3.1%**
Annual % Change	-	4.7%	2.6%	2.0%	-1.0%		

Out of Area = demand responded to by GSPS outside the geographical boundary of Greater Sudbury.

Areas sorted from highest to lowest demand in 2020. Rural area includes demand at Airport.

'Rural' is defined according to the Hemson population boundaries used for demand projections



Data Analysis

Demand

4.3 During this the 5-year sample period, GSPS responded to an average of 73 calls per day. Priority 1 to Priority 4[1] (P1 to P4) demand increased steadily throughout the sample period (see Appendix **D1a**), except for 2020 which was at similar levels to 2019 due to the early stages of COVID-19.

4.4 P3 and P4 demand categories drove the overall increases, accounting for 63% and 23% of all demand respectively. P1 and P2 demand remained at very low, stable levels throughout the sample. While overall 2020 demand did not surpass 2019 levels, this was almost entirely due to initial COVID-19 lockdowns in April and May; by the second half of the year demand by month was generally higher than the same month for the previous year.

4.5 The core Sudbury area accounted for the highest proportion of the total demand (around 71%), and Capreol the lowest (2.5%). Demand increased by an average of 3.1% per year, excluding 2020 (see Figure **4-1**). Some areas saw a decreasing annual change within their own area, though this is mainly due to these areas having small volumes of demand (and therefore more sensitive to small fluctuations in demand) rather than a true decreasing trend.

4.6 A more detailed geographical distribution of P4 demand is mapped in Appendix **D1b**.

4.7 The priority of call in ORH's analysis is based on dispatch priority, the information known to Central Ambulance Communications Centre (CACC) staff and the assigned paramedic crew at the point they are assigned to the call. Each call is also assigned a return priority; the priority of the patient when they are ready to be transported from the scene of the demand onward to hospital. While 63% of demand is initially assigned a P4 dispatch priority, only 9% are assigned a P4 return priority (see Appendix **D1c**). The demand that is not assigned a return priority are typically those that do not get transported to hospital.

4.8 Almost all demand in Greater Sudbury is transported to a singular location: Health Sciences North.

Response Performance

4.9 Mandated reporting of response performance to the Ministry of Health (MoH) calculates City-wide performance from the time the first vehicle is notified until the first vehicle arrival on scene. Targets are set by Canadian Triage Acuity Scale (CTAS) code but not by priority code; calls are not assigned a CTAS code until the first paramedic arrives on scene.

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[1] See definitions in Glossary in Appendix **G**

Figure 4-2: Analyzed Response Performance

Jan 2016 to Dec 2020

Area	P4 Performance		
	6-Minute	8-Minute	10-Minute
Sudbury	55.2%	83.7%	94.3%
Valley East	43.7%	72.8%	90.6%
Rural	20.2%	21.9%	37.6%
Rayside-Balfour	46.7%	71.2%	85.6%
Nickel Centre	35.8%	35.0%	51.9%
Walden	69.7%	79.6%	86.6%
Onaping Falls	8.9%	55.2%	67.0%
Capreol	69.7%	85.9%	92.6%
Overall	**50.8%**	**74.9%**	**86.7%**

Note: Areas sorted from highest to lowest demand

Performance is only calculated using paramedic data, so may not directly align with GSPS-reported figures which include community performance (fire, police, public access defibrillators, etc). This figure shows performance for P4 incidents, across all CTAS codes.

Figure 4-3: Analyzed Average Call Component Times (hh:mm:ss)

Jan 2016 to Dec 2020

Call Component	Measured Between	Dispatch Priority: **P1**	Dispatch Priority: **P2**	Dispatch Priority: **P3**		Dispatch Priority: **P4**	
				Return Priority: **P3**	Return Priority: **Other**	Return Priority: **P4**	Return Priority: **Other**
Call Time to Vehicle Activation	T0 - T2	07:45:21	18:23:29	00:14:56	00:06:06	00:03:08	00:02:17
Mobilisation Time	T2 - T3	00:02:14	00:03:20	00:01:33	00:01:21	00:01:11	00:01:07
Travel Time to Scene	T3 - T4	00:06:00	00:10:59	00:09:35	00:08:09	00:06:03	00:05:32
Time At Scene	T4 - T5	00:17:31	00:18:59	00:18:11	00:16:26	00:20:02	00:18:34
Travel Time to Hospital	T5 - T6	00:13:25	00:21:15	00:15:01	00:12:21	00:10:35	00:13:00
Time at Hospital	T6 - T7	00:13:59	00:19:03	00:27:04	00:24:05	00:31:33	00:26:11
Arrival to Patient Transfer	*T6 - PTOC*	*00:13:11*	*00:17:29*	*00:20:07*	*00:17:41*	*00:22:07*	*00:19:30*
Patient Transfer to Clear	*PTOC - T7*	*00:00:44*	*00:01:17*	*00:06:30*	*00:06:09*	*00:09:14*	*00:06:41*
Occupied Time	T3 - T7/T13	00:44:47	01:09:16	01:10:10	00:47:04	01:09:04	00:49:27
Average Daily Demand		6.5	3.5	4.3	12.7	6.3	39.8

4.10 Across the five-year sample, GSPS were meeting their CTAS performance targets except for Sudden Cardiac Arrest (SCA) patients (see Appendix **D2a**). The performance plan is reported for Greater Sudbury as a whole, though ORH has split this out by area in the appendix. Performance is only calculated using paramedic data, so may not directly align with GSPS-reported figures which include community performance (fire, police, public access defibrillators, etc).

4.11 ORH also measures 6-, 8- and 10-minute response performance for P4 demand (see Figure **4-2**) as this is what is known at the point of dispatch and is how the CACC staff decide how to prioritize calls; ORH therefore needs to set up the model based on priority rather than CTAS to reflect this. As with the CTAS performance, there is significant variation by area.

4.12 CTAS performance has been relatively stable over the last five years (see Appendix **D2b**), with some CTAS codes increasing slightly (CTAS 1, 2 and 5) and some decreasing slightly (CTAS 3 and 4). SCA appears to fluctuate significantly, though this is mainly due to the low volumes of calls in this category.

Call Components

4.13 ORH calculates each component of the call cycle separately and analyzes these to understand how they may vary (see Figure **4-3**). Average occupied time[2] for P4 calls (dispatched and returned as P4) was around 70 minutes, with time at hospital accounting for 31 minutes of this on average. Those calls that were dispatched as P4 but not returned as P4 ('Return: Other') include calls that did not end up being transported to hospital, hence the overall average occupied time being around 20 minutes lower.

4.14 There is a similar profile for the P3 call components. P1 and P2 calls tended to spend less time at hospital than P3 and P4 calls.

4.15 Between 2016 and 2019 there were increases in time at scene (from 17m54s to 18m48s) and time at hospital (from 24m01s to 28m14s) for P4 incidents. In 2020 time at scene increased further (to 20m00s), as did time at hospital (to 30m30s) though these changes are likely related specifically to COVID-19 (see Appendix **D3**).

Resources and Resource Use

4.16 GSPS plan to deploy 288 vehicle hours per day, or 2,016 vehicle hours per week (see Appendix **D4a**).

4.17 Each of the five outer stations (Capreol, Chelmsford, Levack, Val Therese and Waters) deploy a single vehicle 24 hours per day 7 days per week; Capreol and Levack are Paramedic Response Units (PRUs) rather than ambulances, but all

[2] The time spent on calls from the point of mobilisation to becoming clear and ready for the next call (or ready to return to base).

Figure 4-4: Resourcing and Utilization Summary

Station	Skill Level / Vehicle Type		Average Daily Vehicle Hours		Utilization (P1 to P4 + P8)	
			Planned	Actual	Day (07:00 to 19:00)	Night (19:00 to 07:00)
HQ	ACP/PCP	Amb	168	168.3	49.6%	40.5%
Chelmsford	ACP	Amb	24	23.5	23.2%	16.5%
Val Therese	ACP	Amb	24	24.0	24.7%	17.4%
Lively (Waters)	ACP	Amb	24	24.0	16.4%	9.7%
Levack	ACP	PRU	24	23.8	12.3%	9.1%
Capreol	ACP	PRU	24	24.0	13.0%	10.4%
Overall		Amb	240	239.8	42.0%	31.7%
Overall		PRU	48	47.7	12.6%	9.7%
Overall			288	287.5	37.5%	27.7%

are Advanced Care Paramedics (ACPs). From the Headquarters in Azilda ('main base'), there is a maximum of nine vehicles deployed between 14:00 and 17:00 and a minimum of five vehicles between 02:00 and 05:00; these are a mix of ACP-staffed and Primary Care Paramedic (PCP)-staffed ambulances.

4.18 Based on analyzed responses, around 60% of responses by GSPS crews involved an ACP-staffed vehicle (see Appendix **D4b**).

4.19 In evaluating the current use of resources, it is of interest to measure how well front-line resources are utilized. Utilization here is defined as the proportion of a vehicle's planned shift time that is spent responding and dealing with patient care (measured from time mobilized to posting clear). This therefore excludes time spent on rest breaks, returning to base (except when including P8 moves), and other duties such as completing paperwork.

4.20 Overall utilization for GSPS ambulances was 29.5%, increasing to 38.8% when including time spent on P8 standby moves. This varies throughout the day, mirroring the peaks and troughs in demand (see Appendix **D4c**). This also varies considerably by station and for day vs night (see Figure **4-4**).

4.21 There was an average of 85.2 standby moves[3] initiated per day, resulting in 60.5 per day being completed (arriving at the intended coverage location) and 24.8 being cancelled (see Appendix **D4d-i**). When completed, these moves take an average of approximately 14 minutes, compared to an average of approximately 8 minutes when cancelled.

4.22 For completed moves, this has been further broken down by station, mobilizing area and arriving area in Appendix **D4d-ii** (for the top 5 most frequent combinations per station).

[3] Standby moves are journeys made for coverage purposes, either between stations or from a hospital (after completing a call) to a station. This includes vehicles leaving HQ at the start of their shift and returning at the end of their shift.

Figure 5-1: 2021 Base Position Response Performance

Area	P4 Performance		
	6-Minute	8-Minute	10-Minute
Sudbury	58.1%	83.6%	94.2%
Valley East	37.7%	74.4%	90.7%
Rural	8.5%	21.6%	38.1%
Rayside-Balfour	44.5%	68.2%	84.0%
Nickel Centre	21.8%	35.1%	54.3%
Walden	49.5%	75.3%	84.2%
Onaping Falls	41.2%	56.9%	68.4%
Capreol	82.4%	87.2%	91.9%
Overall	**50.8%**	**75.2%**	**87.1%**

Note: Areas sorted from highest to lowest demand

Performance is only calculated using paramedic data, so may not directly align with GSPS-reported figures which include community performance (fire, police, public access defibrillators, etc). This figure shows performance for P4 incidents, across all CTAS codes.

5 PARAMEDIC SERVICES MODELLING OUTCOMES

As for the fire service modelling, ORH populated its paramedic services models with inputs derived from the historical analysis and travel times were calibrated against actual journeys. With a close alignment between modelled and analyzed positions, the models could therefore be used to examine the impacts of a variety of 'what if' modelling scenarios.

The modelling first focused on options for current resources with current demand, including identifying ideal locations through a 'blank canvas' approach and testing moving current resources to the identified ideal locations. The modelling found that current resources are already deployed at the most ideal locations; that is, there were no significant improvements observed in overall performance when moving resources.

Options with future demand and additional resources were then evaluated, including:

- The impact of demand projections in 2031 in a 'Status Quo' position
- Identifying the ideal locations for prioritizing potential new resources (based on overall improvement vs area improvements)
- Testing the impact of removing non-urgent transfers

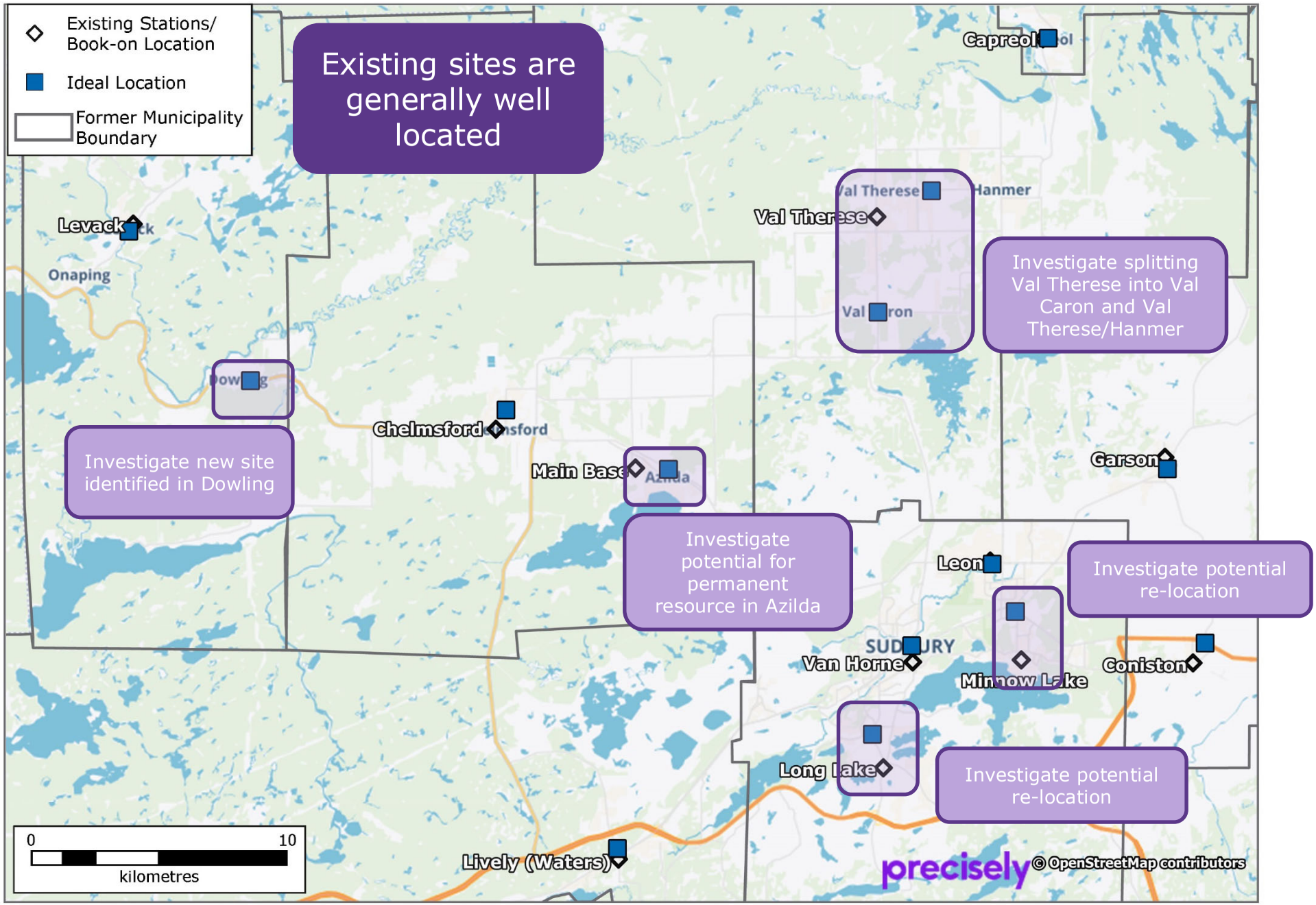
Model Validation and Base Position

5.1 A virtual replica of GSPS operations was created within AmbSim by populating inputs using parameters derived from the analysis presented in Section 4. In addition to this data, ORH developed a detailed travel time model of the Region using commercially available data calibrated against information on actual journey times.

5.2 The model was validated by comparing a wide range of outputs from the model, such as response performance, vehicle workload (utilization) and hospital workload, to the corresponding analyzed figures for these factors based on actual data (see examples in Appendices **E1a** and **E1b**). The comparison of outputs, including others not listed here, showed that the model replicated historical operations accurately and therefore was appropriate to use for different 'what if' modelling scenarios.

5.3 The model was initially set up to reflect GSPS operations during 2019 to provide a robust and up-to-date sample for model validation; however, it was then possible to switch to a more up-to-date Base Position for 2021.

Figure 5-2: 14 Location Blank Canvas Approach



5.4 In line with projections, demand was uplifted slightly in the model and the vehicle shift pattern was updated to reflect the planned resource levels. No other model parameters were changed as it was assumed that these would remain at analyzed levels.

5.5 In the Base Position, overall P4 8-minute response performance, when measured from time assigned, was 75.2% (see Figure **5-1**).

Current Demand and Current Resources

Location Modelling

5.6 ORH's location model was used to assess the configuration of existing station locations. The model uses a genetic algorithm that evaluates large numbers of potential configurations, resulting in an ideal solution.

5.7 The location criteria used in all cases was to minimize the mean response time to P4 demand. All P4 demand was used as modelling against only SCA and CTAS1 demand (the highest priority calls) would not provide enough demand. Only travel time to demand is accounted for in the location modelling process; the exact impact of changing resource deployments within a changed station configuration is fully evaluated by simulation modelling.

5.8 A series of blank canvas location runs were modelled (for 8 through 14 sites), which indicated that existing stations were generally well located; that is, many of the ideal sites were found close to existing stations. Blank canvas modelling identifies ideal locations and takes no account of current station locations or other constraints.

5.9 The results of the blank canvas runs were broadly nested (see Appendices **E2a** to **E2d**), that is, the ideal 14 included the ideal 13, which included the ideal 12, and so on. A further 15th site was later identified at Whitefish.

5.10 The sites found in the 14-site configuration (see Figure **5-2**) were taken forward for testing within AmbSim and several options were identified for further investigation:

- Investigate the potential re-location of Minnow Lake and Long Lake (see Appendix **E3a** for full results)
- Investigate splitting Val Therese into two sites: at Val Caron and Val Therese/Hanmer (see Appendix **E3b**)
- Investigate a new site identified in Dowling (see Appendix **E3c**)
- Investigate the potential for a permanent resource in Azilda (see Appendix **E3d**).

Figure 5-3: Testing Changes to Resourcing

Scenario	P4 Performance		
	6-Minute	8-Minute	10-Minute
Base Position - Overall Performance	50.8%	75.2%	87.1%

Difference from Base Position:

Move to Optimal Minnow Lake and Long Lake	0.6%	0.1%	0.0%
Move Core Resource to Val Caron + Move Val Therese to VT/Hanmer	0.0%	-1.0%	-0.4%
Move Core Resource to Levack + Move Levack PRU to Dowling	-2.7%	-2.6%	-1.7%
Keep Core Resource at Azilda	-3.3%	-2.8%	-1.7%
Move Capreol to Fire Station	-0.2%	-0.1%	-0.1%

5.11 In each of these scenarios no additional resources were added so, with the exception of re-locating Minnow Lake and Long Lake, each involved moving a resource from the Core out to the relevant area. For example, in the third scenario a core resource is moved to Levack and the Levack PRU is moved to Dowling.

5.12 The modelling therefore found that current resources are already deployed at the most ideal locations; that is, there were no significant improvements observed in overall performance when moving resources (see Figure **5-3**). Some local area improvements were noted (for example, improvements to Onaping Falls and Rayside-Balfour in the third scenario) but with a net degradation in overall performance due to the reduction of cover in the Core. Small improvements were observed when moving to the ideal Minnow Lake and Long Lake locations, so this would be worthwhile given the improvements found in the fire service modelling.

5.13 Based on the outcomes of the fire service modelling, AmbSim was also used to test the impact of moving Capreol resources to the fire station (see Appendix **E3e**). This resulted in minimal overall change to response performance, though 6-minute response performance in Capreol would fall from 82.4% to 72.7%; even with this degradation, the Capreol area still has the highest 6-minute performance when compared to the other areas.

Moving Main Base to Lasalle/Notre Dame

5.14 At present, all of the vehicles in the core start (book-on) and end their shift at the main base in Azilda. At the start of their shift, these vehicles travel to the most appropriate core location ready to respond to calls. ORH was asked to test the impact of moving the book-on location for the core GSPS vehicles from Azilda to a site at the junction of Lasalle Boulevard and Notre Dame Avenue.

5.15 This is not a scenario that GSPS currently plans to take forward, but was modelled purely to provide an indication of the potential impacts. For both Sudbury and Nickel Centre, 6-, 8-, and 10-minute P4 performance would improve slightly, leading to a small overall increase (see Appendix **E3f**). Rayside-Balfour performance decreases as, with vehicles starting their shift in Azilda, some natural coverage is provided if a call comes in around shift start times; this is lost if vehicles start their shift at Lasalle/Notre Dame.

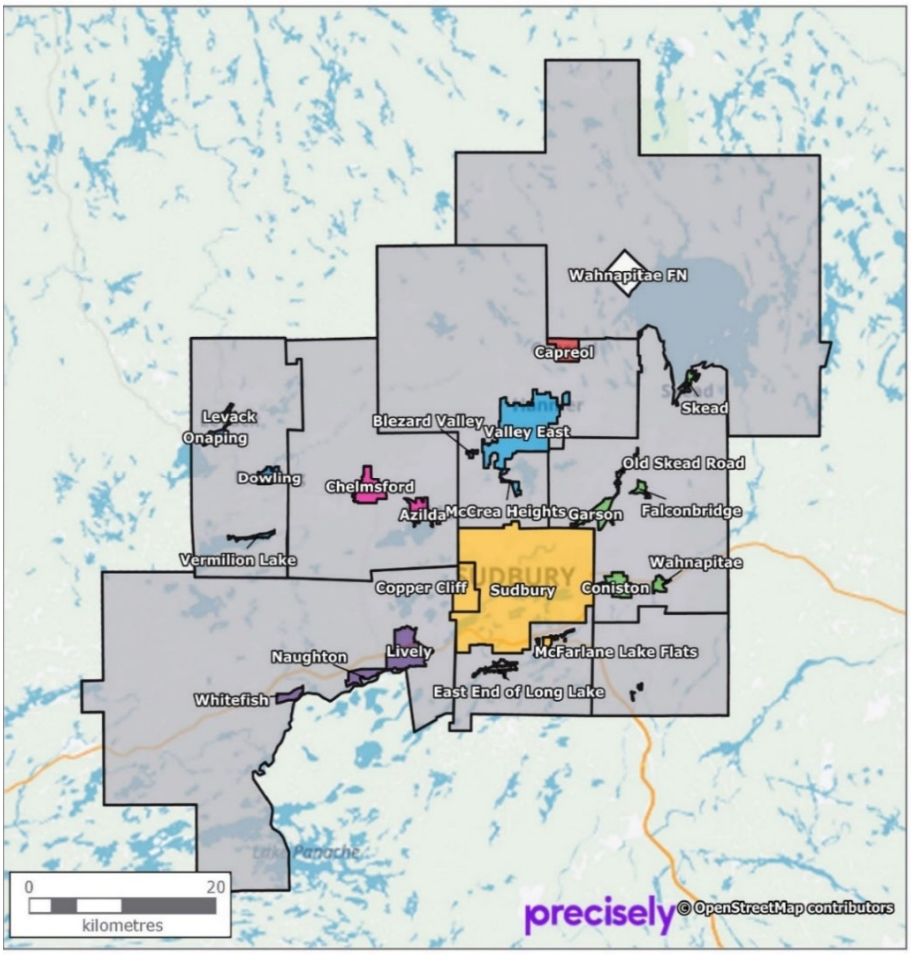
5.16 On average, a total of approximately 7.5 hours are lost per day travelling between the main base in Azilda and the core area sites (accounting for travel time at the start and end of each vehicle's shift). This would be reduced to approximately 3.5 hours between Lasalle/Notre Dame and the core area sites.

Medical Tiered Response Impacts

5.17 The career fire stations, as well as the Capreol and Levack volunteer stations, have medical tiered response arrangements with GSPS to automatically respond to medical calls if the call involves the absence of breathing or airway

Figure 5-4: Hemson Population Projections

Hemson Forecast Total Population City of Greater Sudbury by Former Local Municipality		
	2016	**2031**
Capreol	3,010	3,080
Nickel Centre	13,540	14,000
Onaping Falls	3,970	4,000
Rayside-Balfour	11,820	11,990
Rural	*20,010*	*20,130*
Sudbury	86,870	88,880
Valley East	21,040	21,840
Walden	5,870	6,480
City of Greater Sudbury	**166,130**	**170,400**



obstruction, the absence of pulse, or an unconscious patient (excluding seizures). A fire response may also be requested if the primary paramedic response is significantly delayed for calls involving chest pain or shortness of breath, uncontrolled bleeding or seizures.

5.18 ORH was asked to model the impact on response performance improvements if fire service responses were included to these tiered calls for the differing options around Minnow Lake locations. The P4 6-minute response performance improvements were as follows (~3 calls per week responded to by Minnow Lake fire station):

- 0.2% with Minnow Lake fire and paramedics at current site
- 0.6% with Minnow Lake fire at ideal site (paramedics at current site)
- 1.0% with Minnow Lake fire and paramedics at ideal site

5.19 ORH also tested the impact of introducing medical tiered responses for three of the volunteer fire stations. The P4 10-minute response performance improvement within each volunteer station catchment were as follows: (~0.2 calls per week responded to by each volunteer fire station):

- 0.4% for Dowling
- 0.5% for Wahnapitae
- 0.6% for Whitefish

Demand Projections

Methodology

5.20 ORH estimated demand in yearly intervals from 2021 to 2031 to inform the demand levels for the ten-year plan.

5.21 The approach used is based on the underlying hypothesis is that demand is strongly related to the population age profile; the older a person is, the more likely they are to make multiple requests for paramedic assistance. This method also takes account of the fact that there is an underlying trend for increasing demand in all age groups (which can be observed historically) due to unquantifiable factors such as the overall level of health provision, public expectation, etc, which, it is assumed, will continue into the foreseeable future.

5.22 An overview of the approach taken is provided in Appendix **E4a**.

Figure 5-5: Demand Rates per 1000 Population

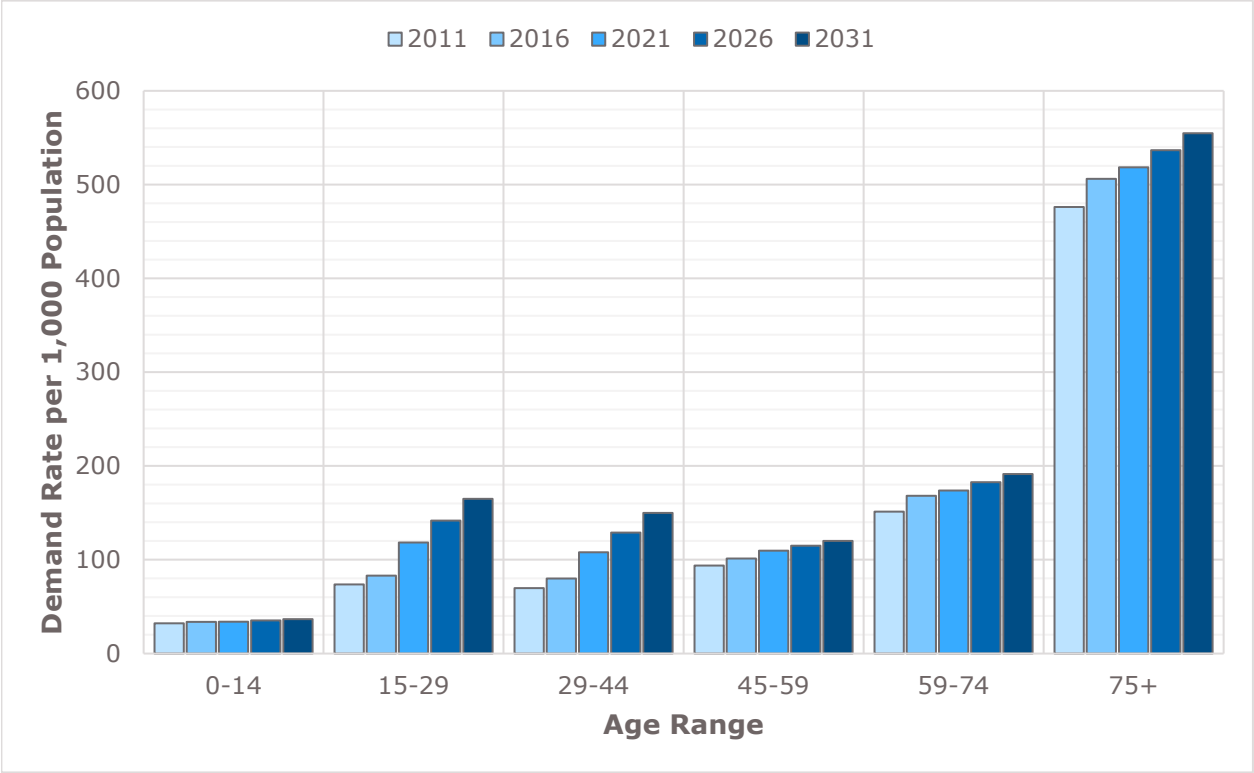
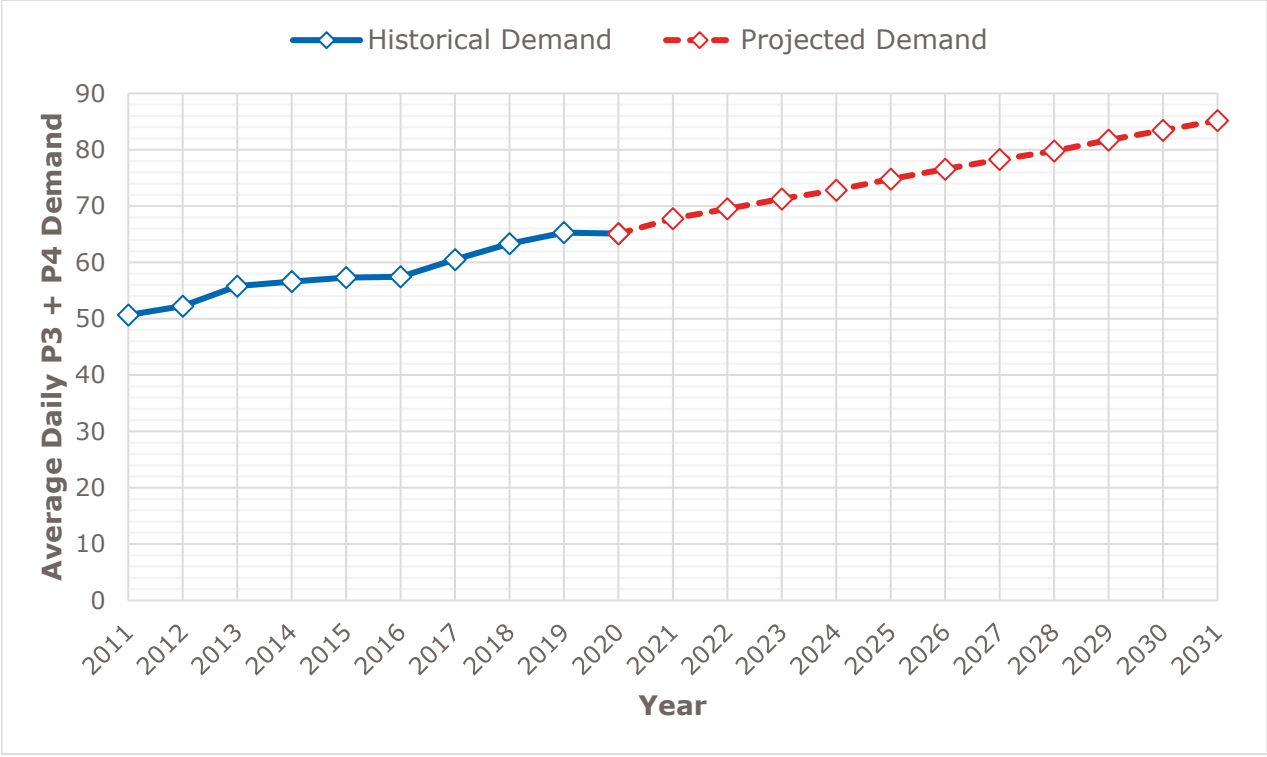


Figure 5-6: Overall Population Projection



Population

5.23 Population data by year, age and area for each year from 2011 to 2031 inclusive was required in order to calculate the demand projections. This data was provided by Hemson and was split into the geographical areas shown in Figure **4-1**.

5.24 Population in 2016 was around 166,000 across Greater Sudbury (see Figure **5-4**); Sudbury accounted for the highest proportion of the total population (52.3%), and Onaping Falls the lowest (2.4%). By 2031, total population is expected to increase to around 170,000, with an average annual increase of 0.2%.

5.25 There is a consistent age profile across all areas of Greater Sudbury (see Appendix **E4b**), with the 45-59 age group accounting for the highest proportion of population in 2016. Comparing the 2016 and 2031 profiles, there is a clear shift into the 59-74 and 75+ age groups in all areas.

Demand

5.26 Demand data by year, age and area was also required in order to calculate the demand projections for each year from 2011 to 2020 inclusive.

5.27 There is a clear correlation between age and demand, with the older age groups generating the most demand. In 2020, demand generated by those aged 75 years or older accounted for 32.4% of all P3 and P4 demand (compared to this age group accounting for 8.7% of the total population).

5.28 As a result, demand rates per 1,000 population are substantially higher for the '75+' age group than for other age groups. Demand rates have been increasing over the past ten years in all age groups and are therefore predicted to continue increasing to 2031 (see Figure **5-5**).

5.29 P3 and P4 demand in Greater Sudbury is expected to increase by 2.4% per year between 2021 and 2031, from 65.1 demand per day to 85.2 demand per day (see Figure **5-6**); this is similar to the increase observed between 2011 and 2031 of 2.9% per year. All areas are projected to increase.

5.30 The compounding impact of ageing population and increasing demand rates leads to demand increasing at a higher rate than population. Although there was a slight dip in the number of calls GSPS responded to in 2020 due to COVID-19, this is not expected to impact the onward projections.

Figure 5-7: 2031 'Status Quo' Response Performance

2031 'Status Quo' Perfomance

Area	P4 Performance		
	6-Minute	8-Minute	10-Minute
Sudbury	55.0%	79.8%	91.4%
Valley East	36.0%	70.8%	87.3%
Rural	8.4%	21.1%	36.6%
Rayside-Balfour	41.9%	64.7%	81.2%
Walden	44.4%	67.3%	75.9%
Nickel Centre	16.9%	26.7%	44.7%
Capreol	79.6%	83.3%	89.0%
Onaping Falls	39.8%	54.8%	65.9%
Overall	**47.9%**	**71.3%**	**83.6%**

Difference from 2021 Base Position

P4 Performance		
6-Minute	8-Minute	10-Minute
-3.1%	-3.8%	-2.8%
-1.7%	-3.6%	-3.4%
-0.1%	-0.5%	-1.5%
-2.6%	-3.5%	-2.9%
-5.1%	-8.0%	-8.3%
-4.9%	-8.4%	-9.5%
-2.7%	-3.9%	-2.9%
-1.4%	-2.1%	-2.5%
-3.0%	**-3.9%**	**-3.5%**

Note: Areas sorted from highest to lowest demand

Future Demand and Additional Resources

Status Quo Trajectory

5.31 To provide meaningful context for future resource recommendations, it was important to create a 'Status Quo' position through to 2031. The demand projections of a 2.4% average increase per annum were applied to the Base Position, and no other operational changes were made.

5.32 By 2031, overall P4 6-minute response performance is expected to decrease by 3.0% (see Figure **5-7**), while 8-minute and 10-minute performance is expected to decrease by 3.9% and 3.5% respectively. The biggest performance impacts were observed for Sudbury, Walden and Nickel Centre; as core resources in Sudbury get busier, vehicles in Walden and Nickel Centre are more likely to be pulled into this area.

5.33 Modelling yearly intervals between 2021 and 2031 showed similar reductions in performance year-on-year (see Appendix **E5**).

Ideal Locations for New Resources

5.34 ORH investigated the ideal locations for new resources over the next ten years, as these would be required to offset the projected demand increases and negative impacts on response performance outlined in the previous sub-section.

5.35 Firstly, ORH looked to prioritize new resources with a focus on making sub-area performance improvements; that is, aiming to improve equity of performance between the areas of Greater Sudbury. In this way, new resources should be prioritized as follows:

(a) Adding an ambulance in the core

(b) Adding an ambulance at the ideal Val Caron site and moving Val Therese resources to the ideal Val Therese/Hanmer site

(c) Converting the Levack PRU to an ambulance and adding a PRU at Dowling

(d) Adding an ambulance (day only) to Lively (Waters)

5.36 The impact on performance for 2031 is given in Figure **5-8**. When compared to the 2021 base position improvements can be seen in all areas, particularly for 6-minute response performance in Onaping Falls, Rayside-Balfour and Valley East. Overall P4 6-minute response performance improves by 6.4%.

5.37 A range of variations to the scenario described above were also modelled (see Appendix **E6**). For example, testing the impact on performance if, instead of adding any new resources in Valley East, the PRU at Capreol was converted to an ambulance.

Figure 5-8: 2031 with New Resources Response Performance

(Focus on Area Improvements)

2031 with New Resources

Area	P4 Performance		
	6-Minute	8-Minute	10-Minute
Sudbury	62.4%	86.4%	95.5%
Valley East	66.1%	83.8%	93.7%
Rural	12.3%	28.2%	46.1%
Rayside-Balfour	54.6%	77.9%	90.5%
Walden	54.9%	82.5%	90.8%
Nickel Centre	27.5%	44.0%	63.4%
Capreol	82.4%	87.8%	92.4%
Onaping Falls	60.3%	75.4%	86.0%
Overall	**57.2%**	**79.8%**	**90.1%**

Difference from 2021 Base Position

P4 Performance		
6-Minute	8-Minute	10-Minute
4.3%	2.8%	1.3%
28.4%	9.3%	3.0%
3.9%	6.6%	8.1%
10.1%	9.7%	6.4%
5.4%	7.1%	6.6%
5.7%	8.8%	9.2%
0.1%	0.6%	0.5%
19.1%	18.5%	17.7%
6.4%	**4.6%**	**3.0%**

Note: Areas sorted from highest to lowest demand

Figure 5-9: 2031 with New Resources Response Performance

(Focus on Overall Improvements)

2031 with New Resources

Area	P4 Performance		
	6-Minute	8-Minute	10-Minute
Sudbury	67.7%	90.0%	96.9%
Valley East	67.0%	84.6%	94.3%
Rural	10.5%	25.4%	44.0%
Rayside-Balfour	45.0%	68.7%	84.4%
Walden	46.5%	70.8%	80.1%
Nickel Centre	39.0%	61.2%	79.8%
Capreol	82.7%	88.2%	92.7%
Onaping Falls	40.8%	56.1%	67.3%
Overall	**59.9%**	**81.1%**	**90.3%**

Difference from 2021 Base Position

P4 Performance		
6-Minute	8-Minute	10-Minute
9.6%	6.4%	2.7%
29.3%	10.2%	3.6%
2.0%	3.8%	5.9%
0.5%	0.6%	0.4%
-3.0%	-4.5%	-4.2%
17.2%	26.1%	25.6%
0.3%	1.0%	0.9%
-0.4%	-0.8%	-1.0%
9.0%	**5.9%**	**3.2%**

Note: Areas sorted from highest to lowest demand

Walden performance falls due to increasing demand and the fact that no additional resources have been added in this area.

5.38 ORH also looked at how resources should be prioritized with a focus on overall performance improvements only; that is, where can resources be added to give the biggest overall performance improvement, regardless of individual area impacts. In this case, the new resources should be prioritized as follows:

(a) Adding an ambulance in the core

(b) Adding an ambulance at the ideal Val Caron site and moving Val Therese resources to the ideal Val Therese/Hanmer site

(c) Adding a second ambulance in the core

(d) Adding a third ambulance in the core

5.39 The impact on performance for 2031 is given in Figure **5-9**. When compared to the 2021 base position, overall P4 6-minute response performance improves by 9.0%. Significant improvements can be seen in Nickel Centre, Sudbury and Valley East, but there is little improvement in the other areas. Walden performance falls due to increasing demand and the fact that no additional resources have been added in this area.

Removing Non-Urgent Transfers

5.40 In 2019, GSPS undertook an average of 7.9 non-urgent transfers per day; approximately 10% of all demand. In the future, GSPS may look for alternative means of transport for these patients rather than utilizing the emergency fleet.

5.41 ORH therefore tested the performance impact of removing this demand from the emergency fleet, creating increased availability to respond to emergency demand. This was modelled against the 2031 Status Quo Trajectory scenario. Overall P4 6-minute response performance improved by 1.1%, with the largest impacts observed in Nickel Centre and Sudbury (see Appendix **E7**). This is equivalent to approximately 240 incidents per year that were not previously receiving a response within six minutes but would under this scenario.

Figure 6-1: Development Plan

Modelling Order	Description
1	Relocate Minnow Lake to the ideal location (both fire and paramedic services)
2	Consolidate Skead and Falconbridge into ideal site for Garson
3	Consolidate Val Caron and Hanmer at current site for Val Therese
4	Relocate the paramedic unit in Capreol to the current fire station
5	Consolidate Vermilion Lake into Dowling
6	Consolidate Beaver Lake into Whitefish
7	Consolidate Wahnapitae and Coniston at ideal site (both fire and paramedic services)
8	Consolidate Waters, Lively and Copper Cliff at Anderson Drive (both fire and paramedic services)
9	Consolidate Azilda at Chelmsford (keep paramedic services book on at current site)

The modelling order for the development plan is based on the priorities purely from a modelling perspective (highest positive impact to greatest negative impact, in terms of response times)

Implementation Phase Order	Description
1	Relocate the paramedic unit in Capreol to the current fire station
	Consolidate Vermilion Lake into Dowling
	Consolidate Beaver Lake into Whitefish
2	Relocate Minnow Lake to the ideal location (both fire and paramedic services)
	Consolidate Skead and Falconbridge into ideal site for Garson
3	Consolidate Val Caron and Hanmer at current site for Val Therese
	Consolidate Waters, Lively and Copper Cliff at Anderson Drive (both fire and paramedic services)
4	Consolidate Wahnapitae and Coniston at ideal site (both fire and paramedic services)
	Consolidate Azilda at Chelmsford (keep paramedic services book on at current site)

The implementation phase order for the development plan takes account of feasibility and investment costs, in addition to the modelled impacts on response times

6 RECOMMENDATIONS

Key Messages

6.1 Based on both the GSFS and GSPS outcomes, the following key messages can be summarized:

- Existing paramedic stations are generally well located, particularly for current resources.
- However, fire station locations are currently not appropriately balanced in the community, and many lack the desired number of available staff.
- Minnow Lake (career fire + paramedic site) could be relocated to improve performance. Although the modelling for career stations has shown that there are potential response time improvements by relocating Van Horne station, there are no identifiable properties at the ideal sites to build a new Main Station. This option has therefore been excluded from the final position.
- Some volunteer fire stations could be consolidated to avoid known capital renewal needs without compromising response times: Vermilion Lake, Beaver Lake, Skead, Falconbridge, Val Caron, Hanmer and Copper Cliff.
- Future changes to fire incident numbers and population growth in the community do not support these stations being sufficiently staffed moving forward. Consolidating stations would provide a more reliable and robust staffing model for GSFS in the future.
- Further consolidations could take place subject to changes to the fire station configuration: Waters, Lively and Copper Cliff at a new site on Anderson Drive; Wahnapitae and Coniston at the ideal site; and Azilda at Chelmsford (paramedic services would remain at Azilda).
- Where new or renovated stations are recommended (due to relocations) there is opportunity to modernize and improve the functionality of these sites, including for paramedic services.
- No other significant response time improvements can be achieved simply by relocating existing resources, for either fire or paramedic services, without also making some other investment/enhancement in the service.

Development Plan

6.2 To assist CGS with the implementation of the recommendations, ORH has created a development plan indicating the priorities from a modelling perspective (highest positive impact to greatest negative impact, in terms of response times) alongside a suggested implementation order, that takes account of feasibility and investment costs (see Figure **6-1**).

6.3 The implementation phase order is as follows:

- Phase 1: relocate the paramedic unit in Capreol to the current fire station, consolidate Vermillion Lake fire station into Dowling, and consolidate Beaver Lake fire station into Whitefish
- Phase 2: relocate Minnow Lake to the ideal site (both fire and paramedic services), and consolidate Skead and Falconbridge fire stations into ideal Garson site
- Phase 3: consolidate Val Caron and Hanmer fire stations into Val Therese, and consolidate Waters, Lively and Copper Cliff fire stations at Anderson Drive (paramedic services at Waters and Lively would also be consolidated at this new site)
- Phase 4: consolidate Wahnapitae and Coniston paramedic and fire stations at the ideal site, and consolidate Azilda fire station into Chelmsford (paramedic services would remain at Azilda)

6.4 The final set of recommended locations is mapped in Appendix **F1**.

Site Search Maps for Ideal Locations

6.5 In projecting the station changes required for the next ten years, there will be uncertainty in the exact locations for new station sites. This will depend on available land and other planning and logistical considerations which will have to be assessed nearer the year scheduled for the change.

6.6 'Site search' maps were therefore generated for each of the recommended sites mentioned above (see Appendix **F2**). The resulting maps are based on the calculated demand coverage for hundreds of alternative locations in the area around the existing stations, with interpolation used for areas between each point. For example, if we know the coverage score for two points that are 250m apart on the same road, we can calculate the coverage from the midpoint of these two locations as the average score.

6.7 The colours on the map represent the suitability of moving the station to each point, with the best locations shown in red. Around the ideal locations, good siting areas are shown in red, and 'poor' areas (in a relative sense compared with ideal) in dark blue, with a graduation between good and poor.

6.8 Site search maps have not been provided for sites that are recommended to stay at their existing location but can be provided separately if required.

