



Intervention Standards Review 2010



**Cumbria
Fire & Rescue**
County Council

CUMBRIA FIRE &
RESCUE SERVICE

Related Documentation

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Executive Summary

The Intervention Standards Review has considered a vast amount of information and analysed our operational intervention standards and performance over the past 5 years. In 2006 Cumbria Fire and Rescue Service CFRS changed its intervention standards as part of the Integrated Risk Management Plan (IRMP) process and this review has looked at the effectiveness of the new standards and identified a number of areas for improvement. The underlying emphasis of the review is to ensure our intervention standards are effective and efficient and that our operational resources are appropriately positioned to respond to the risk and demands placed upon them. The underpinning focus is to improve the safety and reduce risk in our communities and as a result of this review the following changes have been identified and will assist in informing our new 2011-14 IRMP:

- a. To move from Wards to Super Output Areas (SOA) for defining the risk within Cumbria.
- b. Emergency response standards to 'primary' property fires should be based on the refreshed risk profile and the existing three risk classifications of High, Medium and Low. The response to each risk categorisation should be in accordance with the performance times indicated in 'Table 9: Primary Property Fires response standard' and as promulgated in our 2006 IRMP.
- c. Emergency response standards to Road Traffic Collisions (RTCs) should be maintained at current levels in accordance with 'Table 12: RTC response standards' and as promulgated in our 2007 IRMP action plan.
- d. CFRS should create a new policy to redirect resources either en-route to a non life threatening incident or already in attendance and if safe to do so, to life risk incidents and mobilise the next nearest available resource to deal with the less urgent incident.
- e. Community activity should be based on the new risk profile constructed using SOAs and by applying the risk reduction methodology documented herewith. For example, priority should be given to planning CFS initiatives in identified high risk areas where historical performance indicates appropriate attendance standards are not being achieved, or lower risk rural communities where we know our response times are going to be stretched.
- f. To enhance our ability to target the most vulnerable people in our communities the Service should make use of other demographical information and lifestyle datasets. This could possibly be achieved by using designated software solutions to assist in the risk mapping process.

This document should be read in conjunction with our 2010 Strategic Risk Review.

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1. Introduction

In 2006 Cumbria Fire and Rescue Authority (CFRA) presented its new four year Integrated Risk Management Plan (IRMP); The 2006-10 IRMP has delivered significant change to the County's Fire and Rescue Service and enhanced public protection from fire and other emergencies across Cumbria. In 2006 Cumbria Fire and Rescue Service (CFRS) developed a new way of profiling risk within its communities and also set new intervention standards focused on life risk.

The 2006 IRMP risk profiling used a significant amount of data, including past incident statistics, crime and demographic information, in order to categorise every individual ward in the County as either 'High', 'Medium' or 'Low' risk. Intervention standards were then assigned to every ward and detailed the fire engine response times and the level of community safety activity CFRS would aspire to deliver to these areas.

Risk does not stand still. It is vital that we continually assess the risks faced by our communities and consider different options so that we can provide a high class efficient and effective Fire and Rescue Service to all those who live, work or travel through Cumbria. This review has not been carried out in isolation and is strategically linked to our recent Risk Review (available at www.cumbriafire.gov.uk). This Intervention Standards Review provides details of the change in 'fire cover' standards and looks at the history of the national standards that were developed throughout the last Century, leading into the process we undertook back in 2006 to develop a new ward based intervention strategy. It details our journey and provides a number of important recommendations that will help to inform our next IRMP and ensure we continually improve our service delivery.

New risk profiling models have been considered and aim to ensure we continually improve and develop our existing service so that we are in a better position to focus our resources to the actual risk and demands across our County. The review will also provide the underpinning detail to ensure that Cumbria Fire and Rescue Service continue to deliver against its strategic objectives and our vision of "creating safe and secure communities".

2. The History of 'Fire Cover' standards

Emergency fire fighting response (fire cover) nationally has changed considerably over the past 70 years; fire cover standards have been in place since 1936 (amended in 1944 and 1956). These standards were based on property types and were focused predominantly on the risk of fire spread in densely built areas, with highly developed city centres receiving the most provision for (and fastest response to) emergency calls and progressively less provision and speed of response being made for smaller town centres, suburban areas, and country areas, respectively. Indeed, under old legislation there were no standards of cover specified for remote rural and sparsely populated areas, nor for responding to other emergency situations such as life threatening road traffic collisions or wide scale flooding events.

In 1985, The Joint Committee on Standards of Fire Cover (as set out in Fire Service Circular 4/1985) recommended that national response standards should be based on 6 risk categories – 'A', 'B', 'C', 'D', 'remote rural' and 'special risk'. Fire cover provisions (the location of fire stations and engines) were generally determined by the ability of the Fire and Rescue Authority to meet these standards:

Categories, definitions and attendance requirements set out by the Joint Committee on Standards of Fire Cover, 1985:

Category	Definition	Fire Appliance Attendance time (minutes)		
		1st Appliance	2nd Appliance	3rd Appliance
'A' risk	Shopping and business centres, multi-storey hotels and offices, concentrations of theatres, cinemas, clubs, industry and commercial property	5	5	8
'B' risk	Multi-storey shopping and business areas, concentration of hotels, industry and trading estates. Concentration of older multi-storey residential property	5	8	No standard
'C' risk	Extensive areas of residential dwellings such as terraced property, blocks of flats, or light industrial and commercial buildings	10	No standard	No standard
'D' risk	All areas not previously classified as remote rural	20	No standard	No standard
'Remote Rural'	Areas isolated from population centres, containing few buildings	No standard	No standard	No standard
'Special Risk'	Building or site with specific pre-planned emergency arrangements	Pre-Determined attendance		

Table 1: 1985 standards of fire cover

In general, areas comprising many large buildings were deemed to pose a higher risk than those containing smaller or more dispersed buildings. However, there is now a common acceptance that this assumption/model is no longer suitable and there are many factors that need to be considered in determining who is most at risk from fire.

3. IRMP - “Shifting the focus”

The idea of shifting the emphasis of a response strategy from one tailored towards 'property risk' to one based around 'life risk' has been subject to detailed analysis since the mid-1990s.

The fundamental shift away from a model based almost entirely on property density to one focused predominantly on risks to life is underpinned by new legislation; the 'property risk' standards remained in place until they were repealed by the Fire and Rescue Services Act 2004. This

Act requires the production by Government of a Fire and Rescue Service National Framework Document that provides details of the expectations of Fire and Rescue Authorities' (FRAs). The latest Framework Document 2008-11 details the requirements for FRAs to produce Integrated Risk Management Plans (IRMP). CFRS will shortly be producing a new three year IRMP that will be the strategic plan for managing risk and it is the IRMP that will determine our resource allocation and distribution for prevention, protection and intervention activity. This review will be used to inform that planning process.

