Evaluating aspects of hazard awareness, safety message effectiveness and behavioural compliance among visitors to the Glaciers, Westland National Park, New Zealand

A report prepared for the Franz Josef Area Office
Department of Conservation

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INTRODUCTION

This report presents the results of a recent survey and evaluation of visitor awareness of natural hazards and warning messages, including their reactions to safety messages proposed for the Glacier valley walks in Westland National Park. The primary purpose of this report is to provide baseline data for the future identification of trends related to visitor awareness of hazards and warning signs, and the sources of safety information for visitors to these sites. The report also outlines a simple method for the collection of visitor observation data related to visitor behaviour at the glacier walks entry and closure points. Baseline data for each of these observation settings is presented. Finally, the report documents a formative evaluation exercise designed to provide guidance around the most appropriate warning messages to employ at the Glaciers.

The visitor management issue of limited hazard awareness, and high levels of non-compliant visitor behaviour around existing DOC warnings, has prompted several reviews of the human dimensions of glacier hazard management (Bogie, 2007; Espiner, 2007). Other research (Hayes, 2008; Espiner, 1999) has also documented the issue of visitor actions around warnings at the Glaciers.

The present study, in part, follows the call for re-development of interpretive signage at the Glaciers, to increase the personal relevance to visitors of the inherent dangers at the Glacier sites (Espiner, 2007). In his report (Espiner, 2007, p.7) emphasised the need for the following:

1. Design and test an interpretive panel that develops the theme of risk, perhaps even telling the story of a person whose life changed as a result of an accident at one of the glacier sites. Creative signs that detail the consequences of risk-taking behaviour have been trialled at other nature-based sites (see Parkin and Morris, 2005). Interpretive messages have been shown to capture and hold visitor attention more effectively than traditional static text-based signs (Moscardo, 1999). An interpretive safety sign is likely to assist visitors to make informed decisions about the consequences of misadventure.
2. Create a performance measure for non-compliant behaviour that can be applied consistently at the two glacier valleys. Once accurate baseline data has been established, and a target for compliance determined (eg no more than 20% of visitors failing to comply) this will allow monitoring of visitor behaviour (compliance) over the medium and long-term, and allow managers to ascertain the effects of modifications in the way visitors are managed / messages are communicated at these sites. It is important that such monitoring is standardised and measured over an extended timeframe since it is trend information that is most significant, especially given that natural conditions in the valleys create inconsistencies in accessibility.

The present study (in conjunction with concurrent work undertaken by *Interptech*) begins to address these two dimensions of visitor management at the Glacier Valley Walks, and reports on visitor awareness and impressions of existing hazards and warning signs, and an evaluation of proposed interpretive images. In addition, visitor behaviour around information panels at the track entry points, and the roped closure points was monitored and the findings are reported here.

SUMMARY OF STUDY APPROACH

The study was conducted at Fox and Franz Josef Glacier Valley Walks between February 15 and February 23, 2010. Data were collected using a quantitative survey instrument and observation and monitoring techniques. The survey (and evaluation of proposed safety messages) was limited to those visitors over the reported age of 15 years, with sufficient competency in English language comprehension.

Two research assistants, working in tandem, covered the two study sites over the project period. A schedule of observations and visitor surveying was followed (see Appendix 1).

Observations at Entry Points

Observations of visitor behaviour around the interpretive and information panels at the entry points to both glacier valley walks were undertaken on each day of the study period (see Appendix 2 for details). Observers were located in such a way that their own actions would not arouse suspicion. Careful tallies were made of the number of visitors passing the panels, and a record of those who stopped was made. Basic information including the visitor's gender, estimated age, group size, and the length of time spent attending to the panels was recorded (see Appendix 3). A total of 2650 visitors were observed between the two sites over the period of data collection.

Observations at Closure Points

Visitors approaching the current closure point[1] were observed from an unobtrusive vantage point near the roped closure. Observations took place on each day of the study period and approximated the schedule (as weather permitted) provided in Appendix 4. Simple descriptive information was collected in the case of each visitor arriving at the closure point. This included a description of gender, estimated age, group size, and whether or not the visitor complied with warning messages. For each visitor, the observers also recorded if non-compliant visitors were visible at the time, and whether or not guided groups were visible beyond the roped closure (including those groups already climbing the glacier). In total, 1534 visitor observations were documented.

