Integrated Risk Management Planning

Fire Risk Assessment Methodology

2010

Executive Summary

This report describes the methodology on which the current Fire Risk Assessment Map (FRAM) for Merseyside has been determined.

The FRAM has been produced to support the Integrated Risk Management Plan by assessing, categorising and setting out the risk to life from fire and other emergencies within Merseyside.

1. Introduction

The FRAM has been produced to illustrate our evaluation of risk which we believe the people of Merseyside are subject to, in an easy to understand format.

We have developed our existing methodology, refining and adding a sophisticated approach to reflect our knowledge and experience of the factors which affect likelihood of emergencies occurring and the seriousness of any potential outcomes by taking a more sophisticated approach, bringing together the outcomes of consideration of data with professional judgement.

This map will enable us to focus on our stated aim of targeting our resources towards helping those who are most at risk, which is the objective of our Integrated Risk Management Plan (IRMP) process.

In addition, this map will be integrated within our command and control system; Vision, to enables us to manage and report our response performance against our challenging published response standards.

2. Objective of the Document

The purpose of this document is to describe the methodology employed to produce the FRAM of Merseyside Fire & Rescue Service's area.

3. Background to the Fire Risk Assessment Map

An evaluation of risk is a requirement of the current Fire and Rescue Service National Framework 2008-11, which is itself a requirement of the Fire & Rescue Services Act 2004(as amended). A computerised program was produced to assist Fire & Rescue Services in the risk assessment process by Government; The Fire Service Emergency Cover Toolkit (FSEC). When IRMP was first introduced in 2004 it's use was mandatory, this has subsequently been down graded within the National Framework 2008/11 document to non mandatory use.(Ch1 Para1.6 pg 13)

After much research conducted by our external consultants on the validity, priorities and usability of the Fire Service Emergency Cover Toolkit (FSEC) data, it was decided not to employ this data within our risk methodology as we found that the results were counter intuitive to what we knew from experience to be the locations where incidents, injuries and fatalities occurred. This variation is targeted towards the underlying assumption that determination of risk should correlate with reality of emergency occurrences and the severity of their outcomes.

It was decided that such a map is the most readily accessible and understandable format for presenting this risk evaluation.

4. Methodology

This section details the methodology undertaken to produce the current FRAM.

It was agreed that the methodology, where appropriate, should follow that of the FSEC toolkit with the focus of data being based on incidents that posed the greatest life risk to the public.

To be statistically robust a time period of three years of complete incident data was chosen. In the future it is intended that the timeframe to be used when renewing the risk map will be the previous complete 3 years of data ending 31st December. The current map uses data from 1st January 2006 to 31st December 2008.

For the Indices of Multiple Deprivation we will use the most recently published version from the Office of National Statistics. In the current map, the IMD 2007 data have been used.

The Risk Map has been created by using a relative ranking approach. Six datasets have been used and are described in the following sections. This approach provides analysis of the significant factors affecting risk in a predetermined geographical area – the Lower Layer Super Output Area (SOA). For each SOA the value from each dataset is normalised by taking the percentage value; this ranks each of the SOAs as a proportion of the total for each data set.

A weighting factor is then applied to each dataset, to reflect the significance of the affect on likelihood and severity of any potential outcomes of each factor relevant to each other.

The total value for each SOA was then calculated by aggregating the weighted values from each dataset and relatively ranked from highest to lowest to equate to order of risk.

Risk category bands are defined on an inter-percentile range to reflect the three levels of risk defined within our response standards to fire. The bandings are calculated to reflect our priorities and professional assessment of risk.

Consideration was given to the inclusion of the potential outcomes of community based fire safety initiatives, such as the Home Fire Safety Check programme within the model. However it was decided that as the methodology was already focussed upon outcome based data, any effect of these interventions would be inherent in the data sets already used within the model, resulting in the actual impact of all factors on outcomes being considered by the model.

4.1. Incident Data

To achieve appropriate consistency with the FSEC approach, historical incident data has been included on the basis that past occurrences over a significant time period, in this case three years, is a good indicator of the likely future pattern of events occurring.

With the focus on life risk, the most appropriate incident data sets have been used in the evaluation. Geo-coded datasets for the following incident types have been used:

- Dwelling Fires (All causes).
- All incidents where Injuries have occurred.
- Incidents where there has been a recorded Fire Death.
- Special Service Calls involving any risk to life.
- Any fire in non domestic premises which has been the result of a deliberate act.