Appendices

A	Methodology
B	Fire Service Historical Analysis
C	Fire Service Modelling Outcomes
D	Paramedic Services Historical Analysis
E	Paramedic Service Modelling Outcomes
F	Recommendations
G	Glossary

City of Greater Sudbury

Station Location Review

Final Report

ORH/CGS/1

PLAN. PREPARE. **PERFORM.**

A Methodology

A1 Methodology

- **A1a** Data Overview
- **A1b** Analysis Framework
- **A1c** Benefits of Modelling
- **A1d** Modelling Approach

A2 Model Overview

- **A2a** Optimization
- **A2b** Simulation

City of Greater Sudbury Fire and EMS

Data Overview

Fire data Collection

Area	Notes
Workload Data	CGS supplied complete call data for January 1, 2016 to December 31, 2020
Historical Data	Overviews of historic call and performance data plus information on station changes during the sample
Geographical Data	Station locations Service boundaries for fire beats AVL data was not available for fire responses, however the paramedic services data provided a suitable proxy for variation in speeds by road type
Vehicle Availability Data	Not available: Agreed to work on assumption that career vehicles are 100% available; ORH to analyze volunteer response capability

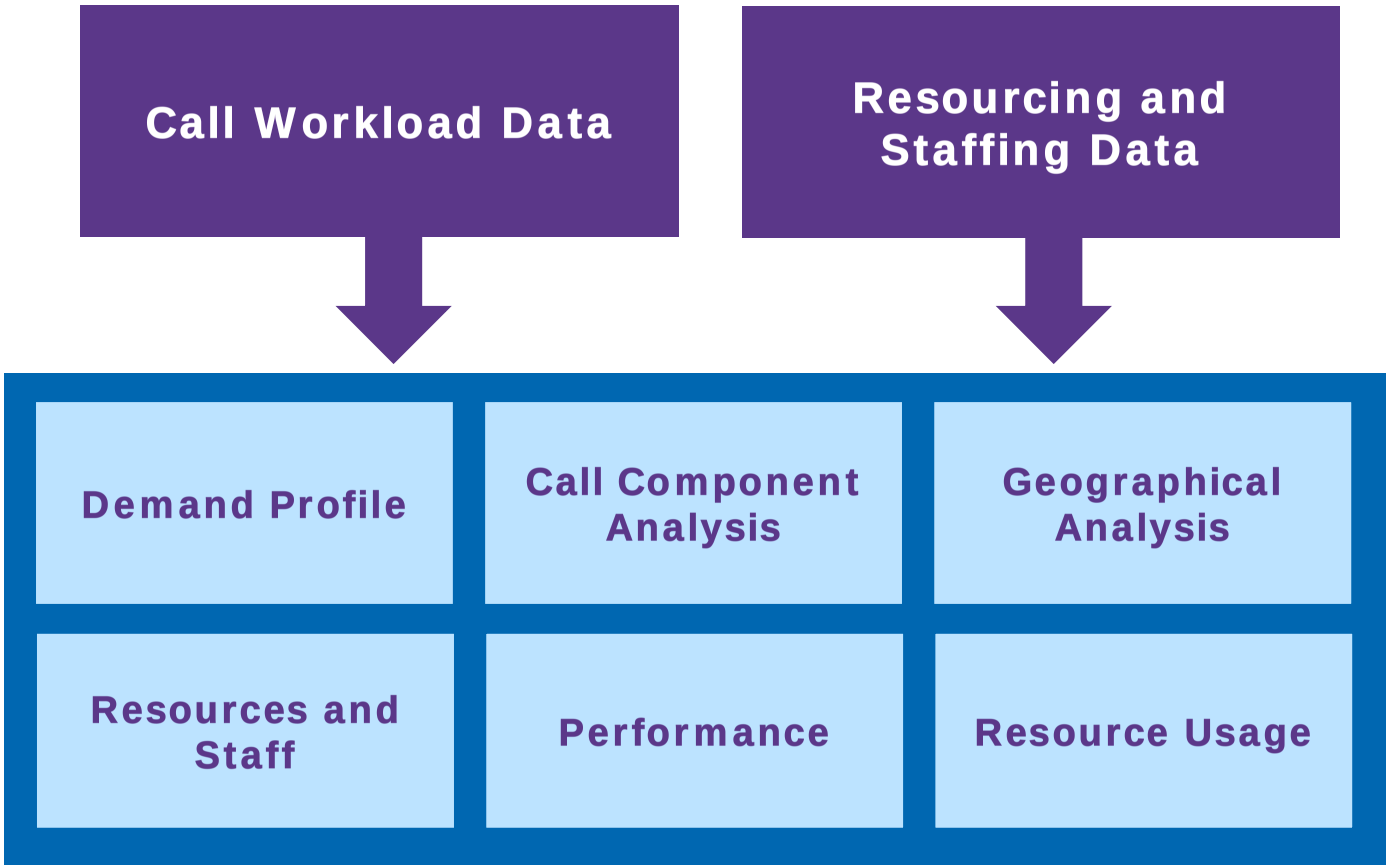
Paramedic Data Collection

Area	Notes
Workload Data	Complete incident call (from ADRS) was supplied for January 2016 to March 2021, inclusive.
Historical Data	Monthly call and performance reports Operational changes reflected in the System Status Plans Historical call data from 2011 to 2020 (with location, age group, and gender) to support the creation of demand projections
Population Data	Hemson population projections by age and area
Geographical Data	Station, response post, and hospital locations Automatic Vehicle Location (AVL) data to calibrate a travel time network Service boundaries
Resource Data	Planned and actual vehicle deployments Vehicle downtime data was not available, which is not unusual; this was not critical to the review. Vehicle numbers and types Meal break arrangements Resource dispatch model End-of-shift procedures Staff establishments Staff abstractions
Hospital Data	Additional information on hospital specialties and divert protocols is not applicable here as the overwhelming majority of patients are transported to a single location: Sudbury Health Sciences North ED

A1b

City of Greater Sudbury EMS

Analysis Framework



Benefits of Modelling

Dynamic systems require sophisticated models: reflect real-world variation

Test multiple ideas quickly, in a safe environment

Identify ideal solutions and compare to feasible options

Overcome limitations of data analysis: assess multiple factors

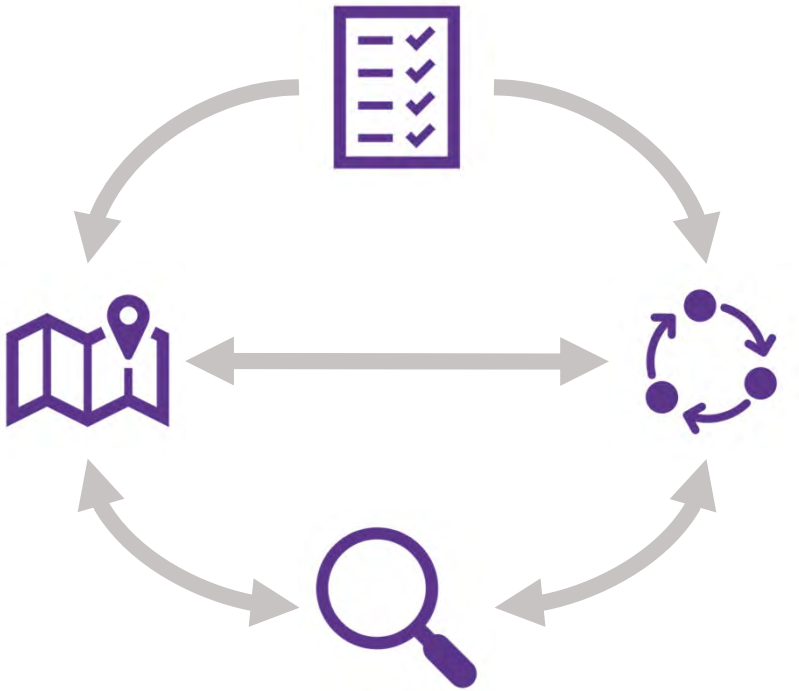
Evidence-based outcomes and priorities for consultation

City of Greater Sudbury EMS

Modelling Approach

Validation

Ensuring the model accurately reflects the current situation



Optimization

Identifying the “best” solutions given known constraints

Simulation

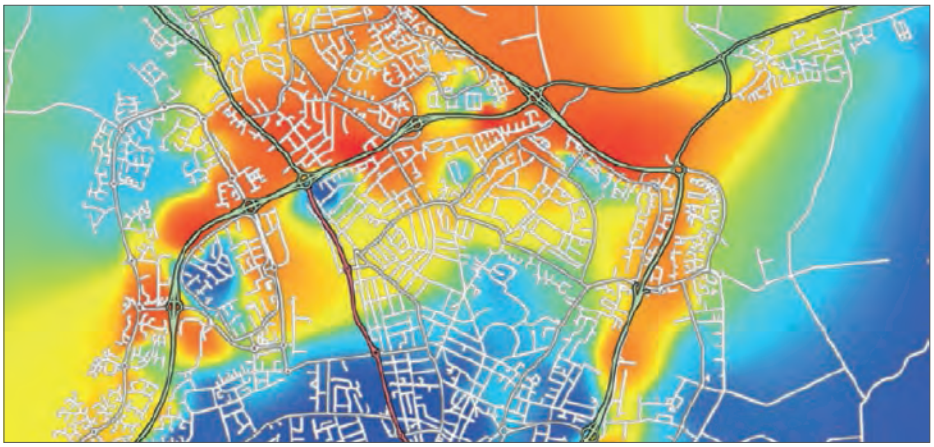
Predicting future service behaviour and answering “what if” questions

Sensitivity

Checking that identified solutions are robust and future-proof

Optimization

ORH Approach



KEY BENEFITS

- Proven approach successfully applied for hundreds of emergency services
- Identify optimal sites for stations and standby points
- Highlight the best locations within a local area
- Take account of specific targets, objectives or operational constraints
- Practical support for implementation

Optimizing response locations for emergency services

THE CHALLENGE

Identifying and evaluating optimal locations for stations and resources is a highly complex procedure. For an example scenario where an emergency service wants to place 20 resources across 15 stations, there are over 1.4 billion potential combinations to consider. If the service is not restricted to existing locations, the numbers become astronomical. Some of the questions that emergency services need to answer include:

- Where is the optimal site to relocate an old station, merge existing stations or build an additional station?
- How many locations are required to meet response standards?
- Where should stations be located to meet future demand?
- What is the optimal balance between stations and standby points?

> ***ORH determined optimum locations for new and existing fire stations using accurate modelling tools, and helped us to identify the most efficient use of our resources.***
>
> Assistant Chief Officer,
> UK Fire & Rescue Service

ORH'S APPROACH

ORH's unique and powerful program, OGRE, optimizes the locations of sites, quickly determining which options best achieve the objectives. In order to do this it uses a sophisticated genetic algorithm to assess configurations.

ORH designed OGRE to answer a range of optimization questions, taking account of issues that are specific to each emergency service. The bespoke optimization process addresses the following:

- **Response standards:** minimize average response times or maximize the number of incidents within specific timeframes?
- **Risk factors:** assess coverage to incident locations or apply a risk-based approach that can include multiple factors?
- **Resources:** the types of vehicle that contribute to coverage, and whether multiple responders are required?
- **Restrictions:** are there any fixed current locations, and can new sites be located anywhere within the area?

To deliver solutions, ORH's experienced consultants work closely with clients to specify their requirements, understand the constraints and iteratively develop outcomes. Using simulation modelling, we fully test all potential options to quantify the impacts on response times and vehicle workload.

The outcomes from the process include:

- Service-wide maps to identify optimal sites and compare to current response locations.
- Detailed impacts on response performance and vehicle workload.
- Site-search maps that highlight the best options for potential sites within the local area.

Simulation

ORH Approach

KEY BENEFITS

- Produces evidence-based solutions to a range of planning questions
- Supports management decision-making when presenting a case for change
- Provides a risk-free environment to quickly test many different options
- Quantifies the impacts on performance of potential changes to service delivery

Answering complex planning questions using simulation modelling

THE CHALLENGE

All emergency services must make difficult decisions about how to deploy resources to provide the best response to the public, factoring in financial pressures, time constraints and other competing issues. Before implementing changes to operations, emergency services should take an evidence-based approach in order to understand the potential impacts on response performance and workload. ORH's market-leading simulation models enable ambulance, fire and police services to make informed decisions in a risk-free environment.

> ***ORH modelled the deployment of ambulance operational resources to assist the organization in achieving contracted response times. ORH's work also informed property investment decisions for ambulance depots over the next eight years. The approach was robust and relevant to our specific circumstances.***
>
> Chief Executive Officer,
> Australian Ambulance Service

ORH'S APPROACH

ORH's models replicate the key characteristics of an emergency service, and predict future behaviour and performance under a variety of different scenarios. We analyze service data in detail to understand current behaviour and provide inputs for the model in terms of demand, resources and response strategies.
The model is also supplied with detailed travel time data, calibrated against actual journeys. Vehicles within the model respond to incident demand according to proximity and dispatch protocols.

We have designed each of our models to examine the different operational practices across all emergency services, for example:

- **Ambulance:** clinical specialities at medical facilities and changes to vehicle and skill mix.
- **Fire:** specialist appliances and multi-vehicle dispatch strategies.
- **Police:** mobile patrols and the balance of emergency and non-emergency incidents.

ORH's experienced consultants use the simulation models to address a wide range of 'what if?' planning questions, including:

- How will future demand changes affect performance?
- Where are the best locations for adding or removing resources?
- What impacts do new response or dispatch protocols have on vehicle workload?

Crucially, the models can assess questions individually or in combination to give a full picture of the impacts on response performance and utilization. Detailed outputs include performance by time of day, maps of response times and the breakdown of workload by incident type.

B Fire Service Historical Analysis

B1 Demand

- **B1a** Demand by Date
- **B1b** Demand by Month
- **B1c** Demand by Category

B2 Demand Profile

- **B2a** Demand by Hour
- **B2b** Demand by Weekend/Weekday

B3 Demand Maps (B3b to B3f follow format of B3a)

- **B3a** Overall Demand
  - B3a-i CGS-wide
  - B3a-ii Sudbury
- **B3b** Fire Demand
- **B3c** Non Fire Demand
- **B3d** Medical Demand
- **B3e** Alarm Ringing Demand
- **B3f** Vehicle Collision Demand

B4 Volunteer Firefighter Availability by Station

- **B4a** Volunteer Firefighters by Station
- **B4b** Volunteer Availability by Year

B5 Workload by Station

B6 Unit Workload

- **B6a** Unit Workload – Career
- **B6b** Unit Workload – Volunteer
- **B6c** Unit Workload by Firebeat

B7 Workload by Category

- **B7a** Workload by Category – Career
- **B7b** Workload by Category – Volunteer

B Fire Service Historical Analysis

B8 Units Arriving at Scene

- **B8a** Units Arriving by Category
- **B8b** Units Arriving at Fire Incidents

B9 Alarm Processing Time

B10 Assembly Time

- **B10a** By Category by Year – Career Units
- **B10b** By Category by Hour – Volunteer Units
- **B10c** By Category by Year – Volunteer Units

B11 Travel Time to Scene

- **B11a** By Category by Year
- **B11b** By Hour by Year

B12 Crew Response Time

- **B12a** Average Crew Response Time
  - B12a-i Career Units
  - B12a-ii Volunteer Units
- **B12b** 90th Percentile Response Time
  - B12b-i Career
  - B12b-ii Volunteer
- **B12c** Crew Response Distribution
  - B12c-i Cumulative Distribution – Career
  - B12c-ii Cumulative Dist. - Career units into Career Fire Beats
  - B12c-iii Cumulative Distribution – Volunteer
- **B12d** Average Crew Response Time

B13 Time at Scene

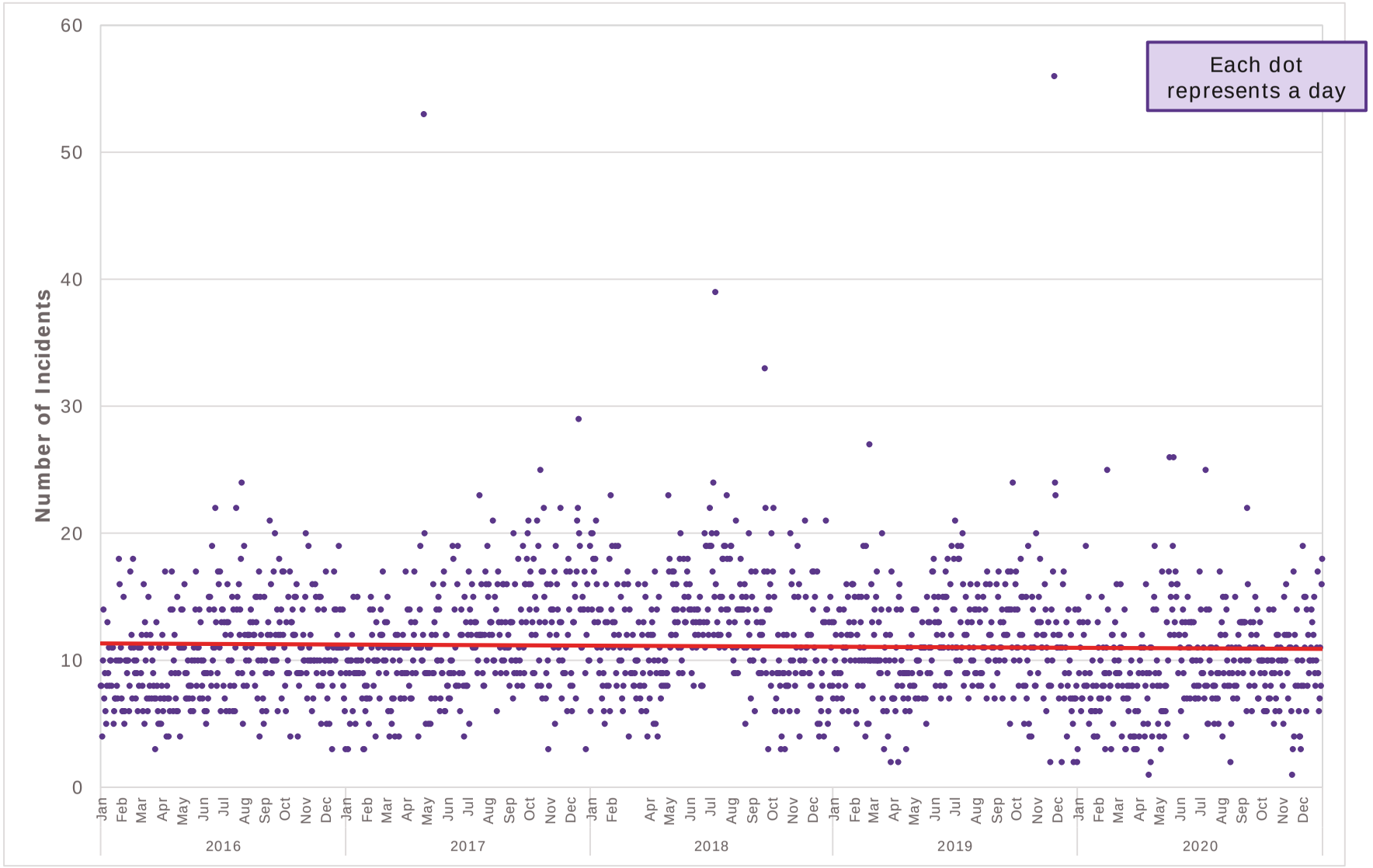
- **B13a** By Category by Year – Career
- **B13b** By Category by Year - Volunteer

B1a

City of Greater Sudbury Fire

Incident Demand by Date

January 2016 - December 2020

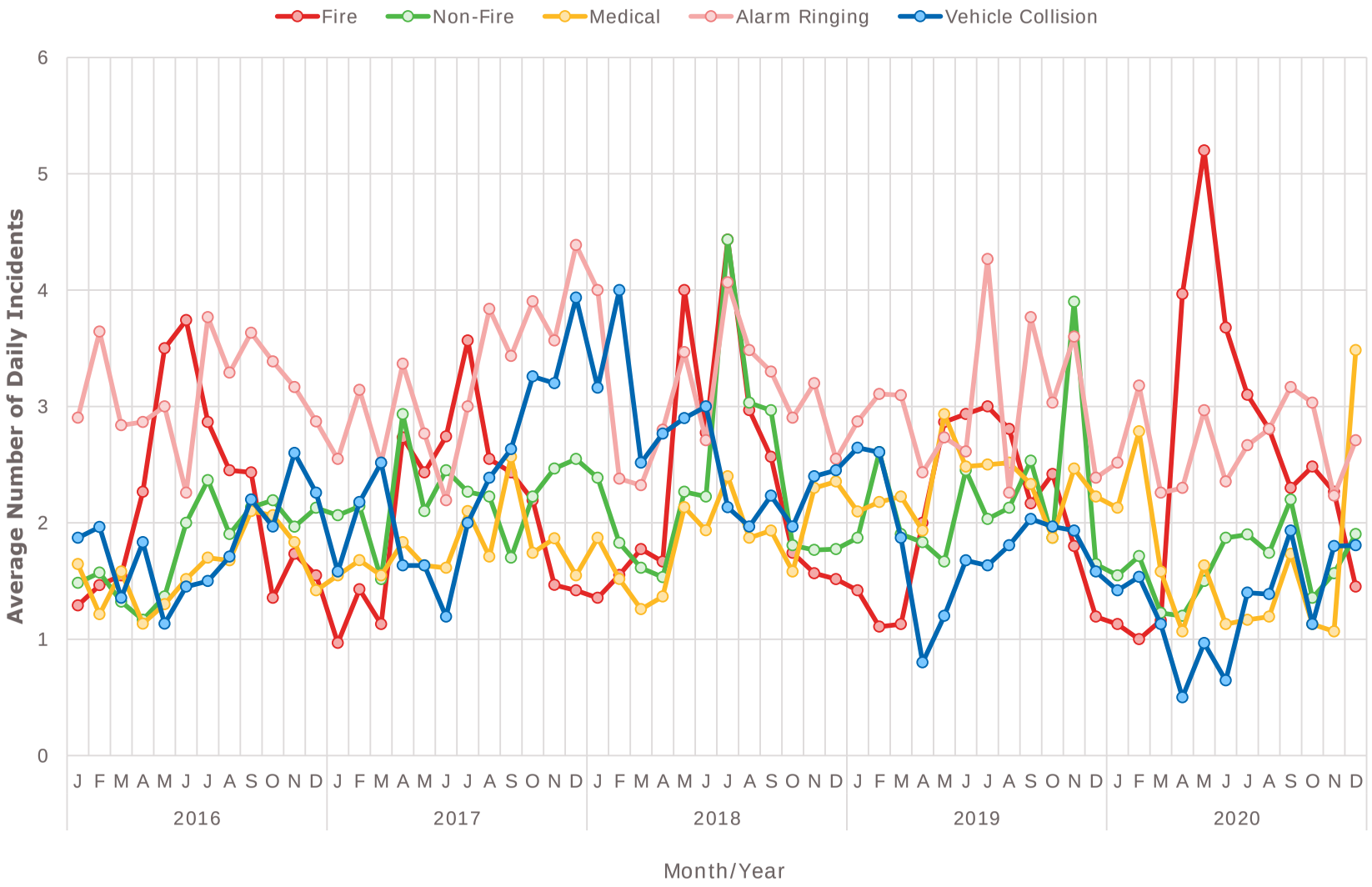


B1b

City of Greater Sudbury Fire

Incident Demand by Month

January 2016 - December 2020



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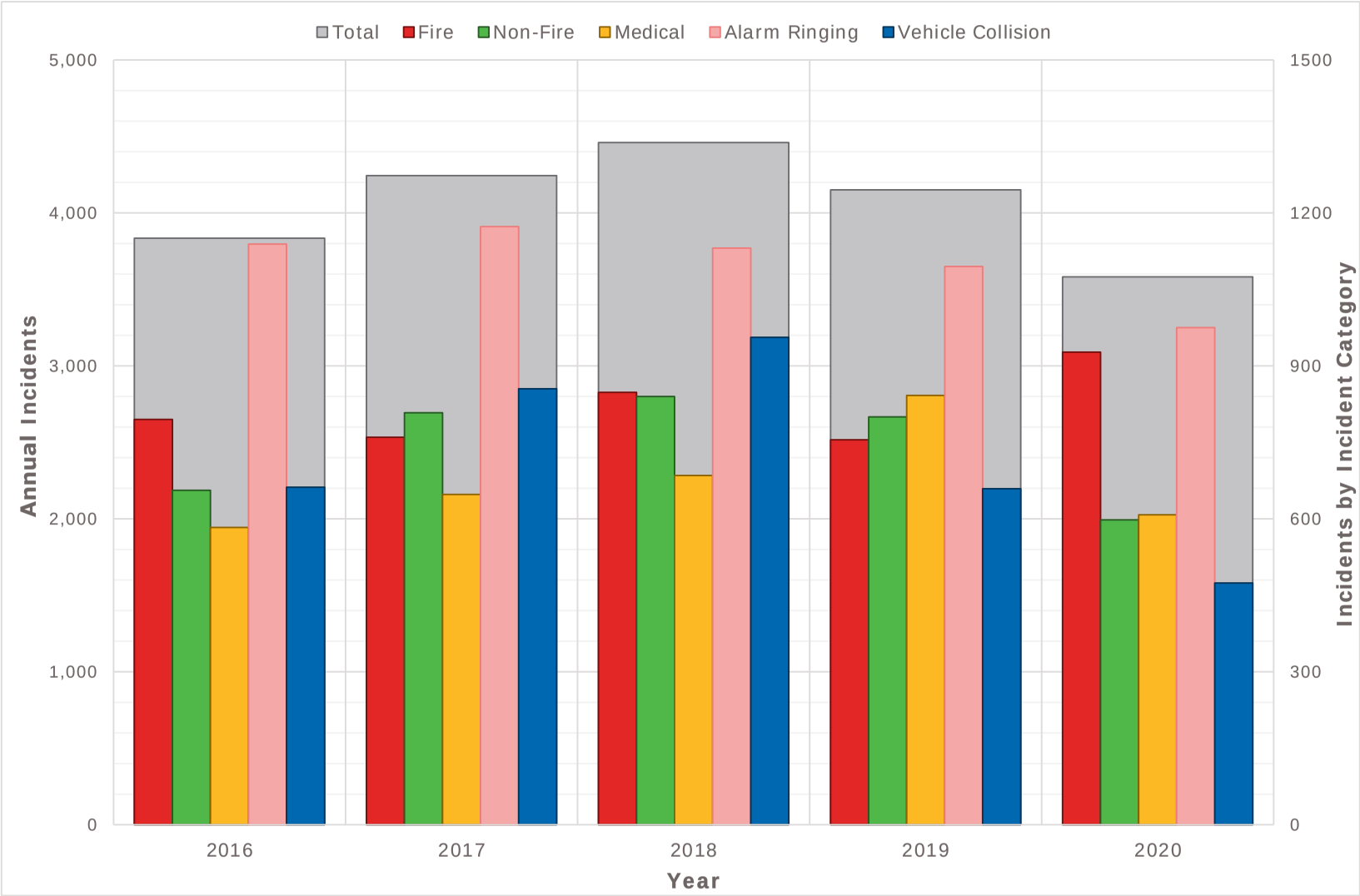
City of Greater Sudbury Fire

