FIRE DEPARTMENT STRATEGIC PLAN CITY OF SOMERVILLE, MASSACHUSETTS

April 2016

Proposal Contact

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April 2016

Hon. Joseph Curtatone, Mayor
City of Somerville
93 Highland Avenue
Somerville, MA 02143

Mayor Curtatone,

The Carlson Group is pleased to present our Strategic Plan for the Somerville Fire Department (SFD). It was a pleasure to work closely with the staff in the Fire Department, SomerStat and other City departments throughout the course of this project. These staff members are a credit to you and to the citizens of Somerville, and their work reflects the vision that you have continued to define for the community.

The City of Somerville is growing and changing in a number of ways that are impacting the Fire Department and that are impacting the delivery of fire, rescue, and EMS services in the community. Adapting to these changes and findings ways to continue to provide exceptional services with rapid response times must be the primary focus of the Fire Department for years to come.

This Strategic Plan identifies the steps that the City should undertake to address the impact of growth on fire and rescue services in Somerville. The Strategic Plan identifies steps in station development, unit placement, staffing, and new approaches to delivering services. A combination of these approaches will provide the City with the benefits of continuing to provide exceptional services in a fiscally responsible manner.

If you have any questions, please do not hesitate to contact Travis Miller at 978.470.4838 or via email: travis@carlsonmed.com.

Sincere Regards,

The Carlson Group

The City of Somerville retained the Carlson Group, a national public safety management consulting firm, to conduct an evaluation of changes in the delivery of fire, rescue, and EMS services in the City and to make recommendations in the form of a Strategic Plan for addressing those changes. This Strategic Plan is primarily focused on two issues:

- How has the workload in the City changed, and where should the City locate fire and rescue resources to continue to respond to incidents effectively?
- What are the changes likely to occur in the City over the next 10 to 15 years, and how should the City and the Fire Department best position themselves to address these changes?

1. Methodology

The Carlson Group was retained by the City of Somerville to serve as consultant, working in conjunction with City staff. This approach allows the City to take advantage of the expertise of the subject matter expert from the Carlson Group, while also making excellent use of the analytical skills of City personnel. Further, this approach enables the City to develop additional internal knowledge, which can be applied to future challenges and concerns.

In the development of this assignment, the consulting team:

- Conducted numerous interviews;
- Collected descriptive data;
- Develop GIS analyses;
- Considered a wide range of potential solutions once issues were identified;
- Met with stakeholders to review issues, potential solutions, recommendations, etc.

The Strategic Plan was developed through the work of an outside consultant from the Carlson Group. The Fire Department, the City's GIS Coordinator, and many other contributors from throughout the City's government provided data collection and other support to the consultant. The consultant met with the Fire Department's bargaining unit leadership to solicit their concerns and to review the findings with them to ensure a smooth process for the Mayor and the Fire Chief.

2. Key Terms

There are several key terms used throughout this document, each of which is defined below:

a) *Fractile Performance* – a mathematical concept that looks beyond the average performance of a system. In this report, we utilize the 90th percentile (or fractile) to examine how well the system provides services 90% of the time. Professionals who examine fire and rescue or other public safety services are often focused beyond the average because it may mask significant issues with system performance, particularly when the system has limited resources and (somewhat) unpredictable timing of incidents.

   When the document states that the SFD performed at a level of five minutes or fewer 90% of the time, we are saying that 90% of the time, the first arriving unit arrived at the scene of the emergency in less than five minutes from the time of dispatch. The average, in this case, is likely to be between two and three minutes.

   When the Strategic Plan states that the 90th percentile performance is 4:54, this means that the area was responded to in 4:54 minutes or faster 90% of the time, with remaining responses slower than that.

b) *Engine Company First Due Area* – a geographic area of historical necessity that precedes the availability of GPS and GIS. They are used in this report as a convenient way to identify areas of workload, growth, changes, etc. If stations are moved, or the number of stations are changed, the first due areas should be changed to reflect the altered response network. Implementation of GPS dispatching reduces the importance of first due areas, but the concept remains important for inspections and other ancillary tasks.

c) *Engine Company* – a piece of fire apparatus that carries water, hoses, ground ladders, and other tools. These are staffed in Somerville with an officer and two firefighters. The engine company has historically been the most flexible unit in the SFD's inventory, able to respond to most emergencies either alone or accompanied by one or more other units.

d) *Truck Company* – a piece of fire apparatus whose primary purpose is to provide elevated access (by ladder or bucket) and master streams (large quantities of water aimed at controlling massive fires). Truck companies typically carry a wide range of heavy tools, and their personnel focus on searching for victims and ventilation of the structure. These are staffed in Somerville with an officer and two firefighters. These may be called ladders, trucks, or platforms by firefighters.

e) *Rescue Company* – a piece of fire apparatus that carries heavy and technical rescue equipment for events that exceed the capacity of the tools carried on engines and trucks. Rescue companies are staffed in Somerville with an officer and two firefighters.

f) *Squad Company* – a smaller unit (SUV, van, mini-pumper, utility truck, non-transport ambulance) designated to respond to medical calls and other incidents not requiring the water, ladders, or tools found on larger units. This type of apparatus does not yet exist in the SFD but, if implemented, would be staffed with two personnel. Similar units are already operating in Cambridge.

g) *Emergency/Critical Call* – national standards often establish benchmarks for performance based on emergency calls. The standards often leave the definition of emergency to the local authority with jurisdiction. For the purposes of this analysis, the Carlson group worked with the SFD to create a list of all response categories that they agree would constitute an emergency. These are often denoted as "critical incidents" in the body of this report.

3. Current Fire Department Deployment and Responsibilities

The Somerville Fire Department is currently statically deployed from five fire stations.[1] The Fire Department provides a range of responses to hazards including:

- Fire prevention and fire suppression;
- First response to medical calls, in support of a third party ambulance company;
- Technical rescue;
- Hazardous materials response.

To provide these services, the Fire Department currently deploys five engines, three ladders, and a heavy rescue unit. Table 1 below shows the current staffing and deployment of SFD personnel.

[1] During the majority of this investigation the Union Square station was closed for emergency repairs and its key personnel and apparatus temporarily located at SFD Headquarters. The station reopened in April of 2016.