An exact data definition is given in Appendix A

4.2. Indices of Multiple Deprivation 2007 (IMD 2007)

The indices of Multiple Deprivation are described in Appendix B.

The use of IMD was chosen because of the proven causal factors of fire and other emergencies which are included within the calculations of the IMD score. The IMD brings together 37 different indicators which cover specific aspects or dimensions of deprivation: Income, Employment, Health and Disability, Education, Skills and Training, Barriers to Housing and Services, Living Environment and Crime. These are weighted and combined to create the overall IMD 2007.

Research documentation has been published by Communities and Local Government (then ODPM) which establishes the strong correlation between fire related injuries and death and deprivation[1].

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[1] Source: Office of the Deputy Prime Minister, 2004, Research Bulletin No.4: Social Exclusion and the risk of Fire.

The IMD 2007 uses the Super Output Area (SOA) as its standard unit of population measurement.

4.3. Geography

SOAs have been chosen as the basic geographical unit, upon which all calculations have been made. Comprising of an average of 1500 residents (minimum size - 1000 residents/400 households), SOAs avoid the problems caused by the inconsistent and unstable electoral ward geography. SOAs are suited for statistical comparison as the effect of population numbers can be assumed to be a constant factor and so removed from the risk evaluation. This approach is also consistent with the method used by the Office of National Statistics.

SOAs are not subject to frequent boundary changes, so are more suitable for meaningful comparison over time. See Appendix B.

4.4. Calculations

The following methodology was applied when calculating the risk scores:

- Data for incidents was gathered from our command and control system and the IMD scores were sourced from the Office of National Statistics.

- Using MapInfo Geographic Information System (GIS), each dataset was analysed by SOA.

- The scores for each dataset of each SOA were exported into MS Excel, where each score was calculated as a percentage score per dataset, per SOA.

- The dataset weighting was then applied. See section 2.5.

- The weighted results in each SOA were aggregated and ranked to deliver the final risk score.

4.5. Risk Weightings

The risk weightings applied within the model build upon national research which has established links between the various factors within the model.

Probability dictates that for every occurrence of fire, there is a chance that a small number of people will be injured and an even smaller proportion will become fatalities. Fires in dwellings have been reflected as the best indicator of likelihood, outcome and risk within the model.

The weighting of each of the variables for injuries and fatalities in fires have been balanced to represent the likelihood of these outcomes occurring.

Fatalities are very lightly weighted to reflect the extremely low level of occurrence, which could have a disproportionate effect on risk and to reflect that at such low levels fatalities are not statistically reliable as a strong indicator of risk.

For consistency with the findings of national research we have reflected the well established strong correlation of fires occurring with socio-geographic data in respect of where people live and the relative deprivation within that particular area, as the second best indicator of risk within the model.

Special services which involve life risk are primarily road traffic collisions, however rescue from height, water and extrications from other machinery are also included in the data. We have assumed within the model that all of these life risk incidents are actually potential injuries or worse. They are weighted to reflect the likelihood of any person suffering a severe outcome. The weighting takes into account the far higher level of occurrence of road traffic collisions which have no significant life risk outcome.

Deliberate fires in non domestic dwellings represent additional risk to life as they are events which are not a normal occurrence. However these events rarely occur and the likelihood of a severe outcome has been established as very low through national research and the legislated fire safety provisions. We have reflected this through the weighting which has been applied.

The weighting factors used within the model were;

Dataset	Weighting Factor
All Dwelling Fires	1.9
All Injuries Occurring in Premises	0.46
Special Services Involving Life Risk	0.35
All Fire Deaths	0.04
All Deliberate Non Domestic Fires	0.05
IMD 2007	1.5

4.6. Risk Categorisation

To ensure consistency with our response standards the existing three tier approach to risk was maintained; High, Medium and Low.

After discounting other statistical methods based upon inappropriate assumptions concerning the data distribution or those based upon averages or standard deviations, we identified that the most accurate and meaningful calculation for risk category would to be based upon an inter percentile range which was evaluated to best reflect reality, the significance of each level of risk and to be consistent with the consensus of professional judgement within the Service.