Incident Demand by Year and Category

January 2016 - December 2020

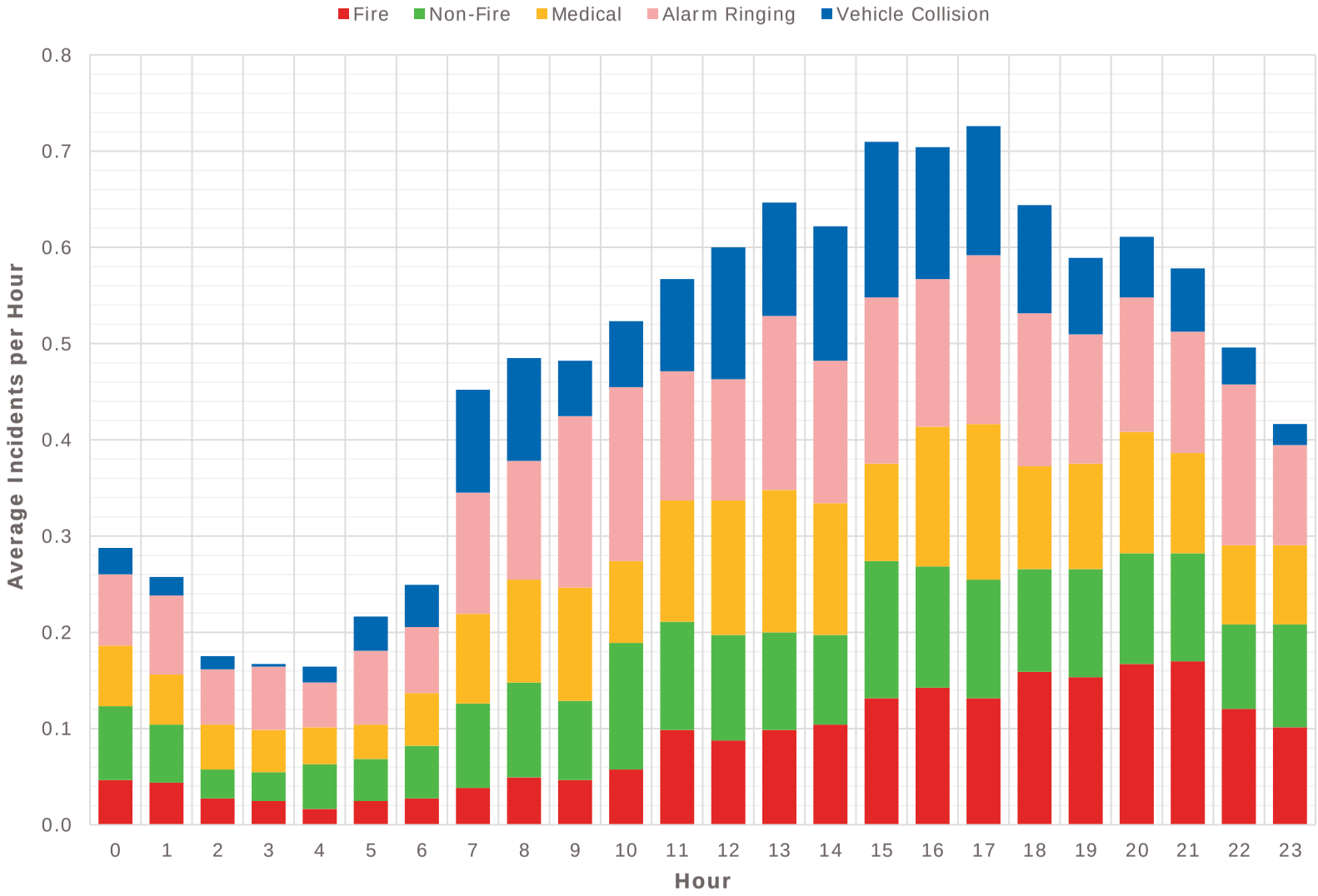


B2a

City of Greater Sudbury Fire

Incident Demand Profile by Hour

January 2016 - December 2020

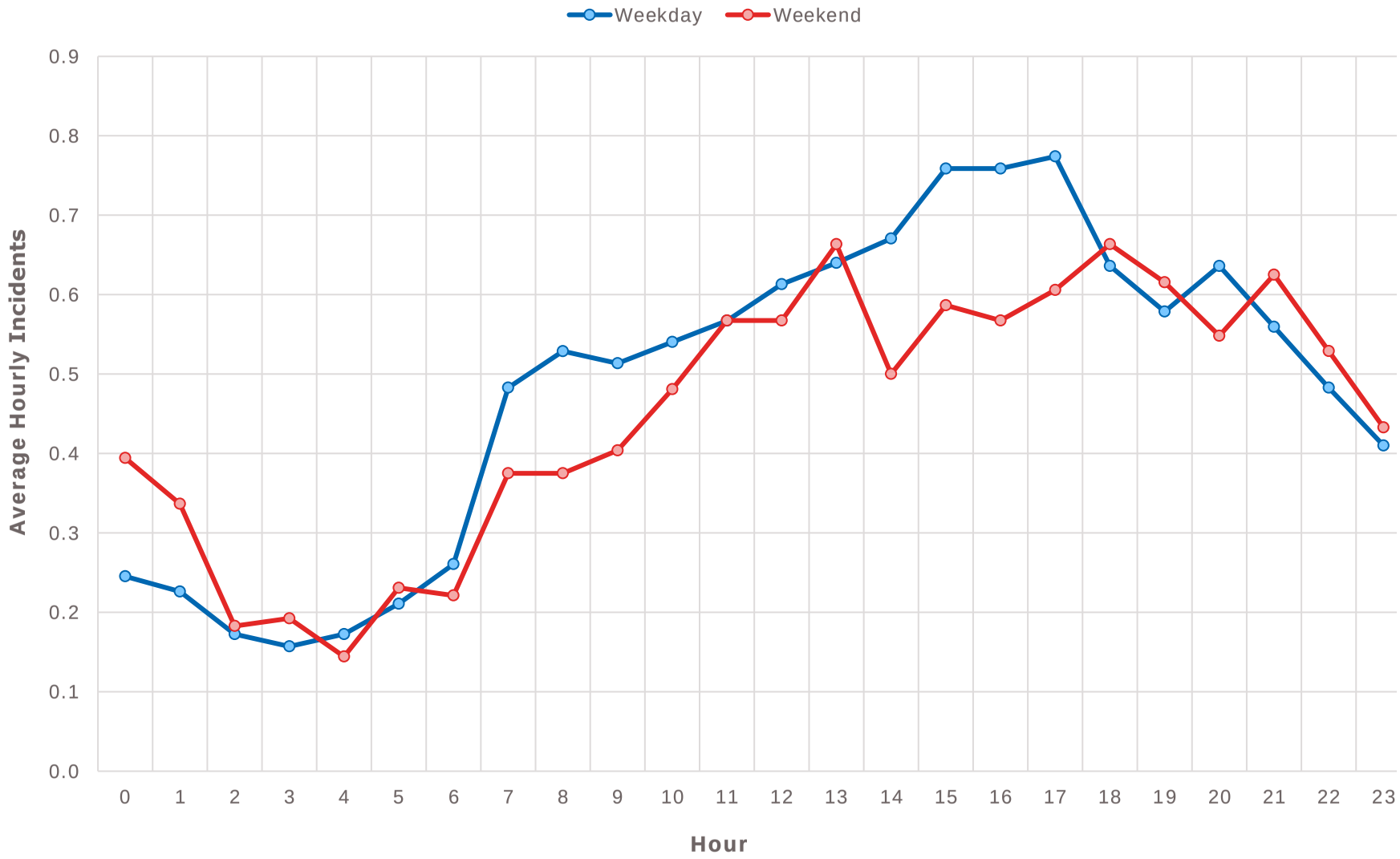


B2b

City of Greater Sudbury Fire

Weekend vs Weekday Incident Demand Profile

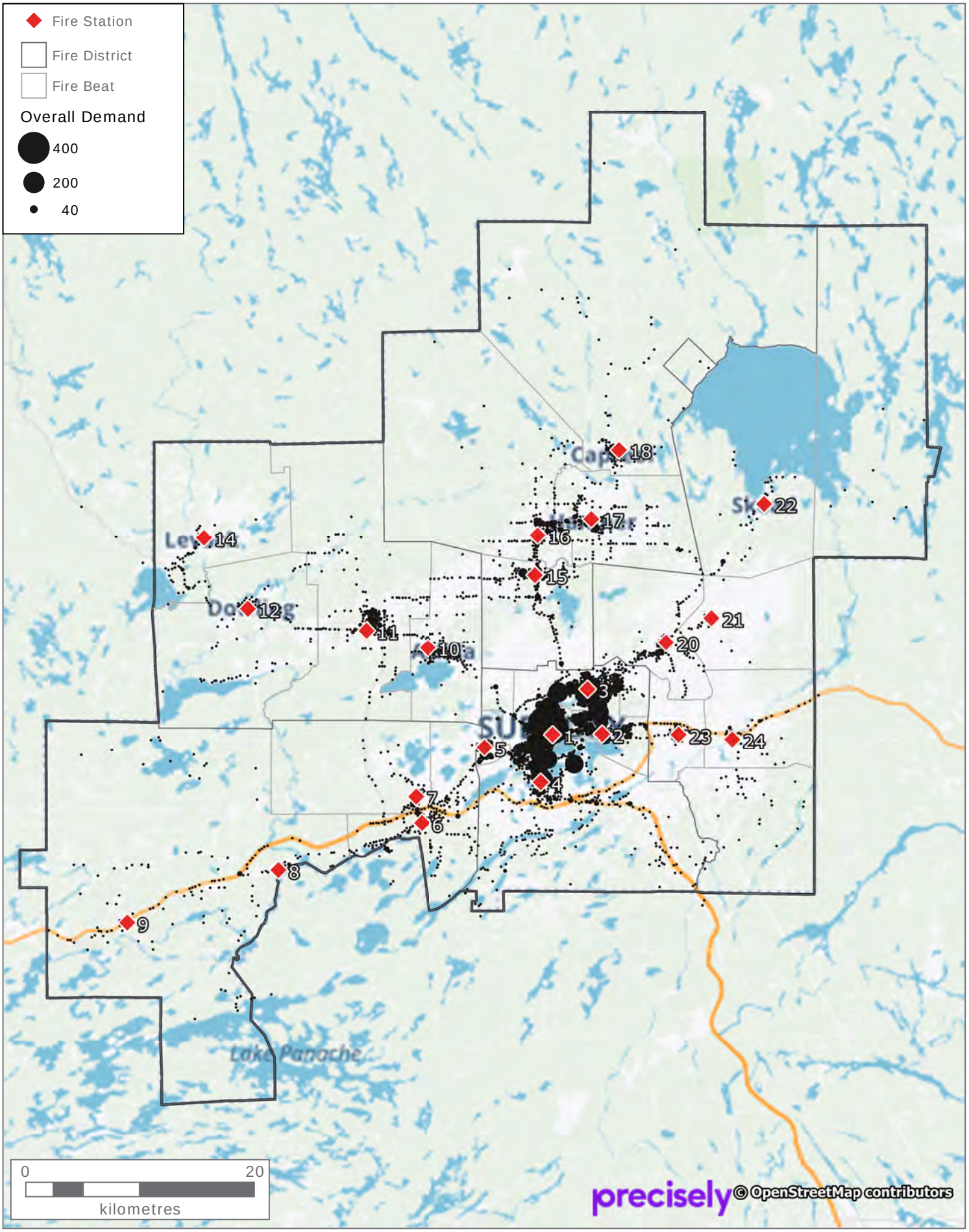
January 2016 - December 2020



Overall Demand - Greater Sudbury

January 2016 to December 2020

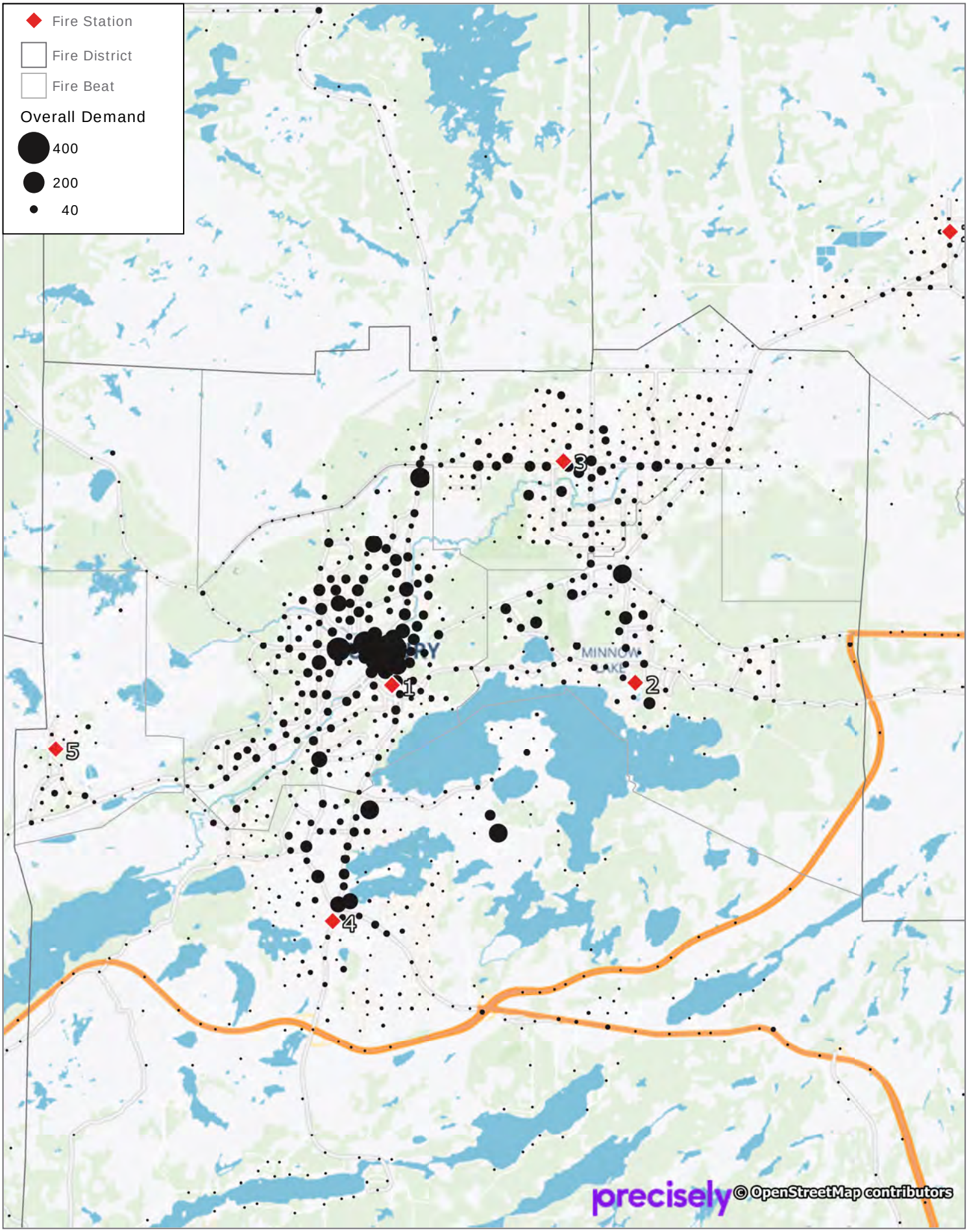
B3a-i



Overall Demand - City Core

January 2016 to December 2020

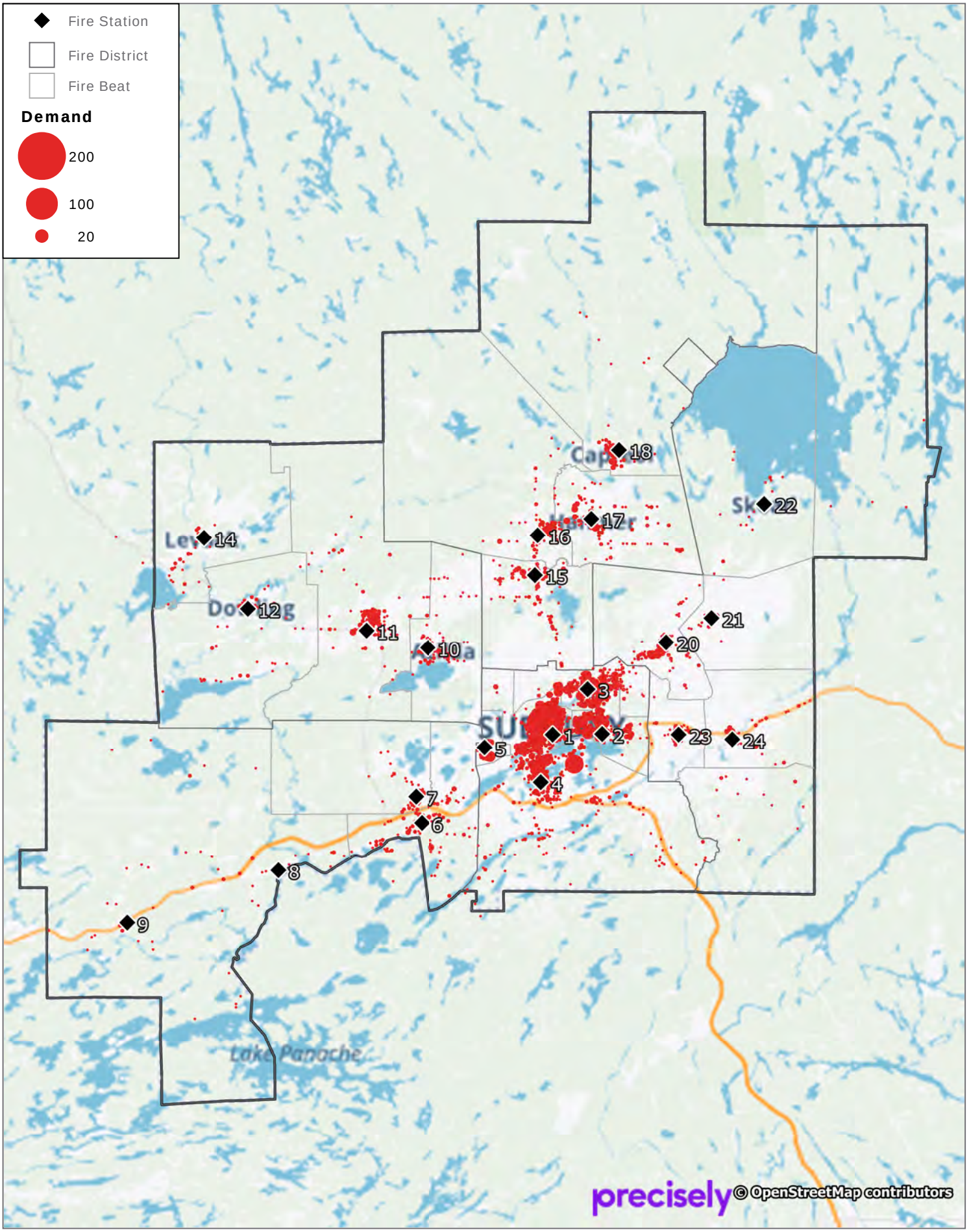
B3a-ii



Fire Demand - Greater Sudbury

January 2016 to December 2020

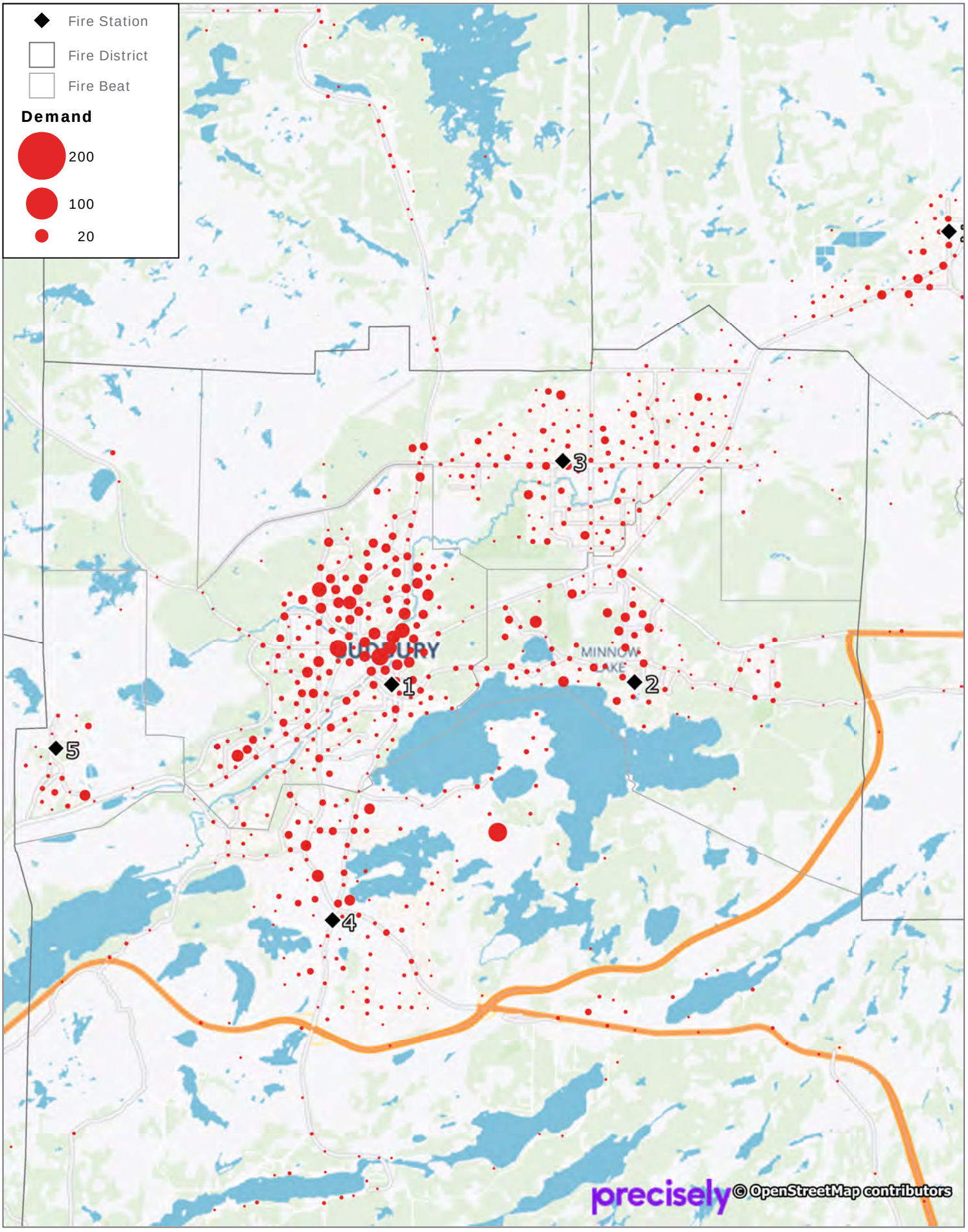
B3b-i



Fire Demand - City Core

January 2016 to December 2020

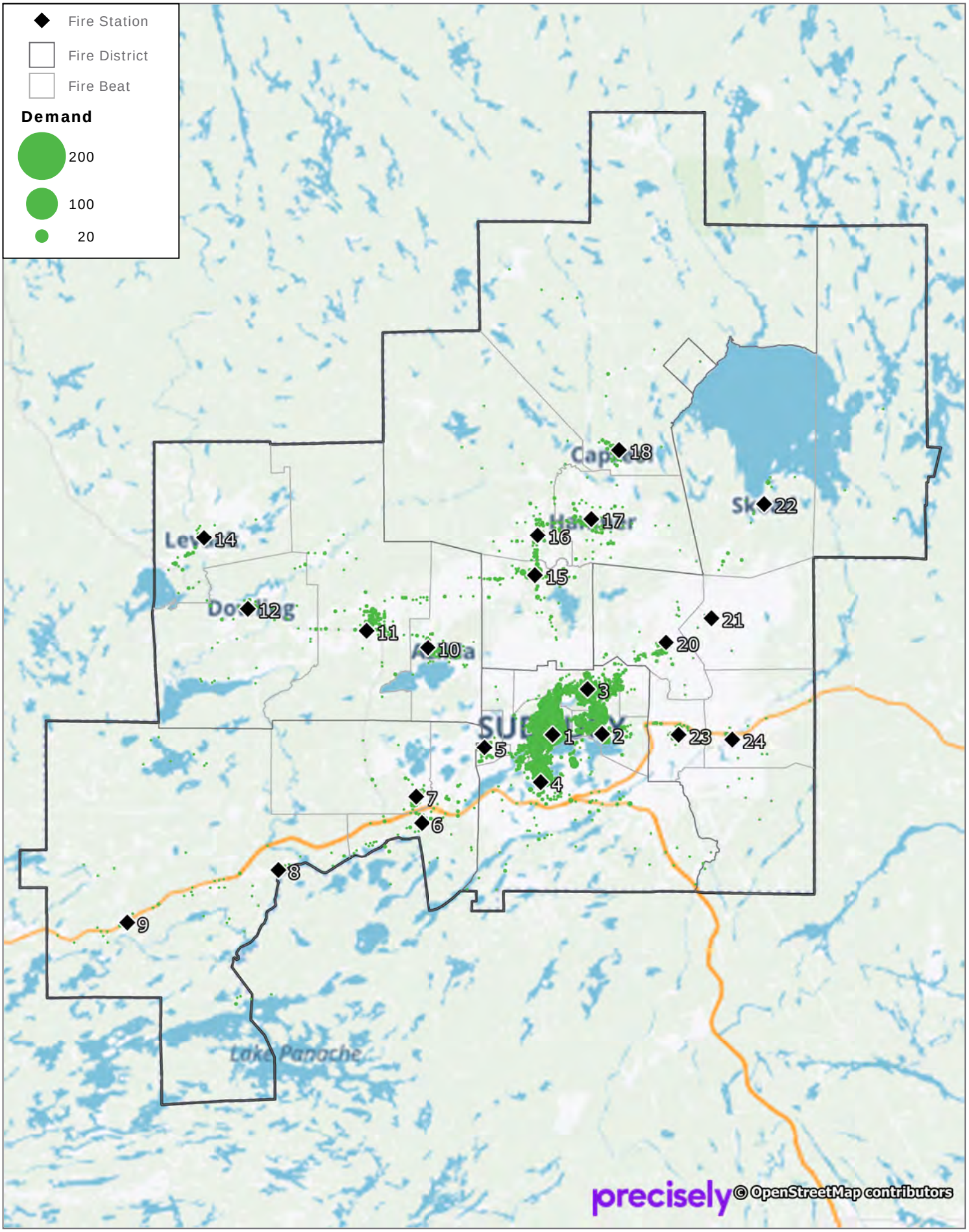
B3b-ii



Non-Fire Demand - Greater Sudbury

January 2016 to December 2020

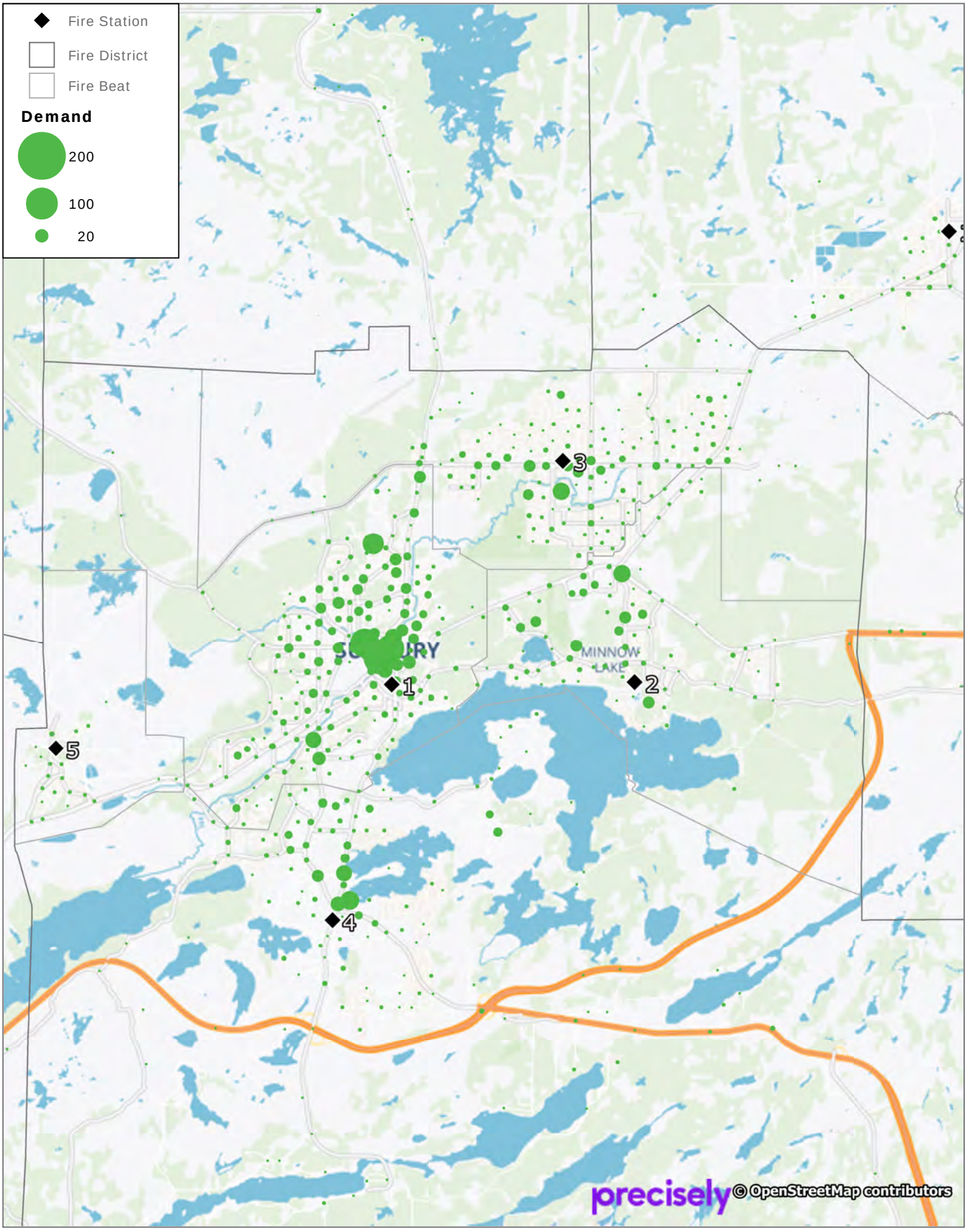
B3c-i



Non-Fire Demand - City Core

January 2016 to December 2020

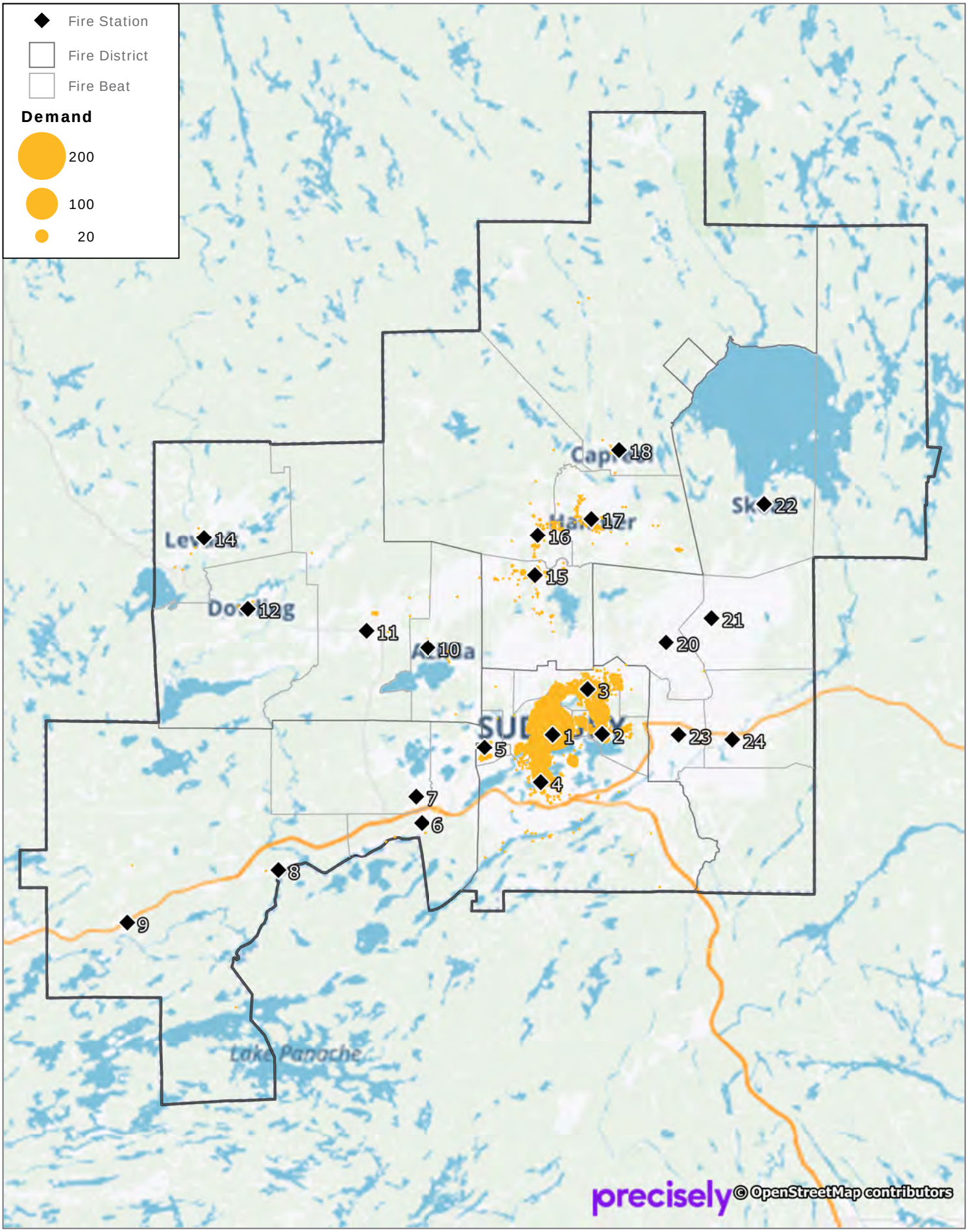
B3c-ii



Medical Demand - Greater Sudbury

January 2016 to December 2020

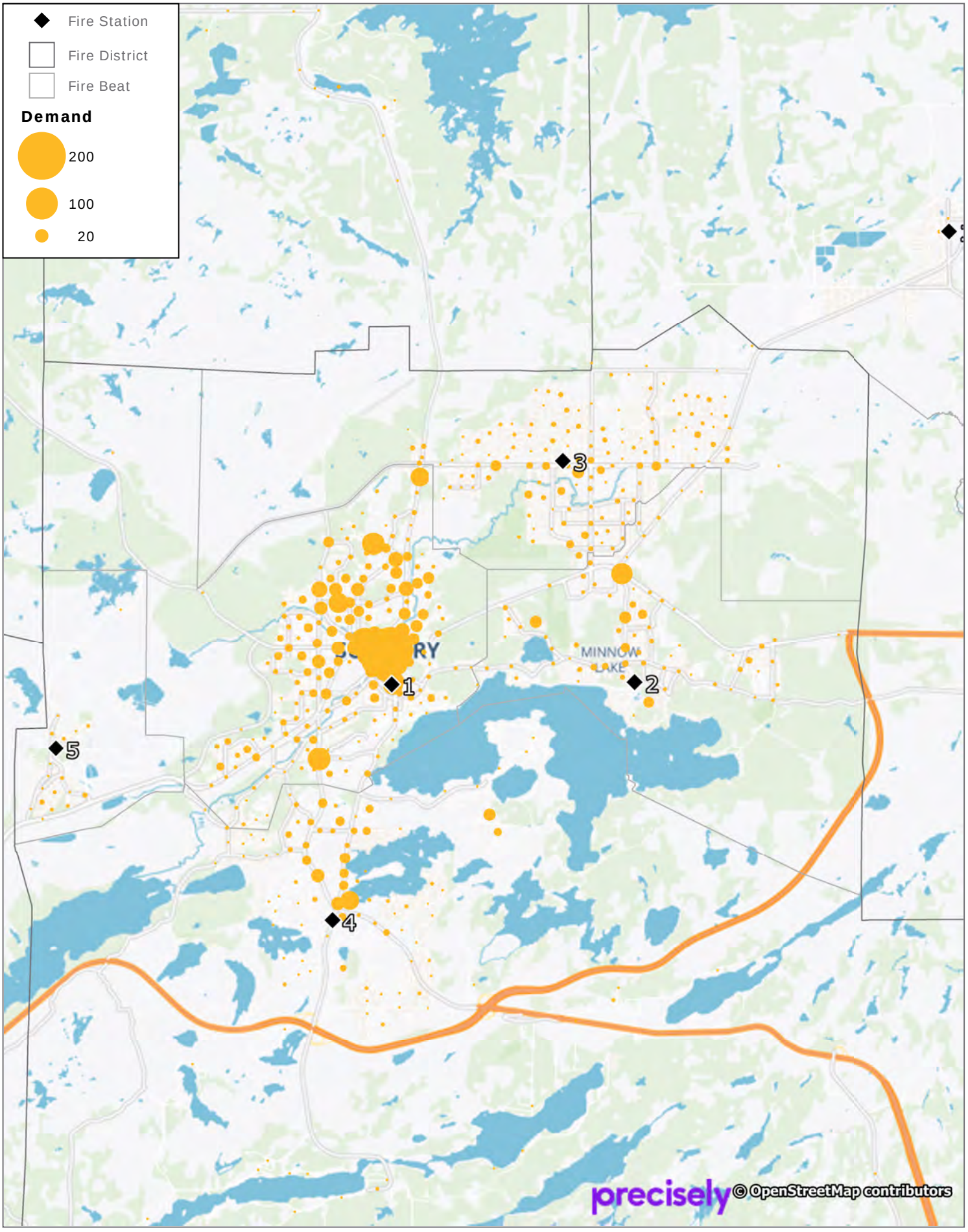
B3d-i



Medical Demand - City Core

January 2016 to December 2020

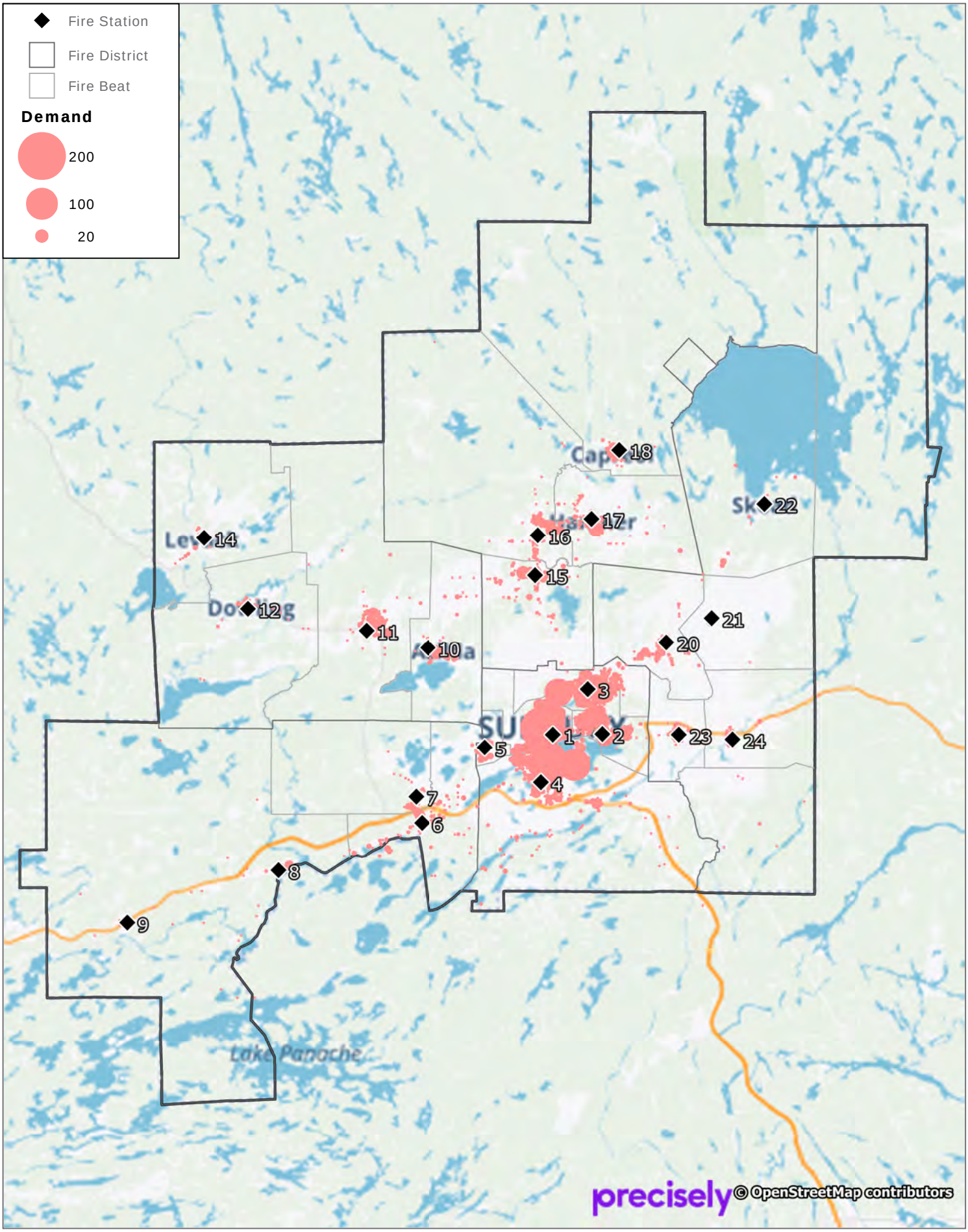
B3d-ii



Alarm Ringing Demand - Greater Sudbury

January 2016 to December 2020

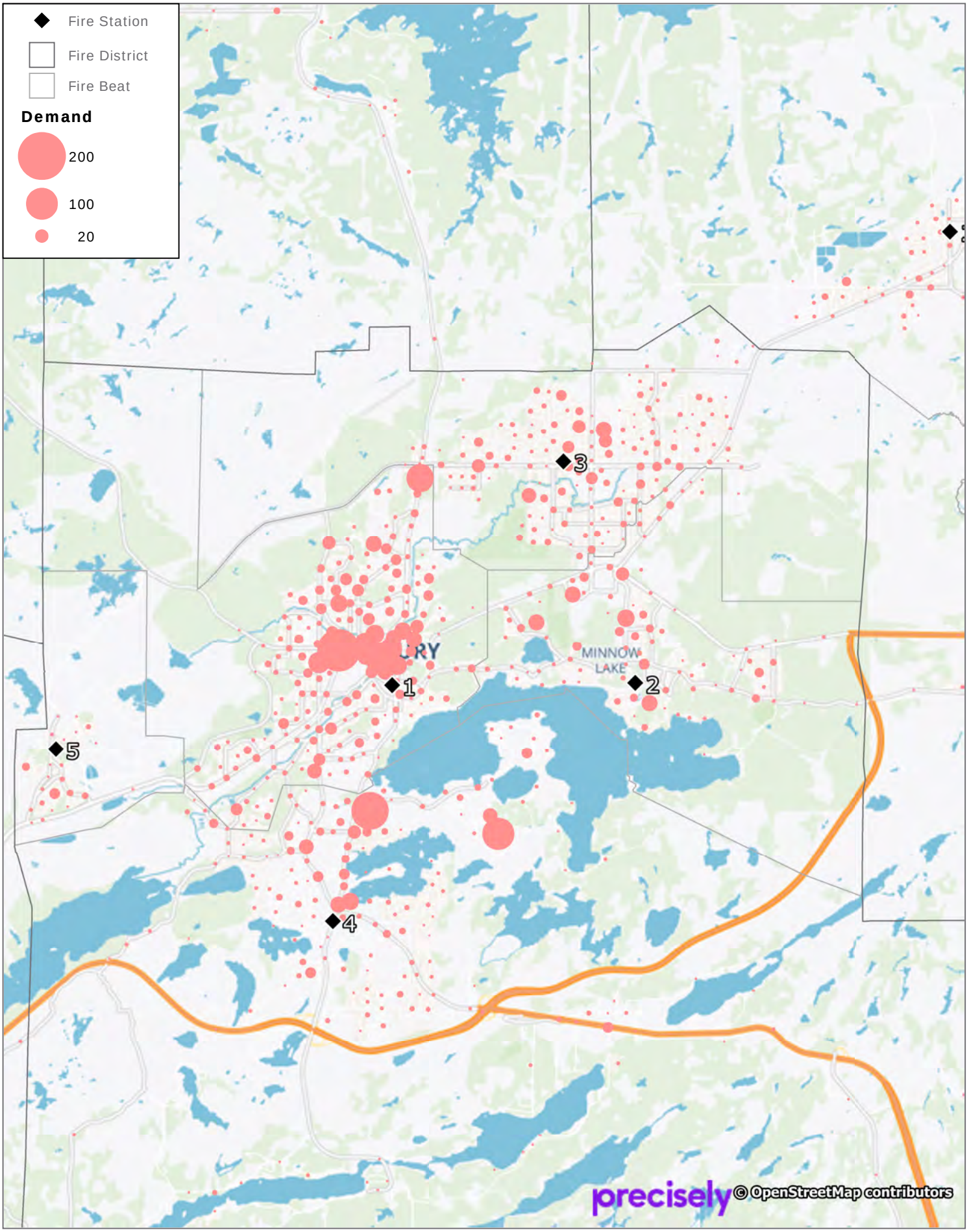
B3e-i



Alarm Ringing Demand - City Core

January 2016 to December 2020

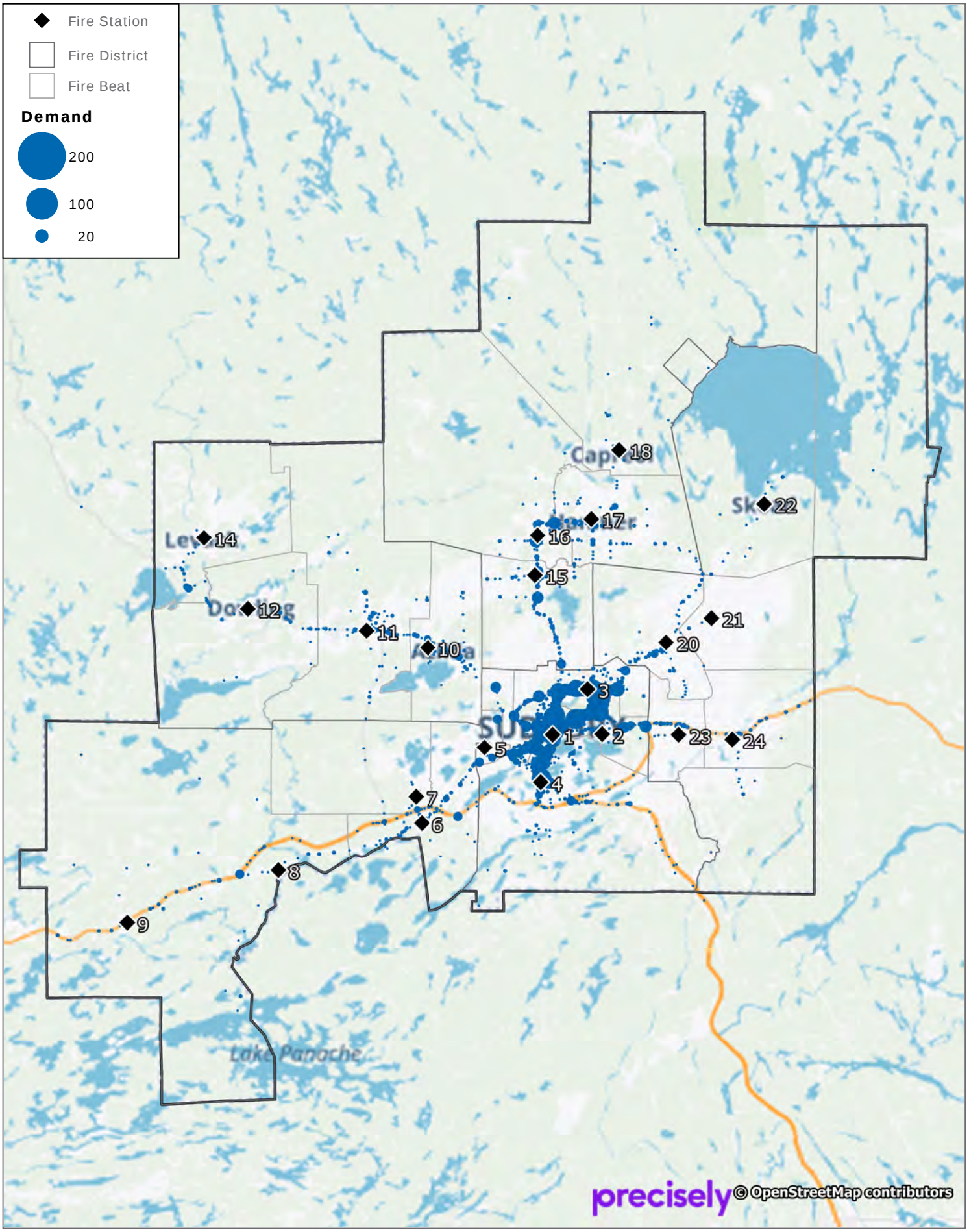
B3e-ii



Motor Vehicle Collision Demand - Greater Sudbury

January 2016 to December 2020

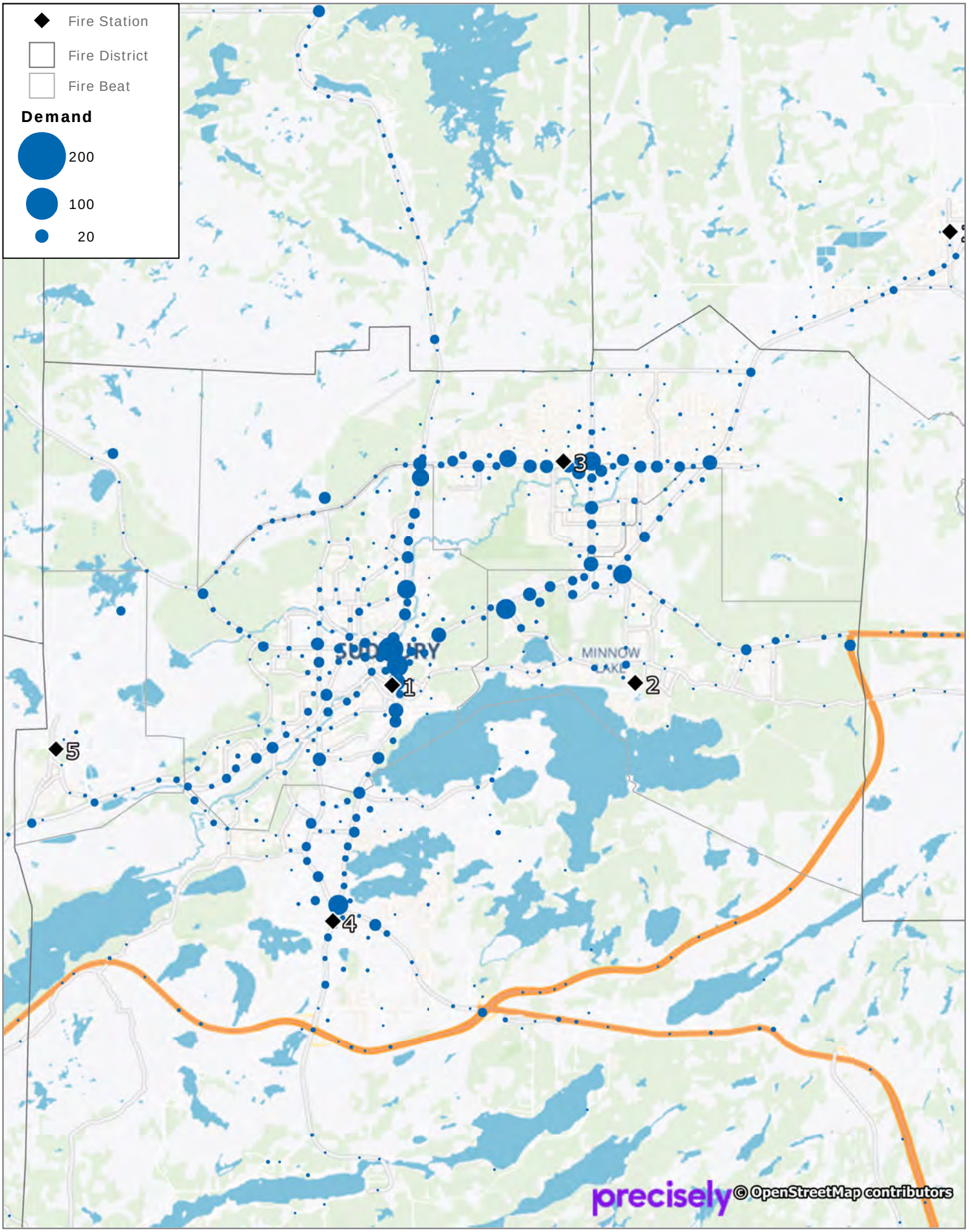
B3f-i



Motor Vehicle Collision Demand - City Core

January 2016 to December 2020

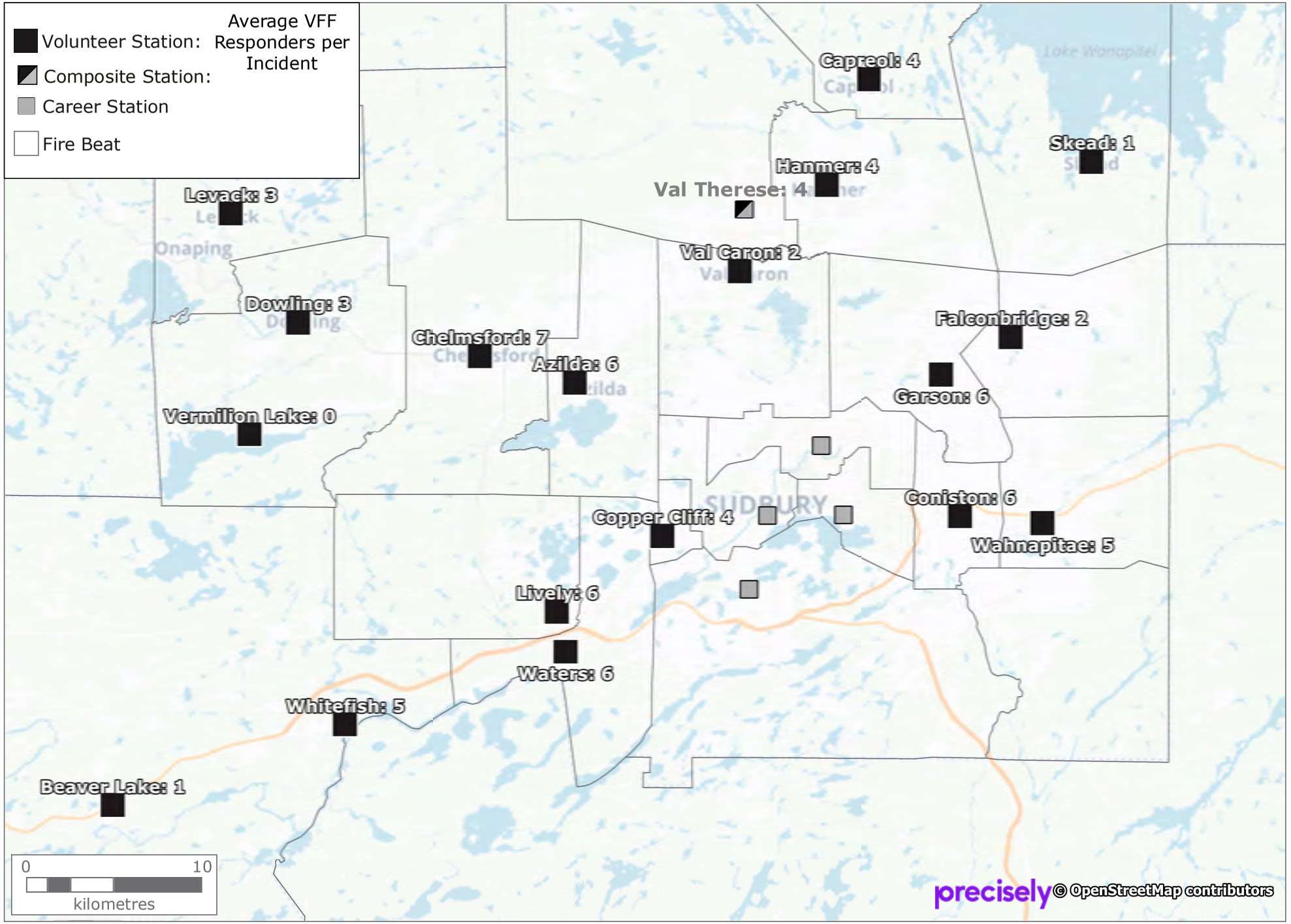
B3f-ii



B4a

Volunteer Firefighters by Station

2020 Assigned/Average Responding Firefighters



City of Greater Sudbury Fire

Volunteer Availability by Year

Station		Year				
		2016	2017	2018	2019	2020
5	Copper Cliff	2.3	2.7	3.5	3.7	3.8
6	Waters	3.3	3.4	4.4	6.0	6.4
7	Lively	3.8	3.4	3.9	6.1	6.1
8	Whitefish	3.0	3.5	4.0	4.3	4.9
9	Beaver Lake	1.4	1.3	1.4	1.6	1.4
10	Azilda	3.9	4.1	4.8	5.9	6.0
11	Chelmsford	6.1	6.0	6.5	7.2	6.9
12	Dowling	2.3	2.3	2.4	2.6	3.2
14	Levack	2.7	2.8	3.1	2.8	3.2
15	Val Caron	1.1	1.2	1.7	1.6	2.0
16	Val Therese	2.6	3.1	3.3	3.9	3.7
17	Hanmer	2.5	3.6	4.4	5.3	4.2
18	Capreol	4.0	4.9	4.9	4.7	4.4
20	Garson	2.6	2.9	3.8	5.2	5.8
21	Falconbridge	1.8	1.4	2.1	2.2	2.4
22	Skead	0.0	1.0	1.0	1.0	1.0
23	Coniston	1.8	2.9	2.7	2.9	5.6
24	Wahnapitae	2.4	3.8	4.1	4.5	4.6
Unknown		*3.1*	*2.5*	*2.2*	*1.7*	*1.2*

Note: This data represents ALL staff that were paid for the call, irrespective of whether they attended the call or not, whether they were at the scene or at a station standby. Due to data limitations, it is not possible to separate volunteer behaviour accurately.

City of Greater Sudbury Fire

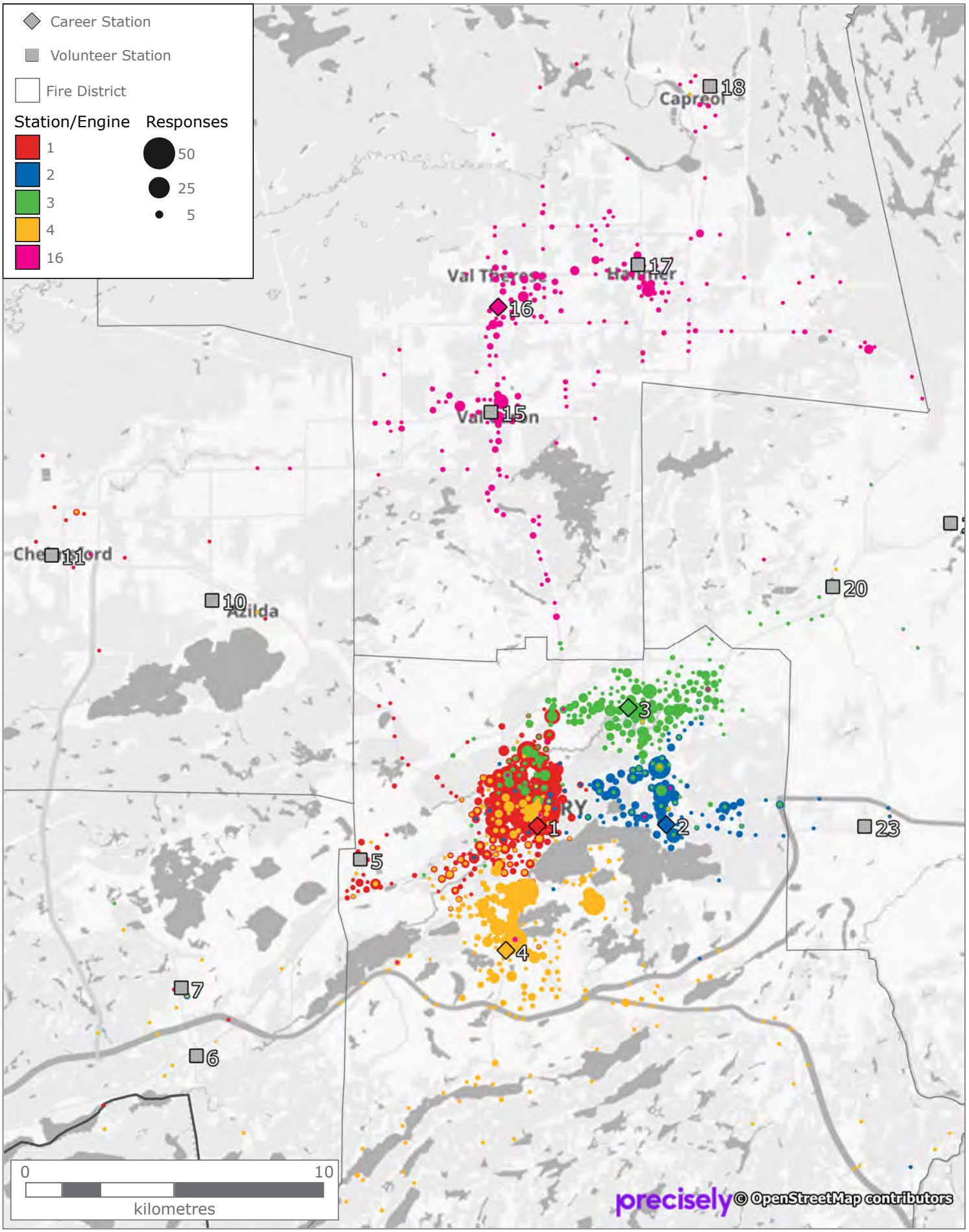
Station Workload

January 2016 - December 2020

Station		2016	2017	2018	2019	2020
1	Van Horne	2,337	2,070	2,143	2,146	1,953
3	Leon	688	707	715	648	615
4	Long Lake	393	760	785	759	604
2	Minnow Lake	457	520	588	469	424
16	Val Therese	505	475	556	509	399
11	Chelmsford	294	260	299	311	263
20	Garson	188	160	227	166	201
7	Lively	106	109	129	143	150
6	Waters	209	203	217	142	129
10	Azilda	201	183	192	146	114
12	Dowling	155	116	110	93	78
18	Capreol	100	102	91	86	64
17	Hanmer	69	74	76	74	59
8	Whitefish	101	105	124	69	58
23	Coniston	68	74	93	56	58
24	Wahnapitae	61	91	63	85	54
14	Levack	86	64	59	50	50
21	Falconbridge	46	32	63	37	50
15	Val Caron	37	28	34	32	32
9	Beaver Lake	33	30	34	24	21
5	Copper Cliff	15	9	25	25	17
22	Skead	20	11	6	6	7
13	Vermillion Lake	18	7	8	1	1

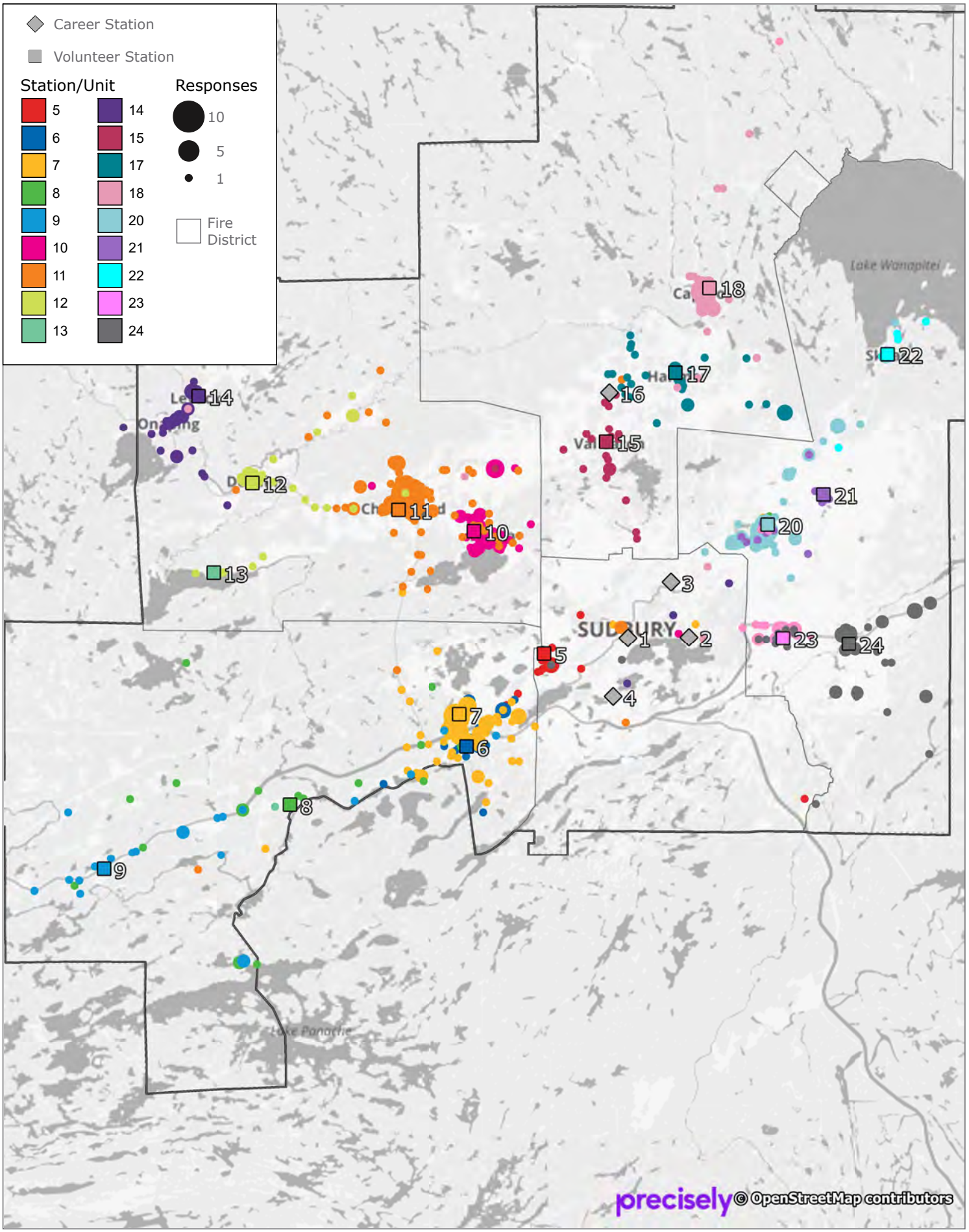
Career Engine Responses 2019

B6a



Volunteer Engine Responses 2019

B6b



B6c

City of Greater Sudbury Fire

Unit Workload by Fire Beat

January 2016 - December 2020

			Firebeat of Call Location																					
	Unit / Firebeat		F1	F2	F3	F4	F5	F6	F7	F8	F10	F11	F12	F14	F15	F16	F17	F18	F20	F21	F22	F23	F24	F25	F26
Responding Unit	E1	Van Horne	6,630	177	174	644	236	25	6	4	27	43	12	10	14	4	2	8	10	0	1	3	2	0	0
	E2	Minnow Lake	349	1,641	317	77	4	1	7	3	3	1	0	2	5	0	0	2	10	1	0	24	12	2	0
	E3	Leon	604	231	2,307	21	5	4	3	2	6	0	0	2	58	11	27	4	58	6	15	3	0	0	0
	E4	Long Lake	680	9	18	2,379	34	46	18	15	3	2	0	0	3	2	0	2	3	1	0	0	1	0	0
	P5	Copper Cliff	2	0	0	2	68	6	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	E6	Waters	11	2	4	6	1	329	105	50	0	3	0	0	0	1	0	0	2	2	0	1	0	1	0
	P7	Lively	3	1	1	4	0	206	185	16	0	4	1	1	0	0	0	0	2	0	0	2	1	0	0
	E8	Whitefish	7	2	2	6	0	28	5	180	4	0	0	0	0	1	0	0	2	2	0	0	1	0	0
	P9	Beaver Lake	2	0	1	6	0	7	3	91	2	0	0	0	0	0	0	0	1	1	0	0	1	0	0
	E10	Azilda	10	2	2	3	1	1	0	2	328	162	4	0	4	1	1	0	0	0	0	0	1	0	0
	E11	Chelmsford	11	1	1	2	1	1	2	1	77	595	51	8	2	2	1	0	0	0	0	0	0	0	0
	E12	Dowling	0	2	2	2	2	1	0	1	1	26	163	72	0	0	0	0	1	0	0	1	0	0	0
	P13	Vermillion Lake	0	0	0	1	1	0	0	1	1	3	21	7	0	0	0	0	0	0	0	0	0	0	0
	P14	Levack	4	2	1	1	8	0	0	1	0	6	9	189	0	0	0	0	1	0	0	4	0	0	0
	P15	Val Caron	1	0	2	1	0	0	0	0	11	1	0	0	81	17	9	0	1	0	0	0	0	0	0
	E16	Val Therese	19	4	16	23	0	0	1	1	15	4	0	1	605	619	585	47	3	1	2	0	0	0	1
	P17	Hanmer	0	0	1	1	0	0	1	0	0	0	0	0	12	46	101	33	0	0	0	0	0	0	1
	E18	Capreol	2	3	1	0	0	0	0	0	0	1	0	1	0	3	13	199	1	0	2	0	0	0	1
	E20	Garson	7	6	5	2	0	1	0	2	0	0	0	1	0	1	6	0	424	30	64	4	4	0	0
	P21	Falconbridge	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	62	46	13	1	0	1	0
	P22	Skead	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	32	0	0	0	0
	P23	Coniston	2	2	2	2	6	0	0	2	0	0	0	0	2	1	0	2	8	0	0	161	37	5	0
	E24	Wahnapitae	6	2	2	4	2	0	1	1	0	1	0	0	0	1	0	0	1	0	0	27	136	33	6

