Fire Research Report

A Strategic Review of the New Zealand Fire Service's Incident Data System

MartinJenkins

December 2009

This report presents the results of a strategic review of the New Zealand Fire Service's (NZFS) incident data system. The review has been undertaken to help the Fire Service improve the quality and accuracy of emergency incident reporting.

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Enhancing Incident Data Collection and Use

December 2009

Final Report

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MARTIN JENKINS

Preface

This report has been prepared for the New Zealand Fire Service by Nicole Brown and Dr. David Dundon-Smith from MartinJenkins (Martin, Jenkins & Associates Limited).

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This report presents the results of a strategic review of the New Zealand Fire Service's (NZFS) incident data system. The review has been undertaken to help the Fire Service improve the quality and accuracy of emergency incident reporting.

In carrying out this review it became evident early on that the purpose and management of incident reporting is not always fully understood or consistent across the service and/or between paid and volunteer brigades. The research has therefore focused on a number of overarching organisational issues related to the NZFS incident data reporting system.

Understanding the information needs of NZFS

The Commission monitors its performance by collecting data about every incident attended by NZFS and Rural Fire Authority (RFA) staff. This information is used to set performance targets and track national and regional trends. However the nature of emergency incidents has changed over time and this is influencing the information needs of the NZFS. One-third (32%) of incidents are now non-fire related, as compared with 24% in 2000/01. As this trend continues, NZFS has become increasingly interested in using incident data to generate a more accurate picture of the scope and impact of both fire and non-fire related incidents.

The incident reporting system is now part of the Station Management System (SMS) and captures a wide range of information about 11 different types of incidents, broken down into 12 data 'groups' and 162 data 'fields'. The structure of the incident reporting system still broadly reflects the National Fire Incident Reporting classifications (or FIRS), which in turn was based on an American system of incident classification. Incident reporting within the Fire Service moved from a paper-based to an online system in 2000.

Volume and frequency of incident data collection within NZFS

The type of incidents that the Fire Service responds to clearly influences how a station, or an individual officer or firefighter, interacts with the incident data reporting system, and their level of familiarity with the options and pathways through incident reports. Paid and volunteer brigades are shown to respond to both different types and volumes of incidents. For example, one-quarter of incidents responded to by volunteer stations in 2008/09 were accounted for by 'rescue, emergency or medical call outs' (ie a non-fire incident) and 23% were accounted for by 'false alarms'. In contrast, half (50%) of incidents responded to by paid brigades are false alarms and, and one-fifth (21%) either a 'miscellaneous' or 'structure' fire. Overall, paid and volunteer brigades respond to a similar number of incidents per annum.

Rural Fire Authority data collection processes

While RFAs now have access to the NZFS incident reporting system, not all of their reporting needs are currently satisfied within SMS. RFAs therefore continue to operate a separate, parallel reporting system.

Incident data quality and accuracy

Three different groups of NZFS staff interact with SMS incident data on a regular basis but each have different objectives and therefore different perceptions about the quality and accuracy of incident data and SMS. These groups include:

- operational staff who predominately complete incident reports within SMS

- local and regional officers who are focused on the use of incident data to assist with business planning

- national office staff who predominately use incident data at the aggregate (New Zealand) level or to investigate specific issues on an as required basis.

The officer in charge has official responsibility for completing incident reports. In practice, incident reports are often delegated to more junior staff. Within volunteer brigades it has become standard practice for some stations to use administrative staff to complete all incident reports, possibly drawing on a paper record completed at the scene by the officer in charge. Currently, these paper records are not standardised across volunteer brigades. In some regions, it has been suggested that up to half of volunteer brigades use a dedicated *incident data reporter*.

Some local stations or districts are perceived to have developed their own 'local rules' when completing incident reports. For example, some stations make greater use of 'Cause – not classified' option.

Most operational staff below the rank of Senior Station Officer are only likely to interact with the reporting system when completing, or inputting, an incident data report, and some of these may perceive SMS and/or the incident data reporting system to have limited relevance to their day-to-day duties. Consequently, operational staff tend not to be regular users of the information collected.

Officers and senior staff at the local and regional level, together with national office staff, use incident data for strategic planning and management purposes. Local stations are now required to produce annual Business Plans.

Strengths of current incident data system

The SMS is widely seen by operational and regional staff to be a vast improvement on previous manual systems for managing incident data. Generally speaking, paid and volunteer staff consider the quality and the accuracy of incident data to be good and improving. Specific strengths referred to include:

- having timely access to incident data – which enables the Fire Service to work more strategically at all levels

- the ongoing process of continuous improvement – paid and volunteer staff recognise the effort that is being made to ensure continuous improvement occurs.

However, there is a general view that the potential of SMS has not yet been fully exploited with regard to incident data.

Incident data issues and concerns

Although SMS and incident data quality and accuracy are viewed as improving, a number of specific issues and challenges relating to the collection and use of incident data do exist.

Uses and users of incident data are not understood

At the operational level, paid and volunteer staff involved in collecting and inputting incident data appear to have a superficial appreciation of how incident data is used and a limited awareness of the range of different groups (both internal to NZFS and across various external agencies) who make use of it.

Structure of SMS interface and problematic data fields

The structure of some data fields raises a number of concerns, particularly with regard to the level of subjective judgement required. Data fields that were frequently mentioned as problematic include:

- indicated fire cause

- incident type

- reporting on the extent of damage

- the structure of field options.

Other concerns related to the coding of Motor Vehicle Accidents, Hazardous Substance incidents, Cause of Fire, and Private Fire Alarms.

Perceived data inaccuracy

Operational and regional staff indicated that they have concerns about the accuracy, consistency and reliability of some incident data, but it is difficult to establish the extent to which inaccurate incident data is a reality or a perception. At the operational level, paid and volunteer staff openly acknowledge difficulties in recording data accurately and attribute this to issues associated with the nature of the incident data fields that are available; the time-consuming nature of reporting and accompanying frustration they sometimes experience when completing incident reports.

Information poor?

Regional staff have described the current incident data system as 'data rich, information poor', and see a need for greater data integration and better connectivity between data sets so that they can access synthesized information in a format that is most relevant to their needs.

Insufficient training on data collection and input

There is widespread acknowledgement within NZFS that the training provided with regard to SMS incident data systems and the use and importance of incident data has been ad hoc and insufficient. While initial staff training was provided on the roll out of the current system, with user manuals also provided, ongoing refresher training has been more sporadic.

Challenges and opportunities for enhancement

While SMS is generally regarded as a valuable tool for incident reporting and that continuous evolution of the system to date has promoted the increased use of incident data, there is a concern, at all levels of the service, that existing business rules are 'out of date'. Before discussing specific enhancements, two overarching issues have been highlighted:

- The time allowed to complete incident reports – should the maximum time allowed to complete incident report remain at 14 days?

- The emergence of the incident data reporter role – is this something the Fire Service wants to encourage? If so, this will need to be standardised and business rules developed to ensure the quality of incident reporting within the service.

Strengthening business rules for incident data would involve an integrated approach focused on making changes in three areas:

- Training and communications
- Quality assurance procedures
- System design.

Training and communications

Training provided to paid and volunteer staff, including incident data reporters, should focus on:

• the use and importance of incident data

• how to complete incident data reports

• how to use incident data for local and regional business planning.

The nature of the Fire Service workforce and the amount of time already allocated to training for firefighters and officers is likely to mean that much of this training will need to be online and/or remotely delivered, possibly through video and tele-conference facilities. Supporting material, both online and paper-based, such as an incident data manual, may also be necessary.

Quality Assurance procedures

The incident data system is dependent on those people collecting and inputting incident data. As such, the system is open to significant human error, especially given that there is currently no local quality assurance procedures and limited, and ad hoc, quality assurance activities undertaken at the national level. To improve the quality of incident data there is a clear need to strengthen local level accountability.

System design

The design of the incident data report and pathways through the report should be informed by:

• the Fire Service's core information needs, as well as those of its key stakeholder agencies, to help reduce the quantity of data collected

• incident data statistics, focusing on the most numerous incidents that the brigades are likely to respond to (as shown in section 3.2 of this report).

It is generally agreed that too much data is currently collected through the incident reports. The Fire Service may wish to undertake both an internal and external consultation process to agree and prioritise what data should be collected and why.

It has also been suggested by some staff that the current reporting system is not intuitive and that the pathways through the incident report can be confusing. This could be improved by:

• ensuring that the business critical information is collected first

• that the first few questions ensure that the incident type is correct and can show the person completing the report the structure of the rest of the report to be completed

• the increased use of guidance notes or system prompts to help with the consistent interpretation of what is being asked for.

Any redesign of the incident reporting system within SMS will also need to incorporate the information needs of RFAs and the NFRA.

Conclusions

This report has clearly highlighted a number of systematic and/or system design issues that need to be addressed to improve confidence in the incident data system across the Fire Service. These need to be addressed as part of a coordinated change management process. Changes to the design of, and pathways through, incident reports will not be sufficient by themselves. There is also a need to implement stronger quality assurance procedures at both the local and national level, as well as to develop a comprehensive system of training on incident data reporting and the use and importance of incident data.