Visitor Survey

Visitors to Fox and Franz Josef Glaciers during the study period of February 15-23 were the target population. Surveyors were situated in such as way so as to ensure a clear view of visitors returning from their walks, but sufficiently removed from any hazard warning signs that might influence the visitors' responses to the survey (ie., not right next to a sign or barrier). Visitors were approached and asked to participate in the study on their return from the glacier walk. This provided visitors with an opportunity to form an impression of the site, as well as be exposed to the various existing warning messages before engagement with the survey questions.

Participants were selected according to a random system which gave each visitor during the survey period an equal chance of involvement in the study (see notes to research assistants Appendix 2). Basic profile information was collected from visitors who declined to be interviewed, to assist in the reporting of the non-response rate.

The visitor survey was entirely interviewer-administrated, ensuring a clean data set (ie., no surveys were self-completed by visitors). The survey form was divided into three sections: i) 'your impressions of the glacier walk' (including awareness of hazards and hazard signs,

[1] At the time of the study, the closure point at both sites was the glacier terminal face.

sources of safety information); ii) 'impressions of safety messages (an evaluation of safety message images); and iii) 'about you and your visit'. Some questions relied on a Likhert-type scale and these were printed on a laminated sheet for respondents to view. The safety messages for the evaluation in part ii of the survey were colour printed on laminated cards and spiral bound for durability and to make it simple for visitors to review and comment. A copy of the survey is presented in Appendix 6.

Response Rate

A total of 263 visitors to the selected sites were approached by the research assistants and invited to participate in the survey. Of these, 203 visitors agreed to take part, and completed the on-site survey. This represents an overall response rate of 77%. In terms of the profile of non-respondents, most (76%) were visiting Fox Glacier, and slightly more than half (58%) were male. The most common reasons given by visitors for declining involvement were 'lack of time' (43%) and 'language difficulty' (25%).

Data Analysis

Data were entered on an Excel spreadsheet, and later transferred to SPSS (version 17.0) for analysis. The data presented below are largely of a descriptive nature, although the potential is there for more detailed interpretation of the material.

RESULTS

Characteristics of the sample

The sample represents 203 visitors to Fox and Franz Josef Glaciers intercepted for interviews between February 15 and 23, 2010. The sample is divided evenly between the two sites. Of those participating, 55% were women, and 45% were men. The vast majority (87.7%) of respondents were from outside of New Zealand, with the most common countries of origin 'other Europe' (25.6%), 'United Kingdom' (21.2%) and 'Australia' (14.8%). Combined, the UK, Germany and other Europe accounted for more than half of respondents (55.2%). The age profile of visitors can be depicted as those under 30 years of age (25.6%), those between 30 and 49 (25.2%), and those over 50 years of age (46.3%).

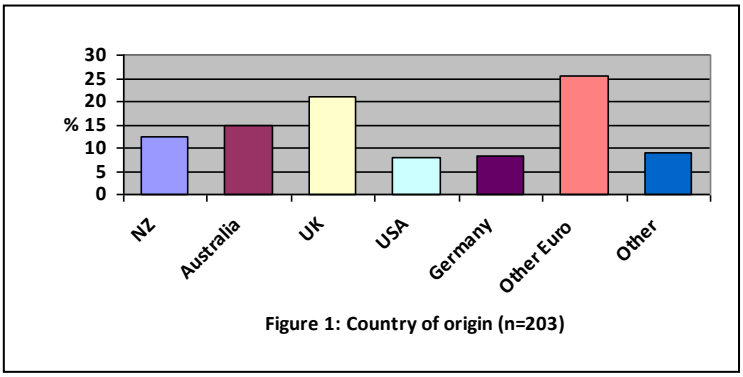

Figure 1: Country of origin (n=203)

As expected, most people visiting the Glaciers are doing so with others. Only a small proportion (6.4%) was 'alone'. The most common group types were 'with partner' (57.1%) and 'with friends' (19.2%). Probably reflecting the timing of the survey (after the New Zealand school holidays had finished), fewer were visiting 'with family' (12.3%). Less than 5% reported being part of an 'organised tour'[2].