Evidence will be provided to support the IRMP in terms of the effectiveness of our intervention standards set in 2006. The review will also incorporate an analysis of current risk categorisations and provide a refresh, using more up to date information and our knowledge of risk. The outcomes of the review have been used to inform our new Strategic Risk Profile (www.cumbriafire.gov.uk).

Our 2006/10 IRMP provided the continued focus of our shift towards prevention rather than intervention and it is this golden thread that will continue to influence our future plans. We set stringent 'intervention' standards in 2006. Intervention in terms of the level of community engagement we would aspire to provide to each ward in the County as well as the response times we aimed to meet for our attendance at dwelling fires. This integrated strategy for managing risk in Cumbria is vitally important due to our geography and rurality, with many sparse populations meaning that it is not possible to meet fast response standards across all areas. The application of other control measures such as more focused community engagement/activity must continue to form part of our overall intervention standards, and an effective approach to integrated risk management.

4. Our existing Intervention Standards

Focusing on Life Risk (IRMP 2006/10)

The Fire & Rescue Services Act 2004 requires Fire and Rescue Authorities to use the Integrated Risk Management Planning process to deliver a flexible service to communities, based on standards that are locally determined, through analysis of actual risk to society not arbitrary and restrictive national standards. Consequently, as part of the 2006/10 IRMP, CFRS developed new emergency response standards based on life risk.

We assessed a wide variety of methods that could potentially have been utilised to establish our new emergency response standards. Each method was evaluated against the specific issues presented by the topography and risk profile of Cumbria, with an overarching aim of ensuring the new standards clearly balanced the three core principals of IRMP – Prevention, Protection, and Response. For Cumbria the challenge of preventative work is to address increased risk. This includes mitigation and supporting projects that tackle the root cause of inequality. Fire risk in Cumbria is not just in urban areas; rurality is also a significant factor. There are more fatalities in rural areas than urban ones and the allocation of resources to preventative work in rural areas is an important consideration. Our challenge back in 2006 was to develop intervention standards that specifically targeted the most at risk persons in our communities and we aim to develop and refine this methodology over the next years and beyond.

Our intervention standards aim to redress the imbalance presented by old legislation that concentrated on building density as opposed to actual life risk. However, whilst focusing on life risk, we still place an appropriate emphasis on the potential commercial, economic, and environmental impact of any fire and other emergency incidents, on Cumbria and our environment and heritage.

There was no recognition in the old standards that risk from fire varies, not in relation to size and density of housing, but rather according to many other far more diverse and complex factors. A review of five years data of fire deaths and casualties in Cumbria concludes that those over the age of 70 are most at risk and further data indicates fire risk is greatest where there is:

- Deprivation
- Rurality
- Single parent families
- Single persons households
- Socially rented accommodation
- Sick/disabled
- People who have never worked

Ultimately, before the IRMP process was adopted the old national standards were not capable of indicating certain areas of housing where rates of fires and casualties were consistently far higher than other areas. Instead, the national standards simply assumed that all housing presented an identical magnitude of fire risk. Not only was this an inaccurate assumption, but perhaps equally significant, this lack of focus on genuine life risk did little to support the effective targeting of Community Fire Safety (CFS) risk reduction initiatives. Our intervention standards therefore focus on the fundamental risk principle of “prevention before intervention”.

Ward focused in 2006

The 2006-10 IRMP undertook our first review of fire and life risk based upon local factors and moving away from the national response standards. We initially carried out an exercise testing the correlation of the principal risk categories within the Fire Service Emergency Cover (FSEC) toolkit (dwelling fire module) with the incidence of dwelling fires in Cumbria. This led to the conclusion that the FSEC model was not sufficiently reliable at predicting fire risk within the principal risk categories:

- Lone pensioner households – only 8.5% of the variation of dwelling fires could be explained by the percentage of lone pensioner households in a ward
- Lone parent households – only 23.5% of the variation of dwelling fires could be explained by the percentage of lone parent households in a ward
- Long-term limiting illness households – only 21.4% of the variation of dwelling fires could be explained by the percentage of long-term limiting illness households (LTLI) in a ward
- Rented accommodation – only 34.6 % of the variation of dwelling fires could be explained by the percent of rented accommodation households in a ward.

So, we took these four independent variables and then combined them in a hierarchical regression model whereupon the process eliminated both lone pensioner and lone parent households but retained rented accommodation and LTLI as valid predictors. This provided sufficient argument to

devise a better risk model for Cumbria, using a variety of other variables that were identified through the document 'Fires in the Home: Findings from the British Crime Survey 2002-03' and the bi- and multi-variant analysis of incidence of fires and smoke alarm ownership conclusions.

A model was developed at ward level which again used hierarchical regression analysis, and incorporated the dependent variable of dwelling fires for a 5-year period (01/04/2000 to 31/04/2005) and independent variables drawn, where possible, from Census 2001 tables to address the following groups, and where no direct demographic variables were available, proxies were used, thus:

- Head of household aged 16-24 - Census 2001 ST11
- Household contains adults and children - Census 2001 KS20
- Lone parent households - Census 2001 KS20
- The respondent of the household has a limiting disability - Census 2001 KS08
- The respondent of the household was of mixed race or black – Census 2001 KS06
- Socio-economic group - A-Level qualifications or above - Census 2001 KS13
- Socio-economic group - likely to have no qualifications - Census 2001 KS13
- The property is rented socially - Census 2001 KS18
- Household a victim of household crime - IMD 2004 Crime domain (proxy)
- The physical condition of the property is poor - IMD 2004 Environment domain (proxy)
- The household is in an area of high physical disorder - IMD 2004 Environment domain (proxy)
- The household is financially unstable - IMD 2004 Income domain (proxy)

Once the regression process had been completed, 10 of the original 69 independent variables were retained and this model became the basis of our 2006/10 IRMP and informed our ward-based response standards for the attendance principally to dwelling fires, and where it was known attendance could not be met, the response was to increase community safety activity to mitigate the risk.

Each ward then had a score based upon adding together the values of the location quotients remaining in the predictive model. Then each overall score was converted to a percentile, and the percentiles divided into high, medium and low risk based upon the following split: Greater than the 90th percentile allocated 'High', between the 40th and 90th percentile allocated 'Medium', and lower than the 40th percentile was allocated 'Low'.

