

Bond University
Research Repository



Assessing Emergency Animal Safe Sites for Evacuation

Ogunmakinde, O. E.; Egbelakin, T.; Henderson, R.

Published in:
IOP Conference Series: Earth and Environmental Science

DOI:
[10.1088/1755-1315/1101/2/022044](https://doi.org/10.1088/1755-1315/1101/2/022044)

Licence:
CC BY

[Link to output in Bond University research repository.](#)

Recommended citation(APA):
Ogunmakinde, O. E., Egbelakin, T., & Henderson, R. (2022). Assessing Emergency Animal Safe Sites for Evacuation. *IOP Conference Series: Earth and Environmental Science*, 1101(2), Article 022044.
<https://doi.org/10.1088/1755-1315/1101/2/022044>

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

For more information, or if you believe that this document breaches copyright, please contact the Bond University research repository coordinator.

PAPER • OPEN ACCESS

Assessing Emergency Animal Safe Sites for Evacuation

To cite this article: O E Ogunmakinde *et al* 2022 *IOP Conf. Ser.: Earth Environ. Sci.* **1101** 022044

View the [article online](#) for updates and enhancements.

You may also like

- [Measuring Community Resilience to the Tsunami Disaster \(Study of Sukarame Village, Carita District, Pandeglang Regency\)](#)
D A P Sari and T E B Soesilo
- [Emergency Shelter Design For Disaster Preparation](#)
Abdel Mounaim, Naniek Widayati Priyomarsono and Rudy Trisno
- [Evaluation of Disaster Prevention and Sheltering Index of Stadiums Based on Combination of Normal and Disaster time](#)
B Song, Y Ma and C Y Li

ECS Toyota Young Investigator Fellowship



For young professionals and scholars pursuing research in batteries, fuel cells and hydrogen, and future sustainable technologies.

At least one \$50,000 fellowship is available annually.
More than \$1.4 million awarded since 2015!



Application deadline: January 31, 2023

Learn more. Apply today!

Assessing Emergency Animal Safe Sites for Evacuation

O E Ogunmakinde¹, T Egbelakin² and R Henderson³

¹ Faculty of Society and Design, Bond University, Robina, QLD 4226, Australia

² School of Architecture and Built Environment, University of Newcastle, Callaghan, NSW 2308, Australia

³ Hunter Local Land Services, Tocal, NSW 2421, Australia

Email: bogunmak@bond.edu.au

Abstract. Providing shelters for animals during disasters such as floods, bushfires and storms requires adequate planning and preparedness. Planning for animals during the disaster response and recovery phases is critical to mitigating the negative effects that animal loss or separation can have. The human-animal bond has the potential to influence people's decisions during emergencies, such as how they will respond and when or if they will evacuate. Evacuation with animals during a disaster event can be difficult and complicated. It is critical, however, that animals are rescued and kept safe during and after disasters. Any compromise can result in the death of such animals. Similarly, even in disaster-related situations, animal handling should be consistent with the Australian Animal Welfare Standards and Guidelines. This project aims to better understand disaster preparedness and resilience, as well as the recovery of animals during a disaster event. Twenty-five potential animal evacuation sites, including saleyards, showgrounds, animal shelters, and racecourses, were identified and accessed in nine local government areas (LGAs) across the Hunter region of New South Wales, Australia. On-site survey using a 5-point Likert scale questionnaire was used to collect data. While none of the facilities are of high standard, 16% would require cosmetic work, 76% would require minor work, and the remaining facilities would require significant work. The project's implication is that the assessment guideline can be included in the local council's emergency management plan to improve adequate planning for safe animal evacuation.

1. Introduction

Humans and their belongings, including animals, are frequently evacuated during disasters such as flooding, storms, bushfires, and cyclones to avoid loss of life. A safe evacuation, however, may depend on whether it was planned or unplanned (urgent). The former allows both organisers and evacuees ample time to prepare, pack, and transport necessary items, including animals, whereas the latter does the opposite. Unplanned evacuation, particularly when animals are involved, can be extremely complex and challenging [1], resulting in unexpected circumstances. As a result, planning and preparation are important keywords in animal evacuation. The goal of evacuation in the case of a disaster is to keep rescued animals safe. Human evacuation, as opposed to animal evacuation, is quite common in emergency situations. This has resulted in some planning and preparations by local governments, such as the identification and inclusion of human evacuation centres (HEC) in emergency management plans (EMPlan). While there are few or no provisions in the EMPlans for animal evacuation, animal owners are entrusted with the responsibility of evacuating their animals and transporting them to HEC. According to Brackenridge et al. [2], such behaviour contributes to evacuation failure and may



jeopardise human safety [3]. Although HECs are safe for humans, they are frequently inadequate for animals because they were not designed for such use, and the size and typology of animals may pose a challenge [4].