The increasing importance of non-fire incidents as a proportion of all emergency incidents within New Zealand requires the Fire Service to consider their long-term data needs and how they wish to work with external stakeholder agencies. This may need an overarching review of emergency incident data reporting across the emergency services in New Zealand to ensure that the right information is being collected by the right agency and shared in an effective manner.

1.　Introduction

This report presents the results of a strategic review of the New Zealand Fire Service's (NZFS) incident data system. The review has been undertaken to help the Fire Service improve the quality and accuracy of emergency incident reporting. This is an essential project for the Fire Service as it will help to improve the intelligence base for emergency incident planning and preparation across the country.

Currently, there are questions as to the robustness and ease of use (standardisation) of the emergency incident reporting system within the Station Management System (SMS). It is also recognised that organisation rules and procedures for completing incident reports could be strengthened. In commissioning this review the NZFS initially sought to examine:

- how online collection methods affects data quality – reviewing both human and system interface factors, and the business rules applied to data collection systems

- the language used in fire and emergency incident reporting – to investigate the common understanding of the terminology or alternative terminology (allowing for the needs of people from diverse backgrounds and the uses to which the information is to be put).

However, on commencing this review, it became evident that the purpose and management of incident reporting is not always fully understood or consistent across the service and/or between paid and volunteer brigades. The research has therefore focused on a number of overarching organisational issues related to the NZFS incident data reporting system.

This report considers what the incident reporting system was set up to achieve, how it has changed over time, how it is used currently, and the extent to which it is meeting current and future organisational needs.

The remainder of this report is structured into five sections as follows:

- Our approach: a brief discussion of how the project was undertaken and guidance in interpreting the findings.

- Understanding the information needs of NZFS: a description of the incident data system that describes how incident data is collected, changes over time and an analysis of incident data by type of station (ie whether paid or a volunteer station).

- Incident data quality and accuracy: based on the perceptions of those who capture and use incident data. This section first looks at the characteristics of both paid and volunteer staff who interact with the system, before setting out their views about the strengths and weaknesses of the current system. The factors contributing to these views and opportunities for improvement are also discussed.

- Challenges and opportunities for enhancement: this section focuses on business rules, systems and procedures necessary to ensure the robustness of incident data at all stages of the incident data cycle (ie when collected and inputted into SMS, and in the use of incident data for business planning purposes).

- Conclusions: setting out the key findings arising from the project and the implications for a wider review and development of the incident data system.

2. Our approach

In response to the 2008/09 Contestable Research Fund, MartinJenkins submitted two proposals to carry out a strategic review of the Fire Service's incident data system, and to develop and apply a framework for evaluating and monitoring the value of the Fire Service's non-fire role and impacts on non-fire related outcomes. It was recognised that there was a degree of overlap between these two projects. Where appropriate, some stakeholders interviewed were asked about both projects.

The strategic review of incident data adopted a mixed method[1] approach, combining qualitative and quantitative data sources. In this approach, different methods are implemented as discrete aspects of the overall inquiry and remain distinct until the end of each phase. The methods are combined at the analysis stage so that different sources of data are compared and contrasted to enable robust triangulation and more accurate interpretation. Our approach to the review has consisted of six main phases as shown in the following table:

Phases	Primary research activity	Research period
Phase one	A short scoping phase to identify the procedural realities shaping how incident data is collected and used by NZFS staff. This phase included an informal visit to a local station and discussions with a number of senior staff (n=3) about data processing; experimentation with the SMS incident data system (using remote access) and a review of relevant documentation. Formal interviews with national office staff (n=3) conducted as part of the non-fire outcomes project also indirectly contributed to this phase.	July 2009
Phase two	Formal qualitative interviews with a selection of NZFS staff from three regions (n=14) and national office (n=6) to understand the issues shaping incident data collection and use incident data. A selection of interviewees was designed to capture a mixture of operational, paid, volunteer, RFA staff including data users and 'inputter' perspectives. Regions were selected on the basis of differences likely to shape incident types, ie urban; rural, higher fatalities; and RFA, vegetation.[2]	August 2009
Phase three	Analysis of 2008 incident types (for all stations) to examine the variance in the volume and frequency of NZFS staff interactions with incident data reporting.	September 2009
Phase four	Feedback workshop to NZFS senior staff to present and discuss the initial findings and their implications.	October 2009

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[1] Greene, J.C., Caracelli, V.J., and Graham, W.F. "Toward a conceptual framework for mixed-method evaluation designs". Educational Evaluation and Policy Analysis, 1989, 11 (3), 255-274.

[2] Phase 2 was carried out during a national strike of Professional Firefighters Union members, which impacted on our ability to approach some firefighters and/or to see how they used the SMS incident reporting system.

Phases	Primary research activity	Research period
Phase five	3 subsequent workshops with NZFS personnel to progress issues and opportunities as identified in the initial workshop (ie phase 4), structured as follows: - data collection and inputting - access and use of incident data - business rules.	November 2009
Phase six	Final analysis and reporting.	November/December 2009

Caveats and interpretation

Quotations used in this report may not always be verbatim. In some instances they are from researchers' notes and may have been altered for clarity or to suppress identifying information.

The nature of a small number of in-depth interviews means the data collected in interviews is not identical across all individuals. While this means consensus opinions are unlikely, this approach allows an iterative picture of incident data reporting practices and use to be revealed.

Isolating views about incident data from views about SMS more generally

As noted earlier the incident data reporting system is housed within the Station Management System that acts as a 'grandparent' system interface and provides access to other data and NZFS information systems. As a result, paid and volunteer staff do not always clearly distinguish between SMS, incident data and other systems within SMS. During interviews it was sometimes apparent that staff comments about incident data were coloured or influenced by frustrations with other systems within SMS (eg use of OSM as a tool to track staff productivity). As a result, it has been difficult to isolate and test staff perceptions of incident data, particularly amongst operational staff that input data, and it is likely that some staff concerns about incident data reflect broader concerns about SMS.

3. Understanding the information needs of NZFS

The New Zealand Fire Service Commission (the Commission or NZFS) is the Crown's primary fire risk management and service delivery agency and is charged with the protection of life and property from the dangers of fire by the Fire Service Act 1975 and the Forest and Rural Fires Act 1977. The Commission works in partnership with a range of agencies including the Rural Fire Authority (RFA) to achieve its mission of 'reducing the incidence and consequence of fire and providing a professional response to other emergencies'.

How fire services are provided within New Zealand

The New Zealand Fire Service

The NZFS has a nationwide network of 440 stations based in the large urban centres and metropolitan areas. NZFS stations are staffed by a mixture of paid professional or 'career' firefighters (1700) and urban volunteers (7000).[3]

The National Rural Fire Authority

Fires that occur in rural areas are managed by approximately 3000 volunteer firefighters, who are members of 89 Rural Fire Authorities (RFAs). The RFAs consist of Territorial Local Authorities, Department of Conservation, New Zealand Defence Force, and Rural Fire District committees. RFA work is coordinated by 14 Regional Rural Fire Committees and the National Rural Fire Authority (NRFA), which provides overview functions for RFAs such as auditing, fire management training, funding grants and monitoring of fire danger conditions.

3.1 NZFS information needs

The Commission monitors its performance by collecting data about every incident attended by NZFS and RFA staff. This information is used to set performance targets and track national and regional trends. However the nature of emergency incidents has changed over time and this is influencing the information needs of the NZFS.

The overall incidence of fires has reduced over the last five years. This is particularly true of structure fires and avoidable residential fire fatalities,[4] both of which are areas that the NZFS has targeted through its fire safety education campaigns. While the contribution of NZFS activities is difficult to distinguish from other factors (such as technological advances in building materials, etc) NZFS has begun to focus more strongly on 'risk reduction', ie encouraging a greater emphasis on proactive management and planning across all levels of the organisation

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[3] http://www.fire.org.nz/Facts-and-Figures/Quick-Facts/Pages/Quick-Facts.aspx, accessed 29 October 2009
[4] The New Zealand Fire Service Commission Annual Report 30 June 2008, pp16-17

to target potential aspects of fire risk (which may include certain populations, social behaviours and geographical regions or localities). As a result, the NZFS has an increased desire for detailed information about types and causes of fire incidents, including the characteristics of the people and materials involved, and the level of damage sustained or prevented.

The Commission also has a growing interest in understanding its non-fire incidents and describing how its work in these areas contributes to the outcomes achieved by partner agencies (such as the Police, Ambulance Services, Civil Defence agencies, etc). Non-fire incidents are a significant and growing part of the Commission's role. They include providing assistance at motor vehicle accidents, managing hazardous substance emergencies, responding to medical emergencies, and local, regional and national level civil emergencies (such as floods, landslides, etc).

