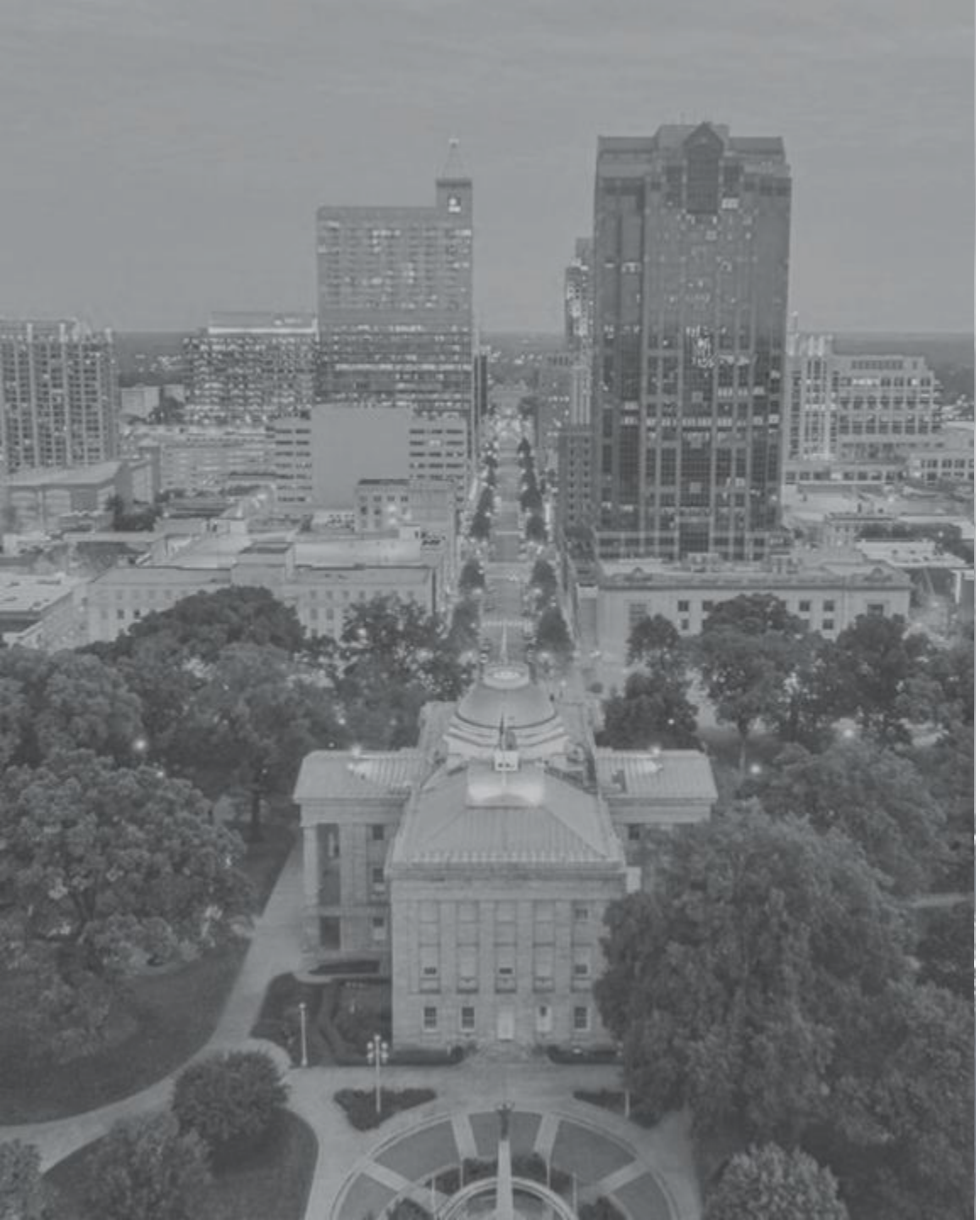
RALEIGH FIRE MASTERPLAN

July 1st, 2025

DARKHORSE EMERGENCY



AGENDA

- BACKGROUND AND EXECUTIVE SUMMARY
- CURRENT STATE
- FUTURE STATE
- STATION RECOMMENDATIONS
- APPARATUS DEPLOYMENT, WORKLOAD, AND STAFFING RECOMMENDATIONS
- FURTHER RECOMMENDATIONS

BACKGROUND AND EXECUTIVE SUMMARY

CONTEXT

- Raleigh is one of the fastest-growing communities in North America, with a quickly rising population, ongoing annexations, and an expanding service area.
- In Sept 2023 the City released an RFP for a comprehensive **Fire Master Plan** to benchmark service, forecast demand, and phase capital / operating investments.
- Darkhorse Emergency leveraged predictive analytics and tools and partnered with North Carolina–based NC Fire Chief Consulting to deliver the data-driven analysis that underpins the recommendations presented today.

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OUR APPROACH

Stakeholder engagement

We met with key stakeholders, both internal and external to RFD, to gather insights, validate challenges, and identify priorities.

Data analysis

We reviewed RFD's incident and response data to identify trends, root causes, and explore resource utilization.

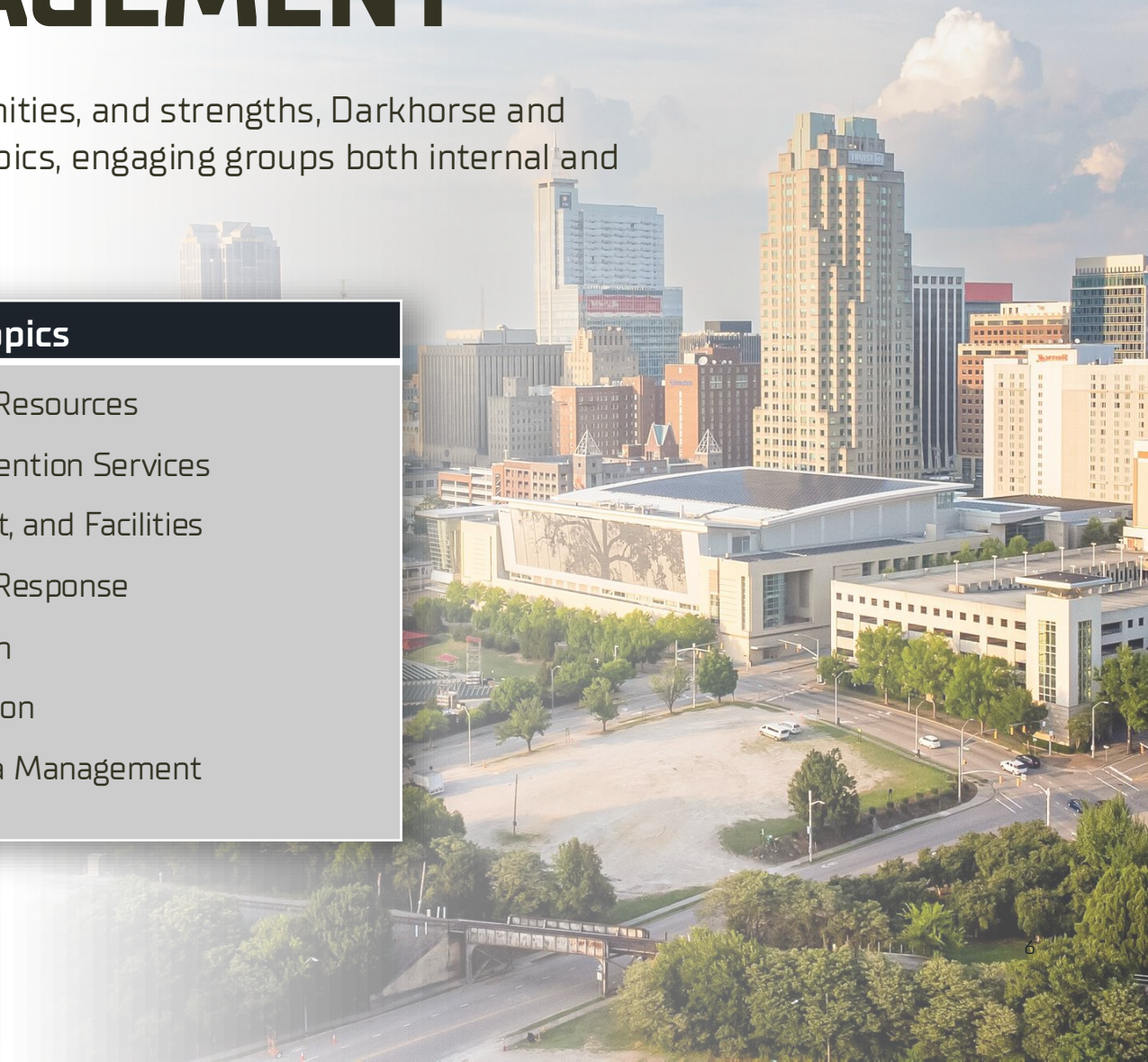
Predictive modeling

We developed a forward-looking model to predict future incident demand and test various scenarios.