Table 1. Station Locations, Unit Deployment, and Minimum Shift Staffing

Station Location	Units	Minimum Shift Staffing
Fire Headquarters	Rescue 1	3
266 Broadway	Engine 2	3
	Ladder 2	3
	C-2	1
Union Square	Engine 3	3
255 Somerville Ave		
Lowell Street	Engine 1	3
651 Somerville Ave	Tower 1	3
Highland Ave	Engine 7	3
265 Highland Ave	C-3	1
Teele Square	Engine 6	3
6 Newbury St	Ladder 3	3
Total Minimum Shift Staffing		**29**

This has been the staffing level and deployment in the City since 2011 when the Rescue unit was added to the Department. While the staffing levels have remained consistent, the workload has not.

4. Changes in the City Have Increased Workload and Response Times

The Carlson Group and project team developed a series of analyses to examine the impact of changes in the City of Somerville on the workload of the Fire Department. The view of these changes from inside the SFD has been that growth in the eastern areas of the City has been driving workload growth in the community, and that this growth has been having negative impacts on response times and unit availability through the City. Our findings indicate that, in some ways, this is an accurate depiction – while in others, it is not. Table 2 below shows total workload growth in the City of Somerville from 2009-2015 in two-year increments.

Table 2. Incidents (Calls) in the City of Somerville (2009-2015)

District	2009	2011	2013	2015
Total Incidents	11,668	12,132	12,895	13,732
% Change (2 Years)	*N/A*	*4.0%*	*6.3%*	*6.5%*
Critical Incidents	10,267	10,554	10,858	11,684
% Change (2 Years)	*N/A*	*2.80%*	*2.88%*	*7.61%*

This review shows significant changes over the past six years, specifically, an increase of 17.7% over the period 2009-2015. Growth is likely to continue given development plans for the City in almost every neighborhood, but in particular on the east side of the City.[2] Table 3, below, provides a breakdown of the calls by major call type:

Table 3. Incidents (Calls) in the City of Somerville, by Major Call Type (2009-2015)

Year	Fire	Medical	Other	Service
2009	2.8%	49.1%	42.9%	5.2%
2010	2.8%	46.8%	43.7%	6.8%
2011	2.9%	46.8%	45.4%	4.9%
2012	3.5%	49.0%	42.5%	5.1%
2013	4.1%	52.9%	37.0%	6.0%
2014	3.2%	52.0%	38.1%	6.7%
2015	3.3%	50.8%	38.4%	7.4%

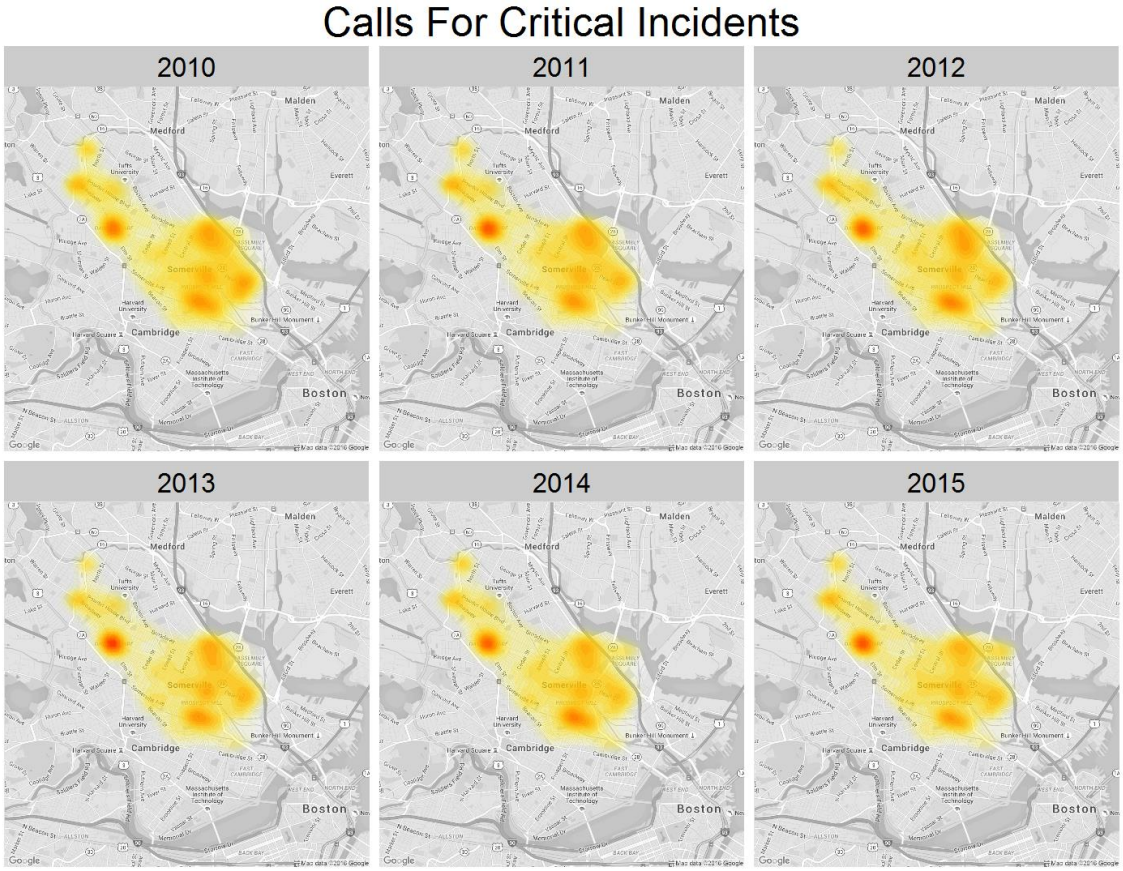
The distribution of calls has been relatively stable by major call type over the period of 2009 – 2015. Calls that are classified as "Fire" in nature represent approximately 3% of calls (or roughly one per day). Medical calls represent approximately 50% of the Fire Department's workload.

Exhibit 1 below shows the geographic distribution of critical calls[3] in the City of Somerville over this same time period.

[2] See SomerVision, Somerville's Comprehensive Plan: http://www.somervillema.gov/spotlights/comp-plan

[3] Critical calls include fire, medical, and other emergencies (as opposed to non-critical "service calls", e.g. helping people locked out of their homes or getting cats out of trees)

Exhibit 1:



This graphic is of particular interest because it shows that not only is there increasing workload in the eastern part of the City, but that there are concentrations of workload throughout the community that must be taken into consideration as the City considers both short and long-term location decision for fire / rescue operations. This can also be seen in the way the SFD's workload is distributed across the existing units of the department over the same time period (Table 4).

