

The Application of Self-Evacuation Archetypes



A Safer Together Research Project

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Environment,
Land, Water
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1. Executive Summary

Householders facing a bushfire threat respond in a variety of ways depending on a diversity of factors including risk perception, stakeholder perceptions, the perceived effectiveness of protective actions, self-reliance, experience and their intended protective actions. Seven self-evacuation archetypes attempt to capture this diversity of attitudes and response to bushfire. However currently there is limited understanding of how this evidence can be best applied to risk reduction strategies including community engagement, bushfire modelling and the evaluation of community education and engagement initiatives. The purpose of this project is therefore to apply understandings of the self-evacuation archetypes to these three important areas of bushfire safety activity.

The Safer Together program, in funding this project has promoted cooperation and collaboration between agencies and researchers in the harnessing of the most recent research to enable improved community engagement and delivery of bushfire management and risk reduction.

This report describes self-evacuation archetypes, details the characteristics and likely behaviour, and discusses community engagement, evacuation modelling, and monitoring and evaluation initiatives.

1.1 Definition and characteristics of self-evacuation archetypes

Archetypes are a typical character with whom an observer might emotionally resonate due to their universally shared, fundamental characteristics of humanity. They reflect an individual's attitudes, needs, motivations and core issues, providing insights into how people feel and are likely to act in a prevailing situation. They clarify patterns of behaviour and drivers to action. The basic characteristics of these archetypes are summarised in Table 1. The archetypes' defining characteristics and major attributes influence their likely attitudes and responses to important factors including threat, stakeholder and protective action perception, locus of control, intention and its strength, planning and preparation and attitudes to warnings. Table 2 provides an example of archetypal differences in threat perception.

1.2 Project Outcomes

Through the bushfire self-evacuation project, a strong interest in and desire to incorporate self-evacuation archetype thinking into existing and future bushfire safety programs was expressed by bushfire safety practitioners. This support was based on a widely held view that bushfire self-evacuation archetypes provide a clearer and more realistic view of the characteristics of community members living in bushfire prone areas. By enhancing their understanding of the nature of the individuals they are working with, bushfire safety practitioners felt that self-evacuation archetypes would strongly assist their efforts to engage, inform and positively influence community members. Bushfire self-evacuation archetypes were usefully applied to agency community engagement, evacuation modelling, and monitoring and evaluation activities as summarized below.

1.2.1 Community engagement and consultation

CFA and DELWP community engagement practitioners perceive self-evacuation archetypes as a valuable means of understanding and addressing the diversity of individual attitudes and responses that they deal with in their work in bushfire prone communities. By recognising and working with the archetypal diversity of the individuals within bushfire prone communities, they feel they can more effectively engage, encourage and drive attitude and behaviour change and build trusting relationships.

The matrix of archetypal attitudes and perceptions is seen by community engagement practitioners as providing a research-based framework for systematically broadening and deepening their understanding of key householder attitudes and behaviour and reinforcing their own experiential and anecdotal insights.

They believed the insights provided through the archetype lens could be used to engage with community members more quickly and effectively.

A means of establishing an individual's archetypal grouping was identified in workshop discussions as fundamental to using an archetypes lens in community consultations. A key finding of this report is that a short, simple questionnaire that can be administered in hard copy or online to identify an individual's archetype, is required by community engagement practitioners.

Once an individual's archetype is established community engagement practitioners want a tool or materials that can be used in the field to facilitate the use of the understandings provided by the archetype analysis. This tool would assist in discussing the individual's attitudes and responses to bushfire and 'nudging' them toward actions to increase bushfire safety. It would also allow them to analyse the attitudes and priorities of community leaders or influencers to better understand how community priorities may form through processes influenced by community leaders. The tool could also be used as a classroom resource or reference in the Building Capacity Program for the training of Level 3 facilitators.

Workshop discussions indicated strong support for a set of flash cards, containing short, simple information about archetypes and an action framework for 'nudging' individuals' attitudes and behaviour. The identification of the need for this community consultation and training resource is a key finding of this project.

1.2.1.1 Recommendations for action on community engagement

1. Develop an online tool for classification of individuals into archetype groups.
2. Finalise readily accessible and visually engaging archetype flash cards for field use by community engagement professionals.
3. Develop an approach to providing a demographic profile of archetype groupings within a community at an SA1 level to establish the context for community engagement in different localities.
4. Pilot, within a CBBM community, a bushfire safety planning and action initiative using the self-evacuation archetypes.
5. Co-develop a training program for Level 3 facilitators in the Building Capacity and Capability project to refine and extend the skills of community engagement professionals.
6. Establish a scenario planning exercise, coordinating community engagement and evacuation modelling, to provide new insights into householder attitudes and response to simulated bushfire events based on their archetypal characteristics.

Table 1: Summary of self-evacuation archetype characteristics and attributes. Adapted from Strahan et al. (2018).

Archetype	Defining characteristics	Major attributes	Evacuate or remain
Responsibility Denier	Believe they are not responsible for their personal safety or for their property	<ul style="list-style-type: none"> • Little knowledge of bushfire/fighting • Do not prepare their property • Do not have firefighting equipment or protective clothing • Likely to wait for direction from emergency services 	Committed to evacuating but expect others to direct and assist in evacuating and defending their property
Dependent Evacuator	Expect the emergency services or others to protect them and their property because they are incapable of protecting themselves	<ul style="list-style-type: none"> • Bushfire threat does not intrude on their property or personal safety • Have little bushfire knowledge and unable to decide on or take responsibility for their protective action • Property is unprepared • No firefighting equipment or clothing • Likely to wait for assistance from others • May have previously evacuated 	
Considered Evacuator	Having carefully considered and planned evacuation, are committed to it as soon as they are aware of a bushfire threat to their property	<ul style="list-style-type: none"> • Bushfire threat intrudes extensively on thoughts and daily life • Perceives major ongoing threat • Little experience of bushfire fighting • Prepare property for survival against embers in their absence • Little bushfire equipment • May have previously evacuated 	Committed to self-directed evacuation
Community Guided	Seek guidance and assistance from and are influenced by neighbours, community members and media who they see as knowledgeable, well informed and providing good advice	<ul style="list-style-type: none"> • Recognize bushfire threat to personal safety but do not think about it. • Believe they do not need to be self-reliant or responsible for safety. • Little bushfire experience or training • Little firefighting equipment • Little property preparation • Deliberate and co-operate with community members 	Committed to listening to community advice and evacuating on advice

Archetype	Defining characteristics	Major attributes	Evacuate or remain
Worried Waverer	Prepare, plan and equip their property and train to defend but worry their lack of practical bushfire fighting experience puts them at risk by remaining	<ul style="list-style-type: none"> • Recognize bushfire threat to property and personal safety. • Perceive evacuating as best for personal safety but remaining best for property protection. • Make considerable efforts to plan, prepare and train for bushfire • But have limited bushfire experience • Likely to delay decision to leave 	Wavering between evacuating and remaining to defend
Threat Denier	Do not believe there is a bushfire risk and therefore that their personal safety or property is threatened	<ul style="list-style-type: none"> • Recognise local bushfire threat but believe specific attributes of their property removes the risk • Little bushfire fighting experience • Do not prepare property • Do not have firefighting equipment or protective clothing • Likely to evacuate late • Expect emergency services to assist 	Committed to remain as perceived lack of threat makes evacuation unnecessary
Experienced Independent	Are highly knowledgeable, competent, experienced and self-reliant fighting bushfire	<ul style="list-style-type: none"> • Experience through volunteering, training and firefighting. • Aware of bushfire threat • See remaining as protective of property and personal safety • Considerable preparation of property • Have firefighting equipment and protective clothing • View others including emergency services and neighbours as lacking capacity to provide them with assistance 	Highly committed to remain because they see themselves as highly experienced/well prepared and committed to protecting assets

Table 2: Archetypal perceptions of threat

		Threat Denier	Dependent Evacuator	Community Guided	Responsibility Denier	Worried Waverer	Considered Evacuator	Experienced Independent
Threat perception	Perception of fire threat and impact	Personal safety and property are not threatened because there is no bushfire risk in the area or to their property and no likelihood of impact	Threat to personal safety is limited because others will assist to decide what to do and to evacuate from the threat. But likely that property is at risk and will be impacted because property protection measures have not been undertaken.	Concerned about threat to personal safety but would draw on support, information, knowledge and expertise of neighbours, the media and emergency services (ES) to assist in addressing the threat. Expect limited impact on personal safety as community will act to protect each other. Little impact on property because protection measures have been taken and neighbours/ES will assist in defending property.	Threat to their safety and property is the responsibility of others to deal with. Expect no threat to or impact on their personal safety or their property because ES are responsible to ensure both are safe.	Perceive likelihood of major threat to and impact on personal safety and property but are unsure of the best way to deal with it	Perceive a major threat to personal safety and property and are strongly committed to evacuate before the threat eventuates. Consequently, believe that personal safety will not be impacted but property impact is likely even though it has been prepared for survival in their absence	Perceive a major threat to their property and personal safety but through successful defence expect no impact on either.

1.2.2 Monitoring and evaluation of bushfire programs

Theories of change and logic models for bushfire safety programs recognise the importance of meeting householders' diverse needs. Self-evacuation archetypes offer a framework for identifying and better understanding these varied householder needs. Once archetypal insights are applied to bushfire safety programs, their monitoring and evaluation requires both identification of archetypes within surveyed populations and an assessment of the effectiveness of archetype adapted programs in achieving bushfire safety objectives.

By applying an archetypal lens the achievement of program objectives can be more clearly demonstrated through a better understanding of householder attitudes, perceptions and needs, and assists in clearer understanding of why householders have these views and needs and how they can be met. More refined and focused program outcome measures and improved program design and targeting are possible through a better understanding of householder needs.

By analysing data from the last two CFA post-season surveys (2018 and 2019) against the small number of archetype questions that were included, this report has demonstrated both the feasibility of identifying archetypes in bushfire prone communities and the new insights that can be generated. The post-season data provided new insights into the extent householders' felt informed, their participation in bushfire safety programs and perceptions of those programs. This further completed the picture of the self-evacuation archetypes and deepened understanding of the impact of their characteristics on their participation in bushfire safety programs.

1.2.2.1 Recommendations for action on MER

7. Review MER frameworks to identify where the archetypes can be incorporated and how they can be applied to further short, medium and long-term agency objectives.
8. Review monitoring, evaluation and reporting instruments including surveys and report templates to establish how the archetypes can be used to better achieve agencies' bushfire safety and community engagement objectives.

1.2.3 Archetypes in evacuation models

Using the insights into individual response to bushfire provided through the self-evacuation archetypes, has improved Victorian vehicular evacuation modelling. Householders' response is no longer based on a homogeneity of household response to bushfire stimuli but now includes differential archetypal responses to environmental cues and official warnings at escalating levels of urgency to act and various levels of risk aversion. The simulation produces a greater diversity and complexity of behaviour consistent with an actual bushfire event.

The simulation now models evacuations that are more varied over time rather than in large bursts of activity driven by identical response to bushfire stimuli. This has the effect of more realistically identifying times and places of likely traffic congestion requiring management and infrastructure that may create pinch points or areas of vulnerability for safe evacuation. The depiction of archetypes during a bushfire event enables a more refined, forensic analysis of householders' evacuation dynamics.

1.2.3.1 Recommendations for action on evacuation modelling

1. Further refine and validate the evacuation model providing a stronger foundation for its planned use in other Victorian bush fire prone regions.

2. Examine model outputs and collect regional household data to enable comparisons between the real world and the outputs and assumptions of the model.
3. Address the impact of multi-member household dynamics on the model.
4. Incorporate data on the characteristics of the archetype populations in the Otway and Dandenong Ranges.

1.3 Conclusions

Agencies seek to enhance bushfire safety through community engagement and education. Community engagement professionals need to understand what householders think about bushfire, why they think it and how they are likely to respond to a bushfire threat. Evidence from research on self- evacuation archetypes provides a rich systematic basis of understanding householders attitudes and their likely responses that professionals have readily adopted.

The use of the archetype lens in agency monitoring and evaluation enables a nuanced understanding of householders' response, settings in which programs are most effective and the reasons for their effectiveness. Better understanding of householders' motivations and priorities enable agencies to work more effectively with them, to better respond to their needs and to gain their trust.

The Victorian government, using the advice of experts, has taken considerable steps in integrating human behaviour into an evacuation model for the Surf Coast region. The new evidence provided by self-evacuation archetype research has enabled this work to be considerably enhanced, extended, broadened and systematised. By applying the archetypes lens a much greater diversity of householder attitudes and responses are modelled and more complex, comprehensive and realistic vehicular dynamics are generated. While incorporating self-evacuation archetype evidence has improved the model, it requires further refinement and validation so the model can be effectively used in other bushfire prone regions of Victoria.

2. Introduction

Bushfire hazard in Australia is significant and expected to worsen and become more difficult to manage as a result of three factors. Climate change has, and is likely to further increase the frequency and severity of bushfire as a result of increasing average temperatures and the lengthening of periods of extreme heat. The growth of population especially in the larger capitals of Melbourne and Sydney and also more generally has led to the extension of residential areas into the interface. The increase in suburban populations in major Australian capital cities exposes greater numbers of households to bushfire threat. Since the global financial crisis, global economic slowdown, including the curtailing of Chinese growth, and constraints on government expenditure, spending on emergency management including fire agencies has come under increasing pressure. Constrained firefighting resources requires that householders in bushfire prone areas take greater responsibility for both preparation and response to bushfire.

Following the Black Saturday bushfires of 2009 and subsequent Royal Commission the optics of bushfire safety policy in Australia have changed. The 'prepare, stay and defend or leave early' policy has been modified, emphasising that leaving before a threat becomes imminent is the safest action to protect life by being away from the bushfire (Australasian Fire and Emergency Services Authorities Council, 2012). Notwithstanding this adjustment the effect of bushfire safety policy for household decision-making is unchanged. Householders potentially threatened by a bushfire event are expected to leave their home well in advance of the fire or to remain and defend a well-prepared and equipped property.

The realities of household decision-making in bushfire are inconsistent with the preferences and assumptions of Australian bushfire agencies. Householders facing a bushfire threat prefer not to disrupt their normal daily routine. Their behaviour has been described in the form of seven self-evacuation (voluntarily leaving) archetypes which are the central feature of this report. The typical behaviour of households confronted by a bushfire threat are characterised by diverse factors that shape householder response to bushfire including threat, stakeholder and protective action perceptions; self-reliance; experience; and protective action intentions. The behaviours are influenced by a complexity of attitudes, values and beliefs. They help to explain how householders attempt to make sense of the risk, influenced by a range of personal, social and situational factors and to balance the perceived threat, their vulnerability, uncertainty and priorities.

There is currently a limited understanding of how research evidence on human behaviour, reflected in the self-evacuation archetypes, can best be applied to bushfire risk reduction strategies, including approaches to community engagement, to bushfire modelling tools or to the evaluation of community education and engagement initiatives. This limits the emergency management sector's ability to improve and adapt bushfire risk reduction strategies, to factor likely human behaviour into incident planning and to advance the sector's ability to make evidence-based decisions.

The purpose of this project is therefore, to harness new understandings of householder behaviour during bushfire provided through the archetypes and to apply these insights in the development of bushfire safety policy and programs. It is this harnessing of evidence that is the touchstone of the "Safer Together" approach that has been pursued by the Victorian government. In late 2015 the Victorian government released the "Safer Together" policy which was part of a broader reform of the Victorian emergency management sector. "Safer Together" involved cooperation and collaboration between land management and fire management agencies in partnership with local communities to harness both professional fire expertise and local knowledge. The principles that guide the Safer Together program are:

- A collaborative, cross-agency approach will be used.
- The community, and how they can be involved and/or contribute, will be considered in all aspects of bushfire risk reduction.

- Establishing, building and continually strengthening relationships within organisations, across organisations, with partners and with community and networks is essential to the work
- Community based processes are iterative and a long-term investment:
- Openness about learning from actions to continually refine and improve approaches.

The objective of the program is to pursue on-ground capability-building projects to enhance cooperation between emergency agencies, improve collaboration with the community and use evidence to manage and reduce bushfire risk and impacts.

‘Sub-objectives aligned to the different focus areas of the program are:

- Build the capacity and capability of bushfire management agencies to work together to manage bushfire risk. Increasingly integrate partner and community perspectives and activities into our approach.
- Collaborate with communities through appropriate and purposeful approaches to identify shared bushfire risk reduction solutions. Improve the community engagement capacity and capability of agencies and partners.
- Knowledge is generated, used and shared to enable improved delivery of bushfire management and risk reduction.
- Monitor evaluate and report on the Safer Together program to improve its delivery and provide accountability.
- Establish a strategy for long-term evaluation of the bushfire management and risk reduction approach.

The use of scientific evidence generated through high quality research is a central tenet of “Safer Together”.

‘...Risk is dynamic and constantly shifting, so we need to keep building on our evidence base. We will continue our investment in science, and in partnership with research institutions, to build knowledge of the relationship between fire and the environment and to better manage risk. (Government of Victoria, 2015)

Bushfire science research and investment in new science is commissioned through Safer Together to address knowledge gaps within the emergency management sector, to reduce the impact of these gaps on and mitigate the risk to community bushfire safety and to build the evidence base.

‘We will continue our investment in science, and in partnership with research institutions, to build knowledge of the relationship between fire and the environment and to better manage risk’ (p 18).

The objectives of this project are therefore to examine the nature of and the extent to which self-evacuation archetypes can be applied to:

- inform the design and delivery of community education and engagement approaches;
- enhance the evaluation of community education and engagement programs; and
- incorporate human behaviour into bushfire modelling.

In the following chapter the archetypes are described in detail and their implications for bushfire safety policy are examined. A description of how the archetypes are applied to bushfire policy and programs follows in Chapter 3, including initiatives in the Safer Together Community Based Bushfire Management and Building Capacity programs; the evaluation of CFA programs and Safer Together projects; and modelling bushfire management and traffic management in a

bushfire event. In Chapters 4, 5 and 6 the results of the sub-projects described in Chapter 3 are discussed. Chapter 7 presents discussion of the key findings of this report and Chapter 8 concludes it.