Our ward based dwelling fire standards

Once we had determined our ward risk categorisations we set out our performance standards for managing the risk in these wards in terms of our expected level of intervention. We classified each ward as high, medium or low depending on the outcomes from the regression analysis and then assigned the level of community activity we would aim to deliver to these areas. Our intervention standards were therefore based upon a combination of prevention and response activity and we published these standards for every individual ward within the County. The outcome from this process was an integrated response to each ward based on the dwelling fire risk therein. The higher the risk, the quicker the operational response and greater the community fire safety activity.

The risk categories and response standards we set in 2006 were:

Category	Definition	Fire Appliance Attendance time (minutes)	
		1st Appliance	Full Attendance
High risk Ward	The risk profile warrants a high level of fire cover and an enhanced level of community safety risk reduction initiatives	Less than 5 minutes	Less than 10 minutes
Medium risk Ward	The risk profile warrants a medium level of fire cover and normal level of community safety risk reduction initiatives	Less than 10 minutes	Less than 15 minutes
Low risk Ward	The risk profile warrants a minimum level of fire cover and normal level of community risk reduction initiatives	Less than 15 minutes	Less than 20 minutes

Table 2: 2006 IRMP Ward Based Response Standards

As stated in our 2006/10 IRMP we aim to meet the above standards on 80% of occasions and monitor our performance principally to dwelling fire response only.

5. Monitoring Performance - Are the existing standards working?

In the 2006 IRMP risk model, the introduction of enhanced community safety in mitigation to a station's inability to meet attendance standards to particular risk wards was introduced. CFRS is fully committed to reducing fires and aims to do so by focusing on protection and prevention activity. In order to evaluate the effectiveness of this strategy we have analysed a number of key areas:

Casualties as a result of fires

Over the 5 year interval (01 April 2004 – 31 March 2009), 8077 primary fires (property and vehicle fires) were attended by CFRS and fire-related casualty statistics were:

- 36 primary fire related fatalities (ave. 7 per year),
- 280 primary fire related serious casualties (ave. 56 per year), and
- 327 primary fire slight casualties (precautionary checks) (ave. 65 per year)

Although year on year the overall number has been declining particularly for the serious casualty group. In terms of the primary fire related fatalities, 14 were as a result of vehicle fires and not dwelling fires.

Primary Fires (property and vehicles)

The following table demonstrates the number of persons killed or seriously injured in primary fires during the period 01/04/2004 to 31/03/2009 by our current ward categorisation:

Locality	No. of people killed or seriously injured (KSI) per 2006/10 IRMP Ward Risk Classes					
	High Risk Ward	%	Medium Risk Ward	%	Low Risk Ward	%
Barrow	23	7.28%	20	6.33%	21	6.65%
Carlisle	31	9.81%	45	14.24%	46	14.56%
Kendal		0.00%	11	3.48%	38	12.03%
Workington	18	5.70%	43	13.61%	20	6.33%
Total	72	22.78%	119	37.66%	125	39.56%

Table 3: No. of people KSI per Ward Area 2004-2009

The analysis of the existing ward categories where serious primary fire incidents have occurred provides evidence to suggest that our existing ward risk profiling does not provide a strong correlation to the locations of our fire casualties. We are aware that 'a fire is a fire' and understand the devastating affects of a fire will be suffered by the occupants on a similar magnitude regardless as to whether the fire is in a mid terraced property in a high risk area, or an isolated cottage in a low risk rural settlement. However, our emphasis must be to remain focused on identifying pockets of society who are statistically more at risk from fire than others and developing an intervention strategy accordingly.

An analysis of our 'fatal' fires provides a similar statistical comparison in respect of the ward categorisations where they have occurred:

Locality	No. of fatal fire casualties per 2006/10 IRMP Ward Risk Classes					
	High Risk Ward	%	Medium Risk Ward	%	Low Risk Ward	%
Barrow	1	2.78%	2	5.56%	3	8.33%
Carlisle	1	2.78%	6	16.66%	7	19.45%
Kendal	0	0.00%	0	0.00%	4	11.11%
Workington	4	11.11%	5	13.89%	3	8.33%
Total	6	16.67%	13	36.11%	17	47.22%

Table 4: No. of fatal fire casualties per Ward Area 2004-2009

Dwelling Fire Response

During the review period we met our fire engine response standards to the 'fatal' dwelling fires on 86% of occasions. The simple fact remains; if occupants are to safely escape from dwelling fires it is vital to provide early warning of fire by means of smoke detection and provide appropriate guidance in developing escape plans, so that occupants are able to make their way out of the affected building before being overcome by toxic smoke.

Road Traffic Collision Casualties

In the period from 01 January 2004 – 31 December 2009, with respect to Road Traffic Collisions (RTCs), although not all attended by the fire service, the police recorded RTC-related casualties as:

- 257 fatalities (ave. 43 per year),
- 1767 seriously injured casualties (ave. 295 per year) and
- 12289 slightly injured casualties (2048 per year),

And as with fire casualties these have been declining year on year.

Figures for 2009 released by Safer Roads for Cumbria revealed that the County had the lowest road fatality figure for many years with serious injury casualties also recording a reduction. In 2009 there were 23 fatalities on Cumbria's roads compared to 44 fatalities in 2007 and 59 in 2006. In common with previous years the majority of those dying were local:

Year	Deaths	Serious Injuries	Other Injuries
2004	57	377	2300
2005	45	369	2209
2006	59	282	2067
2007	44	274	2075
2008	29	247	1913
2009	23	218	1725

Table 5: RTC casualties 2004-2009

Prevention - Home safety visits

During the five year period of the review, 51,131 first visits were carried out across the County, representing some 21.8% of the County's dwelling stock, and a further 4,262 repeat visits were carried out (8% of the County's dwellings). The 2006 IRMP identified a number of wards for enhanced community safety, not all necessarily high risk; sometimes that the fire engine attendance time we set was hard or impossible to meet:

- Nine wards in Allerdale and Copeland districts (Workington locality); Moorclose, Moss Bay, St Michael's, Holme, Marsh, Warnell, Harbour, Mirehouse and Sandwith. Largely there has been evidence of enhanced community safety within the regular station areas, but Holme (19.6%), Marsh (6.9%) and Warnell (5.8%) have received well below the average

23% of households visited over the 5 year period provided within the locality.