STAKEHOLDER ENGAGEMENT

To learn more about RFD and its operations, challenges, opportunities, and strengths, Darkhorse and NCFCC conducted seven stakeholder interviews on a variety of topics, engaging groups both internal and external to RFD

External Groups	Topics
• Human Resources • Strategy and Innovation • Planning and Development • Disaster Preparedness and EOC • City Emergency Communications Center	• Staffing and Human Resources • Community and Prevention Services • Response, Equipment, and Facilities • Communication and Response • Community Expansion • Strategy and Innovation • IT, Software, and Data Management



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EXECUTIVE SUMMARY OF RECOMMENDATIONS

STATION INFRASTRUCTURE	Rebuild/relocate five aging stations and construct four new ones over 25 years in growth corridors; bank land early to reduce costs.
APPARATUS & STAFFING	Add four frontline units, consider quick-response vehicles, increase staffing ratio to maintain minimum and staff all companies at 4 FF to meet NFPA 1710.
OPTIMIZE RESPONSE & COVERAGE	Deploy traffic pre-emption, refine EMS dispatch protocols, and complete a critical-task analysis. Formalize mutual aid and move towards automatic aid with Cary, Knightdale, and Wake-New Hope.
STANDARDS & ACCREDITATION	Adopt Standards of Cover, a data driven culture and pursue CFAI accreditation to embed continuous improvement and commitment to benchmarks.
RISK REDUCTION & TRAINING	Expand Community Risk Reduction by increasing staff, strengthen recruitment/compensation, and add NFPA 1403 instructors plus modular live-burn facilities.

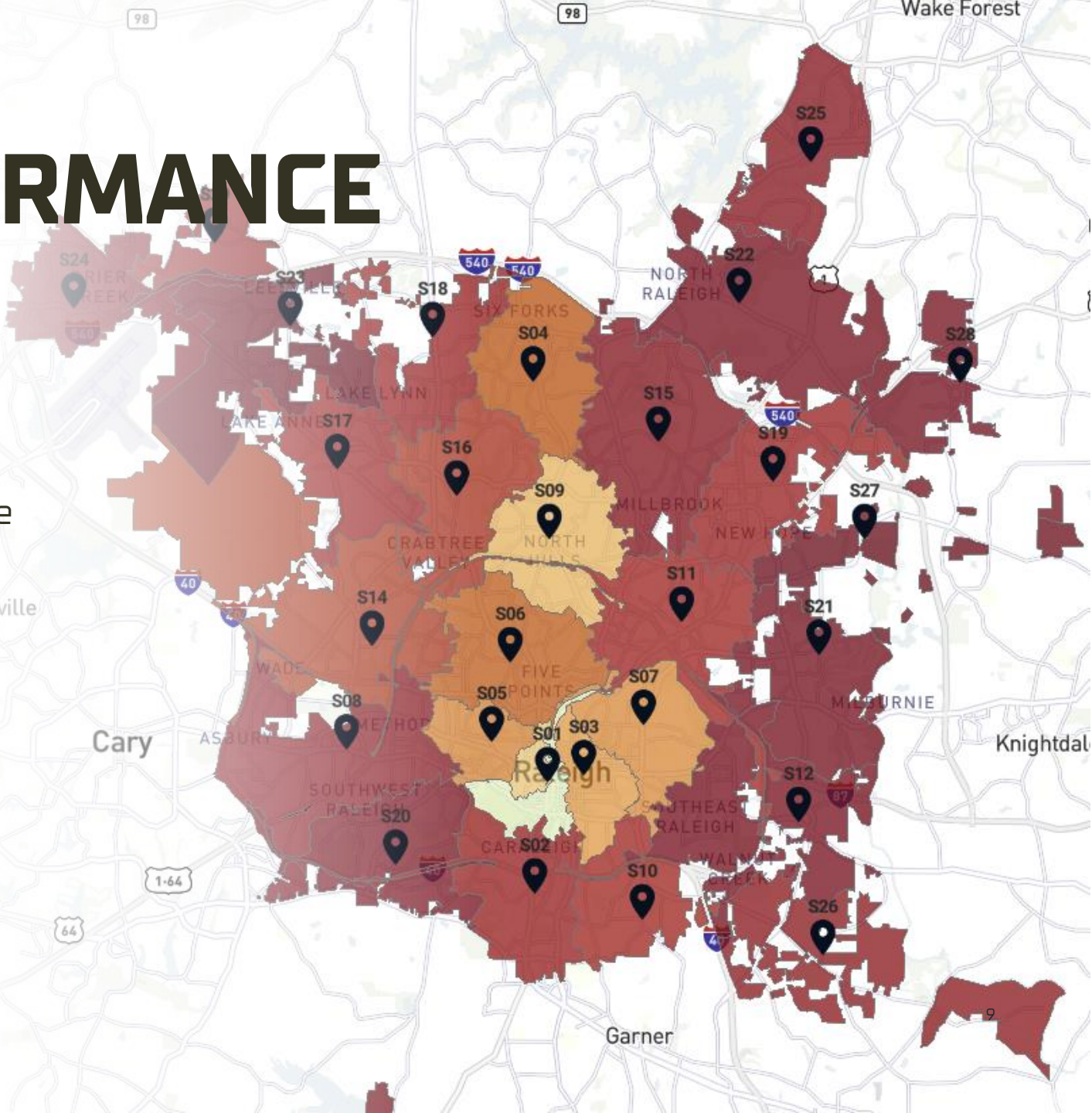
CURRENT STATE

FIRST DUE PERFORMANCE

54%

of first due units met the target of arriving on scene within the first due NFPA target time in 2024.

Performance was highest in the downtown area / station zone 1 at 81%, and lowest in station zone 23 at 31%



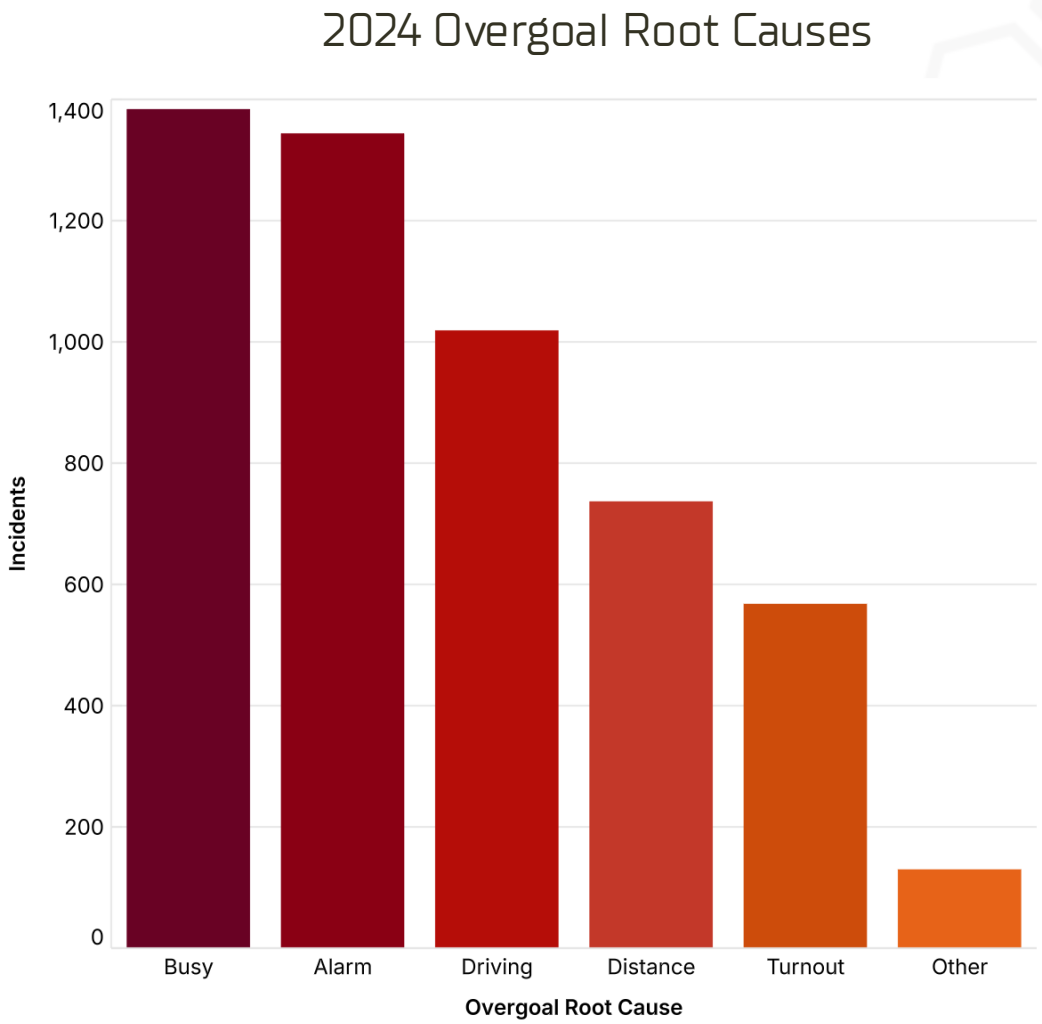
OVERGOAL ANALYSIS

» An **overgoal** is an incident that misses the NFPA 1st due target. To make the most effective recommendations, we conducted a root cause analysis of all of RFD's overgoals to see why they arrived late.