Table 4. Incidents (Calls) Per Day by Unit (2009-2015)

Unit	2009	2010	2011	2012	2013	2014	2015	Percent Change 2011-2014
R1	NA	NA	5.6	6.0	6.0	6.3	6.9	
E2	5.8	5.9	6.0	5.7	5.9	6.2	6.8	18%
E6	6.2	6.8	6.7	6.1	6.4	6.1	6.3	2%
E7	5.5	5.5	5.5	5.3	5.3	5.6	6.1	10%
E1	5.2	5.3	4.1	3.2	3.3	3.3	5.4	3%
E3	6.6	7.0	6.2	6.6	6.8	7.0	5.4	-19%
L2	3.6	3.5	3.5	3.6	4.8	4.8	5.3	46%
L3	2.8	3.1	3.2	3.2	3.4	4.1	4.5	60%
C2	3.7	3.8	3.8	3.5	3.9	4.1	4.1	10%
T1	3.7	3.6	3.1	3.0	3.3	3.7	4.1	11%
C3	3.2	3.5	3.3	3.3	3.3	3.3	3.7	18%

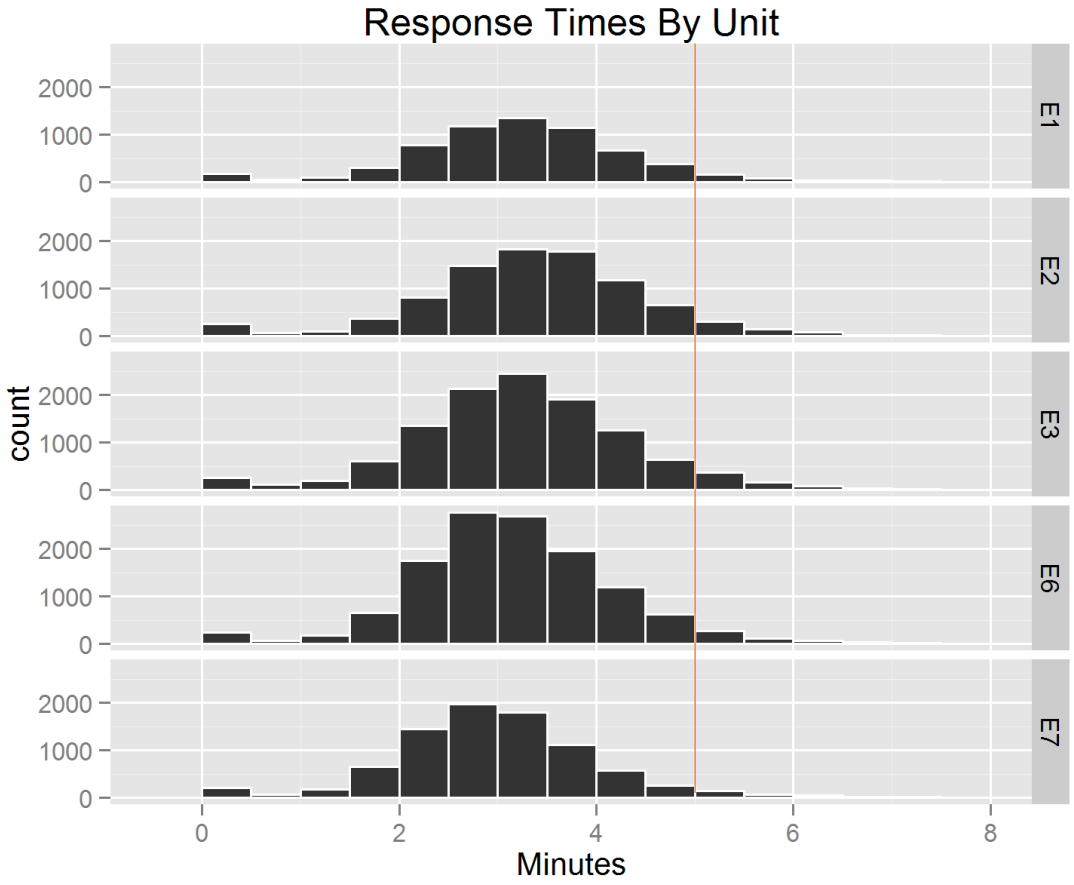
The workload of every unit increased between 2011 and 2014, with one exception (E3 from Union Square saw workload drop in 2015 due to being temporarily relocated to headquarters). This reflects growth in total calls, as shown previously, but also a policy change in the Fire Department to shift workload to the ladder and tower truck companies when the first-due engine company is not available. This policy change has enabled the Fire Department to maintain excellent response times, while also allowing the Fire Department to keep units operating at less than 10 calls per day. High-performing Fire Departments keep a close eye on the average calls per unit per day. If call volume continues to rise and average calls exceed 10 calls per unit per day, the City should consider adding additional personnel and resources to combat potential negative impacts to response times and availability.

The Carlson Group next examined the impact of increasing call volume on response times. This analysis focused on the 90th percentile (defined above), specifically this question: what is the response time at the point where 90% of calls have been reached by the first-due unit? NFPA 1710 establishes, in part, that fire / rescue agencies should target an initial response time of five minutes for the first arriving unit for critical calls. This is comprised of a combination of the time it takes in the station to dress and begin responding (one minute) and the time it takes to drive to the call (four minutes).

The City has enjoyed very impressive response times (more than 90% of calls reached in less than five minutes – which includes in-station response time and driving to the call). This is in large measure due to the City's investment in this vital public safety resource and the deployment of units. The City also benefits from its geography and population density – allowing response units to be located close to one another, enhancing the overlap and resulting coverage.