B7a

City of Greater Sudbury Fire

Workload by Category - Career Units

January 2019 - December 2019

Unit	Station		Fire	Non-Fire	Medical	Alarm Ringing	Vehicle Collision
E1	1	Van Horne	16.4%	16.5%	29.1%	27.2%	10.8%
E2	2	Minnow Lake	24.1%	16.8%	14.2%	30.4%	14.4%
E3	3	Leon	19.8%	20.4%	12.4%	31.5%	15.9%
E4	4	Long Lake	20.9%	14.4%	16.7%	37.1%	10.9%
E16	16	Val Therese	22.4%	14.3%	14.0%	25.4%	23.9%
Avg. Daily Responses			**2.3**	**1.7**	**2.1**	**3.7**	**1.2**

City of Greater Sudbury Fire

Workload by Category - Volunteer Units

January 2019 - December 2019

Unit	Station		Fire	Non-Fire	Medical	Alarm Ringing	Vehicle Collision
P5	5	Copper Cliff	55.6%	5.6%	0.0%	22.2%	16.7%
E6	6	Waters	32.5%	15.7%	0.0%	21.7%	30.1%
P7	7	Lively	27.2%	20.4%	0.0%	34.0%	18.4%
E8	8	Naughton	13.9%	38.9%	0.0%	16.7%	30.6%
P9	9	Whitefish	13.0%	34.8%	0.0%	13.0%	39.1%
E10	10	Azilda	35.1%	18.1%	0.0%	29.8%	17.0%
E11	11	Chelmsford	29.7%	20.0%	0.0%	24.2%	26.1%
E12	12	Dowling	40.4%	23.4%	0.0%	17.0%	19.1%
P13	13	Vermillion Lake	0.0%	0.0%	0.0%	100.0%	0.0%
P14	14	Levack	33.3%	33.3%	5.6%	8.3%	19.4%
P15	15	Val Caron	41.7%	0.0%	0.0%	33.3%	25.0%
SU16	16	Val Therese	48.1%	3.7%	0.0%	31.5%	16.7%
P17	17	Hanmer	60.0%	5.0%	0.0%	30.0%	5.0%
E18	18	Capreol	37.5%	18.8%	10.4%	20.8%	12.5%
E20	20	Garson	43.0%	21.5%	0.0%	24.7%	10.8%
P21	21	Falconbridge	78.9%	5.3%	0.0%	10.5%	5.3%
P22	22	Skead	50.0%	16.7%	0.0%	16.7%	16.7%
P23	23	Coniston	41.0%	12.8%	0.0%	17.9%	28.2%
E24	24	Wahnapitae	45.5%	14.5%	0.0%	16.4%	23.6%
Avg. Daily Responses			**2.1**	**0.9**	**0.2**	**1.2**	**1.2**

B8a

City of Greater Sudbury Fire

Arriving Units by Category

January 2016 - December 2020

Composition by Category

Category	Unit Types										
	E	EEL	ES	EE	EELPC	EL	L	P	EP	Other	Total
Fire	1,961	184	87	97	252	103	42	77	49	1,310	4,162
Non-fire	2,910	18	172	48	13	22	79	68	46	462	3,838
Medical	3,277	3	4	13	1	2	78	14	0	113	3,505
Alarm Ringing	3,235	671	140	183	192	274	105	112	82	640	5,634
Vehicle Collision	2,752	2	177	117	0	7	36	33	50	479	3,653
Total	14,135	878	580	458	458	408	340	304	227	3,004	20,792
Proportion	68.0%	4.2%	2.8%	2.2%	2.2%	2.0%	1.6%	1.5%	1.1%	14.4%	100.0%

E = Engine
L = Ladder
P = Pumper
PC = Platoon Chief
S = Support

City of Greater Sudbury Fire

Number of Units arriving at Fire Incidents

January 2016 - December 2020

Units Arriving *	Incident Count	% of Incidents
1	2,574	62.4%
2	712	17.3%
3	642	15.6%
4	157	3.8%
5	32	0.8%
6	6	0.1%
7	1	0.0%

* Units = Engines, Pumpers and Ladder Units

Note: includes career and volunteer units

City of Greater Sudbury Fire

Call Processing Time by Dispatch

January 2016 - December 2020

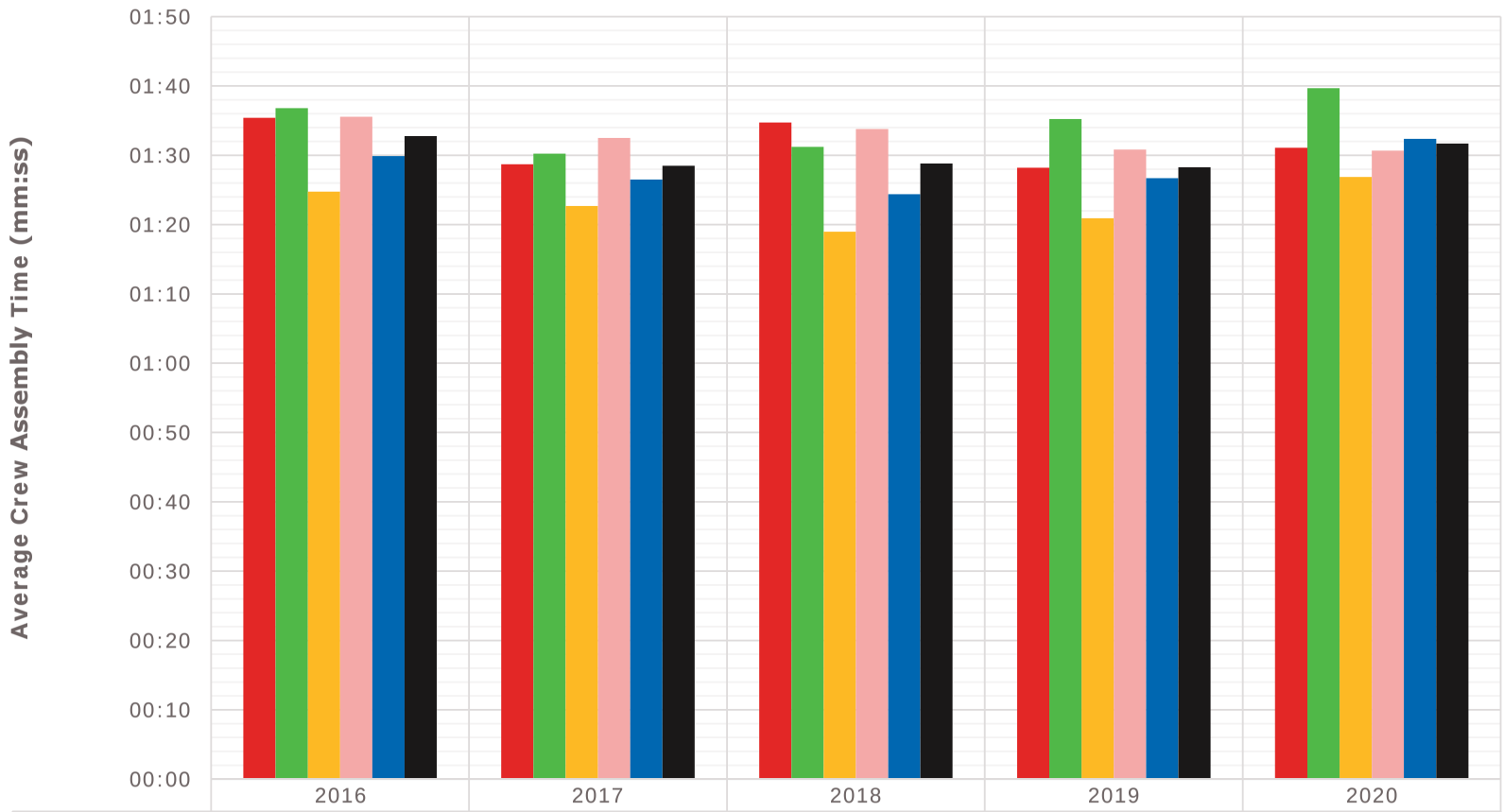
Category	2016	2017	2018	2019	2020
Fire	00:02:09	00:02:02	00:01:59	00:02:00	00:01:57
Non-Fire	00:02:02	00:02:00	00:02:12	00:02:05	00:02:03
Medical	00:01:24	00:01:29	00:01:29	00:01:36	00:01:45
Alarm Ringing	00:01:39	00:01:47	00:01:37	00:01:37	00:01:41
Vehicle Collision	00:01:42	00:01:38	00:01:40	00:01:32	00:01:40
Overall	**00:01:47**	**00:01:47**	**00:01:47**	**00:01:45**	**00:01:49**

B10a

City of Greater Sudbury Fire

Assembly Time by Category by Year: Career Units

January 2016 - December 2020



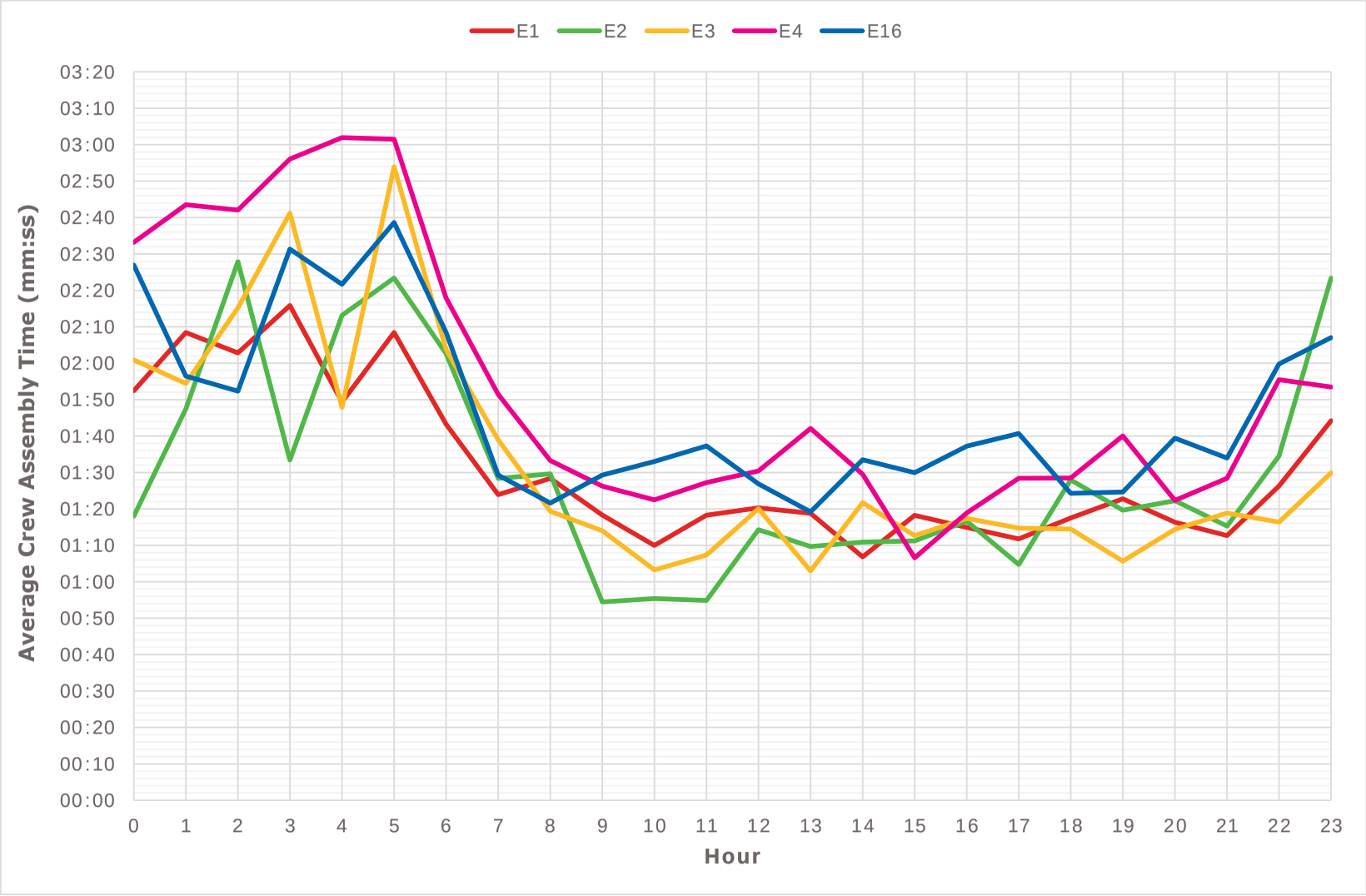
	2016	2017	2018	2019	2020
Fire	00:01:35	00:01:29	00:01:35	00:01:28	00:01:31
Non-Fire	00:01:37	00:01:30	00:01:31	00:01:35	00:01:40
Medical	00:01:25	00:01:23	00:01:19	00:01:21	00:01:27
Alarm Ringing	00:01:36	00:01:32	00:01:34	00:01:31	00:01:31
Vehicle Collision	00:01:30	00:01:27	00:01:24	00:01:27	00:01:32
Overall	00:01:33	00:01:28	00:01:29	00:01:28	00:01:32

B10b

City of Greater Sudbury Fire

Assembly Time by Category by Hour: Career Units

January 2019 - December 2020



B10c

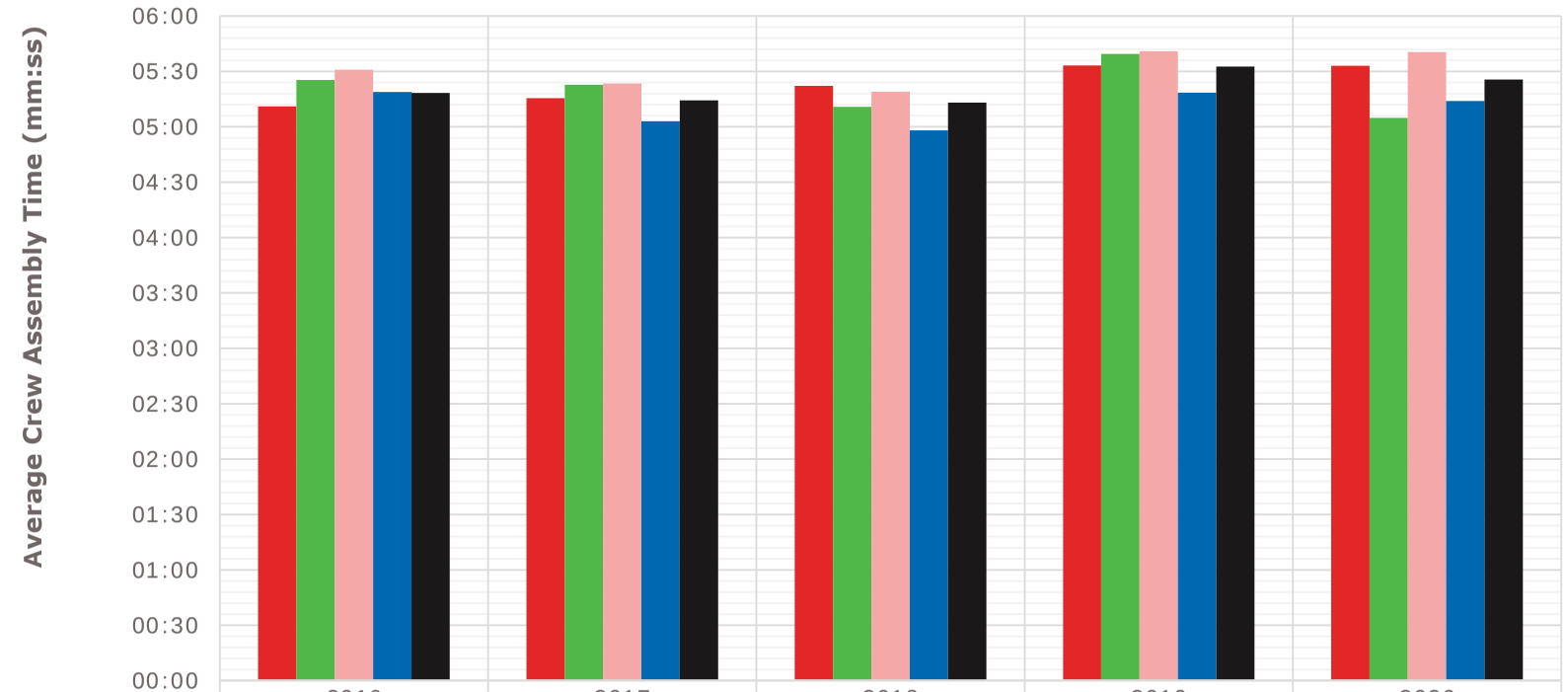
City of Greater Sudbury Fire

Assembly Time by Category by Year: Volunteer Units

January 2016 - December 2020

Crew Turnout Time - Volunteer

January 2016 to December 2020



	2016	2017	2018	2019	2020
Fire	00:05:11	00:05:15	00:05:22	00:05:33	00:05:33
Non-Fire	00:05:25	00:05:23	00:05:11	00:05:39	00:05:05
Alarm Ringing	00:05:31	00:05:24	00:05:19	00:05:41	00:05:40
Vehicle Collision	00:05:19	00:05:03	00:04:58	00:05:19	00:05:14
Overall	00:05:18	00:05:14	00:05:13	00:05:33	00:05:26

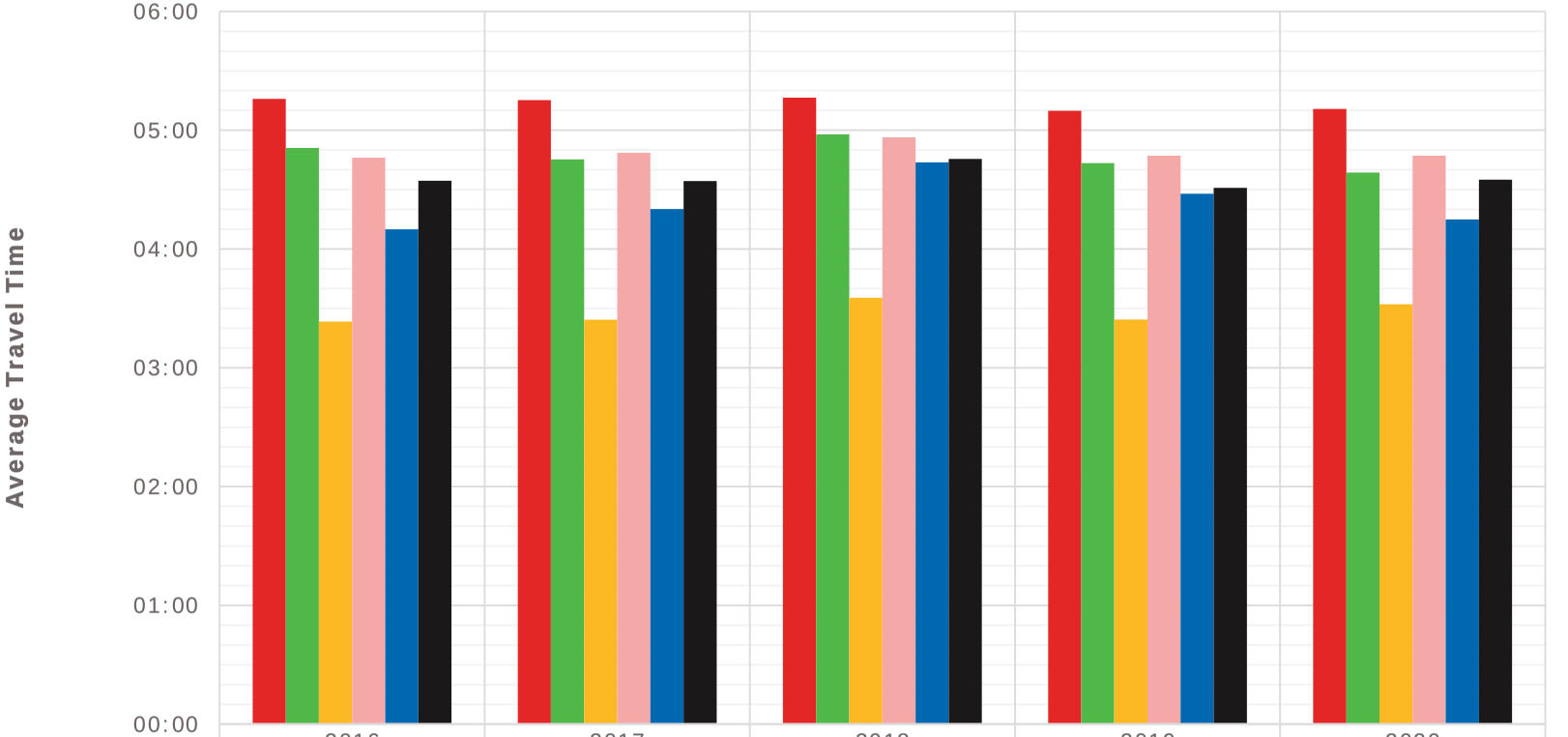
Year

B11a

City of Greater Sudbury Fire

Time to Scene by Category and Year: Career and Volunteer

January 2016 - December 2020



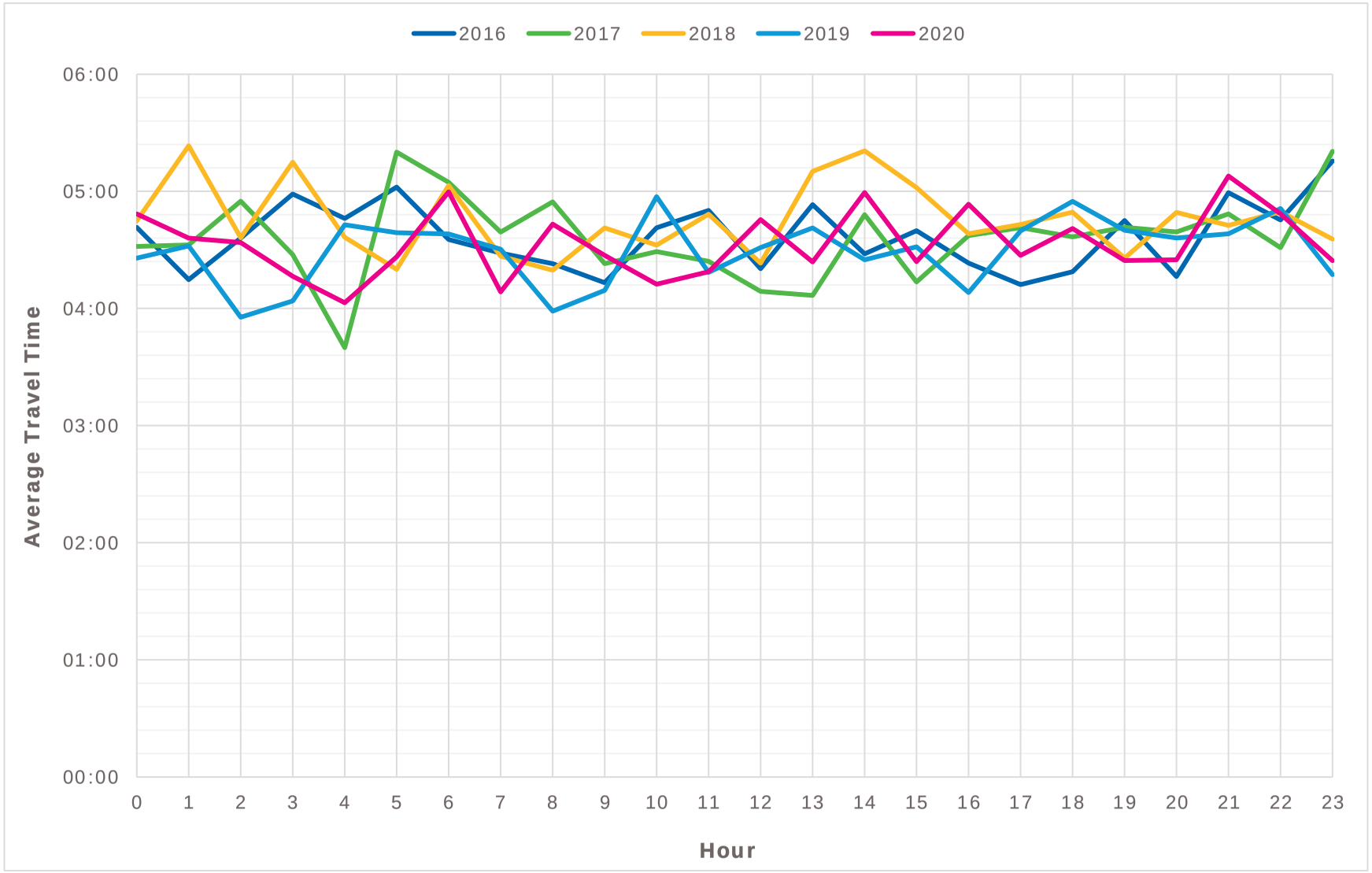
	2016	2017	2018	2019	2020
Fire	00:05:16	00:05:15	00:05:16	00:05:10	00:05:11
Non-Fire	00:04:51	00:04:45	00:04:58	00:04:43	00:04:39
Medical	00:03:23	00:03:24	00:03:35	00:03:24	00:03:32
Alarm Ringing	00:04:46	00:04:49	00:04:56	00:04:47	00:04:47
Vehicle Collision	00:04:10	00:04:20	00:04:44	00:04:28	00:04:15
Overall	00:04:34	00:04:34	00:04:46	00:04:31	00:04:35

B11b

City of Greater Sudbury Fire

Time to Scene by Hour and Year: Career and Volunteer

January 2016 - December 2020

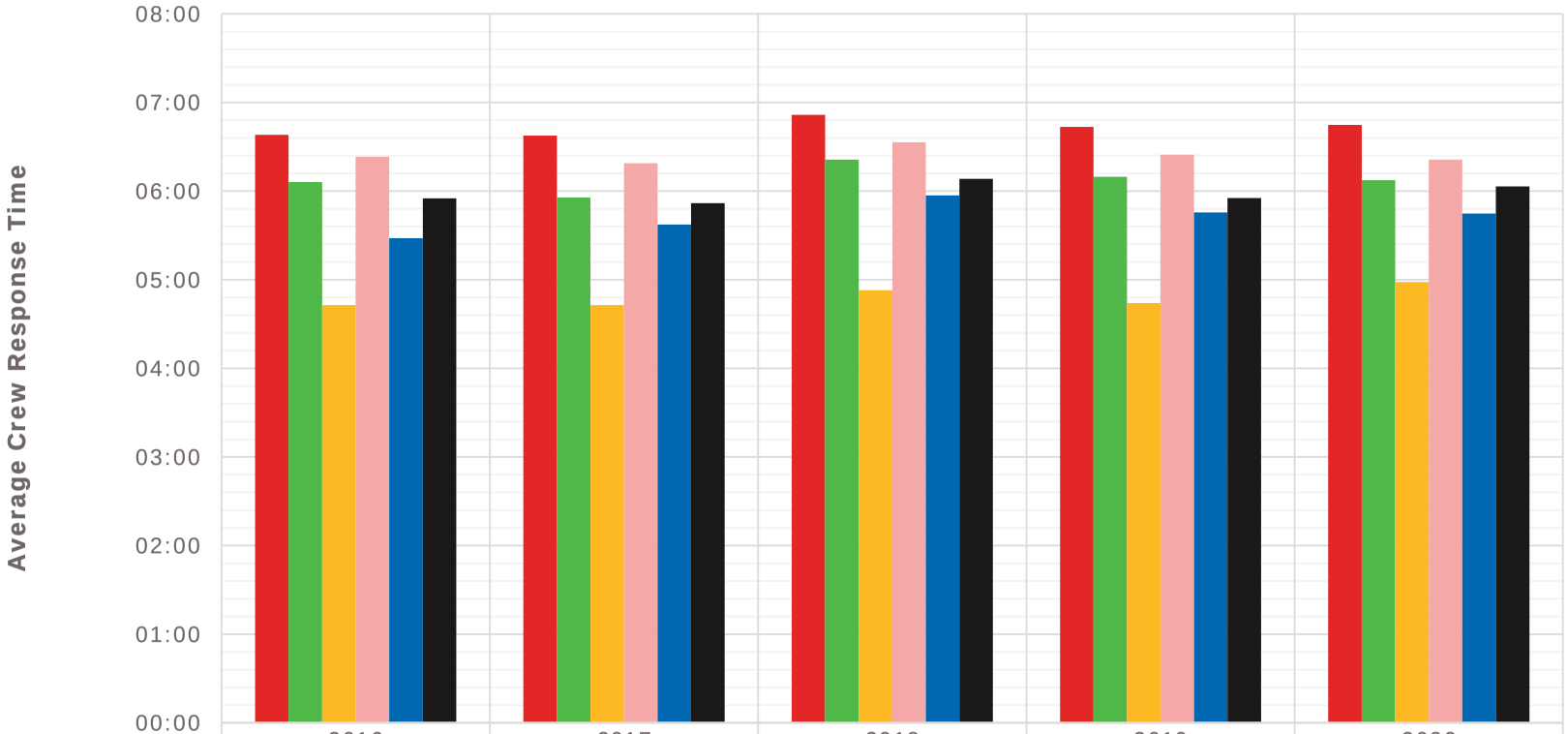


B12a-i

City of Greater Sudbury Fire

Average Crew Response Time: Career

January 2016 - December 2020



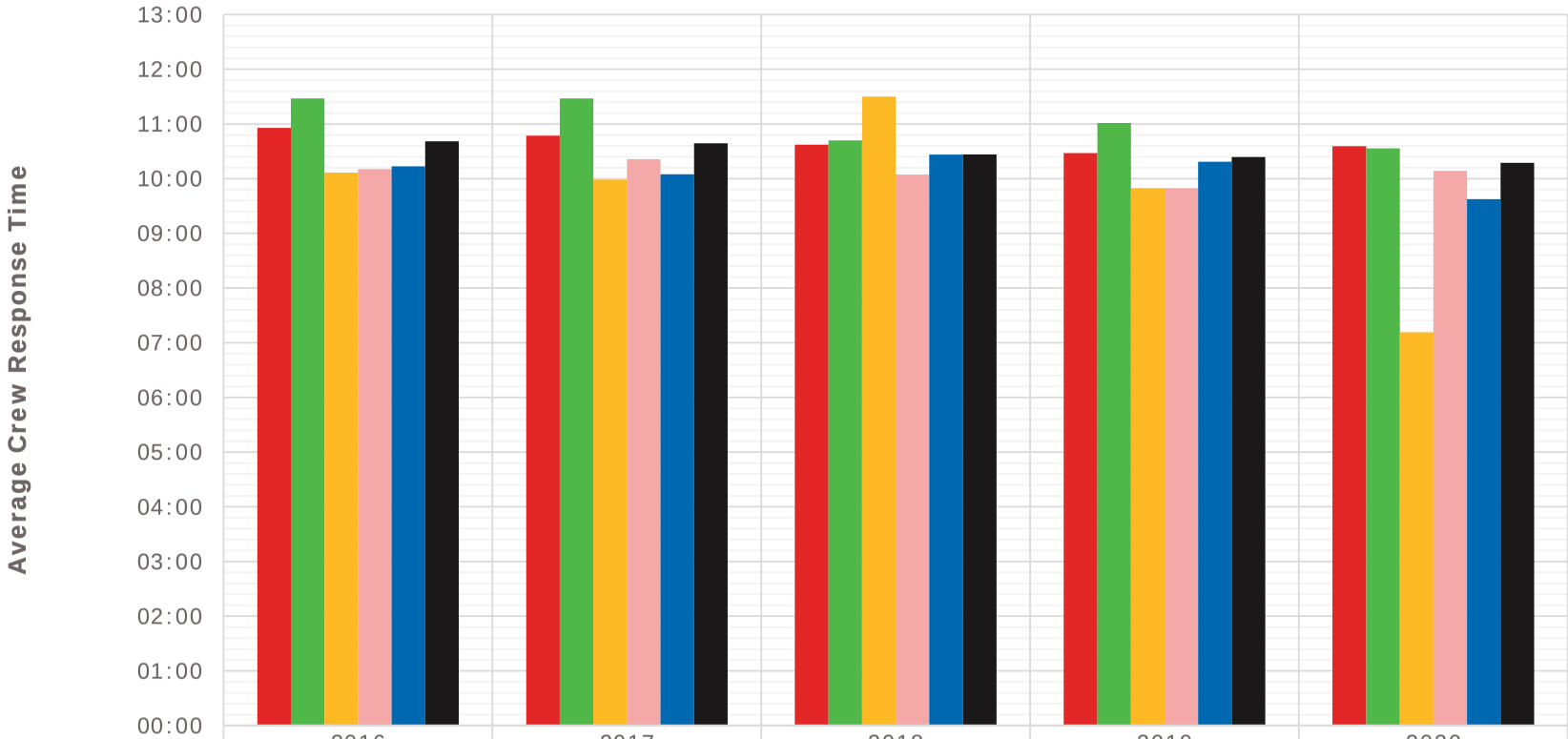
	2016	2017	2018	2019	2020
Fire	00:06:38	00:06:38	00:06:52	00:06:43	00:06:45
Non-Fire	00:06:06	00:05:56	00:06:21	00:06:10	00:06:07
Medical	00:04:43	00:04:43	00:04:53	00:04:44	00:04:58
Alarm Ringing	00:06:23	00:06:19	00:06:33	00:06:25	00:06:21
Vehicle Collision	00:05:28	00:05:37	00:05:57	00:05:46	00:05:45
Overall	00:05:55	00:05:52	00:06:08	00:05:55	00:06:03

B12a-ii

City of Greater Sudbury Fire

Average Crew Response Time: Volunteer

January 2016 - December 2020



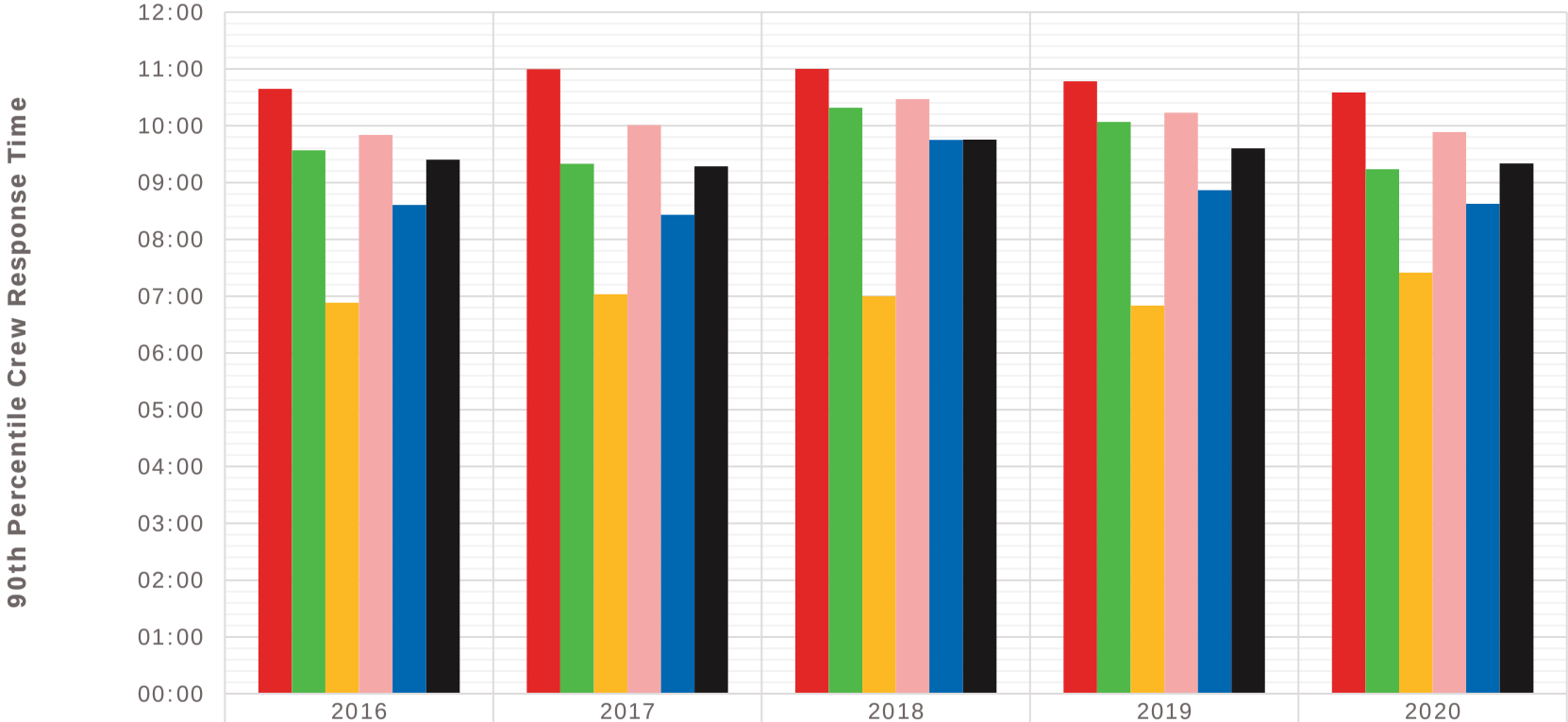
	2016	2017	2018	2019	2020
Fire	00:10:56	00:10:47	00:10:37	00:10:28	00:10:36
Non-Fire	00:11:28	00:11:28	00:10:42	00:11:01	00:10:33
Medical	00:10:07	00:09:59	00:11:30	00:09:50	00:07:11
Alarm Ringing	00:10:10	00:10:21	00:10:04	00:09:50	00:10:08
Vehicle Collision	00:10:14	00:10:05	00:10:26	00:10:19	00:09:37
Overall	00:10:41	00:10:39	00:10:27	00:10:24	00:10:17

B12b-i

City of Greater Sudbury Fire

90th Percentile Crew Response Time: Career

January 2016 - December 2020



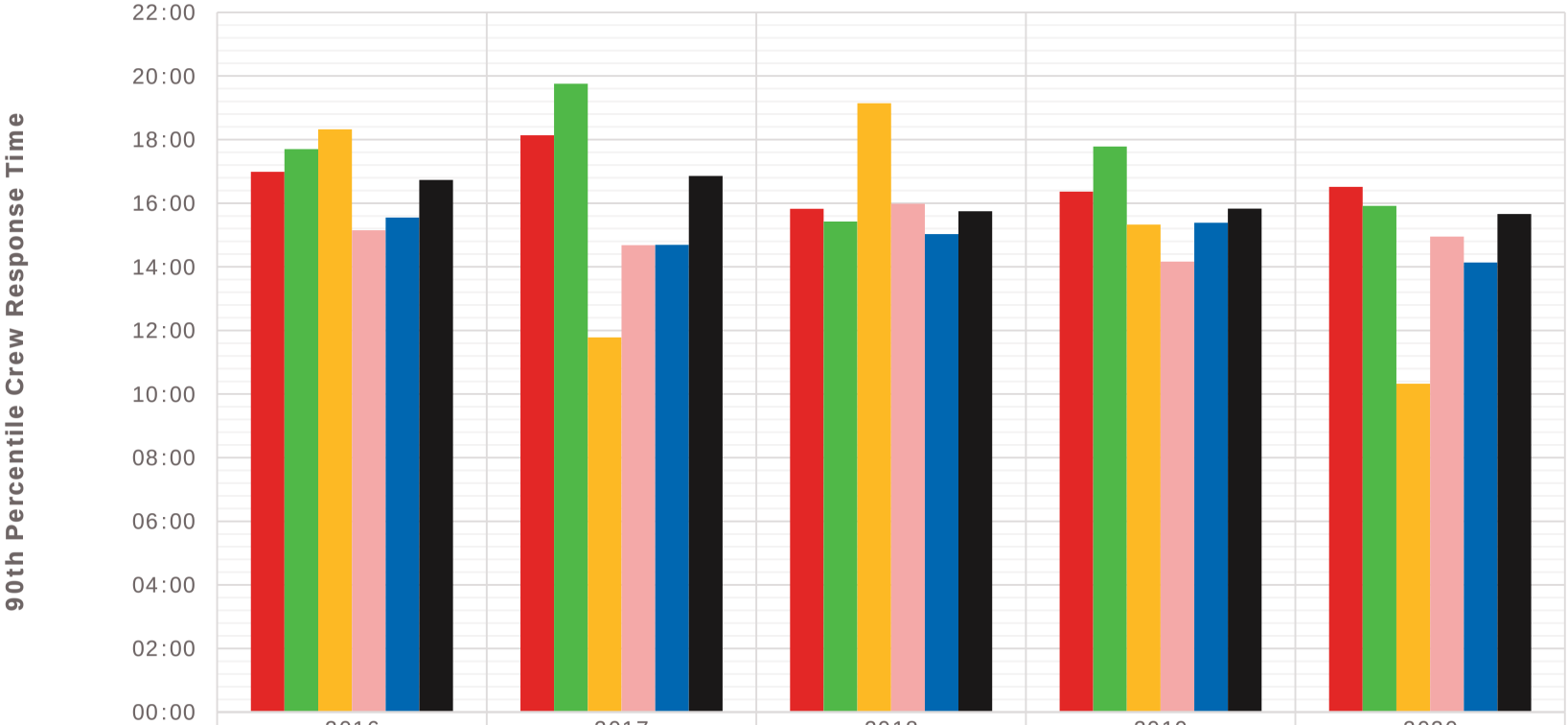
	2016	2017	2018	2019	2020
Fire	00:10:39	00:11:00	00:11:00	00:10:47	00:10:35
Non-Fire	00:09:34	00:09:20	00:10:19	00:10:04	00:09:14
Medical	00:06:53	00:07:02	00:07:00	00:06:50	00:07:25
Alarm Ringing	00:09:50	00:10:01	00:10:28	00:10:14	00:09:53
Vehicle Collision	00:08:36	00:08:26	00:09:45	00:08:52	00:08:38
Overall	00:09:24	00:09:17	00:09:45	00:09:36	00:09:20

B12b-ii

City of Greater Sudbury Fire

90th Percentile Crew Response Time: Volunteer

January 2016 - December 2020



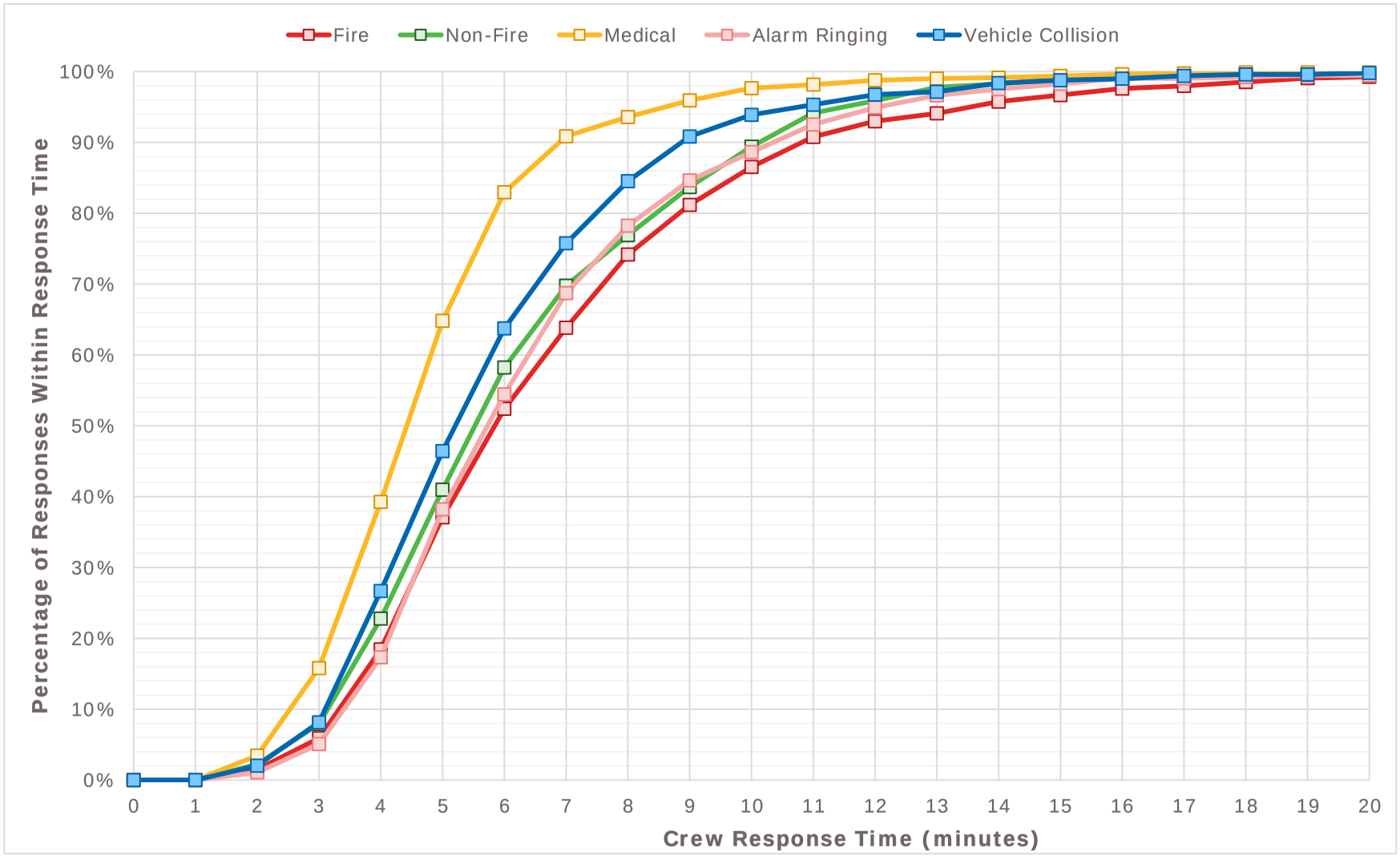
	2016	2017	2018	2019	2020
Fire	00:16:59	00:18:08	00:15:50	00:16:22	00:16:31
Non-Fire	00:17:42	00:19:45	00:15:25	00:17:47	00:15:55
Medical	00:18:19	00:11:47	00:19:08	00:15:20	00:10:19
Alarm Ringing	00:15:09	00:14:41	00:15:59	00:14:10	00:14:57
Vehicle Collision	00:15:33	00:14:41	00:15:02	00:15:23	00:14:08
Overall	00:16:44	00:16:51	00:15:45	00:15:50	00:15:40