3. Archetypes and their use in bushfire

3.1 Australian bushfire management context

Australian bushfire safety policy asserts that householders threatened by bushfire have two safe options - leave early well in advance of the fire threat or remain and defend a well-prepared property (McLennan and Handmer, 2014, McLennan and Handmer, 2012, McLennan and Eburn, 2015). Early evacuation is advocated as the safest option. This implies that household decision-making within a bushfire event is binary. Householders either evacuate, preferably at a time and manner recommended by the authorities, or they remain to defend their property. Once the decision is made, evacuees leave and remain outside the threat area and the defenders stay and defend their property. In fact, householders evacuate at a time and in a manner determined by their unique circumstances and state of mind. Some evacuate and return soon after without ever leaving the threat area. Others leave then return, avoiding roadblocks and emergency services in the fire ground by using back roads, access through neighbour's properties and other means. A few come and go numerous times. Some householders who remain and defend evacuate for a myriad of reasons including failure of equipment, loss of access to water, injury, or incapacity of the defenders, emotional or psychological reactions to the threat, a reassessment of the severity or level of bushfire threat or a change of mind about their willingness to fight the bushfire. Any remainder, depending on the circumstances, could decide to evacuate and in that sense all householders are potential self-evacuators. Many householders ignore or only partially comply with official advice, warnings and directions. Often they rely on their own knowledge, experience and resources and use informal networks for information and support (nous Group., 2013).

Emergency agency planning and the availability of safety measures and support at a local level is, in many cases, limited and not adapted to the local context. Often measures are designed as a 'one size fits all' failing to reflect different householder needs and expectations (nous Group., 2013). Emergency agencies appear to design and deliver bushfire safety measures that they think householders need and should adopt rather than based on what they want and how they actually behave. The considerable diversity of householder behaviour in bushfire and failure to adopt advice and direction causes confusion and frustration for those within emergency authorities responsible for emergency planning, preparation, response and recovery who often explain householder behaviour as based on ignorance, apathy or complacency.

3.2 Definition of archetypes

The concept of an archetype was developed by Carl Jung (1964) as a typical character with whom an observer might emotionally resonate due to their universally shared, fundamental characteristics of humanity. They were based on myths, legends and esoteric teachings, forming part of the individual's unconscious mind. Social cues, replicated through dominant discourse (Campbell, 1988) and collective memory, as shared experiences that are constructed and validated through social interaction (Halbwachs, 1992) are also seen as a basis for the formation of individual and societal perceptions of archetypes .

Archetypes that exist in literature include The Hero, the Mother, The Mentor, The Scapegoat and The Villain, all of which have 'a universal acceptance, as readers identify the characters...in their social and cultural context' (LiteraryDevices Editors., 2013).

Archetypes provide a framework for addressing the questions of who does what, why and when they do it, reflecting individual attitudes, needs, motivations, and core issues that they need to be addressed. They provide insights into how people think, feel, and act in a prevailing situation or circumstance, clarifying patterns of behaviour and drivers to action. Different archetypes reflect a range of typical and generally predictable patterns of actions or response which are influenced by the interaction between the context and a variety of other salient factors. Archetypes also enable a greater understanding of both the potential barriers to and the opportunities and

strategies for communicating and engaging with individuals.

Individuals may change their archetypal behaviour as a result of their changing context or through a learning or experiential journey.

Through the lens of the archetype, individuals' attitudes, perceptions and behaviour can be better understood and more effective engagement and communication strategies developed, validated, and prioritised. This understanding facilitates organisational agreement about the existence and key characteristics of customers/targets; potential openness and acceptance of archetypal viewpoints; and clearer insights into organisational offerings (products and programs) that are useful and likely to be adopted/ engaged with by customers/ clients.

3.3 Archetypes and natural hazards

Community archetypes, based on local social context and community characteristics, that influence approaches to wildfire planning mitigation (Paveglio et al., 2015, Paveglio et al., 2017) (Carroll and Paveglio, 2016) have been discussed within the international literature. Paveglio et al (Paveglio et al., 2015) discuss how diverse human Wildland-Uban Interface (WUI) communities adapt to wildfire risk, positing a continuum of community archetypes with shared characteristics and common strategies for enhancing wildfire adaptiveness. At one end of the continuum, the Formalised Suburban (FS) live in affluent, professional, highly defined, densely populated communities with members, lacking wildfire related skills and experience, often commuting to urban centres, and collective activity around clubs and common areas. The High Amenity/ High Resource (HAHR) community which has a greater heterogeneity of residents and wildfire related skills, is focused on amenity, lifestyle, recreation and acting collectively on environment, embedded in outstanding landscapes. Rurality as a way of life and collective action around the challenges and opportunities this entails characterises the Rural Lifestyle (RL) community. Members are more self-reliant and have a combination of professional and practical skills and experience relevant to wildfire. Finally, the Working Landscape/ Resource Dependent (WLRD) community is based on rural livelihood pursuits and strong intergenerational and place-based ties with working on the land. Members have practical skills and are wildfire experienced. Collective action is community based and influenced by livelihood cooperation (Carroll and Paveglio, 2016).

Carroll and Paveglio argue that these archetypes require wildfire programs, if they are to generate community participation, to recognise the reasons people live where they do, (Carroll and Paveglio, 2016).

This community archetype concept focuses on factors at the area, village, suburb or town level, such as physical environment, community makeup and cohesion, that may influence action within a community. While community archetypes provide a valuable perspective, individuals comprise a community and therefore individual behaviour provides the foundation for the development of community archetypes. Therefore, the basis of individual behaviour and the development of protective response archetypes is the focus of this report.

Within the natural hazard domain, the psychological characteristics of various protective response archetypes was first discussed in a Victorian government report produced by a research team led by Alan Rhodes of Emergency Management Victoria. In the context of bushfire the report defined archetypes as 'typical ways in which people understand the bushfire risk in the area where they live, their attitudes, intentions, priorities and intended behaviour in response to the threat'(nous Group., 2013). Thematic analysis of 120 face-to-face interviews with residents in three bushfire-affected areas in Victoria identified seven archetypal groups. They were characterised by the ways bushfire risk was typically understood, and their attitudes, intentions and priorities including self-efficacy and responsibility, bushfire experience, threat perception, preparedness, use of environmental and social cues, and networks, and intended protective response (nous Group., 2013). Archetypes were useful in understanding the similarities and differences between how householders living in bushfire prone areas perceived and responded to bushfire threat.

The international wildfire literature has for some time signalled the existence of bushfire archetypes. Research on the psychological differences between intended evacuees and remainers resident in bushfire prone areas of south-eastern Australia (McLennan et al., 2015a) found that intended evacuees reported greater concern about bushfire danger, saw themselves and their property as vulnerable, and believed that others perceived leaving as the most desirable protective response. Intended evacuees were concerned their property was likely to be destroyed in their absence and that leaving would be inconvenient. Notwithstanding their strong intention to leave and concern for their home, they were less likely to have an evacuation plan or to prepare their property for undefended survival. Intended remainers believed they were likely to successfully protect their valued property and saw themselves as well connected with other community members.

Bushfire archetypes have also been reported in a doctoral thesis that explored the factors influencing householders' self-evacuation decision-making during bushfire and identified self-evacuation archetypes (Strahan et al., 2017) and in a recently published paper (Strahan et al., 2018). The seven archetypes that were identified through cluster and discriminant factor analysis provide insights into factors that influence householders' protective decisions, provide insights into how householders reach those decisions, and indicate means of improving and developing bushfire safety programs. The existence of archetypal groups suggests that information, advice, and warnings provided by the emergency authorities before and after a bushfire, are received and processed by a heterogeneity of householders as described in the following section, not by a simple dualism of evacuees or remainers as assumed by current Australian bushfire safety policy. Bushfire safety policy can be better focused and targeted by understanding how different archetypes might respond to different approaches or program interventions.

3.4 Self-evacuation archetypes

Self-evacuation archetypes representing the characteristics and behavioural patterns of seven typical groups of householders were developed using quantitative and qualitative data, from a survey of 457 householders who had recently experienced a bushfire (Strahan et al., 2017, Strahan et al., 2018), to provide insights into how various factors influenced their protective decision and the way they came to that decision. This section discusses the archetypes' key characteristics and the factors that differentiate them and demonstrates how and why their characteristics are expressed in their protective actions.

3.4.1 Threat Deniers

Threat Deniers [TD] do not believe that their personal safety or property, including animals, are threatened by bushfire or would be threatened in the future. Most recognize they live in a bushfire prone area but believe that due to location, topography, home construction, property preparation, or some other factor, that they are not at risk. Bushfire does not intrude into their thinking or daily lives. They have little or no bushfire fighting experience, do not prepare their property, do not have equipment for property defence or personal protective clothing. During a bushfire TD would discount the threat typically by referring to the position or direction of the fire or expected wind change. They will remain for as long as possible believing that a fire would ultimately not be a threat and their personal safety was protected. Consequently, they will evacuate dangerously late and expect the emergency services to assist them.

3.4.2 Responsibility Deniers

Responsibility Deniers [RD] believe they were not fundamentally responsible for their personal safety or for the protection of their home and property and that the emergency services had that responsibility. RD see evacuating as the best way to protect their personal safety and remaining as the best way to protect their property and expect emergency services to assist in these actions. They have limited knowledge of bushfire or bushfire fighting, do not prepare their property, do not have firefighting or spot fire equipment, or protective clothing. This extreme lack of preparation reflects their unwillingness to accept responsibility for addressing the bushfire

threat. RD include older and/or less able single people or couples who feel it is unreasonable to be expected to look after themselves. Some RD say the emergency authorities are responsible because public funds (their taxes, emergency levy) fund the emergency organizations. During a bushfire, they do not actively seek out information or carefully consider the information that they receive. They ignore the advice of, but expect assistance from, the emergency services.

3.4.3 Experienced Independents

Experienced Independents [EI] include experienced bushfire fighters, members of volunteer bushfire brigades or had bushfire training and have greater bushfire knowledge than other archetypes. Self-reliance and self-responsibility for their personal safety and protection of their property is a key characteristic. They are aware of major bushfire threat to their property but do not feel their personal safety is threatened. Remaining is seen as the best way to protect personal safety and to safeguard their property and leaving is perceived as placing personal safety and property at risk. Property and structure preparation against fire and embers is extensive. They have firefighting equipment and protective clothing. They have a negative or neutral view of other bushfire stakeholders viewing neighbours, the media, and the emergency services as lacking knowledge about bushfire and not providing useful information and advice to the community about bushfire.

3.4.4 Community Guided

Community Guided [CG] positively perceive the bushfire knowledge and expertise of their neighbours, the media and the emergency services. They inform and influence CG's decisions. Bushfire threat does not intrude into their daily life and they do not believe they need to be self-reliant or accept responsibility for personal or property protection. But they recognize threat to their personal safety and see evacuating as the best way to protect it. They have little experience of bushfire, bushfire fighting or training. CG make limited property preparations but have some firefighting and spot fire equipment. During bushfire CG stay in close contact with their neighbours. They watch television, listen to radio and access web-based information. They share information, discuss its meaning, and seek advice from neighbours. Often, they come to shared understandings and decisions with neighbours about joint protective action.

3.4.5 Worried Waverers

Worried Waverers [WW] are characterised by their concern about the high level of bushfire threat and likely impact on their personal safety and property; their broad-based efforts to address this; and their concern that their lack of bushfire experience puts them at risk. Bushfire threat is present in discussions with neighbours and information seeking. Evacuating is the best way to protect personal safety and remaining is not. WW feel they have bushfire knowledge and information through limited brigade experience and training, and their protective response is well planned. They rate highly and are influenced by media information. They prepare their property well and have fire-fighting equipment and personal protective clothing. However, few have bushfire fighting experience. WW are bushfire aware, have prepared their property, and trained to respond effectively. They did not want to simply evacuate from a fire threat but recognized their inexperience and were worried that remaining would threaten their personal safety. The tension between feeling their property is prepared and they are bushfire trained, and their lack of experience, creates potential for 'waiting to see' how the fire develops and a breakdown of their decision-making resulting in dangerous late evacuation due to their wavering.

3.4.6 Dependent Evacuators

Dependent Evacuators [DE] do not perceive current or future bushfire threat to their household or to their property because they intend to evacuate and believe that the emergency services will protect them and their property. They lack knowledge of and information about bushfire, are unable to decide what they should do and incapable of taking responsibility for themselves. They have no personal experience or training for fighting bushfire, but some had evacuated from a bushfire in the past. Their property is unprepared and unprotected. They have no firefighting

equipment or personal protective clothing. They are committed to evacuating as both the best way to protect their personal safety and to protect their property believing that once they had left the fire services would defend their home.

3.4.7 Considered Evacuators

Bushfire threat intrudes throughout the daily lives of Considered Evacuators [CE] who see it as a current and future threat and likely to damage or destroy their home and property. They have no personal experience fighting bushfire although some had training and had evacuated in the past. They attempt to safeguard their property in their absence by protecting against embers but are not equipped to fight fire or extinguish spot fires and lack protective clothing. They are committed to evacuating, as soon as they are aware of the potential threat, as the best way to protect the personal safety.

3.5 Comparison of the archetypes

The seven archetypes can be further characterised by comparing their similarities and differences (cf. Table 1) as discussed below.

3.5.1 Perceptions of threat

Experienced Independents and Worried Waverers who intended to remain saw a major threat and impact to personal safety and property from the bushfire. Considered Evacuators, who would leave, discounted the threat to personal safety but not property. These three groups also expected bushfire in the future to be a threat. Responsibility Deniers discounted the threat to personal safety because they would leave and believed that others would take responsibility for them. The bushfire did not pose a threat to Threat Deniers because they believed there was no threat. By working with others Community Guided would mitigate the threat and Dependent Evacuators expected others to protect them from the threat. For similar reasons Responsibility Deniers, Threat Deniers, Dependent Evacuators, and Community Guided believed a bushfire in the future would not threaten their property or disrupt their lives. No group thought a bushfire in the future would cause personal injury except Worried Waverers.

3.5.2 Perceptions of intrusiveness

Bushfire threat did not intrude into the lives of Responsibility Deniers, Threat Deniers, Community Guided and Dependent Evacuators because for them either the threat did not exist, or they expected that others would deal with it for, or with them. Worried Waverers, Experienced Independents and Considered Evacuators experienced the threat of bushfire intruding extensively on their daily lives.

3.5.3 Responsibility and self-reliance

Responsibility Deniers, Threat Deniers, Dependent Evacuators, and Community Guided did not believe they needed to be self-reliant in a bushfire or to take responsibility for their property because a bushfire was not a threat, or others would take responsibility or in the case of Community Guided, members of the community would help each other. Experienced Independents, Worried Waverers, Considered Evacuators and Community Guided did not believe the emergency services were responsible for protecting them or their property because they were self-reliant or intended to cooperate with the community. While Threat Deniers didn't need protection from a threat that didn't exist, if there was a threat, they expected the emergency services to protect their home.

3.5.4 Perceptions of other stakeholders

Community Guided and Worried Waverers perceived other stakeholders as knowledgeable, well informed and providing good advice about the bushfire. Neighbours and media were seen as having a responsibility for protecting them. Media and the emergency services were influential, but neighbours were not. Other stakeholders were a large part of the Community Guided and

Worried Waverers' decision-making process.

Table 1: Similarities and differences between archetypes

Factors	Archetypes						
	<u>TD</u>	<u>DE</u>	<u>CG</u>	<u>RD</u>	<u>WW</u>	<u>CE</u>	<u>EI</u>
Intend to evacuate	N	Y	Y	Y	Y	Y	N
Experienced bushfire	N	N	N	N	N	Y	Y
Thought about bushfire threat	N	N	N	N	Y	Y	Y
Need to be self-reliant/ accept responsibility	N	N	N	N	Y	Y	Y
Bushfire Threat/impact to personal safety/ property (RD1) Cause death or injury (CE2) Damage/ destroy house/ property	N	N	N	N	Y	Y	Y
Evacuation best way to protect personal safety	N	Y	Y	Y	Y	Y	N
Evacuation best way to protect property	N	Y	Y	N	Y	Y	N
Remaining best way to protect personal safety	Y	N	N	N	N	N	N
Remaining best way to protect property	N	N	N	Y	N	N	Y
Householder Influence decisions Knowledgeable Well informed (TD1) (EI2) Responsible for protecting	N	N	Y	N	Y	N	Y
Neighbours Knowledgeable Well informed Provide accurate information	N	N	Y	N	Y	N	N
Media Influence decisions (DE1) Knowledgeable (RD1) Well informed Provide accurate information Responsible for protecting	N	N	Y	N	Y	Y	N
Emergency Services: Influence decisions (TD2) (CE1) Knowledgeable Well informed (RD1) Provide accurate information Responsible for protecting	Y	Y	Y	N	Y	N	N
	Y	Y	N	Y	N	Y	N

Superscripts denote exceptions: TI-perceived potential threat/impact. DI-not perceive potential death/injury. ID-influenced decision. K-perceived as knowledgeable. NI-did not influence decision. WI-perceived as well informed.

Adapted from Strahan, K., Whittaker, J. & Handmer, J. 2018. Self-evacuation archetypes in Australian bushfire. *International Journal of Disaster Risk Reduction*, 27, 307-316. p. 312.

On the other hand, Experienced Independents had a negative view of the capabilities, influence and responsibility of other stakeholders who consequently had little part in their decision making.

Threat Deniers and Responsibility Deniers had similarly negative perceptions of other stakeholders but believed that the media and the emergency services (and neighbours in the case of Threat Deniers) were responsible for protecting them. While Responsibility Deniers believed the media had specialist knowledge of bushfire, Threat Deniers thought the emergency services were the specialists, providing good advice about the bushfire.

Both Threat Deniers and Responsibility Deniers primarily saw the emergency services as responsible for protecting them. Considered Evacuators and Dependent Evacuators also viewed neighbours' capability negatively although they were influential in Dependent Evacuators' decision-making while Considered Evacuators felt neighbours had a responsibility to protect them. Dependent Evacuators focused their dependence primarily on the emergency services whose knowledge and advice they viewed positively and expected them to take responsibility for them. They also expected the media to take responsibility even though they viewed their knowledge and advice negatively. On the other hand, Considered Evacuators were influenced primarily by the media which they saw as knowledgeable, well informed and providing good advice and by the emergency services who they expected to take responsibility for their safety.

3.5.5 Perceptions of themselves/ family

Responsibility Deniers, Dependent Evacuators, and Considered Evacuators felt that their knowledge of the bushfire and their information about it was lacking. Responsibility Deniers and Dependent Evacuators felt that they were not responsible for protecting themselves. On the other hand, Experienced Independents, Community Guided and Worried Waverers saw themselves as bushfire capable and responsible although Experienced Independents, did not feel sufficiently well informed about the bushfire. Threat Deniers were a unique case because they ignored inputs from others, including family members. Threat Deniers believed that they were well informed and responsible for themselves because they perceived no threat and did not need to take responsibility. On the other hand, their family, who were removed from the bushfire, were perceived as lacking bushfire knowledge and incapable of understanding that it did not pose a threat, did not influence Threat Deniers' actions.