- Eight wards were within Carlisle and Eden districts (Carlisle locality); Botcherby, Castle, Harraby, Upperby, Lyne, Hartside, Kirkoswald and Skelton. As above wards serviced by the regular station show evidence of enhanced community safety, and the more rural, retained wards have been under provisioned; Hartside (6.5%), Kirkoswald (8.8%) and Lyne (19.7%) are all below the average for percent of homes in a ward visited by the locality (23.2%).
- Eight were with in Barrow district and parts of South Lakeland (Barrow locality); Barrow Island, Central, Hindpool, Newbarns, Ormsgill, Risedale, Walney North, and Hawkeshead. Largely there has been evidence of enhanced community safety within the regular station area with the exception of Ormsgill (22.1%), but Hawkeshead has received well below (18.9%) the average 23% of households visited over the 5 year period provided within the locality.
- Three were within South Lakeland and parts of Eden districts (Kendal locality); Staveley-in-Cartmel, Whinfell and Orton with Tebay. As above wards serviced by the regular station show evidence of enhanced community safety, and the more rural, retained wards have been less well serviced, with Staveley-in-Cartmel (12%) below the average for percent of homes in a ward visited by the locality (15.8%).

Performance Summary

As clearly evidenced, people are at risk regardless of where they live or the risk categories we assign to the particular wards where they reside. The statistical analysis detailed above can always be looked and interpreted in different ways; however, the statistics clearly demonstrate that our 'medium' and 'low' risk wards are vulnerable and unfortunately people are still dying or being seriously injured in fires. The majority of fire related deaths occur in dwelling fires, with the most common cause of death being overcome by gas or smoke; statistically in recent years this cause has accounted for almost half the total number of all fire deaths in the UK (fire statistics, United Kingdom, 2007). Those most at risk are the elderly. CFRS will continue to focus on community safety initiatives in order to reduce the incidence of fire and the consequences of such. It is clear that our ward categorisations need to be refreshed and we need to look at how effective the data we used in our 2006 regression model is today.

As a mainly rural County we must strive to deliver services to all of our communities in a fair and equitable manner. Our intervention standards have been set to address increased risk but we know from our analysis that those at significant risk are not necessarily living in high density built up areas. We also need to consider how our classification of risk compares to other FRAs, in particular those who border Cumbria so that relative comparison can be made.

6. Development of our attendance standards

It is clear that prevention activity is achieving the desired outcomes; overall the numbers of fires and fire related casualties are reducing and CFRS is committed to redirecting resources to prevention and protection activities. Having established a risk based intervention concept, and identified the areas of the County where fire risk was deemed to be elevated, it is necessary to further consider risk in light of more up to date information. We remain focused on providing a specific intervention strategy that targets the most vulnerable people in our communities and if incidents do occur, ensuring we have the correct resources available to deal with the situations efficiently and effectively.

Fires will inevitably happen. The effect that our emergency response times have in relation to the overall outcomes from fire and other emergency situations needs to be given careful consideration. We continue to aspire to reducing risk to life from fire, across the whole of the County, to levels that are as low as reasonably practicable, whilst fully appreciating the inevitability that fires will and do occur.

Emergency response times

There is an abundance of research and statistical analysis available to determine whether a correlation exists between fire service speed of response and casualty outcomes. The Home Office commissioned Entec in 1998 to carry out a national study of response times and fatality rates relationships for dwelling fires. This report (Response time fatality rate relationships for dwelling fires) calculated the individual risk of death from fire in dwellings by first developing a plot of the likelihood of fatality per fire against Fire and Rescue Service (FRS) attendance times. Data used was from attendance times and casualties in dwelling fires reported to the Home office in 1995. Over 13,000 reports were analysed, namely all dwelling fires where a person was reported as a casualty, fatality or being rescued by the FRS in the UK in a single year. This involved calculating the percentage of casualties who were fatally injured when the fire was attended within a given time by the Fire and Rescue Service. The report concluded that the probability of death per fire, correlated to response times in the following manner:

Response time (mins)	Probability of fatality per (persons reported) fire	Which equates to a 1 in 'x' probability
1 to 5	0.038	1 in 26
6 to 10	0.042	1 in 24
11 to 15	0.055	1 in 18
16 – 20	0.072	1 in 14
> 20	0.16	1 in 6

Table 6: Entec report on probability of fatalities per (persons reported) fire

Thus, based on the figures from the national study there was a 1 in 6 probability of a death occurring in dwelling fires attended in over 20 minutes, reducing to a 1 in 26 probability of a death for similar fires attended in less than 5 minutes. What isn't apparent as part of the above research is the time taken from the ignition of the fire to it being discovered? There is research available to indicate that many of those who have died in fires were already dead even before the first call to the Fire and Rescue Service was made. Once a fire starts the best chance of anyone surviving if they are in the building is to have early warning to give them time to escape before conditions become untenable. Previous research, documented as an exhibit in a further Entec report in 1998 entitled "Development and trial of a risk assessment toolkit for the UK Fire Service" states:

"...It should be noted that close to 50% of fatalities occur in fires estimated to have been discovered over 30 minutes after ignition. Given that persons are very likely to be overcome within 10 to 20 minutes of flaring this suggests that there are a proportion of occasions on which victims die prior to the fire brigade receiving an emergency call. This is consistent with the relatively small difference in the fatality rate for fires attended in under five minutes and fires attended in 6 to 10 minutes"

It can also be seen from the above research that there is little substantial increase in the risk of fatality until after 10 minutes has elapsed from the time of ignition. The Entec Report 'Response time fatality rate relationships for dwelling fires' therefore concluded:

"... There is little difference in the risk associated with a 10 minute response standard compared with a 5 minute response standard. Therefore a 10 minute response standard is suggested for all areas of population which have above a certain minimum of persons."

Applying this statement in its entirety would be deemed to be somewhat a return to the old national standards of fire cover and a backward step to a response purely based upon population density, without factoring in other social demographic issues already known to influence the frequency and susceptibility to fire.

The response times of our firefighters and appliances alone cannot prevent fire fatalities and we need to focus resources on preventing the fires occurring in the first place. When fires do occur we need to ensure that the occupants are provided with the best possible chances of escaping safely and to do that early detection is vital. Smoke detectors save lives. **It is no surprise that out of the 22 fatal dwelling fires during the review period, 18 properties had no working smoke alarm.**

The optimum response time is nil. In other words, for the occupant to detect and deal with the situation before their safety is compromised and hence having no requirement to rely on the Fire and Rescue Service. However, this is clearly aspiration rather than realistic. We need to carefully consider the optimum response times based on our knowledge of fire and the potential control mechanisms people can take themselves prior to our arrival. In simple terms, as we have mentioned already, 'a fire is a fire' regardless of the ward area/location of the dwelling involved. The likely impact of that fire on the occupants is the same, irrespective of location. Therefore, in theory, our attendance times to that incident should be the same but the introduction of variables such as incident frequency, cost-effectiveness and geography needs to be considered at the point of setting resource distribution. The geography of Cumbria is a vital consideration because as the population becomes sparser, so too does the infrastructure and consequently the road speed that our fire engines can safely travel.

