Community Risk Review and Assessment of Risk

Nottinghamshire Fire and Rescue Service

Public Document V1

February 2022

PLAN. PREPARE. PERFORM.

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Accreditations

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Office for National Statistics: 2011 Census aggregate data. UK Data Service (Edition: June 2016). This information is licensed under the terms of the Open Government Licence.

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Report Overview

Document Navigation

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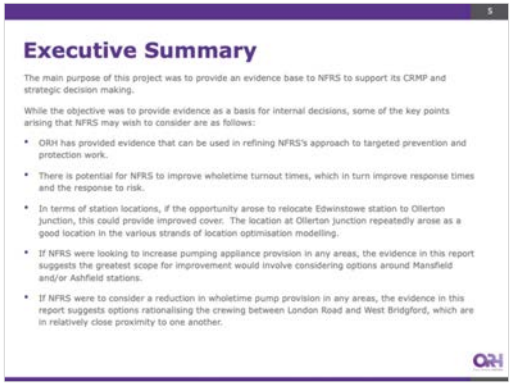
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Executive Summary

The main purpose of this project was to provide an evidence base to NFRS to support its CRMP and strategic decision making.

While the objective was to provide evidence as a basis for internal decisions, some of the key points arising that NFRS may wish to consider are as follows:

- ORH has provided evidence that can be used in refining NFRS's approach to targeted prevention and protection work.
- There is potential for NFRS to improve wholetime turnout times, which in turn improve response times and the response to risk.
- In terms of station locations, if the opportunity arose to relocate Edwinstowe station to Ollerton junction, this could provide improved cover. The location at Ollerton junction repeatedly arose as a good location in the various strands of location optimisation modelling.
- If NFRS were looking to increase pumping appliance provision in any areas, the evidence in this report suggests the greatest scope for improvement would involve considering options around Mansfield and/or Ashfield stations.
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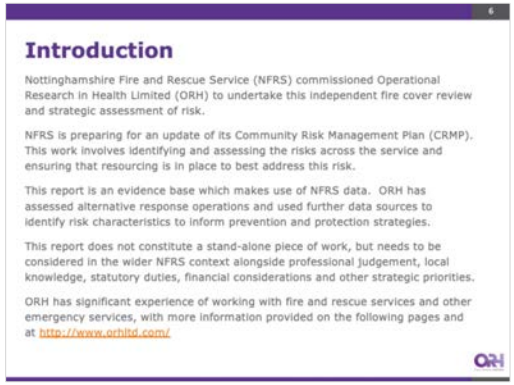
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Introduction

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NFRS is preparing for an update of its Community Risk Management Plan (CRMP). This work involves identifying and assessing the risks across the service and ensuring that resourcing is in place to best address this risk.

This report is an evidence base which makes use of NFRS data. ORH has assessed alternative response operations and used further data sources to identify risk characteristics to inform prevention and protection strategies.

This report does not constitute a stand-alone piece of work, but needs to be considered in the wider NFRS context alongside professional judgement, local knowledge, statutory duties, financial considerations and other strategic priorities.

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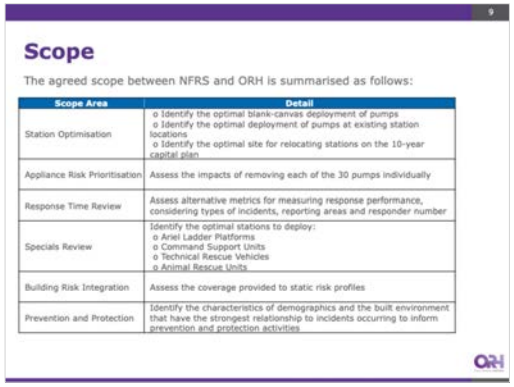
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Scope

The agreed scope between NFRS and ORH is summarised as follows:

Scope Area	Detail
Station Optimisation	o Identify the optimal blank-canvas deployment of pumps o Identify the optimal deployment of pumps at existing station locations o Identify the optimal site for relocating stations on the 10-year capital plan
Appliance Risk Prioritisation	Assess the impacts of removing each of the 30 pumps individually
Response Time Review	Assess alternative metrics for measuring response performance, considering types of incidents, reporting areas and responder number
Specials Review	Identify the optimal stations to deploy: o Ariel Ladder Platforms o Command Support Units o Technical Rescue Vehicles o Animal Rescue Units
Building Risk Integration	Assess the coverage provided to static risk profiles
Prevention and Protection	Identify the characteristics of demographics and the built environment that have the strongest relationship to incidents occurring to inform prevention and protection activities

Other Main Sections

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ORH helps emergency services around the world to optimise resource use and respond in the most effective and efficient way.

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

Every organisation faces a unique set of challenges, so remaining independent and flexible allows us to deliver an appropriate solution every time. The outputs of our work enable clients to make robust, data-driven decisions and explain them clearly to stakeholders.

ORH's approach is always tailored to the needs of the client. Above all, we are committed to getting it right, for the good of our clients and the people who rely on their services.

ORH Support to FRSs

Risk

- Quantifying Risks
- Identifying Relationships
- Targeting Activities

Resources

- Matching to Risk
- Optimal Locations
- Resource Types

Response

- Efficient and Effective
- Day-to-day Management
- Contingency Planning

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Prevention and Protection: Risk Factors

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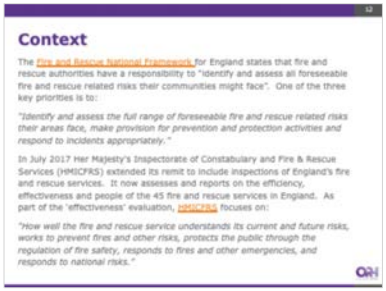
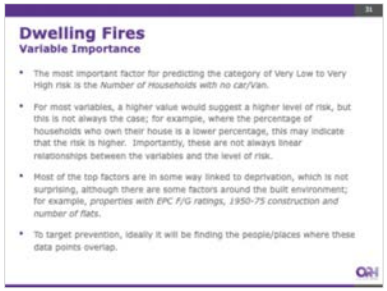
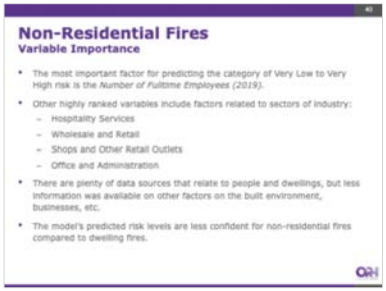
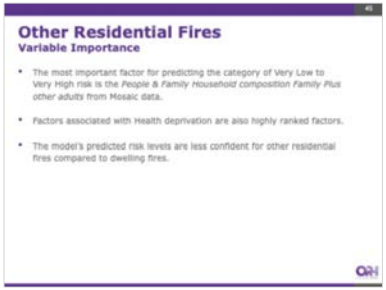
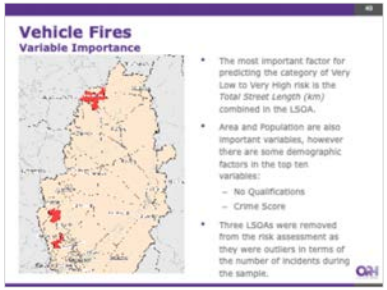
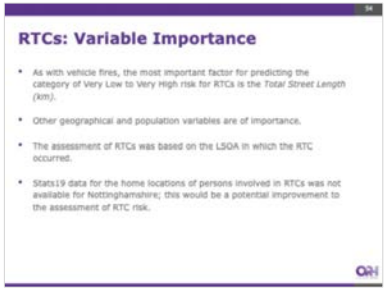


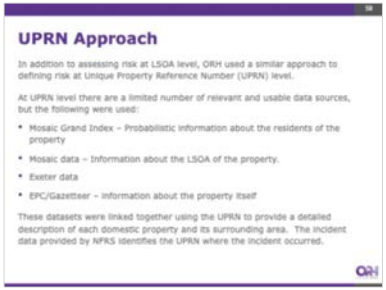












Other Main Sections

Context

The Fire and Rescue National Framework for England states that fire and rescue authorities have a responsibility to "identify and assess all foreseeable fire and rescue related risks their communities might face". One of the three key priorities is to:

"Identify and assess the full range of foreseeable fire and rescue related risks their areas face, make provision for prevention and protection activities and respond to incidents appropriately."

In July 2017 Her Majesty's Inspectorate of Constabulary and Fire & Rescue Services (HMICFRS) extended its remit to include inspections of England's fire and rescue services. It now assesses and reports on the efficiency, effectiveness and people of the 45 fire and rescue services in England. As part of the 'effectiveness' evaluation, HMICFRS focuses on:

"How well the fire and rescue service understands its current and future risks, works to prevent fires and other risks, protects the public through the regulation of fire safety, responds to fires and other emergencies, and responds to national risks."

Context: HMICFRS + 'State of Fire'

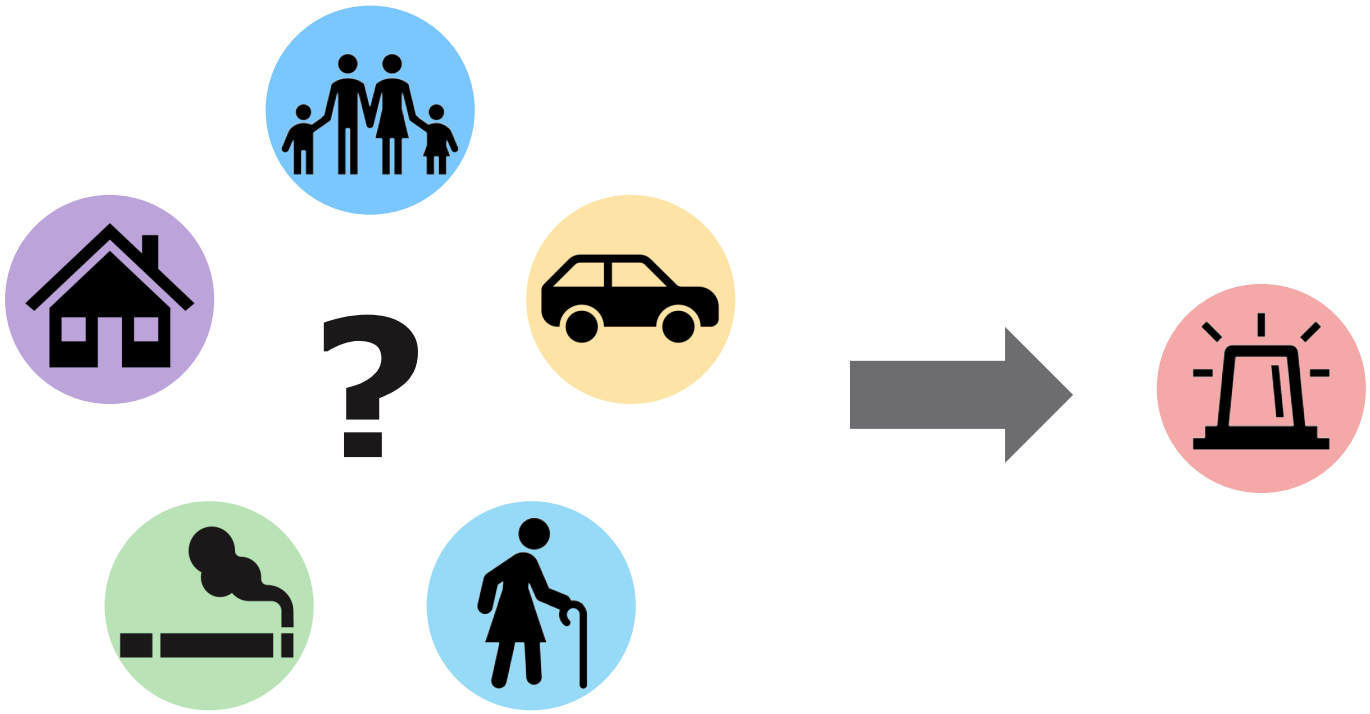
- 'Risk' has always been a multi-faceted topic, and a word that would have 50 different definitions from 50 different fire services.
- While there are national plans to unify FRSs approach, individual services will retain responsibility for determining how 'risk' informs their CRMP.
- Services need to be sensitive and responsive to local risk including understanding when and where demand may be at its highest to make sure that enough resources are available and to target community safety.

Scope

- Consult with NFRS to identify:
  - Incident types to assess in the project
  - Data sources to evaluate risk
- Collect, cleanse, and assess data suitability for use in the project.
- Undertake modelling to identify the characteristics with the strongest relationships to the likelihood of incidents occurring at LSOA level.
- Use UPRN level data to explore characteristics associated with dwelling fires.
- Use incident level descriptive factors and explore their relationship to different consequence measures.

Objectives

- The overall objective is to evidence and quantify risk
- Highlight factors that do and do not strongly align to risk



Approach: LSOA Level Assessment

ORH worked with NFRS to identify the incident categories that NFRS must plan for, taking account of differences in the frequency, location and consequence of incidents.

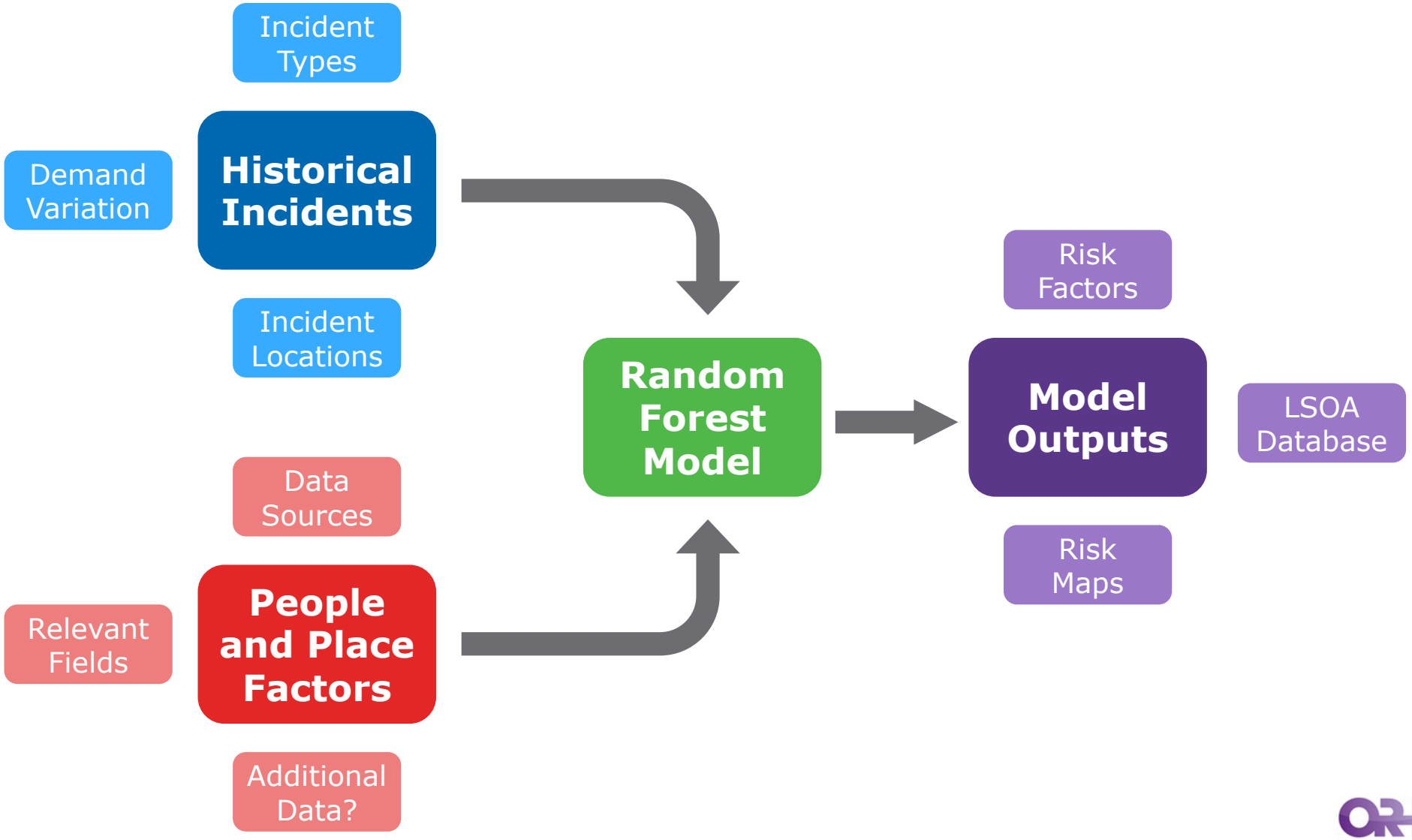
For each category, ORH sought to identify the likelihood of an incident occurring by LSOA in Nottinghamshire through analysis and modelling. This was based on a wide range of suitable data sources where there may be a link to the likelihood of incidents.

ORH created a database of all LSOAs in Nottinghamshire, populated with the historical incident data and all potential data sources, building up an extensive profile of every LSOA.

ORH applied Random Forest modelling and statistical analysis to identify which factors were good indicators for the likelihood of each of the different risk categories. The outputs from this work included:

- Ranked list of contributory factors to likelihood of incidents
- A database of LSOA risk for each incident category

Approach: Overview



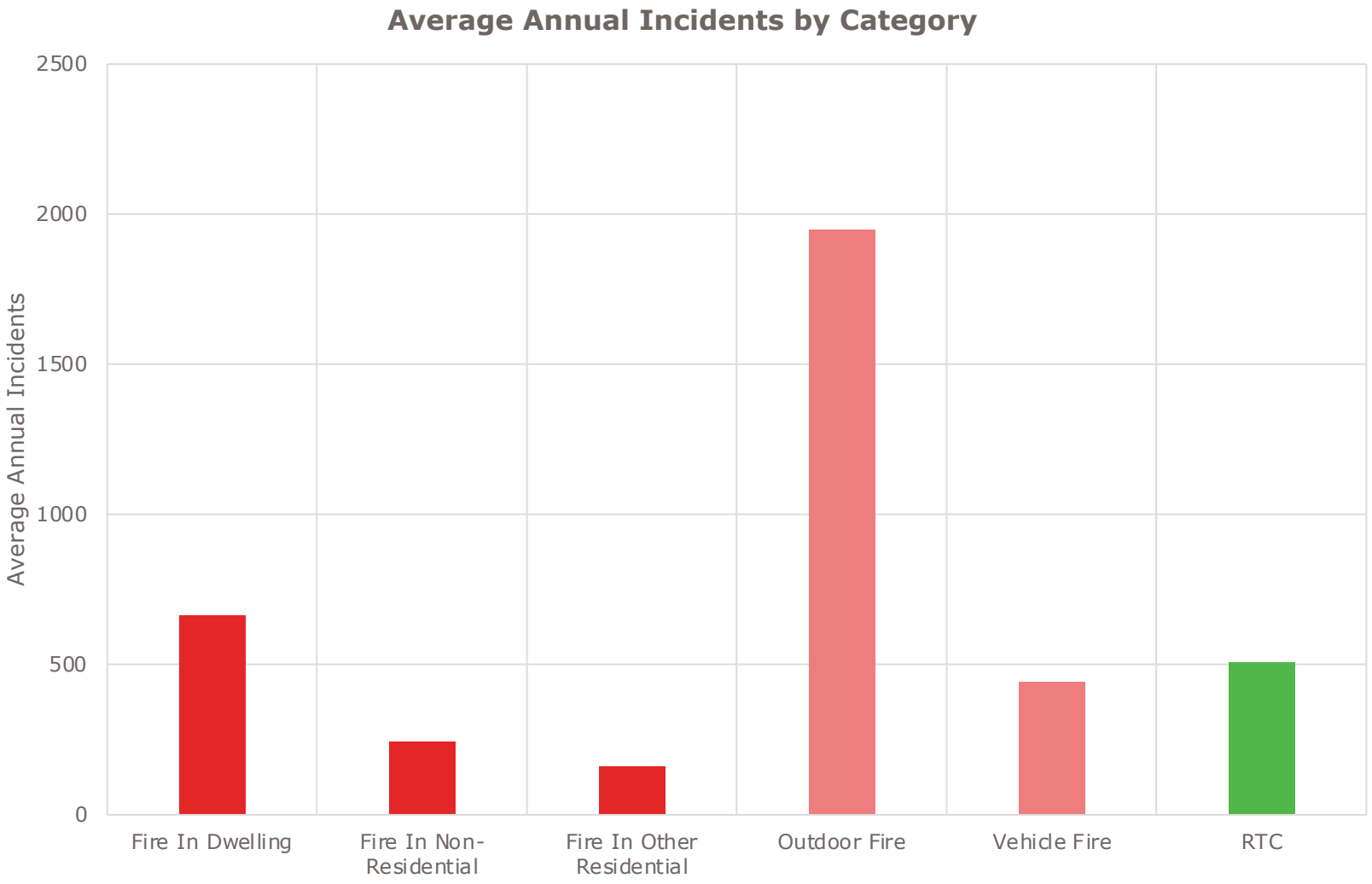
Approach: Historical Incidents

ORH worked with NFRS to identify the incident categories that NFRS must plan for. These needed to be broad enough to be relatively likely to occur and would cause negative outcomes to people, property or infrastructure.

Distinct categories are required when there are differences in the likelihood of where incidents occur (geographical location) and/or the consequences of an incident. For example, where fires occur is very different from where RTCs occur, and the outcomes of these incidents are also very different.

NFRS provided incident and response data for the period January 2011 to December 2020.

Incident Categories



Approach: People and Place Factors

In order to profile areas and identify characteristics in terms of their relationship to the likelihood of where incidents occur, ORH populated a database of all Lower Super Output Areas (LSOAs) with many datasets. This was mainly publicly available data at LSOA level but also data supplied by NFRS.

IMD
- Health
- Income
- Crime

Census
- Occupation
- Car Ownership
- Education

EPC
- Energy Rating
- Building Age
- Tenancy

ONS
- Population
- House Prices
- Council Tax Bands

Mosaic
- Population Characteristics
- Grand Index

Other Data
- Roads
- Geography
- Boundaries

Data Sources

Population Data: ORH used Office of National Statistics (ONS) data to calculate the population by age and gender.

Deprivation Data: Index of Multiple Deprivation (IMD) 2019 data (from the MCLHG) was used to quantify and rank many different characteristics of deprivation.

Road Network Data: ORH holds detailed road network mapping data (including speed limits, road types and length) sourced from HERE.

Housing Data: Housing data from ONS was used to determine household occupancy and the value of houses.

Council Tax Bands: Valuation Office Agency data was used to identify the number of properties in each council tax band and give further data on the distribution of house prices across Nottinghamshire.

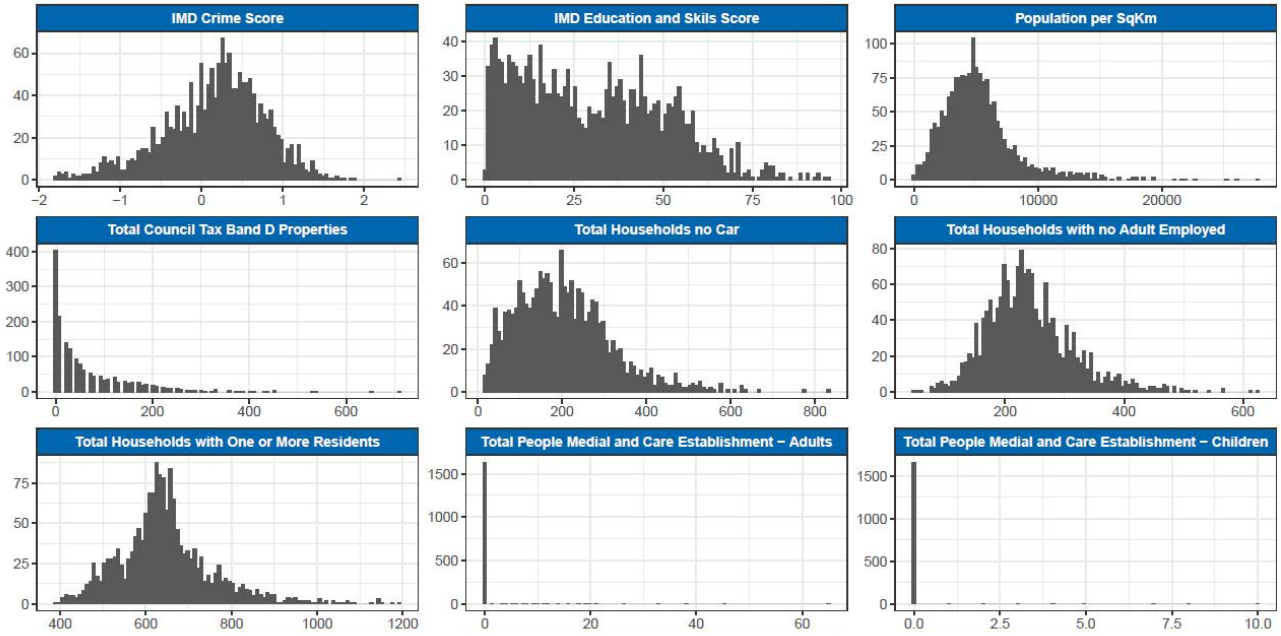
Domestic Building Data: ORH used Energy Performance Certificate (EPC) data from MCHLG to evaluate property characteristics. This data was only available for a proportion of properties.

Selecting Relevant Data Fields

ORH collated over 500 data fields into a single database to provide a detailed description of each LSOA in Nottinghamshire.

Before commencing the modelling, we analysed these fields to gain an understanding of how they fall within NFRS. We then removed irrelevant data, for example, highly correlated fields where two indicators describe something very similar, and skewed data (where almost all LSOAs had a common value).

In total, 160 data fields were taken forward to the statistical modelling.



Random Forest Models

ORH used Random Forest Modelling and statistical analysis to identify which factors are good indicators for each of the different risk categories.

Random Forest Models (RFMs) calculate a risk score by comparing historical incident demand levels and locations with many different combinations of base data variables.

With this comparison, the model determines relationships between variables and the demand pattern. Each variable is ranked based on its individual contribution, enabling the most important factors to be identified.

An area's final value is an aggregation of the individual variables; the modelling can quantify relationships, but not the characteristics that cause incidents.

An advantage of this approach is that if you can estimate how a factor in an area may change, you can identify how risk may be affected. This could especially be key to prevention and protection work.

Approach: Random Forest Model

The aim of the RFM was to predict the risk level of every LSOA in Nottinghamshire (as opposed to a precise number of incidents).

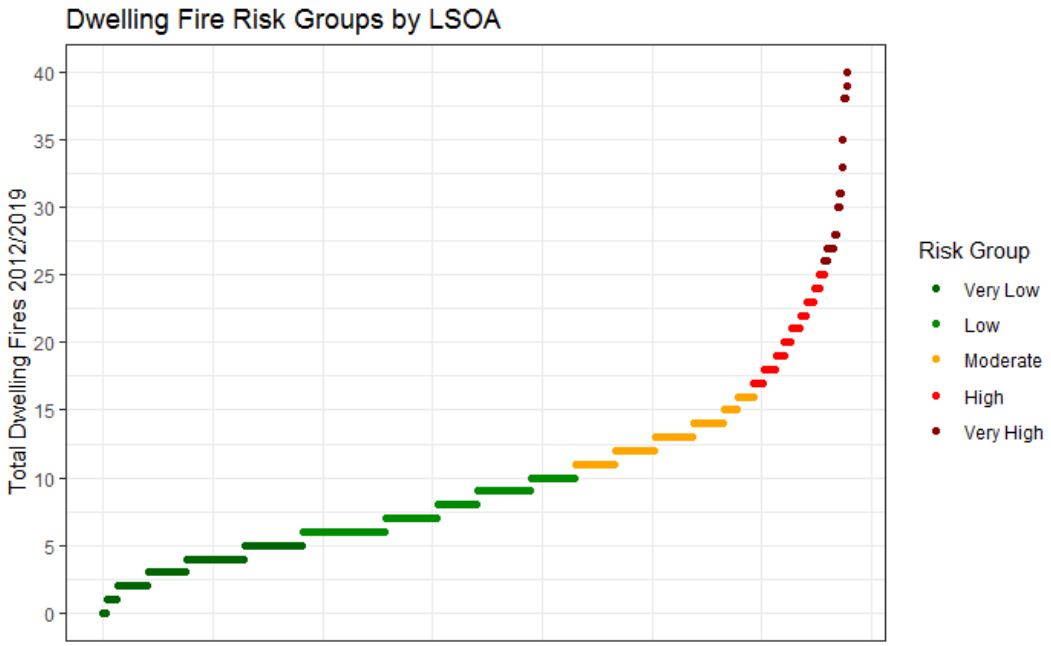
The principle was to use machine learning techniques to identify significant patterns within the data that enable us to establish which factors are most closely linked to risk:

- **Concept**: Form 'decision trees' to ask the most pertinent questions that define risk and add information at each step.
- **Model Setup**: We 'trained' the model using a sample of data (80% of LSOAs), using machine learning to identify best questions to ask. Following the sampling, the model was validated against the remaining 20% of LSOAs. This was repeated five times for completeness.
- **Outputs**: Predicted risk level by LSOA and key characteristics that contribute to risk.

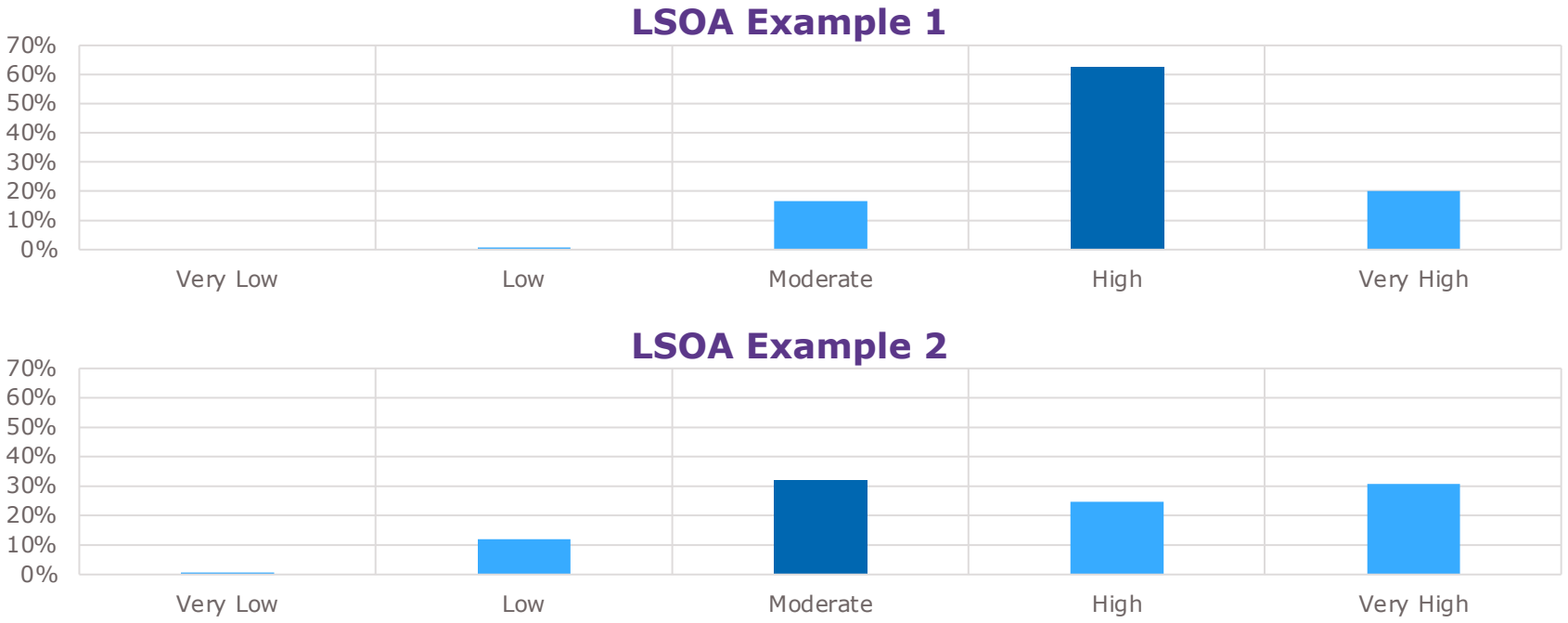
Clustering Data

For each incident type, ORH clustered the LSOAs in Nottinghamshire based on the number of incidents. This was conducted using a clustering algorithm to select appropriate groups.

The key objective of the RFM is to identify the key characteristics that LSOAs in a risk group share with each other, and the importance of these factors in predicting the level of risk.



Predicted Risk Levels



- The output of the RFM for each incident category is a prediction of the risk level for all LSOAs in NFRS, based on the set of characteristics identified as being the most important for classifying the level of risk.
- For each LSOA, a percentage chance is given for the risk group in which it is categorised. In some cases this is a clear result, but other LSOAs could fall into one of several risk groups. For validation, we compared the highest risk category with actual incident numbers.

‘Training’ the Model (Validation)

Samples of the LSOA data were used to train the model to identify what characteristics you might expect in a ‘very high’ to ‘very low’ risk LSOA. All LSOAs were then evaluated in this manner to verify that the model has learned the key characteristics.

The model gives each LSOA a percentage chance of being in each group, rather than an absolute decision. There is a good alignment between ‘actual’ and predicted risk by LSOA:

- For Dwelling Fires, 94% of LSOAs are in the same actual group or one category above or below

Confusion Matrix		Predicted Group				
		Very Low	Low	Moderate	High	Very High
Actual Group	Very Low	101	74	6	1	0
	Low	51	134	54	8	1
	Moderate	5	63	61	26	8
	High	0	4	40	12	8
	Very High	0	0	6	6	10

There is good alignment between ‘actual’ and predicted risk by LSOA; this provides confidence that the model can be used to identify which characteristics have the strongest relationship to incidents occurring.

Model Outputs

In the RFM, each characteristic is ranked based on the strength of its relationship to the risk measure. This allowed ORH to refine the model by discounting variables with a weak relationship to the historical incident pattern.

After removing these variables, the model was run for a second time to ensure that there was no significant loss to the explanatory power, and that the final group of variables accurately described the observed data.

Once the characteristics with the strongest relationship to the likelihood of incidents occurring were identified, they were combined to determine the risk score for that LSOA. Risk scores are presented relative to the highest risk LSOA for that incident/risk type.

The following sections are the outputs from the RFM, which aims to build a picture of risk through the combination of factors.

Full results are provided in a separate database for each incident category.

LSOA Results

- Full results are provided in separate databases of all LOSAs, covering:
  - A percentile grouping for each of the top ten variables
  - The number of historical incidents
  - The probability that the LSOA is Very Low to Very High risk and the most likely grouping for the LSOA
- For each potential risk factor, the LSOAs are clustered into groups (Top 1%, Top 5%, etc) based on their analysed value for this factor.
- Typically, where an LSOA has higher clusters for inputs, the LSOA will be higher risk. However, it is the combination of all these characteristics (not just the top ten) that produce the prediction of risk.
- Usually the LSOAs with the most incidents are predicted to be Very High or High risk. When this does not occur, it can be because:
  - There was one year in the sample with an extraordinary peak in incidents
  - The LSOA shares characteristics with a lower risk group

Dwelling Fires

Dwelling Fires
Variable Importance

- The most important factor for predicting the category of Very Low to Very High risk is the *Number of Households with no car/Van.*
- For most variables, a higher value would suggest a higher level of risk, but this is not always the case; for example, where the percentage of households who own their house is a lower percentage, this may indicate that the risk is higher. Importantly, these are not always linear relationships between the variables and the level of risk.
- Most of the top factors are in some way linked to deprivation, which is not surprising, although there are some factors around the built environment; for example, *properties with EPC F/G ratings, 1950-75 construction and number of flats*.
- To target prevention, ideally it will be finding the people/places where these data points overlap.

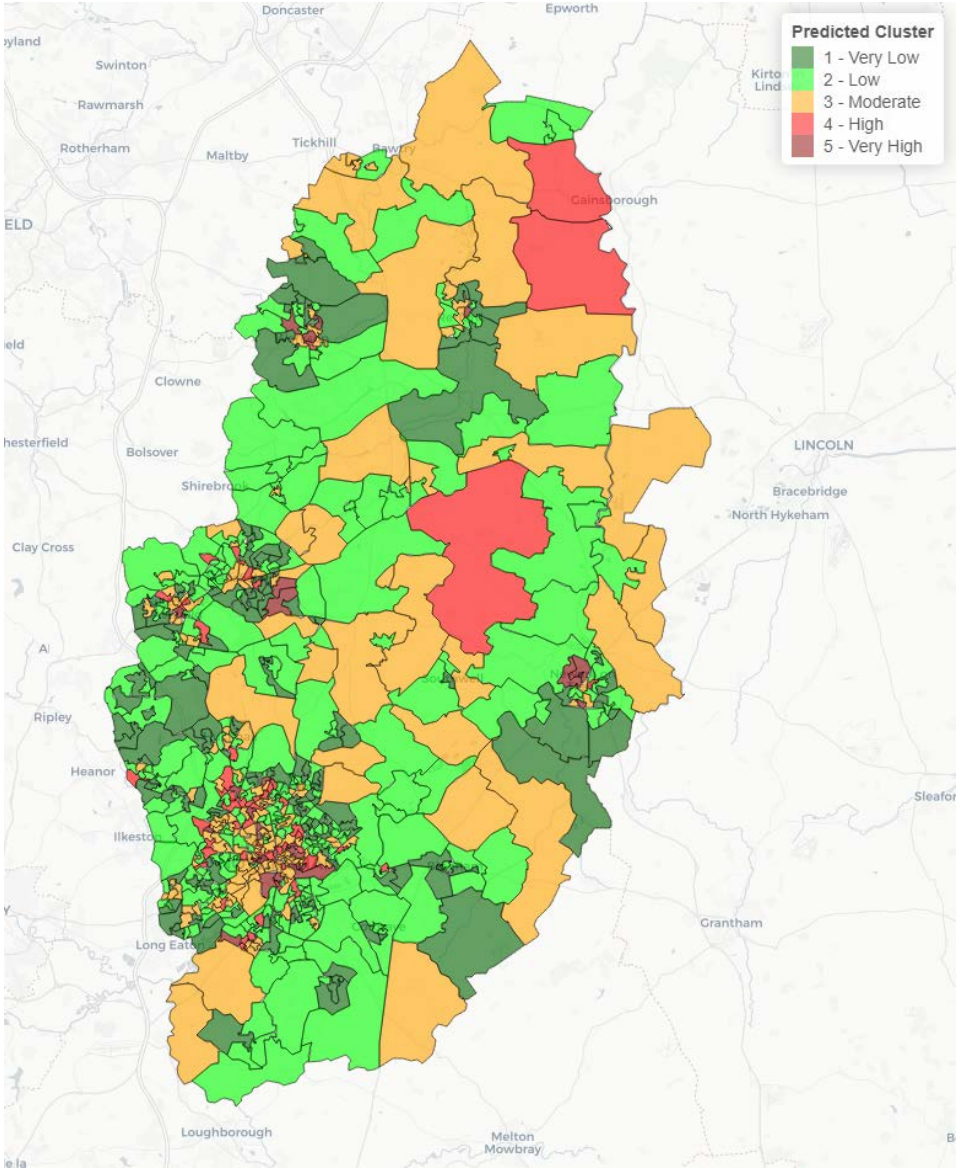
Dwelling Fires
Top 10 Risk Factors

Short Name	Relative Importance	Relationship	Origin
Households with no car/van	100.00%	Positive	Census
% Households who own/share own	93.06%	Negative	Census
Income deprivation affecting older people	59.23%	Positive	IMD
Occupancy room rating - fewer rooms than required	56.42%	Positive	Census
People & family household composition fine multi occupancy dwelling	54.61%	Positive	Mosaic
Work transport to work bus tram	49.25%	Positive	Mosaic
Number of households with no adults in employment	48.29%	Positive	Census
% Households - social renting	45.93%	Positive	Census
Number of flats	45.44%	Positive	Census
Households Council Tax Band A	41.69%	Positive	Valuation Office

The model has evaluated 100s of potential risk factors.
These are the top 10 that it identified as giving the most accurate prediction of the risk of dwelling fires within an LSOA.

Dwelling Fires

Predicted Risk Cluster



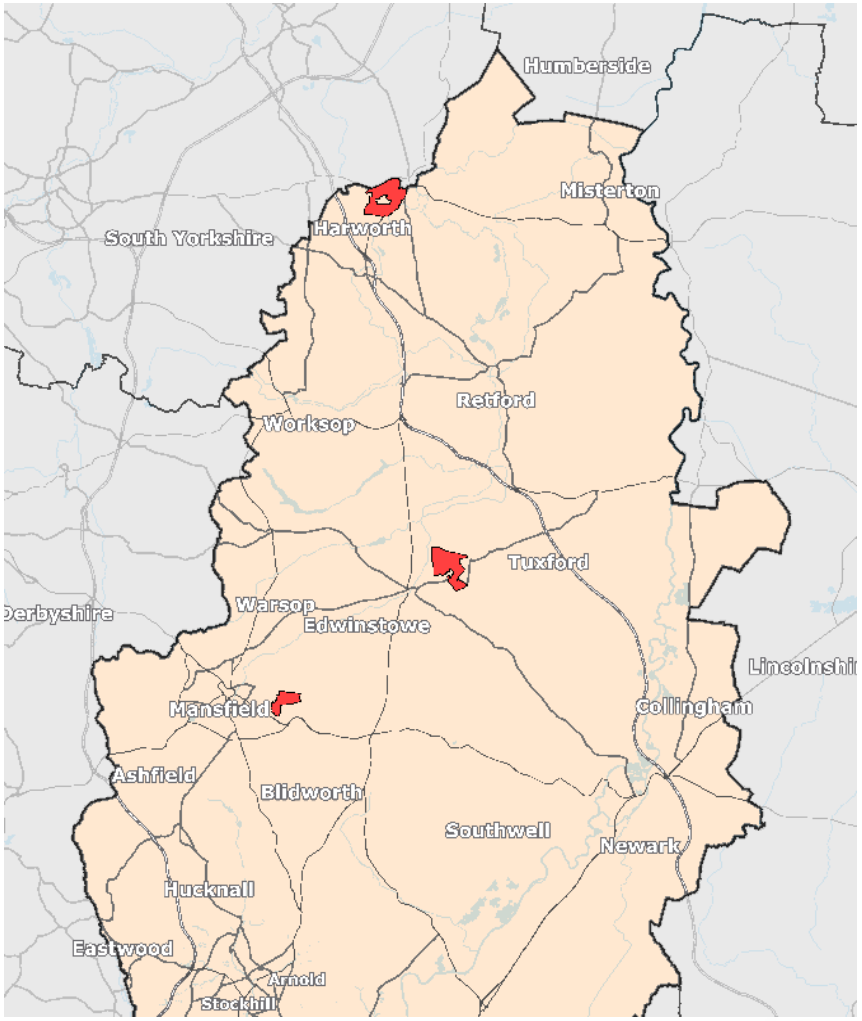
- Using the top ranked risk variables, the model predicts the risk level in each LSOA.
- This map summarises the output in terms of whether each LSOA is most likely to be Very Low to Very High risk.

Note: This map shows the total risk in an LSOA, not the risk density. LSOAs vary in geographical area (each LSOA has an average population of 1,500, or 650 households).

Outdoor Fires

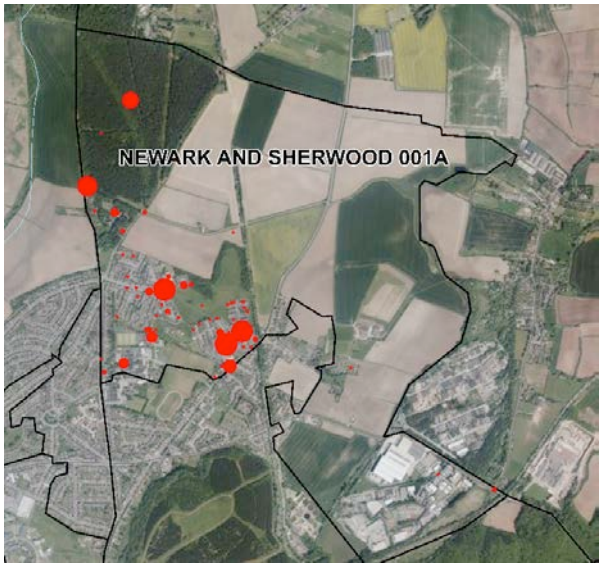
Outdoor Fires
Variable Importance

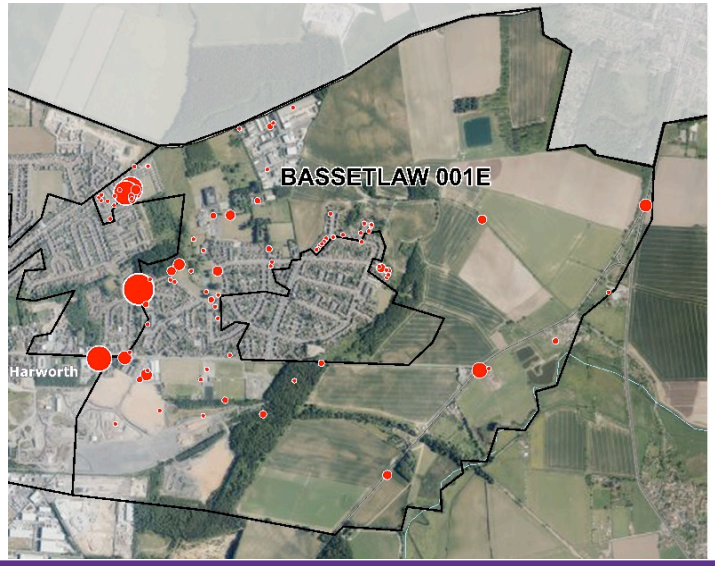
- The most important factor for predicting the category of Very Low to Very High risk is the *Crime Score.*
- Three LSOAs (highlighted opposite) were removed from the risk assessment as they were outliers in terms of the number of incidents during the sample.

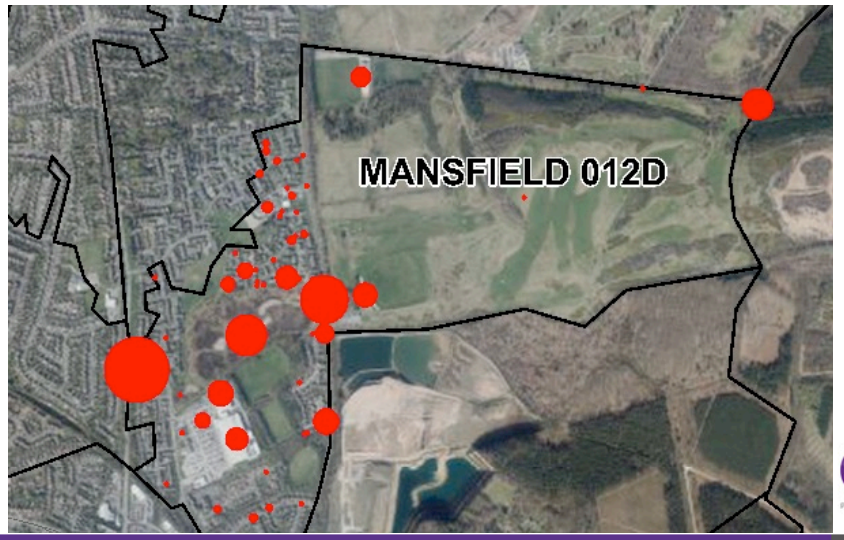


Outdoor Fires
Outliers

- These three LSOAs were removed from the risk assessment as they were outliers in terms of a significantly greater number of incidents during the sample compared to other LSOAs.





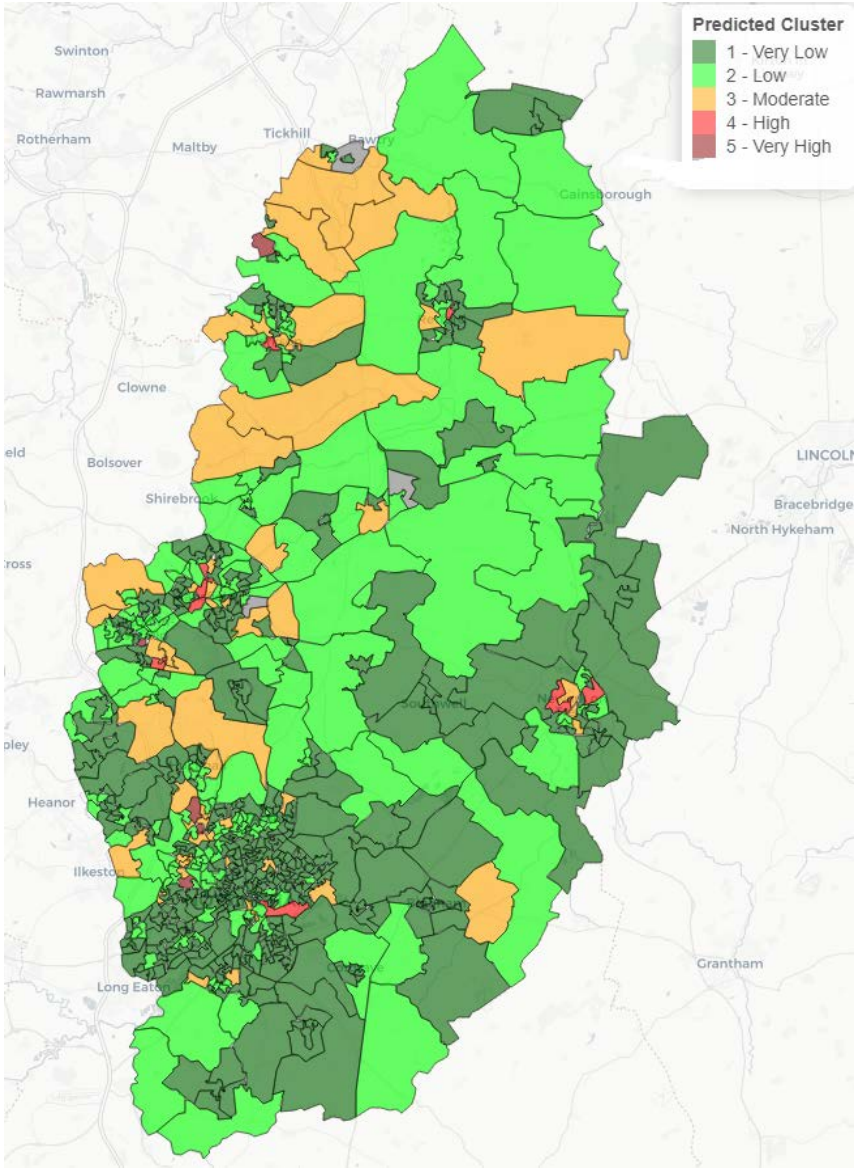


Outdoor Fires
Top 10 Risk Factors

Short Name	Relative Importance	Relationship	Origin
Crime score	100.00%	Positive	IMD
Health deprivation & disability score	86.36%	Positive	IMD
No qualifications	83.12%	Positive	Census
All bad health	76.35%	Positive	Census
Streets length km	70.18%	Positive	HERE
Occupation 2 professional occupations	70.13%	Negative	NOMIS
Education skills and training score	66.63%	Positive	IMD
Number of households with no adults in employment	66.03%	Positive	Census
Area sq km	65.78%	Positive	ONS
Population per sq km	65.11%	Negative	Census

Outdoor Fires

Predicted Risk Cluster



- Using the top ranked risk variables, the model predicts the risk level in each LSOA.
- This map summarises the output in terms of whether each LSOA is most likely to be Very Low to Very High risk.
- Most of the highest risk LSOAs are in urban areas.

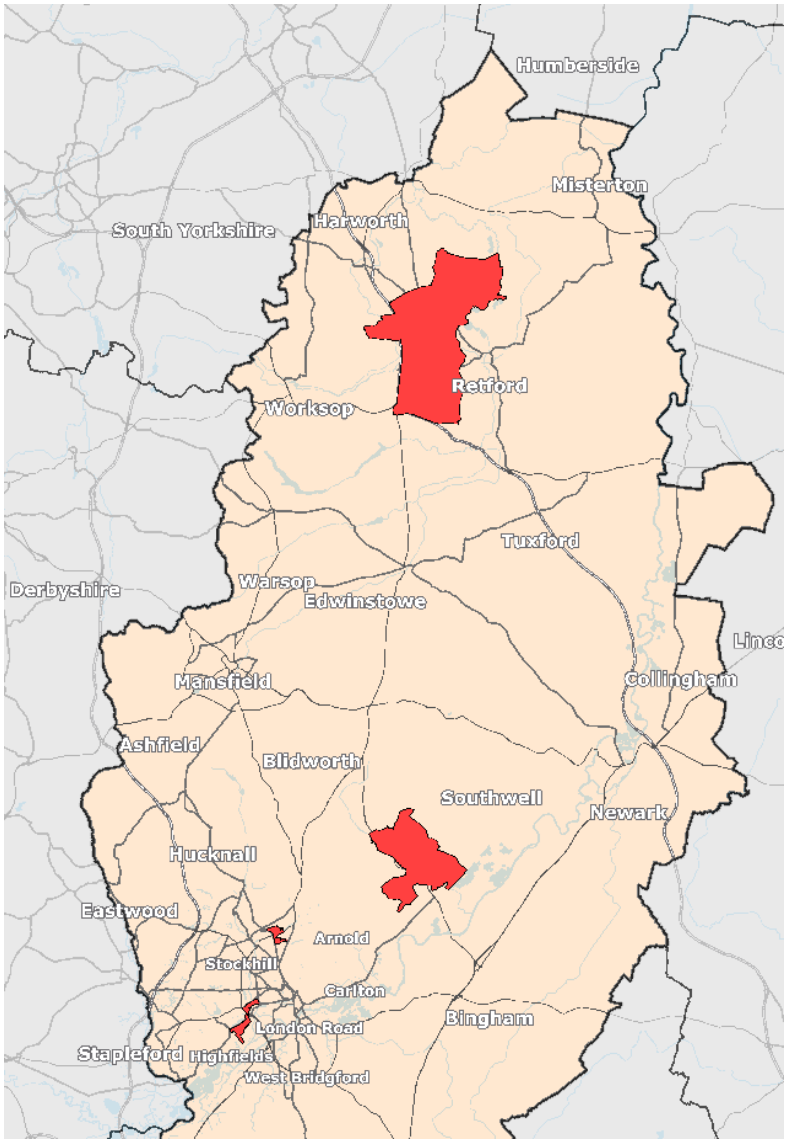
Non-Residential Fires

Non-Residential Fires
Variable Importance

- The most important factor for predicting the category of Very Low to Very High risk is the *Number of Fulltime Employees (2019).*
- Other highly ranked variables include factors related to sectors of industry:
  - Hospitality Services
  - Wholesale and Retail
  - Shops and Other Retail Outlets
  - Office and Administration
- There are plenty of data sources that relate to people and dwellings, but less information was available on other factors on the built environment, businesses, etc.
- The model's predicted risk levels are less confident for non-residential fires compared to dwelling fires.

Non-residential Fires

Outliers



- Four LSOAs were removed from the risk assessment as they were outliers in terms of the number of incidents during the sample.
- These were LOSAs which include the following locations where a high number of incidents occurred:
  - HMP Ranby
  - HMP Lowdham Grange
  - HMP Nottingham and Nottingham City Hospital
  - Queens Medical Centre Hospitals

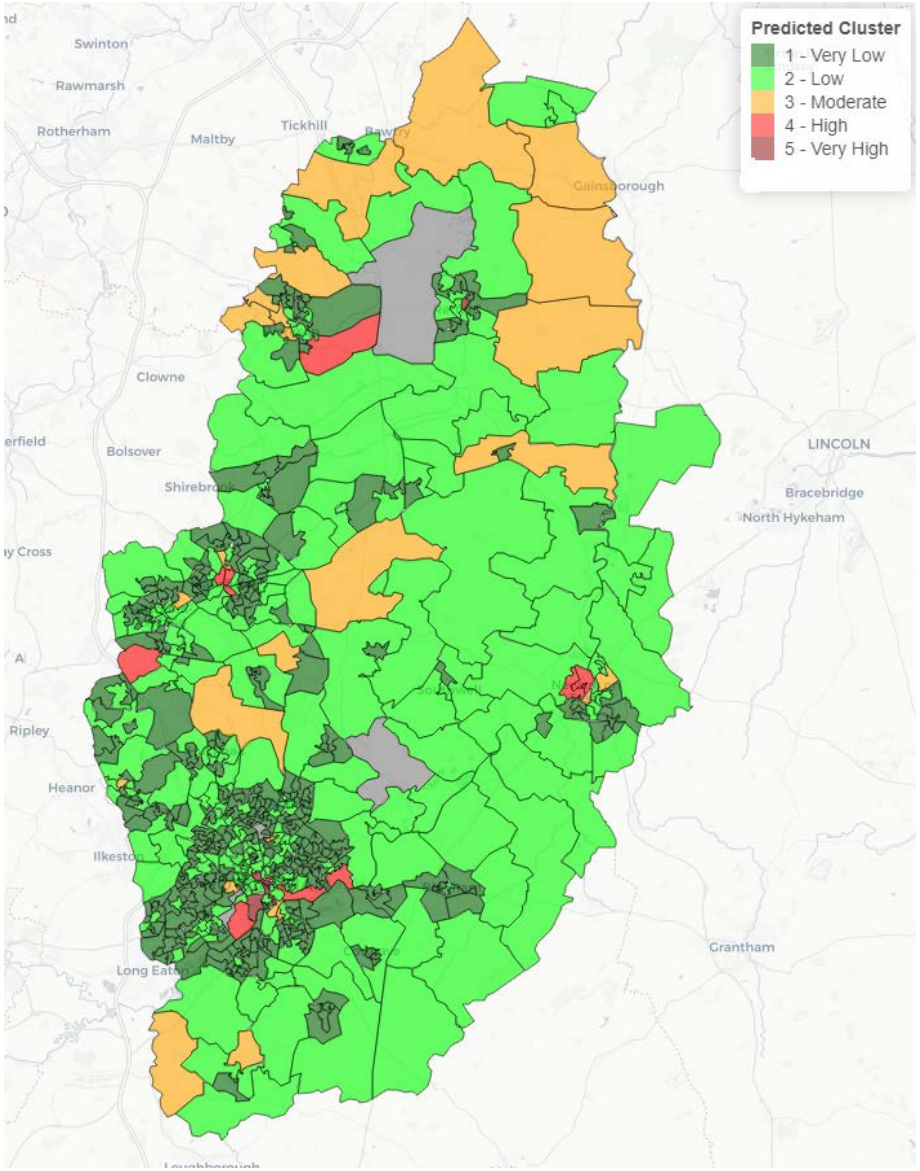
Non-Residential Fires

Top 10 Risk Factors

Short Name	Relative Importance	Relationship	Origin
Full time employees 2019	100.00%	Positive	Census
Part time employees 2019	89.16%	Positive	Mosaic
I Hospitality Services	45.20%	Positive	Experian
G Wholesale and Retail	41.49%	Positive	Experian
Shops and other Retail Outlets	37.03%	Positive	Experian
Office and Administration	36.01%	Positive	NOMIS
Constructed 1950 1975	27.57%	Negative	EPC Data
StreetsLength Km	27.37%	Positive	HERE
Indoors Sub-domain Score	25.50%	Positive	IMD
Factories and Manufacturing	23.51%	Positive	Mosaic

Non-Residential Fire

Predicted Risk Cluster



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- This map summarises the output in terms of whether each LSOA is most likely to be Very Low to Very High risk.
- Most of the highest risk LSOAs are in urban areas.

Other Residential Fires

Other Residential Fires
Variable Importance

- The most important factor for predicting the category of Very Low to Very High risk is the *People & Family Household composition Family Plus other adults* from Mosaic data.

- Factors associated with Health deprivation are also highly ranked factors.

- The model's predicted risk levels are less confident for other residential fires compared to dwelling fires.

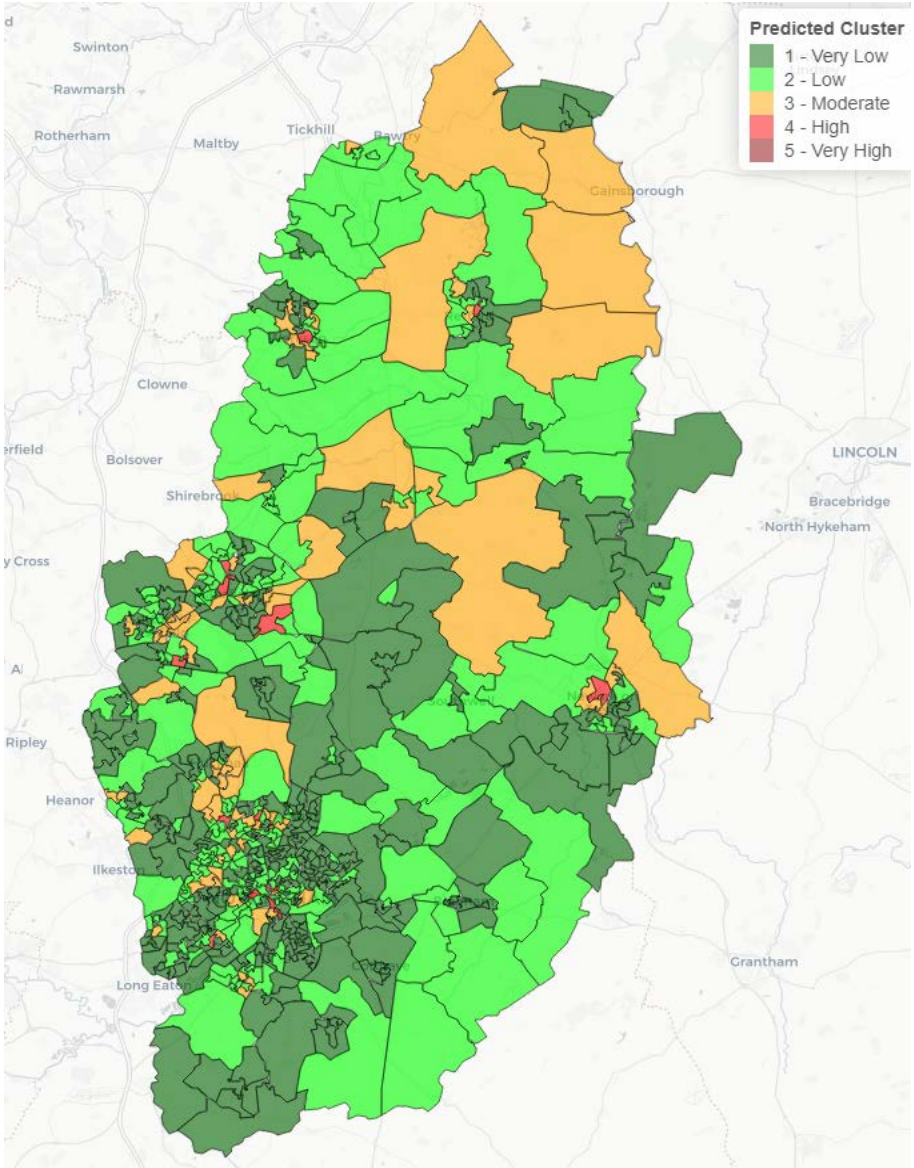
Other Residential Fires

Top 10 Risk Factors

Short Name	Relative Importance	Relationship	Origin
People & Family Household composition Family Plus other adults	100.00%	Positive	Mosaic
Health Deprivation & Disability Score	85.82%	Positive	IMD
Frailty Group3	83.88%	Positive	Exeter
% Population 16+ highest qualification Level3	83.74%	Positive	Census
Households Council Tax Band A	81.45%	Positive	Valuation Office
All Bad health	80.89%	Positive	Census
BH AbsHMax group 30to60	78.61%	Positive	Gazetteer
Number of Flats	77.81%	Positive	Census
Occupation 9 Elementary occupations	72.86%	Positive	NOMIS
Full time employees 2019	72.09%	Positive	Census

Other Residential Fire

Predicted Risk Cluster



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- This map summarises the output in terms of whether each LSOA is most likely to be Very Low to Very High risk.
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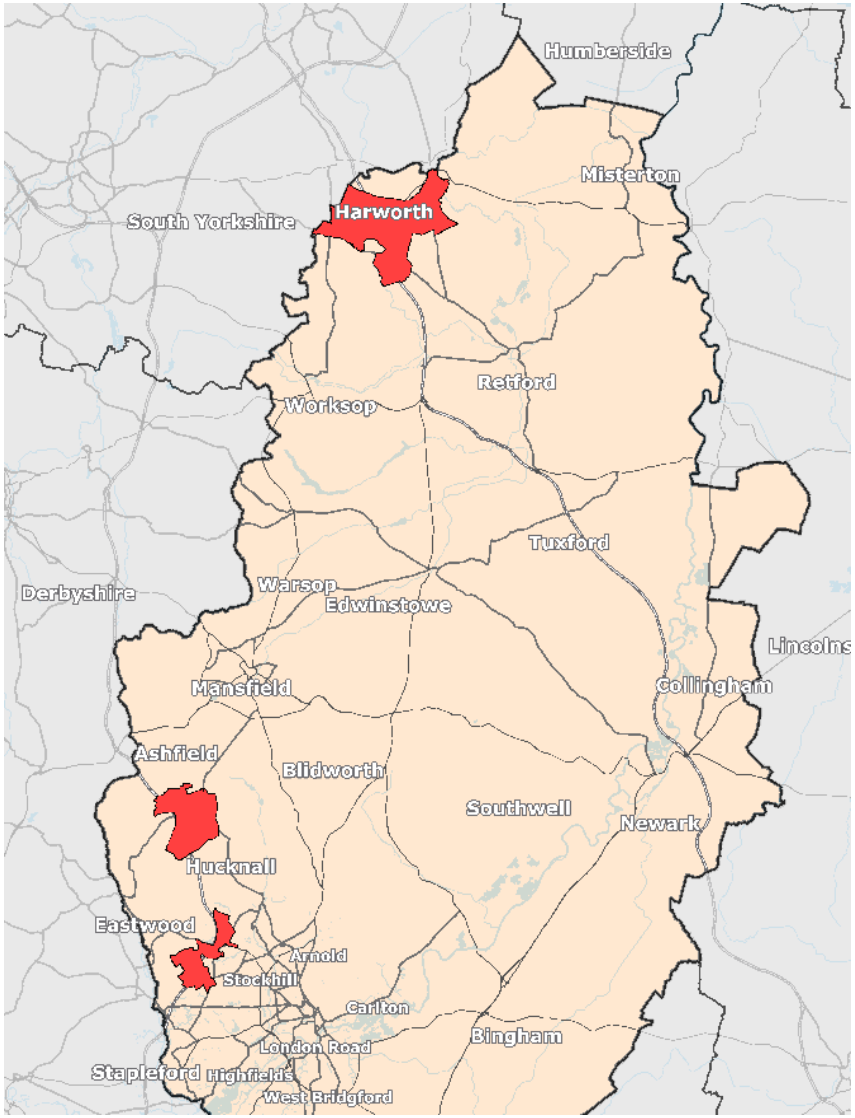
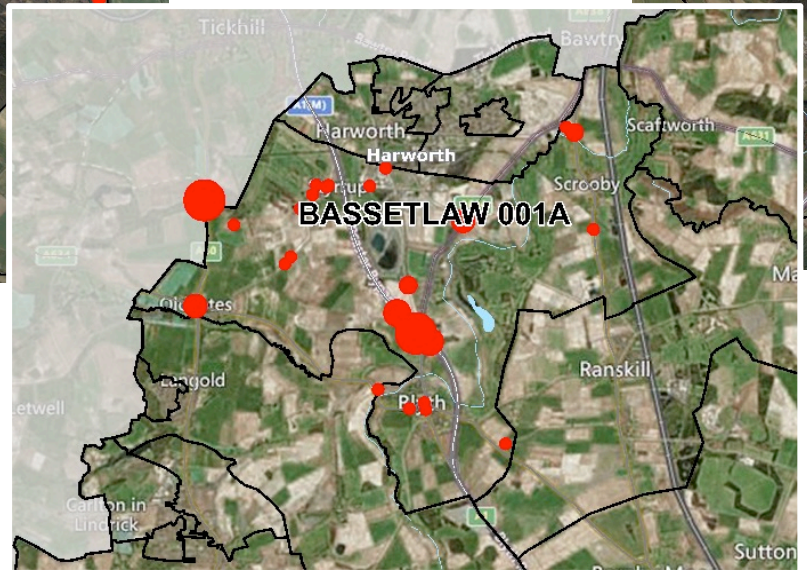
Vehicle Fires

Vehicle Fires
Variable Importance



- The most important factor for predicting the category of Very Low to Very High risk is the *Total Street Length (km)* combined in the LSOA.
- Area and Population are also important variables, however there are some demographic factors in the top ten variables:
  - No Qualifications
  - Crime Score
- Three LSOAs were removed from the risk assessment as they were outliers in terms of the number of incidents during the sample.

Vehicle Fires
Outliers



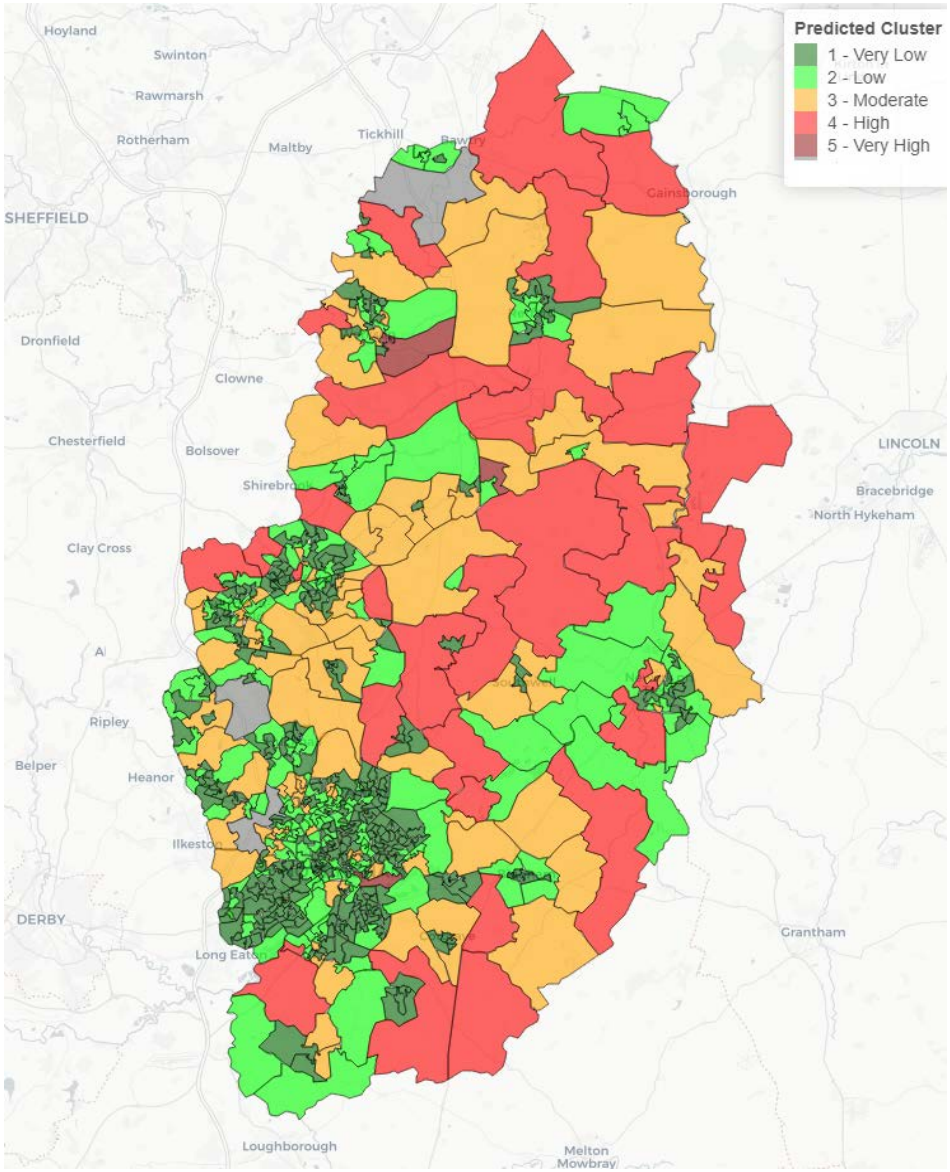
Vehicle Fire Risk

Top 10 Risk Factors

Short Name	Relative Importance	Relationship	Origin
StreetsLength Km	100.00%	Positive	HERE
Area sqKm	78.61%	Positive	ONS
PopPerSqKm	66.06%	Negative	Census
No qualifications	61.56%	Positive	Census
MajHwyLength Km	56.30%	Positive	HERE
Full time employees 2019	49.98%	Positive	Census
% Population 16+ highest qualification Level3	46.28%	Negative	Census
Crime Score	42.21%	Positive	IMD
% Population 16+ highest qualification Level 4 and above	39.60%	Negative	Census
All Bad health	36.30%	Positive	Census

Vehicle Fires

Predicted Risk Cluster



- Using the top ranked risk variables, the model predicts the risk level in each LSOA.
- This map summarises the output in terms of whether each LSOA is most likely to be Very Low to Very High risk.
- Most of the highest risk LSOAs are in rural areas.

RTCs

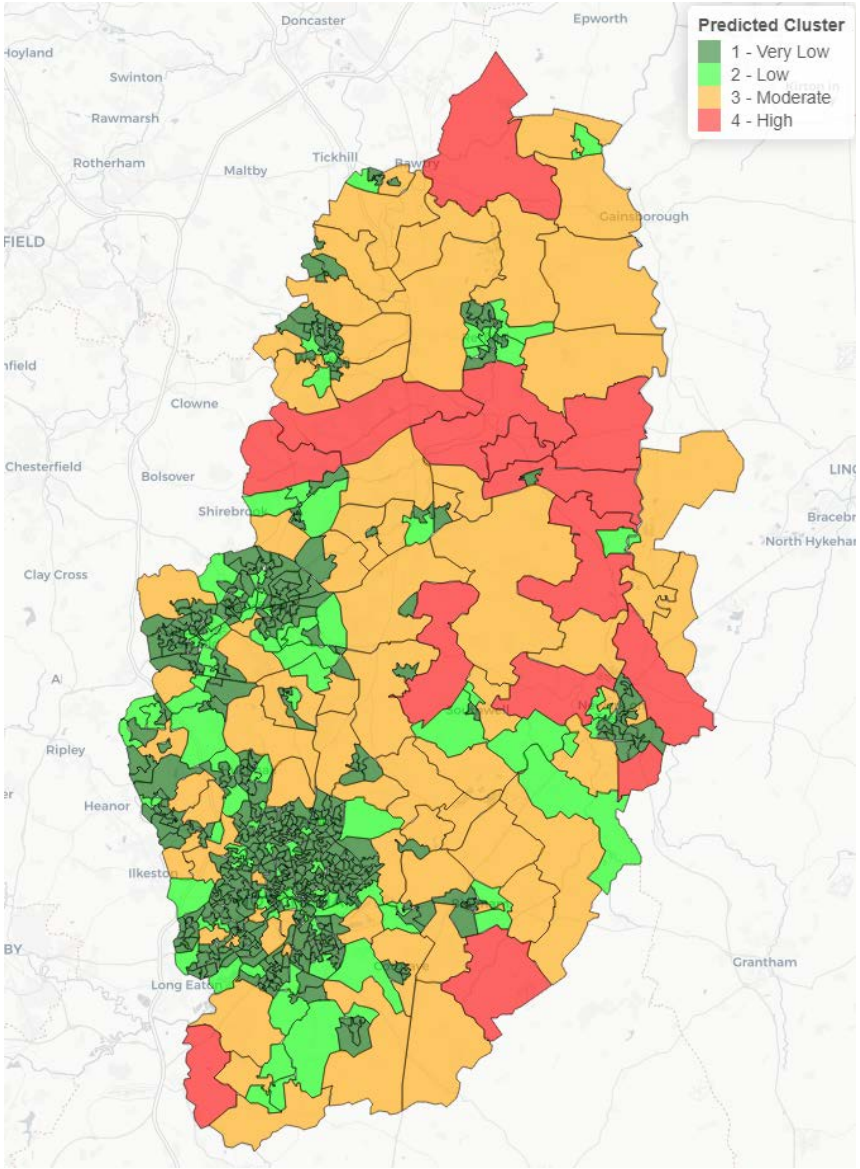
RTCs: Variable Importance

- As with vehicle fires, the most important factor for predicting the category of Very Low to Very High risk for RTCs is the *Total Street Length (km).*
- Other geographical and population variables are of importance.
- The assessment of RTCs was based on the LSOA in which the RTC occurred.
- Stats19 data for the home locations of persons involved in RTCs was not available for Nottinghamshire; this would be a potential improvement to the assessment of RTC risk.

RTCs: Top 10 Risk Factors

Short Name	Relative Importance	Relationship	Origin
StreetsLength Km	100.00%	Positive	HERE
MajHwyLength Km	96.67%	Positive	HERE
Area sqKm	79.22%	Positive	ONS
Population Per SqKm	65.94%	Negative	Census
Primary Route Length Km	42.45%	Positive	Census
Full time employees 2019	38.30%	Positive	Census
A Country Living	36.83%	Positive	Mosaic
Mosaic Money Affluence	33.83%	Positive	Mosaic
Geographical Barriers Sub-domain Score	31.88%	Positive	IMD
All categories Long term health problem or disability	31.19%	Positive	Census

RTCs: Predicted Risk Cluster



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- Most of the highest risk LSOAs are in rural areas.

UPRN Level Dwelling Fire Risk

UPRN Approach

In addition to assessing risk at LSOA level, ORH used a similar approach to defining risk at Unique Property Reference Number (UPRN) level.

At UPRN level there are a limited number of relevant and usable data sources, but the following were used:

- Mosaic Grand Index – Probabilistic information about the residents of the property
- Mosaic data – Information about the LSOA of the property.
- Exeter data
- EPC/Gazetteer – information about the property itself

These datasets were linked together using the UPRN to provide a detailed description of each domestic property and its surrounding area. The incident data provided by NFRS identifies the UPRN where the incident occurred.

Dwelling Fires – UPRN Level
Variable Importance

- The most important factor for predicting the resulting risk is the *Construction Period,* with properties constructed from the late 1960s to the early 1990s at greater risk than other properties.

- A number of factors from the EPC data are some of those that are top-ranked. These factors are known information about a property as opposed to probabilistic information from Mosaic.

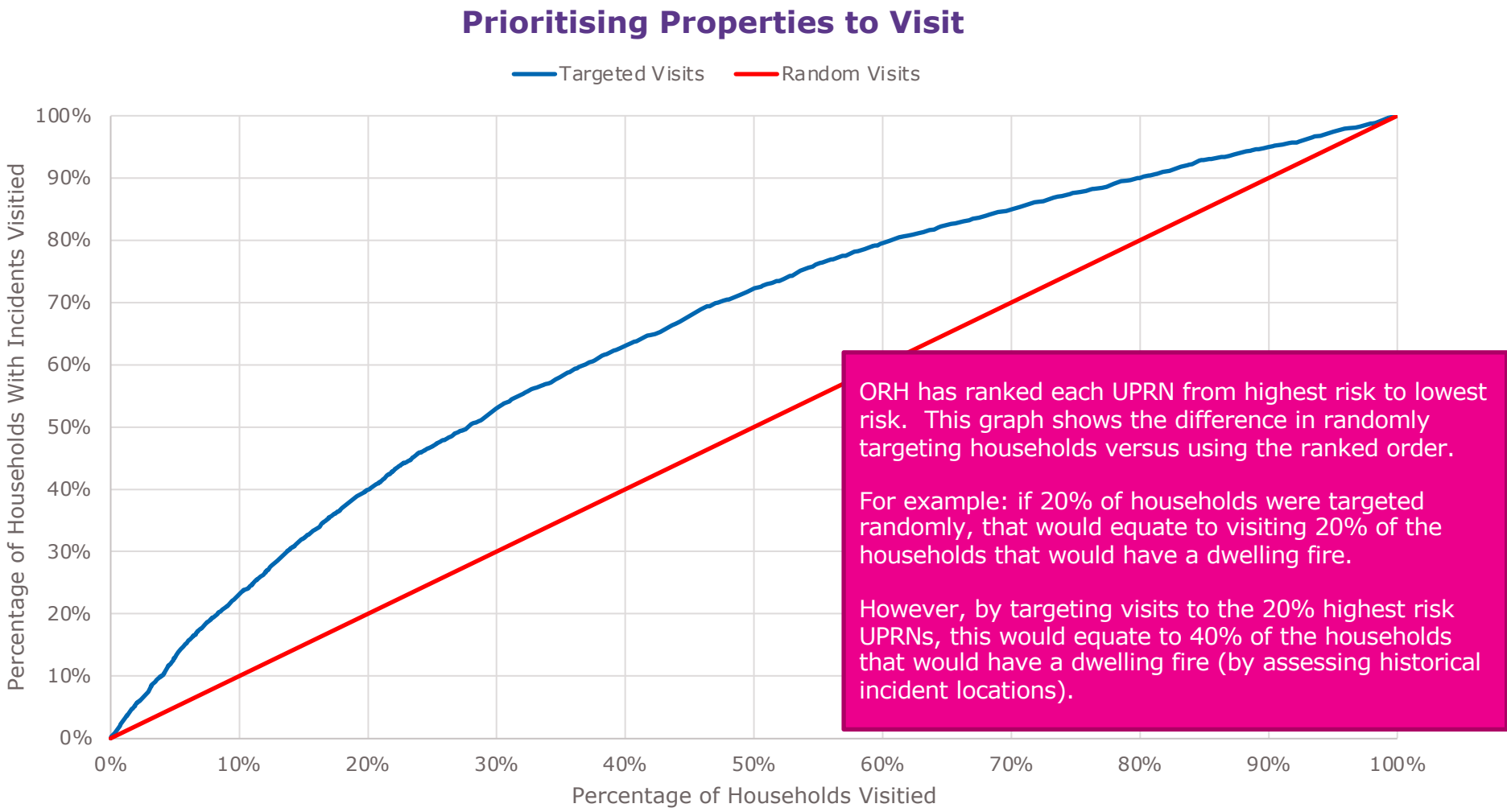
- ORH has ranked each UPRN from highest risk to lowest risk.

- If known information about a property or its inhabitants was to become available (for example, if NFRS are in receipt of a referral), NFRS should still target these appropriately.

Dwelling Fires – UPRN Risk Factors

Indicator	Influence	Data Source
Construction Period	Late 60s to Early 90s	EPC
EPC Energy Rating	G/F/B	EPC
Property Type	Flats	EPC
In Receipt of Housing Benefit	Positive	MOSAIC
Affluence Score	Negative	MOSAIC
Social Grade D/E	Positive	MOSAIC
Has Private Medical Insurance	Negative	MOSAIC
Does not Exercise	Positive	MOSAIC
SEC 3 Intermediate	Negative	MOSAIC
Council or Housing Assosiation Resident	Positive	MOSAIC
Socail Grade A/B	Negative	MOSAIC
Difficult to live on Present Income	Positive	MOSAIC
In Receipt of Council Tax Benefit	Positive	MOSAIC
Drank Alcohol in the Previous 12 Months	Negative	MOSAIC
Mean Residential Property Value	Negative	MOSAIC
SEC 2 Lower Managerial Admin and Professional	Negative	MOSAIC
Social Grade C1	Negative	MOSAIC
Day to Day Activities Limited a Lot	Positive	MOSAIC
IMD	Positive	MHCLG
University Degree or Higher	Negative	MOSAIC
In Receipt of Pensiion Credit	Positive	MOSAIC
In Receipt of ESA	Positive	MOSAIC
Mean Household Income	Negative	MOSAIC
Smoked e-Cigarette in Previous 12 Months	Positive	MOSAIC
Length of Residency Between 1 and 3 Years	Positive	MOSAIC
Length of Residency > 11 Years	Negative	MOSAIC
Length of Residency < 1 Year	Positive	MOSAIC
Renting	Negative	MOSAIC
Length of Residency Between 4 and 10 Years	Positive	MOSAIC
Smoker	Positive	MOSAIC
IMD Education	Positive	MHCLG

Dwelling Fires – UPRN Risk



ORH has ranked each UPRN from highest risk to lowest risk. This graph shows the difference in randomly targeting households versus using the ranked order.

For example: if 20% of households were targeted randomly, that would equate to visiting 20% of the households that would have a dwelling fire.

However, by targeting visits to the 20% highest risk UPRNs, this would equate to 40% of the households that would have a dwelling fire (by assessing historical incident locations).

Dwelling Fires – UPRN Summary

The model identified key risk factors associated with the occurrence of dwelling fires. These relate to the home, its inhabitants and the local environment.

Mosaic information is presented as probabilities. When concrete information exists about a property/individual, the key factors can be used as a checklist.

Using this approach, visits can be targeted towards riskier properties and individuals, minimising redundancy.

However, if definitive information becomes available about a person or property, these can be targeted appropriately.

The model score for each property has been provided to NFRS separately.

Severity

Incident Severity Approach

A Random Forest Model was unable to find significant links between descriptive information about an incident and different measures of outcomes.

Much of the descriptive information at incident level is similar regardless of the incident outcome.

As an alternative, a narrower statistical model was used to discover the significant links between the following descriptive factors and measures of severity (and whether a significant link was found):

Cause	Outcome	
	Casualty	Fire Spread
Ignition Cause	Significant	Not-Significant
Motive	Significant	Significant
Mosaic Indicators	Not-Significant	Not-Significant
Response Time	Not-Significant	Not-Significant

Dwelling Fire – Severity

Casualty Source of Ignition

Source of Ignition	No Casualty	Casualty	Total Incidents	Proportion of Incidents With Casualty	Statistically Significant Difference
Cooking Appliance	928	154	1,082	16.59%	No
Electric Lighting	53	4	57	7.55%	No
Electricity Supply	369	32	401	8.67%	Yes
Fuel or Chemical Related	54	5	59	9.26%	No
Heating Equipment	120	22	142	18.33%	No
Matches and Candles	147	53	200	36.05%	Yes
Naked Flame	156	34	190	21.79%	No
Other	322	41	363	12.73%	No
Other Domestic Style Appliance	242	32	274	13.22%	No
Smoking Related	207	64	271	30.92%	Yes
Spread from Secondary Fire	52	-	52	0.00%	Yes
Total	**2,650**	**441**	**3,091**	**16.64%**	**Reference**

16.64% of all incidents resulted in a casualty.

Incidents with smoking or matches and candles as the source of ignition are more likely to result in a casualty. These differences are significant.

Dwelling Fire – Severity

Casualty Motive

Motive	No Casualty	Casualty	Total Incidents	Proportion of Incidents With Casualty	Statistically Significant Difference
Accidental	2,283	366	2,649	16.03%	Reference
Deliberate	367	75	442	20.44%	Yes
Total	**2,650**	**441**	**3,091**	**16.64%**	**N/A**

Deliberate fires are more likely to result in a casualty than accidental fires.

The difference is statistically significant.

Dwelling Fire – Severity

Fire Spread Motive

Motive	No Fire Spread	Fire Spread	Total Incidents	Proportion of Incidents Where fire Spread	Statistically Significant Difference
Accidental	2,157	492	2,649	22.81%	Reference
Deliberate	268	174	442	64.93%	Yes
Total	**2,425**	**666**	**3,091**	**27.46%**	**N/A**

Deliberate fires are more likely to spread than accidental fires.

The difference is statistically significant.

Risk Assessment: Summary

ORH analysed the historical profile of incident types for the ten years (as agreed with NFRS) to use for risk modelling.

We collated data from many sources to build a database of potential risk factors by LSOA, selecting 160 relevant fields from over 500 available.

The next step involved using machine learning techniques to build a *random forest model* for predicting risk level by LSOA for dwelling fires.

Through this process we identified the most important factors in determining the risk of dwelling fires and the level of risk in each LSOA. Variables related to deprivation were typically of most importance.

This process was also undertaken for other incident types.

ORH has ranked each UPRN from highest risk to lowest risk for dwelling fires.

Deliberate fires are shown to have a statistically significant impact on the consequence of an incident, in terms of the likelihood of fire spread and casualties.

Additional data sources, particularly on non-residential buildings, would provide more depth to some incident categories.

Future Approach: Additional Data

In terms of future enhancements, it is noted that:

- Data from the 2021 Census will be available in the next couple of years; this will provide updated data for some of the analysis included in this report and potentially new data fields.

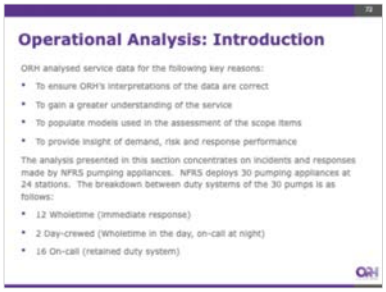
- Stats19 data for the home locations of drivers involved in RTCs was not available for Nottinghamshire; this would be a potential improvement to the assessment of RTC risk.

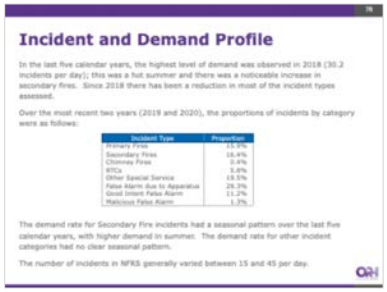
- There was limited data available on commercial buildings across Nottinghamshire; if this could be provided by local authorities it would improve the approach for non-domestic incidents. Additionally, a UPRN level approach could be used if there was a greater level of information available about commercial buildings.

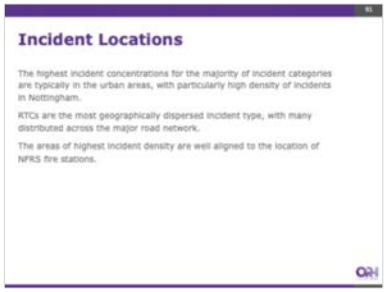
Operational Analysis

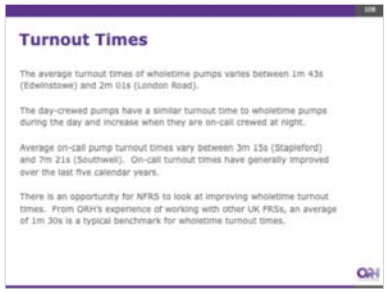
Document Navigation

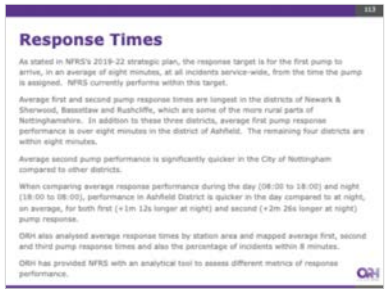
Within this section

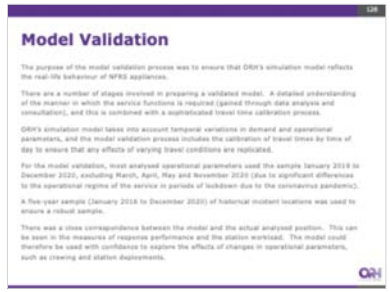












Other Main Sections

Operational Analysis: Introduction

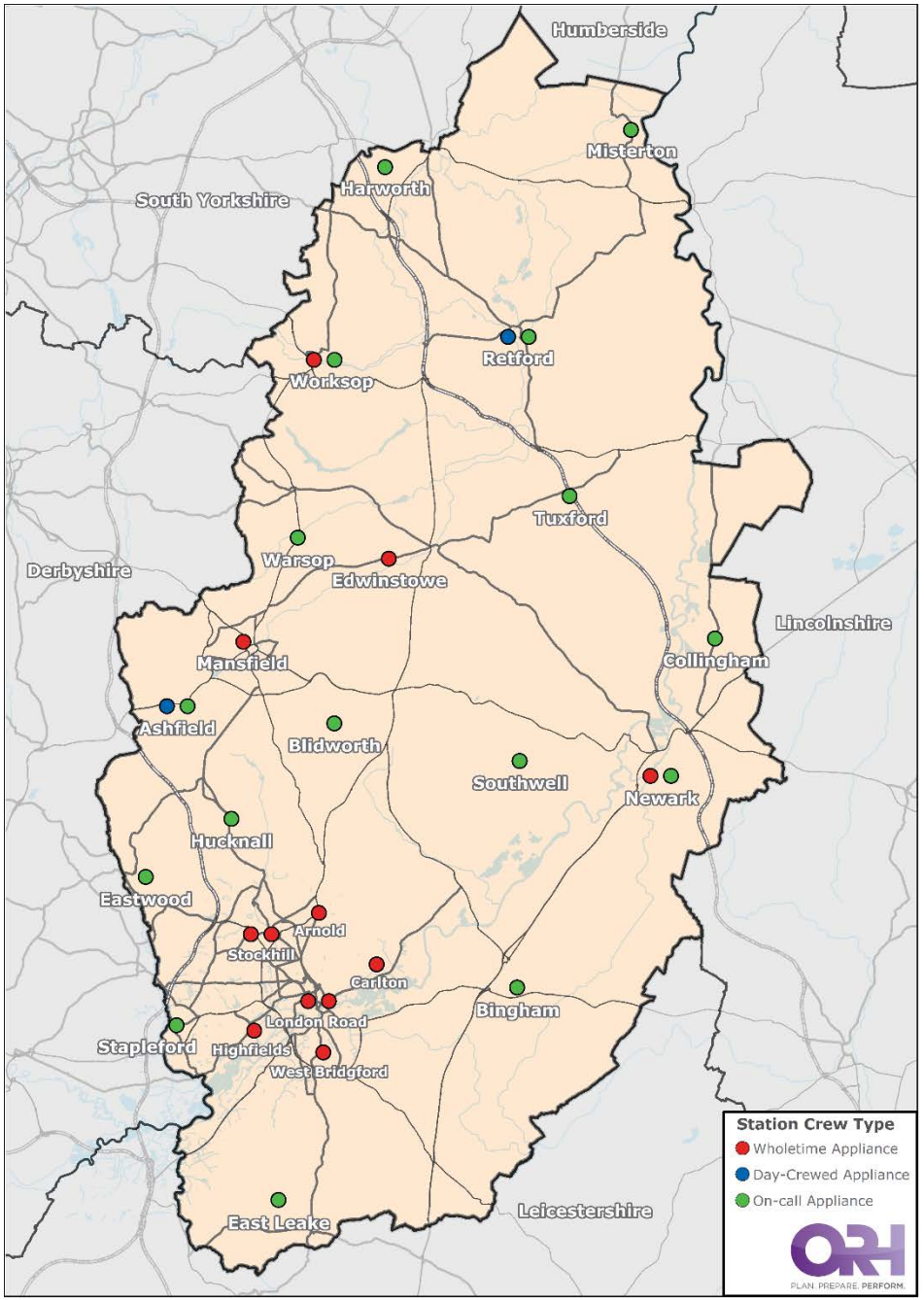
ORH analysed service data for the following key reasons:

- To ensure ORH's interpretations of the data are correct
- To gain a greater understanding of the service
- To populate models used in the assessment of the scope items
- To provide insight of demand, risk and response performance

The analysis presented in this section concentrates on incidents and responses made by NFRS pumping appliances. NFRS deploys 30 pumping appliances at 24 stations. The breakdown between duty systems of the 30 pumps is as follows:

- 12 Wholetime (immediate response)
- 2 Day-crewed (Wholetime in the day, on-call at night)
- 16 On-call (retained duty system)

Station Locations and Pumping Appliance Deployments



Operational Data

NFRS provided incident, response and appliance availability data.

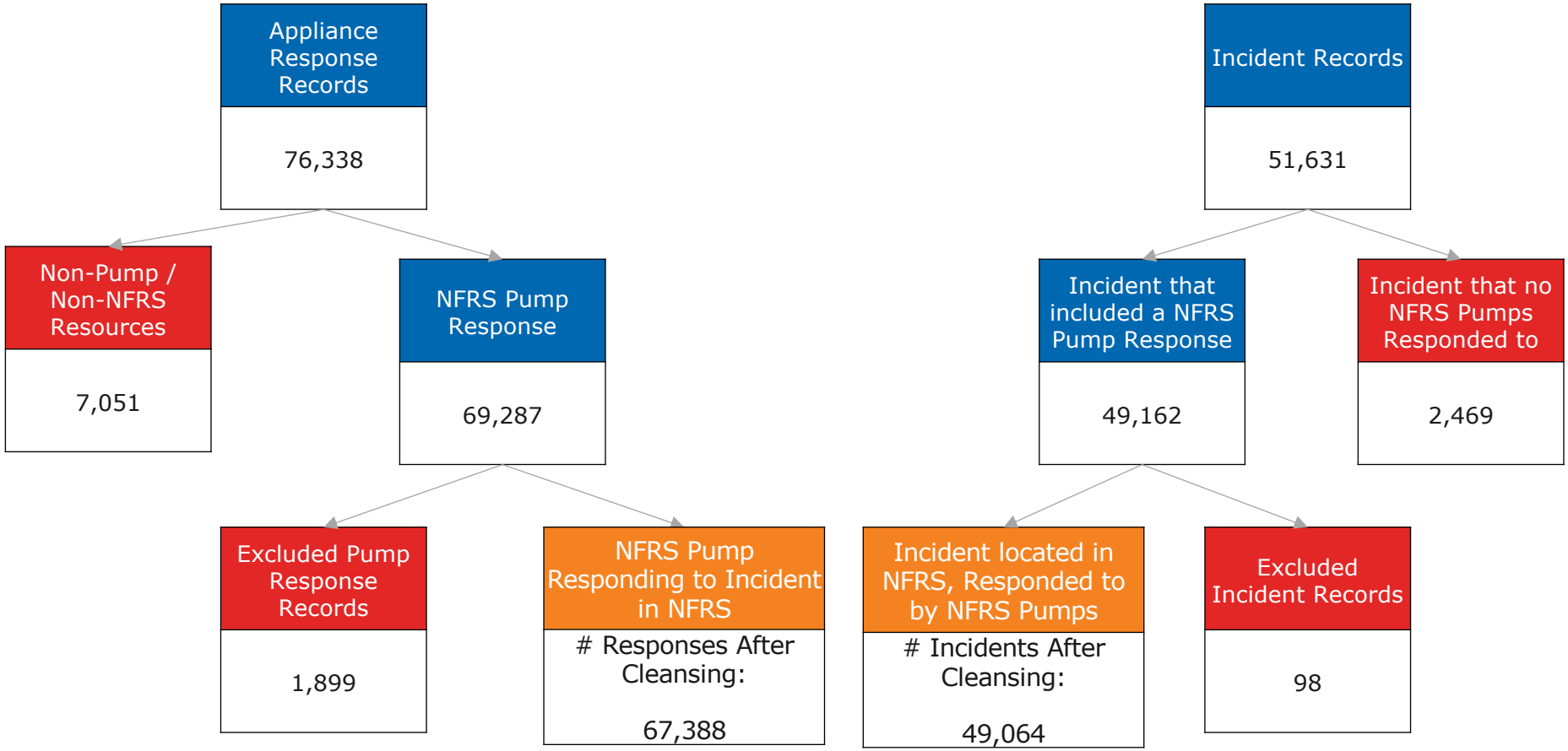
ORH cleansed the incident and response data to remove any erroneous records and ensure that analysis and model inputs were based on reliable representative data.

The main reasons for excluding records were that:

- The records were not NFRS pump records.
- The response was a relief attendance (although the additional workload of appliances is captured within the model).
- The response had time intervals outside acceptable levels.

Data Cleansing

Incidents and Responses Taken Forward



5-Year Sample (January 2016 – December 2020)

Data Cleansing – Exclusion Summary

Exclusion Criteria	Calendar Year					Total
	2016	2017	2018	2019	2020	
Initial Records	16,048	15,954	16,950	13,911	13,475	**76,338**
Non-NFRS/Non-Pump Records	3,129	1,000	1,055	874	993	**7,051**
NFRS Pump Records	**12,919**	**14,954**	**15,895**	**13,037**	**12,482**	**69,287**
NFRS Pumps: Responses with unrepresentative profile of response						
Resource Arrived before Assign Time	6	12	108	10	11	**147**
Reliefs Attendance/Delay in Assigning	361	232	417	179	366	**1,555**
Long Mobilisation Time	19	20	25	15	14	**93**
Long Time to Scene	17	7	25	10	22	**81**
Long Crew Response	3	3	4	8	5	**23**
Total Pump Exclusions	406	274	579	222	418	**1,899**
Total Valid Pump Responses	**12,513**	**14,680**	**15,316**	**12,815**	**12,064**	**67,388**

5-Year Sample (January 2016 – December 2020)

Data Cleansing – Exclusion Criteria

The following criteria excluded records:

Exclusion Criteria	Time From	Time To	Minimum Accepted	Maximum Accepted
Reliefs Attendance/ Delay in Assigning	Time of Call	Time Assigned	0 Mins 0 Seconds	60 Mins 0 Seconds
Mobilisation Time/ Turnout Time	Time Assigned	Time Mobile	0 Mins 0 Seconds	20 Mins 0 Seconds
Time to Scene	Time Mobile	Time Arrived at Scene	0 Mins 0 Seconds	60 Mins 0 Seconds
Crew Response	Time Assigned	Time Arrived at Scene	0 Mins 0 Seconds	60 Mins 0 Seconds

Incident and Demand Profile

In the last five calendar years, the highest level of demand was observed in 2018 (30.2 incidents per day); this was a hot summer and there was a noticeable increase in secondary fires. Since 2018 there has been a reduction in most of the incident types assessed.

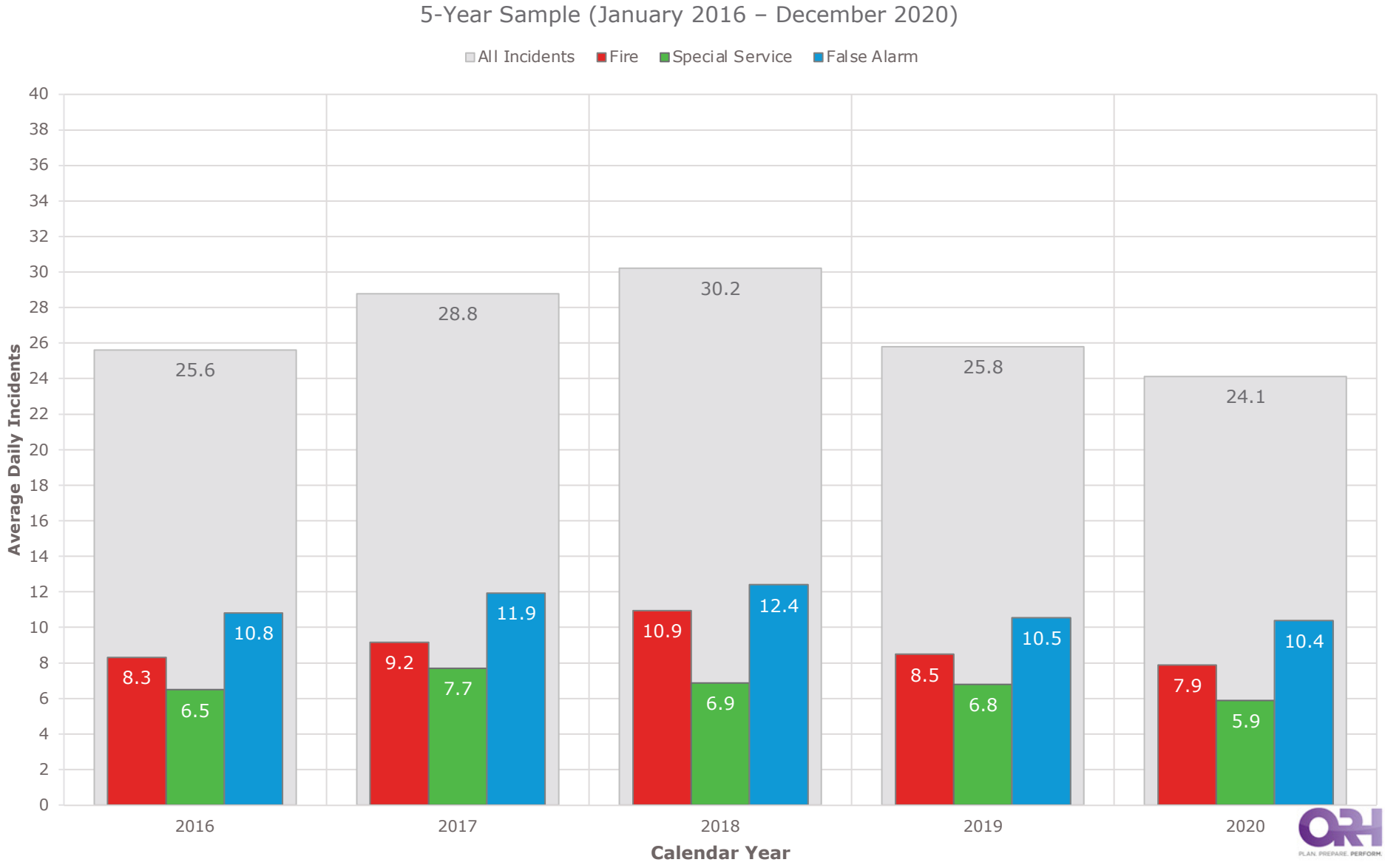
Over the most recent two years (2019 and 2020), the proportions of incidents by category were as follows:

Incident Type	Proportion
Primary Fires	15.9%
Secondary Fires	16.4%
Chimney Fires	0.4%
RTCs	5.8%
Other Special Service	19.5%
False Alarm due to Apparatus	29.3%
Good Intent False Alarm	11.2%
Malicious False Alarm	1.3%

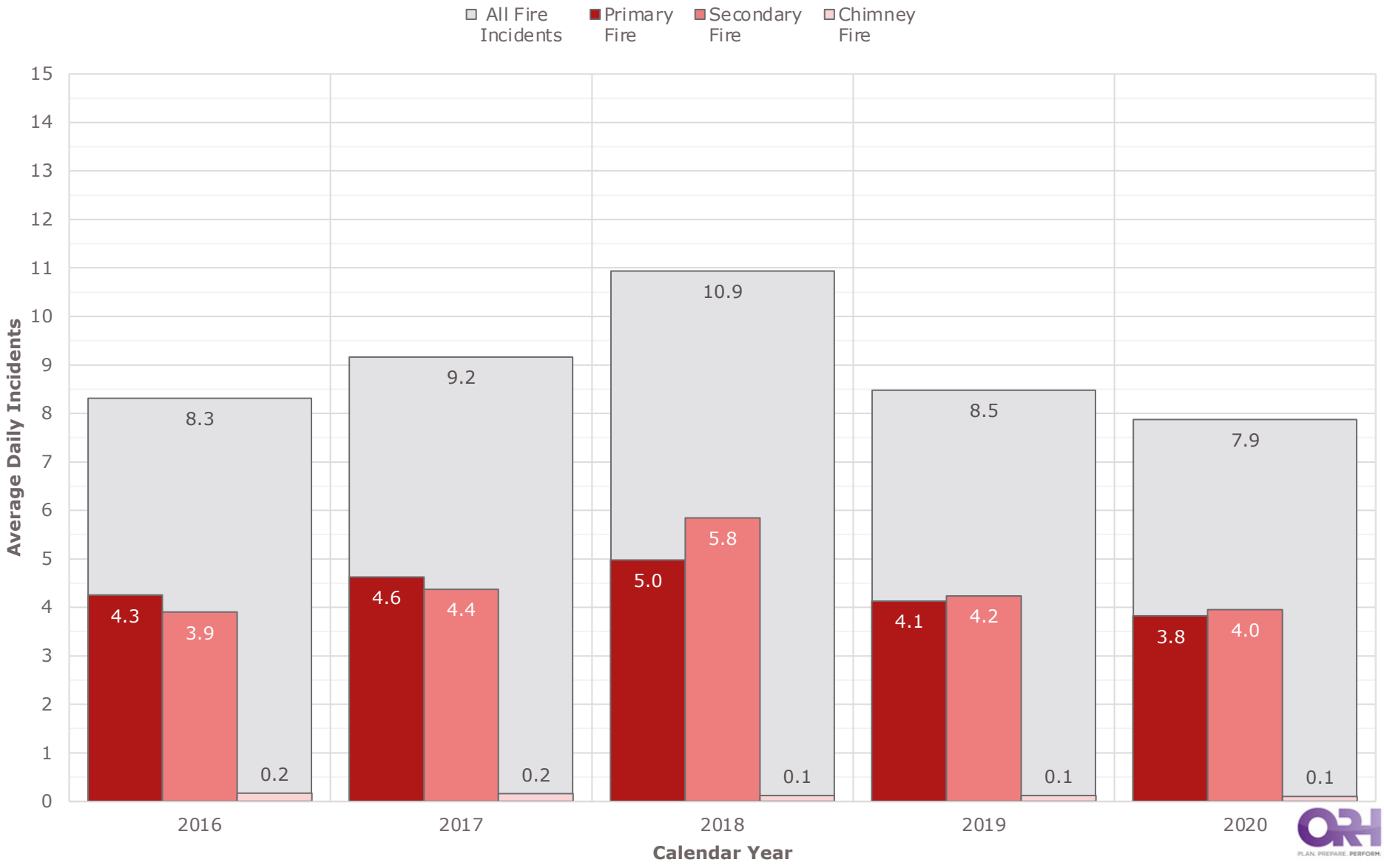
The demand rate for Secondary Fire incidents had a seasonal pattern over the last five calendar years, with higher demand in summer. The demand rate for other incident categories had no clear seasonal pattern.

The number of incidents in NFRS generally varied between 15 and 45 per day.