3.5.6 Perceptions of protective action

Community Guided, Worried Waverers, Dependent Evacuators, and Considered Evacuators all believed that evacuating was the best way to both protect personal safety and property and believed that remaining was not best for personal safety and property protection. Evacuating removed householders from a dangerous situation for which they believed they were inadequately prepared. On the other hand, Experienced Independents believed that remaining was the best way to protect personal safety and property because they had prepared their home to make it defensible and to create a safe environment in which to remain. Responsibility Deniers saw evacuating as best for personal safety but not for property protection and remaining as the opposite. Threat Deniers had a unique perspective. They saw evacuating as not appropriate for personal safety or property protection, probably because if there was no threat, there was no need to evacuate. So, remaining was the best option for personal safety because they would avoid areas that might be threatened by fire. On the other hand, if a threat became imminent, remaining was not the best for property protection because they were unprepared and inexperienced, and they expected the emergency services to protect their property if they were not there.

Community Guided, Worried Waverers, and Dependent Evacuators believed that they did not need knowledge or skill to remain because they would rely on the advice and support of other stakeholders, while Threat Deniers did not need skills to deal with a threat that they believed didn't exist. Considered Evacuators, Experienced Independents and Responsibility Deniers all believed that they needed knowledge and skills for a bushfire threat although Responsibility Deniers expected others to use their skills to protect them, Considered Evacuators intended to apply their skills to evacuating and Experienced Independents believed they had the skills necessary to defend their property and protect themselves.

Threat Deniers, Community Guided, and Dependent Evacuators believed that organising to remain did not require personal time and effort. For Threat Deniers this was because there was no threat to organise for; Dependent Evacuators because they expected others to do it for them; and Community Guided because they would cooperate with neighbours and the emergency services. Responsibility Deniers, Experienced Independents, Worried Waverers and Considered Evacuators knew that organising to remain took time and effort although Responsibility Deniers relied on others to make the effort for them. Experienced Independents knew that the effort was necessary to successfully defend their property, Worried Waverers knew it was necessary but weren't sure they had organised adequately and Considered Evacuators knew, as part of their consideration of options, that effort was required to remain but they had decided to evacuate.

3.5.7 Evacuate or remain

Responsibility Deniers and Dependent Evacuators were unprepared and lacked experience of bushfire and were the most committed to evacuating. Community Guided and Considered Evacuators perceived a high risk to their personal safety and heeded the advice of others so were also committed to evacuating. Worried Waverers were the least committed to evacuating having considered the threat, taken responsibility and prepared and equipped themselves but were worried that they lacked experience of fighting bushfire. Experienced Independents were the most committed to remaining seeing themselves as highly experienced and well prepared. Threat Deniers were committed to remain because they did not believe there was a threat.

3.6 An archetype matrix

The archetypes previously discussed reflect a range of key factors that influence householder behaviour in response to bushfire threat that were identified through previous research. These factors can be best understood through reference to the hazard literature dominated internationally by the Protective Action Decision Model (PADM) (Lindell and Perry, 2012, Lindell, 2018, Strahan and Watson, 2018) and Australian bushfire research. The PADM provides a framework to explain how householders form perceptions of personal risk and take protective responses. The framework incorporates environmental and social cues, information and warnings that influence core perceptions of the nature and extent of the threat, the effectiveness of alternative protective actions and the knowledge and reliability of others involved including neighbours the media and the emergency services. Strahan (Strahan and Watson, 2018) has recently proposed that preparatory, mitigatory and equipping actions significantly influence protective action perceptions where householders can choose whether to defend against the threat or evacuate.

Australian research suggests that people choose to remain because they believe that they can successfully defend their property while others leave because of perceptions of risk to personal safety, advice on evacuation and social and environmental cues (McLennan et al., 2014, McLennan et al., 2012, McLennan et al., 2015a). Recently Strahan et al (2019) has reported that three factors predict wildfire evacuation: perceptions of the effectiveness of evacuation in protecting personal safety; perceptions of threat to property; and the receipt of official warnings. These factors are consistent with those reported by McCaffrey (2017) in a North American wildfire context.

Some of the key factors influencing people's response to bushfire threat that arise out of the insights provided by the literature include:

- Bushfire threat and impact
- Warnings
- Environmental and social cues
- Preparation
- Intended action by primary and secondary actors

- Planning
- Effectiveness of protective action
- Confidence in ability to deal with threat
- Knowledge, understanding, skills and resources

Archetypal differences also influence behaviours that have not been extensively explored in the literature including attitudes to emergency agencies, the existence of community networks and involvement in community education programs.

The archetype matrix, which is summarised below and included in full as supplementary material to this report, outlines how these factors are reflected in each archetype.

Table 2: Matrix of archetypal attitudes and responses

		Threat Denier	Dependent Evacuator	Community Guided	Responsibility Denier	Worried Waverer	Considered Evacuator	Experienced Independent
Threat perception	Perception of fire threat and impact	Personal safety and property are not threatened because there is no bushfire risk in the area or to their property and no likelihood of impact	Threat to personal safety is limited because others will assist to decide what to do and to evacuate from the threat. But likely that property is at risk and will be impacted because property protection measures have not been undertaken.	Concerned about threat to personal safety but would draw on support, information, knowledge and expertise of neighbours, the media and emergency services (ES) to assist in addressing the threat. Expect limited impact on personal safety as community will act to protect each other. Little impact on property because protection measures have been taken and neighbours/ES will assist in defending property.	Threat to their safety and property is the responsibility of others to deal with. Expect no threat to or impact on their personal safety or their property because ES are responsible to ensure both are safe.	Perceive likelihood of major threat to and impact on personal safety and property but are unsure of the best way to deal with it	Perceive a major threat to personal safety and property and are strongly committed to evacuate before the threat eventuates. Consequently, believe that personal safety will not be impacted but property impact is likely even though it has been prepared for survival in their absence	Perceive a major threat to their property and personal safety but through successful defence expect no impact on either.
Confidence	Confidence in ability to deal with threat	Confident because are convinced there is no threat to deal with.	Very low confidence in preparing for or responding to threat	Confident that they can respond to the threat with the active advice and support of neighbours and emergency services	Confident because they believe others will take responsibility for responding to the threat for them.	Confident they have training and equipment to respond but lack confidence in their capacity and decision-making due to lack of experience firefighting.	Confident of dealing with threat by evacuating well in advance of it.	Confident of defending against the threat due to experience, preparation and equipping.

		Threat Denier	Dependent Evacuator	Community Guided	Responsibility Denier	Worried Waverer	Considered Evacuator	Experienced Independent
Intrusiveness (Critical awareness)	Prominence of threat in thinking	Threat does not intrude into thinking, conversations with neighbours or media use	Threat does not intrude into thinking, conversations with neighbours or media use	Threat does not intrude into thinking, conversations with neighbours or media use	Threat does not intrude into thinking, conversations with neighbours or media use	Threat intrudes into interactions with neighbours and media use	Threat intrudes into all aspects of life including thinking, interactions with neighbours and media use	Threat intrudes into all aspects of life including thinking, interactions with neighbours and media use
Locus of control	Locus of control	Very strong internal locus. Believe they know better than others that threat is low	Very strong external locus. Believe they are incapable of evacuating safely without assistance.	Predominantly external locus relying on informed community members to provide advice	Very strong external locus. Believe that their safety is the responsibility of others.	Internal locus. Believe they should be responsible and can protect themselves but are uncertain about their capability.	Very strong internal locus. Believe they are responsible for their safe evacuation.	Very strong internal locus. Believe they are responsible for defence of their property and their personal safety.
Outcome expectations	Belief in the likelihood of actions achieving desired outcomes	Very strong belief that remaining at home ensures personal safety and property protection due to lack of threat to property	Strong belief their personal safety is protected by relying on the emergency services to assist their evacuation	Strong belief that information, advice and support from neighbours, ES and media will result in them taking right protective action for personal safety and property protection.	Strong belief that ES is responsible and ES actions will protect their personal safety and property	Moderate to weak belief that training, preparation and equipping actions will protect personal safety and property	Very strong belief that evacuation in advance of threat will protect personal safety but is likely to put property at risk.	Strong belief that remaining to defend will protect personal safety and property. Some recognition of risk in remaining to personal safety
Protective action perception (priority)	Priority placed on protecting life or property	Prioritising unnecessary due to lack of threat to either personal safety or property	Personal safety is clear priority. ES seen as likely to protect property	Personal safety is priority. Limited preparations taken to protect property	Personal safety is priority. ES seen as responsible for and expected to protect personal safety and property	Personal safety and property protection have similar priority	Personal safety has clear priority. Potential loss of property is recognised and accepted.	Protection of property is clear priority. Through successful property protection personal safety is achieved.

		Threat Denier	Dependent Evacuator	Community Guided	Responsibility Denier	Worried Waverer	Considered Evacuator	Experienced Independent
Knowledge/ Understanding/ skills/ resources	Extent of understanding about the threat and how to respond	Limited skills or resources devoted to threat but believe they have knowledge and understanding of their circumstances that indicate no threat and no need to respond.	Very limited knowledge and understanding of threat and appropriate response. Almost no skills or resources to prepare or respond to the threat.	Some knowledge and understanding of threat and appropriate response significantly supplemented by information and advice from neighbours, ES and media. Few skills or resources to prepare or respond to the threat.	Very limited knowledge and understanding of threat. Almost no skills or resources to prepare or respond to the threat.	Extensive knowledge and understanding of threat although appropriate response is not completely clear. Considerable skills and resources in preparing for and responding to threat	Comprehensive knowledge and understanding of threat. Considerable skills and resources devoted to preparing for, and evacuating	Comprehensive knowledge and understanding of threat. Extensive skills and resources devoted to preparing for and defending property.
Intention (primary)	Intended action by primary actor (s) if threat	Definitely remain	Definitely evacuate	Probably evacuate but may be influenced by advice from neighbours, ES and media	Probably evacuate but expect ES to be responsible for decision	Undecided whether to evacuate or defend. Decision depends on circumstances	Definitely evacuate	Definitely remain
Strength of intention	Degree of commitment to intention	Strong intention to remain but if threat arises, they expect ES to support them to leave and protect property	Strong intention to evacuate and expect ES to assist in this	Weak intention to evacuate. Strength of intention influenced by significant influencers in community-neighbours, ES	Undecided about evacuating or remaining. Rely on direction from ES.	Prefers to remain and defend but will respond to prevailing circumstances and may decide to evacuate	Strong intention to evacuate in advance of the threat. Is well-planned and carefully implemented	Strong intention to remain and defend.
Preparation	Perception of the extent of preparedness of property and household members	No planning or preparation for evacuation or defence. No property preparation or equipping for property defence	Some evacuation planning and preparation. No planning, property preparation or equipping for property defence	Limited property preparation to increase unattended survivability (cover gaps) and equipping (mops, buckets). Identify knowledgeable sources in local networks	No planning or preparation for evacuation or defence. No property preparation or equipping for property defence	Some bushfire training. Extensive property preparation and equipping including personal protective clothing. Some evacuation planning and preparation.	Extensive evacuation planning and preparation. Limited property preparation to increase unattended survivability. No property defence equipping	Planning for property defence. Extensive property preparation and equipping including personal protective clothing

		Threat Denier	Dependent Evacuator	Community Guided	Responsibility Denier	Worried Waverer	Considered Evacuator	Experienced Independent
Planning	Perception of the extent of joint planning by household members	No planning for property defence or evacuation	Planning for evacuation focused on emergency contact with ES and readiness for fast response	Some planning of access to information and advice through neighbours, ES and media. Some planning for property protection and evacuation	No planning for property defence or evacuation.	Planning of access to information through media. Considerable planning for property protection and evacuation	Extensive evacuation planning	Extensive planning for property defence
Community education and information	Participation in community education programs and activities. Use/acceptance of advice and information	Do not participate in community education and activities. Do not accept information or advice inconsistent with their view of lack of threat.	Tend not to participate in community education due to social isolation. Readily accept information and advice from neighbours and ES	Participate in community education and activities. Readily accept information and advice	Tend not participate in community education and activities or accept information and advice	Extensively participates in community education and activities. Readily accept information and advice	Extensively participates in community education and activities. Readily accept information and advice to enhance evacuation planning and implementation	Selectively participates in community education and activities. Selectively accesses and uses information and advice to supplement personal knowledge and experience
Warnings	Accessing of and reliance on official warnings	Largely ignores official warnings as wrong or not relevant to local circumstances	May not be aware of warnings but relies heavily on them when received	Official warnings are actively monitored. Key component of all elements of information and community advice used in protective decision-making	Official warnings are monitored but do not result in action. ES is expected to act to protect their property and personal safety	Official warnings are actively monitored and are a key influencer in protective decision-making	Official warnings are actively monitored and are the key influencer in timing of evacuation	The assessment of environmental cues considerably more than official warnings influence planning and implementation of property defence
Attitude to emergency agencies	Perceptions of/response to advice/actions of emergency agencies (Trust)	Dismissive of ES advice and warnings but expect support if threat eventuates	Highly reliant on and grateful for ES advice, warnings, evacuation assistance and property protection	ES seen as key provider of advice, warnings and assistance but protective response also influenced by informed others in the community	Likely to discount ES advice and warnings but expect ES to assist with evacuation and property protection	Want to be self-reliant and not require ES assistance but hope ES will effectively fight fire to reduce overall threat and be available to assist if needed.	Accept responsibility for evacuating but expect timely warnings and hope ES will protect the local area.	Not reliant on ES for advice or support. May have ES experience and or critical of/ ambivalent toward ES preparation and/or management

4. Application of Archetypes

4.1 Introduction

The archetypes reveal considerable differences in the way householders perceive and respond to bushfire threat. Consequently, bushfire safety programs must be capable of addressing householders' diverse needs in dealing with bushfire threat that result from this variety of perceptions and response. Their perceptions and intended response to a bushfire event determine all aspects of their planning, preparation, response and potential recovery. A preliminary assessment of householder needs, based on the characteristics of the archetypes reported by Strahan et al.(2017), suggest bushfire safety programs require varied foci.

- Considered Evacuators[CE] primarily require assistance with planning safe evacuation; property preparation for its survival in their absence; and establishing reliable sources of information about safe escape routes.
- Dependent Evacuators [DE] need to be assisted in establishing contacts within their communities to help prepare their property and plan a protective response; and to ensure reliable information, communication and evacuation assistance during an event.
- Community Guided [CG] need help to strengthen networks with community members who can provide reliable information on planning, preparation and response; and in establishing strategies for interaction with community members during a bushfire.
- Worried Waverers [WW] need to test out that their planning, preparation and capability reflects the degree of bushfire risk and to establish clear triggers for evacuation that will protect them from decisional delay that could put them in danger.
- Experienced Independents [EI] and Threat Deniers [TD] do not see a need for support or involvement in bushfire safety programs because they perceive themselves as respectively self-reliant or not at risk from bushfire. Responsibility Deniers [RD] expect others to protect them. In all three cases there is an opportunity for bushfire safety programs to clarify the risk context [TD] or likelihood of fire services assistance [RD] or to establish a dialogue or collaboration with the householder supporting the safety of the neighbourhood [EI].

By clearly identifying and defining the needs of people living in bushfire prone areas, bushfire safety programs can be targeted more effectively. In addition, programs are more likely to address real and specific needs and to critically assess and constructively support the householder's needs and intent during a bushfire event.

4.2 Archetype sub-projects

The application of self-evacuation archetypes to community bushfire risk reduction strategies is not yet well understood. While these archetypes are strongly based in research evidence, their implications for community engagement and education strategies, their usefulness in injecting human behaviour into bushfire evacuation modelling, and their usefulness in monitoring and evaluation of bushfire safety programs, have not been closely examined.

The lack of comprehensive and rigorous exploration of the implications of the self-evacuation archetypes limits the emergency management sector's ability to improve and adapt bushfire risk reduction strategies, to factor likely human behaviour into incident planning and to advance the sector's ability to make evidence-based decisions. This project undertakes an initial investigation of the application of the archetypes in these three important areas.

4.2.1 Application of archetypes to community education and engagement programs

An understanding of the mix of archetypes residing in a bushfire prone area can contribute to the implementation of successful bushfire safety interventions at a community level in two ways. First, a clear understanding of the range of archetypes in households within a community supports a broad assessment of likely community bushfire safety needs and how programs might be best designed and delivered.

Second, by applying an archetype lens to community leaders and influencers involved in community bushfire planning, the impact of their perceptions and priorities on vital bushfire safety planning can be better understood. Contrasting the preferences and priorities of community leadership with a profile of archetypes in the wider community can assist in better assessing plans against broader community needs and increasing the likelihood of community commitment, engagement and satisfaction.

Community engagement practitioners such as Community Based Bushfire Management (CBBM) Project Officers, CFA Community Liaison Bushfire Engagement Officers (CLBEs), local government facilitators and DELWP Strategic Conversations Facilitators can use insights into the householder needs and priorities provided by the archetype lens to better tailor their methods, styles of engagement and communication with community members. Chapter 4 discusses the implications of the archetypes for community engagement and education strategies and programs.

4.2.2 Use of archetypes in monitoring and evaluation of CFA programs

The human behaviour framework implicit in the monitoring and evaluation of existing bushfire community education and engagement programs reflects general socio-psychological concepts that have been adapted to use in hazard research. The self-evacuation archetypes now present an opportunity for the greater understanding of human behaviour and decision-making in bushfire to improve bushfire agency monitoring and evaluation. By broadening and deepening understanding of the bases of the diverse attitudes and responses of people living with bushfire risk, the archetype lens enables researchers to identify new variables of interest and examine data from another perspective.

Instruments for monitoring and evaluation of bushfire safety programs need to be modified to enable self-evacuation archetypes to be identified and for program outcomes to be analysed within the context of the archetypes. Questions that can be readily used in agency surveys and in community engagement are needed. The data collected through these archetype-adapted instruments should better clarify how programs contribute to agencies' short, medium and long-term objectives, reflected in theories of change and program logic models. Questions that enable an analysis of data that includes archetypes have been integrated into the CFA's last two post-season surveys. These data can be used in improving CFA bushfire safety programs and in strengthening and broadening the narrative around and understanding of the archetypes. Chapter 5 discusses these issues.

4.2.3 Application of archetypes in bushfire modelling

At the outset of this project it was unclear how bushfire self-evacuation archetypes might be used in bushfire modelling. Preliminary discussions with bushfire modelling experts helped to connect this project with the Victorian Community Bushfire Evacuation Initiative, a project being led by Emergency Management Victoria. Models of bushfire development and those simulating traffic evacuation dynamics are being used in tandem to better combine understandings of the physical and social dynamics of bushfire threats into the management of evacuation. While the incorporation of human behaviour in response to bushfire threat into traffic models is in its early

stages some considerable progress has been made through the Victorian Community Bushfire Evacuation Initiative. This existing work involved the development of the Emergency Evacuation Simulator in conjunction with the Surf Coast and Mount Alexander Shires.