Currently, 32%[5] of incidents are non-fire related compared with 24% in 2000/01, with the sharpest increase being in the response to emergencies resulting from natural hazards, particularly weather related. As this trend continues, NZFS has become increasingly interested in using incident data to generate a more accurate picture of the scope and the impact of its non-fire related activities.

3.2   The NZFS incident data reporting system

Systems for managing incident data have changed over time

The systems used to manage NZFS incident data have been evolving. Prior to 1999, incident data was recorded and collated on paper records, using the National Fire Incident Reporting classifications or FIRS.[6] In 2000, the paper record system was transferred into an electronic format retaining the same classifications, and in 2004, the FIRS system was replaced by the Station Management System (SMS) which is accessible to all Fire Service paid and volunteer staff and more recently, since 2008, to RFA staff.

The original switch from a paper-based to an online system focused solely on the mode of data collection and did not at the time seek to make any substantive changes to what information was collected and in what order. The current online incident reporting system broadly mirrors the layout and structure of the pre-2000 paper-based system. It is the intention of the Fire Service to use the findings set out in this report to inform the next step in the evolution of incident data reporting within New Zealand.

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[5]   Analysis provided by NZFS (Nov 2009).
[6]   The FIRS system is based on an American system of incident classification (USFA) that was originally intended to support robust international comparison of fire incident data. Codes have been added or modified over time to better reflect the New Zealand context.

The Station Management System

As NZFS moves towards greater proactive risk management its information needs have continued to shift over time and the SMS has evolved accordingly with a number of changes made, as discussed in turn below.

Increasing need for more detail: New incident data fields have been added to SMS since its introduction, at least until recently when a moratorium was imposed on further changes or revisions. The Fire Service was concerned that decisions regarding changes to the incident data were not being fully considered with regard to the implications for the use of incident data within the service and by key stakeholder organisations.

For some, an increased level of detail is needed to help monitor incident patterns so that potential fire risks (eg products or materials that are consistently associated with or directly causing fires) can be identified and support NZFS risk reduction activities. One of the challenges of this approach is that the type of information required for proactive management cannot be predicted in advance or, in other words, the NZFS does not know what information it needs, until it needs it. As a result, the NZFS has tended to 'err on the side of caution', by collecting an increasing level of incident data. This has a number of implications, not least the need to keep operational staff, both paid and volunteers, up to date and abreast of these changes. As discussed later in this report, a core issue for the Fire Service is the need for effective and regular refresher training, especially for volunteer brigades.

The need for more detail and the evolution of the SMS has increased the number of administrative tasks carried out at the local level, including the production of annual Business Plans. This in turn requires paid and volunteer officers, as well as other personnel, to have sufficient IT and analytical, as well as report writing, skills.

Increased connectivity: SMS has evolved over time and now acts as a 'grandparent' electronic interface that enables paid and volunteer staff to access a range of administrative information about other NZFS activities such as rostering, skills maintenance, evacuation planning, building reports, etc. SMS also provides links to other information systems such as the geospatial mapping (SMARTMap) and ICAD (the Police incident reporting system).

This greater interconnectivity supports operational coordination and the strategic intelligence of the organisation by allowing NZFS staff to aggregate data from multiple sources and to build a more comprehensive understanding of the factors contributing to actual (or potential) fires and other emergency incidents in a local area or region.

However, volunteer brigades do not have full access to SMS; for example, access to SMART Maps, or may not have broadband access at home and so need to be at the station to access the system effectively.

Incident data

SMS captures a wide range of information about 11 different types of incidents, namely:

• Structure fire

• Mobile property fire

• Vegetation fire

• Chemical, flammable liquid or gas fire

• Miscellaneous fire

• Hazardous emergencies

• Overpressure, rupture, explosives, over heating

• Rescue, emergency, medical call

• Special service call

• Natural disasters

• False alarms.

The data fields[7] available for incident reporting are determined by the incident type classification. This initial selection generates a 'preset' pathway of options from which paid and volunteer staff select. Links with other electronic systems enable some data fields to be automatically populated with data from other sources such as ICAD. However most of the incident reporting information is recorded by operational staff using drop-down menu options and 'tick boxes', and the selection of each option can be open to interpretation.

The incident reporting system requires the correct incident type to be selected. While SMS provides some guidance on the likely nature of the incident,[8] the final choice of incident type is the responsibility of the person completing the incident report. Not all operational staff, both paid and volunteers, appear to be aware that they do not have to accept the suggested incident type.

Different levels of information are collected for different types of emergency incident. While a common set of information is required for every incident (eg type of incident, property type, actions taken, equipment used), the full level of detail required varies depending on the incident type. For example, casualty information is collected only for fire incidents and not for other emergencies.

Hazardous substance emergencies also require a lot of information to be collected. However, there appears to be limited use of this information within the Fire Service. While this information

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[7] Within these data fields are 12 data 'groups' and 162 data 'fields'.
[8] SMS offers a comment on the incident type, based on the incident type set by the Communications Centre.

is passed on to the Environmental Risk Management Authority (ERMA New Zealand), the Fire Service is under no obligation to do so.

Volume and frequency of incident data collection within NZFS

Based on 2008/09 data, Figure 1 shows the top four types of incidents that the Fire Service responds to nationally, with the fifth category accounting for all other types of incidents (29%). As can be seen, false alarms comprise more than one third of incidents (36%) compared with the next highest, 'rescue, emergency and medical call outs', at 14%.

Figure 1: Four most common types of incidents nationally (2008/09)

□ False Alarms ■ Rescue, Emergency, Medical Call ■ Miscellaneous Fire ■ Structure Fire □ Other
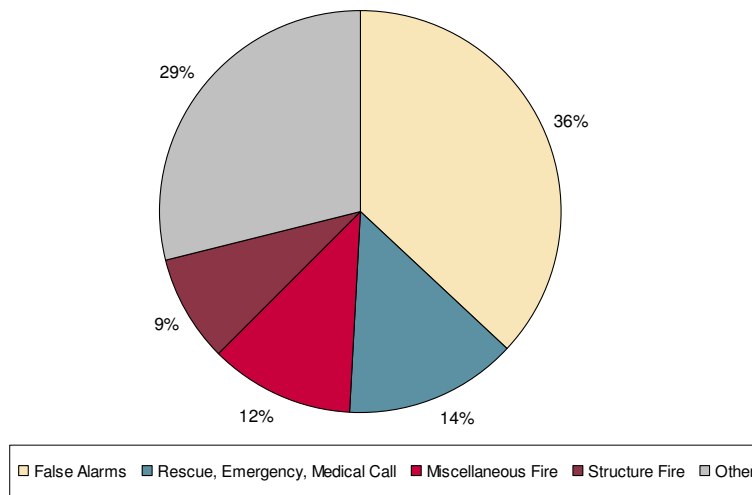
Figure 2: Four most common incidents types by paid and volunteer stations (2008/09)

Paid Stations

□ False Alarms ■ Miscellaneous Fire ■ Structure Fire ■ Hazardous Emergencies □ Other

Volunteer Stations

■ Rescue, Emergency, Medical Call □ False Alarms ■ Vegetation Fire ■ Miscellaneous Fire □ Other
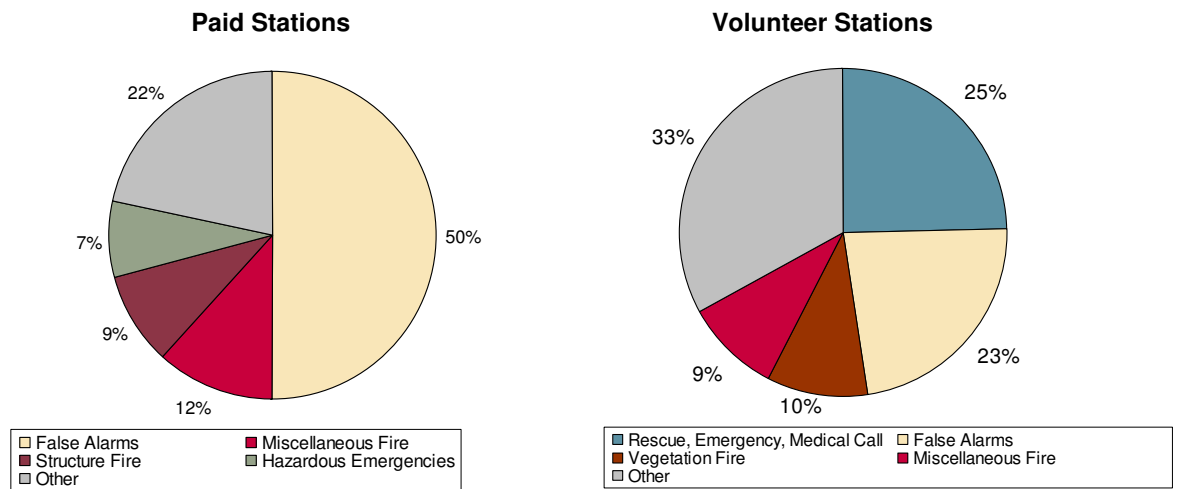
As can be seen from Figure 2 (above), one quarter of incidents responded to by volunteer stations in 2008 were accounted for by 'rescue, emergency or medical call outs' (ie a non-fire incident) and 23% were accounted for by 'false alarms'. In contrast, half (50%) of incidents responded to by paid brigades are false alarms, and one fifth (21%) either a 'miscellaneous' or 'structure' fire.