» The leading causes of late responses are:
- The unit best suited to respond was busy on another call or backfilling in another area.
- Long alarm handling time
- Long travel time

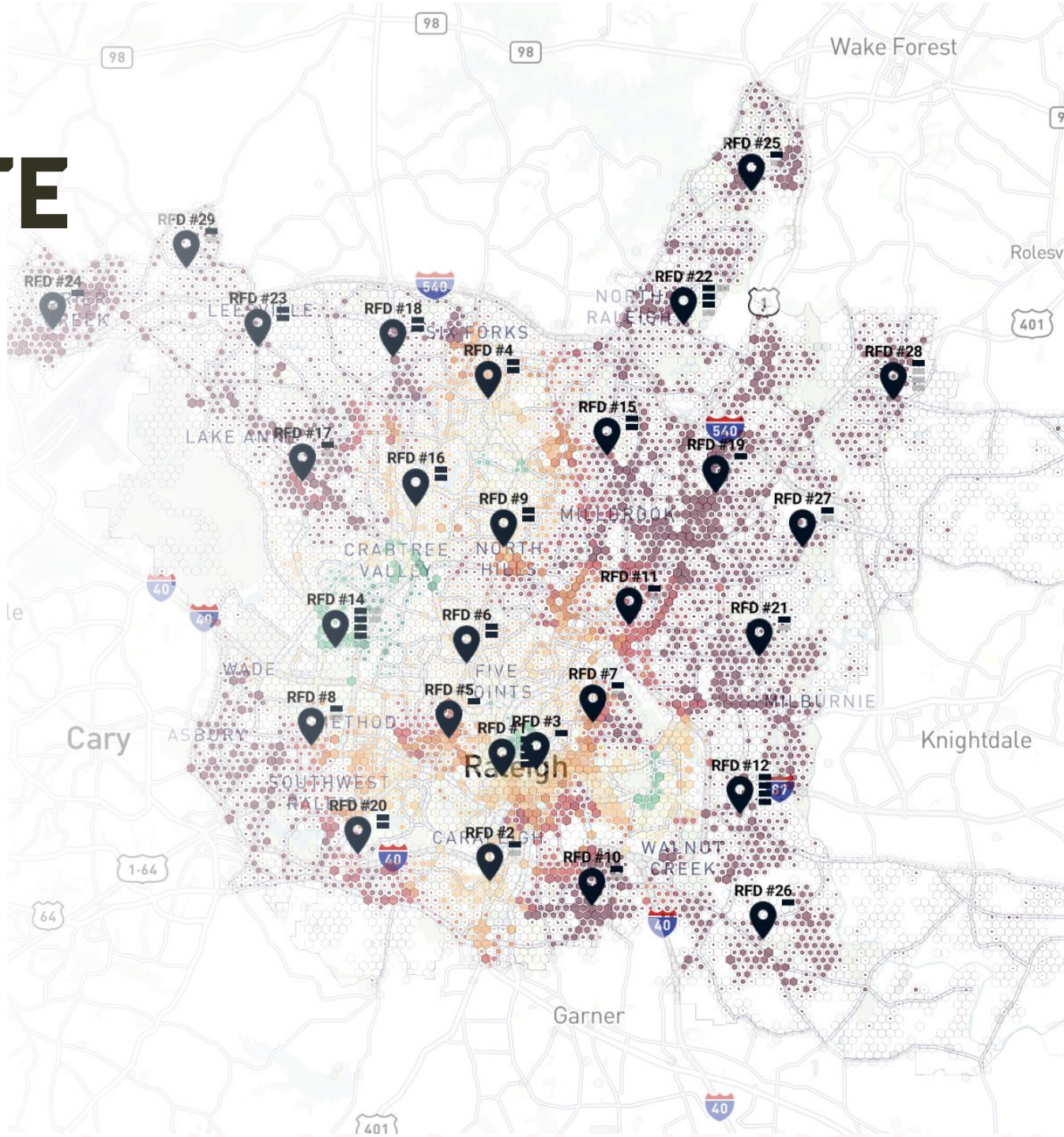
Based on this analysis, RFD's best opportunities for performance improvement are:

1. Reducing alarm handling time
2. Increasing apparatus to address high workload
3. Adding stations to address distance issues



ERF CURRENT STATE

- Effective Response Force (ERF) refers to the number of firefighters that must be assembled within a reasonable time for multiple-unit responses to more serious emergencies, such as building fires.
- NFPA defines the target as:
  - Low/Moderate Risk: 26 FF in 10m20
  - High Risk: 39 FF in 12m30
- RFD is able to meet these targets **48% of the time**



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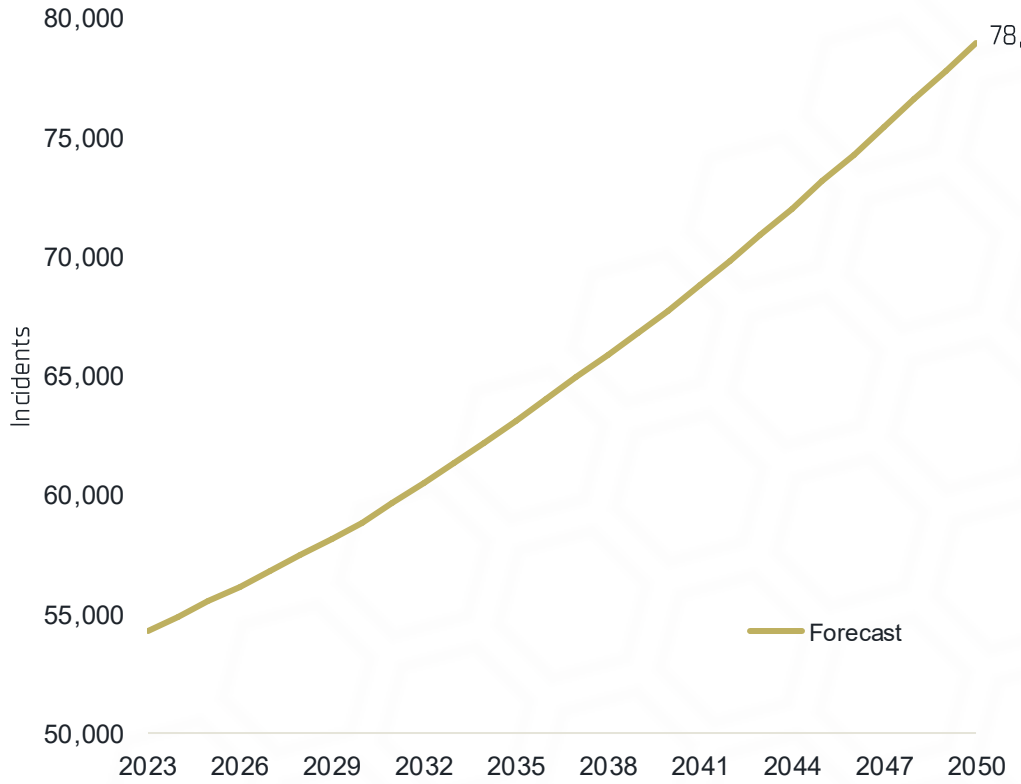
FUTURE STATE

GROWTH FORECAST

Raleigh's rapid population boom - fueled by steady annexations and densification - keeps it among the nation's fastest-growing metros.

Based on expected population growth and annexations , we project call volume climbing from ~55,000 today to nearly 79,000 within 25 years, underscoring the need for long-range capacity planning.



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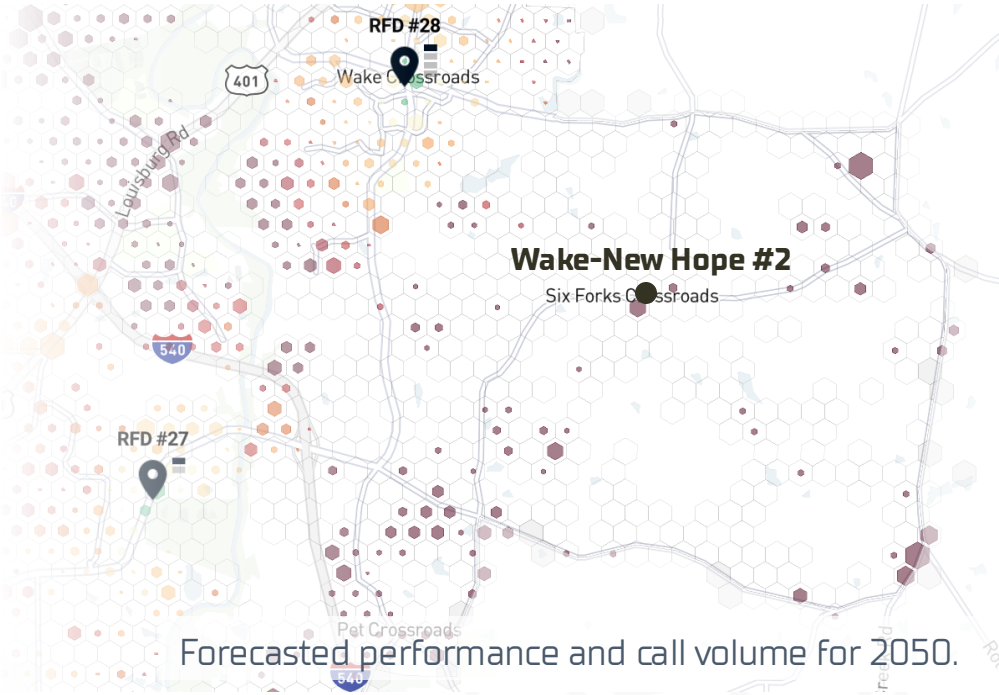
NORTHEAST SPECIAL STUDY AREA