For most respondents (86.2%), this was their first visit to one of the glaciers of Westland National Park. Significantly, almost half (44.3%) reported having visited both glaciers – either as part of the current visit, or on a previous occasion.

Reported awareness of hazards and hazard warning signs

Respondents were asked if they had noticed any natural hazards or dangers as part of their valley walks[3]. Almost three quarters (73.4%) of the visitors said they had not. Of those who did notice natural hazards, rock fall (67%) was the most commonly reported. Very small numbers of visitors noticed 'icefall' (11%) and 'river' (5.5%) hazards.

While personal awareness of hazards was very low, nearly all visitors (95.6%) reported awareness of signs or messages warning of natural hazards. Respondents originating outside of Australasia were more likely[4] to report awareness of signs (98%) than those from

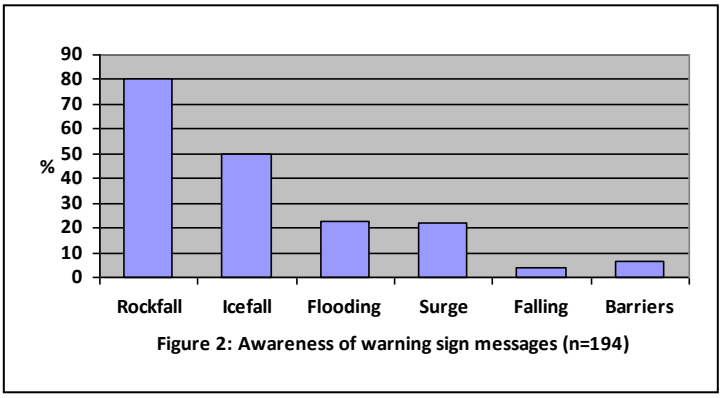

Figure 2: Awareness of warning sign messages (n=194)

[2] The survey excluded visitors engaged in commercially guided walks on the glaciers. Those respondents who reported being part of organised tours were not glacier guided visitors

[3] Percentages in this section do not add to 100 since respondents were permitted multiple responses for questions asking about awareness of specific hazards, signs, and their position.

[4] x^2=7.46, df=1, p=.006

Australia and New Zealand combined (89%). Visitors were most likely to mention messages related to 'rock fall' (80.4%) than any other message. Relatively high numbers of visitors were also aware of warning messages about 'icefall' (50%), 'flooding' (22.3%) and 'river surge' (22%). Only 6.7% of respondents specifically mentioned 'barriers'. All responses were unprompted.

Those visitors who reported an awareness of hazard warning signs were also asked to specify where they noticed these signs. As above, responses were unprompted. The most frequently reported location for visitor awareness of warning messages were the terminal faces of the glaciers (76%). Just over half (51.7%) of respondents specified the car park, and 44.3% identified 'along the walk or trail'.

Respondents were also asked specifically about their awareness of any signs, ropes or barriers that restricted access to parts of the glacier valley. Again, awareness among visitors was strong, with 89.7% reporting that they had seen such signs or barriers. When asked if they had entered any areas restricted by signs, ropes or barriers, the vast majority (93%) claimed they had not[5]. Of the small number (n=13) of respondents who admitted entering the restricted areas, the most common reason for doing so was 'to get a better photo' (70%).

Respondents were asked if they understood why ropes and barriers had been used to restrict access to parts of the glacier sites. Of those who responded to this question (n=189), 'to keep visitors safe from rock fall' (58.7%), 'to keep visitors safe from icefall' (45%), and general comments about keeping visitors out of danger (16.4%) were the most common, unprompted responses.

Using a scale of 1 – 7 (where 1= 'not at all' and 7 = 'very') respondents were asked 'how dangerous' the natural hazards are to visitors who go past the signs, ropes and barriers. Two thirds (67.7%) of respondents claimed that it was 'dangerous' (selecting a 5, 6 or 7 on the scale), with 27% stating that it was 'very dangerous' (selecting a '7' on the scale). For future comparative purposes, the mean score on this scale was 5.16.