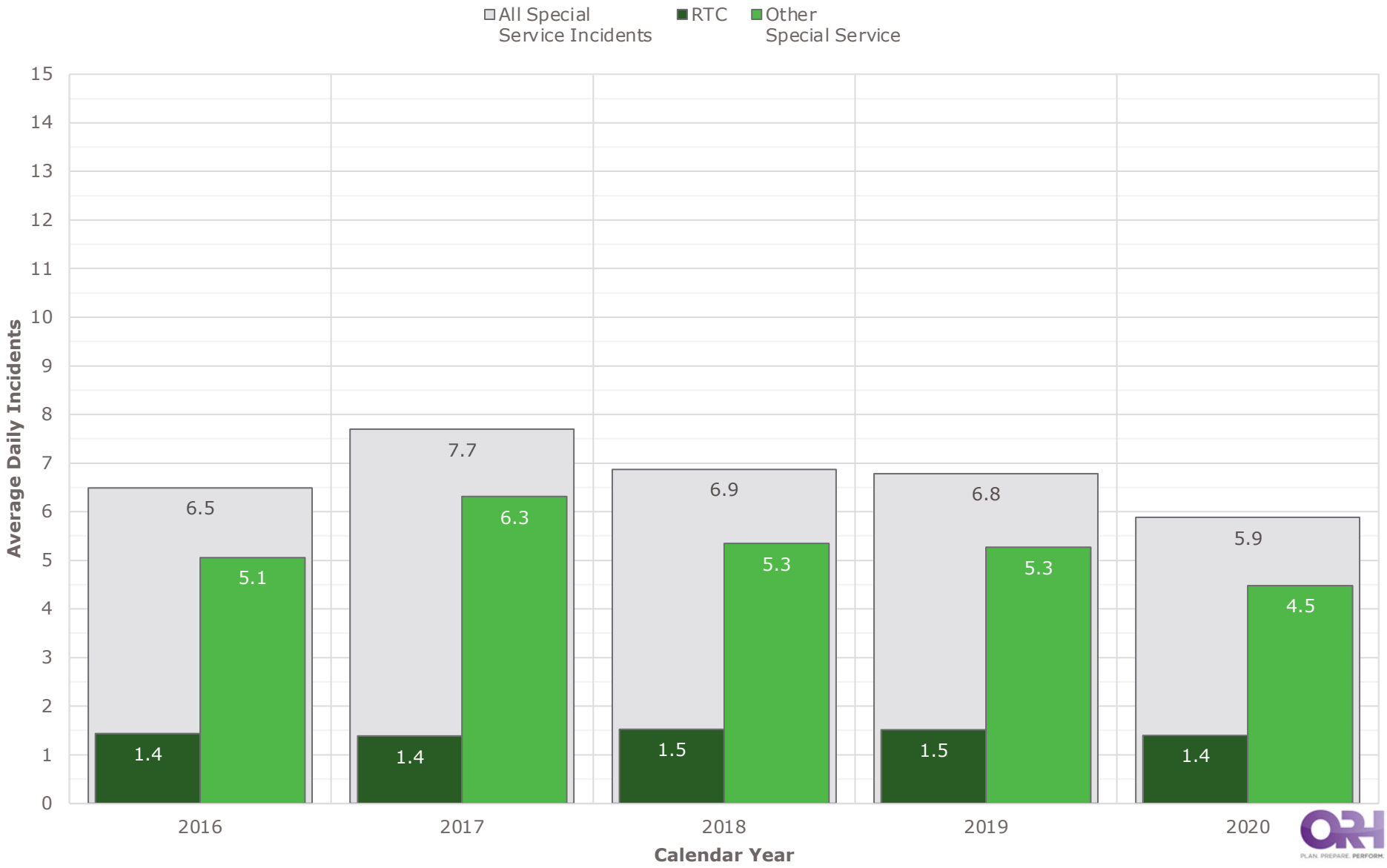
All Incidents



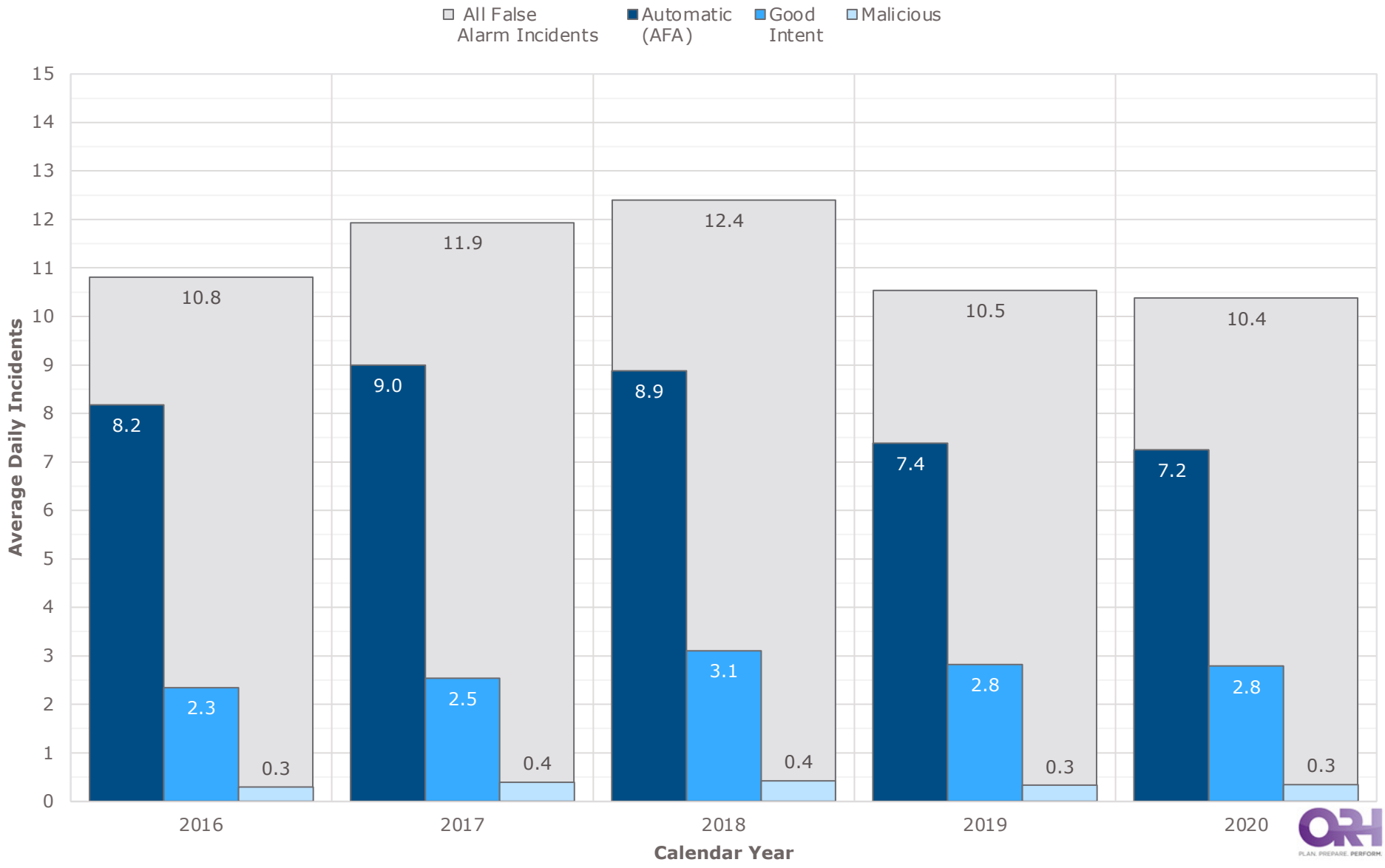
Fire Incidents by Year



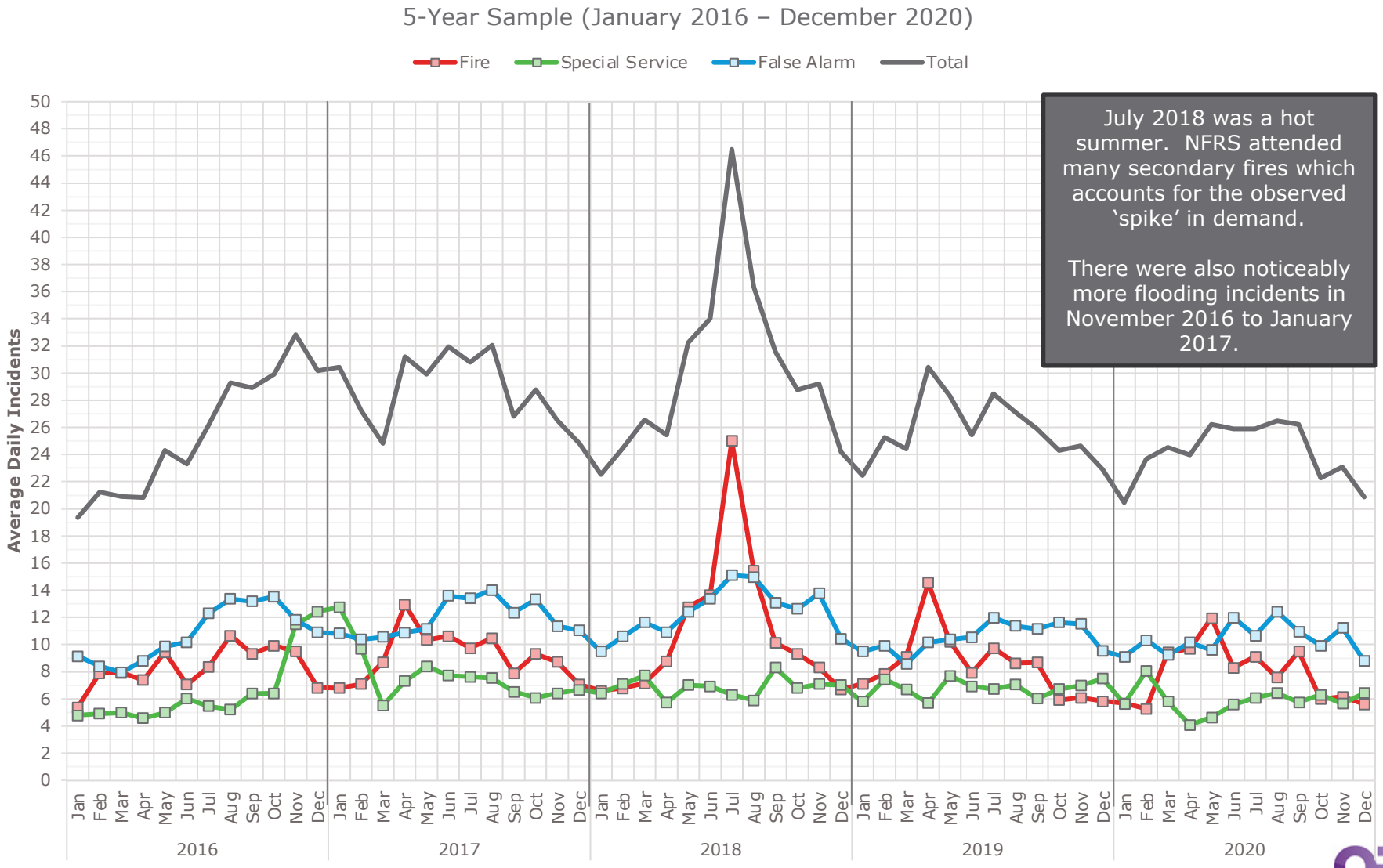
Special Service Incidents by Year



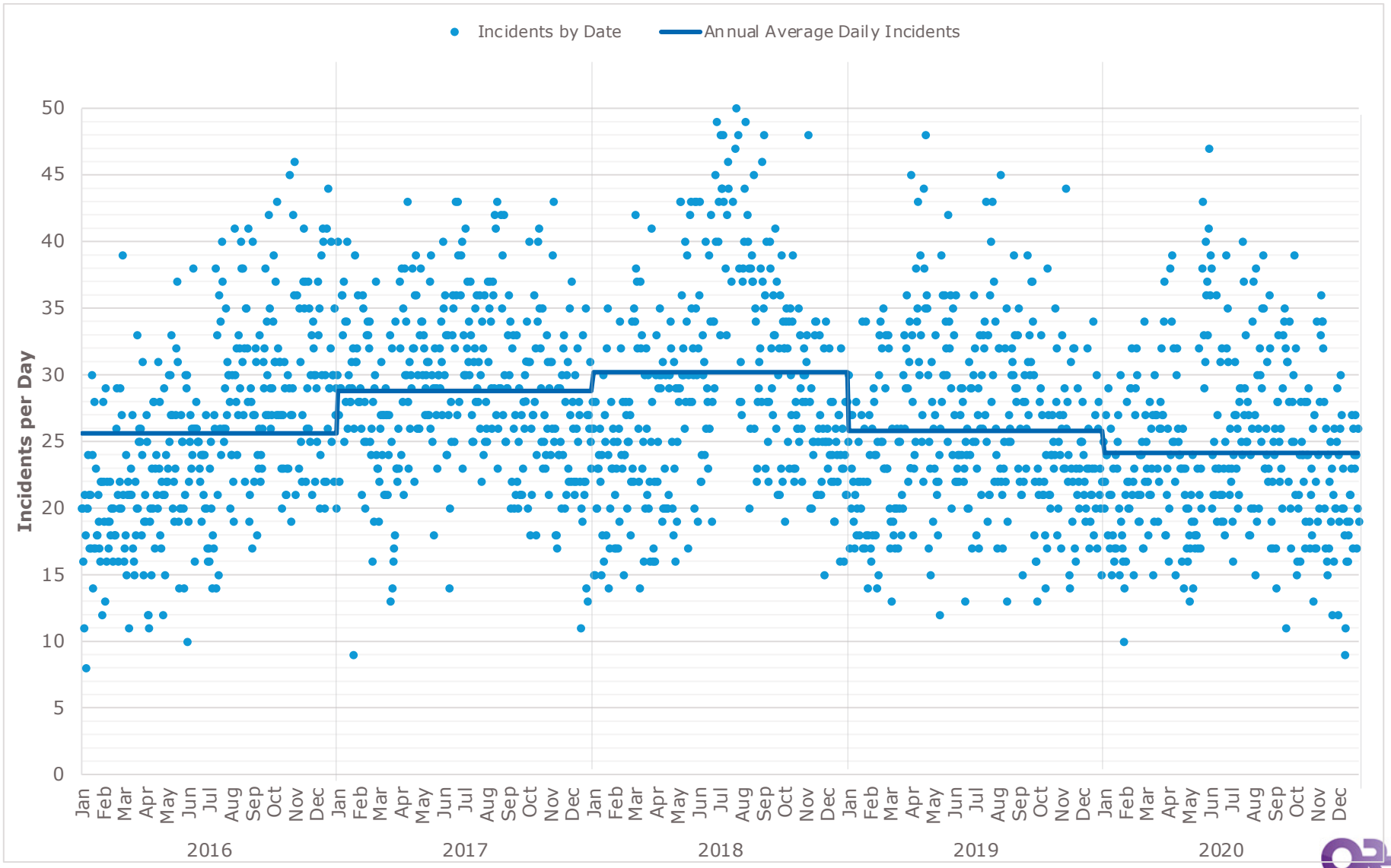
False Alarm Incidents by Year



Demand by Month



Incidents per Day



Incident Profile

31% of incidents received two or more pumps in attendance (69% received one pump). This proportion varies by the type of incident. For example, 51% of primary fires received two or more pumps in attendance, whereas only 7% of secondary fires did.

Category	Average Daily Incidents		Total	Proportion	
	1 Pump in attendance	2+ Pumps in attendance		1 Pump in attendance	2+ Pumps in attendance
Primary Fire	2.1	2.2	4.4	49%	**51%**
Secondary Fire	4.1	0.3	4.5	**93%**	7%
Chimney Fire	0.1	0.0	0.1	**75%**	25%
RTC	0.8	0.6	1.5	**58%**	42%
Other Special Service	4.9	0.4	5.3	**93%**	7%
AFA	4.3	3.8	8.1	**53%**	47%
Good Intent FA	2.0	0.7	2.7	**74%**	26%
Malicious FA	0.2	0.2	0.4	**52%**	48%
Overall	**18.7**	**8.2**	**26.9**	**69%**	31%

5-Year Sample (January 2016 – December 2020)

Sample Periods

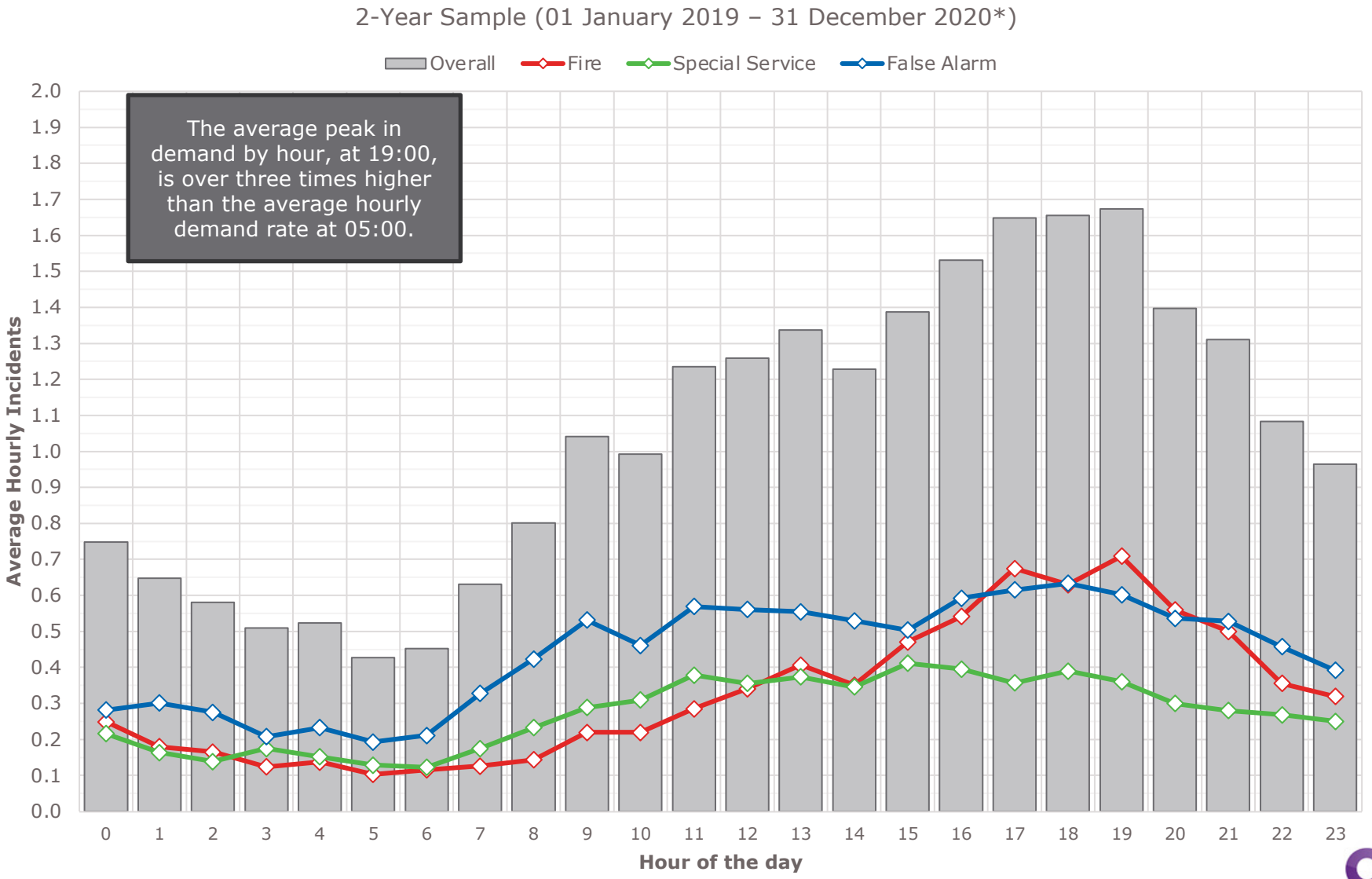
To ensure a robust sample of historical incident locations, ORH used a five-year sample (January 2016 to December 2020). ORH's analysis and experience has shown that, because incidents occur in a similar geographical distribution year-on-year, this is a sound approach to operational response planning.

A two-year sample (January 2019 to December 2020) was used for other model inputs. However, the following months were excluded due to significant differences to the operational regime of the service in periods of lockdown due to the coronavirus pandemic:

- March, April and May 2020
- November 2020

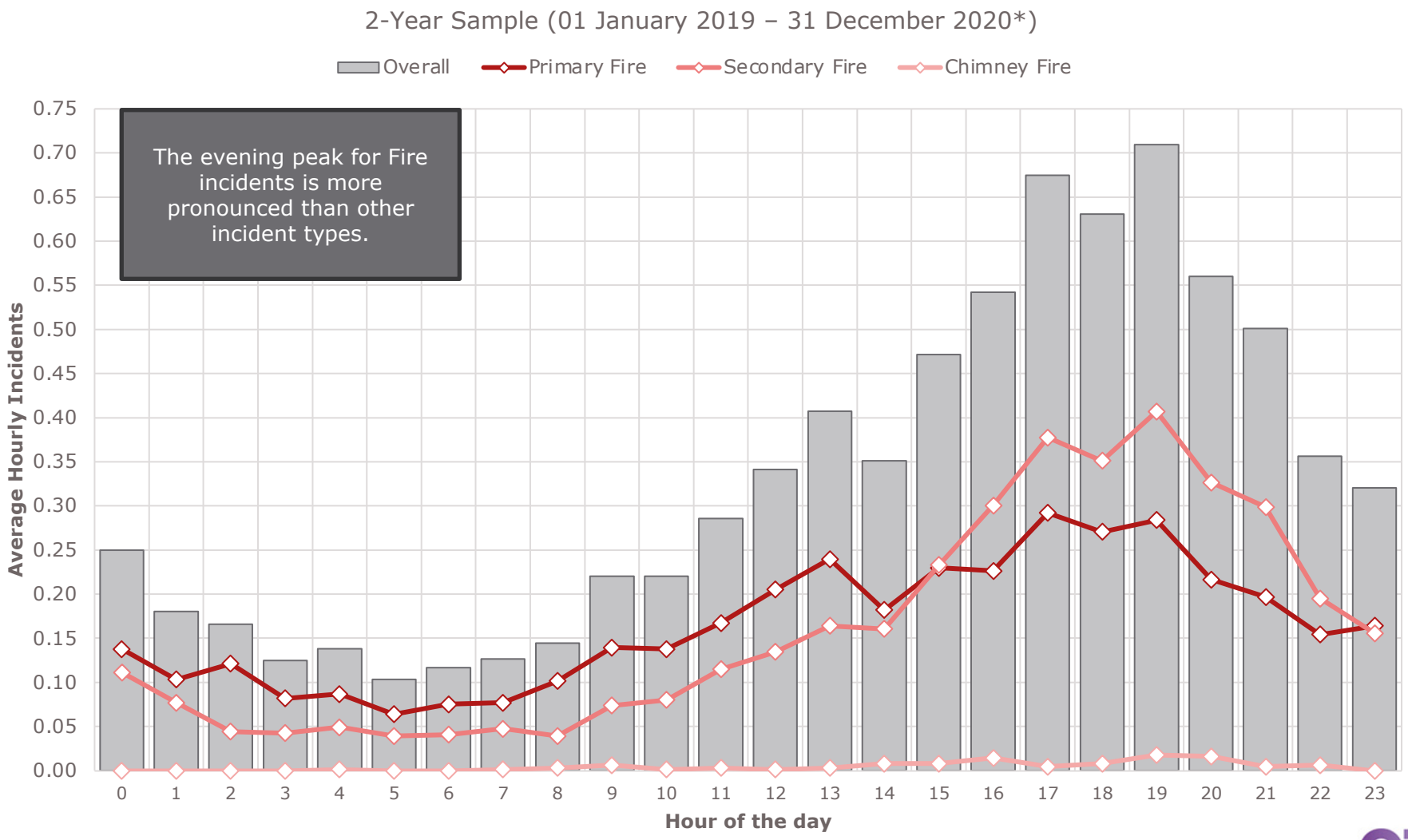
This resulted in a 20-month sample, used for model inputs such as demand rates, availability of resources and other operational parameters.

Demand by Hour



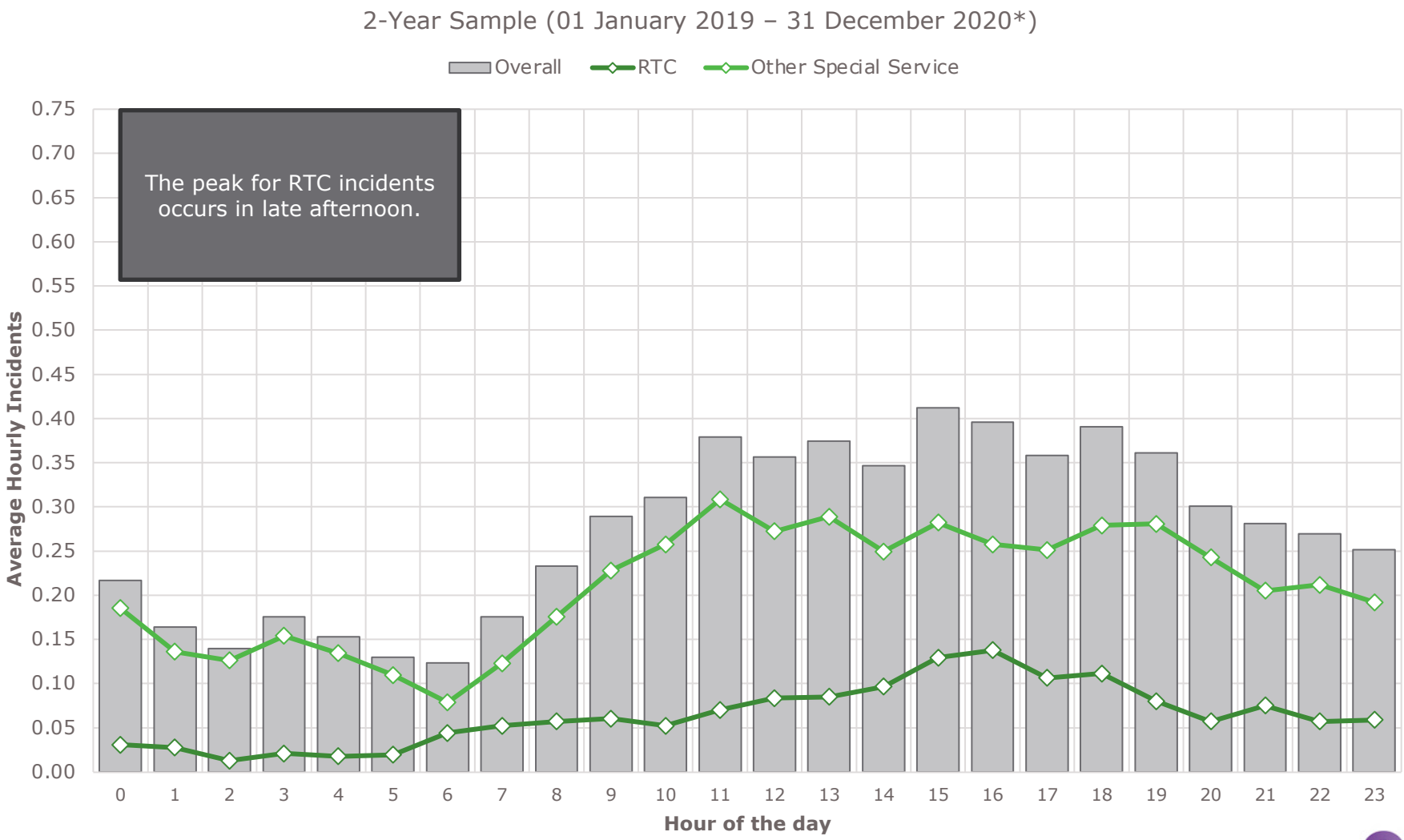
*Excluding March, April, May and November 2020

Demand by Hour - Fires



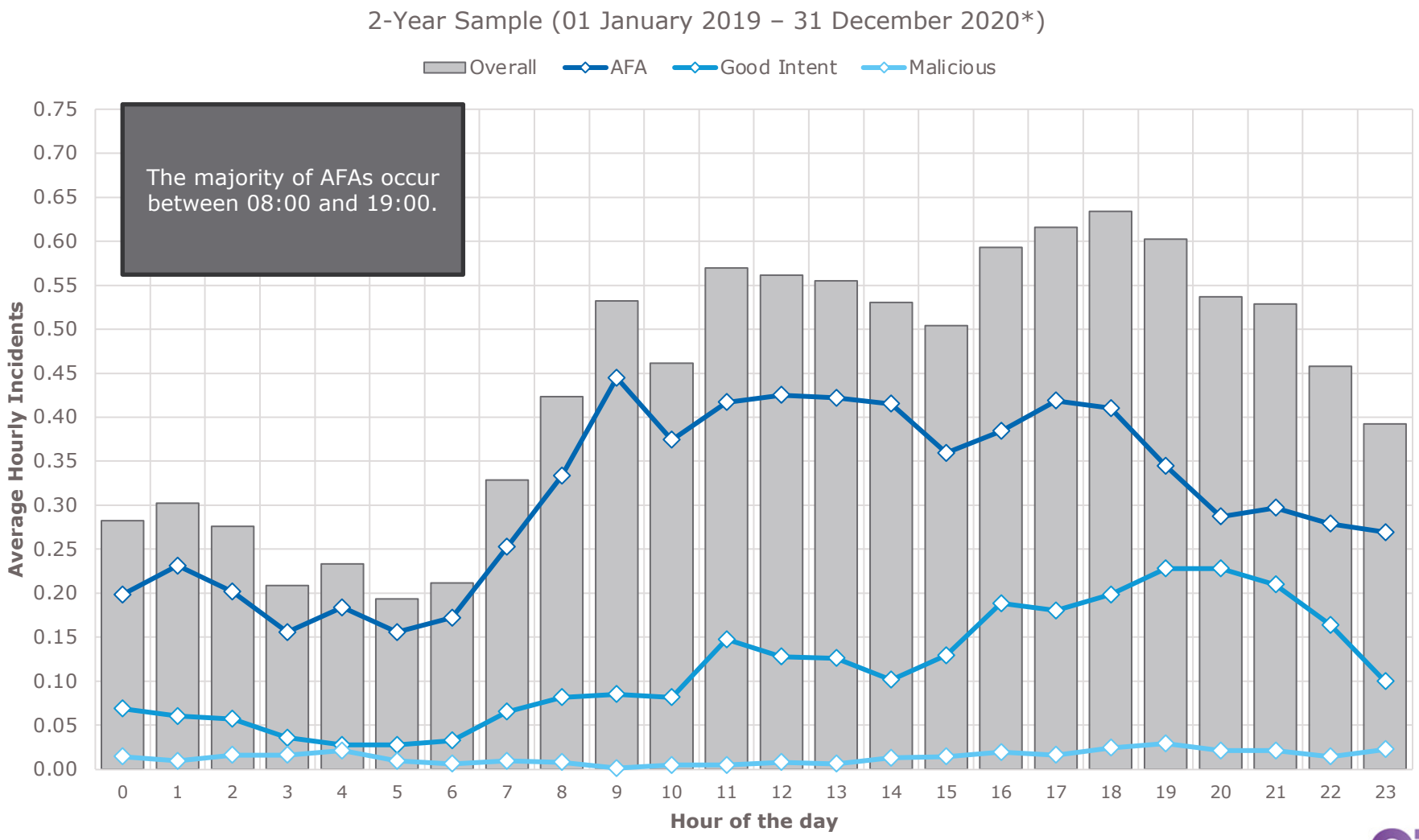
*Excluding March, April, May and November 2020

Demand by Hour – Special Service



*Excluding March, April, May and November 2020

Demand by Hour – False Alarms



*Excluding March, April, May and November 2020

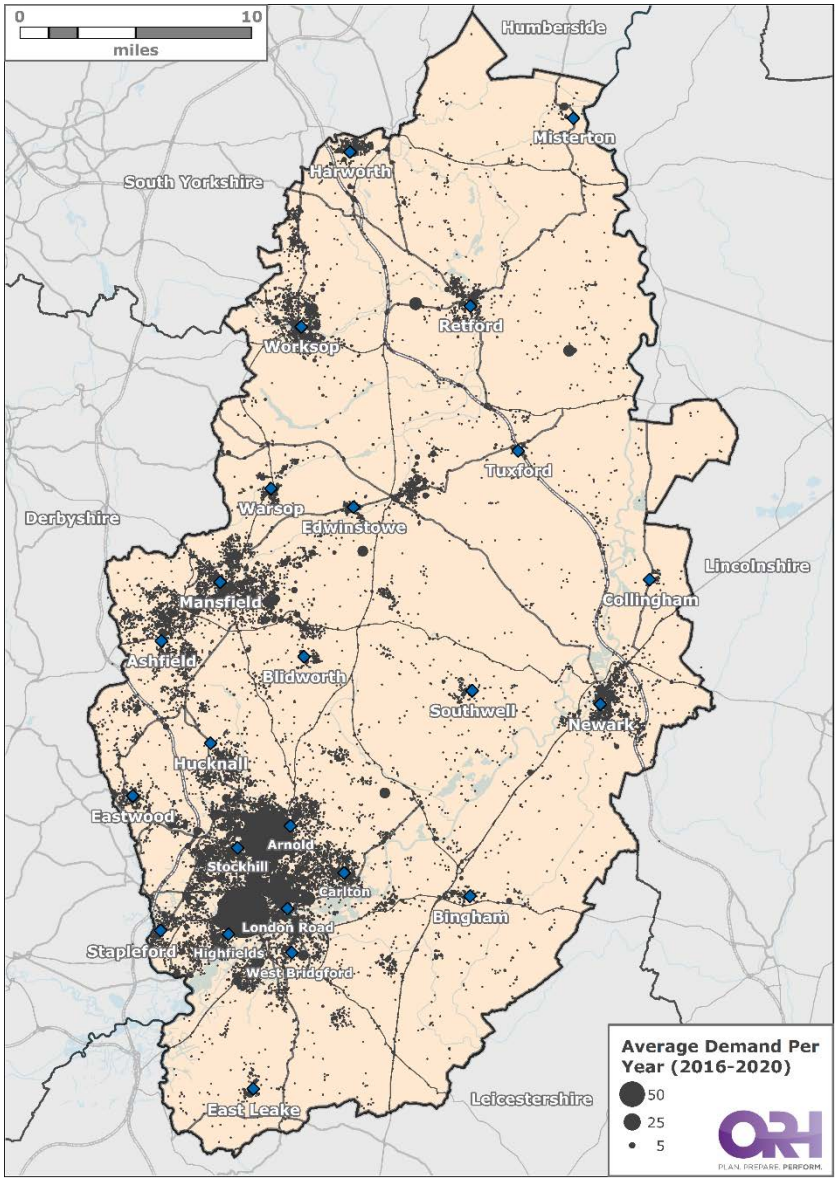
Incident Locations

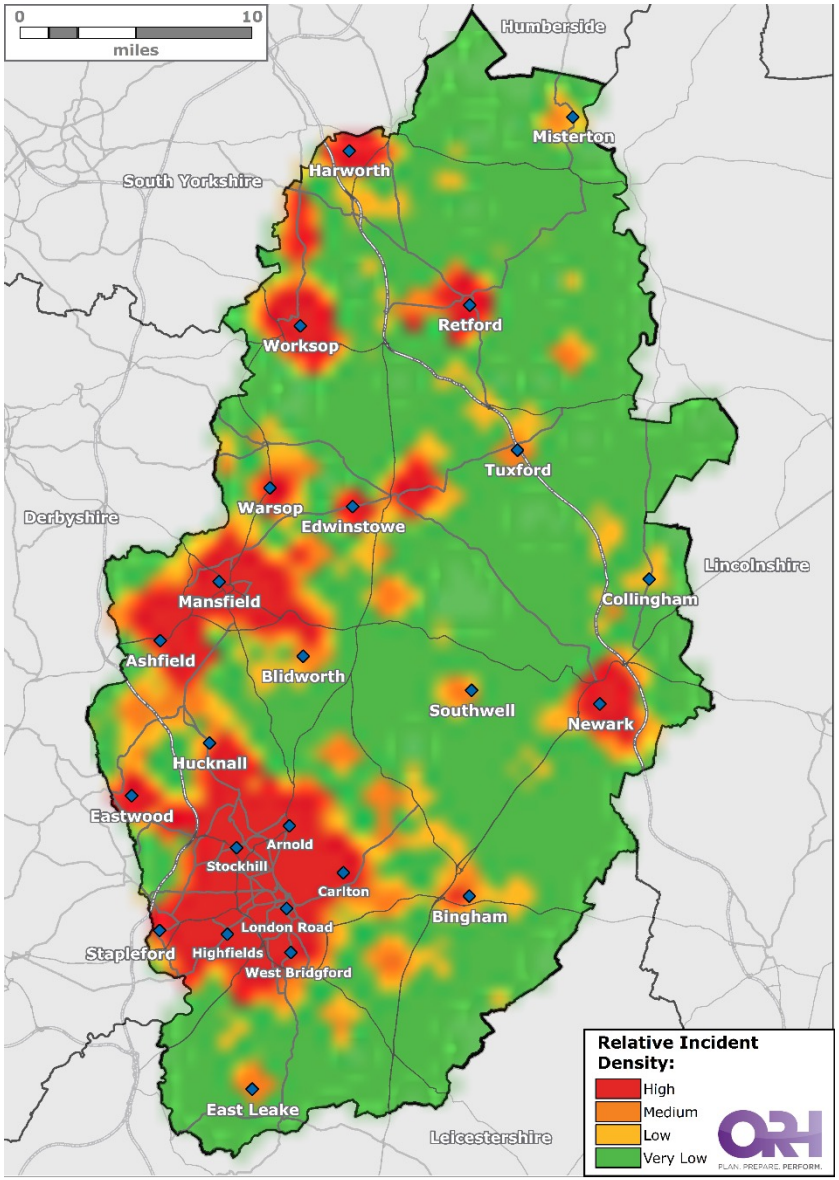
The highest incident concentrations for the majority of incident categories are typically in the urban areas, with particularly high density of incidents in Nottingham.

RTCs are the most geographically dispersed incident type, with many distributed across the major road network.

The areas of highest incident density are well aligned to the location of NFRS fire stations.

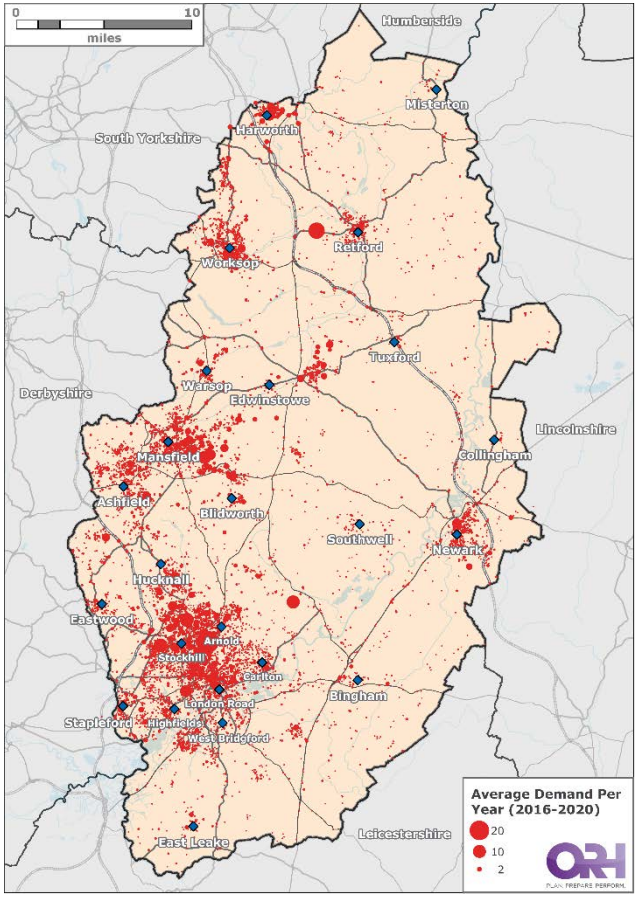
Location of All Incidents



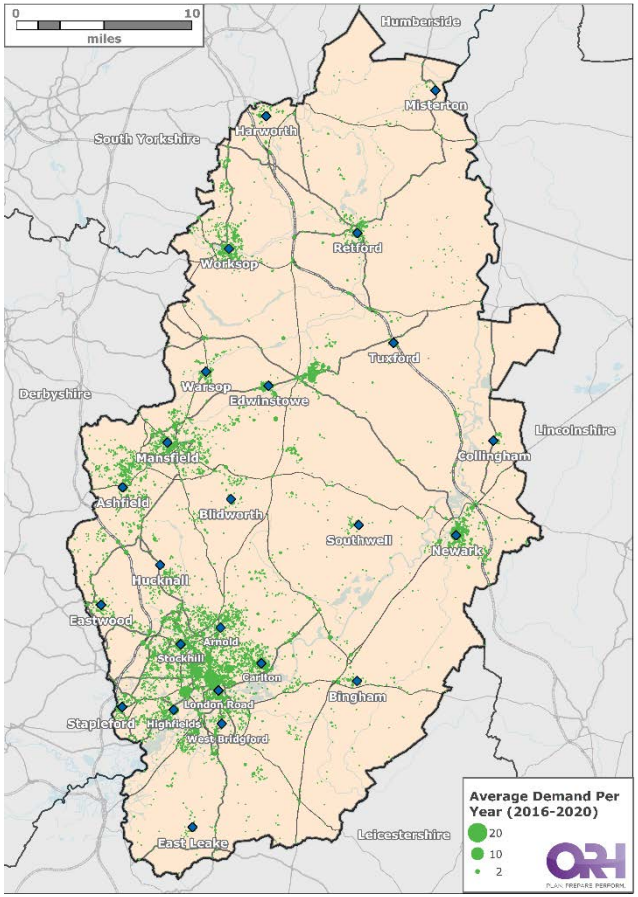


Location of Incidents

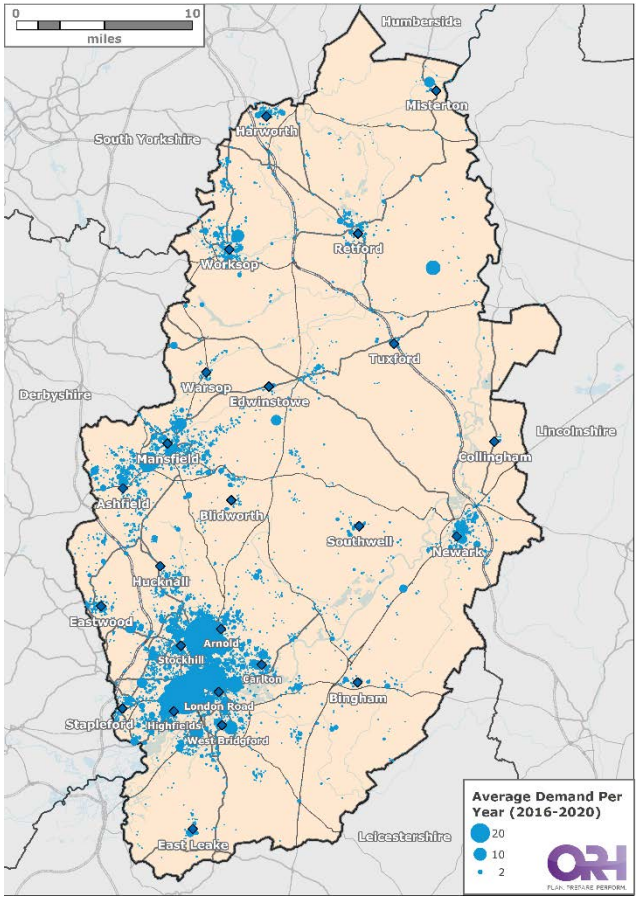
Fire



Special Service

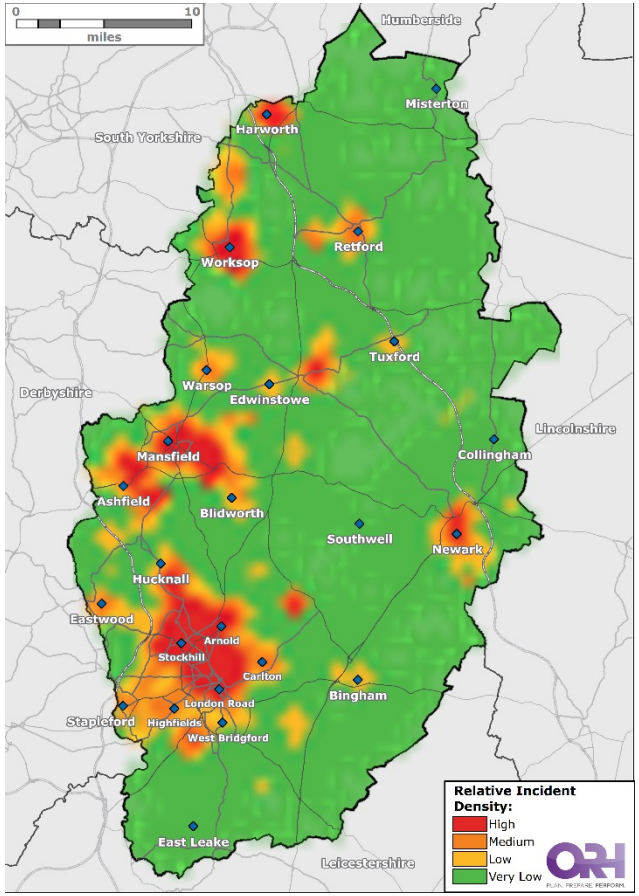


False Alarms

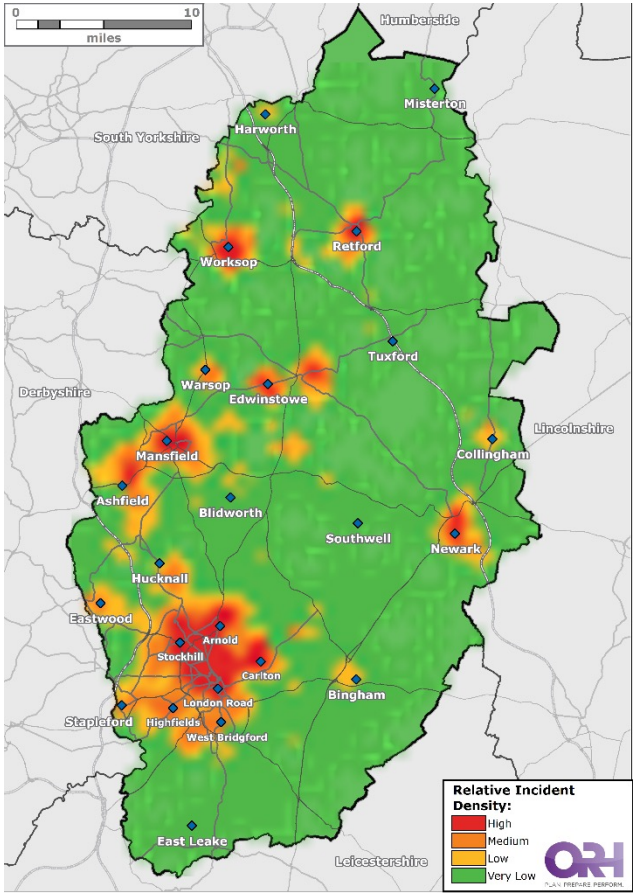


Location of Incidents

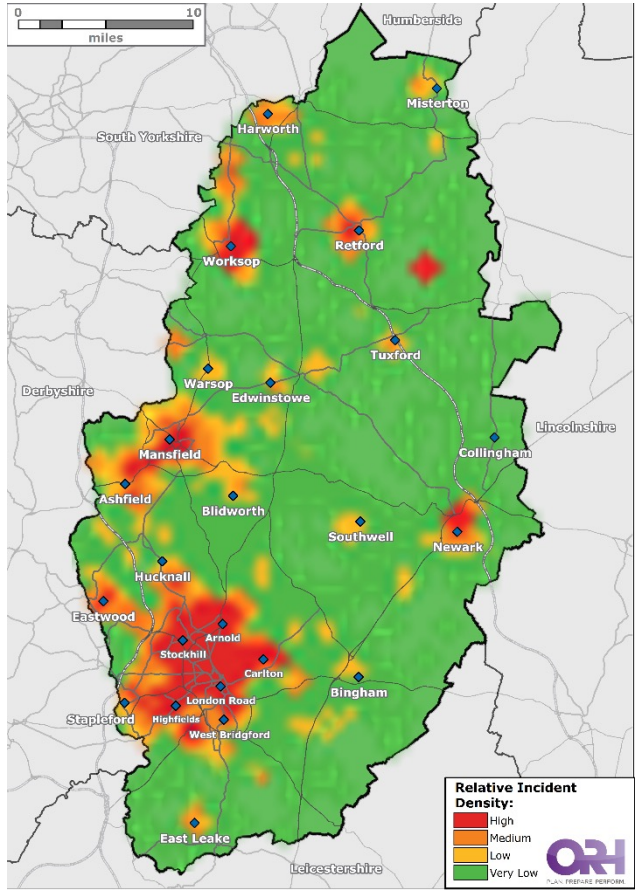
Fire



Special Service

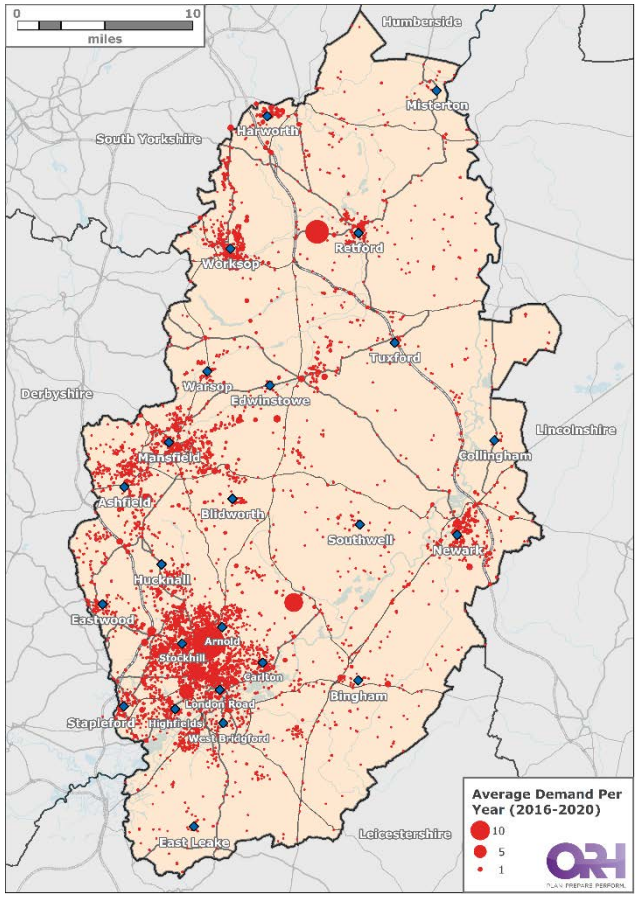


False Alarms

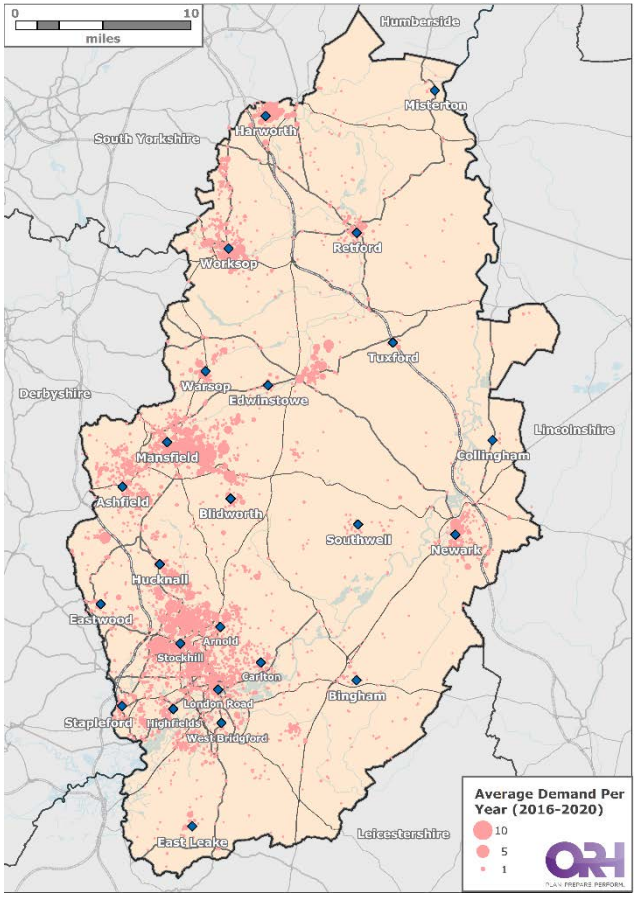


Location of Fire Incidents

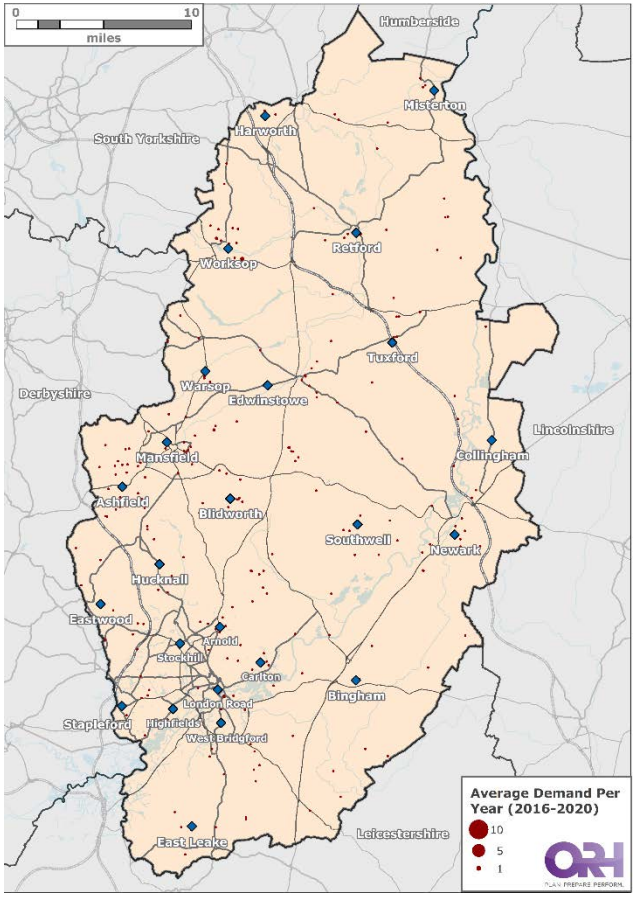
Primary Fire



Secondary Fire

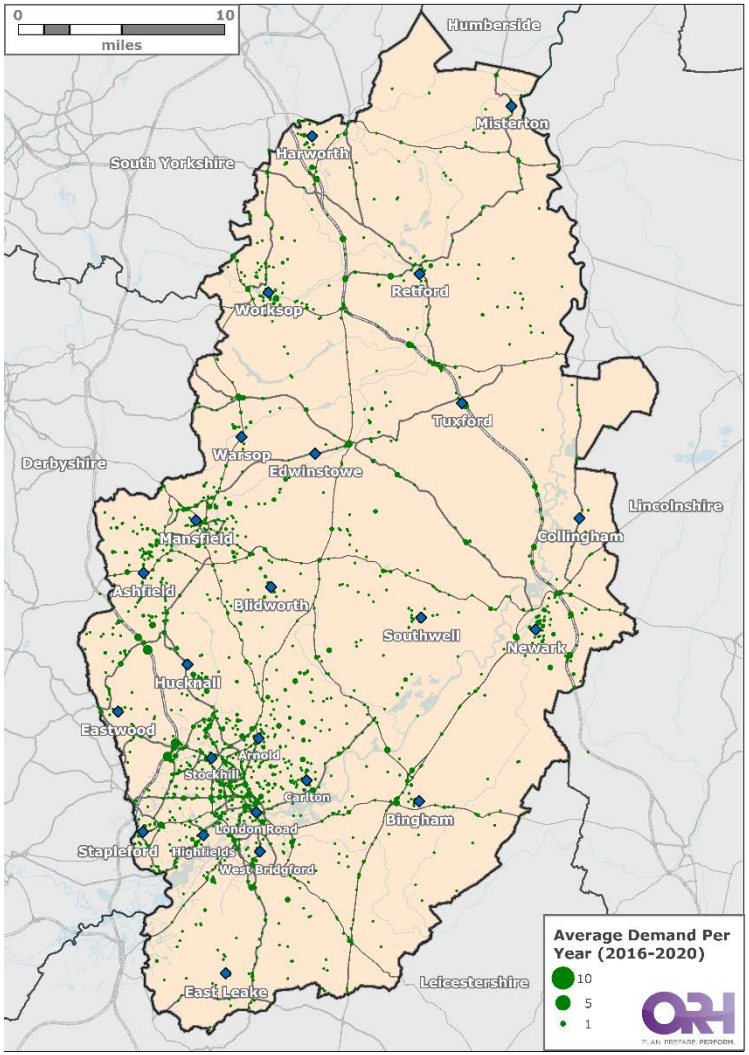


Chimney Fire

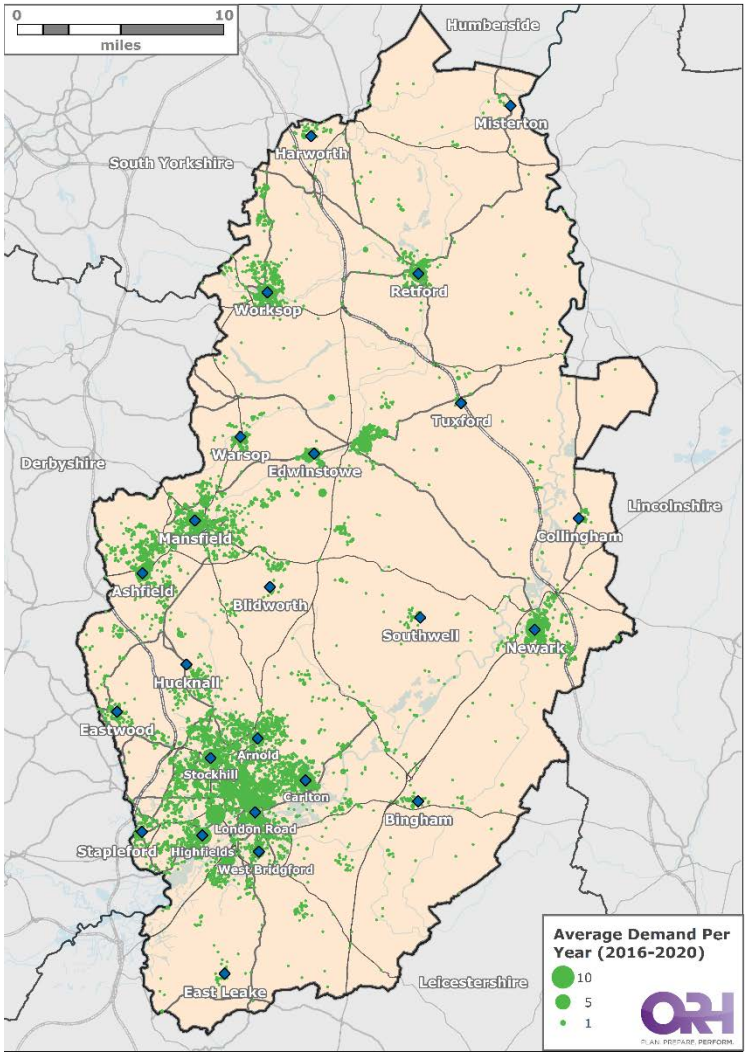


Location of Special Service Incidents

RTC

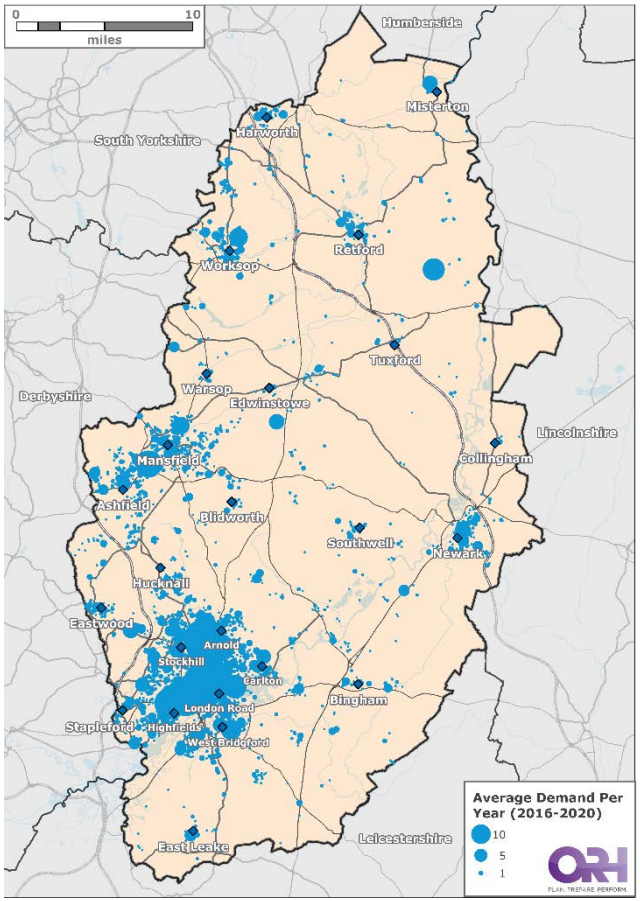


Other

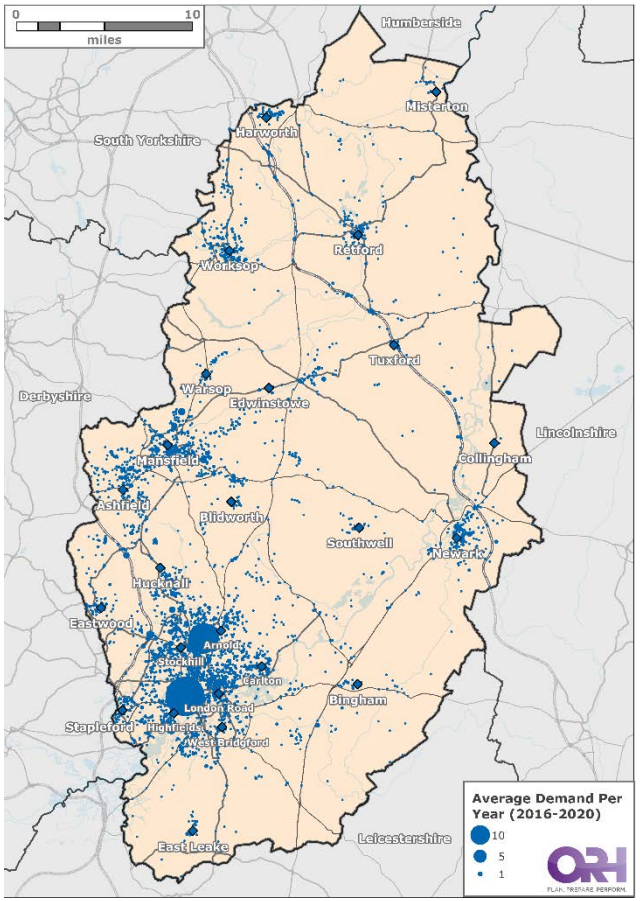


Location of False Alarm Incidents

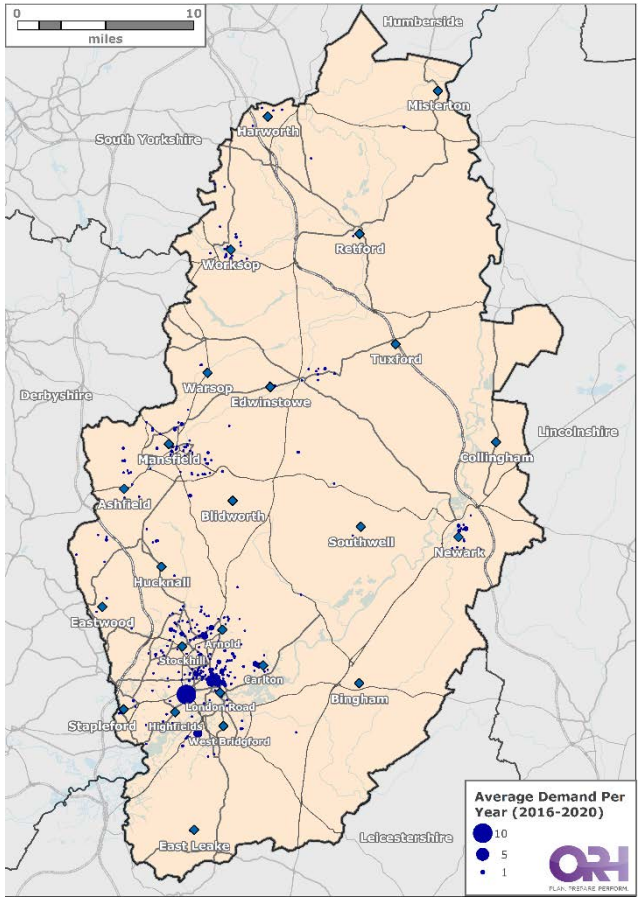
AFA



Good Intent



Malicious



Pump Workload and Availability

Pump Workload

As expected, the wholetime and day-crewed pumps attended more incidents than the on-call pumps, and other points of note are:

- Callsign FET20P1 (Stockhill) attended the most incidents of any pump (3.6 per day on average)
- Callsign FET05P1 (Ashfield day-crewed) attended more incidents than the wholetime pumps located at Newark and Edwinstowe
- Southwell's pump (FET14P1) attended the fewest incidents of any pump (less than one incident per week)

Pump Availability

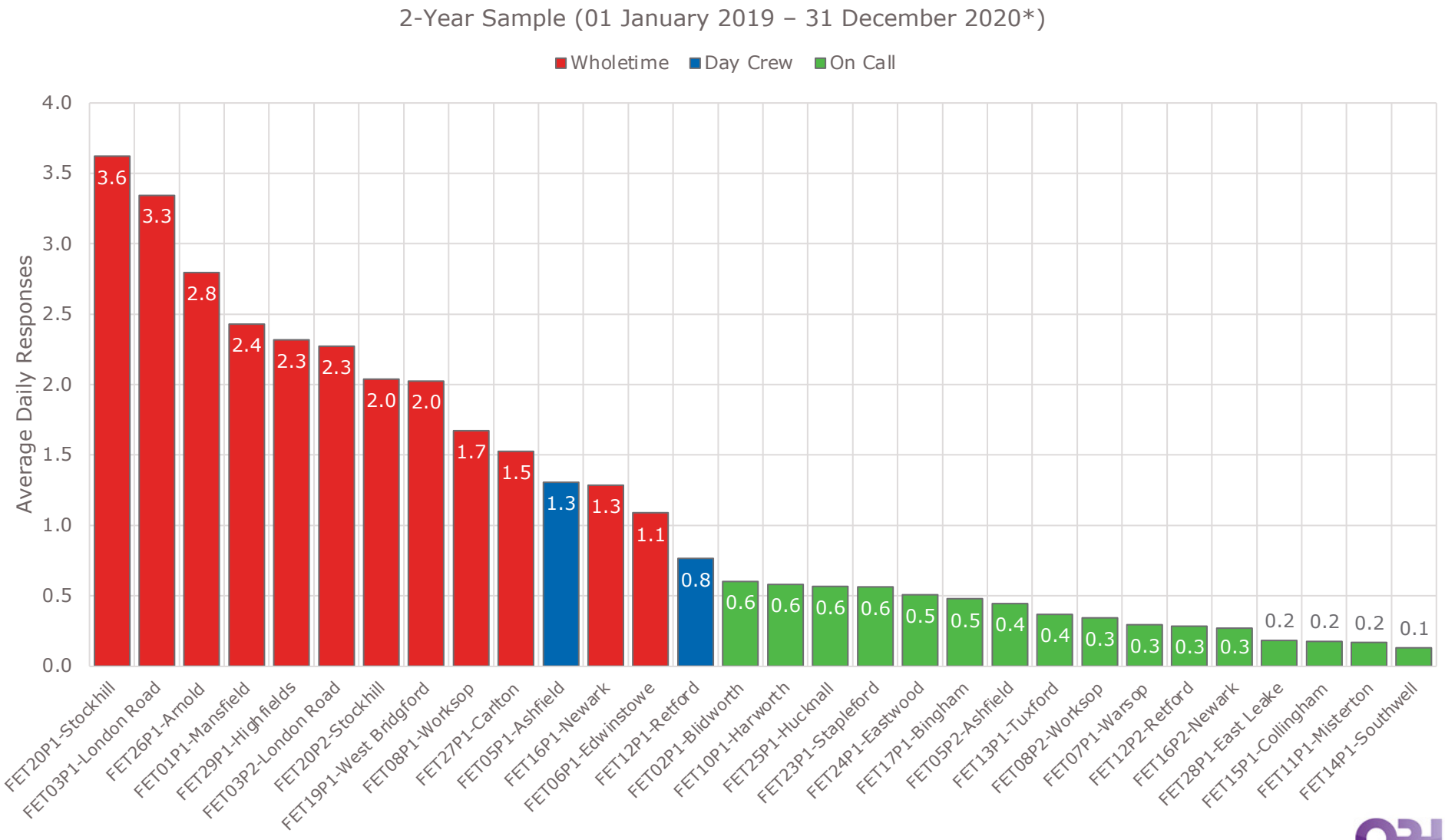
The majority of NFRS on-call pumps were available over 90% of the time, which is higher than in some comparable UK FRSs.

The two pumps (FET12P2 and FET05P2) that have the lowest level of availability are located at two-pump stations where the other pump is day-crewed. Availability of these pumps is noticeably lower at night as it requires two pumps to be crewed with on-call staff at each station. These pumps are also the only on-call pumps that have lower availability at night than during the day.

Callsign FET14P1 (Southwell) is the least available single-pump station (70%).

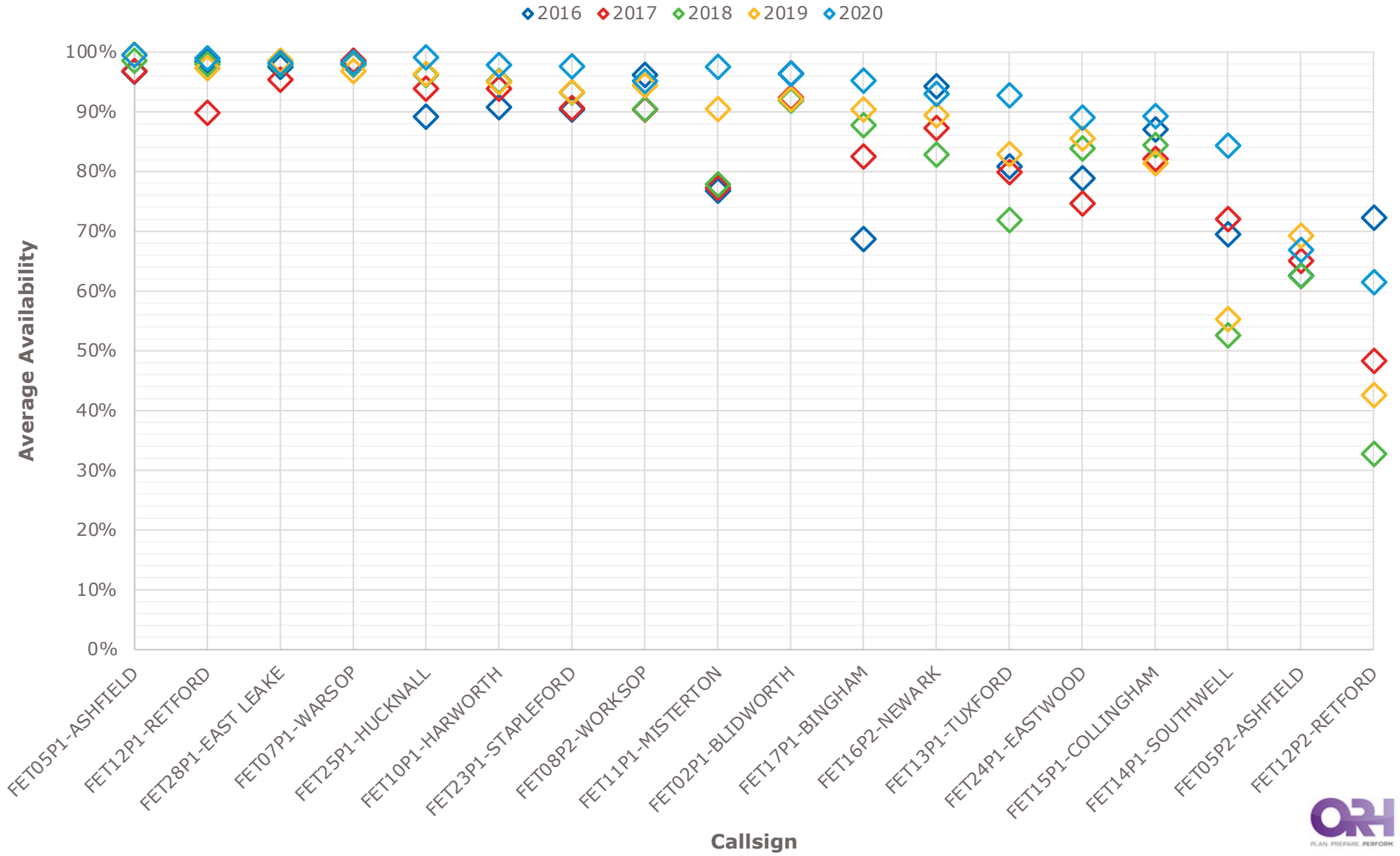
Availability in 2020 was better than in 2019, which is an expected consequence of people's work and living situations changing due to the coronavirus pandemic.

Responses by Callsign

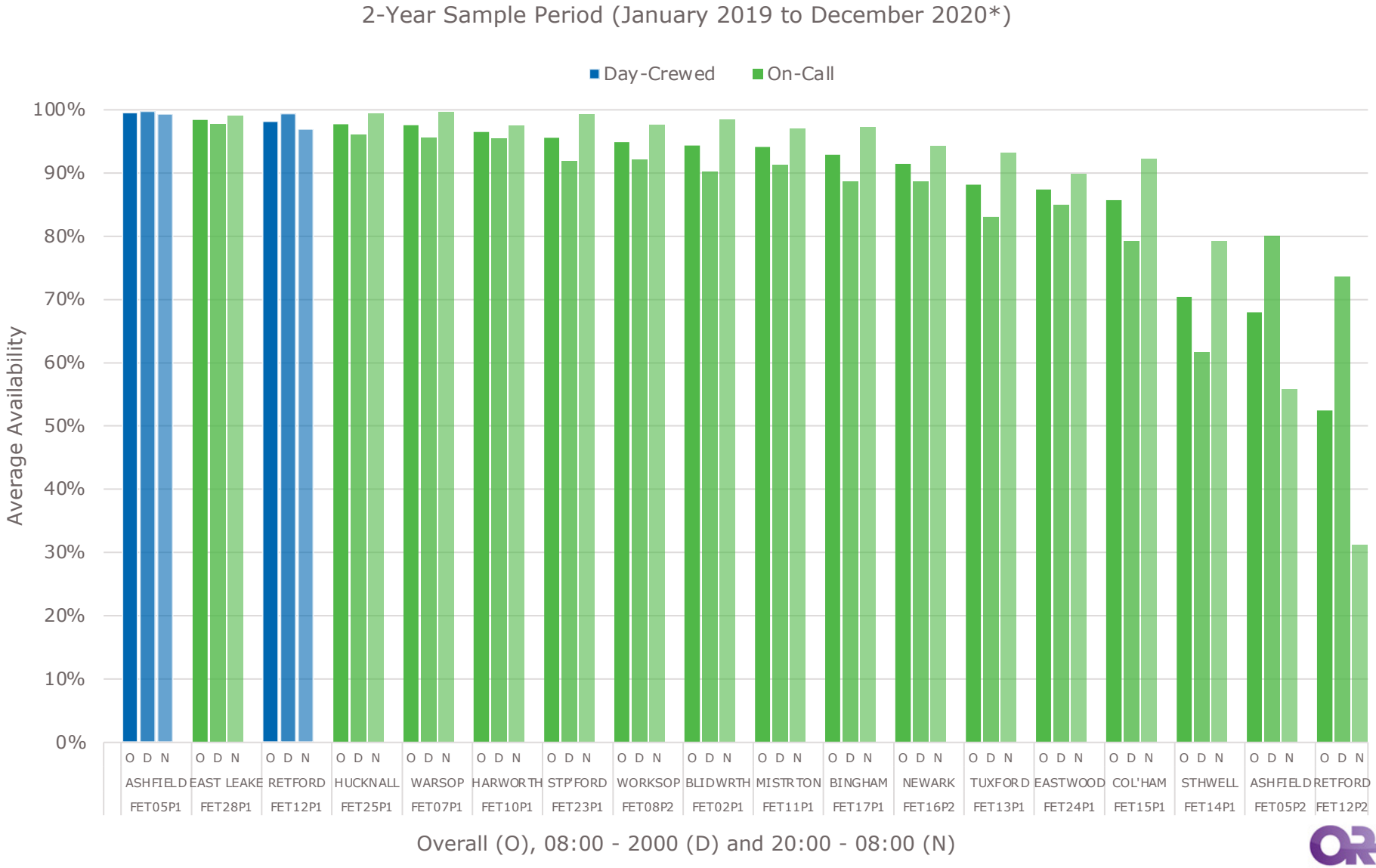


*Excluding March, April, May and November 2020

Pump Availability by Year

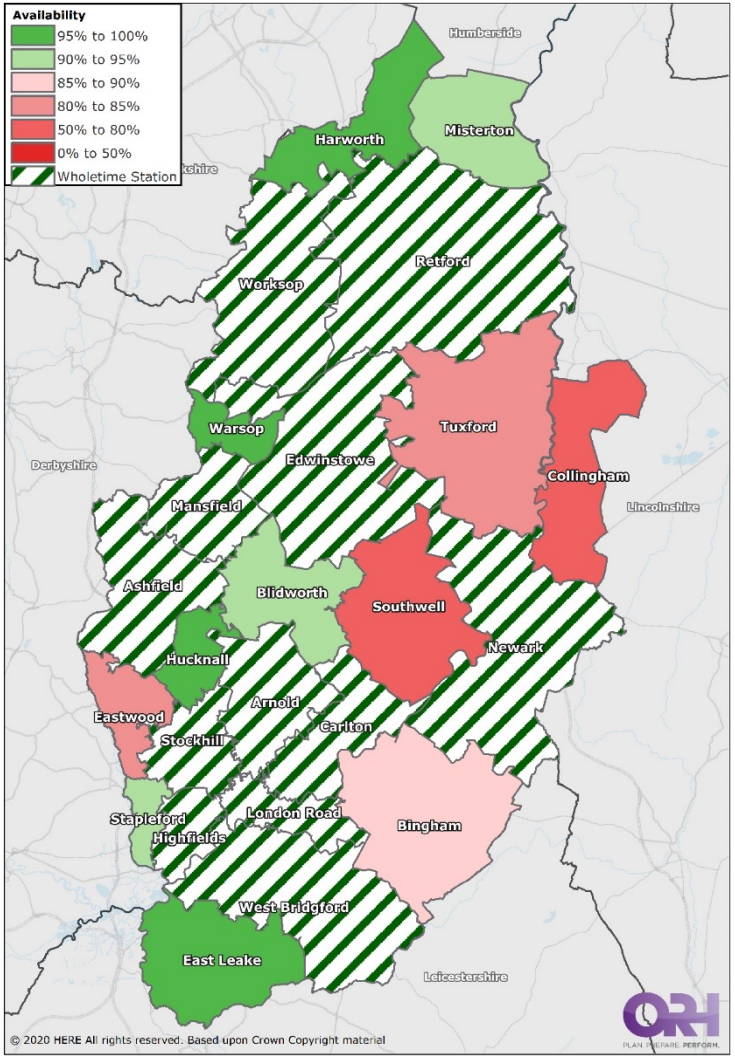


Pump Availability

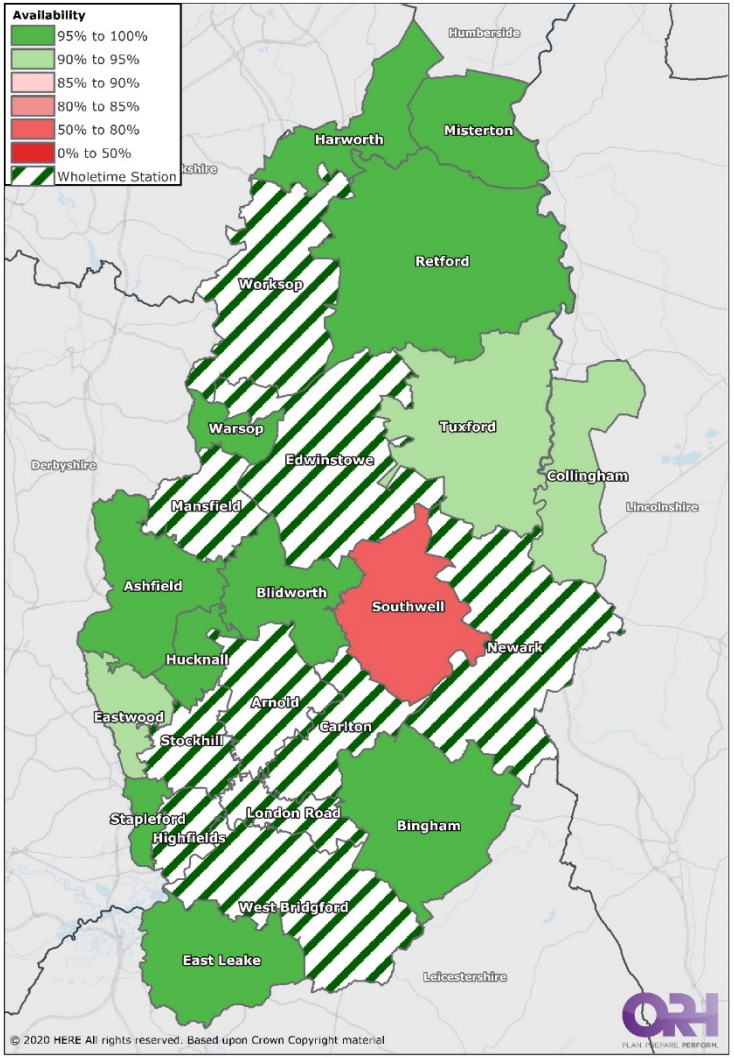


On-Call Pump Availability

Daytime (8am to 8pm)

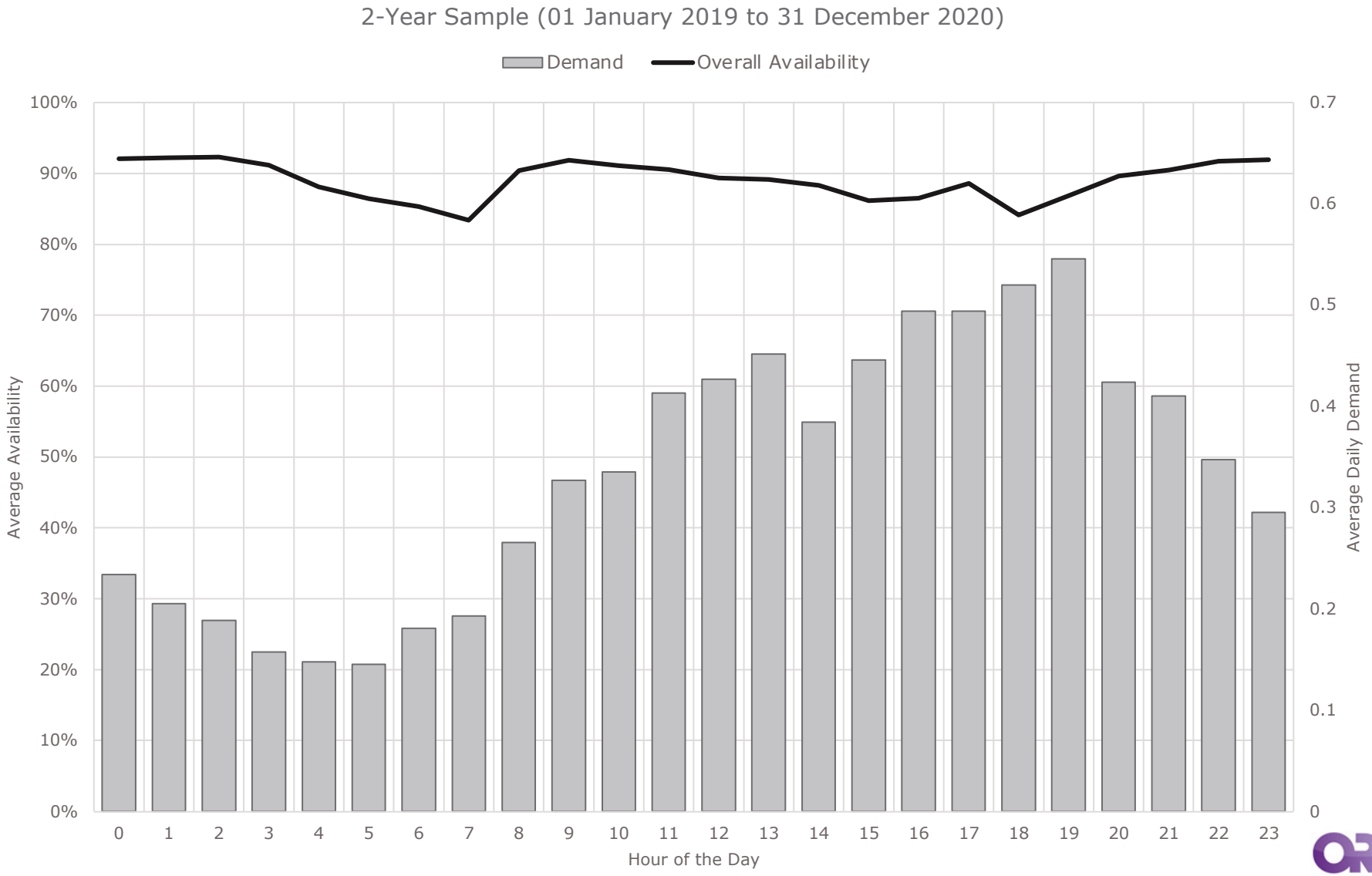


Night-time (8pm to 8am)



2-Year Sample (January 2019 to December 2020)

Availability vs Demand



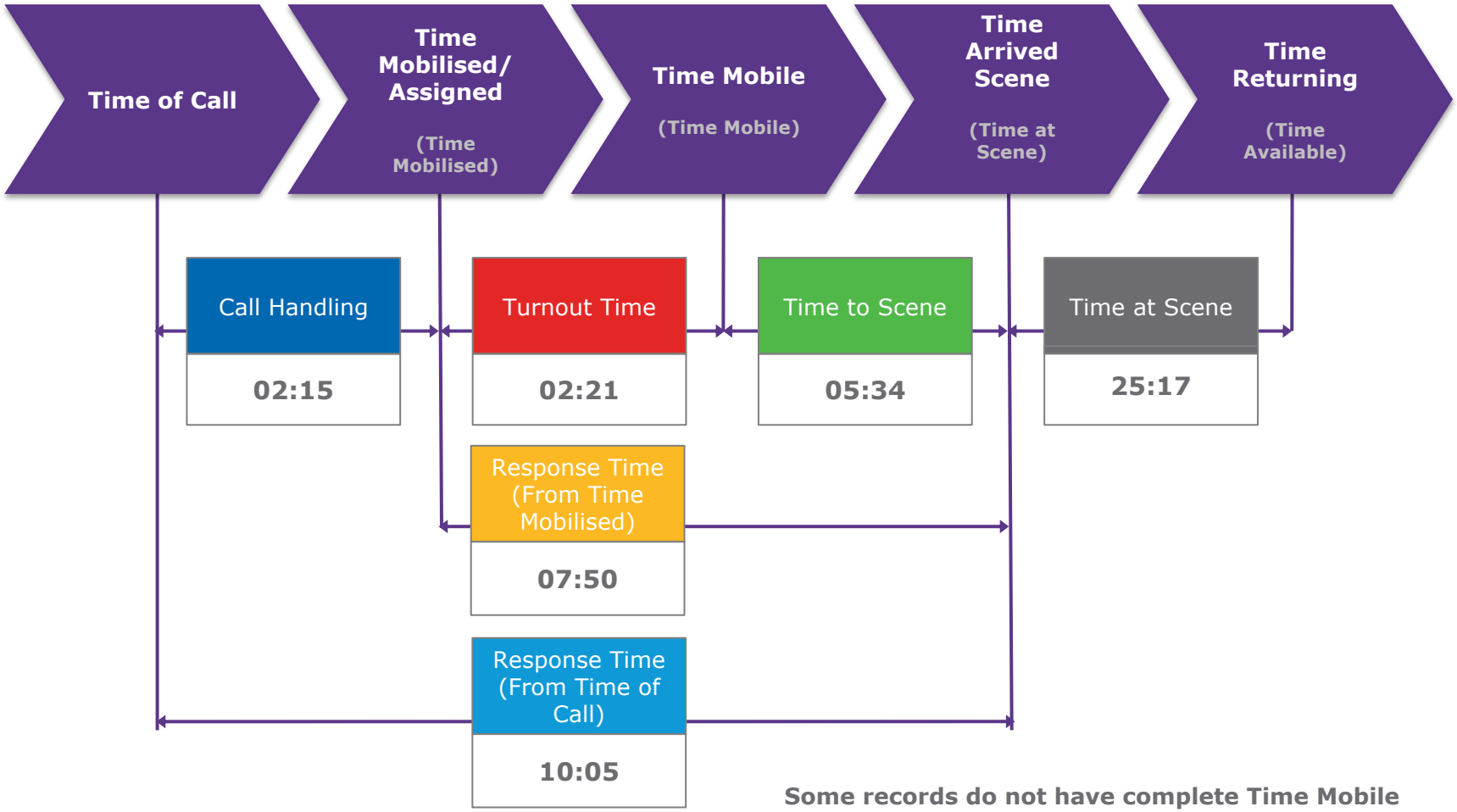
Response Profile: Call Components

For each incident and response, the time stamps associated with the call, incident and responding vehicles were provided. ORH calculated the time intervals to build up a profile of how NFRS responds to incidents.

Based on the most recent two calendar years (excluding data removed due to coronavirus):

- The average time to dispatch the first pump to an incident was 2m 15s (this has reduced over the five-year sample).
- The average turnout time was 2m 21s, but this varies depending on the duty system and time of day.
- The average travel time to scene was 5m 34s, but this varies depending on the proximity to the closest available pumps.
- The average time spent at the scene of the incident was 25m 17s, but this varies depending on the type of incident attended.
- While averages are presented and commented on within this report, ORH's models take account in fluctuations related to observed differences depending on the:
  - Time and day
  - Type of incident
  - Duty system (and individual station) of the pump responding
  - Responder number

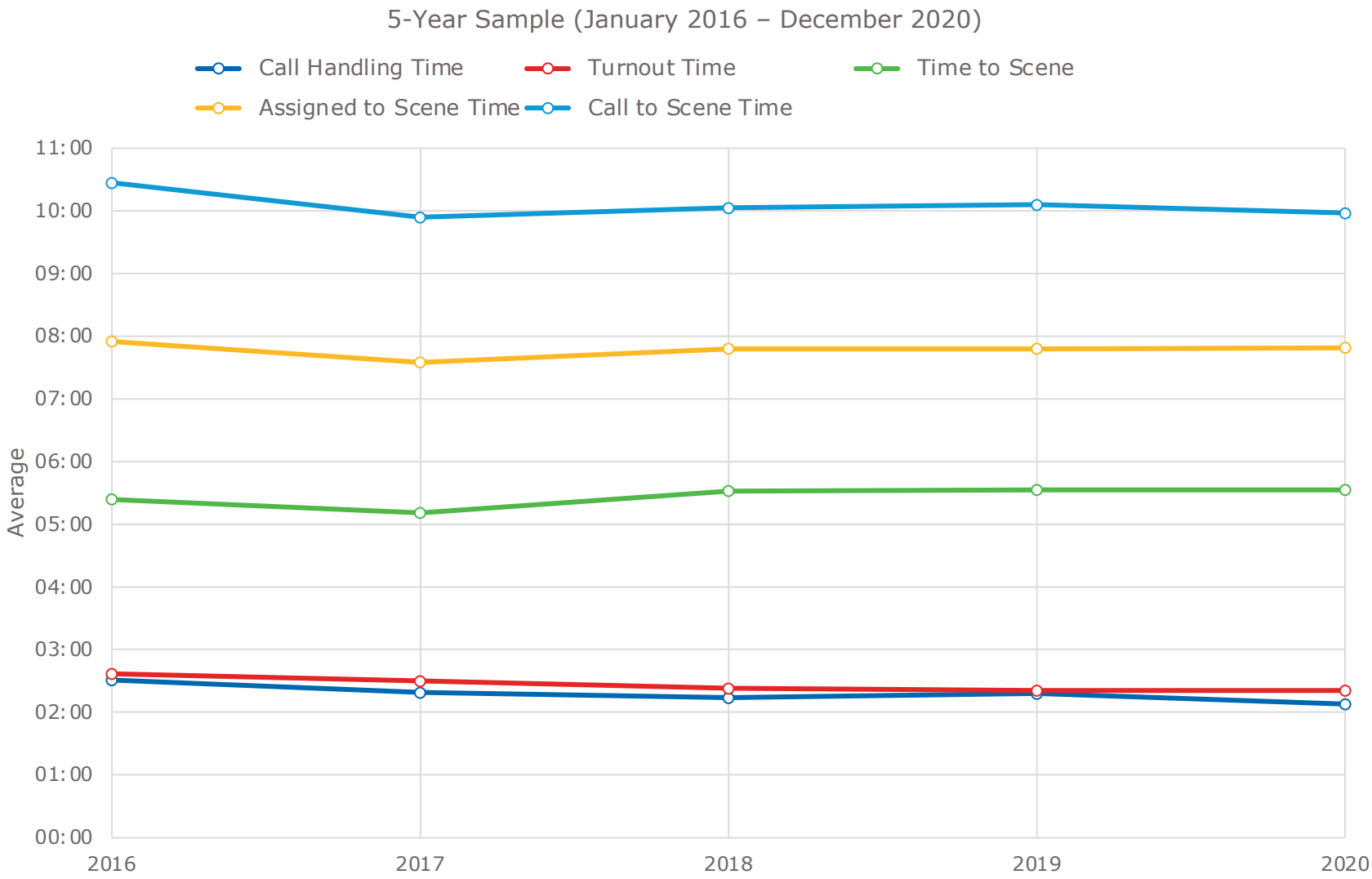
Call/Incident Cycle Times



Some records do not have complete Time Mobile fields. These are still used in calculating the Response Time, but not the Turnout Time or Time to Scene.

First Responding Pump. January 2019 to December 2020 (excluding March, April, May and November 2020)

Call/Incident Time Components



Control Activation
Second Response Lag

2-Year Sample (January 2019 – December 2020*)

Incident Category	Sub-category	Proportion Assigned Simultaneously	Average Assignment Lag
Fire	Primary Fire	81.3%	01:36
	Chimney Fire	56.4%	09:16
	Secondary Fire	42.2%	08:22
Special Service	RTC	81.6%	01:30
	Other Special Service	66.2%	04:39
False Alarm	AFA	93.1%	00:17
	Good Intent FA	92.4%	00:16
	Malicious FA	96.2%	00:08

Category	2+ Pump Incidents
Primary Fire	51%
Chimney Fire	7%
Secondary Fire	25%
RTC	42%
Other Special Service	7%
AFA	47%
Good Intent FA	26%
Malicious FA	48%

The average assignment lag calculates, for incidents when there are 2 (or more) pumps attending, the average time difference between assigning/mobilising the first pump and the second pump.

*Excluding March, April, May and November 2020

Turnout Times

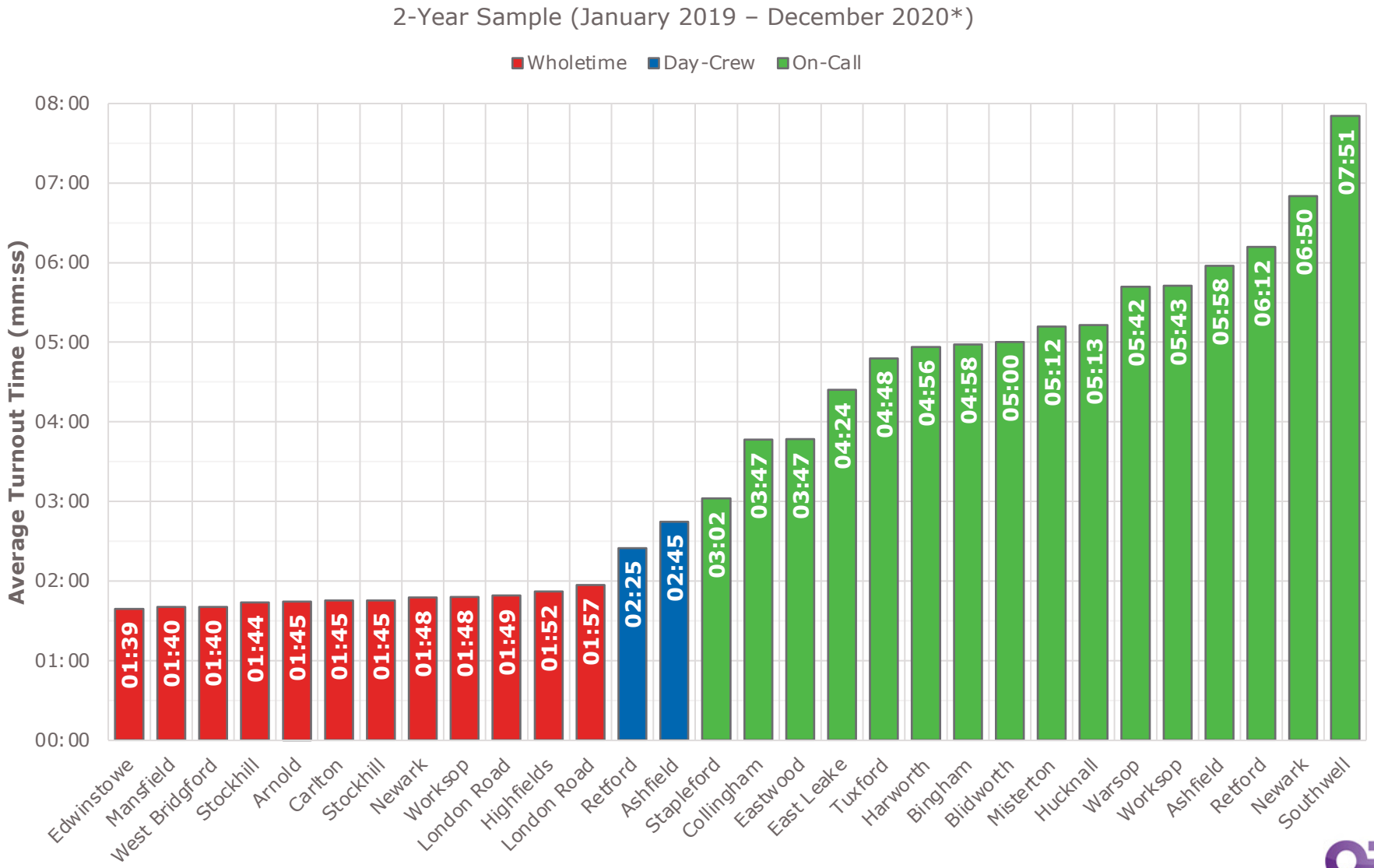
The average turnout times of wholetime pumps varies between 1m 43s (Edwinstowe) and 2m 01s (London Road).

The day-crewed pumps have a similar turnout time to wholetime pumps during the day and increase when they are on-call crewed at night.

Average on-call pump turnout times vary between 3m 15s (Stapleford) and 7m 21s (Southwell). On-call turnout times have generally improved over the last five calendar years.

There is an opportunity for NFRS to look at improving wholetime turnout times. From ORH's experience of working with other UK FRSs, an average of 1m 30s is a typical benchmark for wholetime turnout times.

Turnout Time by Pump



*Excluding March, April, May and November 2020

Turnout Time by Pump

2-Year Sample (January 2019 – December 2020*)

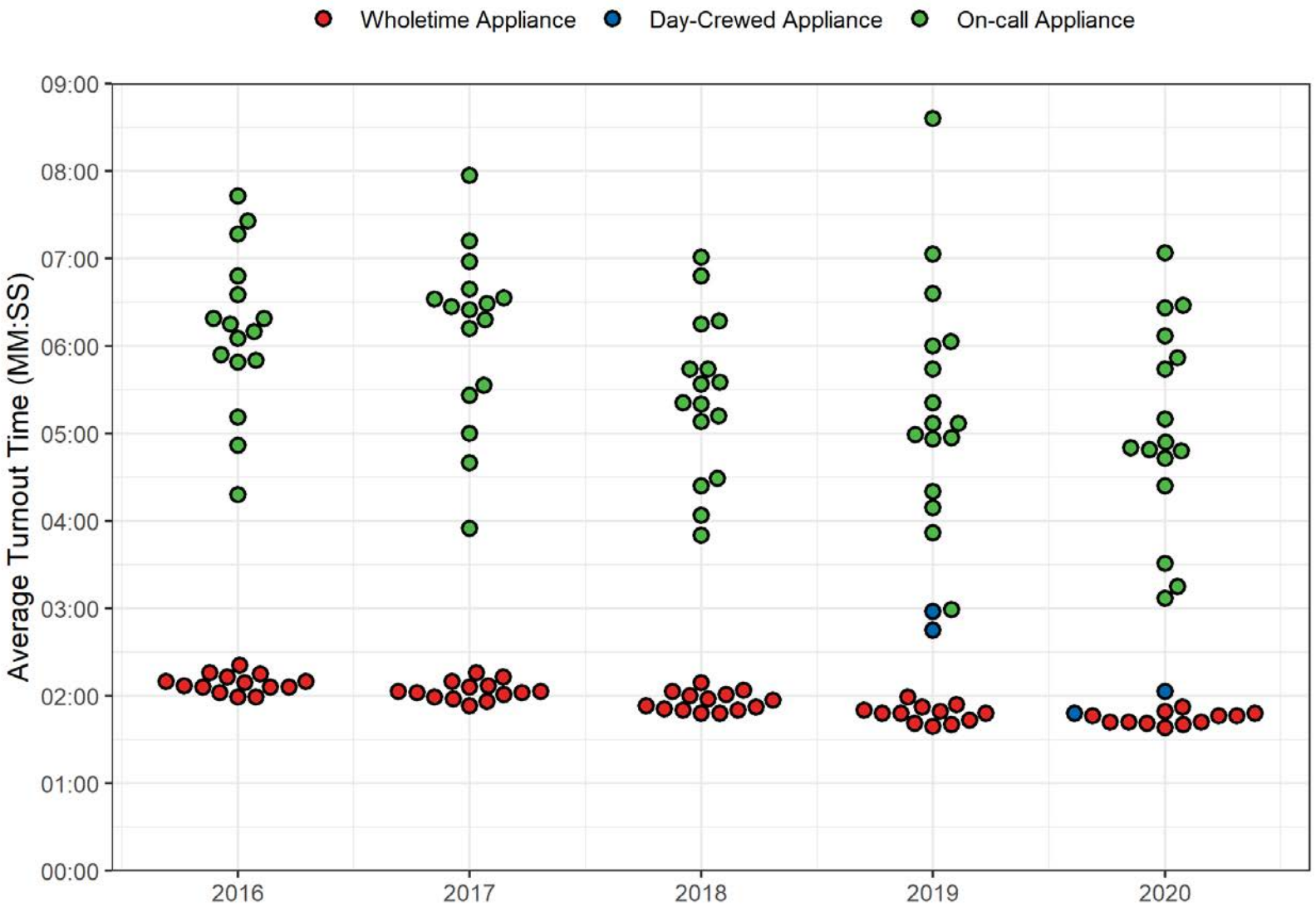
Callsign	Station	Crewing	Weekday		Weekend	
			Day	Night	Day	Night
Arnold	FET26P1	Wholetime	01:39	01:53	01:40	01:54
Carlton	FET27P1	Wholetime	01:35	02:06	01:41	02:00
Edwinstowe	FET06P1	Wholetime	01:35	01:50	01:27	01:50
Highfields	FET29P1	Wholetime	01:44	02:05	01:48	02:05
London Road	FET03P1	Wholetime	01:45	02:13	01:49	02:11
London Road	FET03P2	Wholetime	01:37	02:10	01:37	01:58
Mansfield	FET01P1	Wholetime	01:28	01:56	01:31	01:58
Newark	FET16P1	Wholetime	01:39	02:04	01:37	02:01
Stockhill	FET20P1	Wholetime	01:38	01:51	01:40	01:52
Stockhill	FET20P2	Wholetime	01:39	01:52	01:46	02:01
West Bridgford	FET19P1	Wholetime	01:33	01:53	01:38	01:49
Worksop	FET08P1	Wholetime	01:37	02:00	01:39	02:11
Ashfield	FET05P1	Day-Crew	02:02	04:50	02:03	04:26
Retford	FET12P1	Day-Crew	01:43	05:27	01:48	05:03
Ashfield	FET05P2	On-Call	05:19	06:38	05:33	06:38
Bingham	FET17P1	On-Call	04:23	05:53	05:11	05:05
Blidworth	FET02P1	On-Call	04:42	05:13	05:13	05:42
Collingham	FET15P1	On-Call	03:45	03:57	03:05	05:17
East Leake	FET28P1	On-Call	03:44	05:07	05:05	04:48
Eastwood	FET24P1	On-Call	03:29	03:59	04:02	04:08
Harworth	FET10P1	On-Call	04:35	05:25	04:56	05:21
Hucknall	FET25P1	On-Call	04:48	05:24	05:50	05:30
Misterton	FET11P1	On-Call	05:01	05:11	05:22	05:45
Newark	FET16P2	On-Call	06:40	07:41	06:15	07:22
Retford	FET12P2	On-Call	06:00	06:16	05:31	07:15
Southwell	FET14P1	On-Call	07:03	09:05	08:59	06:52
Stapleford	FET23P1	On-Call	02:33	03:24	03:26	03:53
Tuxford	FET13P1	On-Call	04:53	04:40	04:27	05:15
Warsop	FET07P1	On-Call	05:22	06:31	04:51	06:57
Worksop	FET08P2	On-Call	05:46	05:00	06:16	06:44

Crewing	Weekday		Weekend	
	Day	Night	Day	Night
Wholetime	01:38	02:00	01:40	02:00
Day-Crew	01:55	04:59	01:57	04:39
On-Call	04:40	05:22	05:03	05:37

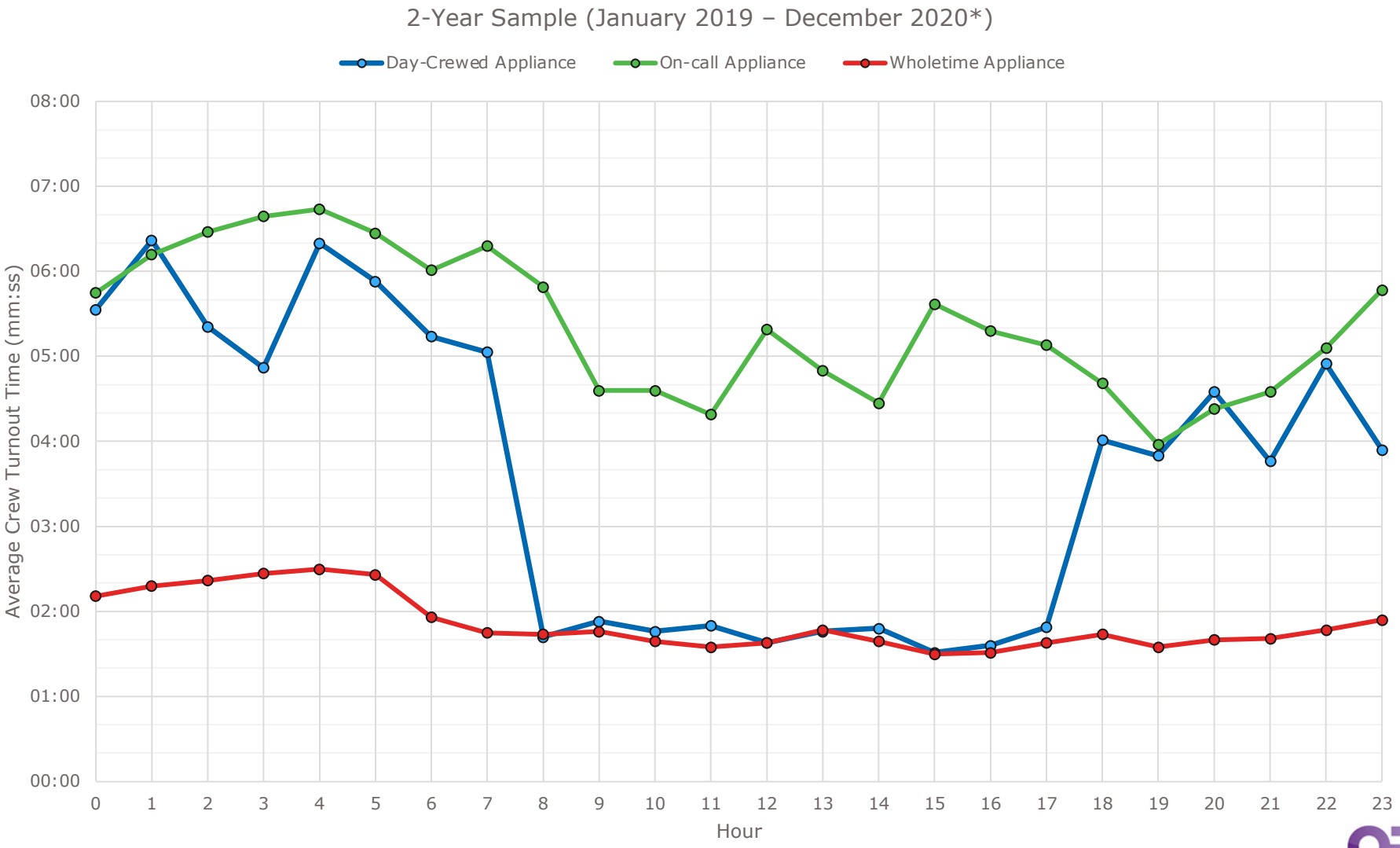
*Excluding March, April, May and November 2020

Day = 08:00 to 20:00. Night = 20:00 to 08:00

Turnout by Pump by Year



Turnout Time by Hour



*Excluding March, April, May and November 2020

Response Times

As stated in NFRS's 2019-22 strategic plan, the response target is for the first pump to arrive, in an average of eight minutes, at all incidents service-wide, from the time the pump is assigned. NFRS currently performs within this target.

Average first and second pump response times are longest in the districts of Newark & Sherwood, Bassetlaw and Rushcliffe, which are some of the more rural parts of Nottinghamshire. In addition to these three districts, average first pump response performance is over eight minutes in the district of Ashfield. The remaining four districts are within eight minutes.

Average second pump performance is significantly quicker in the City of Nottingham compared to other districts.

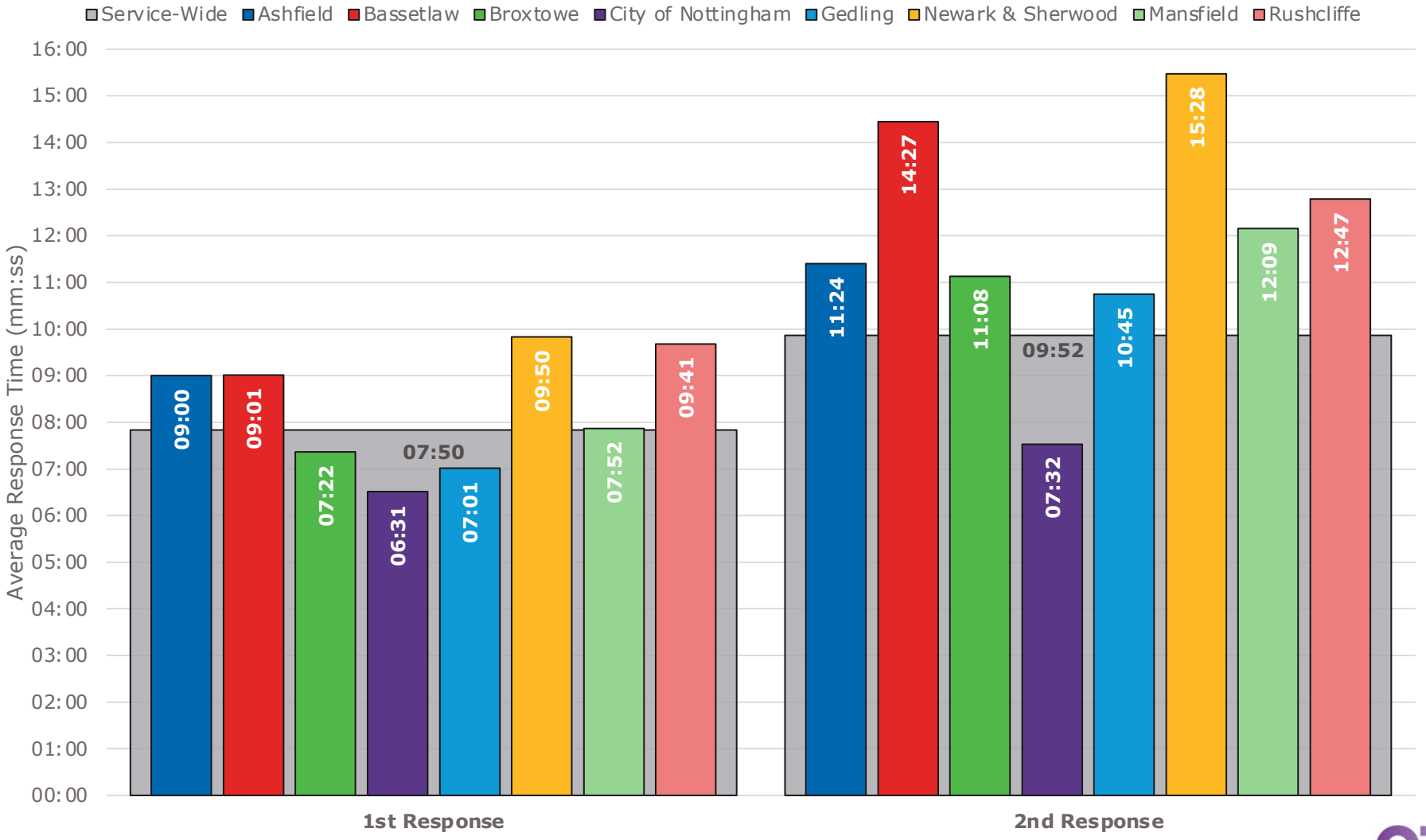
When comparing average response performance during the day (08:00 to 18:00) and night (18:00 to 08:00), performance in Ashfield District is quicker in the day compared to at night, on average, for both first (+1m 12s longer at night) and second (+2m 26s longer at night) pump response.

