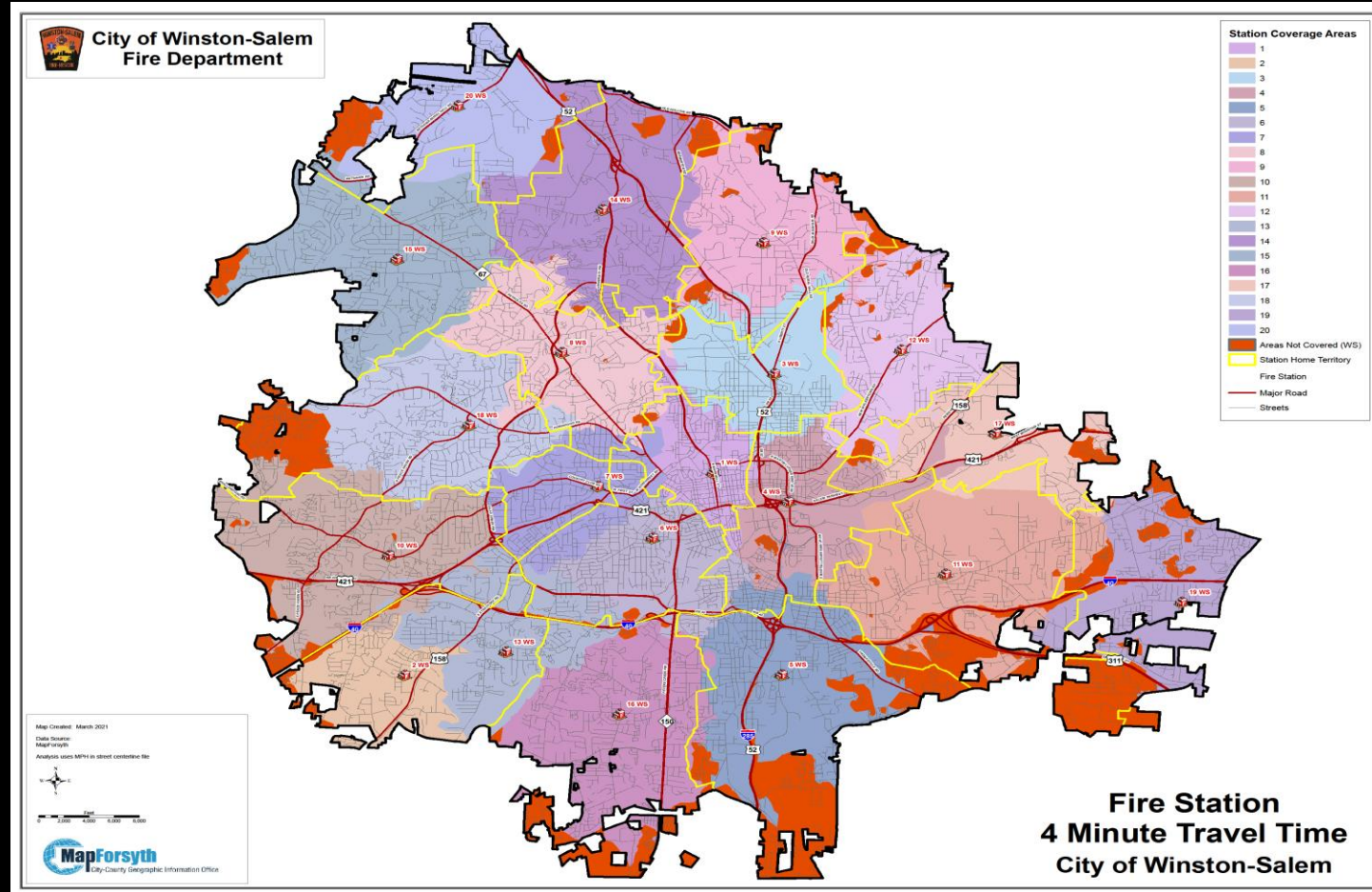


Fire Service Deployment: Assessing Community Vulnerability

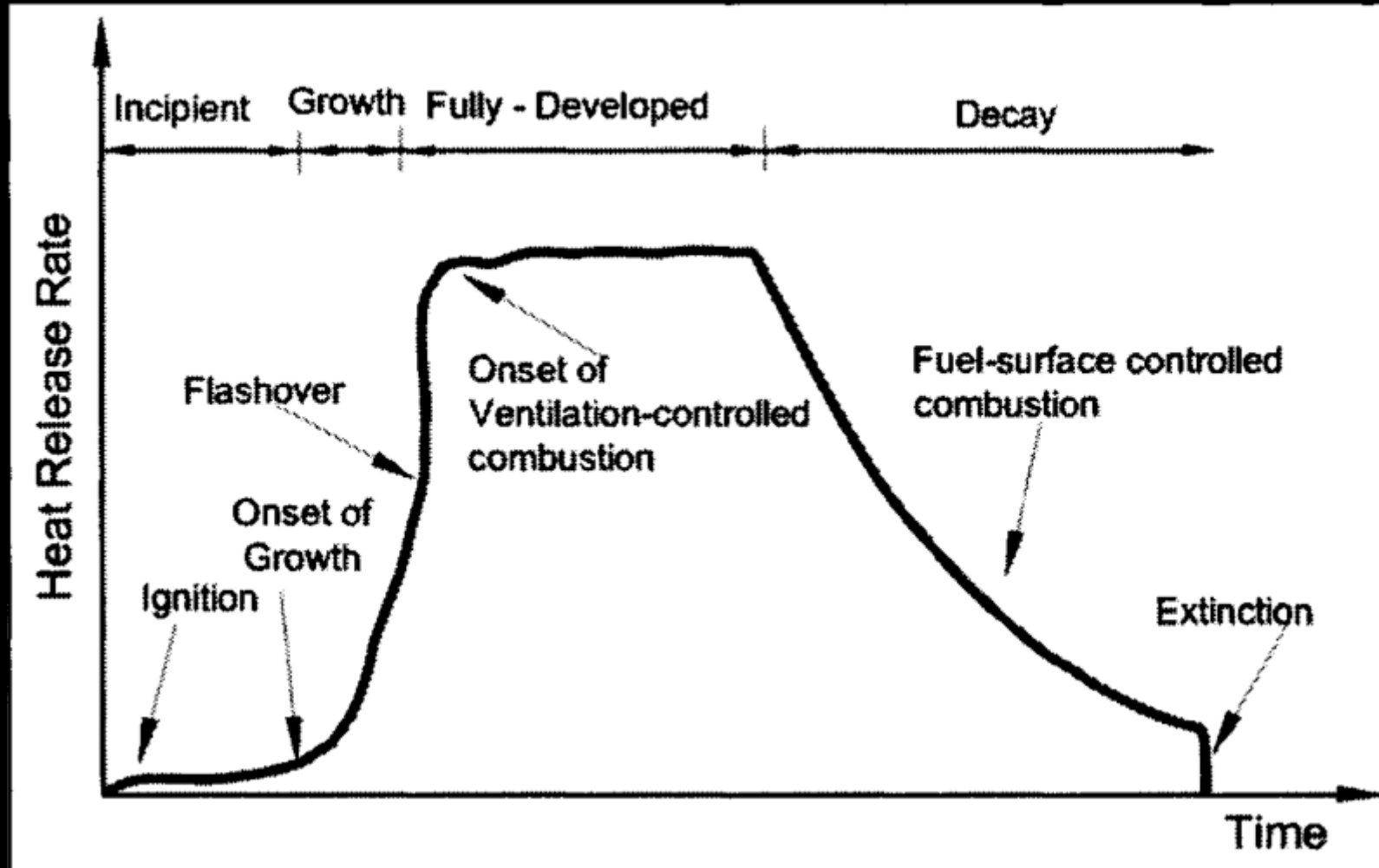


Distribution and Concentration Analysis

Fire Service Deployment: Assessing Community Vulnerability

**The data-driven foundation for
travel-time benchmarks**

Fire Service Deployment: Why is travel time important?



Fire Growth Curve

Fire Service Deployment: Assessing Community Vulnerability

Factors that influence flashover:

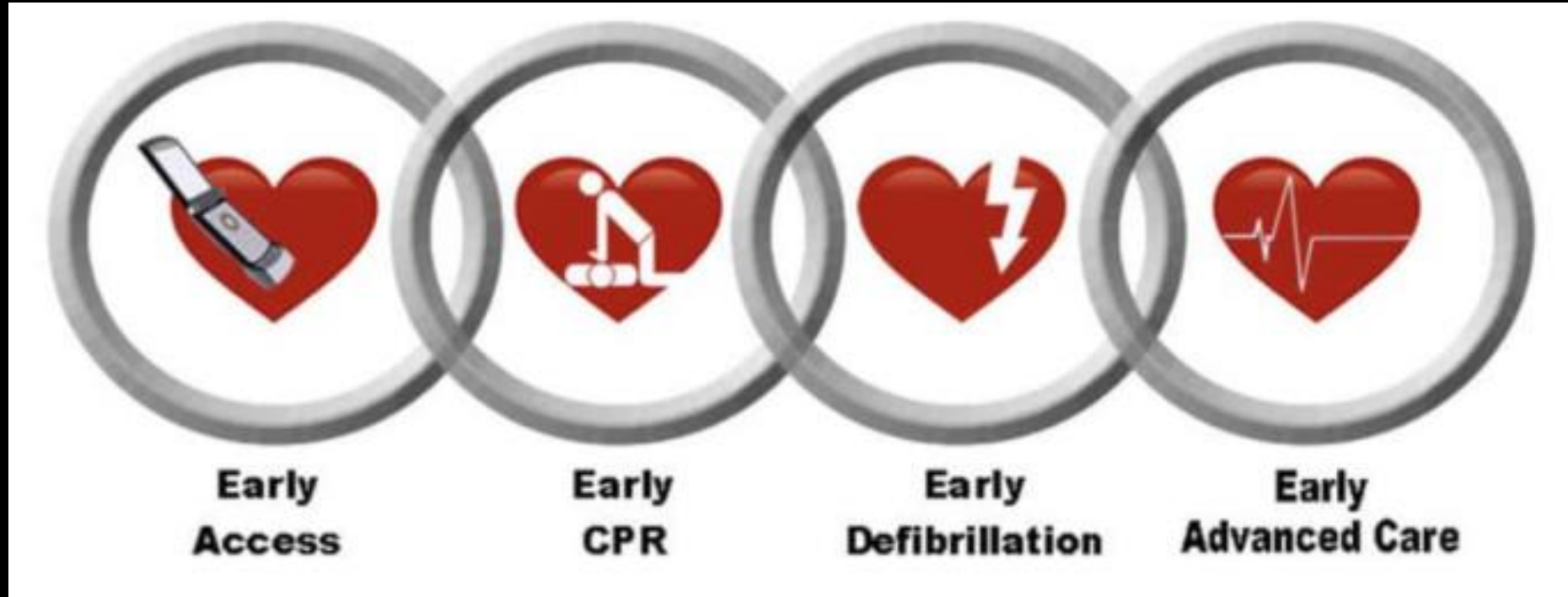
- **Proliferation of synthetics**
- **Open floor plans**
- **Void spaces**
- **“Tighter” construction**
- **Energy-efficient windows**

Fire Service Deployment: Why is travel time important?

Flame Spread	Rate per 1000 Fires		Average Dollar Loss per Fire
	Civilian Deaths	Civilian Injuries	
Confined fires or contained fire identified by incident type*	0.0	8.7	\$200
Confined fire or fire spread confined to object of origin	0.4	11.1	\$1,200
Confined to room of origin, including confined fires and fires confined to object	1.8	23.8	\$4,000
Spread beyond the room of origin but confined to floor of origin	16.2	76.3	\$35,000
Spread beyond the floor of origin	24.6	55.0	\$65,900