The type of incidents dealt with clearly influences how a station, or an individual officer or firefighter, interacts with the incident reporting system, and their overall level of familiarity with the options and pathways through incident reports. The incident reporting system needs to be sensitive to these differences to ensure that all personnel can complete an incident report accurately for any incident type.

As shown in Figure 3, volunteer brigades respond to the largest proportion of incidents for half of the incident types as compared with paid or composite stations.[9] These include:

- Mobile property fires

- Vegetation fires

- Rescue, emergency and medical calls

- Special service calls

- Natural disasters

- Not recorded.

Overall, paid and volunteer brigades respond to a similar proportion of incidents (when false alarms are included).

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[9] Urban stations with both paid and volunteer crews.

Figure 3: Proportion of incident type by volunteer, paid and composite stations (2008/09)

Incidents by type of station
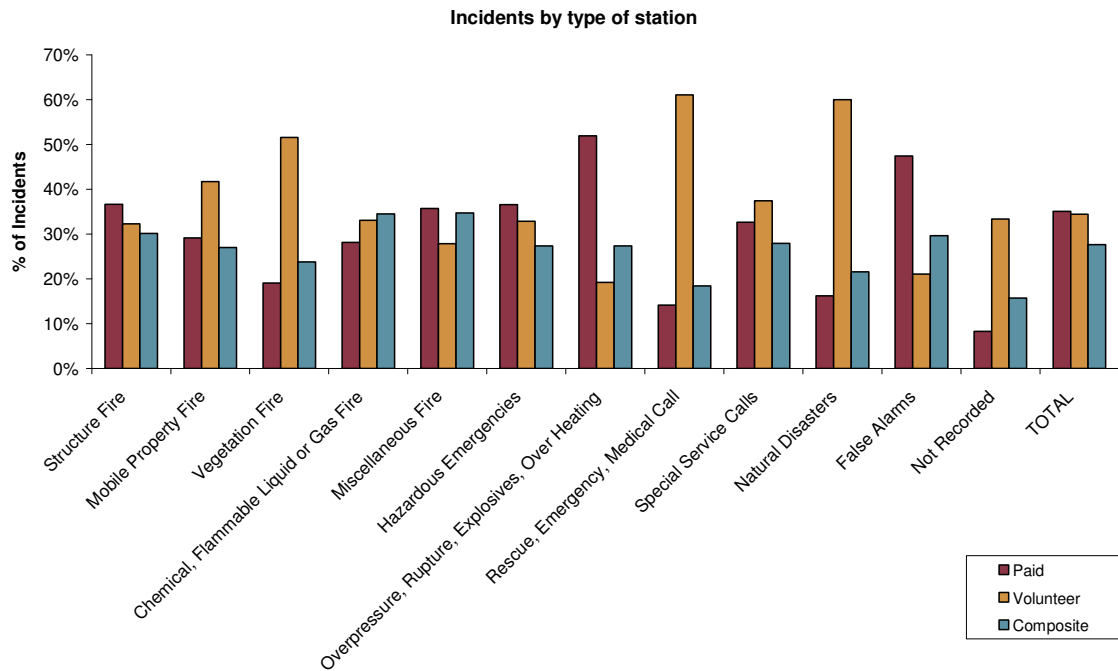
The frequency with which paid and volunteer brigades respond to different types of incidents also varies. Tables 1 and 2 overleaf set out the average monthly frequency of incidents by type of station (paid or volunteer), as well as the minimum and maximum number of callouts per month. As can be seen, for many stations, whether paid or volunteer, the average number of incidents dealt with per month can be very small or even zero.

Variations in the frequency of incident types impacts on how incident data are collected. For example, infrequent reporting of some incidents can mean that paid and volunteer staff are less familiar with certain options or inconsistent in their interpretation of these options, which may impact on the accuracy of the data collected. These differences highlight the challenges faced by the Fire Service in creating a robust incident data system that can be easily and accurately used by all brigades and personnel.

Table 1: Average frequency of incident by paid and volunteer stations (per month, 2008/09 data)

Incident Type	Average Frequency	
	Paid	Volunteer
False Alarms	12.71	1.33
Miscellaneous Fire	3.00	0.55
Structure Fire	2.31	0.48
Hazardous Emergencies	1.90	0.40
Special Service Calls	1.64	0.44
Rescue, Emergency, Medical Call	1.44	1.46
Vegetation Fire	0.94	0.59
Mobile Property Fire	0.80	0.27
Natural Disasters	0.34	0.30
Overpressure, Rupture, Explosives, Over Heating	0.34	0.03
Chemical, Flammable Liquid or Gas Fire	0.04	0.01
Not Recorded	0.01	0.01
Mutual Aid, Cover Moves	0.00	0.00

Table 2: Maximum and minimum frequency of incident by paid and volunteer stations (per month, 2008/09 data)

Type of incident	Paid		Volunteer	
Type of station (ie least or most busy)	**Min**	**Max**	**Min**	**Max**
Structure Fire	1.0	13.9	0.0	6.2
Mobile Property Fire	0.4	3.9	0.0	2.1
Vegetation Fire	0.2	5.5	0.0	6.5
Chemical, Flammable Liquid or Gas Fire	0.0	0.3	0.0	0.3
Miscellaneous Fire	1.8	16.6	0.0	11.3
Hazardous Emergencies	0.8	10.5	0.0	3.7
Overpressure, Rupture, Explosives, Over Heating	0.0	1.8	0.0	0.6
Rescue, Emergency, Medical Call	0.8	9.4	0.0	16.8
Special Service Calls	1.3	9.7	0.0	6.6
Natural Disasters	0.0	2.3	0.0	9.8
Mutual Aid, Cover Moves	0.0	0.0	0.0	0.0
False Alarms	5.7	108.0	0.0	12.7
Not Recorded	0.0	0.2	0.0	0.5
TOTAL	15.8	145.4	0.1	44.1

Rural Fire Authority data collection processes

RFA staff record incident data separately using an Excel spreadsheet system, with annual returns sent to the NRFA. Since 2008, RFAs have become responsible for completing incident reports in SMS. However, for the most part, RFA staff continue to enter data in their original system as it allows them to record additional RFA specific information that cannot be accommodated within the current SMS incident data fields. It has been suggested that these two parallel reporting systems do not always align, which is a concern for the Commission.

Reviewing NZFS data and information needs

Overall, NZFS has an ongoing need for detailed data (mainly at the national office level) and synthesised information (for regional and station level users). The SMS incident data system is capable of producing both. There is also an increasing expectation for regional and local officers, both paid and volunteers, to access and make use of incident data, especially with regard to the production and monitoring of local Business Plans.

The Fire Service needs to have in place an effective system to review information needs over time and to have an agreed mechanism for changing data collection processes to respond to the changing strategic and operational context. It has been suggested however that the current system involves working through hunches and checking these against current data to identify possible trends. NZFS is strongly committed to keeping historical data for this purpose. Where insufficient data exists to test a hunch, additional data fields have been added to the incident data system to fill the 'gap'. This type of process has the potential to result in the collection of a large volume of data that is not used, largely because it is not possible to predict in advance the type of data NZFS is likely to draw upon most.

While the current process has valuable elements (ie working off hunches at the station level allows decisions about data to be guided by the insights and knowledge of experienced firefighters), there is a need for this process to be made more robust so that decisions about what to collect on an ongoing basis are also determined according to the organisational information priorities and the level of use that will be made of the data. This will help to constrain data 'creep' and ensure the incident data system collects only data that is relevant to organisational need. Currently, there does not appear to be an agreed system to examine how incident data is being used and to identify opportunities to remove unnecessary data fields.

4. Incident data quality and accuracy

This section first outlines how Fire Service staff are interacting with the incident data reporting system and then describes the extent to which current NZFS incident data (and SMS) is meeting the needs of the organisation. We have approached this review by examining incident data from the perspective of its main users – ie the data 'input' perspective of operational paid and volunteer staff and the data 'user' perspective of local, regional and national staff. While each groups' opinions differ to some extent, collectively, they highlight common strengths and concerns about the quality and accuracy of incident data which are described below.

4.1 Staff interaction with SMS incident data

Three different groups of NZFS staff interact with SMS incident data on a regular basis but each have different objectives and therefore different perceptions about the quality and accuracy of incident data and SMS. These groups include:

- operational staff who predominately complete incident reports within SMS

- local and regional officers who are focused on the use of incident data to assist with business planning

- national office staff who predominately use incident data at the aggregate (New Zealand) level or to investigate specific issues on an as required basis.