B12c-i

City of Greater Sudbury Fire

Crew Response Time Cumulative Distribution: Career Units

January 2019 - December 2019

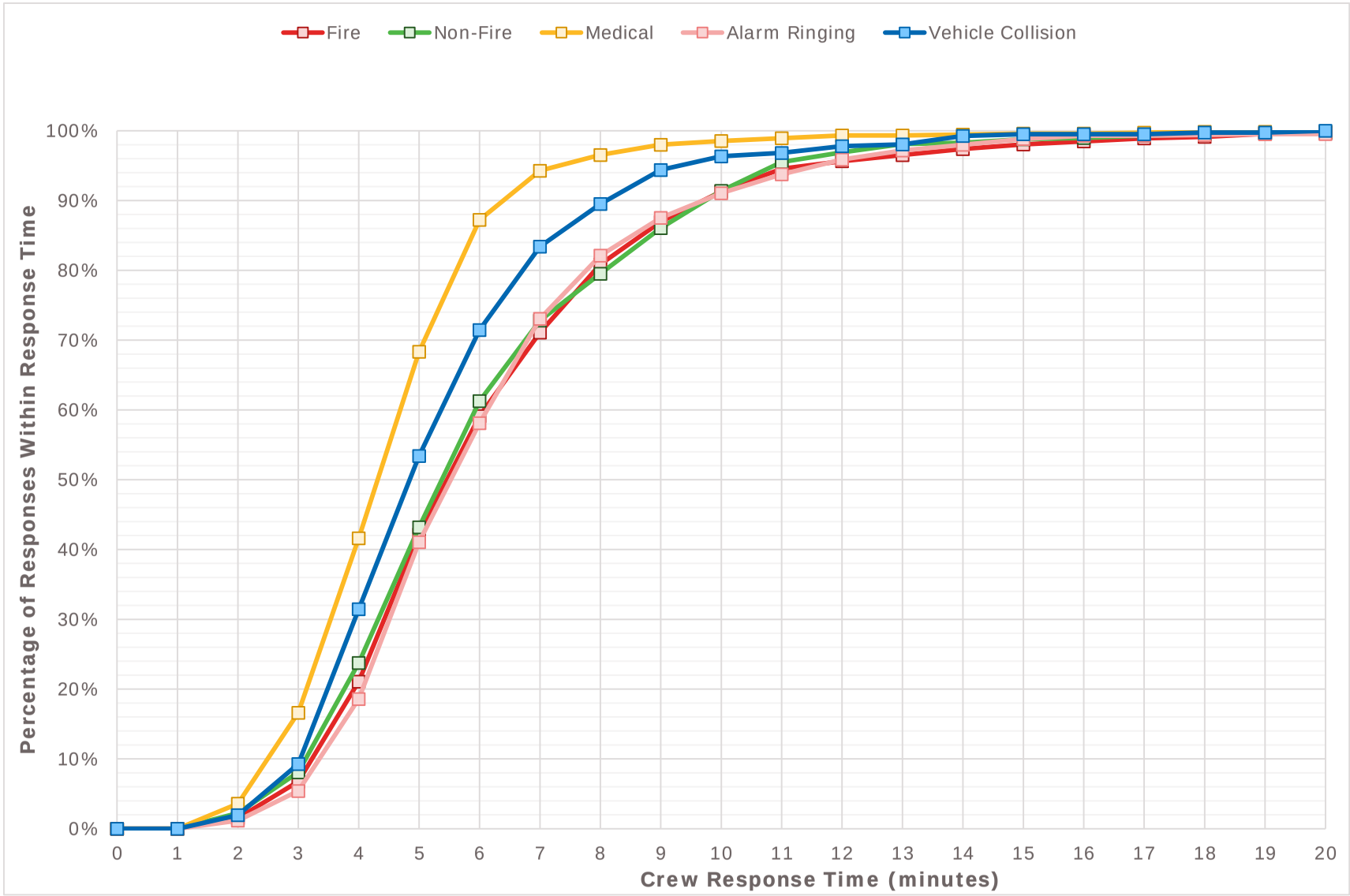


B12c-ii

City of Greater Sudbury Fire

Crew Response Time Cumulative Distribution: Career Units into Career Fire Beats

January 2019 - December 2019

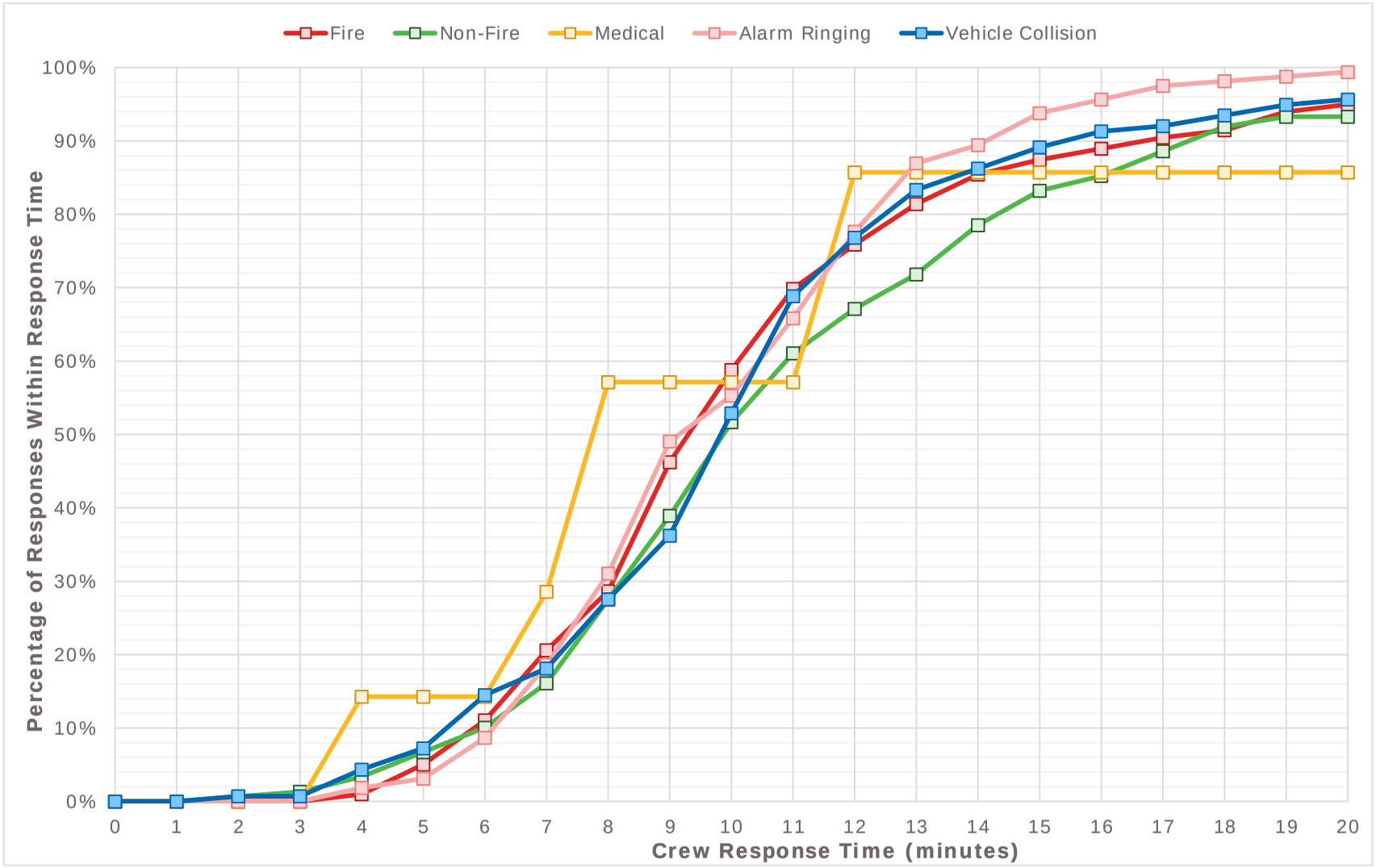


B12c-iii

City of Greater Sudbury Fire

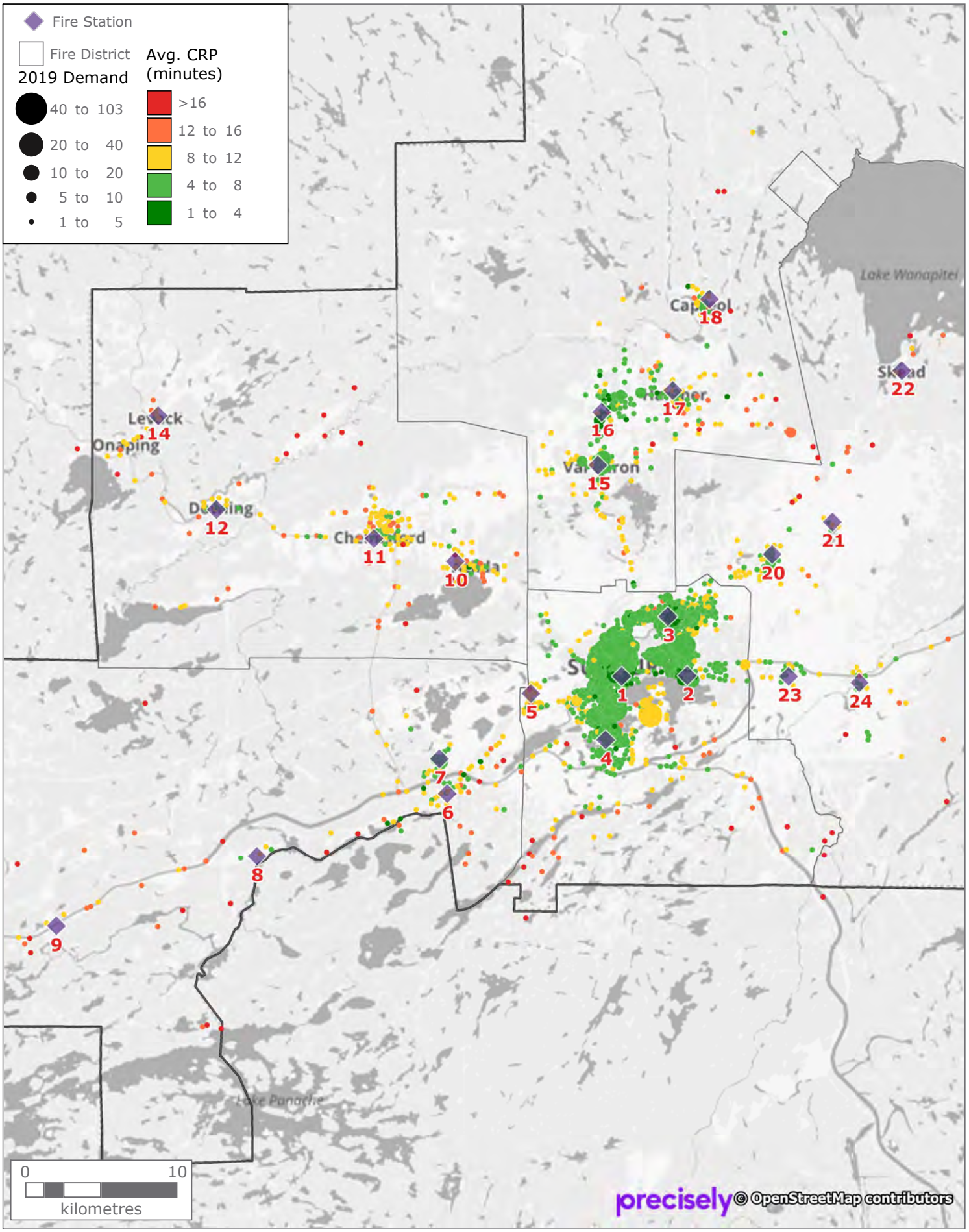
Crew Response Time Cumulative Distribution: Volunteer

January 2019 - December 2019



Average Crew Response Performance 2019

B12d

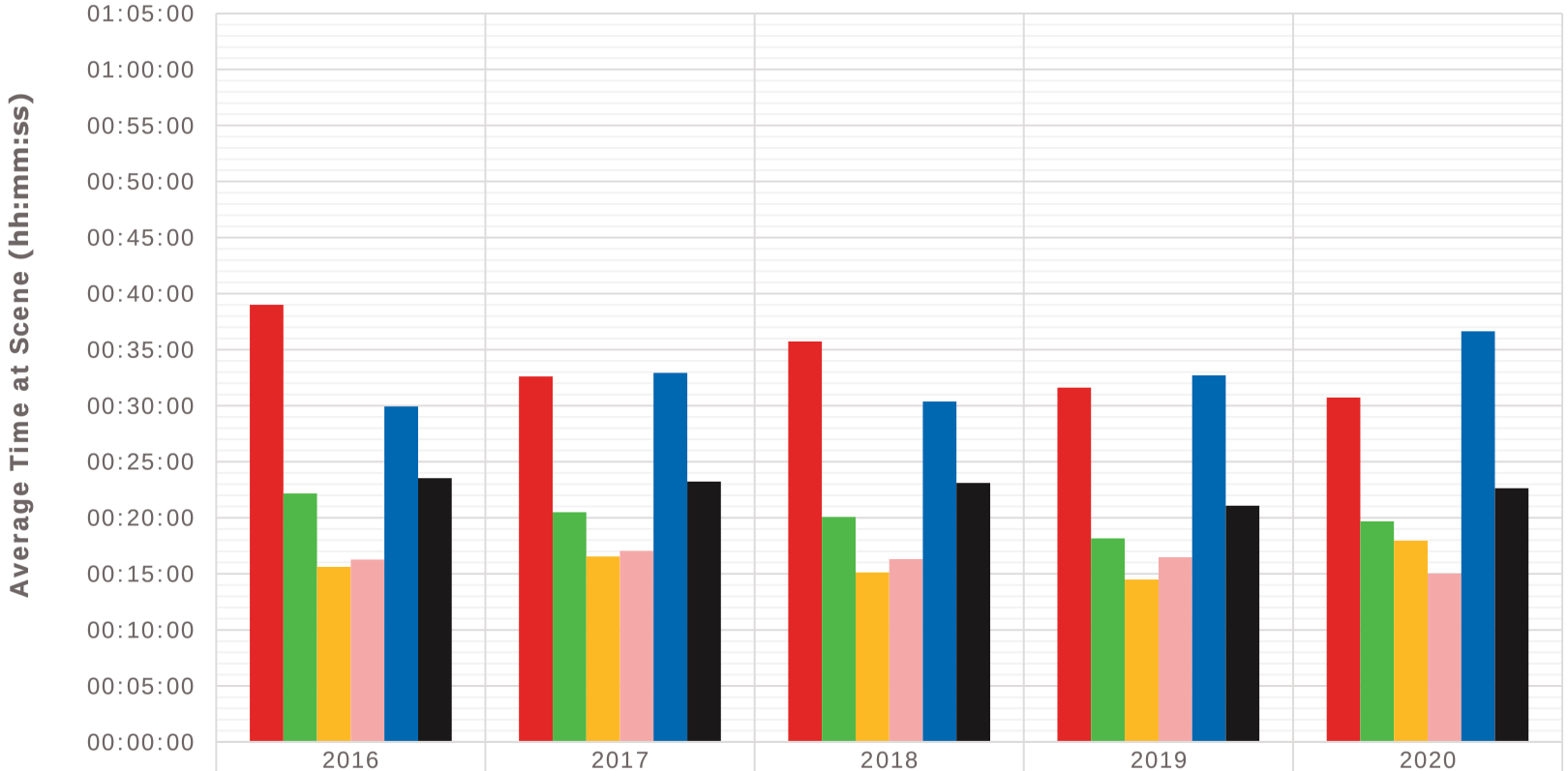


B13a

City of Greater Sudbury Fire

Time at Scene by Category by Year: Career

January 2016 - December 2020



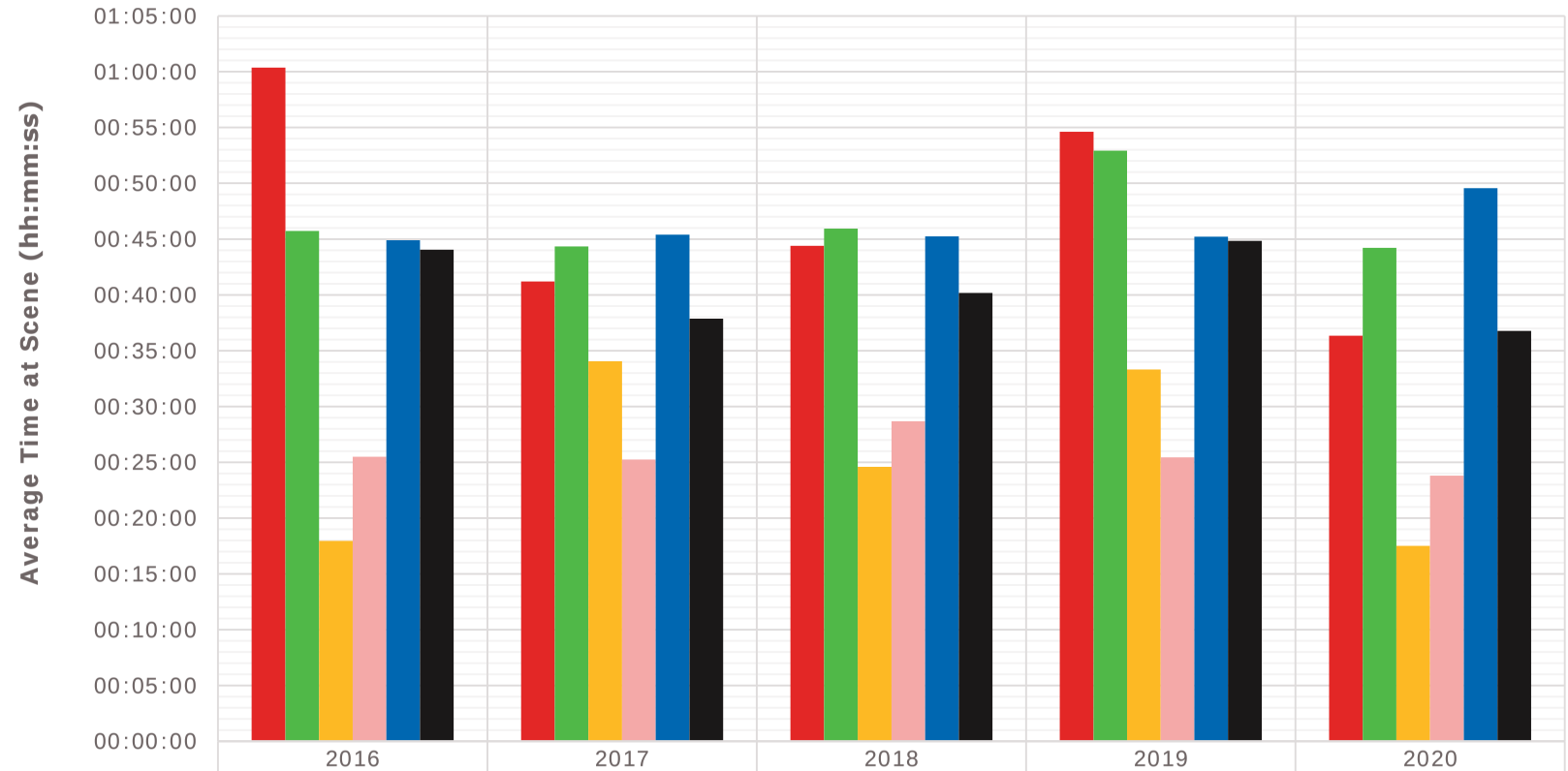
	2016	2017	2018	2019	2020
Fire	00:39:01	00:32:36	00:35:44	00:31:37	00:30:44
Non-Fire	00:22:10	00:20:30	00:20:04	00:18:09	00:19:41
Medical	00:15:37	00:16:32	00:15:07	00:14:29	00:17:57
Alarm Ringing	00:16:16	00:17:02	00:16:19	00:16:28	00:15:01
Vehicle Collision	00:29:56	00:32:56	00:30:22	00:32:43	00:36:39
Overall	00:23:32	00:23:14	00:23:06	00:21:04	00:22:38

B13b

City of Greater Sudbury Fire

Time at Scene by Category by Year: Volunteer

January 2016 - December 2020



	2016	2017	2018	2019	2020
Fire	01:00:22	00:41:12	00:44:24	00:54:37	00:36:20
Non-Fire	00:45:44	00:44:20	00:45:56	00:52:56	00:44:13
Medical	00:17:58	00:34:03	00:24:35	00:33:19	00:17:31
Alarm Ringing	00:25:30	00:25:15	00:28:40	00:25:27	00:23:48
Vehicle Collision	00:44:54	00:45:24	00:45:15	00:45:13	00:49:34
Overall	00:44:03	00:37:52	00:40:11	00:44:50	00:36:46

C Fire Service Outcomes

C1 Model Validation

- **C1a** First Response Distribution
- **C1b** Mean First Response by District
- **C1c** Station Utilization

C2 Career Stations – Ideal 4 Locations

C3 Move Career Stations

- **C3a** Van Horne
- **C3b** Minnow Lake
- **C3c** Leon
- **C3d** Long Lake
- **C3e** Val Therese

C4 Close Minnow Lake Station – Move Resource to Van Horne

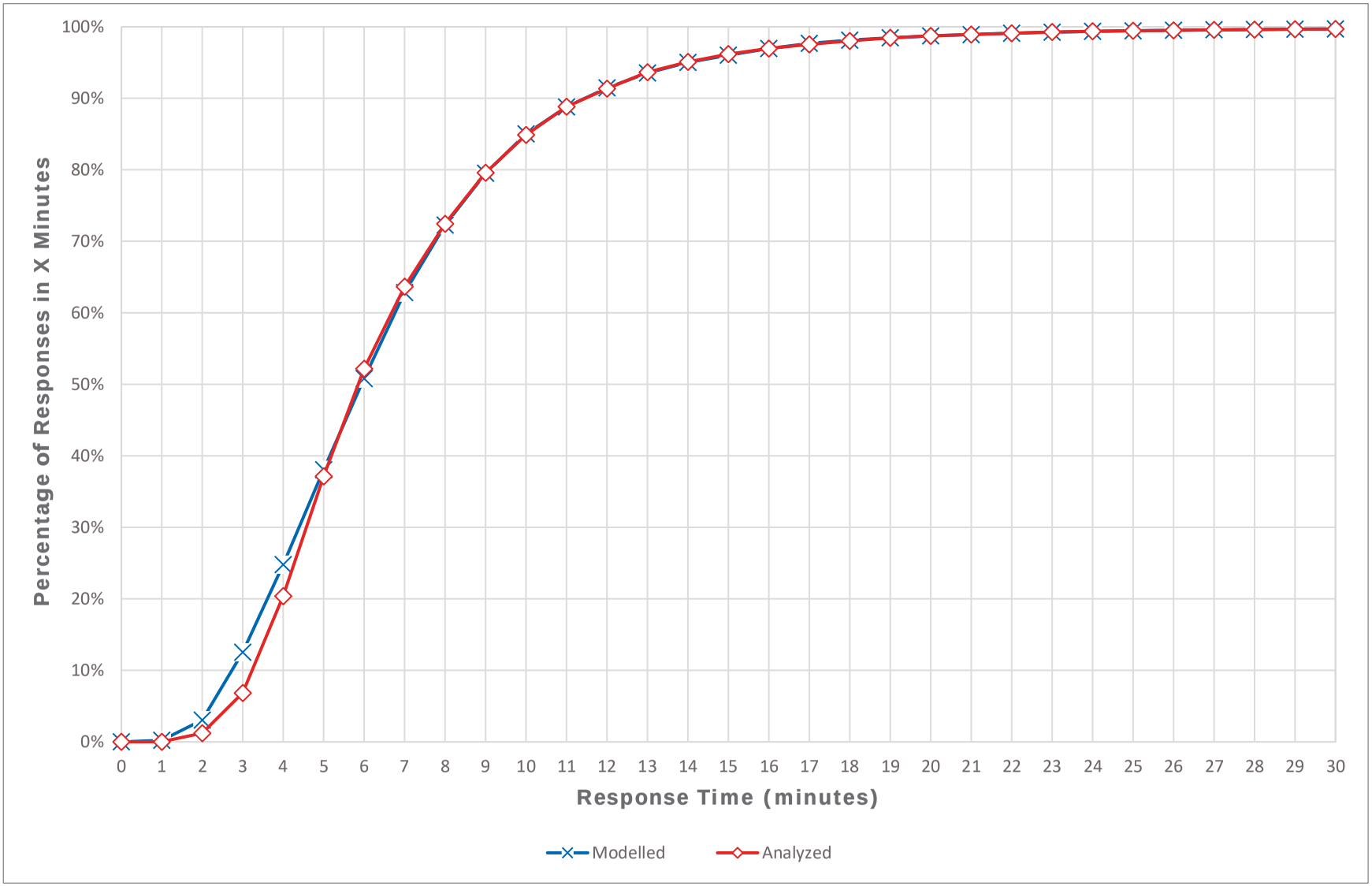
C5 Fire Modelling Options

- **C5a** Fire Modelling Options Map
- **C5b** Modelling Results
- **C5c** Consolidating Val Caron and Hanmer at Val Therese
- **C5d** Volunteer Firefighters by Station

C1a

City of Greater Sudbury Fire

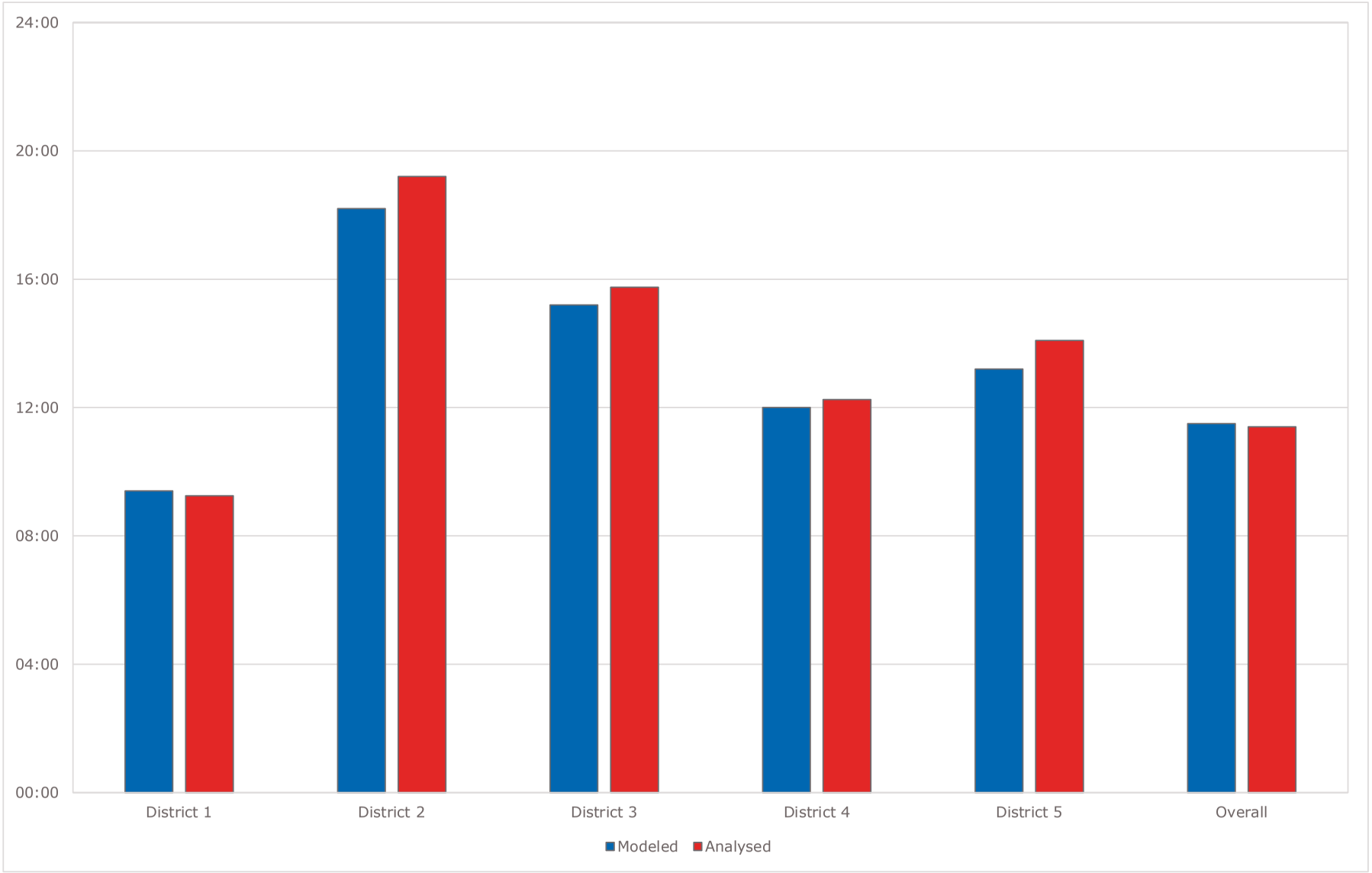
Fire Model Validation: First Response Distribution



C1b

City of Greater Sudbury Fire

Fire Model Validation: 90th Percentile Response Time by District



City of Greater Sudbury Fire

Fire Model Validation: Station Utilization and Workload

January 2016 - December 2020

Station	Utilization			Annual Workload		
	Modelled	Analyzed	Difference	Modelled	Analyzed	Difference
1 (Main Station)	5.4%	4.9%	0.5%	2093	2179	-86
2 (Minnow Lake)	2.5%	2.8%	-0.3%	443	480	-37
3 (New Sudbury)	4.4%	3.4%	1.0%	774	650	124
4 (Long Lake)	4.5%	4.0%	0.5%	800	763	37
5 (Copper Cliff)	0.2%	0.2%	0.0%	22	20	2
6 (Waters)	0.8%	0.8%	0.0%	82	87	-5
7 (Lively)	0.8%	0.9%	0.0%	83	104	-21
8 (Whitefish)	0.4%	0.4%	0.0%	40	39	1
9 (Beaver Lake)	0.3%	0.2%	0.0%	23	23	0
10 (Azilda)	1.0%	1.1%	0.0%	99	103	-4
11 (Chelmsford)	1.6%	1.8%	-0.2%	154	170	-16
12 (Dowling)	0.6%	0.7%	-0.1%	60	49	11
14 (Levack)	0.5%	0.8%	-0.3%	47	43	4
15 (Val Caron)	0.3%	0.3%	0.0%	30	25	5
16 (Val Therese)	2.2%	3.2%	-1.0%	376	416	-40
17 (Hanmer)	0.3%	0.5%	-0.2%	31	43	-12
18 (Capreol)	0.5%	0.5%	0.1%	51	49	2
20 (Garson)	1.0%	1.1%	-0.1%	96	97	-1
21 (Falconbridge)	0.3%	0.3%	0.0%	25	19	6
22 (Skead)	0.1%	0.2%	-0.1%	12	8	4
23 (Coniston)	0.5%	0.6%	-0.1%	53	44	9
24 (Wahnapitae)	0.5%	0.8%	-0.3%	48	60	-12
Overall	**1.5%**	**1.5%**	**0.0%**	**5440**	**5472**	**-32**

C2

City of Greater Sudbury Fire

Model Results: Career - Ideal Locations in City Core

90th Percentile Response Time

Base

Fire Beat	Fires	Non Fires	Medical	Alarms Ringing	Vehicle Collision	Overall	Fire + Non Fire + Vehicle Colision
Van Horne	08:06	08:12	07:06	08:18	08:30	08:00	08:12
Minnow Lake	08:24	09:00	07:06	09:42	08:00	08:36	08:30
New Sudbury	09:54	10:00	08:00	10:12	08:36	09:30	09:30
Long Lake	16:00	16:06	12:12	16:30	13:30	15:24	15:24
Val Therese	10:18	10:30	06:48	09:12	08:06	09:00	09:18
Career Overall	**10:00**	**10:10**	**08:11**	**10:21**	**09:22**	**09:45**	**09:50**

Model

Fire Beat	Fires	Non Fires	Medical	Alarms Ringing	Vehicle Collision	Overall	Fire + Non Fire + Vehicle Colision
Van Horne	07:18	07:12	06:12	07:36	07:36	07:12	07:18
Minnow Lake	08:48	09:36	07:36	10:06	06:18	08:36	08:36
New Sudbury	08:18	08:12	06:30	08:42	06:36	07:42	07:42
Long Lake	15:54	15:54	11:36	16:24	12:48	15:00	15:00
Val Therese	10:18	10:32	06:48	09:12	08:00	09:00	09:18
Career Overall	**09:22**	**09:24**	**07:27**	**09:47**	**08:16**	**08:59**	**09:02**

Model

Fire Beat	Fires	Non Fires	Medical	Alarms Ringing	Vehicle Collision	Overall	Fire + Non Fire + Vehicle Colision
Van Horne	-00:48	-01:00	-00:54	-00:42	-00:54	-00:48	-00:54
Minnow Lake	00:24	00:36	00:30	00:24	-01:42	00:00	00:06
New Sudbury	-01:36	-01:48	-01:30	-01:30	-02:00	-01:48	-01:48
Long Lake	-00:06	-00:12	-00:36	-00:06	-00:42	-00:24	-00:24
Val Therese	00:00	00:02	00:00	00:00	-00:06	00:00	00:00
Career Overall	**-00:38**	**-00:45**	**-00:45**	**-00:34**	**-01:06**	**-00:46**	**-00:48**

C3a

City of Greater Sudbury Fire

Model Results: Career - Move Van Horne to Ideal Location

90th Percentile Response Time

Base

Fire Beat	Fires	Non Fires	Medical	Alarms Ringing	Vehicle Collision	Overall	Fire + Non Fire + Vehicle Colision
Van Horne	08:06	08:12	07:06	08:18	08:30	08:00	08:12
Minnow Lake	08:24	09:00	07:06	09:42	08:00	08:36	08:30
New Sudbury	09:54	10:00	08:00	10:12	08:36	09:30	09:30
Long Lake	16:00	16:06	12:12	16:30	13:30	15:24	15:24
Val Therese	10:18	10:30	06:48	09:12	08:06	09:00	09:18
Career Overall	**10:00**	**10:10**	**08:11**	**10:21**	**09:22**	**09:45**	**09:50**

Model

Fire Beat	Fires	Non Fires	Medical	Alarms Ringing	Vehicle Collision	Overall	Fire + Non Fire + Vehicle Colision
Van Horne	07:18	07:12	06:48	07:42	08:06	07:18	07:30
Minnow Lake	08:18	09:00	07:06	09:42	08:00	08:30	08:30
New Sudbury	09:36	09:48	07:48	10:12	08:18	09:18	09:18
Long Lake	16:00	16:06	12:12	16:30	13:36	15:24	15:24
Val Therese	10:26	10:36	06:48	09:12	07:54	09:00	09:24
Career Overall	**09:33**	**09:39**	**08:00**	**10:03**	**09:08**	**09:21**	**09:28**

Model

Fire Beat	Fires	Non Fires	Medical	Alarms Ringing	Vehicle Collision	Overall	Fire + Non Fire + Vehicle Colision
Van Horne	-00:48	-01:00	-00:18	-00:36	-00:24	-00:42	-00:42
Minnow Lake	-00:06	00:00	00:00	00:00	00:00	-00:06	00:00
New Sudbury	-00:18	-00:12	-00:12	00:00	-00:18	-00:12	-00:12
Long Lake	00:00	00:00	00:00	00:00	00:06	00:00	00:00
Val Therese	00:08	00:06	00:00	00:00	-00:12	00:00	00:06
Career Overall	**-00:27**	**-00:31**	**-00:11**	**-00:18**	**-00:14**	**-00:23**	**-00:22**

C3b

City of Greater Sudbury Fire

Model Results: Career - Move Minnow Lake to Ideal Location

90th Percentile Response Time

Base

Fire Beat	Fires	Non Fires	Medical	Alarms Ringing	Vehicle Collision	Overall	Fire + Non Fire + Vehicle Colision
Van Horne	08:06	08:12	07:06	08:18	08:30	08:00	08:12
Minnow Lake	08:24	09:00	07:06	09:42	08:00	08:36	08:30
New Sudbury	09:54	10:00	08:00	10:12	08:36	09:30	09:30
Long Lake	16:00	16:06	12:12	16:30	13:30	15:24	15:24
Val Therese	10:18	10:30	06:48	09:12	08:06	09:00	09:18
Career Overall	**10:00**	**10:10**	**08:11**	**10:21**	**09:22**	**09:45**	**09:50**

Model

Fire Beat	Fires	Non Fires	Medical	Alarms Ringing	Vehicle Collision	Overall	Fire + Non Fire + Vehicle Colision
Van Horne	08:06	08:06	06:48	08:12	08:00	07:48	08:06
Minnow Lake	08:30	09:36	07:30	09:54	06:00	08:24	08:24
New Sudbury	08:42	08:30	06:42	09:00	07:06	08:12	08:12
Long Lake	15:42	16:00	11:42	16:30	12:50	15:12	15:06
Val Therese	10:24	10:32	06:48	09:12	08:00	09:00	09:18
Career Overall	**09:46**	**09:55**	**07:47**	**10:07**	**08:31**	**09:22**	**09:30**

Model

Fire Beat	Fires	Non Fires	Medical	Alarms Ringing	Vehicle Collision	Overall	Fire + Non Fire + Vehicle Colision
Van Horne	00:00	-00:06	-00:18	-00:06	-00:30	-00:12	-00:06
Minnow Lake	00:06	00:36	00:24	00:12	-02:00	-00:12	-00:06
New Sudbury	-01:12	-01:30	-01:18	-01:12	-01:30	-01:18	-01:18
Long Lake	-00:18	-00:06	-00:30	00:00	-00:40	-00:12	-00:18
Val Therese	00:06	00:02	00:00	00:00	-00:06	00:00	00:00
Career Overall	**-00:14**	**-00:15**	**-00:25**	**-00:14**	**-00:51**	**-00:23**	**-00:20**

C3c

City of Greater Sudbury Fire

Model Results: Career - Move Leon to Ideal Location

90th Percentile Response Time

Base

Fire Beat	Fires	Non Fires	Medical	Alarms Ringing	Vehicle Collision	Overall	Fire + Non Fire + Vehicle Colision
Van Horne	08:06	08:12	07:06	08:18	08:30	08:00	08:12
Minnow Lake	08:24	09:00	07:06	09:42	08:00	08:36	08:30
New Sudbury	09:54	10:00	08:00	10:12	08:36	09:30	09:30
Long Lake	16:00	16:06	12:12	16:30	13:30	15:24	15:24
Val Therese	10:18	10:30	06:48	09:12	08:06	09:00	09:18
Career Overall	**10:00**	**10:10**	**08:11**	**10:21**	**09:22**	**09:45**	**09:50**

Model

Fire Beat	Fires	Non Fires	Medical	Alarms Ringing	Vehicle Collision	Overall	Fire + Non Fire + Vehicle Colision
Van Horne	08:06	08:12	07:00	08:18	08:30	07:54	08:12
Minnow Lake	08:24	09:00	07:06	09:42	08:00	08:30	08:30
New Sudbury	09:36	09:48	07:48	09:54	08:30	09:18	09:24
Long Lake	16:00	16:06	12:06	16:30	13:30	15:24	15:24
Val Therese	10:18	10:30	06:48	09:12	08:00	09:00	09:18
Career Overall	**09:57**	**10:08**	**08:05**	**10:18**	**09:21**	**09:39**	**09:49**

Model

Fire Beat	Fires	Non Fires	Medical	Alarms Ringing	Vehicle Collision	Overall	Fire + Non Fire + Vehicle Colision
Van Horne	00:00	00:00	-00:06	00:00	00:00	-00:06	00:00
Minnow Lake	00:00	00:00	00:00	00:00	00:00	-00:06	00:00
New Sudbury	-00:18	-00:12	-00:12	-00:18	-00:06	-00:12	-00:06
Long Lake	00:00	00:00	-00:06	00:00	00:00	00:00	00:00
Val Therese	00:00	00:00	00:00	00:00	-00:06	00:00	00:00
Career Overall	**-00:03**	**-00:02**	**-00:06**	**-00:03**	**-00:01**	**-00:06**	**-00:01**

C3d

City of Greater Sudbury Fire

Model Results: Career - Move Long Lake to Ideal Location

90th Percentile Response Time

Base

Fire Beat	Fires	Non Fires	Medical	Alarms Ringing	Vehicle Collision	Overall	Fire + Non Fire + Vehicle Colision
Van Horne	08:06	08:12	07:06	08:18	08:30	08:00	08:12
Minnow Lake	08:24	09:00	07:06	09:42	08:00	08:36	08:30
New Sudbury	09:54	10:00	08:00	10:12	08:36	09:30	09:30
Long Lake	16:00	16:06	12:12	16:30	13:30	15:24	15:24
Val Therese	10:18	10:30	06:48	09:12	08:06	09:00	09:18
Career Overall	**10:00**	**10:10**	**08:11**	**10:21**	**09:22**	**09:45**	**09:50**

Model

Fire Beat	Fires	Non Fires	Medical	Alarms Ringing	Vehicle Collision	Overall	Fire + Non Fire + Vehicle Colision
Van Horne	08:06	08:06	06:54	08:16	08:24	07:54	08:12
Minnow Lake	08:24	09:00	07:06	09:42	08:00	08:36	08:30
New Sudbury	09:54	10:00	08:00	10:12	08:36	09:30	09:30
Long Lake	16:06	16:00	12:06	16:24	13:24	15:24	15:18
Val Therese	10:18	10:30	06:48	09:12	08:06	09:00	09:18
Career Overall	**10:01**	**10:06**	**08:04**	**10:18**	**09:18**	**09:42**	**09:49**

Model

Fire Beat	Fires	Non Fires	Medical	Alarms Ringing	Vehicle Collision	Overall	Fire + Non Fire + Vehicle Colision
Van Horne	00:00	-00:06	-00:12	-00:02	-00:06	-00:06	00:00
Minnow Lake	00:00	00:00	00:00	00:00	00:00	00:00	00:00
New Sudbury	00:00	00:00	00:00	00:00	00:00	00:00	00:00
Long Lake	00:06	-00:06	-00:06	-00:06	-00:06	00:00	-00:06
Val Therese	00:00	00:00	00:00	00:00	00:00	00:00	00:00
Career Overall	**00:01**	**-00:04**	**-00:07**	**-00:02**	**-00:04**	**-00:03**	**-00:01**

C3e

City of Greater Sudbury Fire

Model Results: Career - Move Val Therese to Ideal Location

90th Percentile Response Time

Base

Fire Beat	Fires	Non Fires	Medical	Alarms Ringing	Vehicle Collision	Overall	Fire + Non Fire + Vehicle Colision
Van Horne	08:06	08:12	07:06	08:18	08:30	08:00	08:12
Minnow Lake	08:24	09:00	07:06	09:42	08:00	08:36	08:30
New Sudbury	09:54	10:00	08:00	10:12	08:36	09:30	09:30
Long Lake	16:00	16:06	12:12	16:30	13:30	15:24	15:24
Val Therese	10:18	10:30	06:48	09:12	08:06	09:00	09:18
Career Overall	**10:00**	**10:10**	**08:11**	**10:21**	**09:22**	**09:45**	**09:50**

Model

Fire Beat	Fires	Non Fires	Medical	Alarms Ringing	Vehicle Collision	Overall	Fire + Non Fire + Vehicle Colision
Van Horne	08:06	08:12	07:06	08:18	08:30	08:00	08:12
Minnow Lake	08:24	09:00	07:06	09:42	08:01	08:36	08:30
New Sudbury	09:54	10:06	08:00	10:14	08:36	09:30	09:30
Long Lake	16:00	16:06	12:12	16:30	13:32	15:24	15:24
Val Therese	09:42	11:06	05:54	08:30	08:00	08:36	09:12
Career Overall	**09:59**	**10:12**	**08:09**	**10:19**	**09:23**	**09:43**	**09:50**

Model

Fire Beat	Fires	Non Fires	Medical	Alarms Ringing	Vehicle Collision	Overall	Fire + Non Fire + Vehicle Colision
Van Horne	00:00	00:00	00:00	00:00	00:00	00:00	00:00
Minnow Lake	00:00	00:00	00:00	00:00	00:01	00:00	00:00
New Sudbury	00:00	00:06	00:00	00:02	00:00	00:00	00:00
Long Lake	00:00	00:00	00:00	00:00	00:02	00:00	00:00
Val Therese	-00:36	00:36	-00:54	-00:42	-00:06	-00:24	-00:06
Career Overall	**-00:02**	**00:03**	**-00:02**	**-00:01**	**00:00**	**-00:01**	**-00:00**

C4

City of Greater Sudbury Fire

Model Results: Closing Minnow Lake Station (Move Resource to Van Horne)

90th Percentile Response Time

Base

Fire Beat	Fires	Non Fires	Medical	Alarms Ringing	Vehicle Collision	Overall	Fire + Non Fire + Vehicle Colision
Van Horne	08:06	08:12	07:06	08:18	08:30	08:00	08:12
Minnow Lake	08:24	09:00	07:06	09:42	08:00	08:36	08:30
New Sudbury	09:54	10:00	08:00	10:12	08:36	09:30	09:30
Long Lake	16:00	16:06	12:12	16:30	13:30	15:24	15:24
Val Therese	10:18	10:30	06:48	09:12	08:06	09:00	09:18
Career Overall	**10:00**	**10:10**	**08:11**	**10:21**	**09:22**	**09:45**	**09:50**

Model

Fire Beat	Fires	Non Fires	Medical	Alarms Ringing	Vehicle Collision	Overall	Fire + Non Fire + Vehicle Colision
Van Horne	08:00	08:00	06:24	08:06	07:36	07:36	07:54
Minnow Lake	11:06	12:06	09:30	12:30	09:00	11:12	10:54
New Sudbury	10:30	10:48	08:36	10:42	09:36	10:12	10:18
Long Lake	15:42	16:00	11:48	16:30	12:48	15:12	15:06
Val Therese	10:30	10:30	06:48	09:12	08:06	09:00	09:24
Career Overall	**10:19**	**10:32**	**08:09**	**10:39**	**09:05**	**09:56**	**10:03**

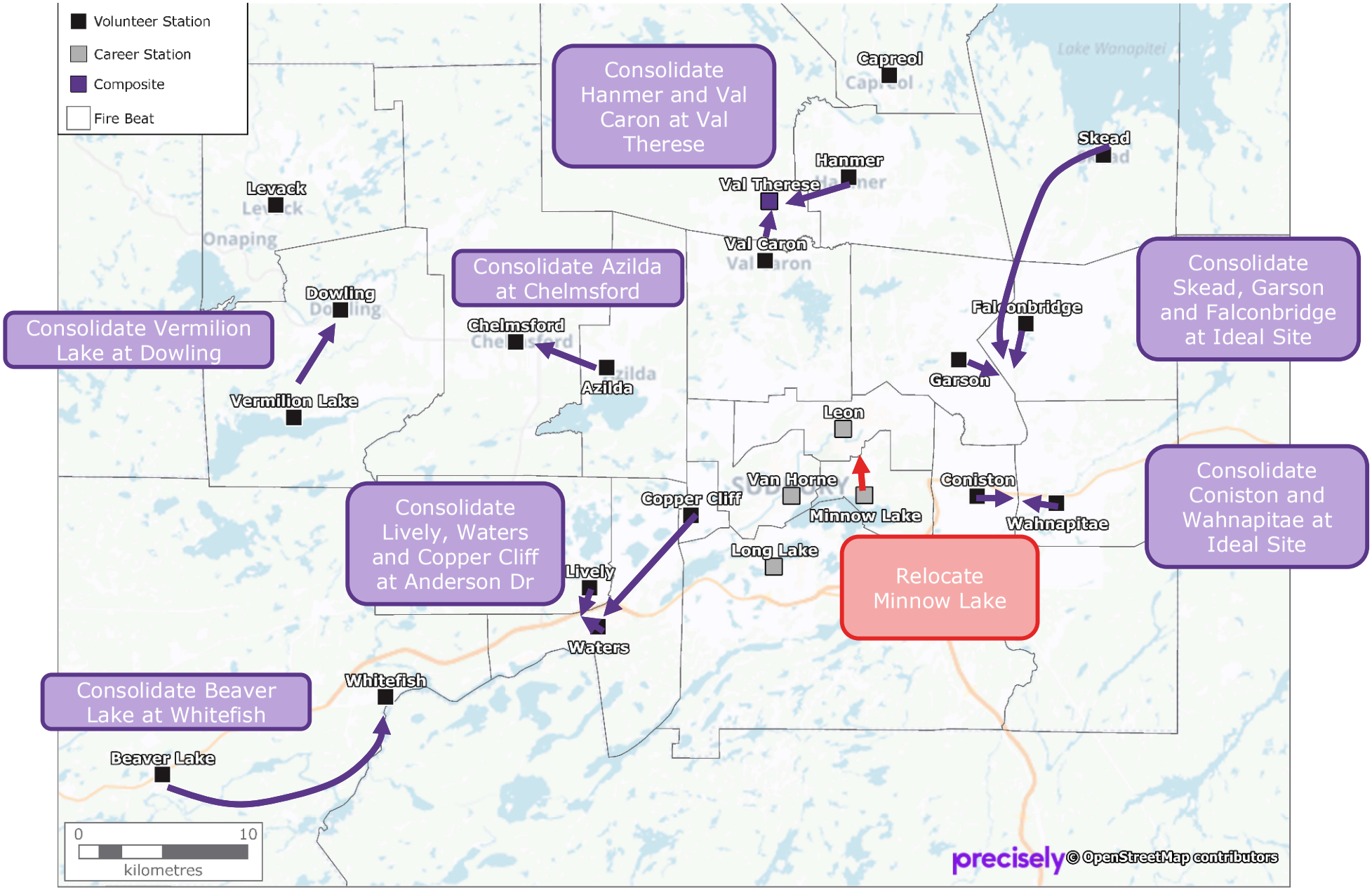
Model

Fire Beat	Fires	Non Fires	Medical	Alarms Ringing	Vehicle Collision	Overall	Fire + Non Fire + Vehicle Colision
Van Horne	-00:06	-00:12	-00:42	-00:12	-00:54	-00:24	-00:18
Minnow Lake	02:42	03:06	02:24	02:48	01:00	02:36	02:24
New Sudbury	00:36	00:48	00:36	00:30	01:00	00:42	00:48
Long Lake	-00:18	-00:06	-00:24	00:00	-00:42	-00:12	-00:18
Val Therese	00:12	00:00	00:00	00:00	00:00	00:00	00:06
Career Overall	**00:19**	**00:23**	**-00:02**	**00:19**	**-00:17**	**00:11**	**00:13**