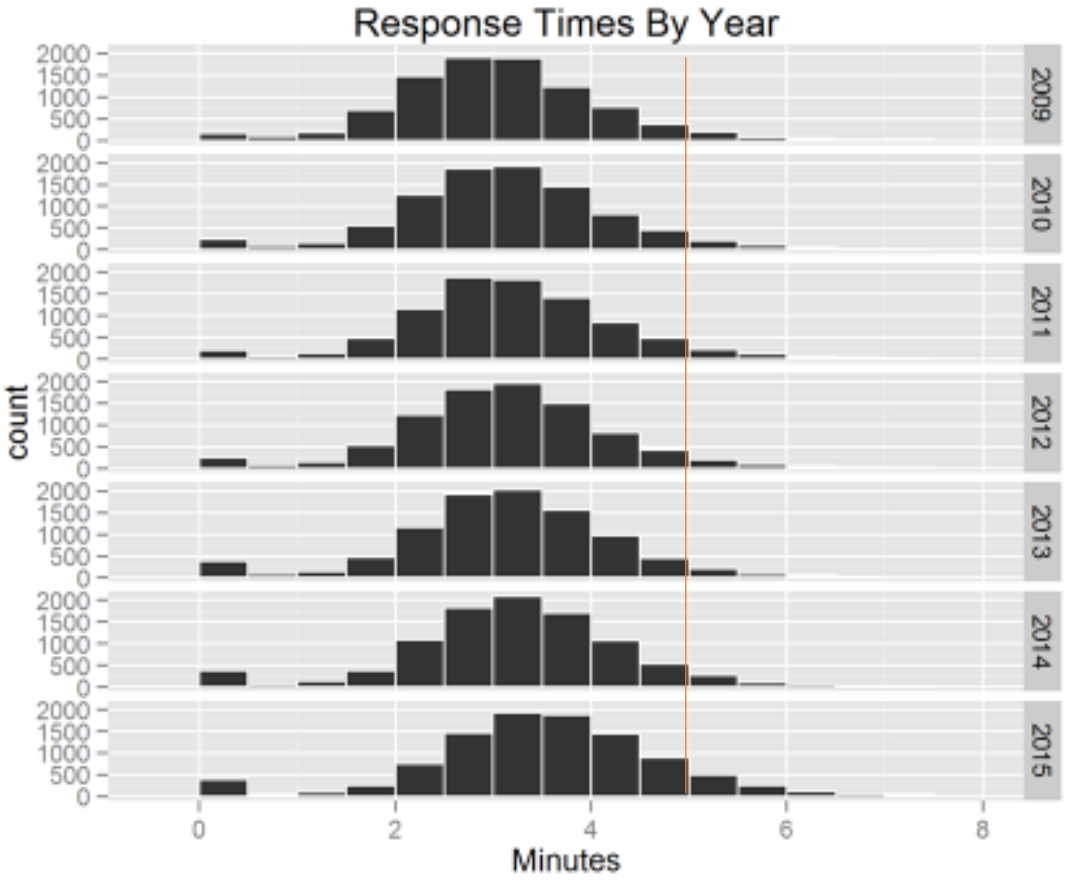
This analysis shows a predictable pattern: as the number of emergency (critical) calls has increased, so too has the response time to reach 90% of calls in most of the first-due areas. One particular challenge has been the area protected by E3 (Union Square). This has both been a result of increasing workload (in and around the first-due area) but also the removal of the unit from its station in Union Square and its relocation to SFD headquarters – a change which has now been reversed as the Union Square facility is able to house personnel and apparatus again. Exhibit 2 shows the distribution of response times for each of the City's five engine companies.

Exhibit 2:



While this distribution indicates that most responses take place in less than five minutes, it is important to look at the trend over time. This is shown in Exhibit 3.

Exhibit 3:

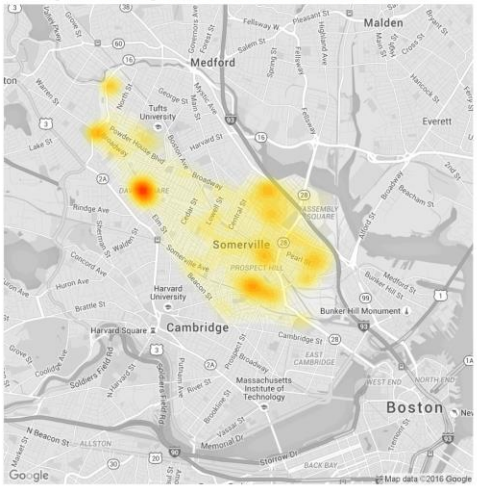


Note that the center of the distribution is moving to the right – in the wrong direction – over time, as workload pressures on the system cause responses to slow down. This is likely caused by an increasing likelihood that the closest unit (or units) is busy and that units from further away must be called upon to respond, even to critical (emergency) calls. It should be noted, however, that the shift in response times over the last several years has been slight. In fact, 2011 is almost indistinguishable from 2014, statistically speaking. The larger shift in 2015 is likely due to the move of E3 out of Union Square. Staff should track the change in 2016 to determine if the larger shift in 2015 was a temporary event due to the movement of Engine 3 out of Union Square and into Headquarters.

A comparison of the location of critical incidents for the period 2009-2015 with the response time challenges shows that, in large measure, the Fire Department is effectively handling current workloads (Exhibits 4 and 5).

Exhibit 4 & Exhibit 5:

Calls For Critical Incidents: 2009-2015



Calls with Response Times Over 5 Minutes: 2009-2015

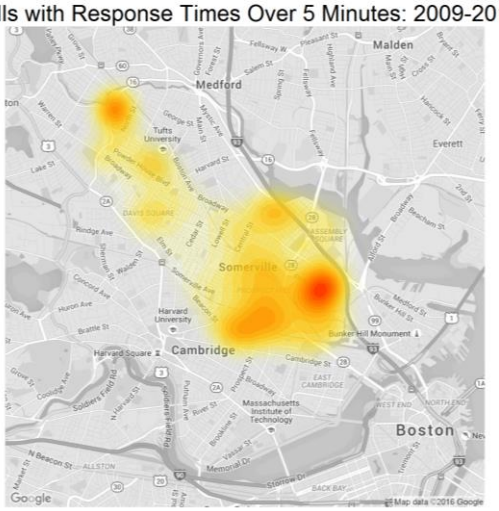
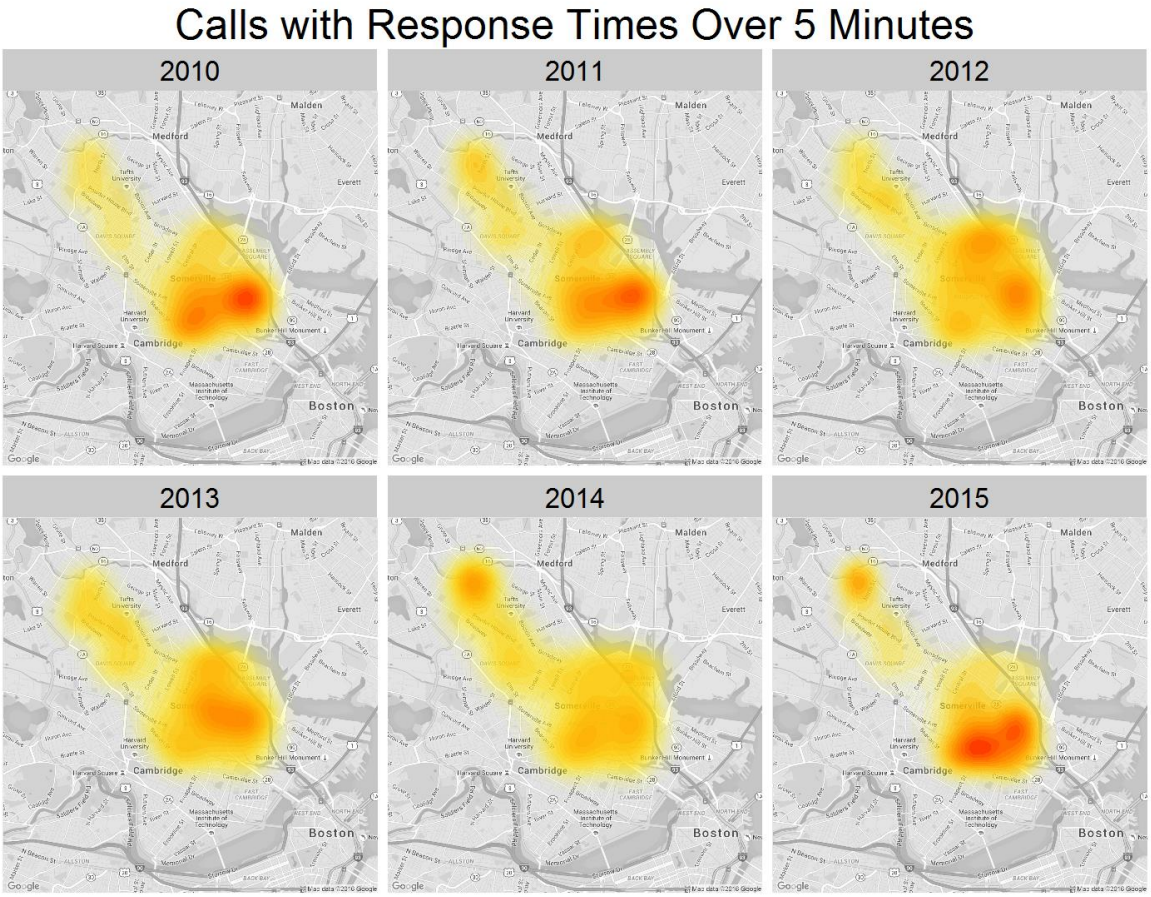


Exhibit 4 shows the distribution of critical incidents from 2009 through 2015, with hot spots most notably in Davis Square, but also in Union Square, Teele Square, and near Mystic Avenue in Winter Hill.

Exhibit 5 shows the distribution of calls with response times in excess of the five-minute target. This shows that the areas east and south of the Headquarters and Union Square stations are those with the most significant challenges in terms of response time. This is a key finding as we consider the options available to the City, and as we make our recommendations going forward. It is important to distinguish between areas which have large call volumes (Davis Square) and areas which receive slower response times (areas east and south of Fire Headquarters and Union Square).

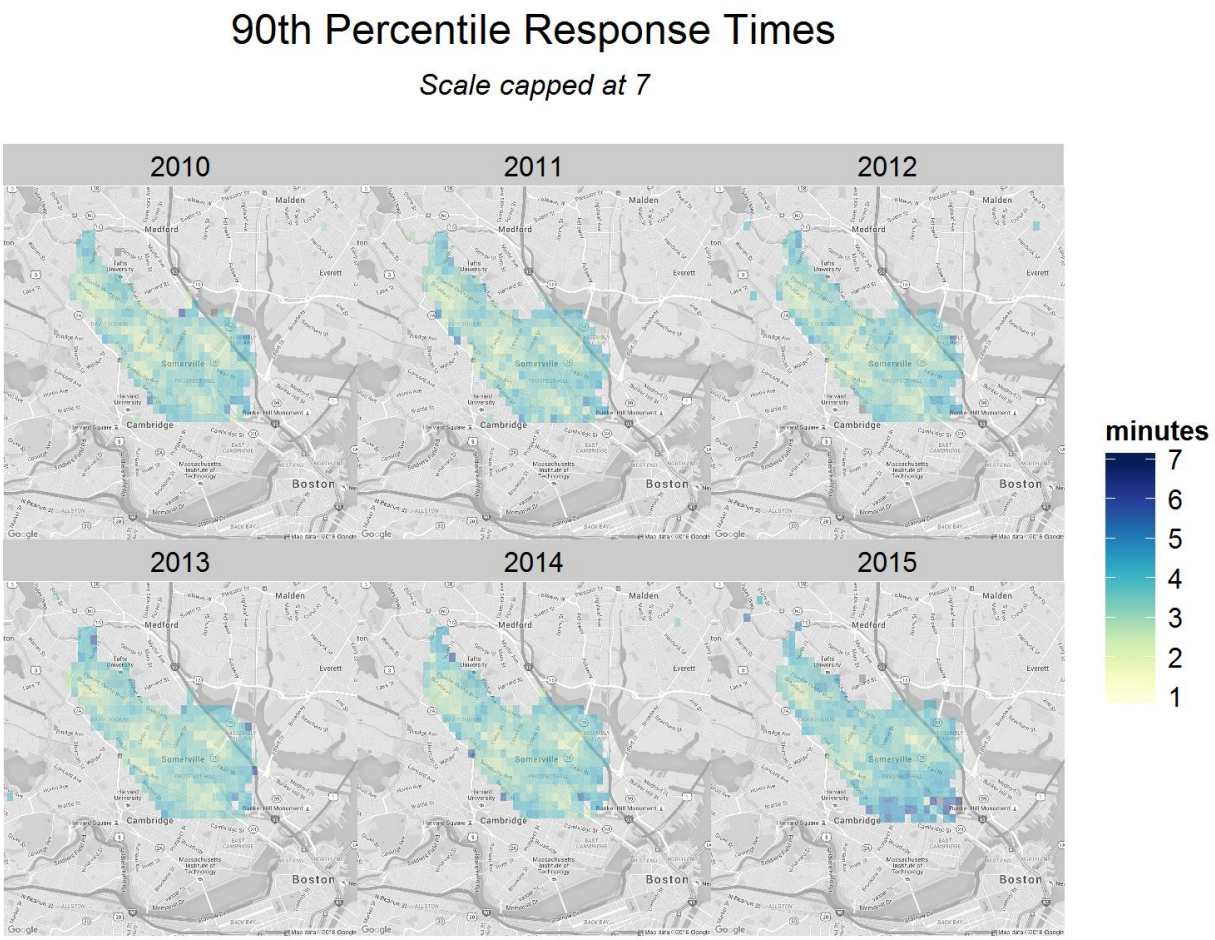
Exhibit 6 shows the temporal trend in response times exceeding the five-minute target. Note that the most challenging areas for the Fire Department have consistently been those in the far western edge of the City and south and east of Union Square (an area slated for significant development in the next ten years, which will only increase workload).

