

2014 ACCESSIBLE PEDESTRIAN SIGNAL SUPPLEMENTAL STUDY

Somerville, Massachusetts

TABLE OF CONTENTS

TABLES	2
FIGURES	2
1. INTRODUCTION	3
BACKGROUND	3
INVENTORY APPROACH	4
2. EXISTING CONDITIONS	5
APS COMPLIANCE	5
3. METHODOLOGY	8
NETWORK PRIORITY RANKING (NPR)	8
MULTI-ASSET PEDESTRIAN ACCESSIBILITY NPR	11
4. REPAIRS/ BACKLOG	13
CURRENT APS BACKLOG	13
CUMULATIVE PEDESTRIAN ACCESSIBILITY BACKLOG	13
5. RECOMMENDATION	14
RECOMMENDED PLAN OF ACTION	14

TABLES

Table No.	Description	Page
1.	Multi-Asset NPR Calculations	11

FIGURES

Figure No.	Description	Page
1.	APS Compliance Distribution	5
2.	APS Compliance Map	7
3.	APS NPR Calculation Flowchart	9
4.	NPR Priority Map	10
5.	Cumulative Pedestrian Accessibility Intersection NPR	12
6.	Cumulative Pedestrian Accessibility Backlog	13

1. INTRODUCTION

BACKGROUND

The City of Somerville is located in Middlesex County, just outside of Boston, Massachusetts opposite the Charles River. Somerville has a comprehensive pedestrian accessibility infrastructure consisting of over 300 accessible pedestrian signals, 6,500,000 ft² of sidewalk area, and over 3,000 ramps, which allow the population of over 67,000 people, as well as tourists, to enjoy the city.



Photo Credit: John Whittington

The City of Somerville, in March 2014, retained the firm of Fay, Spofford & Thorndike (FST) to create an inventory of accessible pedestrian signals (APS) in an effort to make the city more accessible. From the first meeting with ADA Coordinator Betsy Allen, and Acting Director of Engineering Melissa Miguel, it was clear that Mayor Curtatone & the City of Somerville were committed to addressing pedestrian accessibility and conformance with the Massachusetts Architectural Access Board (MAAB).

The inventory of the accessible pedestrian signals was done to enhance the current inventory of sidewalks and ramps to create a comprehensive understanding of the City's pedestrian accessibility infrastructure. Incorporating multiple assets into the decision making process will allow the City to prioritize and develop the best possible repair policies to improve the current infrastructure. The inventory was conducted utilizing geographic information systems (GIS) and global position systems (GPS) in order to create a comprehensive database describing locations and conditions. The inventory was a network-level assessment which collected different elements of the APS which determined its compliance. This inventory builds upon the sidewalk, ramps, and pavement condition inventory conducted earlier by FST, which provides the City of Somerville with a thorough understanding of overall conditions of these assets and assists in developing a long-term capital improvement plan.

This report is designed to be a network level - planning tool and intended to provide a foundation for managing the City's pedestrian accessibility resources by combining technology, local knowledge, and professional engineering input. The following pages describe our approach.

INVENTORY APPROACH:

Using a Global Positioning System (GPS) unit, along with existing Geographic Information Systems (GIS) layers, FST conducted a City-wide accessible pedestrian signal (APS) inventory and assessment with GIS integration to build a comprehensive database.

Beginning in March 2014, FST collected two types of attributes: general attributes which were the base requirements for compliance, and specific attributes which were more detailed elements for compliance. These attributes were collected as they were major contributors in determining compliance set by the Manual on Uniform Traffic Control Devices (MUTCD) and Draft Public Right of Way Accessibility Guidelines (PROWAG).

General Attributes:

- 1) Presence of tack tile arrow (Yes/No)
- 2) Presence of audible tone (Yes/No)
- 3) Accessibility of APS (Yes/No)

Specific Attributes:

- 1) Button vibrates on WALK only (Yes/No)
- 2) Color contrast of arrow is acceptable (Yes/No)
- 3) Direction of arrow pointing correctly (Yes/No)
- 4) Type of audible sound (Beep, Chirp, etc.)