This project has extended the existing model through the development of a mathematical framework for modelling vehicular activity, using the behavioural insights provided by the archetypes. Factors affecting the decision-making of archetypal individuals and how they respond to different information and cues, generated by PHOENIX simulated bushfire, were systematically incorporated into a dynamic vehicle travel demand model. The archetype-based simulation enables perception and response-based predictions of householders' decisions to stay or leave and the timing of their action. The development and application of the dynamic vehicle travel demand model incorporating the self-evacuation archetypes is discussed in Chapter 6.

5. Archetypes and community engagement programs

5.1 Introduction

Archetypes suggest a range of attitudes, behaviours and responses relating to preparation for and response to bushfire. These were summarised in the matrix that was discussed previously (cf. Chapter 2) and included as supplementary material to this report. The differences in how householders understand and respond to bushfire that are detailed in the matrix highlights the considerable diversity in their information and education needs that are to be addressed through the bushfire safety programs provided by CFA and other emergency agencies.

Top down approaches to bushfire safety engagement and education that attempt to tell householders what they should do using generic 'one size fits all' programs are likely to fail given the diversity of attitudes and behaviours reflected in the bushfire archetypes. Instead, bushfire safety programs that successfully engage and advise householders are likely to accept the legitimacy of their perceptions and intentions rather than judging them as wrong. Householders can be engaged in a reflective conversation focused around their needs that opens the way to an ongoing dialogue and improved householder understanding of threat, the implications of their intended protective actions and the planning and preparation that is required that reflects their circumstances.

Community bushfire safety programs that take account of householders' circumstances and likely response to threat and identify and address their actual needs, offer an approach to program design and delivery that is more reflective of the realities highlighted by the bushfire archetypes. A reflective conversation with householders, based around the insights provided by the archetypes has a greater chance of engaging them, being understood and accepted and more effectively adopted. This is possible because the conversation begins with a deeper understanding and acceptance of householder perceptions and needs and their concerns and priorities, and the reasons for their views and intentions.

In this context it was considered that the insights provided by the archetypes might be usefully applied to the work of community engagement professionals working for the Victorian emergency management agencies. This was explored through the project.

5.2 Background

The researchers approached Safer Together's Community First Program and the CFA Community Engagement Team representing bushfire community engagement leadership to explore whether the insights of the archetypes research could be usefully applied to Safer Together projects such as Community Based Bushfire Management (CBBM), Build Capacity and Capability (BCC) and CFA community engagement programs. These discussions with seven practitioners led to a decision to conduct a workshop of community engagement professionals to explore the applicability and usefulness of the archetypes and the tools that might be developed for their practical use in the field.

A five-hour workshop of ten leading community engagement professionals from Safer Together's Community First Program, DELWP and CFA was held in Melbourne on 6 May 2019. The workshop explored the following general issues:

- Archetype research implications for interactions with community members;
- Identifying/ interpreting attitudes and behaviour of community members; and
- Using archetypes in addressing community members' perceptions/ beliefs/ attitudes/ intended behaviour.

This chapter discusses the outcomes of the Workshop.

5.3 Discussion and workshop questions

5.3.1 Policy context

Workshop participants discussed assumptions about community members' attitudes and beliefs that influenced their approach to bushfire safety and their participation in education and training programs

Community bushfire-safety policy essentially presents a binary choice to community members during a bushfire event to either remain and defend their property or to leave immediately they are aware of a bushfire threat. This stark choice of 'staying or going' has complex implications for the type and extent of planning and preparation for protective action that are taken by community members and the nature and extent of bushfire safety education and training which is useful and relevant. The community engagement professionals participating in the workshop concluded that in their experience the perceptions, attitudes, beliefs and intended behaviour of community members were not adequately captured by the 'stay or go' choice even in its more evolved form, advocating 'leaving as always the safest option'.

The archetypes research suggests that there are a range of factors that influence protective action and that community members prepare for and respond to bushfire threat in diverse and complex ways. Consistent with the experience of the community engagement professionals, the findings of the research also suggest that the binary choice to stay and defend or leave does not adequately reflect the reality of what people intend to do, or actually do, during a bushfire.

Bushfire safety engagement and education programs designed around binary protective action stereotypes appear to inadequately address the central issues that shape householders' protective action decisions during a bushfire. To address shortcomings in existing programs, key characteristics of the archetypes that influence bushfire safety attitudes and behaviour could be incorporated to more effectively approach and influence community members and promote community safety. Emergency agencies could design targeted bushfire safety programs to embrace the diversity of householders, the circumstances they confront during a bushfire and the fundamentally different decision paths that they take to a protective response.

5.3.2 Needs for effective community engagement

Workshop participants discussed their need to build a trusting relationship with community members that would allow them to effectively engage and communicate with them, and to encourage and drive attitude and behaviour change. The relationship would need to be able to be built and sustained before, during and after a bushfire event.

Workshop participants reported that they primarily interacted with community members individually and sometimes in groups. Individual, 'one on one' interactions tend to be unstructured, 'in the moment' requiring an ability to make rapid assessments and to respond quickly. In a 'one on one' situation participants said it was desirable to:

- Assess the individual's attitudes to bushfire risk and response so the conversation can be effectively managed.
- Communicate the key bushfire safety messages in a manner that the individual is most likely to understand and accept/ consider/ be willing to further investigate.
- Establish a durable relationship the individual is likely to access again in the future.

Participants also discussed their work in groups including community meetings and local community groups. In many cases community groups were led by key influencers. Participants felt it would be helpful to better understand the perceptions and motivations of these influencers and the ways in which they affect the views of other individuals reflecting different archetypal characteristics in the community/ group. In this way they felt they might better understand how

community priorities are formed and how best to communicate about and influence them to 'drive productive community engagement'.

While they used their considerable experience with community engagement to their advantage, workshop participants highlighted the difficulty of effectively harnessing the opportunity presented by 'one on one' 'moments' and in groups. In most cases they were in time critical situations, often with individuals with whom they had limited knowledge or previous experience. They were generally under pressure to make rapid assessments and be involved in positive and effective discussions on bushfire safety.

5.3.3 Using archetypes in community engagement

Workshop participants were asked: How can we best use the archetypes to support community engagement approaches that enhance community preparedness for bushfires?

Participants felt that insights into attitudes, responses and behaviours to bushfire provided by the archetype research could provide a more effective and nuanced basis for both their individual and group interactions. They wanted to be able to use the archetype research to:

- Quickly and accurately identify the archetype of the individual (one on one) or key influencer (group) that they are interacting with.
- Identify and focus on the key perceptions, attitudes or intended behaviours of the archetype.
- Access a suite of questions or issues useful in informing, influencing or 'nudging' the views and behaviours of individuals or influencers.
- Clarify and target communication and messaging to individuals and groups.
- Allow community members separately or in groups to self-assess their archetype.

Participants felt that the archetypes research could be productively used as a lens for future community engagement program design and in training and development to build the capacity and capability 'of our people' and to build a richer 'consciousness of how and why people respond' the way they do.

Many suggested that a tool to facilitate interactions with individuals and groups would be extremely helpful if it could help simplify and target the discussion.

5.3.4 Usefulness of archetype prototype tool

Workshop participants were asked: Do we think this prototyping tool is valuable and how can it be used to enhance our engagement with the community?

Participants examined a set of prototype flash cards (cf. Figure 1 and in supplementary materials) comprising the seven archetypes and a few responses and behaviours detailed in the response matrix they had received prior to the workshop. They concluded that the prototype cards would be useful primarily in engaging with the community, individually and in groups; and in the training and development of community engagement professionals. The cards were seen as supporting a strengths-based approach by facilitating community engagement professionals' understanding of the people they are dealing with and providing a basis for a rational non-judgemental approach to assessing and responding to their needs. They also felt the prototype cards would provide good training material and could be used as a classroom or reference guide.



Figure 1: Example of prototype archetype flash cards considered by workshop

Participants also felt the cards could be useful for policy makers and program designers in exploring the breadth and complexity of behaviours that bushfire safety policy and programs need to take account of and address. Policy and program development require insights into how householders make protective decisions, what influences those decisions and the likely barriers and enablers of behaviour change.

Ideas for the improvement of the prototype cards suggested by some workshop participants include:

- Do not use character images but colours and the archetype names to differentiate them.
- Use simple language to describe the archetypal response.
- Separate the cards into two sets: one describing the responses and behaviours of all archetypes and the other setting out actions that may be appropriately taken by community engagement professionals to address archetype responses/ behaviour.
- Keep the description of archetypal response short and in plain English.
- Combine actions to address a range of related archetypal responses.
- Ensure actions generally address the archetypal response behaviour rather than making them detailed and unlikely to be generally useful.

Some participants noted that the cards would need to be used by community engagement professionals in a nuanced manner, facilitating the examination of issues including, intentions, risk perceptions, self-responsibility, sources of influence and disability/vulnerability to ensure a clear and complete understanding of individual attitudes and intentions.

Some participants felt a self-assessment tool that allowed individuals to place themselves into an archetypal group was desirable. A hard copy self completion questionnaire or an on-line tool were seen as possibilities.

5.3.5 Next steps required

Workshop participants agreed that an archetypes tool could be effectively used in both training community engagement specialists (e.g. Level 3 facilitator training) through the Building Capacity and Capability project, and through their community engagement work. They identified three areas in which improvement of the prototype archetypes tool was required:

- Develop means of identifying archetypes.
- Simplify, clarify and reduce the level of detail in the archetypes.
- Develop methods for the use of the archetypes cards in the field and for training of facilitators.

For community engagement facilitators identifying archetypes could best be established through a series of questions they could ask individual community members or have individuals self-administer. At a broader community level, workshop participants said that they needed to assess the makeup of a community at a Statistical Area 1 level (SA1). As part of this project, some limited progress has been made in matching archetypes with demographics including sex, age and household composition but this is in the very early stages of development.

The clarification and simplification of the description of the archetypes' response and behaviour requires the removal of what was seen as academic and technical language and reduction of the explanation to the essential elements only. The proposed actions arising from archetypes' response and behaviour also needs to be short and simple but most importantly at a level that prompts ideas in the facilitator to apply to particular needs or circumstances rather than attempting to provide an action solution for every circumstance.

Once the archetype card tool is further developed to reflect the input from the workshop,

participants felt there would be a need to consider the best way of using the cards in a community setting both 'one-on-one' and in groups. For one-on-one use this could be done through the limited distribution of the amended cards and a subsequent meeting of a small number of highly experienced community engagement facilitators to discuss methodologies for the use of the cards. The use of the archetype cards within the context of programs such as the Community Based Bushfire Management Program would require the development of a pilot program based on an assessment of the community archetype profile and the use of the knowledge of archetypal attitudes, behaviour and intentions to make sense of these responses and to effectively influence behaviour to reduce risk and improve safety.

Workshop participants involved in training and development of community engagement facilitators felt that there was a need for the co-development of key inputs from the archetype research into Level 3 facilitator training modules as part of the Building Capacity and Capability project. Archetype insights would provide a new policy lens enabling a fresh interpretation of community context, the types of outcomes that might be seen as possible and desirable and the interventions that can effectively achieve these outcomes. It was felt that the co-development of these training modules could tie in with the Behavioural Insights project currently being undertaken by BehaviourWorks Australia¹ as part of the a Safer Together Community First program.

5.3.6 Actions

The workshop discussion and directions suggest a number of actions which are required to further progress the use of the archetypes research within bushfire safety community engagement and specifically in relation to community engagement practitioners. It will not be possible to complete all of these actions within the ambit of the current project although it is the intention of the researchers to maximise the outputs of the projects within the proper constraints of careful consultation with stakeholders. Future actions required following the conclusion of this project are:

1. Circulate this report on the workshop to participants for their comments and suggestions. The ten workshop participants will be asked to review Chapter 4 to inform future application of the self-evacuation archetypes into community engagement initiatives.
2. Develop a hard copy and online assessment questionnaire/ tool for the use by community engagement facilitators. Preliminary steps taken in this report to establish a question set and a marking framework (cf. Chapter 5) require further refinement and development of an on-line application.
3. Develop an analysis of SA1 data to enable the depiction of a profile of archetypes within an SA1 community. Initial work undertaken in this report (cf. Chapter 6) requires further development and integration of insights of the original self-evacuation archetypes work with those of the post-season survey (cf. Chapter 5) to enable broader application to areas of extreme bushfire risk.
4. Simplify and clarify the description of archetype response/ behaviour for use in flash cards to be used by community engagement practitioners.
5. The attitude-response matrix requires a plain-English edit as a basis for simple and succinct communication of information about self-evacuation archetypes.
6. Develop a set of consolidated archetype action flash cards (mirroring the response/ behaviour cards) as prompts for community engagement facilitators. Following completion of the archetype response/behaviour flash cards, a small working group of community

¹ BehaviourWorks Australia is part of the Monash Sustainable Development Institute at Monash University. BehaviourWorks is currently undertaking a research project funded through the Safer Together Community First Program to explore opportunities to strengthen community-based bushfire risk management programs.

engagement facilitators need to develop actions and action strategies that inform and influence archetype response/behaviour, in a set of action flash cards.

7. Consult with a large group of community engagement facilitators on the amended archetype response/ behaviour and action flash cards.
8. Further collaborate with the BehaviourWorks Australia Safer Together research project.
9. Establish a pilot program based around the archetypes, possibly built on the CBBM approach.

Many people living in bushfire prone areas recognise the archetypes both in themselves and in others. It is a tool that can be effectively used in communities for greater self-understanding and self-directed change. Archetypes are a basis for engagement, reflection and informed challenging of attitudes and behaviour. Community members can use the archetypes to better define, understand, reflect on, assess and improve their approach to bushfire threat. Archetypes allow community members and the bushfire management agencies to engage in a constructive conversation about their response to bushfire risk. There is recognition and acceptance by bushfire management agencies of different intentions and needs and less judgement about the appropriateness of householder views and response.

Dialogue and debate between community members who are informed of their own and other archetypes can prompt greater understanding of others, deeper reflection on concerns, needs and priorities and ultimately, higher quality and generally accepted solutions to community bushfire issues.

Householders can reflect on and assess their perceptions, beliefs and intentions and consider the risks and benefits of their planning, preparation and intended response to bushfire. Greater self-awareness of their archetypes may assist households to reflect on the basis and validity of the protective choices they are likely to make and their impact on one another.

10. Co-develop an archetypes training module for Level 3 community engagement facilitators with the Safer Together Building Capacity and Capability project.

Training and development on archetypes for community engagement professionals provides them with a broader basis for identifying, understanding and responding to the views and responses of community members and to assist householders in identifying and planning appropriate preparation and protective response.

6. Archetypes and monitoring and evaluation

6.1 Introduction

Monitoring is the collection and analysis of information about a project or program, when it is ongoing, while evaluation is the periodic, retrospective assessment of a program. Data collected through monitoring contributes to evaluation (Hobson et al., 2013).

Monitoring and evaluation enables an assessment of the effectiveness of a program in achieving its objectives; provides a basis for organisational learning and decision making about program design, organisational processes, and implementation; can be a basis for empowering and motivating internal and external stakeholders; enables accountability to key stakeholders; provides a basis for influencing government policy; and can contribute to the evidence base on policies and programs.

A logic model provides the key pillar for program design and development and is fundamental to a program monitoring and evaluation structure. A logic model provides an explicit theory of how a program is intended to work, toward whom it is directed, and the outcomes sought. It establishes a starting point, interventions and pathways to outputs and outcomes, demonstrating how a program is intended to work and achieve its objectives. The underlying theory of a program's logic model should, as far as possible, reflect the perceptions and behaviours of the people targeted and the context in which they live. By fully articulating its logic, a program can be more appropriately and comprehensively evaluated against its objectives and outcomes.

For example, the Safer Together Community First program logic model (included in supplementary material) sets out how the program seeks to collaborate with communities to jointly reduce bushfire risk and improve agencies' community engagement capabilities. Recognition and accommodation of the diverse range of attitudes, perceptions and needs of community members reflected in the archetypes provides a sound foundation for the achievement of short, intermediate and long-term program outcomes. The building of agency capability, development of tools and materials, and collaborative planning and engagement with communities, which are key program activities and outputs identified in the logic model, can be supported and enhanced by applying an archetype lens to community engagement activities.

By applying the archetype lens to understand the basis of community members' perceptions and responses and to address their actual needs, community engagement professionals can skilfully and confidently develop fit-for purpose approaches to individuals. Their work can reflect what community members actually think and do based on their varied perceptions, needs and circumstances. Community engagement professionals, using insights into the diversity of archetypes' responses and behaviour, can better understand and build on prevailing community attitudes and priorities to more effectively promote bushfire safety.

The application of the archetypes lens to community engagement activities contributes to the realisation of the program's key intermediate outcomes, including for 'communities (to) experience appropriate, purposeful engagement that meets their needs.'¹ The application of the archetypes lens also contributes to the collaborative engagement of communities by improving agencies' understanding of community perspectives and values; build greater trust based on community recognition that the agencies understand 'where they are coming from'; promote better community preparation and response through targeted interventions and messaging; and increase householders' participation in decision-making with agencies that are seen as constructively engaging them and addressing their needs.

The achievement of these short and medium-term outcomes promotes permanent, long-term community support for and trust in the agencies that are perceived as understanding and responding to community needs. The archetypes lens provides a framework within which agencies can work collaboratively with communities to take shared responsibility over the long term through mutual recognition and respect for their respective roles and responsibilities in and contributions to, bushfire safety.

Government programs are designed to meet unmet needs, address and improve undesirable or adverse behaviours that are inconsistent with community objectives, or to reinforce or support desired behaviours. Bushfire safety programs attempt to counter the drivers of risk behaviour and address householder and community needs in preparing for and responding to bushfire threat.

By reflecting the diverse perceptions and behaviours of householders living with bushfire threat, self-evacuation archetypes provide a rich behavioural and contextual basis for designing and evaluating bushfire safety programs. Their use in the monitoring and evaluation of bushfire safety programs enables a more nuanced understanding of the responses of program targets, the settings in which the program is most effective, and the basis of program outputs and outcomes. The analysis of archetypes enables a more detailed understanding of who does what and why. Understandings of the attitudes, perceptions and intended responses of archetypal householders living in bushfire prone areas can be linked with their involvement in programs, their attitudes toward emergency services and their planning and preparation for and response to a bushfire event.

This chapter presents questions that can be used by emergency authorities as part of monitoring and evaluation of their programs to identify archetypes and to link them with other behavioural or demographic data. The questions can also be used by community engagement professionals to analyse the attitudes and behaviour of community members or to enable householders to self-administer and self-assess their attitudes and behaviour from an archetypal lens. Six basic questions enabling categorisation of respondents into archetypal groups were included in the 2017/18 and 2018/19 CFA Post Season bushfire surveys of extreme bushfire risk areas in Victoria (CFA., 2018; CFA., 2019). This chapter will also present a detailed profile of archetypes and discuss their involvement in programs based on these data.