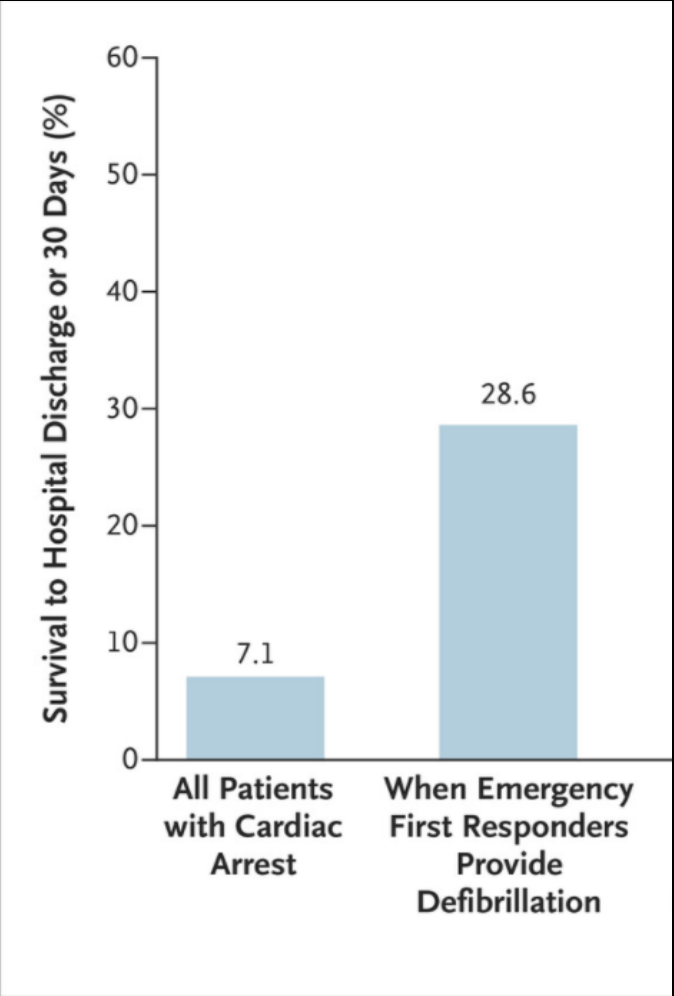
NFPA actual United States fire loss data, 2012-2016

Fire Service Deployment: Why is travel time important?

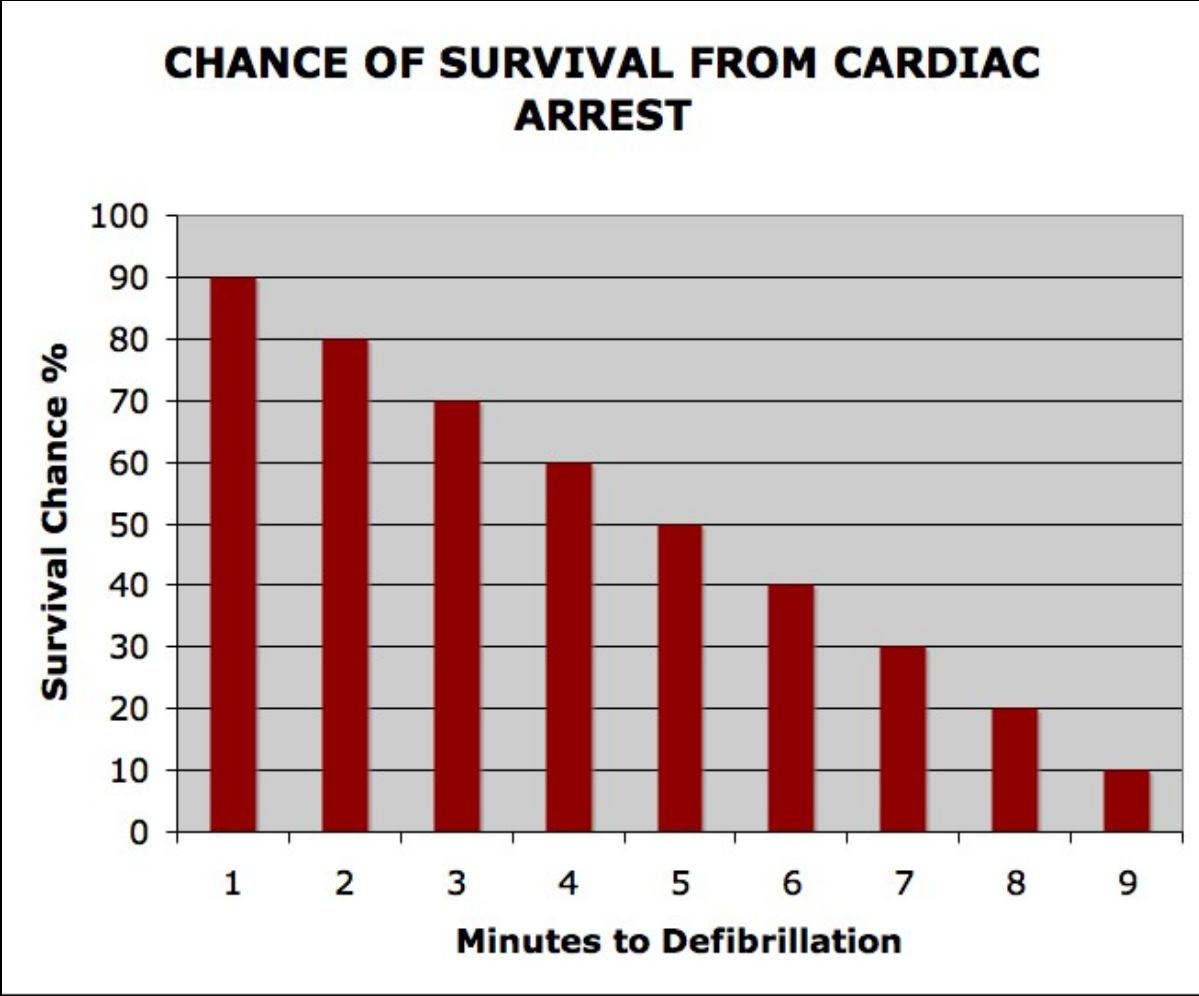


Cardiac Arrest Chain of Survival

Fire Service Deployment: Why is travel time important?