It is impossible to deploy resources that would ensure every dwelling risk is covered by the same quick response times, unlike more urban Fire and Rescue Services. It is also not possible to say that fires will never happen. What is possible, is to analyse historical data and new research that indicates there are a wide range of factors that have a bearing on who is likely to be most at risk, and then identify those groups within our communities and target our prevention and protection resources accordingly. This will also enable us to predict that there are areas in our County that are statistically far less likely to suffer the consequence of a fire than others. The risk profile and demand in those areas identified as less likely to suffer a fire is such, that it would not be justifiable to provide the same intervention standards as for those at higher risk/greater probability.

Recent National Review

A recent review commissioned by Communities and Local Government Department (CLG) in 2009 looking at fire service response times indicated;

“...Response times to Primary Fires (dwelling fires, Other Buildings fires, larger outdoor fires and road vehicle fires) were examined for the period 1996 to 2006. It was found that response times to each type of Primary Fire in England increased from 1999, primarily due to increased traffic levels.”

*“... Using response time fatality rate relationships, it was predicted that the increased response times may contribute to about 13 additional fatalities in dwelling and Other Buildings fires each year, possibly 65 additional deaths in Road Traffic Collisions (RTCs) and an £85m increase in Other Buildings fire damage. However, recorded annual dwelling fire fatalities fell by 142 between 1996 and 2006, and the average size of fires has not increased. **This suggests that increased response times to fires have been more than offset by other factors**, particularly improved fire safety. Deaths in Road Traffic Collisions have also fallen in this period.”*

The Way Forward

Our approach to responding to risk is well developed and as well as assessing the overall risk of a local area, our resource and response requirements will continue to be determined by considering the following:

- Geographical cover – The area of service provision. This is driven by the geographical dispersion of potential incidents and the distance to travel by our response vehicles.
- Workload – The likely number of independent responses required, taking into account historical incident data.
- Type of response – The characteristics of the risk which determine the resource requirement within that area.
- Weight of attack – The amount of equipment and staff required to deal with an incident based on an analysis of the potential impact of each emergency situation.

Inevitably some of the above factors are intrinsically linked. There is dependency between ‘type of

response' and 'weight of attack'. Furthermore, other factors such as response time, firefighter safety and local topology serve as constraints for defining the limits of these variables. We will continue to focus our efforts on risk reduction initiatives, however, fully understand that a modern fire and rescue service should be governed by the following principles:

- Maintain public protection from fire and, if possible, enhance that protection by means of proactive prevention and protection activity
- Actively promote firefighter safety
- Provide a primary focus of fire cover which continues to be directly addressed to life risk
- Continue to be cost effective and consistent with the principles of best value for public money

These four key principles have been considered as part of our recent review of risk across Cumbria and full details of our new risk profile are contained in our Strategic Risk Review (www.cumbriafire.gov.uk).

The 2009/10 Ward Risk Review process

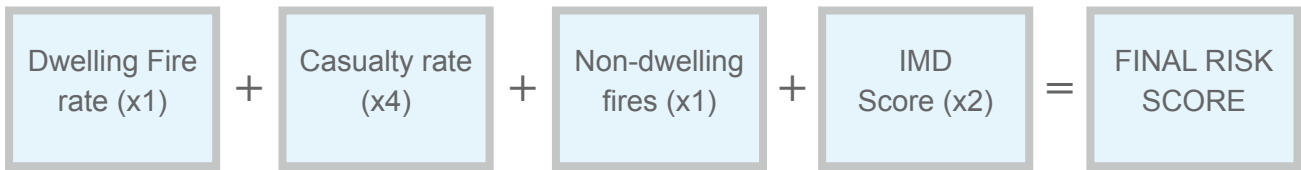
In order to accurately assess the current risk in our areas we have reviewed our 2006 regression model. If we were to repeat the regression using the same Census tables as previous it would result in only the dependent variable and IMD scores to have changed time frames. All of the other variables were static set in 2001, and the model would be flawed and weakened, indeed, on running the model with dwelling fires for the period 01/04/2004 to 31/03/2009 the coefficient of determination (R²) for the model reduced from 0.64 to 0.31 (i.e. down from accounting for 64% of the variation to only 31%).

Between the 2006 IRMP and 2009, a number of new experimental datasets have become available through the Office of National Statistics, which although not as comprehensive as the decennial census do provide a wealth of data with which to build a new model with more current information; Consideration was given to developing a new regression model based on these fundamentals. However, a key consideration in monitoring our performance is the ability to benchmark ourselves against other FRAs and consider how the risks faced by our communities compare with those living in other counties, especially within the North West region. We also want to be in a position where we can analyse risk in a way that allows us to determine whether our prevention and protection strategies are having the desired effect. A decision was taken to liaise with a neighbouring FRA and consider the risk model used as part of their IRMP process, which provides a scoring methodology and allows a comparative approach to Cumbria's risk profile.

Lancashire FRA's risk mapping involves an analysis of fires and associated casualties, along with a consideration of the deprivation within each area by use of the Index of Multiple Deprivation (IMD) score. The Index of Multiple Deprivation (IMD) 2007 is a measure of multiple deprivations and is made up of seven domain indices. These are:

- Income
- Employment
- Health Deprivation and Disability
- Education, Skills and Training
- Barriers to Housing and Services
- Crime
- Living Environment

Lancashire FRA’s risk model is therefore a development of the model used in our 2006 IRMP; we have maintained societal risk as a valid predictor of fire but at the same time focused on fires resulting in casualties and by applying the following weighting factors we are able to identify those areas within Cumbria that are more likely to suffer a fire resulting in injury:



The weighting factors used to combine the various elements of the formula take into account sensitivity issues to ensure the final risk grading always changes in a manner that informs our key target area – National Indicator 49, the number of primary fires and related fatalities and non-fatal casualties (excluding precautionary checks). The formula is weighted to provide emphasis on casualties and deprivation as if it was incorrectly structured, it would tend to disproportionately reflect an increase in calls as evidence of increasing risk, which is not always the case. In practice, even if the number of reported fires increases in a given area, due to the structure of the formula as long as casualty rates decrease, then so too will overall levels of risk in that area (both in reality and within the final risk score).