6.2 Archetype questions

Survey questions to efficiently establish a respondent's archetype have been developed using K means cluster analysis that identify factors that differentiate archetype attitudes and behaviour based on significant differences in behaviour that are not explained by chance (reflecting a significant F value). Refer to Strahan et al for further details on the details of this analysis. These factors are perceptions of threat, protective actions and stakeholders; responsibility and self-reliance; and intended protective action. These, except for that latter, are detailed in Table 3 below. Intended protective action is used here to deputise for protective action taken in a bushfire event (evacuate or remain). Intended protective action, to remain, leave or wait and see is used to differentiate archetypes because, in the absence of recent experience with bushfire, intended protective actions are a surrogate for actual protective behaviour since they have been shown to be a key determinant of the decision to remain or leave (McLennan et al., 2019)

So that questions based on these factors can be administered and interpreted, for statistical and online assessment they are based on a continuous five-point scale (except for intended protective action) as detailed in Table 4. For a hard copy assessment, a binary scale will be used and scored as detailed in Table 5.

Table 3: Factors differentiating archetypes

Factor	Element	F
Threat perception	Threat to property	63.249
	Impact on property	77.033
	Future threat to property	11.536
Intrusiveness of bushfire threat	Thinking about threat	31.189
Self-reliance	I accept responsibility for property	7.543
	I need to be self-reliant in bushfire	6.765
	ES is responsible for protecting me	6.017
Protective action perception	Leaving is the best way to protect personal safety	53.675
	Remaining best way to protect personal safety	50.869
	Remaining is the best way to protect property	20.590
Stakeholder perception	Neighbours:	
	Knowledgeable about bushfire	10.033
	Well informed	21.587
	Give good advice	6.071
	TV/Radio:	
	Knowledgeable about bushfire	17.332
	Well informed	19.546
	Give good advice	21.791
	Local CFA brigade are:	
	Knowledgeable about bushfire	10.366
	Well informed	10.593
	Give good advice	9.500

Table 4: Archetype measures

Concept	Question stem	Item	Scale type	Scale
Intrusiveness: the extent to which householders perceived the salience of bushfire in their daily lives.	During the last bushfire season how frequently did you	Think about the threat of bushfires? Read information on bushfire in brochures, newspapers, the Internet, etc.?	5-point Likert	1 = Not at all 2 = Very little 3 = Some of the time 4 = Often 5 = Very often Don't know -non-metric
Future likelihood of bushfire: the likelihood that a bushfire in the future would pose a threat to the householder	In the future, how likely do you feel it is that a bushfire will...?	Threaten your property?	5-point Likert	1 = Very unlikely 2 = Unlikely 3 = Neither likely nor unlikely, 4 = Likely 5 = Very likely Not applicable–non-metric
Responsibility of emergency services: Householder's perception that emergency services are responsible for protecting their personal safety and property.	To what extent do you agree or disagree with the following?	The emergency services are responsible for protecting me if there is a bushfire The emergency services are responsible for protecting my home if a bushfire threatens it	5-point Likert	1 = Strongly disagree 2 = Disagree 3 = Neither agree nor disagree 4 = Agree 5 = Strongly agree
Responsibility of the householder: Householder's perception that they were responsible for protecting their personal safety and property	To what extent do you agree or disagree with the following?	I know that I need to be self-reliant in the event of a bushfire I accept responsibility for my home and property during the bushfire season	5-point Likert	1 = Strongly disagree 2 = Disagree 3 = Neither agree nor disagree 4 = Agree 5 = Strongly agree

Concept	Question stem	Item	Scale type	Scale
Threat of the bushfire: The perceived danger posed to personal safety and property	How large do you think the threat a bushfire in your town or suburb is to...?	You (and your family)? Your property?	5-point Likert	1 = No threat, 2 = Small threat 3 = Moderate threat 4 = Large threat 5 = Very large threat
Impact of the bushfire: Magnitude of effect it would have on people and property	How large an impact do you think a bushfire in your town or suburb would have on...?	You (and your family)? Your property?	5-point Likert	1 = No impact 2 = Small impact 3 = Moderate impact 4 = Large impact, 5 = Very large impact
Perception of leaving: Effectiveness in protecting safety and property and the resources involved	I would like you to think about the following statements and tell me if you strongly agree, agree, neither agree or disagree, disagree or strongly disagree with them...	Leaving my property is the best way to protect myself (and my family) if there is a bushfire in my town or suburb Leaving my property is the best way to protect my property if there is a bushfire in my town or suburb	5-point Likert	1 = Strongly disagree 2 = Disagree 3 = Neither agree nor disagree 4 = Agree 5 = Strongly agree
Perception of remaining: Effectiveness in protecting safety and property and the resources involved	I would like you to think about the following statements and tell me if you strongly agree, agree, neither agree or disagree, disagree or strongly disagree with them...	Remaining is the best way to protect myself (and my family) if there is a bushfire in my town or suburb Remaining is the best way to protect my property if there is a bushfire in my town or suburb	5-point Likert	1 = Strongly disagree 2 = Disagree 3 = Neither agree nor disagree 4 = Agree 5 = Strongly agree
Perceptions of neighbours as a stakeholder: Capability and reliability in relation to neighbours.	To what extent do you think your neighbours?	Have knowledge and understanding of bushfire? Are well informed about bushfire? Give good advice about bushfire?	5-point Likert	1 = Not at all 2 = Small extent 3 = Moderate extent 4 = Large extent 5 = Very large extent Don't know -non-metric

Concept	Question stem	Item	Scale type	Scale
Perceptions of the media as a stakeholder: Capability and reliability in relation to the media.	To what extent do you think TV and radio?	Have knowledge and understanding of bushfire? Are well informed about bushfire? Give good advice about bushfire?	5-point Likert	1 = Not at all 2 = Small extent 3 = Moderate extent 4 = Large extent 5 = Very large extent Don't know -non-metric
Perceptions of the emergency services as a stakeholder: Capability and reliability in relation to the emergency services.	To what extent do you think the emergency services?	Have knowledge and understanding of bushfire? Are well informed about bushfire? Give good advice about bushfire?	5-point Likert	1 = Not at all 2 = Small extent 3 = Moderate extent 4 = Large extent 5 = Very large extent Don't know -non-metric
Intended protective action Householders' protective action intentions in the event of a bushfire	If a bushfire were to occur in the town or suburb where you live, which of the following are you most likely to do?	Stay and try to protect your property throughout the fire Do as much as possible to try to protect your property but leave if threatened by the fire Wait to see what the fire is like before deciding whether to stay and defend or leave Wait for police or fire and emergency services to tell you what to do on the day Leave as soon as you know there is a fire threatening your town or suburb You would not be home because you intend to leave on days of high fire danger Unsure. Don't know/ hadn't thought about what I would do	Nominal (1-7)	As listed under item

These questions can be used in a range of different ways:

- As part of a survey involving statistical identification of archetypes and analysis of data.
- In a (hardcopy or online) survey of individual community members administered by a community engagement facilitator.
- As a self-administered online or hard copy survey for community members.

It is envisaged that agency monitoring and evaluation data would be analysed using cluster analysis and discriminant factor analysis to categorise respondents within archetype groups. Hardcopy surveys would be accompanied with an identification frame to allow community engagement facilitators to establish the archetype group in which a community member is likely to belong. Online surveys would incorporate software that assesses responses and automatically allocates the respondent's archetype.

A preliminary identification frame is detailed in Table 5. A YES/NO response applies to each archetype measure as listed in Table 4 except for intended protective action. Scoring of responses is explained in Table 5 which also describes the score range for each archetype. For example a respondent will be identified as an Experienced Independent (score range 20-29) because they will score 1 for item 8 because they will intend to remain, and respond NO (score 1) for items in 3, 5, 6 and 7 and YES (score 2) to the remainder.

Table 5: Archetype identification frame

Archetype	Scale Type	Score range
Experienced Independent	Binary (NO -1 , YES-2) for all archetype measures except for: Intended protective action: Remain – 1 Wait and see-10 Do as much as can but leave if threatened - 15 Wait and see (ES) – 30 Leave as soon as know of fire – 40 Won't be there - 40	20-29
Threat Denier		30-39
Community Guided		40 - 43
Worried Waverer		44 - 51
Responsibility Denier		52 - 60
Dependent Evacuator		61 - 64
Considered Evacuator		65 - 72

6.3 Using Archetypes to add value to analysis of survey data

6.3.1 Background

By using a bushfire archetypes lens as part of analysing data generated through monitoring and evaluation efforts, bushfire management agencies are better able to achieve assessment objectives, add value to community programs and continually improve. The Safer Together program logic suggests areas in which the archetype lens can contribute to the improvement of bushfire safety programs.

This section discusses the usefulness of the archetype lens in monitoring and evaluation of bushfire programs. It also provides examples of how the archetype lens can be used by analysing data from the CFA's 2017/18 and 2018/19 Post Season survey (CFA., 2018; CFA., 2019).

6.3.2 Archetypes as part of the CFA Post-Season survey

The self-evacuation archetype concept posits that householders display a range of typical attitudes and protective responses to bushfire risk. The seven archetypes discussed in Chapter 2 are based on data from householders who had recently experienced a bushfire in the 2014 Parkerville/ Stoneville/ Mt Helena bushfire within the Perth Hills or the 2015 Sampson Flat fire in the Adelaide Hills. But how can this concept be applied in designing and assessing bushfire safety engagement and education programs for people living in bushfire prone areas?

CFA regularly conducts surveys of householders living in areas of extreme bushfire risk, as identified in the Victorian Fire Risk Register – Bushfire (VFRR-B), to explore community attitudes toward and preparedness for bushfire risk. These post-season surveys include questions on householders' risk perceptions, planning and preparedness, protective action intentions, perceptions of and interactions with CFA and their demographics including household type, location and type of property, disability, gender and age. The last two post season surveys (2018 and 2019) included a small number of questions that enabled basic identification of self-evacuation archetypes (included as supplementary material).

The archetypes concept can be adapted from data on householders who had recently experienced a bushfire to those who live in bushfire prone areas but are unlikely to have recent bushfire experience, by recognising the implications of important similarities and differences in the formation of their attitudes and responses. Both groups live in areas that are highly prone to bushfire, so their physical circumstances are similar. Both groups live in a range of locations from peri-urban areas dominated by residential sized blocks and small acreages in woodland, forest and scrub, to rural areas characterised by larger farms with pasture and croplands and small towns and villages close to farming areas and native bushland.

However, differences exist between the balance of archetypes in each group because the factors influencing their construction in the recent fire experience sample reflects householders' experience of those bushfires, while the factors affecting the post-season respondents, including their intended protective response, are influenced by the lack of major bushfire activity in Victoria in that period and householders' lack of recent, if any, bushfire experience. Differences also arise due to the considerably greater number of respondents aged 65 years and over (54.2%) in the post-season sample compared to the recent fire experience sample (36%).

Consequently, fewer post-season householders were identified as bushfire experienced, prepared and capable, Experienced Independents, intending to remain and defend. More were classified as Worried Waverers who planned to remain but lacked the bushfire experience to be confident that they were sufficiently prepared for and capable of property defence. Slightly more post-season respondents were Community Guided, comfortable relying primarily on neighbours and informed others in their community for bushfire guidance and support. The relatively benign bushfire context may have made self-reliance and responsibility for property seem more readily achievable, reducing the number of Responsibility Deniers expecting the emergency services to protect them. The larger proportion of post-season Dependent Evacuators is likely due to the difference in the age profiles of the samples.

Taking account of the reasons for differences in the numbers of some archetypes and noting the considerable consistency in the proportion of other archetypes within the two groups detailed in Table 6, the archetype concept appears generally transferable to extreme bushfire prone areas in Victoria. The characteristics of the archetypes derived from analysis of householder response to the 2018 and 2019 post-season surveys are similar to those described in Chapter 2 and summarised in Strahan et al. (2018) except where noted in the discussion. The new insights into the attitudes and behaviours are discussed in the following section.

Table 6: Proportion of Archetypes in Parkerville (2014) & Sampson Flat (2015) Bushfires and CFA Post-Season surveys (2018 and 2019)

Archetype	Parkerville and Sampson Flat bushfires (n=457) Percent	CFA Post-season surveys (n=2042) Percent
Threat Denier	13.6	13.6
Responsibility Denier	10.3	4.8
Dependent Evacuator	6.8	18.5
Considered Evacuator	17.3	17.2
Community Guided	18.4	20.6
Worried Waverer	13.3	18.6
Experienced Independent	20.3	6.6

6.3.3 Attitudes and behaviour of archetypes in extreme bushfire prone areas

Analysis of post-season survey data provides a broader, fuller picture of the nature of self-evacuation archetypes because of the diversity of bushfire prone regions included and the range of attitudes measured. The following discussion of each archetypal group draws on contingency analysis of central issues addressed in the post-season survey that is detailed in the supplementary material. Percentages reported in the text and highlighted in the supplementary material represent archetypal attitudes or behaviour that are significantly different from each other ($p > 0.05$).

6.3.3.1 Threat Denier

Threat Deniers (TD) plan to remain at their property during a bushfire in their area because they don't believe that their personal safety or property is at risk. Post-season data suggests that more than others TD do not perceive a bushfire risk to their area now (95%) or in the future (92%) and see little or no risk to their home (71%). They do not obtain CFA bushfire safety information (45%), fail to prepare for bushfire (28%) and do not participate in most bushfire safety programs (FRV- 89%, BPW -97%, PAVS-95%, CFG-95%, CBE-95%). More than others they interact with a CFA Brigade at a community event (22%). They wait to see (59%) how a bushfire in their area develops before they act. If they are threatened by fire, they expect the fire services will protect them (79%). They tend to be men (54%) and live in residential properties (65%) 0.5 to 1 km from bushland (29%).

6.3.3.2 Community Guided

Community Guided (CG) tap into the advice of neighbours, the media and those they see as influential others in the community who are perceived as knowledgeable, informed and able to provide good advice about bushfire. Post-season data suggest that more than others they are women (60%) living within 150 metres of bushland (66%). They perceive a major bushfire risk (100%) in their area and extreme risk to their property now (96%) and in the future (99%). Their protective actions are guided by community advice but lean strongly toward evacuating (57%) if a fire threatens. They believe they (93%) and the community (84%) are well prepared for bushfire. They feel more than others that they are informed about what to do on days of forecast Extreme bushfire risk (96%), how to get warnings (86%) where to (86%) and when to (91%) go if there is a fire. More than others Community Guided receive/obtain information on bushfire safety (76%) and participate in many CFA programs namely (FRV- 32%, BPW -16%, PAVS-16%, CFG-17%, CBE-15%, Brigade-29%). More than others CG believe that Fire Ready Victoria (FRV) and Bushfire Planning workshops (BPW) improves, to a large extent, their understanding

of bushfire risk (71% and 72% respectively) and what needs to be done to plan (68% and 81%) and results in action to plan and prepare for bushfire risk (66% FRV). More than others, speaking to the local fire Brigade at a local community event, to a large extent, improves understanding of risk of bushfire (59%), of what needs to be done to plan or prepare (61%) and results in CG taking action (62%).

6.3.3.3 Considered Evacuator

Considered Evacuators (CE) carefully consider their circumstances and plan and prepare for evacuation when they are aware of a bushfire in their area. Post season data indicate however that more than others except Experienced Independents, they intend to remain if there is a bushfire (14%). CE see current (98%) and future (94%) threat and extreme property risk of bushfire (73%) prompting them to prepare themselves and their household (90%). This preparation may also relate to CE's belief, held by them more than others, that people in their community are unprepared (33%) and their neighbours could not provide assistance (16%). It may also relate to CE's belief that they are unlikely to be assisted by fire trucks (62%), wouldn't be warned (17%) and would not be told by emergency services when to leave (36%). CE participate, more than others, in some CFA programs namely (FRV-23%, PAVS-9%, Brigade-24%). They feel more than others that PAVS had a large impact on them taking action to plan and prepare for bushfire risks (39%). However, they feel their interaction with the local CFA Brigade results in a small improvement in understanding of bushfire risk (35%) and of what is needed to plan or prepare for that risk (29%). CE more than others live within 150 metres of bushland (67%) and are aged 55 to 64 years (30%). As a result of their planning, property preparation and training CE are likely to feel that they are well prepared, and consequently some may consider remaining due to the relatively benign bushfire context that has prevailed in their area.

6.3.3.4 Worried Waverer

Worried Waverers (WW) prepare themselves and their property, including having fire-fighting equipment, to remain and defend against bushfire. But they worry their lack of bushfire experience may place them at risk. WW in the post-season surveys say, more than others, that they would wait and see (51%) how a fire develops, confirming their wavering status. More than others they feel informed about how to get warnings (82%) and when to leave (88%) and would expect to get an official warning during a fire (94%). WW more than others, receive or obtain CFA information on bushfire safety (67%) but have only moderate involvement in CFA safety programs. WW more than others live 150 to 500 metres from bushland (33%) and believe that the bushfire risk to their property is moderate (56%).

6.3.3.5 Responsibility Denier

Responsibility Deniers (RD) do not believe they are responsible for their personal safety or protecting their property. Post season data suggests that RD more than others would evacuate (54%) but are unprepared (26%) and uninformed about how to get warnings during a bushfire (31%), and about where to go (31%) and when to leave (28%). They expect fire trucks will assist them (79%). They do not obtain CFA bushfire safety information (48%) and do not participate in most bushfire safety programs (FRV- 85%, PAVS-94%, CFG-95%, Brigade-84%) or in local groups (48%). They are, more than others, women (54%) renting (10%) a residential house (65%).

6.3.3.6 Dependent Evacuator

Dependent evacuators (DE) believe they are incapable of protecting themselves or their property from bushfire, and expect others, especially the emergency services, to do so. Post season data show DE see bushfire threat in their area as small (31%), risk to their home as moderate (65%) and future threat to their home as unlikely (31%). DE believe they are prepared for a fire (89%)

partially because they feel informed about how to get warnings (86%) and when to leave (88%), would expect to get an official warning during a fire (94%) and be assisted by fire trucks (76%). Consistent with their belief that others will assist them, DE believe more than others that people in the community (86%) and the emergency services (98%) are prepared for bushfire. More than others they obtain CFA bushfire safety information (67%) and participate in some CFA programs (FRV-23%, BPW-13%, CFG-10%, Brigade-28%). The extent of DE interaction with local Brigades at community events is only exceeded by the CG archetype. DE tend to be women (52%).