C5a

City of Sudbury Fire

Final Fire Modelling Options



City of Greater Sudbury Fire

Results by Fire Beat - Fire, Non Fire & Vehicle Collision Incidents

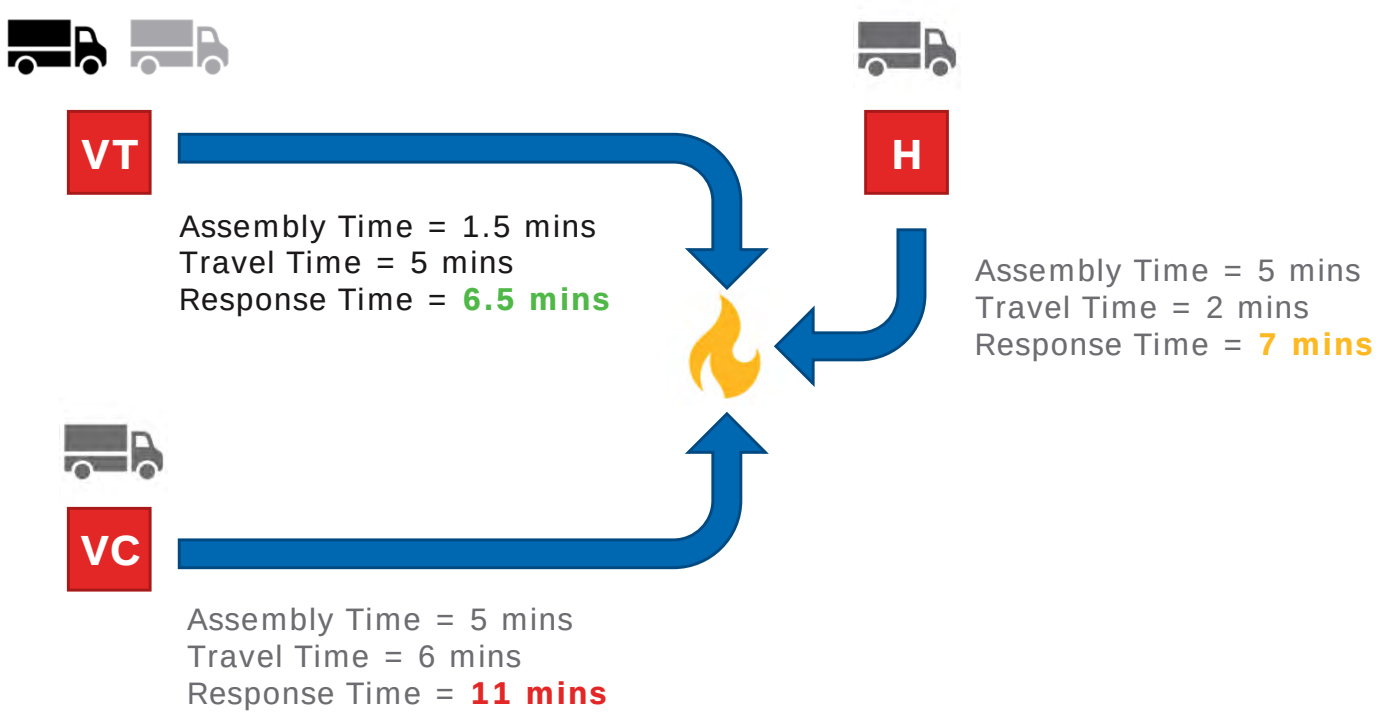
90th Percentile Response Time

Fire Beat	Fire Beat Name	Base	Final Scenario	Difference
F1	Van Horne	08:12	08:06	-00:06
F2	Minnow Lake	08:30	08:48	00:18
F3	New Sudbury	09:30	08:36	-00:54
F4	Long Lake	15:24	15:06	-00:18
F16	Val Therese	09:18	08:48	-00:30
Career Overall		**09:50**	**09:36**	**-00:15**
F5	Copper Cliff	13:06	13:42	00:36
F6	Waters	16:48	17:18	00:30
F7	Lively	12:35	13:00	00:25
F8	Beaver Lake/Whitefish	27:30	27:24	-00:06
F10	Azilda	14:48	18:00	03:12
F11	Chelmsford	15:12	14:18	-00:54
F12	Dowling	22:54	22:36	-00:18
F14	Levack	13:48	13:48	00:00
F15	Val Caron	10:12	10:06	-00:06
F17	Hanmer	13:48	13:30	-00:18
F18	Capreol	27:42	27:41	-00:01
F20	Garson	11:30	10:24	-01:06
F21	Falconbridge	13:48	14:40	00:52
F22	Skead	21:12	21:03	-00:09
F23	Coniston	10:30	10:36	00:06
F24	Wahnapitae	12:30	12:48	00:18
F25	-	22:06	23:06	01:00
F26	-	34:18	33:06	-01:12
Volunteer Overall		**15:11**	**15:16**	**00:05**
Overall		**12:12**	**12:02**	**-00:10**

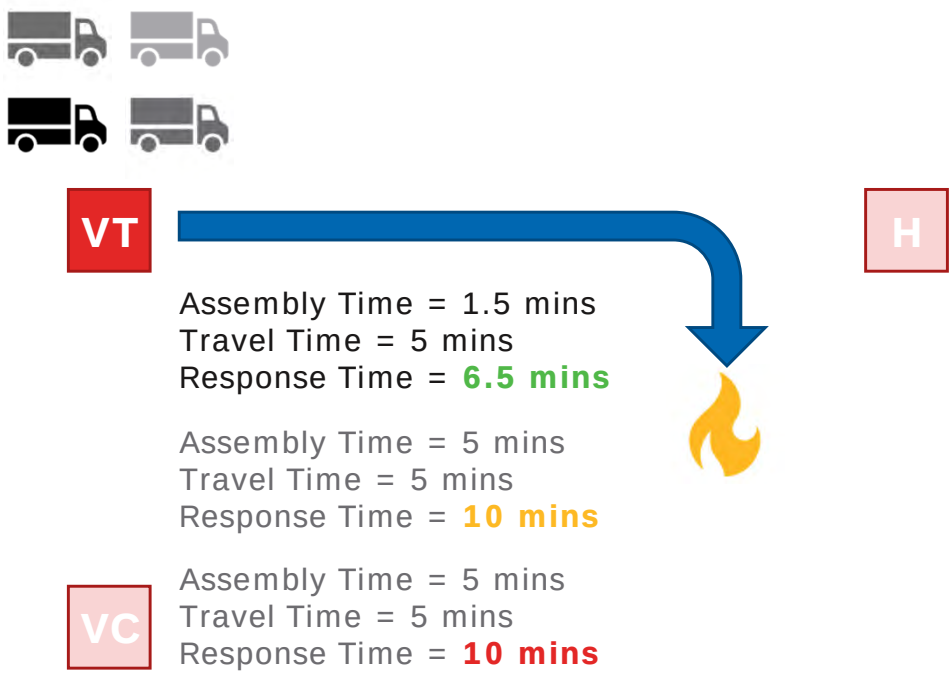
Consolidating Val Caron and Hanmer at the current site for Val Therese

C5c

Current



Proposed



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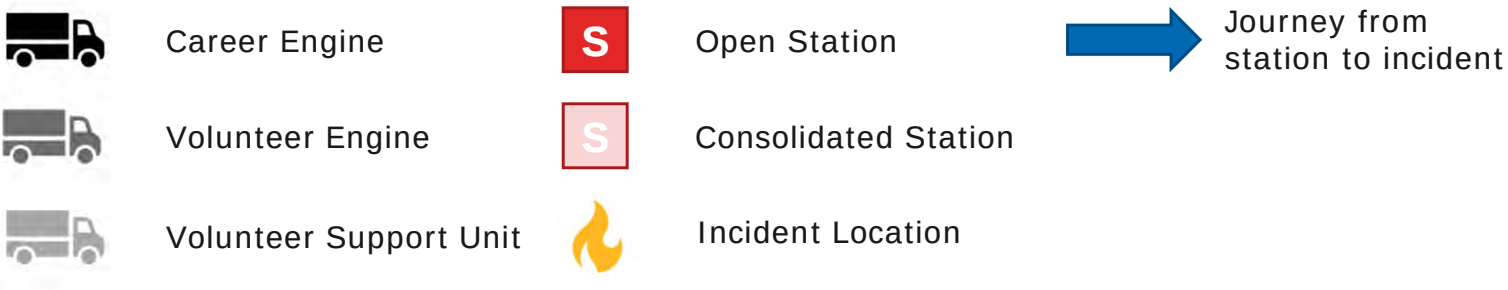
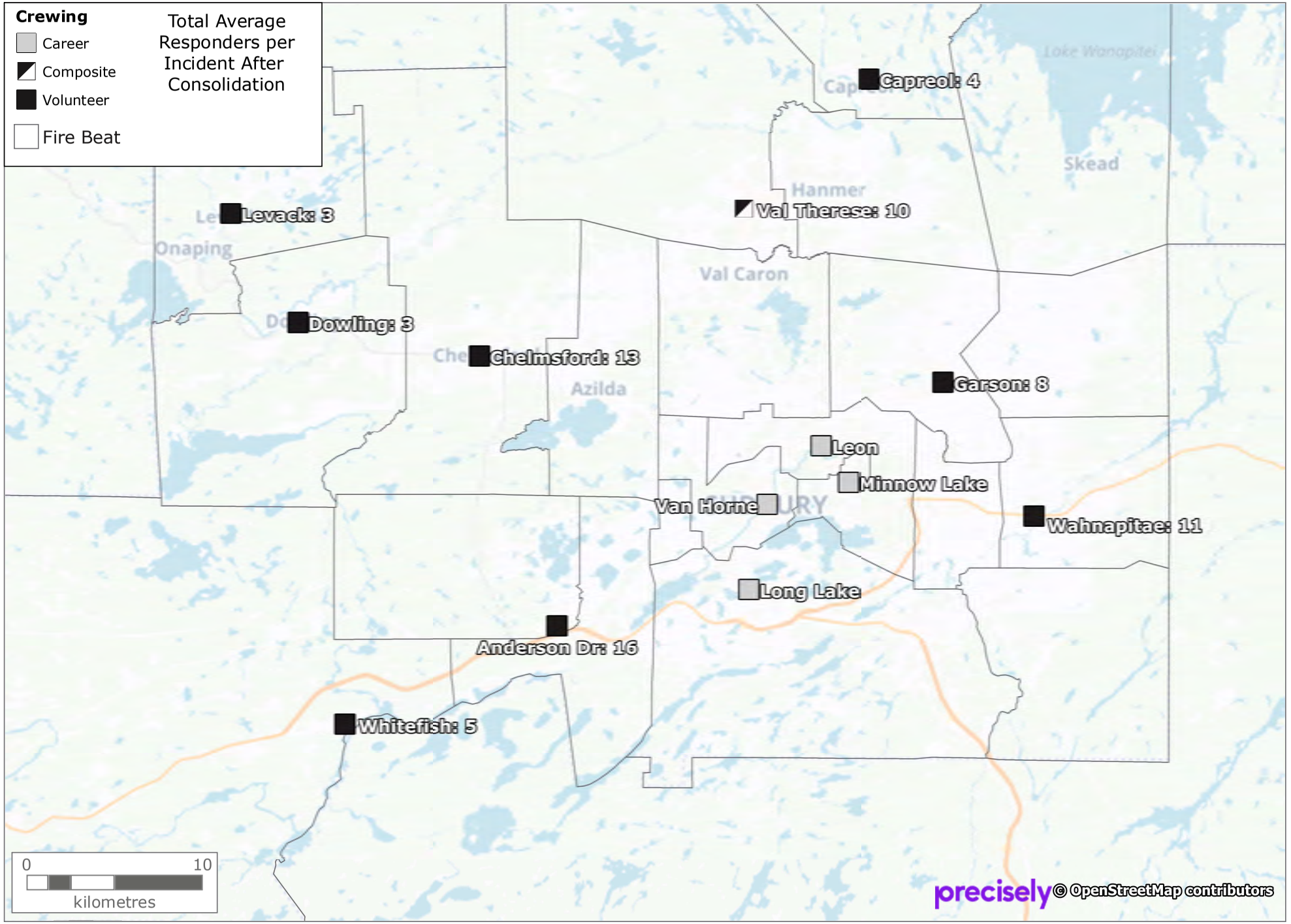


C5d

Total Average Responders per Incident After Consolidation

2020 Assigned/Average Responding Firefighters



D Paramedic Services Historical Analysis

D1 Demand

- **D1a** Historical Demand by Month
- **D1b** P4 Demand Distribution
  - D1b-i Greater Sudbury
  - D1b-ii Core
- **D1c** Dispatch vs Return Priority

D2 Performance

- **D2a** CTAS Response Performance by Area
- **D2b** CTAS Response Performance by Year

D3 Call Components by Year

D4 Resources and Resource Use

- **D4a** Planned vs Actual Resourcing
- **D4b** Responses with ACPs
- **D4c** Utilization by Hour
  - D4c-i Overall
  - D4c-ii By Station
- **D4d** Standby Moves
  - D4d-i Summary by Station
  - D4d-ii Completed Moves Mobilizing and Arriving Areas

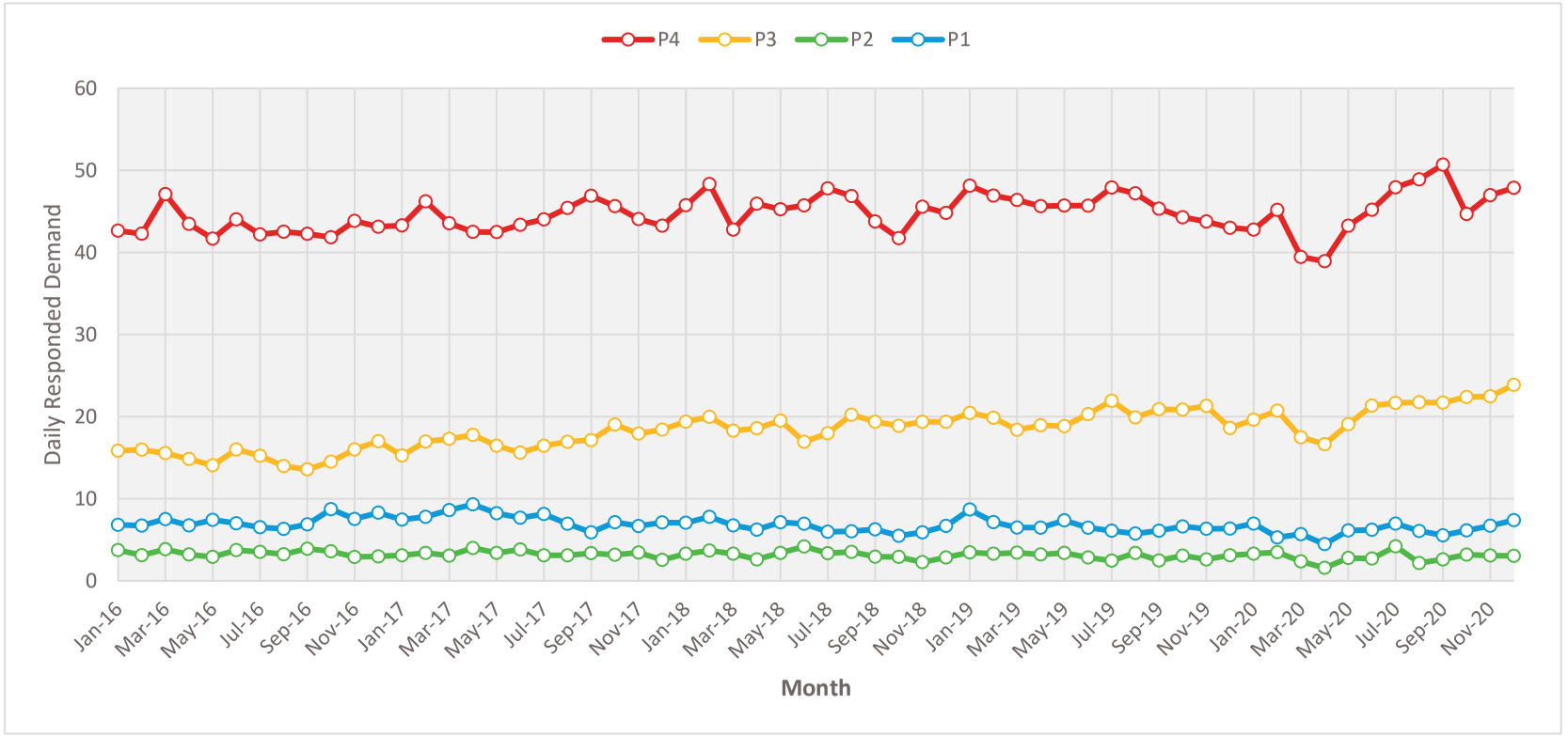
D1a

City of Greater Sudbury EMS

Historical Demand by Month

Average Daily Responded Demand (P1 to P4)

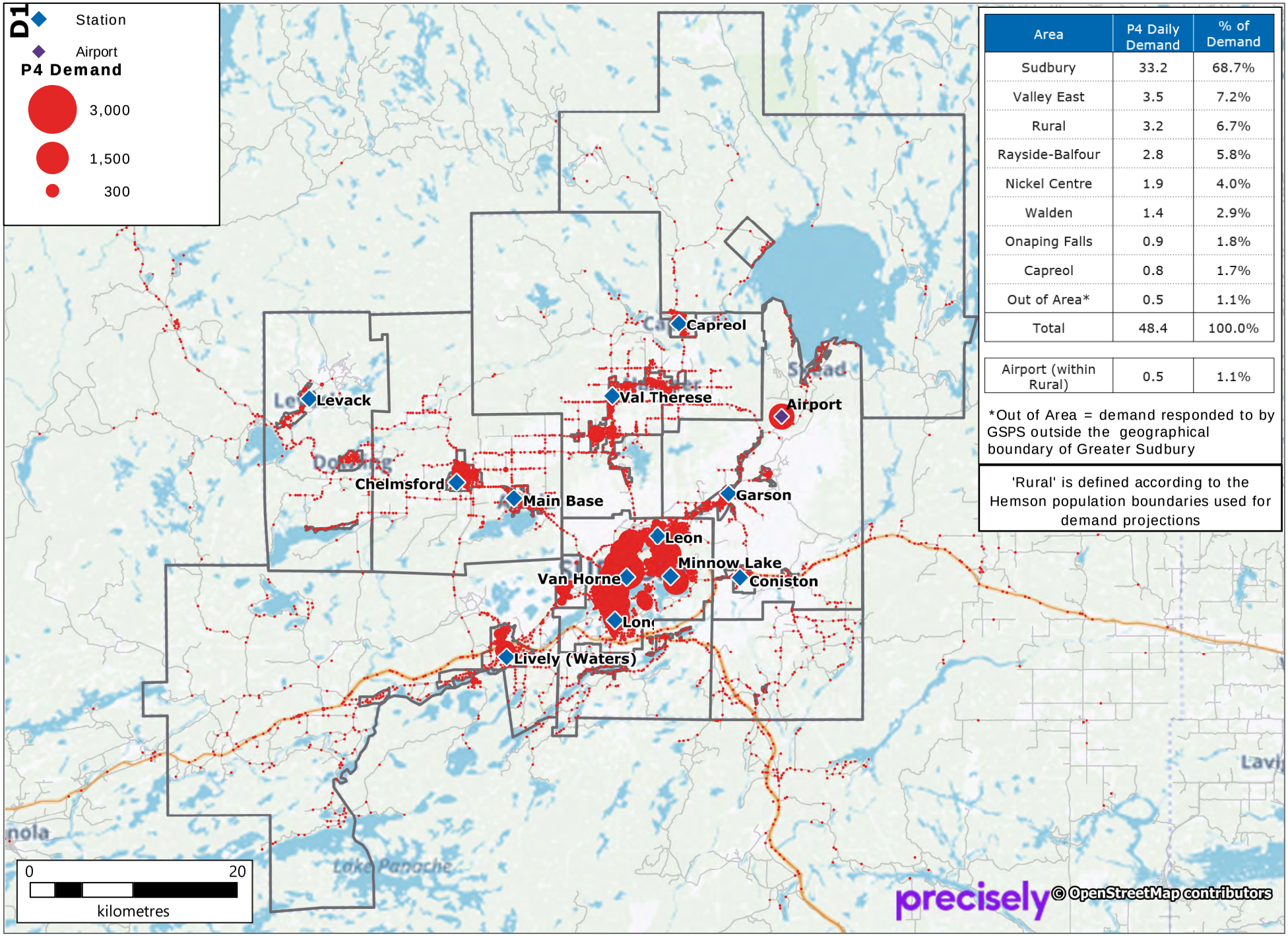
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Overall
2016	69.0	68.1	74.0	68.2	66.1	70.8	67.5	66.0	66.6	68.6	70.3	71.4	**68.9**
2017	69.1	74.4	72.5	73.6	70.5	70.4	71.7	72.4	73.3	75.0	72.1	71.3	**72.2**
2018	75.5	79.8	71.1	73.3	75.3	73.8	75.1	76.6	72.3	69.0	73.1	73.7	**74.0**
2019	80.7	77.2	74.7	74.2	75.3	75.3	78.4	76.2	74.8	74.8	74.0	71.1	**75.6**
2020	72.6	74.7	65.0	61.6	71.2	75.4	80.8	78.9	80.5	76.4	79.2	82.2	**74.9**



D1b-i

P4 Demand Distribution

City of Greater Sudbury - January 2016 to December 2020



Area	P4 Daily Demand	% of Demand
Sudbury	33.2	68.7%
Valley East	3.5	7.2%
Rural	3.2	6.7%
Rayside-Balfour	2.8	5.8%
Nickel Centre	1.9	4.0%
Walden	1.4	2.9%
Onaping Falls	0.9	1.8%
Capreol	0.8	1.7%
Out of Area*	0.5	1.1%
Total	48.4	100.0%

Airport (within Rural)	0.5	1.1%

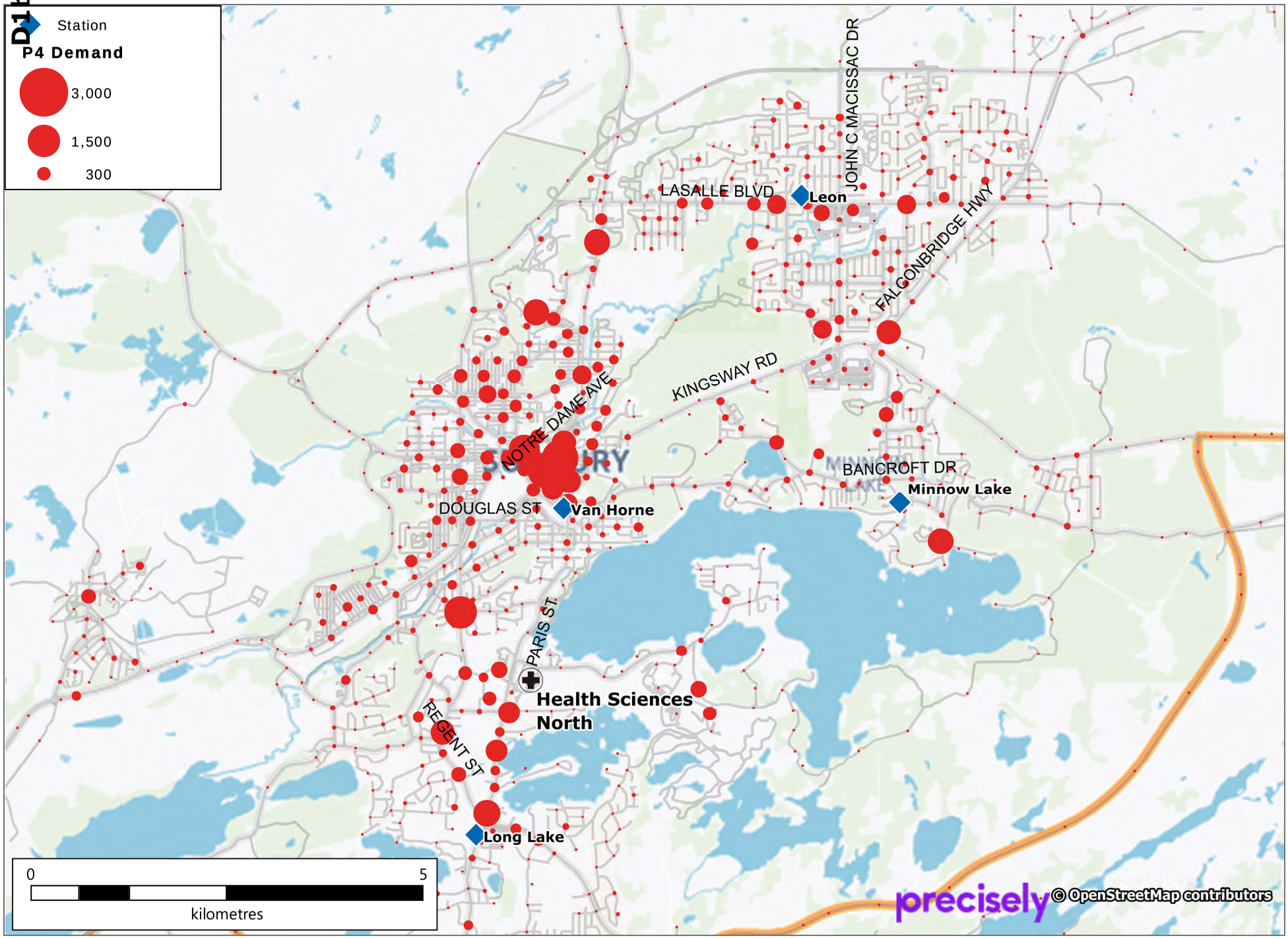
*Out of Area = demand responded to by GSPS outside the geographical boundary of Greater Sudbury

'Rural' is defined according to the Hemson population boundaries used for demand projections

D1b-ii

P4 Demand Distribution

City of Greater Sudbury - Sudbury Core



City of Greater Sudbury EMS

Dispatch vs Return Priority

January 2016 - December 2020

Daily Demand

Dispatch Priority	Return Priority					Overall
	P1	P2	P3	P4	Unknown	
P1	4.8	0.0	0.1	0.0	1.6	6.5
P2	1.1	2.0	0.2	0.1	0.2	3.5
P3	7.3	0.0	4.3	0.4	5.0	17.0
P4	10.6	0.0	14.8	6.3	14.3	46.1
Overall	**23.8**	**2.1**	**19.3**	**6.8**	**21.1**	**73.1**

Proportion by Dispatch Priority

Dispatch Priority	Return Priority					Overall
	P1	P2	P3	P4	Unknown	
P1	73.7%	0.7%	1.0%	0.3%	24.4%	100%
P2	30.3%	56.7%	5.3%	2.8%	5.0%	100%
P3	43.0%	0.2%	25.2%	2.2%	29.5%	100%
P4	23.0%	0.0%	32.1%	13.7%	31.1%	100%
Overall	**32.5%**	**2.8%**	**26.4%**	**9.3%**	**28.8%**	**100%**

D2a

City of Greater Sudbury EMS

Response Performance by CTAS

January 2016 - December 2020

Average Daily Demand – P4

Category	Area									Overall
	Capreol	Nickel Centre	Onaping Falls	Rayside-Balfour	Sudbury	Valley East	Walden	Rural	Out of Area	
SCA (CTAS0)	0.0	0.0	0.0	0.0	0.5	0.1	0.0	0.1	0.0	0.8
CTAS 1	0.0	0.0	0.0	0.0	0.6	0.1	0.0	0.1	0.0	0.9
CTAS 2	0.2	0.5	0.2	0.7	6.5	0.9	0.3	0.8	0.1	10.2
CTAS 3	0.5	1.0	0.5	1.5	16.5	1.8	0.8	1.7	0.3	24.6
CTAS 4	0.2	0.5	0.2	0.8	11.1	1.0	0.5	0.8	0.1	15.2
CTAS 5	0.1	0.2	0.1	0.3	5.0	0.3	0.1	0.3	0.0	6.4
Sub-Total	**1.0**	**2.3**	**1.1**	**3.3**	**40.3**	**4.1**	**1.7**	**3.7**	**0.6**	**58.1**
Unknown	*0.1*	*0.3*	*0.1*	*0.5*	*11.7*	*0.5*	*0.2*	*1.4*	*0.1*	*14.9*
Total	**1.1**	**2.5**	**1.2**	**3.8**	**52.0**	**4.6**	**2.0**	**5.1**	**0.7**	**73.0**

Response Performance (Time Notify to Arrive Scene) – P4

Within Target

Category	Target Minute	Target %	Area									Overall
			Capreol	Nickel Centre	Onaping Falls	Rayside-Balfour	Sudbury	Valley East	Walden	Rural	Out of Area	
SCA	6	70%	67%	21%	75%	69%	72%	51%	60%	11%	0%	61%
CTAS1	8	80%	94%	25%	53%	77%	91%	79%	81%	17%	13%	80%
CTAS2	10	85%	94%	51%	68%	86%	95%	91%	85%	39%	23%	86%
CTAS3	15	85%	98%	91%	92%	98%	99%	98%	96%	71%	50%	96%
CTAS4	15	85%	97%	91%	91%	97%	99%	98%	96%	74%	54%	97%
CTAS5	15	85%	100%	93%	98%	96%	100%	98%	97%	78%	55%	97%

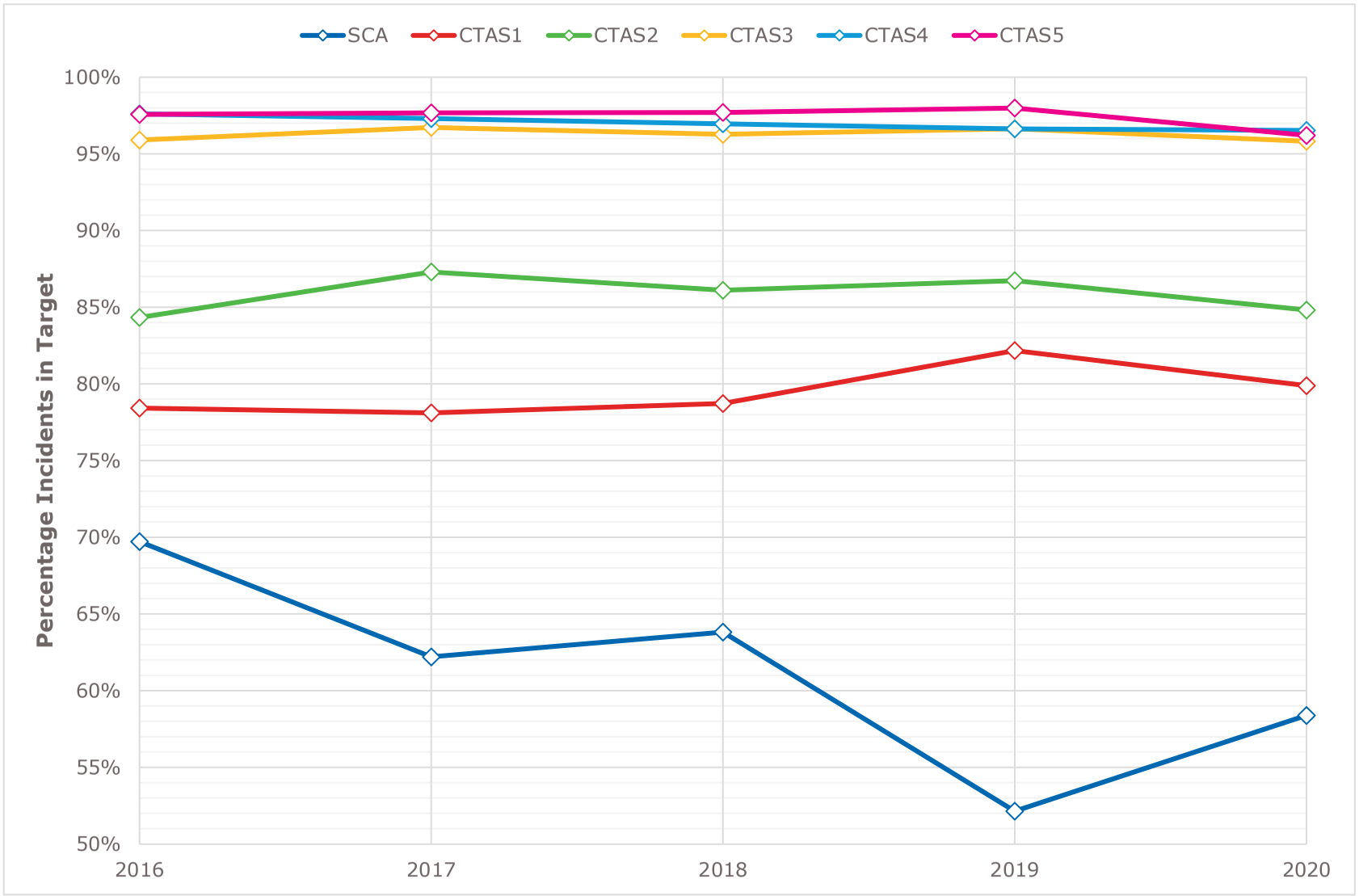
Note: Performance is only calculated using paramedic data, so may not directly align with GSPS-reported figures which include community performance (fire, police, public access defibrillators, etc).

D2b

City of Greater Sudbury EMS

Response Performance by CTAS

January 2016 - December 2020



D3

City of Greater Sudbury EMS

Call Components by Year: Priority 4 Calls

January 2016 - December 2020

Call Component	Measurement	Year					Overall
		2016	2017	2018	2019	2020	
Call Time to Vehicle Activation	T0 - T2	0:02:37	0:02:22	0:02:19	0:02:20	0:02:21	0:02:24
Mobilisation Time	T2 - T3	0:01:10	0:01:07	0:01:09	0:01:07	0:01:07	0:01:08
Travel Time to Scene	T3 - T4	0:05:37	0:05:29	0:05:34	0:05:34	0:05:45	0:05:36
Time At Scene	T4 - T5	0:17:54	0:18:23	0:18:42	0:18:48	0:20:00	0:18:46
Travel Time to Hospitals	T5 -T6	0:12:39	0:12:28	0:12:42	0:12:35	0:12:12	0:12:32
Time at Hospital	T6 - T7	0:24:01	0:26:55	0:27:23	0:28:14	0:30:03	0:27:15
Arrival to Patient Transfer	T6 - PTOC	0:19:14	0:20:31	0:18:46	0:20:35	0:21:09	0:20:01
Patient Transfer to Clear	PTOC - T7	0:04:45	0:06:21	0:08:30	0:07:37	0:08:49	0:07:09
Occupied Time	T3 - T7/T13	0:50:56	0:52:36	0:52:37	0:51:52	0:52:37	0:52:08

Increase from 2016

Decrease from 2016

D4a

City of Greater Sudbury EMS

Planned vs Acutal Resourcing Levels

2017 - 2020

Planned Resource Levels (Daily)

Station	Skill Level / Vehicle Type		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Total
HQ	ACP/PCP	Amb	6	6	5	5	5	5.5	6.5	7	7	8	8	8	8	8	9	9	9	8.5	7.5	7	7	6	6	6	168
Chelmsford	ACP	Amb	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	24
Val Therese	ACP	Amb	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	24
Lively (Waters)	ACP	Amb	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	24
Levack	ACP	PRU	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	24
Capreol	ACP	PRU	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	24

Actual Resource Levels (Daily)

Station	Skill Level / Vehicle Type		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Total
HQ	ACP	Amb	4.7	4.7	4.0	3.7	3.7	4.1	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	5.1	5.5	5.5	5.1	4.7	4.7	4.7	4.7	4.7	4.7	110.3
	PCP		1.4	1.4	1.3	1.3	1.3	1.4	2	2.8	3.2	3.4	3.4	3.4	3.4	3.4	3.5	3.6	3.5	3.4	2.8	2	1.6	1.4	1.4	1.4	58.0
Chelmsford	ACP	Amb	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	24
Val Therese	ACP	Amb	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	24
Lively (Waters)	ACP	Amb	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	24
Levack	ACP	PRU	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	24
Capreol	ACP	PRU	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	24

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Total
HQ Planned vs Actual Difference	0.1	0.1	0.4	0.0	0.0	0.0	0.0	0.3	0.7	-0.1	-0.1	-0.1	-0.1	-0.1	-0.3	0.0	0.0	0.0	0.1	-0.3	-0.6	0.1	0.1	0.1	0.3
HQ ACP:PCP Ratio	3.4	3.4	3.1	2.9	2.9	2.8	2.2	1.6	1.4	1.3	1.3	1.3	1.3	1.3	1.5	1.5	1.5	1.5	1.7	2.3	2.9	3.4	3.4	3.4	1.9

Note: Skill Level refers to highest skill on the vehicle, and ACP:PCP Ratios refer to ACP crew : PCP crew (where an ACP crew could be made up of an ACP + PCP). ACP:PCP Ratio should be read as, for example, 3.4 ACP crews : 1 PCP crew at midnight.

D4b

City of Greater Sudbury EMS

Incidents with ACP Responses

January 2016 - December 2020

Responding Station for Incident	Incidents with at least 1 ACP Crew on Scene		Incidents with No ACP Crew on Scene		Total Incidents (Average Daily)
	Average Daily Incidents	% of Total Incidents	Average Daily Incidents	% of Total Incidents	
Main Base (LEL Centre)	2.1	59.4%	1.4	40.6%	3.5
Coniston	0.2	26.0%	0.5	74.0%	0.6
Leon Fire Hall	10.1	71.8%	4.0	28.2%	14.0
Long Lake Fire Hall	2.7	42.7%	3.6	57.3%	6.3
Minnow Lake Fire Hall	1.6	44.2%	2.0	55.8%	3.6
Nickel Centre Fire Hall	1.2	27.8%	3.0	72.2%	4.2
Van Horne Fire Hall	13.5	44.9%	16.5	55.1%	30.0
Capreol Base	1.8	96.1%	0.1	3.9%	1.9
Chelmsford Base	4.3	99.6%	0.0	0.4%	4.3
Levack Base	1.2	88.6%	0.2	11.4%	1.4
Lively (Waters) Base	3.1	99.5%	0.0	0.5%	3.1
Valley East Base	4.8	99.6%	0.0	0.4%	4.8
Total	**46.6**	**59.8%**	**31.4**	**40.2%**	**78.0**

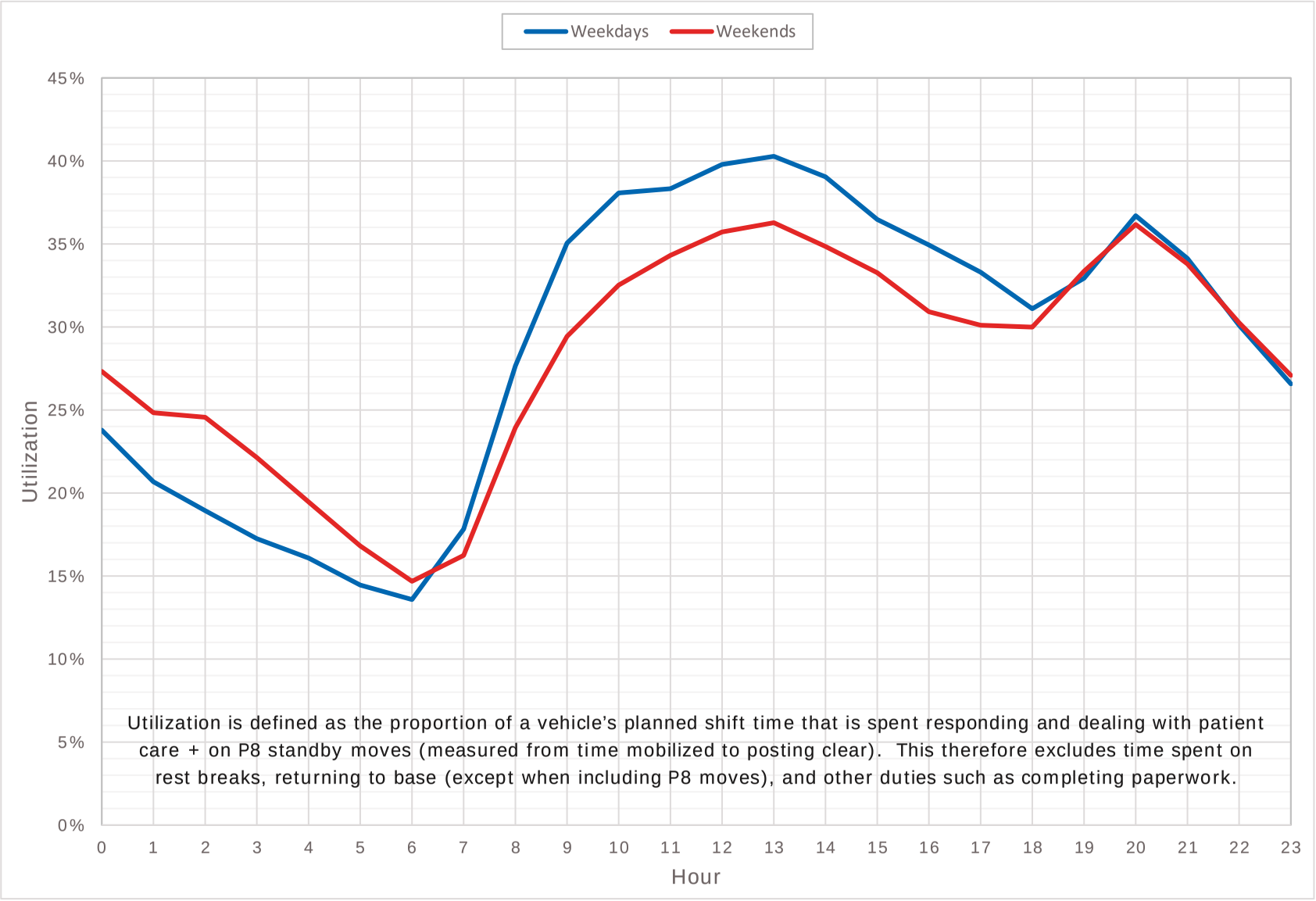
Note: this does not reflect the proportion of incidents that required an ACP on scene, simply whether one attended or not. The proportion of incidents with a mandatory requirement for an ACP on scene is far lower than 60%.

D4c-i

City of Greater Sudbury EMS

Ambulance Utilization (P1 to P4)

January 2016 - December 2020

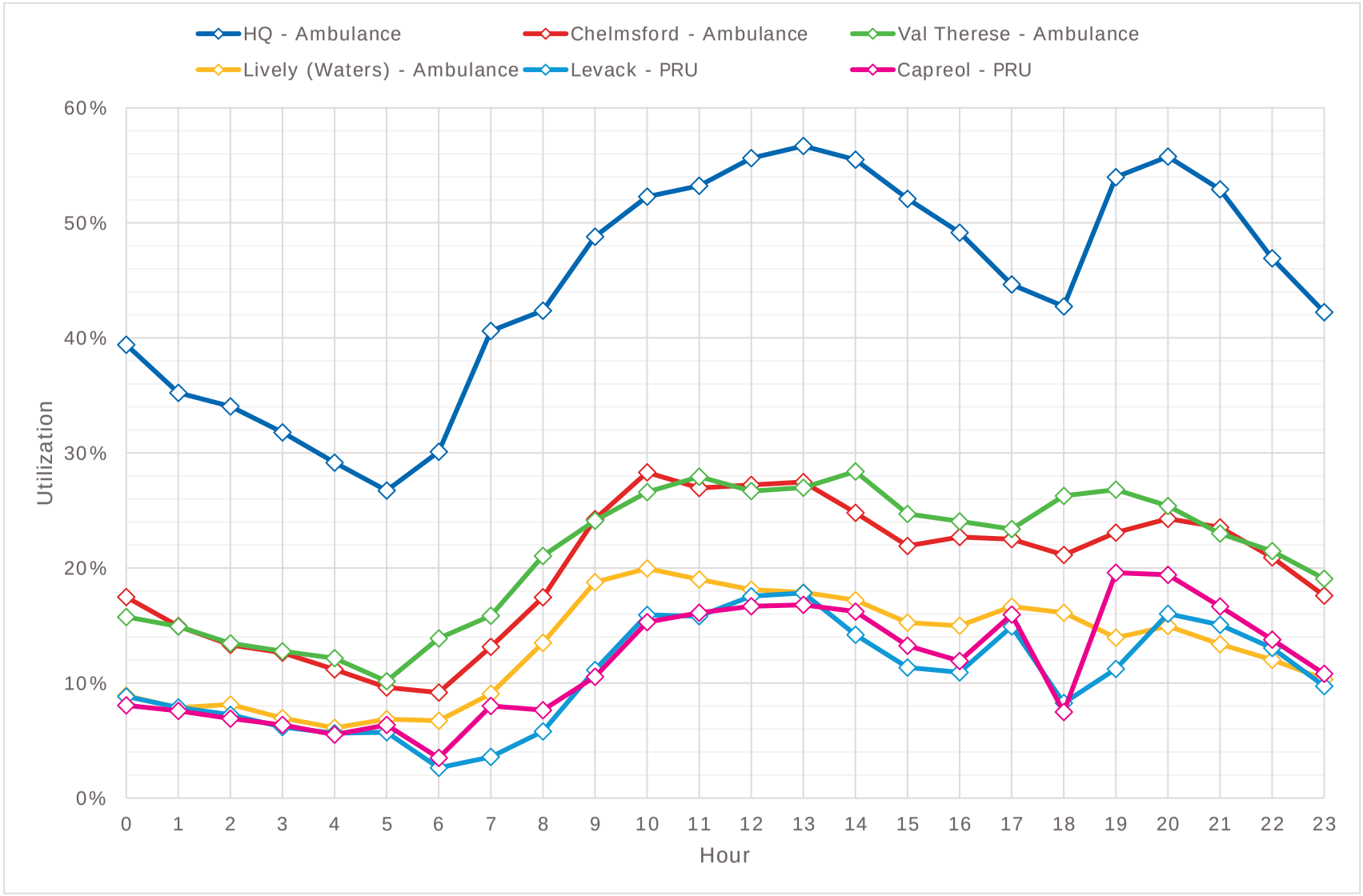


D4c-ii

City of Greater Sudbury EMS

Utilization by Station (P1 to P4 + P8)

January 2016 - December 2020



D4d-i

City of Greater Sudbury EMS

Standby Moves

January 2016 - December 2020

Responding Station	Moves Initiated	Moves Completed	Moves Cancelled	Moves Cancelled: Avg Travel Time	Moves Completed: Avg Travel Time
Main Base (LEL Centre)	59.9	42.9	17.0	07:56	13:19
Coniston	0.5	0.3	0.2	10:19	16:59
Leon Fire Hall	4.5	3.0	1.4	07:49	16:21
Long Lake Fire Hall	2.7	1.9	0.8	09:52	15:38
Minnow Lake Fire Hall	1.5	1.0	0.6	09:05	17:26
Nickel Centre Fire Hall	2.4	1.6	0.8	10:20	19:47
Van Horne Fire Hall	8.6	5.7	2.9	08:26	13:40
Capreol Base	2.6	2.0	0.5	14:31	11:17
Chelmsford Base	0.2	0.1	0.1	05:32	11:44
Levack Base	2.1	1.8	0.4	16:26	11:55
Lively (Waters) Base	0.1	0.1	0.1	05:15	09:42
Valley East Base	0.1	0.1	0.1	04:57	10:24
Overall	**85.2**	**60.5**	**24.8**	**08:25**	**13:43**

Note: Travel time is calculated from mobilization time to time arrive at scene. For cancelled moves, there is no time arrive at scene (as they are cancelled before arriving) so the cancel time is used instead.