Another issue for animal owners is locating safe places in or near their community, according to a study conducted by Gurtner and Parison [5]. As per the study, in the event of a disaster, more than half of animal owners are unsure where to take their animals, and another third are unsure whether they should take them at all. People's decisions during emergencies, such as how they will respond and when or if they will evacuate, may be influenced by the human-animal bond. Any compromise can result in the death of such animals. During the 2019-2020 bushfires in Australia, nearly three billion animals were killed or displaced, and many threatened species and other ecological communities were severely harmed [6]. This high percentage of losses highlights the importance of adequate pre-disaster planning for the evacuation of animals to safe locations during a disaster event. It also emphasises the importance of continuing to care for animals in safe places during a disaster. Such safe havens and care, however, must adhere to the Australian Animal Welfare Standards and Guidelines.

It is critical for potential animal safe places to have basic facilities, equipment, biosecurity, and emergency protocols, as well as access to water and feed troughs. The adequacy and condition of the infrastructure are also important considerations. As a result, it is critical that facilities capable of meeting these requirements be identified, assessed, and ready for emergency animal evacuation. Livestock saleyards and regional showgrounds are examples of existing facilities that could provide emergency animal shelter. District pony clubs, dog kennels, and catteries can also help to a lesser extent. Temporary cages may be available at commercial veterinary hospitals and clinics, but they are rarely accessible after hours. Horse, dog, and harness racetracks may be appropriate refuges in more urban areas. Hence, understanding disaster preparedness and resilience, as well as identifying facilities that can serve as safe havens for animals during emergencies or disasters, is critical.

Several studies have been conducted in Australia to investigate animal emergency evacuation. Taylor et al. [7], for example, investigated pet animal preparedness and evacuation, whereas McCarthy et al. [8] investigated animal emergency preparedness and planning. It is obvious that these studies focused on pets. There is little or no research in Australia on stock animal preparedness and evacuation. As a result, this research was carried out to help fill this gap and to provide first-hand information about the condition of potential animal safe sites in the Hunter region. The study provides insights into a variety of safety issues, such as the structural adequacy of potential sites for both animals and their owners, the vulnerability of potential sites to bushfire and flood, as well as site accessibility, capacity, communication, and utilities. The main objective of the study was to investigate the physical condition of proposed animal safe places and their various elements to determine the type and extent of maintenance work required to bring them up to the minimum standard for an operational animal evacuation site. The remainder of this paper is organised as follows: Section 2 discusses the methodology and research protocol adopted for the study. Section 3 provides the results in accordance with the main objective and discusses the research findings. Section 4 presents the conclusion and identifies limitations and areas for future studies.

2. Materials and Methods

This study followed a five-stage process as shown in Figure 1. The first stage was the development of facility registers. This involved a desktop review through online medium to identify potential safe animal places across the Hunter region. In addition, extant information about animal evacuation during disasters were sourced. This cumulated into identifying potential facilities for animal evacuation. These Facilities were determined based on their location, availability, suitability of existing facilities, and capacity. After a careful consideration in consultation with the Hunter Local Land Services, 25 facilities were identified (see Table 1) to meet the basic requirements of animal shelters.

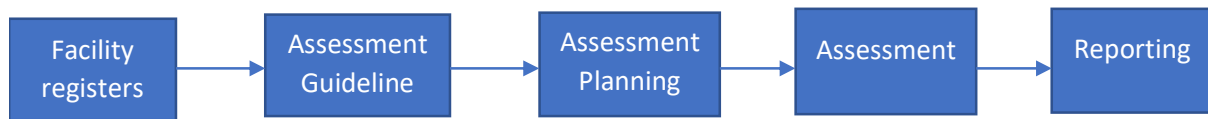


Figure 1. Study process.

Table 1. List of facilities identified from the facility register

Facility	Local Government Areas								
	Cessnock	Maitland	Singleton	Upper Hunter	Dungog	Mid-Coast	Muswellbrook	Lake Macquarie	Newcastle
	SG1	SG2 SY3	SG3 SY6 AF1	SG4 SY5 AF2	SG5 SG6 SY1	SG7 SG8 SG9 SG10 SG11 SG12 SY2 SY4 SY7 RC1	SG13	SG14	RC2

Stage two involved the development of the assessment guideline. Following on from the first stage and utilising the information obtained, we developed an assessment guideline for the facilities. The requirements of relevant guidelines and policies including the Australian Animal Welfare Standards and Guidelines, biosecurity, and emergency protocols were considered in developing the assessment guideline. The guideline focused on assessment criteria such as site access, capacity, infrastructure, utilities, and experience of previous disaster. The assessment questions were structured to collect quantitative data via the 5-point Likert scale (1 = Poor; 2 = Fair; 3 = Average; 4 = Good; and 5 = Excellent).

Stage three was the planning of the assessment. Prior to attending the sites, we contacted managers and/or representatives of the potential sites to inform them of our visit and to seek their consent to participate in the study. Overwhelmingly, we had approvals from all the proposed sites. Logistics including transportation, geographical location and weather conditions were considered in this stage. Stage four involved the actual assessment of the facilities. We visited all the sites to undertake an onsite assessment of the physical conditions. The assessments were conducted over a five-month period (January – May 2021). The assessment guideline collected data on the condition of the facilities, number and type of animals that can be accommodated, accessibility during disasters, and availability of animal management equipment such as water and feed troughs, loading ramps, and yards/stables. Data collected were analysed via descriptive and inferential statistics. The last stage involved the reporting of findings and ranking of the facilities for suitability during disasters.