Operational staff: refers to those based in a local station, both paid and volunteer staff, who are responsible for responding to incidents (ie Senior Station Officers, Station Officers and firefighters). Operational staff are responsible for collecting and/or inputting incident data at the local station level by completing an online incident report within SMS. The officer in charge is responsible for completing the incident report.

In practice however, incident reports are often completed by other staff such as Station Officers, senior firefighters and/or administrative staff.[10] Within volunteer brigades it has become standard practice for some stations to use administrative staff to complete all incident reports, possibly drawing on a paper record completed at the scene by the Officer in charge. Currently, these paper records are not standardised across volunteer brigades, with individual stations developing their own paper-based incident reporting systems. In some regions, it has been suggested that up to half of volunteer brigades use a dedicated **incident data reporter**, whether a volunteer or a paid administrative staff member.

Most operational staff below the rank of Senior Station Officer are only likely to interact with the reporting system when completing, or inputting, an incident data report, and some of these may perceive SMS and/or the incident data reporting system to have limited relevance to their day-

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10   Regional Fire Safety Investigation Officers may also amend or complete incident reports on a case by case basis as part of their role in investigating a fire.

to-day duties. This view may be more prevalent among volunteer brigades, especially those using dedicated incident data reporters. Consequently, operational staff tend not to be regular users of the information collected.

Without a full understanding of the value and importance of incident data to the Fire Service, the main objective of operational staff can become to complete incident data reports quickly. This may contribute to a tendency for some paid and volunteer staff to place a premium on speed over accuracy when completing an incident data report. Aspects of the system that hinder quick completion are viewed negatively, with the following quotes providing a sense of how operational staff interact with SMS incident data:

> Incidence reporting is an "encumbrance". This is why [station] decided to bring in another volunteer who provides administrative support to the brigade. As many as half of the volunteer brigades have a support officer to help with SMS and other administrative tasks. (Operational perspective)

> Incident reporting can be daunting. Volunteer brigades take longer to do a fire report and for most the next training night is the day you come in and do your report. Some have a policy that says you have to come in the next day/night to complete. Other brigades (where I have significant security and information issues) are where they have a single person who does the report and it becomes a case of **** in and **** out, and a lot of guessing. (Regional perspective)

> If you're going to be really honest and hit a tab on an exposure fire, you have to enter in lots of information before you can go on, so we had seven cars go on fire and you fill it all out and if you don't the system goes all red and goes "ARK" and you have to go back and complete, and that's what frustrates the brigade. They want to do it 'bang, bang reports done' in 3 or 4 minutes. (Regional perspective)

> It takes 5 minutes for a false alarm incident report, but can take up to 50 minutes for a large incident. False alarms equal a one page report but any flames reported requires a seven page report. Unnecessary for minor fires and encourages SOs to record them as a false alarm. (Regional perspective)

Some local stations or districts are perceived to have developed their own 'local rules' when completing incident reports. For example, some stations make greater use of 'Cause – not classified' option. While these stations can be identified at regional or national level there is no formal process to follow up why this is the case and to address these local systems or 'rules', if required.

At the station level operational staff are a mix of older and younger staff. Older staff are typically in senior roles (ie Senior Station Officers) and are experienced firefighters. This group recalls the 'pencil and paper' days of manual incident reporting and may be less computer literate than their younger colleagues. This may colour their perceptions of the online reporting system. As incident data has not always been quickly or easily accessible for analytical purposes, the older generation of firefighters may not be proactive users of the online information. Instead they may prefer to rely on their accumulated knowledge and personal 'gut instinct' to detect patterns that may signal a potential fire risk in their local area.

In contrast, younger operational staff tend to be more computer literate but typically have less practical fire fighting experience. These staff may find the incident reporting system relatively easy to use but their limited practical fire fighting experience may impact on the accuracy with which they code and capture information about each incident. They may also be uncertain as to the value and significance of incident data.

Furthermore, the majority (87%)[11] of NZFS staff are volunteers with other paid work responsibilities and this may lead them to perceive incident reporting as particularly time consuming, at least as compared with paid firefighters. They are also aware of the ongoing changes made to incident data fields and question the relevance and breadth of the data collected in incident data reports.

> I attribute the symptoms I'm about to describe to the fact that most staff are volunteers, and we are a response driven organisation, so the mindset is not academic, and all staff start as operational level and move up through ranks – ie there is no streaming, which is why strategic thinkers stick out quickly. There is also a 'patch it up quickly' mentality. Training is rolled out with a 'once over lightly' approach, rather than with a real strong drive and embedded. Transition between roles up the ranks (especially to officer level) focuses on management and leadership but there is no signalling about technical skills and purpose and importance of incident data responsibilities. (Regional perspective)

Local and regional officers: are those with strategic planning and management responsibilities[12] and tend not to be directly involved in inputting incident data into SMS but will regularly use this data to monitor performance and inform the development of local and regional initiatives.

They are primarily interested in readily accessible, accurate information (ie rather than data) about their regional incident trends, and how to aggregate this (eg with deprivation index and geospatial mapping data) to support a 'bigger picture' assessment of fire causes, possible prevention strategies and comparative regional performance. Many of these regional staff often seek assistance from national SMS analysts to process their tailored data requests.

> I come from the fire trucks, back to the early 80's when system was paper based, we had little info and you filled out a report that went to HQ and you never saw it again. The quality of information then wasn't important to those at regional level. But today the quality is imperative. We can't touch everyone [in our region], so we need to target. We factor incident data in with deprivation and ethnicity data... we need good information. (Regional perspective)

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[11] The Commission's quick facts website states the NZ Fire Service has 1707career firefighter positions and 7000 urban volunteer firefighters: date accessed 19 October 2009. Rural areas are serviced by the Rural Fire Authority volunteers.

[12] Including Regional Commanders, Area Managers, Senior Station Officers, Fire Safety and Investigation Officers.

The increased use of incident data has been at the centre of the culture change that the Fire Service has undergone to date and is still undergoing, as highlighted by the following quote.

> Are better at planning than used to be, when started 8-10 years ago. Was autonomous and bottom driven but are getting cleverer at it now. (Regional perspective)

National office staff: have overall responsibility for the performance, strategic direction and coordination of the NZFS. This group has a strong need for a greater volume of national aggregated data that can be used to monitor national incident trends (ie fire and non-fire emergencies), track national performance against agreed indicators and undertake research to support and enhance NZFS delivery.

Two or three national office staff are also involved, to varying degrees, in the quality assurance of incident data. However, this quality assurance role appears to be of a limited nature and has become more ad hoc over time. In fact, other than the person completing the incident data report, no one else within the Fire Service is accountable for the quality of incident data reporting. Quality assurance of incident data is therefore dependent primarily on the person completing the incident report.

4.2   Strengths of current incident data system

This section sets out the recognised strengths of the incident reporting system within SMS. Overall, SMS is widely seen by operational and regional staff to be a vast improvement on previous manual systems for managing incident data. In carrying out this research we encountered no individual that believed that the transition from a paper-based to an online system had not been an improvement.

> Relative to other organisations, SMS has real substance and [our] data is correct 80% of the time. The problem is partly an issue of increasing confidence to reduce the perception of inaccuracies, because lots of good data is available. (Regional perspective)

Specific strengths referred to include:

- having timely access to incident data – the current incident data reporting system has enabled the Fire Service to start to work more strategically at all levels, allowing local stations to target local issues

- the ongoing process of continuous improvement – paid and volunteer staff recognise the effort that is being made to ensure continuous improvement occurs, with iterative modifications to incident data fields and links between incident data and other data such as location.

There is however a concern that increased access to SMS and incident data in particular has not been matched by the capability of paid and volunteer staff to make use of it, and that the potential of SMS has not yet been fully exploited with regard to incident data. Paid and

volunteer staff appreciate that a wealth of data from multiple systems is available within SMS but report that it is often difficult to synthesise and customise it to meet their specific needs. As a result, regional staff often seek analytical assistance from national office SMS support staff or incident data analysts who can process these requests. Over time, these common requests have resulted in a series of standardised Cognos reports that can be accessed or produced on request. However, the production of customised reports appears to be driven more by local or regional requests than by national direction. The Fire Service may wish to investigate whether the full potential of the Cognos reporting tool is being utilised.

Paid and volunteer staff generally support SMS and the need for good quality incident data, and are confident that ongoing technical changes can be made to facilitate better access to high quality information.

> The electronic system is 50-90% 'right', 'not completely broken'. (Regional perspective)

> Overall I feel the system is 80% perfect, but I think the person capability for completing reports needs to be audited as well as content of the reports. (Regional perspective)

> [There] is a lot of data but we need information. Basically the system is OK but there is a lot of unrecognised potential, as an organisation. I don't want or expect ops staff, or even regional staff, to focus on data analysis. I want to see aggregated information being used to support fact-based management. (Regional perspective)

The current system of developing analytical reports seems to be dependent on two or three information analysts at the national level. Similar roles are not generally replicated at the regional level.