D4d-ii

City of Greater Sudbury EMS

Completed Standby Moves - Mobilizing and Arriving Areas (Top 5 Combinations per Station)

January 2016 - December 2020

Responding Station	From Area (Mobilizing)	To Area (Arriving)	% of Station's Completed Standby Moves	Average Travel Time
Capreol Base	Capreol	Valley East	74%	12:13
	Valley East	Valley East	12%	06:48
	Rural	Valley East	6%	09:38
	(Unknown)	Valley East	6%	10:25
	Capreol	Capreol	0%	02:59
Chelmsford Base	Rayside-Balfour	Sudbury	28%	18:04
	Rayside-Balfour	Rayside-Balfour	22%	04:57
	Sudbury	Sudbury	15%	04:00
	Rayside-Balfour	Rural	11%	13:58
	Sudbury	Rayside-Balfour	6%	24:57
Coniston	Sudbury	Sudbury	31%	08:25
	Sudbury	Nickel Centre	23%	21:15
	Nickel Centre	Sudbury	13%	15:50
	Valley East	Nickel Centre	4%	33:48
	Nickel Centre	Nickel Centre	3%	13:33
Leon Fire Hall	Sudbury	Sudbury	50%	14:41
	Nickel Centre	Sudbury	15%	12:56
	Sudbury	Valley East	7%	20:38
	Valley East	Sudbury	6%	20:03
	Sudbury	Rayside-Balfour	5%	24:56
Levack Base	Onaping Falls	Onaping Falls	81%	12:08
	(Unknown)	Onaping Falls	6%	11:29
	Rural	Onaping Falls	6%	07:51
	Rayside-Balfour	Onaping Falls	5%	11:32
	zOOA	Onaping Falls	1%	22:27
Lively Base	Walden	Sudbury	26%	10:09
	Walden	Walden	21%	04:02
	Sudbury	Sudbury	17%	06:07
	Walden	Rural	12%	14:45
	Sudbury	Walden	10%	17:26

Responding Station	From Area (Mobilizing)	To Area (Arriving)	% of Station's Completed Standby Moves	Average Travel Time
Long Lake Fire Hall	Sudbury	Sudbury	42%	10:20
	Sudbury	Walden	19%	16:07
	Sudbury	Rayside-Balfour	11%	26:15
	Walden	Sudbury	5%	14:28
	Sudbury	Valley East	4%	25:15
Main Base (LEL Centre)	Sudbury	Sudbury	64%	10:26
	Valley East	Sudbury	8%	21:38
	Sudbury	Nickel Centre	6%	21:08
	(Unknown)	Sudbury	6%	11:08
	Rayside-Balfour	Sudbury	3%	21:26
Minnow Lake Fire Hall	Sudbury	Sudbury	58%	12:55
	Sudbury	Rayside-Balfour	8%	29:45
	Sudbury	Valley East	6%	26:46
	Rayside-Balfour	Sudbury	5%	27:18
	Sudbury	Walden	5%	21:45
Nickel Centre Fire Hall	Sudbury	Nickel Centre	33%	18:53
	Nickel Centre	Valley East	24%	24:24
	Valley East	Nickel Centre	9%	23:39
	Nickel Centre	Sudbury	6%	13:59
	Sudbury	Sudbury	5%	09:18
Valley East Base	Valley East	Sudbury	34%	13:05
	Valley East	Valley East	32%	05:01
	Sudbury	Sudbury	12%	04:30
	Valley East	Rural	7%	16:37
	Sudbury	Valley East	5%	24:06
Van Horne Fire Hall	Sudbury	Sudbury	52%	08:38
	Sudbury	Rayside-Balfour	7%	23:19
	Rayside-Balfour	Sudbury	6%	19:29
	Valley East	Sudbury	6%	20:20
	Nickel Centre	Sudbury	6%	17:47

E Paramedic Service Outcomes

E1 Model Validation

- **E1a** Performance
- **E1b** Utilization

E2 Blank Canvas Optimization

- **E2a** 8 and 9 Ideal Sites
- **E2b** 10 and 11 Ideal Sites
- **E2c** 12 and 13 Ideal Sites
- **E2d** 14 and 15 Ideal Sites

E3 Outcomes for Current Resources

- **E3a** Move to Ideal Minnow Lake and Long Lake
- **E3b** Move Core Resource to Valley East with Two Sites
- **E3c** Move Core Resource to Levack and Levack PRU to Dowling
- **E3d** Keep Core Resource at Azilda
- **E3e** Move Capreol to Fire Station
- **E3f** Move Main Base to Lasalle/Notre Dame

E4 Demand Projections

- **E4a** Projection Methodology
- **E4b** Population Profiles

E5 Status Quo Trajectory

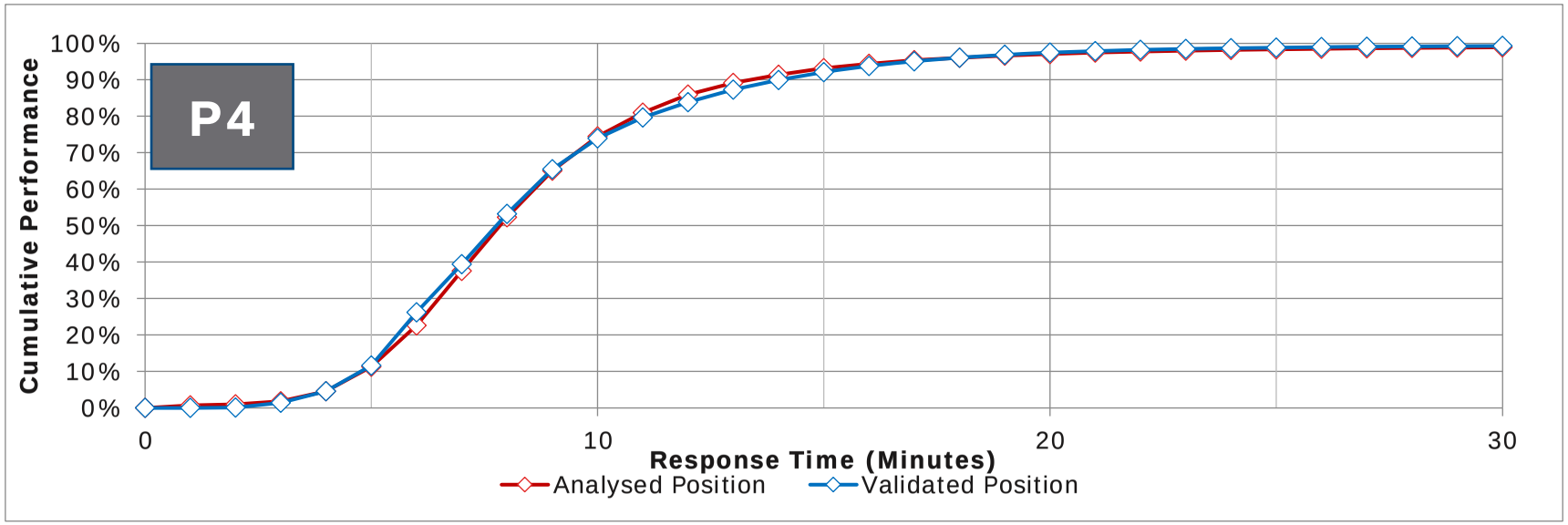
E6 Ideal Locations for New Resources – Alternative Scenarios

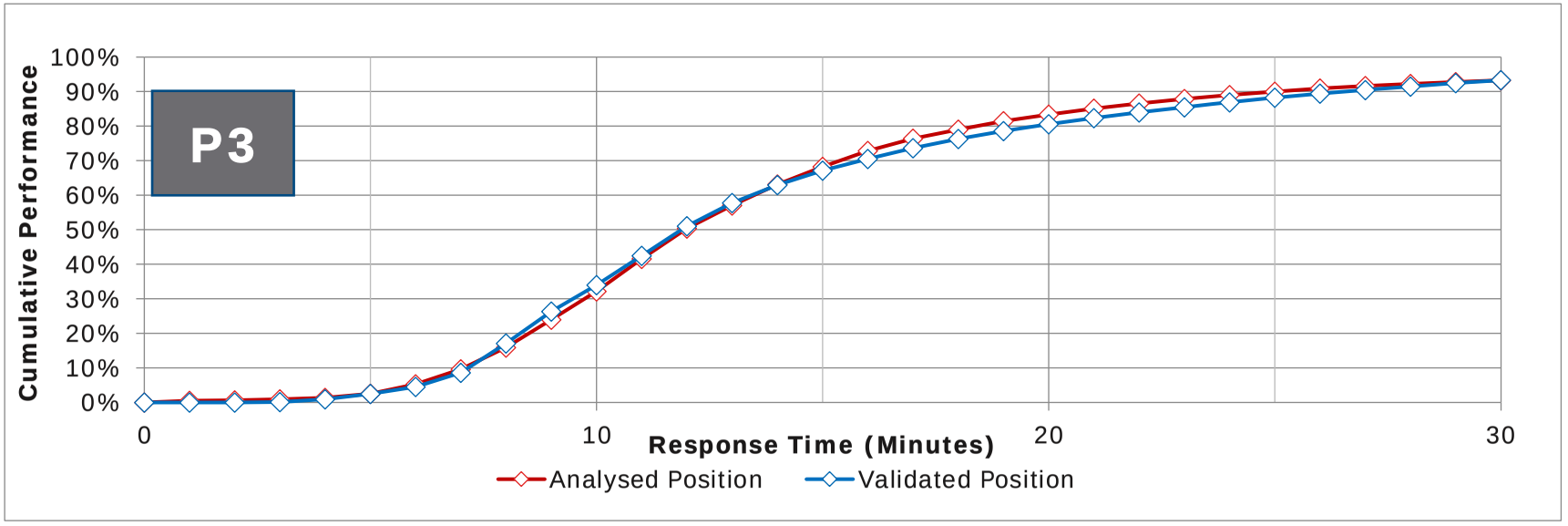
E7 Removing Non-Urgent Transfers

E1a

City of Greater Sudbury EMS

AmbSim Validation - Performance

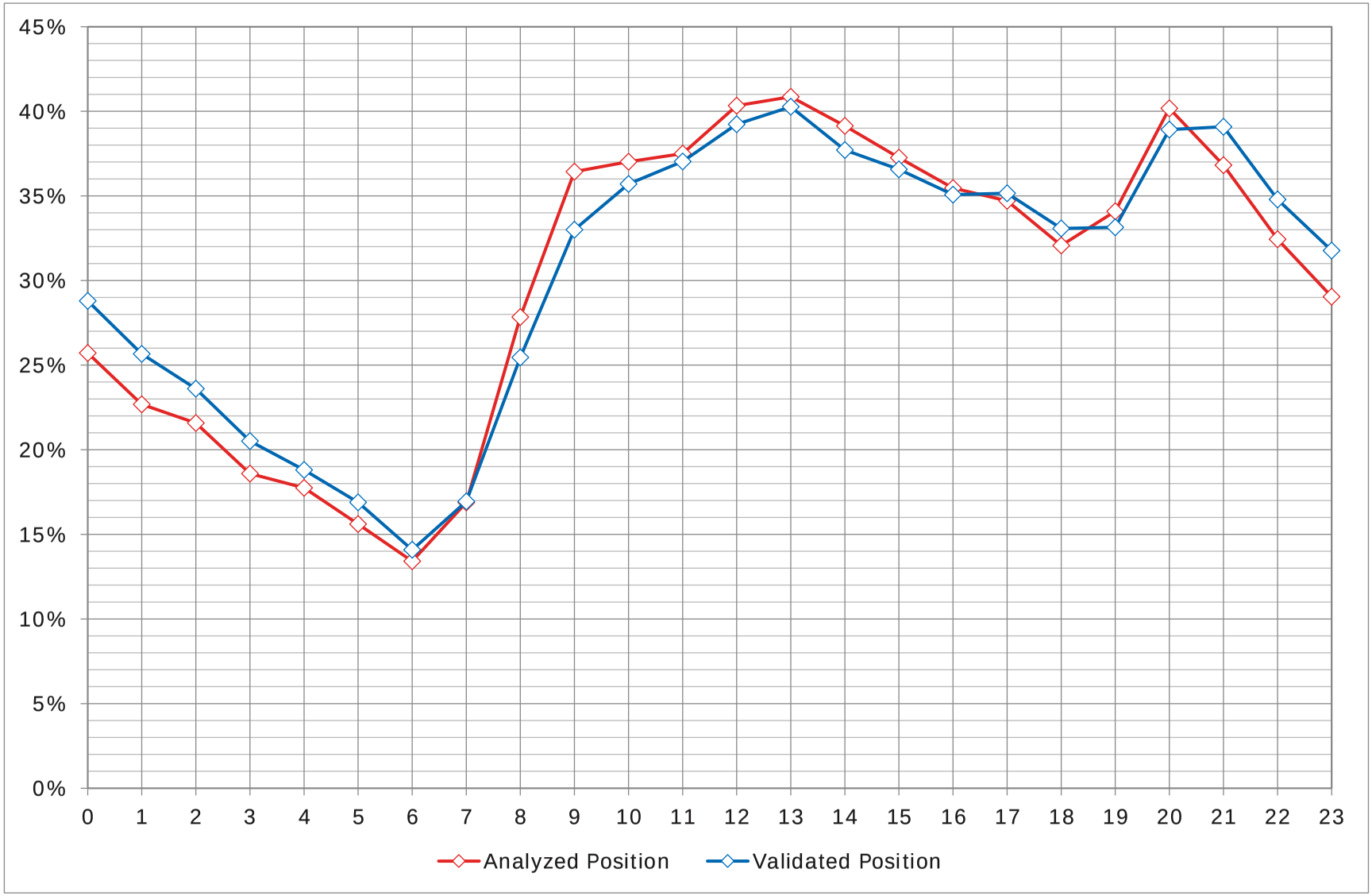




E1b

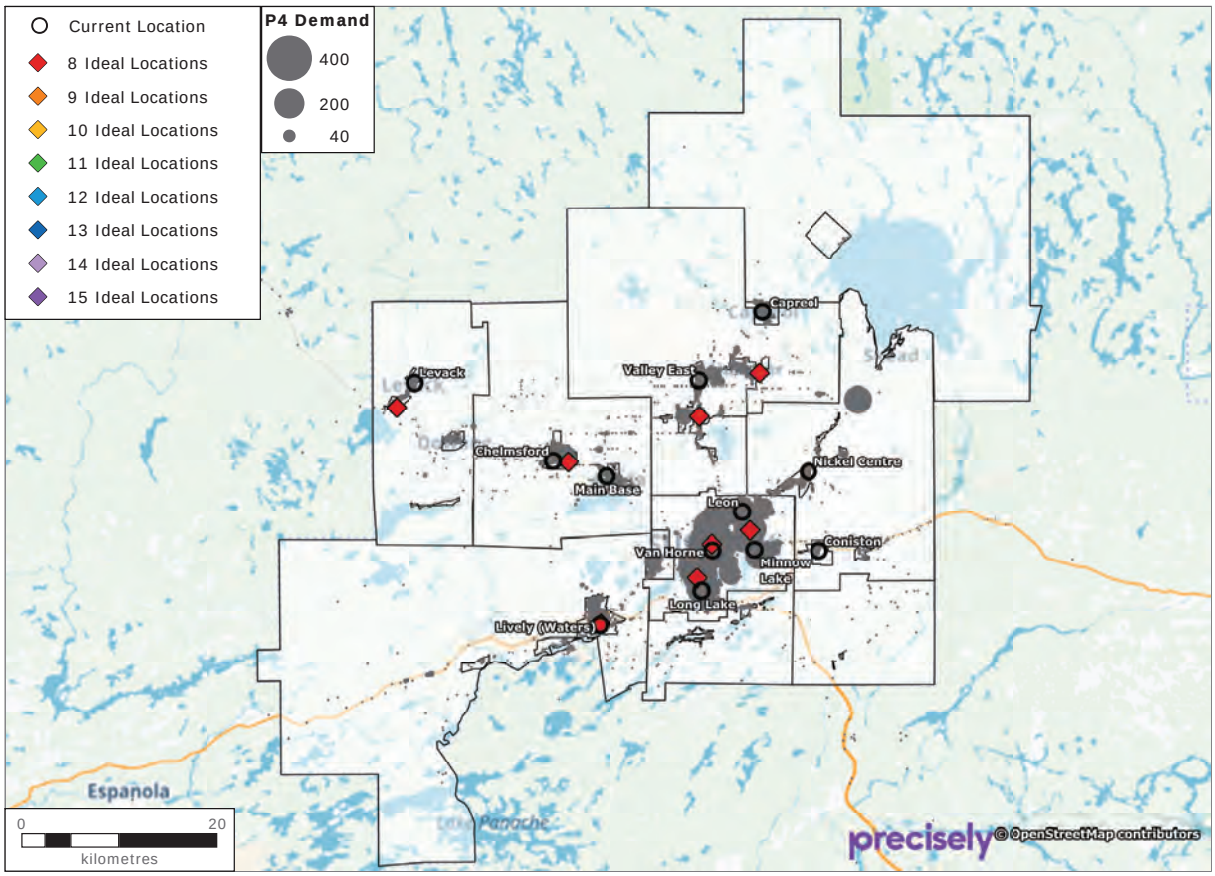
City of Greater Sudbury EMS

AmbSim Validation - Ambulance Utilization



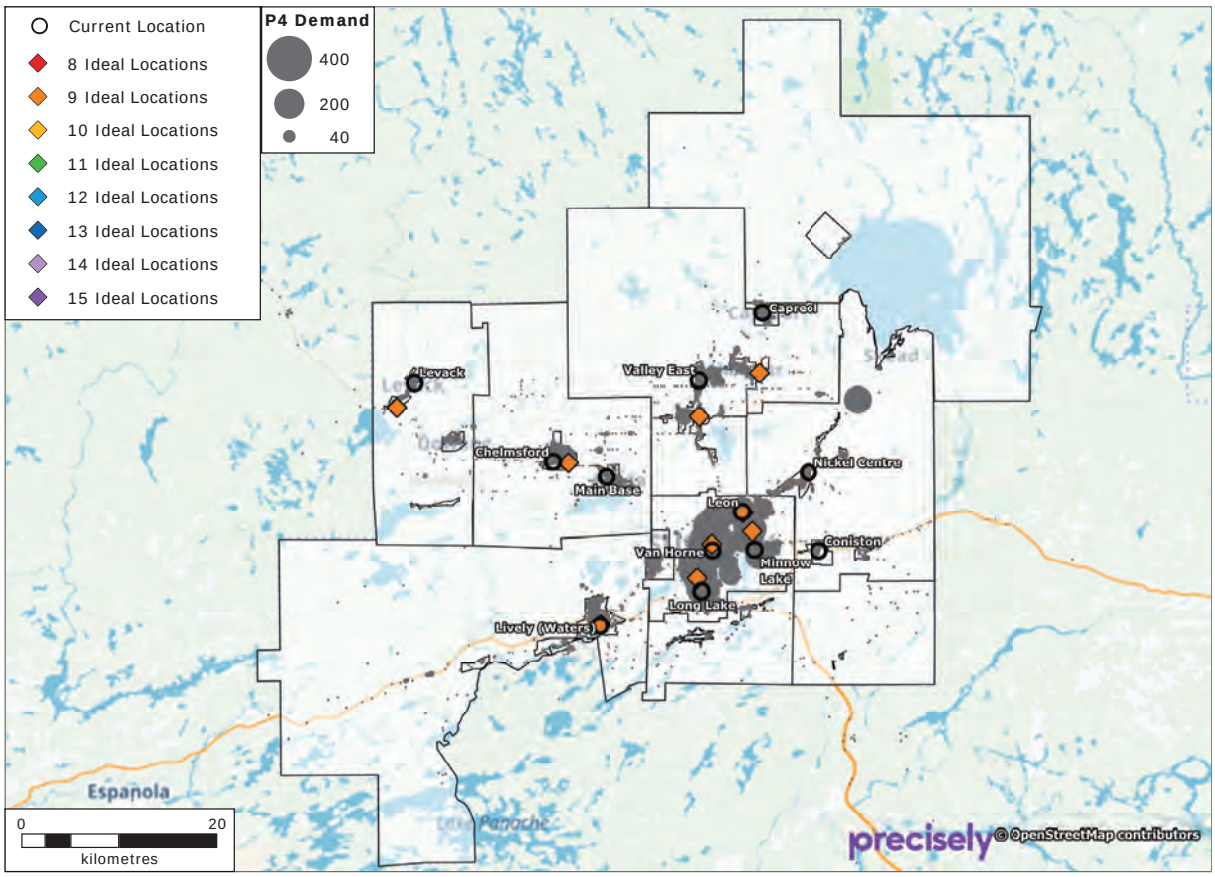
Optimization Results - Minimizing Average Response Time to P4 Incidents - 8 Locations

2019 Demand



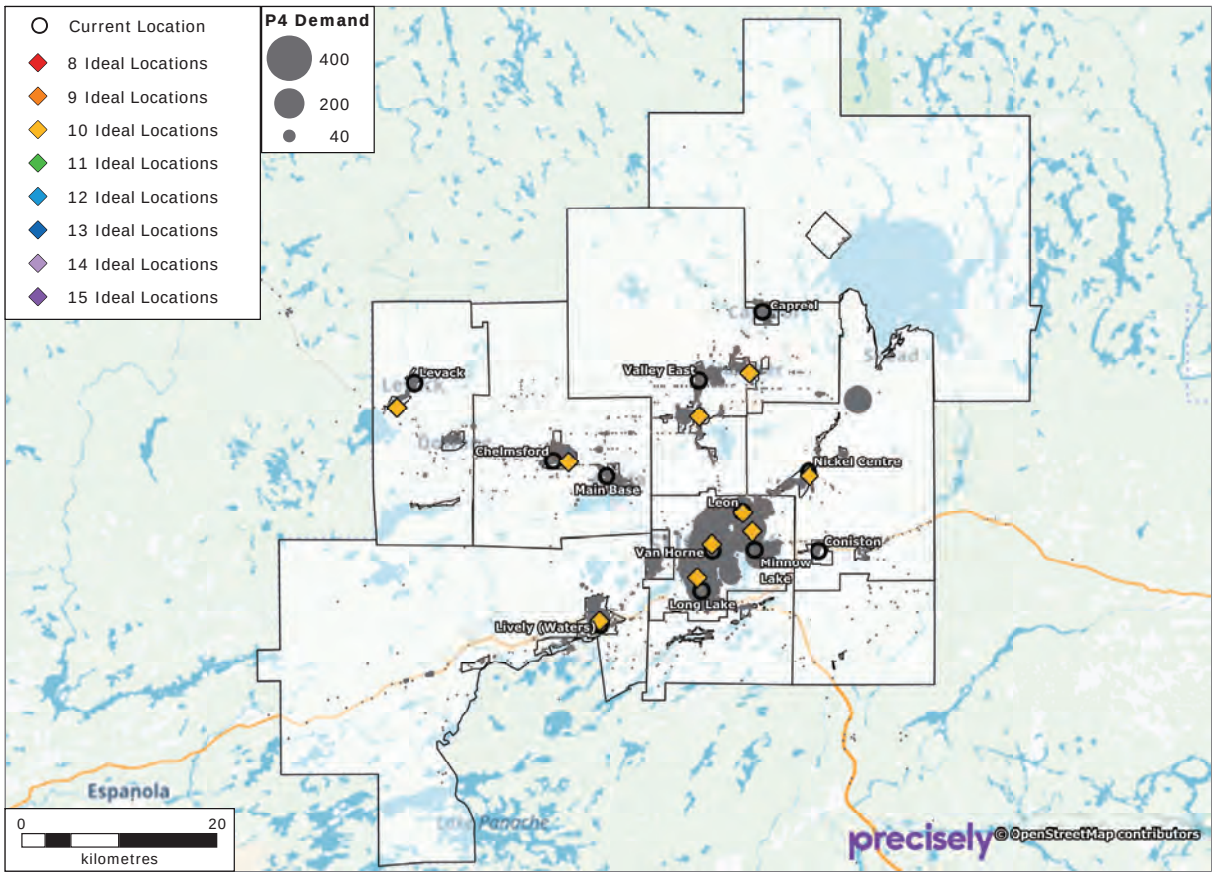
Optimization Results - Minimizing Average Response Time to P4 Incidents - 9 Locations

2019 Demand



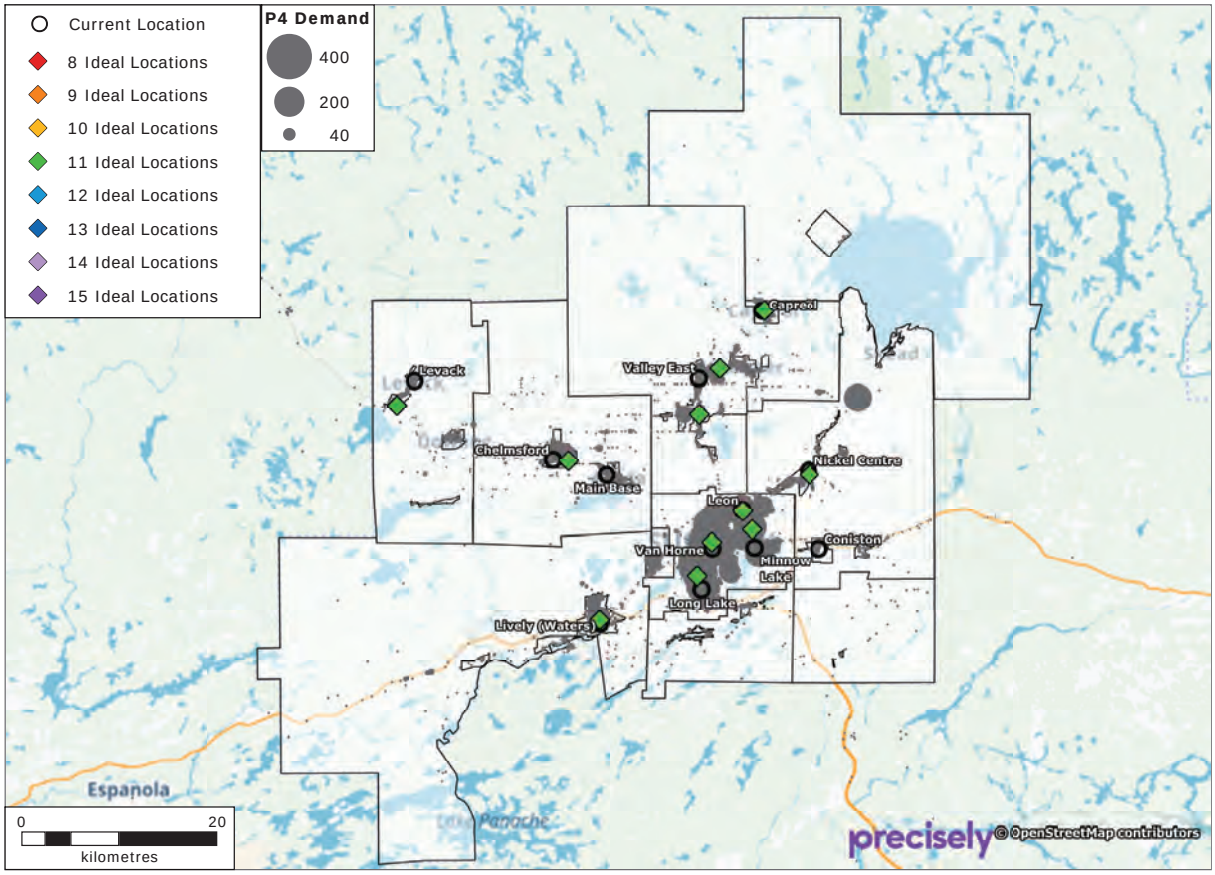
Optimization Results - Minimizing Average Response Time to P4 Incidents - 10 Locations

2019 Demand



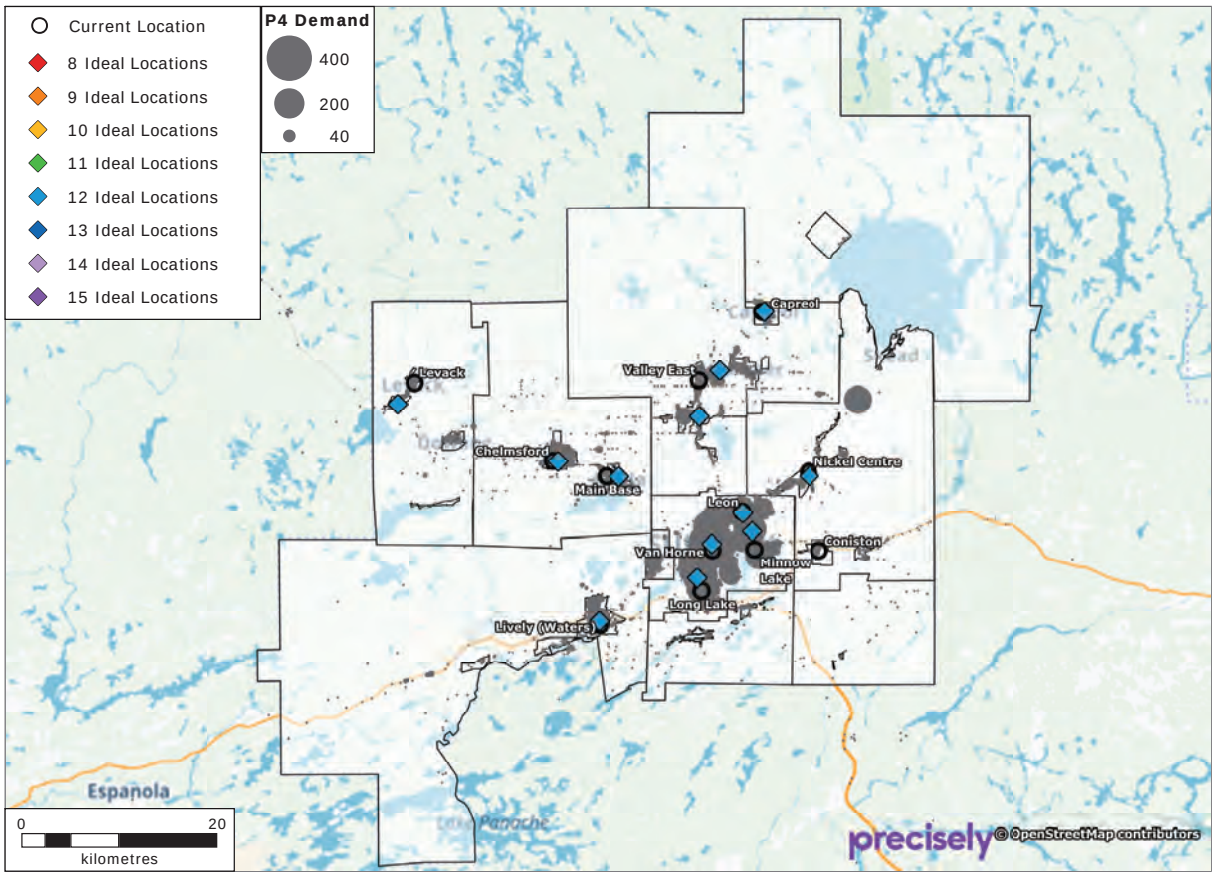
Optimization Results - Minimizing Average Response Time to P4 Incidents - 11 Locations

2019 Demand



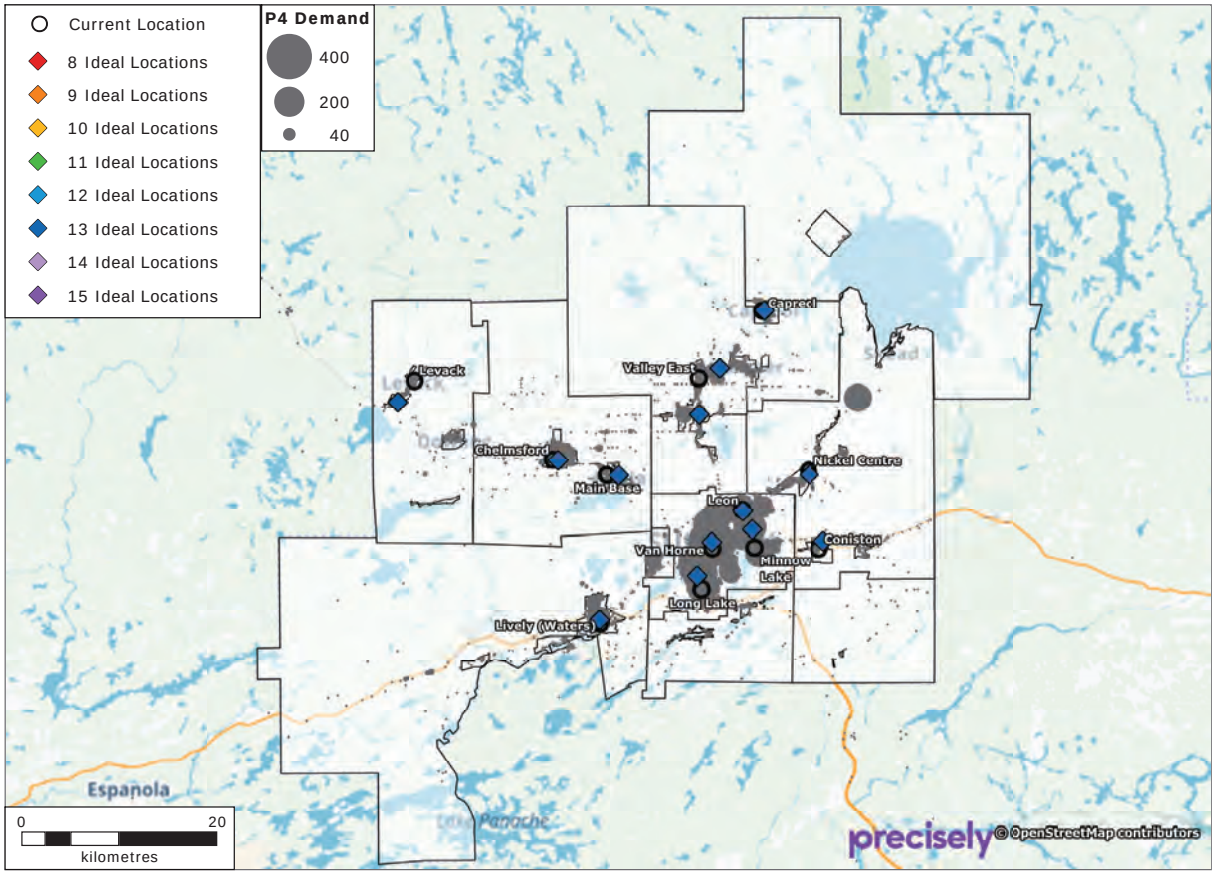
Optimization Results - Minimizing Average Response Time to P4 Incidents - 12 Locations

2019 Demand



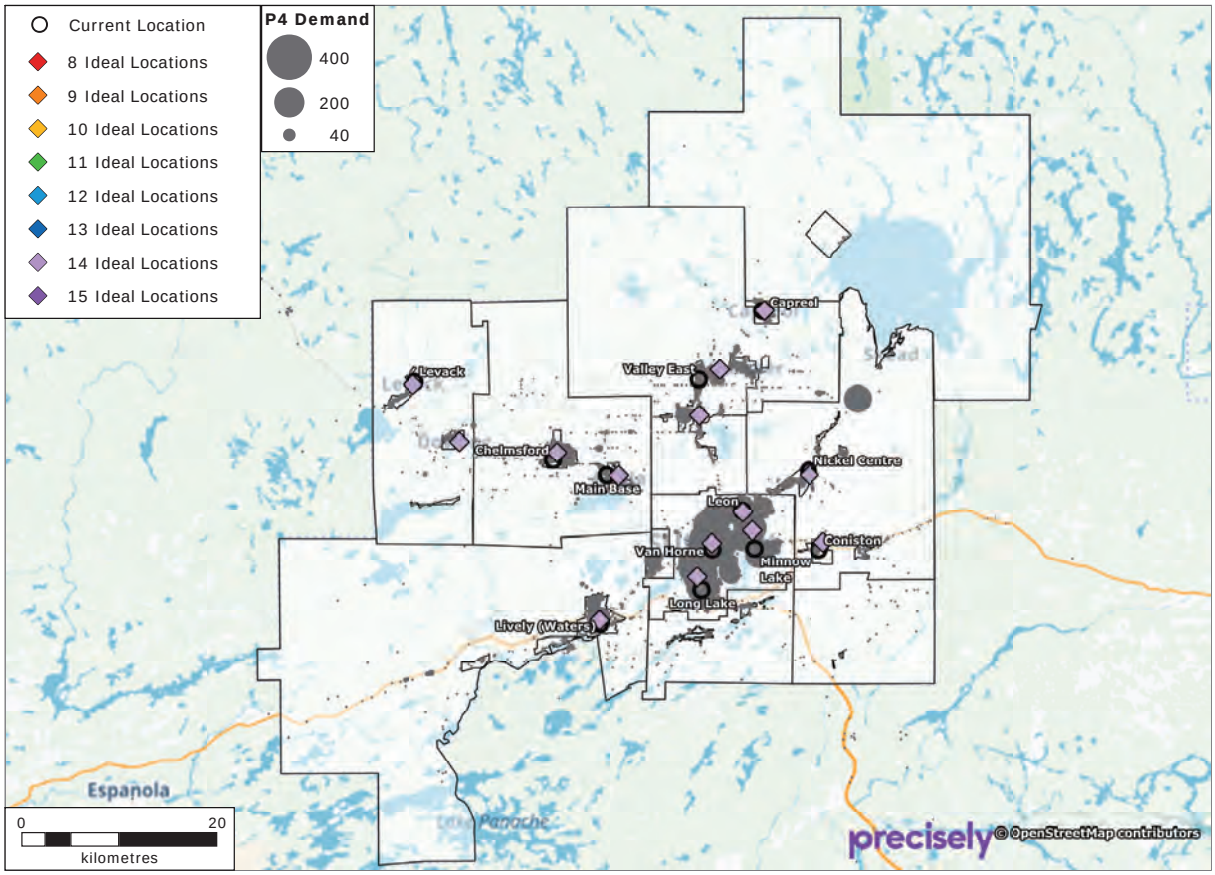
Optimization Results - Minimizing Average Response Time to P4 Incidents - 13 Locations

2019 Demand



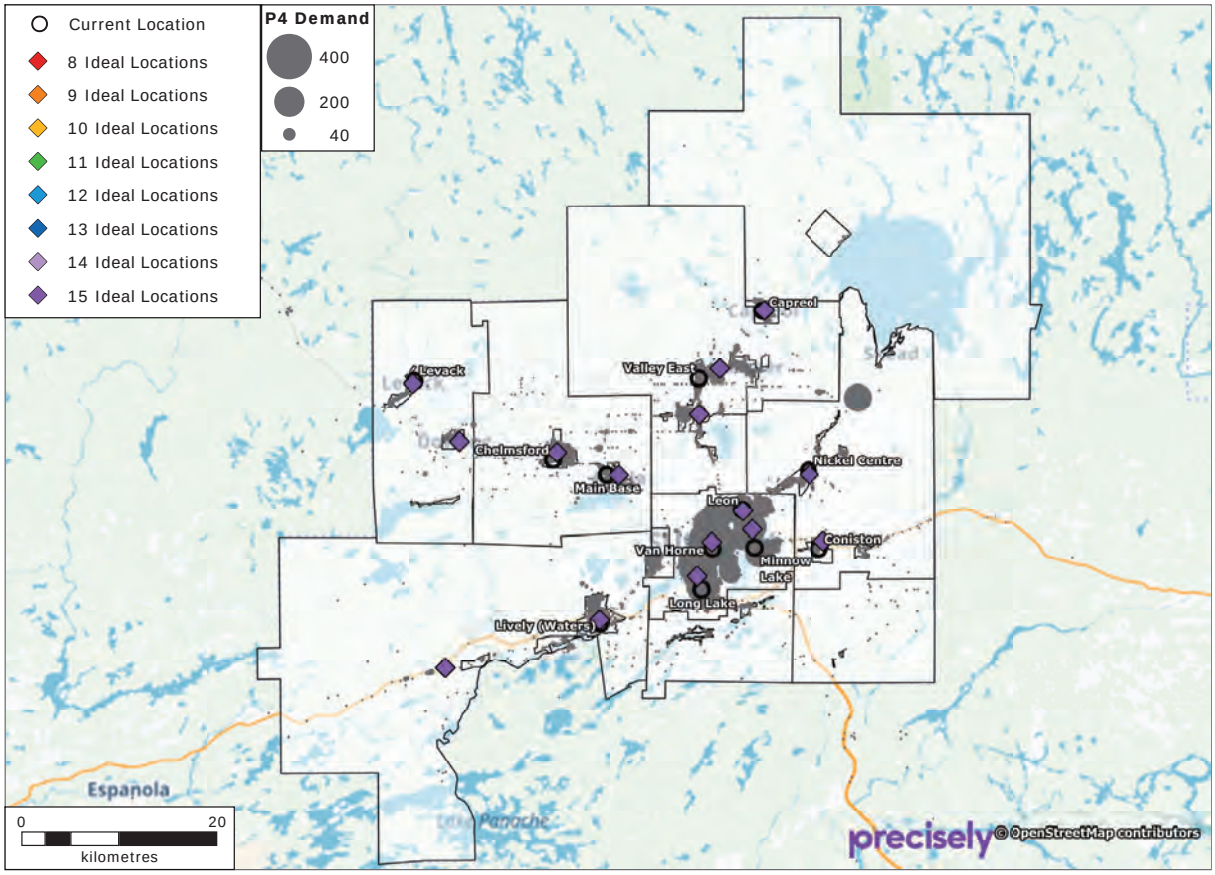
Optimization Results - Minimizing Average Response Time to P4 Incidents - 14 Locations

2019 Demand



Optimization Results - Minimizing Average Response Time to P4 Incidents - 15 Locations

2019 Demand



E3a

City of Greater Sudbury EMS

Performance Results - Move to Ideal Minnow Lake and Long Lake

Model Results

Area	P4 Performance		
	6-Minute	8-Minute	10-Minute
Sudbury	58.9%	83.7%	94.1%
Valley East	37.8%	74.6%	90.9%
Rural	8.4%	21.6%	37.8%
Rayside-Balfour	44.6%	68.2%	84.0%
Nickel Centre	22.1%	35.8%	55.4%
Walden	49.5%	75.6%	84.4%
Onaping Falls	41.0%	56.5%	68.1%
Capreol	82.3%	87.2%	91.8%
Overall	**51.4%**	**75.3%**	**87.1%**

Difference from 2021 Base Position

P4 Performance		
6-Minute	8-Minute	10-Minute
0.8%	0.1%	0.0%
0.1%	0.2%	0.2%
-0.1%	0.0%	-0.3%
0.1%	0.0%	0.0%
0.2%	0.7%	1.2%
0.0%	0.2%	0.2%
-0.2%	-0.4%	-0.3%
0.0%	-0.1%	0.0%
0.6%	**0.1%**	**0.0%**

Note: Areas sorted from highest to lowest demand

E3b

City of Greater Sudbury EMS

Performance Results - Move Core Resource to Valley East with Two Sites

Model Results

Area	P4 Performance		
	6-Minute	8-Minute	10-Minute
Sudbury	58.1%	83.5%	94.1%
Valley East	38.3%	61.7%	83.7%
Rural	9.4%	22.9%	39.1%
Rayside-Balfour	44.1%	67.8%	83.8%
Nickel Centre	22.0%	35.2%	54.2%
Walden	49.6%	75.5%	84.3%
Onaping Falls	41.1%	56.6%	68.0%
Capreol	81.1%	85.0%	90.4%
Overall	**50.9%**	**74.2%**	**86.7%**

Difference from 2021 Base Position

P4 Performance		
6-Minute	8-Minute	10-Minute
0.0%	-0.1%	0.0%
0.6%	-12.8%	-7.0%
0.9%	1.3%	1.0%
-0.4%	-0.4%	-0.2%
0.2%	0.1%	0.0%
0.1%	0.2%	0.1%
-0.1%	-0.3%	-0.3%
-1.3%	-2.3%	-1.5%
0.0%	**-1.0%**	**-0.4%**

Note: Areas sorted from highest to lowest demand

E3c

City of Greater Sudbury EMS

Performance Results - Move Core Resource to Levack and Levack PRU to Dowling

Model Results

Area	P4 Performance		
	6-Minute	8-Minute	10-Minute
Sudbury	53.2%	78.9%	91.1%
Valley East	36.5%	72.0%	88.5%
Rural	10.3%	23.8%	39.9%
Rayside-Balfour	54.1%	77.3%	90.1%
Nickel Centre	14.7%	23.8%	41.5%
Walden	48.6%	73.9%	82.6%
Onaping Falls	61.4%	76.2%	86.5%
Capreol	81.6%	85.8%	90.8%
Overall	**48.1%**	**72.5%**	**85.3%**

Difference from 2021 Base Position

P4 Performance		
6-Minute	8-Minute	10-Minute
-4.9%	-4.7%	-3.1%
-1.2%	-2.4%	-2.2%
1.8%	2.2%	1.8%
9.6%	9.2%	6.1%
-7.1%	-11.4%	-12.7%
-0.9%	-1.4%	-1.6%
20.2%	19.3%	18.1%
-0.7%	-1.4%	-1.0%
-2.7%	**-2.6%**	**-1.7%**

Note: Areas sorted from highest to lowest demand

E3d

City of Greater Sudbury EMS

Performance Results - Keep Core Resource at Azilda

Model Results

Area	P4 Performance		
	6-Minute	8-Minute	10-Minute
Sudbury	53.5%	79.4%	91.4%
Valley East	36.7%	72.4%	88.9%
Rural	8.4%	22.3%	38.8%
Rayside-Balfour	49.2%	76.4%	91.5%
Nickel Centre	15.2%	24.4%	42.1%
Walden	48.9%	74.3%	83.1%
Onaping Falls	41.7%	57.3%	68.9%
Capreol	81.5%	85.7%	90.9%
Overall	**47.6%**	**72.4%**	**85.4%**