3. Findings and Discussion

The assessment provides a large amount of data about the condition of each facility. The condition was scored on a five-point Likert scale, 1 to 5 (i.e., 1 = Poor; 2 = Fair; 3 = Average; 4 = Good; 5 = Excellent). Similarly, "Not Available" (NA) was used when a condition or factor was unavailable. The raw score for each facility in conjunction with closely related assessment considerations are presented in relevant figures and tables.

3.1. Participation

The assessment included 25 facilities from nine local councils in the Hunter region, including 14 showgrounds, seven saleyards, two racecourses, and two animal facilities. Most of the facilities (40%) are from the Mid-Coast local council, and 60% are showgrounds. A representative from each of the 14

showgrounds, ranging from show committee presidents to groundskeepers, took part in the assessment on behalf of the showground committee (see Figure 2). In terms of the saleyards, participants in the assessment varied from managers to owners, with managers representing racecourses and animal facilities. All participants were asked to participate voluntarily. According to the findings in Figure 2, the majority of participants are show committee presidents (5), followed by council representatives (4), sales managers/supervisors (4), and show committee secretaries (3). The findings imply that these participants can provide accurate information about their facilities and actively participate in the assessment process.

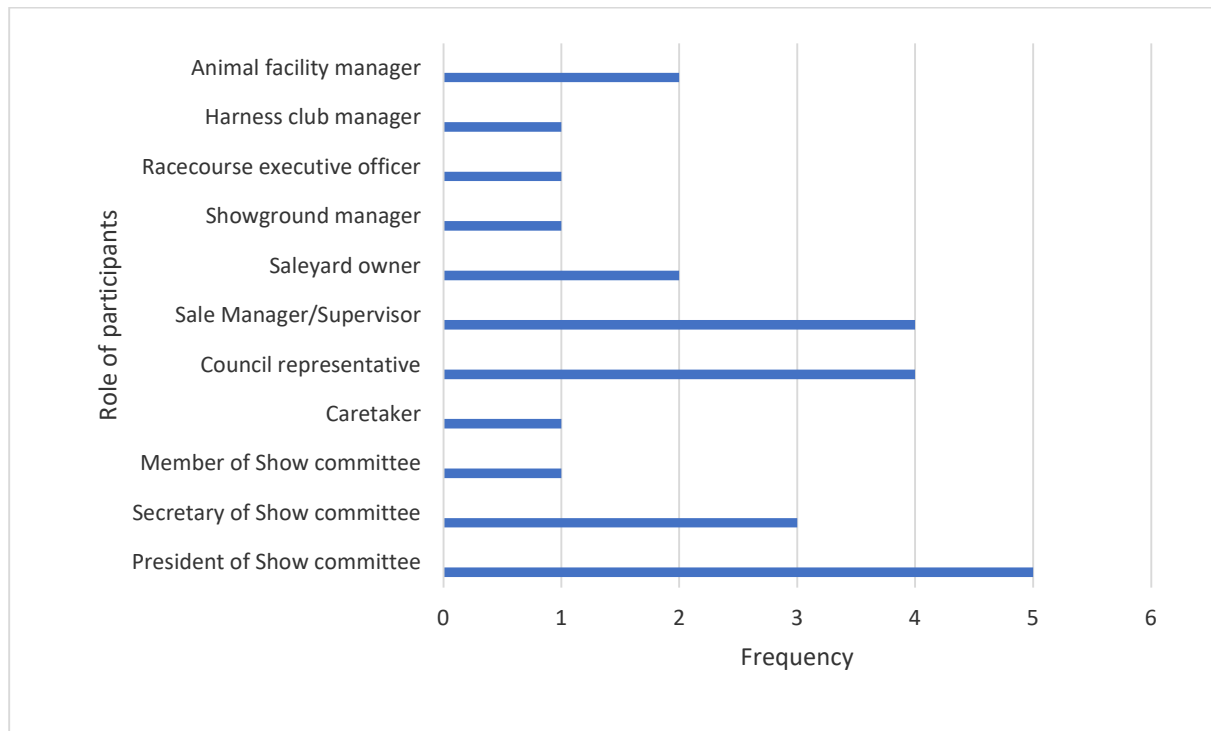


Figure 2. Participants' roles.

3.2. Characteristics of the facilities

One of the most important characteristics of the facilities assessed is their ability to hold and handle animals in accordance with Australian Animal Welfare Standards and Guidelines. This emphasises the importance of assessing each facility's potential capacity, the types of spaces available, and the conditions of those spaces. The assessment results indicate that the number and type of animals that each facility can handle varies depending on the size and space available (see Table 2). According to the findings, animal saleyards can hold more animals than showgrounds and racecourses. This is because they were designed for it, implying that they would be the first option if a large number of animals are needed to be evacuated. Furthermore, some of these saleyards can accommodate animals of varying sizes.