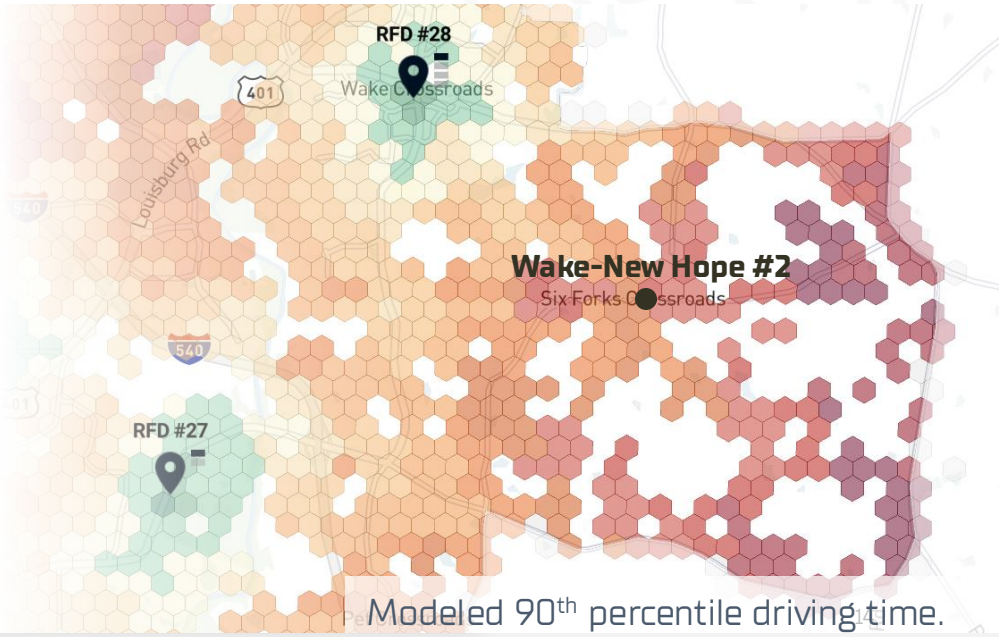
» The Northeast Special Study Area could add ~8.5 mi^2 to Raleigh's service area.

» The area is not within reasonable driving distance of Raleigh's existing stations and is expected to take >6 minutes to travel to.

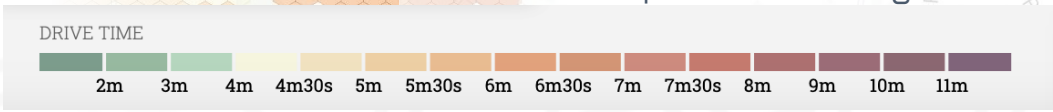
» Wake New-Hope #2 is situated in the center of the NESSA.



Forecasted performance and call volume for 2050.



Modeled 90th percentile driving time.



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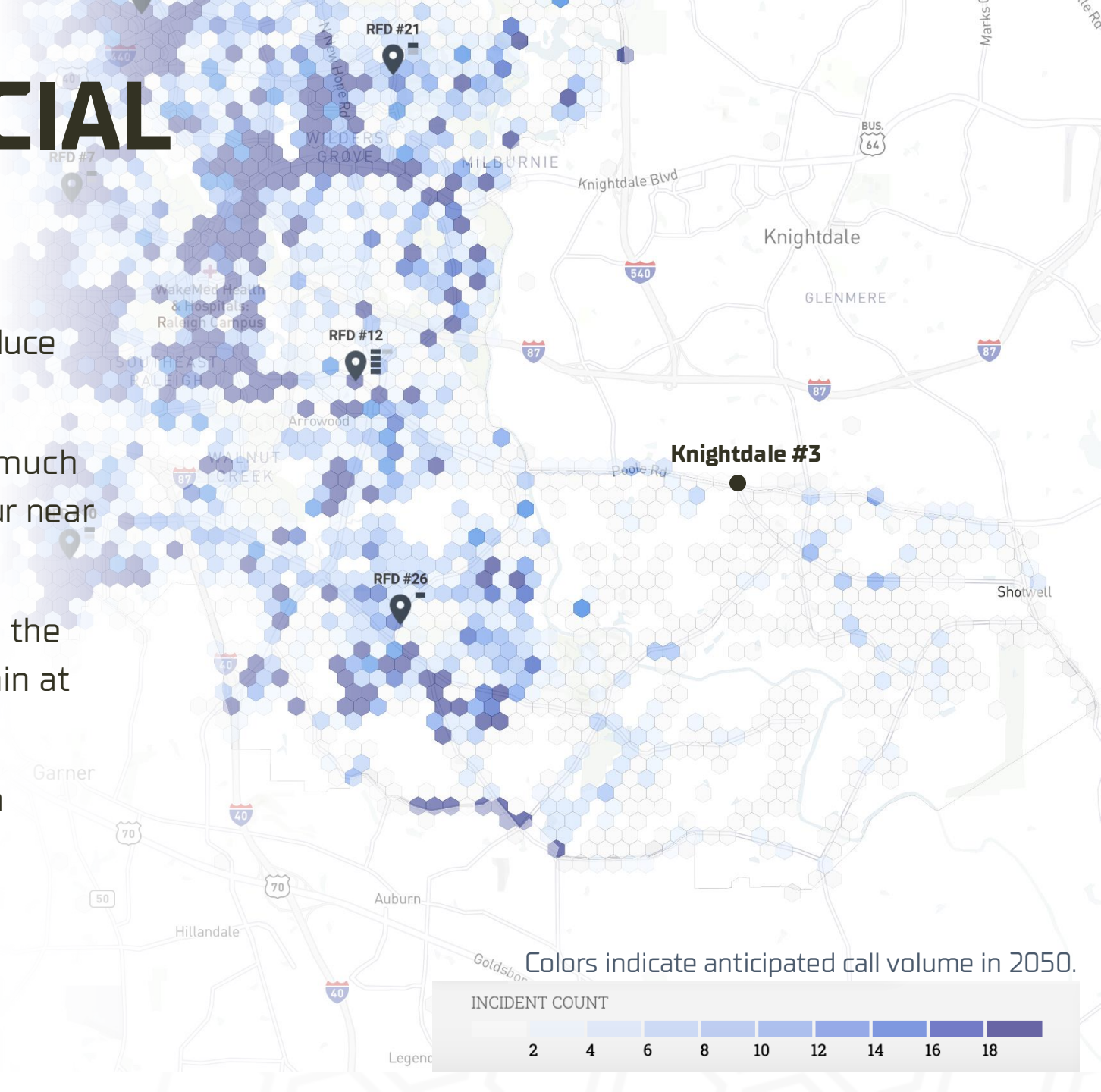
SOUTHEAST SPECIAL STUDY AREA

- The Southeast Special Study Area could introduce around 17.5 mi^2 to Raleigh's service area.
- Despite the additional area, densification and much of the call volume growth are expected to occur near Station 26.
- Outside of Raleigh's current jurisdiction, within the SESSA, population density is expected to remain at approximately 500 pop/mi^2
- Knightdale #3 is located nearby and could be a service partner in the area.



Colors indicate anticipated call volume in 2050.