IF next closest APS is less than 10' away

- 5) Two push buttons on same support (Yes/No)
- 6) Locator tone presence (Yes/No)

**If two pushbuttons are on the same support, a locator tone is necessary*

- 7) Speech information presence

**Example: "Wait to cross Broadway at School"*

- 8) Speech message during WALK

**Example: "Walk sign is on to cross Broadway"*

IF next closest APS is greater than 10' away

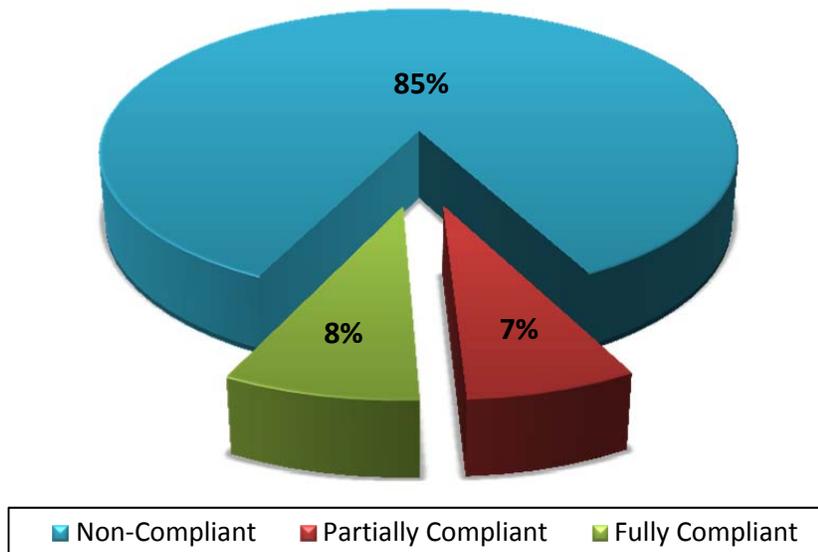
- 9) Percussive sound during WALK (Yes/No)

2. EXISTING CONDITIONS

APS COMPLIANCE:

A total of 309 APS were inventoried throughout the City of Somerville. The compliance of each APS was determined by the guidelines set by MUTCD (2003) and Draft PROWAG (2005). If all elements of the APS met the guidelines it was considered compliant. If the APS had either a tack tile arrow or audible tone, but failed to meet other guidelines it was considered partially compliant. If none of the guidelines were met (no tack tile arrow or audible tone), it was considered non-compliant. The breakdown of the compliance of the APS is shown below. As can be seen, the majority of the APS in Somerville are non-compliant (85%), while 7% are partially compliant, and 8% fully compliant.

Figure 1
APS Compliance Distribution



The figures on the next page show the visual difference between the three categories:

NOT COMPLIANT- 85%



Central Street @ Highland Ave

PARTIAL COMPLIANCE- 7%



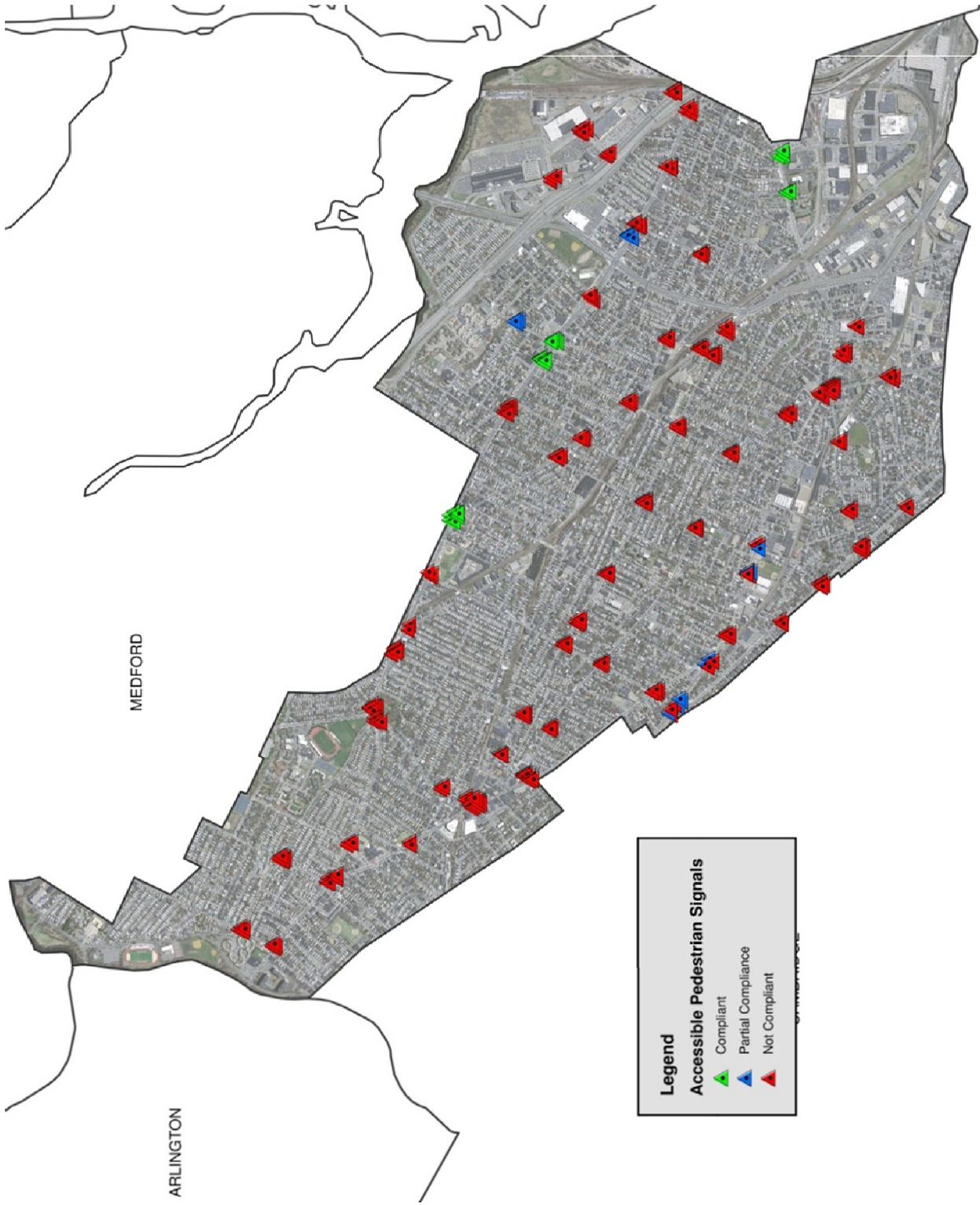
Somerville Ave @ Mossland St

FULL COMPLIANCE- 8%



School Street @ Broadway

Figure 2
APS Compliance Map



3. METHODOLOGY

NETWORK PRIORITY RANKING (NPR):

The NPR number reflects the comparative merit of repairing one APS over another, using variables other than simple observed deficiencies. A systematic NPR was developed for each APS with variables discussed between FST and Somerville officials. There were 4 key criterions that were scored separately to determine the overall NPR value:

1. APS Condition
2. Proximity to MBTA Station
3. Proximity to High Pedestrian Traffic Parcels
4. Intersection Configuration

1. APS CONDITION

APS which have neither tack tile arrows nor an audible tone significantly reduces the safety of disabled pedestrians. If the APS itself was missing from the intersection, an NPR score of 350 was given. In the case that both the tack tile arrow and audible tone were missing, a NPR score of 300 was given. If the APS had some compliant elements, it was considered partially compliant, and an NPR score of 150 was given. Lastly, if the APS was fully compliant, a score of 0 was given.

2. PROXIMITY TO MBTA STATION

The APS locations were related spatially to the closest MBTA stations within a buffer of 300 feet. If the APS fell outside of the 300 foot buffer, an NPR score of 0 was given. However, if the APS fell within the buffer, an NPR score was given based on its distance to the station, giving more weight to those closer to the station, shown in the equation below:

$$NPR_{MBTA} = 300 - \text{distance to MBTA station}$$

3. PROXIMITY TO HIGH PEDESTRIAN PARCELS (HPP)

The APS locations were related spatially to High Pedestrian Parcels within a buffer of 150 feet. High Pedestrian Parcels include hospitals, schools, retail, etc. The NPR score for each APS was based on its distance from an HPP ranged from 0-150. If the APS fell outside of the buffer, a score of 0 was given. However, if the APS fell within the buffer, a score was given based on distance from the HPP, shown below.