3.3. Conditions of the animal handling equipment

When determining safe places for animal emergencies, the ability of each facility to cater for different animal sizes (small, medium, large, and extra-large) is critical. Similarly, the availability of animal shelter (both covered and open) and animal handling facilities such as crushes, yards, pens, sheds, scales, fodder bins, and feed troughs would aid in the smooth transition, operation, and ongoing care for animals during disasters. In addition, it is crucial to consider the availability of a quarantine space/area as well as the potential for animal injury and hazard. Hence, an estimate of space availability for various animal sizes would be appropriate. Figure 3 depicts the availability and condition of some animal handling

equipment and considerations such as hay/feed shed, wash bay, quarantine space, and water and feed troughs. The condition of the equipment was ranked on a scale of 1 to 5, with 1 = Poor; 2 = Fair; 3 = Average; 4 = Good; 5 = Excellent; NA = Not Available. The availability of hay shed allows for the storage and preservation of animal food. Sixteen (64%) of the facilities assessed have hay sheds in diverse states of repair, ranging from average to excellent. Likewise, 56% of the facilities have wash bays (with conditions ranging from average to excellent) where trucks or vehicles can be washed down to prevent the spread of any disease outbreak.

Table 2. Size and estimated number of animals per facility

Size	Animal	Facility																								
		AF1	AF2	RC1	RC2	SG1	SG2	SG3	SG4	SG5	SG6	SG7	SG8	SG9	SG10	SG11	SG12	SG13	SG14	SY1	SY2	SY3	SY4	SY5	SY6	SY7
Large	Horse	N	100	100	110	20	80	100	80	60	80	80	20	60	105	60	50	100	60	15	200	100	20	30	100	500
	Cattle	N	30	N	10	40	30	50	30	40	35	50	30	250	50	40	500	400	20	35	400	2000	30	1500	3000	1000
Medium	Sheep	Y	Y	N	N	15	50	Y	Y	N	Y	Y	Y	Y	50	Y	Y	100	Y	N	N	100	Y	N	2000	2000
	Goat	Y	Y	N	N	15	50	Y	Y	N	Y	Y	Y	Y	50	Y	Y	100	Y	N	N	100	Y	N	2000	2000
Small	Dog/cat	Y	N	N	N	Y	Y	Y	Y	N	Y	N	Y	Y	150	N	Y	Y	Y	N	N	Y	Y	N	Y	N
	Poultry	20	N	N	N	20	100	144	20	20	25	N	20	Y	50	N	200	Y	20	N	10	N	20	N	30	N

Key: Y = Yes; N = No

According to the findings, animal handling equipment are available at all facilities, but its condition varies. There is currently no dedicated space for animal quarantine in seven (28%) of the facilities. However, if the need arises, there are spaces that can be used for that purpose. Figure 3 shows that only five (20%) of the 25 facilities lack water and feed troughs. The remaining 20 facilities' water and feed troughs are in average or good condition, and they may need to be renovated or replaced if necessary. The implication of this finding is that the government agencies in charge of animal care and evacuation should take these characteristics into account when determining suitable and appropriate facilities for animal emergencies in the Hunter region. Similarly, it suggests the need to upgrade facilities that lack one or more pieces of equipment or whose equipment is in poor condition to meet the requirements of the Australian Animal Welfare Standards and Guidelines.