Exhibit 6:



Another way of looking at SFD performance is to ask the question in reverse – i.e., how long does it take for the Department to respond to 90% of its calls? Exhibit 7 shows this result for each year between 2010 and 2015.

Exhibit 7:



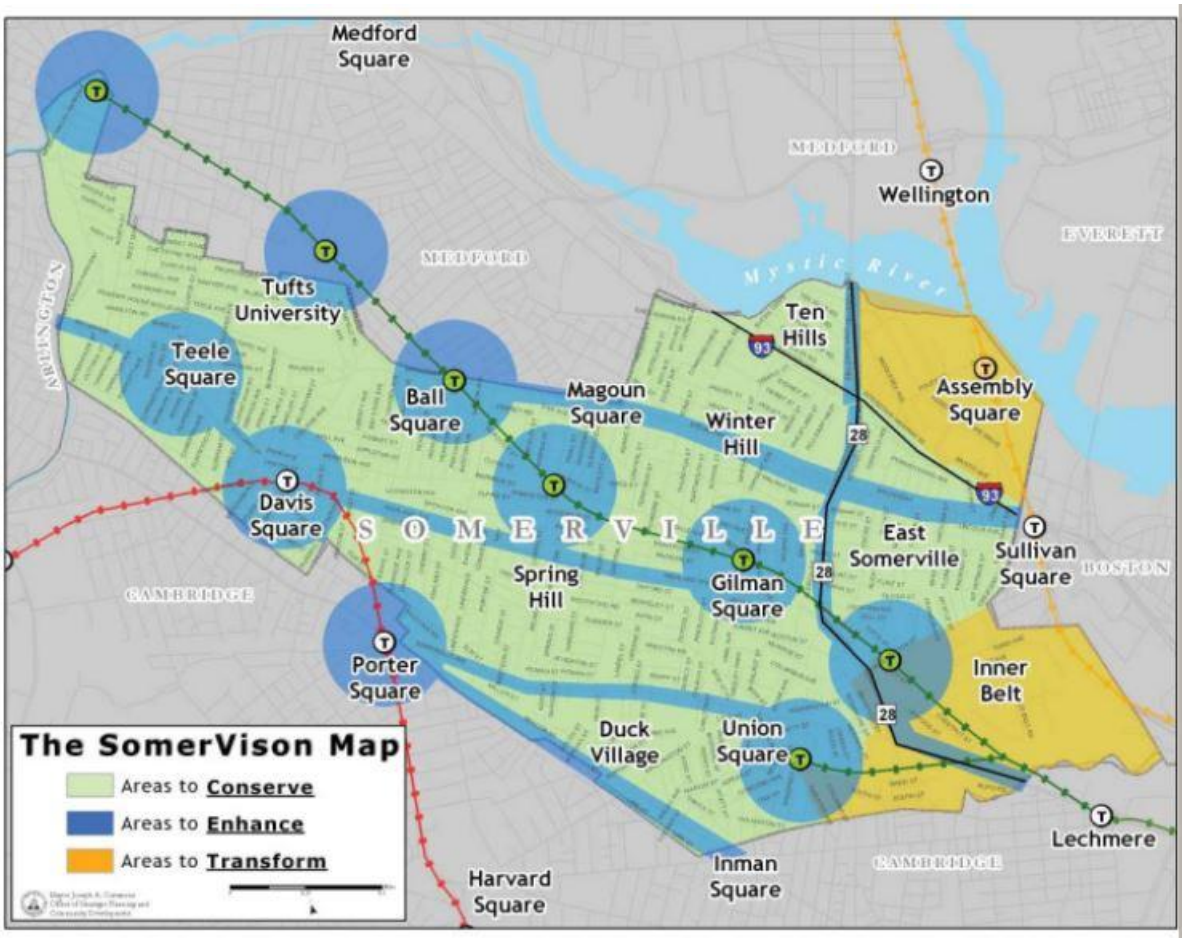
This exhibit clearly illustrates that the most significant challenges (i.e., longest response times) are located on the periphery of the City and south and east of Headquarters and Union Square. Interestingly, the most significant challenges are not necessarily in those areas with the most significant workload – in fact, Davis Square (a very busy area) has very good response times due to the proximity of multiple response units. A close examination of the map for 2015 shows the impact of removing the station at Union Square – particularly for those calls south of the Square.

5. Workload Is Projected to Continue Growing Given Current Plans in the City

The Carlson Group next focused on the question: what can be expected to occur with respect to call growth in the City? The City of Somerville is in the midst of a period of dynamic growth, with potential major projects located across large areas of the City, and "smaller" projects located Citywide. A review of the SomerVision document indicates that the City expects to see transformative changes in areas including Assembly Square, Union Square, Brickbottom,

Boynton Yards, and Inner Belt, with significant enhancement (through major development and re-development) possible in almost every commercial square in Somerville. The following, Exhibit 8, is taken directly from SomerVision, and clearly depicts the vision for development and redevelopment across the City. [4]

Exhibit 8: SomerVision Citywide Map – Neighborhoods in Transition



The members of the Carlson Group project team worked closely with Somerville staff to develop specific growth forecasts, but this effort was stymied by several important factors:

- Timing of specific projects is very difficult to forecast if they are not permitted and underway at this time.
- Dynamic discussions and policy making around the location of the expanded "T" stops will have an impact of timing, location, size, etc. of developments and re-developments.