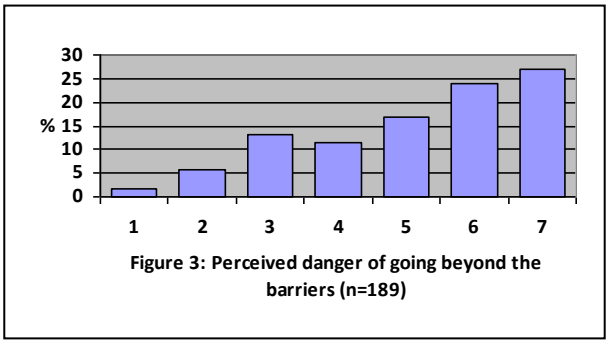

Figure 3: Perceived danger of going beyond the barriers (n=189)

There appeared to be no statistically significant differences in the mean 'danger' scores between sites, but differences were identified for some visitor types. For instance, those who admitted entering the restricted areas had significantly lower scores on the scale (3.85), compared to those who did not enter (5.26)[6]. Surprisingly, men (5.56) scored the behaviour of entering restricted areas as more dangerous than their female counterparts (4.85)[7]. Further analysis showed that New Zealand visitors had significantly higher scores on the danger of ignoring the barriers (5.92), when compared to international visitors (5.04)[8].

[5] The 7% who admitted they had entered restricted areas corresponds closely with the observed rate of compliance presented later in this report
[6] F=9.194, df=1, p=.003
[7] F=8.766, df=1, p=.003
[8] F=6.29, df=1, p=.013

Awareness of safety information available

In order to understand the off-site sources from which visitors may have obtained safety-related information, respondents were asked a series of questions about their awareness of safety information prior to their arrival at the glaciers. More than half (57.6%) of those interviewed, recalled seeing or hearing information about safety at the glaciers before they began their walk in the glacier valley. This was especially the case for those visiting Franz Josef Glacier, of whom 65% recalled safety information prior to arrival, compared with 50% of their Fox Glacier counterparts[9]. When prompted for the location of this safety information, the most common responses were 'brochure' (56.5%), 'DOC visitor centre' (37.6%), and 'guide books' (36.5%). Just 5.8% mentioned the web as a source of safety information. In a separate question, respondents were also asked if, in planning for their trip to the glaciers, they had visited the DOC website. The vast majority (89.2%) had not done so.

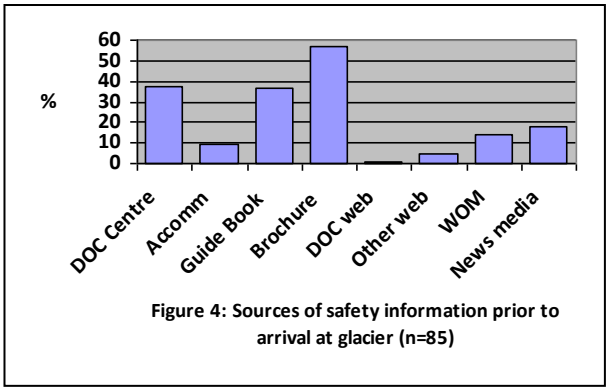

Figure 4: Sources of safety information prior to arrival at glacier (n=85)

Respondents to the survey appeared satisfied with the extent of safety information available to them at the glacier sites. Just 11.8% of visitors, when prompted, agreed that they would have liked to see more information about safety on their glacier walk.

Visitor behaviour at Entry Points

The behaviour of visitors at the Glacier Valley Walks entry points (the car park areas of both Fox and Franz Josef Glaciers) was monitored as per the observation schedule (see Appendix 1 and 2). Combined, the total number of visitors observed was 2650 across the two sites. Of these, 911 visitors were recorded as having stopped to attend to the interpretive panels or information signs. This represents slightly over one third (34%) of all visitors to the two sites at the time of the observations. A comparison of sites shows that visitors to Fox Glacier are less likely to stop to read the panels[10]. At Fox, 30% of those observed, at least paused to view the signs at the track entrance. This compares with 38 % of visitors to Franz Josef Glacier.