-New England Journal of Medicine



-Staying Alive Paramedical Services

Fire Service Deployment: Assessing Community Vulnerability

**What is distribution and
concentration?**

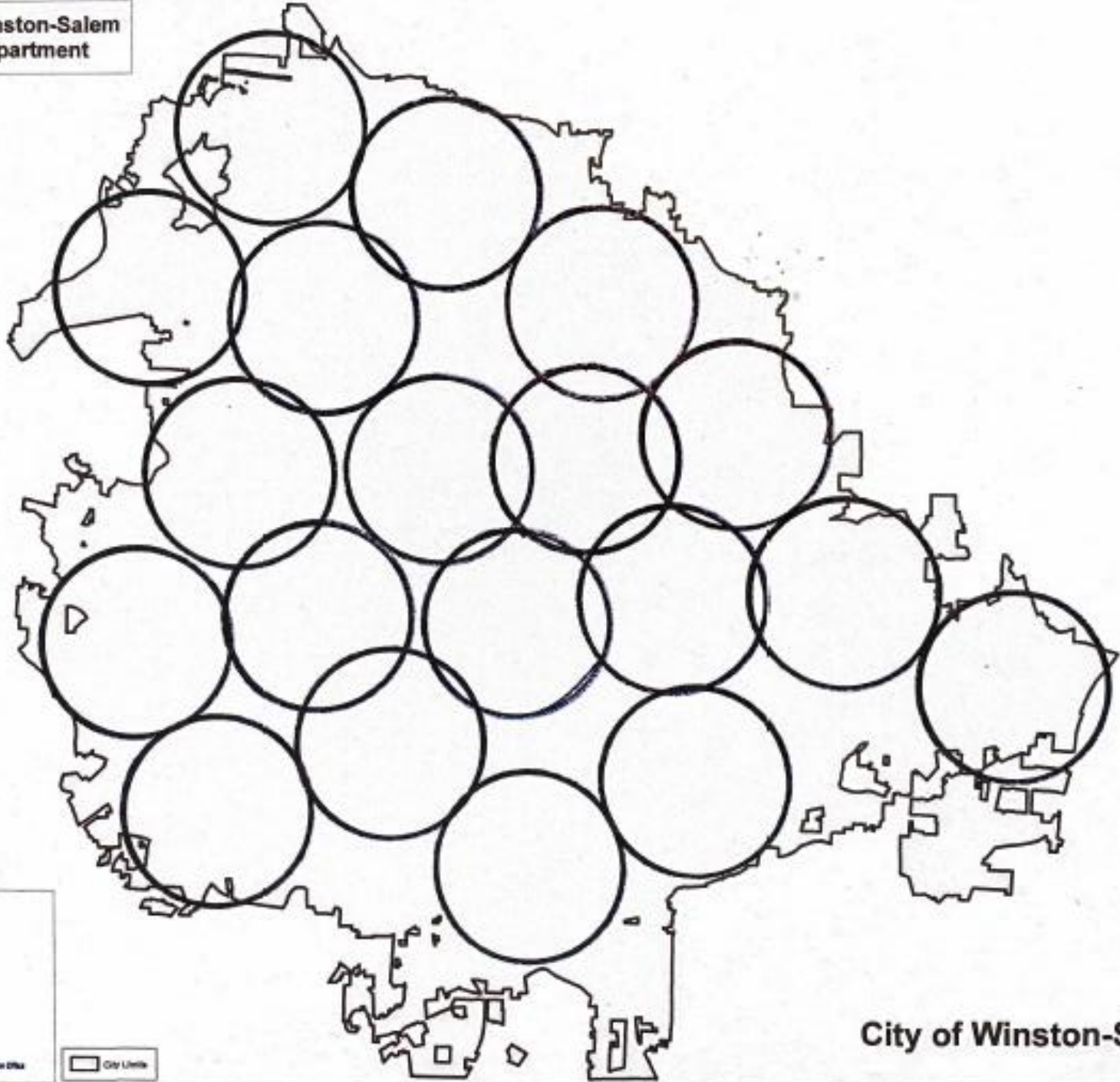
Fire Service Deployment: Assessing Community Vulnerability

Distribution

A measure of the percentage of the community covered by first-due suppression units. Distribution is a product of a community's geography and travel time to emergencies.



City of Winston-Salem
Fire Department



Map Created: April 2011
City Source:
Map Source:

0 1000 2000 3000

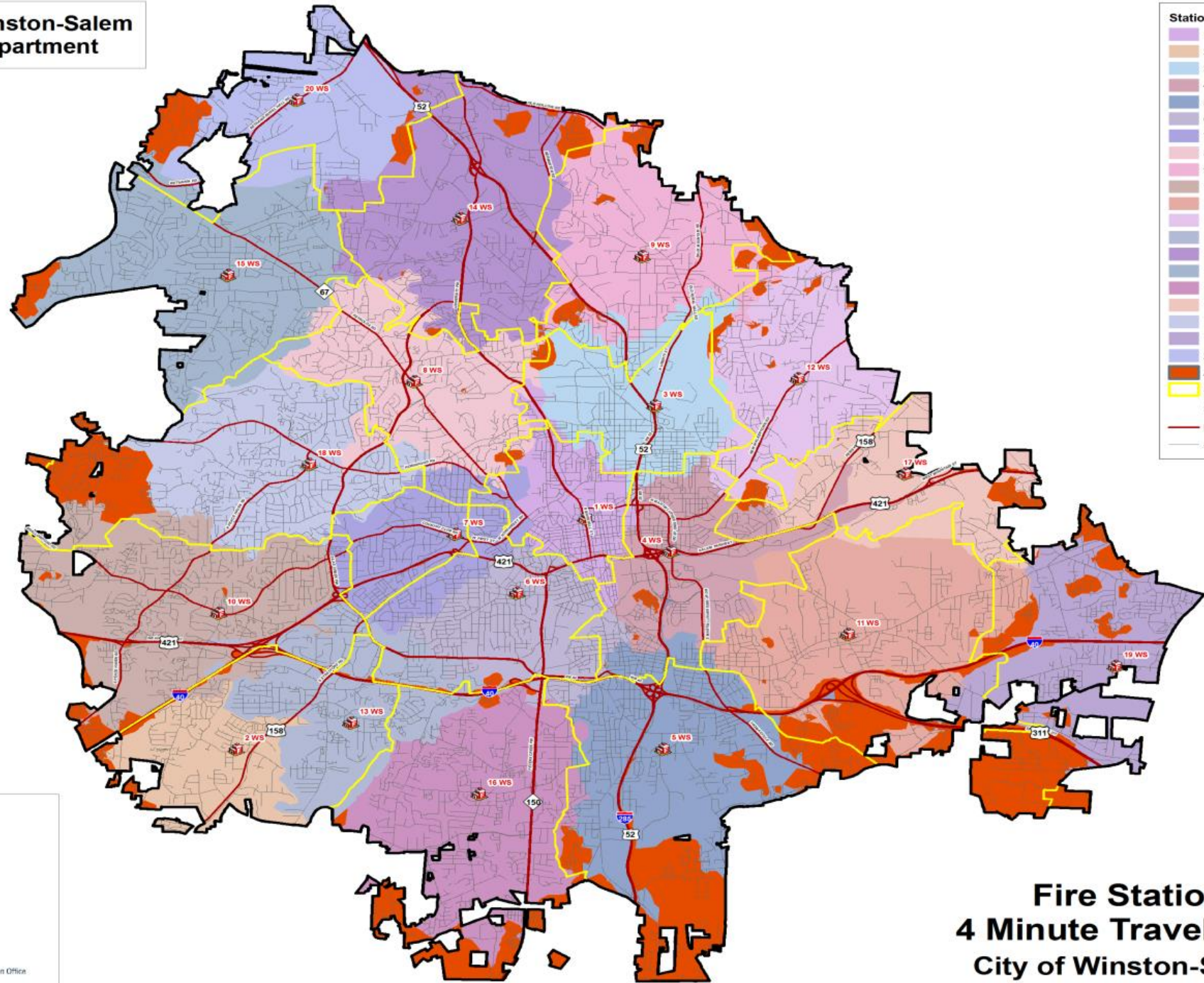
MapForsyth
City-County Geographic Information Office