Areas designated as low risk, represent areas where there is an extremely small chance of fires or other emergencies occurring and the outcomes are generally likely to be less severe.

The Medium risk areas are the areas where the hazards have already been identified and addressed to ensure they are as low as reasonably practicable.

High risk areas identify those areas where our focus in prevention and response will be until we have reduced the risks within these areas to a medium level.

The banding which accurately represents our professional evaluation of risk is;

Low   – the 42.5 percentile and below of SOAs ranked by risk score.
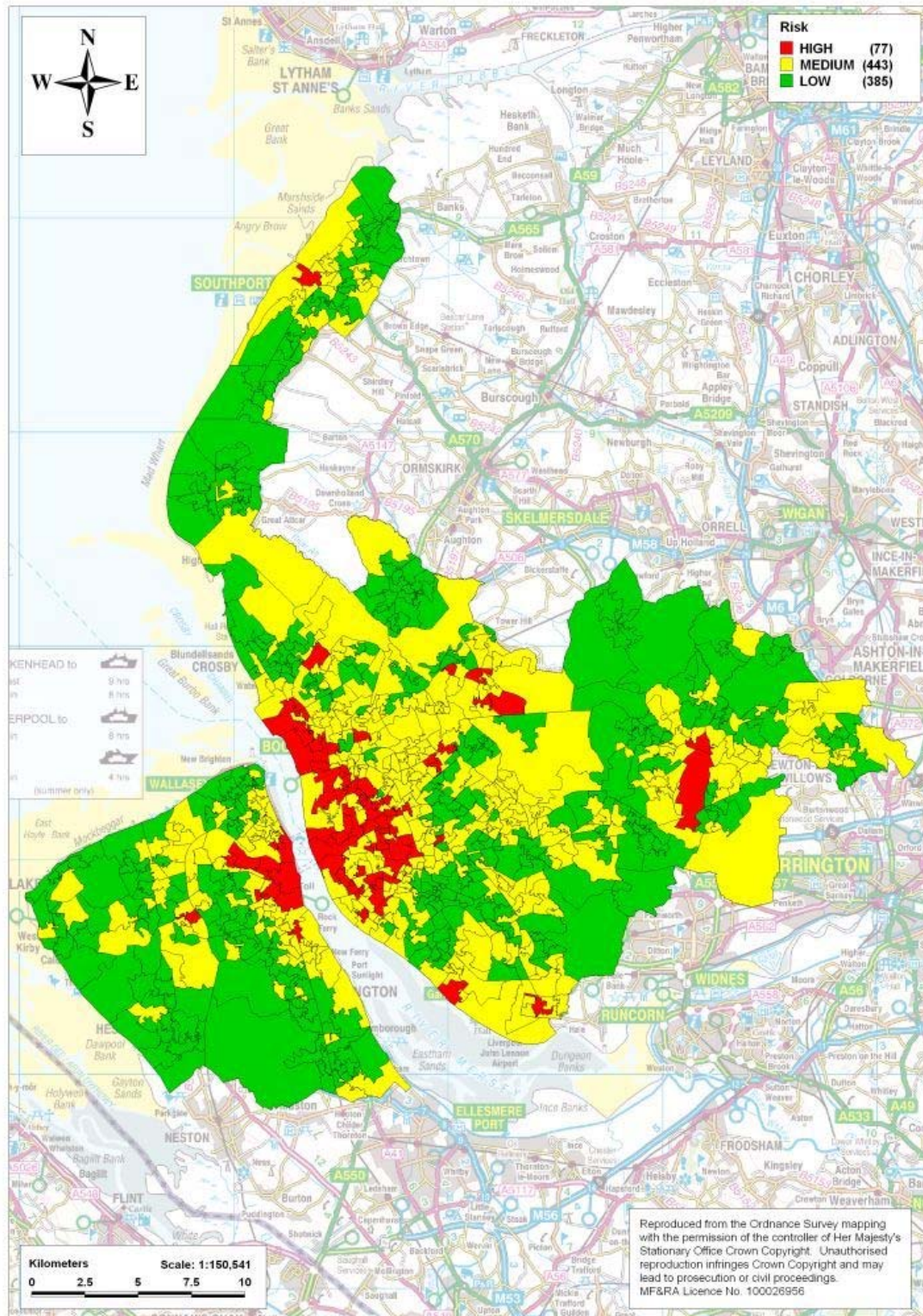
Medium   – Between the 42.5 and 91.5 percentile of SOAs, ranked by risk score.