6.3.3.7 Experienced Independent

Experienced Independents (EI) see themselves as responsible and self-reliant, with the knowledge, skills and capability necessary to successfully defend their property from bushfire. Post season data shows that EI, more than others intend to remain at their property during bushfire (22%). They may discount current (83%) and future (82%) threat and extreme property risk of bushfire (55%) based on their bushfire knowledge, capability to defend and preparation (87%). Like CE, EI have reasons to believe that they need to be self-reliant in bushfire. EI believe, more than others, that people in their community (39%) and the emergency services (13%) are unprepared and their neighbours could not assist (16%) in a bushfire. They also believe more than others that they are unlikely to be assisted by fire trucks (51%), wouldn't be warned (27%) and would not be told by emergency services when to leave (38%). Given their commitment to defend their property EI appear to set high standards for knowledge and capability. They feel more than others, uninformed about what to do on a day of forecast Extreme fire danger (22%) and how to get warnings (33%), when to leave (34%) and where to go (34%) during a bushfire. They do not obtain CFA bushfire safety information (50%) and participate more than others in CFG (15%,) and CBE (13%) More than others they do not speak to the CFA Brigade at local events (84%), believing they improve understanding of bushfire risk to a small extent (35%). EI more than others are men (59%) living within 150 metres of bushland (61%) and do not participate in local groups (41%).

6.3.4 Broadening the understanding of archetypes in extreme bushfire prone areas

The concept of bushfire self-evacuation archetypes was developed in the limited context of householders' experience of a bushfire event (Strahan et al., 2018). Archetypal characteristics were identified and analysed in a broader context of individual decision-making and factors predicting self-evacuation from bushfire (Strahan et al., 2019). The extension of the analysis of self-evacuation archetypes to 2018 and 2019 CFA post-season data enabled the scope of factors addressed to be widened and understandings of the characteristics of the archetypes to be refined and enlarged. The findings on the attitudes and behaviour of archetypes in extreme bushfire prone areas discussed in the previous section provides new and more refined understandings and interpretations of the attitudes and behaviour of the archetypal groups.

Threat Deniers do not see a need to seriously consider bushfire threat, engage with bushfire safety issues such as planning and property preparation, or participate in bushfire safety programs. They may stay in touch with their local Brigade as 'insurance' against being wrong about the lack of threat, will wait till the last minute before taking protective action and expect emergency services will assist.

Community Guided are convinced of the extreme bushfire risk in their area and see neighbours, people with bushfire experience and members of CFA in their community as an important resource network they can consult. They see their good preparation and knowledge reinforced by broader community preparation and capability. They reinforce and strengthen their capability by participating in CFA bushfire safety programs to improve understanding of risk and what is required to address it and they take actions. Interaction with their local CFA Brigade is a key to this strengthening of their capability. They are co-dependent on community members.

In contrast, Experienced Independents fiercely believe they are responsible for and capable of preparing and successfully defending their property and that others, such as neighbours and the emergency services, are not able, and will not assist them in a bushfire. They participate in neighbourhood programs (e.g. CFG) but appear to be largely on the periphery of community bushfire activity and may be happy to be so.

Considered Evacuators are also highly independent and committed to protecting their (and their household's) personal safety. Like the EI they believe they must rely on their own planning, preparation and capability rather than getting assistance from neighbours or the emergency services. They judiciously participate in bushfire safety programs targeted at enhancing their capability and better preparing their property especially the Property Advisory Visiting Service which is highly influential in their efforts to prepare their property.

Worried Waverers don't know whether they will remain or leave, and this translates for many into the intention to wait and see how a fire develops before deciding on a protective action. WW know how to, and expect to get warnings and believe they know when to leave. Their wavering may be based on living at a distance from bushland and perceiving only a moderate bushfire risk to their home, reinforcing a belief that their capabilities may enable them to successfully defend.

Responsibility Deniers believe that emergency services are tasked with the protection of the community and must protect their household and property. They comprehensively pass off responsibility for their bushfire safety to others, failing to prepare their property, getting information to assist their protection, or facilitating safe evacuation.

Dependent Evacuators similarly rely on others, believing they are incapable of effective personal or property protection. But unlike RD their recognition of incapacity drives their efforts to plan and prepare and inform themselves about bushfire safety, official warnings and evacuation triggers. Perceptions of limited threat and impact of bushfire on their home reflect their confidence in the assistance of others.

The archetypes provide new insights into the diverse attitudes and behaviours of people living in extreme bushfire prone areas of Victoria. Householders see CFA bushfire safety engagement and education efforts through the lens of their personal needs and attitudes. For example, householders who are TD, CG and CE interacting with a local CFA Brigade may on the face of it appear similar but reflect different needs and objectives. TD will stay in touch with the Brigade to ensure they are on good terms, just in case the Brigade is needed. They do not intend to improve planning or preparation for a threat they almost totally discount. On the other hand, CG will seek to build the Brigade into their support network, engaging actively in bushfire safety programs and strengthening their capability to plan, prepare and respond. CG are likely to have an extensive, friendly and informal relationship with the Brigade, building them into a genuinely cooperative network. CE engage with the Brigade to build capability in areas where they feel they need to improve planning and preparation for evacuation. This relationship is fundamentally practical and purposeful.

If these community members are perceived and treated as a heterogenous group, the Brigade will forego important opportunities to improve bushfire safety by effectively engaging and influencing the different archetypes within in it. It will also miss the opportunity to demonstrate a greater understanding of individual needs and perspectives and to build trust with members of the community.

6.3.5 Implications for program monitoring and evaluation

At an overarching level the objective of MER is to assess the extent to which bushfire safety programs meet community needs and purposefully engage community members but accurate assessment depends fundamentally on establishing and taking account of the diversity of individual needs within bushfire prone communities .

The needs of CE are to build practical capacity to plan, prepare and implement safe evacuation

from bushfire, while CG seek to build a support network of community members to advise and assist them in preparing and responding to a bushfire event. DE see themselves as incapable of effectively protecting their personal safety and property during fire and conscientiously attempt to strengthen their capacity but need assistance from the emergency services. RD in contrast expect assistance and protection from emergency services as the right of a taxpayer. EI want to be left alone to prepare and respond in the ways they believe are most effective and appropriate to the successful defence of their property. WW believe they can successfully remain and defend using capabilities adequate to the demands of the fire, but they are unsure since their capabilities have never been tested. TD believe their property will not be threatened by bushfire and do not engage with the issue except as insurance in case they are mistaken. The archetypes' diverse attitudes and responses to bushfire risk creates very different needs for bushfire safety engagement and education.

Through the improved understanding of the needs and attitudes of community members that the archetypes provide, MER can offer more nuanced measures of program outcomes and how they can be better designed and targeted.

The insight provided through archetype informed MER can improve design and delivery of community bushfire safety programs, so they better reflect the needs of community members, build mutual trust and create the basis for a productive and ongoing dialogue between the community and the emergency services.

7. Application of Archetypes in bushfire modelling

7.1 Background

Models of bushfire development (such as PHOENIX) and simulating traffic evacuation dynamics assist in understanding the physical and social dynamics of bushfire threats. Failure to incorporate important elements of human behaviour in response to bushfire threat is a major shortcoming of these models (Folk et al., 2019). Some studies that considered household behaviours in bushfire have been conducted (McLennan et al., 2014, McLennan and Elliott, 2012, McLennan et al., 2012, McLennan et al., 2019) and recently reviewed (Folk et al., 2019). However, the integration of householder decision response to imminent bushfire threat into dynamic travel demand models for vehicular traffic is in its early stages (Russo and Chilà, 2014).

The formative nature of this work may be explained by the lack of a systematic modelling framework of household perceptions and response to bushfire (Russo and Chilà, 2014, Dixit et al., 2012). Progress has been made in identifying functional requirements of a model (Ronchi et al., 2017), the factors to include (Folk et al., 2019) and recently, a means of connecting physical conditions with householder decision-making and their protective response (Lovreglio et al., 2019). In this context a mathematical framework for modelling householder decision-making, using the behavioural insights provided by the archetypes, was developed. Factors affecting householder decision-making and how they respond to different information and cues were systematically incorporated into a dynamic vehicle travel demand model. The archetype-based simulation enables perception and response-based predictions of householders' decision to stay or leave and the timing of their action. The following discussion draws on a detailed working paper outlining the development of the archetype based simulation model.

7.2 Previous model development

The existing vehicular evacuation model has been developed over a number of years and primarily trialled in Surf Coast Shire (2018) and Mount Alexander Shire (2016-17) using assumptions about individual behaviour based on academic and grey literature, the knowledge of experts with extensive experience in bushfire research, and the lived experience of emergency services personnel.

Through the auspices of Emergency Management Victoria (EMV) the research and policy lead contacted Dr Dharendra Singh of the RMIT University to discuss the applicability of self-evacuation archetypes to the task of further integrating human behaviour into the vehicular evacuation simulations that had been developed for the Surf Coast Shire region.

This earlier work had developed the Emergency Evacuation Simulator (Figure 2) containing seven components. The model had been developed for the Surf Coast area with the three central components being the MATSim Model comprising a traffic model of the local road network and the driving agents representing the population of the region; the Jill BDI Model containing BDI agents in the Jill system and the Phoenix Fire model that reads information about the bushfire spread from the Phoenix Rapidfire simulator. The brains of the agents, contained within the Jill model, work with their bodies in the MatSim Model responding to bushfire spread information provided by the Phoenix Fire model.

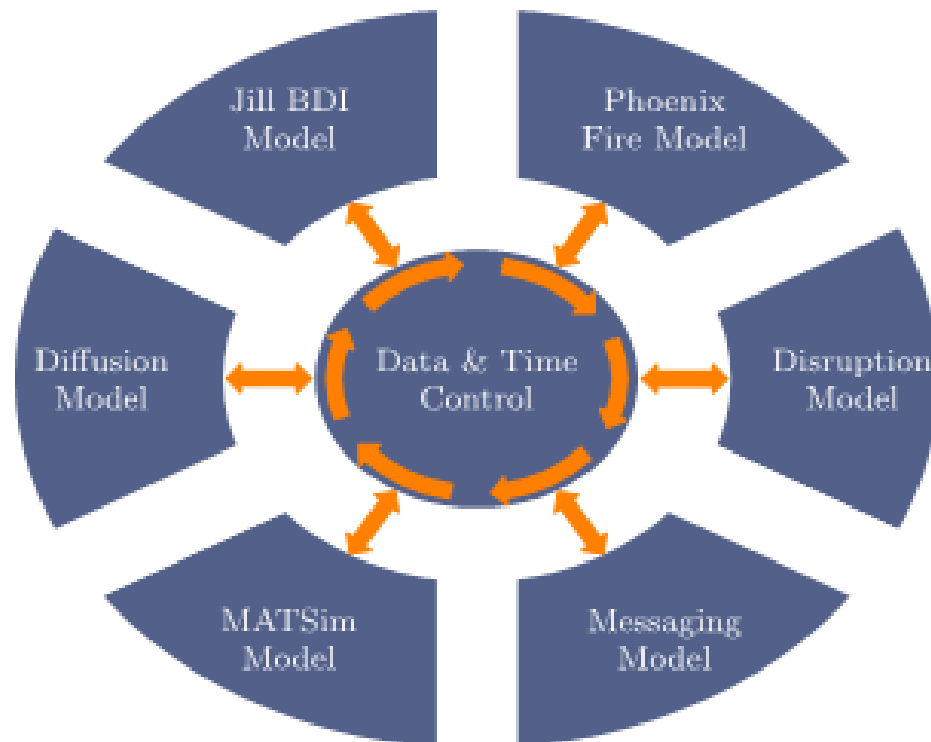


Figure 2: Components of the Emergency Evacuation Simulator

The four other components are the “Disruption model” which injects road disruptions including closures and accidents that constrict traffic flow; “Diffusion model” which models diffusion of information about the fire and roadblocks; “Messaging model” which injects emergency services messaging such as Advice, Watch and Act, Emergency Warning and Evacuate Now; and “Date and Time Control” that controls the simulation loop and the progress of simulation time, calling the components one in each time step to manage the data sharing between components.

7.3 Refining the emergency evacuation simulator using self-evacuation archetypes

The iterative refinement of the emergency evacuation simulator was, for this project, centred on the archetypes’ evacuation decision-making in response to the bushfire threat, preceding the on-road decision-making, both incorporated into the Jill BDI model. This work involved intensive discussions and consultations between the Research Lead and the Agency Research Lead and Dr Singh over a period of six months, meeting every three weeks on average. The archetypes based model, represented by individuals assigned an archetypal group, enables perception and response-based predictions of individual’s decision to stay or leave and the timing of their action. Householders make protective decisions based on their personal circumstances such as their location and type of household; their understanding of the bushfire situation based on an assessment of environmental and social cues and the receipt of official warnings; and their risk propensity. The following reports how the self-evacuation archetypes were incorporated into the simulation model.

7.3.1 Estimating the likelihood of archetypes

Data from the study completed by Strahan of householders in the Perth (2014) and Adelaide (2015) Hills provided a demographic profile of archetypes. The likelihood of a individual with a demographic profile defined by age, gender, and household type fitting a particular archetype

was captured in a matrix. Parts of the matrix were incomplete due to a lack of sample for all demographic profiles in the original data. This is illustrated in Table 7 where Worried Waverers are assigned a zero probability. Where no data was available for a profile an unknown archetype was created with 100% probability. The total matrix size was 70 (seven age groups; two genders; and five household types) by eight archetypes (7+ the unknown type). The proportion of the population in each archetype, including the unknown type is illustrated in Figure 3.

Table 7: Hypothetical sample row from Strahan data matrix, showing the likelihood (%) of a 65 to 74-year-old male living in households without dependents, belonging to each archetype.

Person	CE	CG	TD	WW	RD	DE	EI	UT
Male, 65-74 years, Couple without dependents living at home	1.2	1.2	4.8		2.4	2.4	6.0	

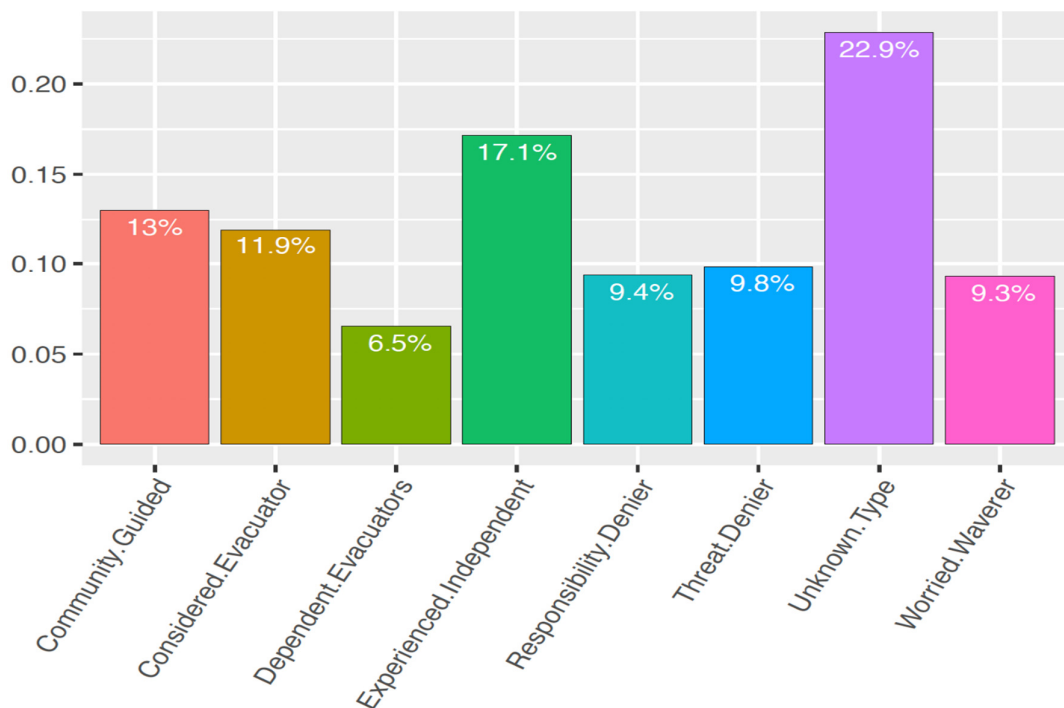


Figure 3: Baseline proportions of archetypes

The following illustrate the matrix by age, gender and household type. The distribution of archetypes by demographic profile provided in the matrix can be used to probabilistically reassign archetypes to individuals living in any region, based on that region's demography.