ORH also analysed average response times by station area and mapped average first, second and third pump response times and also the percentage of incidents within 8 minutes.

ORH has provided NFRS with an analytical tool to assess different metrics of response performance.

Average Response Time - District

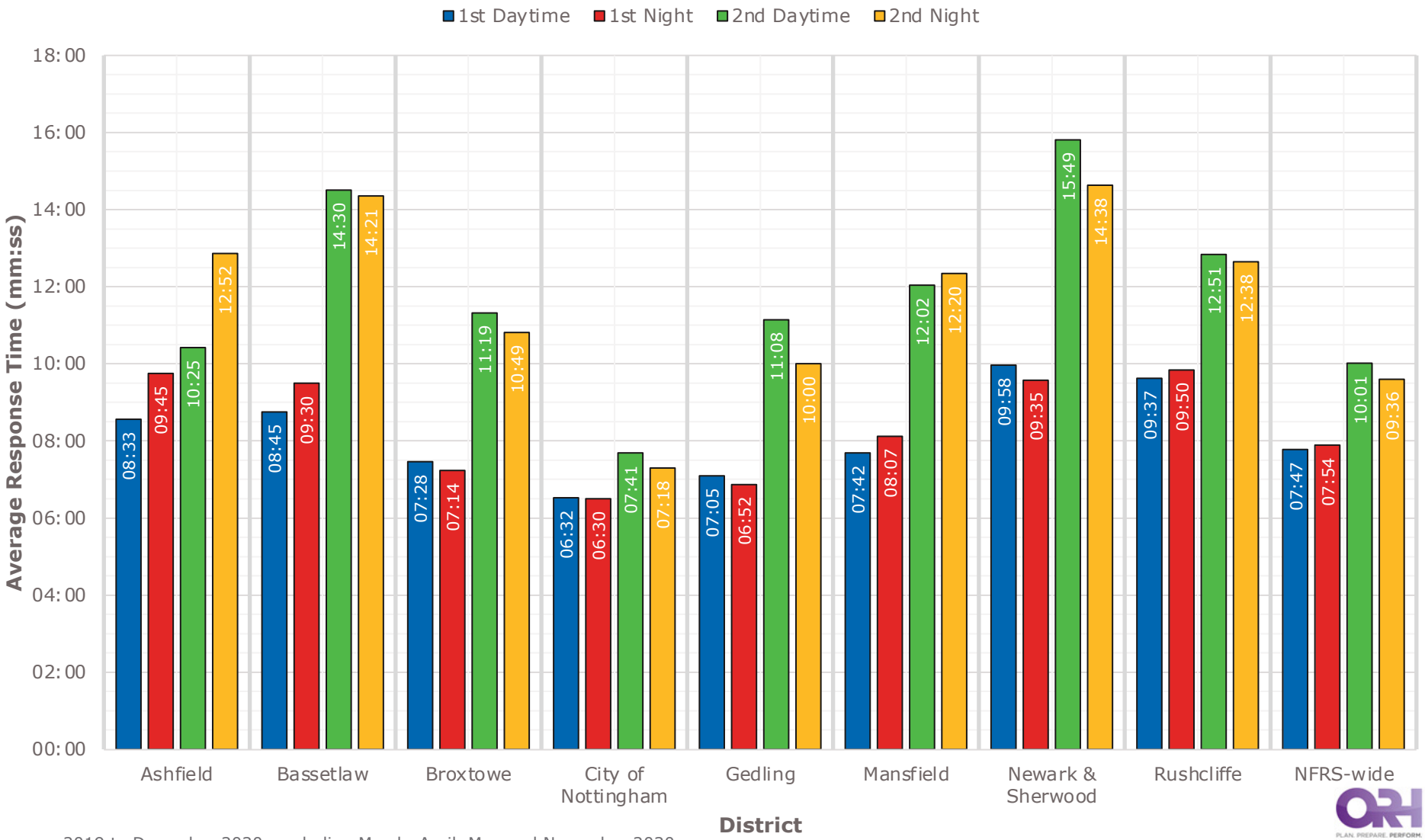
All Incidents (January 2019 to December 2020*)



*Excluding March, April, May and November 2020

Response Time Measured from Time Mobilised to Time at Scene

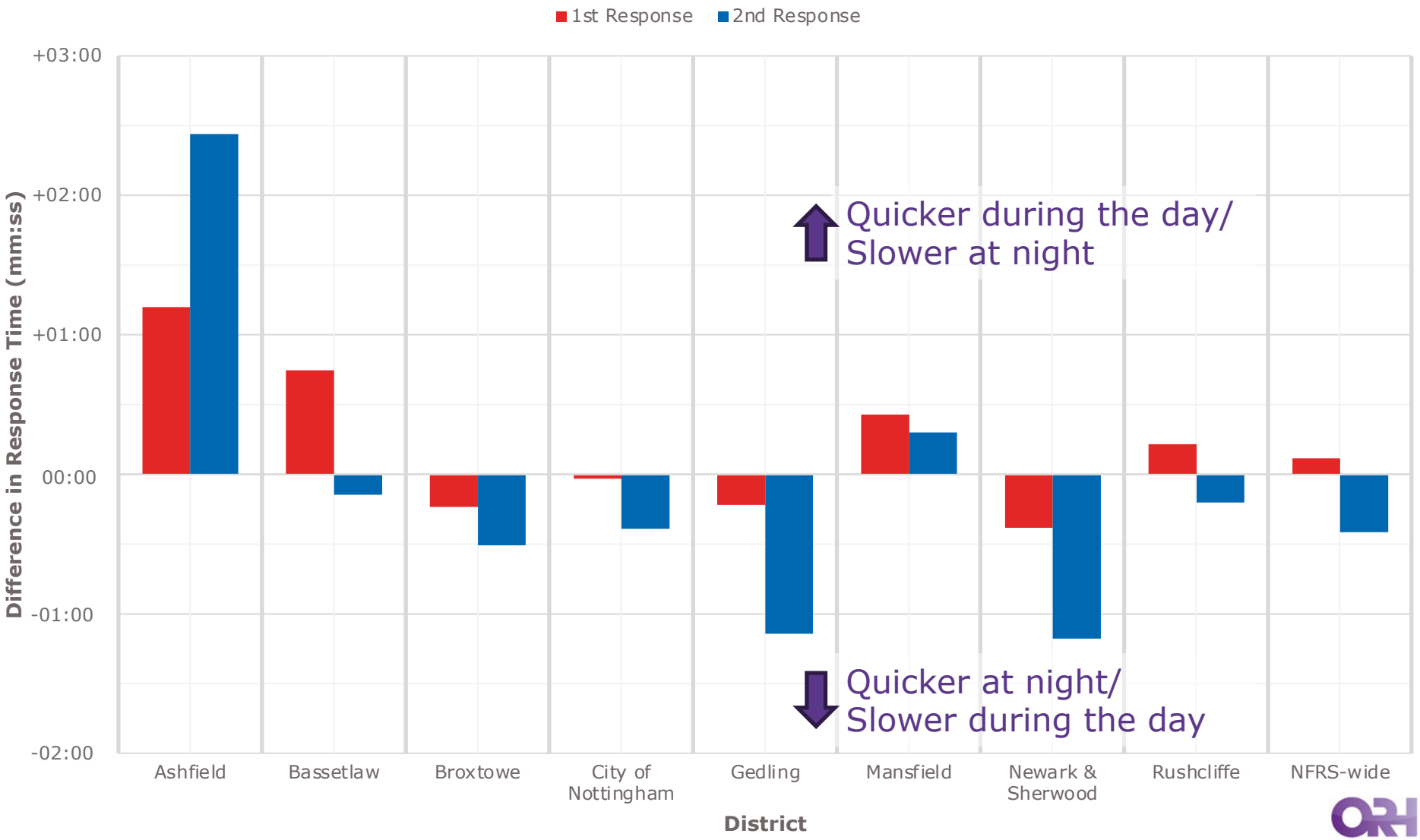
Analysed Average Response Time
By District, Responder Number and Day/Night



January 2019 to December 2020, excluding March, April, May and November 2020

Difference: Day Versus Night Response

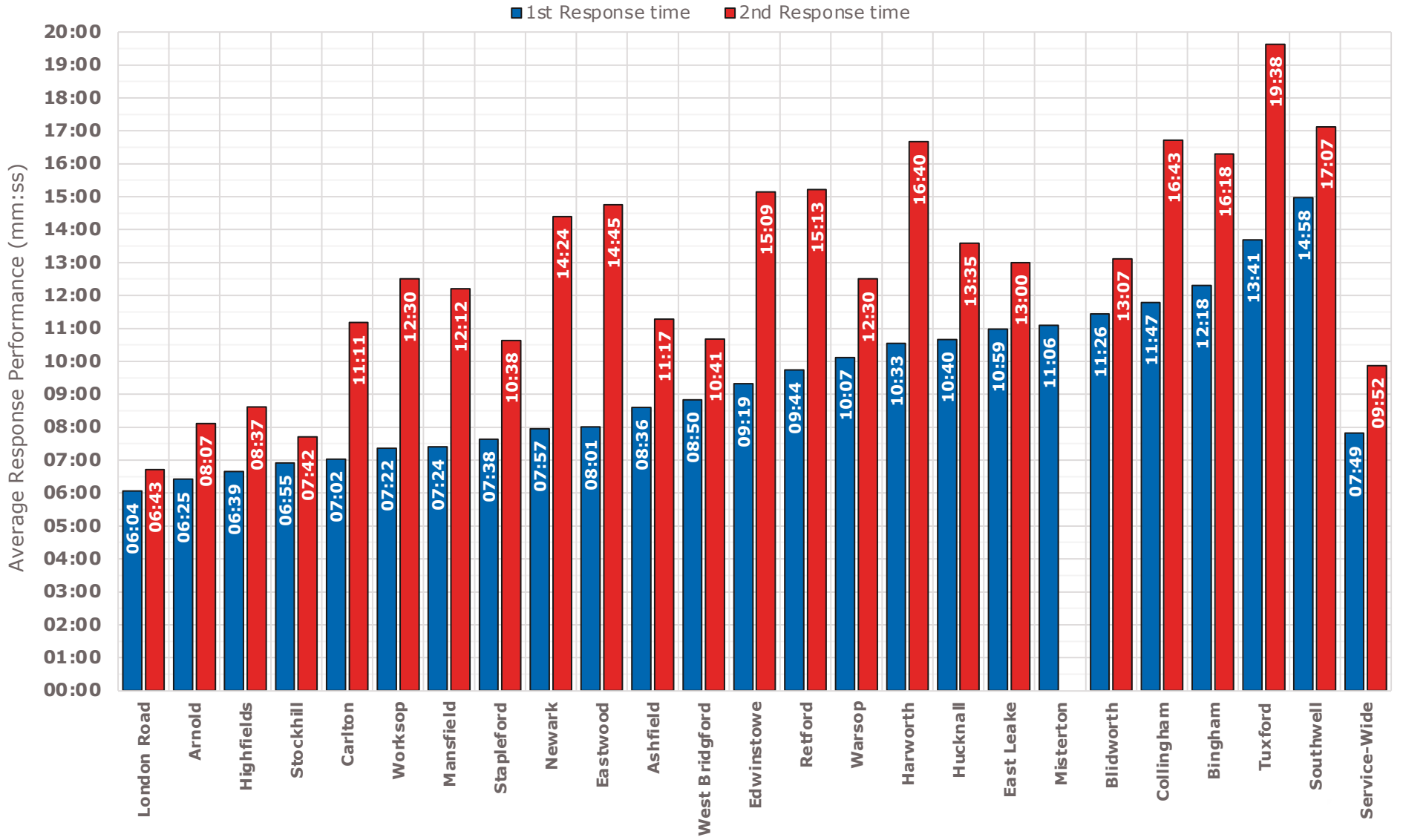
Analysed Response Times



January 2019 to December 2020, excluding March, April, May and November 2020

Average Response Time – Station Area

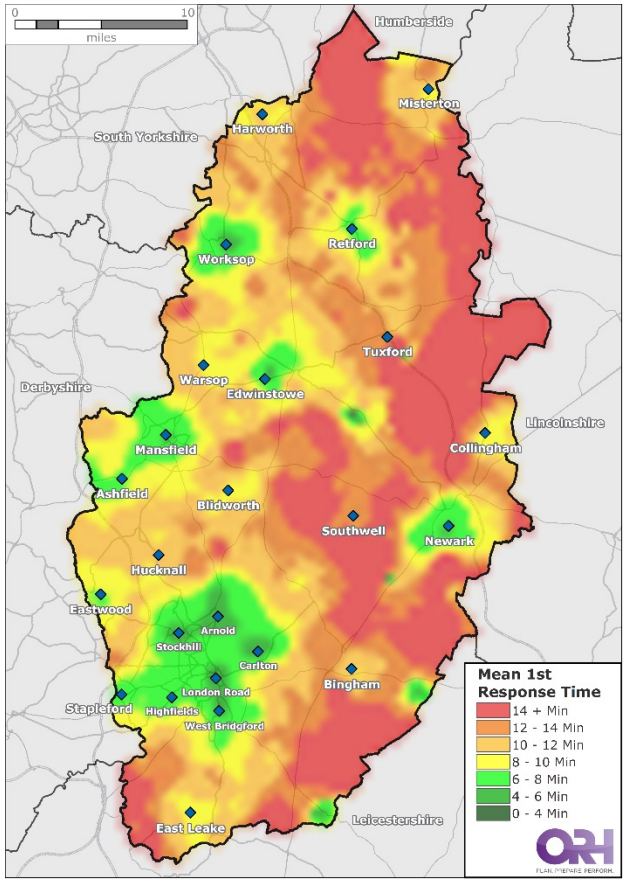
All Incidents (January 2019 to December 2020*)



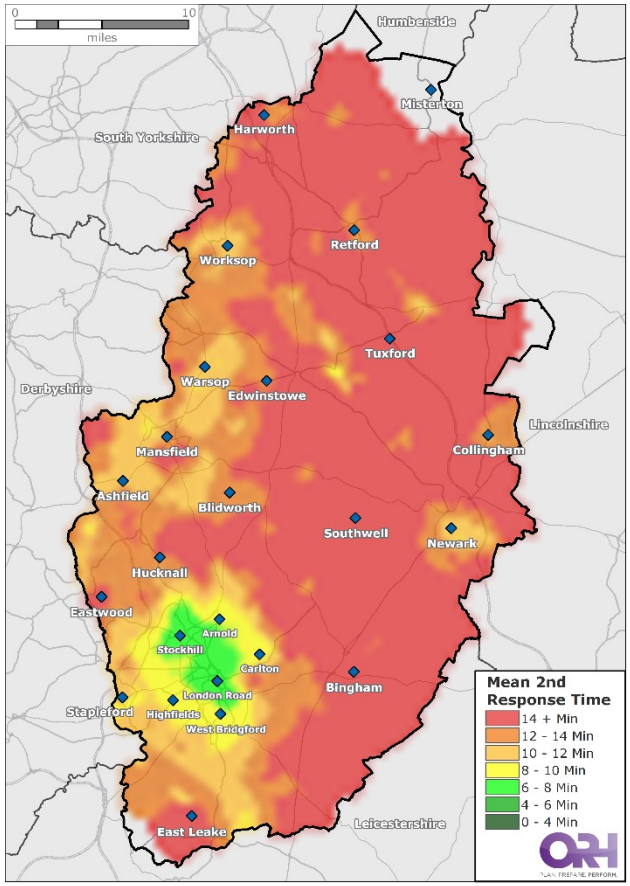
*Excluding March, April, May and November 2020 Response Time from Time Mobilised to Time at Scene. Note: No Data for Misterton 2nd Response.

Average Response to All Incidents

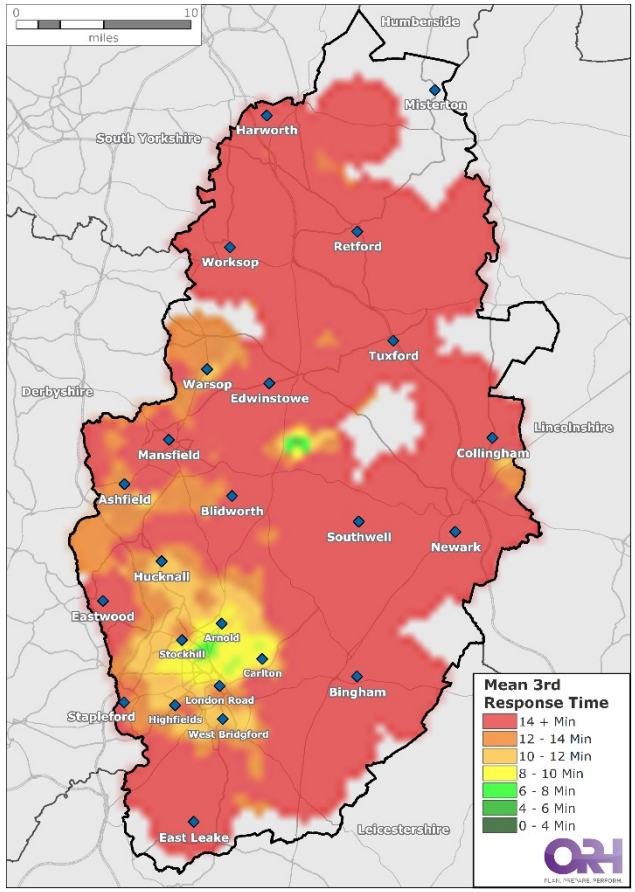
First Response



Second Response



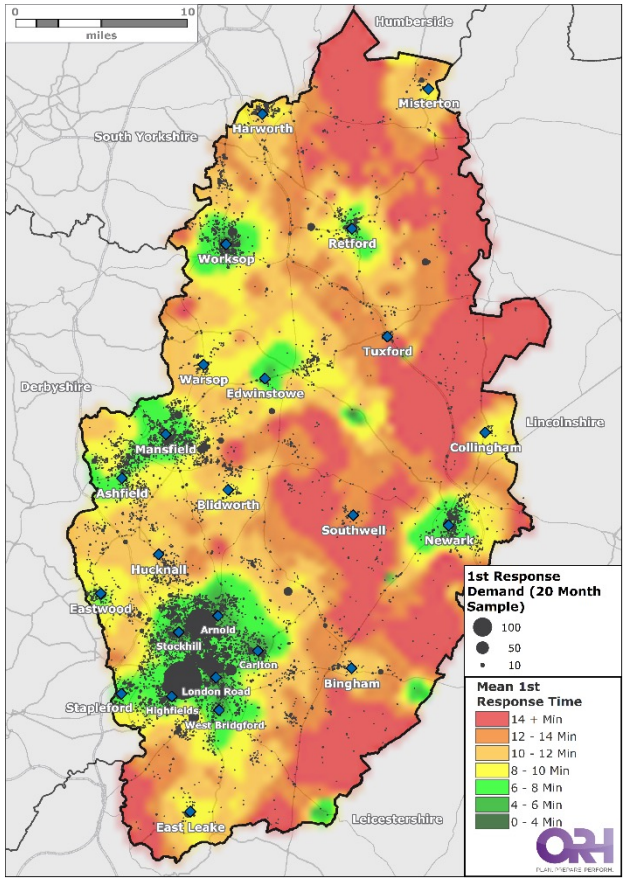
Third Response



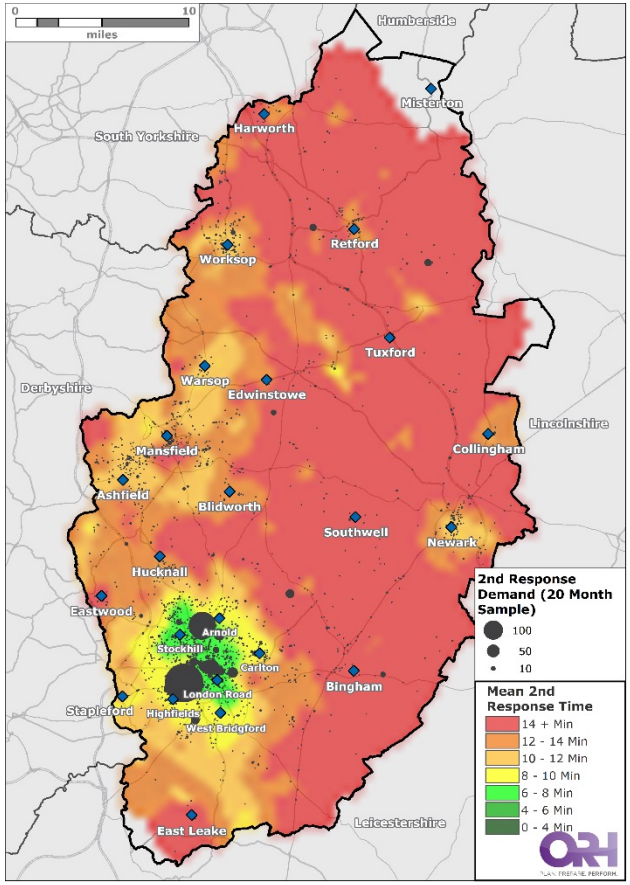
January 2019 to December 2020, excluding March, April, May and November 2020

Average Response to All Incidents

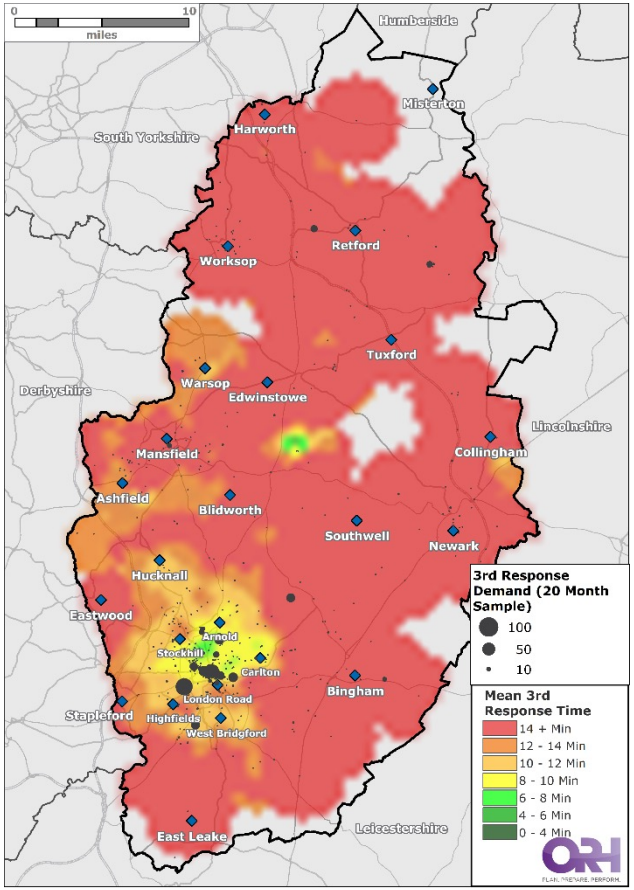
First Response



Second Response

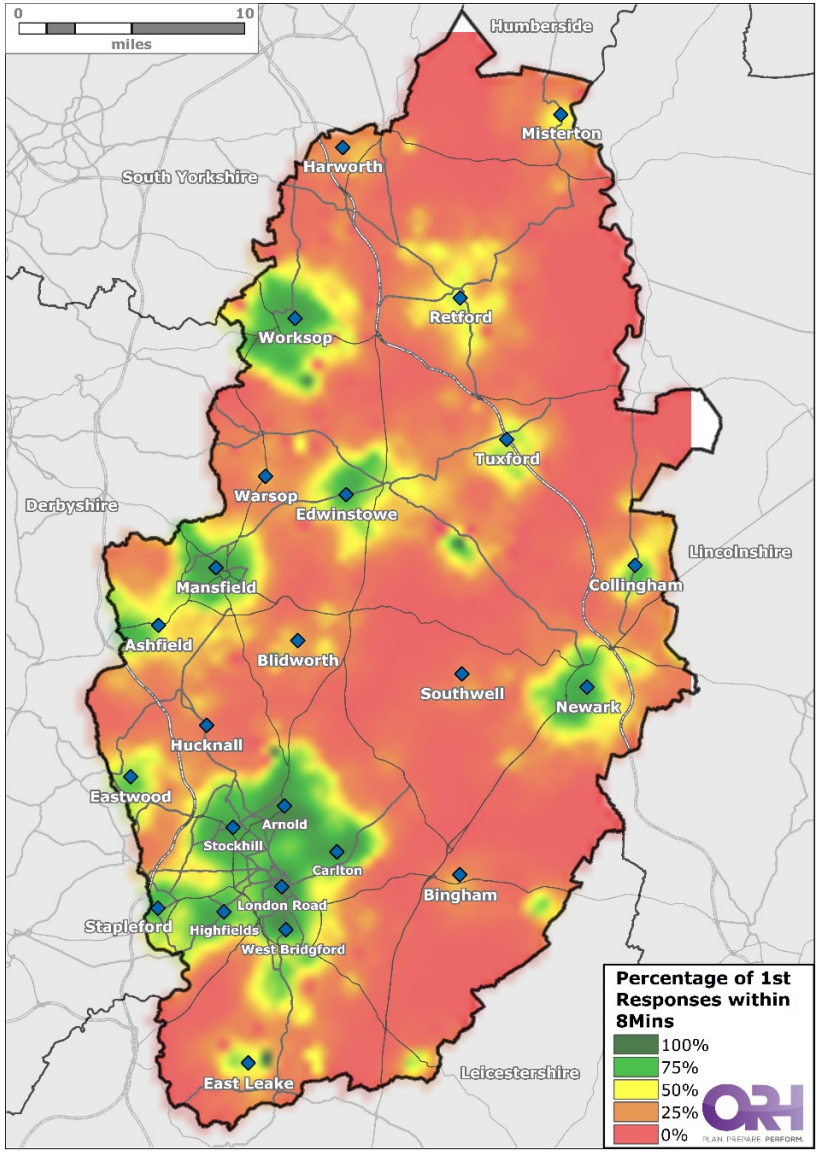


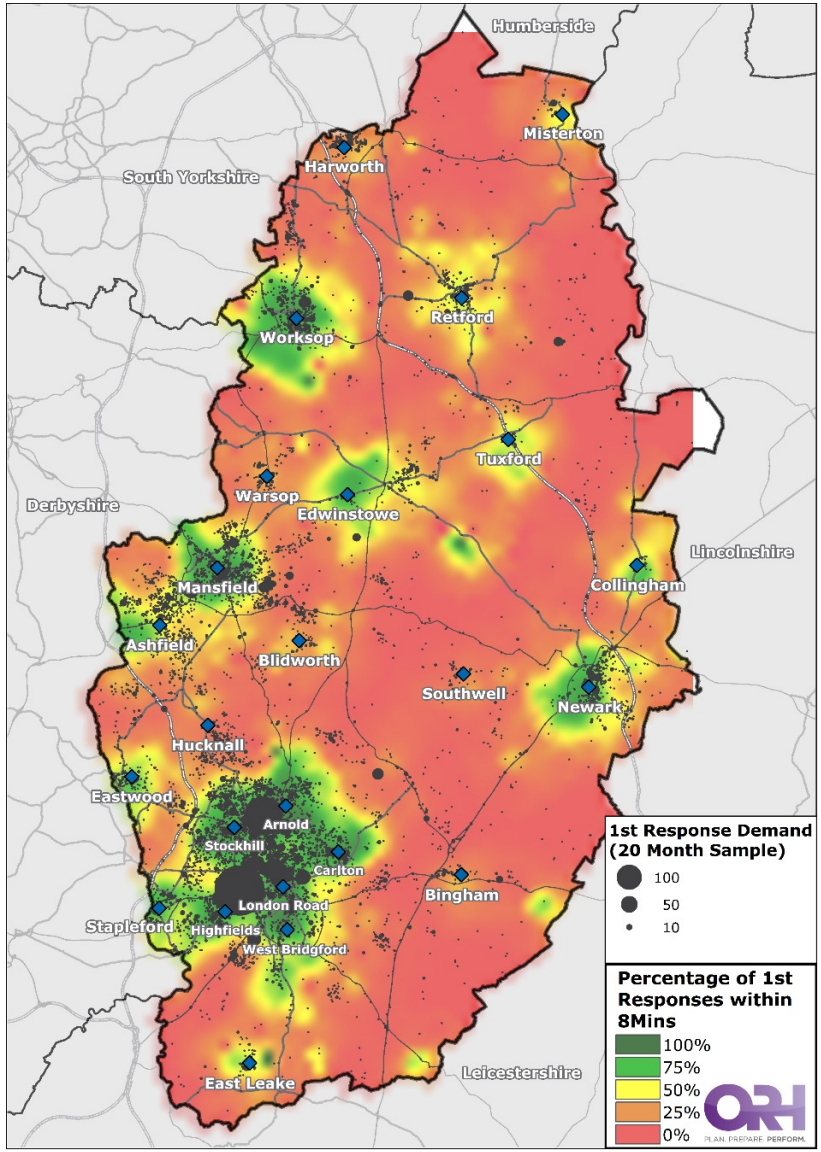
Third Response



January 2019 to December 2020, excluding March, April, May and November 2020

First Response Within 8 Minutes





January 2019 to December 2020, excluding March, April, May and November 2020

Life-Risk Incidents

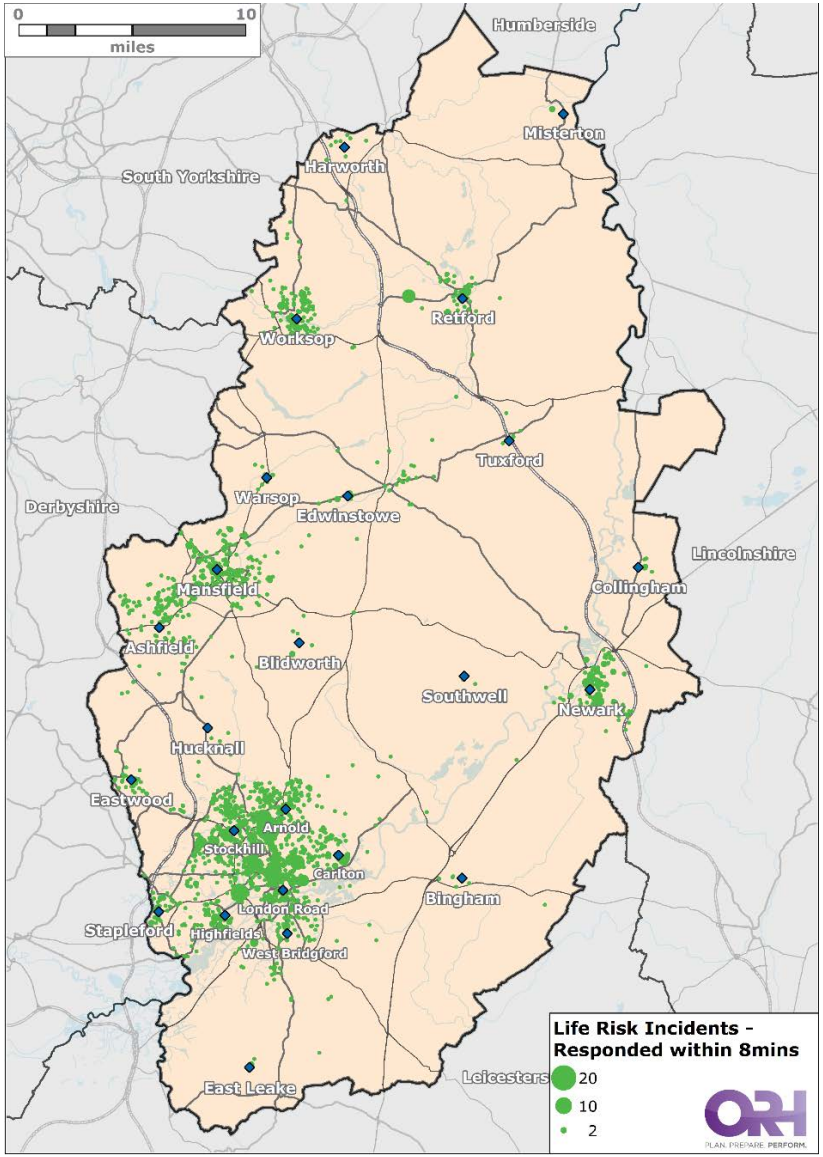
While pumps are operationally used for a wide range of incidents, NFRS identified incident types that are classified as *life-risk* incidents. This risk profile was used for the optimisation modelling.

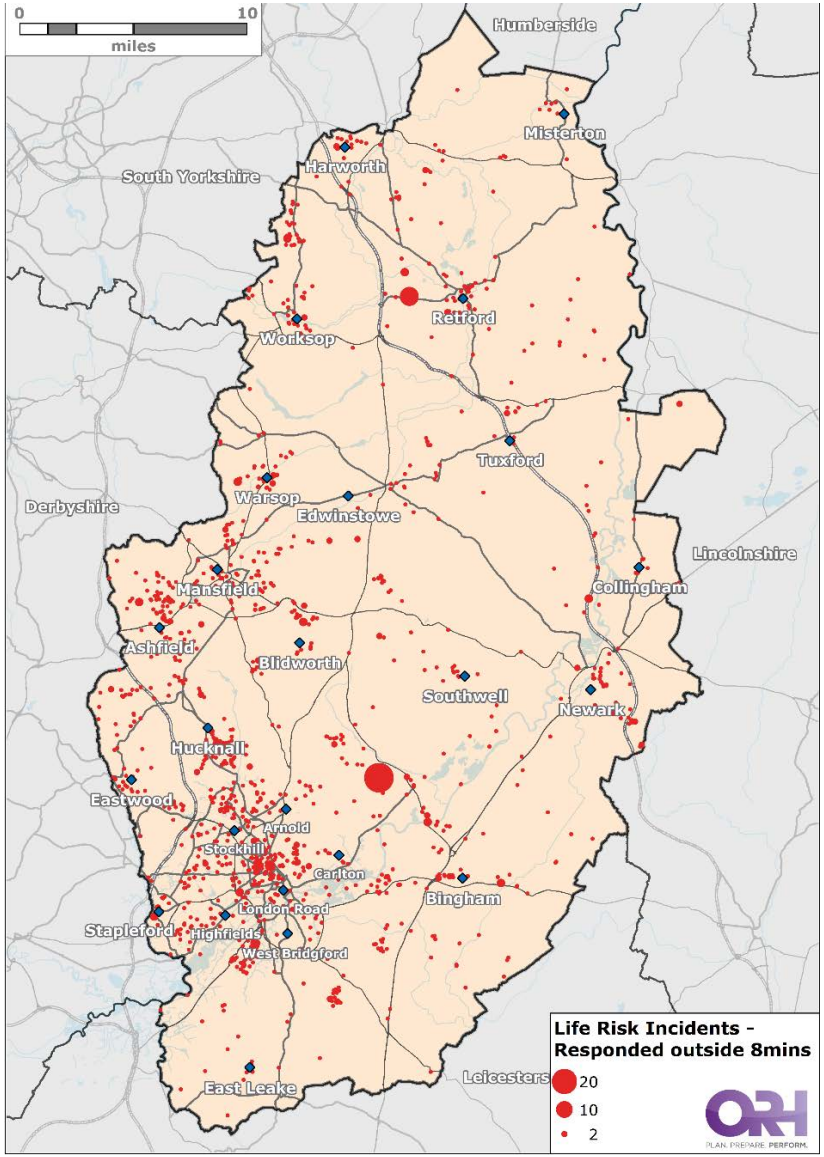
Life-Risk Incident Type
Assist Other Agency
Effecting Entry
Hazardous Materials
Medical Incident
Person Rescue
Suicide Threat
Water Rescue
Primary Dwelling Fire
Primary Non Residential Building Fire
Primary Residential Building Fire
RTC: Persons Trapped
Secondary Dwelling Fire
Secondary Non Residential Building Fire
Secondary Residential Building Fire

Non-Life-Risk Incident Type
Chimney Fire
False Alarm
Animal Rescue
Flooding
Lift Release
Making Safe
Services not Required
Object Removal
Other SSC
Spills and Leaks
Primary Building (Structure) Fire
Primary Outdoor Location Fire
Primary Road Vehicle Fire
RTC: Making Safe
RTC: Other
Secondary Building (Structure) Fire
Secondary Outdoor Grass Fire
Secondary Outdoor Location Fire
Secondary Outdoor Rubbish Fire
Secondary Road Vehicle Fire
Unknown

Further analysis sub-categorising life-risk/non life-risk incidents is provided in the following pages.

Life-Risk Incidents In/Out 8 Minutes



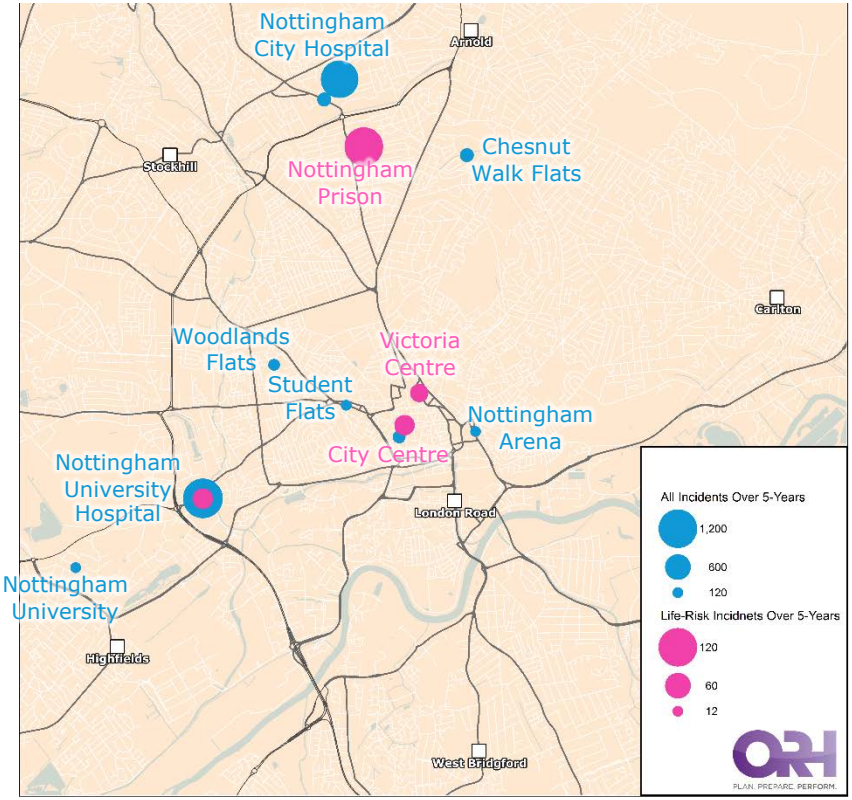


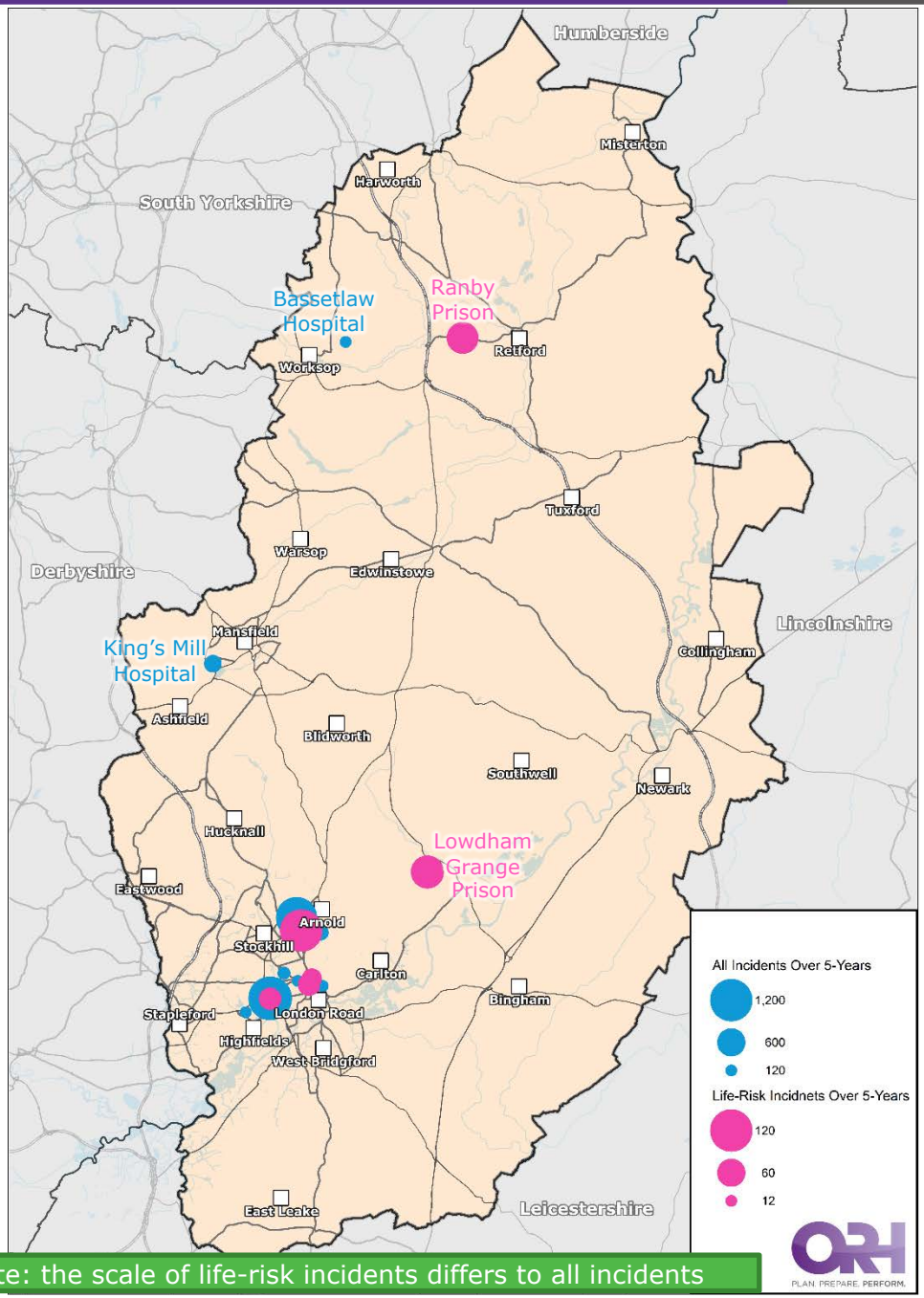
January 2019 to December 2020, excluding March, April, May and November 2020

Frequently Attended Locations

Locations displayed if, over five years, NFRS attended:

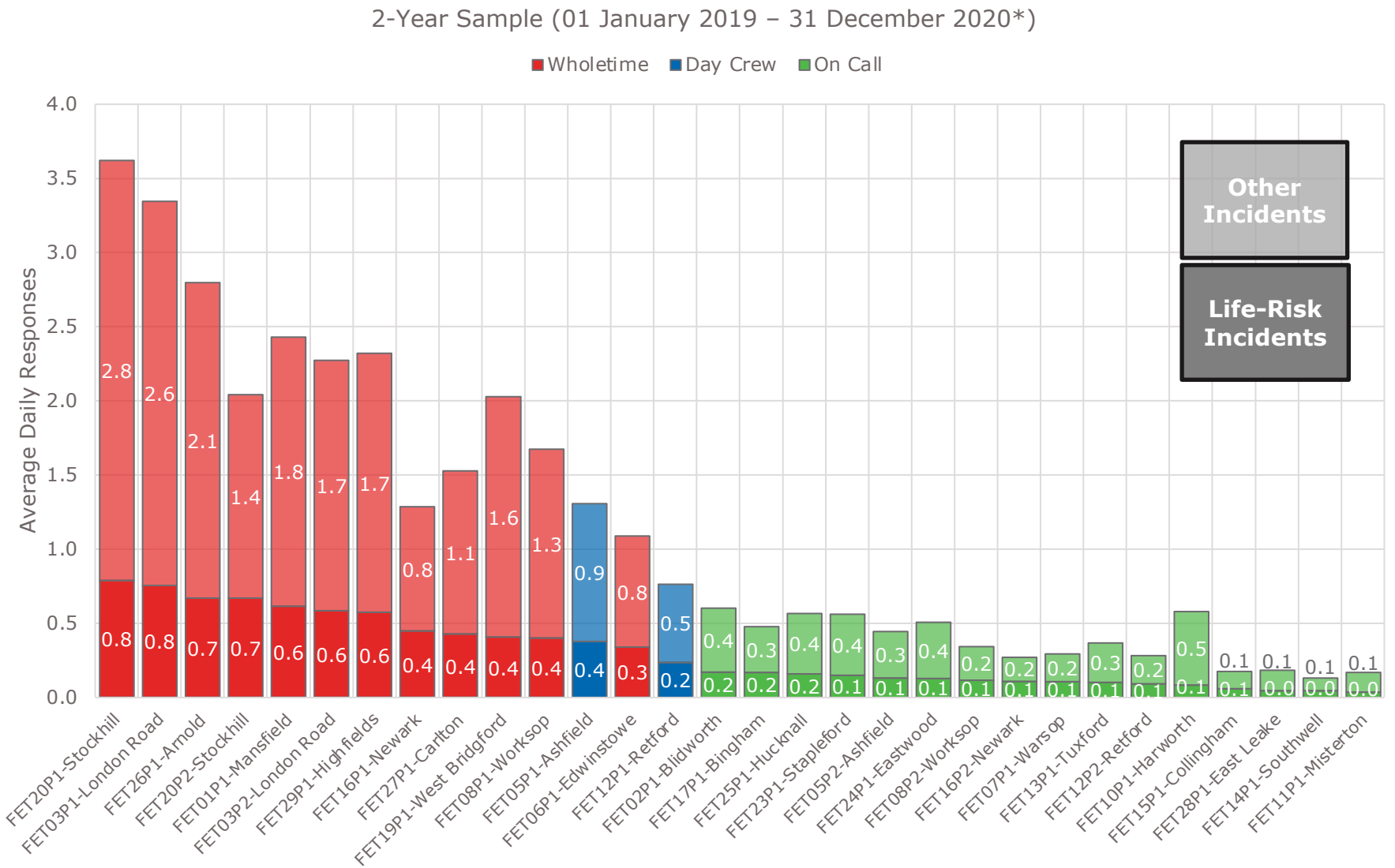
- Over 30 times (once every two months on average) to life-risk incidents, or
- Over 120 times (twice every month on average) for all incidents





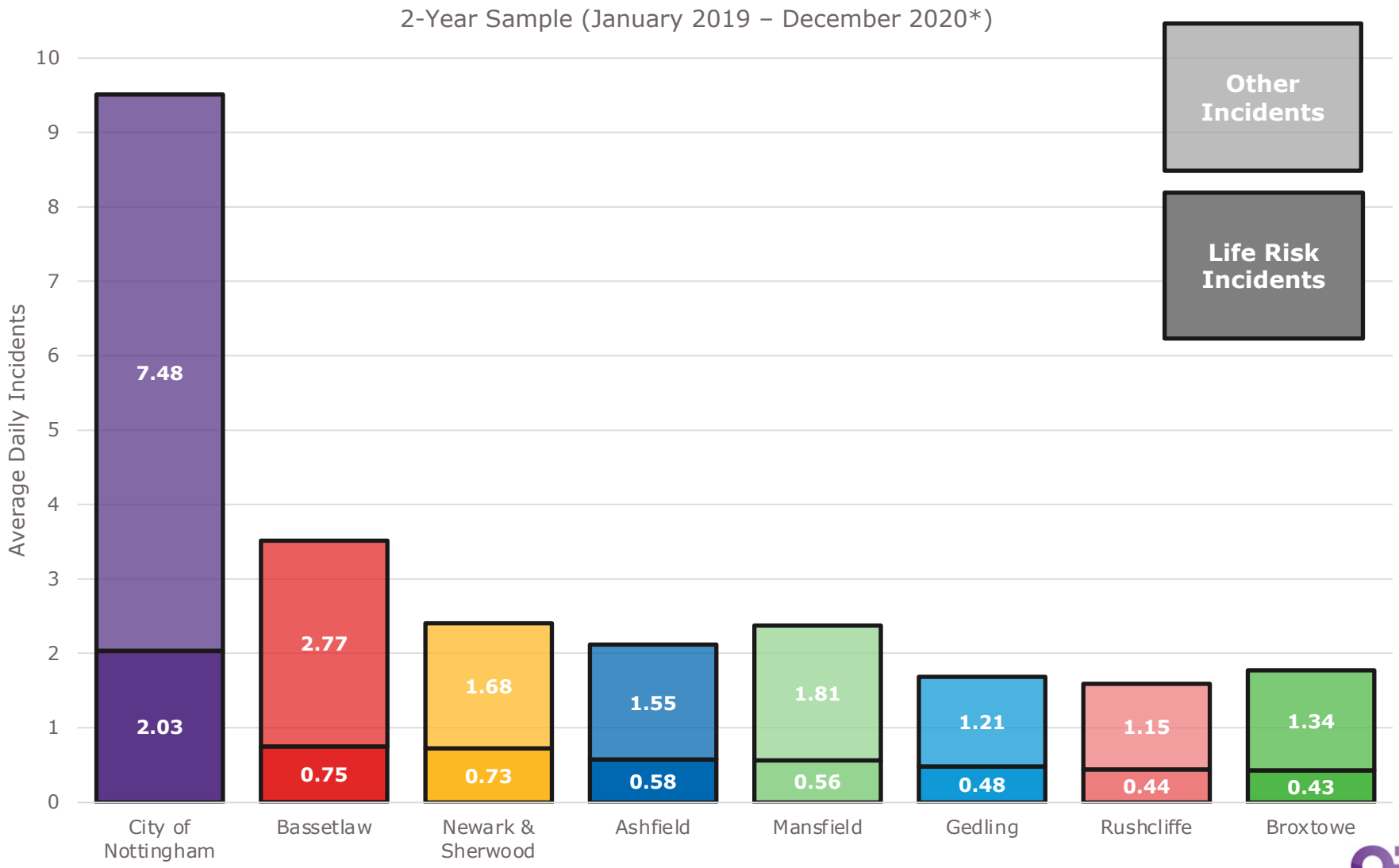
Note: the scale of life-risk incidents differs to all incidents

Responses by Callsign



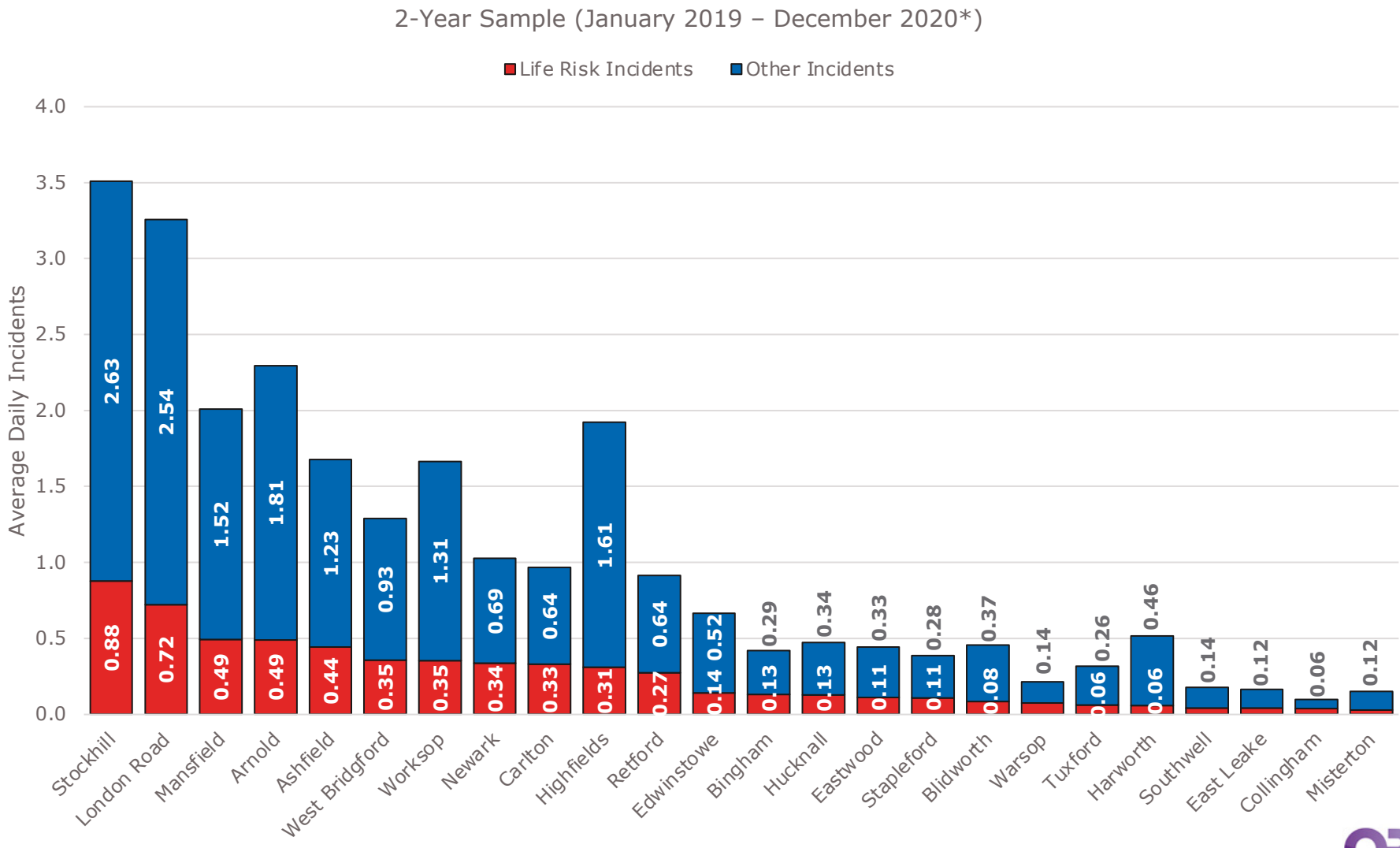
*Excluding March, April, May and November 2020

Incidents by District



*Excluding March, April, May and November 2020

Incidents by Station Area



*Excluding March, April, May and November 2020

Model Validation

Model Validation

The purpose of the model validation process was to ensure that ORH's simulation model reflects the real-life behaviour of NFRS appliances.

There are a number of stages involved in preparing a validated model. A detailed understanding of the manner in which the service functions is required (gained through data analysis and consultation), and this is combined with a sophisticated travel time calibration process.

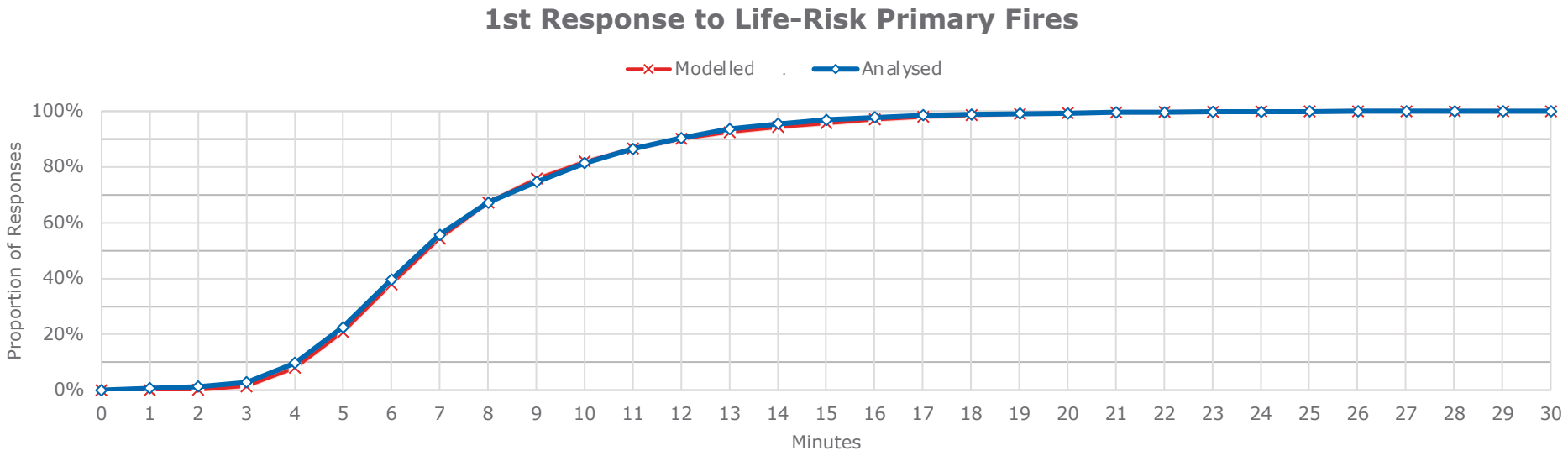
ORH's simulation model takes into account temporal variations in demand and operational parameters, and the model validation process includes the calibration of travel times by time of day to ensure that any effects of varying travel conditions are replicated.

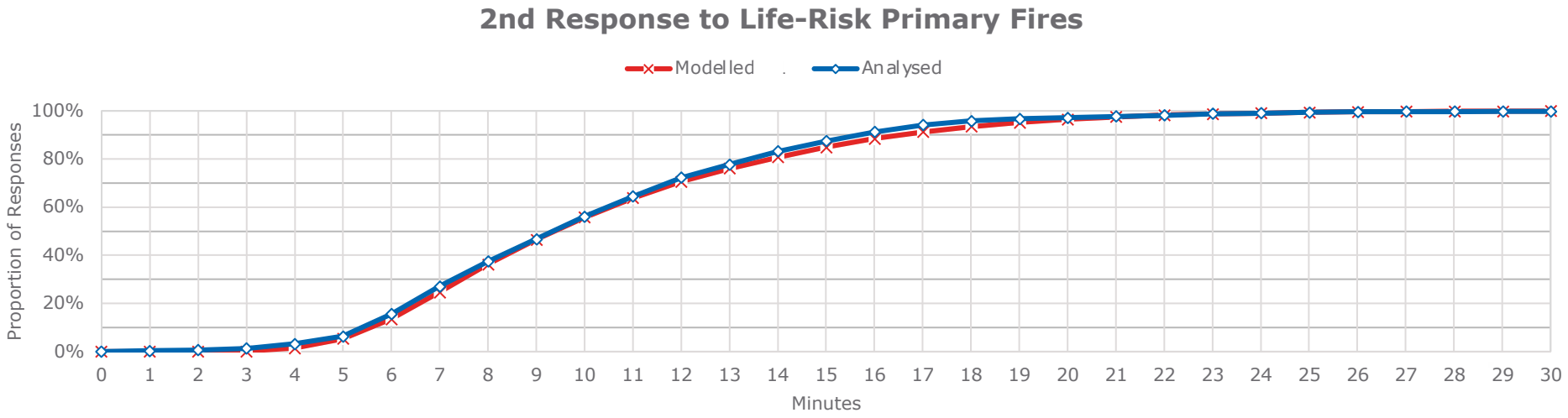
For the model validation, most analysed operational parameters used the sample January 2019 to December 2020, excluding March, April, May and November 2020 (due to significant differences to the operational regime of the service in periods of lockdown due to the coronavirus pandemic).

A five-year sample (January 2016 to December 2020) of historical incident locations was used to ensure a robust sample.

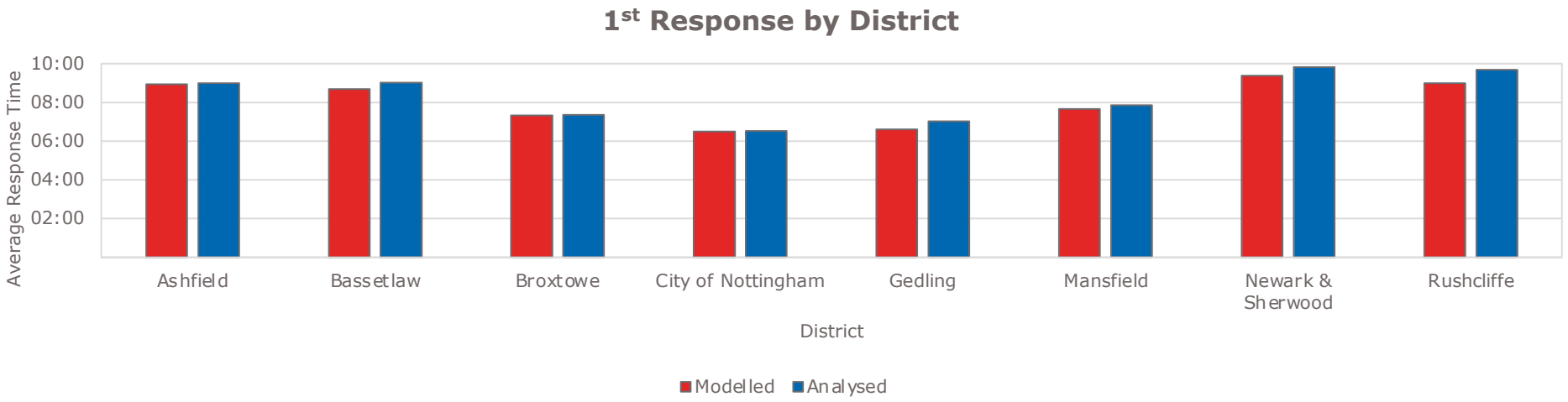
There was a close correspondence between the model and the actual analysed position. This can be seen in the measures of response performance and the station workload. The model could therefore be used with confidence to explore the effects of changes in operational parameters, such as crewing and station deployments.

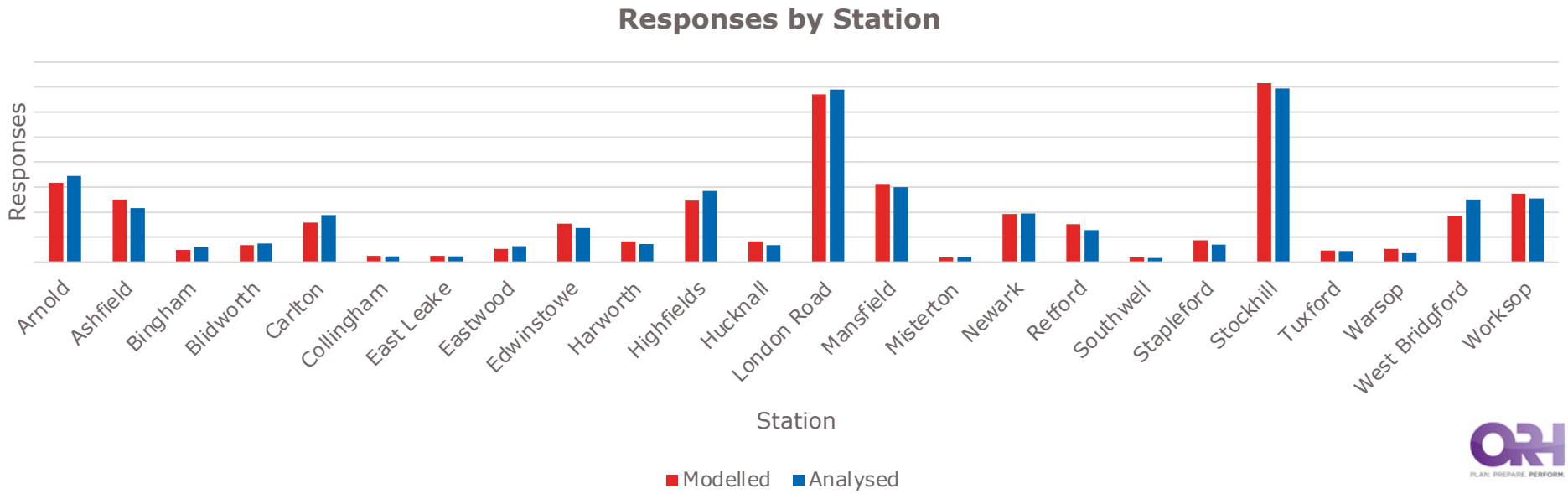
Model Validation





Model Validation





Model Base

Model Base

The model validation process ensured that the model accurately replicates the operational regime of NFRS; however, it was necessary to establish a modelled base position that reflects the 'expected' position of the service. The model base position was then used to compare all modelled changes against.

The following parameters were agreed with NFRS for setting the modelled base:

- Worksop station relocated to the development site off Sandy Lane
- On-call availability and turnout times set to the levels in financial year 2019/20

Reporting Measures

In addition to reporting response performance in line with NFRS's response standard, other metrics were agreed with NFRS to ensure that a fuller picture of the impact of any changes were known. The measures agreed were:

- Average 1st response to life-risk incidents
- Average 2nd response to life-risk incidents
- The percentage of life-risk incidents responded to within 15 minutes
- Average 1st pump response to all incidents

ORH reported these metrics NFRS-wide and also by district.

Performance Metrics: Base Position

To Compare Modelled Options Against

Modelled Base

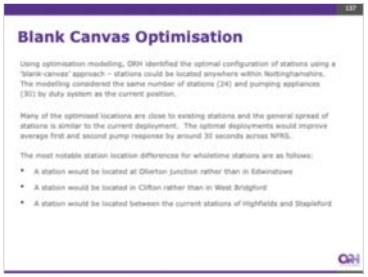
Times in mm:ss

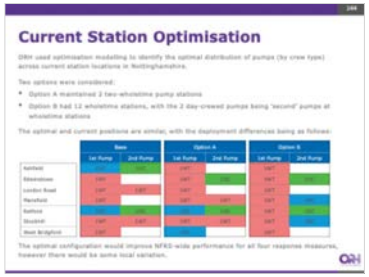
District	Life-Risk Incidents			All Incidents
	Average 1st	Average 2nd	% of 1st in 15 Minutes	Average 1st
Service-Wide	07:48	11:02	95.5%	07:50
Ashfield	08:46	12:23	96.0%	09:01
Bassetlaw	08:36	13:58	92.8%	09:02
Broxtowe	07:22	11:30	97.3%	07:23
City of Nottingham	06:57	08:03	97.5%	06:31
Gedling	06:31	10:24	98.0%	07:01
Mansfield	07:22	13:00	98.3%	07:52
Newark & Sherwood	09:12	14:47	90.7%	09:50
Rushcliffe	09:18	12:13	89.6%	09:42

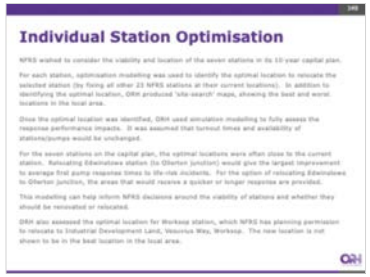
Deployment Modelling

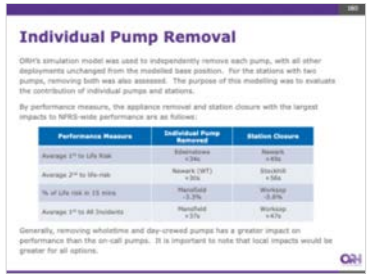
Document Navigation

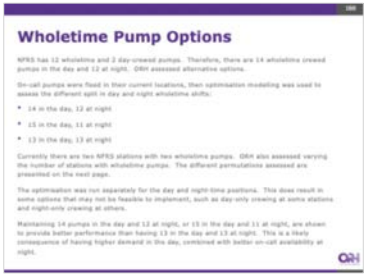
Within this section

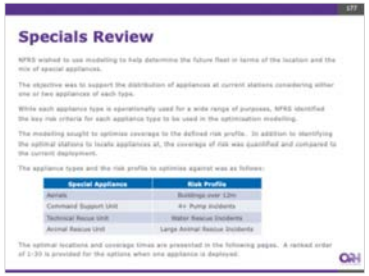








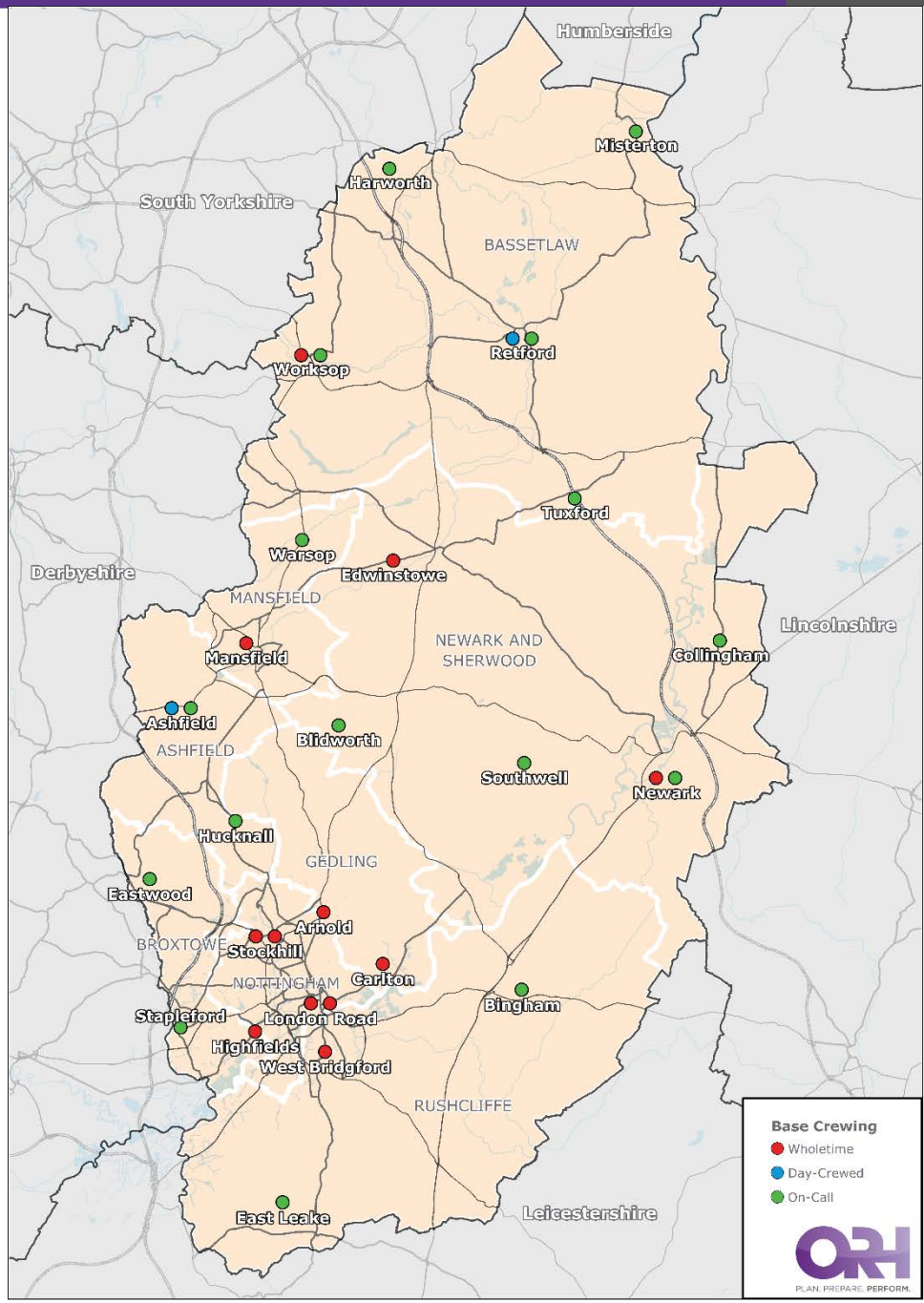




Other Main Sections

Base Crewing

- 24 Stations
  - 2: 2WT
  - 2: 1WT 1OC
  - 6: 1WT
  - 2: 1DC 1OC
  - 12: 1OC
- 30 Pumps
  - 12 Wholetime
  - 2 Day-Crewed
  - 16 On-Call



Station Optimisation:

Blank Canvas Optimisation

Blank Canvas Optimisation

Using optimisation modelling, ORH identified the optimal configuration of stations using a 'blank-canvas' approach – stations could be located anywhere within Nottinghamshire. The modelling considered the same number of stations (24) and pumping appliances (30) by duty system as the current position.

Many of the optimised locations are close to existing stations and the general spread of stations is similar to the current deployment. The optimal deployments would improve average first and second pump response by around 30 seconds across NFRS.

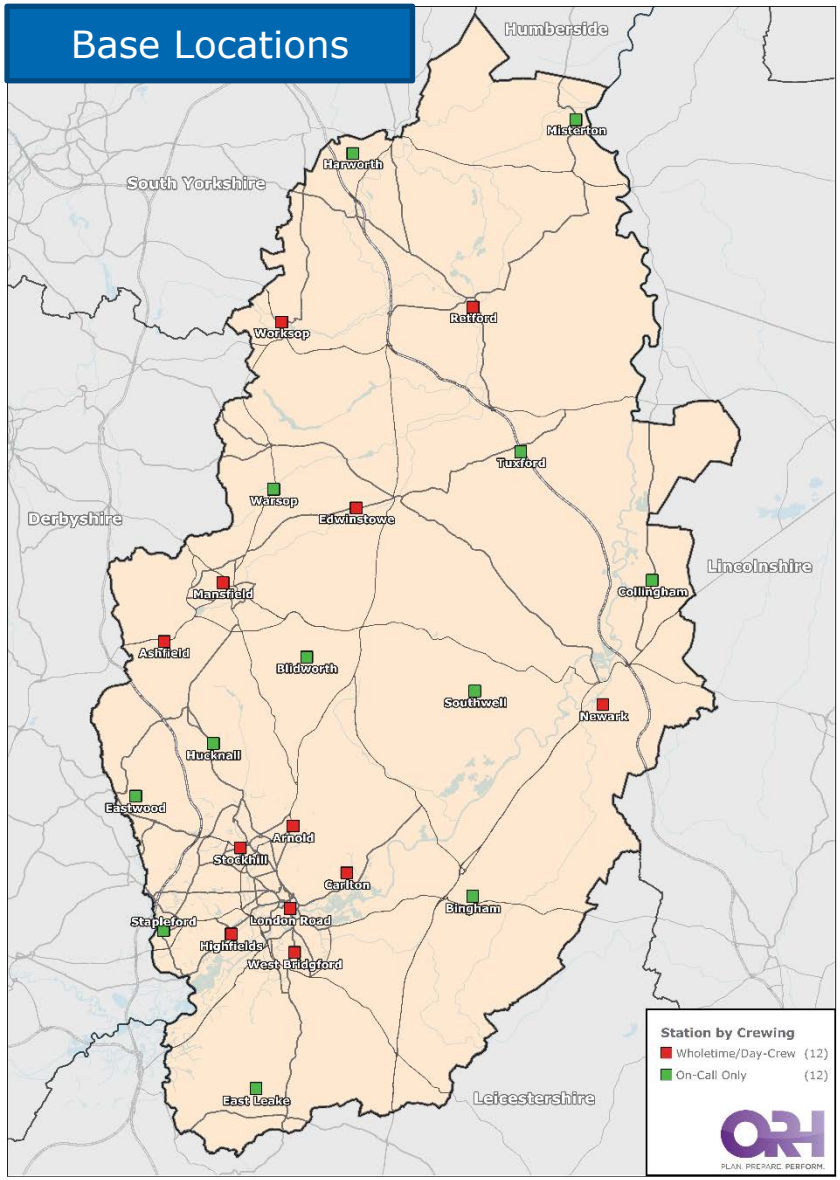
The most notable station location differences for wholetime stations are as follows:

- A station would be located at Ollerton junction rather than in Edwinstowe
- A station would be located in Clifton rather than in West Bridgford
- A station would be located between the current stations of Highfields and Stapleford

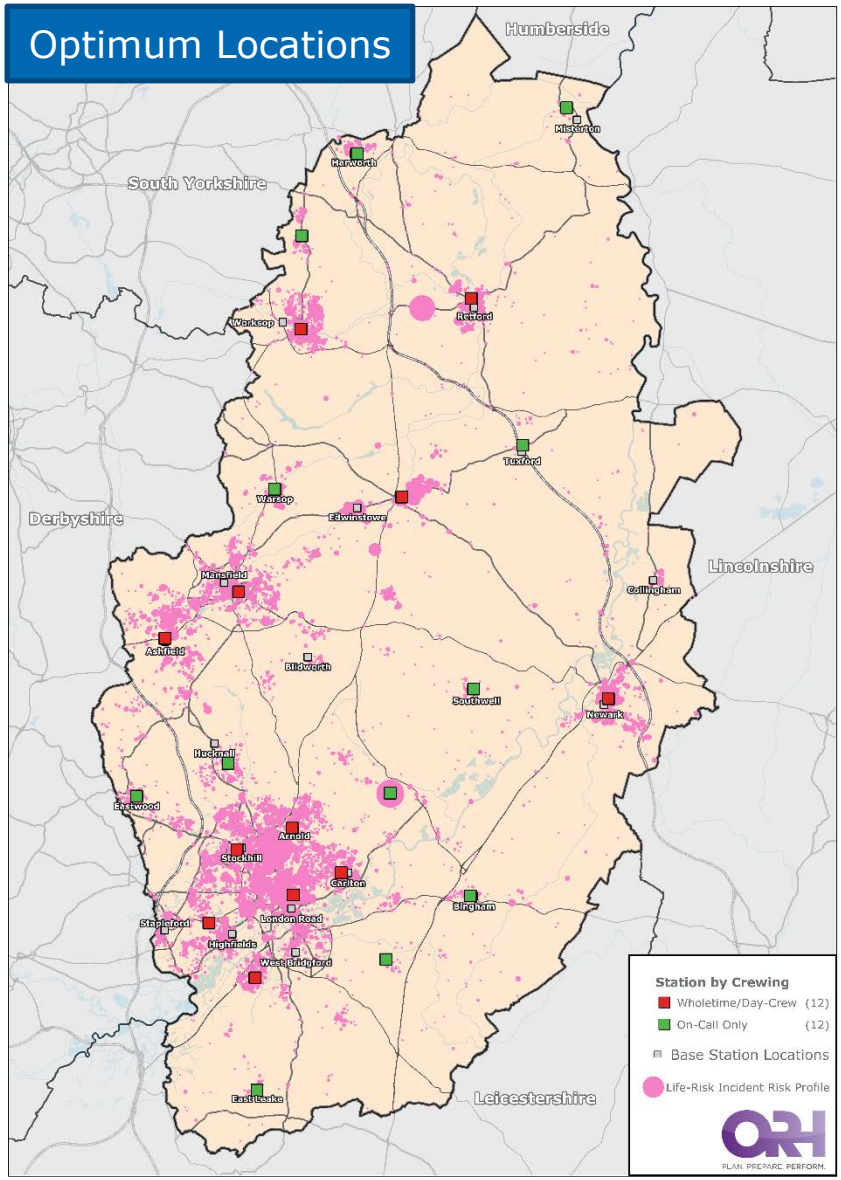
Blank Canvas Optimisation

Station Locations

Base Locations

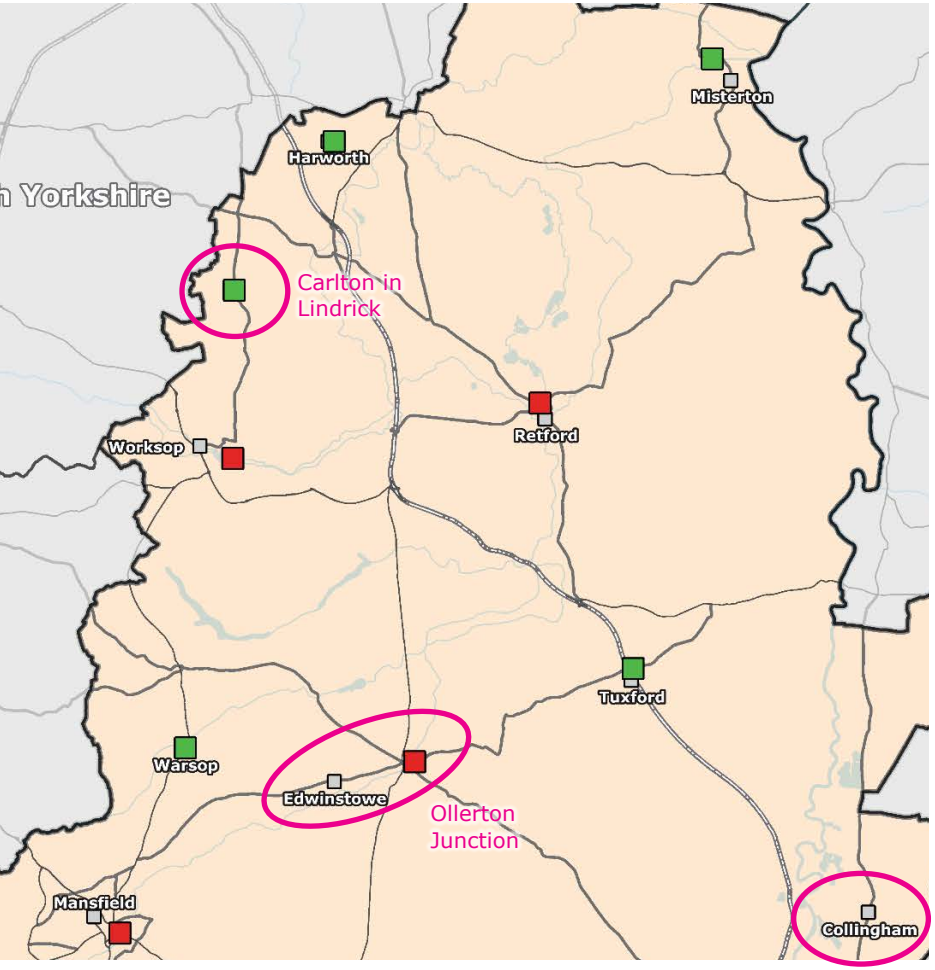


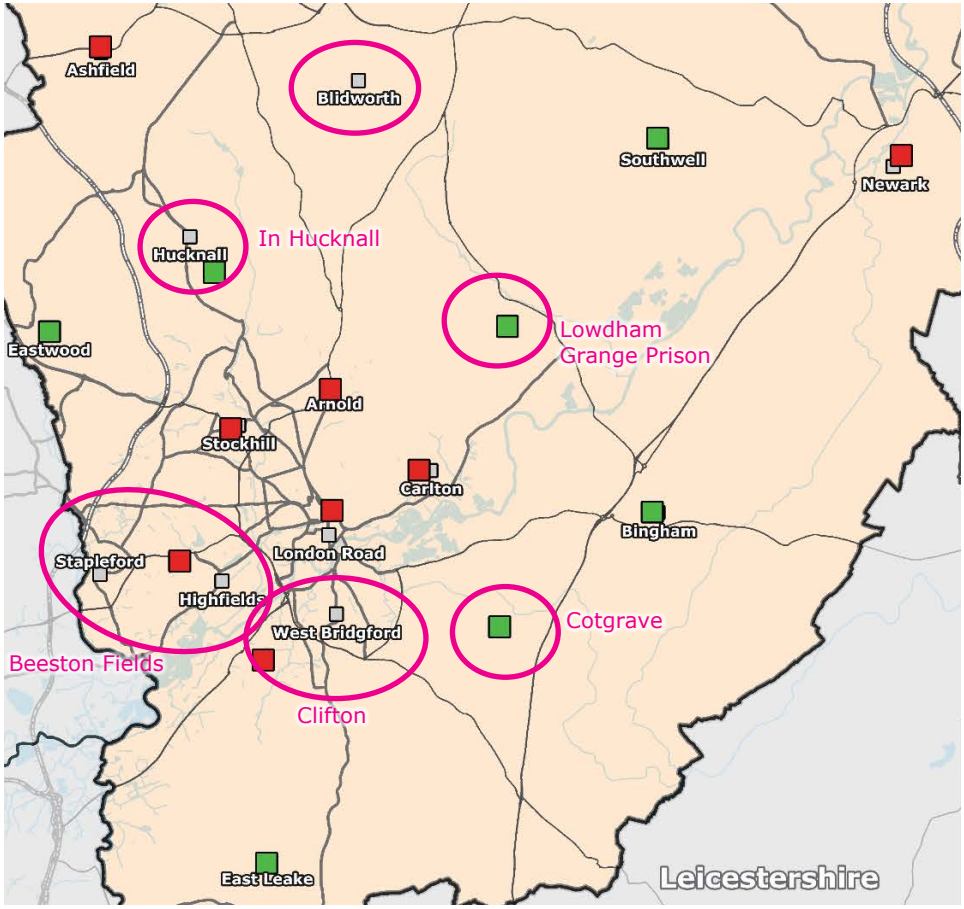
Optimum Locations



Blank Canvas Optimisation

Optimal Station Locations

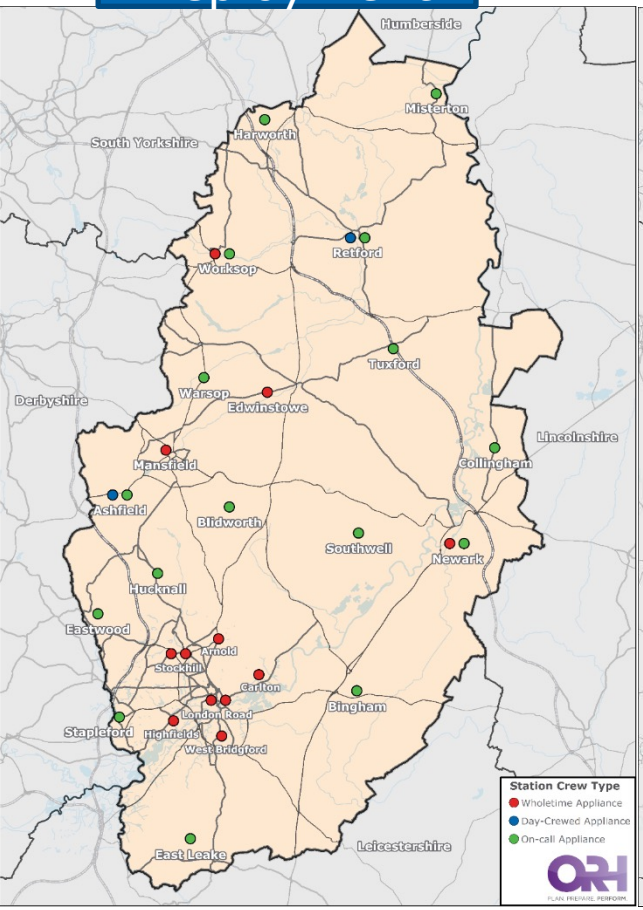




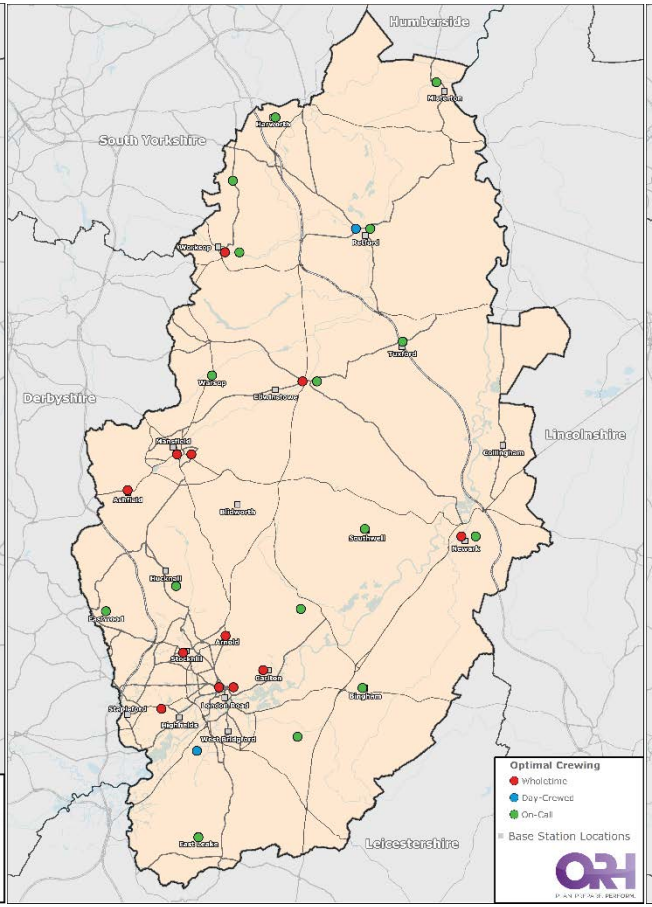
Blank Canvas Optimisation

Deployments

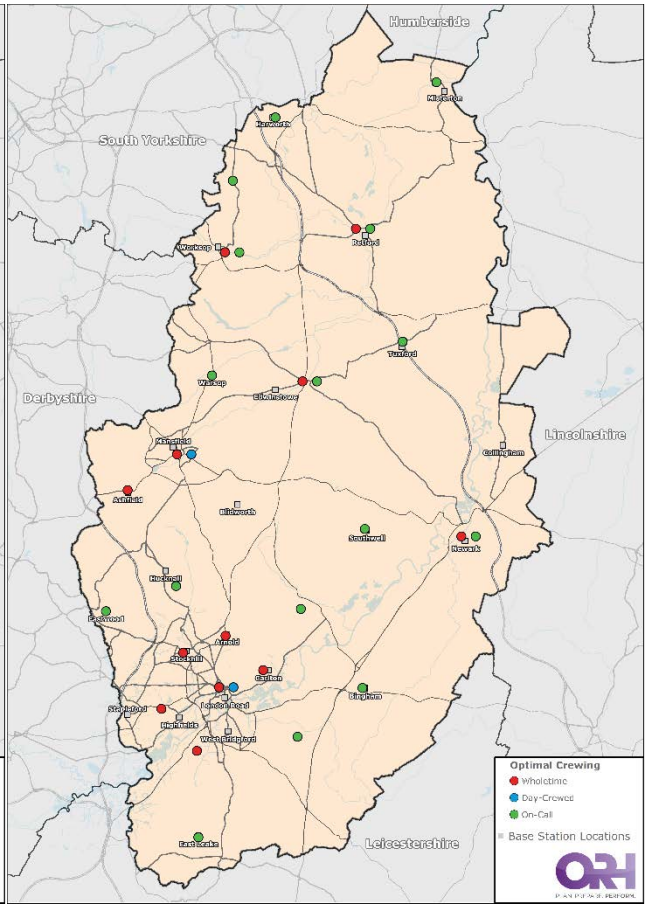
Current Deployment



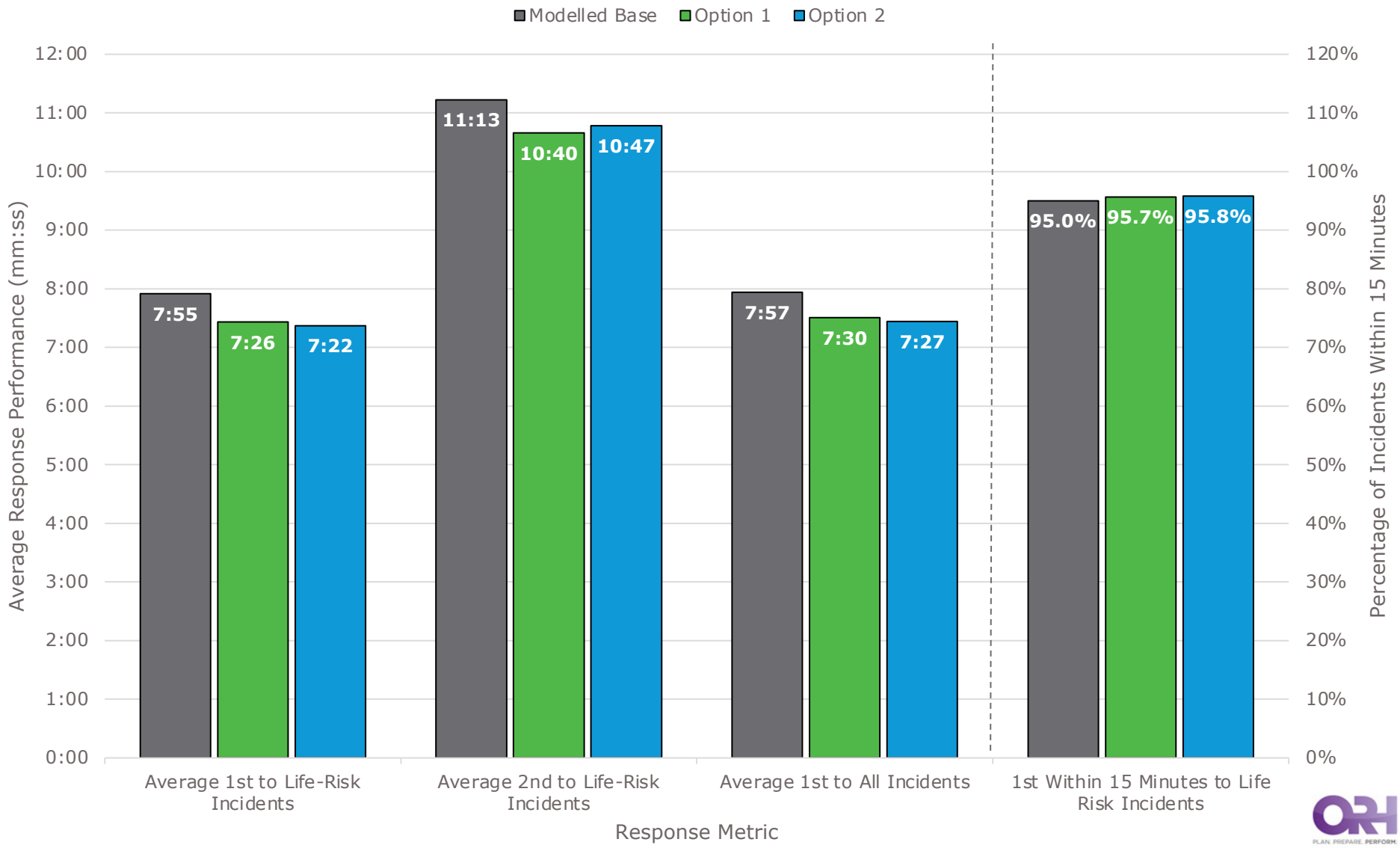
Option 1



Option 2



Blank Canvas Optimisation



Blank Canvas Optimisation

Modelled Response Performance

Average 1st to Life-Risk Incidents

District	Modelled Base	Option 1	Option 2	Impact Option 1	Impact Option 2
Service-wide	7:55	7:26	7:22	-0:29	-0:33
Ashfield	8:52	7:58	7:59	-0:54	-0:53
Bassetlaw	9:07	8:07	7:44	-1:00	-1:23
Broxtowe	7:26	8:08	8:09	+0:42	+0:43
City of Nottingham	6:56	6:26	6:24	-0:30	-0:32
Gedling	6:30	6:34	6:34	+0:04	+0:04
Mansfield	7:19	6:40	6:46	-0:39	-0:33
Newark & Sherwood	9:23	8:18	8:18	-1:05	-1:05
Rushcliffe	9:24	10:09	10:01	+0:45	+0:37

Average 2nd to Life-Risk Incidents

District	Modelled Base	Option 1	Option 2	Impact Option 1	Impact Option 2
Service-wide	11:13	10:40	10:47	-0:33	-0:26
Ashfield	12:34	13:29	13:33	+0:55	+0:59
Bassetlaw	14:53	12:54	12:41	-1:59	-2:12
Broxtowe	11:33	14:23	14:23	+2:50	+2:50
City of Nottingham	8:01	8:49	9:04	+0:48	+1:03
Gedling	10:24	10:00	10:02	-0:24	-0:22
Mansfield	13:06	7:57	8:46	-5:09	-4:20
Newark & Sherwood	14:55	12:32	12:36	-2:23	-2:19
Rushcliffe	12:13	12:22	12:23	+0:09	+0:10

Station Optimisation:

Current Station Optimisation

Current Station Optimisation

ORH used optimisation modelling to identify the optimal distribution of pumps (by crew type) across current station locations in Nottinghamshire.

Two options were considered:

- Option A maintained 2 two-wholetime pump stations
- Option B had 12 wholetime stations, with the 2 day-crewed pumps being 'second' pumps at wholetime stations

The optimal and current positions are similar, with the deployment differences being as follows:

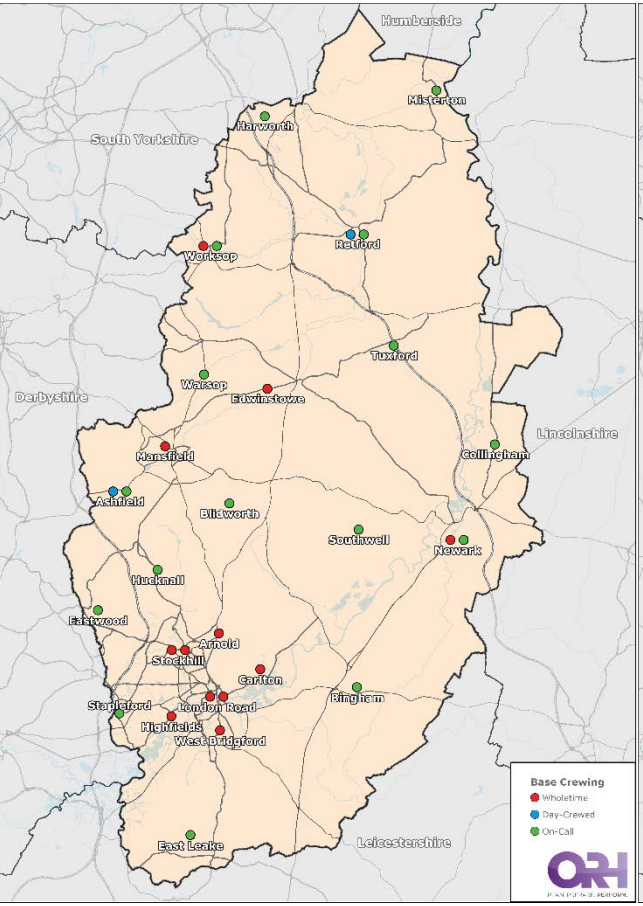
	Base		Option A		Option B	
	1st Pump	2nd Pump	1st Pump	2nd Pump	1st Pump	2nd Pump
Ashfield	1DC	1OC	1WT		1WT	
Edwinstowe	1WT		1WT	1OC	1WT	1OC
London Road	1WT	1WT	1WT		1WT	
Mansfield	1WT		1WT	1WT	1WT	1DC
Retford	1DC	1OC	1DC	1OC	1WT	1OC
Stockhill	1WT	1WT	1WT	1WT	1WT	1DC
West Bridgford	1WT		1DC		1WT	

The optimal configuration would improve NFRS-wide performance for all four response measures, however there would be some local variation.

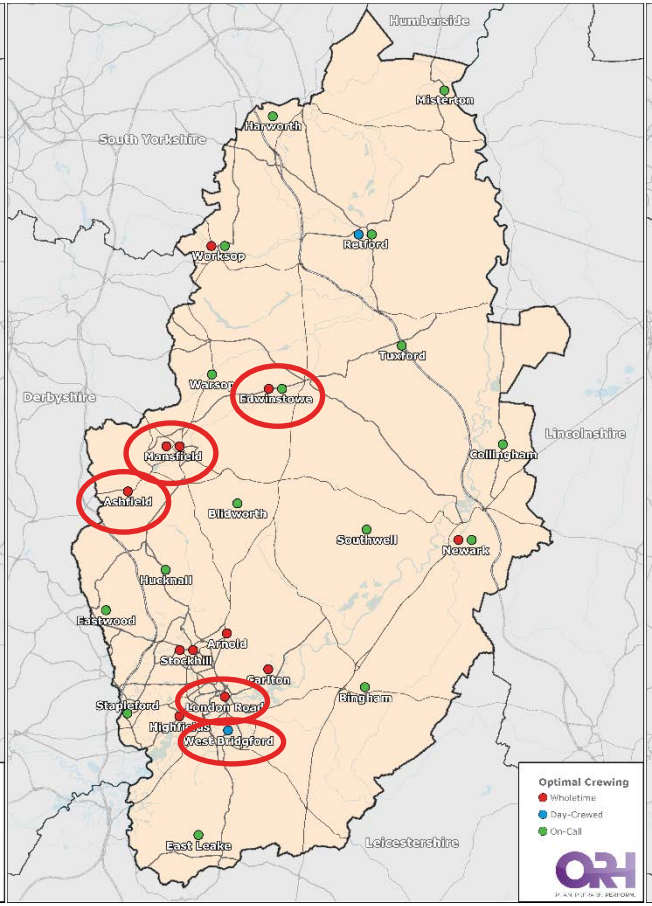
Current Station Optimisation

Deployment Changes

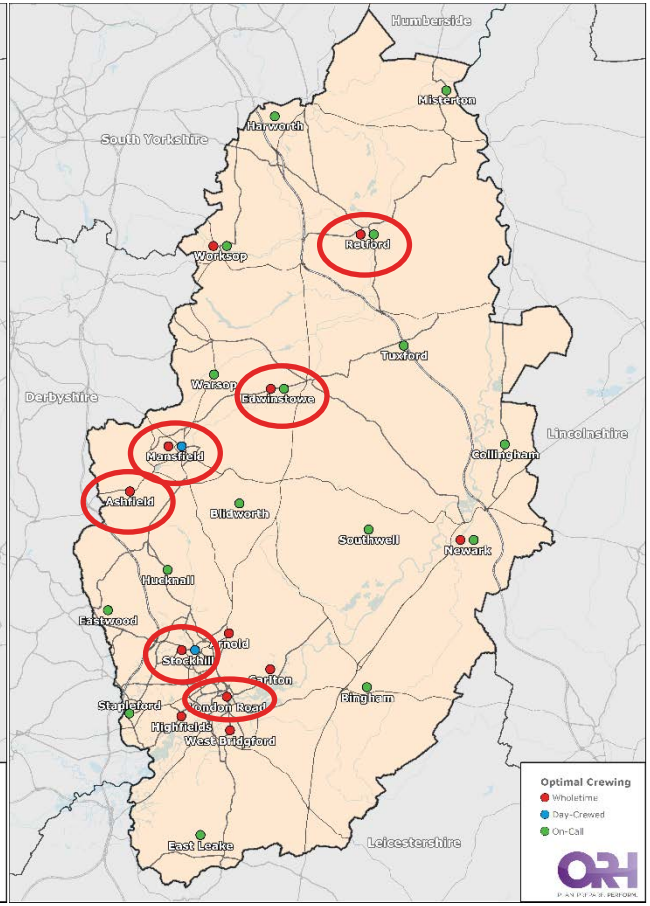
Current Deployment



Option A

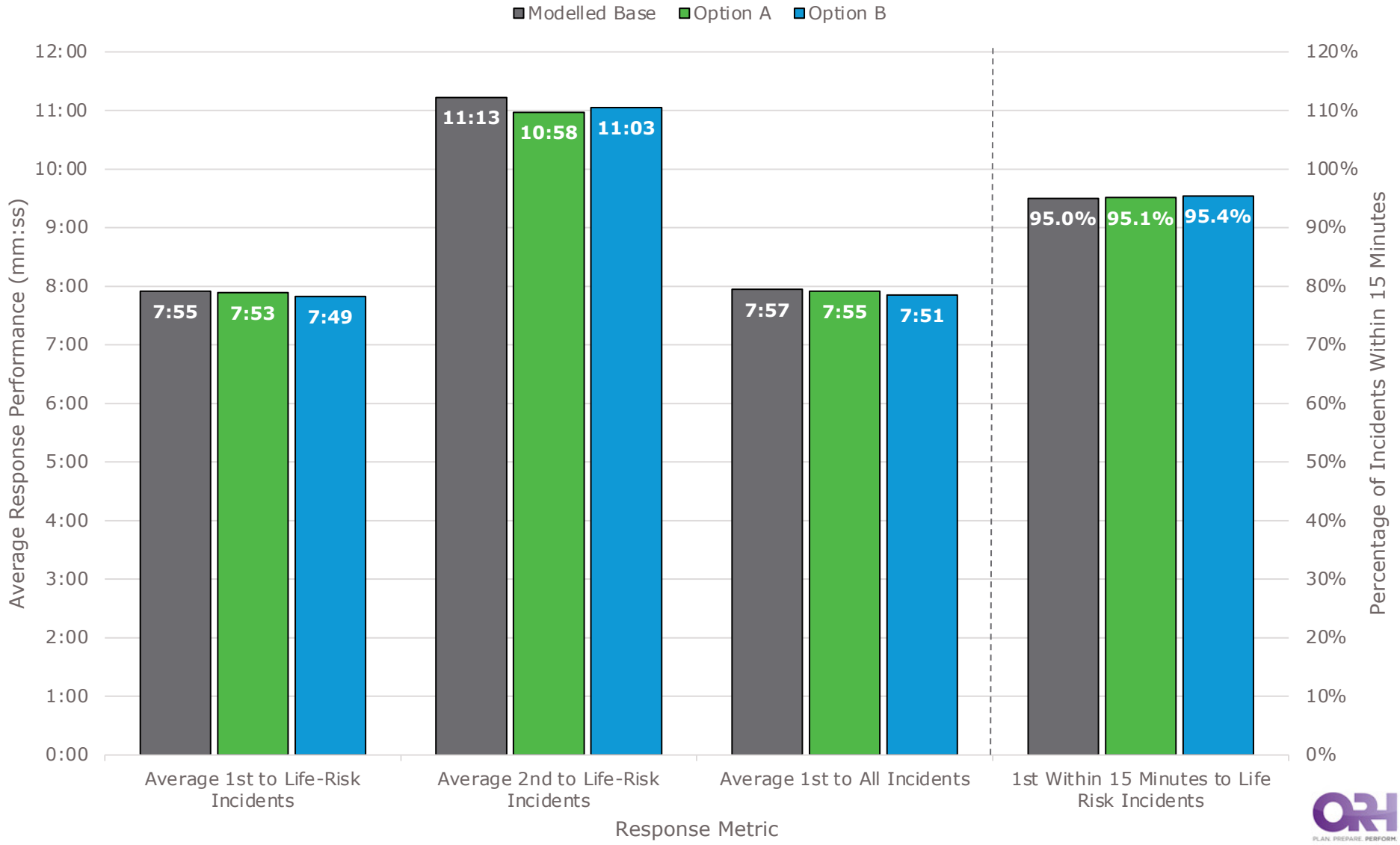


Option B



Current Station Optimisation

Modelled Response Performance



Current Station Optimisation

Modelled Response Performance

Average 1st to Life-Risk Incidents

District	Modelled Base	Option A	Option B	*Impact* Option A	*Impact* Option B
Service-wide	7:55	7:53	7:49	-0:04	-0:06
Ashfield	8:52	8:04	8:04	-0:48	-0:48
Bassetlaw	9:07	9:07	8:45	0:00	-0:22
Broxtowe	7:26	7:26	7:27	0:00	+0:01
City of Nottingham	6:56	7:08	7:08	+0:08	+0:12
Gedling	6:30	6:33	6:34	+0:03	+0:04
Mansfield	7:19	6:51	6:56	-0:23	-0:23
Newark & Sherwood	9:23	9:18	9:18	-0:05	-0:05
Rushcliffe	9:24	9:51	9:29	+0:05	+0:05

Average 2nd to Life-Risk Incidents

District	Modelled Base	Option A	Option B	*Impact* Option A	*Impact* Option B
Service-wide	11:13	10:58	11:03	-0:14	-0:10
Ashfield	12:34	12:48	12:52	+0:17	+0:18
Bassetlaw	14:53	14:53	14:43	0:00	-0:10
Broxtowe	11:33	11:34	11:42	+0:01	+0:09
City of Nottingham	8:01	8:47	8:59	+0:42	+0:58
Gedling	10:24	10:27	10:29	+0:04	+0:05
Mansfield	13:06	7:59	8:47	-4:19	-4:19
Newark & Sherwood	14:55	13:39	13:39	-1:16	-1:16
Rushcliffe	12:13	13:00	12:36	+0:23	+0:23

Station Optimisation:

Individual Station Optimisation

Individual Station Optimisation

NFRS wished to consider the viability and location of the seven stations in its 10-year capital plan.

For each station, optimisation modelling was used to identify the optimal location to relocate the selected station (by fixing all other 23 NFRS stations at their current locations). In addition to identifying the optimal location, ORH produced 'site-search' maps, showing the best and worst locations in the local area.

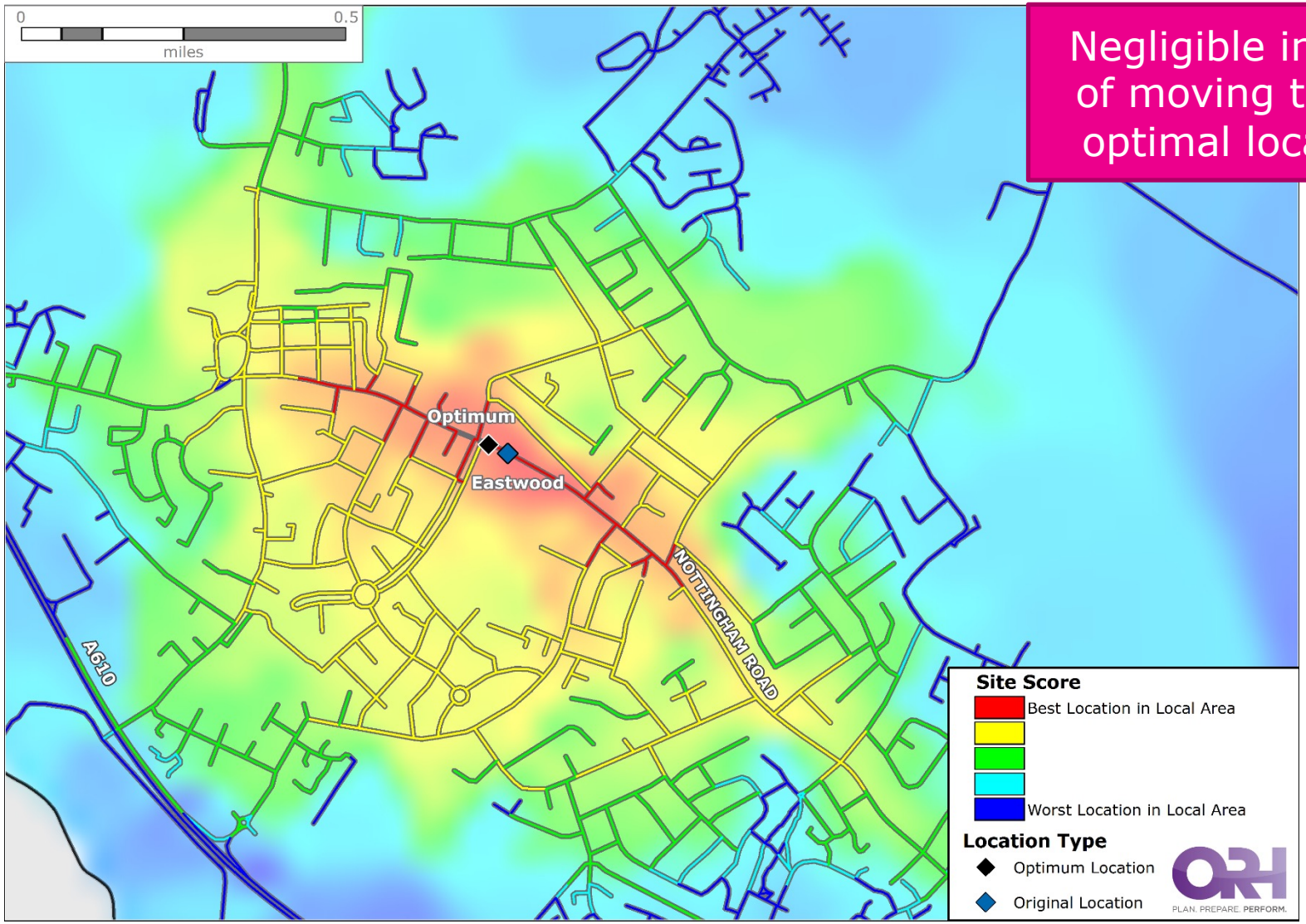
Once the optimal location was identified, ORH used simulation modelling to fully assess the response performance impacts. It was assumed that turnout times and availability of stations/pumps would be unchanged.