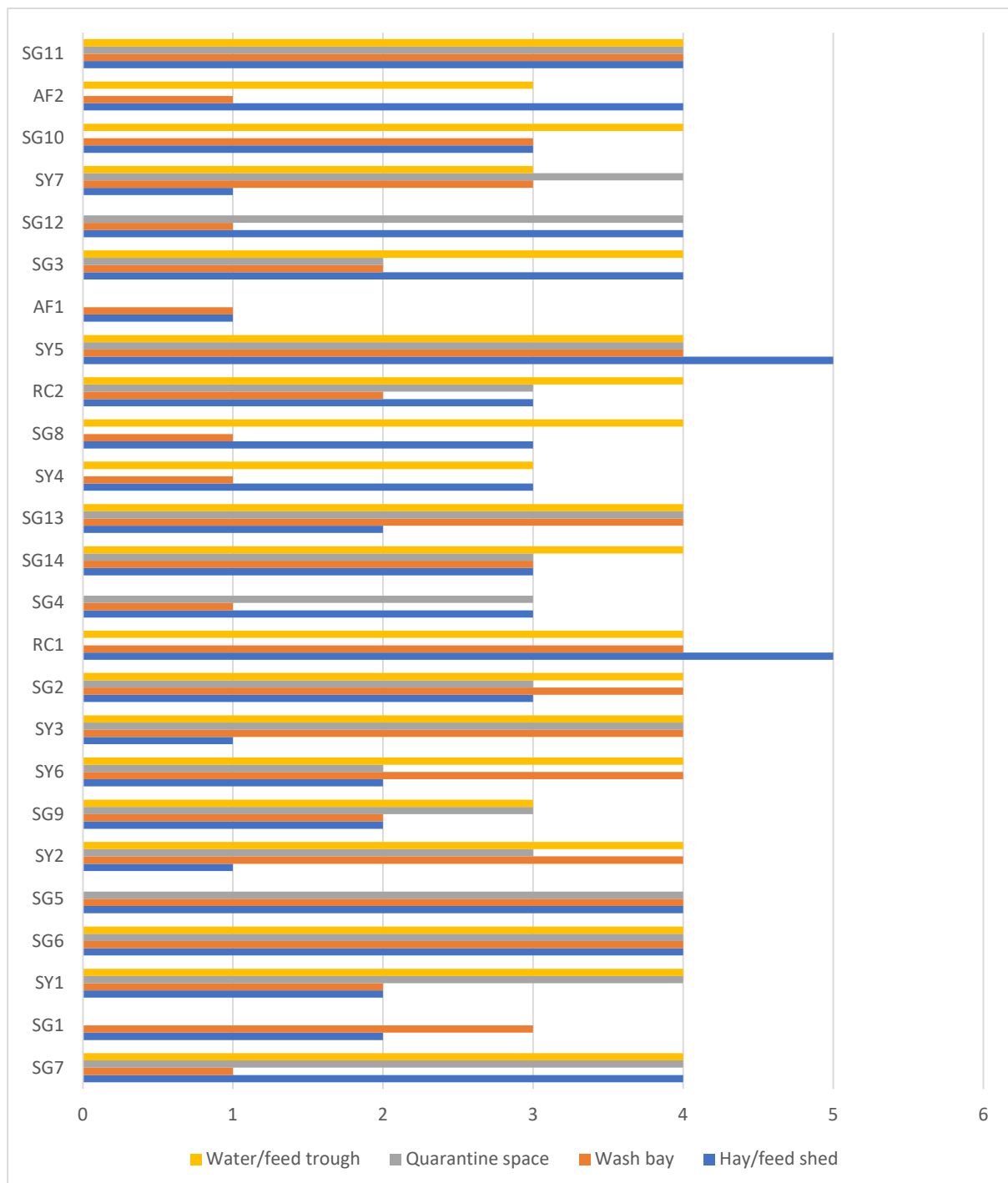


Figure 3. Animal handling equipment and space.

3.4. Evacuation routes

Identifying evacuation routes, including any impediments and alternatives if primary routes become inaccessible, is a critical consideration in evacuation planning. Road closures during a disaster can be caused by a variety of factors, including flooding, proximity to a bushfire front, and hazardous trees. Table 3 shows the results of an assessment of the access road(s), primary evacuation routes, and alternative routes for each of the facilities. The findings reveal that eight (32%) of the 25 facilities do not have either primary evacuation routes or alternative routes. This highlights the importance of carefully considering each facility on a case-by-case basis to determine its suitability, especially when it comes to evacuation routes, in order to avoid a double tragedy.

3.5. Site Access

Access to the site is an important factor to consider in animal emergencies. Because disasters can occur at any time of day or night, it is critical for animal safe places to be easily accessible and capable of providing some level of safety for the animals and their owners. Therefore, the site access, including unauthorized entry, suitable entry, and exit, fencing, and disability access were assessed and ranked on a scale of 1 to 5, with 1 = Poor; 2 = Fair; 3 = Average; 4 = Good; 5 = Excellent; NA = Not Available. Although most of the saleyards are private property, they are available for use in the event of a disaster by contacting the owners or managers. Access to the showgrounds (as a public facility) is unrestricted but may be limited by locked gates and buildings/facilities where necessary and applicable. It comes as no surprise that all the facilities have adequate access and egress. As shown in Figure 3, quite a few (16%) of the facilities do not have disability access, and the condition of those that do ranges from fair to good. The implication of these findings is that potential animal safe places do provide some level of safety, but some improvements, particularly the provision of disability access ramps, may be required.

3.6. Infrastructure

Infrastructure is vital, especially when it comes to the operation of government agencies in charge of animal care and the stock themselves. For the government agency, an office space/room that can be used for animal profiling and equipment storage may be required. Stables or pens would be required for animals, particularly large and medium-sized ones. The infrastructure's condition was assessed and ranked on a scale of 1 to 5, with 1 = Poor; 2 = Fair; 3 = Average; 4 = Good; 5 = Excellent. According to the results summarised in Figure 4, all the facilities assessed have an office space that is in good condition and can be used for profiling and registering animal owners and their stocks. This would improve the government agency's smooth operation and effective management of the evacuation processes. Furthermore, the condition of stables and pens (where applicable) was assessed, and the results show a range of conditions ranging from poor to good (Figure 5). This indicates the need for renovation, particularly for those classified as fair and average, in order to keep animals and workers safe on the site. Four of the facilities, on the other hand, lack storage space for Agriculture and Animal Services Functional Area (AASFA) equipment, whilst the others have fair to good storage. The availability of a storage facility for AASFA equipment would help the evacuation process by mitigating the stress of material logistics.