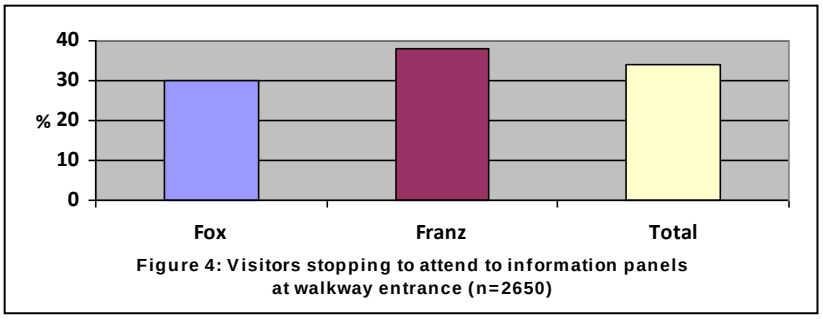

Figure 4: Visitors stopping to attend to information panels at walkway entrance (n=2650)

[9] $x^2 = 4.37$, df=1, p=.036
[10] $x^2 = 19.44$, df=1, p<.001

Records were also taken of the time visitors spent attending to the messages on the information and interpretive panels. The average time spent attending to the signs / panels was 31 seconds. This average is inclusive of a range from fewer than 5 seconds, to 180 seconds (3 minutes). While visitors to Fox Glacier may be slightly less likely to stop and attend to the messages at the entrance to the valley walk, on average they did spend longer (34.5 seconds) than their Franz Josef counterparts (28.5 seconds) at the panels once they did stop. When the data is collapsed and re-analysed, 57.9% of all respondents spend less than 30 seconds at the panels; 23.7% spend more than 30 seconds, but less than one minute; and only 18.4% spend one minute or more attending to the panels. Other analysis shows that there are statistically significant differences between sites for time spent at the interpretation panels[11]. Nearly two thirds (63%) of Franz Josef visitors spent fewer than 30 seconds at the panels, compared with 52% of Fox visitors. Fox visitors (29%) were more likely than Franz visitors (19.8%) to spend between 30 and 59 seconds at the signs. No statistically significant differences were found for the variables of gender, age or group size.

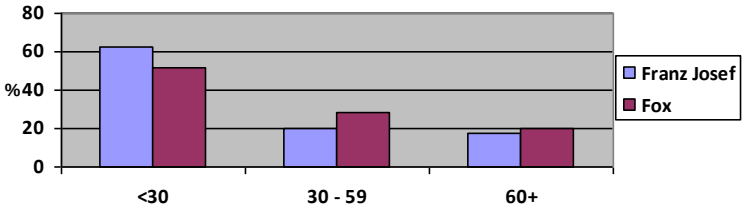

Figure 6: Time (seconds) spent attending to messages on information panels at walkway

Visitor behaviour at Closure Points

A total of 1534 visitor observations were recorded across the study dates. Of these, only a very small proportion (4.7%) failed to comply with the warning messages. In other words, the compliance rate across the glacier valley sites was 95.3%. It is also useful to emphasise that this compliance rate compares favourably to the rates reported in previous studies. Espiner (2001) reported a maximum compliance rate of approximately 80% at both glaciers[12], and Corbett (2001), in a study at Franz Josef, found the compliance rate to be approximately 70%. Hayes (2008) showed how the position of the closure point could dramatically influence compliance with his findings revealing compliance rates at Fox of 83% (closure at terminal face) far out-stripped the compliance at Franz of 55% (closure points at the end of the forest walk or at Champness Rock).