For the seven stations on the capital plan, the optimal locations were often close to the current station. Relocating Edwinstowe station (to Ollerton junction) would give the largest improvement to average first pump response times to life-risk incidents. For the option of relocating Edwinstowe to Ollerton junction, the areas that would receive a quicker or longer response are provided.

This modelling can help inform NFRS decisions around the viability of stations and whether they should be renovated or relocated.

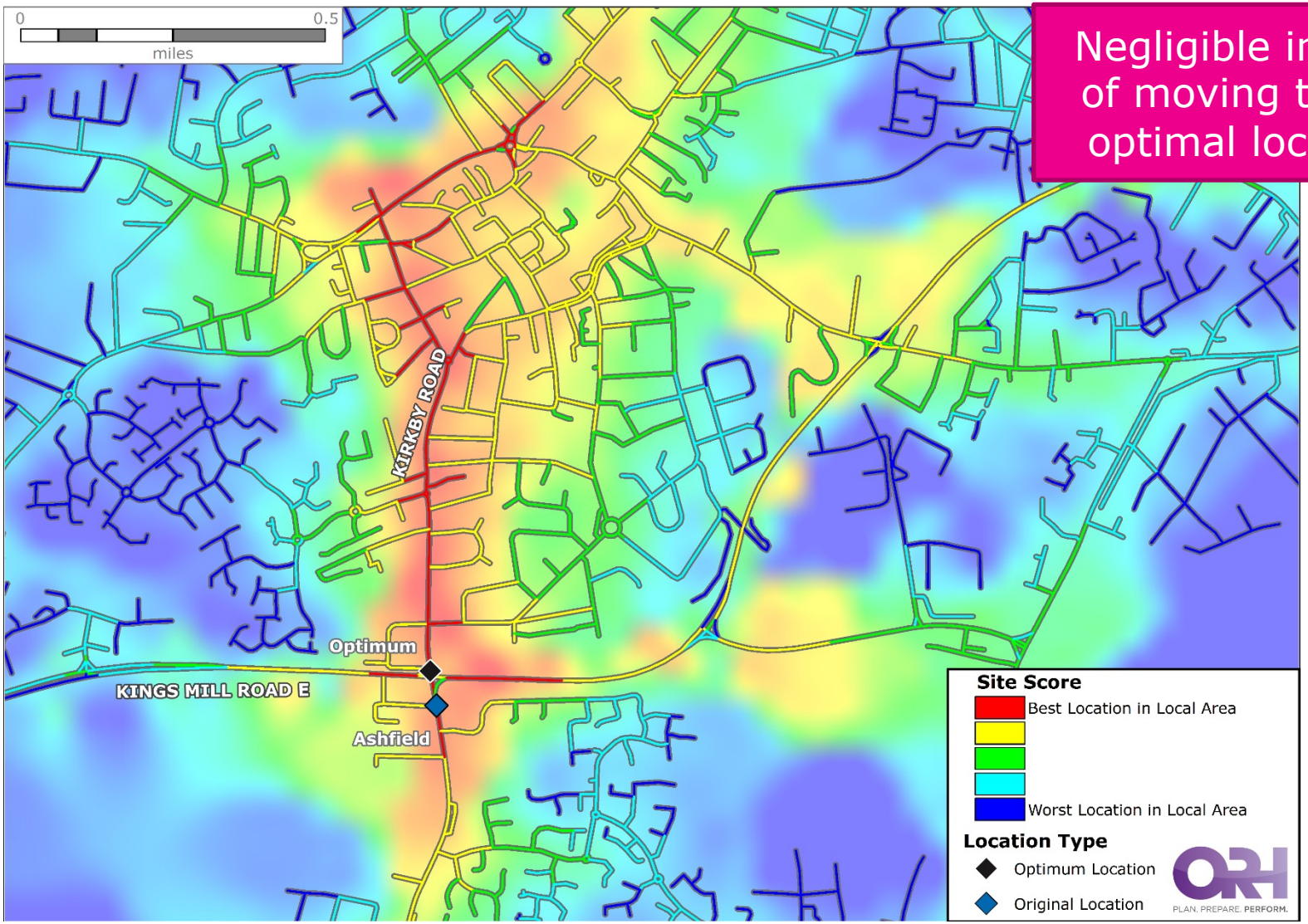
ORH also assessed the optimal location for Worksop station, which NFRS has planning permission to relocate to Industrial Development Land, Vesuvius Way, Worksop. The new location is not shown to be in the best location in the local area.

Eastwood Station Site-Search



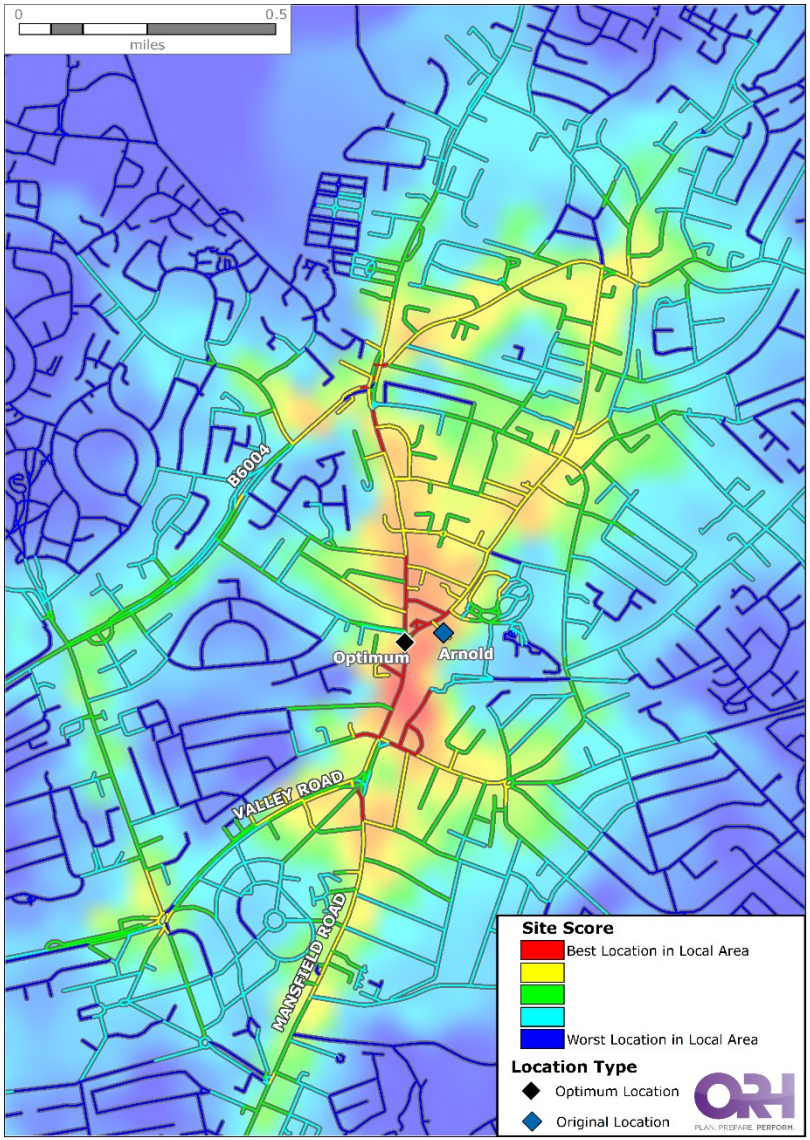
Negligible impact of moving to the optimal location

Ashfield Station Site-Search



Negligible impact of moving to the optimal location

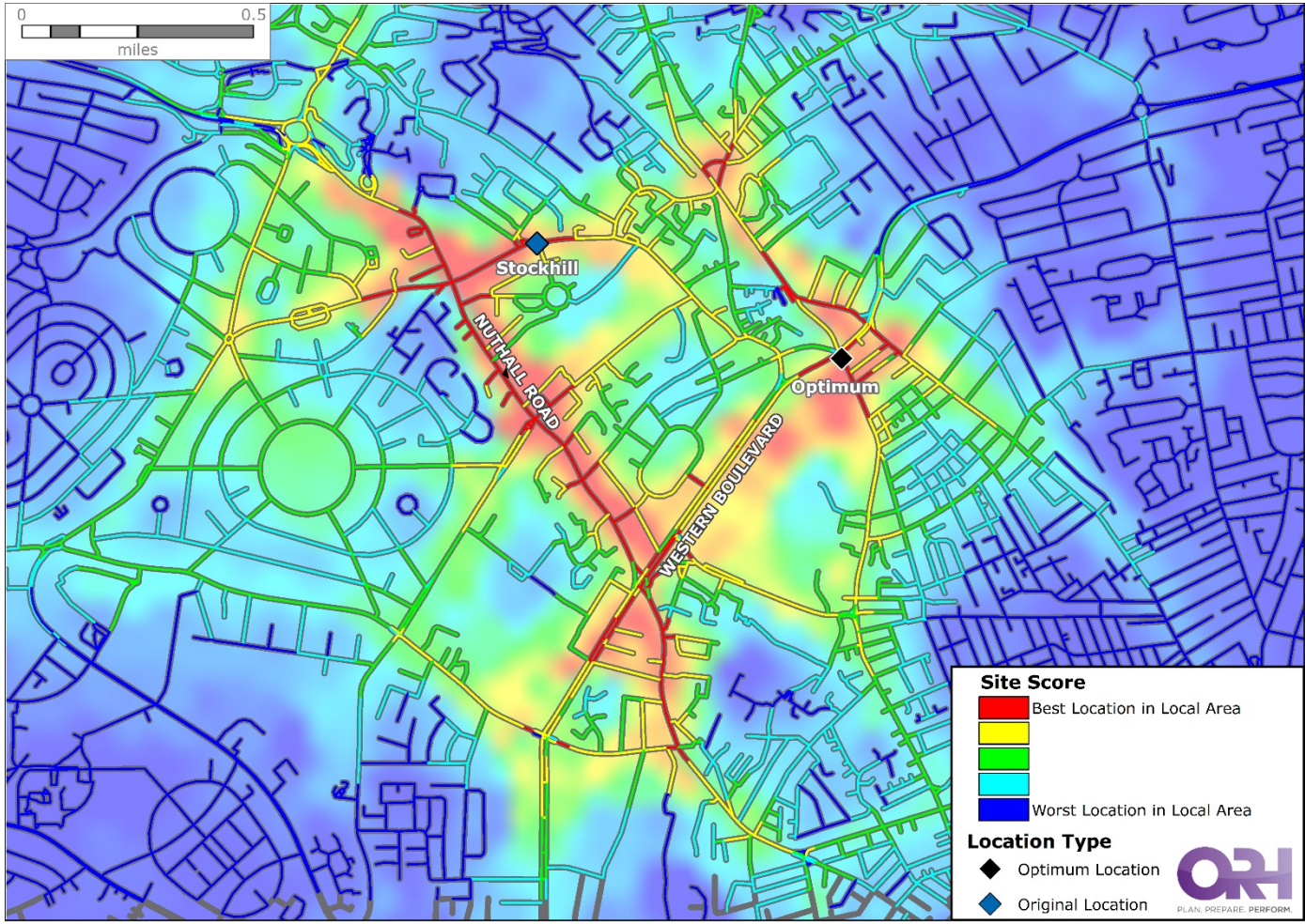
Arnold Station Site-Search



Impact of Relocating to the Optimal Location

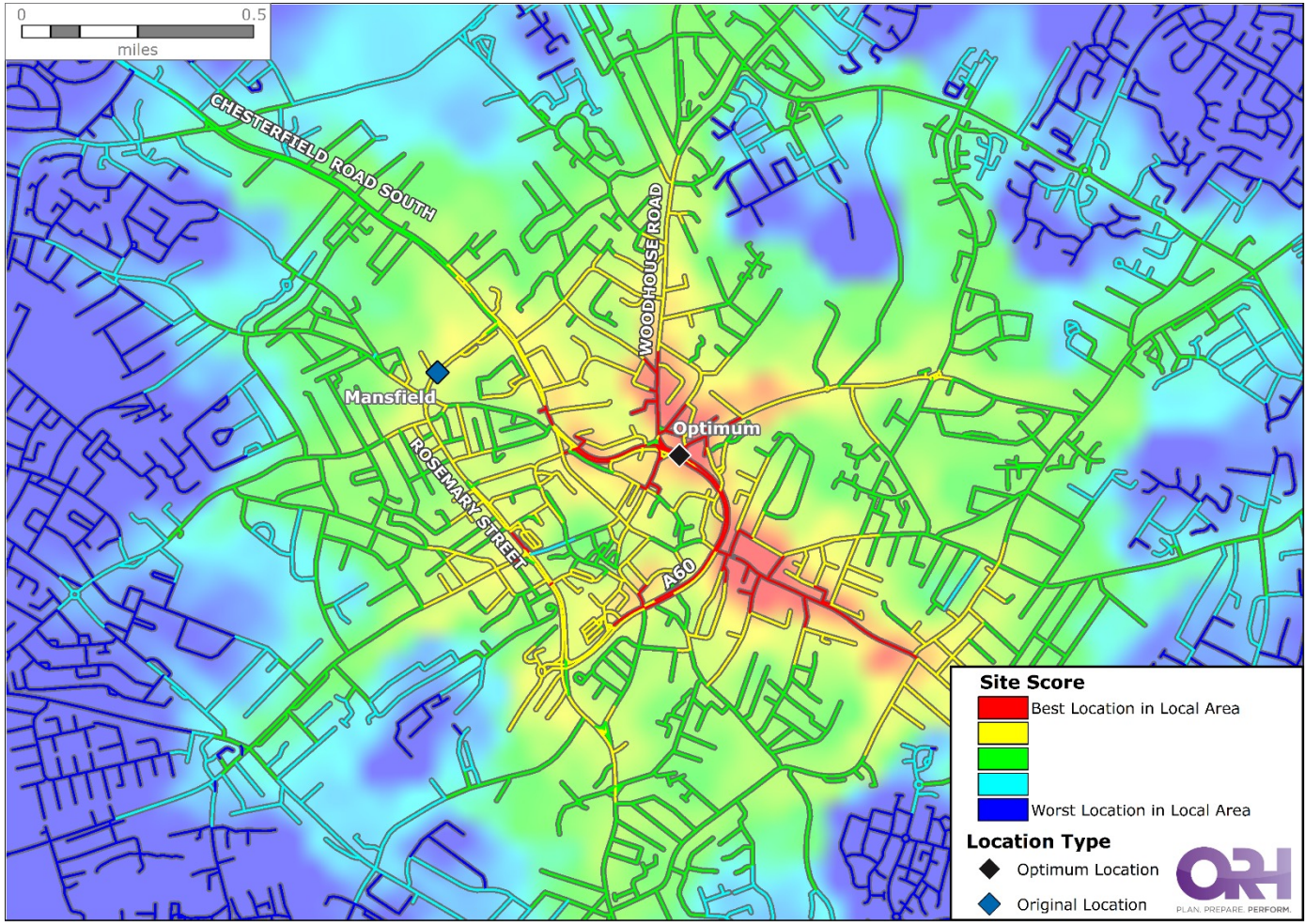
District	Life-Risk Incidents			All Incidents
	Average 1st	Average 2nd	% of 1st in 15 Minutes	Average 1st
Service-wide	-0:01	0:00	0.0%	-0:02
City of Nottingham	-0:03	-0:01	0.1%	-0:04
Gedling	+0:01	-0:06	0.0%	+0:01
Rushcliffe	-0:01	0:00	0.0%	0:00

Stockhill Station Site-Search



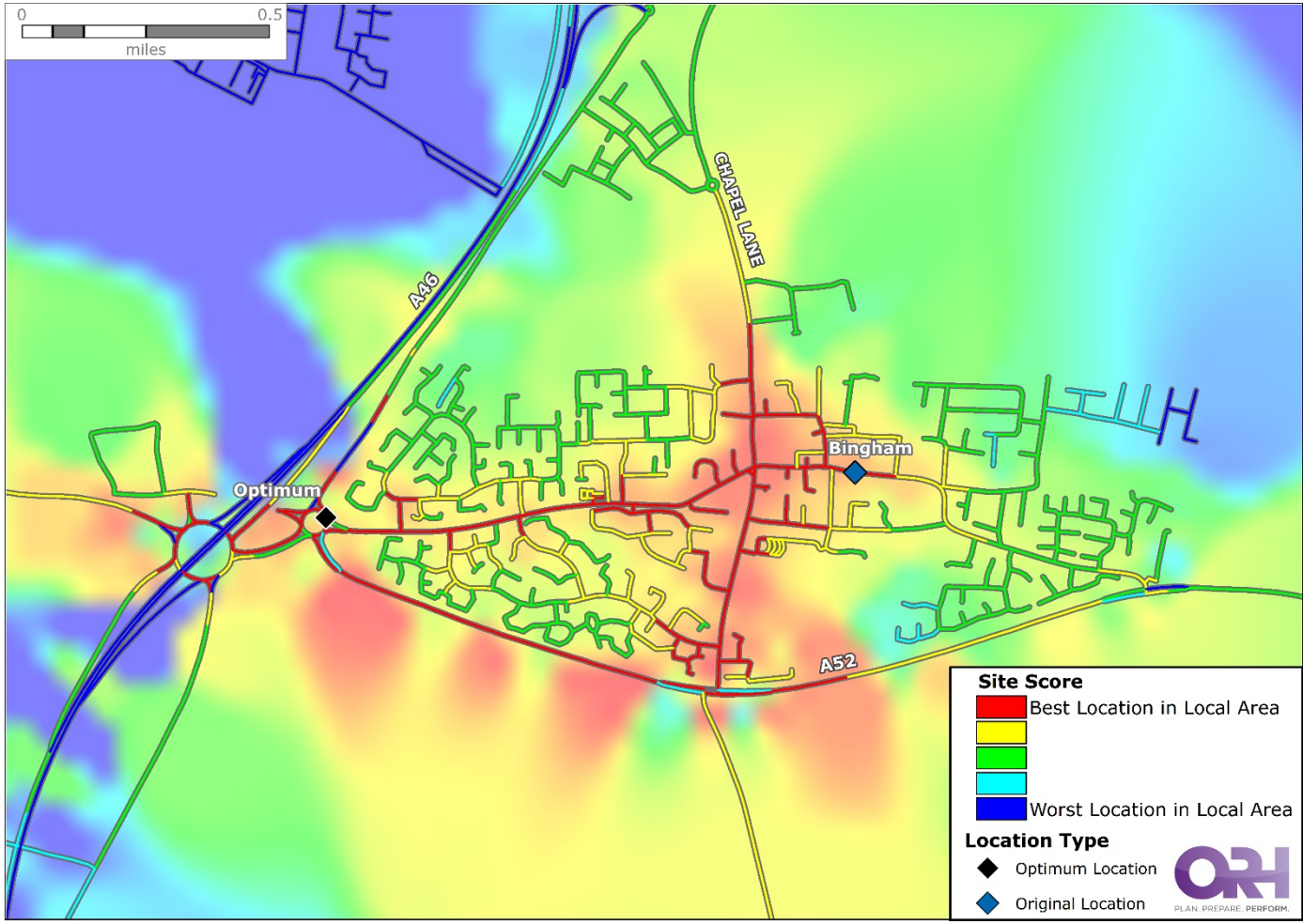
District	Average 1st to Life-Risk	Average 2nd to Life-Risk	% of 1st in 15 Minutes to Life-Risk	Average 1st to All
Service-wide	-0:02	-0:02	-0.1%	-0:01
Ashfield	+0:01	+0:05	-0.1%	+0:01
Broxtowe	+0:20	+0:44	-1.8%	+0:19
City of Nottingham	-0:09	-0:13	0.0%	-0:06
Gedling	-0:02	-0:20	0.1%	-0:02

Mansfield Station Site-Search



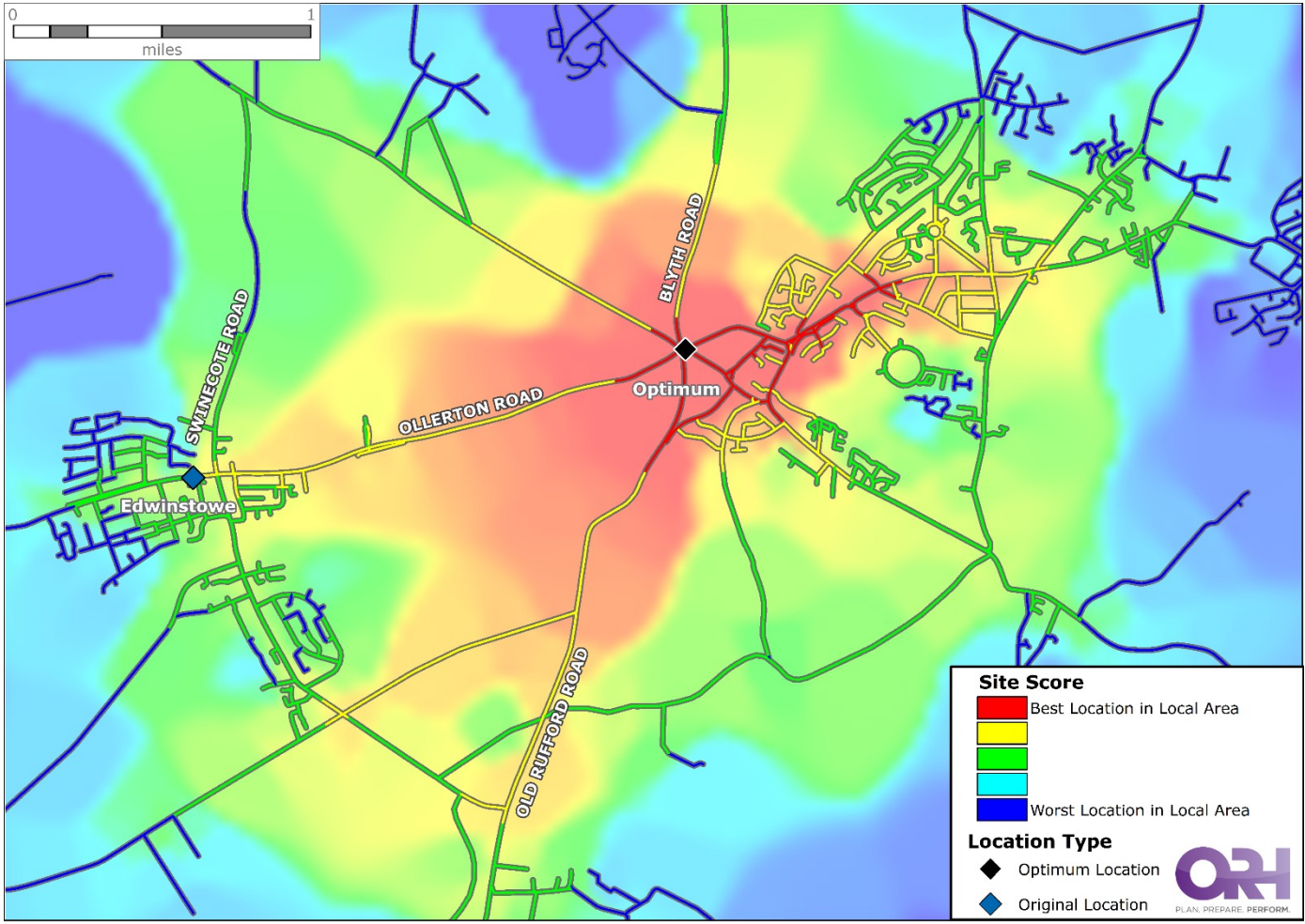
District	Average 1st to Life-Risk	Average 2nd to Life-Risk	% of 1st in 15 Minutes to Life-Risk	Average 1st to All
Service-wide	-0:01	+0:01	0.1%	-0:03
Ashfield	+0:06	+0:13	-0.3%	+0:07
Mansfield	-0:18	-0:02	0.3%	-0:30
Newark & Sherwood	-0:02	-0:06	0.3%	-0:02

Bingham Station Site-Search



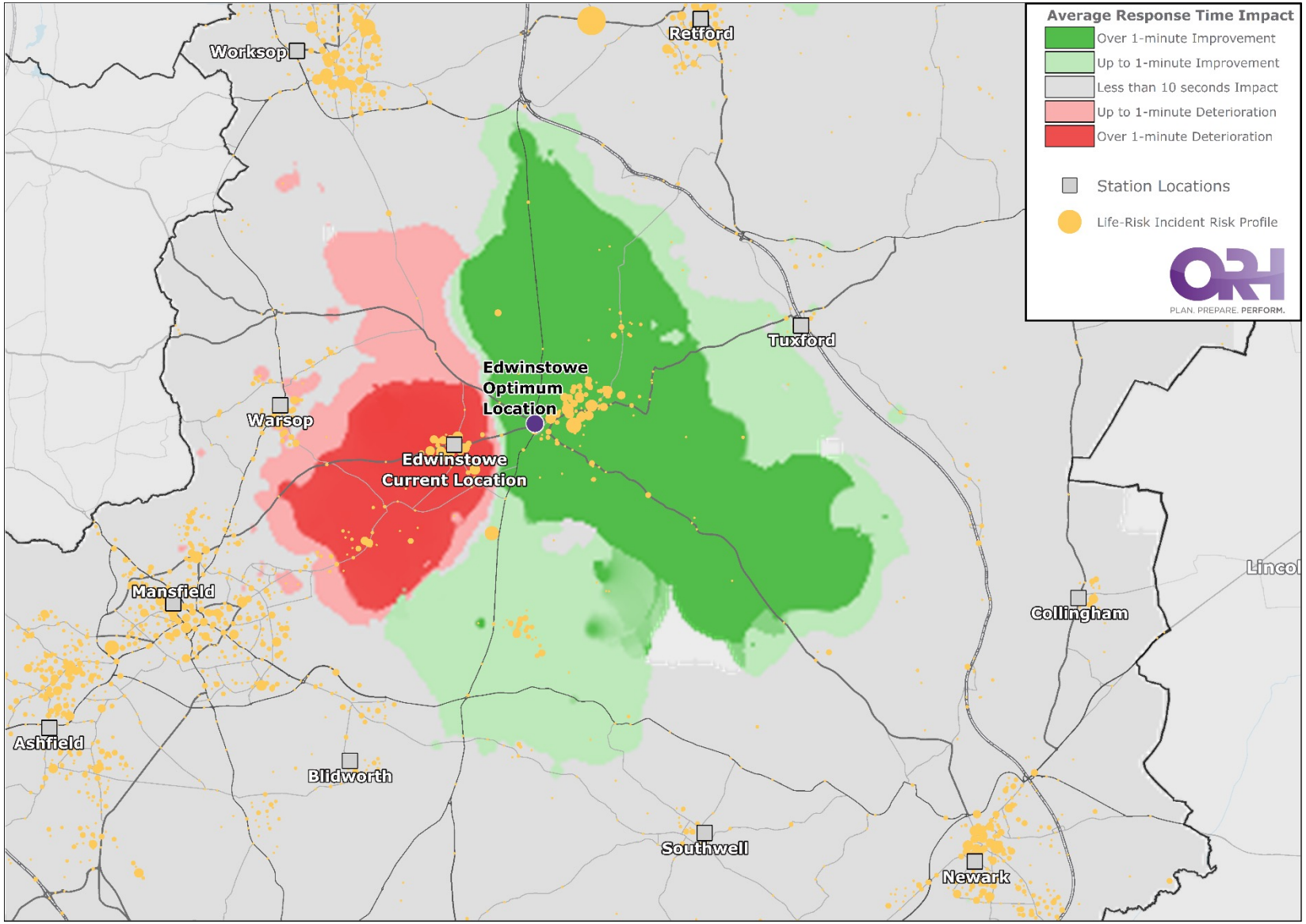
District	Average 1st to Life-Risk	Average 2nd to Life-Risk	% of 1st in 15 Minutes to Life-Risk	Average 1st to All
Service-wide	-0:01	0:00	0.1%	-0:01
Rushcliffe	-0:07	-0:02	1.1%	-0:06

Edwinstowe Station Site-Search



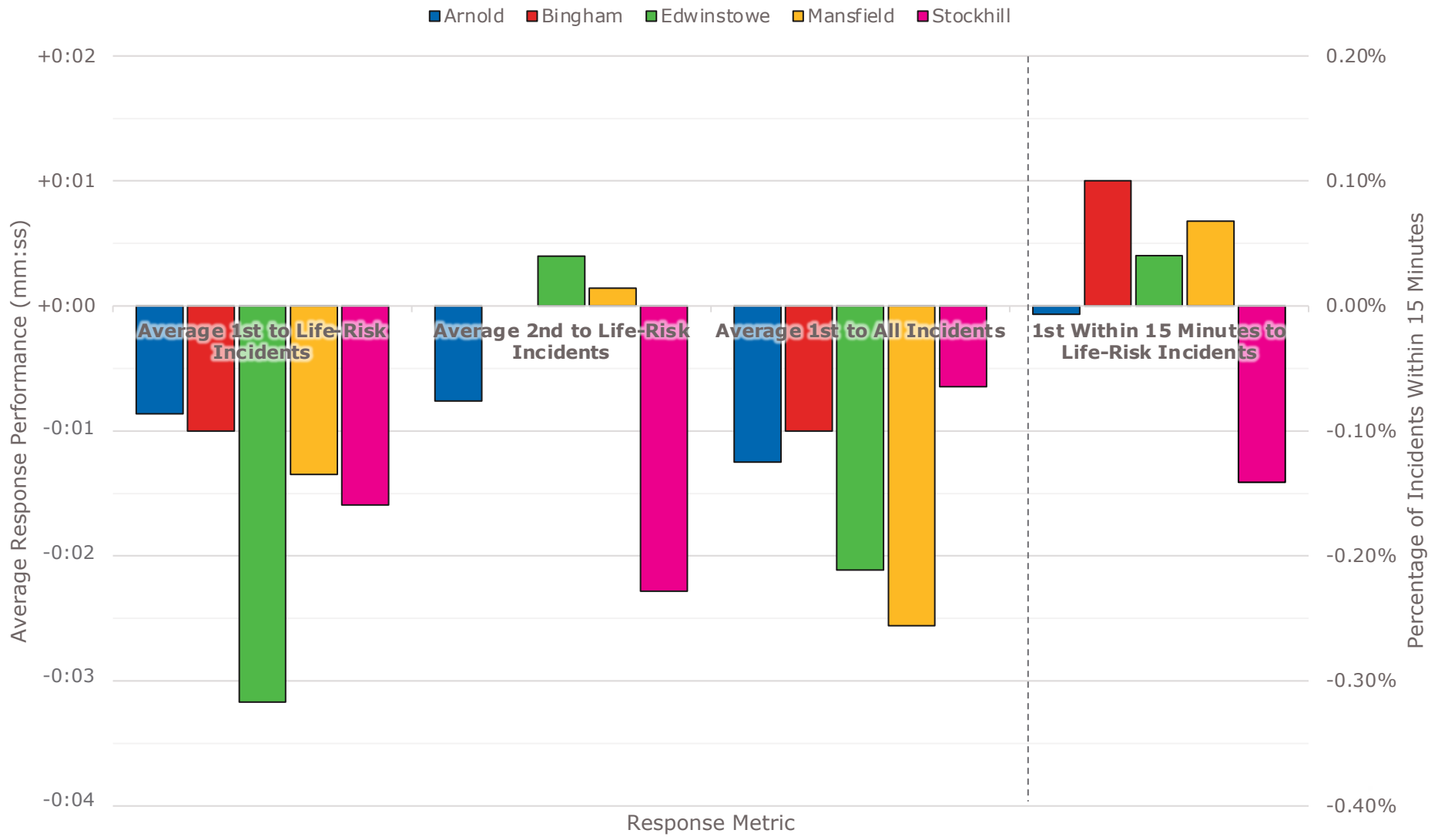
District	Average 1st to Life-Risk	Average 2nd to Life-Risk	% of 1st in 15 Minutes to Life-Risk	Average 1st to All
Service-wide	-0:03	+0:01	0.0%	-0:02
Bassetlaw	-0:02	-0:04	0.1%	-0:01
Mansfield	+0:03	+0:21	-0.3%	+0:02
Newark & Sherwood	-0:21	-0:04	0.4%	-0:19

Edwinstowe Impact



Individual Station Optimisation

Relocate to Optimal Site Impacts



Individual Pump Removal

Individual Pump Removal

ORH's simulation model was used to independently remove each pump, with all other deployments unchanged from the modelled base position. For the stations with two pumps, removing both was also assessed. The purpose of this modelling was to evaluate the contribution of individual pumps and stations.

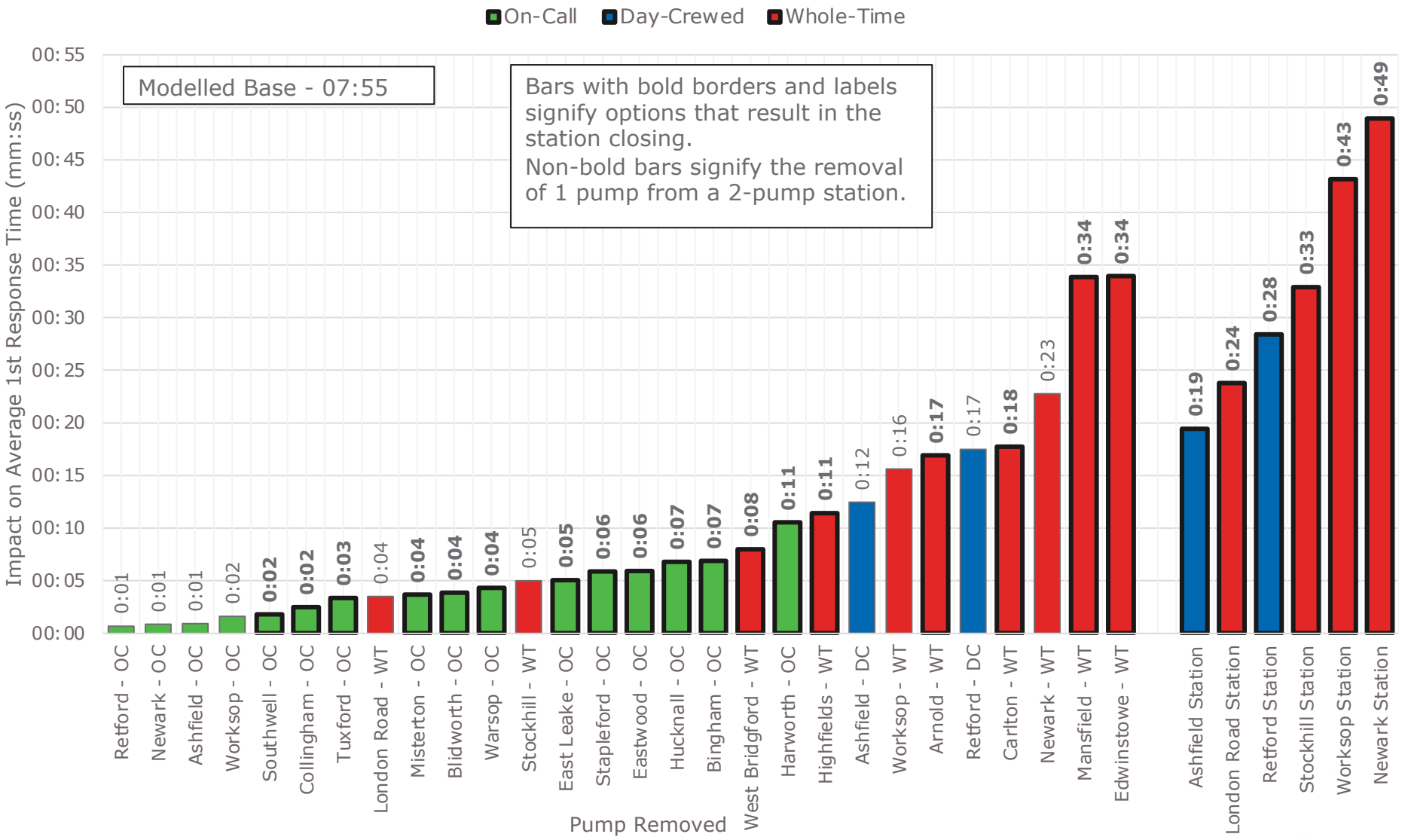
By performance measure, the appliance removal and station closure with the largest impacts to NFRS-wide performance are as follows:

Performance Measure	Individual Pump Removed	Station Closure
Average 1st to Life Risk	Edwinstowe +34s	Newark +49s
Average 2nd to life-risk	Newark (WT) +30s	Stockhill +56s
% of Life risk in 15 mins	Mansfield -3.3%	Worksop -5.6%
Average 1st to All Incidents	Mansfield +37s	Worksop +47s

Generally, removing wholetime and day-crewed pumps has a greater impact on performance than the on-call pumps. It is important to note that local impacts would be greater for all options.

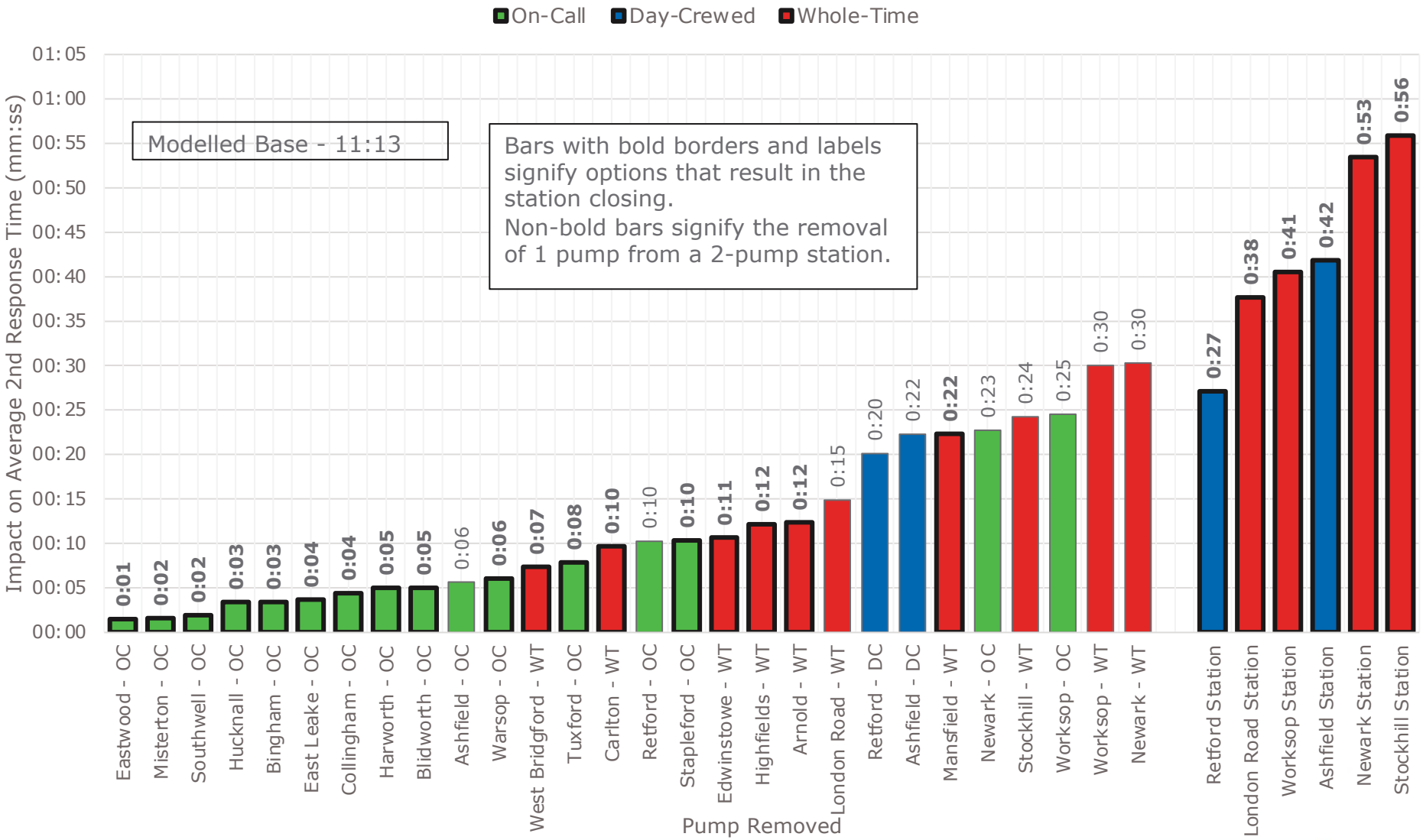
Individual Pump/Station Removal

Average 1st Response to Life-Risk Incidents



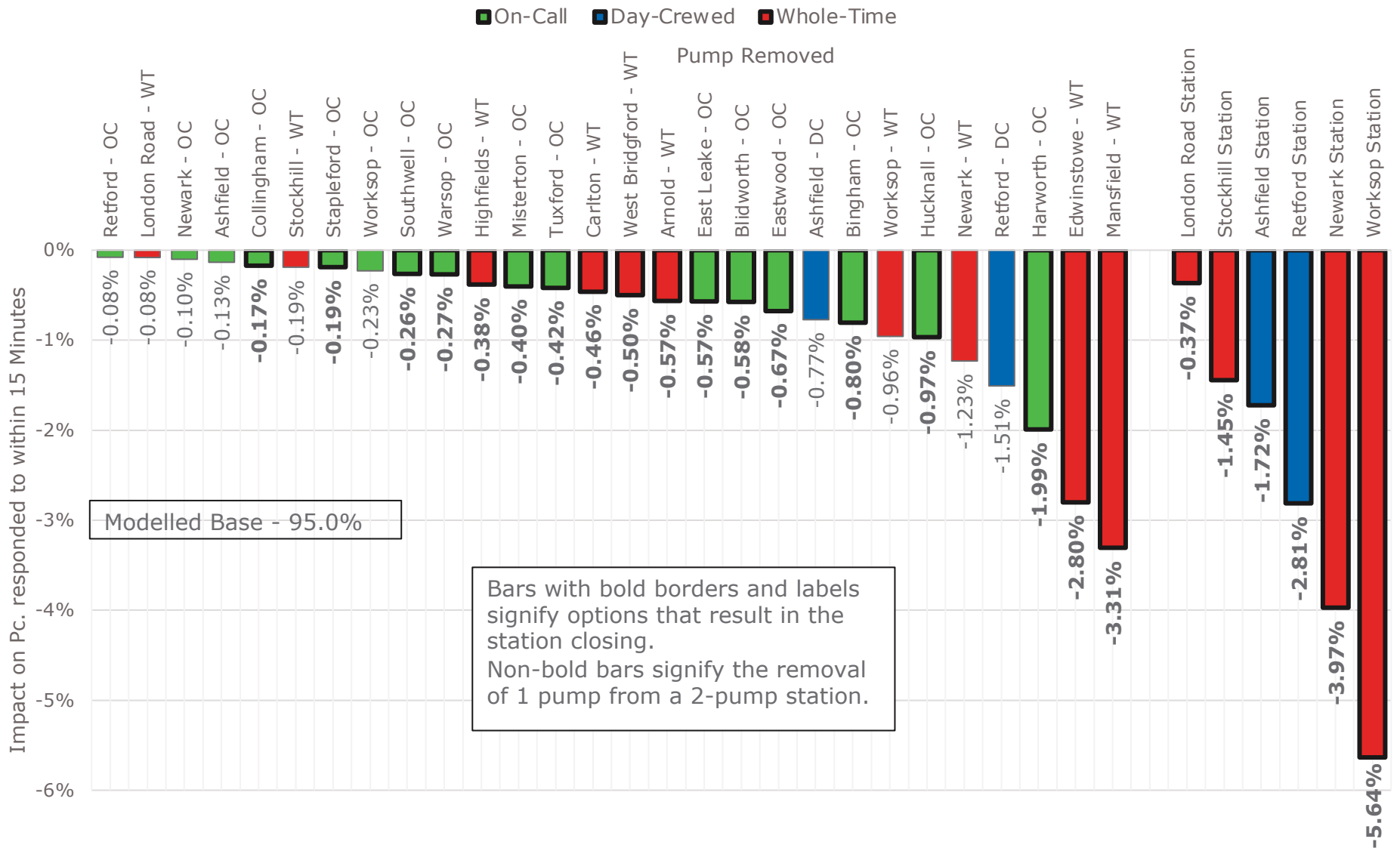
Individual Pump/Station Removal

Average 2nd Response to Life-Risk Incidents



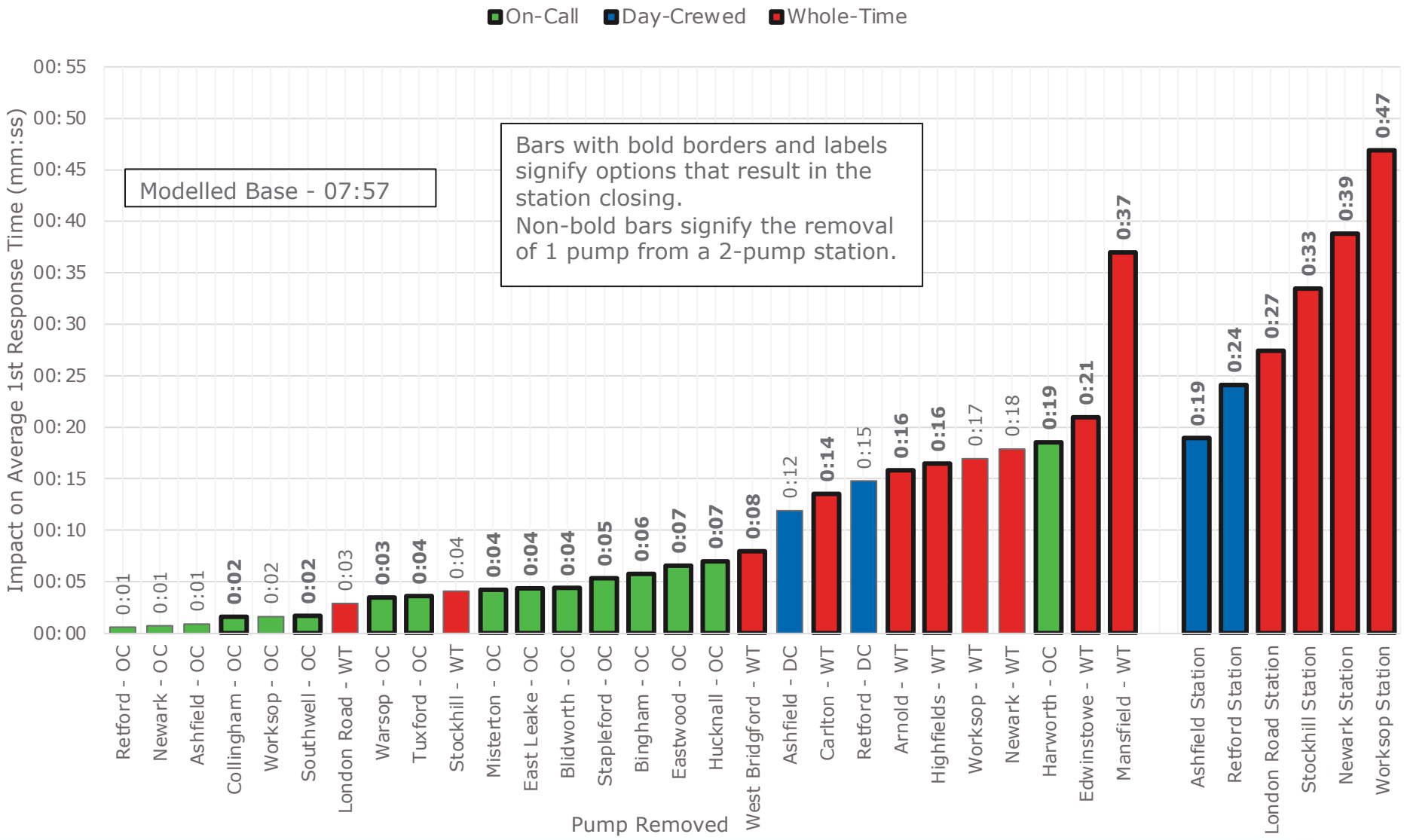
Individual Pump/Station Removal

Proportion of Life-Risk Incidents in 15 Minutes



Individual Pump/Station Removal

Average 1st Response to All Incidents



Second Wholetime Pump Options

Wholetime Pump Options

NFRS has 12 wholetime and 2 day-crewed pumps. Therefore, there are 14 wholetime crewed pumps in the day and 12 at night. ORH assessed alternative options.

On-call pumps were fixed in their current locations, then optimisation modelling was used to assess the different split in day and night wholetime shifts:

- 14 in the day, 12 at night
- 15 in the day, 11 at night
- 13 in the day, 13 at night

Currently there are two NFRS stations with two wholetime pumps. ORH also assessed varying the number of stations with wholetime pumps. The different permutations assessed are presented on the next page.

The optimisation was run separately for the day and night-time positions. This does result in some options that may not be feasible to implement, such as day-only crewing at some stations and night-only crewing at others.

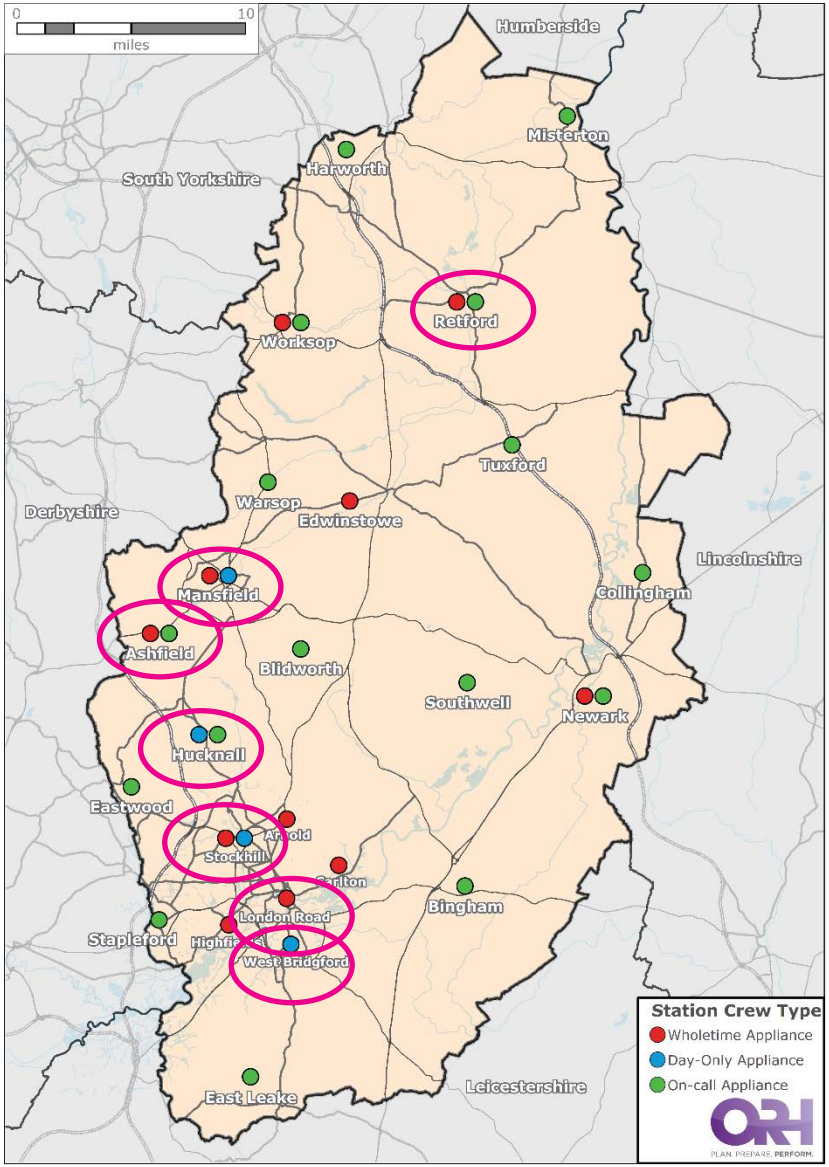
Maintaining 14 pumps in the day and 12 at night, or 15 in the day and 11 at night, are shown to provide better performance than having 13 in the day and 13 at night. This is a likely consequence of having higher demand in the day, combined with better on-call availability at night.

Pump Redeployment Modelling

	Daytime			Night			Life-Risk Incidents			All Incidents
	Stations With WT Crewing	Stations With 2 WT Crews	Wholetime Crews	Stations With WT Crewing	Stations With 2 WT Crews	Wholetime Crews	Average 1st	Average 2nd	% of 1st in 15 Minutes	Average 1st
Modelled Base	12	2	14	10	2	12	7:55	11:13	95.0%	7:57
Optimised Deployments										
	13	2	15	10	1	11	-0:02	0:09	0.0%	-0:03
Option A	13	2	15	11	0	11	-0:06	-0:04	0.2%	-0:06
Option B	12	2	14	10	2	12	0:00	-0:07	0.0%	-0:01
Option C	12	2	14	11	1	12	-0:03	-0:07	0.2%	-0:04
Option D	12	2	14	12	0	12	-0:05	-0:04	0.3%	-0:06
	13	1	14	11	1	12	-0:06	0:01	0.2%	-0:06
	13	1	14	12	0	12	-0:08	0:04	0.3%	-0:08
	14	0	14	12	0	12	-0:09	0:12	0.6%	-0:09
	11	2	13	11	2	13	0:02	-0:03	-0.1%	0:01
	12	1	13	12	1	13	-0:05	0:03	0.3%	-0:05
	13	0	13	13	0	13	-0:07	0:17	0.3%	-0:08

Option A – 13/11WT Day/Night

Option A	Daytime Base Position	Night Base Position	Daytime	Night
Total WT Crews	14	12	15	11
Stations With WT Crewing	12	10	13	11
Stations With 2 WT Crews	2	2	2	0
Ashfield	1WT 1OC	2OC	1WT 1OC	1WT 1OC
Hucknall	1OC	1OC	1WT 1OC	1OC
London Road	2WT	2WT	1WT	1WT
Mansfield	1WT	1WT	2WT	1WT
Retford	1WT 1OC	2OC	1WT 1OC	1WT 1OC
Stockhill	2WT	2WT	2WT	1WT
West Bridgford	1WT	1WT	1WT	-



Option A – 13/11WT Day/Night

Modelled Base

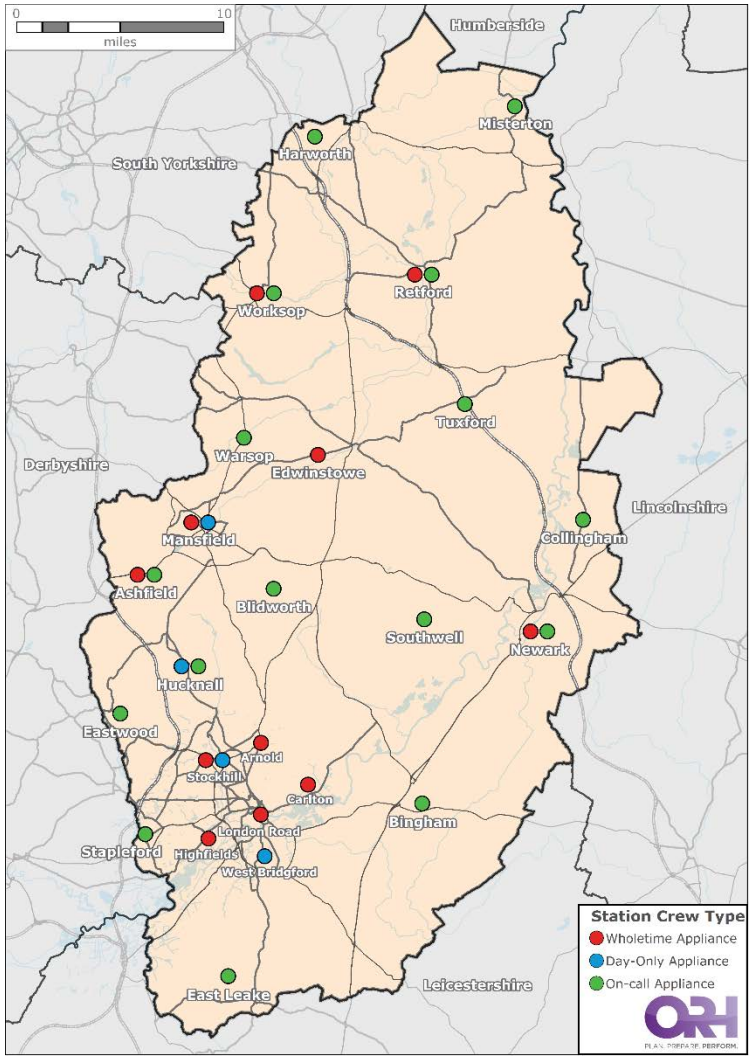
District	Life-Risk Incidents			All Incidents
	Average 1st	Average 2nd	% of 1st in 15 Minutes	Average 1st
Service-wide	7:55	11:13	95.0%	7:57
Ashfield	8:52	12:34	95.6%	9:06
Bassetlaw	9:07	14:53	91.4%	9:37
Broxtowe	7:26	11:33	97.0%	7:26
City of Nottingham	6:56	8:01	97.5%	6:31
Gedling	6:30	10:24	97.8%	7:01
Mansfield	7:19	13:06	98.0%	7:52
Newark & Sherwood	9:23	14:55	89.5%	10:02
Rushcliffe	9:24	12:13	88.9%	9:47

Model Output

District	Life-Risk Incidents			All Incidents
	Average 1st	Average 2nd	% of 1st in 15 Minutes	Average 1st
Service-wide	7:49	11:09	95.2%	7:51
Ashfield	7:22	11:10	98.4%	7:36
Bassetlaw	8:39	14:10	92.4%	9:14
Broxtowe	7:28	11:47	97.0%	7:29
City of Nottingham	7:12	9:10	97.1%	6:44
Gedling	6:29	10:21	98.0%	6:58
Mansfield	6:59	9:26	99.0%	7:33
Newark & Sherwood	9:22	14:53	89.6%	10:01
Rushcliffe	10:00	13:25	86.2%	10:29

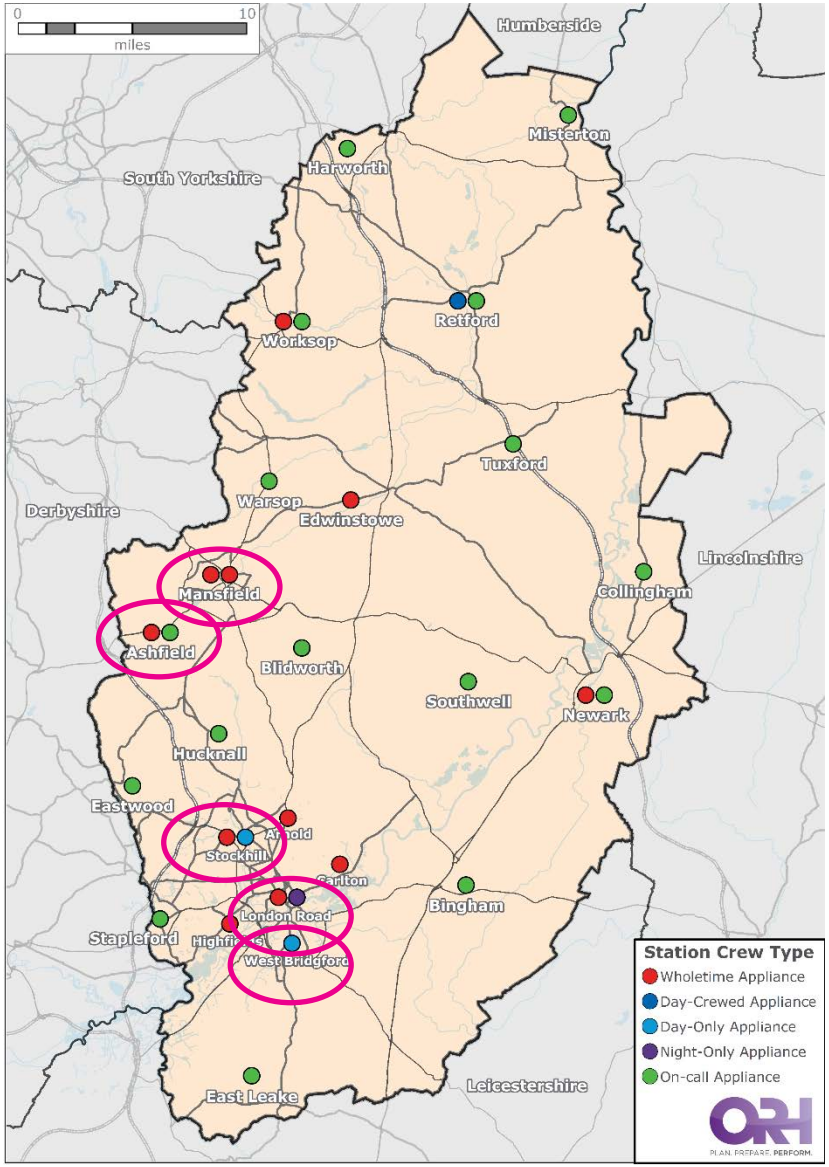
Impact

District	Life-Risk Incidents			All Incidents
	Average 1st	Average 2nd	% of 1st in 15 Minutes	Average 1st
Service-wide	-0:06	-0:04	0.2%	-0:06
Ashfield	-1:30	-1:24	2.8%	-1:30
Bassetlaw	-0:28	-0:43	1.0%	-0:23
Broxtowe	+0:02	+0:14	0.0%	+0:03
City of Nottingham	+0:16	+1:09	-0.4%	+0:13
Gedling	-0:01	-0:03	0.2%	-0:03
Mansfield	-0:20	-3:40	1.0%	-0:19
Newark & Sherwood	-0:01	-0:02	0.1%	-0:01
Rushcliffe	+0:36	+1:12	-2.7%	+0:42



Option B – 12/10WT Day/Night

Option B	Daytime Base Position	Night Base Position	Daytime	Night
Total WT Crews	14	12	14	12
Stations With WT Crewing	12	10	12	10
Stations With 2 WT Crews	2	2	2	2
Ashfield	1WT 1OC	2OC	1WT 1OC	1WT 1OC
London Road	2WT	2WT	1WT	2WT
Mansfield	1WT	1WT	2WT	2WT
Stockhill	2WT	2WT	2WT	1WT
West Bridgford	1WT	1WT	1WT	-



Option B – 12/10WT Day/Night

Modelled Base

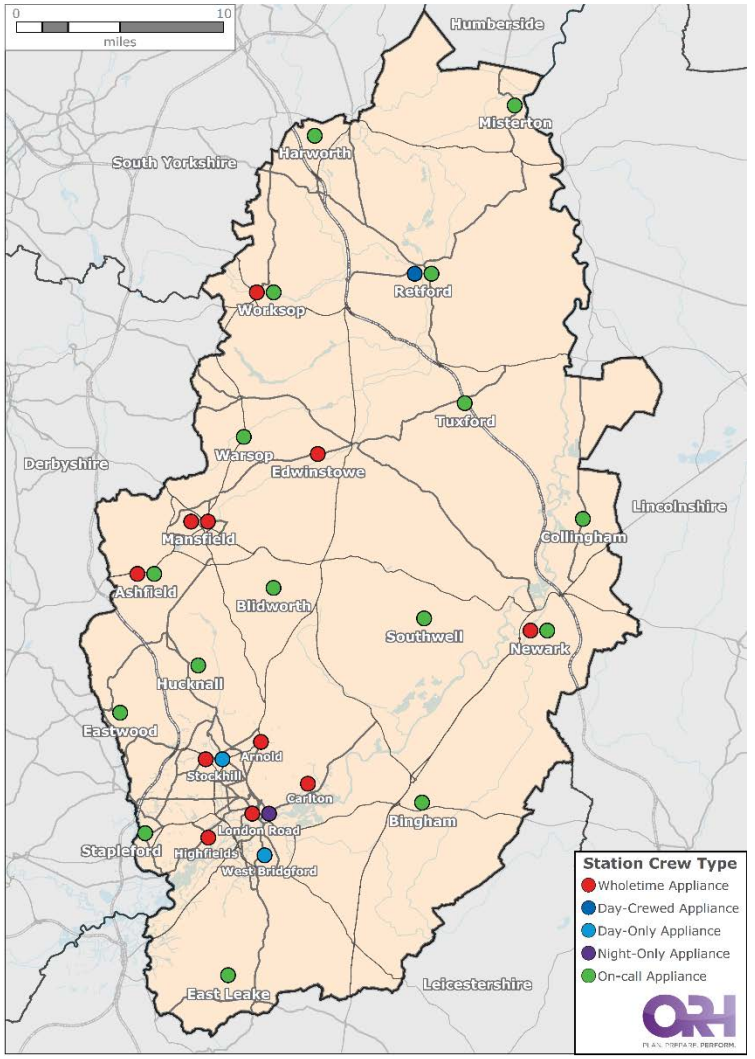
District	Life-Risk Incidents			All Incidents
	Average 1st	Average 2nd	% of 1st in 15 Minutes	Average 1st
Service-wide	7:55	11:13	95.0%	7:57
Ashfield	8:52	12:34	95.6%	9:06
Bassetlaw	9:07	14:53	91.4%	9:37
Broxtowe	7:26	11:33	97.0%	7:26
City of Nottingham	6:56	8:01	97.5%	6:31
Gedling	6:30	10:24	97.8%	7:01
Mansfield	7:19	13:06	98.0%	7:52
Newark & Sherwood	9:23	14:55	89.5%	10:02
Rushcliffe	9:24	12:13	88.9%	9:47

Model Output

District	Life-Risk Incidents			All Incidents
	Average 1st	Average 2nd	% of 1st in 15 Minutes	Average 1st
Service-wide	7:55	11:06	95.0%	7:56
Ashfield	8:00	11:55	97.5%	8:12
Bassetlaw	9:07	14:53	91.3%	9:37
Broxtowe	7:29	11:50	96.8%	7:29
City of Nottingham	7:10	8:53	97.1%	6:42
Gedling	6:34	10:29	97.6%	7:05
Mansfield	6:50	7:56	99.3%	7:26
Newark & Sherwood	9:22	14:53	89.7%	10:01
Rushcliffe	9:54	12:48	86.7%	10:24

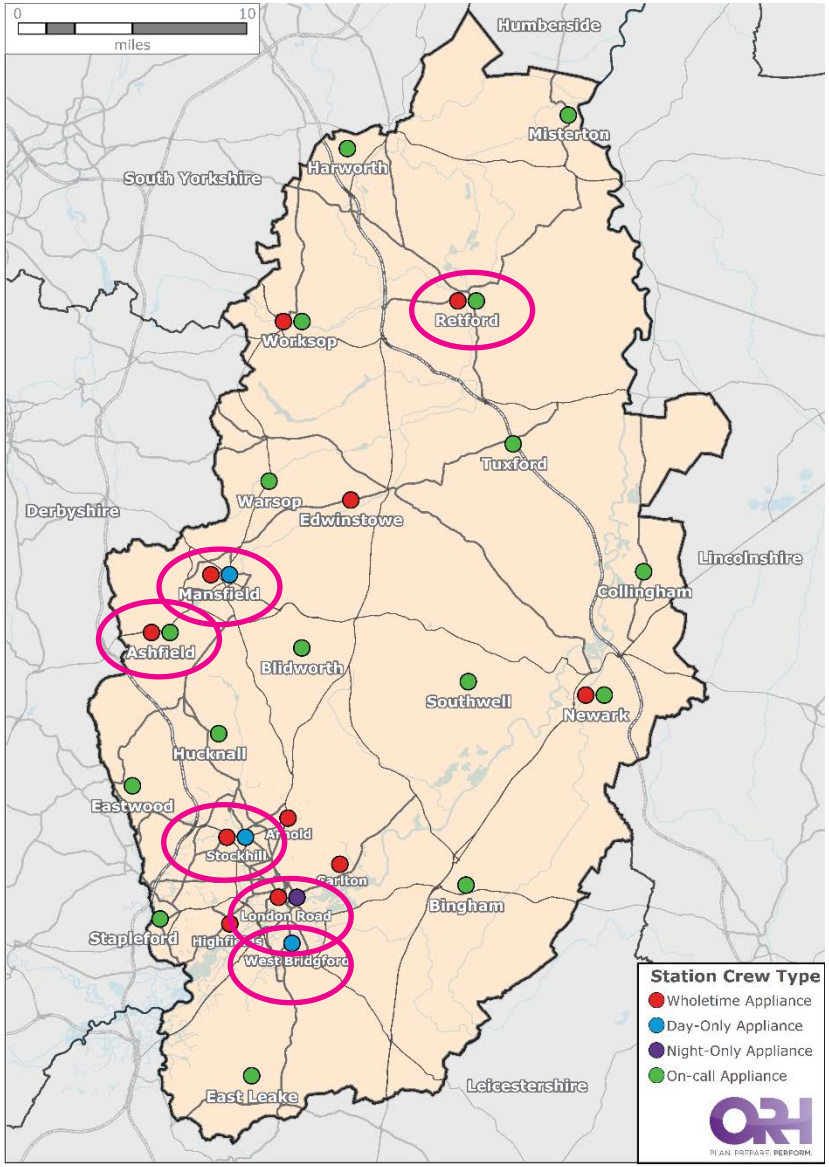
Impact

District	Life-Risk Incidents			All Incidents
	Average 1st	Average 2nd	% of 1st in 15 Minutes	Average 1st
Service-wide	0:00	-0:07	0.0%	-0:01
Ashfield	-0:52	-0:39	1.9%	-0:54
Bassetlaw	0:00	0:00	-0.1%	0:00
Broxtowe	+0:03	+0:17	-0.2%	+0:03
City of Nottingham	+0:14	+0:52	-0.4%	+0:11
Gedling	+0:04	+0:05	-0.2%	+0:04
Mansfield	-0:29	-5:10	1.3%	-0:26
Newark & Sherwood	-0:01	-0:02	0.2%	-0:01
Rushcliffe	+0:30	+0:35	-2.2%	+0:37



Option C – 12/11WT Day/Night

Option C	Daytime Base Position	Night Base Position	Daytime	Night
Total WT Crews	14	12	14	12
Stations With WT Crewing	12	10	12	11
Stations With 2 WT Crews	2	2	2	1
Ashfield	1WT 1OC	2OC	1WT 1OC	1WT 1OC
London Road	2WT	2WT	1WT	2WT
Mansfield	1WT	1WT	2WT	1WT
Retford	1WT 1OC	2OC	1WT 1OC	1WT 1OC
Stockhill	2WT	2WT	2WT	1WT
West Bridgford	1WT	1WT	1WT	-



Option C – 12/11WT Day/Night

Modelled Base

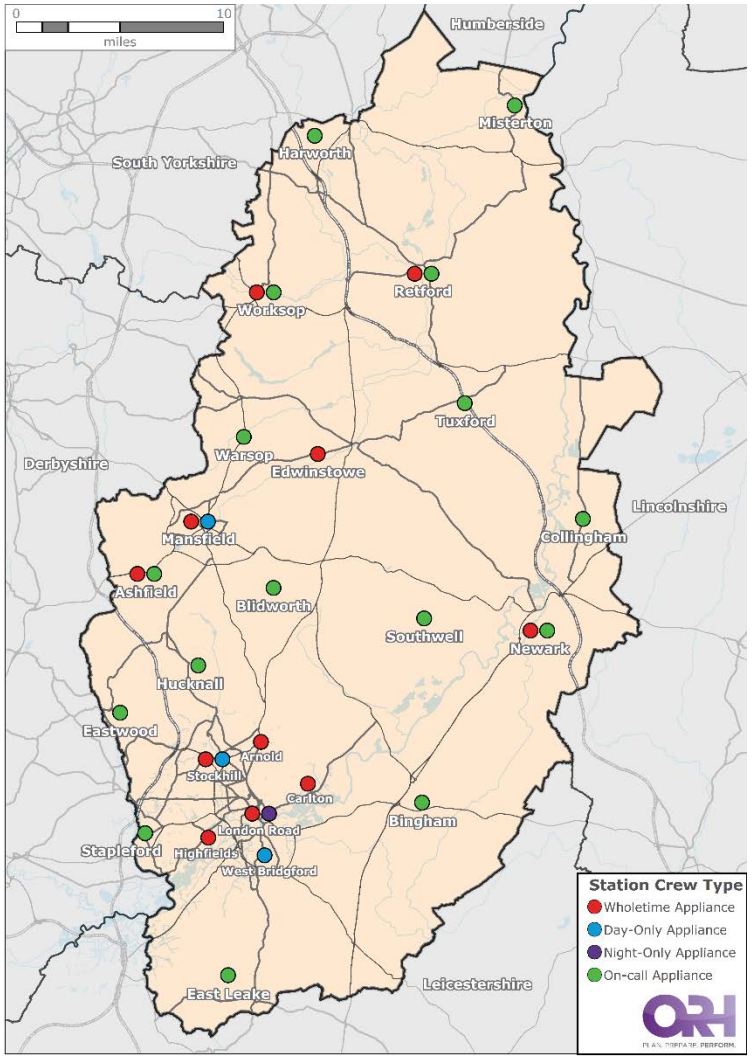
District	Life-Risk Incidents			All Incidents
	Average 1st	Average 2nd	% of 1st in 15 Minutes	Average 1st
Service-wide	7:55	11:13	95.0%	7:57
Ashfield	8:52	12:34	95.6%	9:06
Bassetlaw	9:07	14:53	91.4%	9:37
Broxtowe	7:26	11:33	97.0%	7:26
City of Nottingham	6:56	8:01	97.5%	6:31
Gedling	6:30	10:24	97.8%	7:01
Mansfield	7:19	13:06	98.0%	7:52
Newark & Sherwood	9:23	14:55	89.5%	10:02
Rushcliffe	9:24	12:13	88.9%	9:47

Model Output

District	Life-Risk Incidents			All Incidents
	Average 1st	Average 2nd	% of 1st in 15 Minutes	Average 1st
Service-wide	7:52	11:06	95.2%	7:53
Ashfield	8:02	11:59	97.4%	8:13
Bassetlaw	8:39	14:07	92.4%	9:13
Broxtowe	7:29	11:50	96.8%	7:29
City of Nottingham	7:10	8:53	97.1%	6:42
Gedling	6:33	10:28	97.6%	7:05
Mansfield	6:59	9:28	99.0%	7:33
Newark & Sherwood	9:21	14:53	89.7%	10:01
Rushcliffe	9:54	12:48	86.7%	10:23

Impact

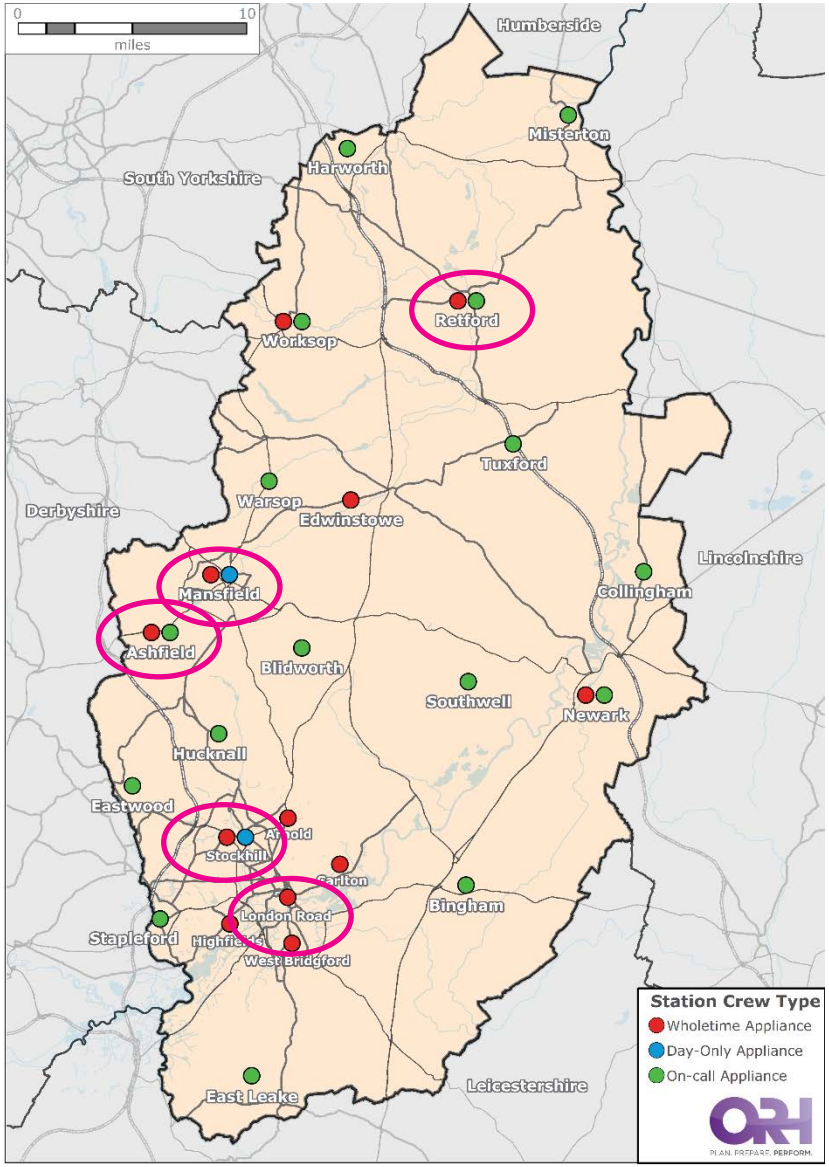
District	Life-Risk Incidents			All Incidents
	Average 1st	Average 2nd	% of 1st in 15 Minutes	Average 1st
Service-wide	-0:03	-0:07	0.2%	-0:04
Ashfield	-0:50	-0:35	1.8%	-0:53
Bassetlaw	-0:28	-0:46	1.0%	-0:24
Broxtowe	+0:03	+0:17	-0.2%	+0:03
City of Nottingham	+0:14	+0:52	-0.4%	+0:11
Gedling	+0:03	+0:04	-0.2%	+0:04
Mansfield	-0:20	-3:38	1.0%	-0:19
Newark & Sherwood	-0:02	-0:02	0.2%	-0:01
Rushcliffe	+0:30	+0:35	-2.2%	+0:36



Option D – 12/12WT Day/Night

Option D	Daytime Base Position	Night Base Position
Total WT Crews	14	12
Stations With WT Crewing	12	10
Stations With 2 WT Crews	2	2
Ashfield	1WT 1OC	2OC
London Road	2WT	2WT
Mansfield	1WT	1WT
Retford	1WT 1OC	2OC
Stockhill	2WT	2WT

Daytime	Night
14	12
12	12
2	0
1WT 1OC	1WT 1OC
1WT	1WT
2WT	1WT
1WT 1OC	1WT 1OC
2WT	1WT



Option D – 12/12WT Day/Night

Modelled Base

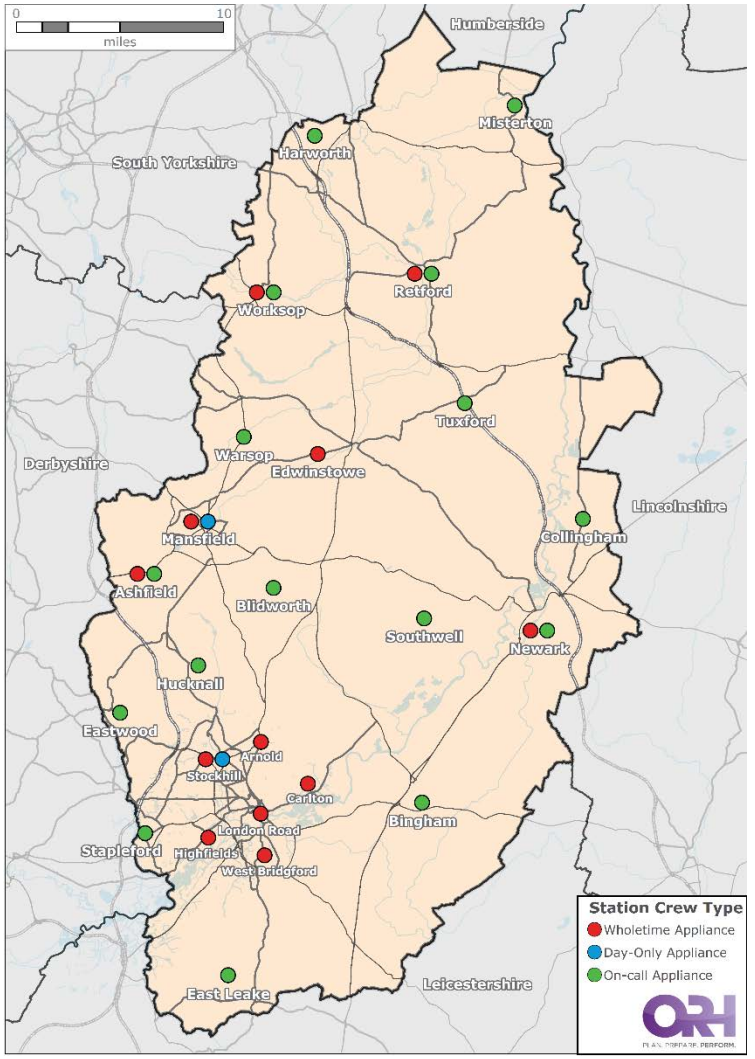
District	Life-Risk Incidents			All Incidents
	Average 1st	Average 2nd	% of 1st in 15 Minutes	Average 1st
Service-wide	7:55	11:13	95.0%	7:57
Ashfield	8:52	12:34	95.6%	9:06
Bassetlaw	9:07	14:53	91.4%	9:37
Broxtowe	7:26	11:33	97.0%	7:26
City of Nottingham	6:56	8:01	97.5%	6:31
Gedling	6:30	10:24	97.8%	7:01
Mansfield	7:19	13:06	98.0%	7:52
Newark & Sherwood	9:23	14:55	89.5%	10:02
Rushcliffe	9:24	12:13	88.9%	9:47

Model Output

District	Life-Risk Incidents			All Incidents
	Average 1st	Average 2nd	% of 1st in 15 Minutes	Average 1st
Service-wide	7:50	11:09	95.3%	7:51
Ashfield	8:02	12:00	97.4%	8:13
Bassetlaw	8:39	14:06	92.4%	9:13
Broxtowe	7:29	11:49	96.8%	7:29
City of Nottingham	7:09	9:06	97.3%	6:41
Gedling	6:34	10:29	97.5%	7:05
Mansfield	6:59	9:28	99.0%	7:33
Newark & Sherwood	9:21	14:53	89.6%	10:01
Rushcliffe	9:30	12:34	88.5%	9:53

Impact

District	Life-Risk Incidents			All Incidents
	Average 1st	Average 2nd	% of 1st in 15 Minutes	Average 1st
Service-wide	-0:05	-0:04	0.3%	-0:06
Ashfield	-0:50	-0:34	1.8%	-0:53
Bassetlaw	-0:28	-0:47	1.0%	-0:24
Broxtowe	+0:03	+0:16	-0.2%	+0:03
City of Nottingham	+0:13	+1:05	-0.2%	+0:10
Gedling	+0:04	+0:05	-0.3%	+0:04
Mansfield	-0:20	-3:38	1.0%	-0:19
Newark & Sherwood	-0:02	-0:02	0.1%	-0:01
Rushcliffe	+0:06	+0:21	-0.4%	+0:06



Specials Review

Specials Review

NFRS wished to use modelling to help determine the future fleet in terms of the location and the mix of special appliances.

The objective was to support the distribution of appliances at current stations considering either one or two appliances of each type.

While each appliance type is operationally used for a wide range of purposes, NFRS identified the key risk criteria for each appliance type to be used in the optimisation modelling.

The modelling sought to optimise coverage to the defined risk profile. In addition to identifying the optimal stations to locate appliances at, the coverage of risk was quantified and compared to the current deployment.

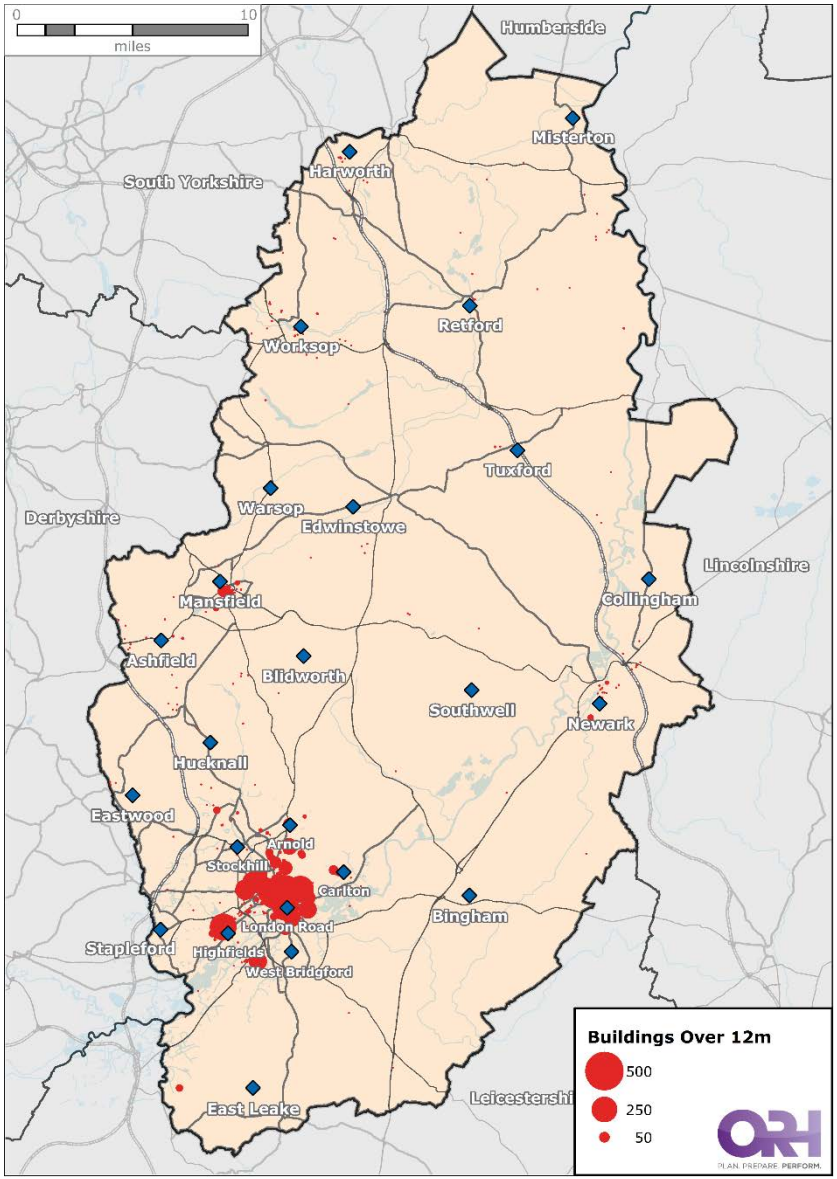
The appliance types and the risk profile to optimise against was as follows:

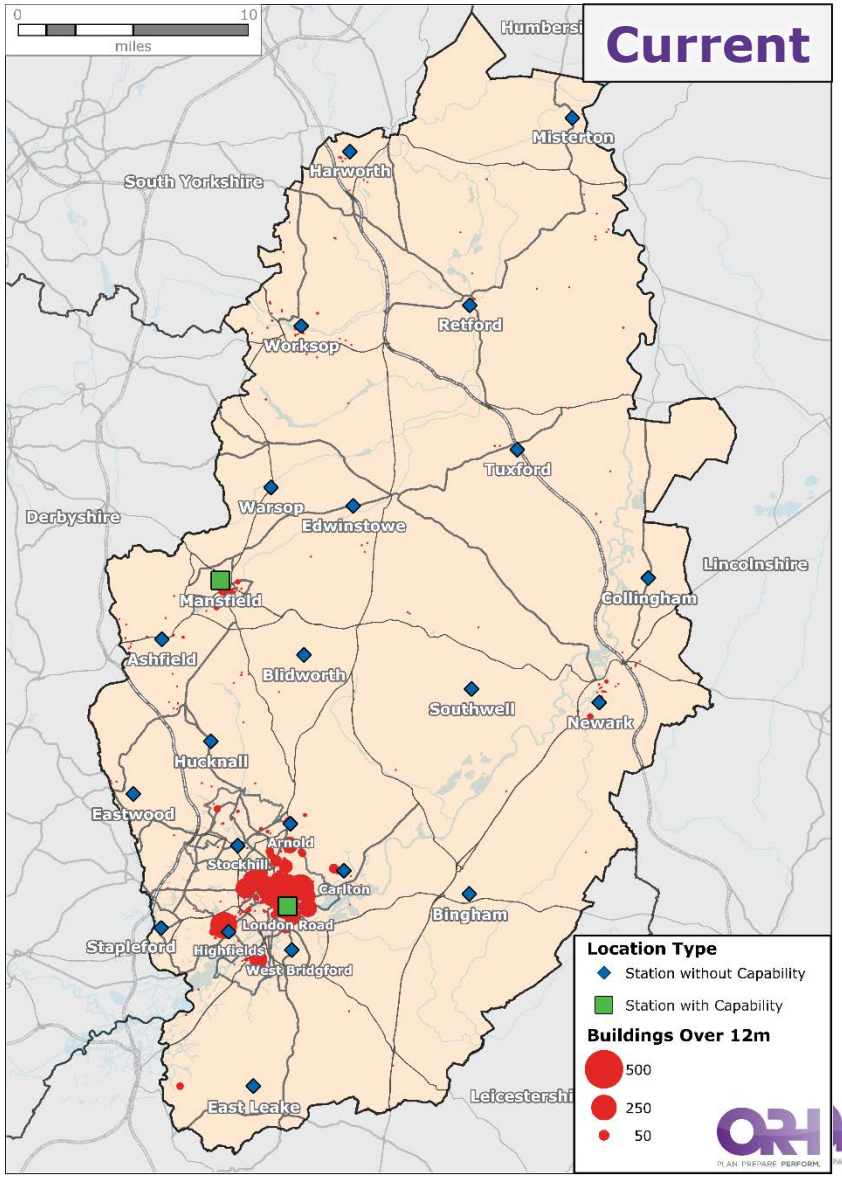
Special Appliance	Risk Profile
Aerials	Buildings over 12m
Command Support Unit	4+ Pump incidents
Technical Recue Unit	Water Rescue Incidents
Animal Rescue Unit	Large Animal Rescue Incidents

The optimal locations and coverage times are presented in the following pages. A ranked order of 1-30 is provided for the options when one appliance is deployed.

Aerial Ladder Platform (ALP)

Risk Profile and Current Deployment

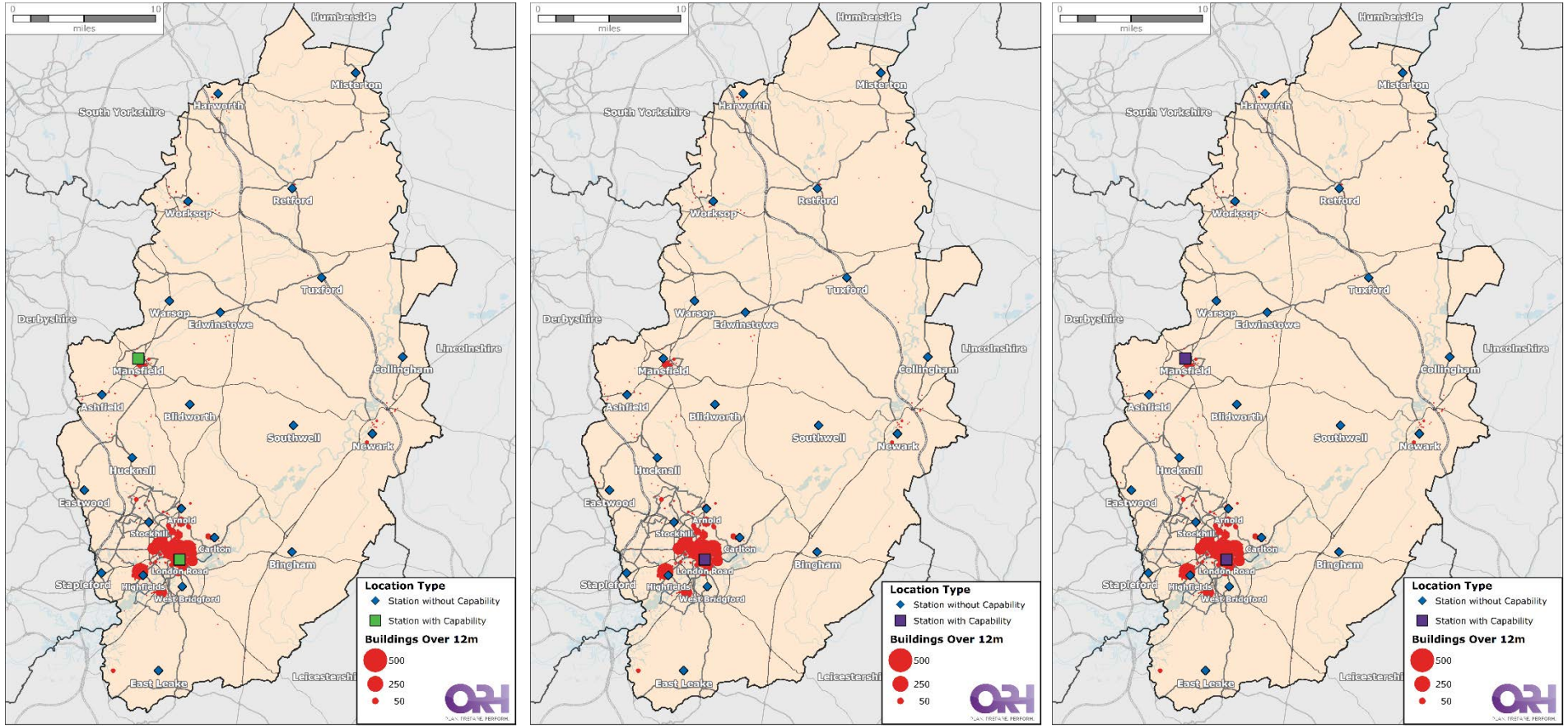




Aerial Ladder Platform (ALP)

Optimal Deployments

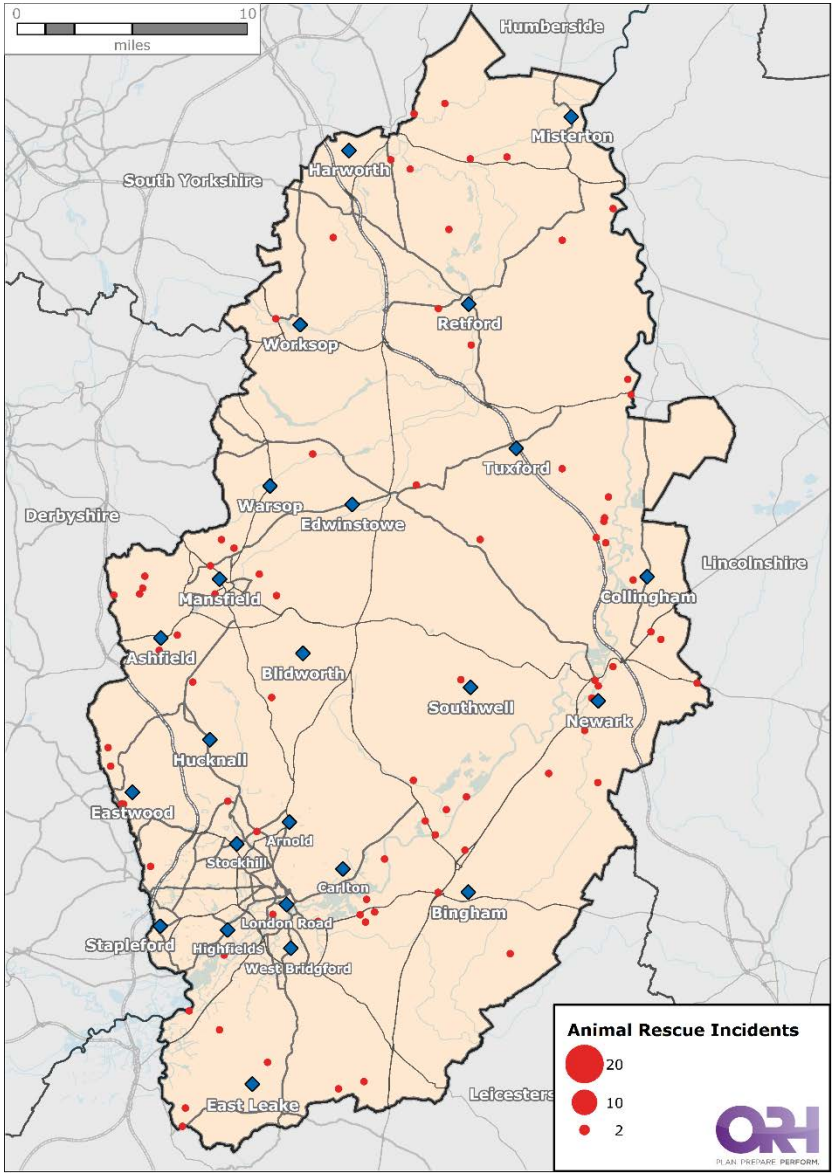
Current	Optimal 1 Station	Optimal 2 Station

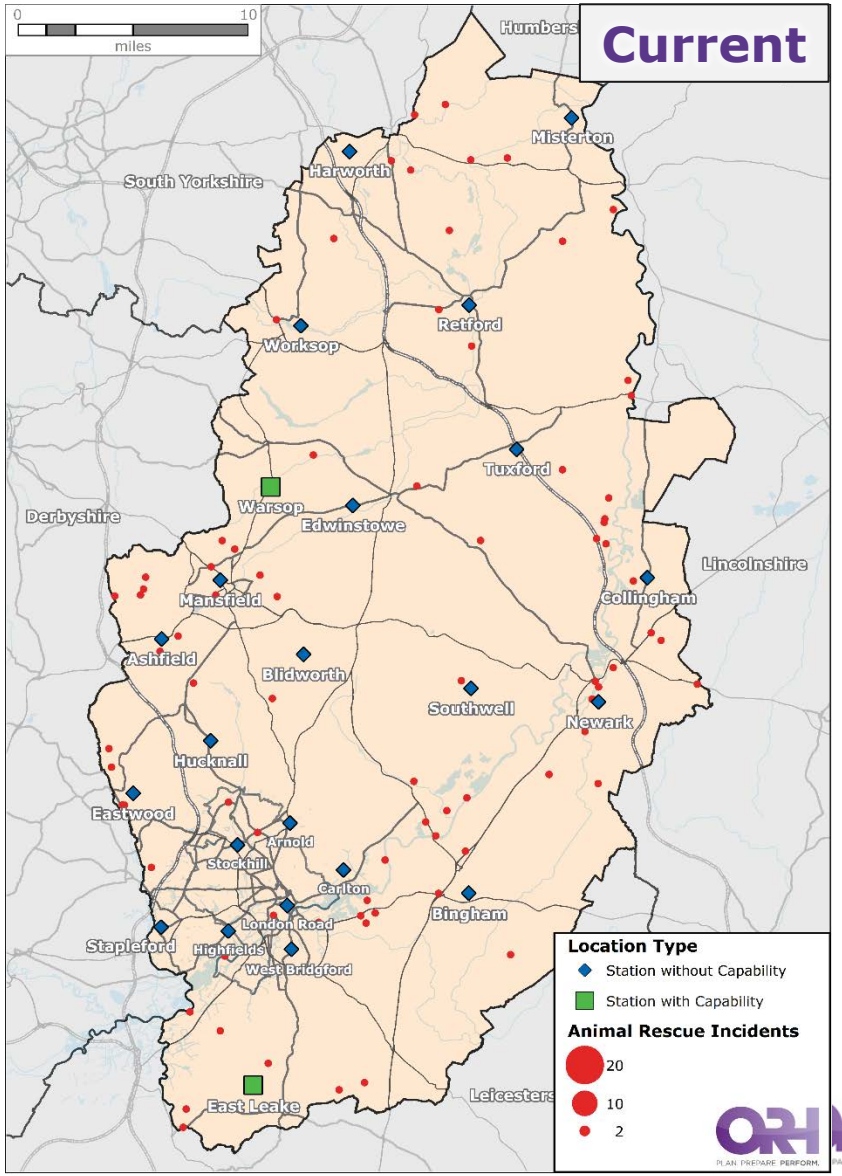


Based on Locations of Buildings over 12m

Large Animal Rescue

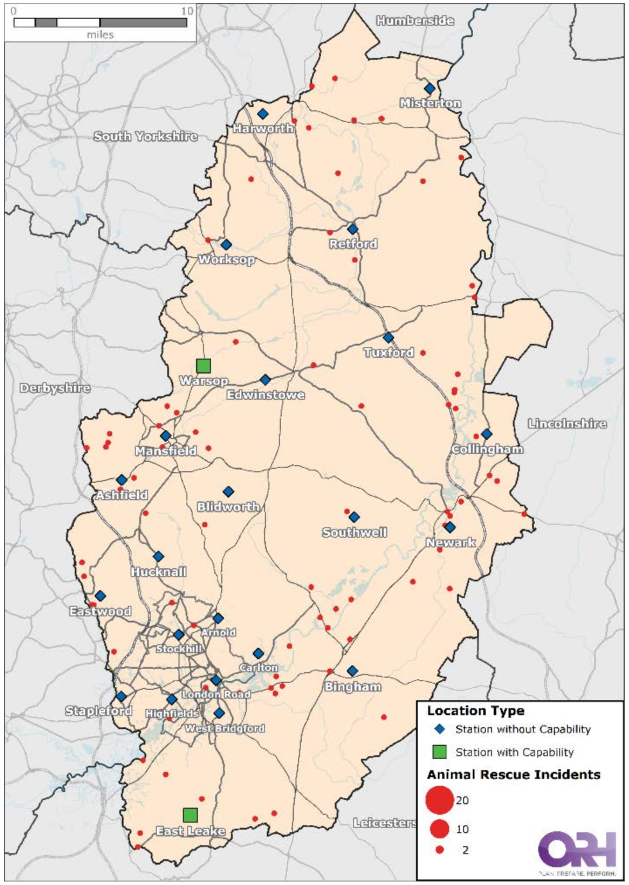
Demand and Current Deployment

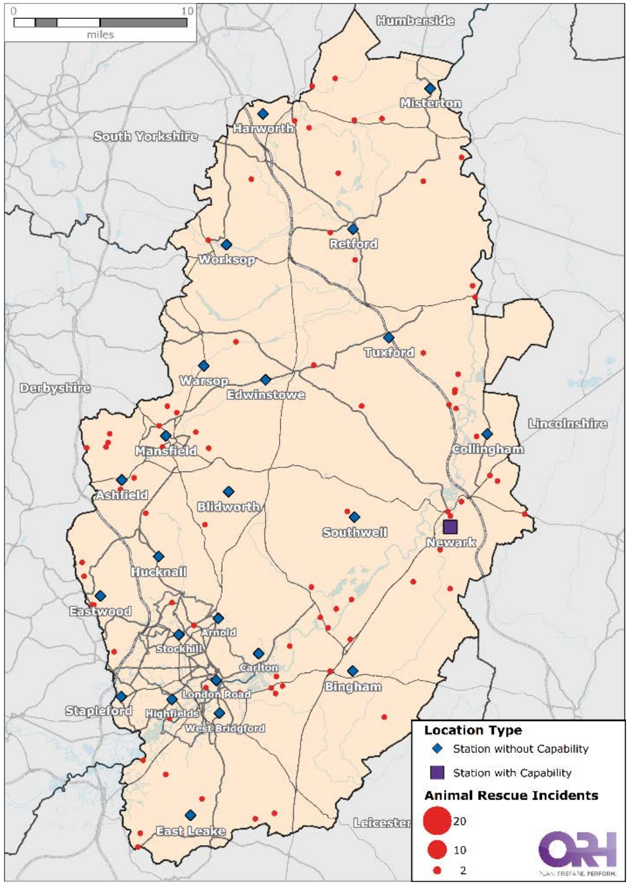


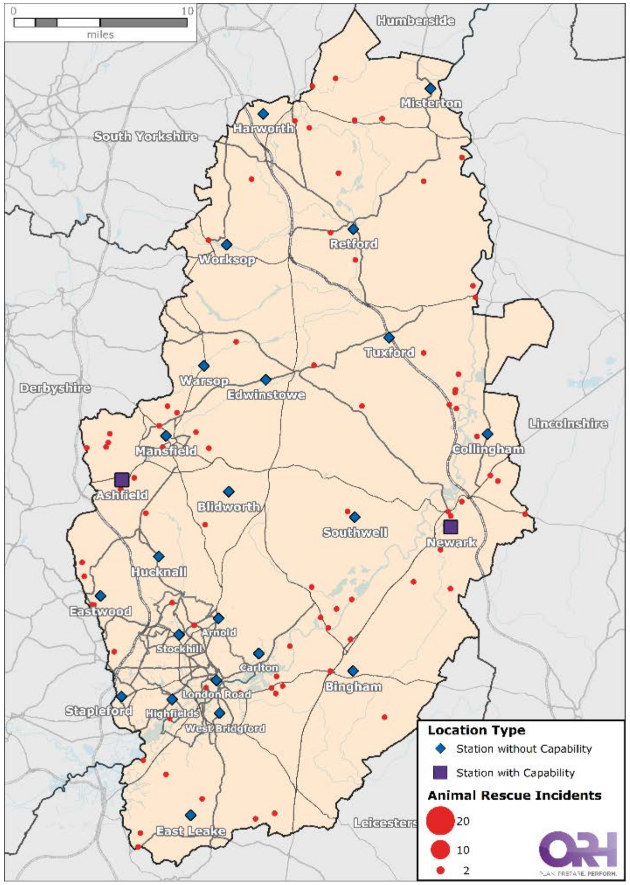


Large Animal Rescue
Current and Optimal Deployments

Current	Optimal 1 Station	Optimal 2 Station

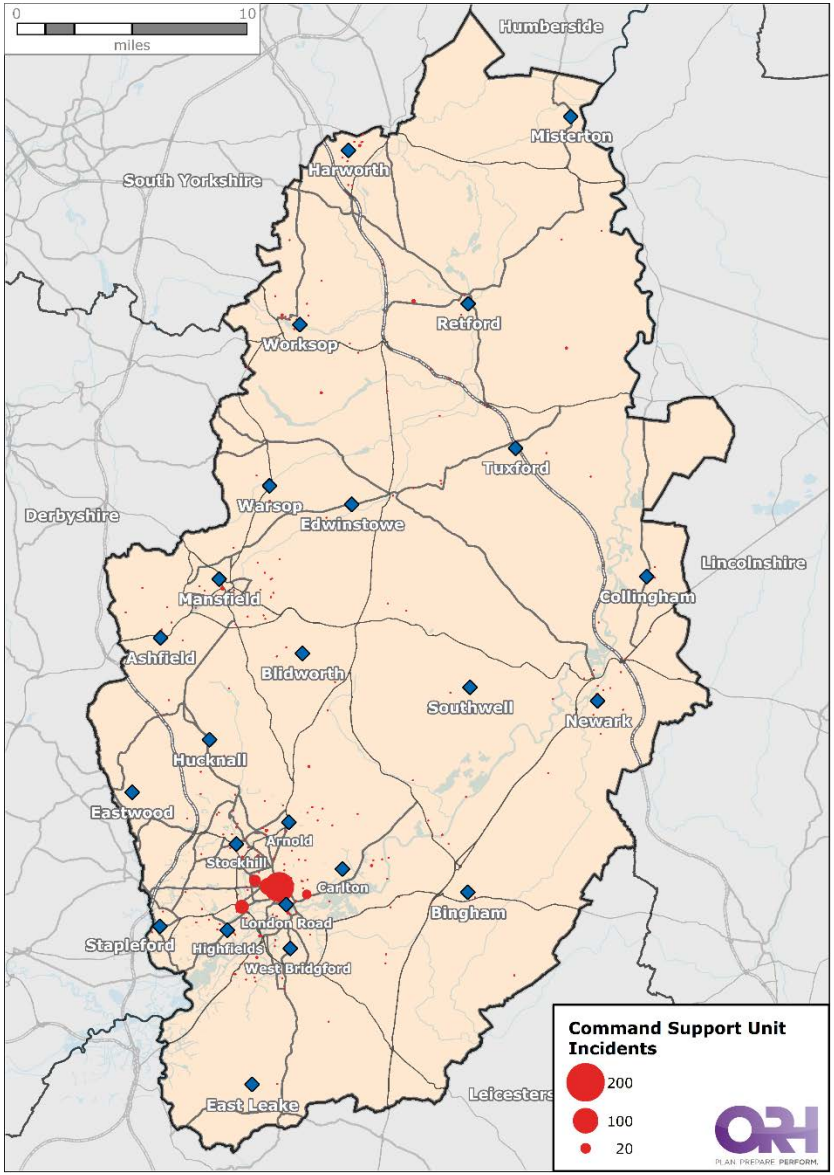


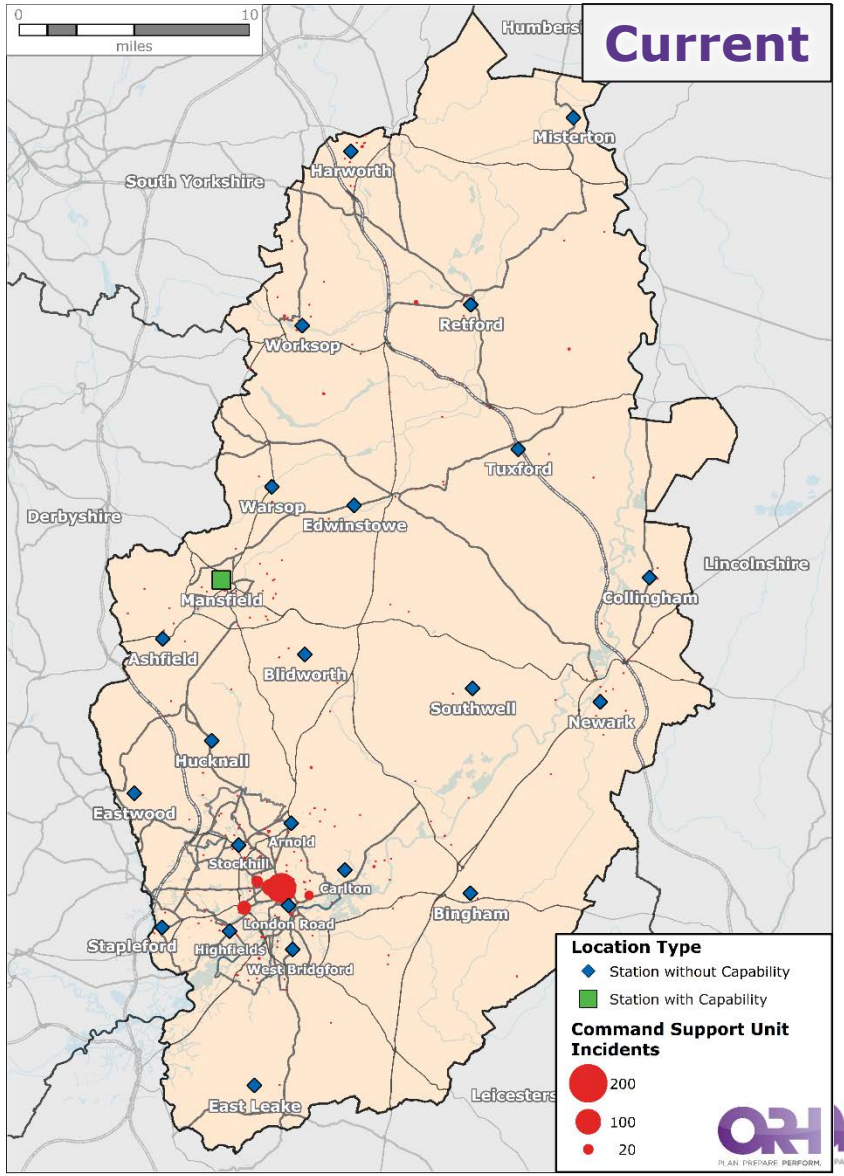




Command Support Unit

Demand and Current Deployment

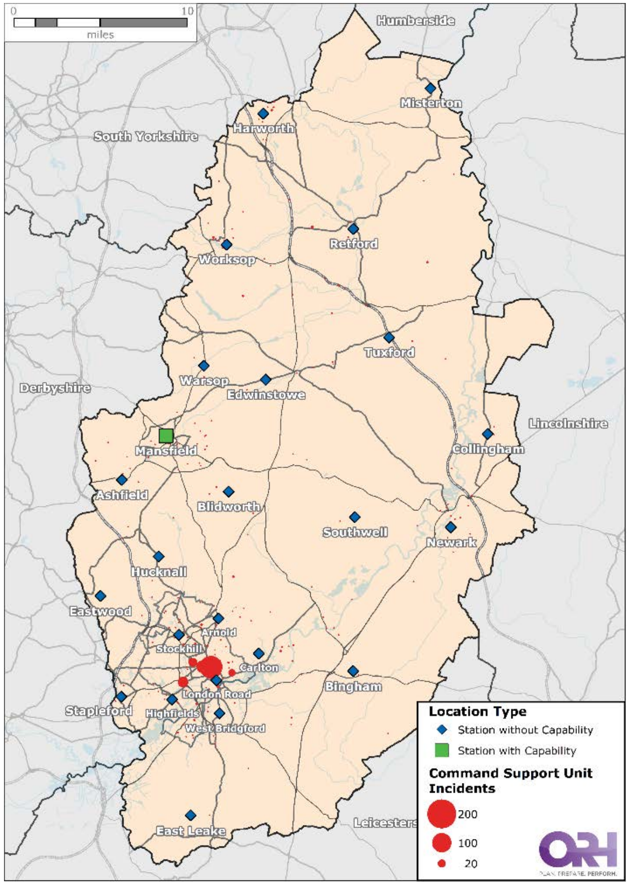


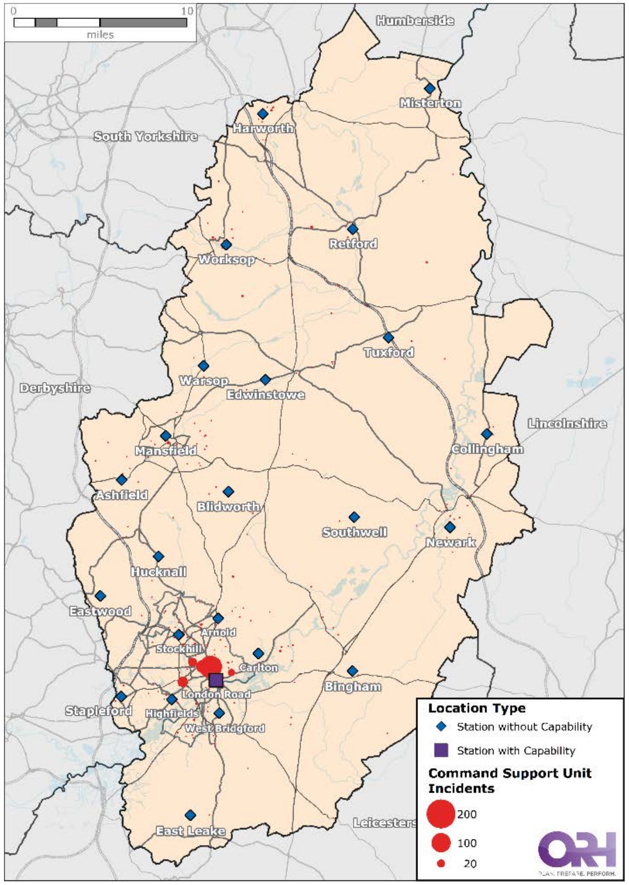


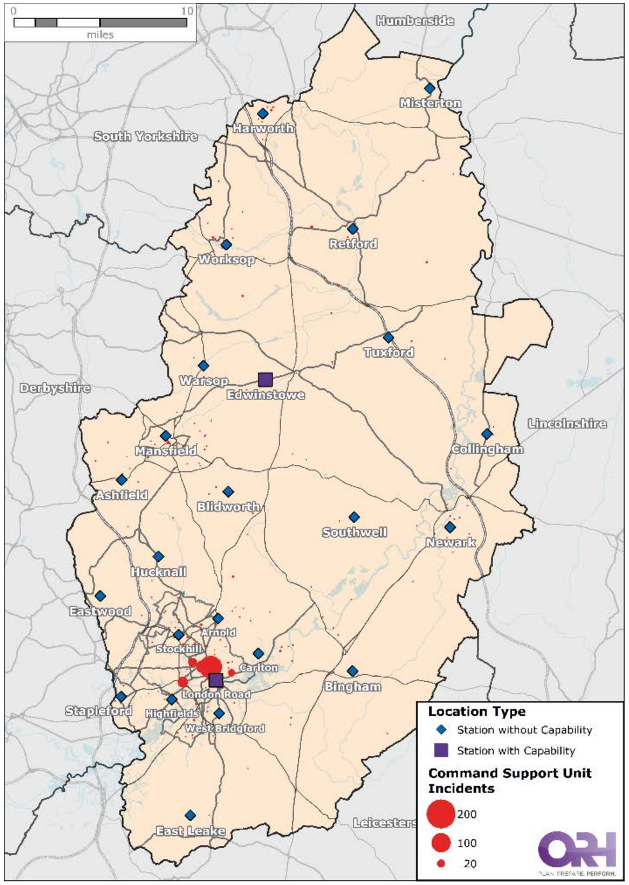
Command Support Unit

Current and Optimal Deployments

Current	Optimal 1 Station	Optimal 2 Station



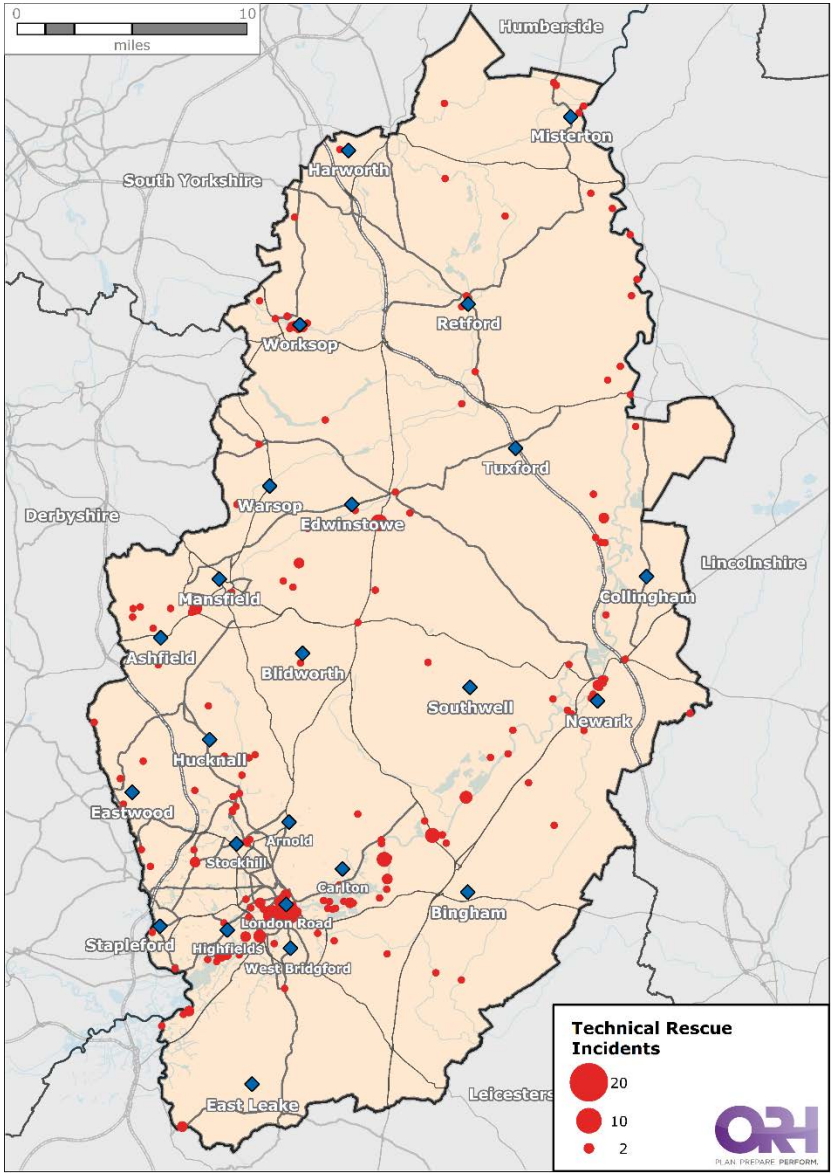


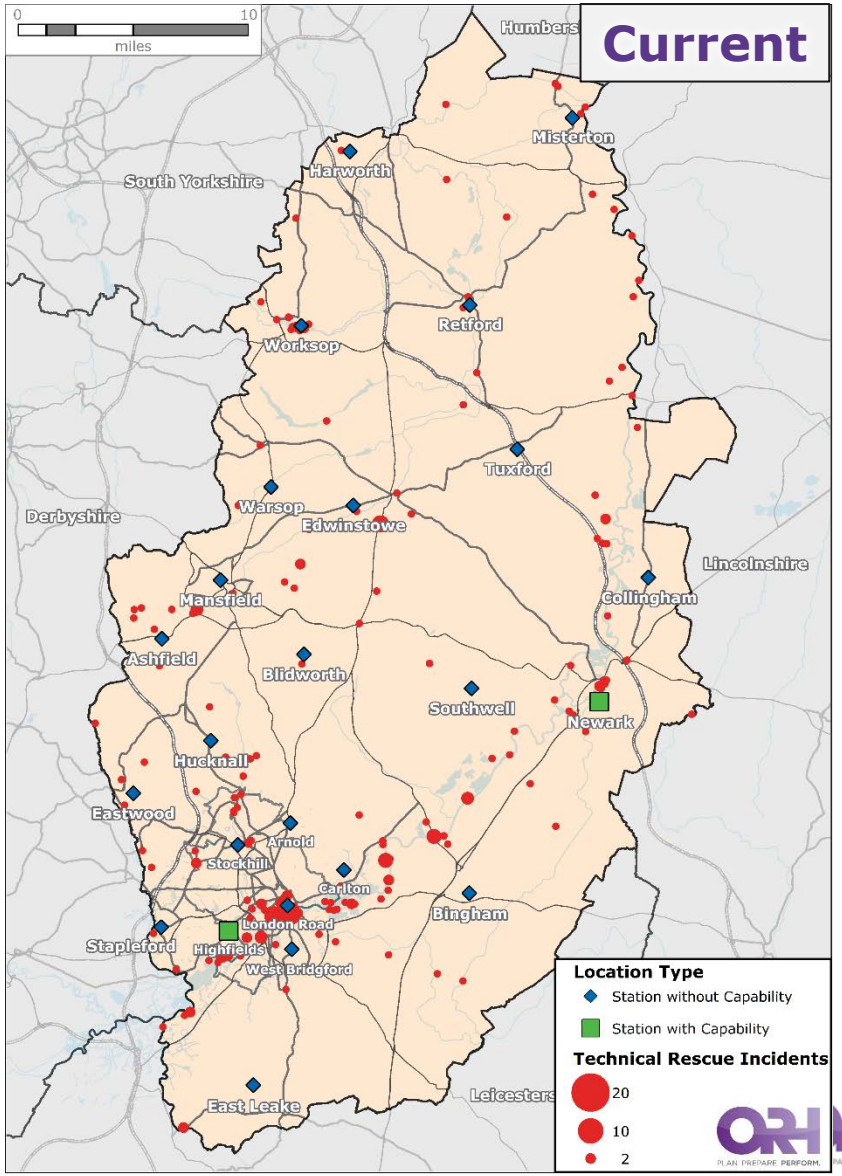


PLAN. PREPARE. PERFORM.