$$NPR_{HPP} = 150 - \text{distance to Parcel}$$

4. INTERSECTION CONFIGURATION

Lastly, the configuration of each intersection was taken into account when prioritizing the APS. This was done to add a safety component to the prioritization methodology. The more dangerous the intersection was for pedestrians, the higher the NPR score was. NPR scores were as follows:

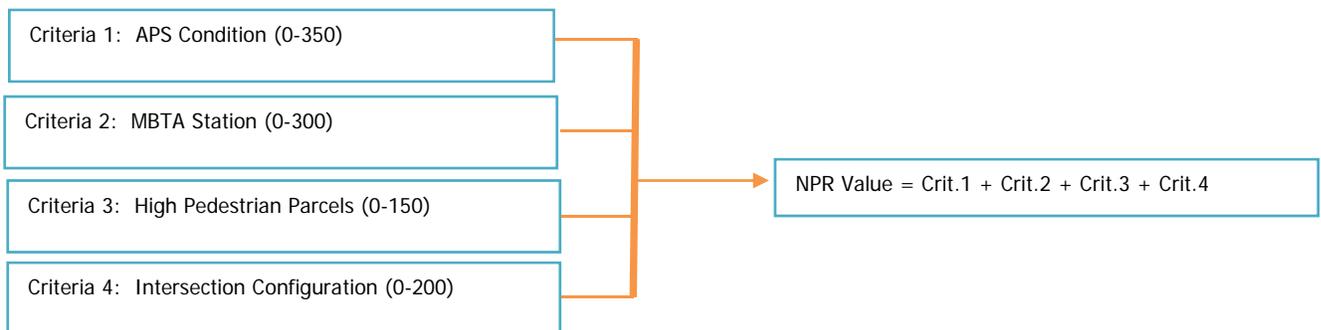
- 4 way intersection: 25 points
- 3 way intersection: 50 points
- 5+ way intersection: 100 points
- Mid-block: 200 points

Vehicles are unsuspecting of pedestrians at mid-block crosswalks and typically travel at faster speeds, which is why the priority on those intersections was the highest.

NPR Formula

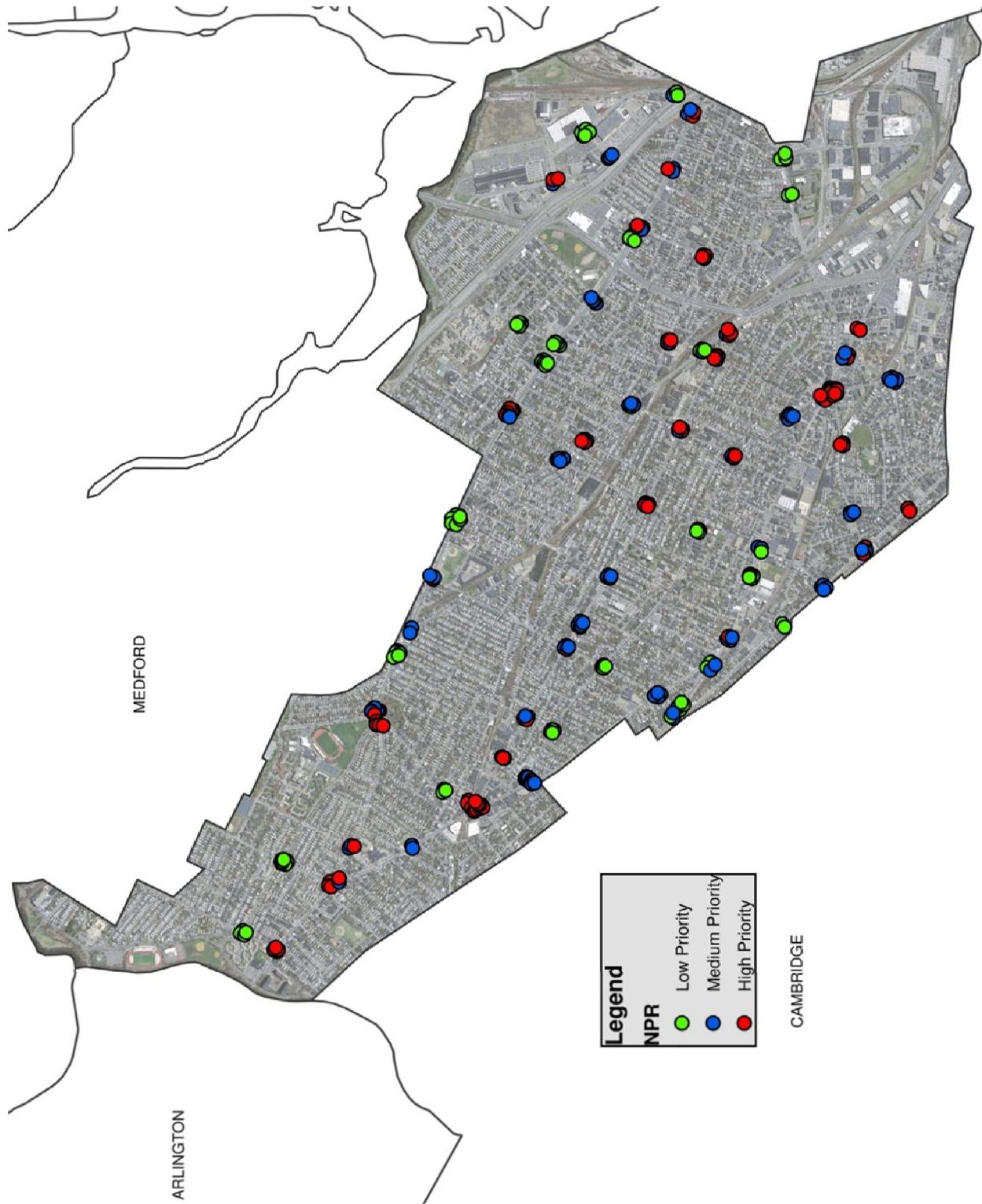
The NPR formula adds the rankings for each criterion together to get a composite number ranking for each APS in the data set. Figure 3 below shows a flowchart of the method:

Figure 3
APS NPR Calculation Flowchart



Once the final NPR values were summed for all APS, they were distributed into three categories based on a geometric split. Figure 4 shows the priority levels for APS in the City of Somerville.

Figure 4
NPR Priority Map



MULTI-ASSET PEDESTRIAN ACCESSIBILITY NPR:

In order to optimize the Pedestrian Accessibility Study for the City of Somerville, an overall Network Priority Ranking was created which includes all three assets which were collected for this study: ramps, sidewalks, and APS. By merging the priority of these assets, it allows the City to focus on intersections in which the priority is on all the assets cumulatively, instead of individually.

All assets were assigned to intersection nodes. Ramps and APS were assigned to a single intersection, whereas sidewalks were assigned to two intersections (both ends of the sidewalk polygon). After all assets were assigned to the appropriate intersection, the individual NPR ranges were normalized to 1000; i.e. the range for the NPR scores for ramps ranged from 0 to 833, and were multiplied by 1.2 so the new range would go from 0-1000. Next, an importance factor was given to each asset to give more weight to specific assets within each intersection. In this study, ramps received a 60% importance factor, while sidewalks and APS received a 20% importance factor. The table below shows the individual NPR ranges for each asset, along with the importance factors:

Table 1
Multi-Asset NPR Calculations

Asset	NPR Range	Normalized	Importance Factor
Ramps ¹	0-833	*1.2= 0-1000	60% = 0-600
Sidewalks ¹	0-1323	*.75= 0-1000	20% = 0-200
APS	0-906	*1.1= 0-1000	20% = 0-200

After the new NPR scores were calculated for all individual assets, they were summed for each intersection. Figure 5 on the next page shows the highest priority intersections for cumulative pedestrian accessibility.

1. NPR values from 2013 Pedestrian Accessibility Study, May 2013, FST Inc.

Figure 5
Cumulative Pedestrian Accessibility Intersection NPR



4. REPAIRS/BACKLOG

CURRENT APS BACKLOG:

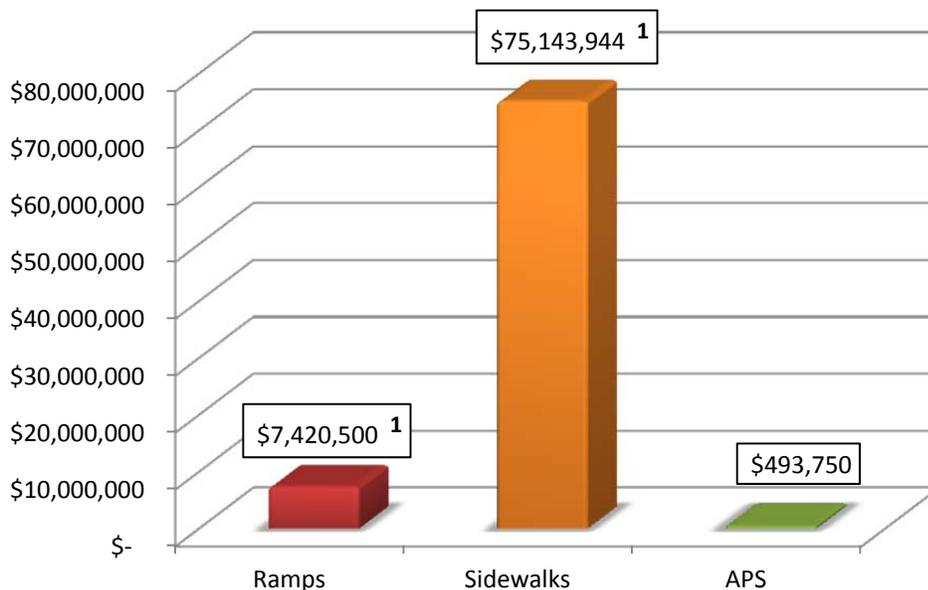
Backlog is defined as the cost of replacing all APS within one year bringing them all to full compliance. Backlog is a “snapshot” or relative measure of outstanding repair work. The backlog not only represents how far behind the Somerville APS network is in terms of its condition, but it also offers a basis for comparison for future and/or past year’s backlog(s) to determine if the City is catching up, or falling behind. Backlog dollars represent the cost to replace the APS unit only. It does not include related repair costs for relocation of signal poles.

As of June 2014, Somerville’s backlog of APS repair work totaled \$493,750.

CUMULATIVE PEDESTRIAN ACCESSIBILITY BACKLOG:

In relative to the other two pedestrian accessibility assets, the repair costs for the APS is miniscule, but within a limited budget can make a difference. The Figure below shows the backlog of all three pedestrian accessibility assets, which total \$83,058,194.

Figure 6
Cumulative Pedestrian Accessibility Backlog



1. Backlog Dollar values from 2013 Pedestrian Accessibility Study, May 2013, FST Inc.

5. RECOMMENDATION

RECOMMENDED PLAN OF ACTION:

The overall accessible pedestrian signal network in the City of Somerville is currently in poor condition. With 85% of the APS failing to meet compliance, there is considerable work to be done to improve the walkability and accessibility safety. It was calculated that the backlog for repairing all non-compliant APS in Somerville totals to \$493,750.

The City has recently taken steps to include accessibility improvements while performing capital roadway improvement projects however this commitment will direct funding away from its pavement management plan, previously studied under a separate report indicating a funding shortfall. It's important for the City to have a balanced attack of mixed treatments to tackle deteriorating infrastructure and non-compliant sidewalks and ramps.

Now that the City has a comprehensive understanding of its pedestrian accessibility assets, it is vital to take action and addressing the growing backlog. Currently, between sidewalk, ramps, and APS, the backlog totals to \$83,058,194. Somerville needs to increase future funding levels for all pedestrian accessibility assets. Based on this existing backlog collectively, **\$2,300,000 annually should be spent to improve the City's sidewalks, ramps, and APS.** The City should consider utilizing the cumulative multi-asset NPR approach, and focus on repairing all three assets on high priority intersections. This approach focuses on high pedestrian volume regions which are in immediate need of repair.

Somerville should assemble an ADA Task Force including members from different City departments, as well as members from the physically challenged and disabled communities. Review and feedback from the accessibility community can vastly benefit Somerville's efforts for improving pedestrian accessibility. The City's ADA Task Force should maintain and expand upon the database assembled by FST. Asset management is a systematic process that needs the long-term commitment and support of Somerville's practitioners and decision-makers to maintain the pedestrian ramp management database system. The following are general recommendations and standard management and upkeep practices for ramps and sidewalks:

In summary, the pedestrian accessibility inventory should serve as a valuable tool to the City of Somerville and to Somerville decision-makers in their pro-active approach to managing Somerville's infrastructure network.