While it became clear that the project team could not develop meaningful and defensible detailed projections, the Carlson Group is confident that workload will continue to grow in Somerville. This workload growth will need to be carefully monitored by the Fire Department to

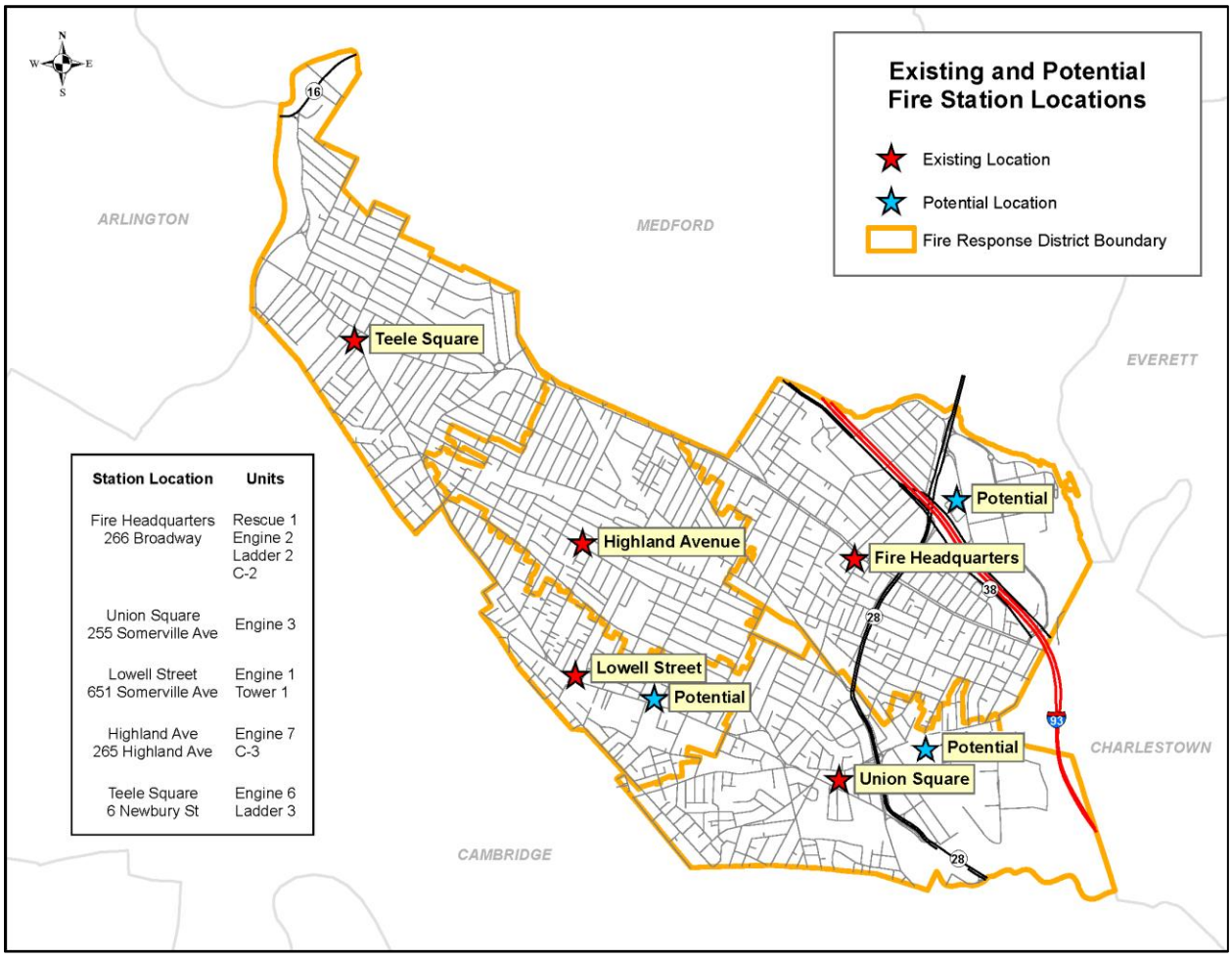
[4] City of Somerville, SomerVision, 2012, Comprehensive Plan 2010-2030, p. 17.

ensure that response times remain at their current exceptional level, and that workload does not begin to outstrip the ability of the Department to effectively respond to emergencies.

6. The City's Station Location Alternatives Are Limited Given Density

The Carlson Group next turned its attention to the question: could or should the Fire Department either shift its fire station locations or add to the Department's response network? Exhibit 9 below shows current stations and some potential locations.

Exhibit 9:



A number of key factors need to be taken into consideration when considering the location of a fire station. These include the following:

- Impact on response times and community coverage;
- Availability of suitable land;
- Fiscal impacts from purchasing, land development, moving, etc.;
- Suitability of available properties for use as a fire station;
- Potential impacts on neighboring properties;

- Competing municipal uses for potential sites;
- Competing municipal needs for available land;
- Alternatives uses of each potential piece of property.

Each community will evaluate each fire station location decision differently. Some may, through necessity, have to consider fiscal impacts more strongly than others.

As part of this Strategic Planning exercise, the Carlson Group's project team solicited input from various sources (including staff from the Fire Department, Mayor's Office, SomerStat, the Office of Strategic Planning and Community Development, and Capital Projects and Planning) regarding potential suitable station locations. This is a more significant challenge in Somerville than it might be in other communities, due to high population density and the intensive utilization of most land in the City.

Two locations were preliminarily identified: one on Somerville Avenue about a third of a mile east of the current fire station at Lowell Street and a series of potential parcels located east of I-93. It was also suggested that sites east of Union Square might become available if the City were open to land swaps and other maneuvers. In considering how to move forward, the Carlson Group recommends that the City take into account that:

- Call volume will continue to increase as the City continues to grow, particularly in Assembly Square, Union Square, and other transformational areas east of Union Square;
- The ability to maintain a station within the heart of Union Square is decreasing – as development pressure in this area increase, so too will the pressure to relocate both the fire station and the police station;
- Removal of the Union Square station and other forecasted growth / major projects in the City will require the relocation of Engine 3 and the construction of a new facility;
- There may be opportunities to locate a fire station on the same site as any future police / public safety headquarters;
- The opportunity to host and locate a regional 911 / PSAP / dispatch center in Somerville should be taken into account when making public safety location decisions;
- Fire Headquarters is not providing for sufficient training, meeting, or other administrative spaces;
- The Lowell Street location has the most capacity for handling additional workload;
- Continued growth in eastern parts of the City, and the challenges of the existing road network, strongly support the eventual construction of a fire station in this area.