Risk ratings within the formula

It is important that the new risk model is informed using appropriate evidenced based risk weightings. The detailed Entec Risk Assessment Toolkit Report commissioned by the Home Office and designed to be used by Fire and Rescue Services’ to categorise risk, provides details on tolerable levels of risk and this information has been used to inform our new risk model. The following tables provide details of the risk weightings that have applied to each of the component parts of the risk calculation:

Dwelling Fire Rate (per SOA)			
Calculation	Description	Banding	Risk score
$\frac{\text{Number of dwelling fires}}{\text{Number of dwellings}}$ (averaged over 5 years)	Annual rate of fire per 'n' dwellings greater than 1 in 200	Greater than 0.005	12
	Annual rate of fire per 'n' dwellings between 1 in 200 and 1 in 300	0.005 to 0.003334	10
	Annual rate of fire per 'n' dwellings between 1 in 300 and 1 in 400	0.003333 to 0.0026	8
	Annual rate of fire per 'n' dwellings between 1 in 400 and 1 in 600	0.0025 to 0.001667	6
	Annual rate of fire per 'n' dwellings between 1 in 600 and 1 in 800	0.001666 to 0.00125	4
	Annual rate of fire per 'n' dwellings less than 1 in 800	Less than 0.00125	2

Dwelling Fire Casualty Rate (per SOA)			
Calculation	Description	Banding	Risk score
$\frac{\text{Number of casualties / fatalities}}{\text{Number of residents}}$ (averaged over 5 years)	Annual rate of fire casualty per 'n' residents greater than 1 in 1000	Greater than 0.001	12
	Annual rate of fire casualty per 'n' residents Between 1 in 1000 and 1 in 1500	0.001 to 0.0006668	10
	Annual rate of fire casualty per 'n' residents Between 1 in 1500 and 1 in 2000	0.0006667 to 0.0005	8
	Annual rate of fire casualty per 'n' residents Between 1 in 2000 and 1 in 3500	0.0005 to 0.0002858	6
	Annual rate of fire casualty per 'n' residents Between 1 in 3500 and 1 in 5000	0.0002857 to 0.0002	4
	Annual rate of fire casualty per 'n' residents Less than 1 in 5000	Less than 0.0002	2

FDR1 NON-DWELLING FIRE RATE (per SOA)			
Calculation	Description	Banding	Risk score
Frequency of FDR1 fires occurring in buildings other than dwellings (5 year period)	Number of FDR1 fires in buildings other than dwellings; 15 or more	15 or more	12
	Number of FDR1 fires in buildings other than dwellings; Less than 15	Less than 15	10
	Number of FDR1 fires in buildings other than dwellings; Less than 10	Less than 10	8
	Number of FDR1 fires in buildings other than dwellings; Less than 6.67	Less than 6.67	6
	Number of FDR1 fires in buildings other than dwellings; Less than 5	Less than 5	4
	Number of FDR1 fires in buildings other than dwellings; Less than 3.33	3.33 or less	2

INDEX OF MULTIPLE DEPRIVATION (per SOA)			
Calculation	Description	Banding	Risk score
IMD 2007 Score	IMD2007 Score greater than 33.8	Greater than 33.8	12
	IMD 2007 Score between 33.8 and 24.7	Between 33.8 and 24.8	10
	IMD 2007 Score between 24.7 and 19.5	Between 24.7 and 19.6	8
	IMD 2007 Score between 19.5 and 14.8	Between 19.5 and 14.9	6
	IMD 2007 Score between 14.8 and 11.25	Between 14.8 and 11.25	4
	IMD 2007 Score less than 11.25	Less than 11.25	2

As indicated in the risk calculation tables, statistics have been used in five year periods to ensure the overall risk classifications are not adversely affected by annual ‘spikes’ and than any change to risk grades assigned to a particular area is underpinned by corroborative data.

A more defined approach (Super Output Areas)

In our 2006/10 IRMP we published our intervention standards in terms of operational response times and community safety activity for every individual ward in the County. We now propose to develop this further and drill down into smaller areas in order to target those most in need. Therefore, we intend to set our response standards based on ‘Super Output Areas (SOA)’

SOAs give an improved basis for comparison across the Country because the units are more similar in size of population than, for example, electoral wards. They are also intended to be stable, enabling the improved comparison and monitoring of policy over time.

Our current system, based on wards, is useful but less precise due to their larger size, leading to significant risk variation across the ward.

Super Output Areas address a number of issues:

- They enable comparison of areas of a similar size nationally.
- This new geography is much better at identifying the pockets of deprivation that are a feature of urban areas - pockets that can be overlooked if only looking at data at ward level.
- The boundaries are durable, enabling ready comparison over time.

Super Output Areas are subdivisions of the existing 2001 wards. They have a minimum size of 1,000 residents (400 households) and a maximum size of 3,000 residents, but generally on average, contain 1,500 residents. Not only is this an ideal size to facilitate robust statistical comparison, but also since these areas have been designed specifically for statistical purposes, their boundaries will never be changed.

Due to the statistically robust nature of geographical risk categorisation, and the social homogeneity within each super output area, a new Cumbria risk profile will not only underpin our emergency response standards, but will also provide a more in depth tool to allow managers to accurately target Community Fire Safety initiatives to those most in need. Having established a clear link between prevention, protection and intervention, the more detailed risk approach at SOA level represents a fully integrated strategy to risk management.

Overall SOA Risk Score and final Risk Grade

In 2006 our risk categorisations were based on percentiles, with ward risk scores greater than the 90th percentile allocated 'High' risk status, those between the 40th and 90th percentile allocated 'Medium', and lower than the 40th percentile allocated 'Low'. Applying this methodology each year would not allow us to determine whether risk was increasing or decreasing as we would always have 10% of wards classed as 'high' risk due to the proportionate grading methodology.

In common with Lancashire FRA we have applied the new risk formula to our Super Output Areas and then the final risk scores were quartiled between the lowest possible score (16) and the highest (96), enabling us to categorise each SOA as High, Medium or Low according to the following bands:

Risk Score	Risk Grading
76 and above	HIGH
35 to 75	MEDIUM
34 and below	LOW

Table 7: New SOA risk score and grading table

Cumbria Risk Profile

In order to analyse whether our prevention and protection activities have been having the desired effects in reducing the risk within Cumbria we have retrospectively analysed data and fed it into our new risk model, comparing our risk profile over 5 year periods. By undertaking this process we are able to assess whether the new regression model is robust and furthermore, whether risk across the County is reducing:

Cumbria Risk Profile		Incidents 2002/3-06/07		Incidents 2003/04-07/08		Incidents 2004/05-08/09		Incidents 2005/06-09/10	
		2007-8 RISK		2008-9 RISK		2009-10 RISK		2010-11 RISK	
Score	Risk Grade	Risk Score	No. of SOAs	Risk Score	No. of SOAs	Risk Score	No. of SOAs	Risk Score	No. of SOAs
76 and above	High	1350	16	1522	18	1692	20	1286	15
35 to 75	Medium	7530	147	7766	151	6686	132	6834	137
34 and below	Low	3768	159	3546	153	4074	170	3986	170
Total Risk Score		12648		12834		12452		12106	
Risk score change compared to 2006/7				1.45%		-1.57%		-4.48%	

Table 8: Cumbria risk profile

We can determine from the above chart that the overall risk in Cumbria has reduced over the period based on comparing the statistics from the 2002/3 - 2006/7 period to the latest five year span of 2005/6 – 2009/10. Also, by comparing the latest five year statistics to the 2009/10 review period, the overall risk in our high risk areas has significantly reduced by over -24%. This demonstrates that since the production of our 2006-10 IRMP the risk levels are reducing, particularly in SOAs determined to be high risk.