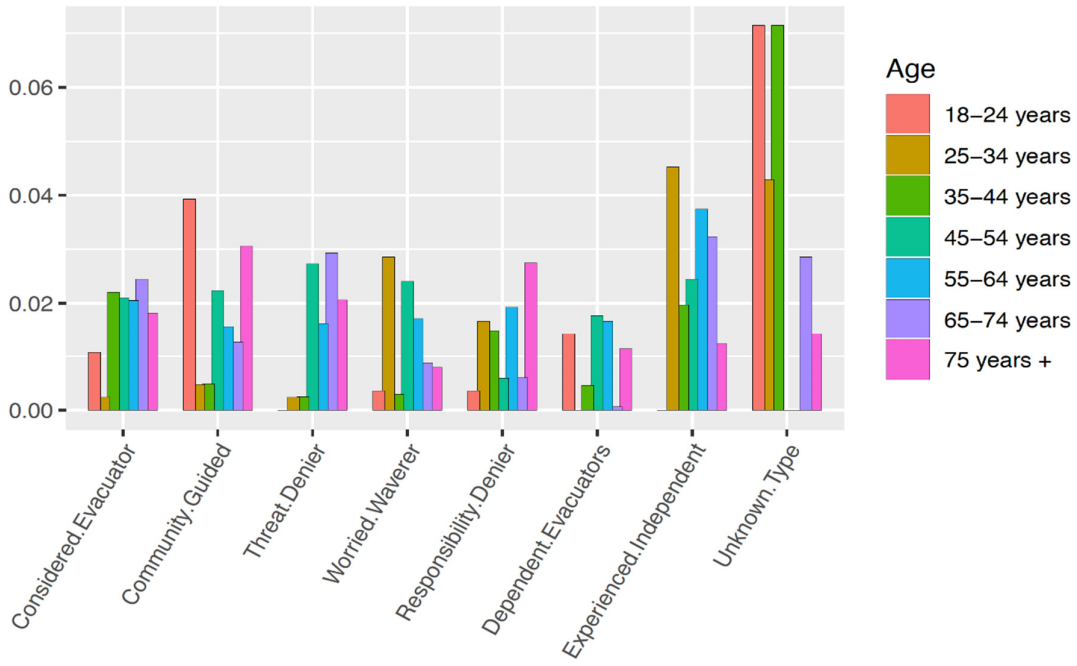


Figure 4: Distribution of archetypes by age group

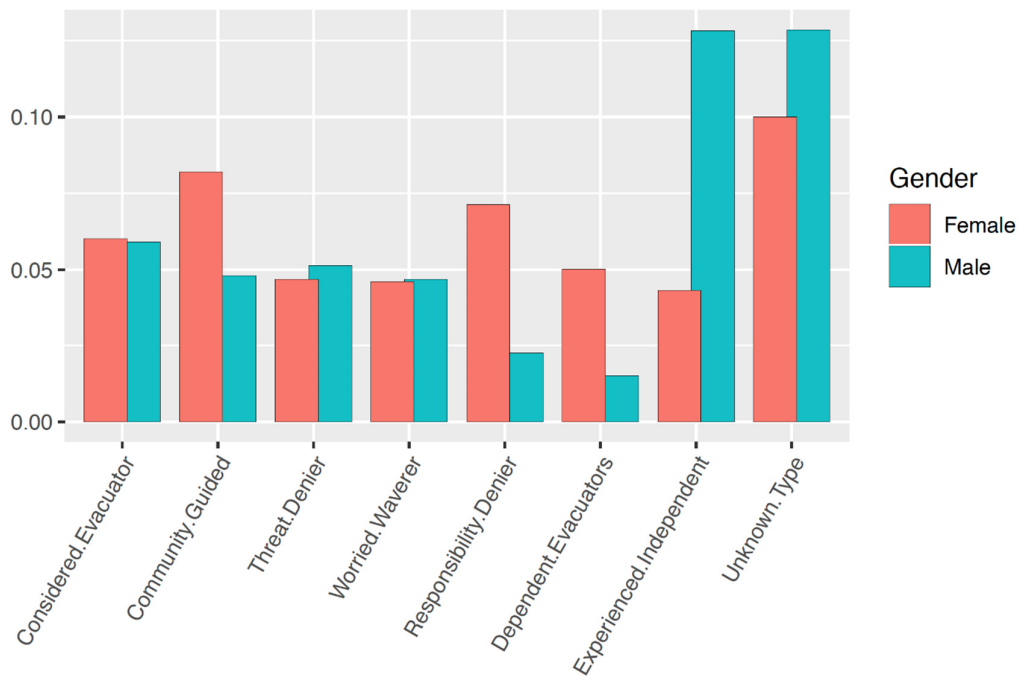


Figure 5: Distribution of archetypes by gender

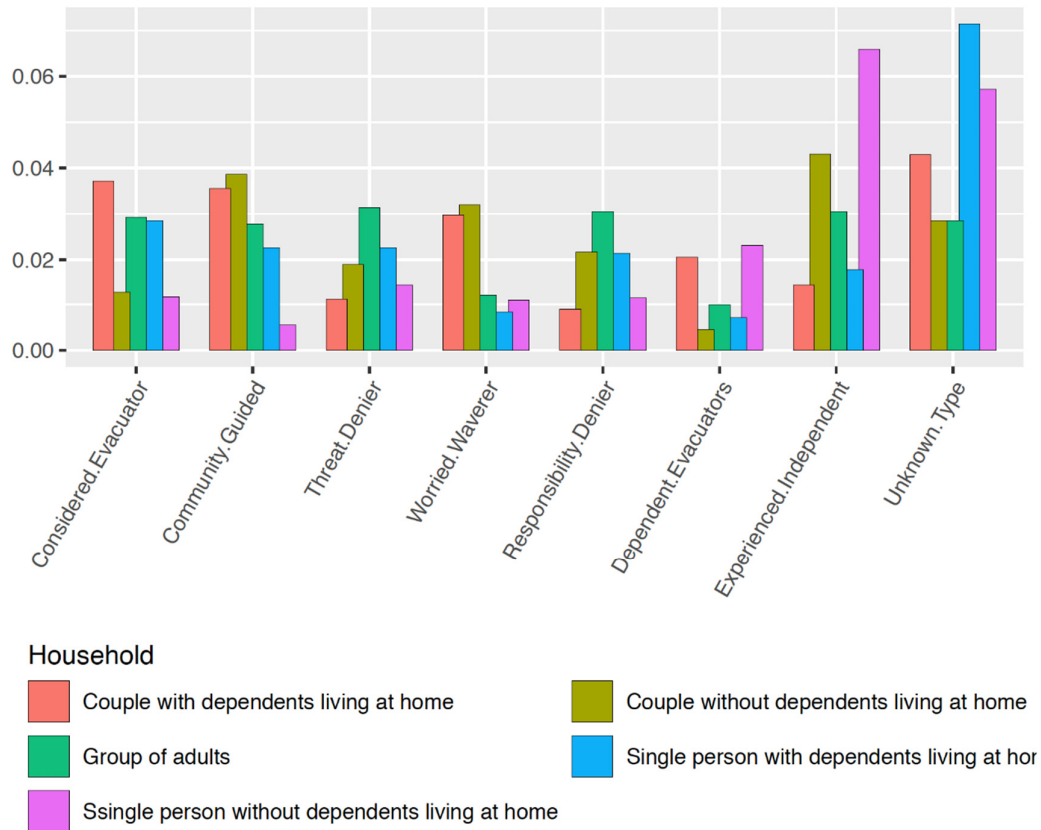


Figure 6: Distribution of archetypes by household type

7.3.2 Synthesising the population for the region

The three key demographic characteristics of residents in the town of Castlemaine (SA2 region), age, gender and household type, drawn from the 2016 Census data, provided a profile or signature of the residents of Castlemaine and the likely nature of the population. These data suggested that the population would comprise, more than the Victorian average, older residents, women and couples and singles in households without children.

Virtual instances of individuals and households were constructed and their demographic attributes (age, gender, and household type) assigned to the Castlemaine population. This assignment of demographic attributes was undertaken ensuring that the virtual population was a good statistical match for the Castlemaine population. While these data painted a statistical picture of residents, they did not provide a basis for understanding their attitudes toward bushfire risk and how they might respond to a bushfire event. To understand how Castlemaine residents might respond to a bushfire their demographic characteristics were matched against the characteristics of archetypes with the same demographic profile.

7.3.3 Assigning archetypes to the population

To achieve this matching, archetypes were probabilistically assigned to the synthetic population of the Castlemaine region (Figure 7) by operating sequentially on each individual in that population. For each individual the demographic profile was extracted along with the associated archetype probabilities for that profile and on this basis the individual was statistically assigned an archetype. The working paper includes as supplementary material, details the algorithm (Algorithm 1) used in the statistical assignment process.

7.3.4 Assigning attitudes to archetypes

A range of factors influence individual response to bushfire. These include proximity of the fire, environmental cues such as seeing smoke and embers and official warnings at ascending levels of urgency. The factors were chosen for the simulation model because they are influential in protective action decision-making and (functionality afforded by the underlying simulation system). The attitude values of these factors were assigned to individuals representing the different archetypes based on evidence drawn from the literature (Strahan et al., 2019, McLennan et al., 2014, McLennan et al., 2015b, Whittaker et al., 2016, Whittaker and Taylor, 2018) and expert knowledge provided by the Research Lead and Agency Research Lead.

Table 8 details values of these attitudes assigned to individuals. Rows in Table 8 show the relative difference in the value that each archetype places on that attitude, regardless of all other factors, while columns show how an archetype values the different attitudes relative to one another. Higher values in the table indicated a high level of importance placed on an attitude. For example, the Considered Evacuator places much more importance on seeing fire ($VisibleFire=0.60$) than on seeing smoke ($VisibleSmoke=0.3$) and slightly more importance on receiving emergency warning ($EmergencyWarn=0.34$) than seeing smoke.

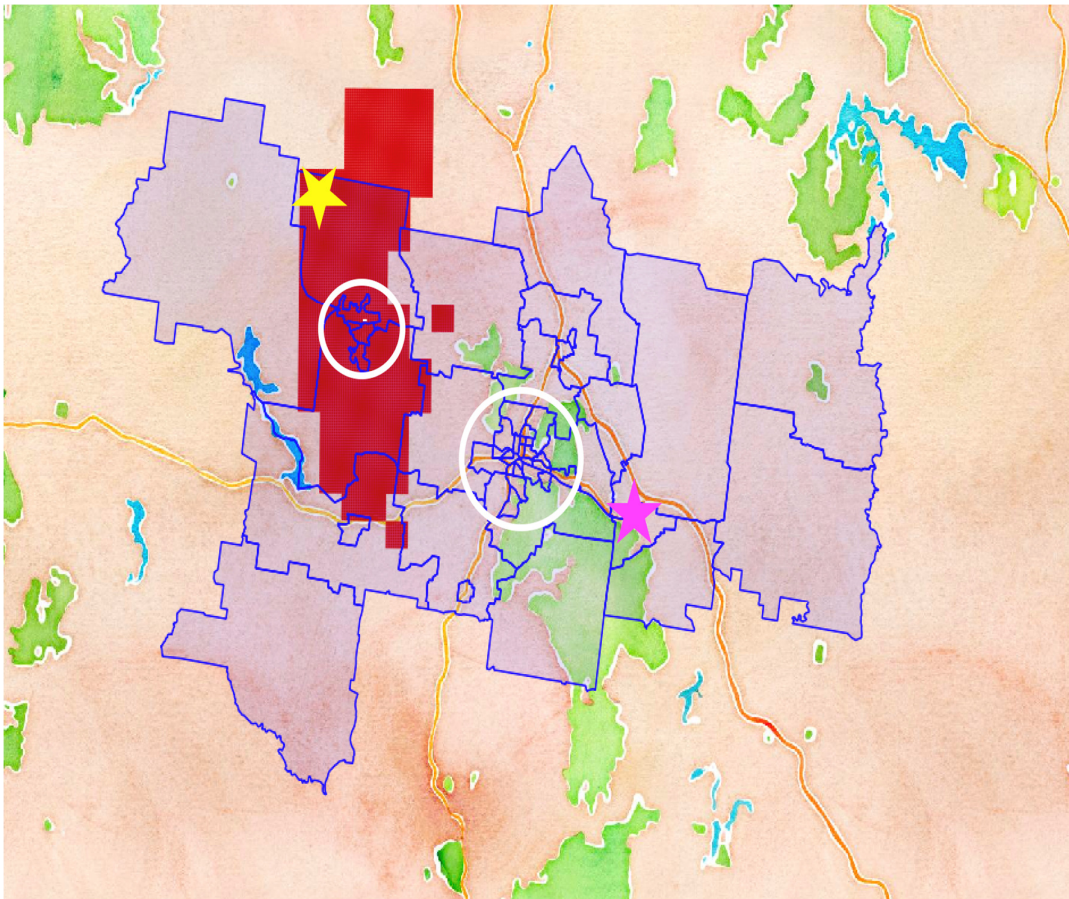


Figure 7: The modified Castlemaine region

Region is within the large blue area. The smaller blue bounded areas containing an average of 400 people are census level 1 statistical areas (sa1). The Maldon township is highlighted in the small white ellipse and Castlemaine is the large white ellipse. The red area is the extent of the time-varying grid shape of the bushfire generated by the Phoenix rapidfire simulator. Ignition point is indicated by the yellow star. Elphinstone, the town of refuge, is represented by the pink star.

Table 8: Archetypes' attitudes matrix

Attitude	CE	CG	TD	WW	RD	DE	EI
VisibleSmoke	0.30	0.20	0.00	0.10	0.00	0.20	0.00
VisibleEmbers	0.50	0.40	0.20	0.40	0.20	0.40	0.30
VisibleFire	0.60	0.50	0.50	0.50	0.30	0.50	0.40
Advice	0.10	0.10	0.00	0.17	0.00	0.00	0.00
WatchAndAct	0.18	0.17	0.00	0.17	0.00	0.00	0.00
EmergencyWarn	0.34	0.33	0.00	0.31	0.00	0.00	0.00
EvacuateNow	0.30	0.30	0.00	0.29	0.36	0.00	0.44
ThresholdInit	0.30	0.30	0.60	0.30	0.40	0.30	0.40
ThresholdFinal	0.30	0.50	0.80	0.70	0.50	0.30	0.90

Each column in the table represents the attitudes of an archetype, and each of these attitude-value pairs were assigned to individuals in the Castlemaine population who had been classified into that archetypal grouping. Some differences in the risk-aversion of individuals within an archetypal grouping are reflected in the assignment of threshold sample distribution values derived from the mean of their initial response (ThresholdInit) and final protective response (ThresholdFinal) to the bushfire assuming a standard deviation of 0.1. The values ascribed to the attitudes of the archetypes outlined in Table 8 reflect expert knowledge of householder behaviour in bushfire. These values were subsequently calibrated to match more generally the levels of responses typically seen in bushfires in Australia, as described in the following section.

The 'on-road' behaviour of individuals in a bushfire event used here is represented in the Jill model based on the Belief-Desire-Intention (BDI) model of agency derived from work of rational systems (Bratman, 1987) and intentional stance (Dennett, 1989) and translated into a computational model of bounded rationality (Cohen and Levesque, 1990, Rao and Georgeff, 1995, Rao and Georgeff, 1991). BDI posits that individuals act according to the beliefs about the world. They have desires about states of affairs they would like to bring about and these desires determine their goals. Their intentions are goals they are committed to achieving. While they plan action to achieve goals these are normally at a high level and can change, adapting to unforeseen circumstances. This framework enables goals to be achieved based on the implementation of and changes to plans in response to changing context and circumstances. For example, a individual's response to bushfire depends on whether they have dependents and the proximity of the dependents to them at the time they become aware of the fire. A individual may plan to pick up a dependent and return home but because of the progress of the bushfire this may change, resulting in the individual going to some other location rather than returning home. It has been assumed that individuals are all located in homes at the time the bushfire commences. This simplifying assumption reflects a lack of data availability and the fact that the focus of this modelling is on the impact of archetypal behaviour rather than activity modelling.

Because the archetypes concept relates to individuals' attitudes and response leading up to a decision to leave or remain, this BDI-based behaviour relates to all individuals in the population irrespective of their archetype once they have decided to leave and have commenced their evacuation journey. For this reason, it is not explored in depth here.

7.3.5 Calibrating the attitudes of archetypes

The model was tuned to further improve the match the between observed reactions of archetypes to environmental stimuli and expected levels of response to these stimuli. The attitudes listed in Table 8 were initially manually assigned uncalibrated values based on evidence in the literature and expert interpretation of quantitative and qualitative bushfire data. A calibration process was then applied to produce the attitude values detailed in Table 8. The

calibration married the archetype uncalibrated attitude values to estimates of their relative response to the listed stimuli. This is detailed as Algorithm 2 in the working paper.

7.4 How archetypes influence model outputs

The integration of attitudes and responses to bushfire, informed by the self-evacuation archetypes, into a dynamic travel demand model for the Castlemaine region has made the outputs of the simulation (model predictions) more complete and possibly realistic. The simulation model produces a greater diversity and complexity of behaviour which is inherent in actual bushfire events. At the same time, it is sufficiently simple and general to be able to be applied in different regions of Victoria. This improvement is important because the outputs of the simulation, including visualisations of traffic, are used by the emergency services to better understand community risks and to improve government planning and preparedness.

Previous versions of the simulation model were based on attitude values that relied on expert interpretation of the literature and experience that did not include evidence of archetypal behaviour which are quantitatively based. Consequently, within the model, the degree of influence that the proximity of the bushfire, environmental cues and warnings had on householders' protective responses, lacked a systematic framework and they exhibited identical attitude values and thresholds. With the incorporation of the archetypes into the simulation model, the greater diversity of individual attitude values and thresholds for protective action, results in a wider range and timing of potential actions. Instead of large numbers of individuals leaving at the same time because of their identical response to bushfire and smoke proximity or warnings, there is a greater variety of response as a result of their archetypal attitudes. For example, Threat Deniers aware of a bushfire emergency in their area, remain much longer than Considered Evacuators because they are much less concerned about seeing smoke and embers, and even visible fire is less of a concern to them. TD are also unaffected by the receipt of official warnings while CE are increasingly concerned about escalating warnings. CE also have a much lower risk aversion threshold for taking a decision to leave than do TD.

The differential influence of bushfire related factors on archetypes' response to a bushfire event, coupled with varying thresholds for starting to engage with the event and ultimately taking protective action, produce more complex and ultimately more realistic decision- making outcomes and simulation outputs. Figure 8 is a screenshot of the evacuation simulation for the Castlemaine region. The large red area is the progressing fire front, and the light glow around its perimeter, the ember front as generated by the Phoenix Rapidfire simulation. Blue dots represent people at home, predominantly in the township of Maldon (off centre) and Castlemaine (bottom right). Individuals considering their decision to act are represented as glowing pink dots and those who have just arrived to pick up dependents are white dots. Of particular interest are the coloured triangles that represent the different archetypes in cars on the road.

While it is extremely difficult and potentially misleading to generalise the outputs of a complex simulation, it is instructive to consider the difference in activity of the archetypes at this point of time in the bushfire event. There are many more Responsibility Deniers (pink) and Worried Waverers (blue) than Considered Evacuators (yellow) and Community Guided (green) on the road. Threat Deniers (orange) and Experienced Independents (red) are not apparent in the simulation at the point in time captured by the screenshot. This is what might be generally expected given archetypal differences although the Jill BDI behaviour in dealing with dependents complicates the story. A complete picture of the activity of the archetypes in the process of decision and evacuation is provided in the simulation video which is attached as supplementary material.

This more complete picture enables a better understanding of the likely types, motivations and protective objectives of people travelling in their vehicles. For example, CE are likely to be attempting to safely leave the area threatened by bushfire whereas EI may be picking up a dependent to then return home. The incorporation of the archetypes into the evacuation

simulation provides the analyst and decision maker insights beyond the heterogeneity of previous models into the hearts and minds of those responding to the threat of bushfire. Stakeholders have confirmed that the model outcomes are generally consistent with their understanding and experience of householder behaviour in bushfire.

The more complex archetype based outputs of the simulation include: vehicle trajectories with individuals timestamped decisions; intelligence on likely congestion bottlenecks within the road network; understandings of likely, worst, best case evacuation outcomes; an analytical tool for the simulation of current weather conditions and possible bushfire scenarios to test response strategies including timing and level of emergency messages sent individuals and traffic control and road block deployments.

7.5 Future directions

The recognition of varying attitudes and responses to bushfire threat through the integration of archetypal behaviours into the dynamic travel demand model (Emergency Evacuation simulator) has contributed to some improvement to the simulation but further refinements are necessary. Further careful examination of the behaviour of the different archetypes through a detailed examination of their trip chains and routes and output log of their BDI reasoning captured in the simulation, as described in the technical paper, is needed for advanced model tuning. Model validation is also highly desirable although this faces some conceptual and practical problems. While the modelling assumes rational individual behaviour, rational thinking may be difficult for some confronted with an imminent and dangerous bushfire threat. More data about household behaviour in the Castlemaine region is also required to confirm calculations and assumptions about the numbers of individuals in archetype groups. Collaboration between the Castlemaine community, emergency services and the researchers is planned to explore the application of the evacuation modelling to community bushfire planning and preparedness.