City Limits

City of Winston-Salem



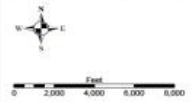
**City of Winston-Salem
Fire Department**



Station Coverage Areas

- 1
- 2
- 3
- 4
- 5
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- 7
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- 10
- 11
- 12
- 13
- 14
- 15
- 16
- 17
- 18
- 19
- 20
- Areas Not Covered (WS)
- Station Home Territory
- Fire Station
- Major Road
- Streets

Map Created: March 2021
 Data Source: MapForsyth
 Analysis uses MPH in street centerline file



**Fire Station
4 Minute Travel Time
City of Winston-Salem**

Fire Service Deployment: Assessing Community Vulnerability

Reliability

The probability that the required number of competently prepared staff and properly equipped apparatus will be available when a fire or emergency call is received.

Fire Service Deployment: Assessing Community Vulnerability

Reliability of WSFD's seven busiest engines

Engine 1	89.9%
Engine 10	90.4%
Engine 4	90.4%
Engine 6	90.6%
Engine 14	91.6%
Engine 3	91.7%
Engine 5	91.9%

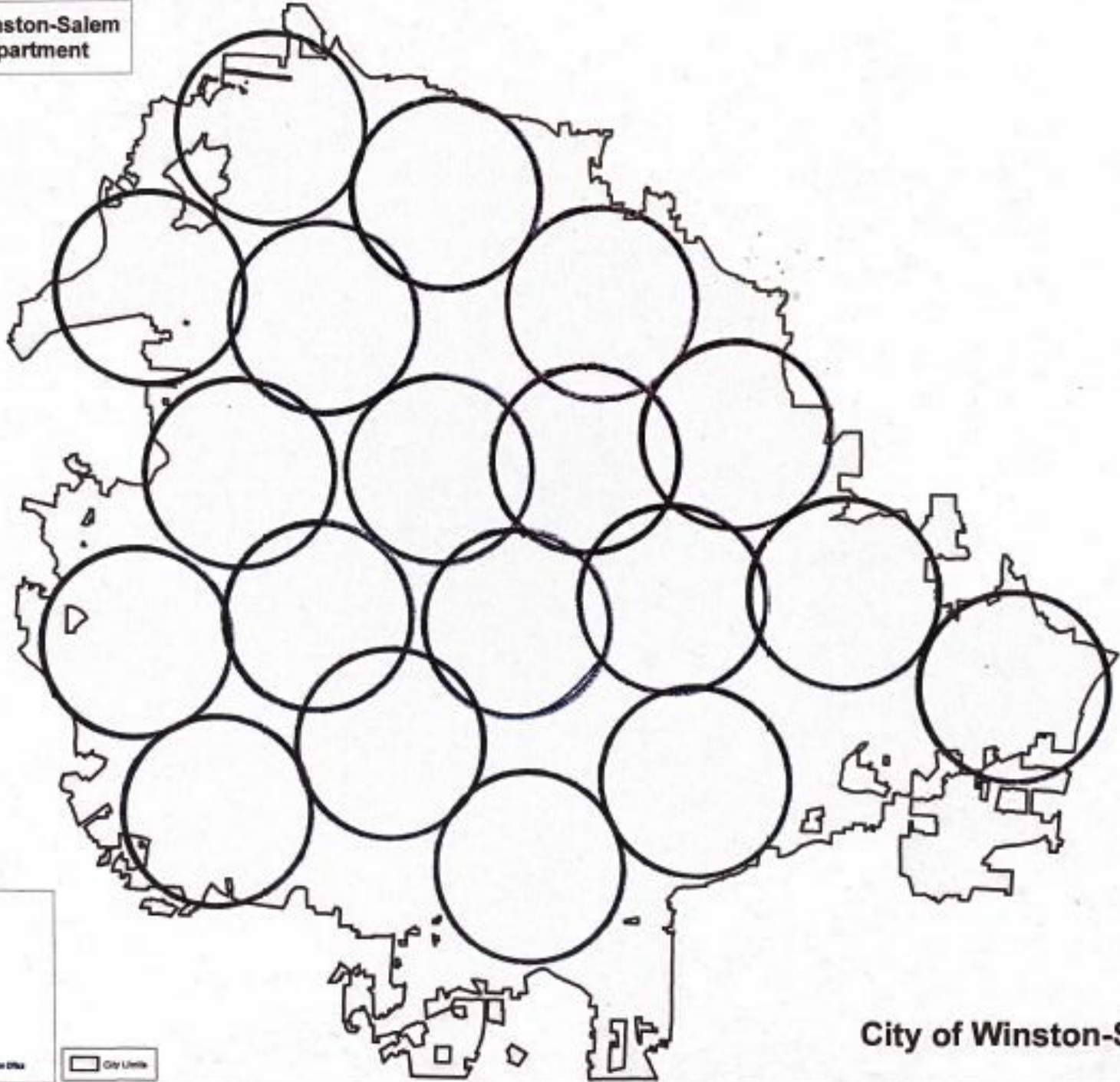
Fire Service Deployment: Assessing Community Vulnerability

Concentration

A measure of a fire department's ability to deliver an initial effective response force to the scene of an emergency. Concentration is a product of fire station location, resource deployment, and staffing levels.