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STATION RECOMMENDATIONS

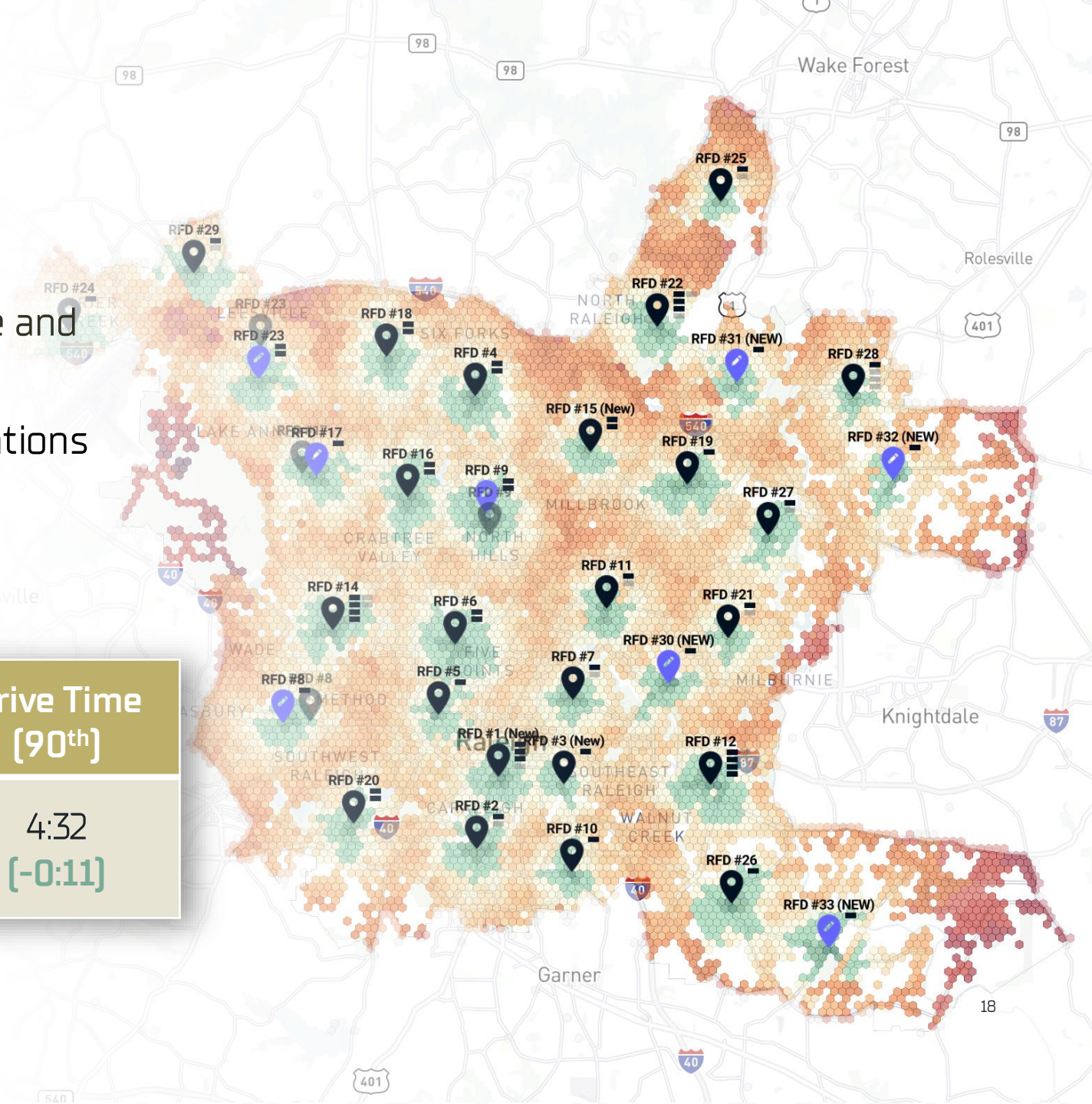
STATION REPLACEMENT

Station (in order of priority)	Rebuild/Relocate	Reason(s)	Summary
Station 23 8313 Pinecrest Rd.	**Relocate**	• Station is at end-of-life • Current facilities are sub-standard • Land is leased and is not a good option for purchase	Areas to the South of Station 23 should be considered for relocation; Station 23's optimal placement is approximately Country Trail / Pinecrest Rd.
Station 9 4465 Six Forks Rd.	**Relocate**	• Station is at end-of-life • Lot is too small for rebuild	Candidate locations along Six Forks Rd. provide similar response performance to the optimal location.
Station 8 5001 Western Blvd.	**Relocate**	• Station is nearing end-of-life • Lot is too small for rebuild	Station 8 should be moved slightly West to address call volume growth around Western Boulevard.
Station 10 2711 Sanderford Rd.	**Rebuild**	• Station is nearing end-of-life • Lot is too small for rebuild	Station 10 land should be rebuilt if possible. Swapping land with the adjacent Parks site should be explored as an opportunity to expand the current lot.
Station 17 4601 Pleasant Valley Rd.	**Rebuild**	• Station is nearing end-of-life	Station 17's current location is optimal; the station should be redeveloped on the same property, if possible.

4 NEW STATIONS

» The existing coverage gaps in Wilders Grove and Neuse Crossroads should be addressed by building 2 new stations, and 2 additional stations should be built in response to service area expansion in the NE and SE.

Service Area (2050 Demand)	First Due	Overgoals	Drive Time (90th)
Future ETJ	65.20% (+2.75%)	10,873 (-859)	4:32 (-0:11)



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Phase I

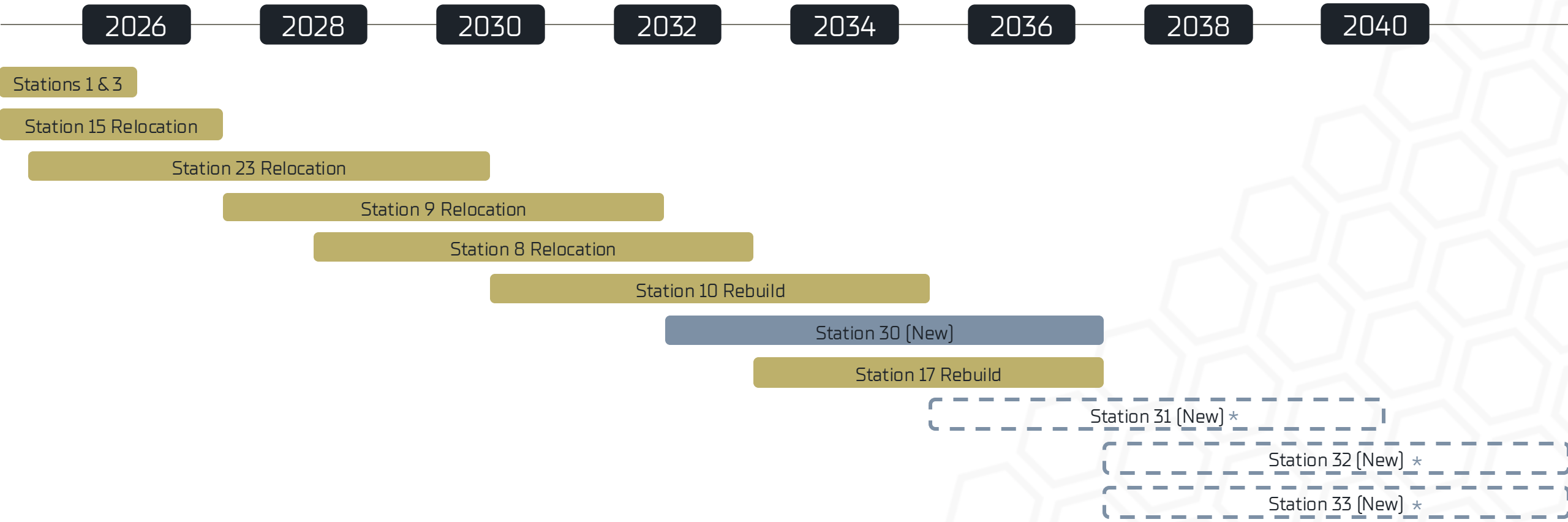
Remodeling, relocating, increasing and improving operational and non-operational resources.

Phase II

Planning and building additional stations to keep up with ETJ expansion.

Phase III

Continued focus on increasing and improving resources proportionally to demand.



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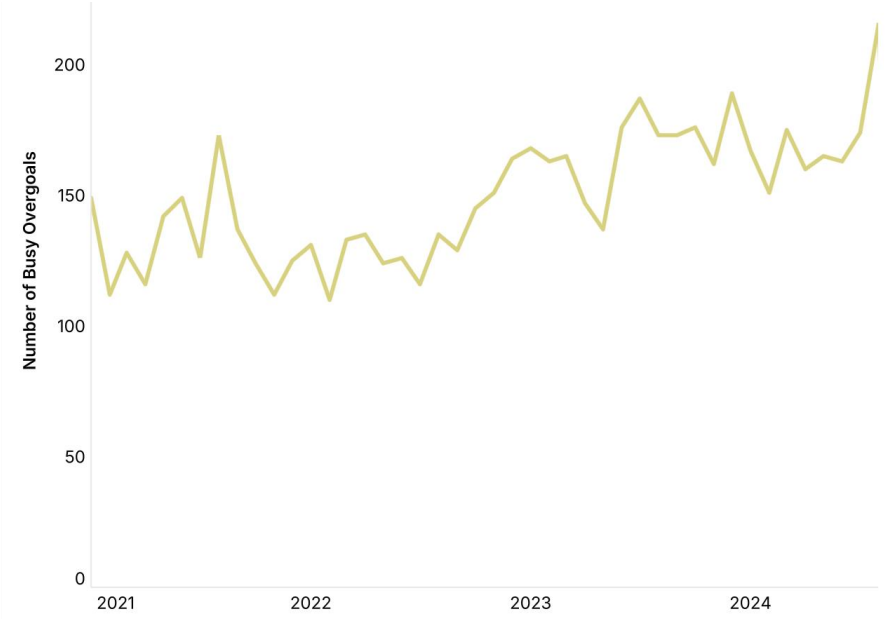
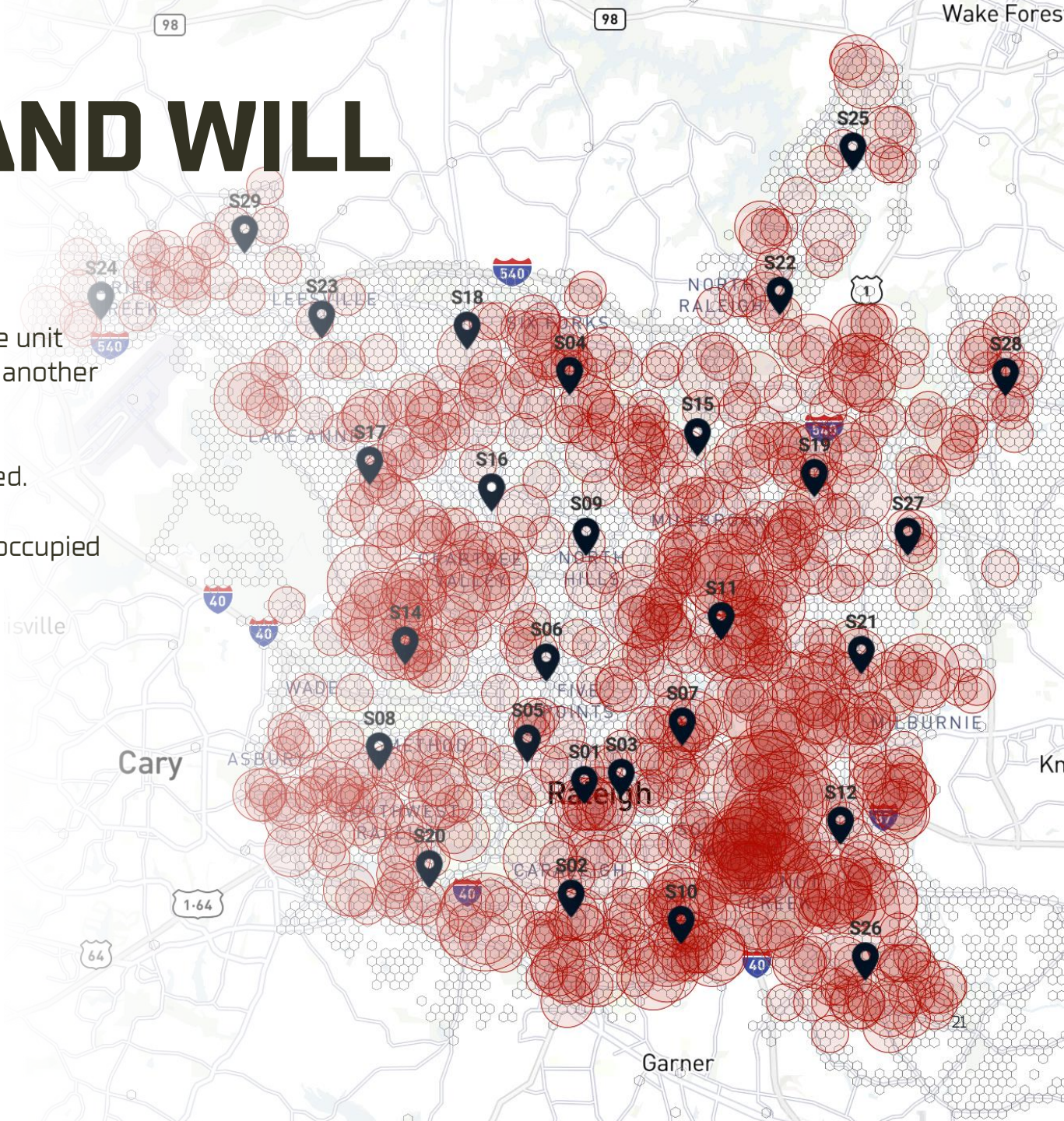
* Exact timing dependent on service area expansion.