Further analysis of visitor characteristics and compliant behaviour in the present study revealed some statistically significant differences. While there was almost no difference in compliance between Fox and Franz Josef Glacier, analysis of gender[13], age[14] and group size[15] showed that certain characteristics were more common among non-compliant visitors. For instance, men, who made up 51% of the observation sample overall, accounted for almost 70% of the non-compliant visitors. Similarly, those whose estimated age was under 30 years, were much more likely (8.2%) than those aged 30-49 years (2.9%) or 50+ years (3.1%) to ignore safety messages. This age group, comprising less than one third of all visitors, accounted for 56% of non-compliant behaviour. Group type also appears to be a factor in non-compliant actions of visitors, with 'couples' (3.3%) only half as likely as 'singles' (6.5%),

[11] (x^2=10.24, df=2, p=.006)
[12] Post installation of pictorial images similar to those now used at both glacier sites
[13] x^2=9.57, df=1, p=.002
[14] x^2=20.06, df=2, p<.001
[15] x^2=10.1, df=3, p=.018

groups of 3-5 people (6.4%) and groups of 6 or more (7.2%) to transgress the defined boundary.

Statistically significant differences were also found for instances where other non-compliant visitors were clearly visible to new visitors arriving at the point of observation[16]. When non-compliers were visible, the visitors were three times more likely to non-comply themselves (rate increased from 3.9% to 11.6%). In 75% of the cases where visitors ignored the warning signs, there were already visitors beyond the roped closures.

The influence of other people beyond the barrier ropes did not appear to extend to commercially guided groups. In one third of the observations recorded, guides and their clients were visible beyond the roped closure point (typically climbing the glacier). Non-compliance was found to be lower (2.8%) when guided groups were present, than when they were absent from view (5.7%). This effect was shown at both glacier sites, and found to be statistically significant[17].

The time of day also appears to be a factor influencing compliance. Those visiting the glaciers after 10.30am but before 2.30pm were almost four times more likely (6.6%) to transgress the rope closure, compared to those visiting after 2.30pm (1.7%)[18].

[16] x^2=18.45, df=1, p<.001
[17] x^2=6.18, df=2, p=.013
[18] x^2=24.3, df=3, p<.001

Evaluation of proposed interpretive images

Respondents were presented with a set of six colour graphical images depicting possible interpretive messages warning of hazards at the glaciers. Each respondent was asked to evaluate various dimensions of each image, and their comments were recorded by the interviewer[19]. A set of pre-coded responses was not shown to the respondent, but used to make the recording of responses more efficient. Responses not fitting the pre-coded options, were recorded verbatim, and later post-coded for analysis. The images are attached as Appendix 5. A summary of the findings is presented below (Table 1).

Table 1: Visitor interpretations of the main messages contained in each image (n=202)

Visitor interpretation of message	Image 1	Image 2	Image 3	Image 4	Image 5	Image 6
1.Do not cross any ropes or barriers	59.0	61.4	57.4	55.0	44.1	47.5
2.Do not get too close to the glaciers	1.4	1.0	1.0	1.0	0.5	0
3.Think before crossing the rope or barrier	0.5	21.3	1.0	0.5	0.5	1.0
4. Visitors have been injured or killed at the glaciers in the past	12.0	2.5	1.5	0.0	0.5	1.0
5.Rockfall and icefall are hazards at the glaciers	9.0	4.0	4.0	3.5	1.5	1.5
6. It's not cool to go too close to the glacier	0.0	0.0	0.5	0.0	26.0	2.5
7. Safety is the responsibility of the visitor	0.5	1.5	3.0	36.0	1.5	4.0
8. It's not smart to cross the ropes or barriers	1.0	1.5	1.0	1.5	8.4	32.1
9. The glacier / ice can collapse	0.5	1.0	1.0	0.5	0.5	0.5
10.You *can* cross the ropes or barriers	1.0	0.5	0.0	1.5	2.5	11.0
13.You could be injured or killed	10.0	4.0	3.0	3.0	9.5	5.5
14. General risk / danger / safety	13.0	9.0	11.5	7.0	7.4	4.0
15. You must obey the signs	2.5	2.0	1.5	2.0	1.5	1.5
16. Take care and pay attention	8.0	0.0	2.0	2.5	0.5	0.5
17. It's not worth the risk	0.0	0.5	20.3	0.5	0.5	1.0
19. You will freeze	0.0	0.0	0.0	0.5	2.5	1.5
11. Don't know	1.0	0.5	2.0	1.5	9.0	10.0
12. Other	4.0	1.5	3.5	3.0	5.0	4.0