City of Winston-Salem
Fire Department



Map Created: April 2011
City Source:
Map Source:

0 1000 2000 3000

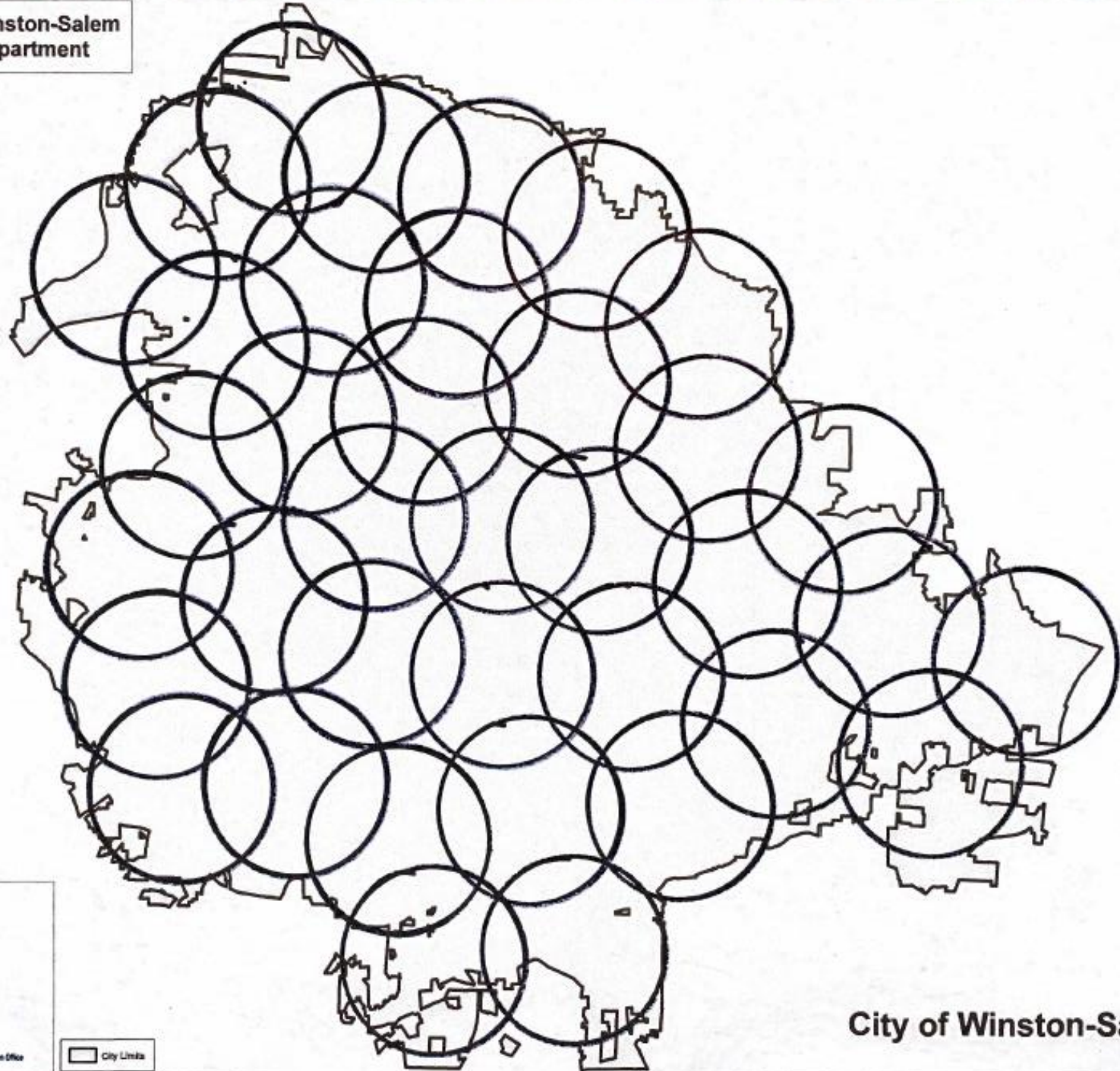
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City Limits

City of Winston-Salem



City of Winston-Salem
Fire Department




Map Created: April 2011

Data Source:
MapInfo



0 1000 2000 3000

MapForsyth
City-County Geographic Information Office

 City Limits

City of Winston-Salem

Fire Service Deployment:

Assessing Community Vulnerability

A distribution and concentration analysis assesses whether or not a fire department can get to an emergency quickly enough and with sufficient personnel resources to have a reasonable opportunity to create a positive outcome.

Fire Service Deployment: Assessing Community Vulnerability

**Who defines “quickly enough” and
“sufficient personnel resources?”**

Fire Service Deployment: Assessing Community Vulnerability

- **Elected and appointed leaders**
- **Fire department**
- **Home and business owners**
- **Fire Service Accreditation Model**
- **Insurance Services Office**
- **NC Office of State Fire Marshal**

Fire Service Deployment: Assessing Community Vulnerability

**The most referenced fire service response
time benchmarks are contained in NFPA 1710**

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

Fire Service Deployment: Assessing Community Vulnerability

NFPA 1710:

“The ability of adequate fire suppression forces to significantly influence the outcome of a structure fire is undeniable and predictable.”

Fire Service Deployment: Assessing Community Vulnerability

NFPA 1710 travel time recommendations:

- **Four minutes, or less, for the arrival of the first engine company (distribution)**
- **Six minutes, or less, for the arrival of the second company**
- **Eight minutes, or less, for the arrival of the full alarm assignment (concentration)**

Fire Service Deployment: Assessing Community Vulnerability

**NFPA 1710 initial effective response force
recommendations:**

- **Residential fire: 17 personnel in 8 minutes**
- **Apartment fire: 28 personnel in 8 minutes**