The fundamental issue of how household dynamics influence protective action decisions and travel demand must be addressed. The model currently describes a household represented by an archetype in control of a single vehicle. It is an open question how a household of two adults, possibly of different archetypal characteristics, with dependents, will respond to a bushfire threat given the evidence in the literature of decisional conflict between household members (Proudley, 2008, Whittaker et al., 2016, Eriksen et al., 2016, Tyler and Fairbrother, 2018) and multi vehicle ownership by 41% of Castlemaine households (Australian Bureau of Statistics, 2019).

The Victorian Government, through the Emergency Management Victoria (EMV)-led Victorian Community Bushfire Evacuation Initiative Working Group, is considering whether the work reported here can be applied and extended into the Dandenong Ranges and the Otway Ranges, two important bushfire prone regions of Victoria. In this context further tuning and validation of the model is extremely important. Findings and understandings from the current modelling process need to be adapted to the unique contexts within the Dandenongs and the Otways.

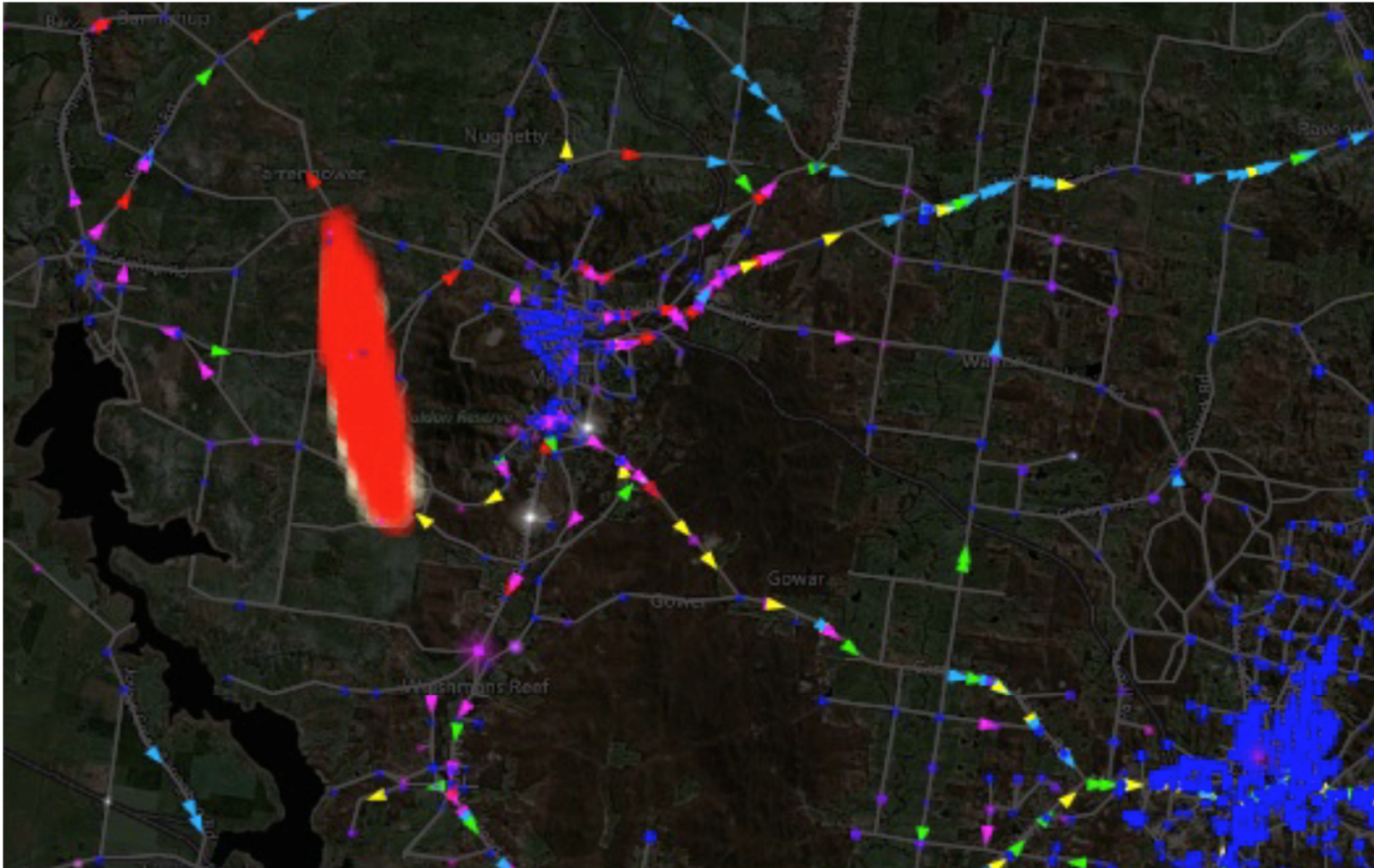


Figure 8: Screenshot of the evacuation simulation for the Castlemaine region

8. Discussion

8.1 Introduction

The objective of this project is to test ways in which recent research insights on bushfire self-evacuation archetypes can be applied to enhance existing approaches by bushfire agencies to community engagement, bushfire evacuation modelling and monitoring and evaluation.

Research suggests that seven self-evacuation archetypes have quite different attitudes and responses to bushfire threat. Consequently, this project has examined, first, how bushfire safety engagement and education can take account of the different needs of householders living in bushfire prone areas. Second, how, including an archetypal lens in agency monitoring and evaluation of bushfire safety activities and programs, produces a broader and deeper understanding of diverse householder attitudes and responses, and clarifies pathways for improvement in program design and targeting. Third, how incorporation of archetypal self-evacuation attitudes and responses to bushfire evacuation modelling contributes to a more comprehensive, systematic and insightful injection of human behaviour into these models.

This chapter discusses the findings from the examination of issues relating to community engagement, monitoring and evaluation, and evacuation modelling, including general findings and those specific to each sub project. Community engagement findings result from a consultation process with CFA and DELWP community engagement practitioners. Findings on monitoring and evaluation arise out of desktop research and analysis by the Research Lead. Findings on vehicular evacuation modelling were generated through a close collaboration between the Research Lead, the Agency Research Lead and Dr Dhirendra Singh, Senior Research Fellow, School of Science, RMIT University.

8.2 General findings

Through the bushfire self-evacuation project, a strong interest in and desire to incorporate self-evacuation archetype thinking into existing and future bushfire safety programs was expressed by bushfire safety practitioners. This support was based on a widely held view that bushfire self-evacuation archetypes provide a clearer and more realistic view of the characteristics of community members living in bushfire prone areas. By enhancing their understanding of the nature of the individuals they are working with, bushfire safety practitioners felt that self-evacuation archetypes would strongly assist their efforts to engage, inform and positively influence community members.

8.3 Findings on community engagement and consultation

Through the consultation process with CFA and DELWP community engagement practitioners we found that these professionals perceive self-evacuation archetypes as a valuable means of understanding and addressing the diversity of individual attitudes and responses that they deal with in their work in bushfire prone communities. They believe that by recognising and working with the archetypal diversity of the individuals within bushfire prone communities, they will more effectively engage with them, encourage and drive attitude and behaviour change and build trusting relationships.

The matrix of archetypal attitudes and perceptions in areas including perceived threat, preparedness and intended protective response is seen by these professionals as providing a research-based framework for systematically broadening and deepening their understanding of key householder attitudes and behaviour and reinforcing their own experiential and anecdotal insights.

Community engagement practitioners reflected on the limited time and resources available to them to engage with individuals 'one on one' and the need to rapidly and accurately assess community members to facilitate positive and effective discussion on bushfire safety. They

believed the insights provided through the archetype lens could be used to engage with community members more effectively.

A means of establishing an individual's archetypal grouping was identified in workshop discussions as fundamental to using an archetypes lens in community consultations. A key finding of this report is that a short, simple questionnaire that can be administered in hard copy or online to identify an individual's archetype, is required by community engagement practitioners.

Once an individual's archetype is established community engagement practitioners want a tool or materials that can be used in the field to facilitate the use of the understandings provided by the archetype analysis. This tool would assist in discussing the individual's attitudes and responses to bushfire and 'nudging' them toward actions to increase bushfire safety. It would also allow them to analyse the attitudes and priorities of community leaders or influencers to better understand how community priorities may form through processes influenced by community leaders. The tool could also be used as a classroom resource or reference in the Building Capacity Program for the training of Level 3 facilitators.

Workshop discussions indicated strong support for a set of flash cards, containing short, simple information about archetypes and an action framework for 'nudging' individuals' attitudes and behaviour. The identification of the need for this community consultation and training resource is a key finding of this project.

8.3.1 Future directions in community engagement

Through the consultations with community engagement practitioners we have concluded that future actions to develop an online tool for classification of individuals into archetype groups, and readily accessible and visually engaging archetype flash cards for field use by community engagement professionals, are required.

A model to provide a demographic profile of archetype groupings within a community at an SA1 level is required to provide the context for community engagement in different localities.

A pilot program within a CBBM community applying archetype insights to facilitate bushfire safety planning and actions could be employed to test the usefulness of the approach.

Co-development of a training program for Level 3 facilitators in the Building Capacity and Capability project is also an important action in refining and extending the skills of community engagement professionals.

An important opportunity exists to draw together community engagement and evacuation modelling initiatives discussed in this report through a scenario planning exercise that would provide new insights into householder attitudes and response to simulated bushfire events based on their archetypal characteristics.

8.4 Findings on monitoring and evaluation of bushfire programs

Theories of change and logic models for bushfire safety programs recognise the importance of meeting householders' diverse needs. Self-evacuation archetypes offer a framework for identifying and better understanding these varied householder needs. Once archetypal insights are applied to bushfire safety programs, their monitoring and evaluation requires both identification of archetypes within surveyed populations and an assessment of the effectiveness of archetype adapted programs in achieving bushfire safety objectives.

This project has discussed how, by applying an archetypal lens the achievement of program objectives can be more clearly demonstrated through a better understanding of householder attitudes, perceptions and needs. This lens also assists in better understanding why householders have these views and needs and how they can be met.

More refined and focused program outcome measures and improved program design and targeting are possible due to a better understanding of householder needs.

By analysing data from the last two CFA post-season surveys (2018 and 2019) against the small number of archetype questions that were included, this report has demonstrated both the feasibility of identifying archetypes in bushfire prone communities and the new insights that can be generated.

The respondents in extreme bushfire risk communities in Victoria were older on average than the Parkerville and Sampson Flat sample. In addition, the Victorian sample had experienced a relatively benign bushfire environment since the 2009 Black Saturday bushfires. These differences in samples resulted in a significant disparity in the proportion of householders in three archetypes (EI, DE and RD) but no fundamental difference in their characteristics. This is an important finding of this project. The post-season surveys addressed issues that had not been previously explored in relation to archetypes and analysis of these data provided new insights into how informed they felt, their participation in bushfire safety programs and perceptions of those programs.

In particular, this project found that archetypes displayed quite different patterns of participation in bushfire safety programs that largely reflect their characteristics. Community Guided (CG), participated to a greater extent, in more CFA bushfire safety programs, than did other archetypes. Consistent with their reliance on community network building, CG attended local meetings on bushfire, developed their fire plans at community workshops, cooperated with their neighbours to improve the safety of their properties and workshoped fire scenarios with local people. CG also actively interacted with their local CFA Brigade as a key part of their support and advice network. Worried Waverers (WW) on the other hand did not participate in any programs significantly more or less than any other archetype.

Dependent Evacuators (DE) participated more than others in programs that provided information about local threat and appropriate response, assisted in planning their protective response and built links with their local Brigade. For DE their participation was a matter of building some knowledge about what to expect during a fire and creating linkages with the CFA Brigade who they hope would come and assist them to leave. Consistent with their focus on immediately evacuating from a bushfire threat, Considered Evacuators (CE) more than others participated both in local meetings on bushfire safety and interacted with the local CFA Brigade for information about the level and likely nature of the threat in the area. More than others CE did not participate in bushfire planning workshops which, with a focus on planning protective response was irrelevant since they planned to immediately leave.

Experienced Independents (EI) more than others, participated only in the local neighbourhood bushfire safety program and less than others interacted with the local Brigade. This pattern of interaction likely reflects EI concerns about the lack of preparedness of properties that impact their own and their belief that their neighbours and the emergency services are ill-prepared and lack capability. Consistent with their denial of a bushfire threat to their property Threat Deniers (TD) more than others did not participate in bushfire safety programs except for building a relationship with their local Brigade which may be their 'insurance' against being wrong about their assessment of threat to their property.

These findings further complete the picture of the self-evacuation archetypes and deepens understanding of the impact of their characteristics on their participation in bushfire safety programs.

8.4.1 Future directions for MER

The self-evacuation archetype concept presents an opportunity for bushfire management agencies to build it into their monitoring, evaluation and reporting frameworks. Actions are needed to review MER frameworks to identify where the archetypes can be incorporated and how they can be applied to further short, medium and long-term objectives of the agencies.

Monitoring, evaluation and reporting instruments including surveys and report templates should also be reviewed to establish how the archetypes can be used to better achieve agencies' bushfire safety and community engagement objectives.

8.5 Findings on using the archetypes in developing evacuation models

By using the insights into individual response to bushfire provided through the self-evacuation archetypes, vehicular evacuation modelling developed for Victorian locations, has been improved. Household response is no longer based on a heterogeneity of household response to bushfire stimuli but now includes differential archetypal responses to environmental cues and official warnings at escalating levels of urgency to act and various levels of risk aversion. The simulation produces a greater diversity and complexity of behaviour consistent with an actual bushfire event.

The simulation now models evacuations that are more varied over time rather than in large bursts of activity driven by identical response to bushfire stimuli. This has the effect of more realistically identifying times and places of likely traffic congestion requiring management and infrastructure that may create pinch points or areas of vulnerability for safe evacuation. The depiction of archetypes on the road during a bushfire event enables a more refined, forensic analysis of householders' evacuation dynamics.

8.5.1 Future directions in developing evacuation models

Further tuning and validation of the current model is required. This involves detailed examination of model outputs and collection of regional household data to allow comparisons between the real world and the outputs and assumptions of the model. Refinement and validation of the current model will also provide a stronger foundation for its planned adaptation to other Victorian bush fire prone regions. There is also a pressing need to address the impact of multi-member household dynamics on the model.

Adaptation of the model to the Otway and Dandenong Ranges requires considerable further work to ensure that it accurately portrays the archetype populations of those regions.

9. Conclusions

9.1 Introduction

Bushfire will become more of a problem in the future.

Government and emergency management agencies make considerable efforts to prepare and protect households from bushfire but their resources are limited.

People living in bushfire prone areas need to take responsibility for themselves and to be capable of preparing their properties and themselves and taking effective protective action when threatened by bushfire.

Bushfire risk reduction strategies can be enhanced by the use of this latest research on self-evacuation archetypes. Bushfire education on engagement strategies provided through community engagement professionals can be enhanced by better understanding the attitudes and likely responses of householders. Dynamic vehicular evacuation modelling requires human behaviour to be systematically included into simulations. Agency monitoring and evaluation frameworks need to more effectively establish householder attitudes and the reasons for them, and to use this information to improve bushfire safety policy and program design. Insights into householder attitudes and behaviours provided by research on self evacuation archetypes can be used in these three key areas to improve community bushfire safety. This use of research evidence is consistent with the aim of the Safer Together Program.

9.2 Community engagement strategies

Bushfire agencies aim to increase community bushfire safety through their programs of community engagement and education. To do this well community engagement professionals need to understand what householders think about bushfire, why they think it and how they are likely to respond to a bushfire threat. Evidence from research on self- evacuation archetypes provides a rich systematic basis of understanding householders attitudes and their likely responses.

Community engagement professionals who participated in this project felt that the archetypes assisted in their understanding of householders and provided a framework for more effective interaction with them. The matrix of archetypal responses provided these engagement professionals with broad and detailed insights into the diverse archetypal attitudes that they deal with in their daily community work. They were highly supportive of the prototype flash cards designed as a tool for one on one and group consultations. Improvements to the prototype tool have been suggested and further consultation to finalise and pilot test in the field, is the subject of future research and action. The archetypes matrix and engagement tool are also seen as important training materials that should be incorporated into agency training for higher level community engagement professionals.

9.3 Monitoring and evaluation

The objective of agency monitoring and evaluation is primarily to better understand the views of community members living in bushfire prone areas and use this information to better design and deliver bushfire safety programs. The use of the archetype lens in monitoring and evaluation of bushfire safety programs enables a more nuanced understanding of the responses of householders, the settings in which programs are most effective and the reasons why programs are more or less effective. Better understanding of householders' motivations and priorities allow bushfire agencies to work more effectively with them, to be seen as responsive to their needs and to gain their trust. In this way the application of the archetypes research enables bushfire agencies to better achieve short, medium and long-term program objectives.

Analysis of data from the 2018 and 2019 CFA post season surveys, which included questions that allowed grouping of respondents by archetype, demonstrated that the concept can be

readily transferred to a population where bushfire risk is extreme but not necessarily recently experienced.

This project has developed questions that can be used by agencies in monitoring and evaluation to establish a respondent's archetypal grouping so this information can be used with other data to provide new insights into householder attitudes and bushfire safety program use. It has also produced an identification framework which will allow community engagement facilitators to establish archetypal grouping of individuals using a hard copy or online survey.

9.4 Dynamic vehicle evacuation modelling

The incorporation of householder attitudes and response to bushfire into dynamic traffic evacuation models is in its formative stages. The Victorian government using the expert resources of RMIT, CSIRO, La Trobe University, and others acknowledged in the Technical Paper, have taken considerable steps in integrating human behaviour into a vehicle evacuation model for the Surf Coast region. The expert interpretation of research evidence and bushfire experience has been used in these efforts. The new evidence provided by research into self-evacuation archetypes has enabled this work to be considerably enhanced, extended, broadened and systematised. Data from the archetypes research has enabled a demographic profile of householders in the Castlemaine region to be matched to archetype demographics. In addition the value placed on environmental cues and warnings in prompting protective action by householders has been explicated by the archetypes research. By applying the archetypes lens a much greater diversity of householder attitudes and responses are modelled and more complex, comprehensive and realistic vehicular dynamics are generated. While the incorporation of the self evacuation archetypes evidence has improved the model, it requires further refinement and validation in order that it can be effectively used in other bushfire prone regions of Victoria.

This project has demonstrated the potential value of using the research evidence on householder attitudes and response to bushfire provided through the archetypal lens, in enhancing fire agency bushfire safety engagement and education programs, integrating human behaviour into dynamic vehicular evacuation models and designing agency monitoring and evaluation frameworks to better understand householder attitudes and responses as a basis for improved bushfire safety program design and targeting.

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