Technical Rescue Vehicles

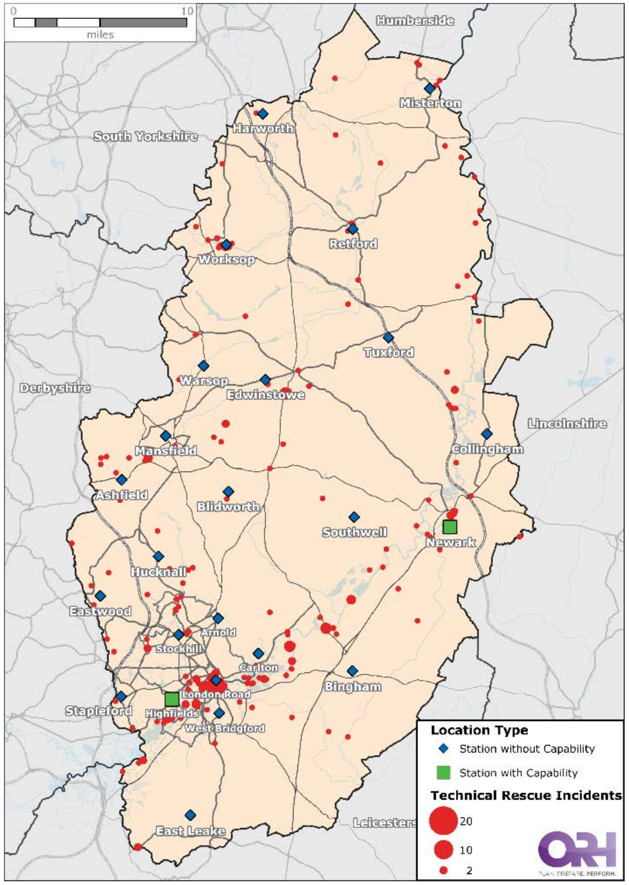
Demand and Current Deployment

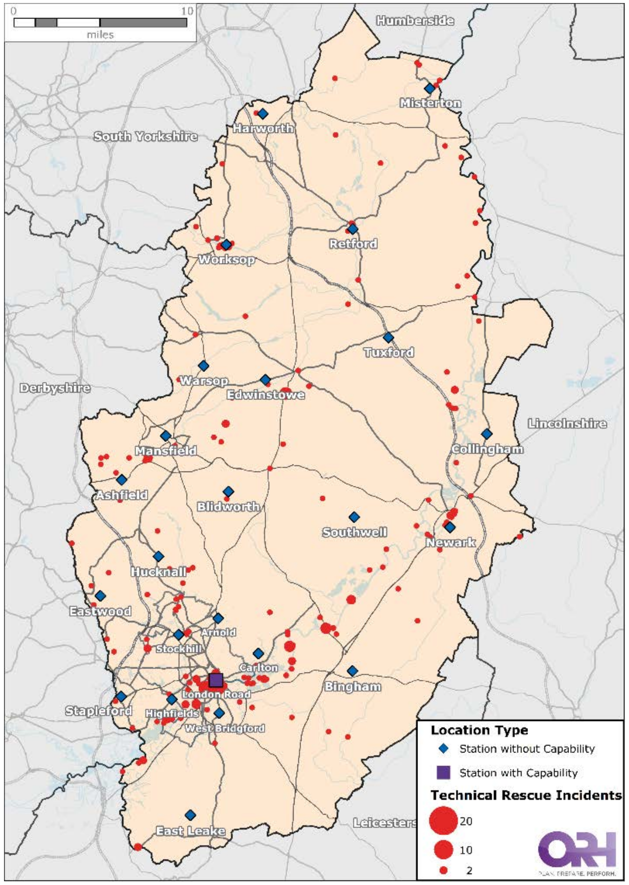


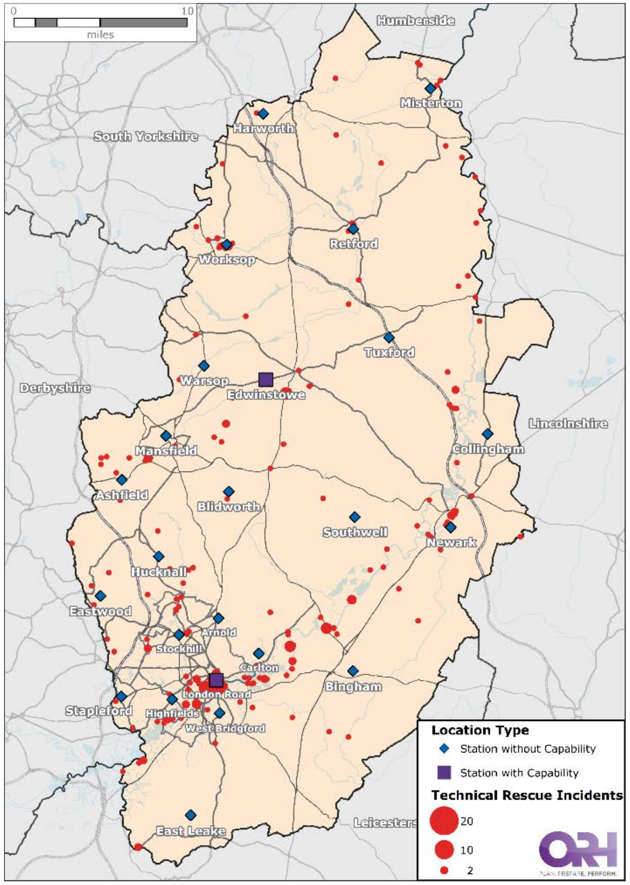


Technical Rescue Vehicles
Current and Optimal Deployments

Current	Optimal 1 Station	Optimal 2 Station







PLAN. PREPARE. PERFORM.

Optimal Locations

Special Appliance Type	Current Number of Appliances	Stations		
		Current Position	Optimal 1	Optimal 2
Aerial Ladder Platform (ALP)	2	London Road Mansfield	London Road	London Road Mansfield
Large Animal Rescue	2	Warsop East Leake	Newark	Newark Ashfield
Joint Incident Command Unit (JICU)	1	Mansfield	London Road	London Road Edwinstowe
Technical Rescue	2	Highfields Newark	London Road	London Road Edwinstowe

Modelled Coverage Time Summary

Special Appliance Type	Current Number of Appliances	Coverage Time		
		Current Position	Optimal 1	Optimal 2
Aerial Ladder Platform (ALP)	2	06:10	06:46	06:10
Large Animal Rescue	2	32:20	31:56	23:35
Joint Incident Command Unit (JICU)	1	30:42	14:42	10:06
Technical Rescue	2	20:47	26:02	16:58

Special Appliance Type	Current NO. of Stations used	Difference		
		Current Position	Optimal 1	Optimal 2
Aerial Ladder Platform (ALP)	2	*06:10*	00:36	00:00
Large Animal Rescue	2	*32:20*	-00:24	-08:45
Joint Incident Command Unit (JICU)	1	*30:42*	-16:00	-20:36
Technical Rescue	2	*20:47*	05:15	-03:49

Single Resource Ranking

Ranking	Aerial Ladder Platform		Large Animal Rescue		Command Support Unit		Technical Rescue	
	Station	Coverage Time	Station	Coverage Time	Station	Coverage Time	Station	Coverage Time
1	London Road	06:46	Newark	31:56	London Road	14:42	London Road	26:02
2	Stockhill	10:42	Edwinstowe	32:32	Arnold	16:42	Arnold	26:34
3	West Bridgford	10:55	Arnold	33:53	Stockhill	16:42	Carlton	27:07
4	Highfields	11:08	Mansfield	34:36	Carlton	17:59	Stockhill	27:54
5	Arnold	11:40	Carlton	34:54	West Bridgford	18:28	West Bridgford	28:47
6	Carlton	12:04	Southwell	34:59	Highfields	19:21	Highfields	30:51
7	Stapleford	19:01	London Road	35:13	Stapleford	26:19	Newark	32:22
8	Eastwood	23:49	Blidworth	35:37	Hucknall	26:54	Bingham	32:26
9	Hucknall	24:04	Stockhill	35:59	Bingham	28:39	Edwinstowe	32:52
10	Bingham	24:48	Ashfield	36:22	Eastwood	28:52	Blidworth	33:11
11	East Leake	27:15	Bingham	36:55	Ashfield	28:55	Mansfield	33:14
12	Ashfield	27:41	West Bridgford	37:36	Blidworth	29:54	Ashfield	33:26
13	Blidworth	29:38	Tuxford	38:13	Mansfield	30:42	Southwell	33:56
14	Mansfield	31:24	Hucknall	39:04	Edwinstowe	33:46	Hucknall	33:58
15	Southwell	34:30	Warsop	39:39	Southwell	34:04	Stapleford	37:24
16	Newark	34:34	Highfields	40:28	Newark	34:23	Eastwood	38:29
17	Edwinstowe	36:29	Retford	40:47	East Leake	34:28	Warsop	39:58
18	Warsop	43:32	Worksop	40:47	Warsop	40:44	Tuxford	42:12
19	Collingham	47:49	Collingham	40:57	Worksop	46:26	Collingham	42:53
20	Worksop	51:09	Eastwood	45:23	Collingham	46:31	Worksop	43:09
21	Tuxford	51:48	Stapleford	46:24	Tuxford	47:14	East Leake	43:26
22	Retford	54:56	East Leake	50:36	Retford	49:48	Retford	45:01
23	Harworth	01:03:30	Harworth	50:45	Harworth	58:29	Harworth	54:45
24	Misterton	01:17:47	Misterton	01:00:48	Misterton	01:12:13	Misterton	01:06:19

Static Risk Factors

Static Risk Factors

NFRS identify high risk locations where they have specific plans in place to manage risk. These are classified into the following groups:

- COMAH (control of major accident hazards) sites
- Tactical level four sites
- Tactical level three sites

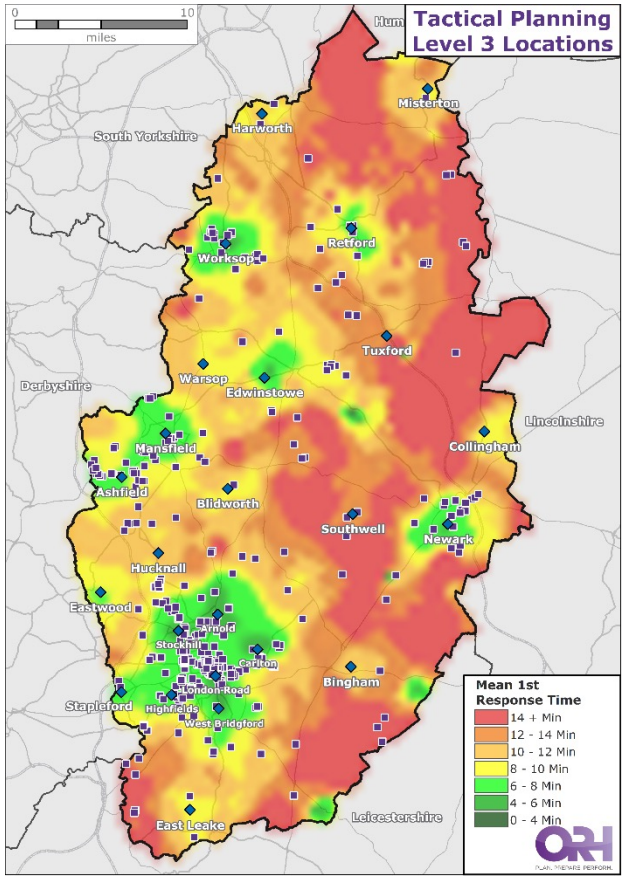
There is the potential for high severity incidents at these locations, so NFRS is cognisant of this when considering resourcing requirements.

ORH has overlayed these locations on the average response map to inform the coverage of these. The COMAH sites furthest from existing NFRS stations are as follows:

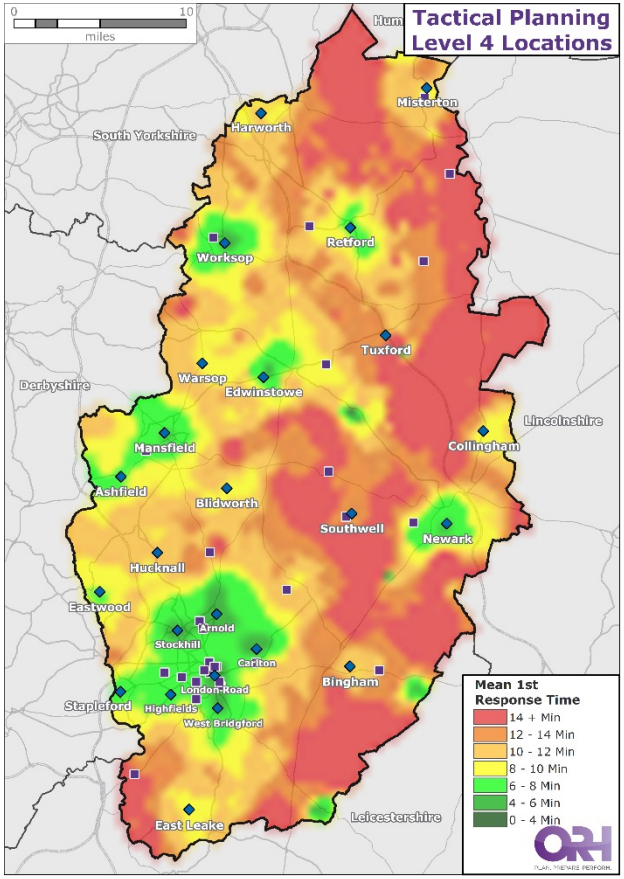
- Cottam power station
- Ratcliffe-on-Soar Power Station (although coverage may also be provided by Long Eaton in Derbyshire and Castle Donnington in Leicestershire)

Tactical Planning & COMAH Sites

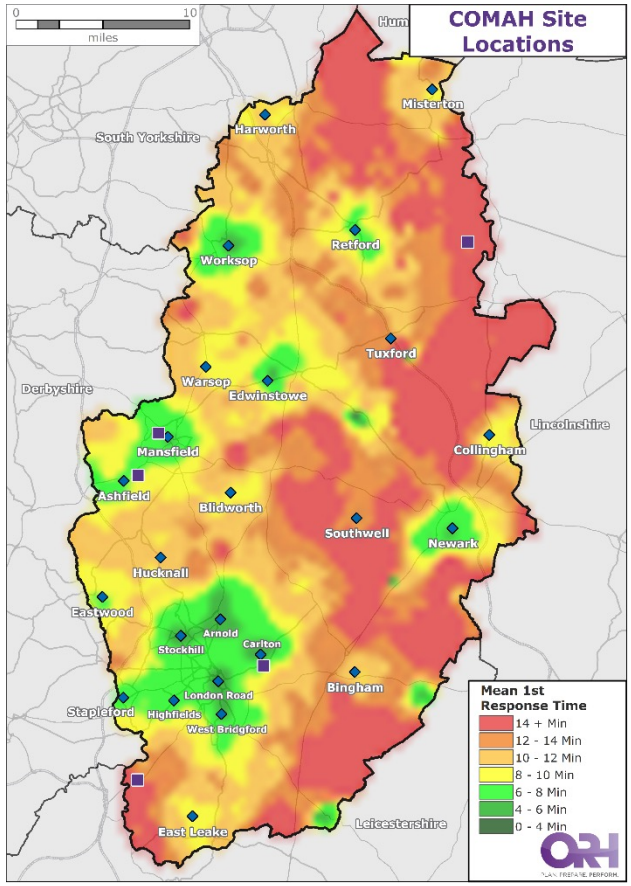
Tactical Level 3



Tactical Level 4



COMAH Sites



January 2019 to December 2020, excluding March, April, May and November 2020

Over-the-Border Coverage

Over-the-Border Coverage

The study has focused on NFRS resources covering the risk and demand in Nottinghamshire.

It was not possible to fully integrate over-the-border resources into the models as ORH does not have access to all data to be able to profile how these resources operate (for example, the availability and full workload by time of day).

It is important to have awareness of the potential coverage that over-the-border resources can provide. NFRS supplied ORH with an assumed turnout time by neighbouring station, and ORH mapped the potential coverage that could be provided into Nottinghamshire should it be required.

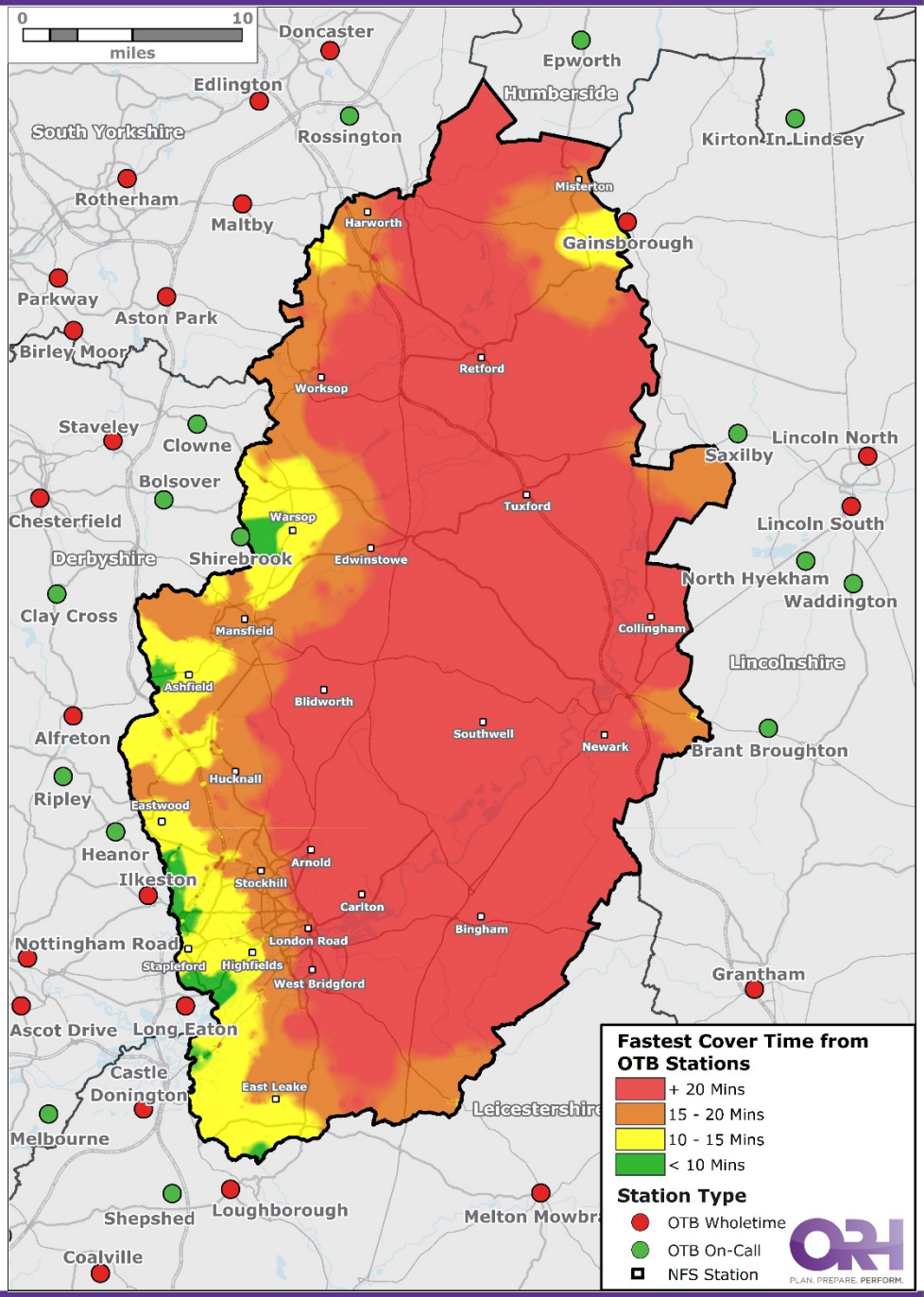
The main area where over-the-border resources could support Nottinghamshire is along the border with Derbyshire, but also smaller areas on the border with the others FRSs. Stations that have the furthest potential to reach into Nottinghamshire are:

- Long Eaton, Ilkeston, Alfreton and Shirebrook (Derbyshire)
- Castle Donnington and Loughborough (Leicestershire)
- Gainsborough (Lincolnshire)
- Maltby (South Yorkshire)

The scope of these resources providing cover depends on collaborative arrangements between services and dispatch protocols. Greater over-border coverage with NFRSs tri-service partners (Derbyshire and Leicestershire) is possible due to borderless mobilising.

OTB Coverage

Expected coverage times from over-the-border stations



NFRS Fire Stations

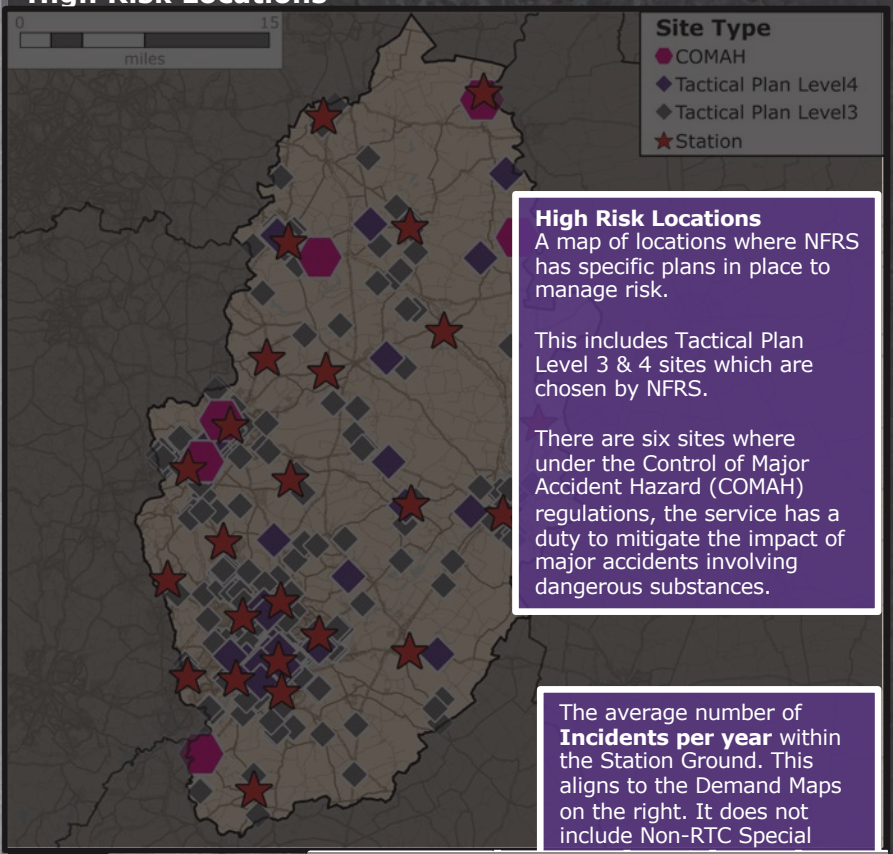
There are 30 pumps deployed across 24 stations in Nottinghamshire.

These statistics relate to what occurs in each **Station Ground**. Station Grounds are based on likely turnout areas.

Bestwood Lodge Dr
Arnold
Nottingham
NG5 8PD
0115 967 0880

Population	Households	Commercial	Area
1,091,482	478,630	45,052 Premises	2,157Km²

High Risk Locations



High Risk Locations
A map of locations where NFRS has specific plans in place to manage risk.

This includes Tactical Plan Level 3 & 4 sites which are chosen by NFRS.

There are six sites where under the Control of Major Accident Hazard (COMAH) regulations, the service has a duty to mitigate the impact of major accidents involving dangerous substances.

The average number of **Incidents per year** within the Station Ground. This aligns to the Demand Maps on the right. It does not include Non-RTC Special Service.)

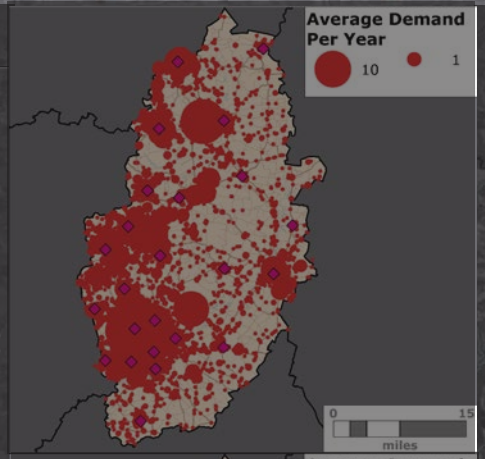
Type 2016 -2020	Fires	False Alarms	RTCs
Incidents Per Year	3,264	4,093	528

Average No. of incidents per year, within the station ground, by type. (Not Including Non-RTC Special Service.)

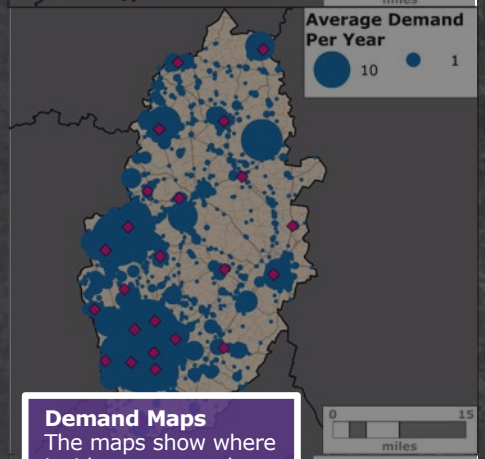
NOTTINGHAMSHIRE Fire & Rescue Service
Creating Safer Communities

Date produced:
06 October 21

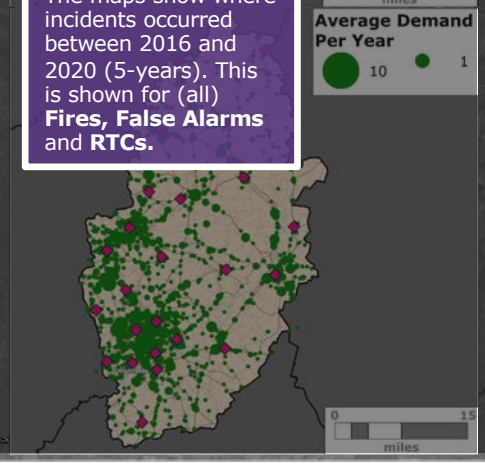
Fires



False Alarms

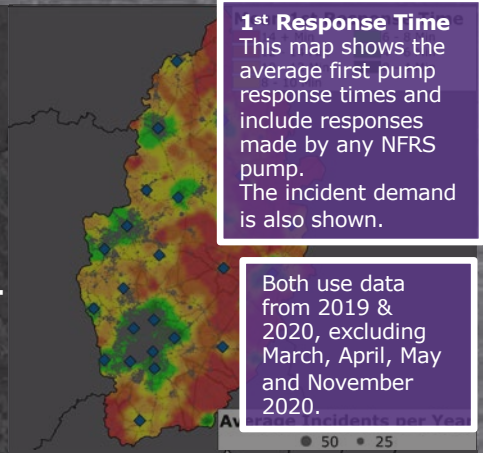


RTCs



Demand Maps
The maps show where incidents occurred between 2016 and 2020 (5-years). This is shown for (all) **Fires, False Alarms** and **RTCs.**

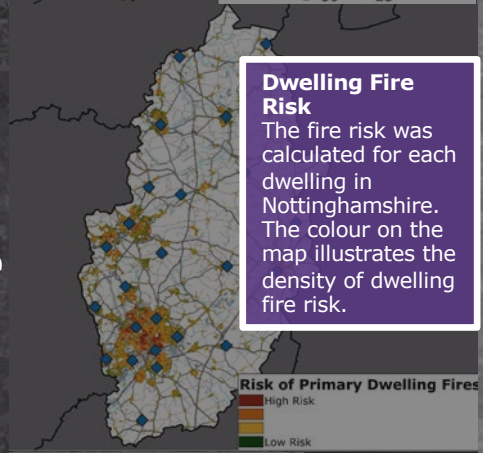
1st Response Time



1st Response Time
This map shows the average first pump response times and include responses made by any NFRS pump.
The incident demand is also shown.

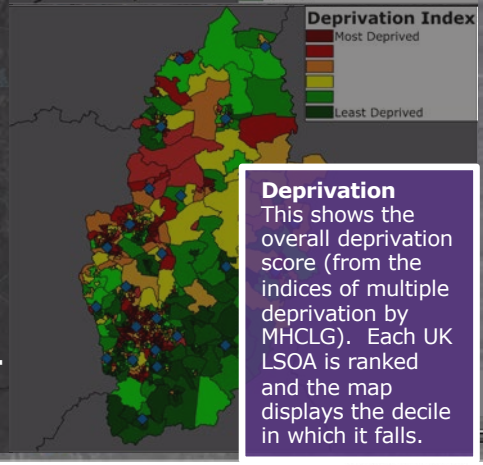
Both use data from 2019 & 2020, excluding March, April, May and November 2020.

Dwelling Fire Risk

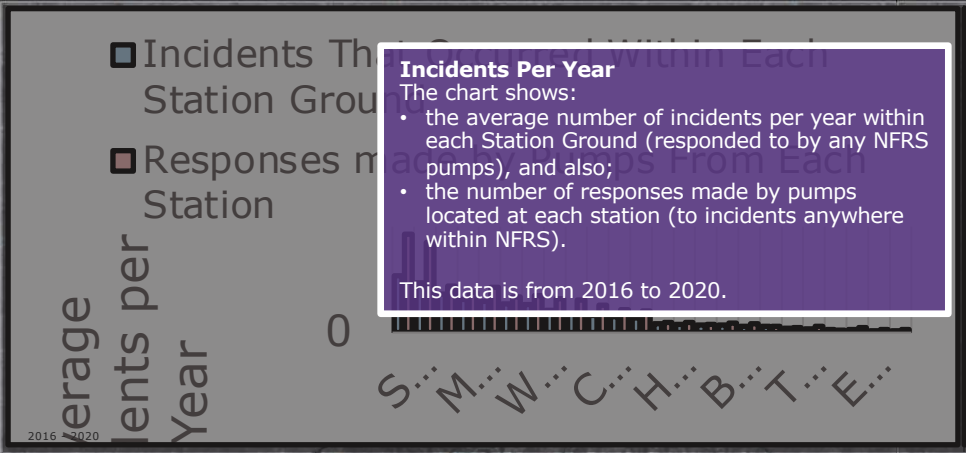


Dwelling Fire Risk
The fire risk was calculated for each dwelling in Nottinghamshire. The colour on the map illustrates the density of dwelling fire risk.

Deprivation



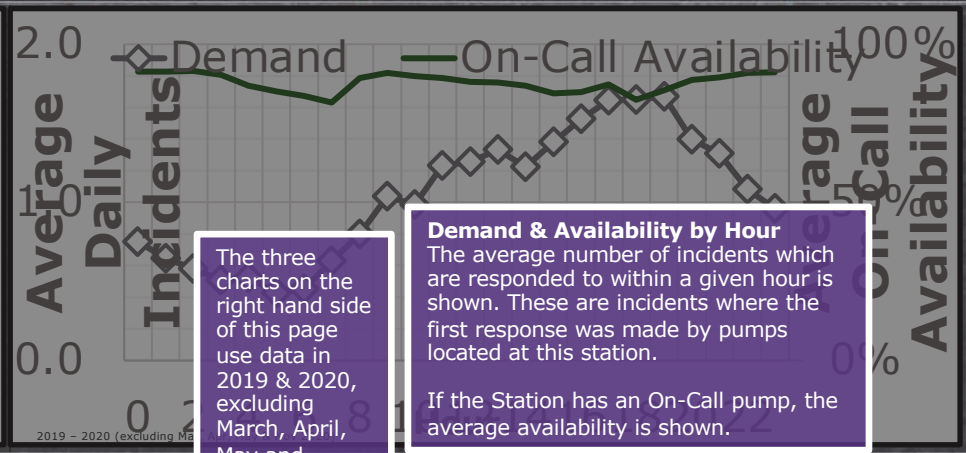
Deprivation
This shows the overall deprivation score (from the indices of multiple deprivation by MHCLG). Each UK LSOA is ranked and the map displays the decile in which it falls.



Incidents Per Year
The chart shows:

- the average number of incidents per year within each Station Ground (responded to by any NFRS pumps), and also;
- the number of responses made by pumps located at each station (to incidents anywhere within NFRS).

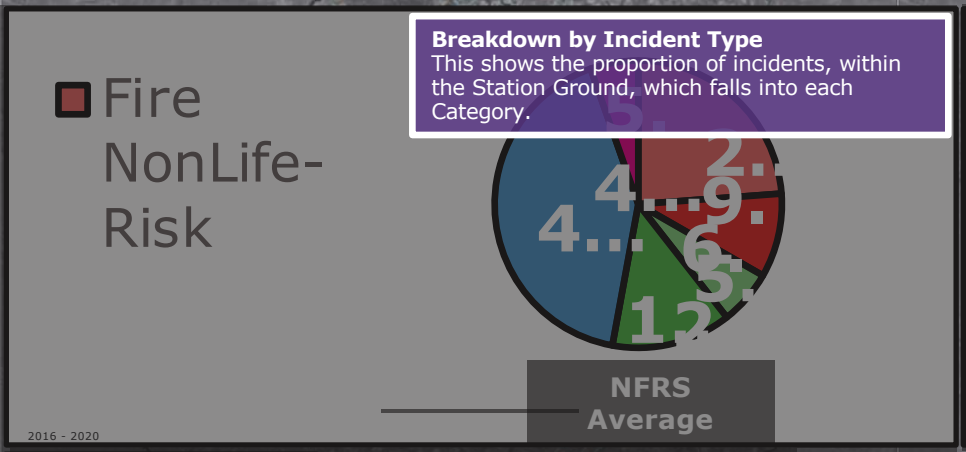
This data is from 2016 to 2020.



The three charts on the right hand side of this page use data in 2019 & 2020, excluding March, April, May and November 2020.

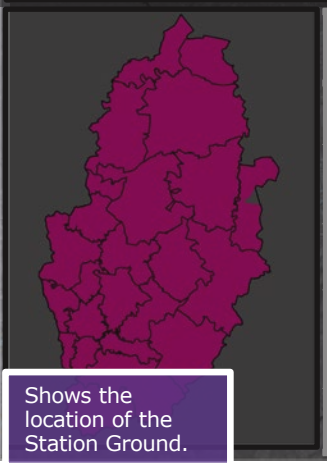
Demand & Availability by Hour
The average number of incidents which are responded to within a given hour is shown. These are incidents where the first response was made by pumps located at this station.

If the Station has an On-Call pump, the average availability is shown.



Breakdown by Incident Type
This shows the proportion of incidents, within the Station Ground, which falls into each Category.

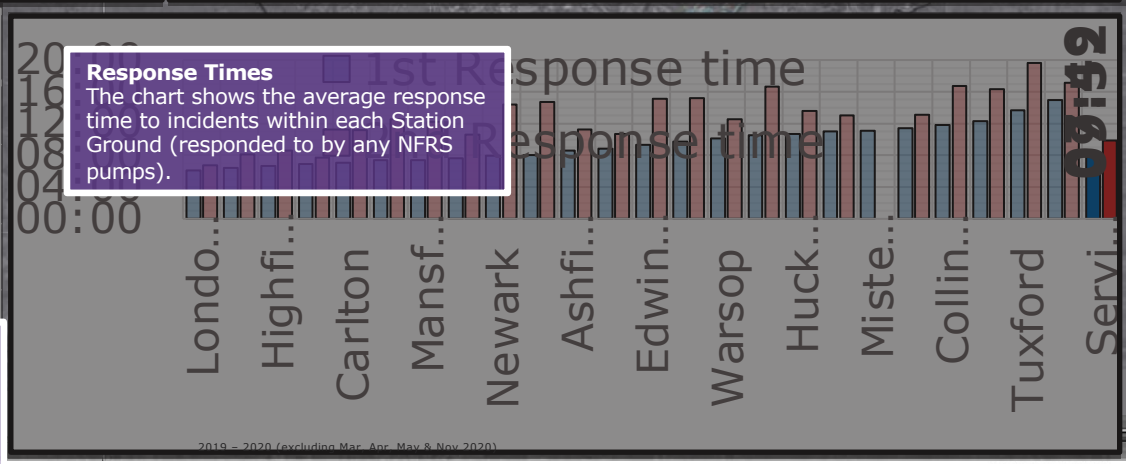
Turnout Time
The average turnout time (from time assigned to mobile) is shown for each pump. For Day-Crewed Appliances, the day (0800-1800) and night (1800-0800) scores are also shown.



Shows the location of the Station Ground.

Ethnicity - 2011 Census	Population	Percentage
White	969,501	88.8%
Mixed/ multiple ethnic groups	30,981	2.8%
Asian/ Asian British	57,178	5.2%
Black/ African/ Caribbean/ Black British		2.5%
Other		

Ethnicity
A breakdown of the ethnic makeup within the Station Ground. 2011 Census Data is used.



Response Times
The chart shows the average response time to incidents within each Station Ground (responded to by any NFRS pumps).

NFRS Fire Stations

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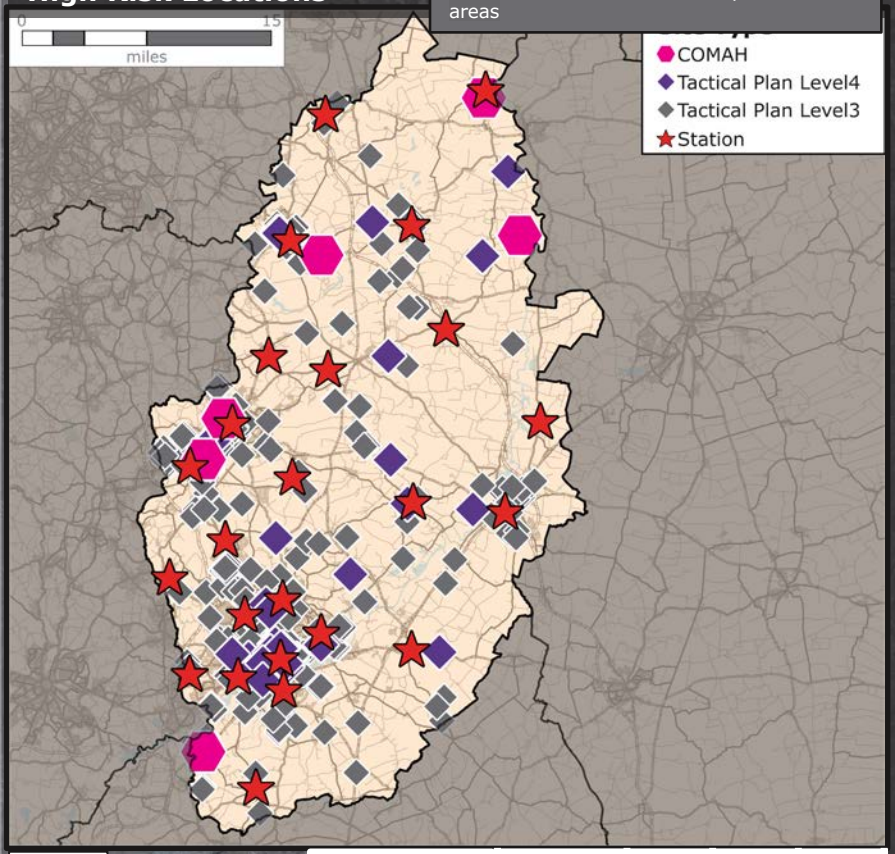
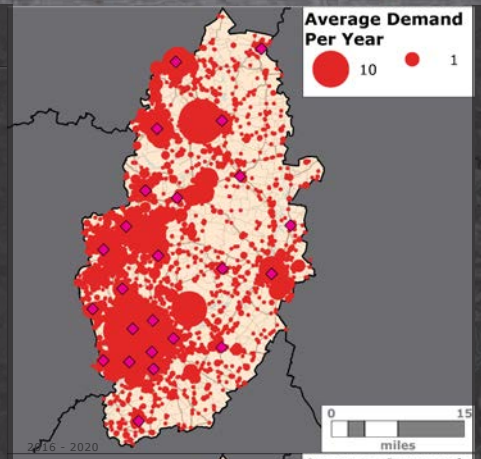
High Risk Locations

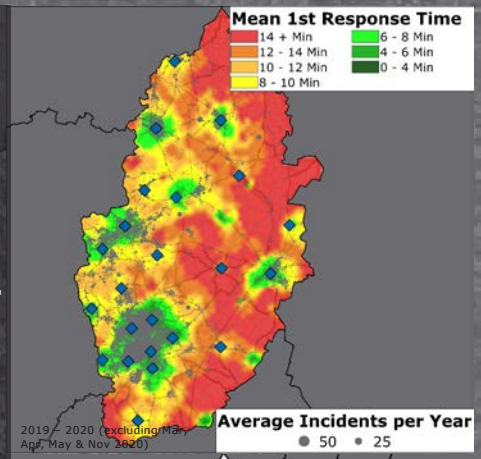
Station Grounds based on likely turnout areas



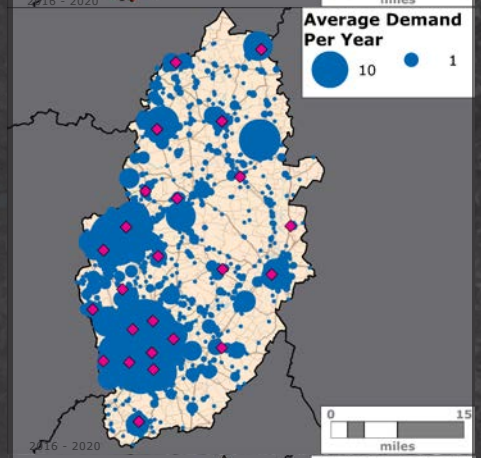
Fires



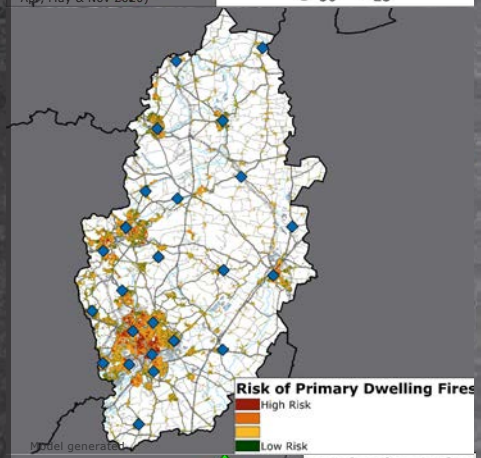
1st Response Time



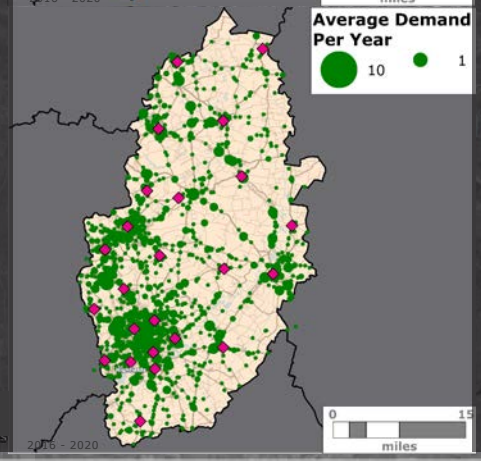
False Alarms



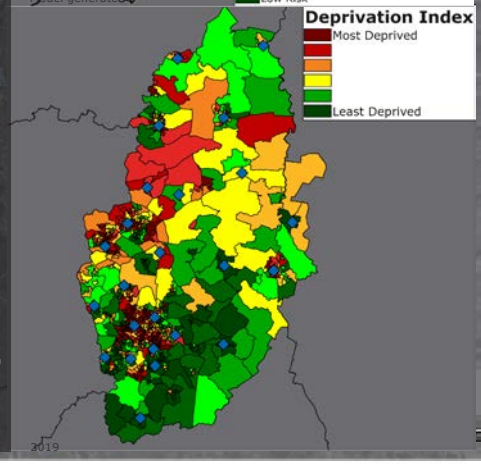
Dwelling Fire Risk



RTCs



Deprivation



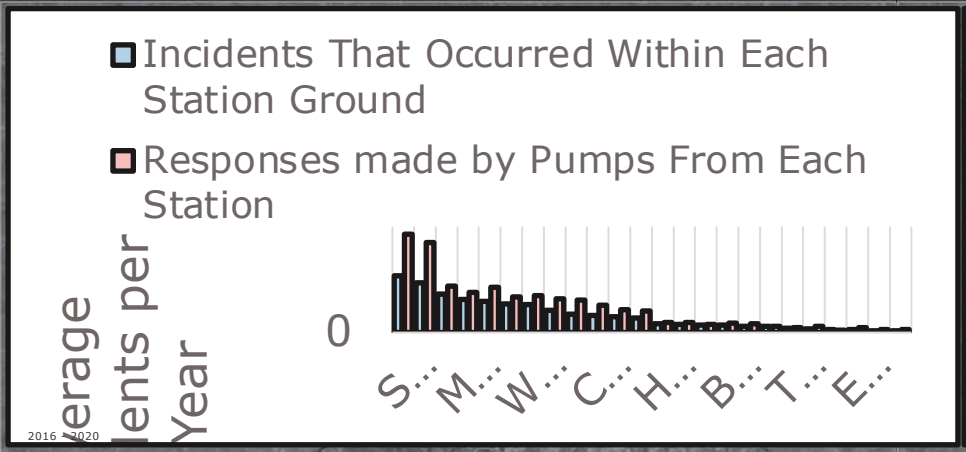
PLAN. PREPARE. PERFORM.

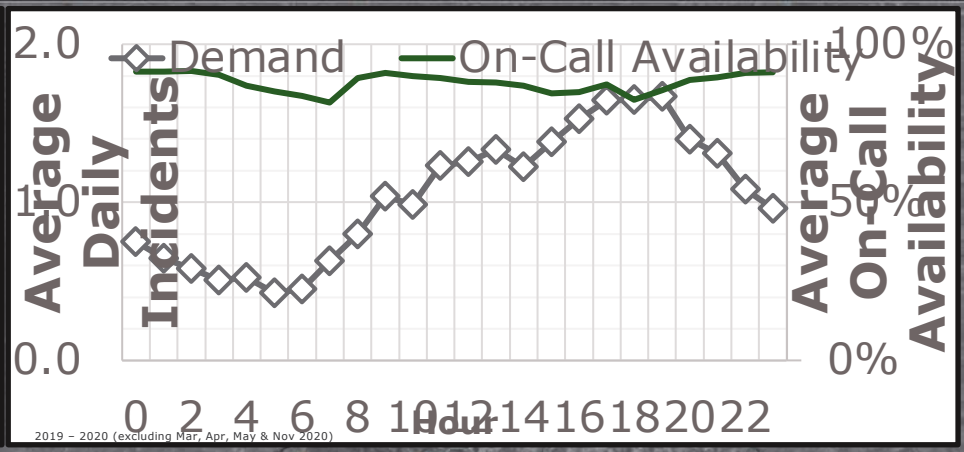
NOTTINGHAMSHIRE Fire & Rescue Service
Creating Safer Communities

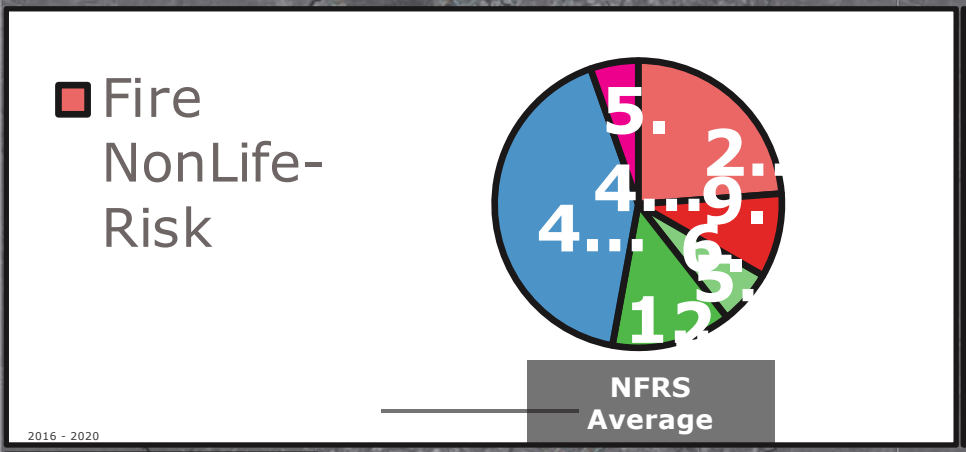
Date produced:
06 October 21

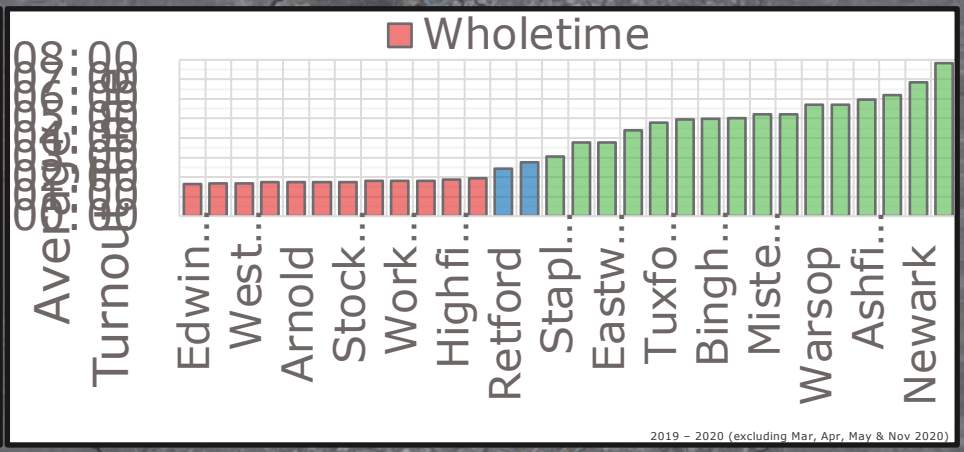
Average No. of incidents per year, within the station ground, by type. (Not Including Non-RTC Special Service.)

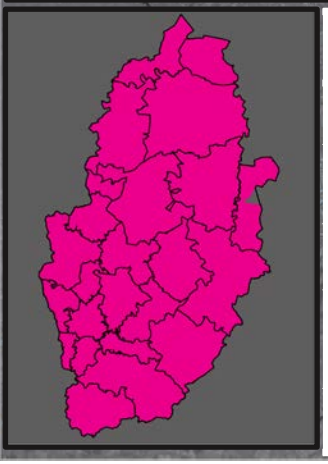
Type 2016 -2020	Fires	False Alarms	RTCs
Incidents Per Year	3,264	4,093	528



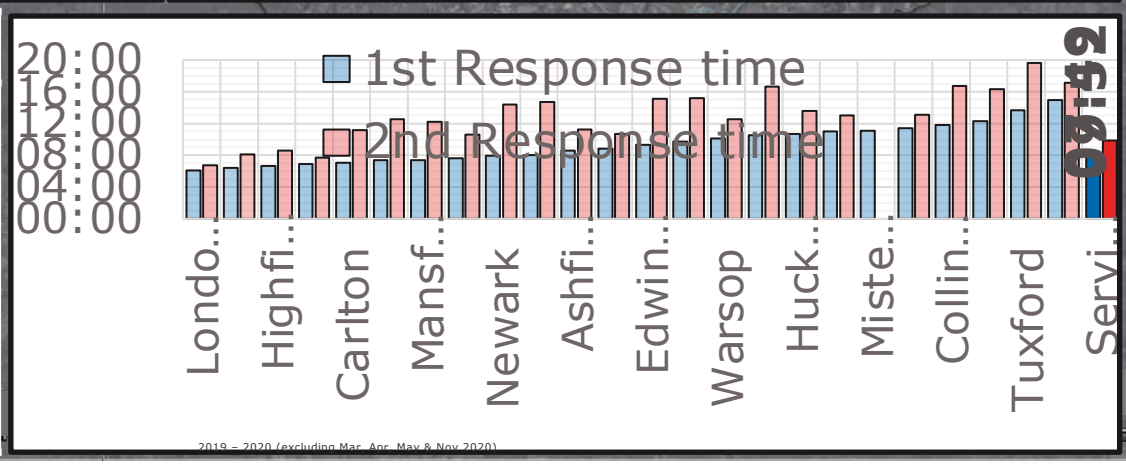








Ethnicity - 2011 Census	Population	Percentage
White	969,501	88.8%
Mixed/ multiple ethnic groups	30,981	2.8%
Asian/ Asian British	57,178	5.2%
Black/ African/ Caribbean/ Black British	27,287	2.5%
Other	6,535	0.6%



Arnold Fire Station

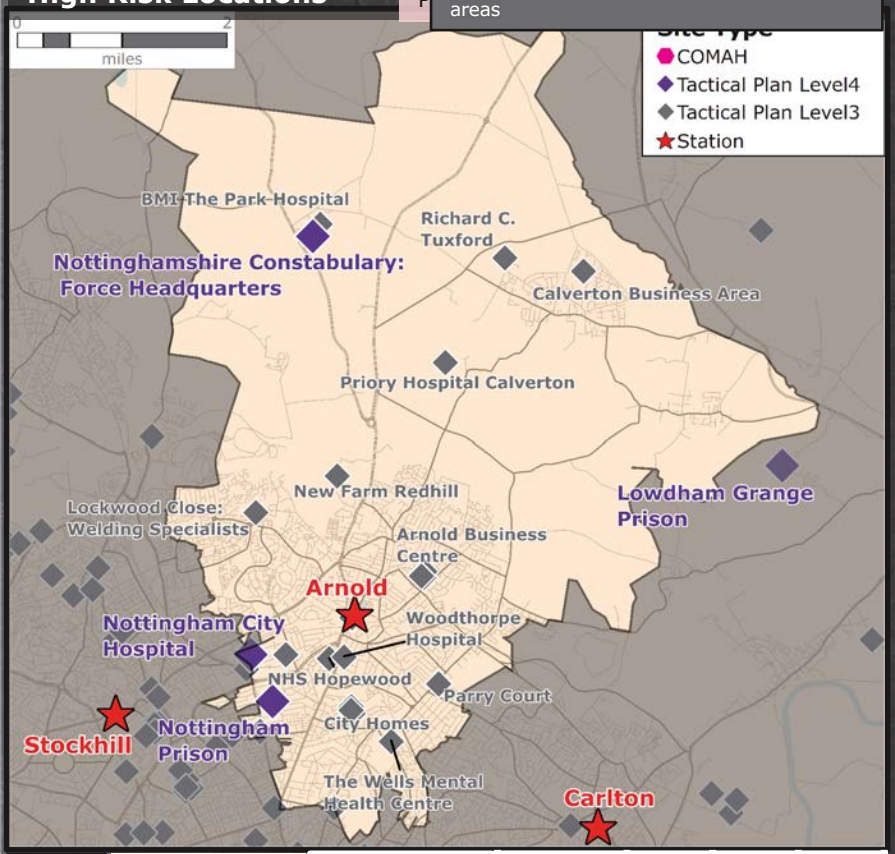
Station 26 is in Gedling District. It has one Wholetime pumping appliance.

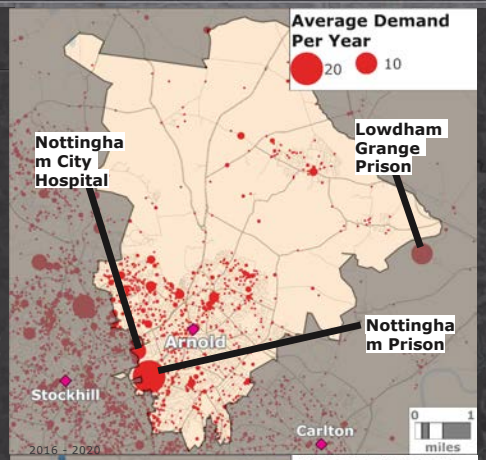
Jubilee Road
Arnold
Nottinghamshire
NG5 6JR
0115 838 8100

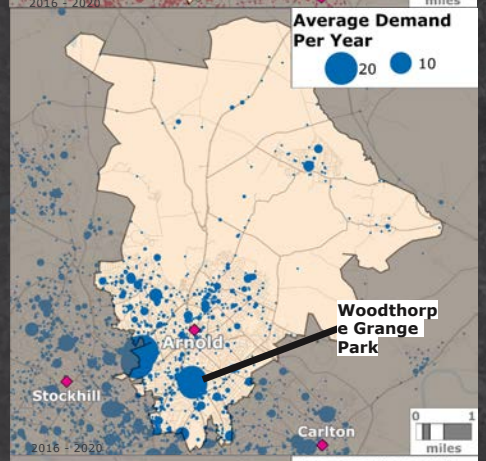
Population	Households	Commercial	Area
94,153	42,241	2	69.9Km²

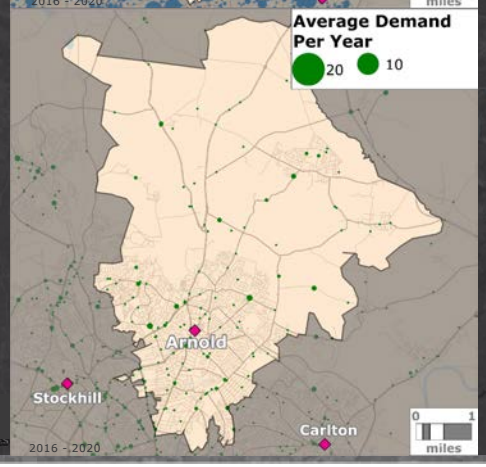
High Risk Locations

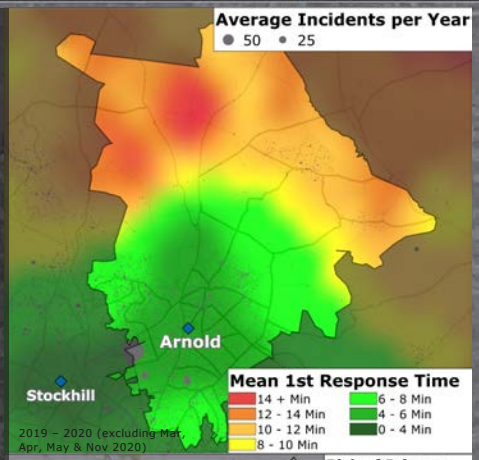
Station Grounds based on likely turnout areas

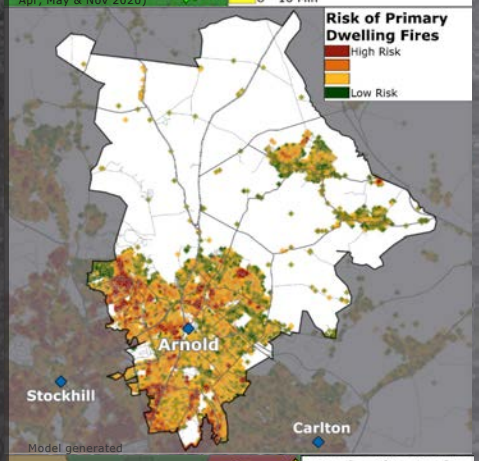


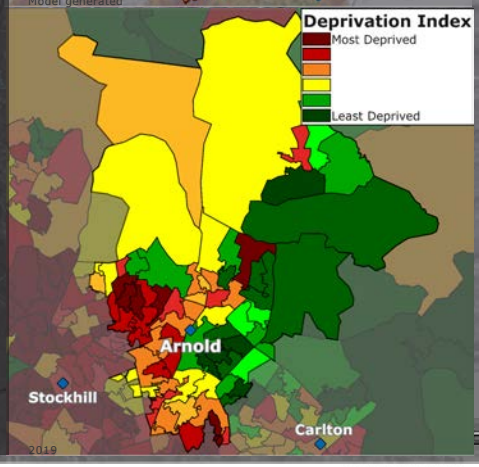










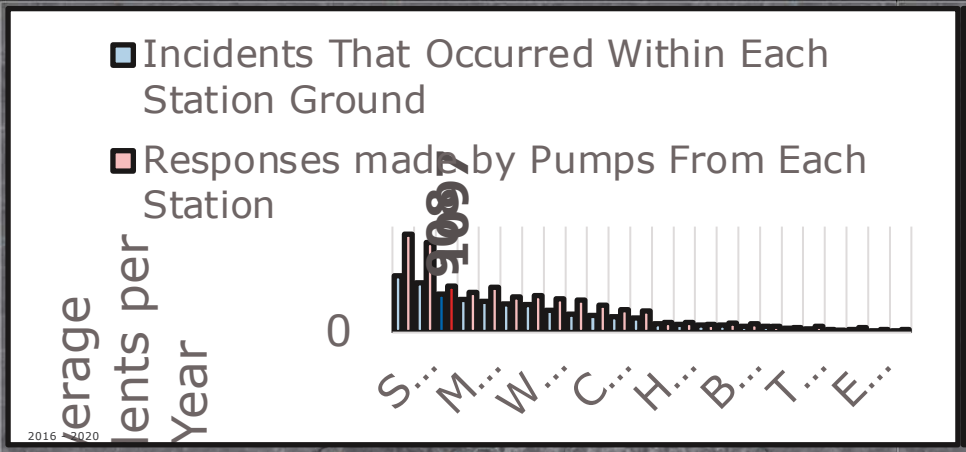


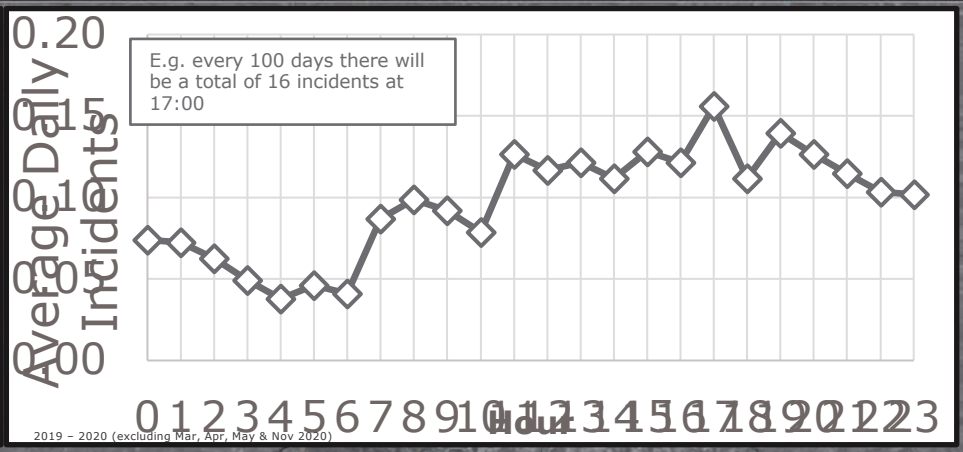
NOTTINGHAMSHIRE Fire & Rescue Service
Creating Safer Communities

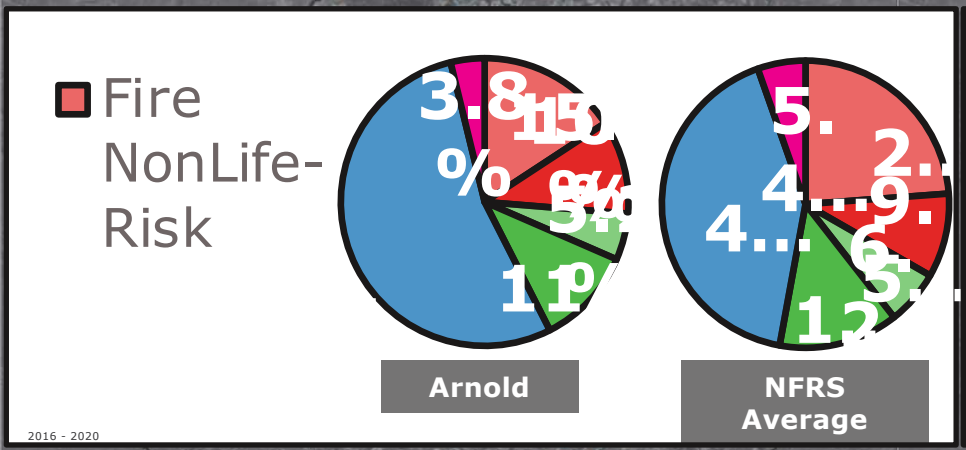
Date produced: 06 October 21

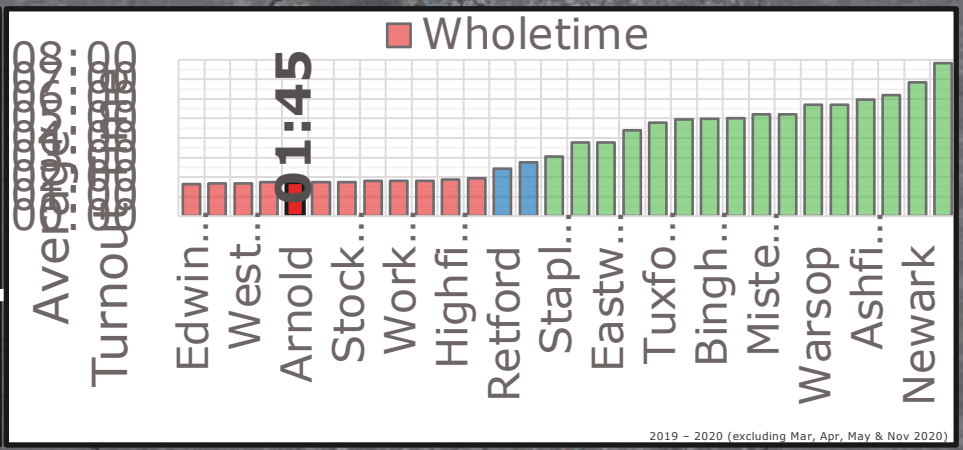
Average No. of incidents per year, within the station ground, by type. (Not Including Non-RTC Special Service.)

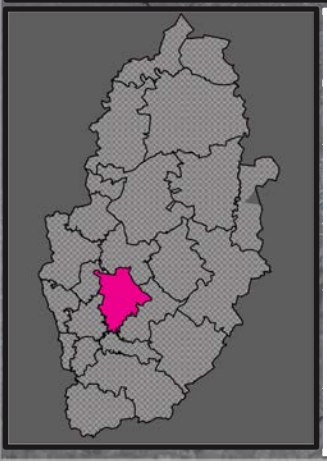
Type 2016 -2020	Fires	False Alarms	RTCs
Incidents Per Year	239	488	35



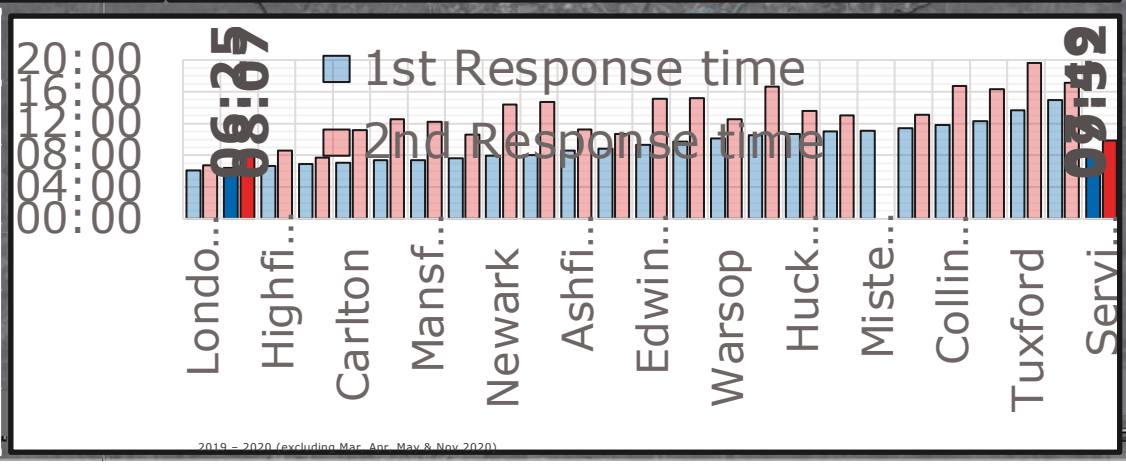








Ethnicity - 2011 Census	Population	Percentage
White	82,362	87.5%
Mixed/ multiple ethnic groups	3,642	3.9%
Asian/ Asian British	4,272	4.5%
Black/ African/ Caribbean/ Black British	3,414	3.6%
Other	463	0.5%



Ashfield Fire Station

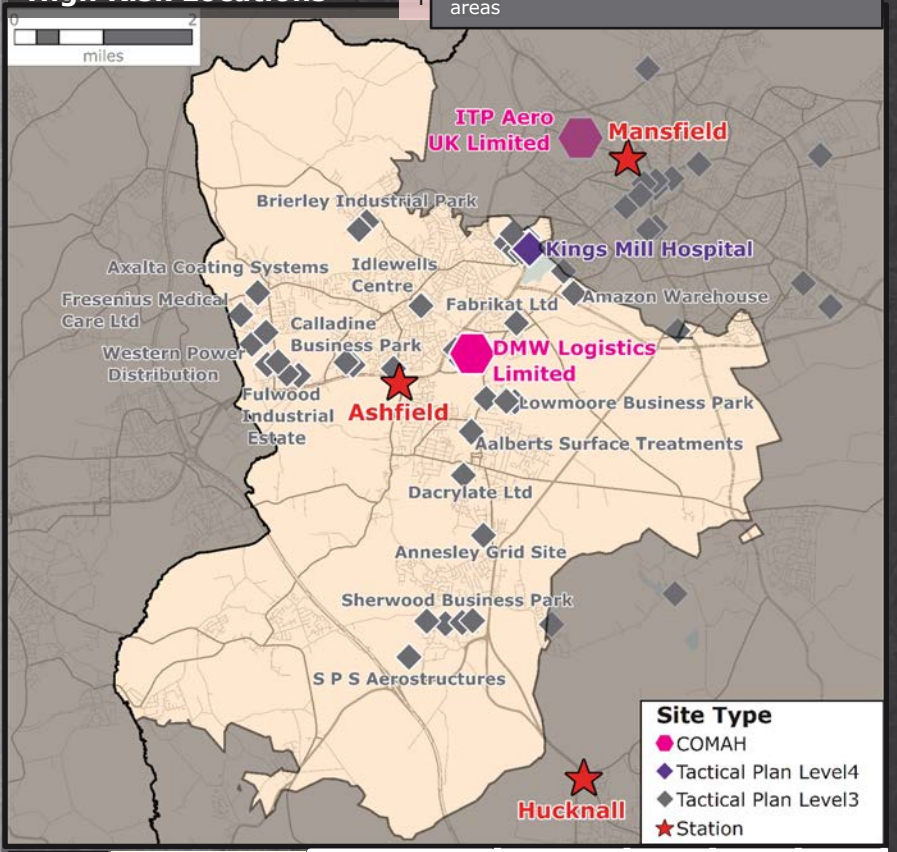
Station 5 is in Ashfield District. It has one Day-Crewed and one On-Call pumping appliance. It is also home to one High Volume Pump.

Sutton Road
Kirkby in Ashfield
Nottinghamshire
NG17 8FX
0115 838 8100

Population	Households	Commercial	Area
84,373	37,789	3	91.8Km²

Station Grounds based on likely turnout areas

High Risk Locations

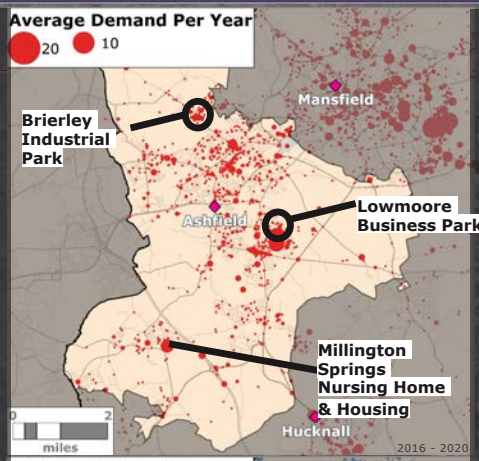


Type 2016 -2020	Fires	False Alarms	RTCs
Incidents Per Year	260	245	47

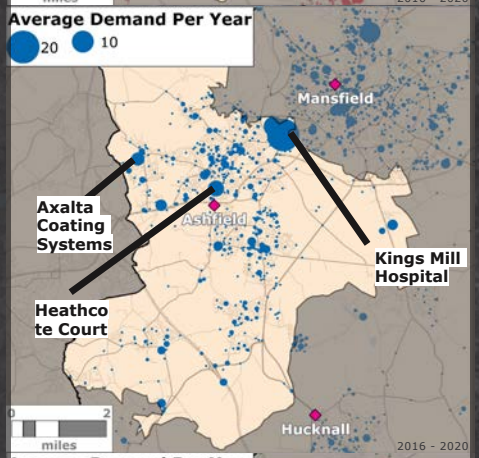
Average No. of incidents per year, within the station ground, by type. (Not Including Non-RTC Special Service.)

Date produced: 06 October 21

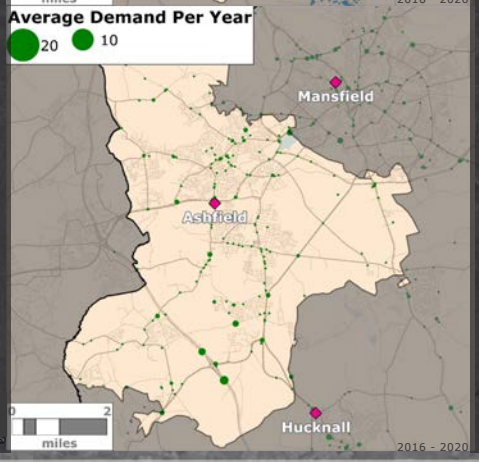
Fires



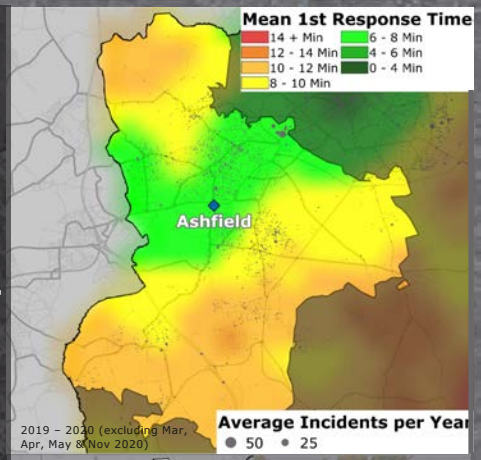
False Alarms



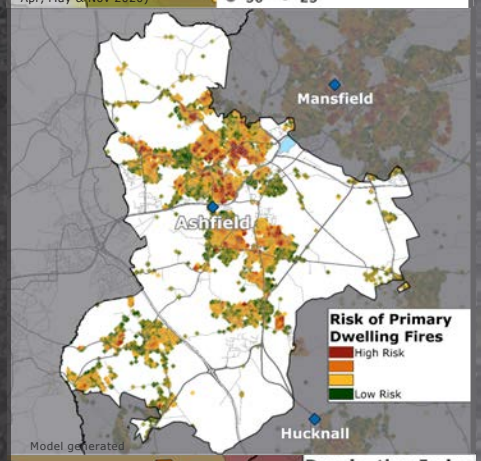
RTCs



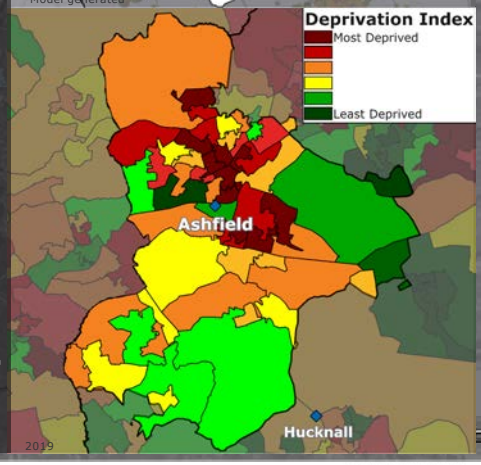
1st Response Time

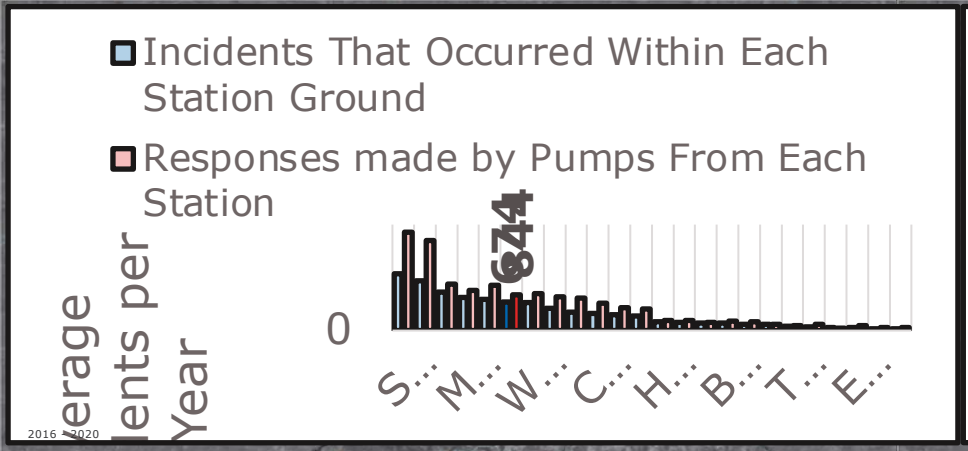


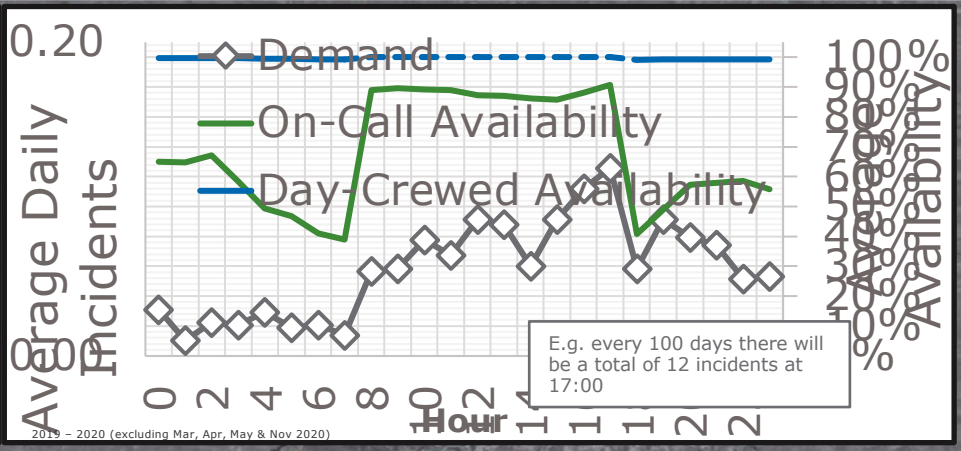
Dwelling Fire Risk

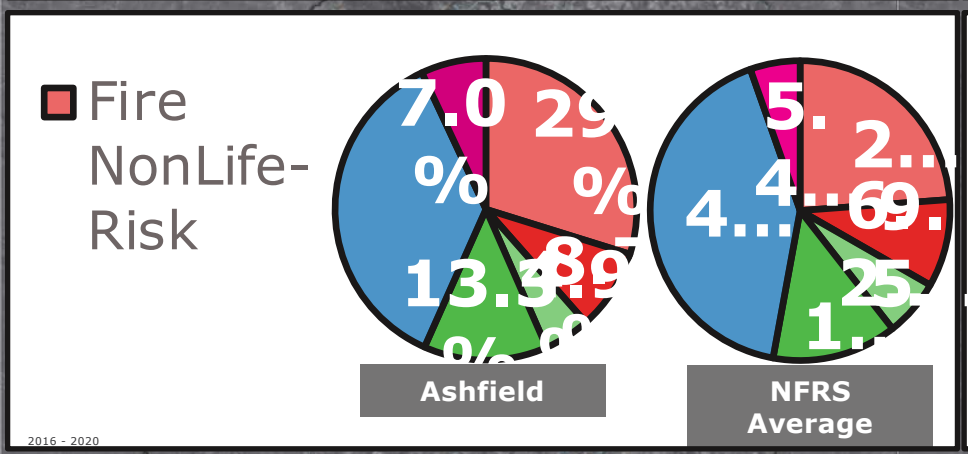


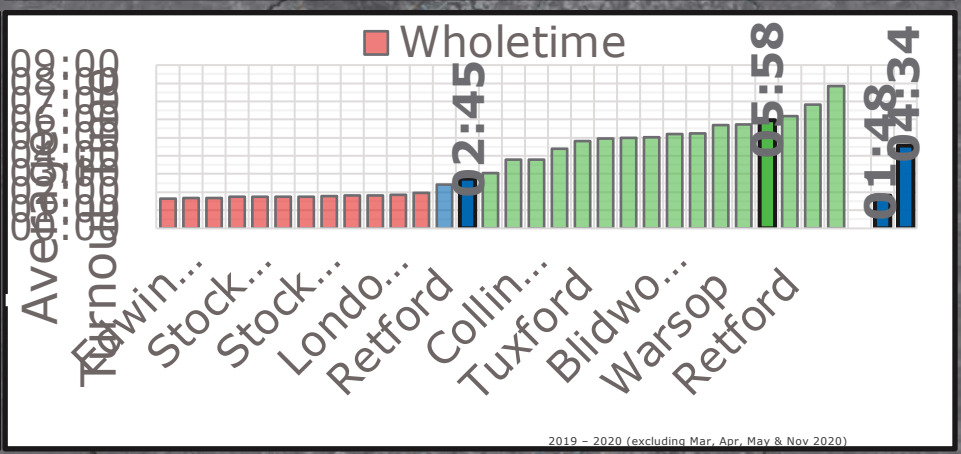
Deprivation

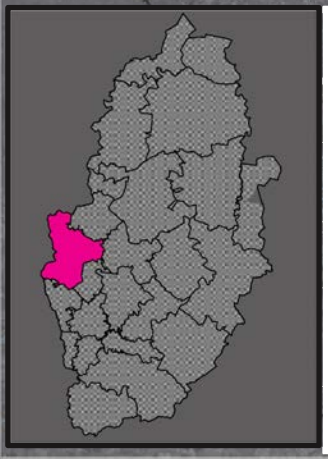




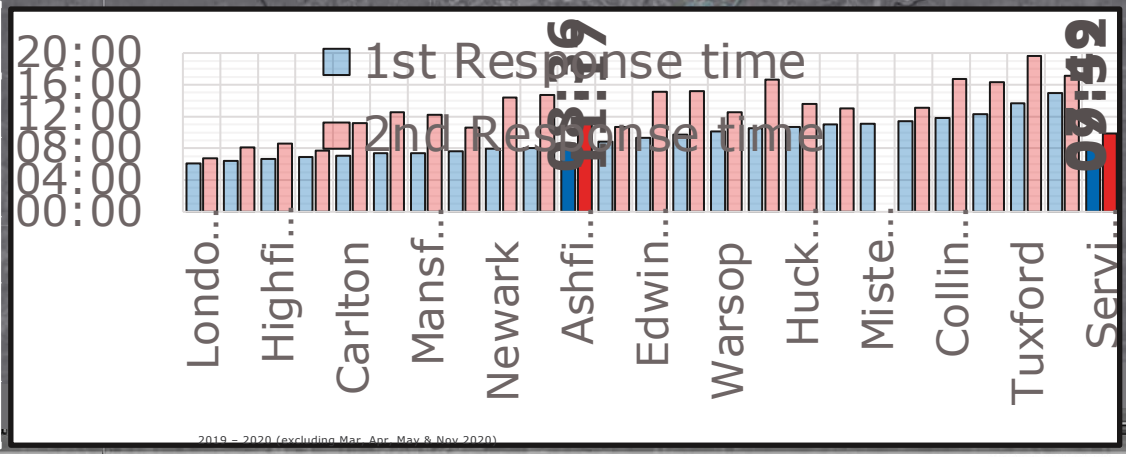








Ethnicity - 2011 Census	Population	Percentage
White	82,503	97.8%
Mixed/ multiple ethnic groups	673	0.8%
Asian/ Asian British	809	1.0%
Black/ African/ Caribbean/ Black British	288	0.3%
Other	100	0.1%



Bingham Fire Station

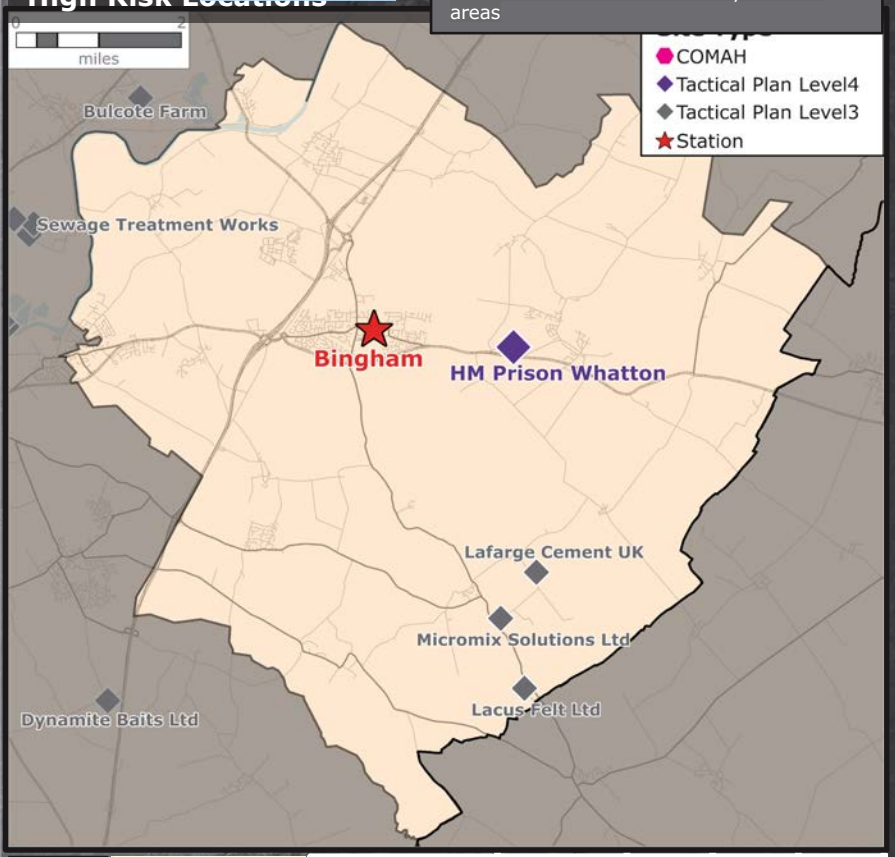
Station 17 is in Rushcliffe District. It has one On-Call pumping appliance.

42 Long Acre
Bingham
Nottinghamshire
NG13 8AH
0115 838 8100

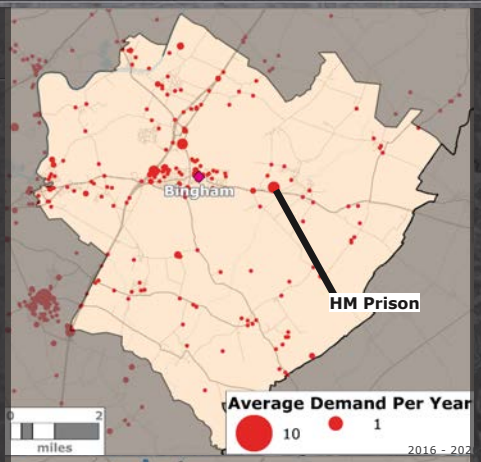
Population	Households	Commercial	Area
27,753	10,149	9	135.9Km²

High Risk Locations

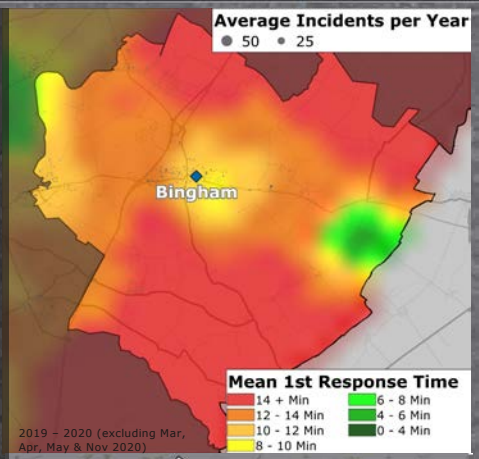
Station Grounds based on likely turnout areas



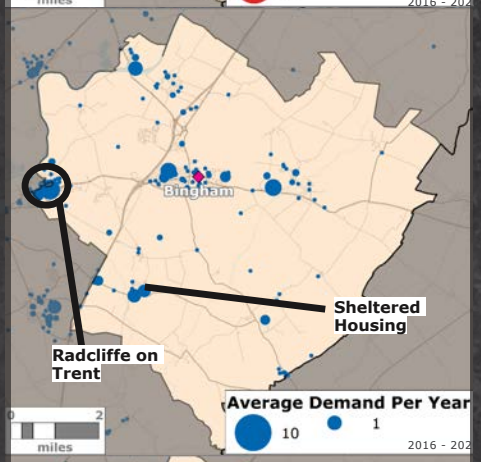
Fires



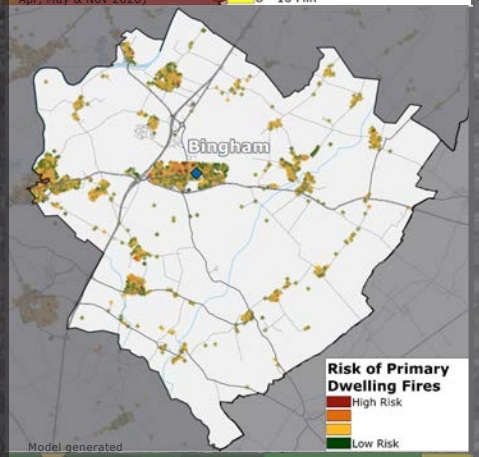
1st Response Time



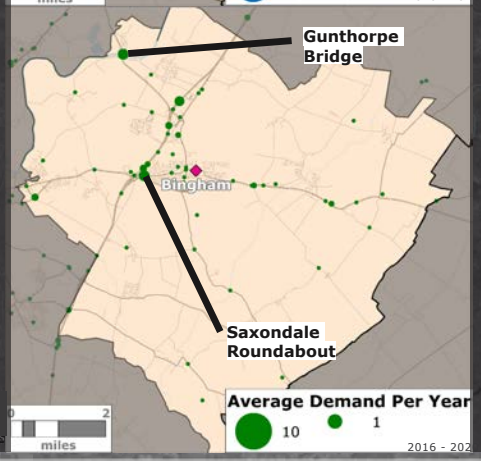
False Alarms



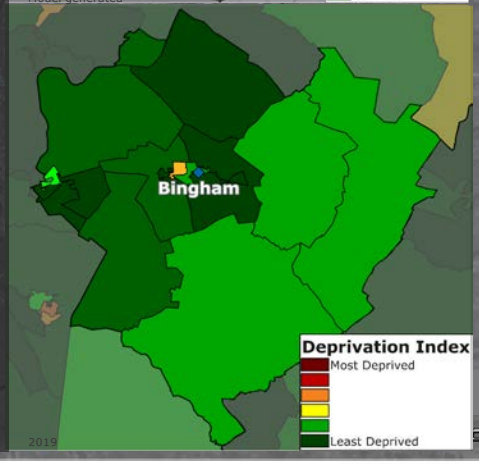
Dwelling Fire Risk



RTCs



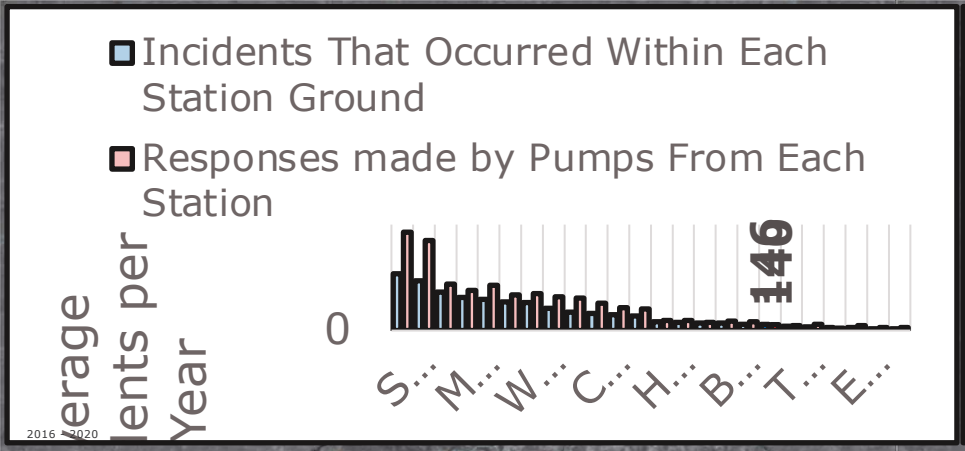
Deprivation

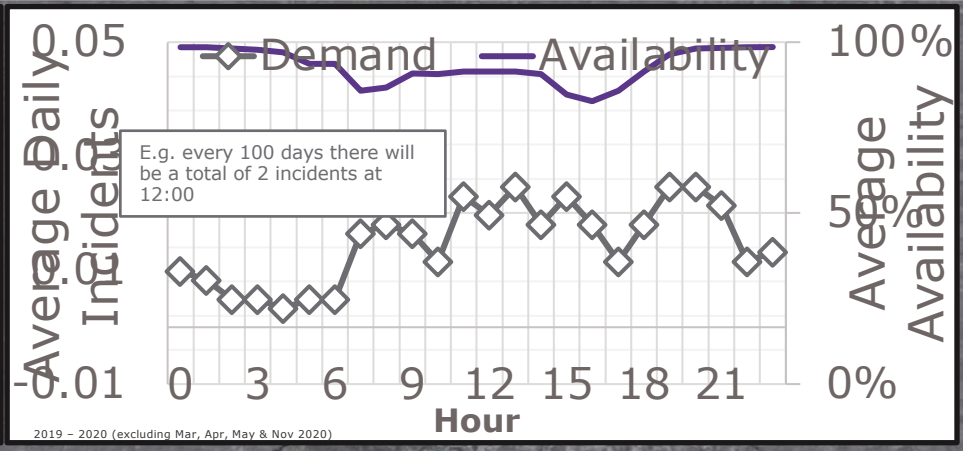


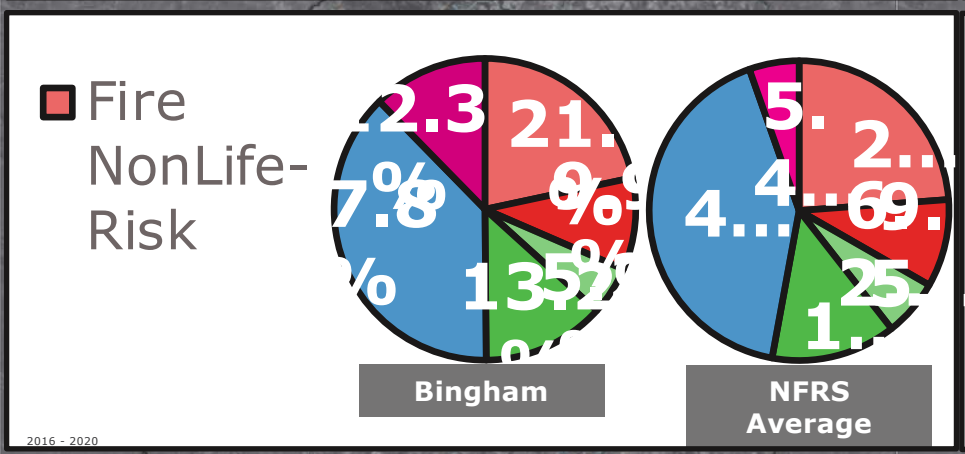
Date produced: 06 October 21

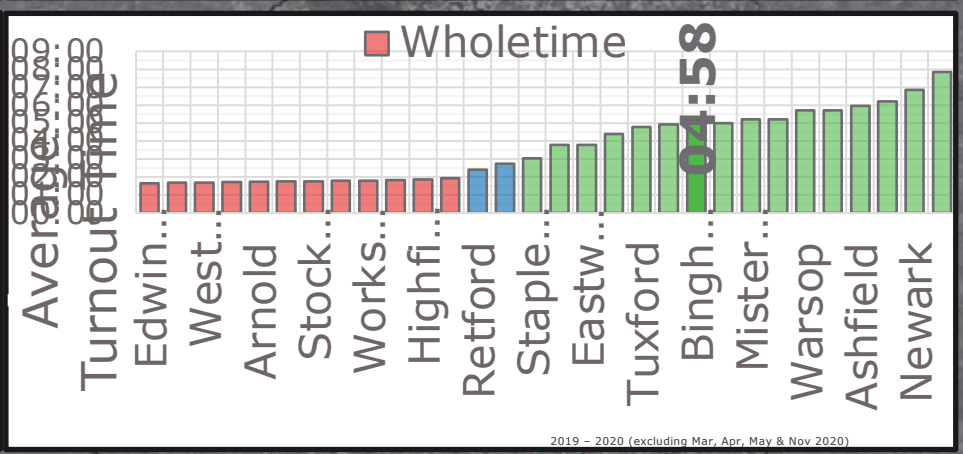
Average No. of incidents per year, within the station ground, by type. (Not Including Non-RTC Special Service.)