Fire Service Deployment: Assessing Community Vulnerability

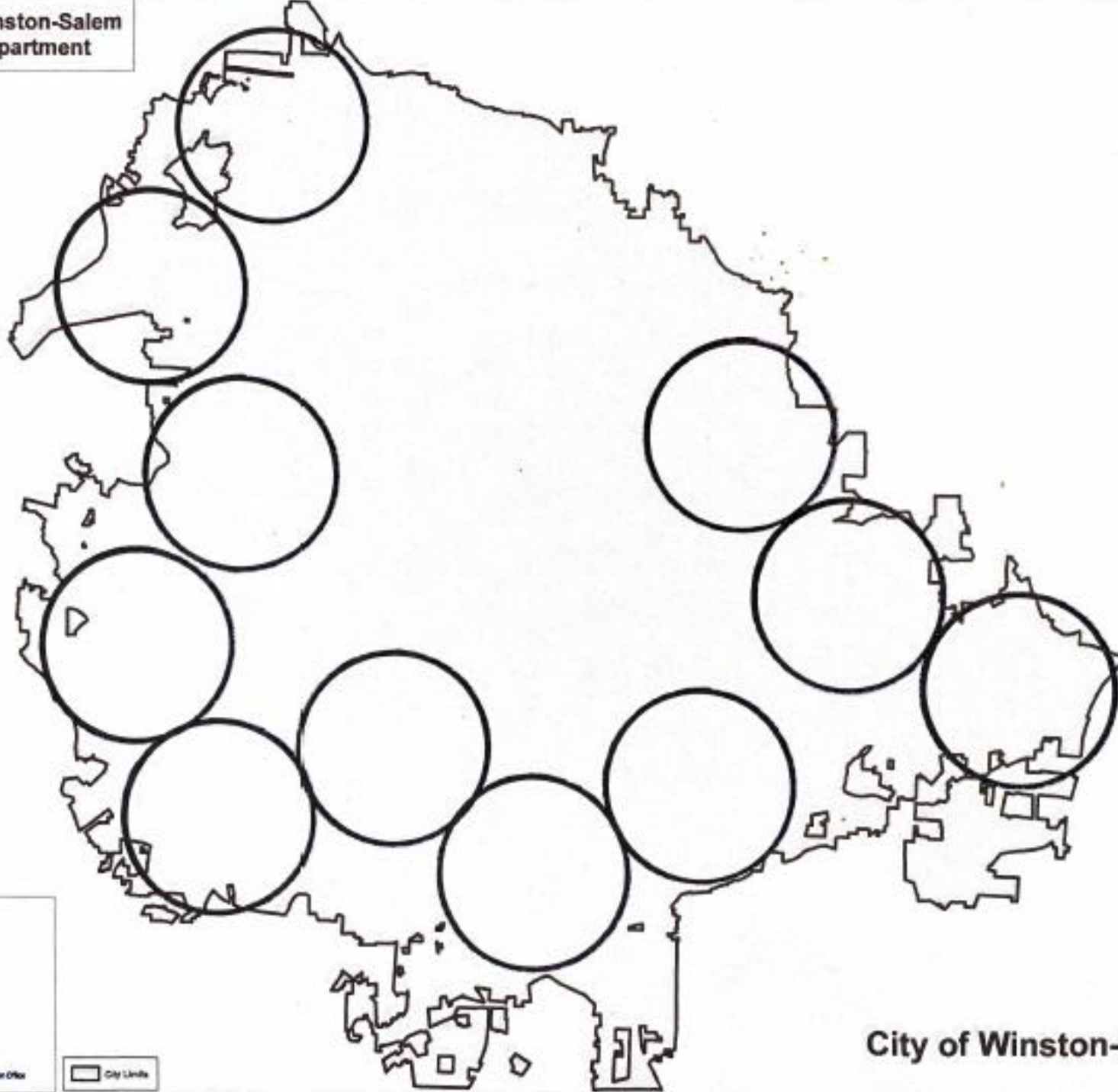
**What is a full alarm assignment or
effective response force?**

Fire Service Deployment: Assessing Community Vulnerability





City of Winston-Salem
Fire Department



Map created April 2011

0 100 200 300 Feet

MapForsyth
City-County Geographic Information Office

City Limits

City of Winston-Salem

Fire Service Deployment: Assessing Community Vulnerability

2019 Distribution (residential fire):

NFPA recommends

4:00

WSFD 90th percentile

5:05 (+27%)

2019 Concentration (residential fire):

NFPA recommends

8:00

WSFD 90th percentile

12:01 (+50%)

Fire Service Deployment: Assessing Community Vulnerability

2019 Distribution (apartment fire):

NFPA recommends

4:00

WSFD 90th percentile

5:05 (+27%)

2019 Concentration (apartment fire):

NFPA recommends

8:00

WSFD 90th percentile

20:29 (+163%)

Fire Service Deployment: Assessing Community Vulnerability

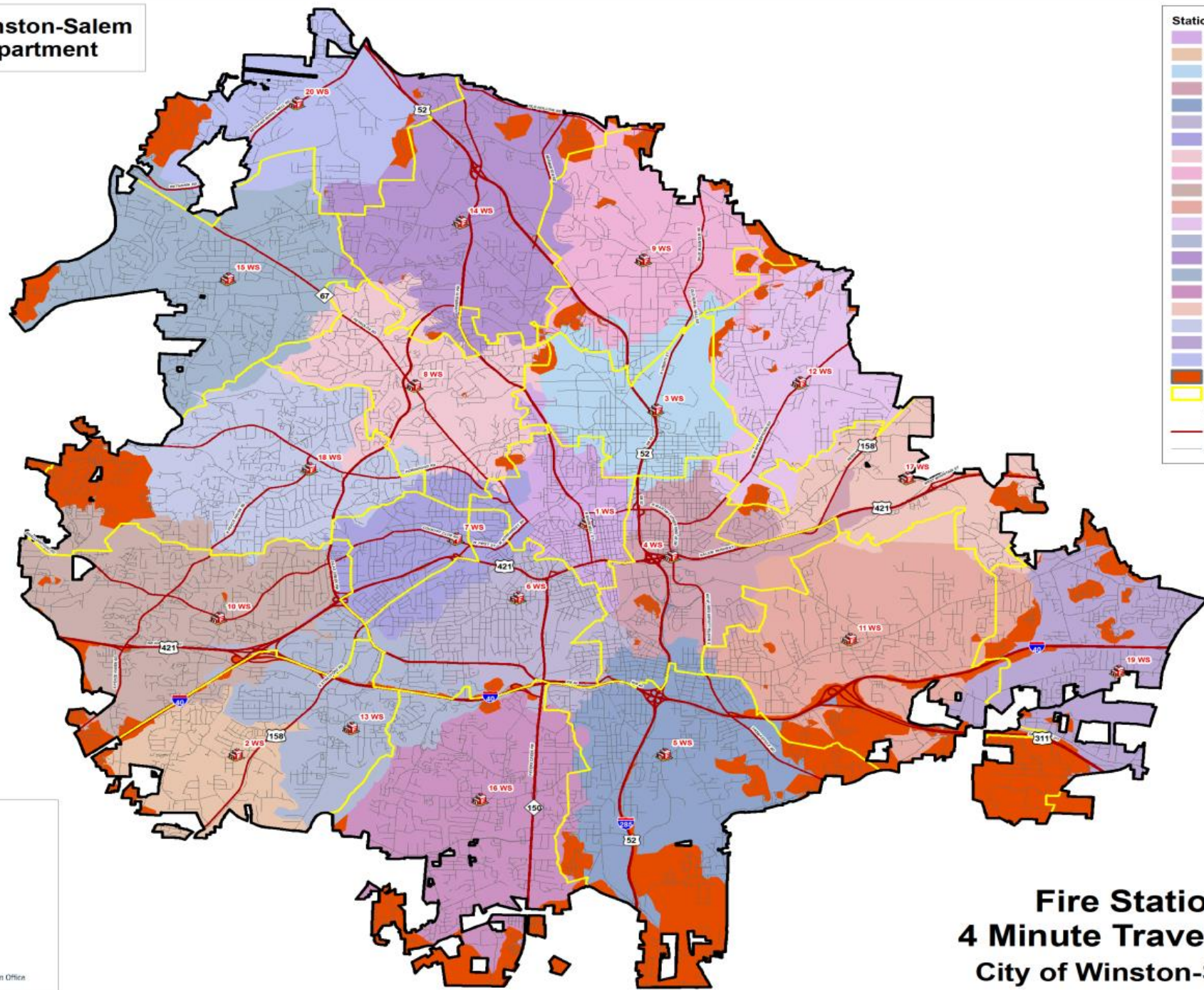
Urban Fire Forum:

“If response times and force assembly times are high, it is an indicator of insufficient resources and outcomes from risk events are more likely to be negative.”

Fire Service Deployment: Assessing Community Vulnerability

Fire Station Territories

<u>Station</u>	<u>4 Minute Travel Polygon</u>	<u>Home Territory</u>
1	9.3 mi ²	3.1mi ²
2	14.2	7.5
3	10.8	4.6
4	11.0	6.0
5	9.8	10.5
6	9.9	6.0
8	13.0	6.3
9	13.5	7.3
10	9.1	9.2
11	14.2	10.1
12	9.7	6.0
14	14.7	8.6
15	13.7	8.6
16	10.6	9.8
17	9.2	5.0
18	10.9	9.4
19	10.7	7.8
20	10.5	6.6



Station Coverage Areas

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Map Created: March 2021
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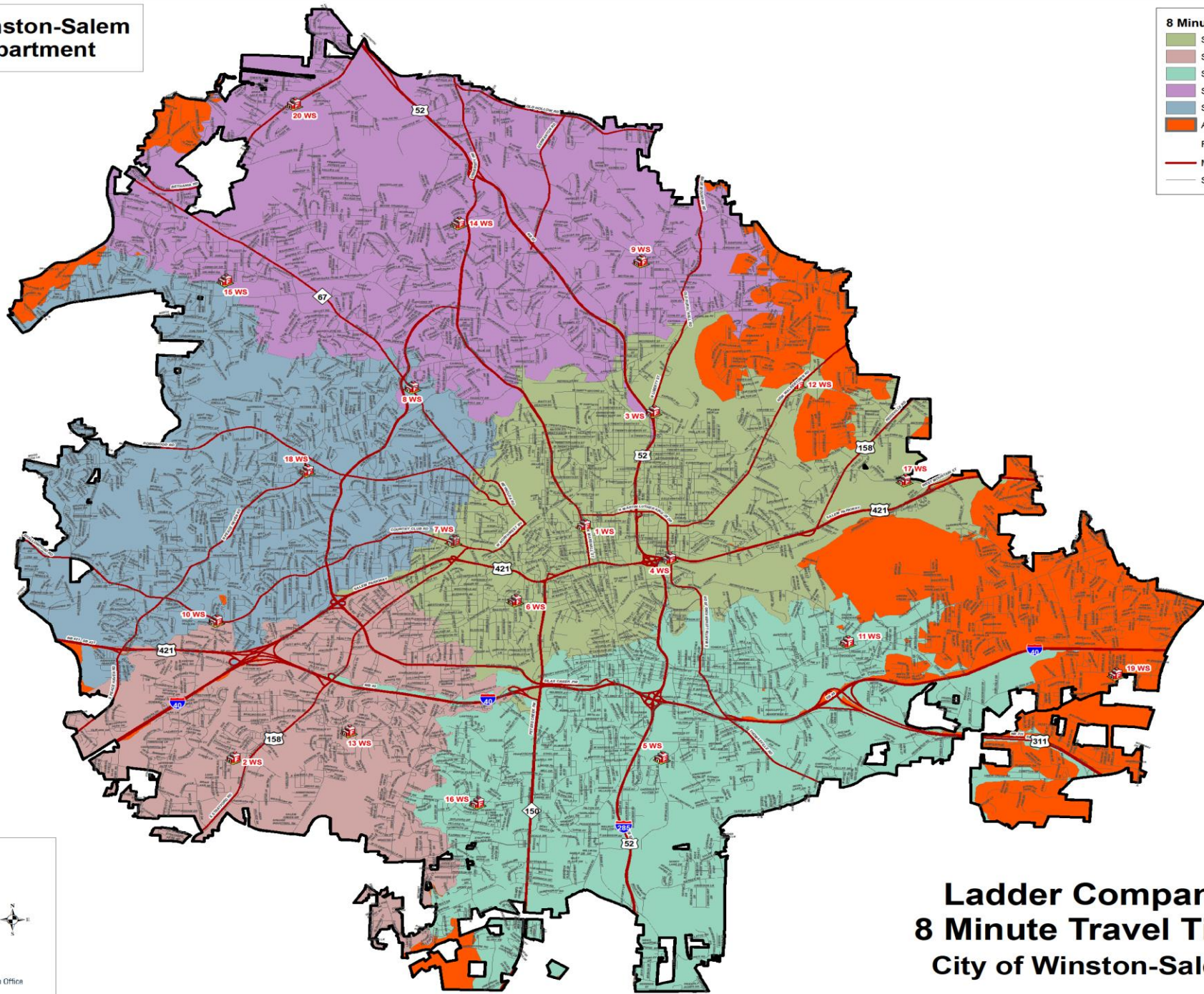
MapForsyth
 City-County Geographic Information Office

**Fire Station
4 Minute Travel Time
City of Winston-Salem**



8 Minute Travel Time

- Station 1
- Station 2
- Station 5
- Station 14
- Station 18
- Areas Not Covered (WS)
- Fire Station
- Major Road
- Streets



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MapForsyth
City-County Geographic Information Office

Ladder Company 8 Minute Travel Time City of Winston-Salem

Fire Service Deployment: Assessing Community Vulnerability