4.3   Incident data issues and concerns

Although SMS and incident data quality and accuracy are viewed as improving, a number of specific issues and challenges relating to the collection and use of incident data do exist. Some of these issues have been previously documented in prior work undertaken for the Commission[13] and have implications vis-à-vis the enhancement of incident data.

First, however, it is important to note that operational paid and volunteer staff currently have few direct incentives to record incident data accurately or in a timely manner. They may also believe that incident data has little, if any, direct relevance to their work. This can reinforce the tendency for paid and volunteer staff to complete incident reports as quickly as possible.

Specific issues of concern are described below.

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[13]   Glazier Systems (1999) 'Report on the New Zealand Fire Service on Incident Information Needs'.

Uses and users of incident data are not understood

At the operational level, paid and volunteer staff involved in collecting and inputting incident data appear to have a superficial appreciation of how incident data is used and a limited awareness of the range of different groups (both internal to NZFS and across various external agencies) who make use of it. Ongoing changes to incident data fields also raise questions for operational staff about who is using incident data and whether all the data collected is relevant.

> Time - guys are just wanting to fill out quickly and a bit of kiwiana is involved [ie the 'she'll be right' attitude] and there is an issue with guys on trucks not realising what data will be used. I'm sure we would get more value if we articulated that better. It hasn't been a priority for us as we've evolved. We have some mechanisms but enforcing that is a big logistical exercise. (Regional perspective)

> No value in the SMS incident data, time wasting exercise, onerous. Main problem is lack of suitable fields, which don't reflect real terms needed to describe events - so [we] guess or say unknown. Goal is to complete and 'get rid of task' asap. Volume of calls so high that time-consuming completion for no purpose is particularly detested. Recognise that accurate information may aid prevention interventions but majority of information doesn't appear to support this purpose. (Operational perspective)

Structure of SMS interface and problematic data fields

Aspects of the current structure of the incident data system may add to the issues described above, further reducing incentives for accurate data reporting. The structure of some data fields raises a number of concerns.

The level of subjective judgment and interpretation required to interpret data codes: some operational and regional staff note that a number of descriptors are imprecise and can be interpreted differently at a station level (ie across a station as well as between different stations). Changes to the existing fields and inclusion of new data fields have further compounded confusion over how best to classify incident information.

For example, in the case of a deliberately lit fire, staff are required to classify its cause, whether it was 'unlawful', 'suspicious', 'lawful', 'legality unknown', and 'deliberate – unclassified'. These terms may be inconsistently interpreted and applied, particularly given the relative infrequency with which some crews attend different types of fires. There can also be significant flow-on effects, with regard to making it harder to pinpoint fire risks or inhibit legal proceedings, when data is analysed and shared at the regional level or with external groups (such as insurance investigators or the Police), as the following quotes indicate:

> A few years ago we pulled out all our suspicious fires data in certain areas in town, we'd thought something was up and the Police did too, but the SMS data had listed these fires as unlawful and they weren't showing up. Cops are not interested in 'unlawful'. 'Suspicious' is their magic word. (Regional perspective)

> Too many fire reports are listed as unlawful, when they should have been listed as suspicious. Unlawful is more burning off scrub in a restricted fire season without a permit, or a burn-off in a closed season, not lit with the known intention of causing damage. If you label that fire as unlawful a potential defence lawyer can argue the point in court that the fire brigade only deemed the fire unlawful. A suspicious fire holds a lot more weight in a court situation, especially to jurors, than an unlawful reported fire. (Regional perspective)

Data fields that were frequently mentioned as problematic include:

Indicated fire cause: understanding the cause of a fire is a priority for NZFS. While a large number of codes are available to classify fire cause, they do not clearly distinguish between:

- direct cause of ignition - eg short circuit, earth fault; flammable liquid spill

- human intention - eg suspicious; unlawful, deliberately lit, etc

- contributing factors - eg behaviours such as falling asleep, being drug or alcohol impaired, and/or playing with a heat source, etc.

Some field descriptions are also perceived by some paid and volunteer staff to be very similar. For example, 'heat source too close to combustibles' or 'combustible placed too close to heat source'. As a result, the cause of any one fire can be correctly coded in multiple ways and the staff interviewed frequently noted that the level of subjective judgement required may impact on the robustness of fire cause data. Given the value of this information, inconsistencies in coding this information are a clear cause for concern.

> Tick boxes are great, but categories are not well defined. I need to know the contributing factors, the behaviours involved and the actual cause of ignition. (Regional perspective)

Incident type: the classification of non-fire incidents were also acknowledged as problematic by some paid and volunteer staff, including at national office level. This is primarily because for non-fire incidents firefighters can provide similar assistance in different emergency situations. For example, the three most common non-fire incidents are 'rescue, emergency, medical calls', 'hazardous emergencies' (ie dealing with hazardous substances) and 'special service calls'. Firefighters may provide similar types of support at these incidents, including basic medical assistance, extricating injured persons, directing traffic and/or cleaning up hazardous substances such as petrol.

Decisions about how to best describe a non-fire incident appear to depend largely on the type of assistance provided, but the fields available to describe the incident may be constrained because of the incident type code initially assigned by communication centre staff. As a result, there are concerns about the accuracy and consistency of the data relating to non-fire incidents.

The involvement of external agencies in these non-fire incidents may also be a confounding factor, requiring national office to determine whether they need to understand and monitor the

NZFS contribution to other agencies or collect information about the actual assistance provided by the Fire Service.

Reporting on the extent of damage*:* regional and operational staff identified the potential for confusion that exists in correctly interpreting and classifying fire damage in an incident report. Damage may be interpreted as referring to flame, smoke, water and control damage, and the level of damage sustained in each instance is likely to vary.

This information was used to support an internal performance monitoring (ie saving 80% of a property from damage is a key NZFS performance target), but has not been used in the last two years by the Fire Service. Not all Fire Service personnel appear to be aware of this change in performance targets.

Paid and volunteer staff report receiving little if any clarification about how to interpret property damage, and suggest that incident data relating to damage should be viewed with some scepticism.

> So what is 80% - smoke versus flame versus floor damage? My understanding is that it should be floor damaged by fire, but this discounts smoke and heat damage that affects a greater proportion of a building and is counted as damage in an insurance claim issue. So what does the 80% refer to? (Regional perspective)

While the value of damage can now be automatically calculated within the reporting system (ie using the reported area of damage and type of property), often the extent of damage caused by flame, smoke or water is the same or not completed at all. Insurance company information can also disagree with the estimated extent of damage, and are more concerned with the financial cost of the damage (or the cost to make good the damage).[14]

Whereas the Fire Service collects information with regard to the extent of damage for property fires, incident data reports collect the extent of the area saved from damage for mobile property. Operational staff did not appear to understand what the reason was for this and believed that this was resulting in inaccurate reporting.

The structure of field options: regional and operational staff comment that the order in which data fields are completed, and data input pathways generally, are complex and force patterns of reporting that generate frustration. This can hinder accurate, timely data input. As noted above, the data fields available in each report are determined by the initial incident type descriptors assigned by communications centre staff. This intentionally filters the options available for reporting but also limits the available data fields in any one incident report, and may also open multiple tabs that can't be closed without a response. This can encourage paid

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[14]   It was suggested in one of workshops that insurance company estimates of damage are seven times that recorded by the NZFS.

and volunteer staff to use 'shortcut' data fields such as 'unknown' in order to exit data fields, undermining the accuracy and quality of incident data.

Operational staff frequently acknowledged taking shortcuts when completing incident reports. There is also a general view that the structure of data fields could be ordered better to reflect the significance and relevance of the information sought, so that the most critical data is entered first, followed by fields of lesser importance. At present, data fields relating to fire cause are among the last to be completed in an incident report, even though regional staff consider this information to be critical. Paid and volunteer staff completion of these fields may be affected by general frustration with the system and hurried by a desire to finish reporting tasks generally, contributing to actual (as well as perceived) data accuracy problems:

> It is too complicated and too ambiguous - you look at the structure of the way its set up so that the ones we get are the ones we get all the time. I'd like to see it set up so that the most important or more serious causes show up first. So you'd have suspicious, unlawful, lawful, the legality and not known. The rats and mice stuff, they could go and may be a note that says 'double check status and cause with FSO or RFA'. (Regional perspective)

Other, more specific, examples of staff concerns with the structure of data fields include:

- Motor vehicle accidents – there was some confusion how to complete an incident report for an MVA, with some staff suggesting that there were several fields that could be appropriate for the same incident (eg '*Mobile property accident: no hazardous substance spill*', '*rescue: in or under vehicle/mobile property*')

- Hazardous substance incidents – require a lot of information and staff appeared to be unsure why this was relevant, and what to record/not to record depending on the nature of the incident

- Cause of fire – why it is not possible to use 'suspicious' for vegetation fires, given the need for accurate information for the Fire Awareness and Intervention Programme delivered by the NZFS

- Private fire alarms (PFAs) – PFAs are monitored by the Fire Service, as well as other stakeholders, and include false alarms resulting from faulty equipment or some other reason. When the incident type recorded is a PFA and it is a false alarm there is no option for 'no apparent cause', resulting in some personnel selecting other options so that they can complete the incident report. However, when it is a false alarm, the correct incident type should be 'False Alarm: Undetermined Alarm Activation', not a PFA.