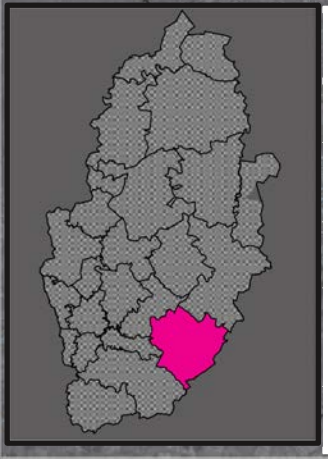
Type 2016 -2020	Fires	False Alarms	RTCs
Incidents Per Year	46	55	18



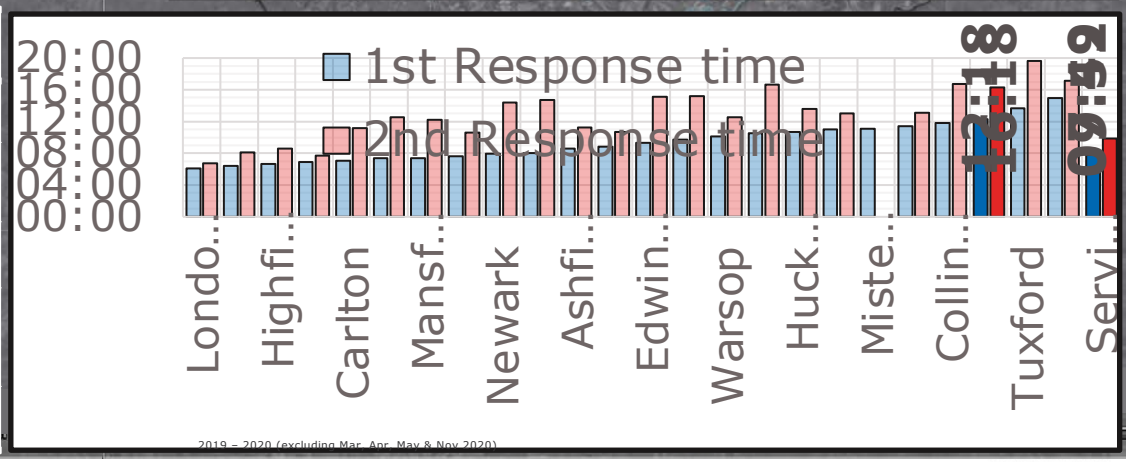




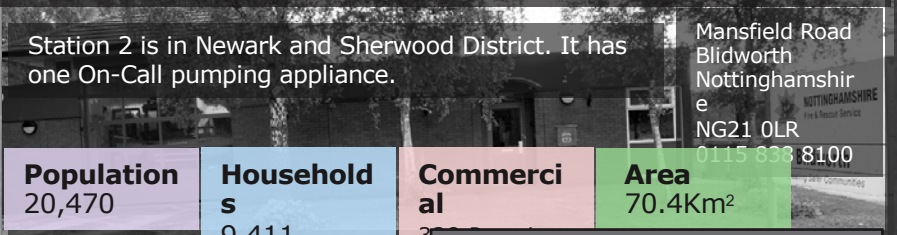




Ethnicity - 2011 Census	Population	Percentage
White	24,948	96.9%
Mixed/ multiple ethnic groups	356	1.4%
Asian/ Asian British	300	1.2%
Black/ African/ Caribbean/ Black British	108	0.4%
Other	41	0.2%



Blidworth Fire Station



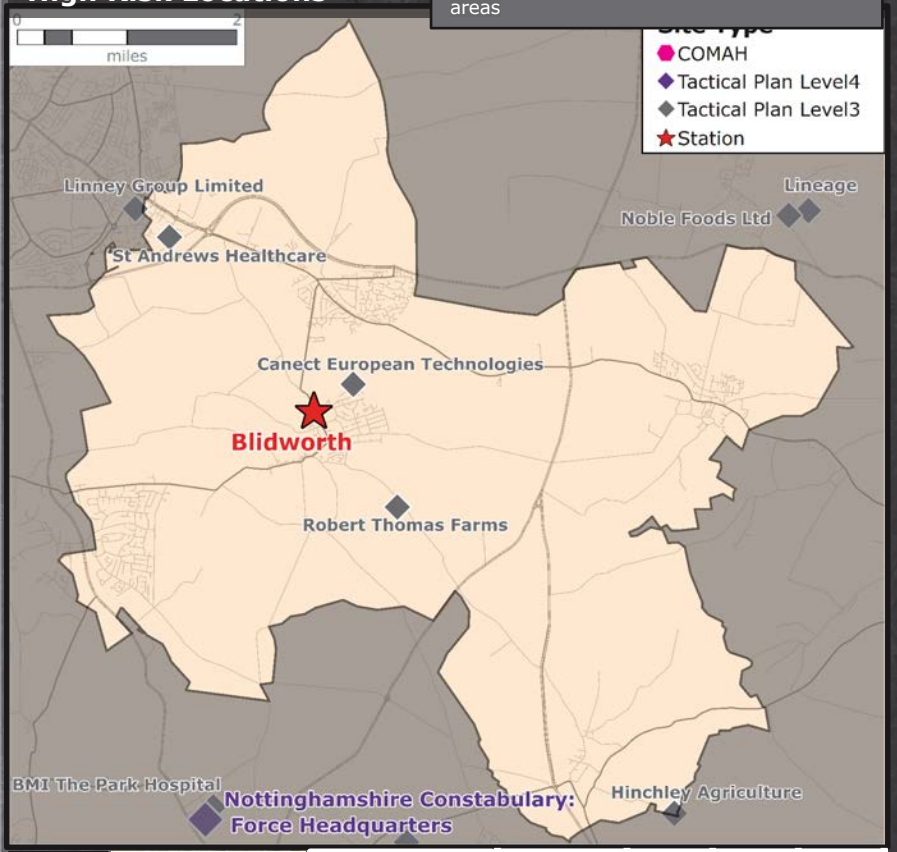
Station 2 is in Newark and Sherwood District. It has one On-Call pumping appliance.

Mansfield Road
Blidworth
Nottinghamshire
NG21 0LR
0115 838 8100

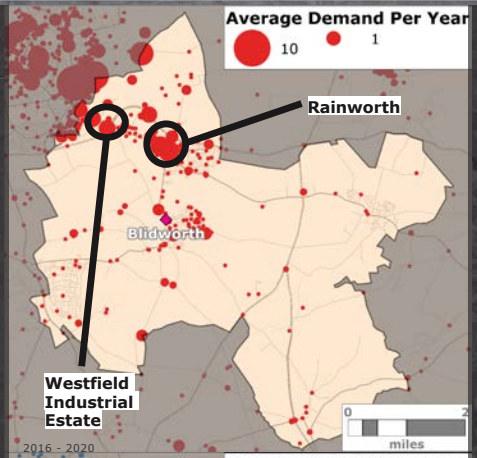
Population	Households	Commercial	Area
20,470	9,411	[illegible]	70.4Km²

High Risk Locations

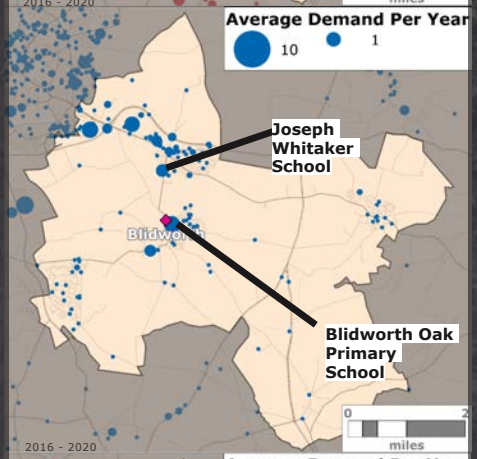
Station Grounds based on likely turnout areas



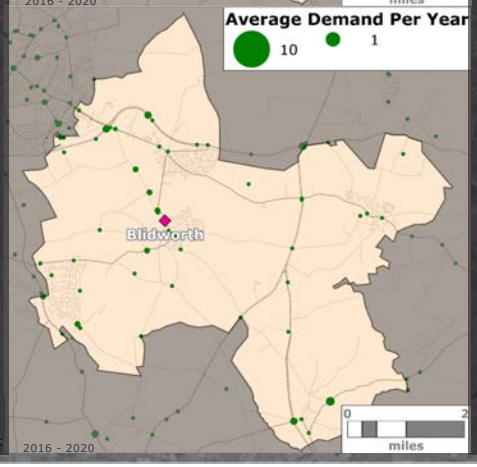
Fires



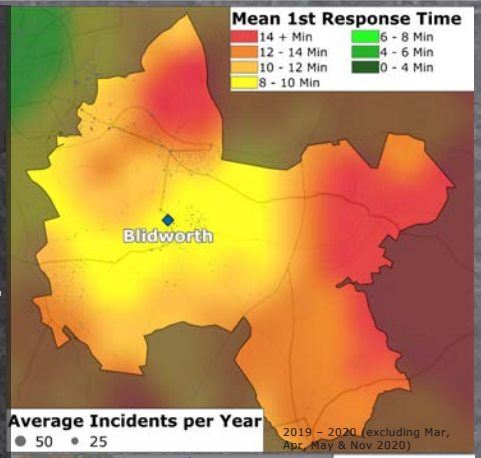
False Alarms



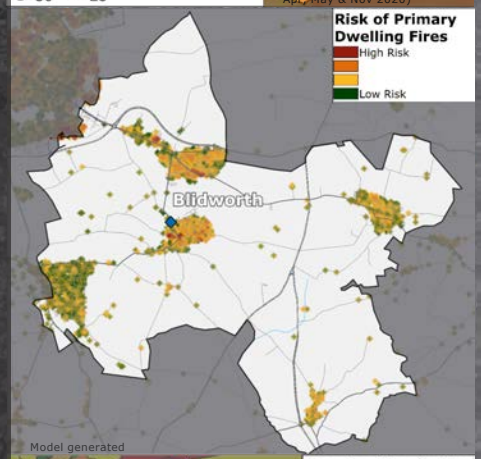
RTCs



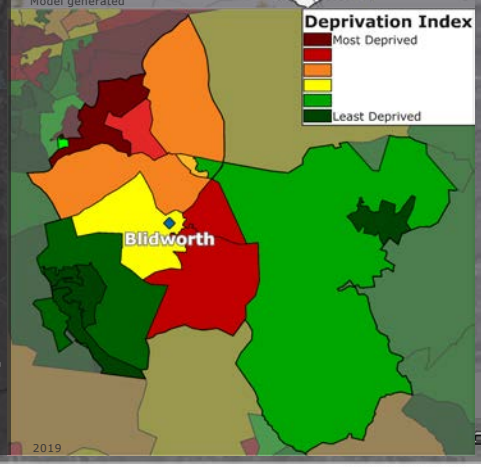
1st Response Time



Dwelling Fire Risk



Deprivation



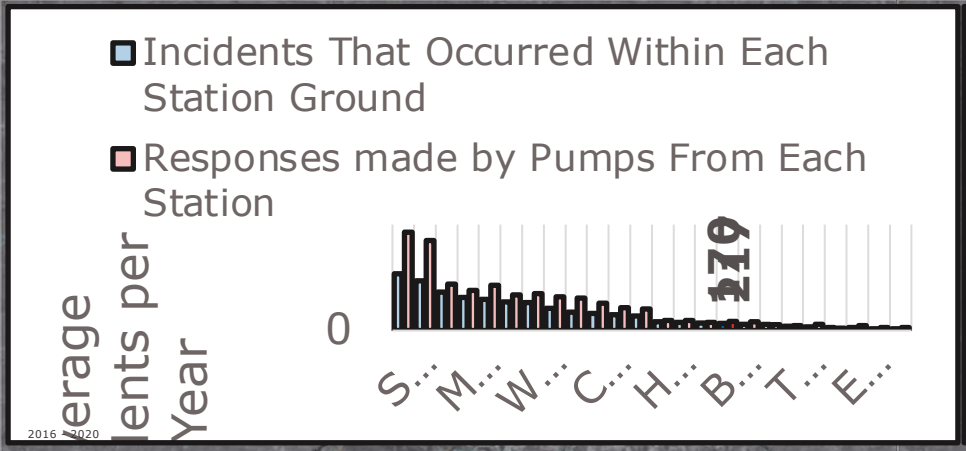
PLAN. PREPARE. PERFORM.

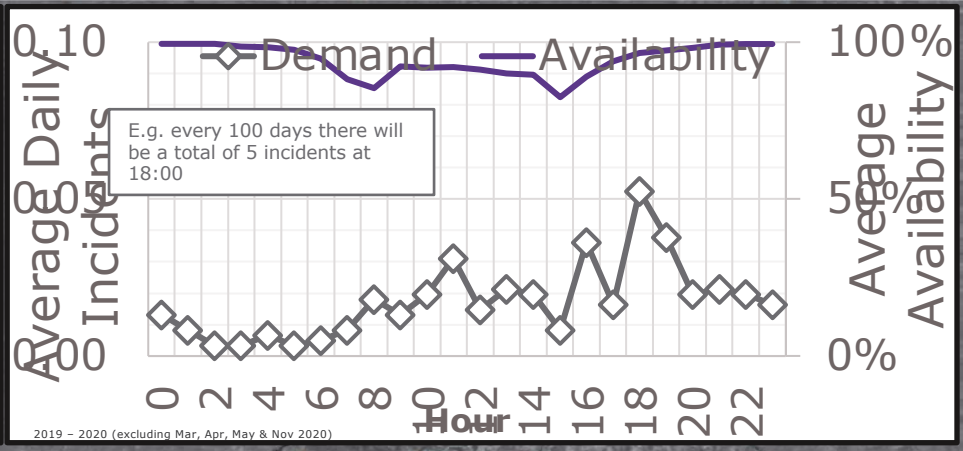
NOTTINGHAMSHIRE Fire & Rescue Service

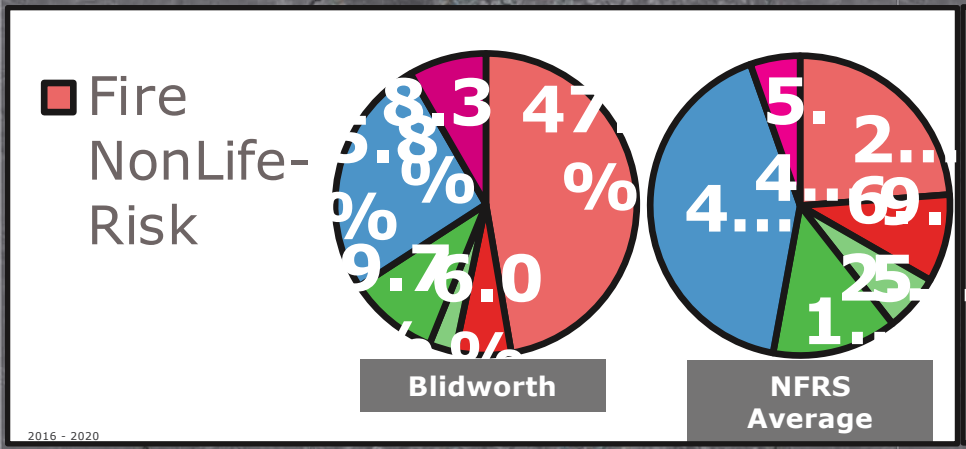
Date produced: 06 October 21

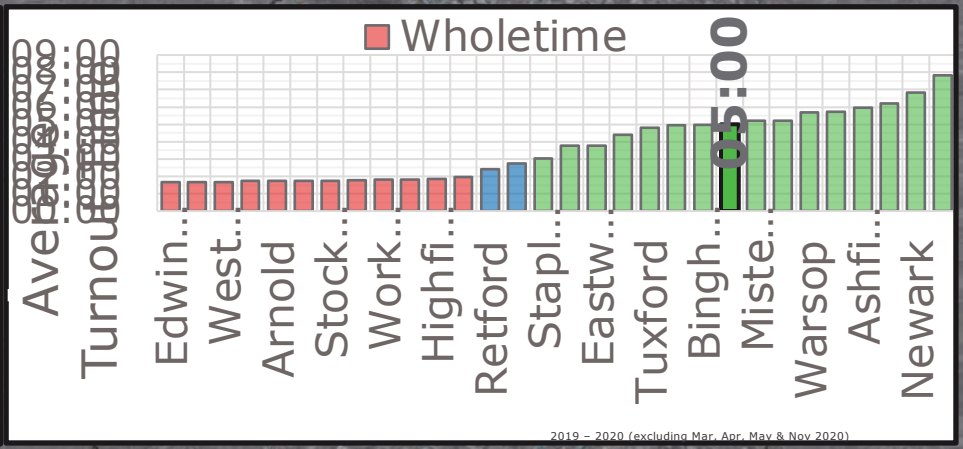
Average No. of incidents per year, within the station ground, by type. (Not Including Non-RTC Special Service.)

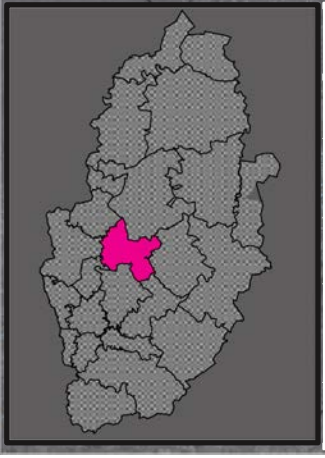
Type 2016 -2020	Fires	False Alarms	RTCs
Incidents Per Year	91	44	14



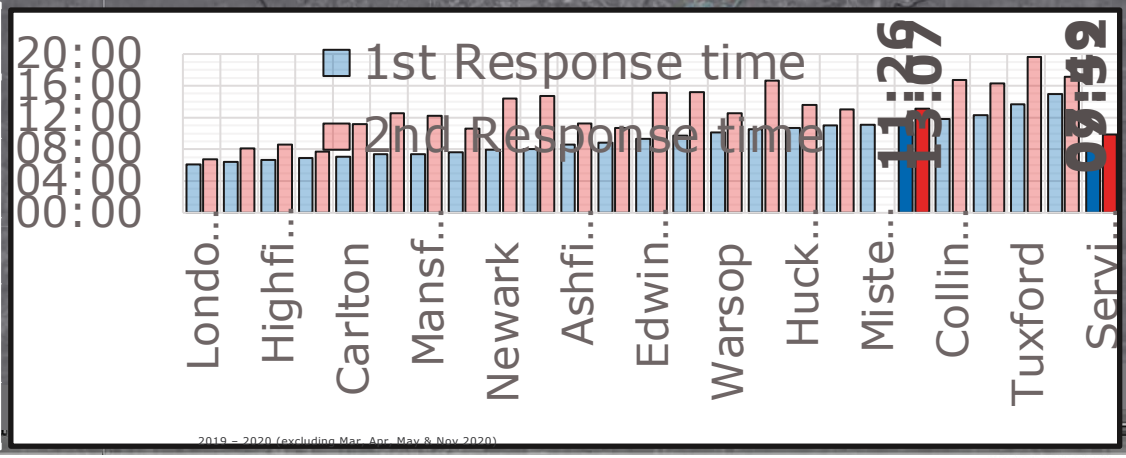








Ethnicity - 2011 Census	Population	Percentage
White	19,967	97.5%
Mixed/ multiple ethnic groups	186	0.9%
Asian/ Asian British	243	1.2%
Black/ African/ Caribbean/ Black British	50	0.2%
Other	24	0.1%



Carlton Fire Station

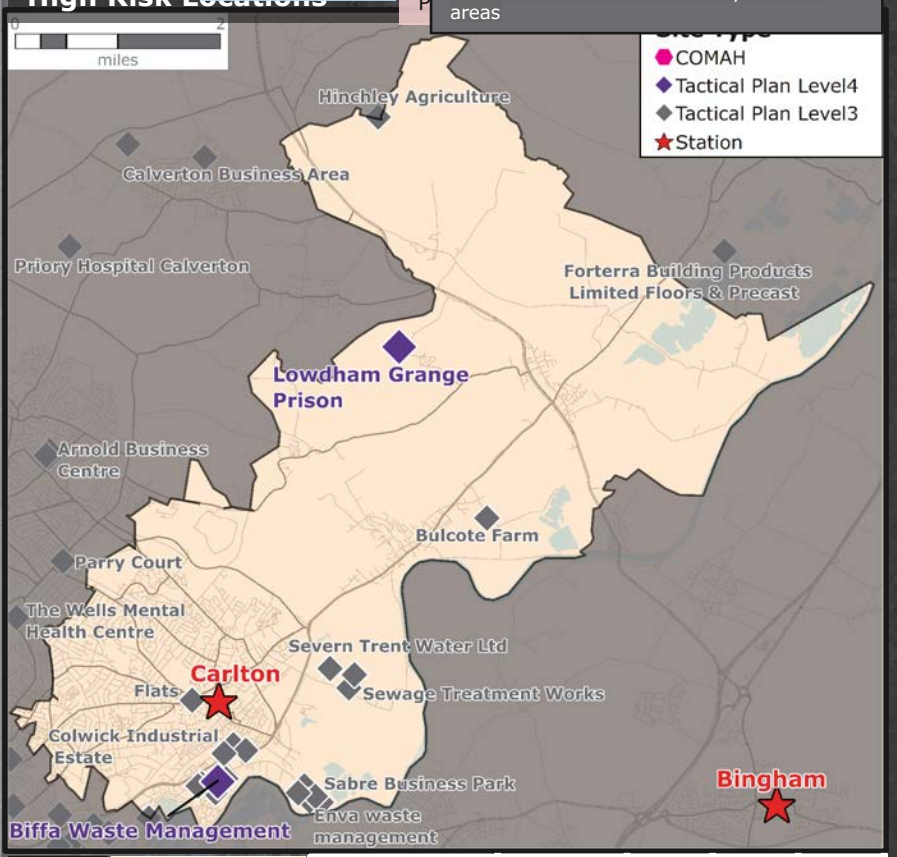
Station 27 is in Gedling District. It has one Wholetime pumping appliance.

Manor Road,
Carlton,
Nottingham,
NG4 3AY
0115 838 8100

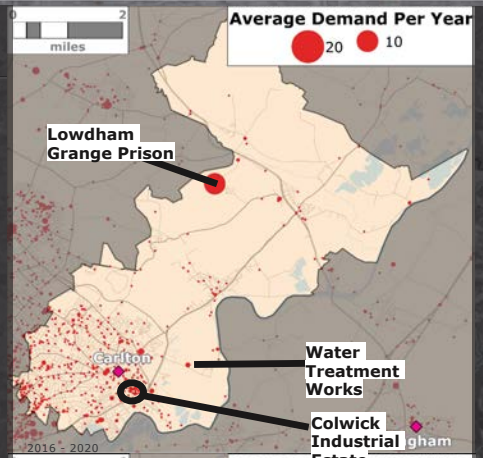
Population	Households	Commercial	Area
64,002	28,135	1	63.5Km²

High Risk Locations

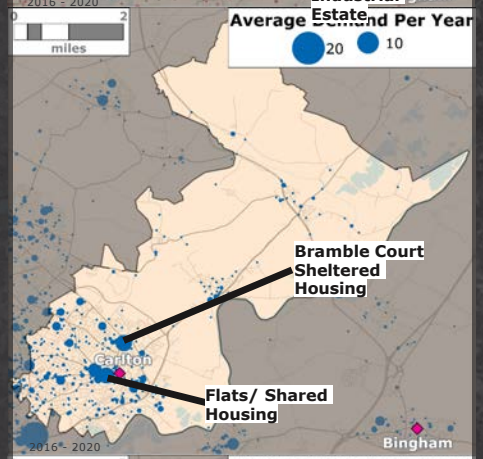
Station Grounds based on likely turnout areas



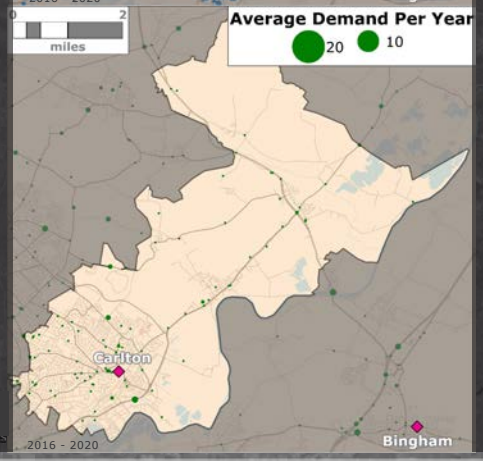
Fires



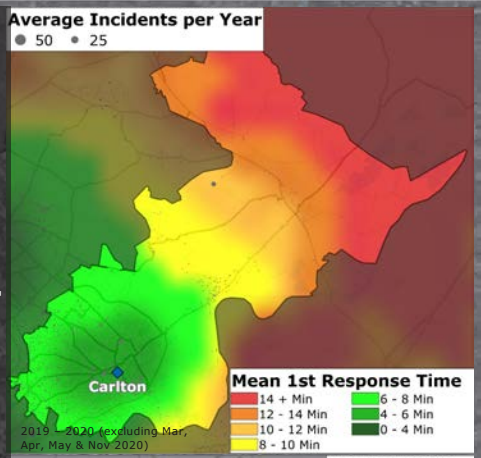
False Alarms



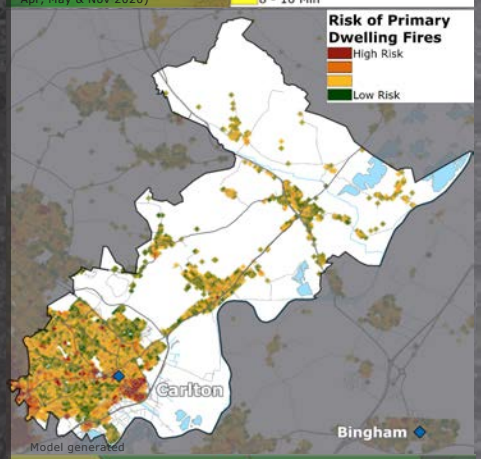
RTCs



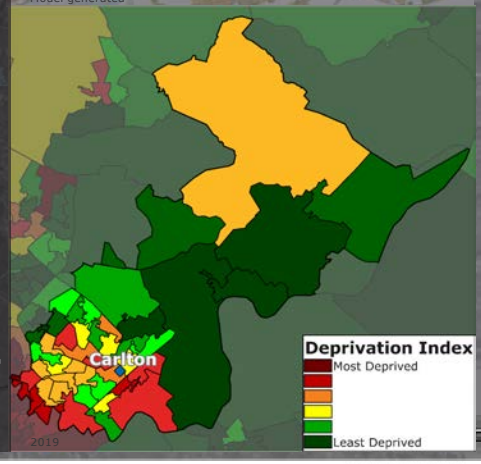
1st Response Time



Dwelling Fire Risk



Deprivation

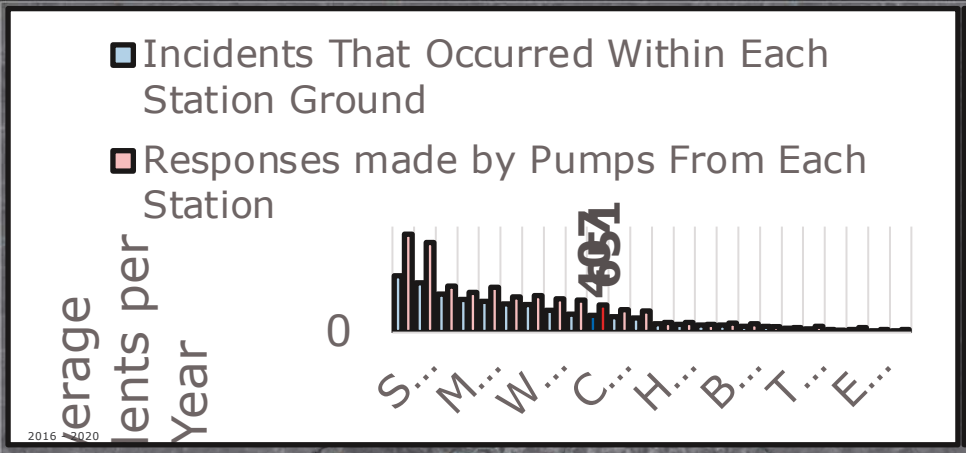


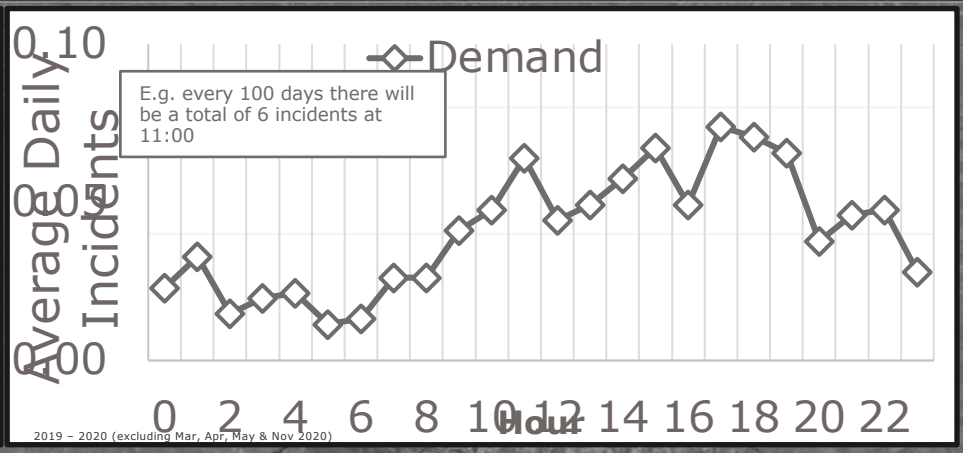
Type 2016 -2020	Fires	False Alarms	RTCs
Incidents Per Year	114	142	22

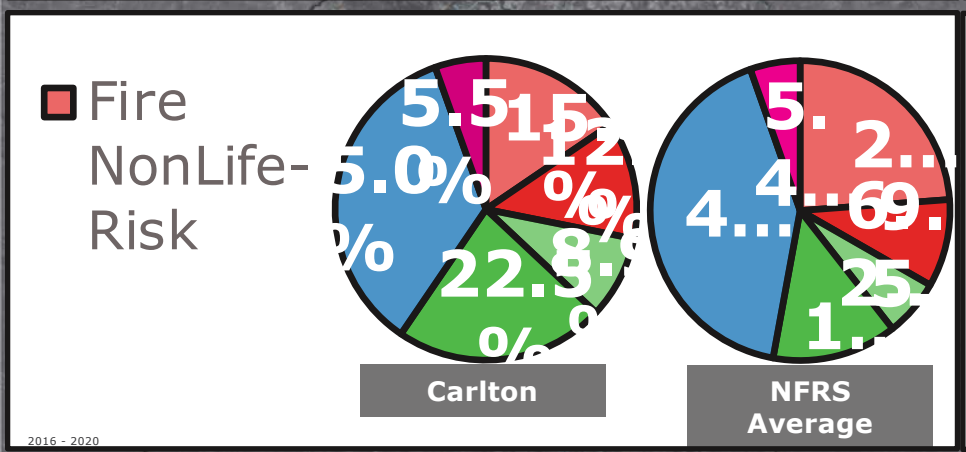
Average No. of incidents per year, within the station ground, by type. (Not Including Non-RTC Special Service.)

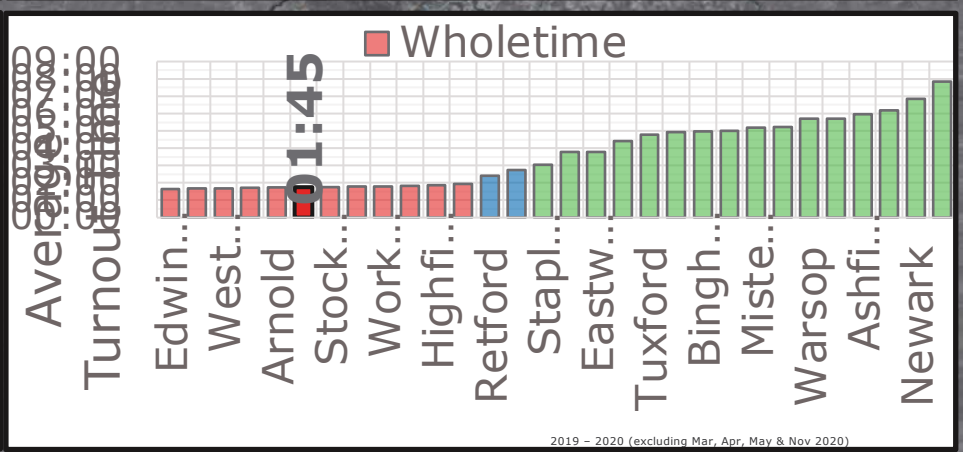
NOTTINGHAMSHIRE Fire & Rescue Service

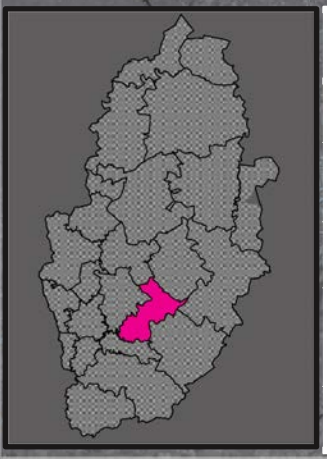
Date produced: 06 October 21



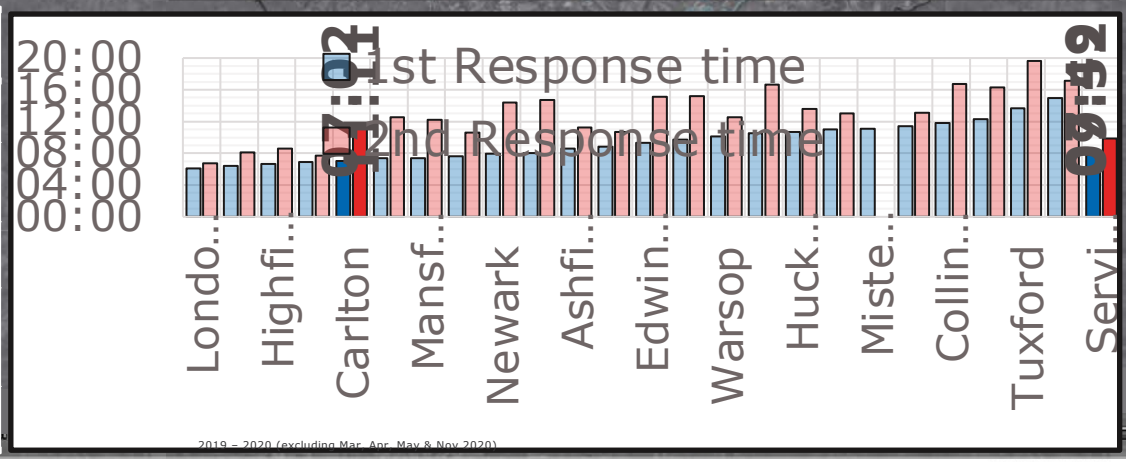








Ethnicity - 2011 Census	Population	Percentage
White	57,387	89.7%
Mixed/ multiple ethnic groups	1,990	3.1%
Asian/ Asian British	2,955	4.6%
Black/ African/ Caribbean/ Black British	1,393	2.2%
Other	277	0.4%



Collingham Fire Station

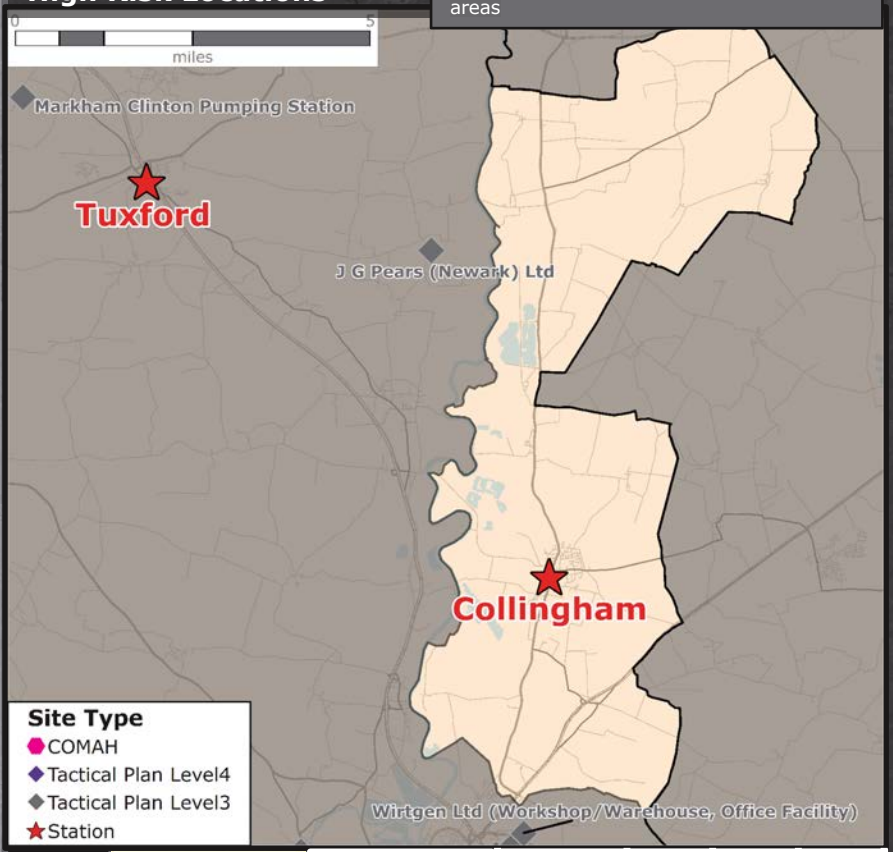
Station 15 is in Newark and Sherwood District. It has one On-Call pumping appliance.

Baptist Lane
Collingham
Nottinghamshire
NG23 7LT
0115 838 8100

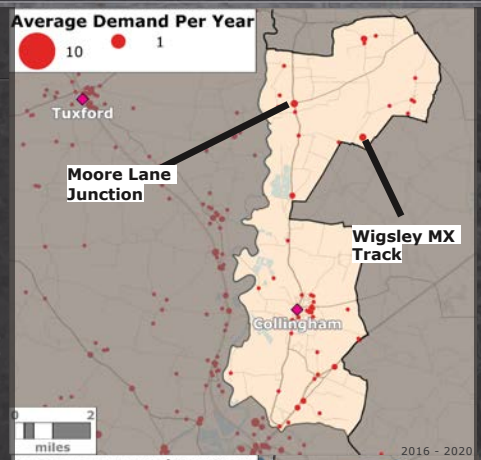
Population	Households	Commercial	Area
4,736	2,103		84.7Km²

High Risk Locations

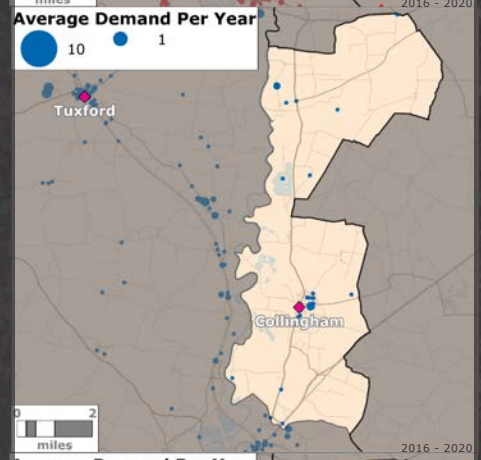
Station Grounds based on likely turnout areas



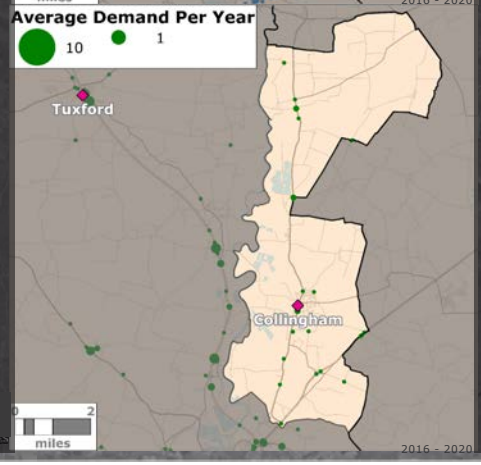
Fires



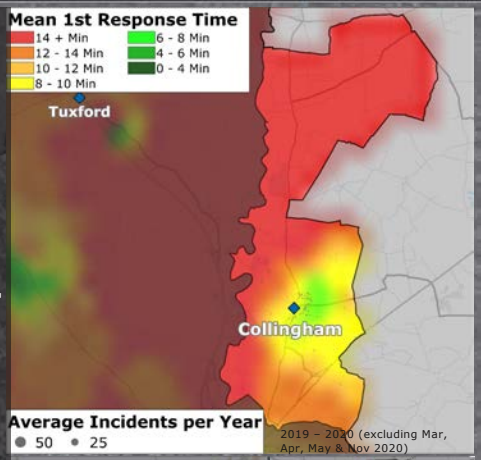
False Alarms



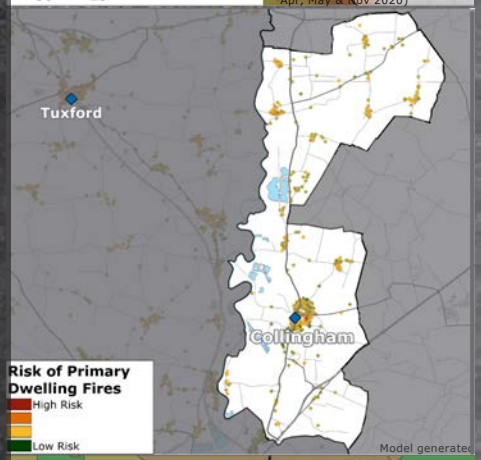
RTCs



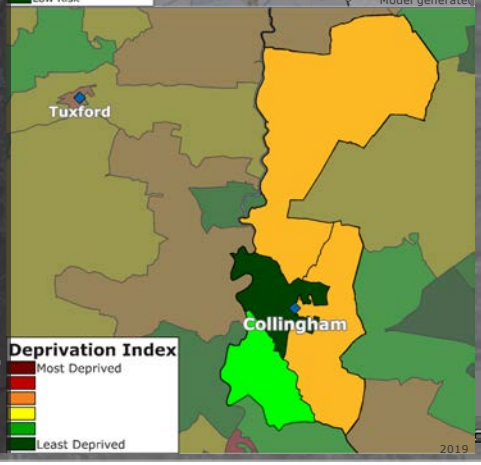
1st Response Time



Dwelling Fire Risk



Deprivation

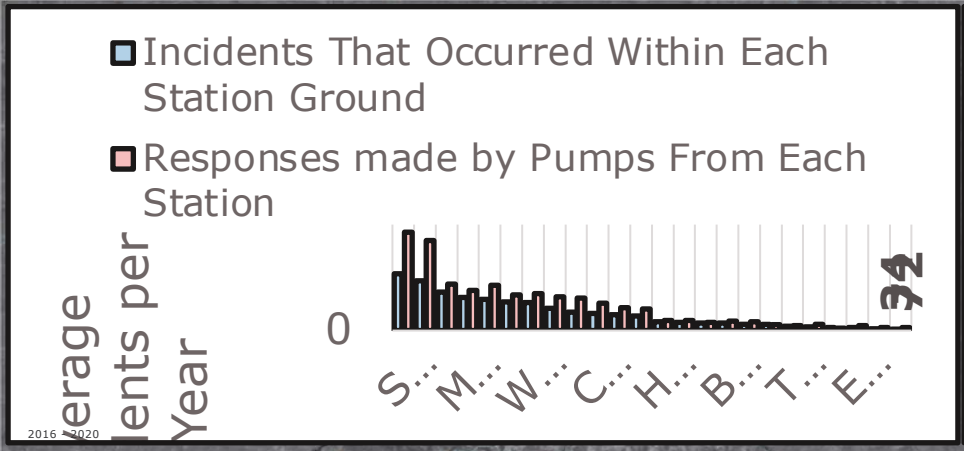


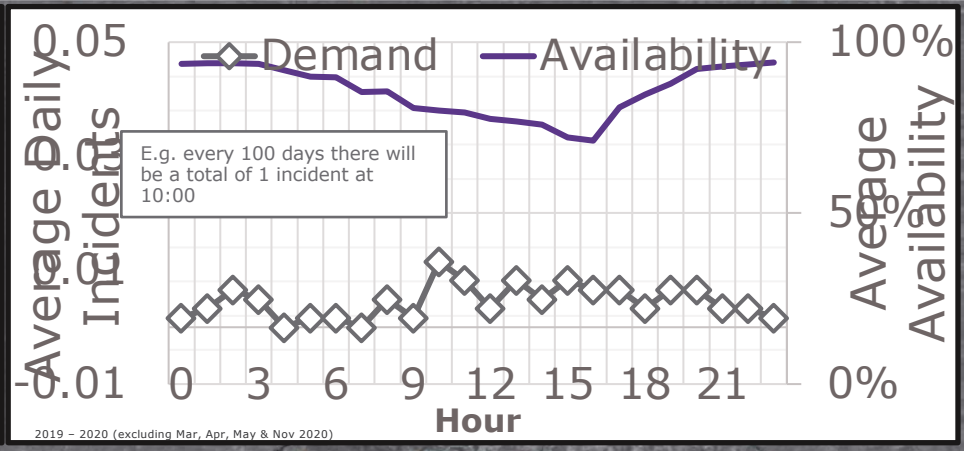
NOTTINGHAMSHIRE Fire & Rescue Service

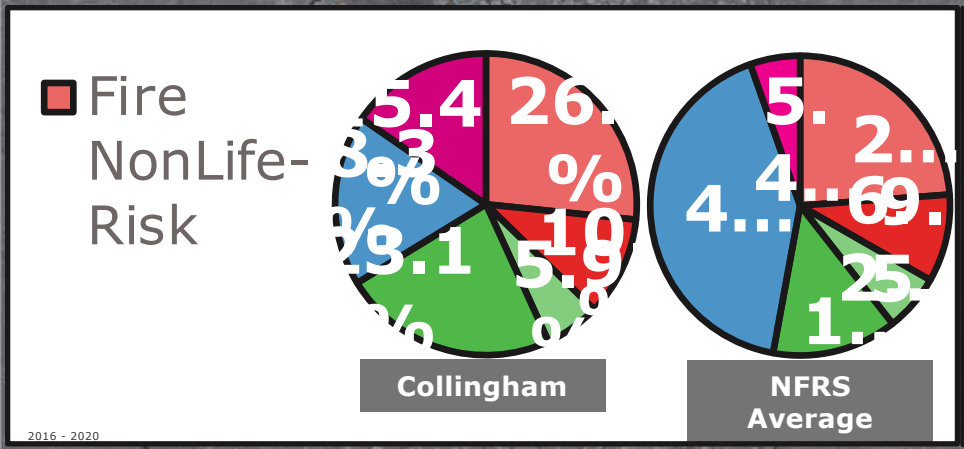
Date produced: 06 October 21

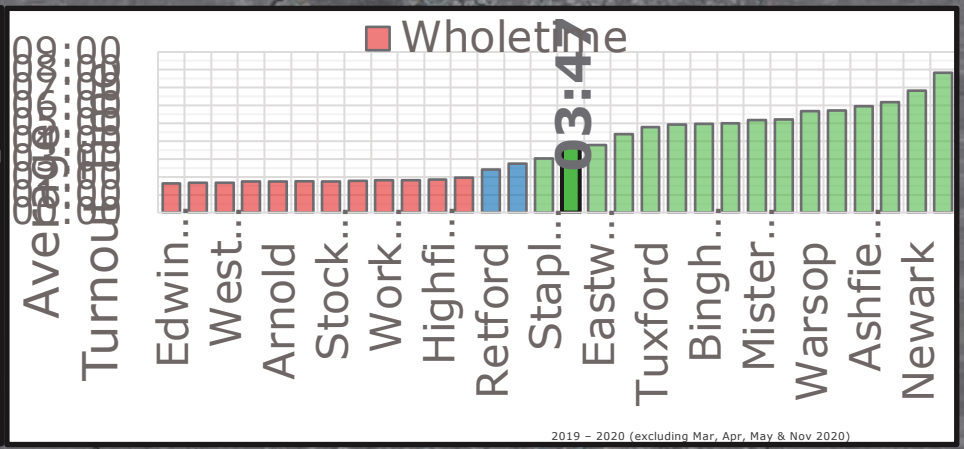
Average No. of incidents per year, within the station ground, by type. (Not Including Non-RTC Special Service.)

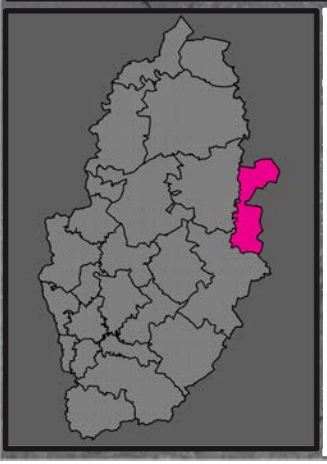
Type 2016 -2020	Fires	False Alarms	RTCs
Incidents Per Year	13	6	5



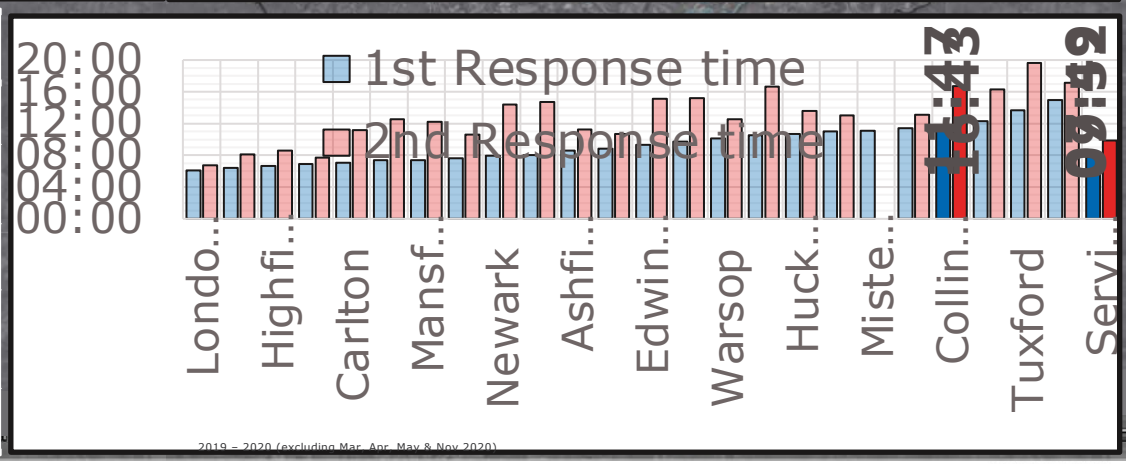








Ethnicity - 2011 Census	Population	Percentage
White	4,667	98.5%
Mixed/ multiple ethnic groups	34	0.7%
Asian/ Asian British	24	0.5%
Black/ African/ Caribbean/ Black British	10	0.2%
Other	1	0.0%



East Leake Fire Station

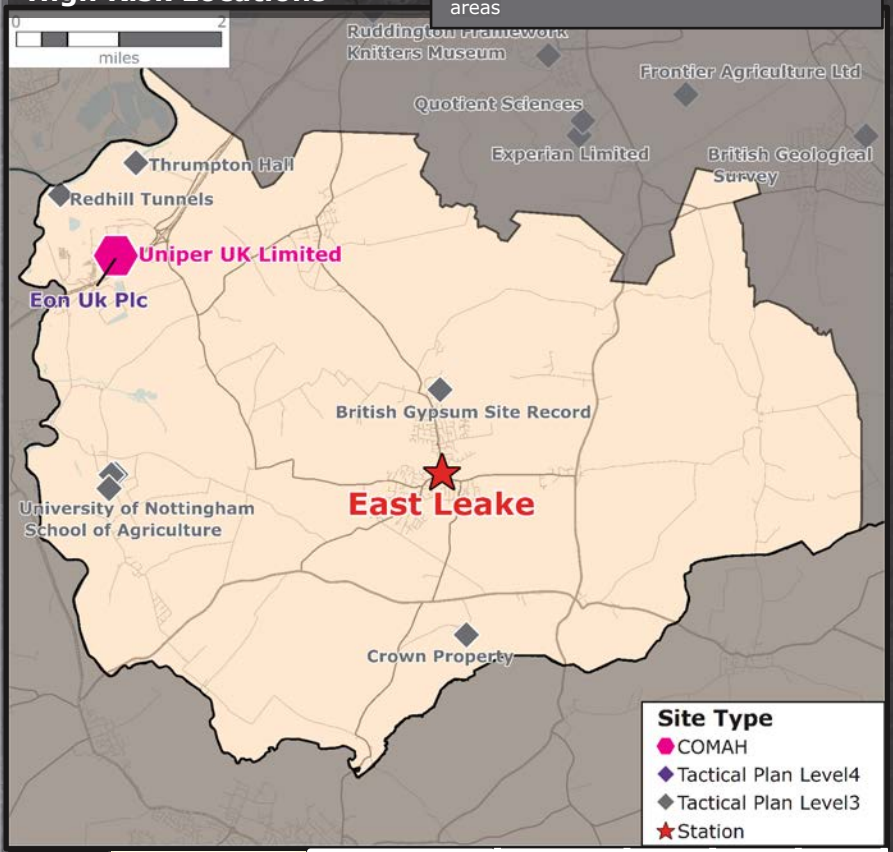
Station 28 is in Rushcliffe District. It has one On-Call pumping appliance. It is also home to an Animal Rescue Unit.

Gotham Road
East Leake
Loughborough
LE12 6JG
0115 838 8100

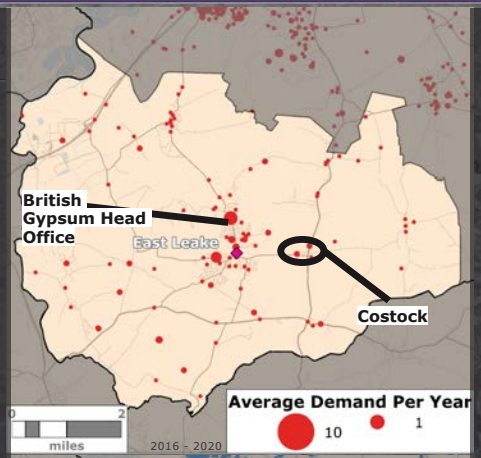
Population	Households	Commercial	Area
13,115	4,713	5	91.7Km²

High Risk Locations

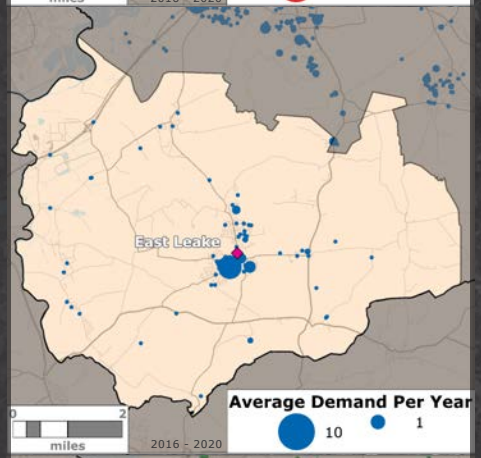
Station Grounds based on likely turnout areas



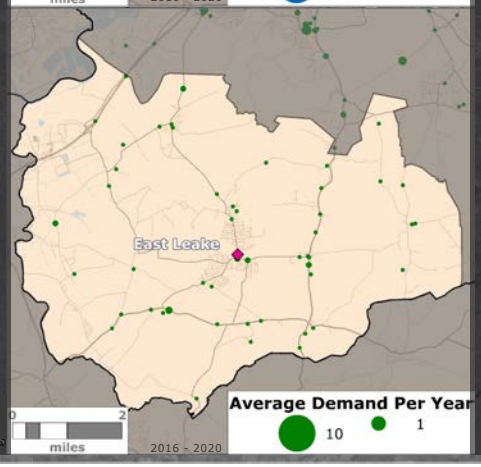
Fires



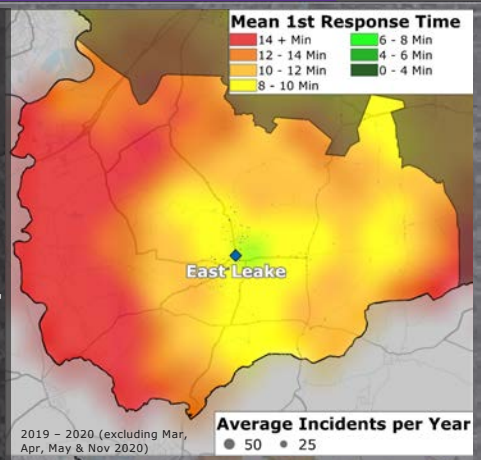
False Alarms



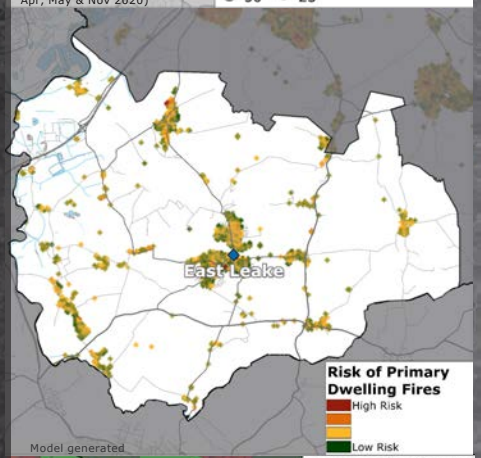
RTCs



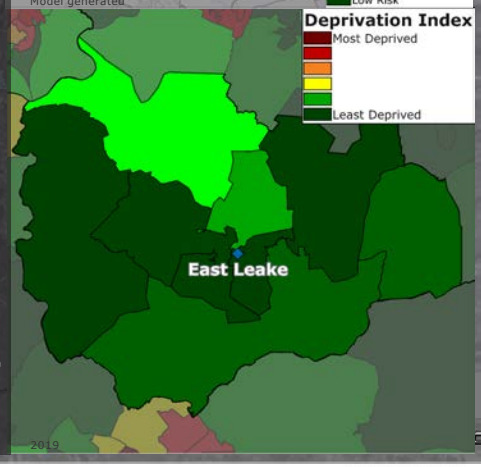
1st Response Time



Dwelling Fire Risk



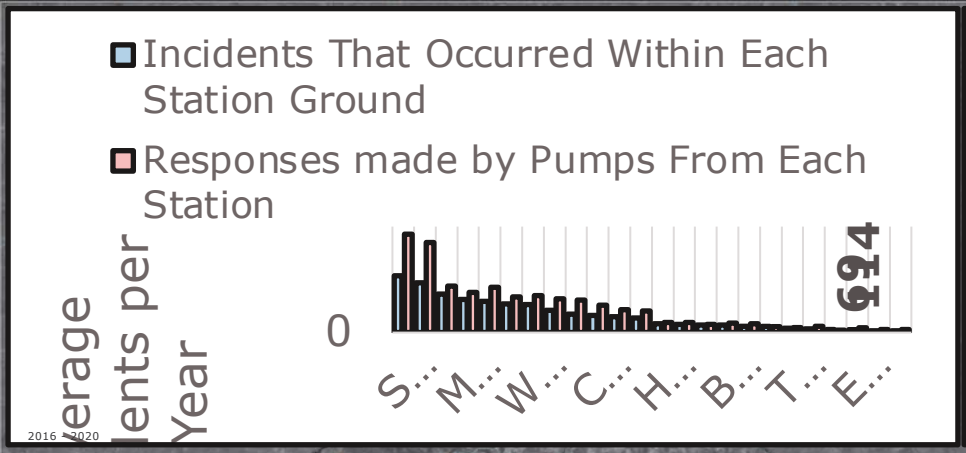
Deprivation

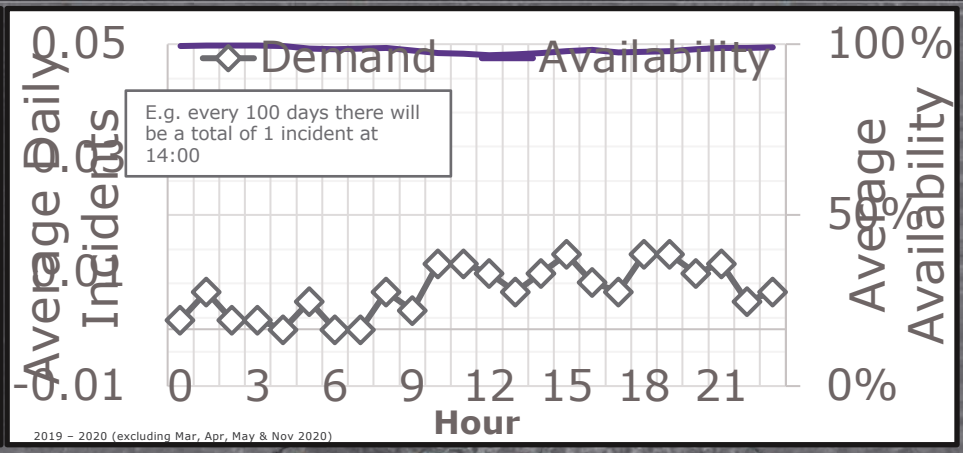


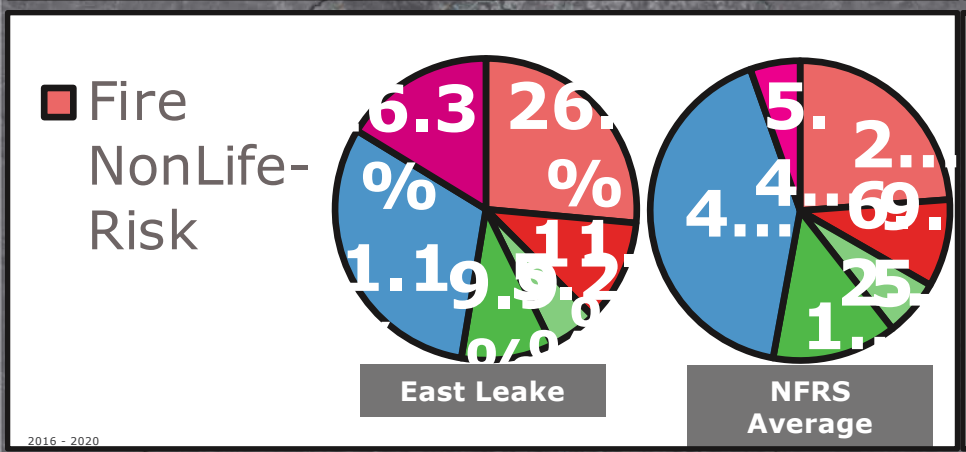
Type 2016 -2020	Fires	False Alarms	RTCs
Incidents Per Year	26	21	11

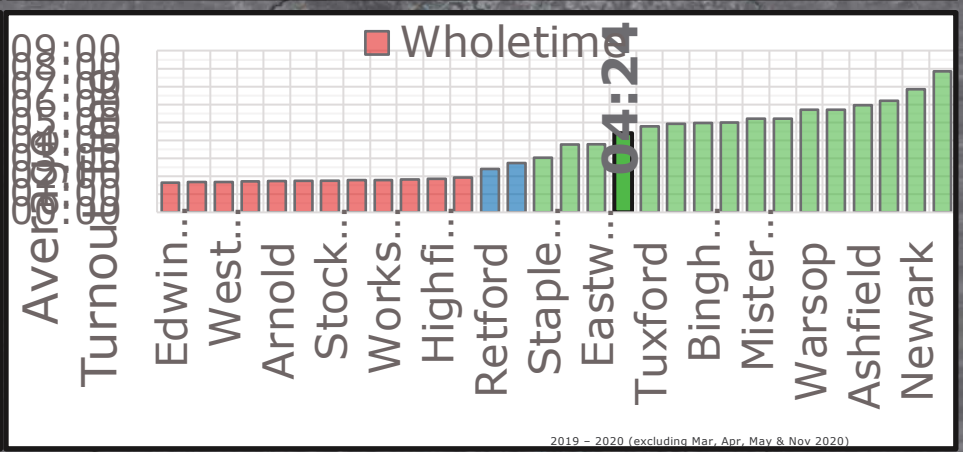
Average No. of incidents per year, within the station ground, by type. (Not Including Non-RTC Special Service.)

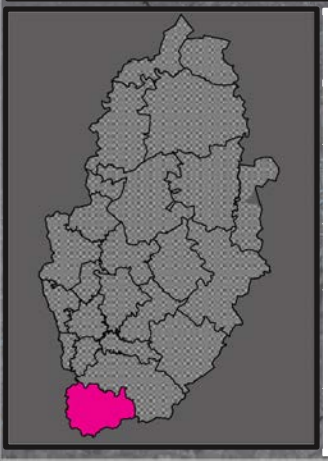
Date produced: 06 October 21



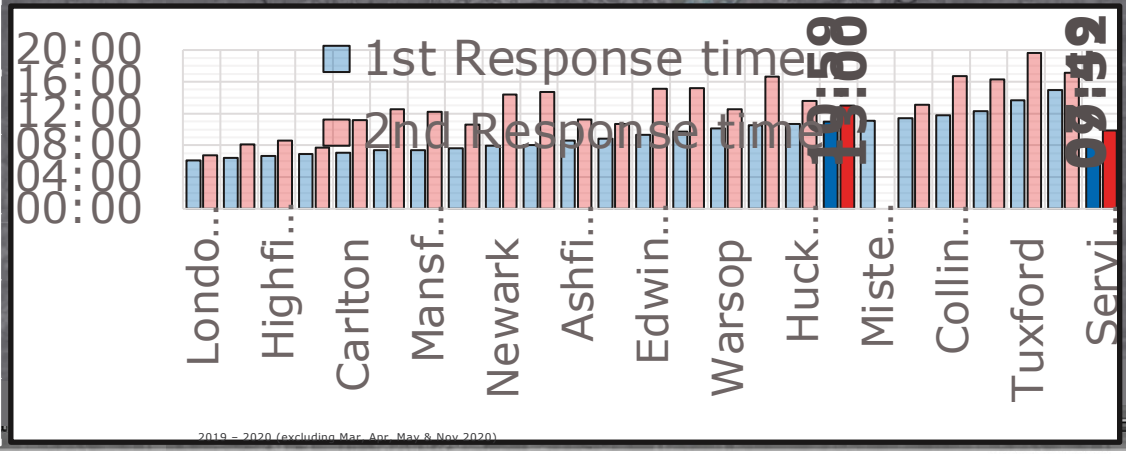








Ethnicity - 2011 Census	Population	Percentage
White	12,634	96.3%
Mixed/ multiple ethnic groups	161	1.2%
Asian/ Asian British	250	1.9%
Black/ African/ Caribbean/ Black British	46	0.4%
Other	24	0.2%



Eastwood Fire Station

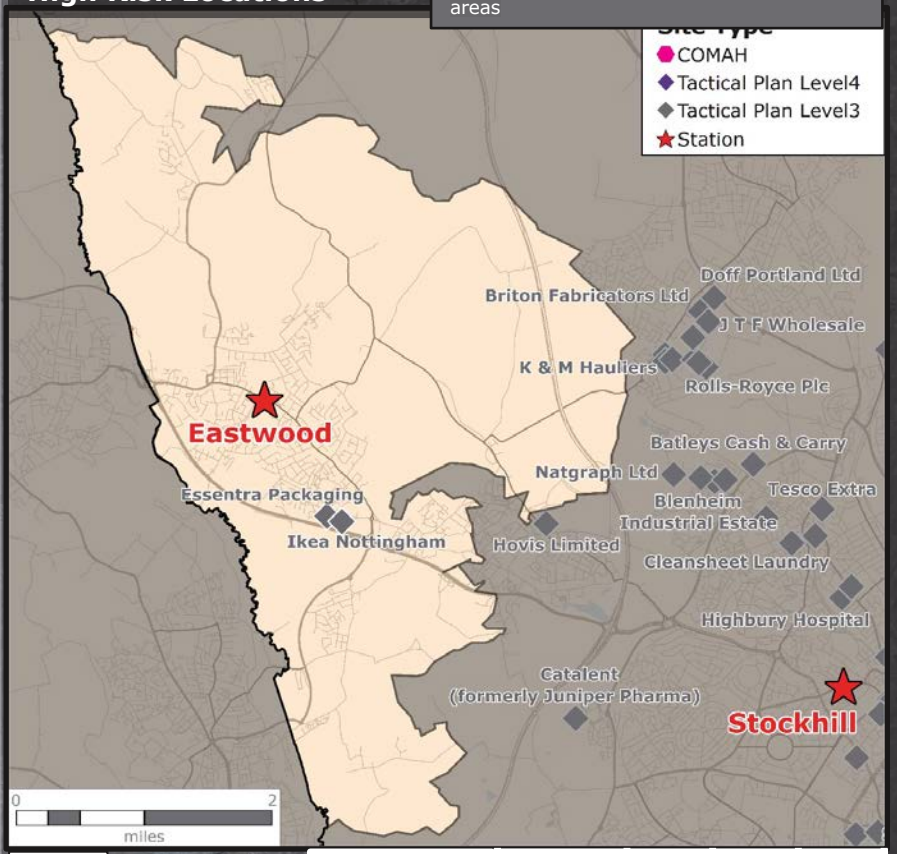
Station 24 is in Broxtowe District. It has one On-Call pumping appliance.

Nottingham Road
Eastwood
NG16 3GN
0115 838 8100

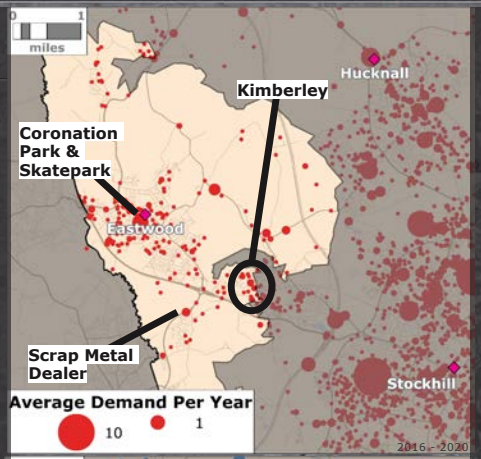
Population	Households	Commercial	Area
28,803	13,497	6[illegible]	37.3Km²

High Risk Locations

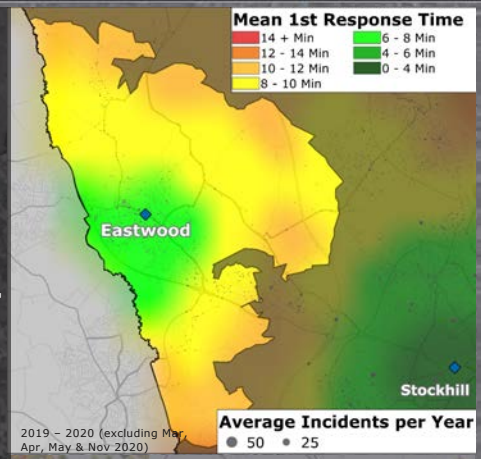
Station Grounds based on likely turnout areas



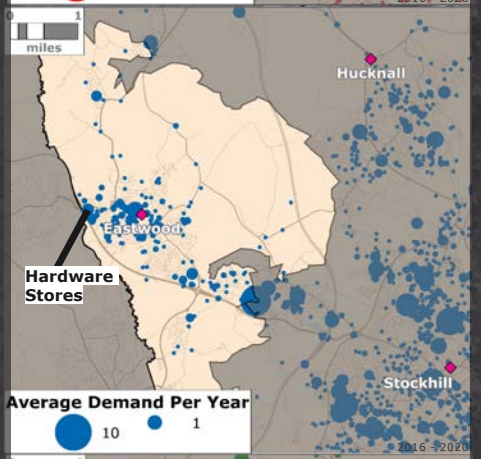
Fires



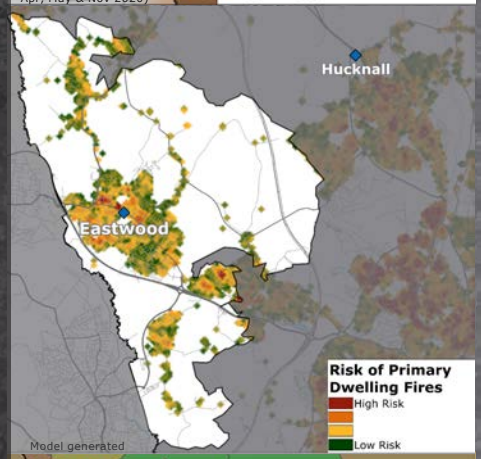
1st Response Time



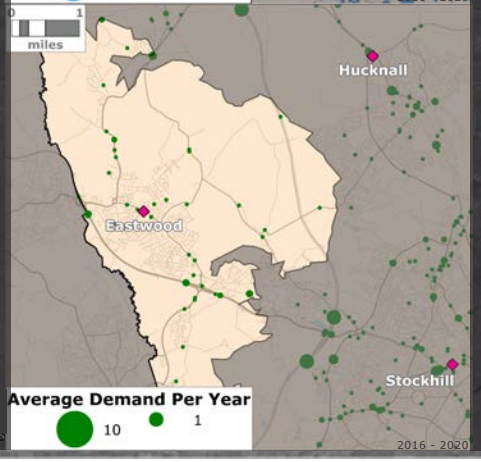
False Alarms



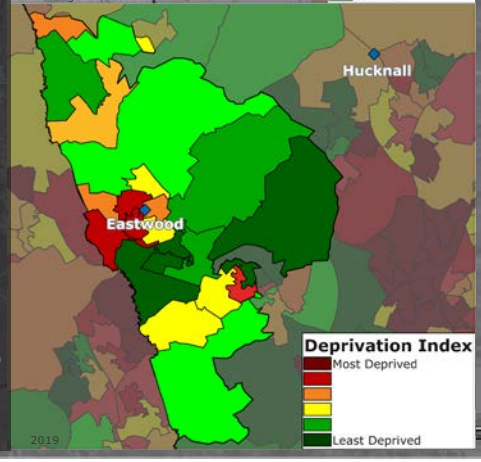
Dwelling Fire Risk



RTCs



Deprivation

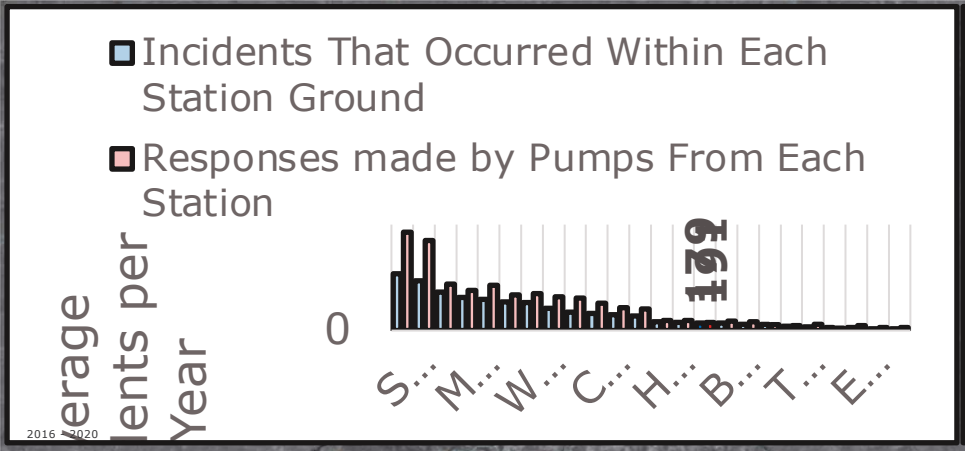


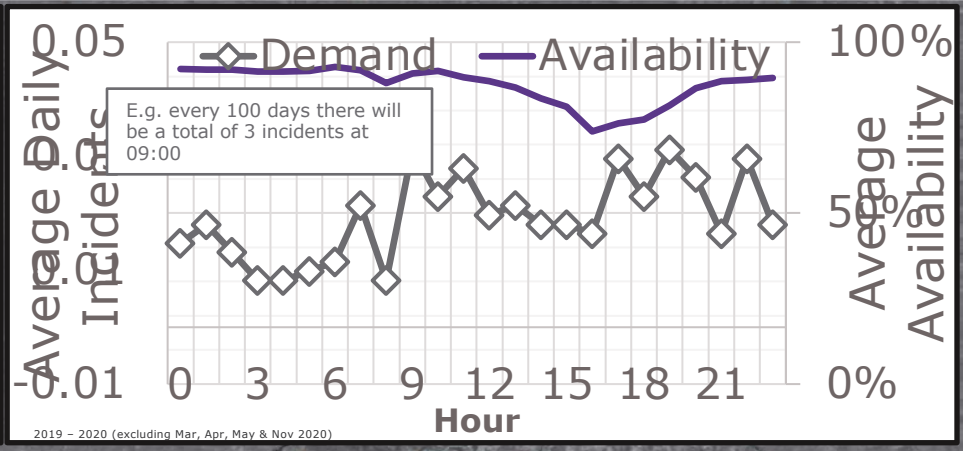
Type 2016 -2020	Fires	False Alarms	RTCs
Incidents Per Year	57	78	11

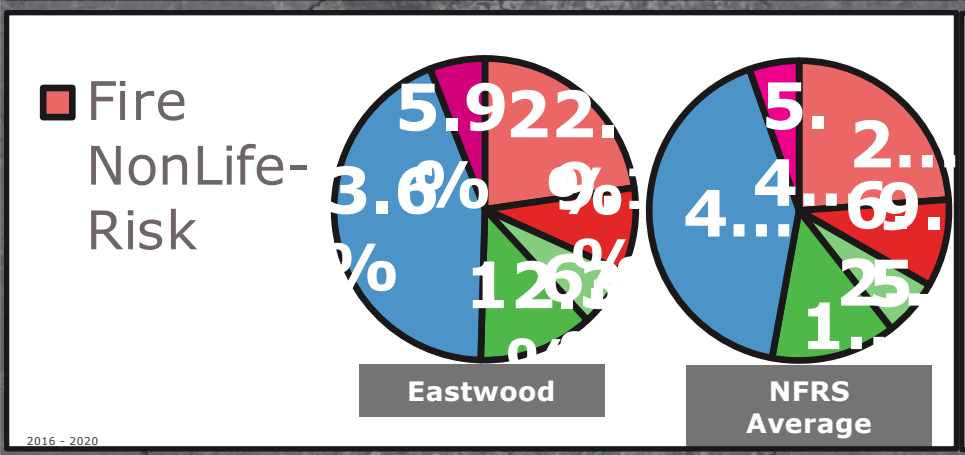
Average No. of incidents per year, within the station ground, by type. (Not Including Non-RTC Special Service.)

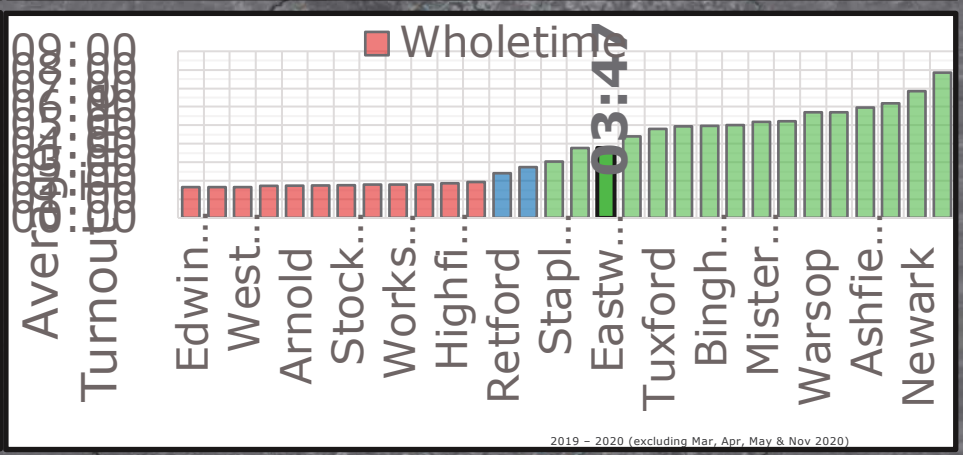
NOTTINGHAMSHIRE Fire & Rescue Service

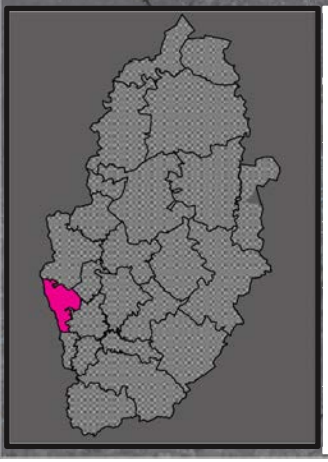
Date produced: 06 October 21



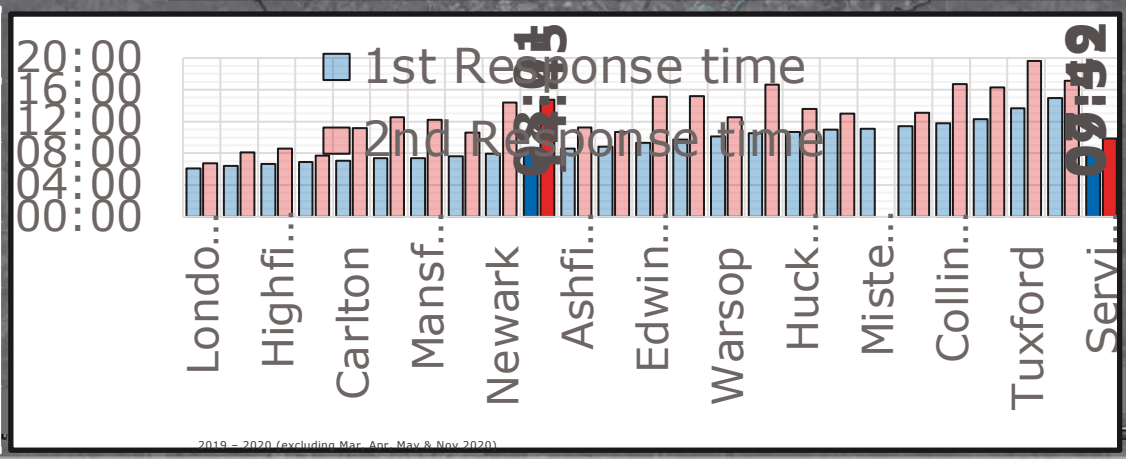




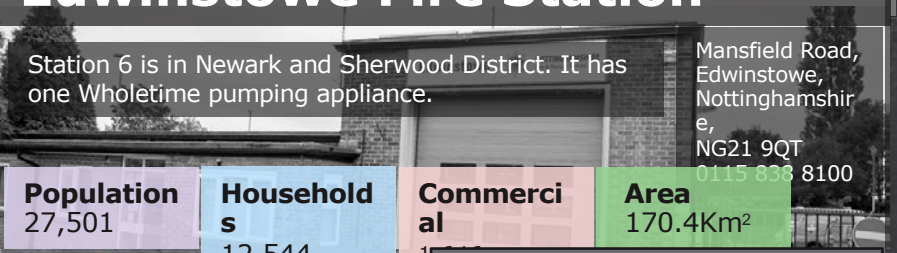




Ethnicity - 2011 Census	Population	Percentage
White	28,297	98.2%
Mixed/ multiple ethnic groups	233	0.8%
Asian/ Asian British	188	0.7%
Black/ African/ Caribbean/ Black British	47	0.2%
Other	38	0.1%



Edwinstowe Fire Station



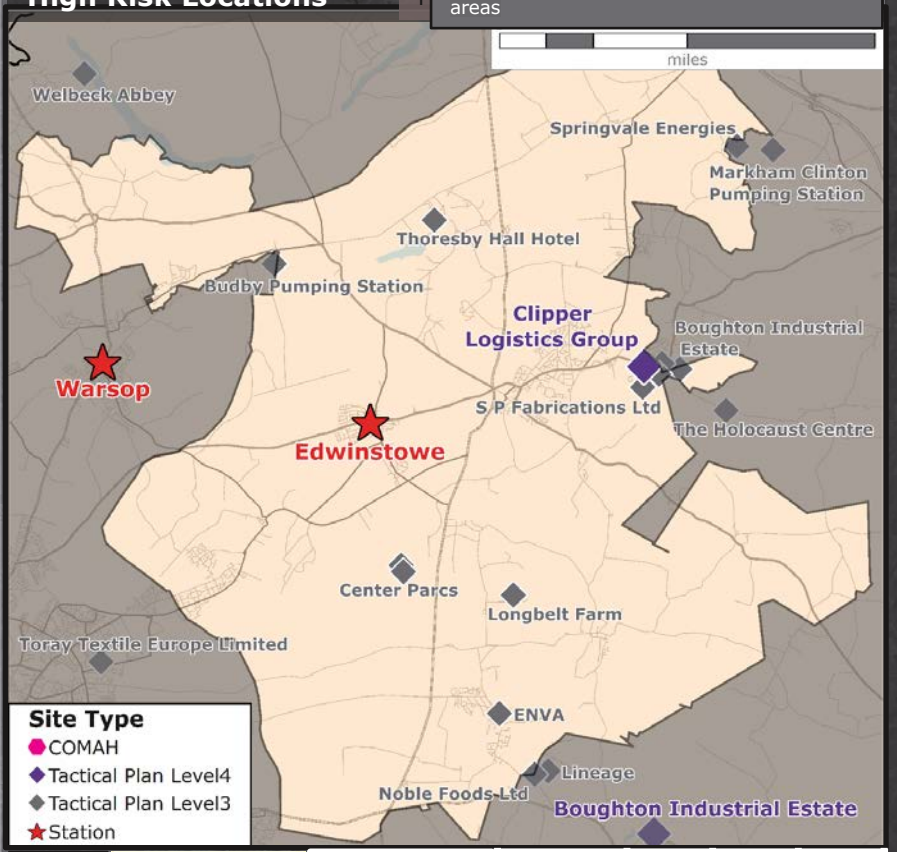
Station 6 is in Newark and Sherwood District. It has one Wholetime pumping appliance.

Mansfield Road,
Edwinstowe,
Nottinghamshire,
NG21 9QT
0115 838 8100

Population	Households	Commercial	Area
27,501	12,544		170.4Km²

High Risk Locations

Station Grounds based on likely turnout areas

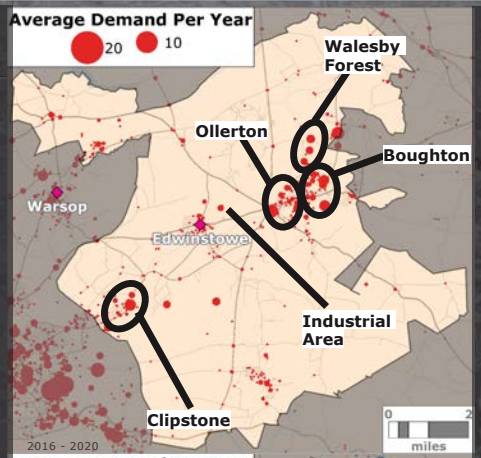


Type 2016 -2020	Fires	False Alarms	RTCs
Incidents Per Year	149	68	24

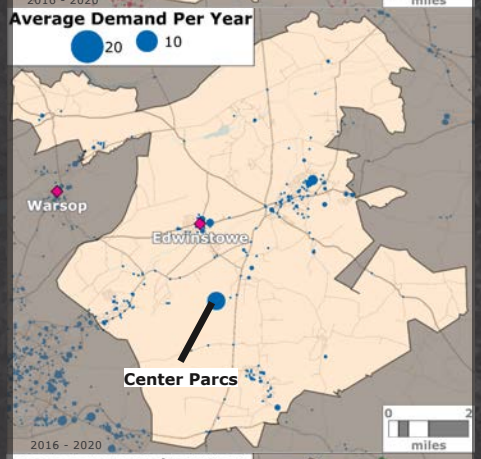
Average No. of incidents per year, within the station ground, by type. (Not Including Non-RTC Special Service.)

Date produced: 06 October 21

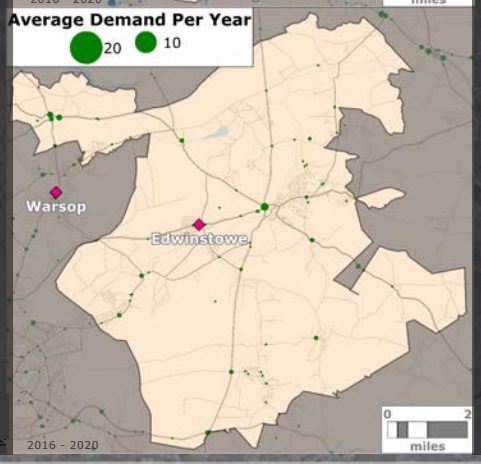
Fires



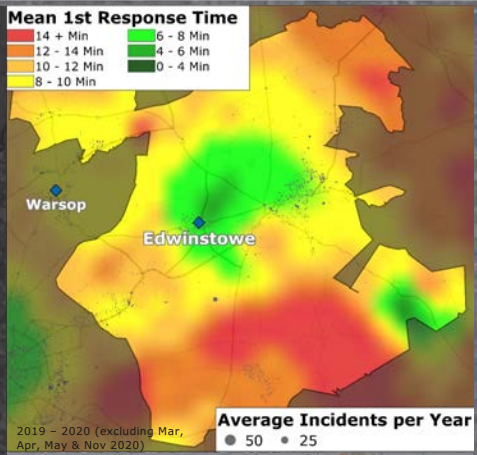
False Alarms



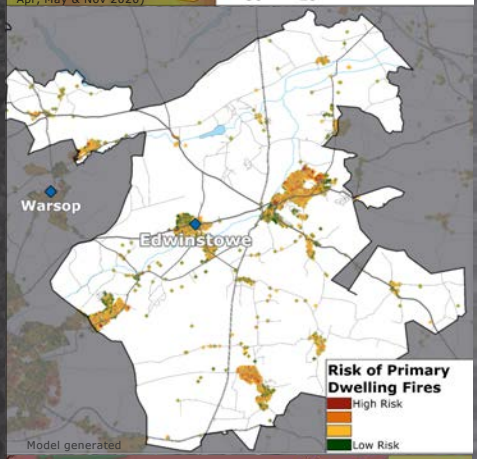
RTCs



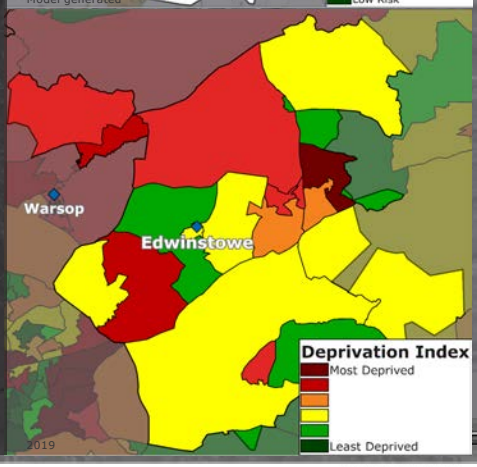
1st Response Time

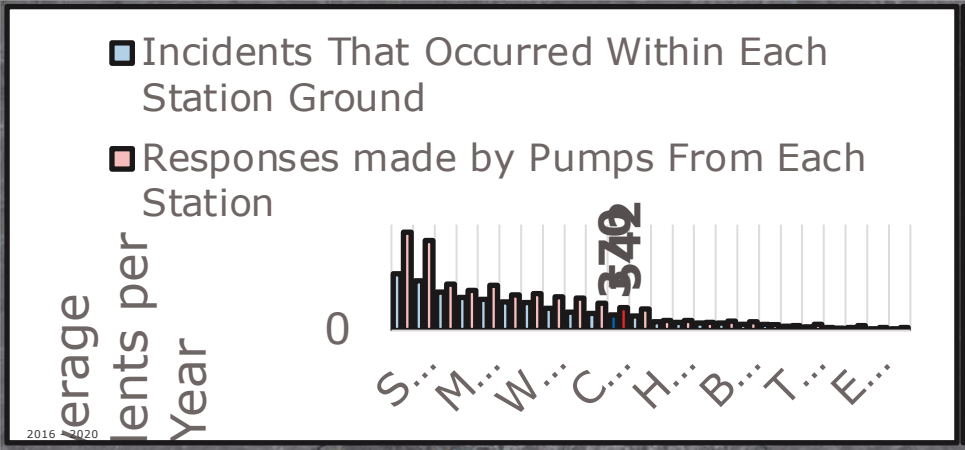


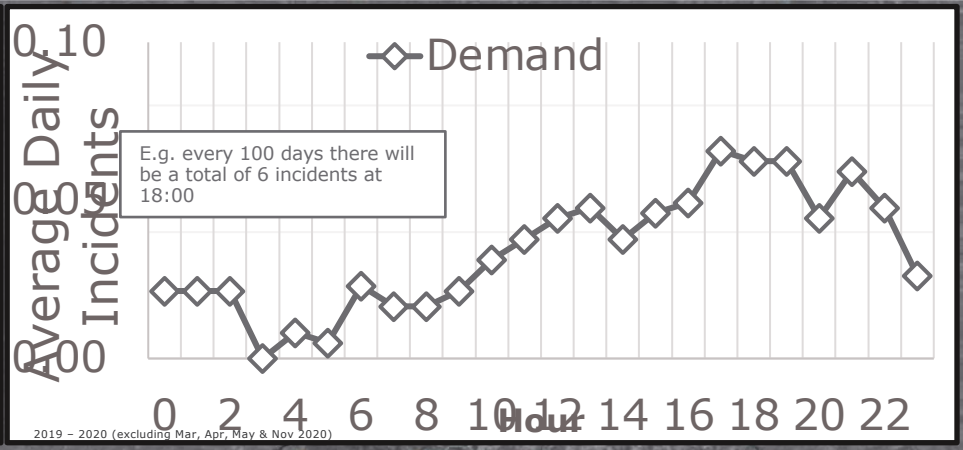
Dwelling Fire Risk

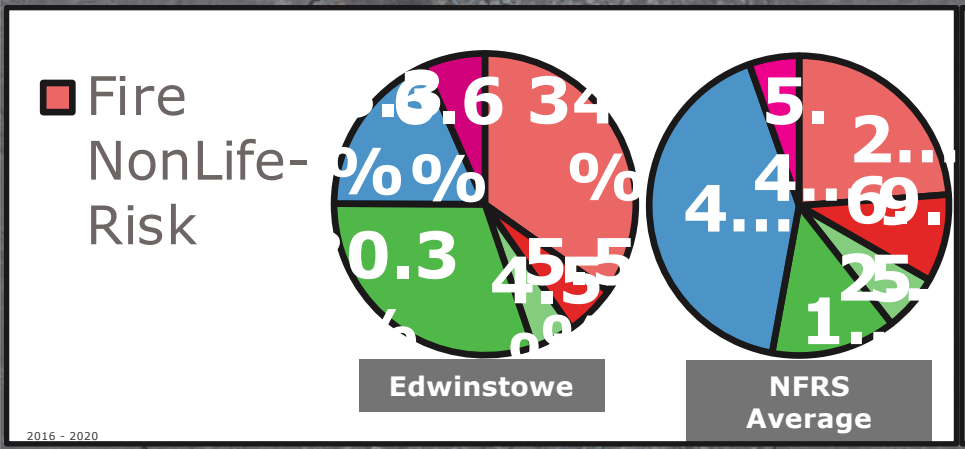


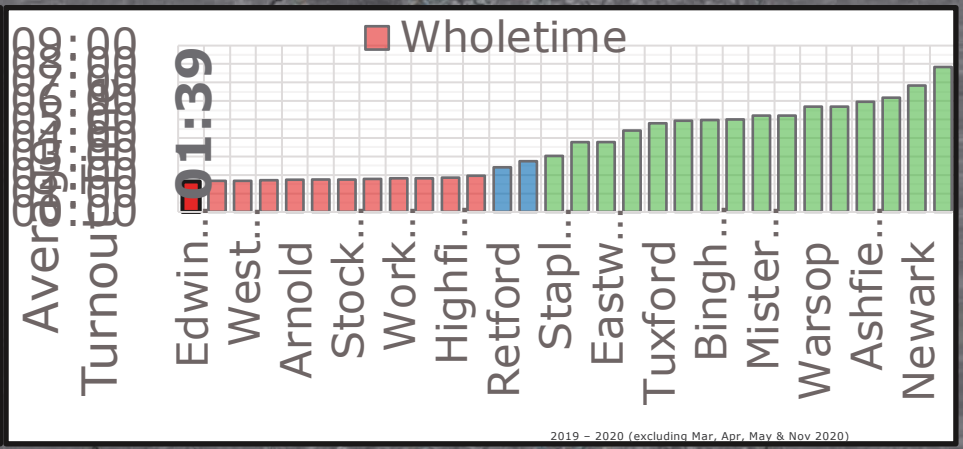
Deprivation

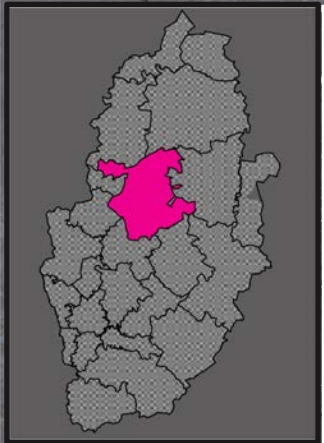




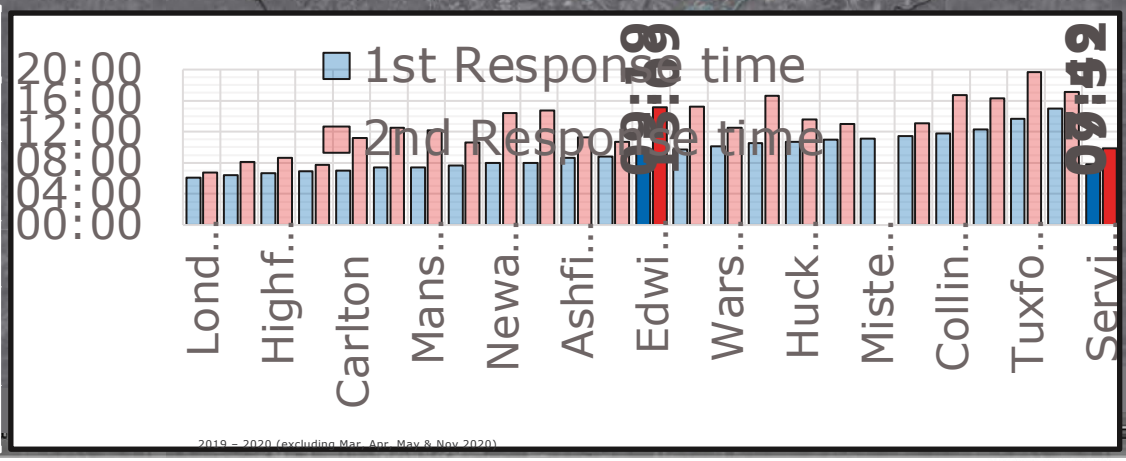








Ethnicity - 2011 Census	Population	Percentage
White	27,130	98.7%
Mixed/ multiple ethnic groups	186	0.7%
Asian/ Asian British	114	0.4%
Black/ African/ Caribbean/ Black British	52	0.2%
Other	19	0.1%



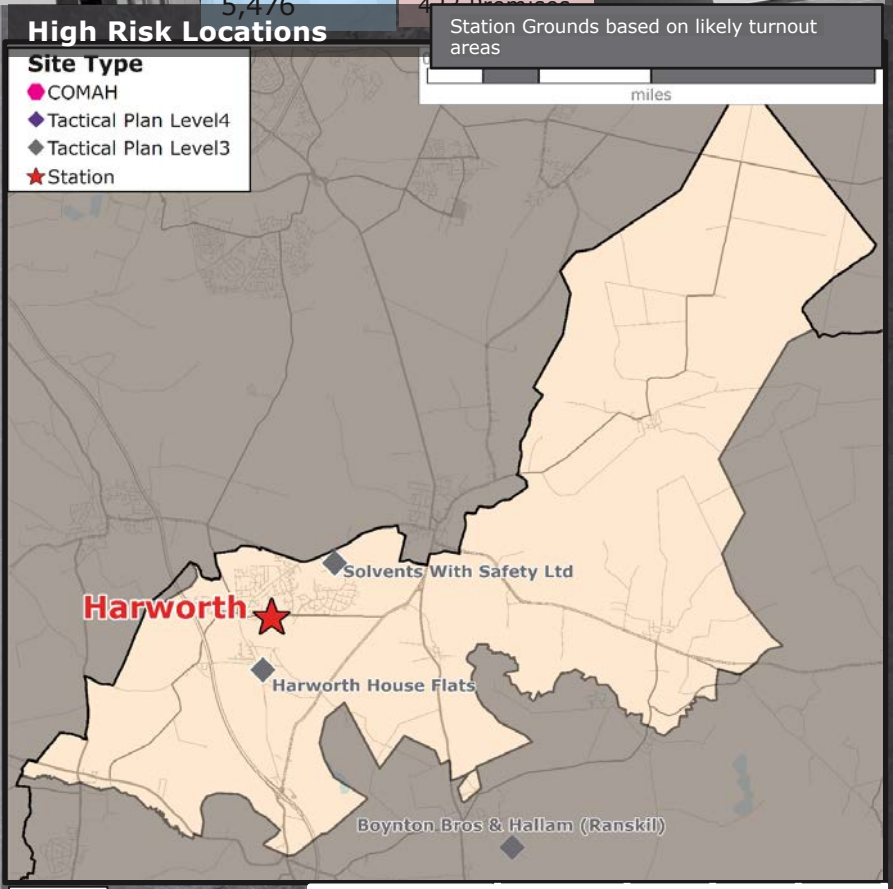
Harworth Fire Station

Station 10 is in Bassetlaw District. It has one On-Call pumping appliance.

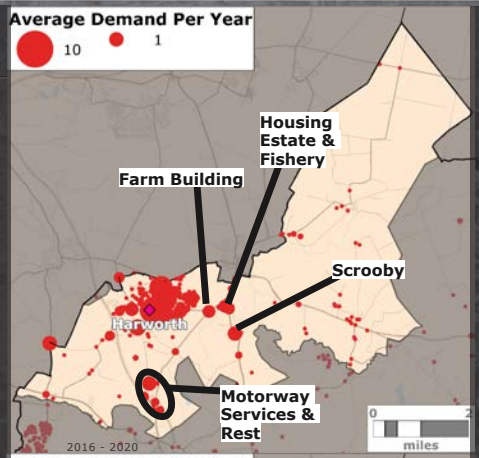
Scrooby Road
Harworth
DN11 8JW
0115 838 8100

Population	Households	Commercial	Area
11,466	5,476	433 Premises	70.7Km²

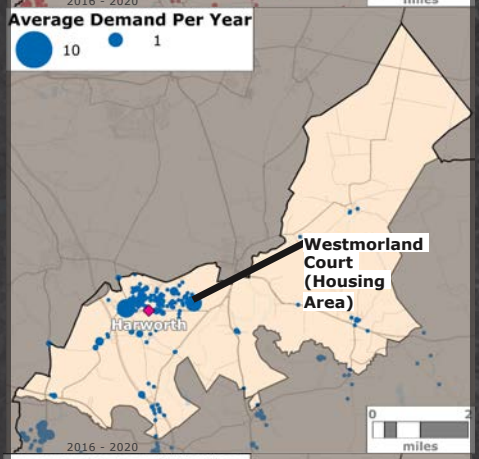
High Risk Locations



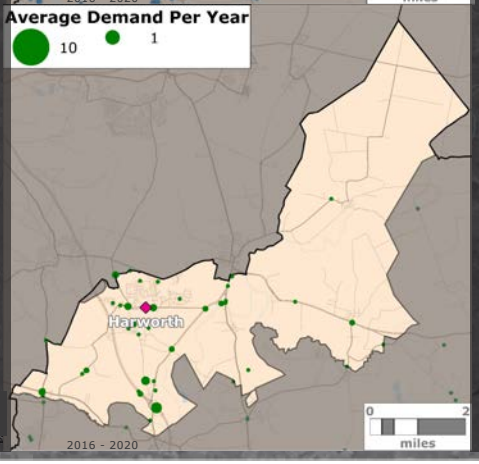
Fires



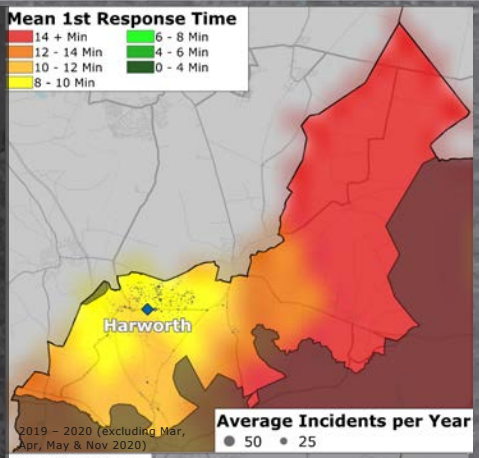
False Alarms



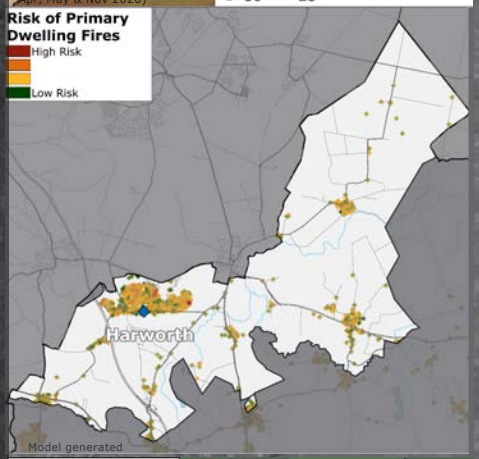
RTCs



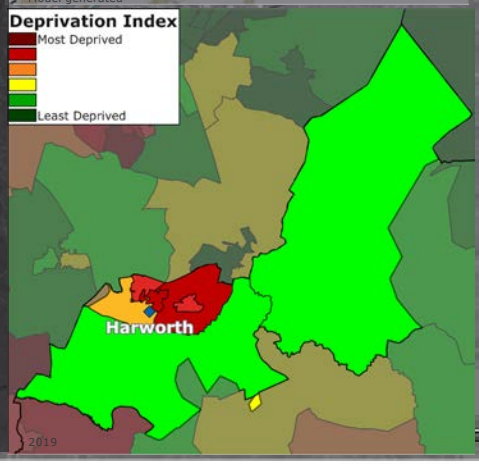
1st Response Time



Dwelling Fire Risk



Deprivation

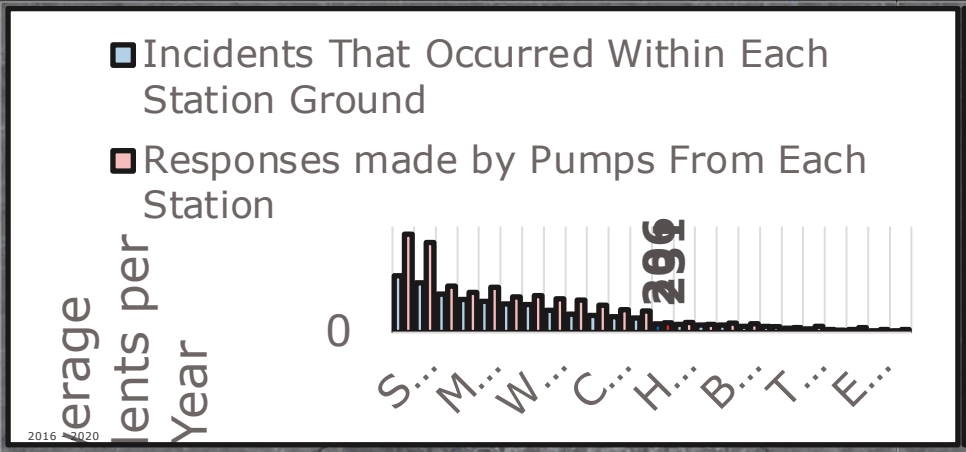


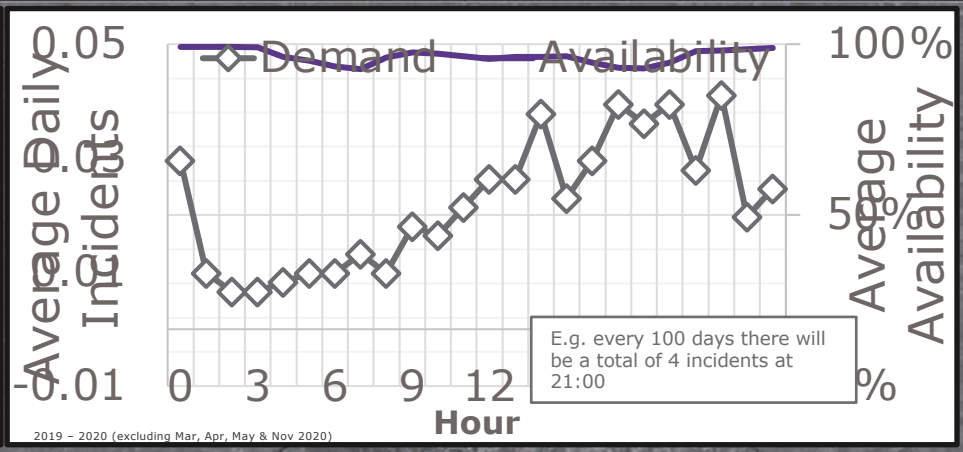
Type 2016 -2020	Fires	False Alarms	RTCs
Incidents Per Year	126	53	14

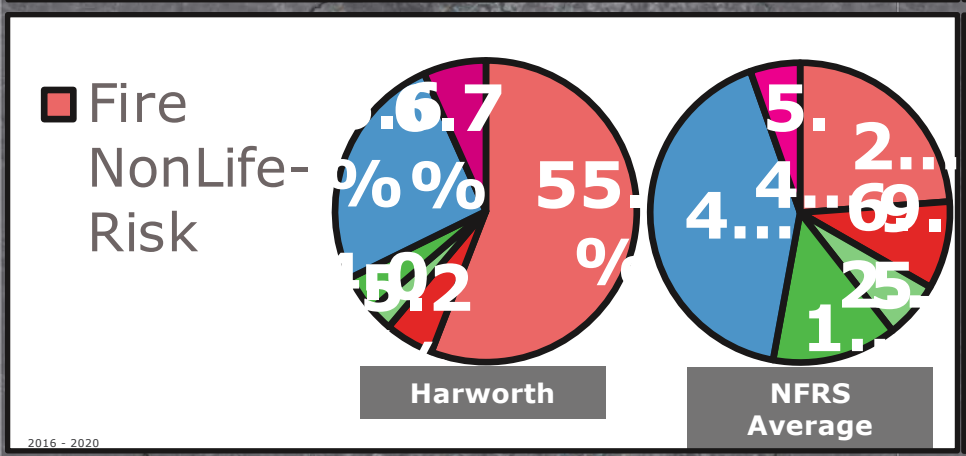
Average No. of incidents per year, within the station ground, by type. (Not Including Non-RTC Special Service.)