Table 3. Site access and evacuation routes

Site Access	Facility																								
	AF1	AF2	RC1	RC2	SG1	SG2	SG3	SG4	SG5	SG6	SG7	SG8	SG9	SG10	SG11	SG12	SG13	SG14	SY1	SY2	SY3	SY4	SY5	SY6	SY7
Primary evacuation route(s)	NA	2	1	2	2	1	1	1	NA	1	2	1	1	NA	2	1	1	2	NA	1	NA	1	NA	NA	NA
Alternative route(s)	NA	2	1	3	3	2	2	2	NA	2	3	1	1	NA	2	2	1	3	NA	2	NA	1	NA	NA	NA

NA = Not Available

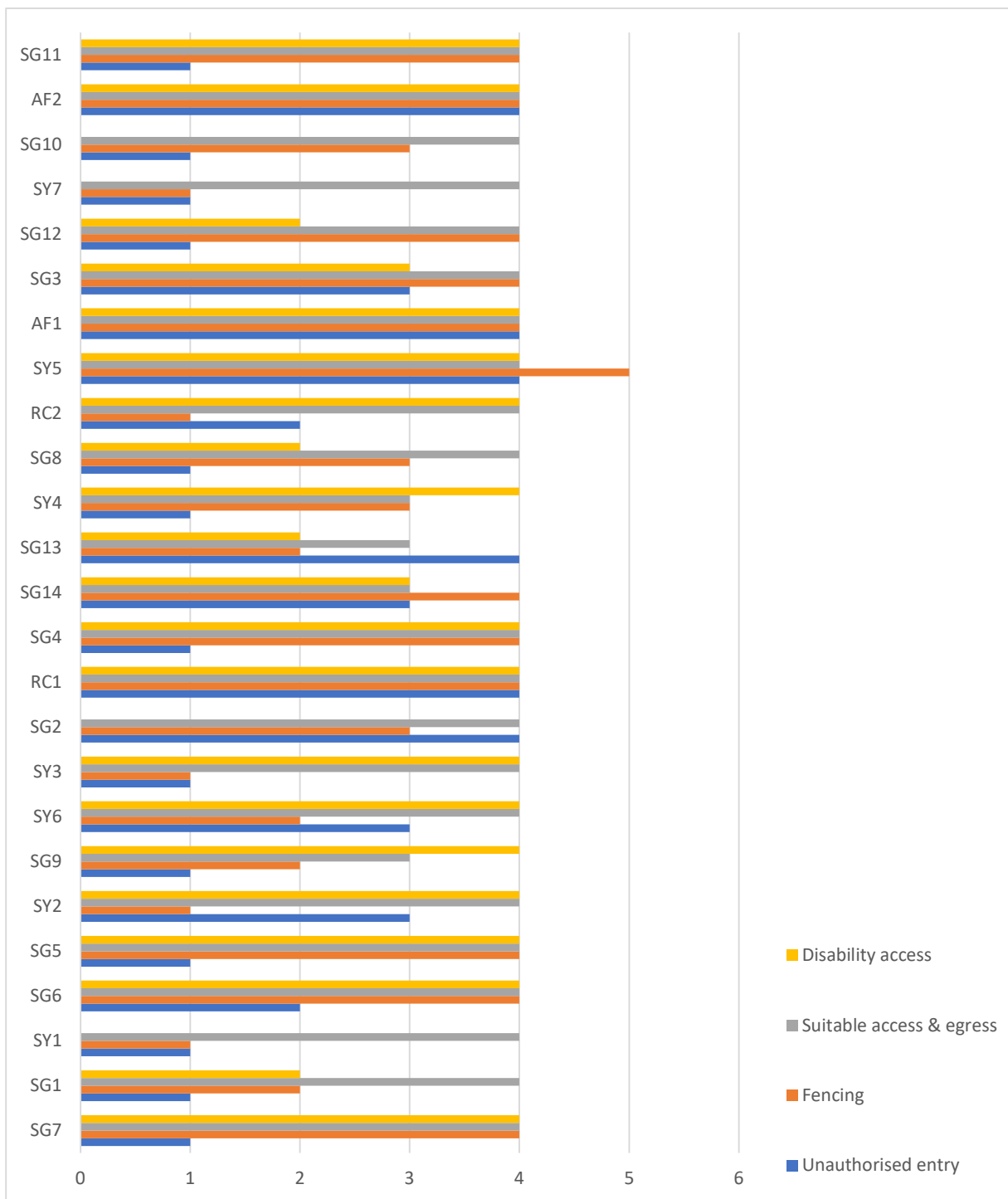


Figure 4. Conditions of site access

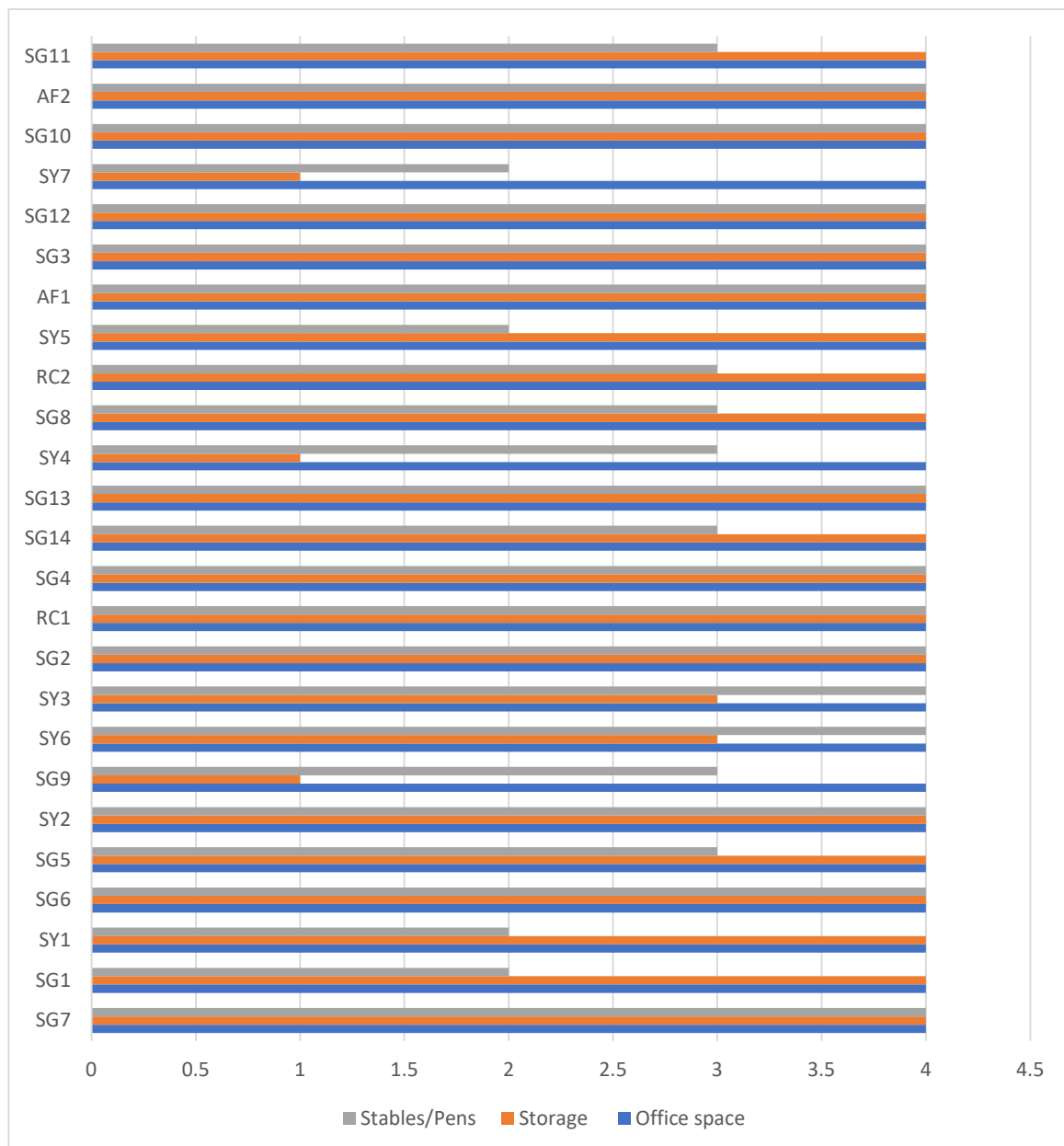


Figure 5. Conditions of infrastructure

3.7. Prioritisation of facilities

The susceptibility of the facilities to bushfire and flooding is critical to the evacuation procedure. Because the evacuation's purpose is to transport the animal to safety, it is critical to ensure that the facilities do not pose a risk due to their vulnerability to bushfire or flooding. A standardised relative rating system (Table 4) was adopted to assess the overall condition of the facilities as well as their vulnerability to flooding and bushfires. Prioritisation of facilities was done based on the assessment of their condition and risk vulnerability.