The data show that, for most of the six images, the central message understood by visitors is 'do not cross any ropes or barriers'. Between 44% and 61% of all respondents identified this as the main theme. Beyond this, visitors were able to identify specific sub-themes inherent in each of the images, although not at high rates. In Image 1, just 12% of the respondents made specific mention the historical accidents theme; in Image 2, one fifth of visitors referred to the 'think before you act' message; in Image 3, a similar proportion (21%) reported the 'it's not worth the risk' idea. Interestingly, over one third (36%) of the sample recognised the message of 'visitor responsibility' – the highest recognition for any them outside the 'do not cross the barriers' message. In Image 5, one quarter (26%) of respondents noted the 'it's not cool' theme; and in Image 6 about one third (32%) of visitors recognised the 'it's not smart' idea.

To this extent, all of the images presented to the respondents had good recognition rates. It is worth noting, however, that Images 5 (9%) and 6 (10%) had higher proportions of respondents who said they did not know what the message was, compared to Images 1 – 4 (where 'don't know' responses were all under 2%).

[19] As anticipated, some respondents offered more than one interpretation for some images. The figures presented show the proportion of respondents who offered each interpretation.

Dimensions of the proposed images

Participants in the study were asked to evaluate each of the images in terms of a prescribed set of characteristics. Evaluations were made using a seven point scale on which 1= 'not at all', and 7 = 'very'. These dimensions were designed to help establish the most effective messages. Table 2 presents the mean scores for each of these items.

Table 2: Mean scores for visitor evaluations of message dimensions (n=202)

	Clarity	Convince	Authority	Language	Appropriate	Attractive
Image 1	5.53	5.10	4.57	6.01	5.36	4.74
Image 2	5.47	4.99	4.41	5.97	5.26	4.88
Image 3	5.57	5.20	4.85	5.96	5.44	5.43
Image 4	5.47	4.95	4.63	5.90	5.19	5.24
Image 5	4.74	4.17	3.38	5.30	4.43	3.44
Image 6	4.49	3.96	3.34	4.95	4.26	3.41

As is evident in Table 2, most of the images tested scored well (mean scores of 5.0 and above) on the dimensions of clarity, the ease with which the language used could be understood, the appropriateness of the content, and the attractiveness of the colours, graphics and fonts used. Lower scores were achieved for most of images in the dimensions of how convincing the message was, and the degree of authority conveyed. A clear division is also evident in the findings, between Images 1-4 and Images 5 and 6, with the latter scoring lower than the former in almost every dimension tested. To the extent that high mean scores on each of the dimensions above correlate with effective messages, the mean scores can be added to demonstrate the relative effectiveness of each image. Using this approach, Image 3 (total scale score of 37.88) appears to be more effective than any other image. Images 1, 2 and 4 scored between 30 and 31.3, whereas Image 5 and 6 scored 25.46 and 24.41 respectively.

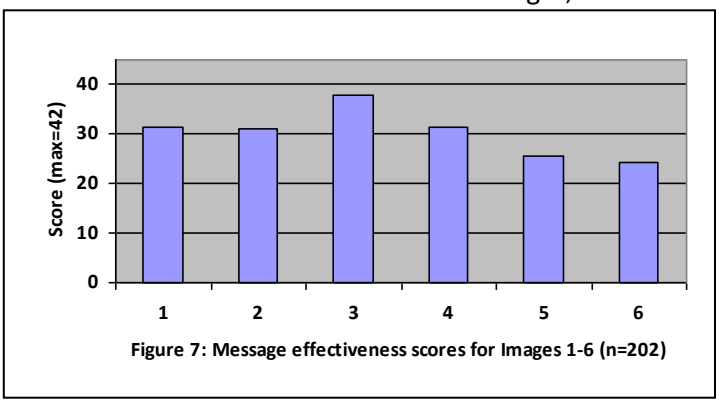

Figure 7: Message effectiveness scores for Images 1-6 (n=202)

In other analysis (not shown) the differences in the Image evaluations is also clear. For the purposes of presentation, the scale score of 5, 6, and 7 have been combined to represent the affirmative end of the spectrum (ie., the scale points to the right of the neutral point). While more than half of the sample felt that Images 3 (61.6%), 4 (53.2%) and 1 (52.2%) were 'authoritative', fewer than one quarter of respondents felt this way about Images 5 and 6 (both 23%). Older visitors (those aged 50 years and over) were much more likely[20] to agree that Images 5 and 6 were 'authoritative'. Similarly, Images 1 – 4 were rated as 'clear' by at least 75% of respondents, but less so for Image 5 (58.1%) and Image 6 (51.7%).