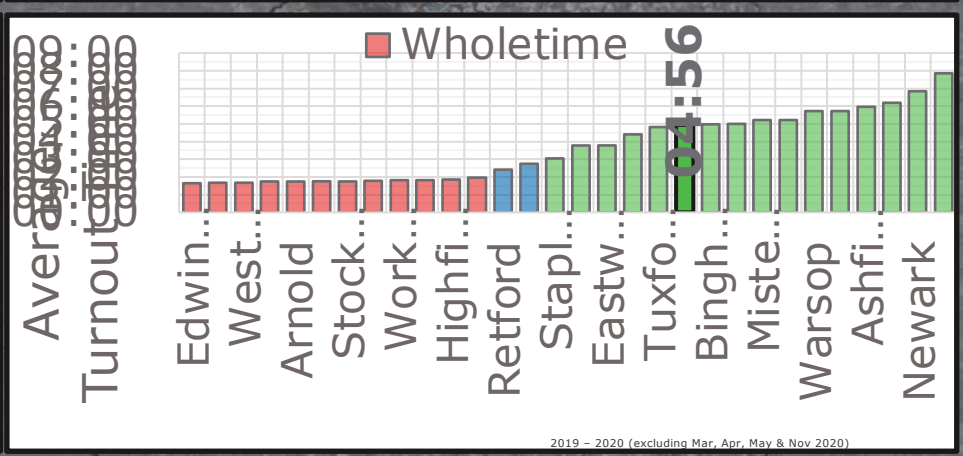
NOTTINGHAMSHIRE Fire & Rescue Service

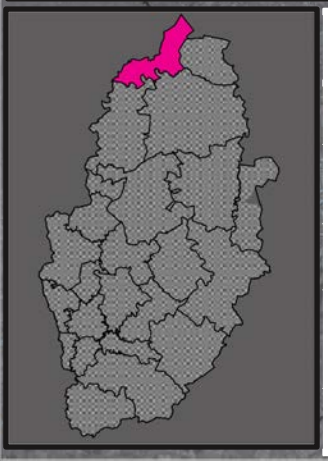
Date produced: 06 October 21



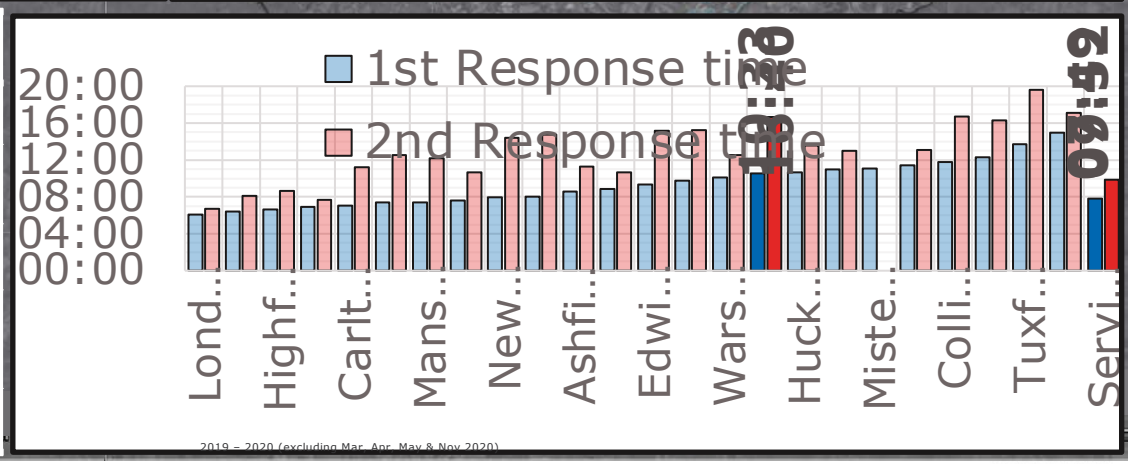








Ethnicity - 2011 Census	Population	Percentage
White	11,240	98.0%
Mixed/ multiple ethnic groups	91	0.8%
Asian/ Asian British	105	0.9%
Black/ African/ Caribbean/ Black British	15	0.1%
Other	15	0.1%



Highfields Fire Station

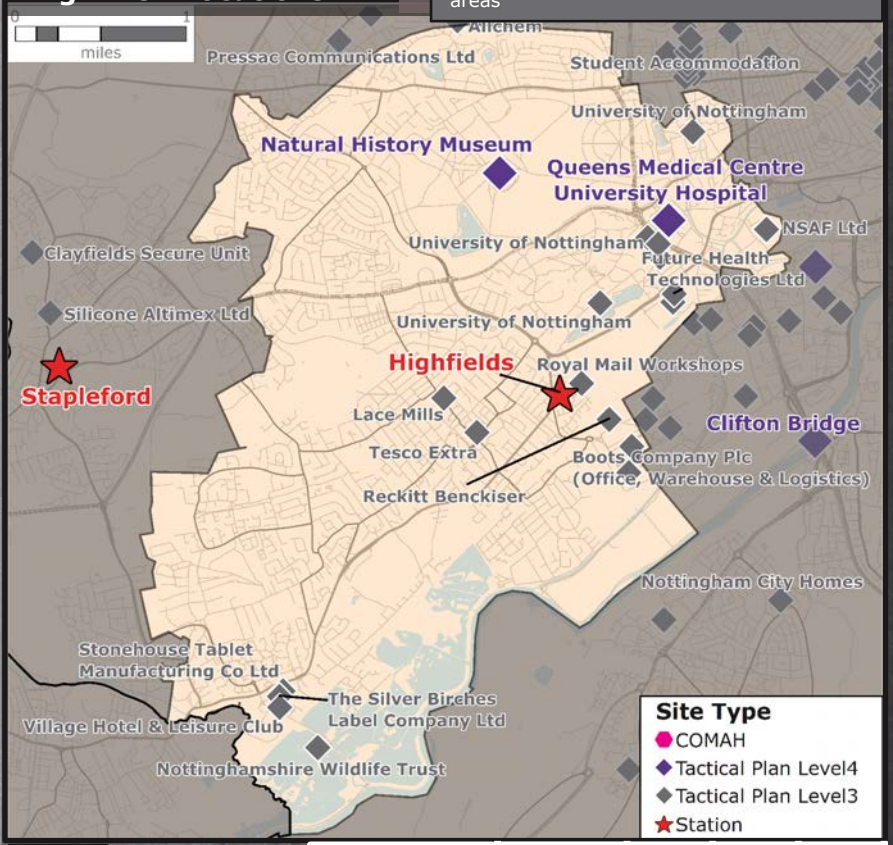
Station 29 is in Broxtowe District. It has one Wholetime pumping appliance. It is also home to a Specialist Rescue Unit.

Hassocks Lane
Beeston
Nottingham
NG9 2GQ
0115 838 8100

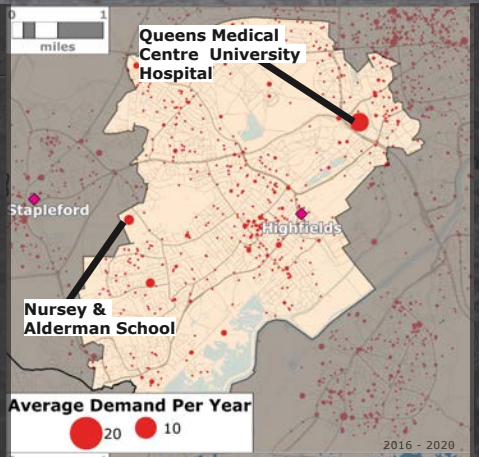
Population	Households	Commercial	Area
76,014	30,289	[illegible]	27.1Km²

High Risk Locations

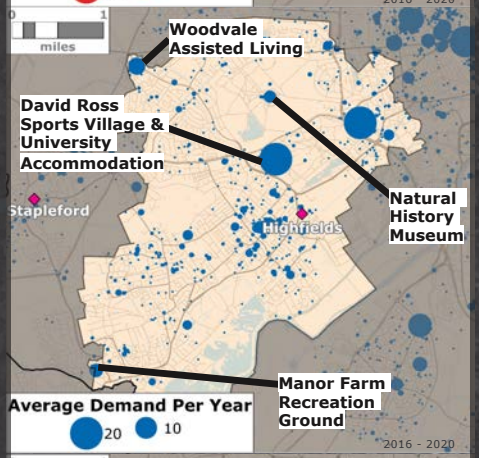
Station Grounds based on likely turnout areas



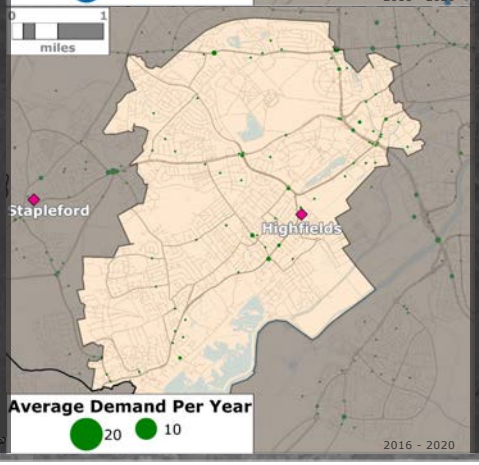
Fires



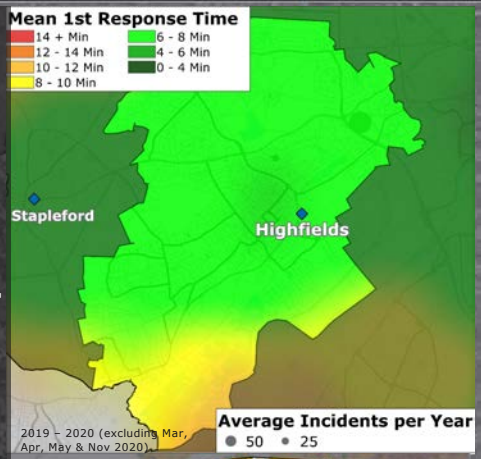
False Alarms



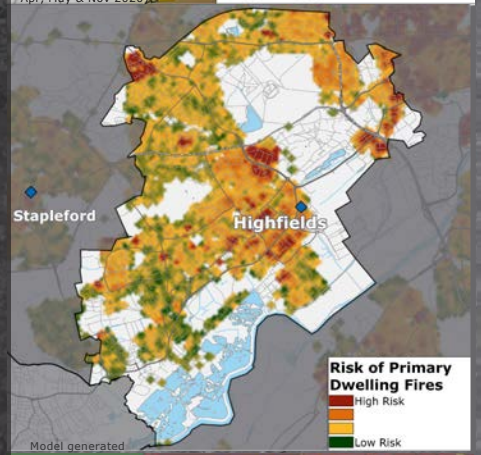
RTCs



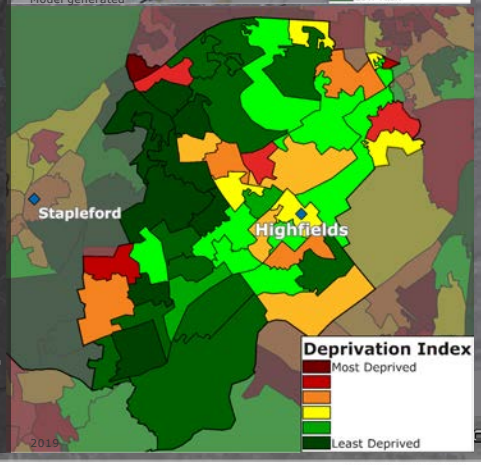
1st Response Time



Dwelling Fire Risk



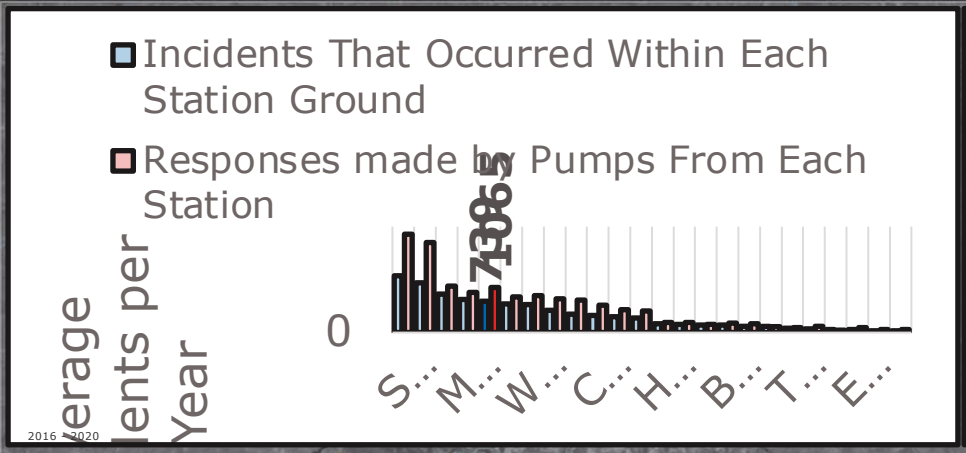
Deprivation

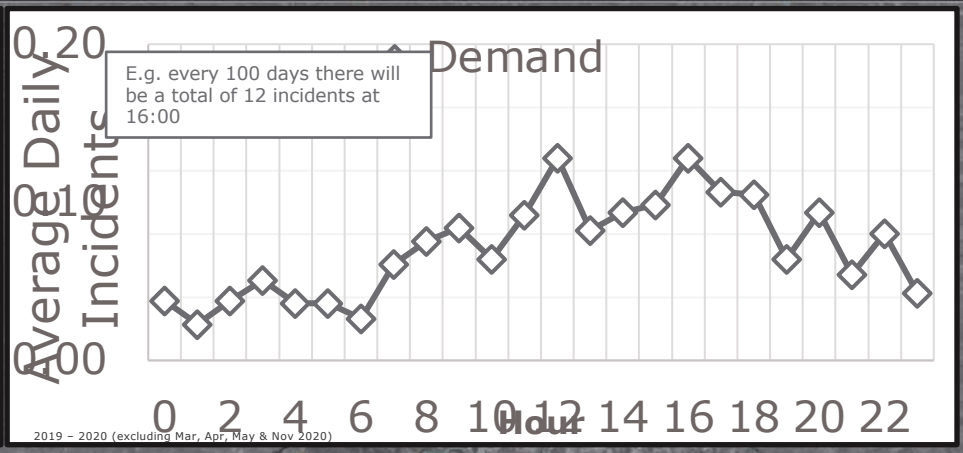


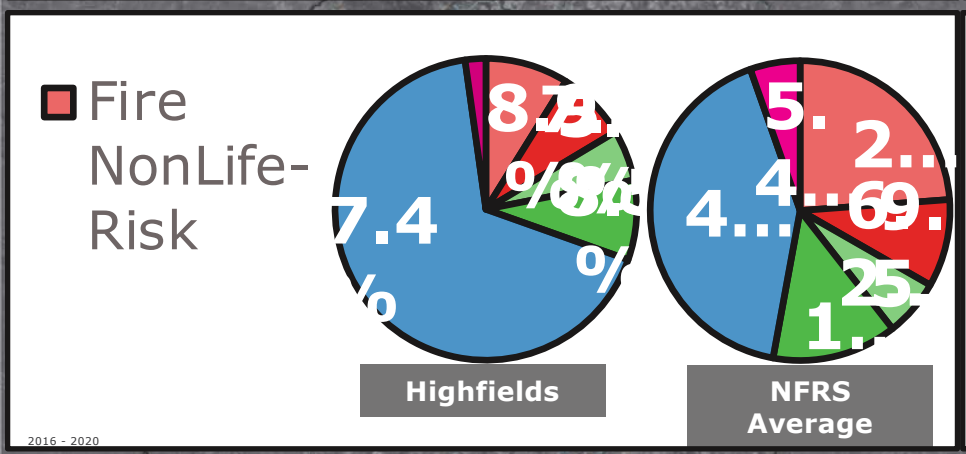
Type 2016 -2020	Fires	False Alarms	RTCs
Incidents Per Year	121	498	16

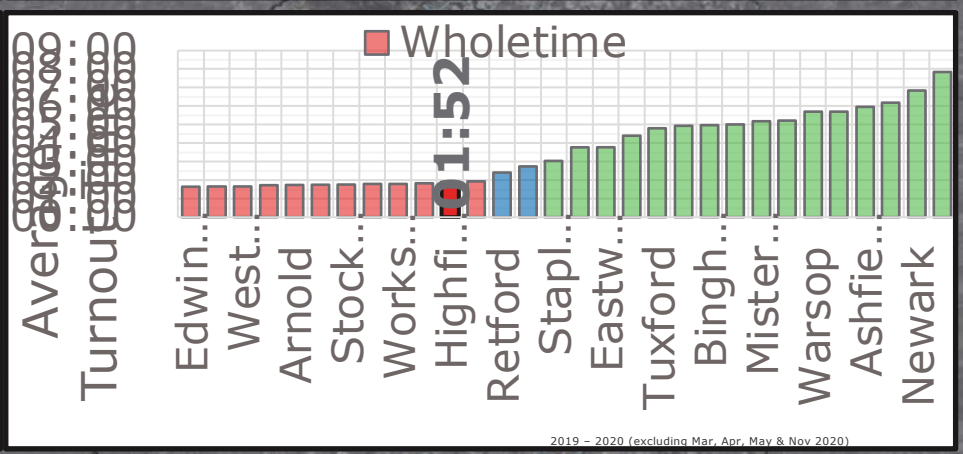
Average No. of incidents per year, within the station ground, by type. (Not Including Non-RTC Special Service.)

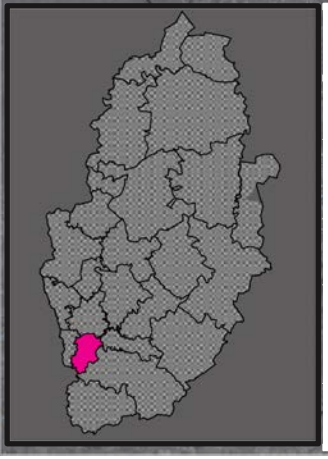
Date produced: 06 October 21



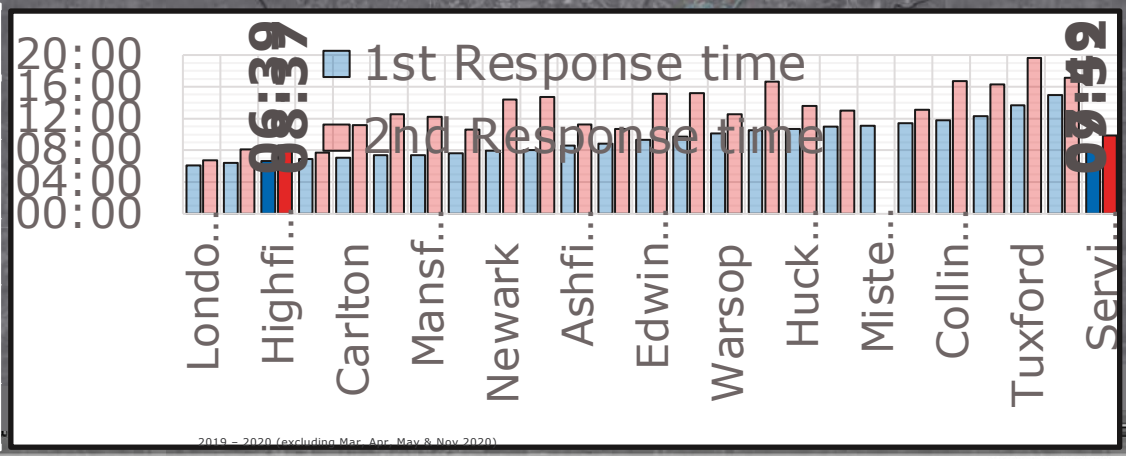








Ethnicity - 2011 Census	Population	Percentage
White	60,870	80.1%
Mixed/ multiple ethnic groups	2,221	2.9%
Asian/ Asian British	9,724	12.8%
Black/ African/ Caribbean/ Black British	1,931	2.5%
Other	1,268	1.7%



Hucknall Fire Station

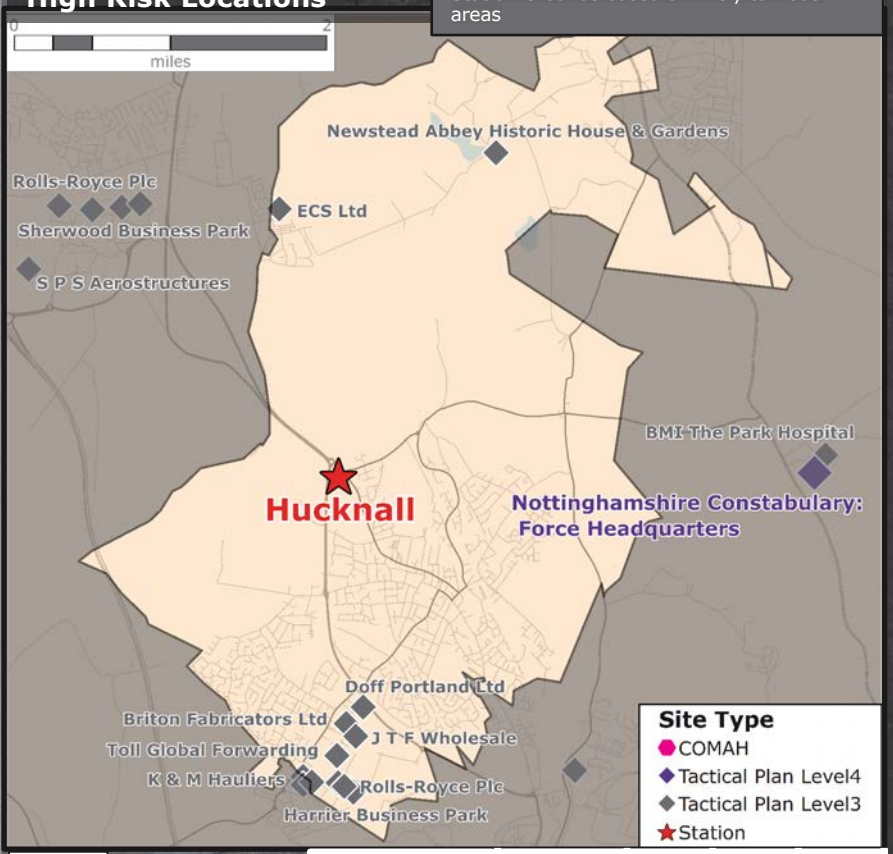
Station 25 is in Ashfield District. It has one On-Call pumping appliance.

Annesley Road
Hucknall
Nottingham
NG15 8AY
0115 838 8100

Population	Households	Commercial	Area
32,090	14,943	927 Premises	28.8Km²

High Risk Locations

Station Grounds based on likely turnout areas

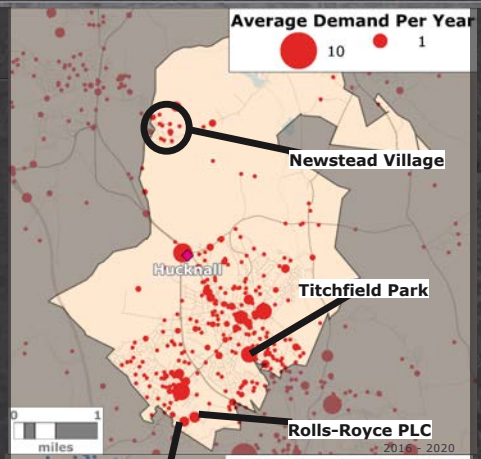


Average No. of incidents per year, within the station ground, by type. (Not Including Non-RTC Special Service.)

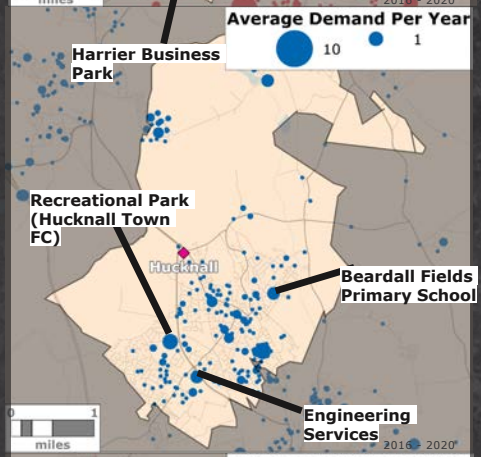
Type 2016 -2020	Fires	False Alarms	RTCs
Incidents Per Year	86	59	11

Date produced: 06 October 21

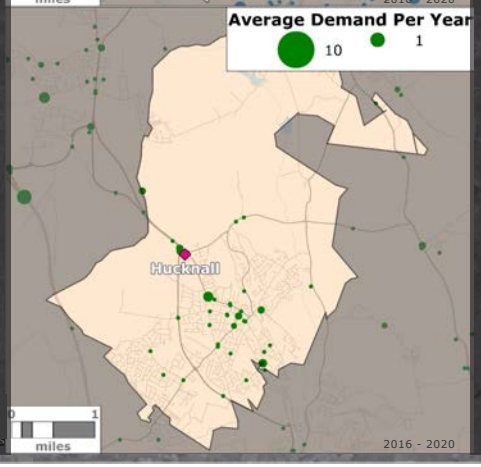
Fires



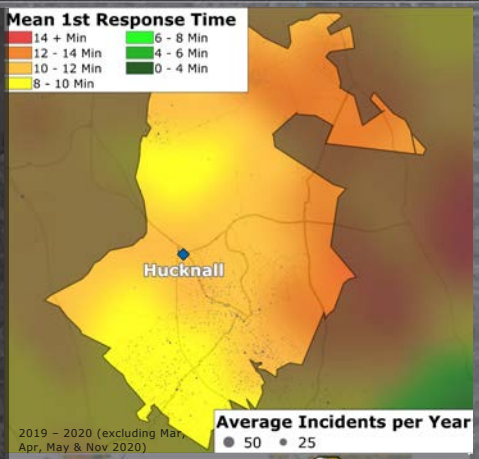
False Alarms



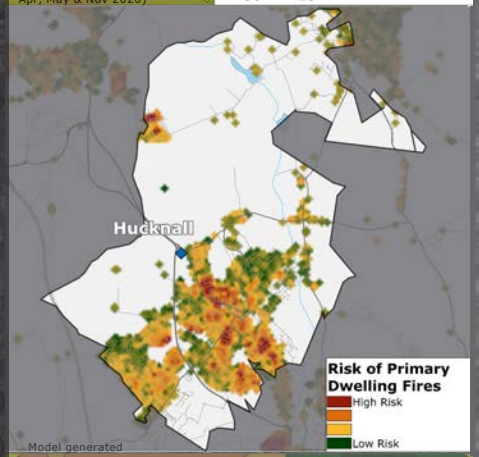
RTCs



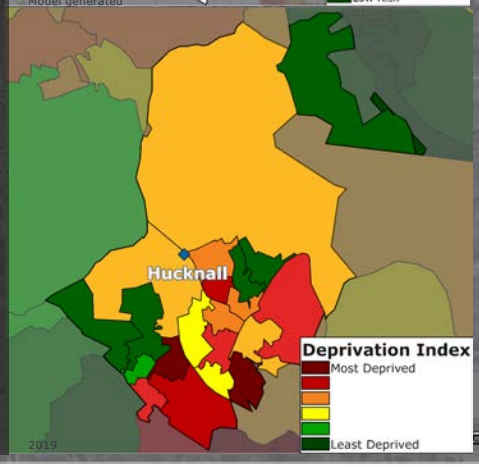
1st Response Time

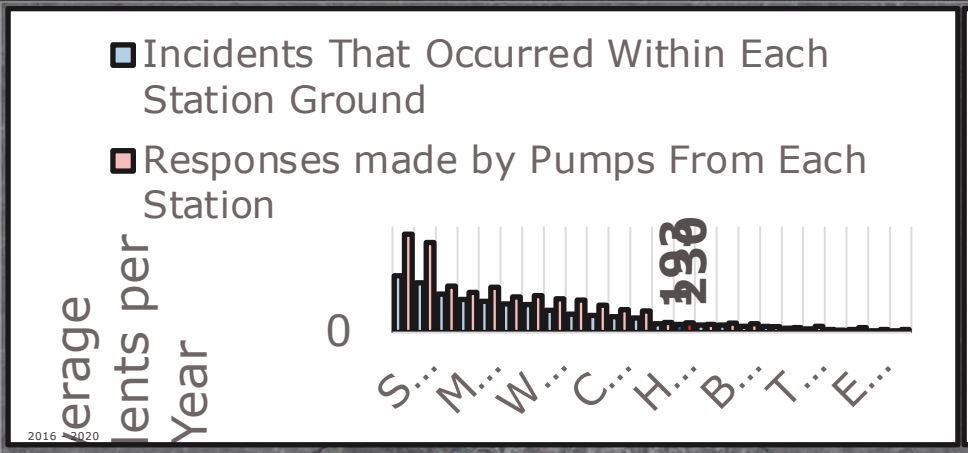


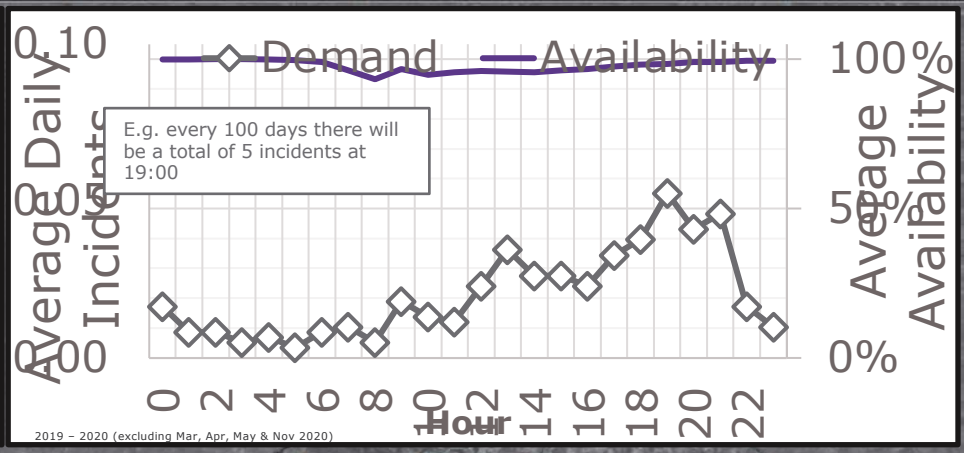
Dwelling Fire Risk

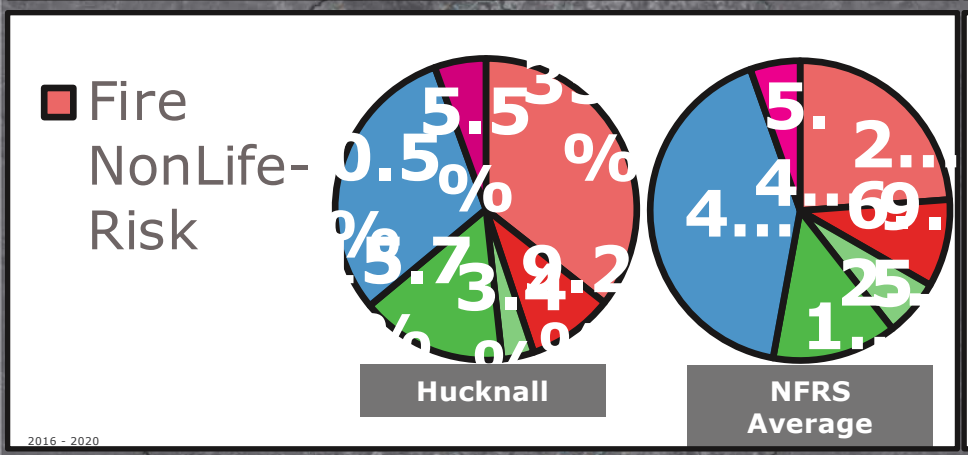


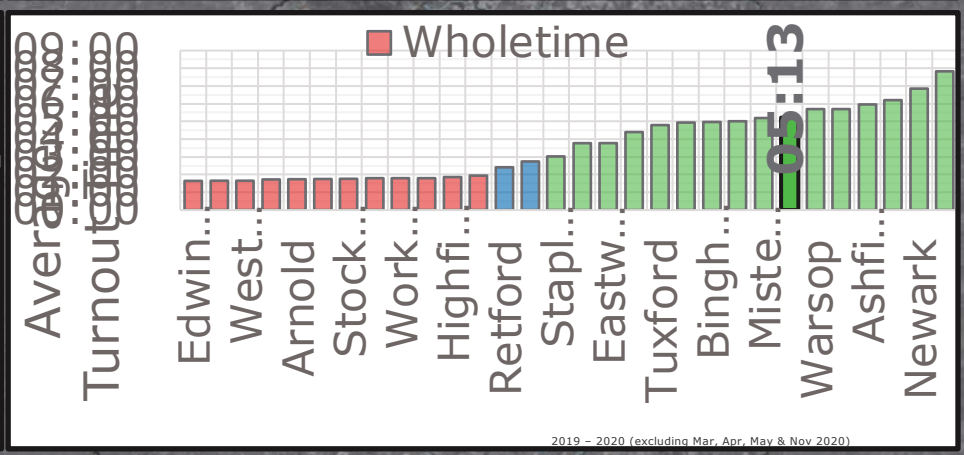
Deprivation

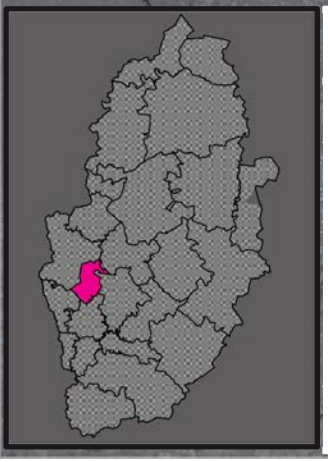




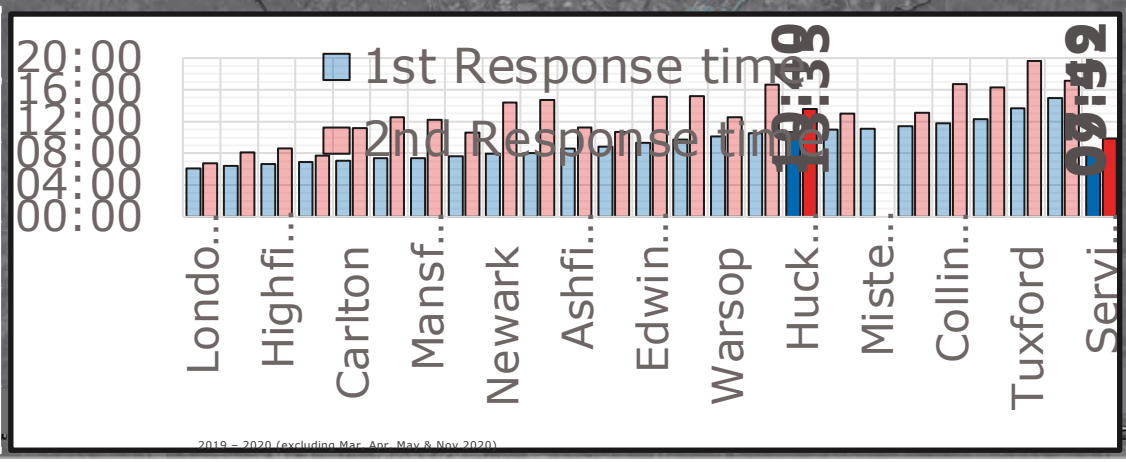








Ethnicity - 2011 Census	Population	Percentage
White	31,112	97.0%
Mixed/ multiple ethnic groups	378	1.2%
Asian/ Asian British	383	1.2%
Black/ African/ Caribbean/ Black British	186	0.6%
Other	31	0.1%



London Road Fire Station

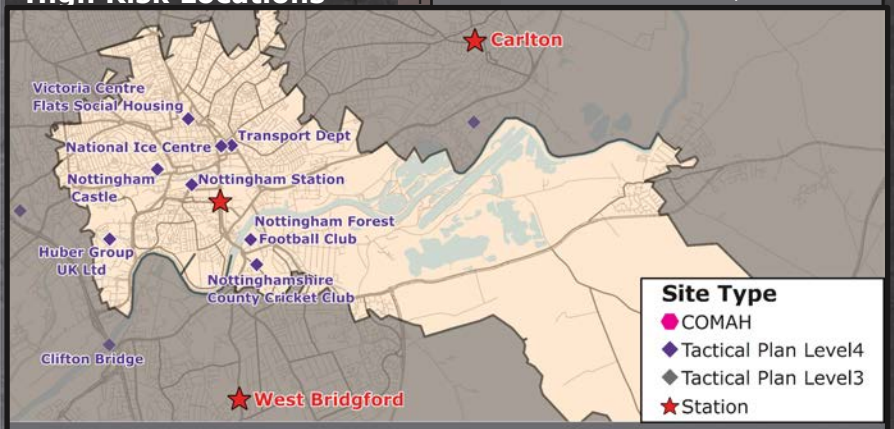
Station 3 is in the City of Nottingham. It has two Wholetime pumping appliances. It is also home to a Aerial Ladder Platform.

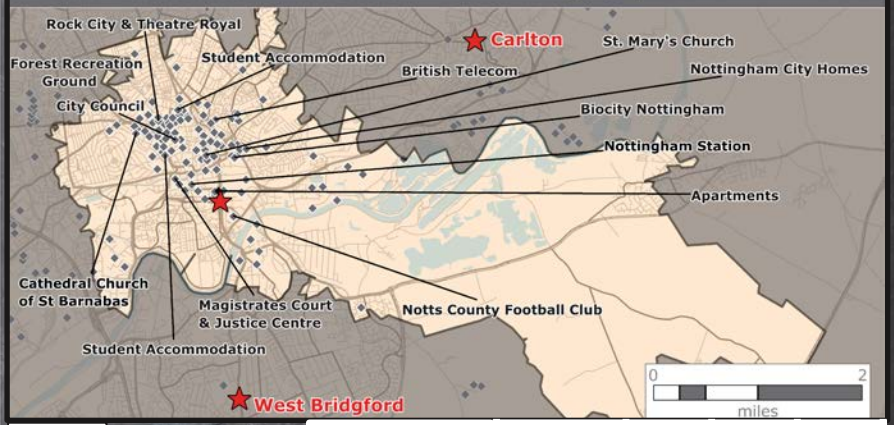
London Road
Nottingham
NG2 3BQ
0115 838 8100

Population	Households	Commercial	Area
81,915	39,668	7,333	34.4Km²

High Risk Locations

Station Grounds based on likely turnout





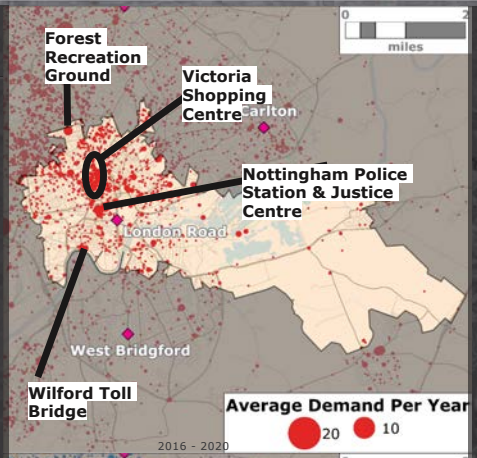
NOTTINGHAMSHIRE Fire & Rescue Service

Date produced: 06 October 21

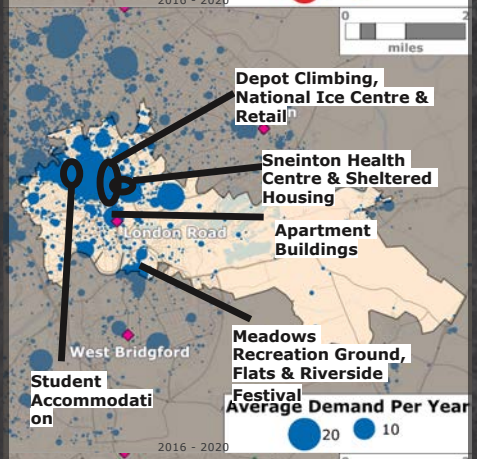
Average No. of incidents per year, within the station ground, by type. (Not Including Non-RTC Special Service.)

Type 2016 -2020	Fires	False Alarms	RTCs
Incidents Per Year	238	629	31

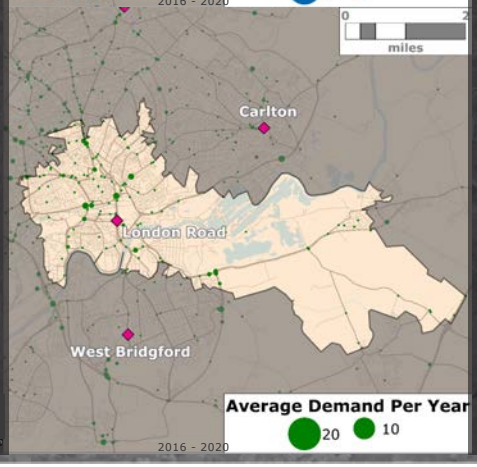
Fires



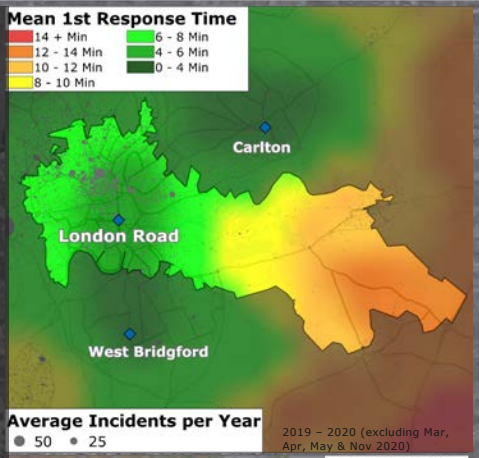
False Alarms



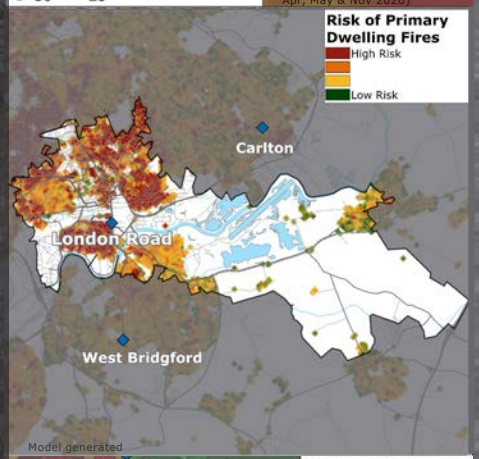
RTCs



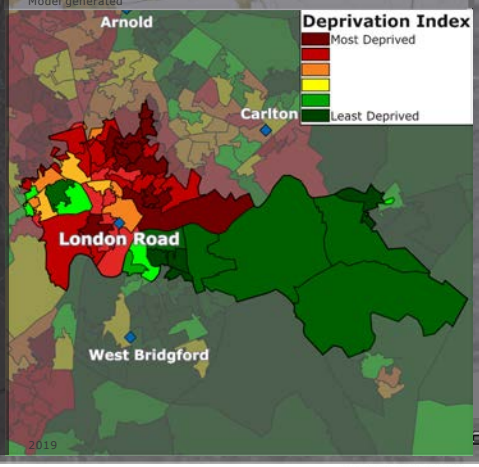
1st Response Time

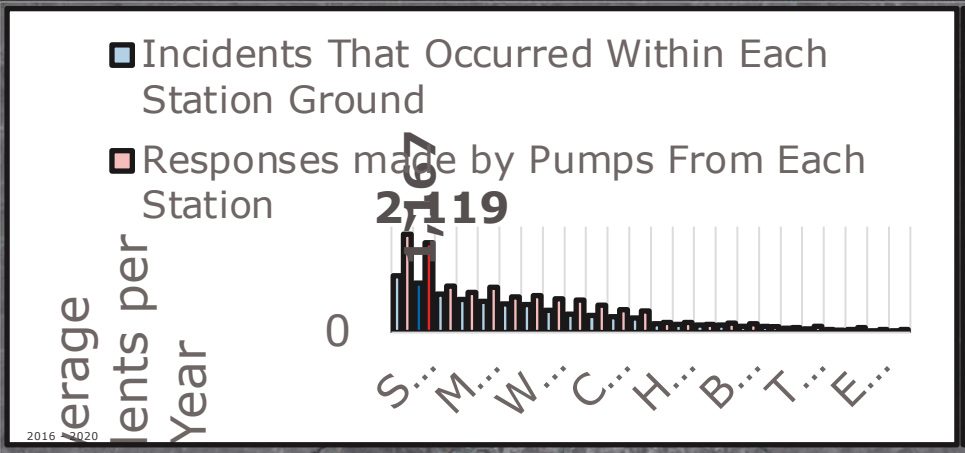


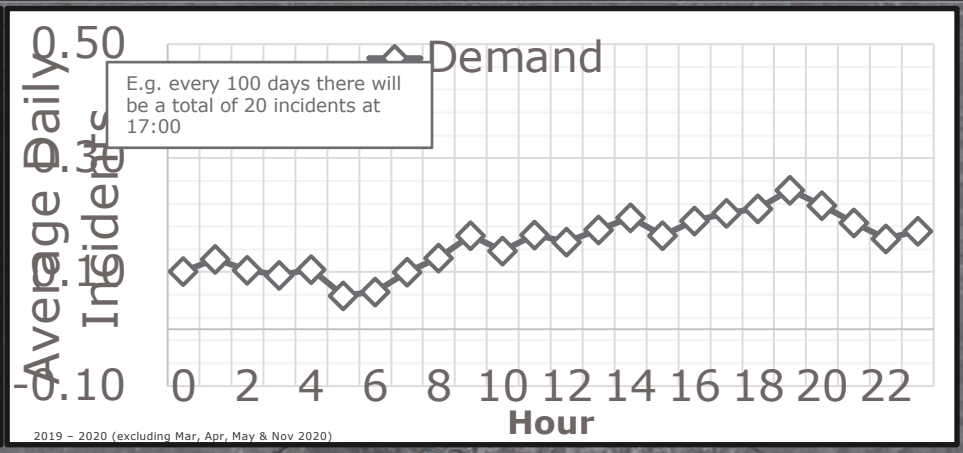
Dwelling Fire Risk

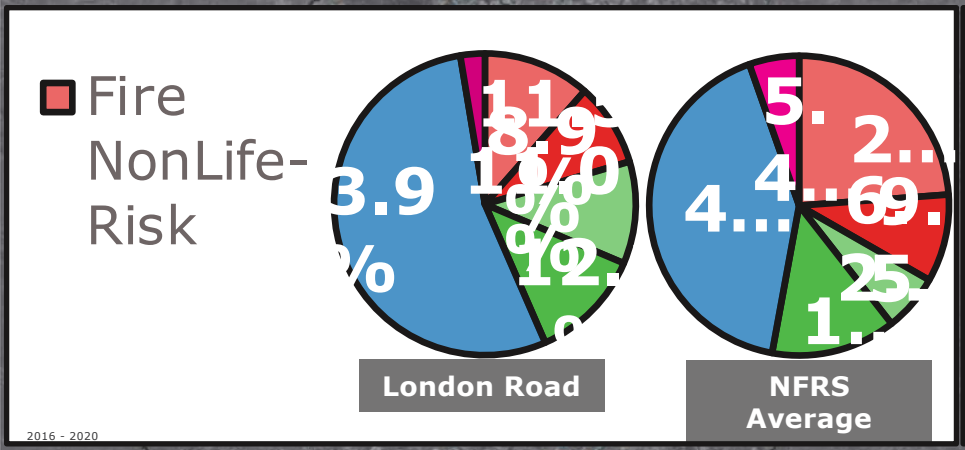


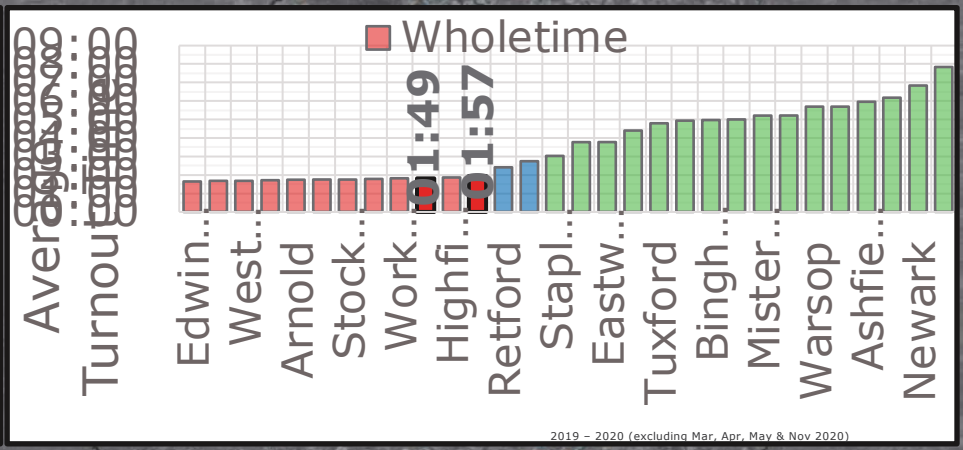
Deprivation

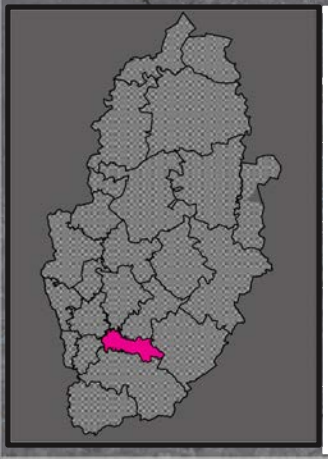




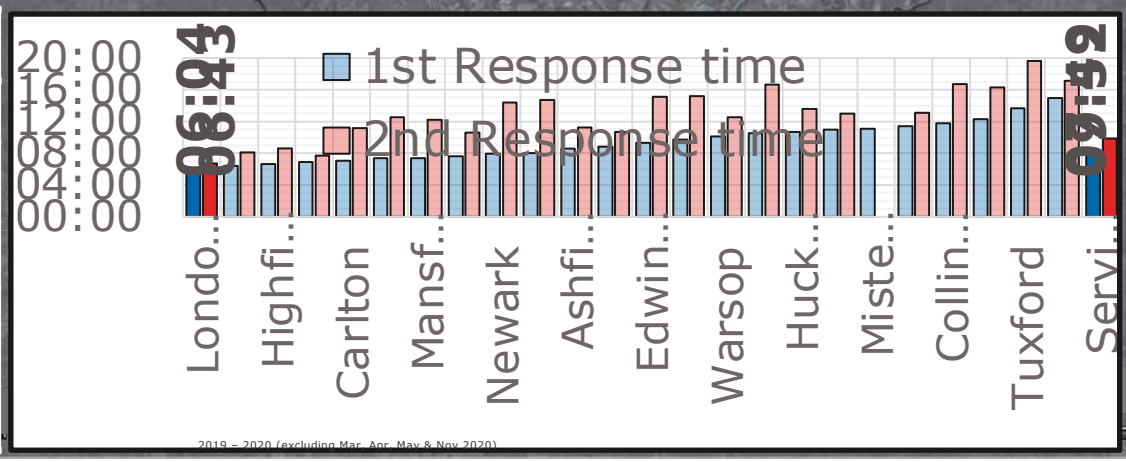








Ethnicity - 2011 Census	Population	Percentage
White	56,259	68.7%
Mixed/ multiple ethnic groups	5,962	7.3%
Asian/ Asian British	11,631	14.2%
Black/ African/ Caribbean/ Black British	6,526	8.0%
Other	1,537	1.9%



Mansfield Fire Station

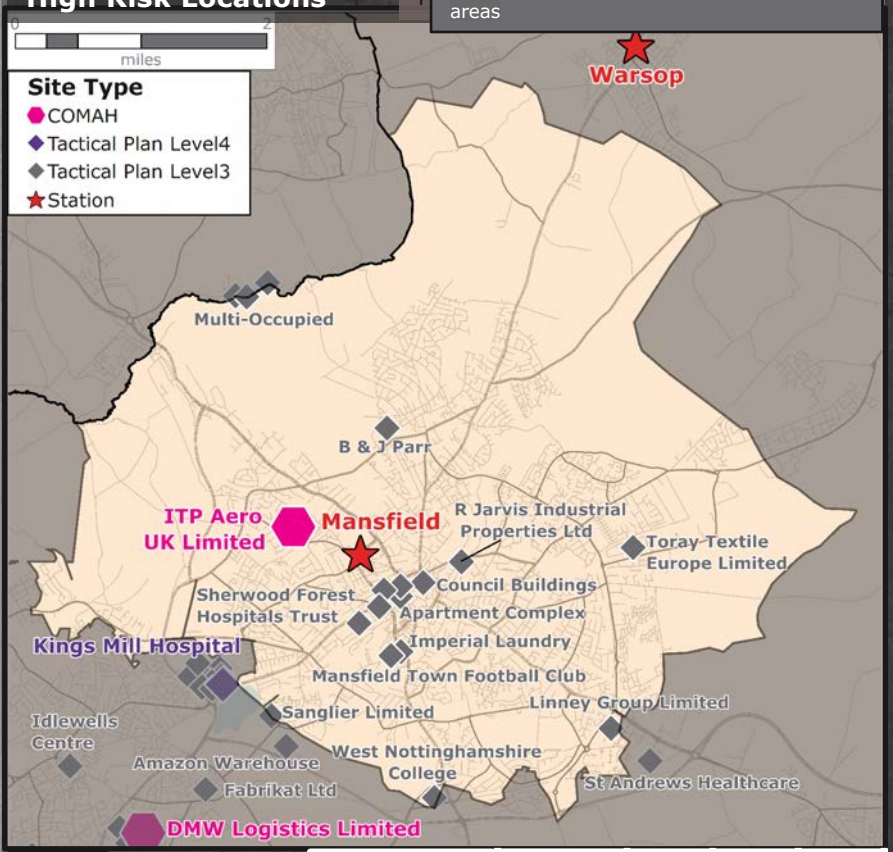
Station 1 is in the Mansfield District. It has one Wholetime pumping appliance. It is also home to a Aerial Ladder Platform and one Command Support Unit.

Rosemary Street
Mansfield
NG19 6AB
0115 838 8100

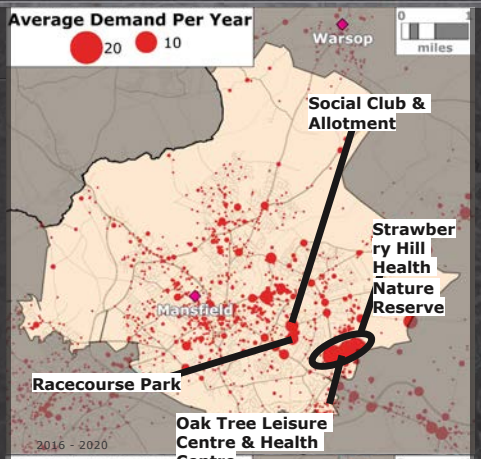
Population	Households	Commercial	Area
93,026	41,762	3,544	53.7Km²

High Risk Locations

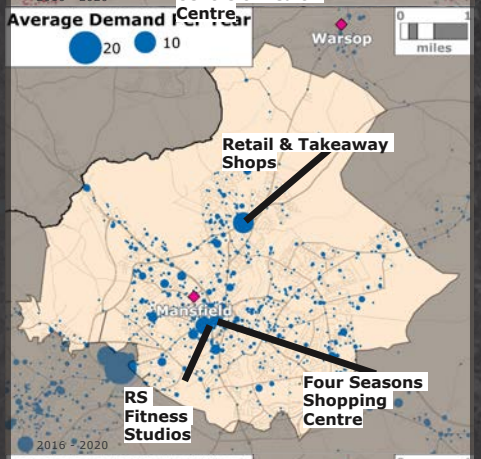
Station Grounds based on likely turnout areas



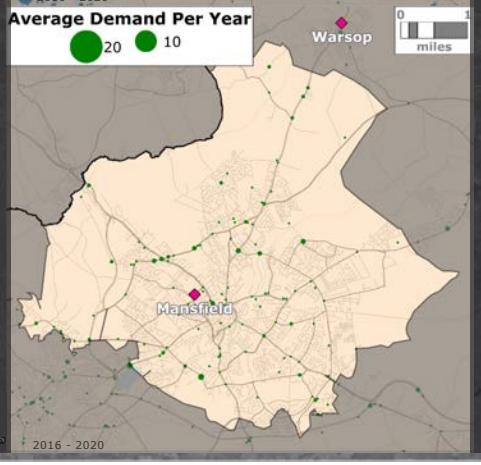
Fires



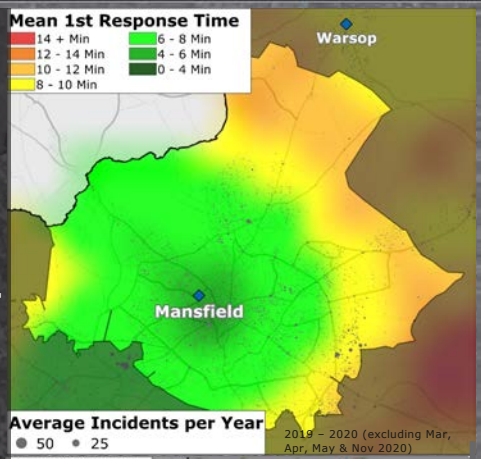
False Alarms



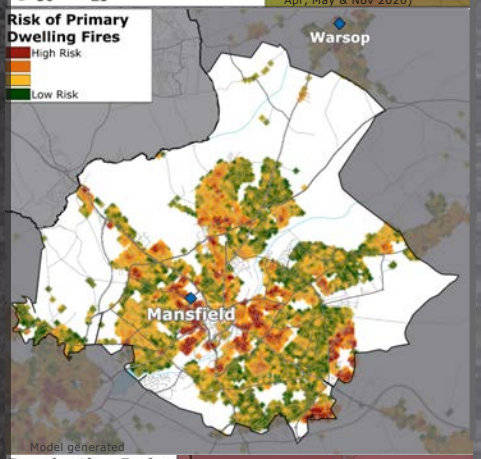
RTCs



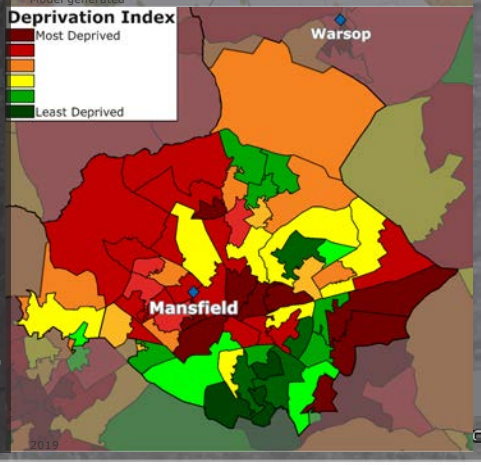
1st Response Time



Dwelling Fire Risk



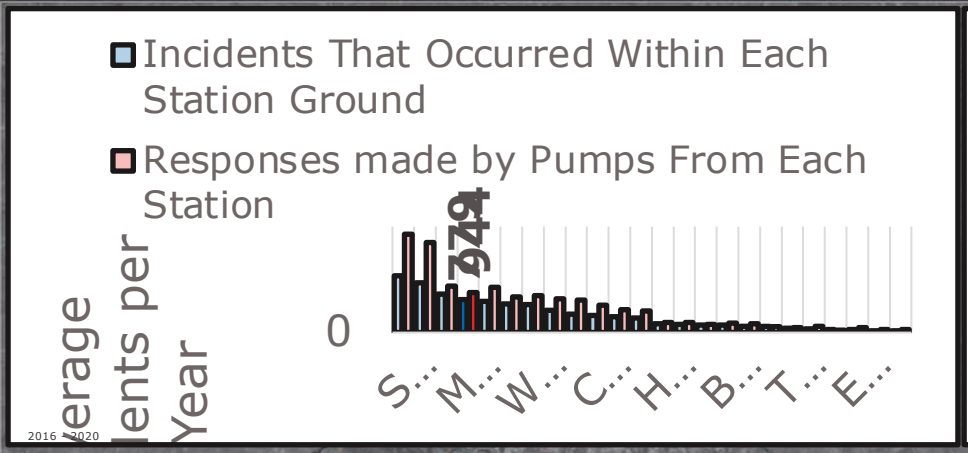
Deprivation

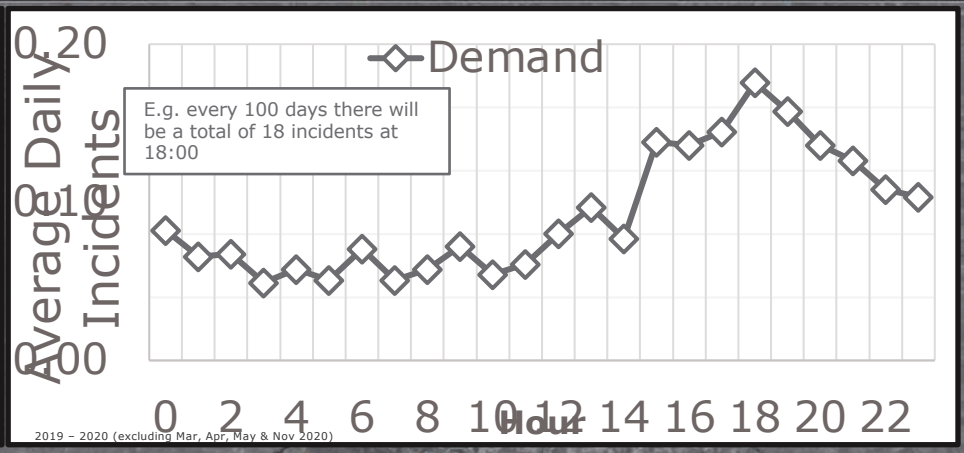


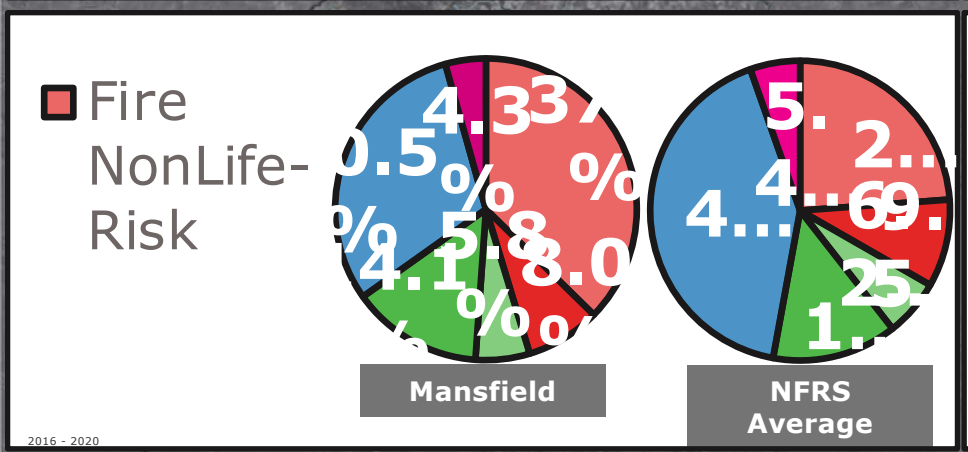
Date produced: 06 October 21

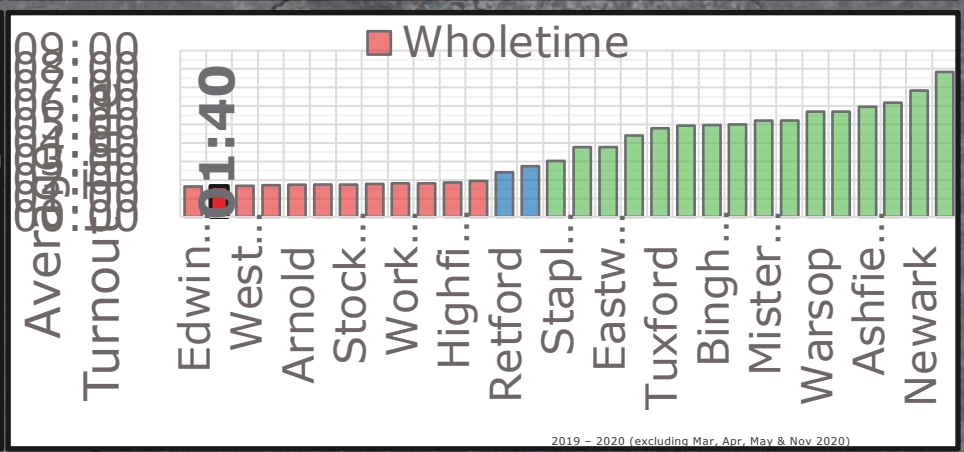
Average No. of incidents per year, within the station ground, by type. (Not Including Non-RTC Special Service.)

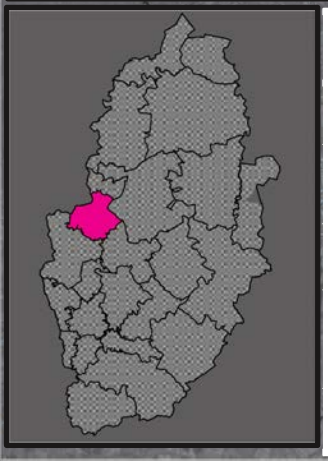
Type 2016 -2020	Fires	False Alarms	RTCs
Incidents Per Year	353	237	34



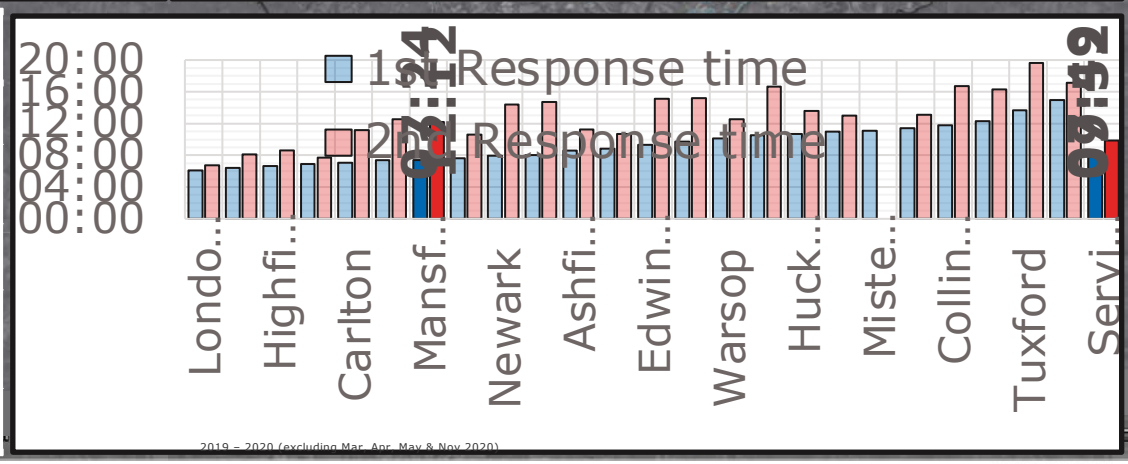








Ethnicity - 2011 Census	Population	Percentage
White	90,280	97.0%
Mixed/ multiple ethnic groups	1,025	1.1%
Asian/ Asian British	1,216	1.3%
Black/ African/ Caribbean/ Black British	365	0.4%
Other	140	0.2%



Misterton Fire Station

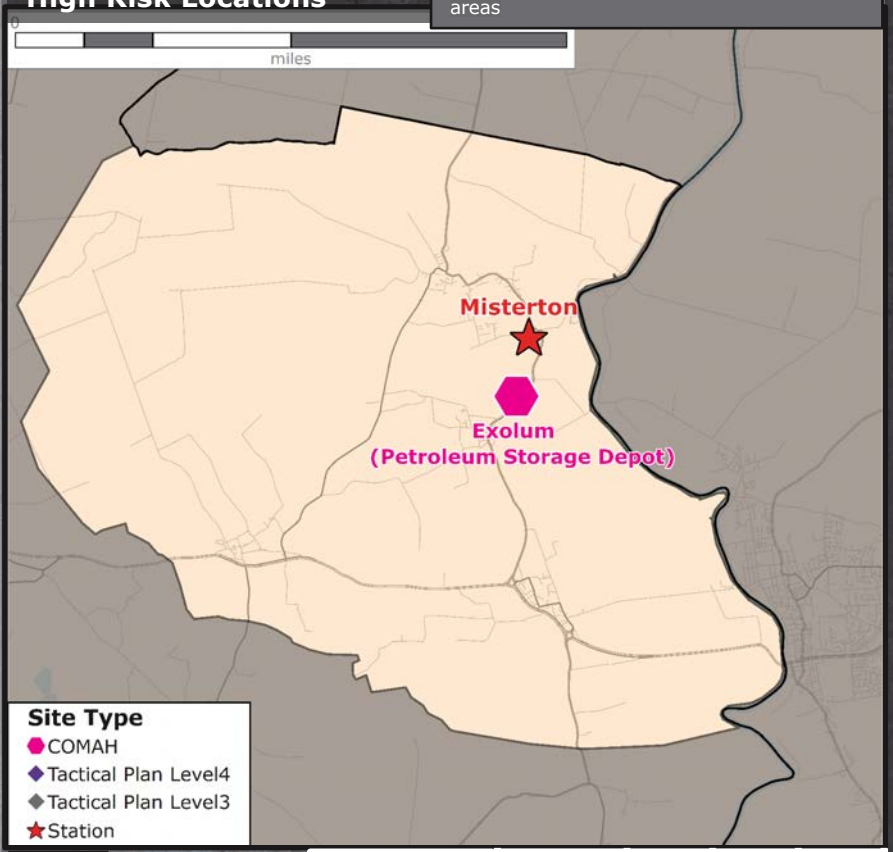
Station 11 is in Bassetlaw District. It has one On-Call pumping appliance.

Fox Covert Lane
Misterton
Doncaster
DN10 4DL
0115 838 8100

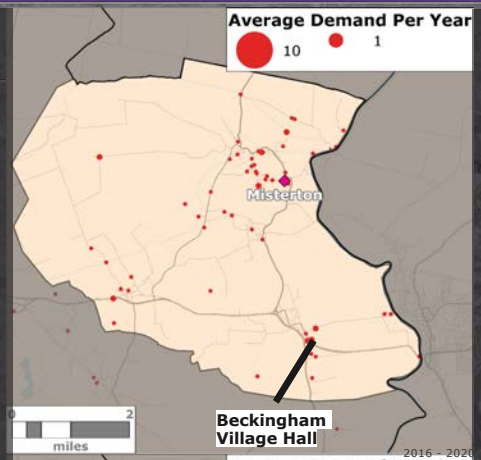
Population	Households	Commercial	Area
5,451	2,172	[illegible]	68.9Km²

High Risk Locations

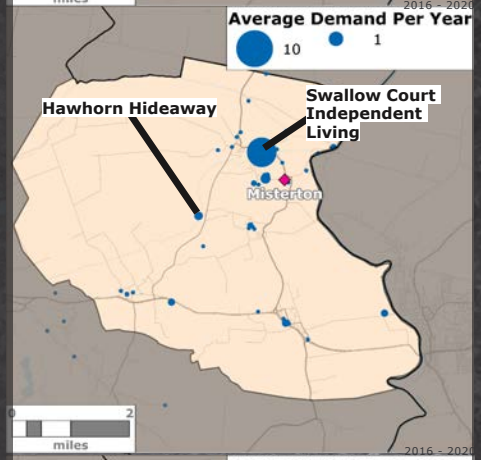
Station Grounds based on likely turnout areas



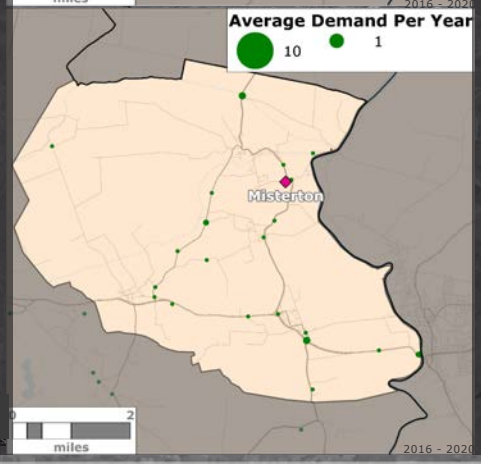
Fires



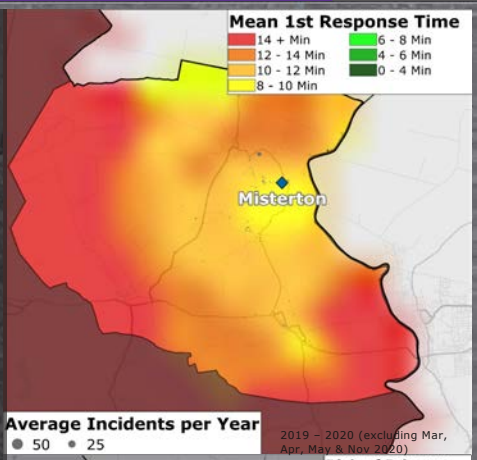
False Alarms



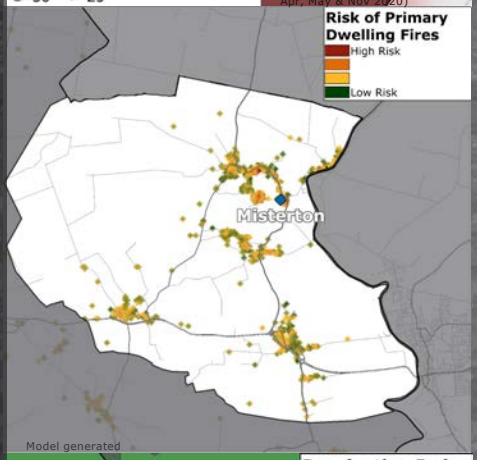
RTCs



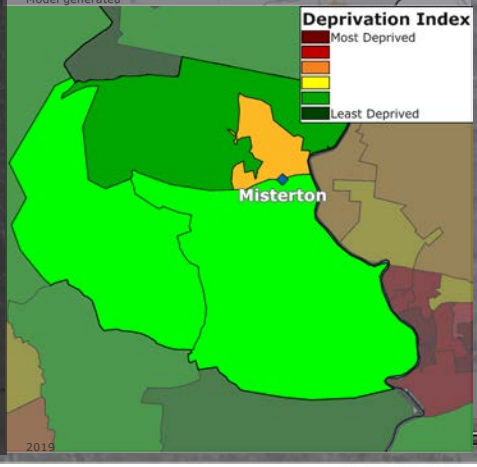
1st Response Time



Dwelling Fire Risk



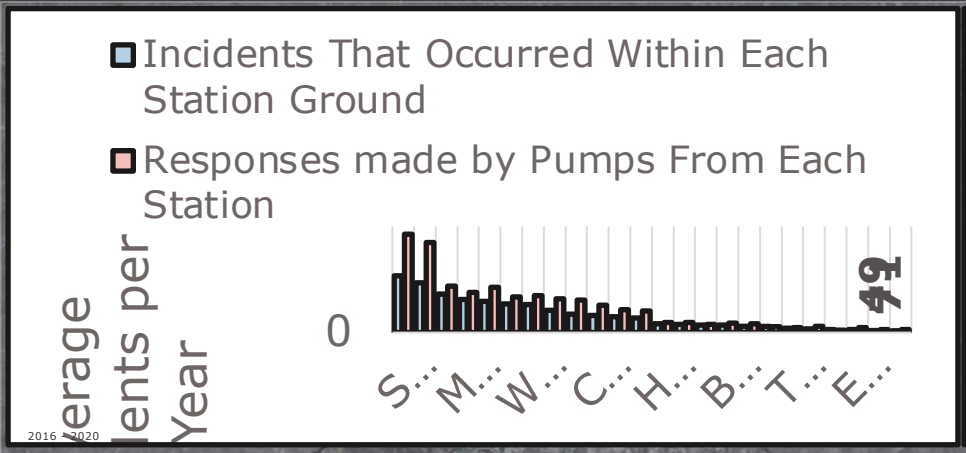
Deprivation

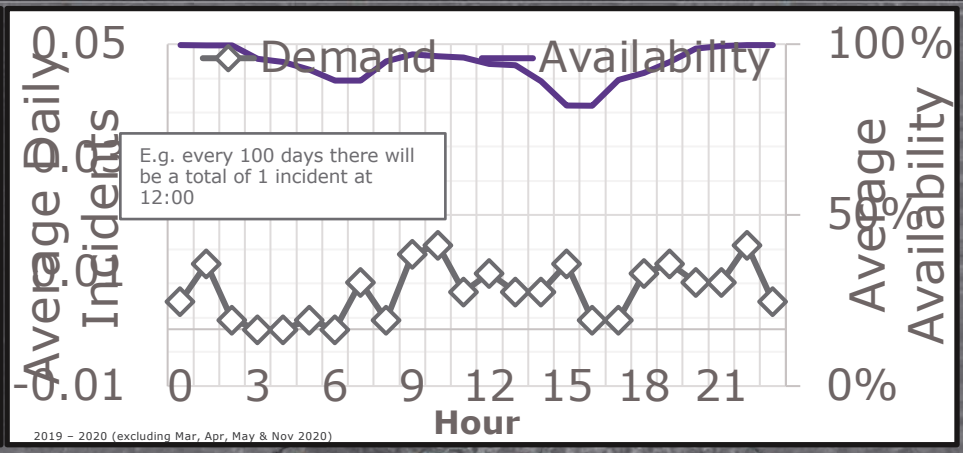


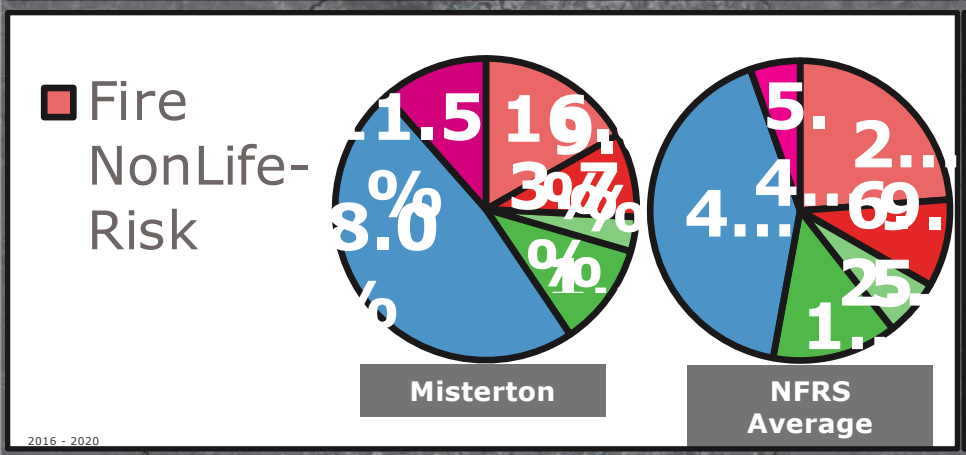
Average No. of incidents per year, within the station ground, by type. (Not Including Non-RTC Special Service.)

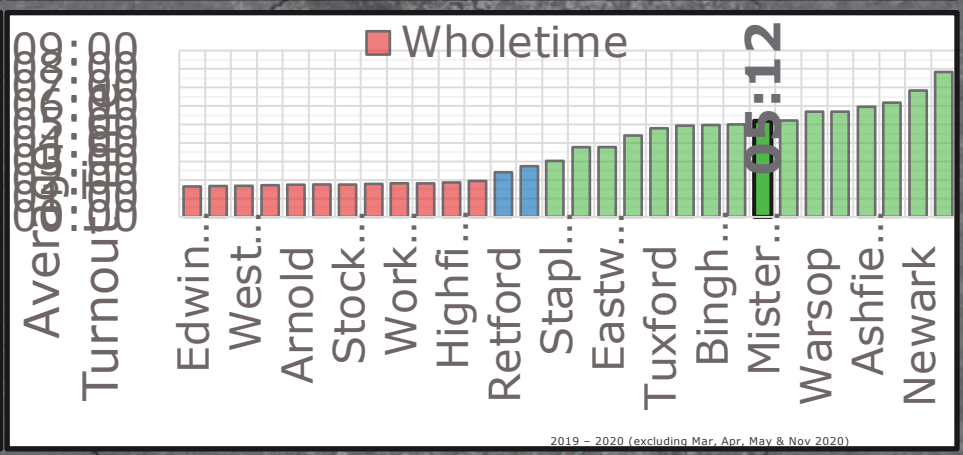
Type 2016 -2020	Fires	False Alarms	RTCs
Incidents Per Year	13	23	6

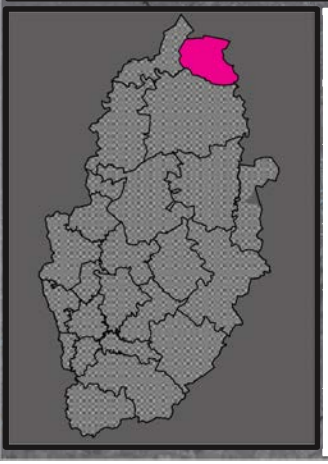
Date produced: 06 October 21



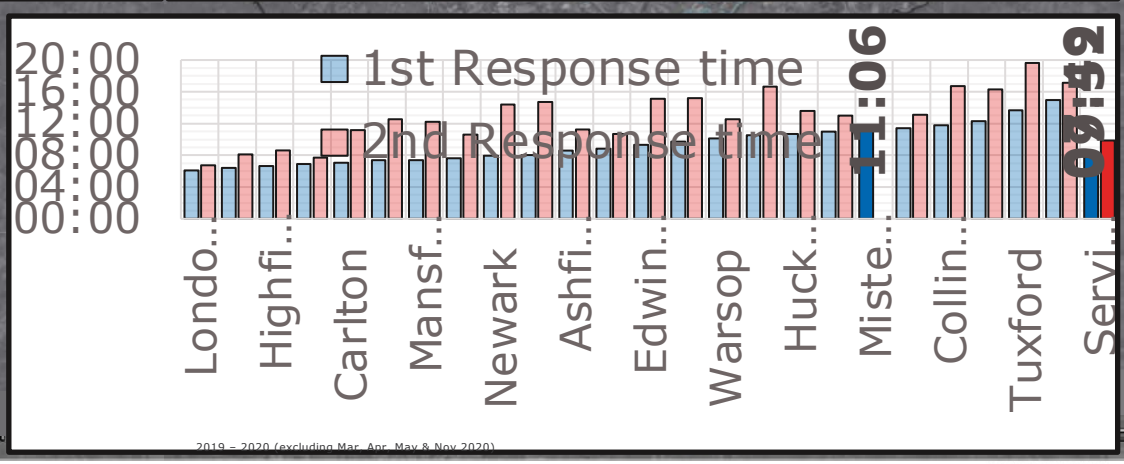








Ethnicity - 2011 Census	Population	Percentage
White	5,408	99.2%
Mixed/ multiple ethnic groups	14	0.3%
Asian/ Asian British	10	0.2%
Black/ African/ Caribbean/ Black British	17	0.3%
Other	2	0.0%



Newark Fire Station

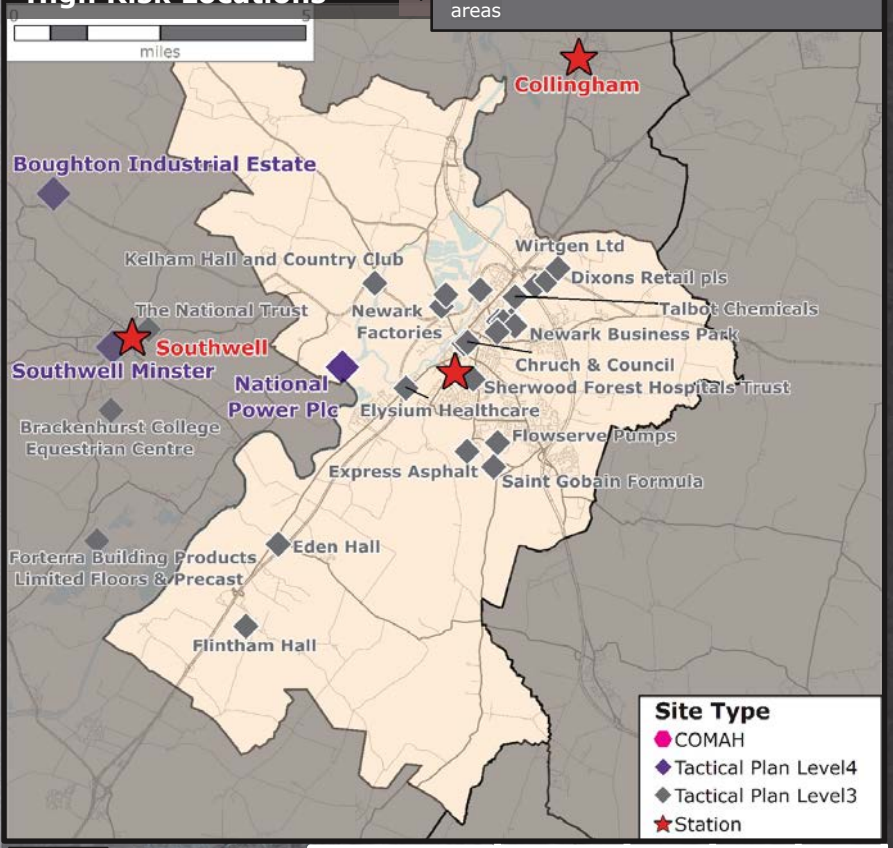
Station 16 is in Newark and Sherwood District. It has one Wholetime and one On-Call pumping appliance. It is also home to a Specialist Rescue Unit.

Boundary Road
Newark
Nottinghamshire
NG24 4A
0115 838 8100

Population	Households	Commercial	Area
49,814	22,529	2,975	181.2Km²

High Risk Locations

Station Grounds based on likely turnout areas

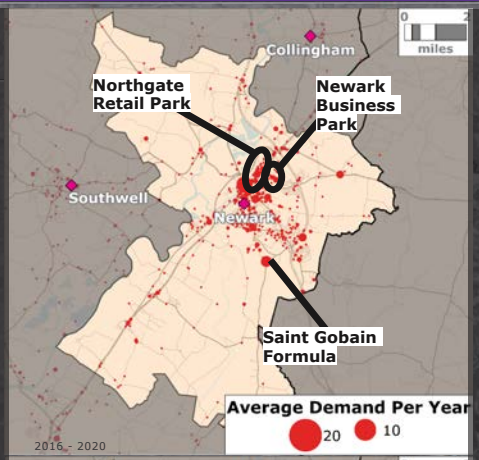


Type 2016 -2020	Fires	False Alarms	RTCs
Incidents Per Year	158	132	38

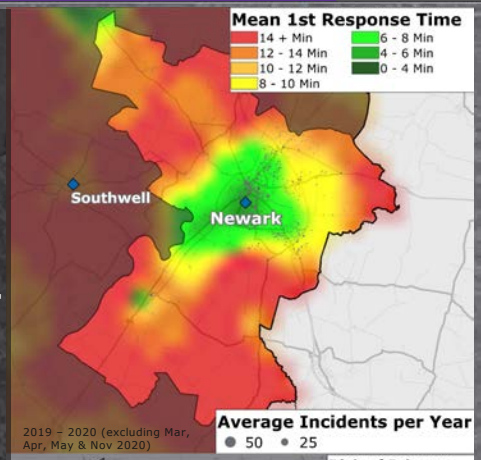
Average No. of incidents per year, within the station ground, by type. (Not Including Non-RTC Special Service.)

Date produced: 06 October 21

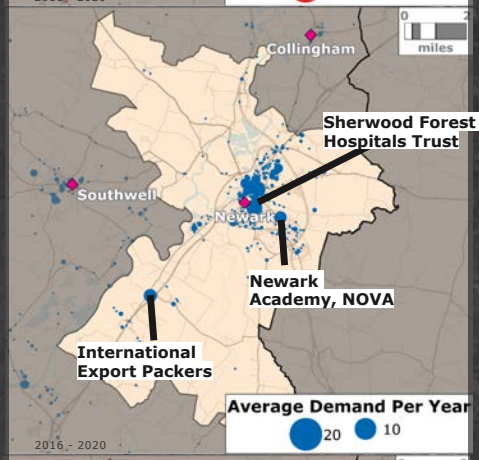
Fires



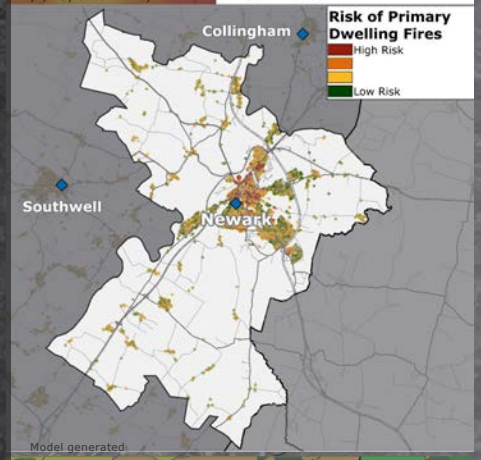
1st Response Time



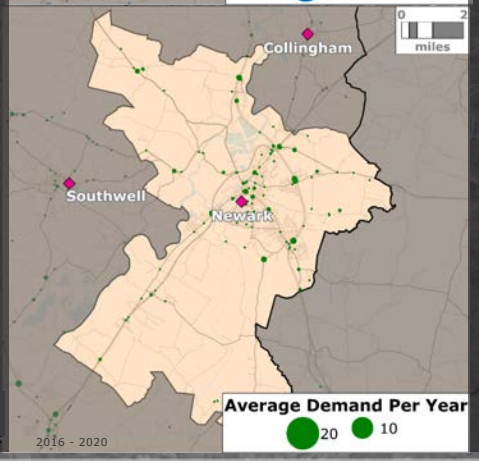
False Alarms



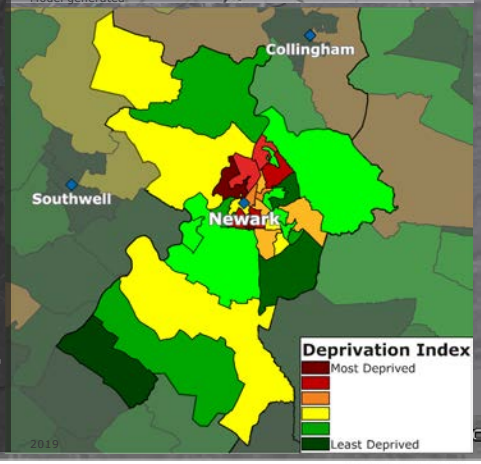
Dwelling Fire Risk

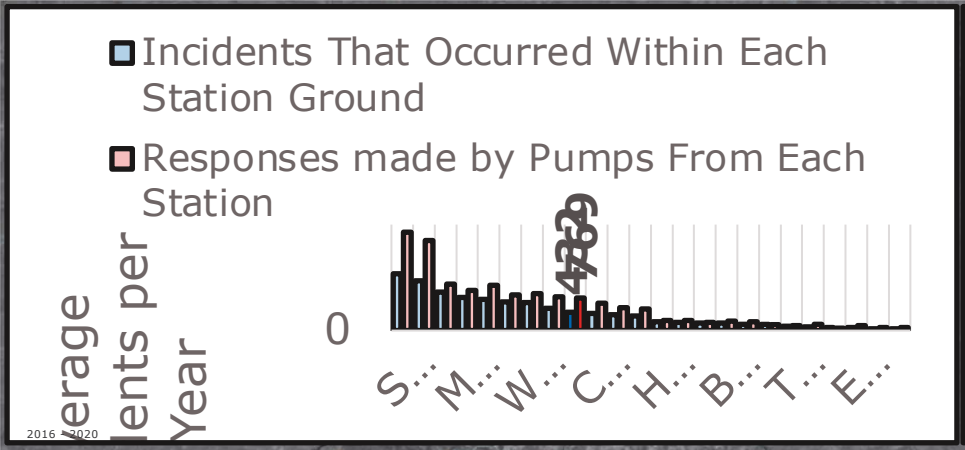


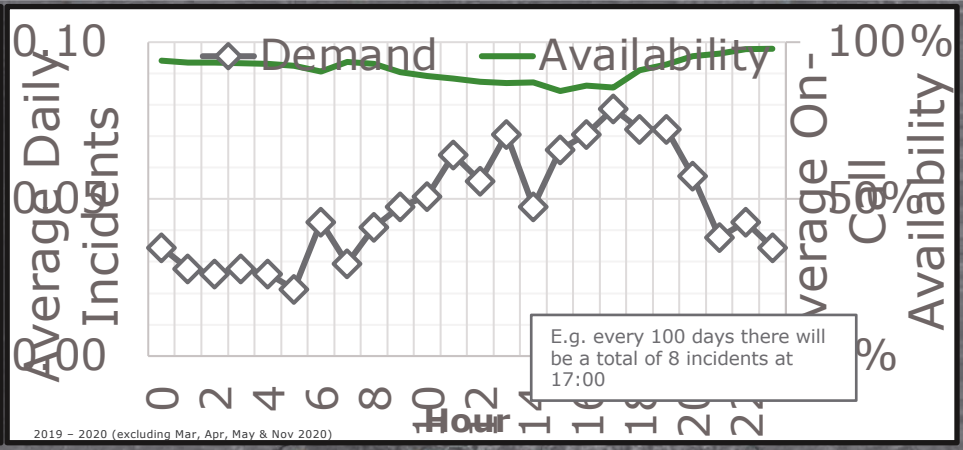
RTCs

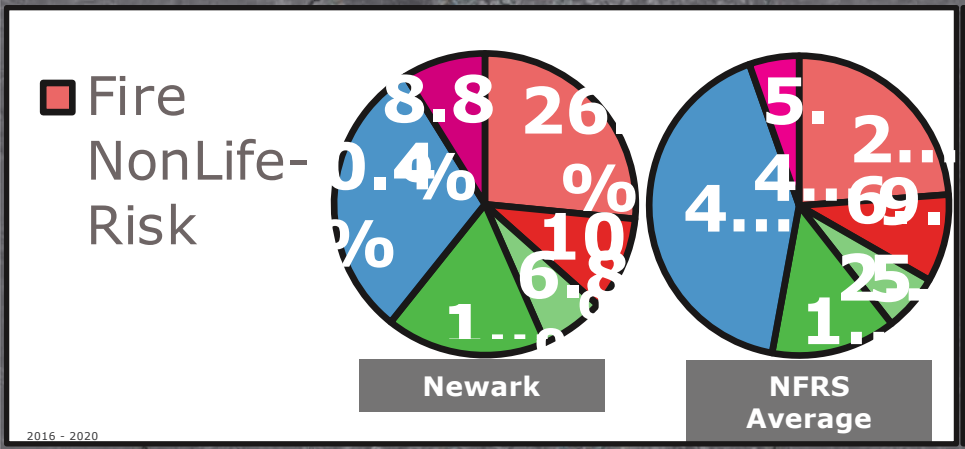


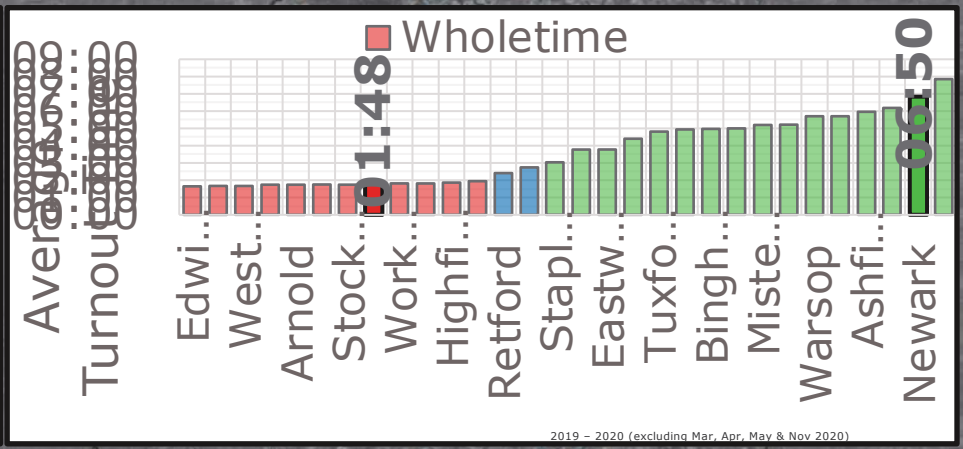
Deprivation

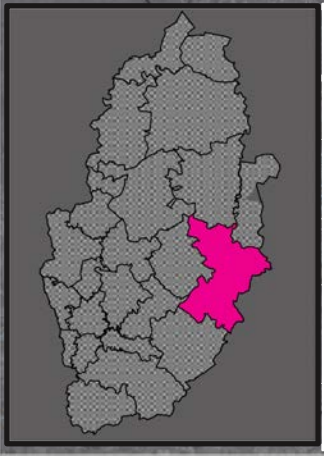




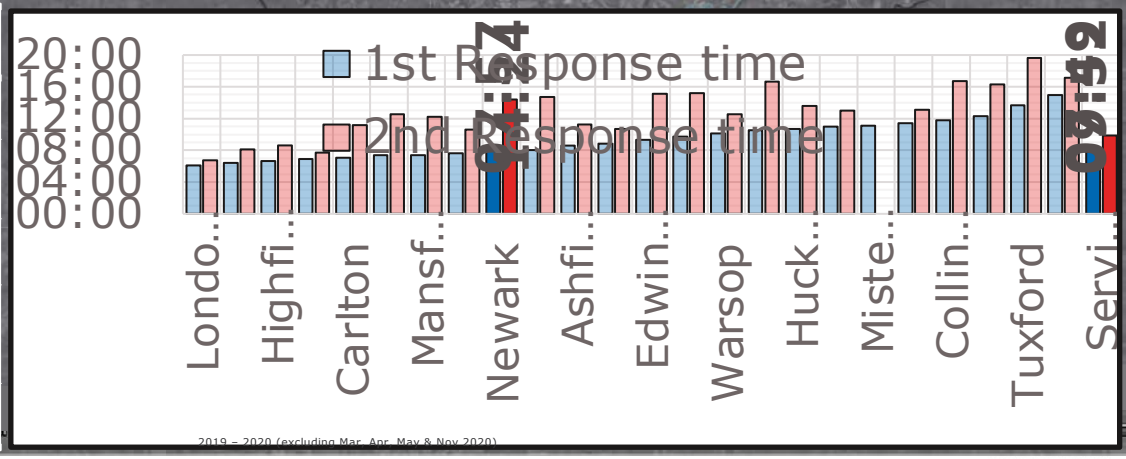








Ethnicity - 2011 Census	Population	Percentage
White	48,351	97.1%
Mixed/ multiple ethnic groups	579	1.2%
Asian/ Asian British	600	1.2%
Black/ African/ Caribbean/ Black British	204	0.4%
Other	80	0.2%



Retford Fire Station

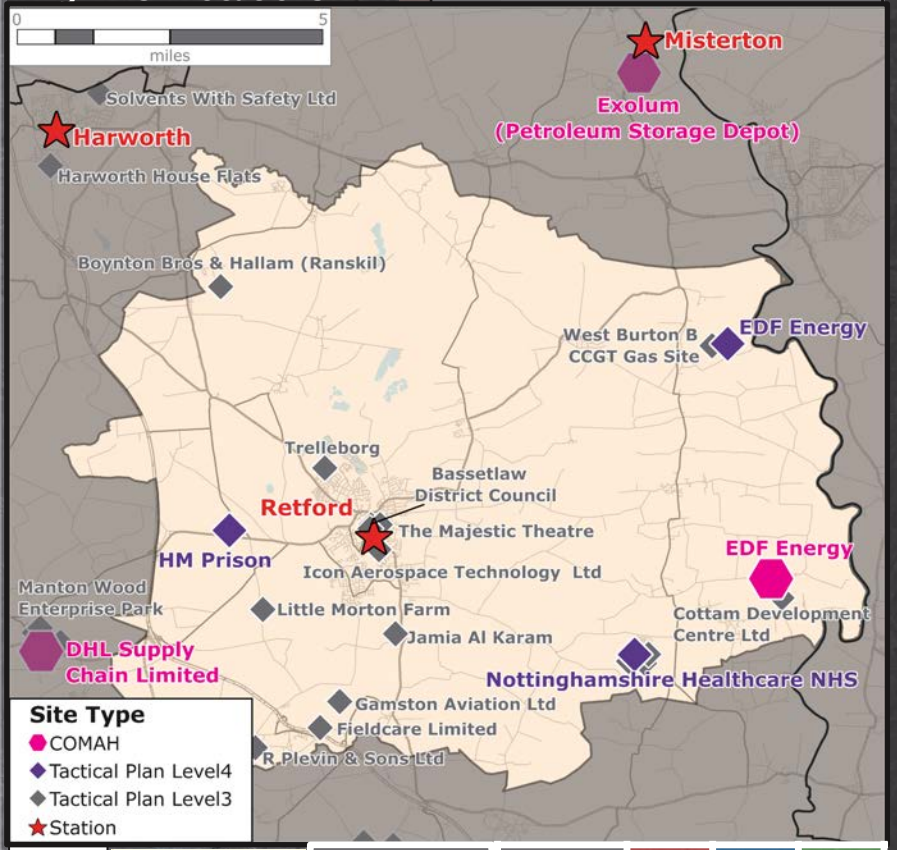
Station 12 is in Bassetlaw District. It has one Day-Crewed and one On-Call pumping appliance.

Wharf Road
Retford
DN22 6EN
0115 838 8100

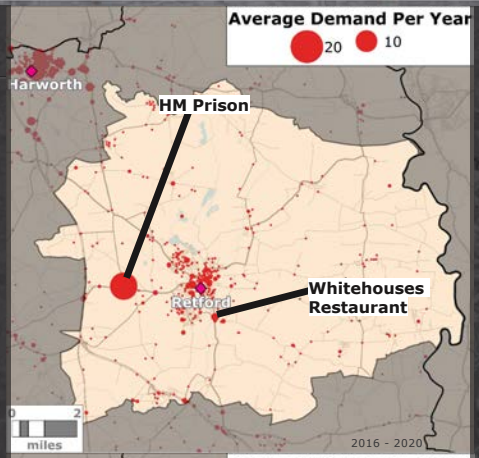
Population	Households	Commercial	Area
35,217	14,096	1,933	243.9Km²

High Risk Locations

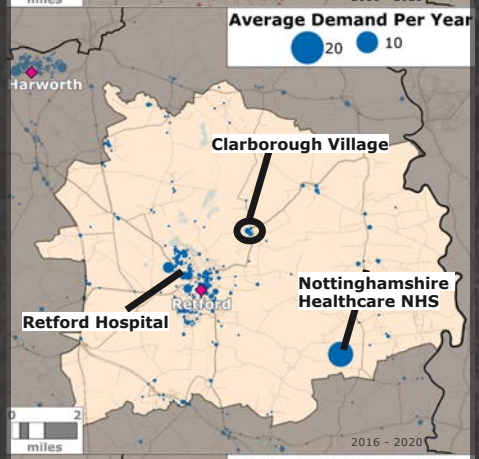
Station Grounds based on likely turnout



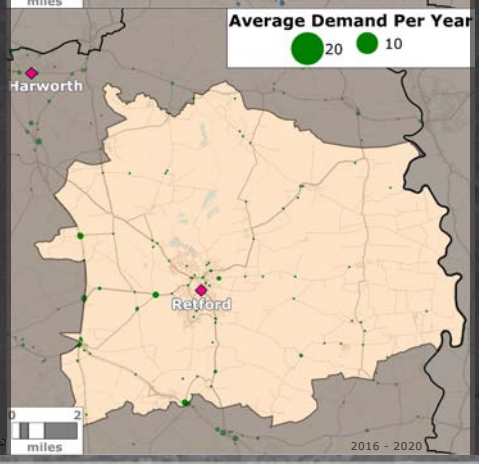
Fires



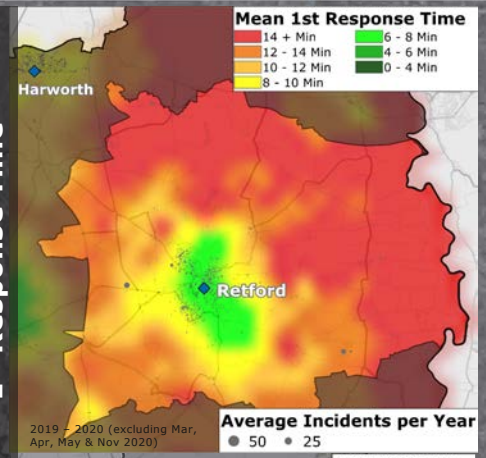
False Alarms



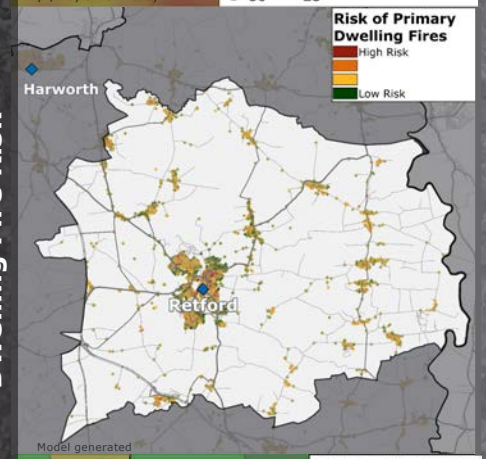
RTCs



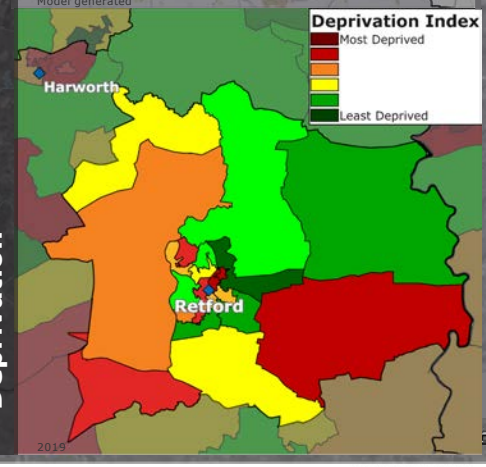
1st Response Time



Dwelling Fire Risk



Deprivation

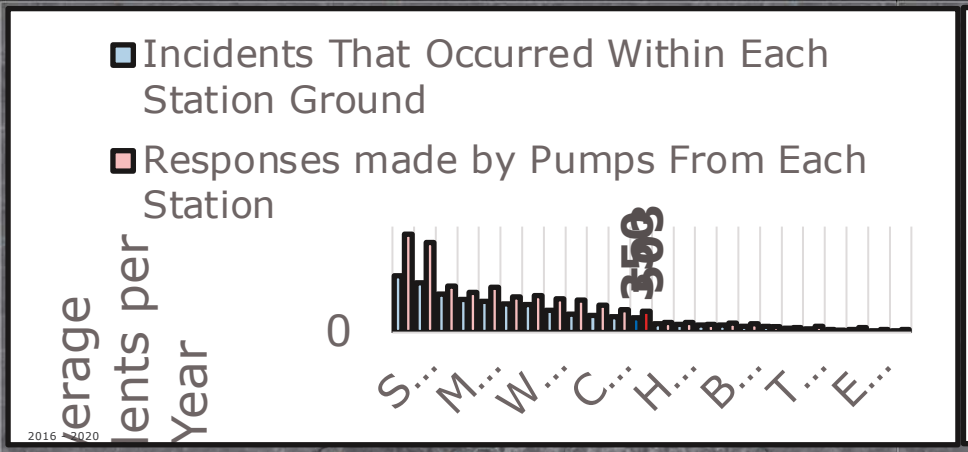


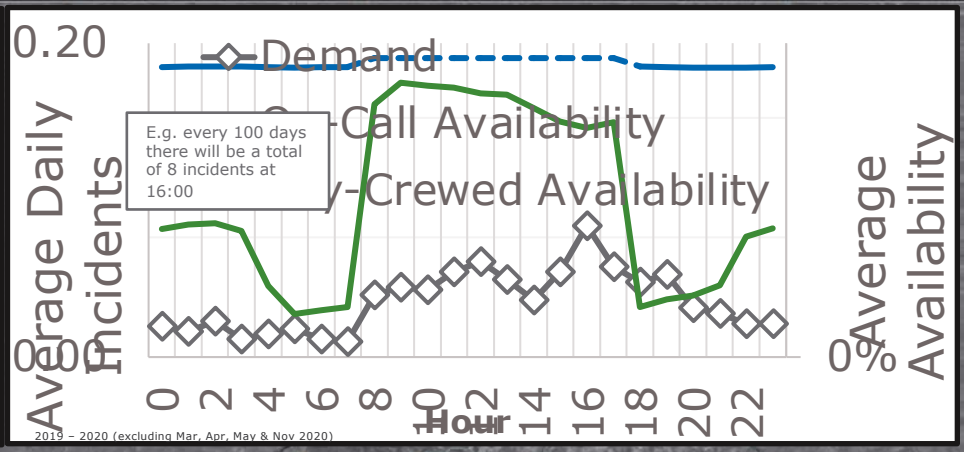
Type 2016 -2020	Fires	False Alarms	RTCs
Incidents Per Year	120	135	24

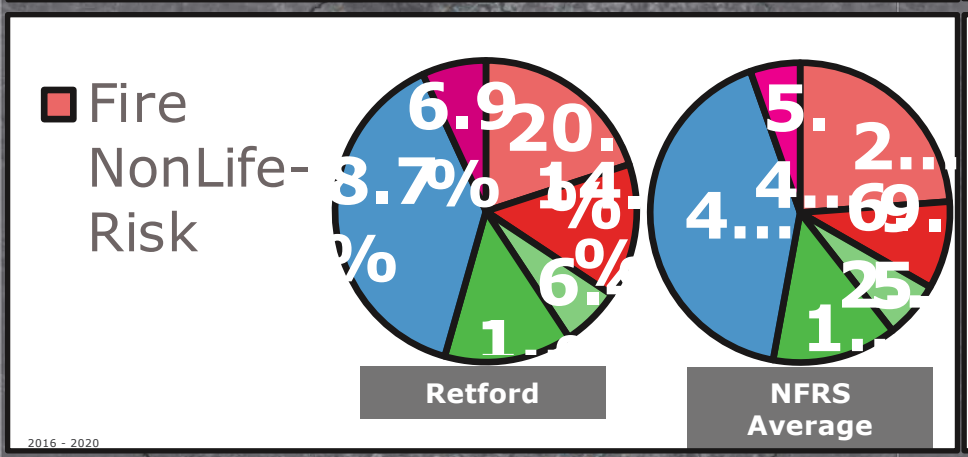
Average No. of incidents per year, within the station ground, by type. (Not Including Non-RTC Special Service.)

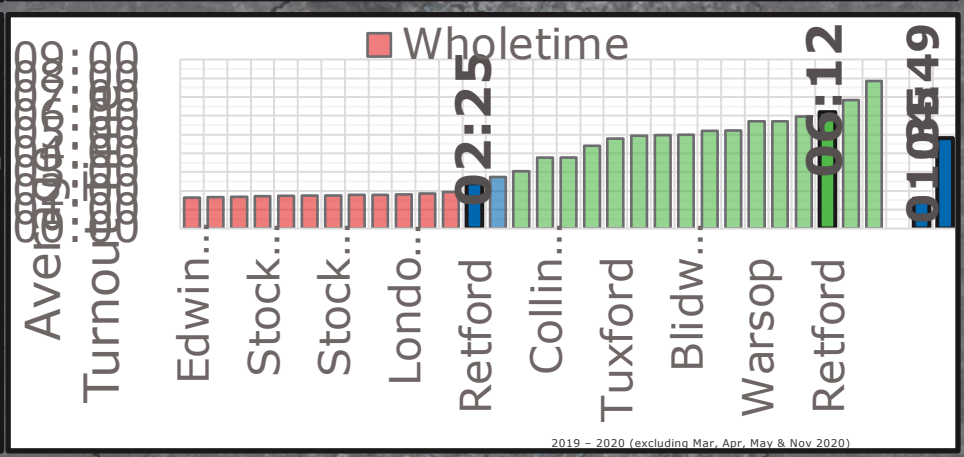
NOTTINGHAMSHIRE Fire & Rescue Service

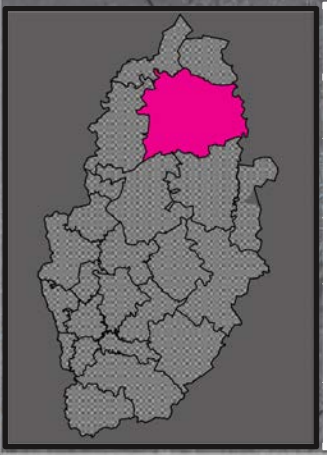
Date produced: 06 October 21



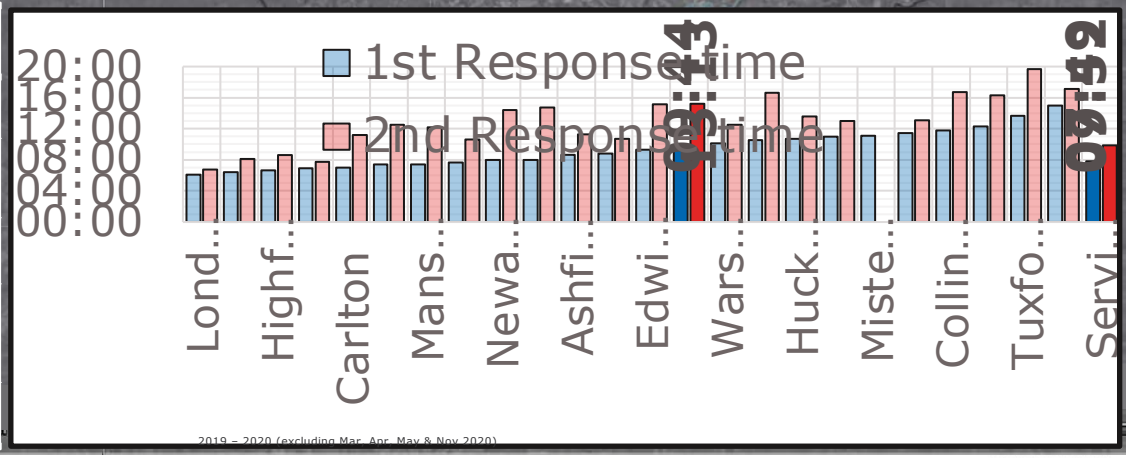




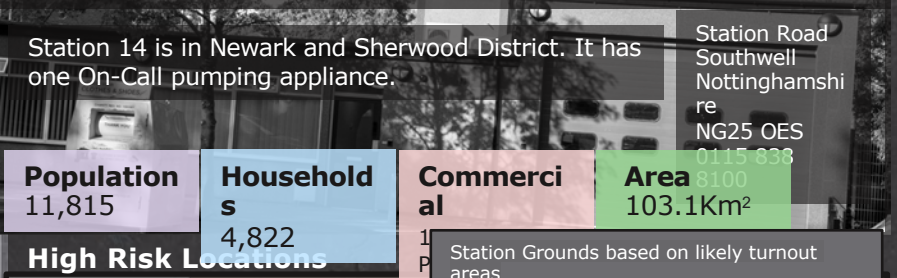




Ethnicity - 2011 Census	Population	Percentage
White	34,041	96.7%
Mixed/ multiple ethnic groups	372	1.1%
Asian/ Asian British	518	1.5%
Black/ African/ Caribbean/ Black British	236	0.7%
Other	50	0.1%



Southwell Fire Station



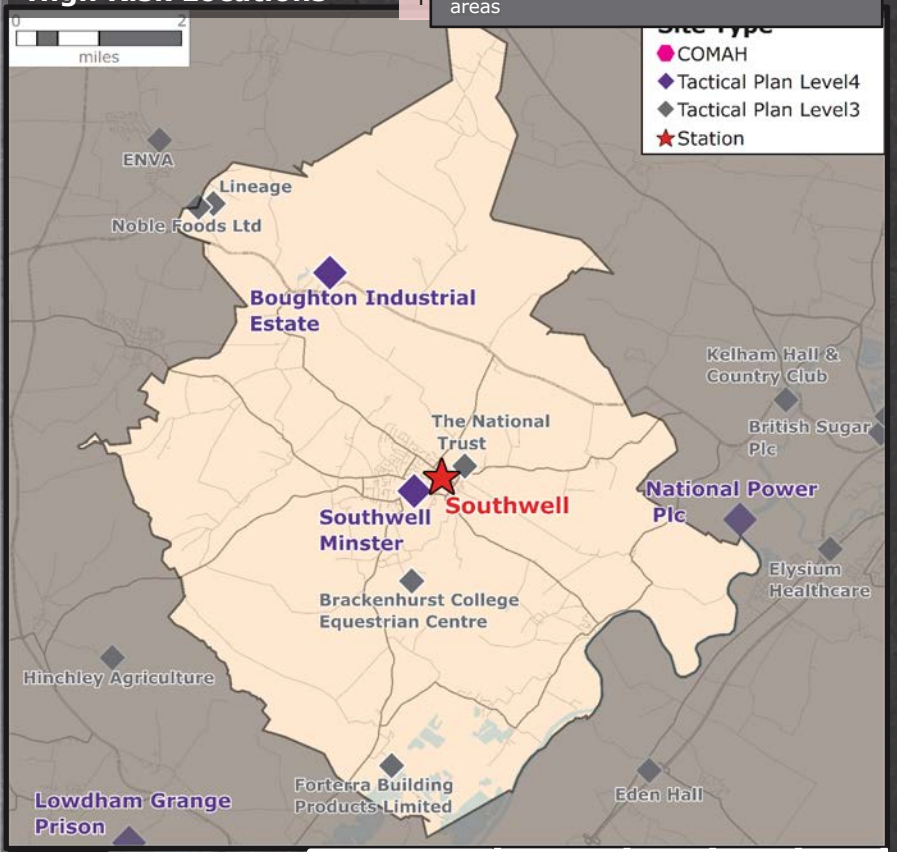
Station 14 is in Newark and Sherwood District. It has one On-Call pumping appliance.