Table 4. Condition ratings

Condition	Description
A	Facility is well maintained and in high standard (exceeds requirements)
B	Facility would require some cosmetic work (meets requirements)
C	Facility would require some minor work (suitable with additional equipment)

D	Facility would require major works (major works required)
E	Facility is in a bad condition and not habitable (below requirements)
Risk priority	Description
1	Bushfire (Facility not suitable for use during bushfire)
2	Flooding (Facility not suitable for use during flooding)

The results (Table 5) show that 76% of the facilities are in "C" condition, meaning that they are suitable but would require some additional equipment such as mobile pens and yards. Similarly, 8% of the facilities are in "D" condition, suggesting that, while they are fit for use, considerable work, such as stable refurbishment, would be required to be completed. It is worth noting that 16% of the facilities evaluated meet the Australian Animal Welfare Standards and Guidelines and can be used with or without some cosmetic work. This suggests that facilities classified as "C" or "D" require urgent renovation or remedial work to bring them up to standard required in time for the bushfire season. On the other hand, 44% of the facilities are vulnerable to bushfires, implying that they cannot be used during a fire outbreak, and 24% are vulnerable to flooding. Likewise, 8% of the facilities are vulnerable to both bushfire and flooding, making them unsuitable for animal evacuation during disasters. These findings imply that the government agency in charge of animal care will be able to choose whether to renovate facilities. They also act as a reference for determining which facilities could be used in the event of flooding or bushfires. These findings will also help animal owners make informed decisions about where to take their animals in the event of a disaster.

Table 5. Prioritisation of facilities

Condition and risk	Facility																										
	AF1	AF2	RC1	RC2	SG1	SG2	SG3	SG4	SG5	SG6	SG7	SG8	SG9	SG10	SG11	SG12	SG13	SG14	SY1	SY2	SY3	SY4	SY5	SY6	SY7		
Condition	B	B	C	C	C	C	C	C	C	C	B	C	C	C	B	C	C	D	D	C	C	C	C	C	C		
Risk priority	1	-	2	-	1	2	-	1	2	1	-	1	1	2	2	1&2	2	1&2	-	-	1	1	1	1	1		
Rank	3	1	18	5	8	18	5	8	18	8	1	8	8	18	4	24	18	25	23	5	8	8	8	8	8		

Key: A – Exceeds requirements; B – Meets requirements; C – Suitable with additional equipment; D – Major works required (consider other locations). 1 – Not suitable during bushfire; 2 – Not suitable during a flood

4. Conclusions

This study investigated the physical condition of proposed animal safe places and their various elements to determine the type and extent of maintenance work needed to bring them up to the minimum standard for an operational animal evacuation site. The assessment was carried out in five stages, including the creation of a facility register, assessment guidelines, assessment planning, actual assessment, and reporting. A 5-point Likert scale questionnaire was used to assess all 25 potential animal safe places on-site. In this study, all 25 identified animal safe places were represented by a variety of people who could provide authentic information about the sites.

The characteristics of the facilities assessed revealed that saleyards have a greater capacity to hold animal sizes ranging from large to small. In terms of animal handling equipment condition, more than half of the facilities have average to excellent hay sheds and wash bays, while less than half have dedicated animal quarantine space. As a place of business, access to the facilities is normally in good to exceptional condition, with some level of security for animals and their owners due to the presence of fences and gates. The state of the stables and pens ranges from poor to good, indicating that they should be renovated before use. Prioritization of the facilities revealed that seven facilities meet requirements and would require cosmetic work, while the remaining facilities would require minor and major work.

The findings of this study should help government agencies, local councils, emergency management teams, and other stakeholders plan for and consider renovation/upgrade of potential animal safe places. It can provide some information that would be included in the emergency management plans of local councils within the Hunter Region. It would also be a valuable resource for government agencies and

animal owners in determining where to take their animals in the event of a disaster. This paper is part of a larger study in which data was collected using both quantitative and qualitative methods.

5. References

- [1] Taylor M, Lynch E, Burns P and Eustace G 2015 The preparedness and evacuation behaviour of pet owners in emergencies and natural disasters *Australian Journal of Emergency Management* **30** 18-23
- [2] Brackenridge S, Zottarelli L K, Rider E and Carlsen-Landy B 2012 Dimensions of the human–animal bond and evacuation decisions among pet owners during Hurricane Ike *Anthrozoös* **25** 229-38
- [3] Zottarelli L K 2010 Broken bond: An exploration of human factors associated with companion animal loss during Hurricane Katrina *Sociological Forum* **25** 110-22
- [4] Chadwin R 2017 Evacuation of pets during disasters: a public health intervention to increase resilience *American journal of public health* **107** 1413-7
- [5] Gurtner Y and Parison S 2021 Promoting owner responsibility for pets in disasters *Australian Journal of Emergency Management* **36** 37-43
- [6] Royal Commission 2020 Final Report: Royal Commission into National Disaster Arrangements Available from: <https://www.royalcommission.gov.au/system/files/2020-12/Royal%20Commission%20into%20National%20Natural%20Disaster%20Arrangements%20-%20Report%20%20%5Baccessible%5D.pdf>
- [7] Taylor M, Eustace G and McCarthy M 2015 *Animal Emergency Management in Australia. An audit of the current legislation, plans, policy, community engagement resources, initiatives, needs, and research dissemination* Report for the Bushfire and Natural Hazards Cooperative Research Centre, Melbourne Australia
- [8] McCarthy M, Bigelow J and Taylor M 2018 Emergency preparedness and planning for animals: A case study in the Blue Mountains, NSW *Australian Journal of Emergency Management* **33** 50-6