The Carlson Group recommends that the City take the following steps to address these issues:

- If a new public safety headquarters / police station is constructed, a small fire station (two apparatus bays and appropriate living quarters) should be considered for that site;
- The Fire Department and the City should consider potential sites for a fire station east of Union Square;

- Union Square operations should be shifted to the new location east of Union Square;
- The Fire Department and the City should carefully assess 515 Somerville Avenue as a fire station location site. City and SFD staff should analyze the costs and benefits of 515 Somerville Avenue. They should weigh those against the costs and benefits of retrofitting the Lowell Street station. There is no significant operational impact when considering Lowell Street vs. 515 Somerville Avenue;
- The Fire Department and City should seek out a secured, climate controlled location where Fire Department reserve vehicles can be stored. While this should optimally be in the City of Somerville, the search should not be limited to within the City if nothing suitable can be found. Reserve apparatus do not need to be stored in a front-line fire station.

In addition to these options, the Carlson Group recommends that the City consider the following.

7. Alternatives for Service Delivery

One approach that has seen increasing attention and implementation nationally is the idea of adding a new type of response unit to the Fire Department's capabilities: that of a rescue squad. One does not need to seek out fire departments on the west coast to find a functioning example of such a unit – in fact, one only has to look to the next community to west of Somerville: Cambridge. The units in Cambridge are staffed with an officer and a firefighter and are used to augment the capabilities of the existing engine companies. They are more agile, are able to get through traffic more quickly, are easier to find locations to park (apparatus parking being an increasing challenge for the SFD), and can be sent to a wide range of calls that have traditionally been assigned to engine companies. The photos, which follow, depict two examples of these types of units (communities have put small pumps and water tanks on them as well):

The Carlson Group believes that the City should carefully monitor response times and workload and, when the need for additional units is identified, implement a squad program similar to that which has been operating in the City of Cambridge. This program can be described, as follows:

- Squads would be staffed with an officer and a firefighter;
- The SFD would start with one and add another in the following year;
- The first squad would require one captain, three lieutenants, and four firefighters – the second would require four lieutenants and four firefighters – this pattern would be duplicated if more were added;
- The squad companies would be assigned to non-life-threatening medical calls and other service calls – for threat-to-life medical calls, the SFD would send either a squad or an engine – whichever is closer. For non-life-threatening calls, where an extended response time would be acceptable, the SFD could send a squad – even if an engine were closer;
- With two squads the City should be divided into an east and west territory – one unit should be located at headquarters, the other assigned to another station;
- If the decision is taken to add squads with water tanks and pumps, clear guidelines as to their utilization (trash / dumpster / car fires) must be in place.

When implemented, these units will enable the City and the SFD to reduce the number of calls to which the engine companies must respond, enabling the City to avoid the expense of acquiring, housing, and staffing a new (sixth) engine company.

As noted earlier, the City of Cambridge has a pair of 2-person squad companies. These two units have been very successful at handling medical calls and other workload that would otherwise have been assigned to engine companies. Table 5 shows the Cambridge Fire Department squad data from the past three calendar years.

Table 5. Calls handled by Cambridge Fire Department Squads (2013-2015)

Year	Responses	Bldg. Fires
Squad 2		
2015	3,514	47
2014	3,271	51
2013	2,901	59
Squad 4		
2015	1,853	49
2014	1,634	44
2013	1,626	51
Totals		
2015	5,367	96
2014	4,905	95
2013	4,527	110
Number per Day		
2015	14.70	n/a
2014	13.44	n/a
2013	12.40	n/a

This shows that the implementation of squad companies, if given a well-defined mission of handling less-serious calls for service, can take significant workload off the engine companies – preserving a Fire Department's most flexible resource (its engines) for a subsequent concurrent call (emergency or otherwise).

8. Addressing Issues in the Dispatch System

There are several issues that were identified by the consultant that should be a focus for the City and the Fire Department (and other public safety agencies operating in Somerville). These include:

- *Move to a merged dispatch center in the City that includes Fire, Police, and the City's ambulance contractor.* Work with the Police Department and with the City's ambulance provider to reduce the time lag between answering the phone and notifying the Fire Department that they are required on medical emergencies. The current system has calls being answered by either the State Police (cellular calls) or the Somerville Police (land line calls). If it is a medical emergency, calls are then transferred to the Cataldo Ambulance for pre-arrival instructions / emergency medical dispatch (triage). From there, the ambulance company will determine if the Fire Department is to be notified – though there are reports of missed notifications.
- *Improve data collection and distribution in the Fire Department.* The Fire Department has no laptops or tablets in their response apparatus. Steps should be taken to introduce this technology, with wifi capability, so that data can be transmitted to Fire Alarm (en route, arrival, cleared, etc.) and so that data can be transmitted to the units (address, pre-fire plans for certain buildings, etc.).

9. Recommended Steps for the Fire Department and the City

The Carlson Group recommends that the City take the following steps in implementing the findings and recommendations included in this study. These steps are in a priority order, though it should be noted that we recognize that other City priorities may cause these to change:

- Work to add GPS transceivers in the Fire Department's apparatus and add appropriate software modifications in Fire Alarm to allow for implementation of closest unit dispatch;
- Identify and purchase land for one, two, or three new stations, based on careful cost-benefit analyses:
    - East of Union Square (to provide a new location for E3);
    - 515 Somerville Avenue or a renovated Lowell St. station;

    - If necessary because of either workload or response time issues, the City should also consider building near Assembly Square;
- Continue to monitor workload and response times. After stations have been relocated, evaluate the option of implementing a squad program – starting with a single unit operating from headquarters (there is sufficient parking and sleeping quarters);

These steps will allow the Fire Department to handle this exciting period of growth in the City of Somerville, and to continue providing the excellent level of service expected by the community.