Station Road
Southwell
Nottinghamshire
NG25 OES
0115 838 8100

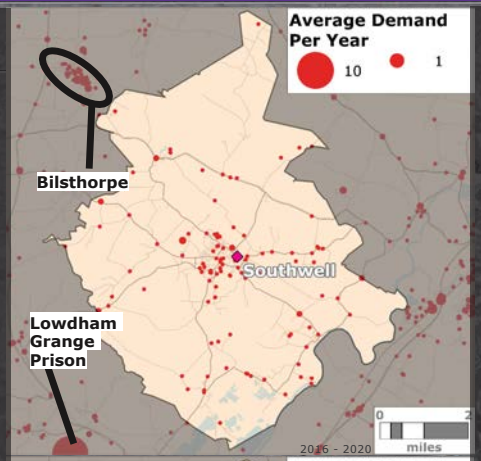
Population	Households	Commercial	Area
11,815	4,822	1	103.1Km²

High Risk Locations

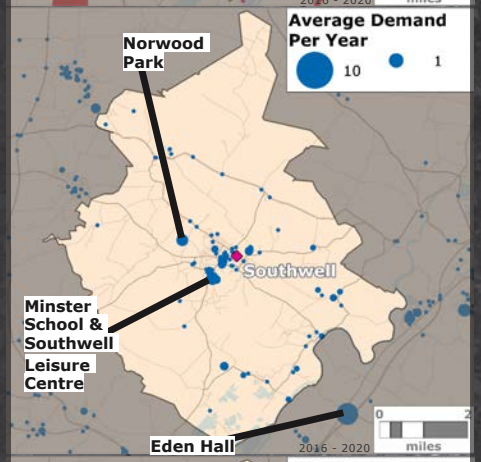
Station Grounds based on likely turnout areas



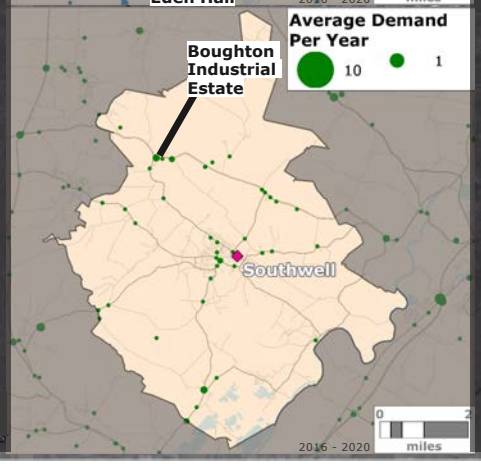
Fires



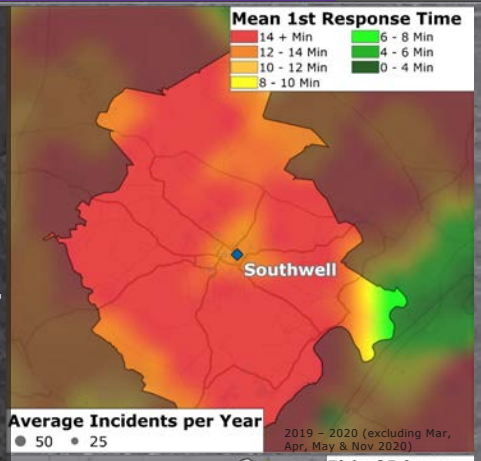
False Alarms



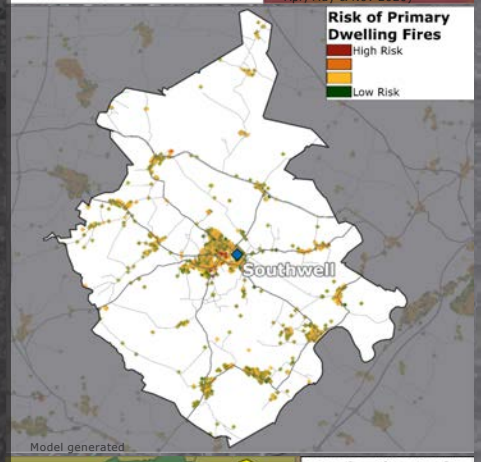
RTCs



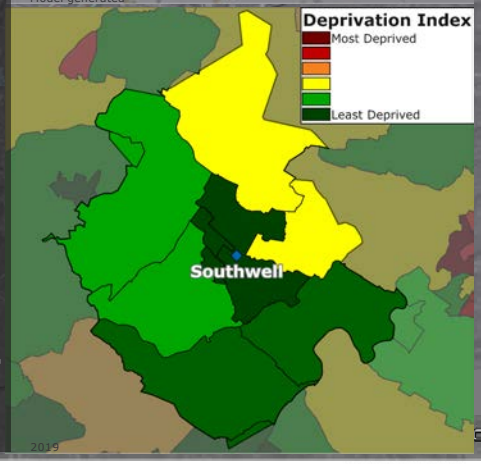
1st Response Time



Dwelling Fire Risk



Deprivation

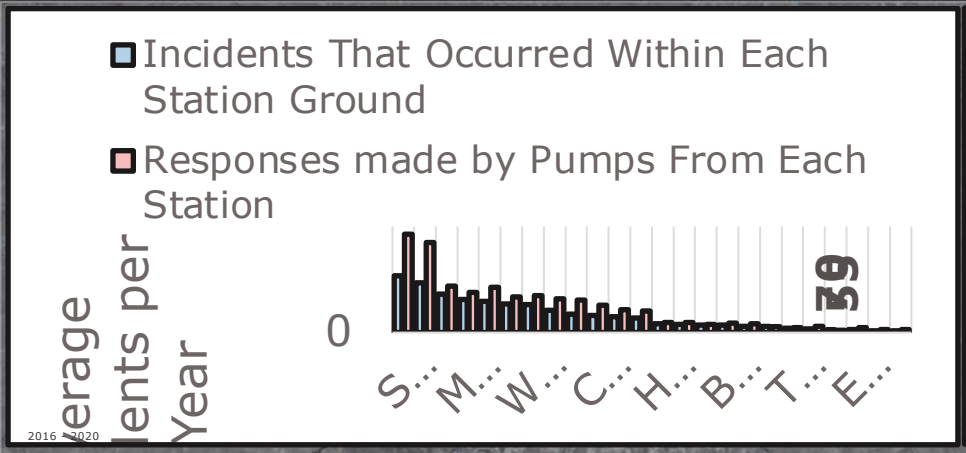


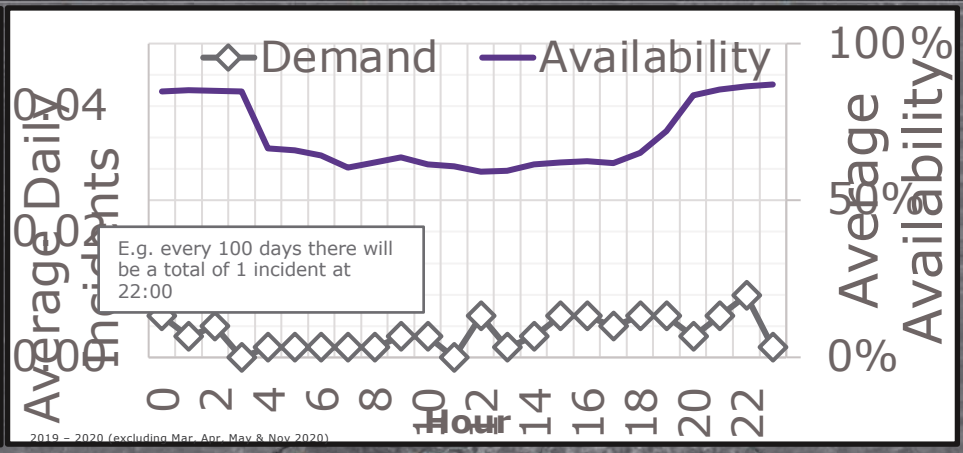
NOTTINGHAMSHIRE Fire & Rescue Service
Creating Safer Communities

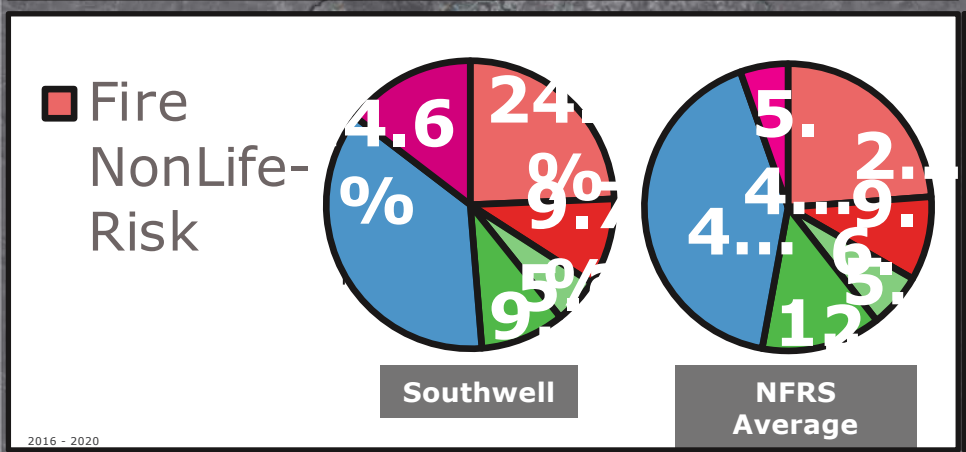
Date produced: 06 October 21

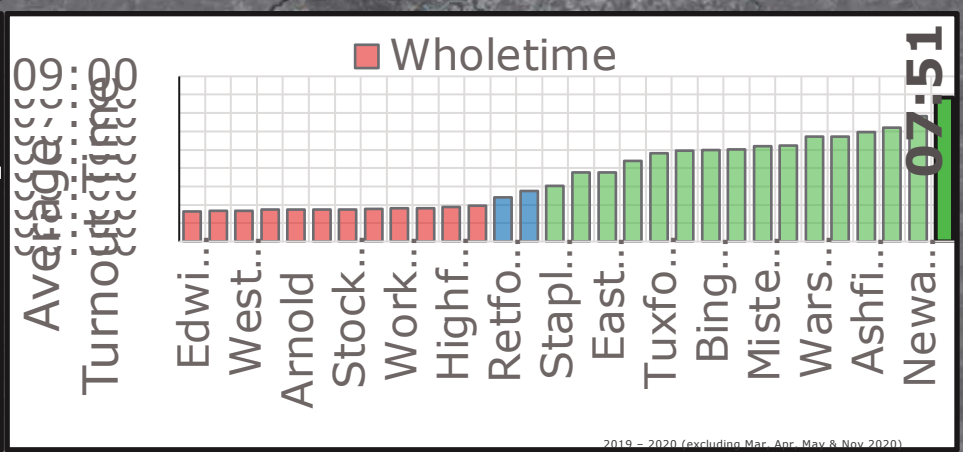
Average No. of incidents per year, within the station ground, by type. (Not Including Non-RTC Special Service.)

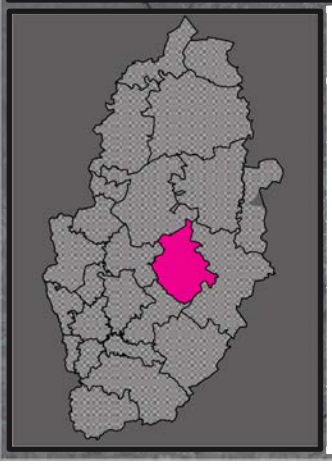
Type 2016 -2020	Fires	False Alarms	RTCs
Incidents Per Year	24	26	10



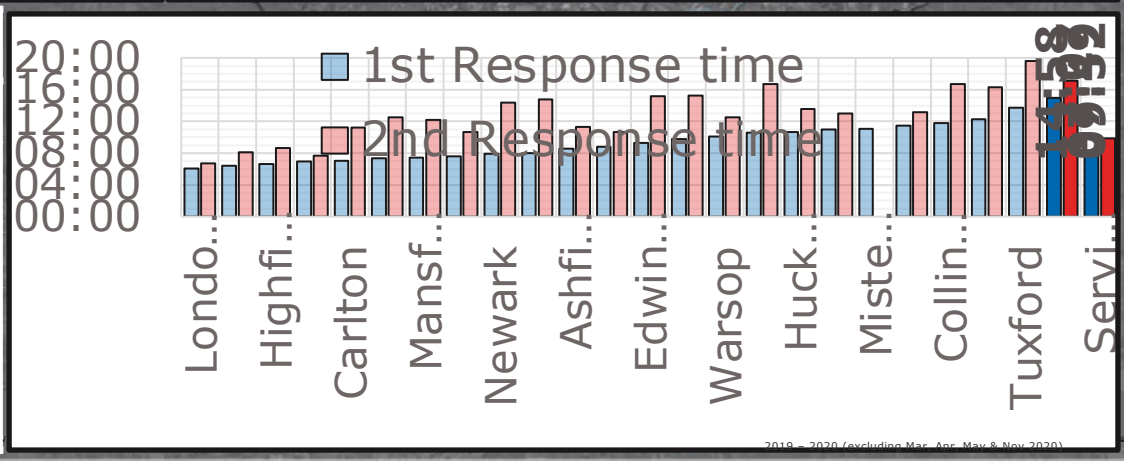








Ethnicity - 2011 Census	Population	Percentage
White	11,539	97.7%
Mixed/ multiple ethnic groups	112	0.9%
Asian/ Asian British	84	0.7%
Black/ African/ Caribbean/ Black British	53	0.4%
Other	27	0.2%



Stapleford Fire Station

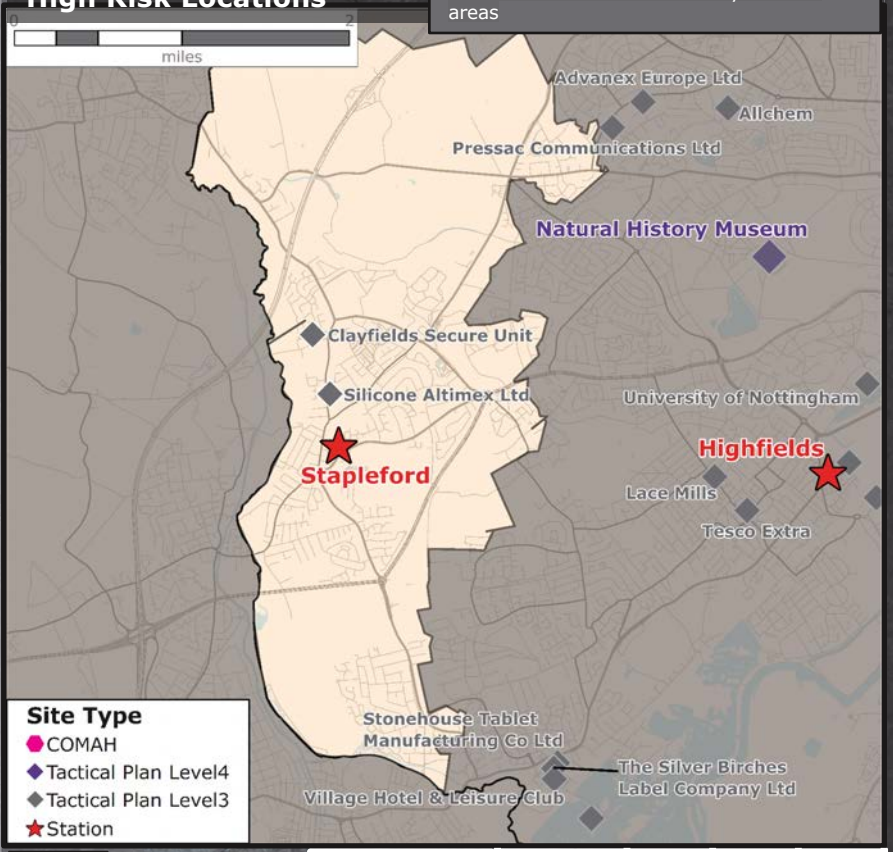
Station 23 is in Broxtowe District. It has one On-Call pumping appliance. It is also home to a Welfare Unit and a Fuel Bowser.

Pinfold Lane
Stapleford
Nottingham
NG9 8DL
0115 838 8100

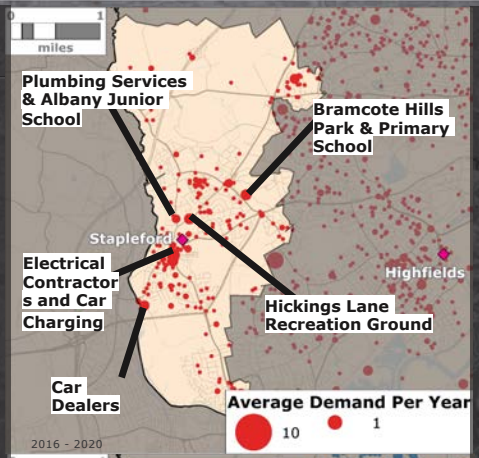
Population	Households	Commercial	Area
27,912	12,114	727 Premises	16.5Km²

High Risk Locations

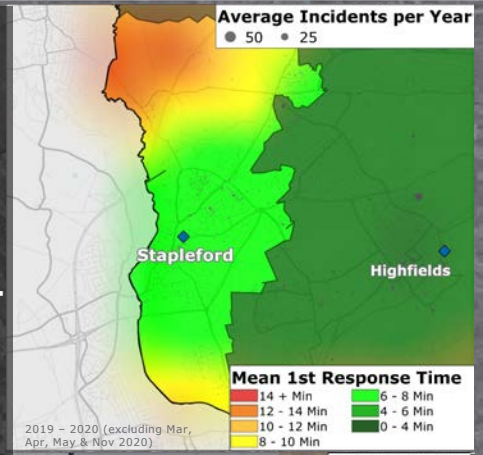
Station Grounds based on likely turnout areas



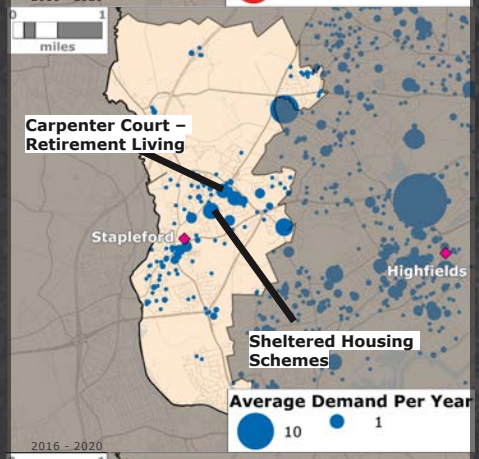
Fires



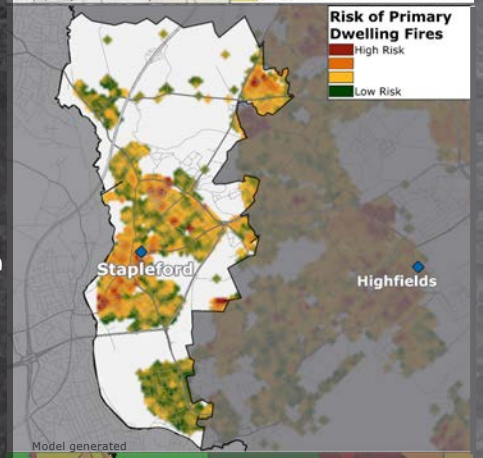
1st Response Time



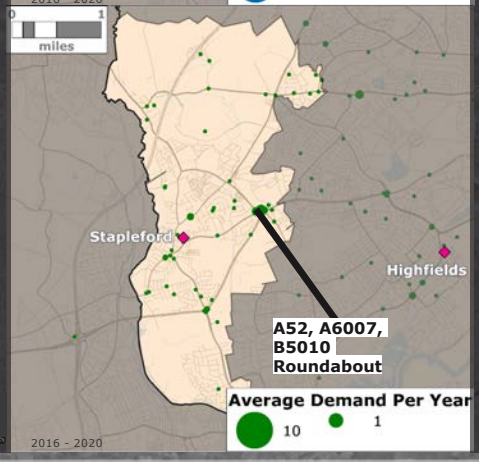
False Alarms



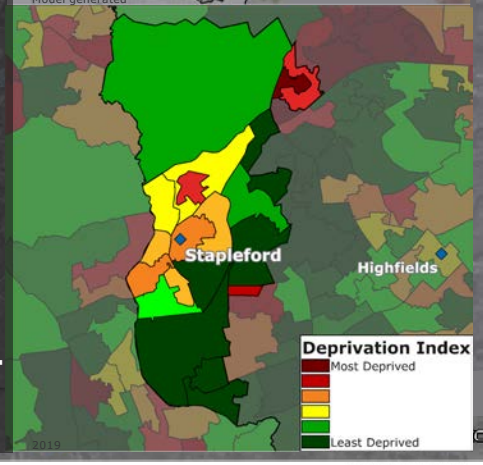
Dwelling Fire Risk



RTCs



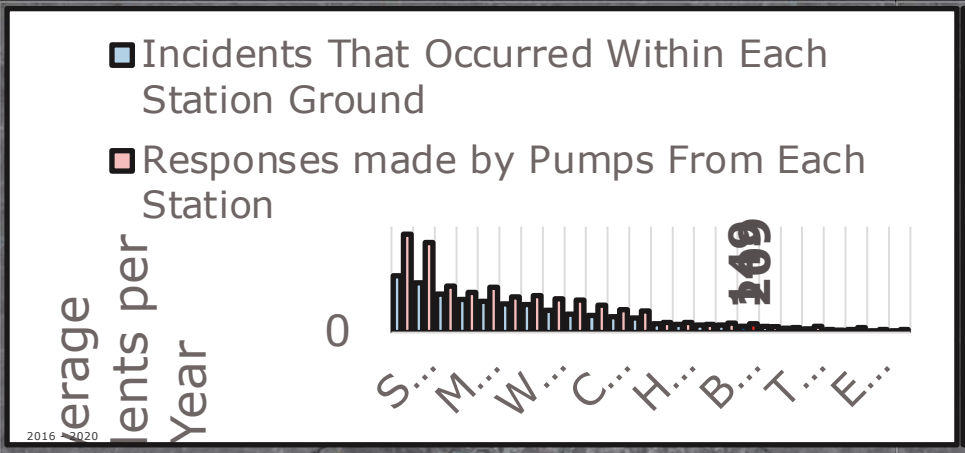
Deprivation

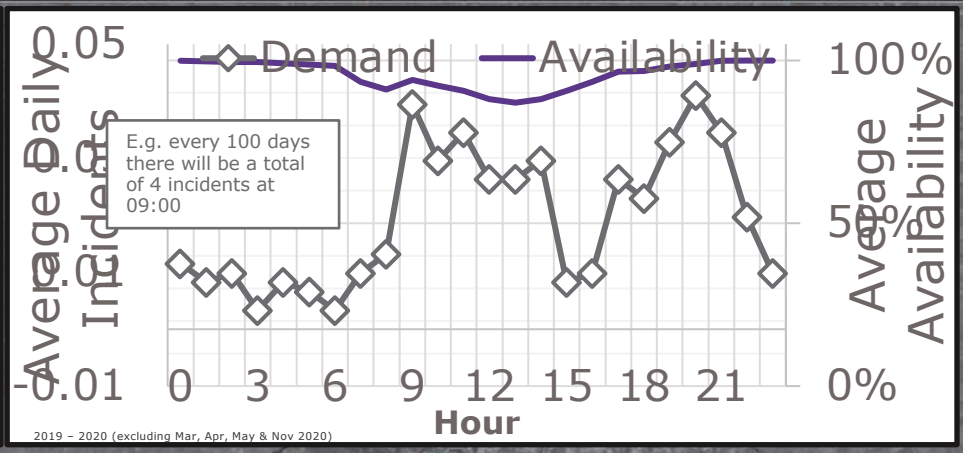


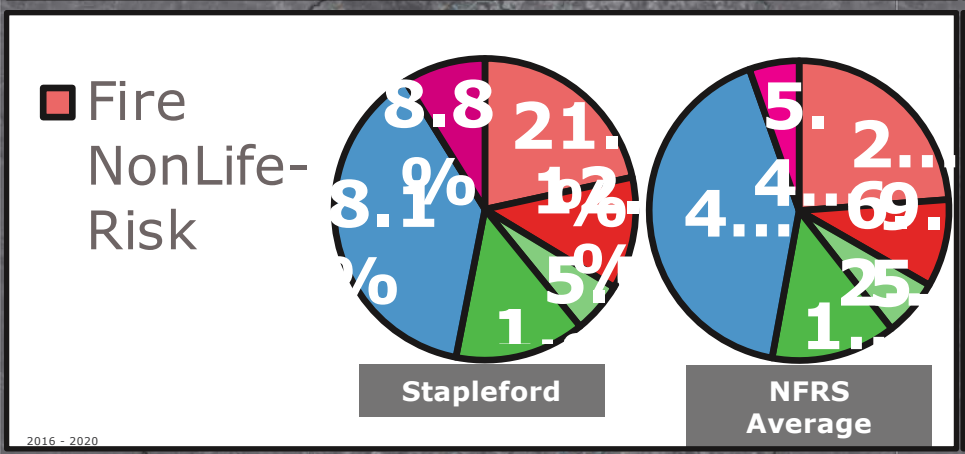
Date produced: 06 October 21

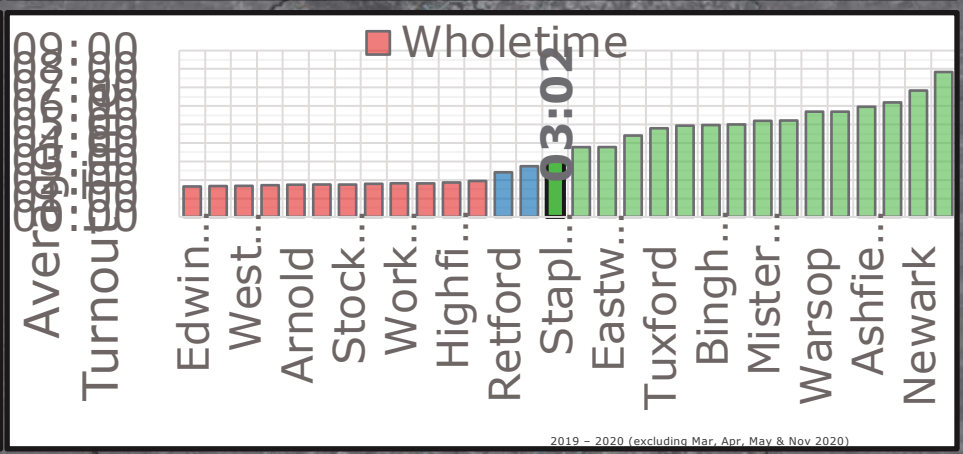
Average No. of incidents per year, within the station ground, by type. (Not Including Non-RTC Special Service.)

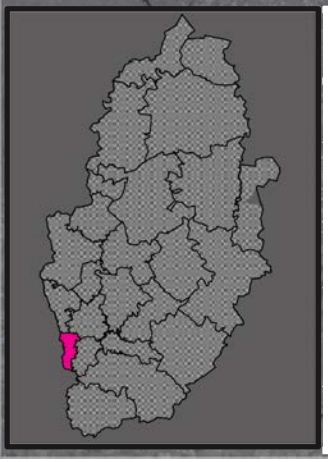
Type 2016 -2020	Fires	False Alarms	RTCs
Incidents Per Year	50	57	13



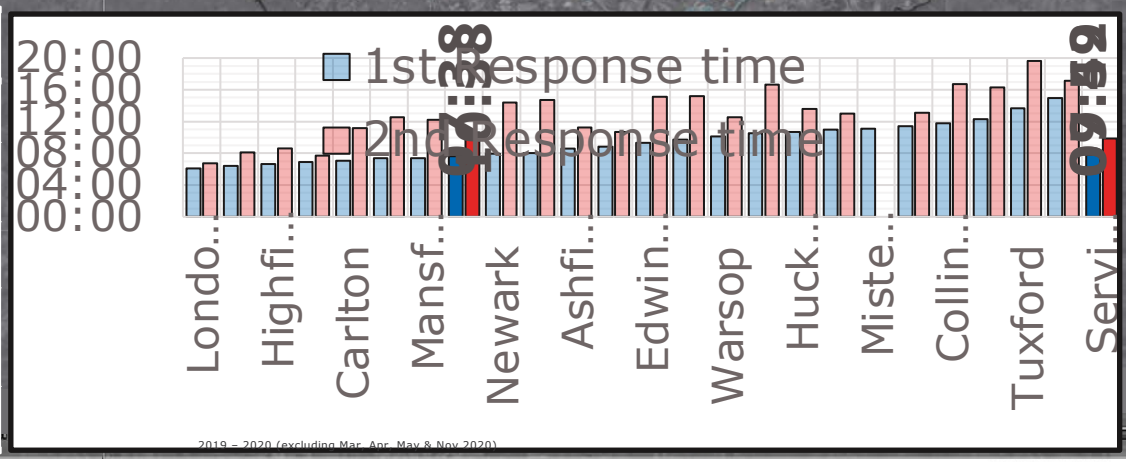








Ethnicity - 2011 Census	Population	Percentage
White	25,951	93.0%
Mixed/ multiple ethnic groups	561	2.0%
Asian/ Asian British	919	3.3%
Black/ African/ Caribbean/ Black British	365	1.3%
Other	116	0.4%



Stockhill Fire Station

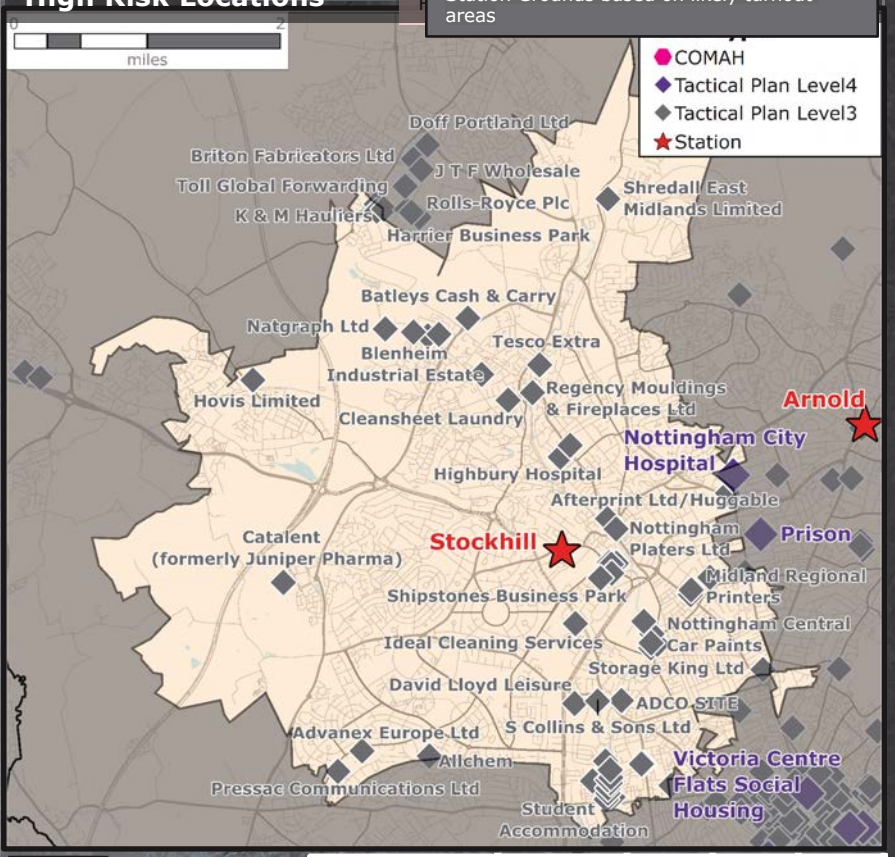
Station 20 is in the City of Nottingham. It has two Wholetime pumping appliances. It is also home to the Environmental Protection Unit.

Stockhill Lane
Basford
Nottingham
NG6 0LG
0115 838 8100

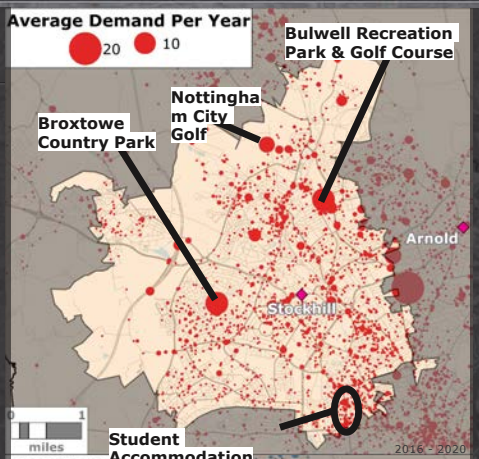
Population	Households	Commercial	Area
143,166	60,195	5,005	43.9Km²

High Risk Locations

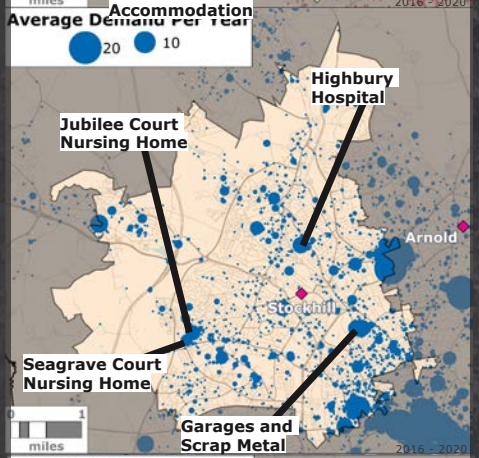
Station Grounds based on likely turnout areas



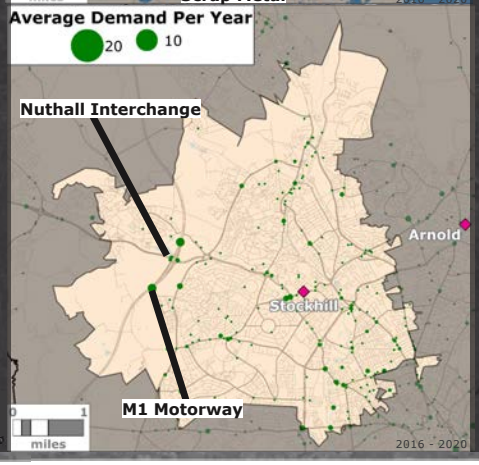
Fires



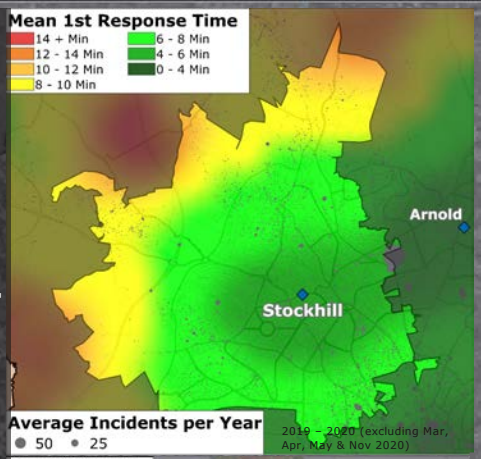
False Alarms



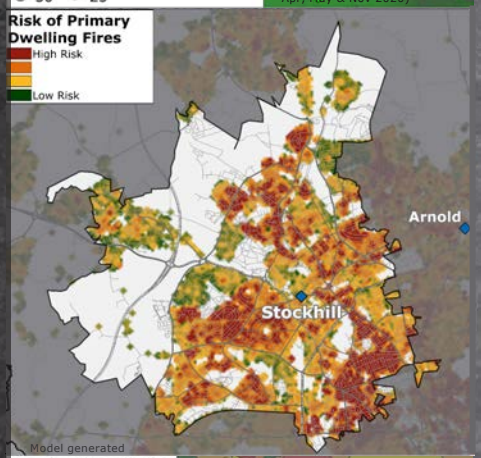
RTCs



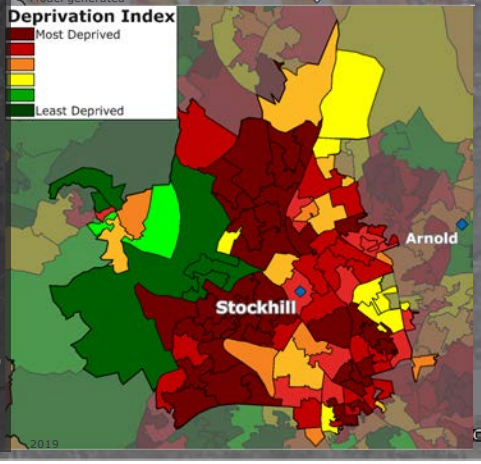
1st Response Time



Dwelling Fire Risk



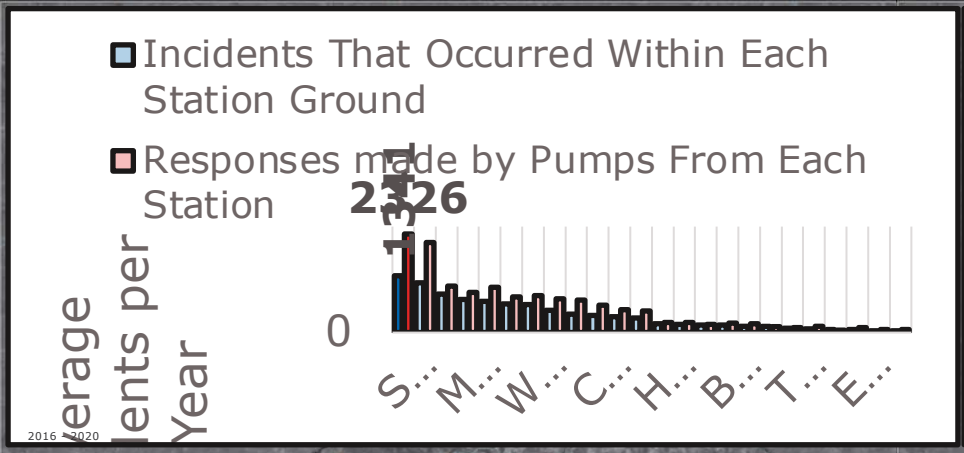
Deprivation

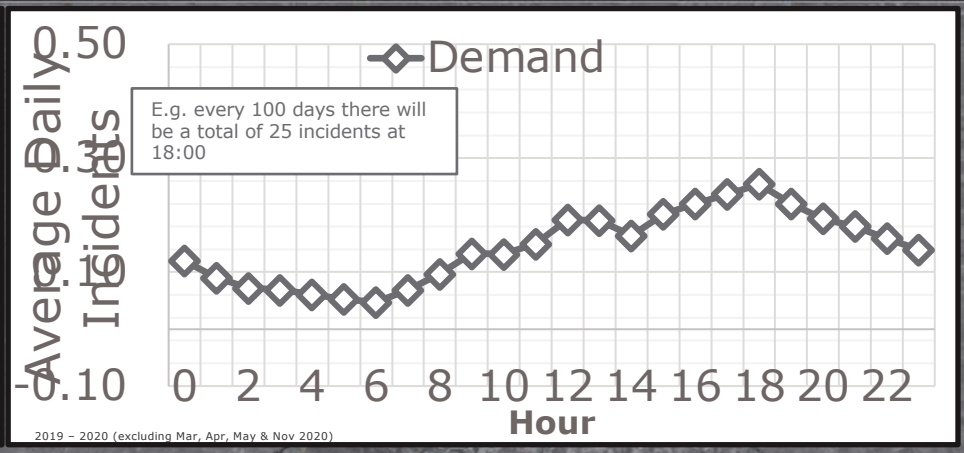


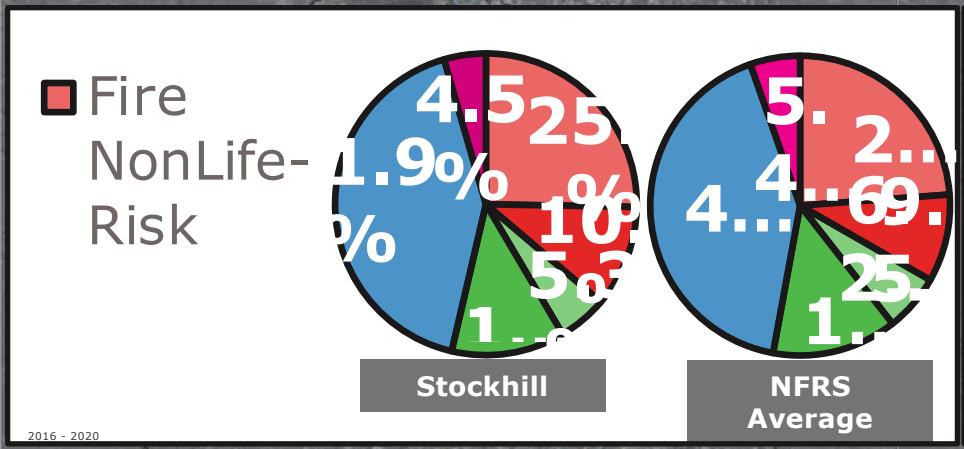
Date produced: 06 October 21

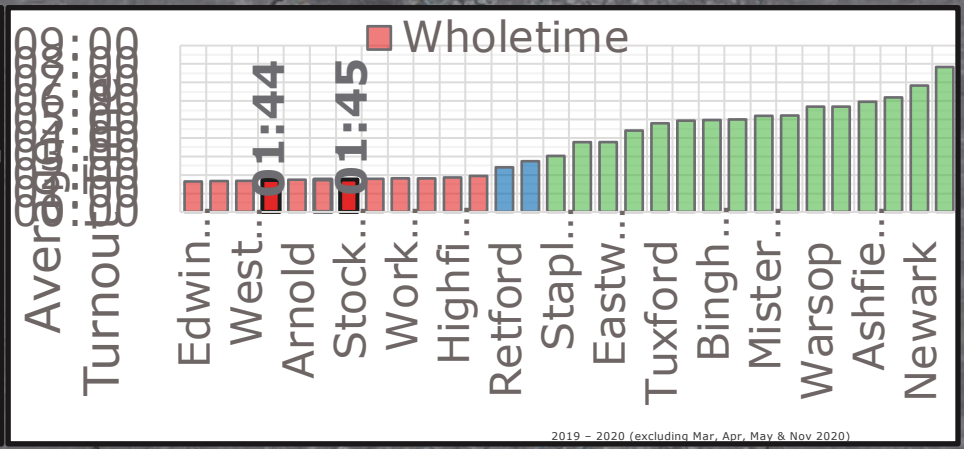
Average No. of incidents per year, within the station ground, by type. (Not Including Non-RTC Special Service.)

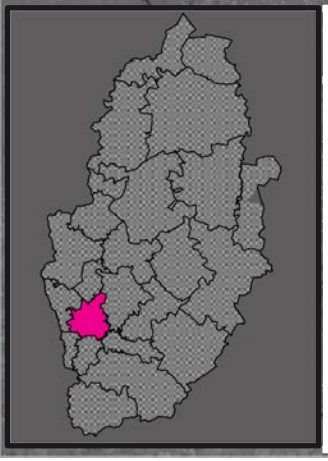
Type 2016 -2020	Fires	False Alarms	RTCs
Incidents Per Year	486	561	60



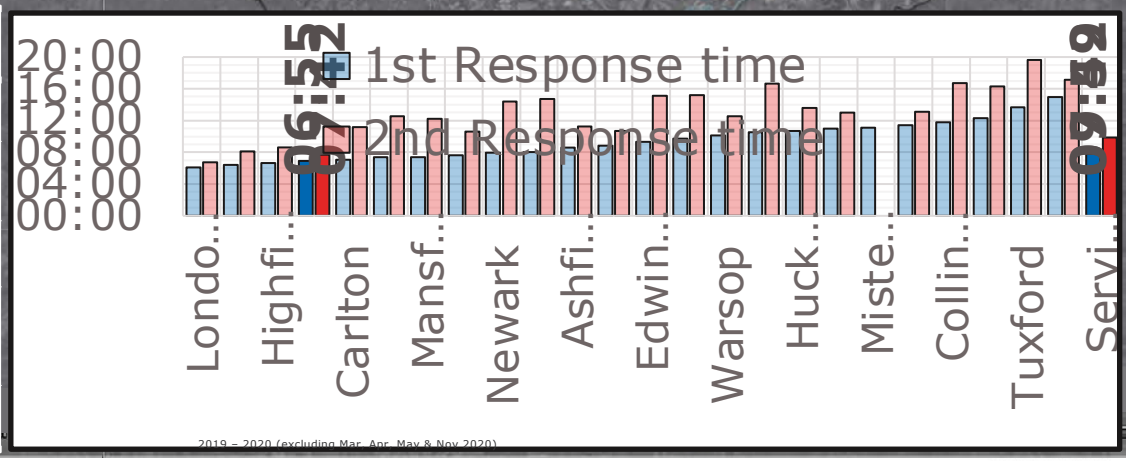








Ethnicity - 2011 Census	Population	Percentage
White	103,488	72.3%
Mixed/ multiple ethnic groups	9,566	6.7%
Asian/ Asian British	17,631	12.3%
Black/ African/ Caribbean/ Black British	10,762	7.5%
Other	1,719	1.2%



Tuxford Fire Station

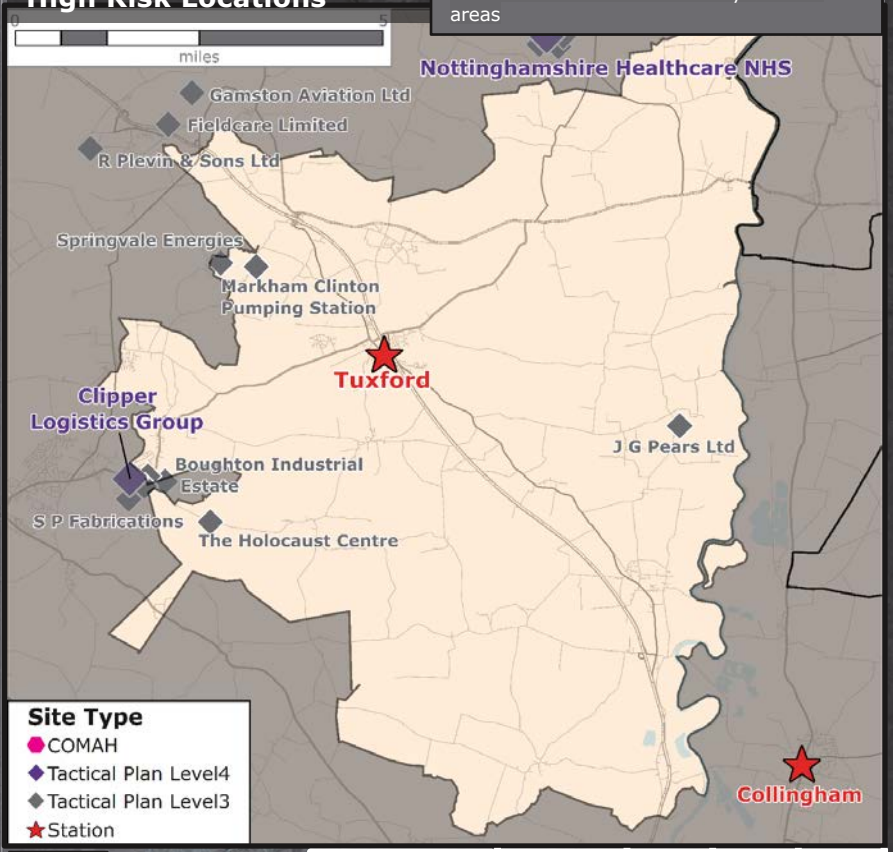
Station 13 is in Bassetlaw District. It has one On-Call pumping appliance.

Clark Lane
Tuxford
Nottinghamshire
NG22 ONA
0115 838 8100

Population	Households	Commercial	Area
10,436	4,880	677 Premises	162.8Km²

High Risk Locations

Station Grounds based on likely turnout areas

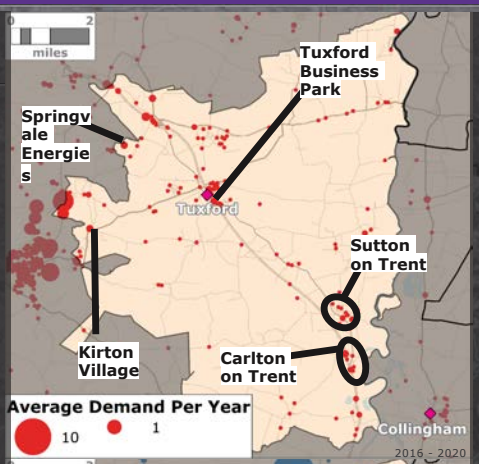


Average No. of incidents per year, within the station ground, by type. (Not Including Non-RTC Special Service.)

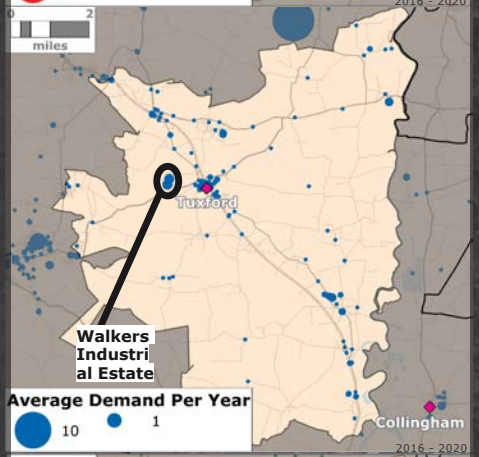
Type 2016 -2020	Fires	False Alarms	RTCs
Incidents Per Year	38	37	15

Date produced: 06 October 21

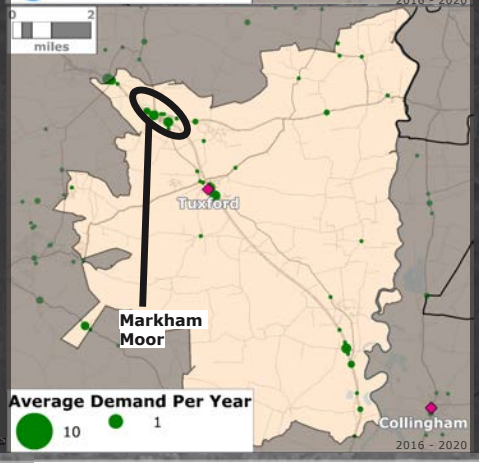
Fires



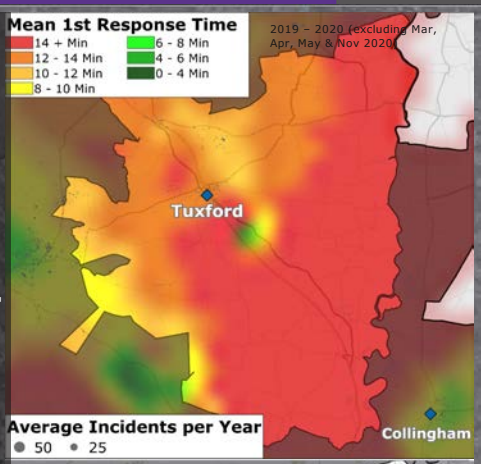
False Alarms



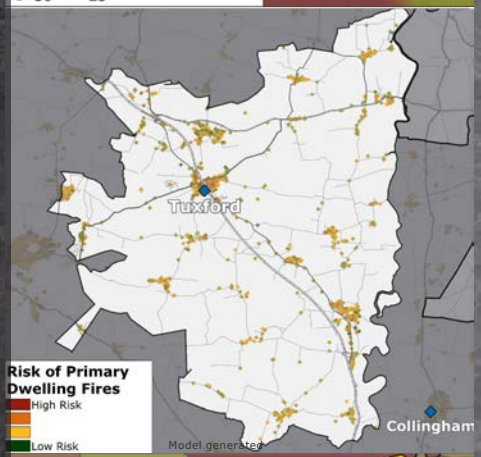
RTCs



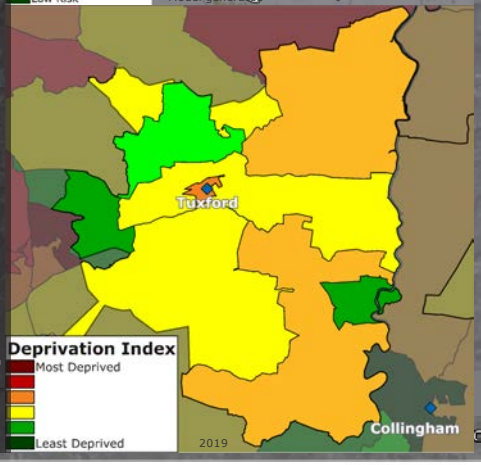
1st Response Time

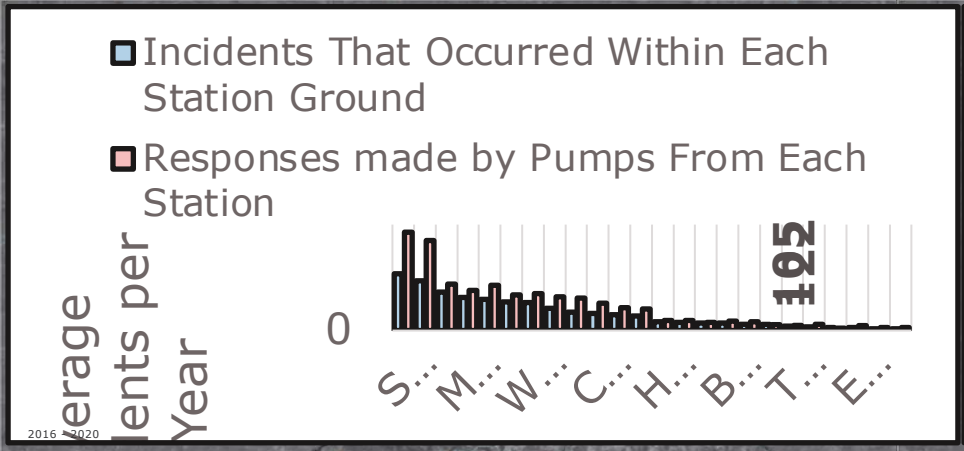


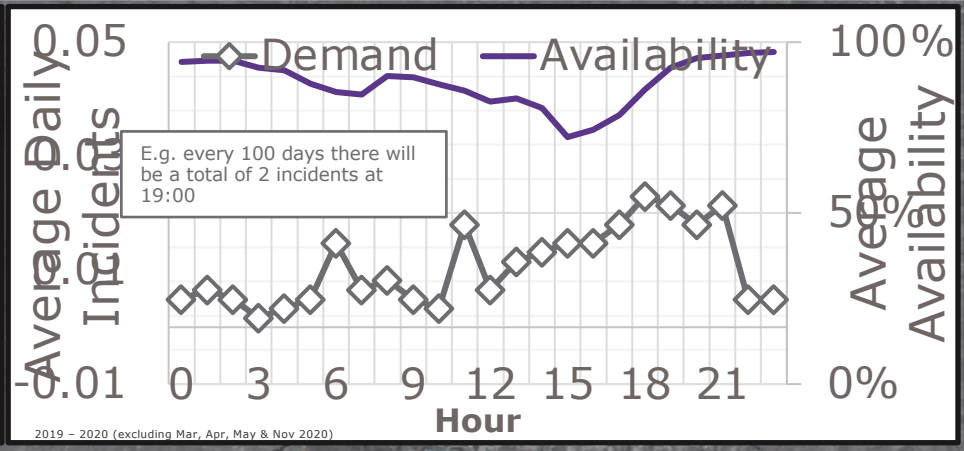
Dwelling Fire Risk

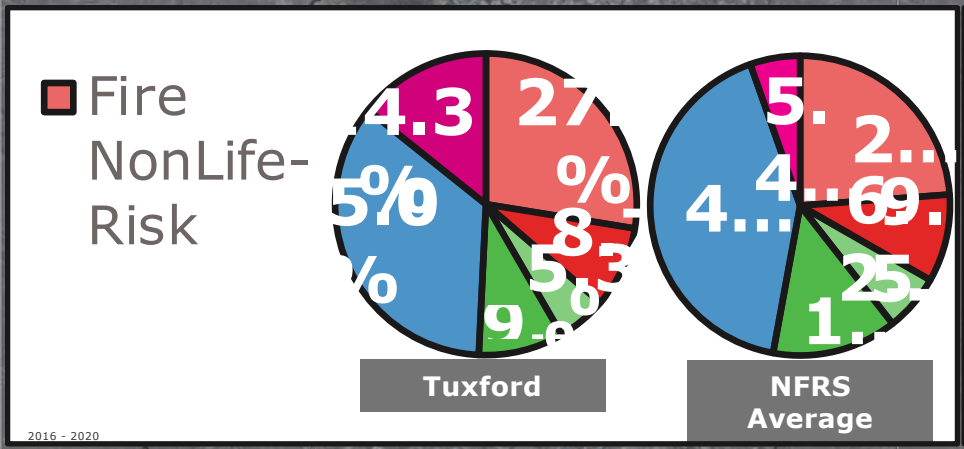


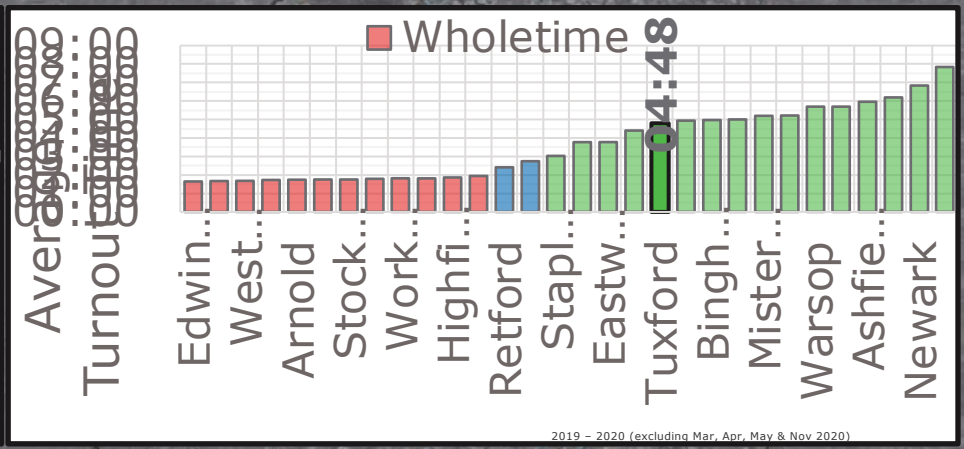
Deprivation

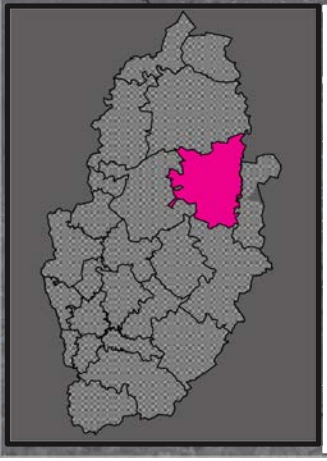




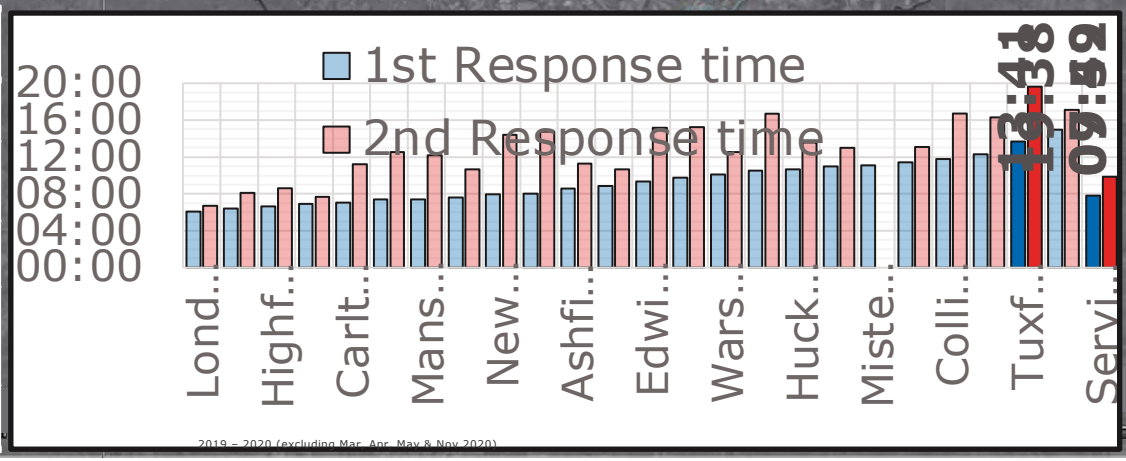




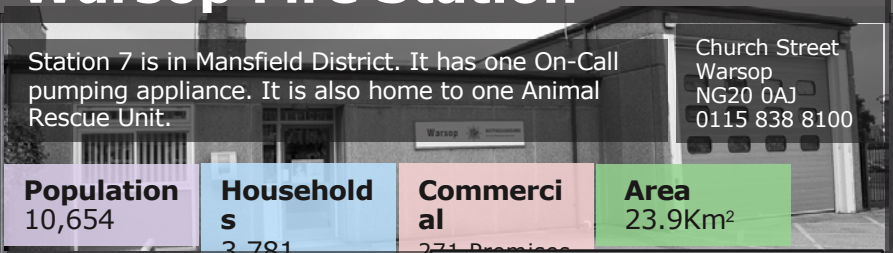




Ethnicity - 2011 Census	Population	Percentage
White	10,312	98.8%
Mixed/ multiple ethnic groups	63	0.6%
Asian/ Asian British	30	0.3%
Black/ African/ Caribbean/ Black British	16	0.2%
Other	15	0.1%



Warsop Fire Station



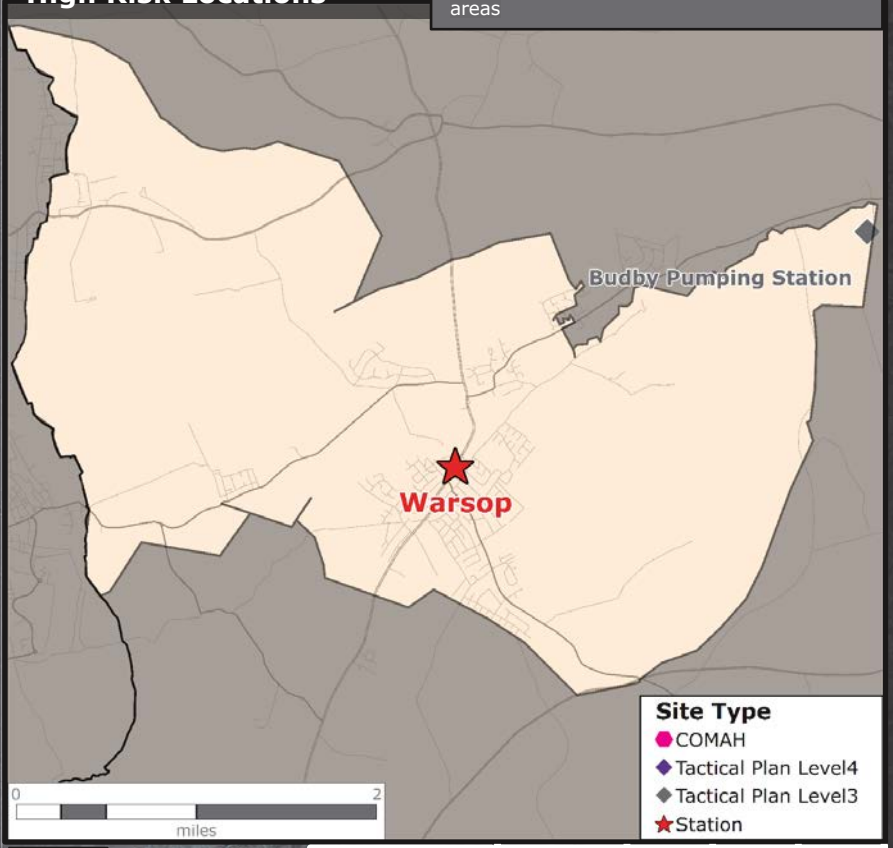
Station 7 is in Mansfield District. It has one On-Call pumping appliance. It is also home to one Animal Rescue Unit.

Church Street
Warsop
NG20 0AJ
0115 838 8100

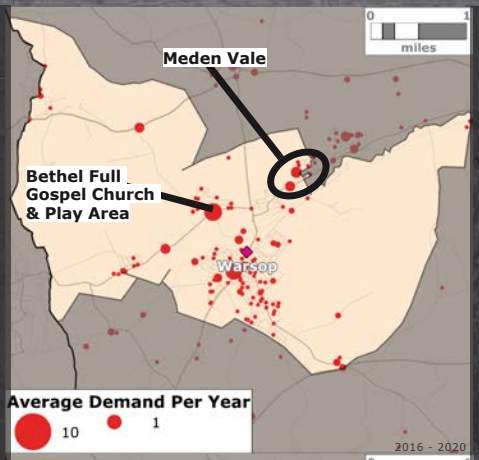
Population	Households	Commercial	Area
10,654	3,781	271 Premises	23.9Km²

High Risk Locations

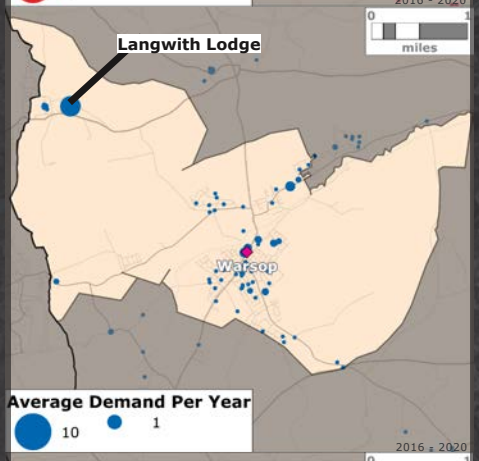
Station Grounds based on likely turnout areas



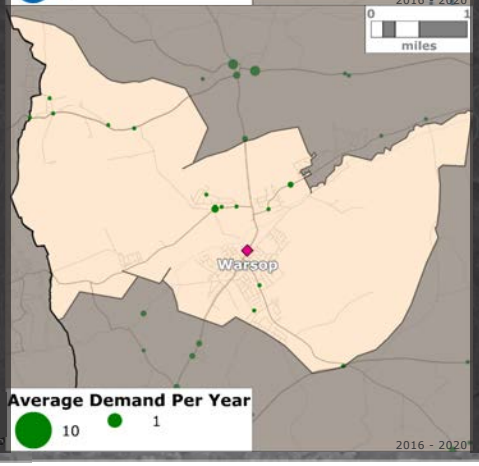
Fires



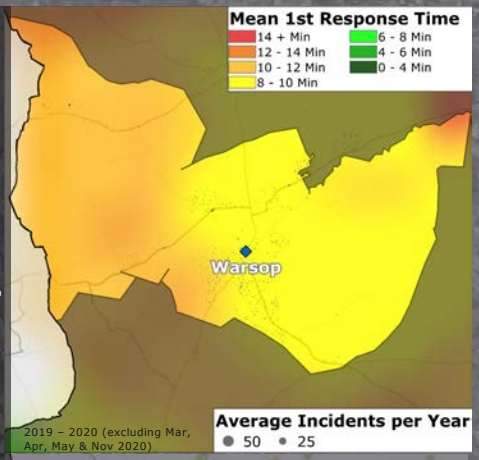
False Alarms



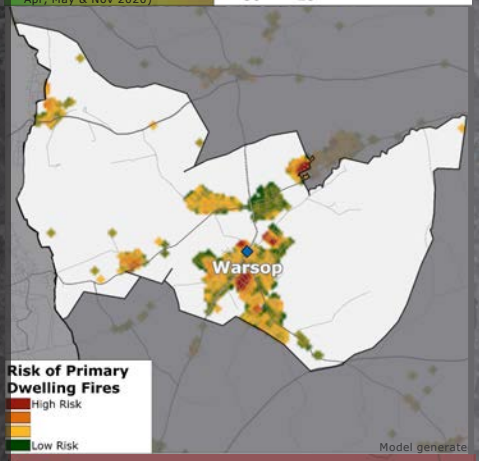
RTCs



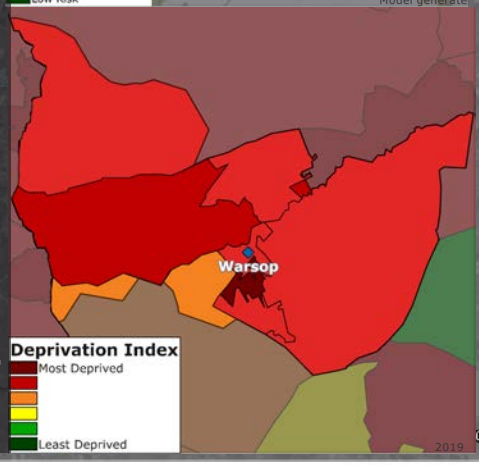
1st Response Time



Dwelling Fire Risk



Deprivation



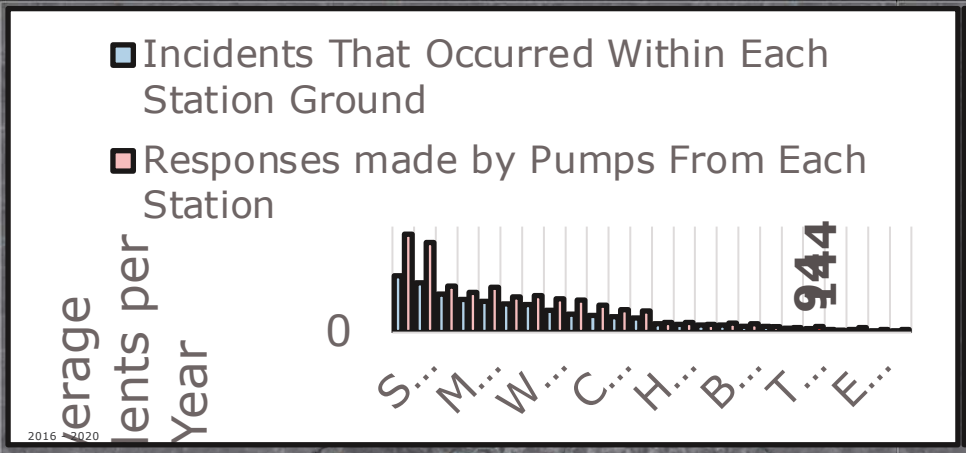
PLAN. PREPARE. PERFORM.

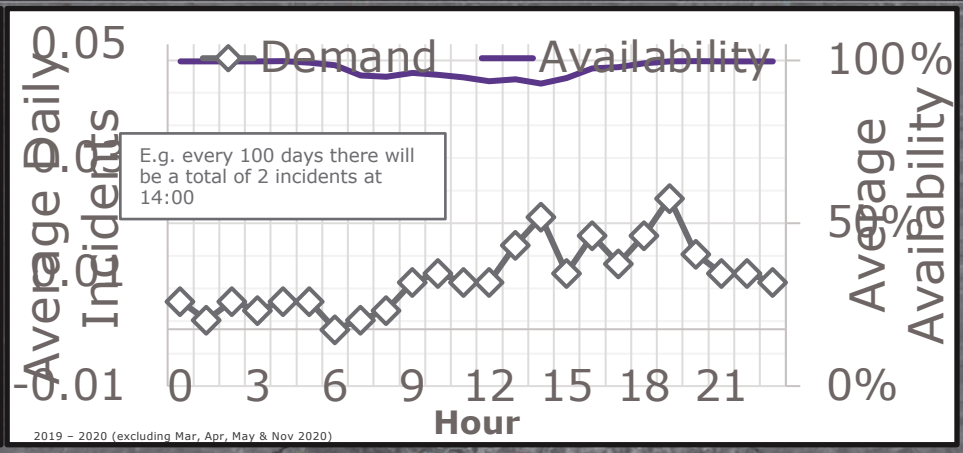
NOTTINGHAMSHIRE Fire & Rescue Service
Creating Safer Communities

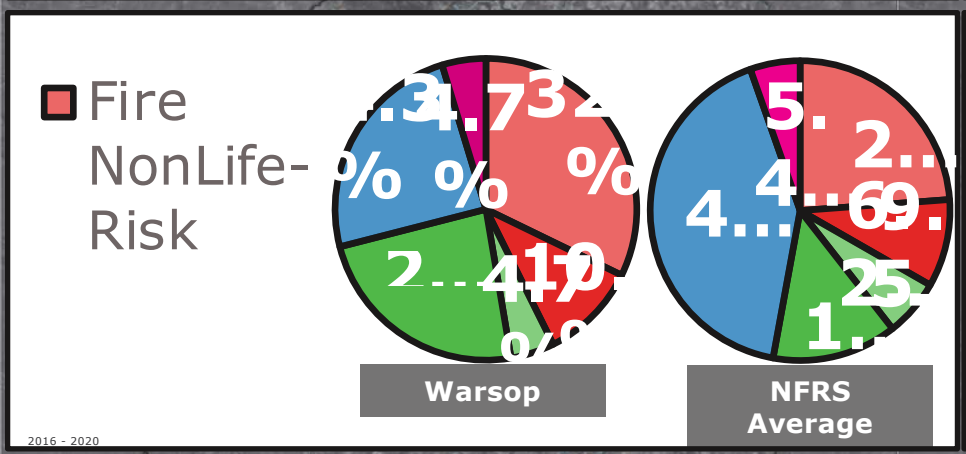
Date produced:
06 October 21

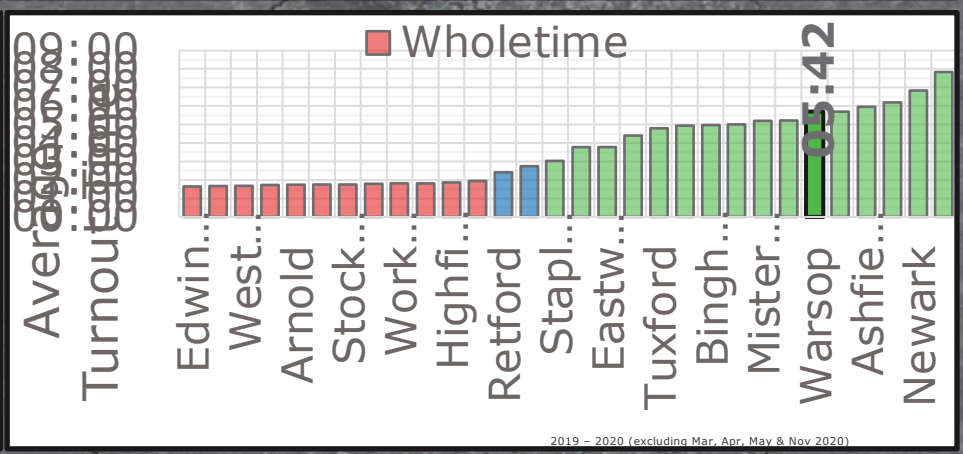
Average No. of incidents per year, within the station ground, by type. (Not Including Non-RTC Special Service.)

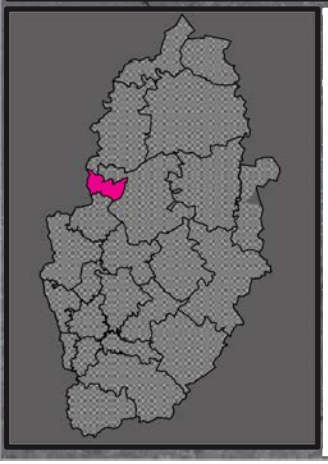
Type 2016 -2020	Fires	False Alarms	RTCs
Incidents Per Year	40	23	4



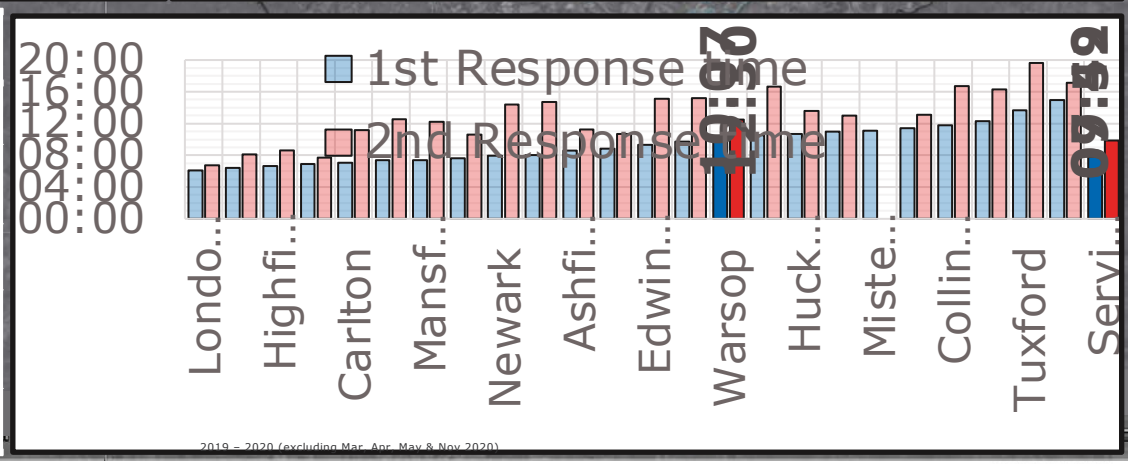








Ethnicity - 2011 Census	Population	Percentage
White	10,530	98.8%
Mixed/ multiple ethnic groups	58	0.5%
Asian/ Asian British	27	0.3%
Black/ African/ Caribbean/ Black British	24	0.2%
Other	15	0.1%



West Bridgford Fire Station

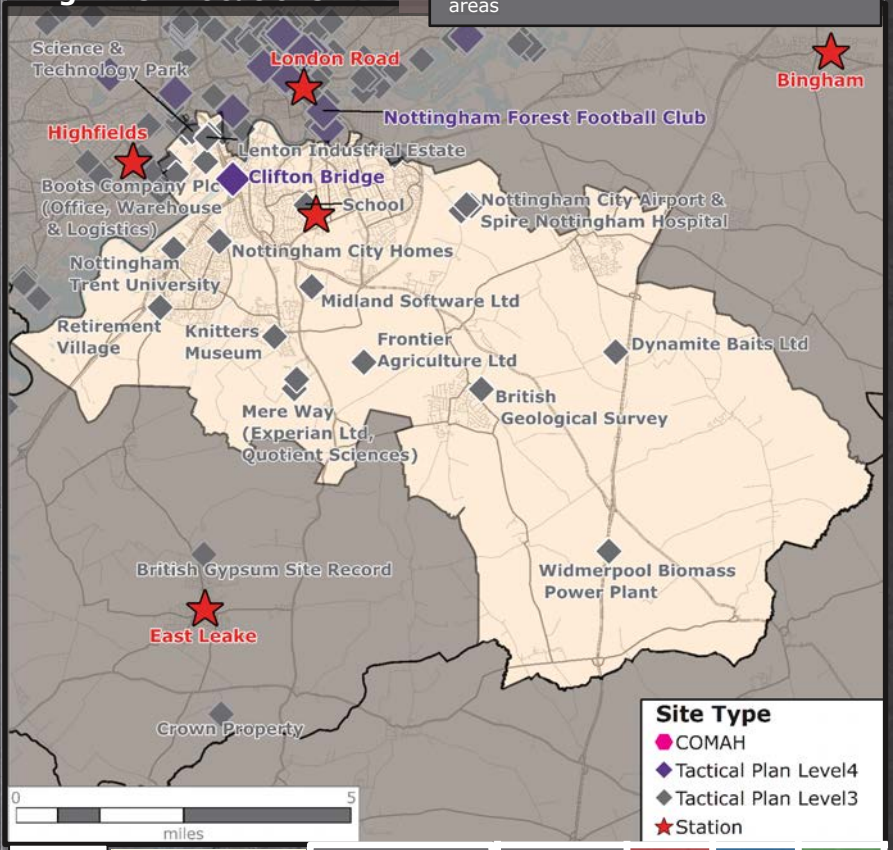
Station 19 is in Rushcliffe District. It has one Wholetime pumping appliance.

Loughborough Rd
West Bridgford
Nottingham
NG2 7FA
0115 838 8100

Population	Households	Commercial	Area
85,847	37,089	2,100	141.7Km²

High Risk Locations

Station Grounds based on likely turnout areas

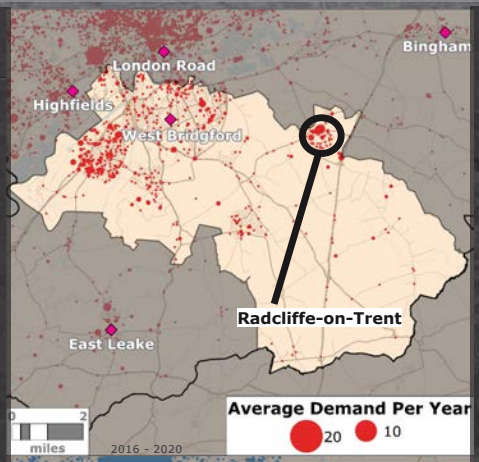


Type 2016 -2020	Fires	False Alarms	RTCs
Incidents Per Year	160	221	35

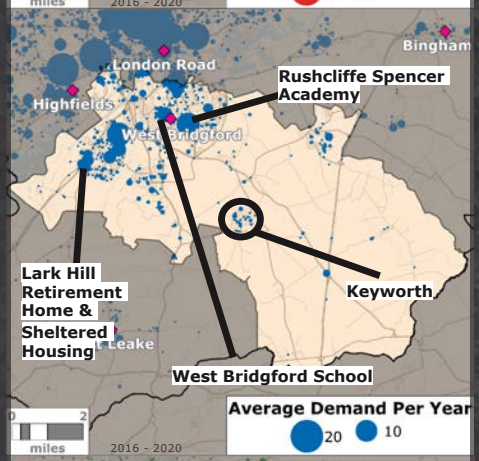
Average No. of incidents per year, within the station ground, by type. (Not Including Non-RTC Special Service.)

Date produced: 06 October 21

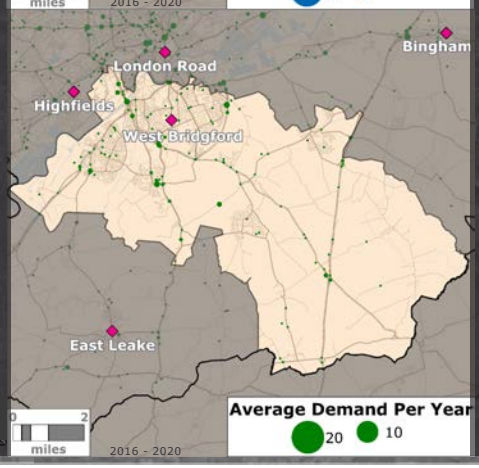
Fires



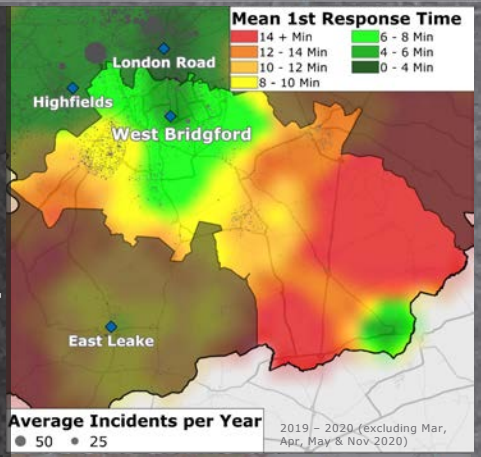
False Alarms



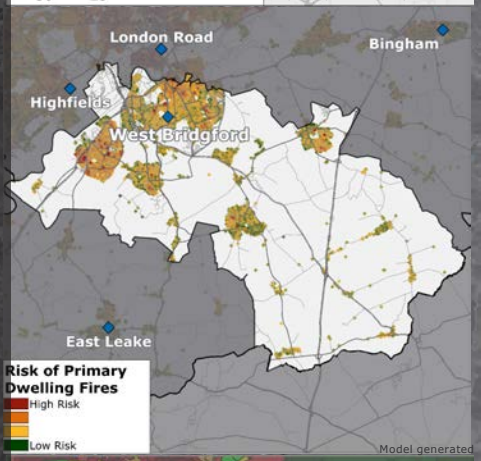
RTCs



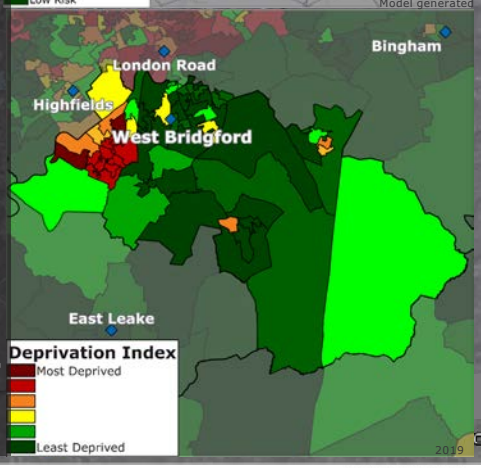
1st Response Time

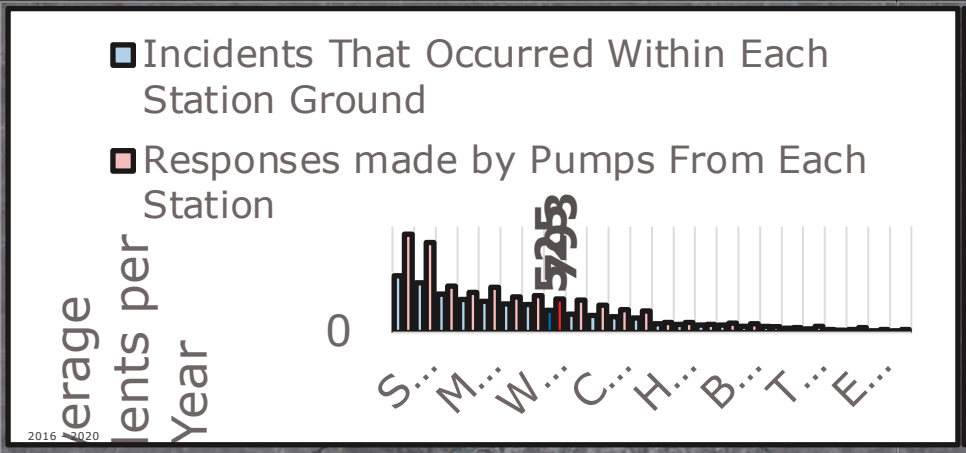


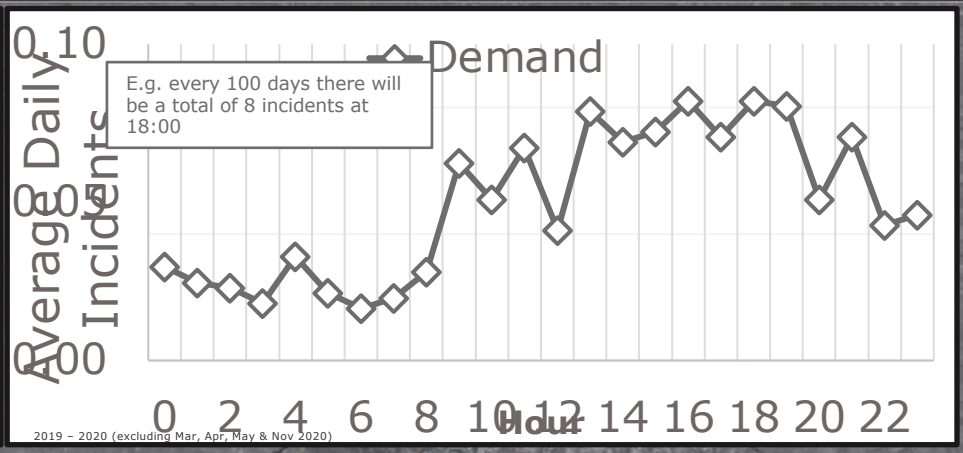
Dwelling Fire Risk

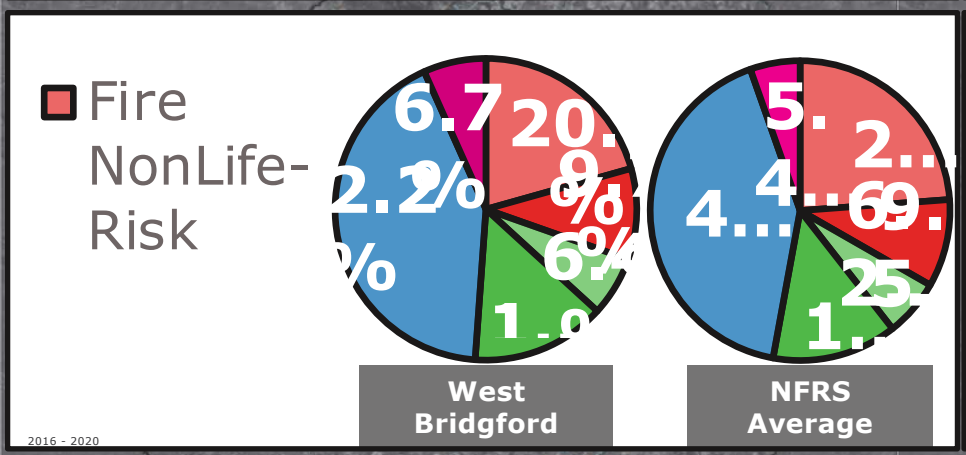


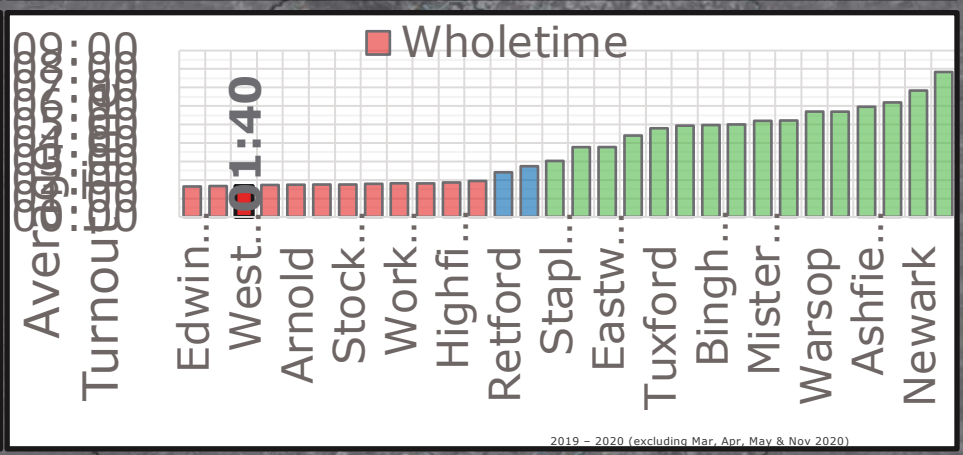
Deprivation

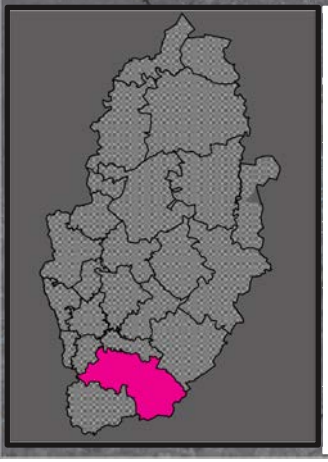




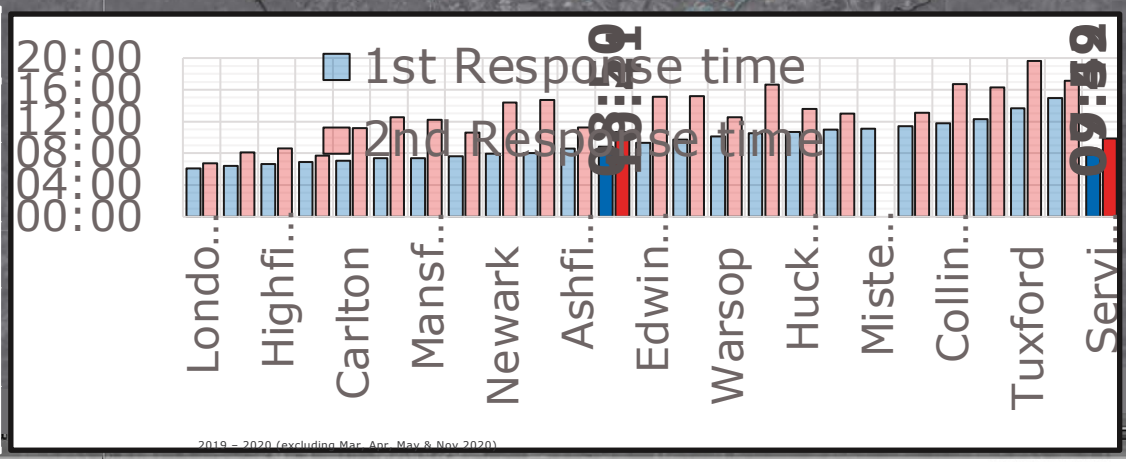








Ethnicity - 2011 Census	Population	Percentage
White	77,913	90.8%
Mixed/ multiple ethnic groups	2,046	2.4%
Asian/ Asian British	4,538	5.3%
Black/ African/ Caribbean/ Black British	937	1.1%
Other	413	0.5%



Worksop Fire Station

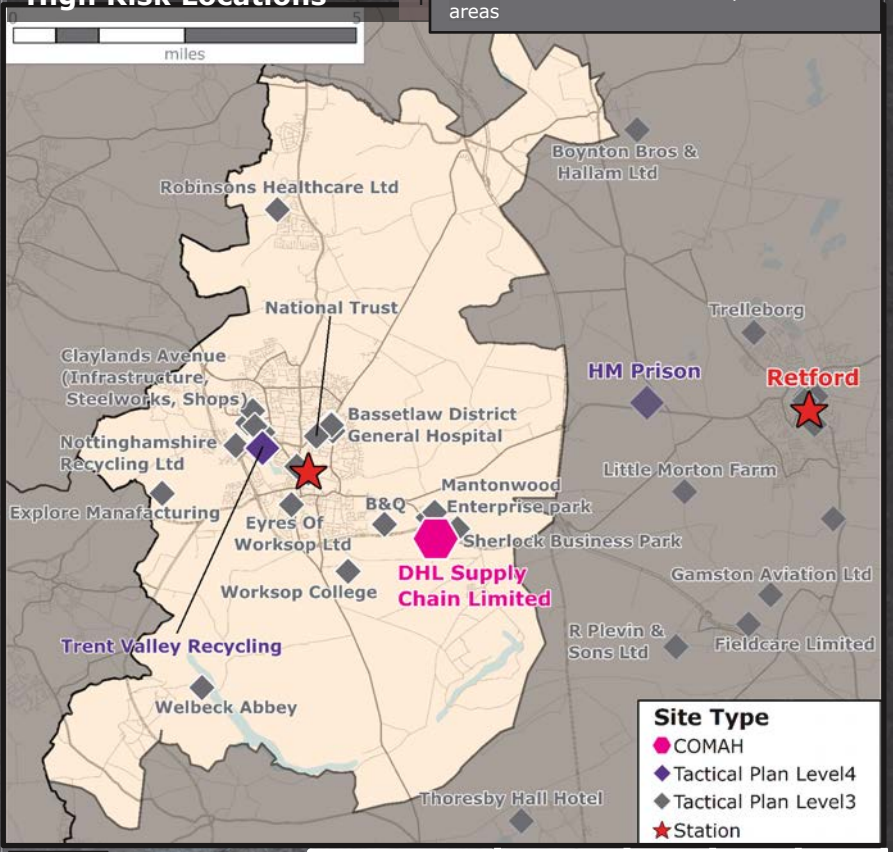
Station 8 is in Bassetlaw District. It has one Wholetime and one On-Call pumping appliance. It is also home to a Water and Foam Unit.

Eastgate
Worksop
S80 1QS
0115 838 8100

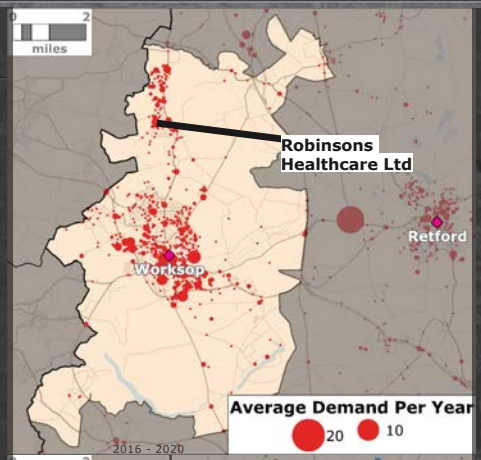
Population	Households	Commercial	Area
53,753	24,202	2,151	140.6Km²

High Risk Locations

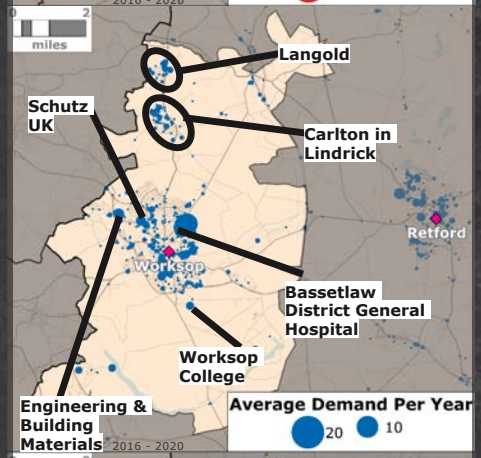
Station Grounds based on likely turnout areas



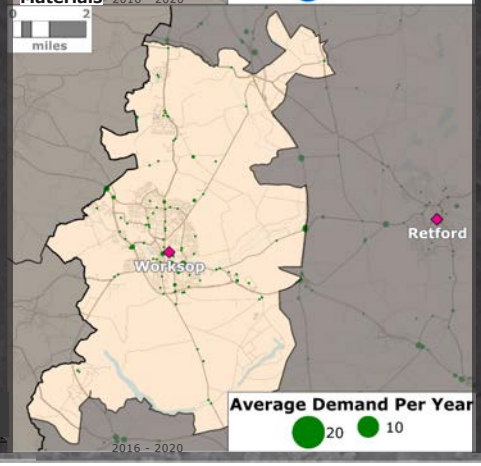
Fires



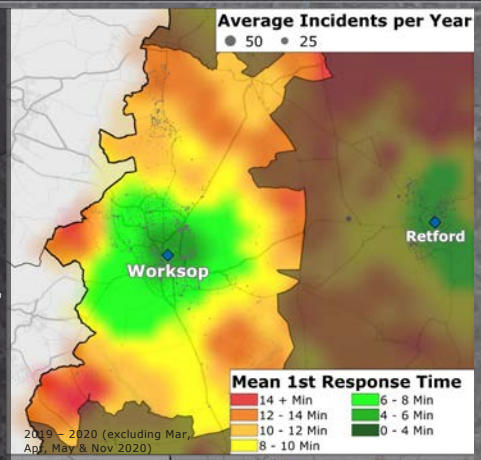
False Alarms



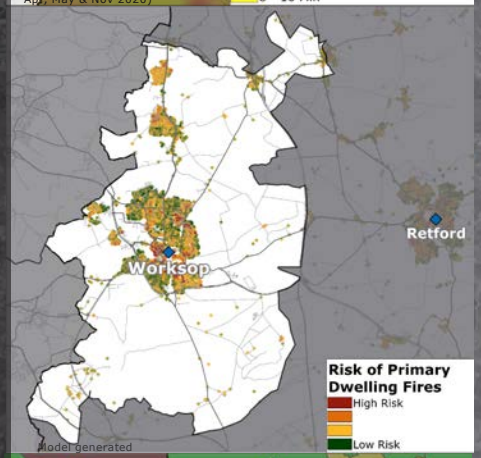
RTCs



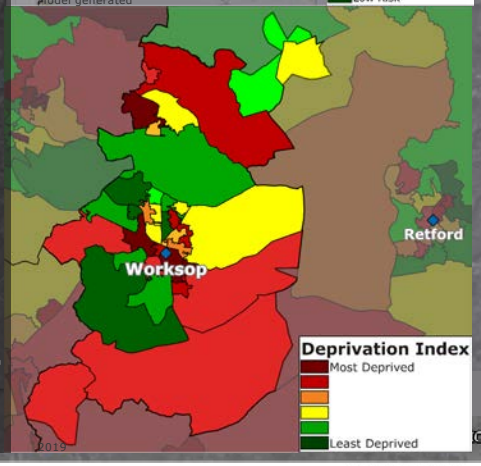
1st Response Time



Dwelling Fire Risk



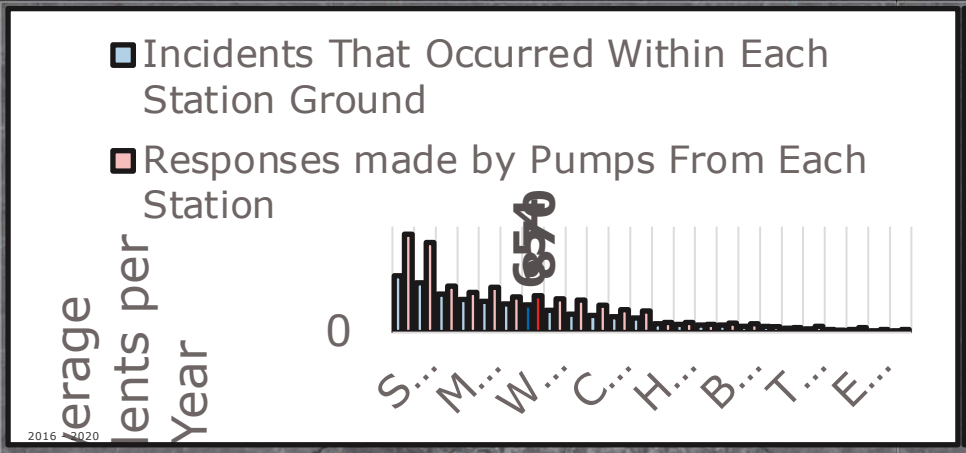
Deprivation

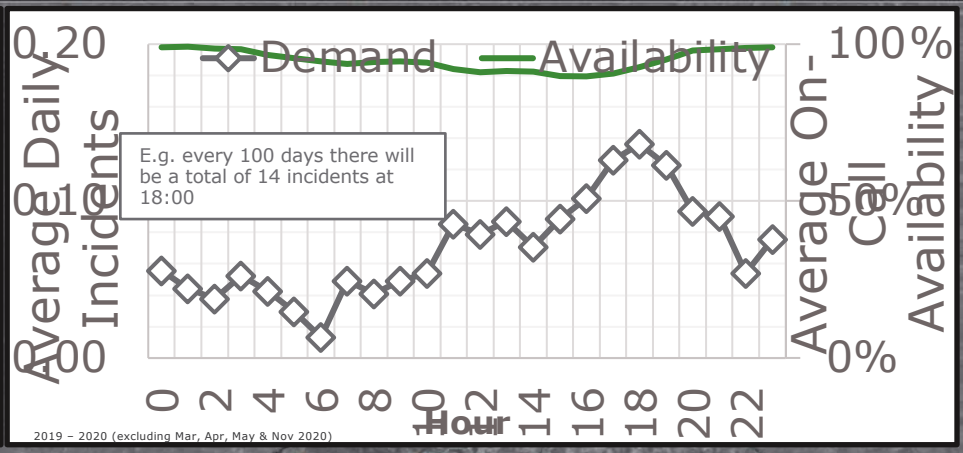


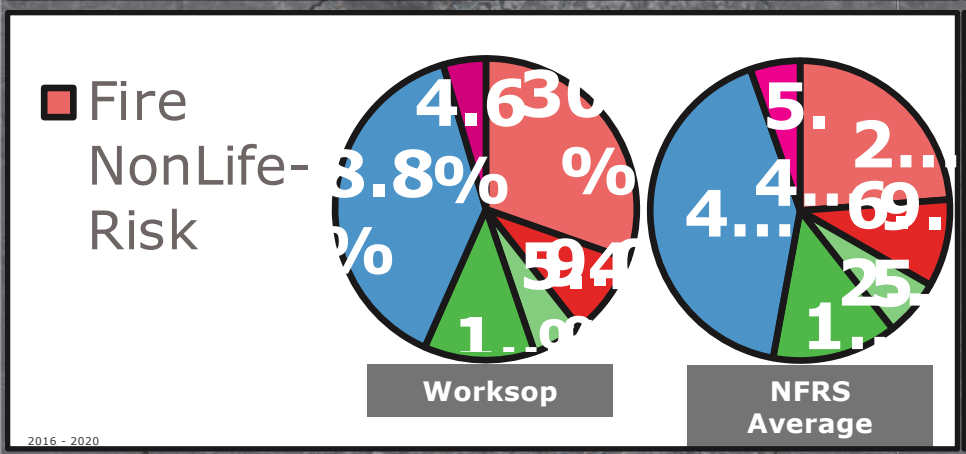
Average No. of incidents per year, within the station ground, by type. (Not Including Non-RTC Special Service.)

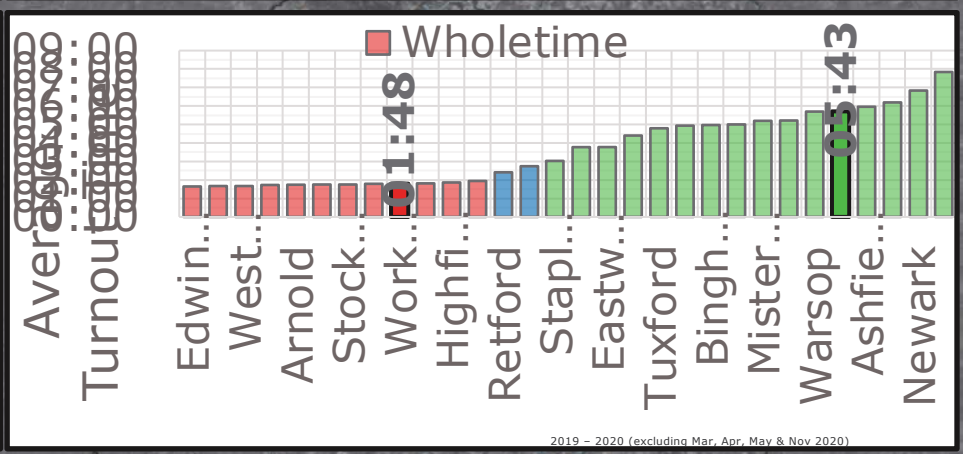
Type 2016 -2020	Fires	False Alarms	RTCs
Incidents Per Year	237	253	30

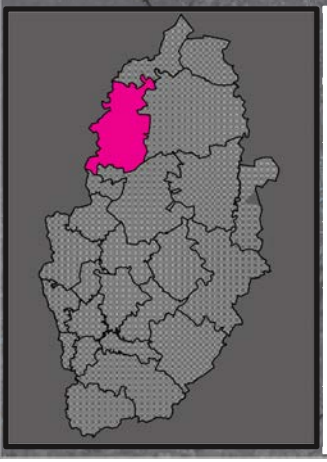
Date produced: 06 October 21



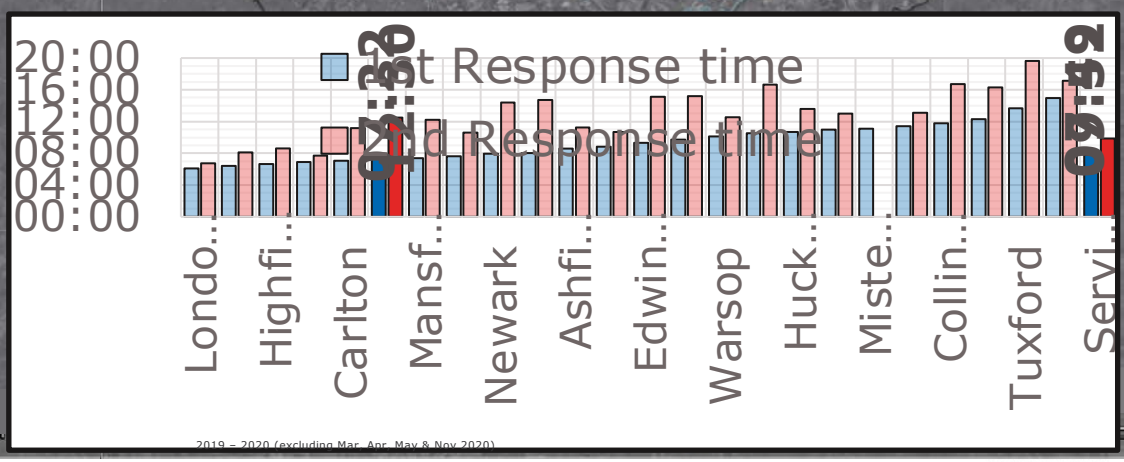








Ethnicity - 2011 Census	Population	Percentage
White	52,312	97.3%
Mixed/ multiple ethnic groups	472	0.9%
Asian/ Asian British	607	1.1%
Black/ African/ Caribbean/ Black British	242	0.5%
Other	120	0.2%



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