APPARATUS DEPLOYMENT, WORKLOAD, AND STAFFING

UNITS ARE BUSY, AND WILL GET BUSIER

- Responses that missed the NFPA 1710 1st due target because the unit best suited to respond was busy on another call, or backfilling in another area.
- These overgoal incidents signal where additional units are needed.
- This is particularly an issue during peak hours, as units become occupied with calls or backfilling in other areas.

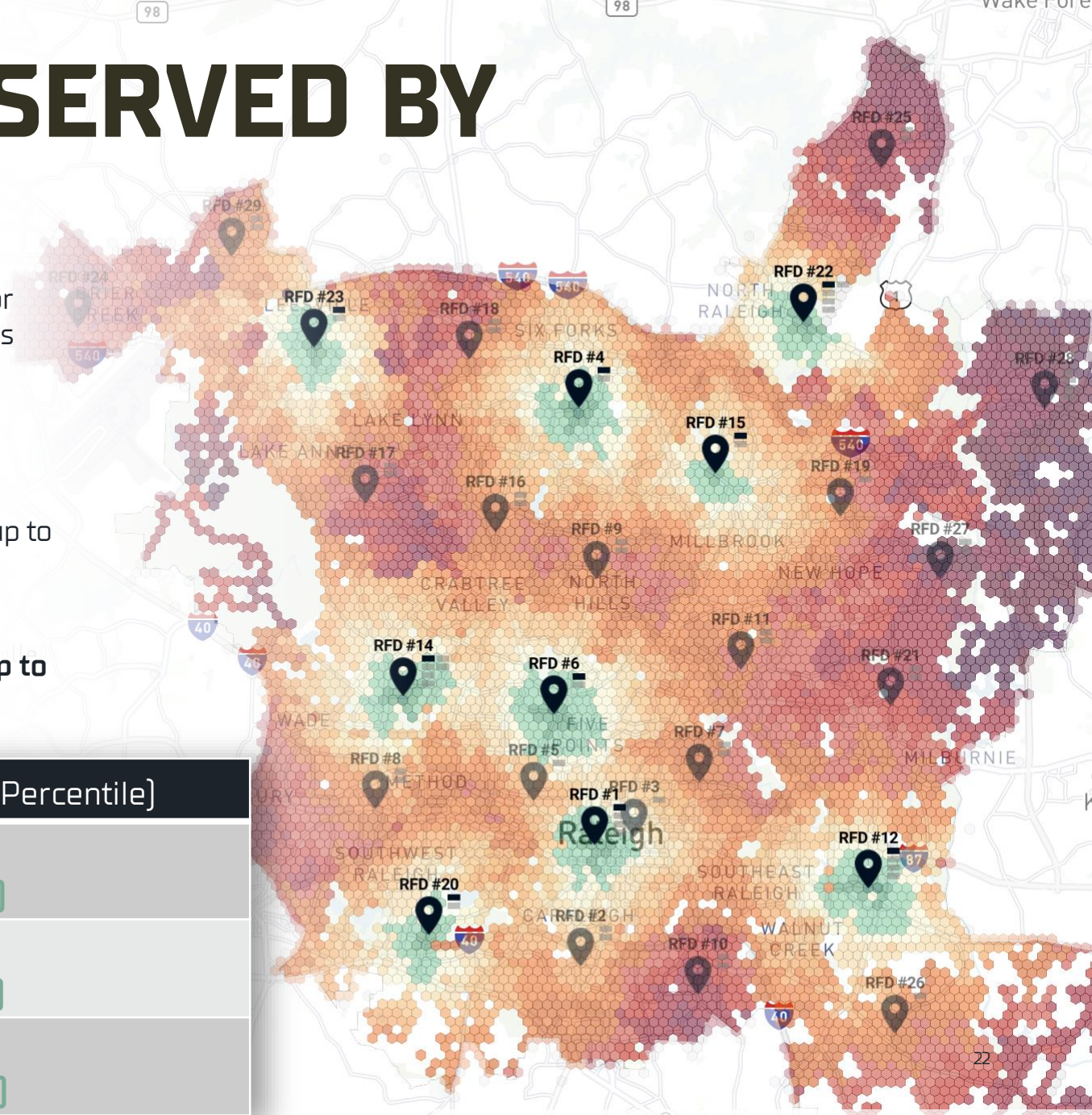




RALEIGH IS UNDERSERVED BY LADDER TRUCKS

- In a large, rapidly growing city, ladder trucks, which are specialized for rescue and fire operations, need to be able to respond quickly across the city.
- Raleigh is currently underserved by ladder trucks, resulting in **more time before rescue or firefighting operations can begin**.
- For a ladder to drive to any incident in Raleigh, we expect it to take up to **6m05s**, 90% of the time.
- By optimizing where ladders are stationed and adding 2 new ladder trucks and crews to Raleigh's deployment, **we can reduce this by up to 25s city-wide**.

Scenario	Drive Time (90th Percentile)
Optimize existing ladder deployment	5:52 (-0:13)
Optimize existing ladder deployment + 1 ladder	5:44 (-0:21)
Optimize existing ladder deployment + 2 ladders	5:40 (-0:25)



RFD's current ladder deployment and drive times.