Changing classification codes may reduce the impact of inconsistent interpretation, but incident reporting will always require a degree of judgment. A clear understanding of how good quality incident data will help operational staff to make better decisions in the future will be important in this regard.

Perceived data inaccuracy

Operational and regional staff indicated that they have concerns about the accuracy, consistency and reliability of incident data, but it is difficult to establish the extent to which inaccurate incident data is a reality or a perception. At the operational level, paid and volunteer staff openly acknowledge difficulties in recording data accurately and attribute this to issues associated with the nature of the incident data fields that are available (as discussed above); the time consuming nature of reporting and accompanying frustration they sometimes experience when completing incident reports.

> It [SMS] is the main tool for running the station but not sufficiently reactive/flexible. When receive calls from local people and they go out (eg smoke alarms, non-emergency work and not recorded via ICAD) often this is not inputted into SMS. It takes too long and does not capture 30% of what we do. One of the biggest causes of fire in …. is rubbish stacked too close to an industrial/commercial building but this cannot be captured easily within SMS. Have to find a near fit and information is subject to interpretation.   The process is not robust and the level of frustration is high among staff – especially those least computer literate. Some firefighters don't use SMS at all.   The statistics are ******** - not accurate. (Operational perspective)

Regional staff concerns are based on their experiences of finding inconsistencies in data and their own recollections of completing incident reports inaccurately.   As a result they can distrust incident data.

> In our experience people do what is 'close enough', especially if hurried. They will use the 'unable to classify' code because it's convenient and quick. Basically, people use short cuts. This is because there is a lack of appreciation and lack of accountability in [the organisation's] culture. (Regional perspective)

> In my days on trucks it was easy to usurp the system. If you got a petrol spill under 30 litres I only had to fill in the top box. I often took the shortcut road, it might be 80 litres but I just said 30 – not sure if that's the same now. (Regional perspective)

Lack of local quality assurance, accountability or validation: While there is some, albeit limited, data quality audit exercises performed at an aggregate level by national office staff, there are no consistently enforced processes for ensuring the quality and accuracy of the data at the point of completion. This is important given that a range of factors may be contributing to inaccurate data entry (eg the level of interpretation required to classify data, the relative infrequency with which staff report on various incidents, the limited time busy urban stations and volunteers have to complete incident reports, the use of dedicated data reporters by some stations and the use of locally developed paper-based reporting systems).

The lack of local 'point of entry' quality control is acknowledged by both operational and regional staff. This is however regarded as a training-related issue, further exacerbated by organisational tensions between firefighters and officers and/or between local stations and national office.

However, national level reporting of fire and non-fire incidents (eg the NZFS Annual Report) does not reveal any significant anomalies or causes for concern. This suggests that data inaccuracies may be generated at a more detailed level within incident reporting, rather than with regard to key performance monitoring data.

Information poor?

A significant level of data is collected about incidents within SMS and this can be combined with data from other systems to meet the individualised needs of different groups. However, the ability to synthesise this data requires that paid and volunteer staff have a sufficient level of technical and analytical capability which is not always the case. Regional staff have described the current incident data system as 'data rich, information poor', and see a need for greater data integration and better connectivity between data sets so that they can access synthesised information in a format that is most relevant to their needs.

> Information about incidents is not in the form I want it – when meeting Mayors, CEOs etc. I want to show systems and services and demonstrate the value of the Fire Service. Don't need data, I need tailored information. (Regional perspective)

> [We need a] wider range of in-depth reports to enable information to be used in a more intelligent fashion…all staff need to see information as a means to an end. 'Show me the picture' so I can define and debate it with others and focus the organisation on 'real life' issues and behaviours. (Regional perspective)

As noted earlier, regional requests for tailored information has led to the development of a number of standardised Cognos reports that can provide tailored summaries as required (eg on various incident types and volumes per region). However, there is no standardised process for addressing these requirements.

Supporting strategic analysis: the wealth of data and inability to move easily between different data sets (eg between summary reports and individual incident records) can make data analysis overwhelming for regional data users. Greater use of automatic triggers to signal repeat occurrences (eg multiple false alarms at a single address) and other patterns in incident data are seen as a way to support more effective (and efficient) data analysis.

> I can go to individual incident reports or get summaries, figures of certain types etc, but I want to be able to (and this is where it becomes un-user friendly to use at a management level – which doesn't affect the brigades) extract the data. I can't click onto the incident or take me to a listing of all seven jobs, so I can analyse and see if we have a trend of incidents with common characteristics. I can't actually do anything with it, it's only a PDF,[15] and this is where the system duplicates itself. So right I have the PDF, then I have to go to a different search and I have try and find which out of all our fires the seven were. And when I search by that incident type it says there aren't any of that sort, but it told me there were. So have I got something wrong? I want links to the live files with an option to use numbers of actual incidents. (Regional perspective)

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[15]   SMS allows the user to convert the report into a number of different report formats.

Insufficient training on data collection and input

There is widespread acknowledgement within NZFS that the training provided with regard to SMS incident data systems has been ad hoc and insufficient. While initial staff training was provided on the roll-out of the current system, with user manuals also provided, ongoing refresher training has been more sporadic. Key concerns about the level and quality of training provided are set out below.

> …they haven't been trained properly. When SMS came out you got a manual. No one sat down – we have been out and have tried to help them as much as we can and its been around for a few years so not a huge issue but if we are going to do a manual it needs to be really, really simple. Current manual is confusing – it's like a lot of Fire Service manuals – too many pages. I haven't used it myself. A lot of it is self-taught and looking over shoulders and that's where we can get information problems. I'm encouraging the officers to get the young fellers off the trucks and into the office and do that report with the officer with them so we're up-skilling. But if you have someone who is pretty blasé about doing it then you're getting misinformation about how to do it. (Regional perspective)

> It's the blind leading the blind. (Operational perspective)

> Non existent. (Regional perspective)

> A huge issue for the whole organisation - it's a huge gap in what and who we are. The prevailing thought is that it's all online and 'what do you need to know?' (Regional perspective)

> Its been an evolutionary process and no one gives you an explanation of why you're supposed to do what you do [in regards to incident data reporting] as they move up ranks, or even how to do it. It's a big and important exercise because this is core data. (Regional perspective)

Lack of systemic targeted training on incident data: Senior Station Officers receive an introduction to SMS during their initial officer training, who are then expected to support other staff to use incident data systems. This approach to training may contribute to a general perception, especially amongst operational staff, that incident data is not of significant importance to the organisation and reinforces the impression that incident data has no relevance on a day-to-day station level. It also means that Senior Station Officers first engagement with the incident data system may be coloured by these perceptions and encourage them to adopt a casual attitude to incident data collection.

A number of incident data reporters interviewed as part of this project had received no formal training on completing incident reports. Most seem to have 'learned by doing' and some believed that in the beginning they were 'winging it'.

Uses and value of incident data are not emphasised or understood in training: Training provided to date does not appear to have overtly clarified how incident data is used and shared within the NZFS or externally. In the absence of this understanding paid and volunteer staff may not fully appreciate the importance of the data collected and the need for accuracy and consistency when completing incident reports.

Lack of effective refresher training: While there is a high retention rate for both paid and volunteer crews, changes to incident data fields and the use of incident data within the Fire Service requires ongoing investment in refresher training. The lack of such training appears to be a key weakness in the Fire Service's incident data reporting system.

5. Challenges and opportunities for enhancement

While SMS is generally regarded as a valuable tool for incident reporting and that continuous evolution of the system to date has allowed for increased use and value of incident data, there is a concern, at all levels of the service, that existing business rules are 'out of date' and have not kept pace with system changes. Rules and procedures are perceived to be inconsistently applied or enforced, and that more needs to be done to quality assure data collection and input processes at the local level, as well as the use of incident data at the local and regional level.

Set out below are a number of challenges and/or opportunities for enhancing incident data. These focus on the need to refresh 'business rules' across different aspects of the incident data reporting system.

5.1 Incident data 'business rules'

The quality and accuracy of incident data can be significantly enhanced by making more overt use of NZFS 'business rules' relating to incident data. By business rules we mean a shared understanding and business practices that support organisational direction and day-to-day activities. In this instance business rules could refer to:

- the existence of a shared understanding about:

    – NZFS proactive focus on risk management

    – the use of incident data to support organisational direction

    – the internal context in which information is collected and used (ie the organisational factors that shape how data is captured and shared)

- the existence of shared practices relating to:

    – training on incident data systems

    – data input processes

    – information use and analysis.