7 Intervention Standards Conclusion

Response Times

Taking all of the research into consideration and applying a more robust analysis of our area in terms of actual risk within each SOA we have considered a number of options:

1. Move to one standard response time across the Service. This approach has been adopted by several FRAs, however they are generally the more urban counties such as Greater Manchester. In Cumbria due to the geographical area of our service provision it would be unrealistic to set one standard. This is supported by the fact that not all areas have the same level of risk or demand. **Therefore ruled out as an effective risk model for Cumbria at this present time.**
2. Move to an 'Urban' and 'Rural' response time standard across the Service. This again has been adopted by several FRAs some of which are similar in terms of rurality issues to

Cumbria. Adopting two standards based on what is in effect a ‘population density’ response strategy would be a return to the old standards of fire cover. This approach would not take into consideration the increase in risk as a result of much wider economical and demographical issues. **Therefore ruled out as an effective risk model for Cumbria at this present time.**

3. Maintain an integrated approach to intervention and set appropriate response times and community activity according to the risk within each area. At present the Service has set response standards based on a Ward Risk Profile and times set in terms of ‘high’, ‘medium’ and ‘low’ risk. The response times are 5 minutes, 10 minutes and 15 minutes respectively. It is unrealistic to set standards that are unachievable and hence the 5 minute standard is the quickest time that could safely be set. These response standards were set as part of the 2006 IRMP and are a significant improvement on the old standards of fire cover. They are specifically tailored towards addressing increased risk and focusing resources accordingly and hence should continue to be the standard adopted by CFRS.

This review concludes that our response standards should be maintained and applied to each SOA risk category and monitored against ‘primary’ property fires as:

SOA Risk Category	Emergency Response Standard (primary property fires)
High Risk	1st appliance to attend in less than 5 minutes Full attendance in less than 10 minutes
Medium Risk	1st appliance to attend in less than 10 minutes Full attendance in less than 15 minutes
Low Risk	1st appliance to attend in less than 15 minutes Full attendance in less than 20 minutes

Table 9: Primary Property Fires Response Standard

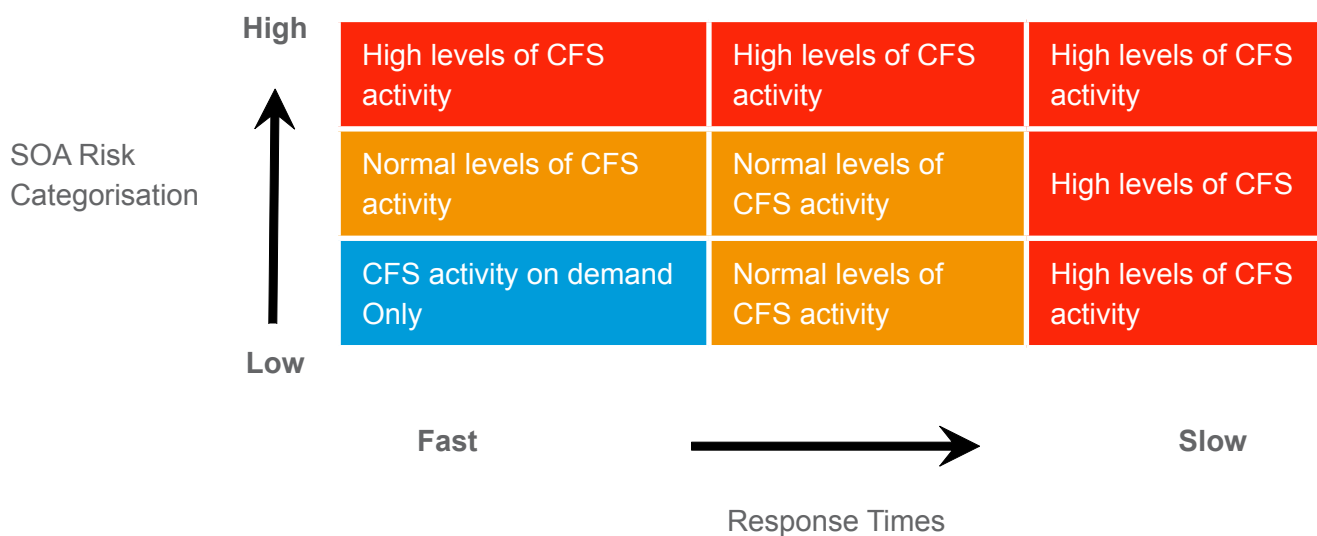
AIMING TO ACHIEVE OUR STANDARDS ON 80% OF OCCASIONS

Whilst it is now accepted across the UK Fire and Rescue Service that a 5 minute response standard is challenging we believe that this standard should remain for those communities where our robust analysis dictates they are most likely to suffer a fire resulting in injury or death. Our high risk incident response times are commensurate with clear evidence indicating increasing level of risk and ultimately, the most onerous standard is as fast as we could reasonably be expected to achieve, taking into account the increase in road traffic congestion and the sparse nature of our County and road infrastructure. In any case, the available evidence suggested that even faster response into such areas would be unlikely to reduce casualty and fatality rates below current levels.

The financial investment necessary to achieve even faster response across Cumbria would not provide value for money and investment in additional community safety initiatives is more likely to result in reduced injuries and fatalities, particularly for those living in our most isolated communities.

The level of community activity in each area

Our new SOA risk profile will be used to define clear areas of risk so that targeted community safety activity can take place. Due to our knowledge that these locations are statistically more likely to suffer a fire than other areas it is sensible to increase our resources and position them in order to respond to that demand. We will re-evaluate the risk in each SOA on an annual basis and promulgate the updated risk in our individual annual Station Action Plans. Also, by reviewing risk annually we will be in a clear position to determine whether our intervention strategy is having the desired affects of reducing the incidence of fire and related fire casualties. This approach will enable our front line delivery of community activity to be accurately targeted to those most at risk.