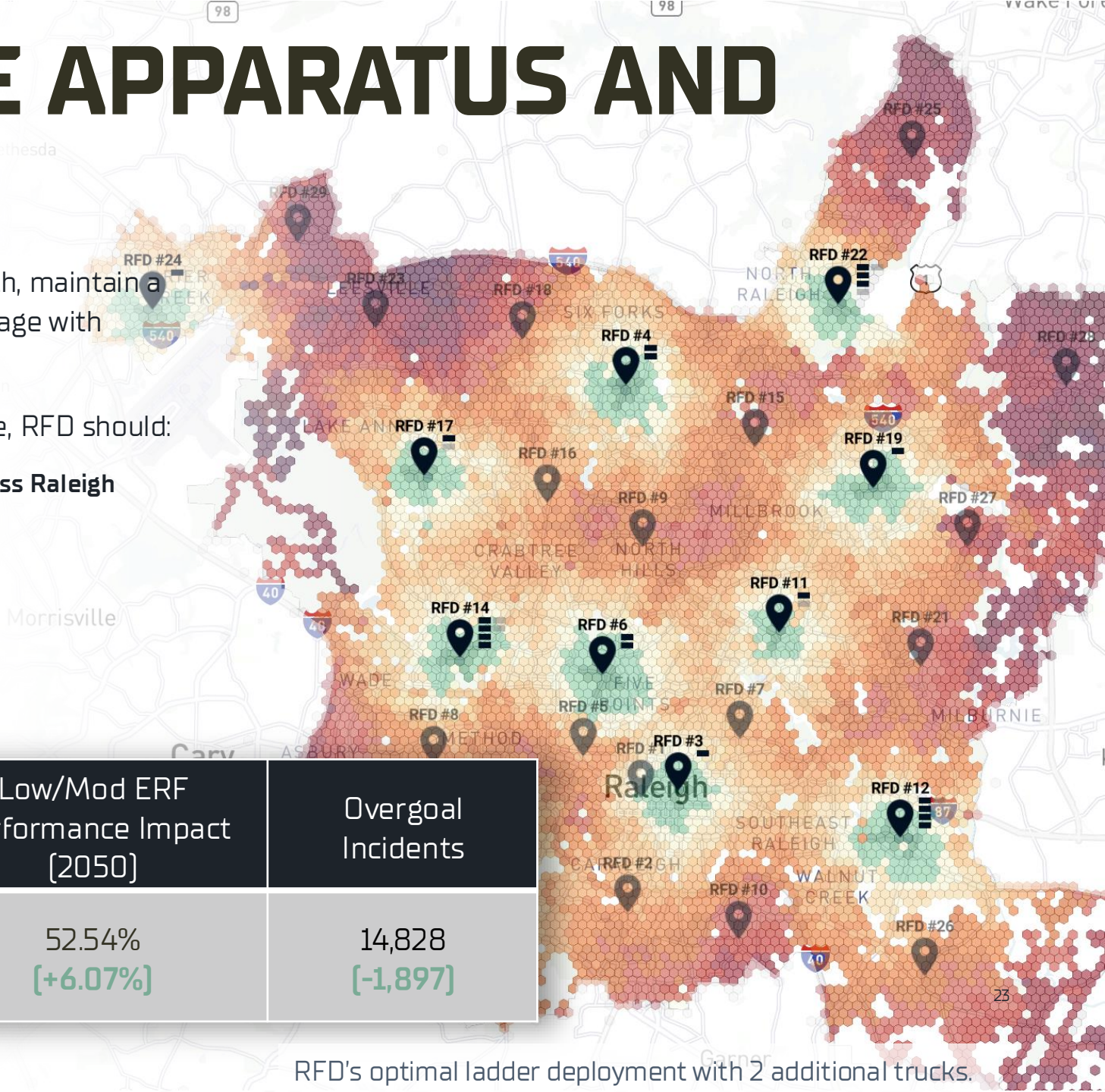
ADD 4 FRONTLINE APPARATUS AND CREWS

Raleigh needs additional units to keep up with demand growth, maintain a manageable per-unit workload, and achieve acceptable coverage with ladders city-wide.

To address the need for ladder trucks and growing call volume, RFD should:

- **Redistribute its existing ladders to optimize their coverage across Raleigh**
- **Add 4 frontline units and staff:**
  - **2 Ladder companies**
  - **1 Engine company**
  - **1 Quick Response Vehicle**

Scenario	1st Due Performance Impact (2050)	Low/Mod ERF Performance Impact (2050)	Overgoal Incidents
Optimize existing ladder locations, and add 2 ladders, 1 engine, and 1 QRV.	64.19% (+1.35%)	52.54% (+6.07%)	14,828 (-1,897)



RFD's optimal ladder deployment with 2 additional trucks.

RIGHT-SIZING DAILY FIREFIGHTER STAFFING

Staffing Factor

The number of personnel needed to staff one 24/7 firefighting position, accounting for the number of shifts and time spent in absence.

Minimum industry standard:

3.75 hires per 24/7 FTE

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RFD currently operates with a staffing factor of 3.63, below the industry minimum of 3.75.

This inadequate staffing creates a cycle where stress, burnout, and injury-related leave create coverage gaps that can only be filled with overtime hours - a costly approach that risks worsening the underlying causes of absence.

While RFD aims to have 152 positions on duty per 24 hour shift, with 184 total firefighters, they often fall short of this minimum level. To reach the minimum staffing factor of 3.75, RFD should have at least 190 firefighters per shift.

Recommendation:

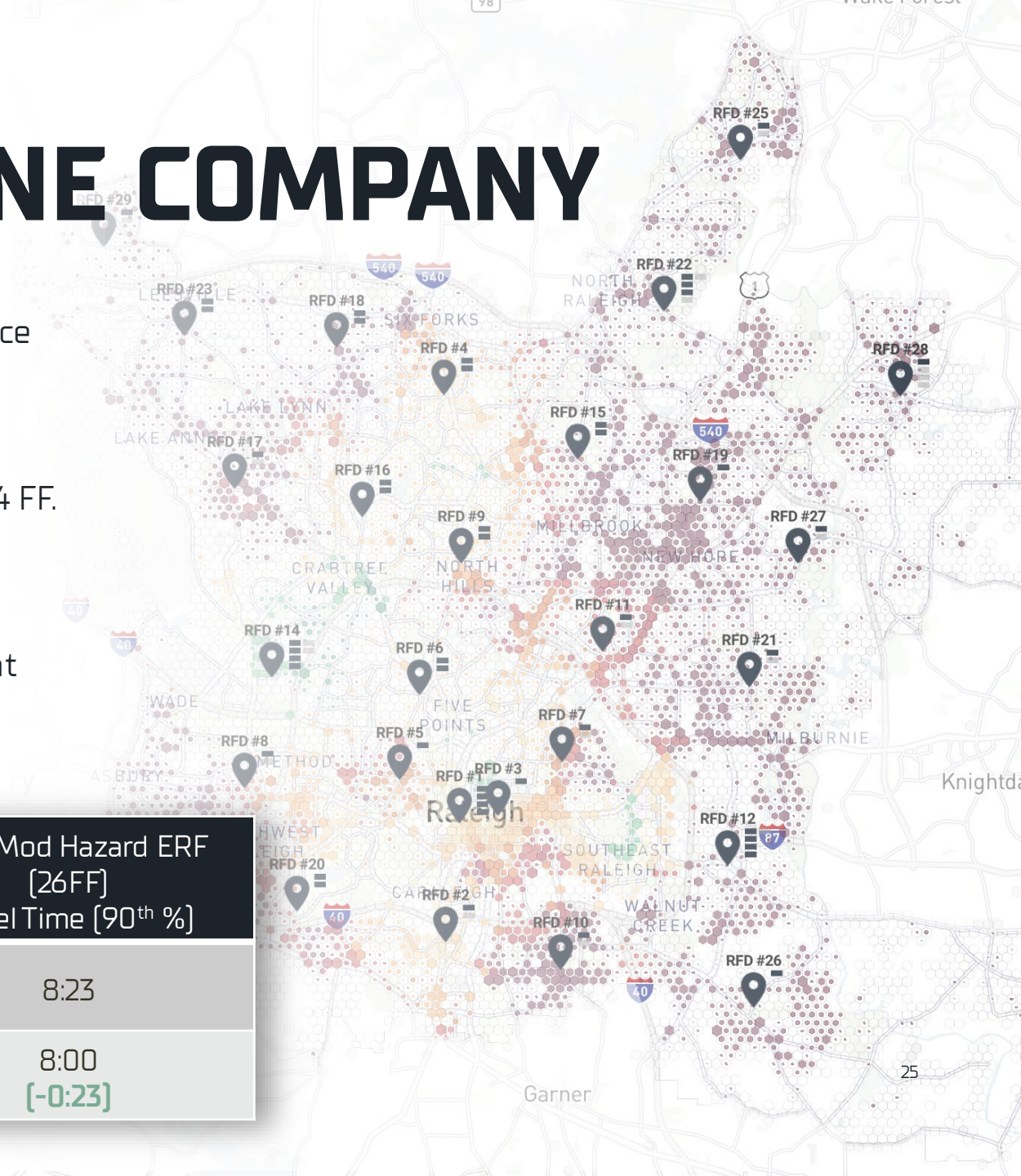
- RFD needs to **immediately hire at least 18 additional firefighters** (6 across 3 shifts) to bring their staffing factor to 3.75.
- Moving forward, RFD should **maintain a minimum staffing factor of 3.75 for any newly added 24/7 firefighting positions.**
- As demands on modern fire services continue to increase, RFD should aim to exceed this industry minimum whenever possible to ensure staff safety and well-being.
- The size and number of academy classes have a profound effect on the number of firefighters that RFD can train. RFD should evaluate its training capacity on an ongoing basis to ensure it can keep up with hiring demand.

STAFF 4FF PER ENGINE COMPANY

When fewer units are needed to meet the Effective Response Force (ERF) for an incident, ERF performance increases significantly, and action can be taken sooner.

NFPA 1710 recommends that each engine company be staffed by 4 FF. This ensures an effective response on the scene and avoids over-deploying units to compensate for understaffed companies.

RFD should work towards 4FF per engine by increasing recruitment over the next 6 years.