Difference from 2021 Base Position

P4 Performance		
6-Minute	8-Minute	10-Minute
-4.6%	-4.2%	-2.8%
-1.0%	-2.1%	-1.8%
-0.1%	0.7%	0.7%
4.7%	8.2%	7.5%
-6.6%	-10.7%	-12.1%
-0.6%	-1.0%	-1.2%
0.5%	0.4%	0.6%
-0.8%	-1.5%	-1.0%
-3.3%	**-2.8%**	**-1.7%**

Note: Areas sorted from highest to lowest demand

E3e

City of Greater Sudbury EMS

Performance Results - Move Capreol to Fire Station

Model Results

Area	P4 Performance		
	6-Minute	8-Minute	10-Minute
Sudbury	58.2%	83.6%	94.2%
Valley East	37.6%	73.8%	89.6%
Rural	8.5%	21.6%	37.7%
Rayside-Balfour	44.6%	68.1%	84.0%
Nickel Centre	21.9%	35.0%	54.1%
Walden	49.5%	75.4%	84.4%
Onaping Falls	41.0%	56.5%	68.1%
Capreol	72.7%	86.2%	93.4%
Overall	**50.7%**	**75.1%**	**87.0%**

Difference from 2021 Base Position

P4 Performance		
6-Minute	8-Minute	10-Minute
0.1%	0.0%	0.0%
-0.1%	-0.6%	-1.2%
0.0%	0.0%	-0.4%
0.0%	0.0%	0.0%
0.1%	-0.1%	-0.1%
0.0%	0.1%	0.2%
-0.2%	-0.4%	-0.3%
-9.6%	-1.0%	1.5%
-0.2%	**-0.1%**	**-0.1%**

Note: Areas sorted from highest to lowest demand

E3f

City of Greater Sudbury EMS

Performance Results - Moving Main Base to Lasalle / Notre Dame

Model Results

Area	P4 Performance		
	6-Minute	8-Minute	10-Minute
Sudbury	59.0%	84.2%	94.4%
Valley East	38.0%	74.7%	90.9%
Rural	7.9%	20.9%	37.6%
Rayside-Balfour	41.2%	63.7%	80.3%
Nickel Centre	23.3%	37.1%	56.5%
Walden	49.3%	75.1%	84.0%
Onaping Falls	41.1%	56.6%	67.8%
Capreol	82.3%	87.3%	91.9%
Overall	**51.3%**	**75.4%**	**87.1%**

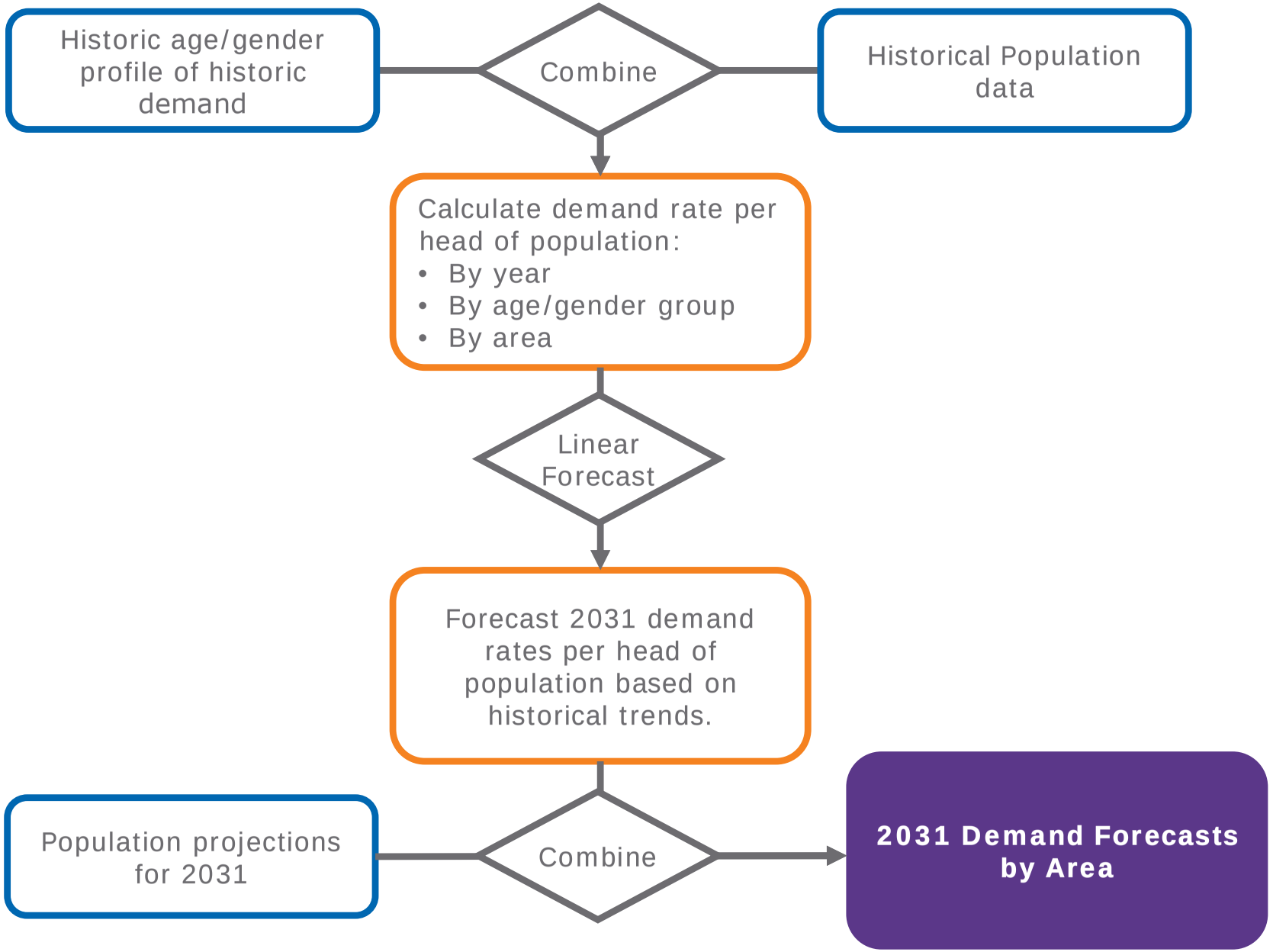
Difference from 2021 Base Position

P4 Performance		
6-Minute	8-Minute	10-Minute
0.9%	0.6%	0.2%
0.3%	0.2%	0.2%
-0.6%	-0.8%	-0.5%
-3.3%	-4.4%	-3.7%
1.5%	2.0%	2.3%
-0.2%	-0.2%	-0.3%
-0.1%	-0.3%	-0.5%
-0.1%	0.1%	0.1%
0.5%	**0.2%**	**0.0%**

Note: Areas sorted from highest to lowest demand

E4a

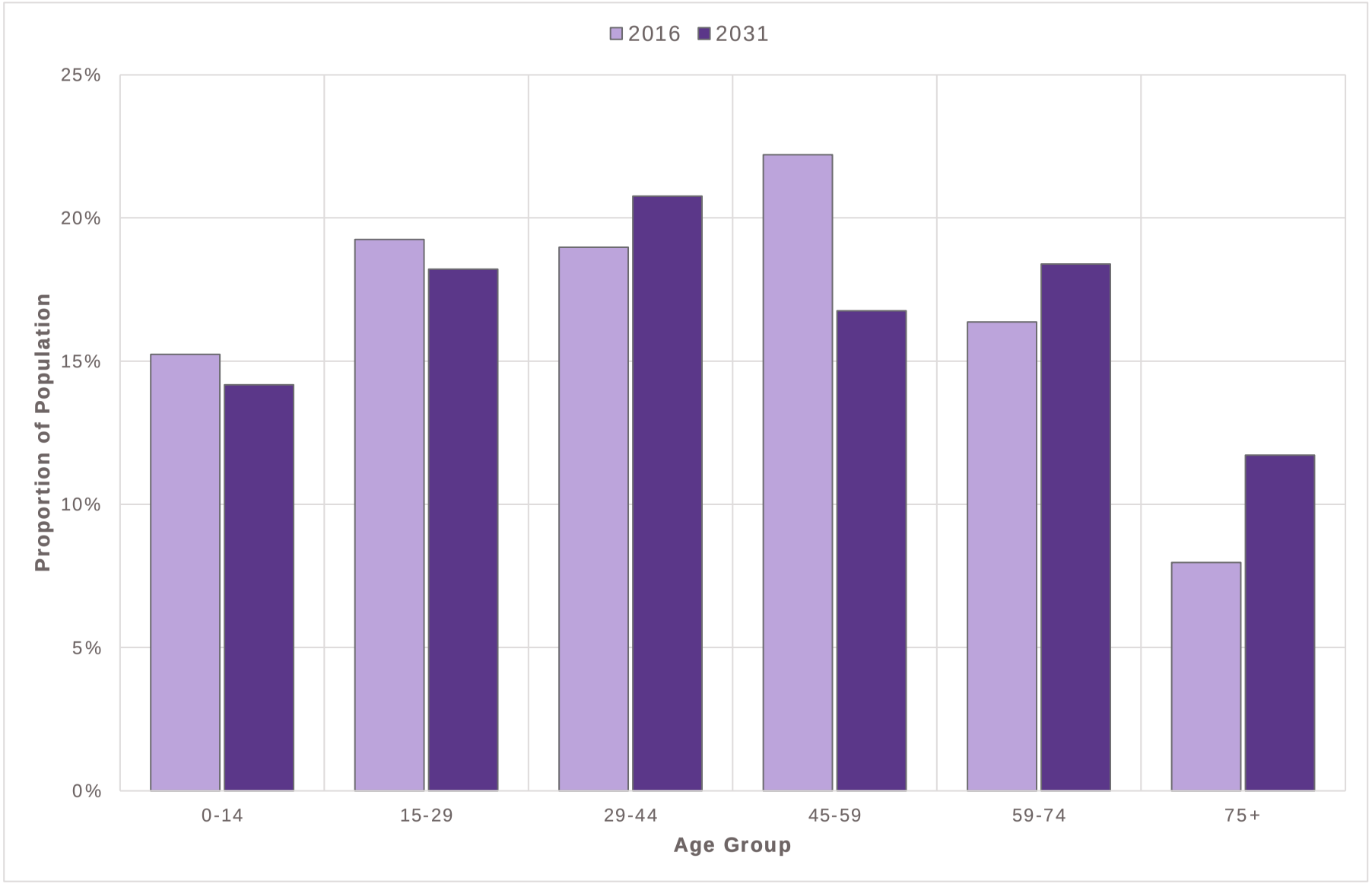
Population Based Projection Method



E4b

City of Greater Sudbury EMS

Population Profile - 2016 vs 2031

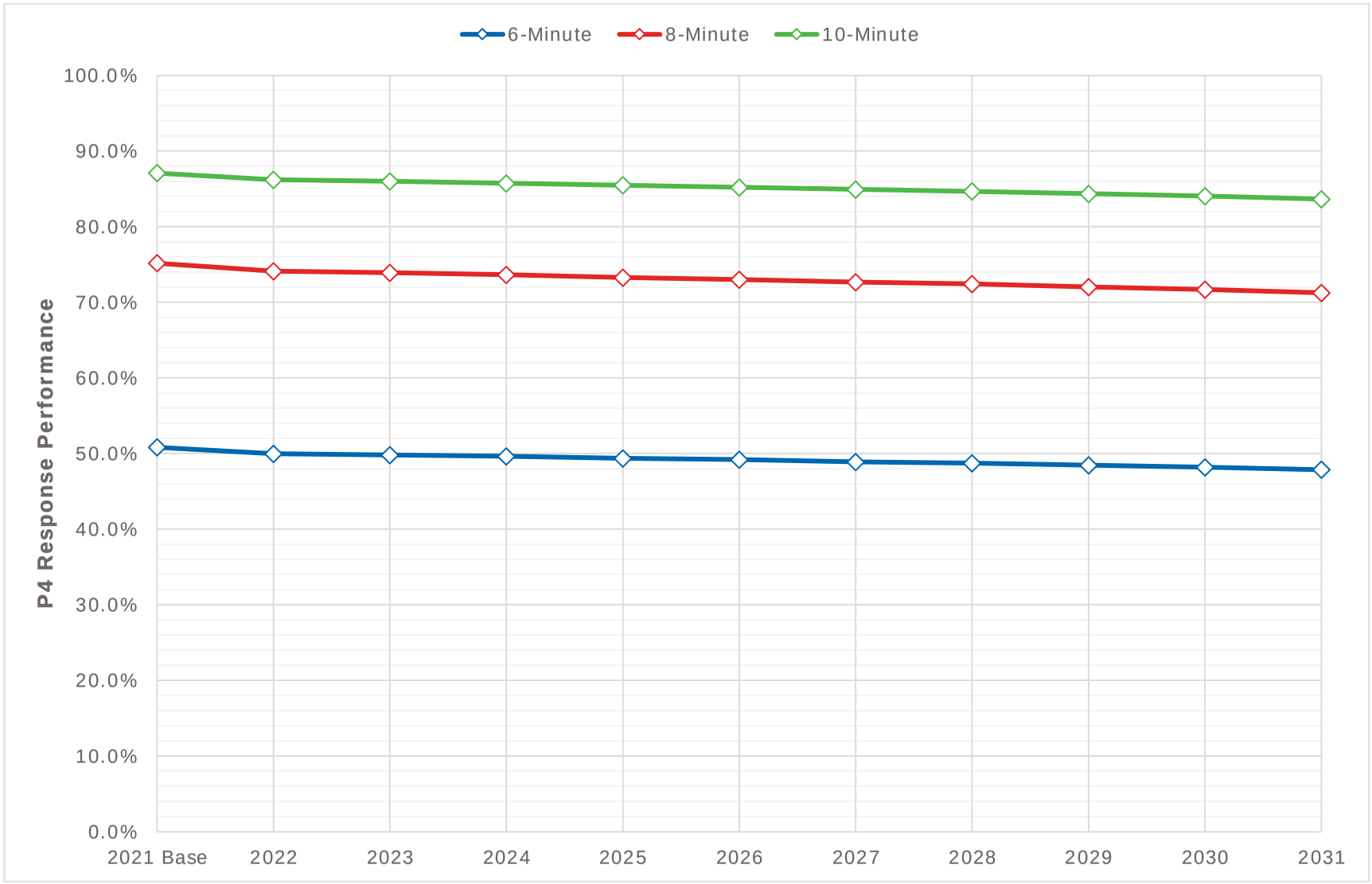


E5

City of Greater Sudbury EMS

Status Quo Annual Performance Change

2021 to 2031



City of Greater Sudbury EMS

Ideal Locations for New Resources – Alternative Scenarios

Scenario	Area	P4 Performance			*Difference from 2031 with New Resources* P4 Performance		
		6-Minute	8-Minute	10-Minute	6-Minute	8-Minute	10-Minute
2031 with New Resources (Focus on Area Improvements)	Capreol	82.4%	87.8%	92.4%	-	-	-
	Rural	12.3%	28.2%	46.1%	-	-	-
	Valley East	66.1%	83.8%	93.7%	-	-	-
	Walden	54.9%	82.5%	90.8%	-	-	-
	Overall	57.2%	79.8%	90.1%	-	-	-
No new resources in Valley East, convert Capreol PRU to Ambulance	Capreol	66.2%	74.6%	81.4%	-16.2%	-13.2%	-11.0%
	Valley East	37.8%	74.2%	90.2%	-28.3%	-9.6%	-3.5%
	Overall	54.4%	78.3%	89.2%	-2.8%	-1.5%	-0.9%
Add resource at Val Therese (without splitting into two ideal sites)	Valley East	41.7%	80.9%	95.6%	-24.5%	-2.9%	1.9%
	Overall	55.3%	79.2%	89.9%	-2.0%	-0.6%	-0.2%
Use Val Caron/Hanmer Fire Stations instead of ideal site	Valley East	50.7%	77.3%	91.5%	-15.5%	-6.5%	-2.2%
	Overall	56.1%	79.3%	89.9%	-1.1%	-0.5%	-0.2%
Whitefish 12/7 Ambulance instead of Lively (Waters)	Rural	14.4%	30.3%	48.4%	2.0%	2.2%	2.3%
	Walden	48.9%	74.7%	84.0%	-6.0%	-7.8%	-6.8%
	Overall	56.9%	79.3%	89.7%	-0.3%	-0.4%	-0.4%
Whitefish 24/7 PRU instead of Lively (Waters)	Rural	16.3%	32.7%	50.6%	4.0%	4.6%	4.5%
	Walden	49.9%	75.3%	85.6%	-5.0%	-7.2%	-5.2%
	Overall	57.0%	79.4%	89.8%	-0.2%	-0.4%	-0.3%

E7

City of Greater Sudbury EMS

Performance Results - Removing Non-Urgent Transfer in 2031

Category	Transfer	Non-Transfer
P1	4.6	1.6
P2	3.3	0.0
P3	1.0	17.7
P4	0.7	46.2
Overall	9.6	65.5

Demand Removed in Model Run

Model Results

Area	P4 Performance		
	6-Minute	8-Minute	10-Minute
Sudbury	56.3%	81.3%	92.5%
Valley East	36.4%	72.0%	88.5%
Rural	8.2%	21.1%	36.8%
Rayside-Balfour	42.5%	65.7%	81.9%
Walden	45.1%	68.6%	77.1%
Nickel Centre	18.4%	29.3%	47.7%
Capreol	80.0%	83.8%	89.5%
Onaping Falls	40.2%	55.3%	66.6%
Overall	**49.0%**	**72.6%**	**84.8%**

Difference from 2031 Status Quo

P4 Performance		
6-Minute	8-Minute	10-Minute
1.4%	1.5%	1.1%
0.4%	1.2%	1.2%
-0.2%	-0.1%	0.2%
0.6%	1.0%	0.8%
0.7%	1.2%	1.2%
1.4%	2.6%	3.0%
0.3%	0.4%	0.5%
0.4%	0.6%	0.7%
1.1%	**1.4%**	**1.1%**

Note: Areas sorted from highest to lowest demand

Overall Number of Additional Annual Incidents In Target	**242**	**305**	**249**

F Recommendations

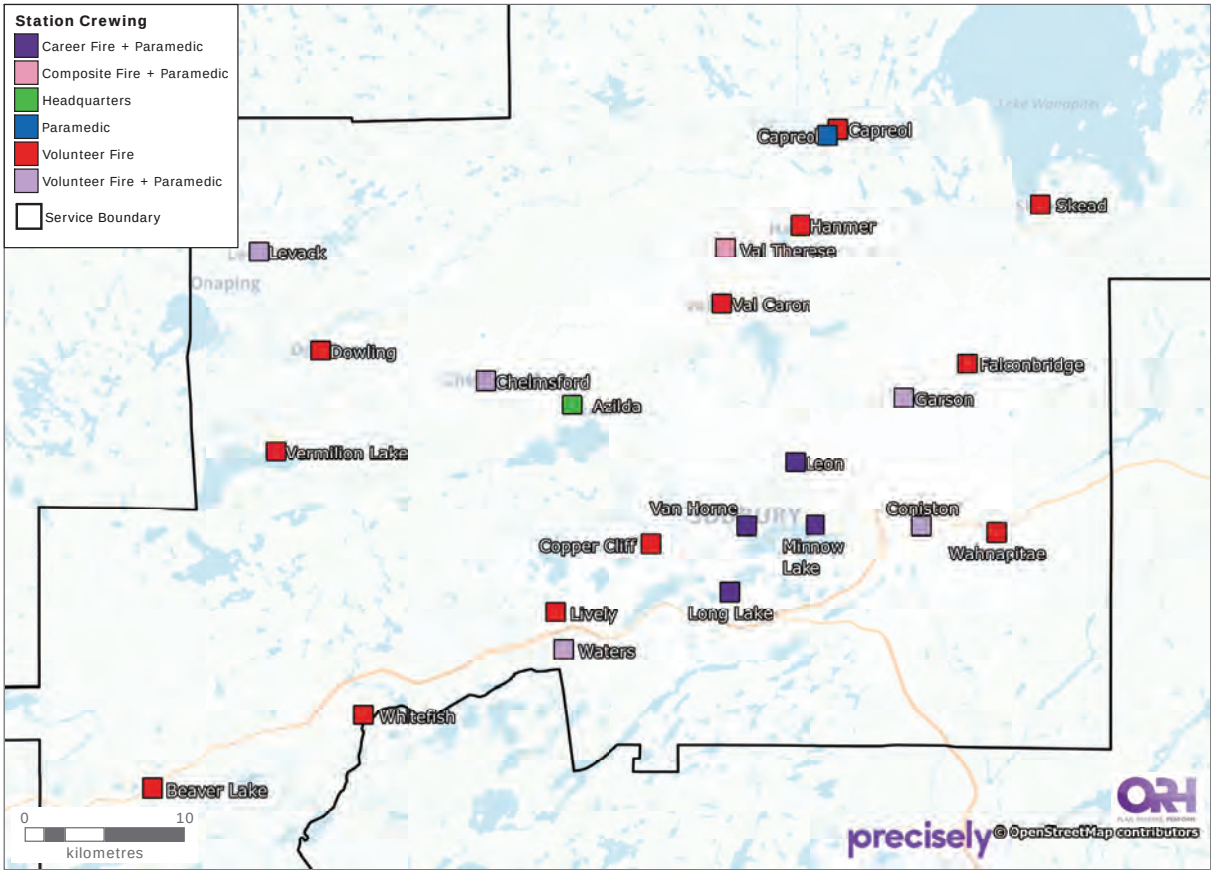
F1 Recommended Locations

F2 Site Search Maps

- **F2a** Minnow Lake
- **F2b** Van Horne
- **F2c** Garson
- **F2d** Anderson Drive
- **F2e** Wahnapitae

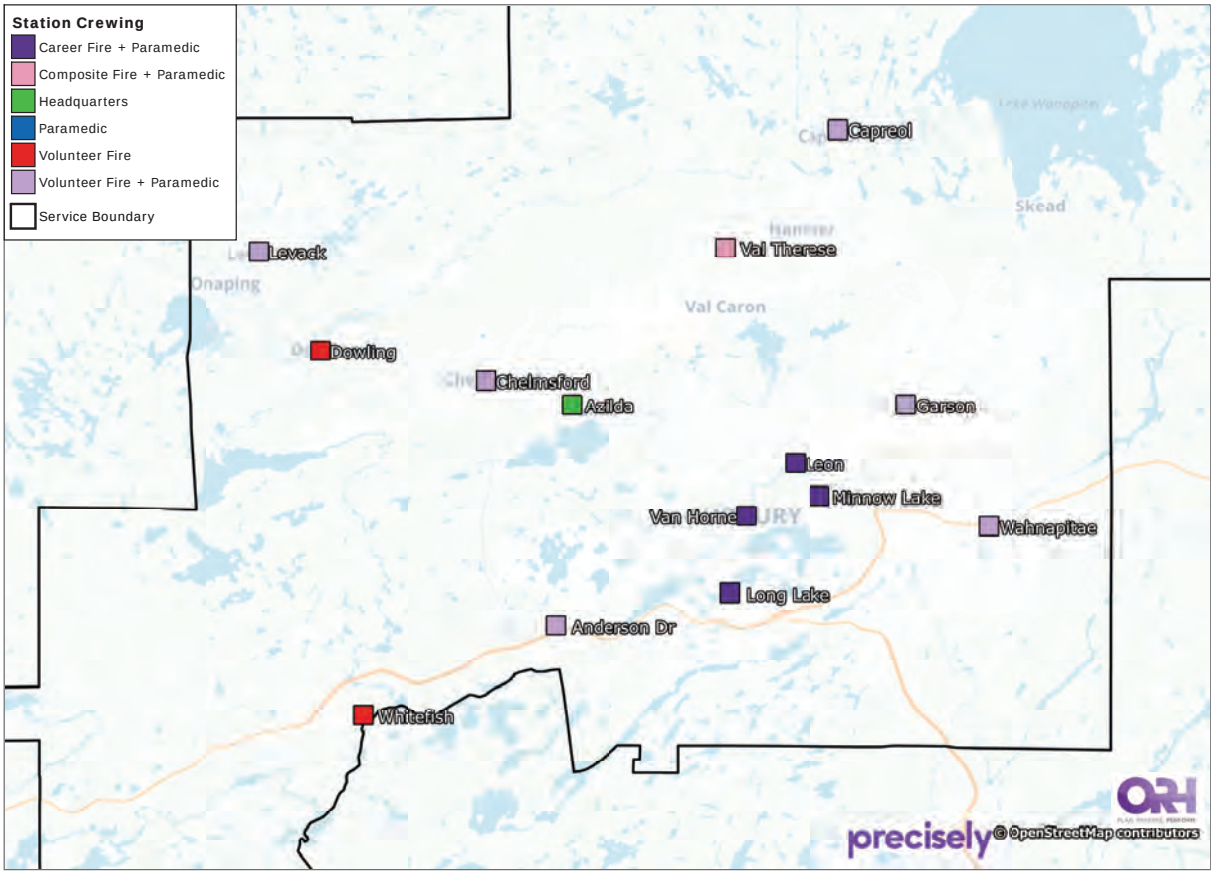
Paramedic and Fire Stations in Greater Sudbury

Current Configuration



Paramedic and Fire Stations in Greater Sudbury

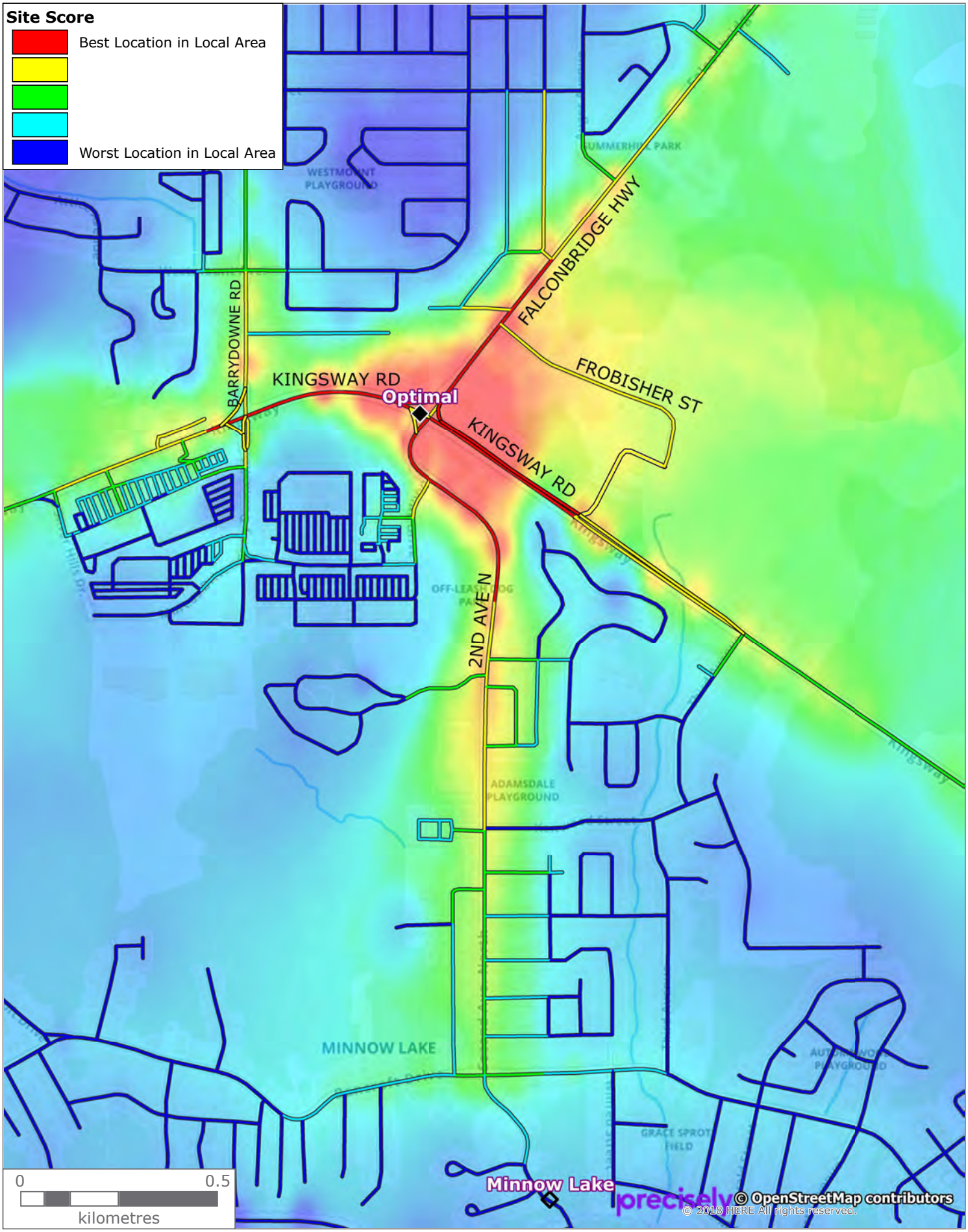
Proposed Configuration



Site Search Map for Minnow Lake Optimal Location

City of Greater Sudbury

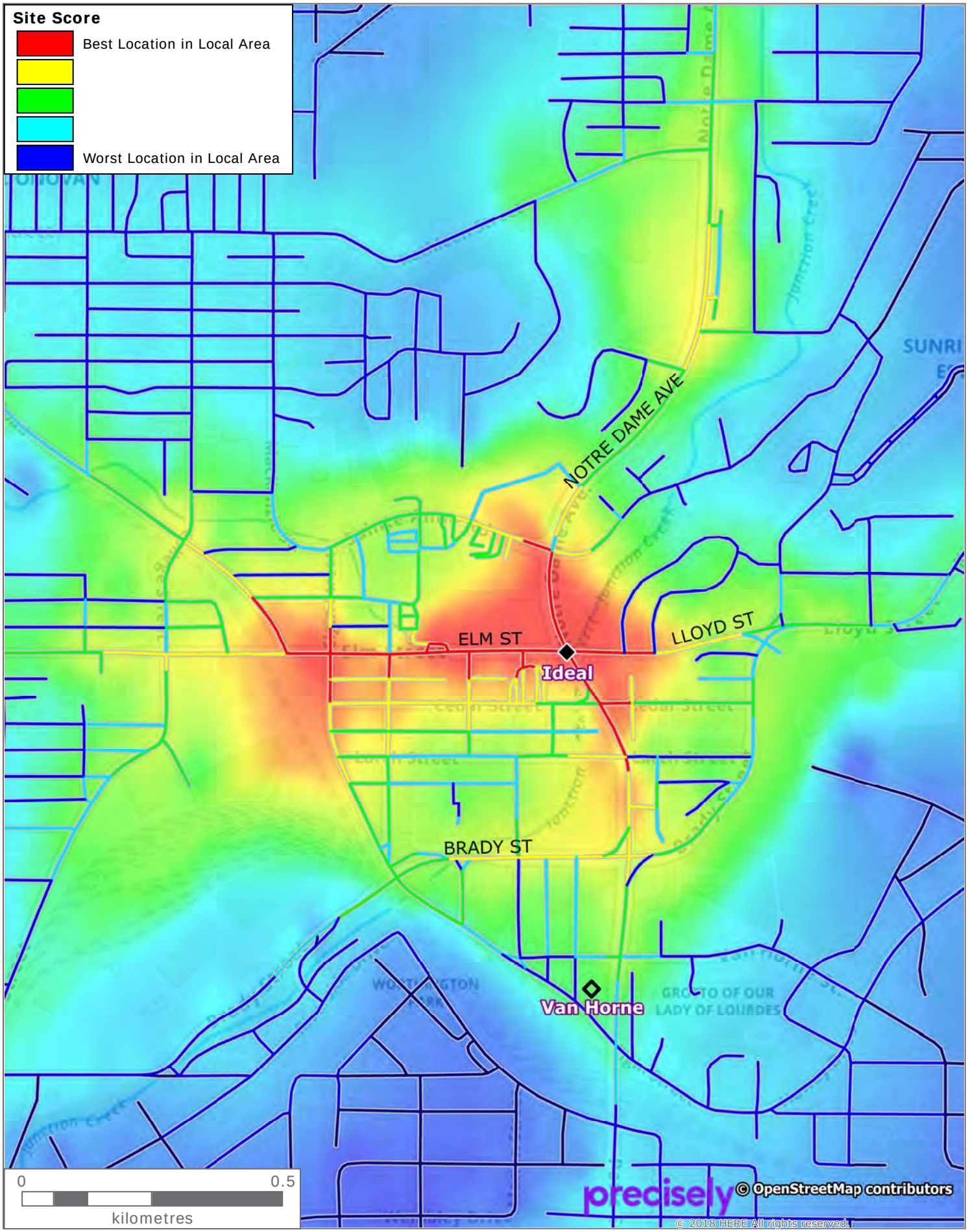
F2a



Site Search for Van Horne Ideal Location

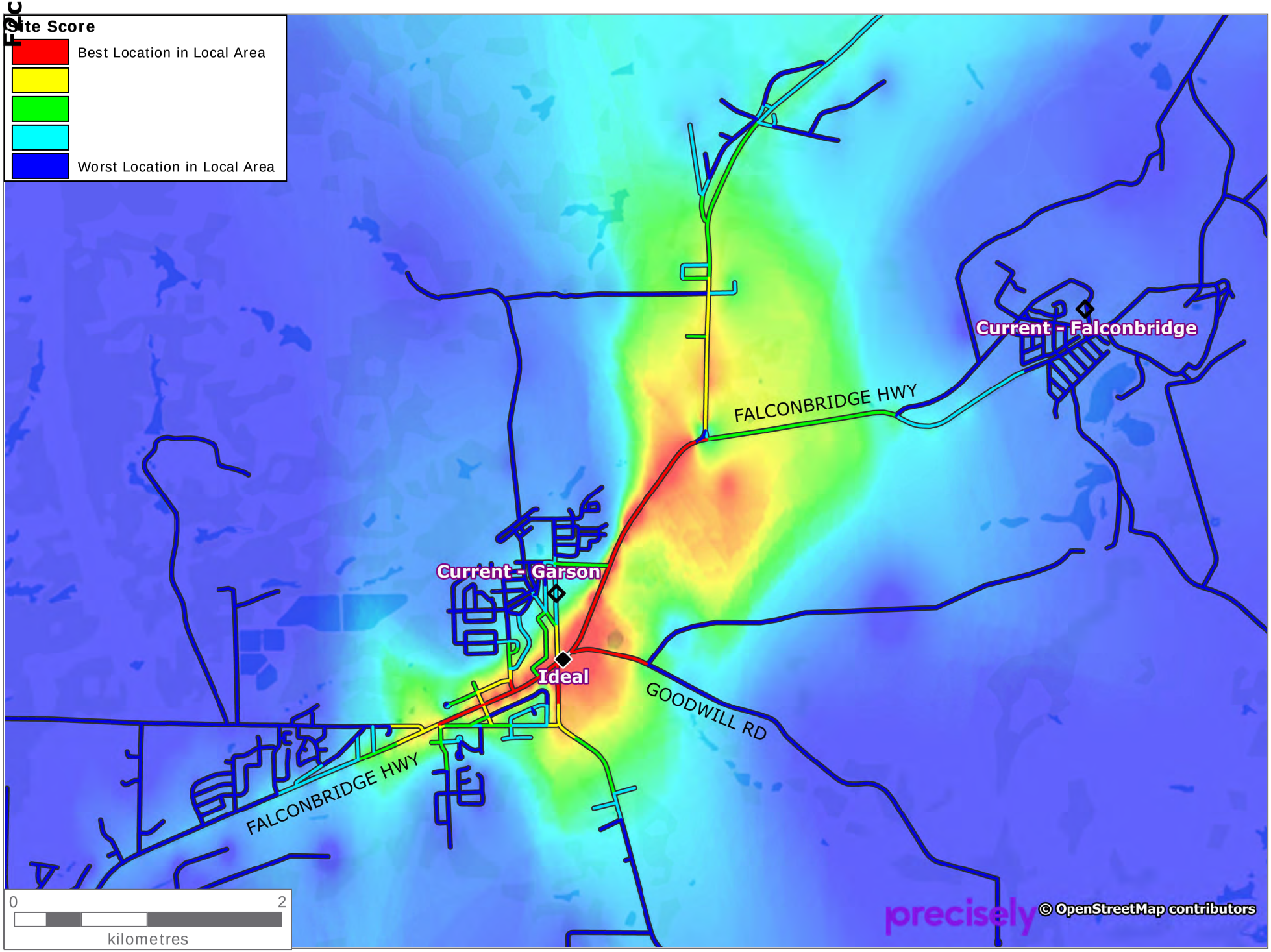
City of Greater Sudbury

F2b



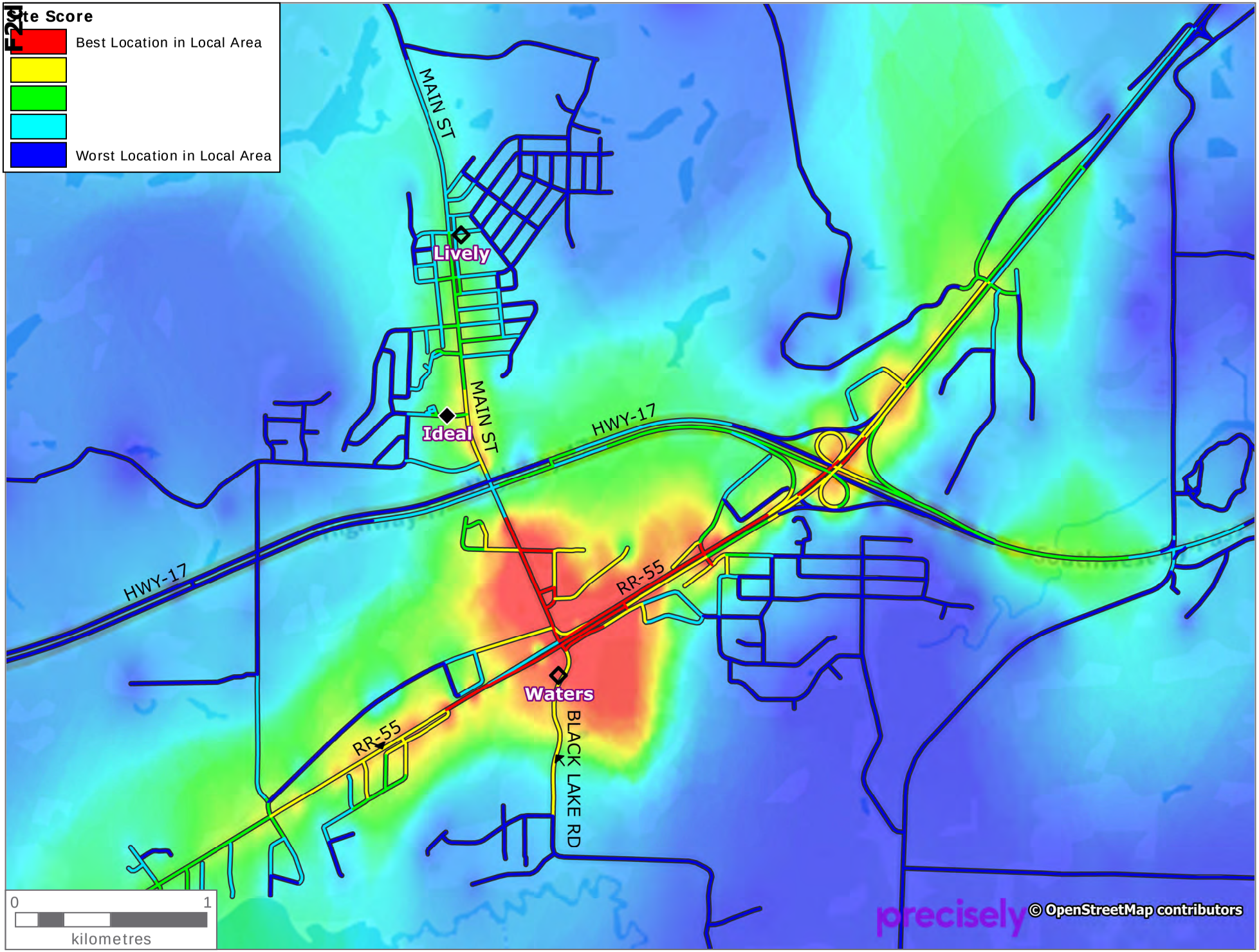
Site Search for Garson and Falconbrigde Ideal Location

City of Greater Sudbury



Site Search for Lively and Waters Ideal Location

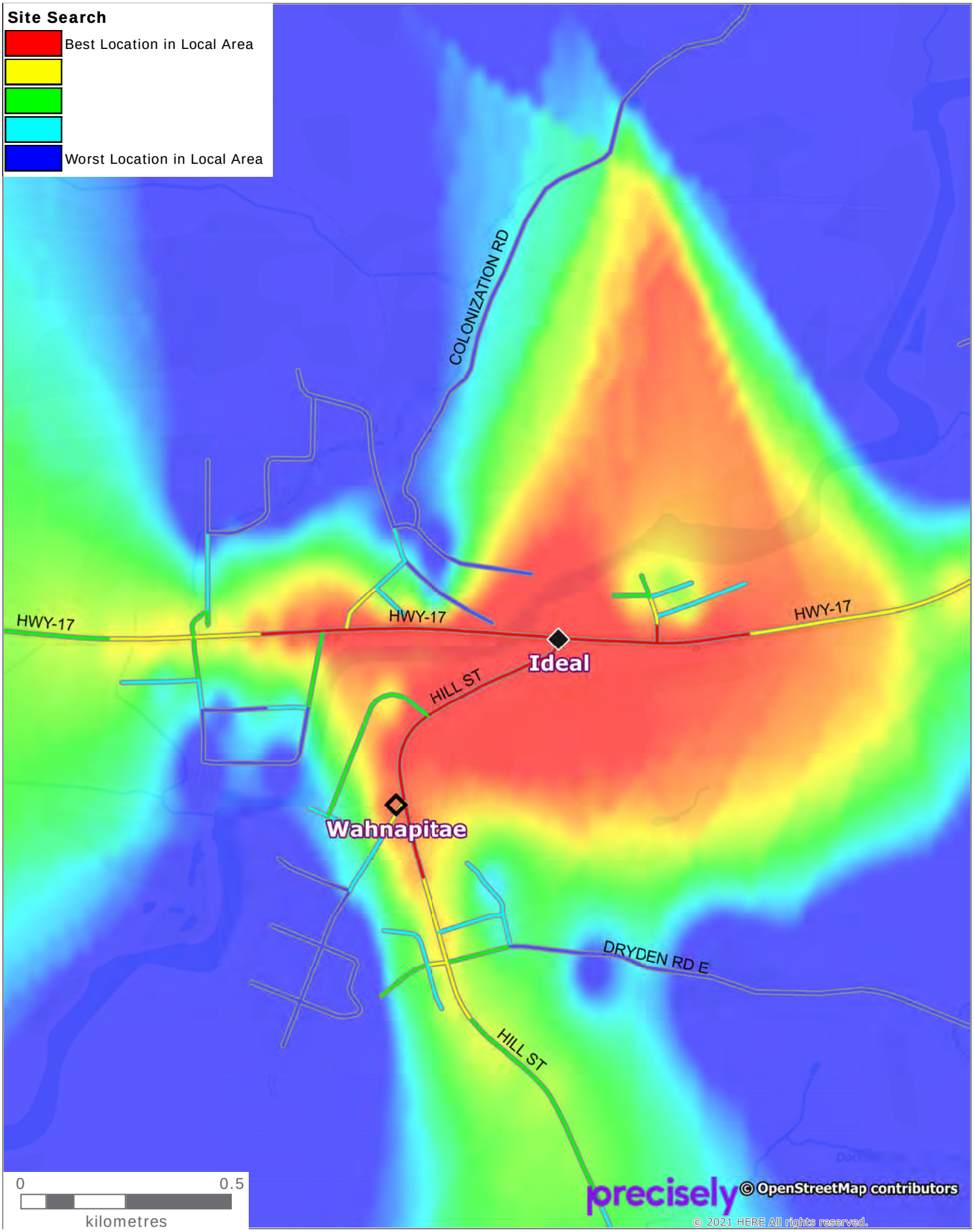
City of Greater Sudbury



Site Search Map for Wahnapitae Station Ideal Location

City of Greater Sudbury

F2e



G Glossary

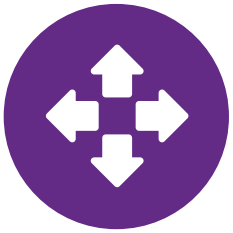
Glossary

Term	Definition	
Activation Time	Time from T1 Call Received to T2 Unit Notified	
Assembly Time	Time taken for the vehicle to go enroute after it has been notified	
Availability	The average number of volunteer responses per incident by station	
AVL	Automatic Vehicle Location	
CACC	Central Ambulance Communications Centre	
CTAS	Canadian Triage and Acuity Scale	
	1	(Resuscitation): Conditions that are threats to life or limb (or imminent risk of deterioration) requiring immediate aggressive interventions
	2	(Emergent): Conditions that are a potential threat to life, limb or function requiring rapid medical intervention or delegated acts
	3	(Urgent): Conditions that could potentially progress to a serious problem requiring emergency intervention
	4	(Less Urgent): Conditions that are related to patient age, distress, or potential for deterioration or complications which would benefit from intervention or reassurance
	5	(Non Urgent): Conditions that may be acute but non-urgent as well as conditions which may be part of a chronic problem with or without evidence of deterioration
GSFS	Greater Sudbury Fire Services	
GSPS	Greater Sudbury Paramedic Services	
Demand	Any call to which at least one vehicle has arrived at the scene	
Mobilization	A unit being mobilized to an incident (may be more than one unit mobilization for an incident and may not reach scene)	
Mobilization Time	Time from T2 Unit Notified to T3 Unit Mobile	
MoH	Ministry of Health	
Occupied Time	Time from T2 Unit Notified to Unit Clear	
Location Modelling	Using a sophisticated, geographically based genetic algorithm to evaluate multiple configurations of locations and identify best options.	
Non Fire Incidents	Incidents with the following categories: Assist Other Agencies, Hazards and Leaks and Rescues	
ORH	Operational Research in Health Ltd	
Priority 1 to 4	P1	(Deferrable): can be delayed without physical harm to patient
	P2	(Scheduled): non-emergency calls with a time element (e.g. scheduled transfers)
	P3	(Prompt): not life threatening or not in immediate danger
	P4	(Urgent): life threatening or in immediate danger (life, limb or function threatened).
Response	A unit arriving at the scene of an incident (there may be more than one unit response at an incident)	

Glossary

Term	Definition	
Response Time	1	Time from T2 Unit Notified of the first notified unit to T4 Arrive Scene of the first arrived unit. BCPS uses this measurement of response time.
	2	Time from T0 Call Answer to T4 Arrive Scene of the first arrived unit. ORH also monitors this measurement of response time for modelling purposes.
Simulation Modelling	Using a discrete event simulation model, which replicates the key characteristics of an emergency service, to predict future behaviour under a variety of difference scenarios.	
Standby (Priority 8)	Moving a crew from one station to another station to maintain coverage	
Time Events (Paramedic Services)	T0	Time Call Answered
	T1	Time Available for Dispatch
	T2	First Unit Notified
	T3	First Unit Mobilized
	T4	First Unit Arrived at Scene
Utilization	The combined occupied time of all units divided by the combined total deployed unit hours (shift start to shift end)	

Emergency Service Planning



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