Before highlighting specific enhancements that can be made to the incident reporting system, it is first important to address two overarching issues:

Time allowed to complete an incident report

Currently, incident reports are required to be completed within 14 days of the incident occurring, with a reminder automatically triggered by SMS after 7 days. It is believed that the average time to complete an incident report is around 7 for paid brigades, rising to 21 days for volunteer

brigades and 40 days for RFAs. When looking at completion times by the 'median', the respective figures are 2, 7 and 14. This suggests that while most brigades across the NZFS and the RFAs are completing incident reports well within the allowable time, a minority are not.

For those incident reports not completed within 14 days, a second reminder is sent and then one every week thereafter until the report is completed. Overdue reports are highlighted within monthly/quarterly reporting to Area and Regional Commanders, who will then follow-up with Chief Fire Officers as required.

While this system has significantly reduced the number of overdue incident reports, it is still necessary to question whether a period of 14 days is required to complete an incident report and the impact this length of time has on the ability to recall information accurately. Many paid and volunteer staff take notes about an incident while on scene, to aid the completion of an incident report at a later time, but this is not universal or required practice.

The Fire Service needs to consider whether incident data quality will be enhanced further if the time allowed to complete an incident report is reduced, possibly from 14 to 7 days. The above analysis shows that most stations do not deal with many incidents in an average month and, as already commented on, most paid stations complete incident reports within 2 to 3 days. ICAD information is uploaded now within an hour in most instances thus enabling incident reports to be completed on returning to the station. Reducing the number of days allowed to complete an incident report will also send a clear signal throughout the service of the importance of incident data.

Incident data reporter role

The Fire Service also needs to decide whether the emergence of an incident data reporter role within some brigades is something to be supported or whether an alternative solution needs to be found. There are good arguments both for and against such a dedicated role. A particular issue is that the person completing the report will not have been present at the incident and will not have a full understanding of the environment or context around the incident. That said this role does seem to be a pragmatic solution for some brigades, especially volunteer stations. If the Fire Service decides to support and encourage the use of such a role, it will need to develop business rules around them, especially with regard to what happens when this person is on annual leave – currently incident reports can be left uncompleted until this person returns.

5.2 The value of an integrated, organisation-wide approach

Operational staff already have a degree of resistance to the current incident data system which is easily exacerbated by other factors such as tensions between operational and regional/ national staff and station level concerns about how ongoing changes to SMS systems are used to monitor their activities. To be effective, changes to the incident data system within SMS need

to be reinforced with other forms of support such as targeted training and national communications that collectively articulate why and how NZFS can use incident data more effectively.

> But SMS has been going for quite a few years now, so there's no point in having a training session, I think it needs to be refreshed: the system and the training, and the understanding of the training.   If we just do it [training] now, that will get their backs up. But if we were to change and simplify it [the system] that's when we could do refresher training, if you have an excuse to sit down with a volunteer brigade and say 'hey fellers [the system] has been made more simple', they'd be more receptive.

Strengthening business rules for incident data needs to involve an integrated approach focused on making changes in three areas:

• Training and communications

• Quality assurance procedures

• System design.

Training and communications

The Fire Service will need to consider whether it is appropriate that staff who have received no training on how to complete an incident report should be allowed to do so. This appears to be more common for volunteer brigades, with many becoming reliant on a dedicated incident data reporter, or with those paid brigades that use administrative support to complete their incident reports. These volunteer and/or administrative staff will have received no fire fighting training and possibly no training with regard to incident data reports.

While these staff may be computer literate and can use paper-based records completed by the first attending officer, this opens up the incident reporting system to considerable risk. It is recommended that the Fire Service investigate the possibility of restricting access to the SMS incident data system to those staff who have received the appropriate level of training. A similar system, or business rule, has been adopted within the Ministry of Education with regard to the implementation of a new electronic enrolment register that schools complete on a daily basis. The Ministry provides temporary passwords to new administrative staff in schools, who then have a limited period to complete their training before access to the system is withdrawn.

Training provided to paid and volunteer staff, including incident data reporters, should focus on:

• the use and importance of incident data

• how to complete incident data reports

• how to use incident data for local and regional business planning.

All staff who complete incident reports must understand how the Fire Service and other external agencies use the data, and the importance of completing incident reports correctly. This is particularly important for those staff who are not directly involved in the use of incident data in local or regional business planning. After the initial training on the importance of incident data, this knowledge will need to be maintained and refreshed through regular and proactive communications from national office showing how the Fire Service is using the information to improve their operational performance.

Training on how to complete incident reports should be provided to staff on joining the Fire Service and at regular intervals to keep them up to-date with any changes to the incident reporting system. Similar training is required for those staff using incident data at the local and regional level for business planning purposes.

Clearly, the nature of the Fire Service workforce and the amount of time already allocated to training for firefighters and officers is likely to mean that much of this training will need to be online and/or remotely delivered, possibly through video and tele-conference facilities. Supporting material, both online and paper-based, such as an incident data manual, may also be necessary.

Quality Assurance procedures

The incident data system is dependent on those people collecting and inputting incident data. As such, the system is open to significant human error, especially given that there are currently no local quality assurance procedures and limited, and ad hoc, quality assurance activities undertaken at the national level. To improve the quality of incident data there is a clear need to strengthen local level accountability. As was suggested in carrying out this research, you can delegate responsibility but not accountability for incident reporting. Someone at the local level must be held accountable for the timely and accurate completion of incident reports.

A pilot in Southland has instituted such a system of local accountability. The Fire Service will need to examine the outcome of this pilot and standardise practices across the service. National office may also need to be more proactive with regard to quality assurance, with staff time dedicated to checking incident data having been reduced over time. There needs to be a more transparent system of quality control that is evident to all stations.

With regard to role of the dedicated incident reporter (whether paid or a volunteer), there is a need to:

• standardise the use of paper-based records across the Fire Service

• confirm guidelines for when the data reporter <u>must</u> consult with the first responding officer (or delegated person) when completing the incident report.

System design

The design of the incident data report and pathways through the report should be informed by:

- the Fire Service's core information needs, as well as those of its key stakeholder agencies, to help reduce the quantity of data collected

- incident data statistics, focusing on the most numerous incidents that the brigades are likely to respond to (as shown in section 3.2 of this report).

It is generally agreed that too much data is currently collected through the incident reports. However, most paid and volunteer staff within the Fire Service are unaware of how much of the incident data is used. The Fire Service may wish to undertake both an internal and external consultation process to agree and prioritise what data should be collected and why. This process should be repeated on a regular basis, every two or three years, to ensure that 'mission creep' does not lead to an increase in the data collected.

It has also been suggested by some staff that the current reporting system is not intuitive and that the pathways through the incident report can be confusing. This could be improved by:

- ensuring that the business critical information is collected first

- that the first few questions ensure that the incident type is correct and can show the person completing the report the structure of the rest of the report to be completed

- the increased use of guidance notes or system prompts to help with the consistent interpretation of what is being asked for.

Any re-design of the incident reporting system within SMS will also need to incorporate the information needs of RFAs and the NFRA, with the intention to remove the existing duplication of incident reporting for RFAs. This would ensure that the Commission is receiving both reliable and compatible information on the incidents attended to by RFAs.

6.   Conclusions

SMS and incident data have improved the ability of the Fire Service to operate strategically. The collection and use of incident data have undergone gradual change since the switch from a paper-based to online system in 2000. The findings set out in this report will help to inform the next stage in the evolution of incident reporting within the Fire Service.

In reviewing the collection and use of incident data across the Fire Service, this report has again identified a number of issues that have been known about for some time (ie the Glazier 1999 report). However, most national and regional staff are confident that key performance data collected as part of the incident reporting system is generally robust, at least at the aggregate (national) level. Concerns with data quality appear to be centred on the more detailed aspects of the incident reports (as outlined in section 4 of this report).

This report has clearly highlighted a number of systematic and/or system design issues that need to be addressed to improve confidence in the incident data system across the Fire Service. These need to be addressed as part of a coordinated change management process to ensure that changes can build on and complement each other. Changes to the design of, and pathways through, incident reports will not be sufficient by themselves. There is also a need to implement stronger quality assurance procedures at both the local and national level, as well as a comprehensive system of training on incident data reporting and the use and importance of incident data. This training will need to be aimed at existing and new staff, including paid and volunteer crews, as well as administrative staff – especially those undertaking the incident data reporter role.

Section 5 identified and discussed a number of potential enhancements that could be made to the incident data reporting system. The Fire Service may wish to consider how best to consult on these, both within the Fire Service (across paid and volunteer brigades, including Rural Fire Authorities) and with external stakeholder agencies.

The increasing importance of non-fire incidents as a proportion of all emergency incidents within New Zealand requires the Fire Service to consider their long-term data needs and how they wish to work with external stakeholder agencies, such as the Police, ambulance services, etc. This may need an overarching review of emergency incident data reporting across the emergency services in New Zealand to ensure that the right information is being collected by the right agency and shared in an effective manner.