To further enhance our ability to target the most vulnerable people in our communities other demographical information and lifestyle datasets should be used to help inform our Community Strategy. Over recent years a number of companies have developed tailored software solutions to assist with identification of ‘at risk’ people in our communities using datasets such as ACORN or MOSAIC. These software packages allow geodemographic segmentation of the UK’s population and help to identify risk groups so that prevention and protection activity can be specifically targeted to those most in need. Such software solutions are designed to assist both operational and dedicated community safety staff to enhance service delivery and would integrate with the new Cumbria Risk model.

Performance Management

The purpose of this exercise was to establish how our existing operational resources have performed against the existing ward based response standards. The data is indicated in terms of the percentage success rate against the standard set in 2006, following an analysis of five years of dwelling fire responses (2004/5 – 2008/9).

	Total No. of Dwelling Fires 2004/05 to 2008/09	Incidents Excluded (eg late fire call)	No. of occasions appliance failed to meet standard	No. of occasions appliance achieved the standard	Percentage success Rate
1st Appliance	2323	122	468	1733	78.70%
2nd Appliance		945	146	1232	89.40%

Table 10: Dwelling fire response performance 2004-2009

The above table indicates that we are just falling short of our performance target of 80% to dwelling fires when we analyse the first pump performance against the 2006 Ward Risk categorisations.

In 2009 the Service introduced three policies to ensure the safety of operational personnel when responding to incidents; firstly CFRS will no longer mobilise fire engines with only 3 available personnel. The moral pressure on firefighters to act, particularly at life threatening incidents, is extremely high. Three firefighters cannot safely be deployed to rescue persons and hence the minimum number of operational personnel responding as part of any initial fire call will be four. Secondly, the Service has recently implemented a policy to send three fire engines to all 'persons reported' fires. This will ensure sufficient back up crews are mobilised to support the initial attending appliance. And thirdly, all fire engines will now only respond providing there is one crew member who has received training, and demonstrated the required competency at 'incident command'. Combined, these three policies will ensure that on arrival at any life threatening incident appropriate risk assessments can be carried out and suitable initial actions taken by the first responding crew to mitigate the risk to themselves and the communities we serve.

Emergency Special Services – RTC Response

The Fire and Rescue Services Act 2004, defines the statutory responsibility for FRAs to undertake a rescue function (in addition to satisfying firefighting responsibilities). Section 8 of the Act states with regard to Road Traffic Collisions (RTCs):

'...A Fire and Rescue Authority must make provision for the purpose of protecting people from serious harm to the extent it considers it reasonable to do so, in the event of RTCs, in its area'

We are all too aware that the impact of RTC casualties can have a far higher and more immediate bearing on society than fires in terms of human suffering. The intervention of the fire service is essential and integral to reducing the gravity of human injury so in 2007 we set response standards to RTCs, aiming to have the first attending fire engine on scene within 15 minutes on at least 80% of occasions. Since the inception of this new standard we have managed to achieve a very high success rate and provide details of our performance since 2004:

Locality	Year and Percentage RTC attendance time of 15 minutes achieved					
	2004-05	2005-06	2006-07	2007-08 (start of the new performance standard)	2008-09	2004-09 overall %age achievement
Barrow	88.1	91.3	92.16	90.74	86.36	89.87
Carlisle	84.82	87.69	86.6	83.16	82.43	85.24
Kendal	65.93	71.43	71.29	72.15	72.97	70.64
Workington	95.96	91.09	94	91.49	92.77	93.08
CFRS	83.43	85.05	85.1	84.16	83.64	84.32

Table 11: RTC response performance 2004-2009

Overall the Service is achieving the standard; however, sometimes within the Kendal locality due to the travel distance times from the Fire Stations to the M6 motorway in particular, the 15 minute standard is challenging.

Deaths and serious injuries arising from RTC's are declining year on year and the justification for the 15 minute response standard is based around the chances of casualty survival following such an incident. Statistically a casualty has the best chance of surviving serious internal injuries that can arise from RTC incidents if they are delivered to an operating theatre within 60 minutes of the collision occurring. This concept is well known throughout the emergency services as 'the golden hour'. Cumbria Fire and Rescue Service's RTC response standard has been set to ensure we respond in a manner that interfaces with the other emergency services, in the joint aim of securing the best patient outcomes. We will continue to train with our emergency service partners to ensure that when our response is required we have a firm understanding of roles, capabilities and expertise in order to deliver the desired outcomes to all involved.

Our response standards to RTCs should be maintained at:

Risk Category	Emergency Response Standard (RTC Incidents)
RTC anywhere in the County	1st fire engine to attend in less than 15 minutes

Table 12: RTC Response Standards

AIMING TO ACHIEVE THIS STANDARD ON 80% OF OCCASIONS

All other incidents

It is important, as part of this review, to make it explicitly clear that that CFRS will always respond to emergency situations as quickly and safely as possible. We will always mobilise the most appropriate resources based upon the information provided to fire control at the time of call. However, in order to provide a more efficient and effective service to our communities we need to focus and prioritise our operational response to life risk incidents.

This review concludes that we should send the nearest available fire appliance considering the following:

- If a life threatening incident occurs in the same station area whilst an appliance is en route to a non life critical incident, the appliance should immediately be re-directed to the life threatening incident.
- If a life threatening incident occurs in the same station area whilst an appliance is dealing with a secondary incident, if safe to do so, the appliance should leave the secondary incident to attend the life threatening incident.
- In either case, the secondary incident should then be attended by the next nearest available appliance.

Although the Service will only monitor attendance performance standards for 'primary' property fires and RTC incidents our attendance at all other incidents will, by default, be achieved in similar times as those experienced for life risk calls. **The nearest available appliances will always be mobilised immediately.** The only difference being that the Service will not over emphasise the need to measure attendance performance to all other incidents.

The outcomes from this review will not delay any mobilisation to any type of incident. Cumbria Fire and Rescue Service will still mobilise immediately based on the type of incident reported, not on the risk grading of the area. The only exception to this being the justifiable introduction of the facility to divert appliances from non life threatening incidents to those where life may be at risk.

8 Glossary of terms

'Primary' property fires include all fires in buildings, (non-derelect) and outdoor structures.

The FSEC Toolkit is an online software package aimed at assisting Fire and Rescue Authorities to analyse risk, resources and response when compiling Integrated Risk Management Plans (IRMPs).

Location quotients compare two percentages or proportions; a quotient is simply the result of the division of one number by another.

In statistics, the **coefficient of determination, R²** is used in the context of statistical models whose main purpose is the prediction of future outcomes on the basis of other related information. It is the proportion of variability in a data set that is accounted for by the statistical model. It provides a measure of how well future outcomes are likely to be predicted by the model.