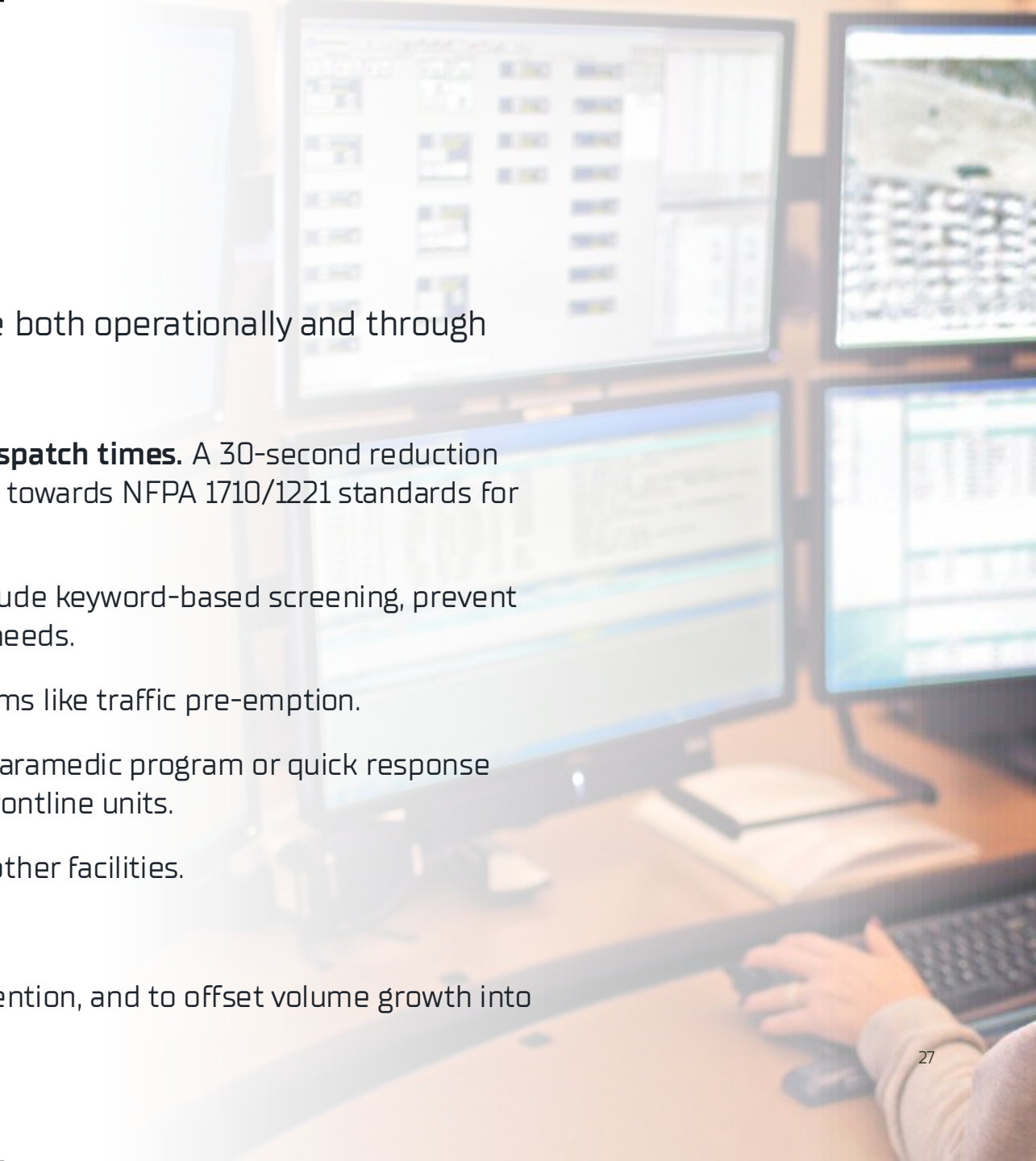
Staffing Scenario	Low/Mod Hazard ERF (26FF) Performance	Low/Mod Hazard ERF (26FF) Travel Time (90th %)
Current (3FF Engine Companies)	48.33%	8:23
NFPA 1710 (4FF Engine Companies)	57.77% **(+9.45%)**	8:00 **(-0:23)**

FURTHER RECOMMENDATIONS

IMMEDIATE

Raleigh should work towards improving aspects of its service both operationally and through admin/support:

- **Address alarm overgoals by improving call processing and dispatch times.** A 30-second reduction would yield +8.66% first-due performance. Raleigh should work towards NFPA 1710/1221 standards for call processing and dispatch.
- Work with Wake EMS to **refine EMS dispatch protocols** to include keyword-based screening, prevent unnecessary dispatch, and ensure dispatch aligns with patient needs.
- **Increase station coverage by enhancing drivability** with systems like traffic pre-emption.
- **Introduce non-traditional response types**, like a community paramedic program or quick response vehicles, to high-volume locations to manage the workload of frontline units.
- Enhance resources in **fire-rescue training, maintenance**, and other facilities.
- Integrating **HR support** into the RFD.
- Expand **community risk reduction** to emphasize incident prevention, and to offset volume growth into the future.



MID-LONG TERM

To effectively serve a rapidly growing city, the RFD needs to work towards meeting industry standards and adopting best practices:

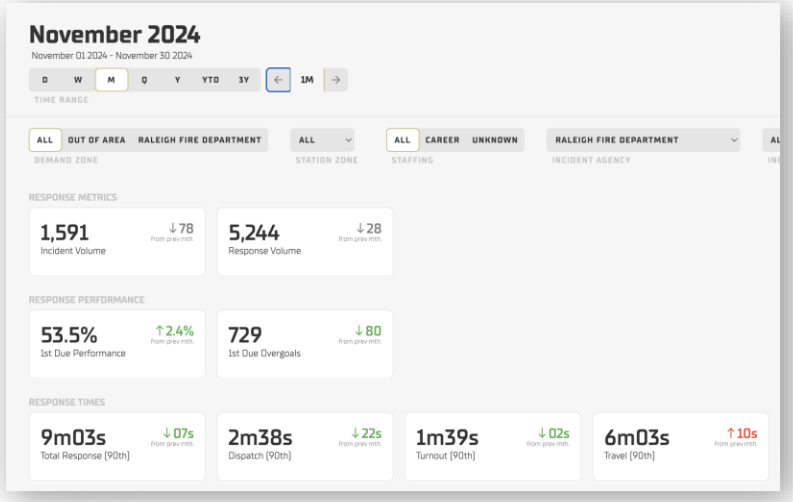
- **Standard of Cover (SOC) and CFAI accreditation.** Adopting industry standards and an ongoing review process is paramount in continuous improvement.
- **Expand mutual/automatic aid with partners.** Strong collaboration with regional partners will always result in a more cost-effective service for citizens.
- **Conduct critical task analysis (CTA).** CTA identifies the most important tasks necessary for successfully managing a fire incident and mitigating risks.
- **Secure land for future fire stations.** Land banking reduces the capital investment required for land procurement and station planning as land value continues to increase.

CONTINUOUS IMPROVEMENT

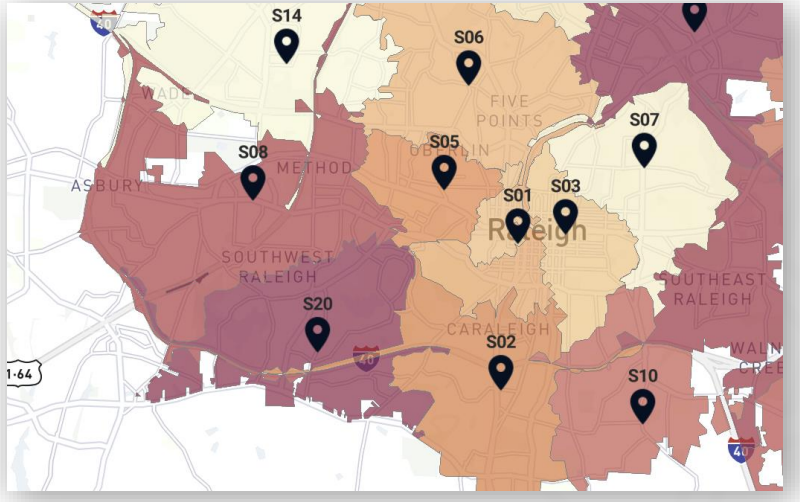
Raleigh is a growing and dynamic city. At key points, such as at the completion of a station and before beginning a new project, RFD should re-evaluate its needs and the needs of the community to ensure the recommendations presented here remain relevant.

The Darkhorse Response app suite allows RFD to continually monitor key performance metrics, analyze their historical data and current state, predict how the department will perform, and test the impact of different operational changes.

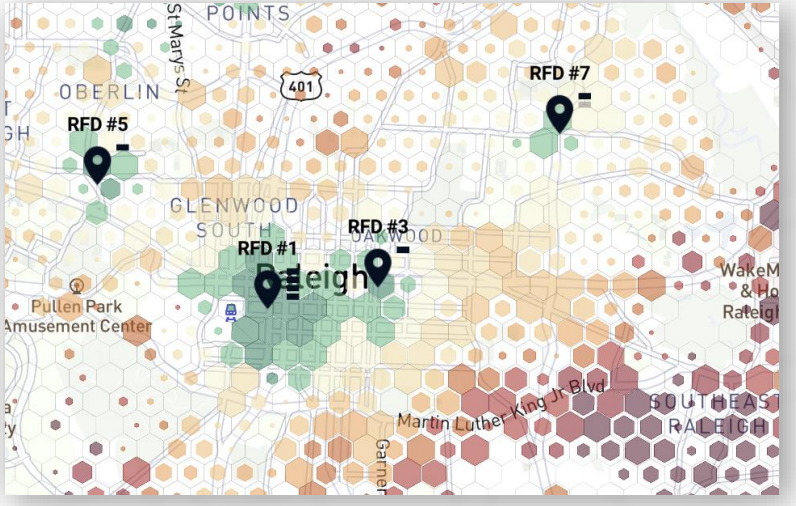
Headquarters (HQ)



Diagnostics



Deployment

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