High   – the 91.5 percentile and above of SOAs ranked by risk score.

5. Risk Map

The results for the risk score for each SOA were mapped according to location within Merseyside.

6. Risk Map Review

The map will be updated on an annual basis, to ensure that we reflect the current risks in Merseyside; this will be co-ordinated with the production of the IRMP.

However, if any circumstance arises which materially affects the outcomes; we will produce a revised map to reflect these changes.

7. Risk Methodology Review

Work is continuing to validate and further develop this methodology to ensure we accurately reflect reality and maintain consistency with validated national research and guidance. The methodology will be managed through a project board to ensure this development is co-ordinated throughout the Service.

Appendix A: Definitions of Incident Data.

Descriptions of the datasets used in risk map calculations.

All Dwelling Fires

- All fires in dwellings regardless of motive.

- Dwellings are defined as; single dwelling house, houses of multiple occupancy, high rise flats over 4 stories, houses converted to flats, selected other sleeping accommodation, Caravans, Trailers, Motor vehicles, Railway rolling stock and Water craft used as permanent dwellings.

- FSEC Codes; 01, 02 03, 02 04, 02 07, 02 08(not prisons), 03 03, 03 06.

All Injuries

- All fires were injuries to members of the public have occurred.

- Injuries are defined as any physical injury requiring hospital treatment immediately following the incident, not including treatment at the scene or precautionary checks at hospital.

- FSEC Codes; 01, 02, 03.

Special Service Calls Involving Life Risk

- All Special Service calls where there has been a risk to life.

- FSEC Codes;   06 01 – Road Traffic Accidents
                07 01 – Extrications
                10 01 – Hazchem
                11 01 – Rescues by Line
                12 01 – Rescues by Ladder
                13 01 – Rescues from Flood Water
                14 01 – Other Special Services

All Fire Deaths

- All Fatalities which are directly attributed to fire, caused by any motive in a premises.

Deliberate Fires in Non Domestic Premises

- All fires in Non Domestic premises started deliberately.

- FSEC Codes;   02 01 – Hospitals
  02 02 – Care Homes
  02 05 – Hostels
  02 06 – Hotels
  02 08 – Prisons only
  02 09 – Further Education
  02 10 – Public Buildings
  02 11 – Licensed Premises
  02 12 – Schools
  02 13 – Shops
  02 14 – Other premises open to the public
  02 15 – Factories & Warehouses
  02 16 – Offices
  02 17 – Other Workplaces

Appendix B: Indices of Multiple Deprivation 2007 – A Brief Overview.

The Index of Multiple Deprivation 2007 (IMD 2007) is a measure of multiple deprivation at the small area level.

The IMD 2007 contains seven domains of deprivation including:

- Income (22.5%)
- Employment (22.5%)
- Health Deprivation and Disability (13.5%)
- Education, Skills and Training (13.5%)
- Barriers to Housing and Services (9.3%)
- Crime (9.3%)
- Living Environment (9.3%)

The percentage figures in brackets refer to the weighting that is applied to each of the domains to calculate the IMD score. An IMD score is calculated for each of the 32,482 Super Output Areas in England. The higher the score, the more deprived the SOA. There are 905 SOAs in Merseyside.

Points to note:

- The national average score is 21.67.
- Merseyside have 6 of the top 10 most deprived areas, including the most deprived area.
- 64% of Super Output Areas in Merseyside are more deprived than the national average.

Appendix C: Practitioner's Guidance

This section will contain detailed technical advice relating to the use of the computerised systems which support this methodology. To be completed.
Data Extraction
Mapping
IMD
Data Quality Assurance
Data Processing
Output

Document Control

Active Date	Review date	Author	Department
19/02/10	01/06/10	J. Kellaway	IRMP

Amendment History

Version	Date	Reasons for Change	Amended by
1	12/11/09	Original version	J. Kellaway
2	18/01/10	Post validation amendments	J. Kellaway
3	09/02/10	Publication document	J. Kellaway

Related Documents

Doc. Type	Ref. No.	Title
Strategy	IRMP 2010	IRMP 2010/13