There were also some statistically significant differences between visitors in the way that images were evaluated. For instance, women (23%) were more likely[21] than men (8%) to be unconvinced by the message in Image 1. Women (19.3%) were also more likely[22] than men (5.6%) to find Image 1 'inappropriate'. Respondent age group also appears to influence reactions to warning messages, with the those aged under 30 years (66.6%) much less

[20] x^2=11.2, df=2, p=.024
[21] x^2=8.22, df=2, p=.016
[22] x^2=8.8, df=2, p=.012

likely[23] than those aged 30-49 (89.3%) and over 50 years (81.3%) to rate Image 3 as 'attractive'.

These evaluative findings were confirmed further when respondents were asked which of the six images was best at helping them understand the importance of remaining behind the barriers (Figure 8).

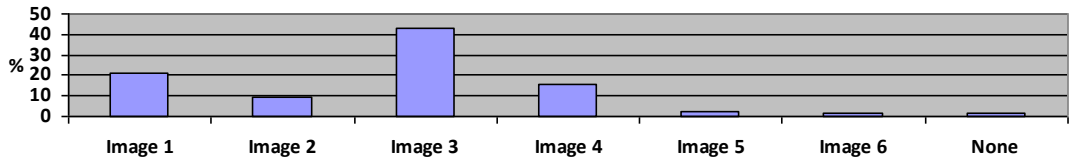

Figure 8: Visitor perception image best at conveying the importance of staying behind the barriers (n=202)

The data in Figure 8 clearly demonstrate that Image 3 is perceived as the most effective illustration for communicating the importance of staying behind the safety barriers. Images 5 and 6 were considered to be the least helpful in portraying this particular message.

[23] $x^2 = 15.37$, df=4, p=.004

DISCUSSION AND RECOMMENDATIONS

This section of the report provides a brief summary of the key findings, and draws some relevant conclusions regarding the management of visitors around the natural hazards present at the two glacier sites. On the basis of these conclusions, recommendations are made.

Awareness of hazards and safety messages

While most visitors had not noticed any specific natural hazards themselves, there was very high awareness of signs and warning messages (especially rock fall). Nine out of every ten visitors is aware of the existence of warning signs, and eight out of every ten visitors is specifically aware that there are signs and barriers that restrict access to parts of the glacier valley walk for reasons of visitor safety. Furthermore, two thirds of visitors perceive the action of crossing the barriers (un-guided) is 'dangerous'. Based on this evidence, we conclude that **visitor awareness of safety messages at the two sites is generally high, and that the key messages are understood**.

While slightly more than half of visitors interviewed obtained some relevant safety information off-site, an important minority (43%) reported no awareness of safety-related information about the glacier valley walks prior to their arrival at the sites. Surprisingly perhaps, 'brochures' were cited as the most common source of safety information. The DOC website hardly registered with visitors in this regard. This suggests that **one area where there is significant scope for improving the delivery of pre-arrival safety information is through the DOC website**.

Behaviour at the walkway entry points

Approximately one third of all visitors to the glacier valley walks did stop, even if only briefly, to attend to the information and interpretation panels at the entry points. While this proportion is, perhaps, higher than might have been predicted, it is significant that two thirds of visitors appear to ignore the panels altogether. It is also important to emphasise that even those visitors who do stop at the panels spend very little time looking at the text and images, with most spending less than half a minute. Based on this evidence, we conclude that:

i) **more could be achieved in capturing and holding the attention of visitors at the entry point panels**; and
ii) **the importance of highly salient and image-based messages is critical given the brief time devoted by visitors to the messages on the panels**

Compliance at closure points

Behavioural compliance with the safety messages and barriers at the terminal closure points, during the time of the observations, was generally very high (95%). This result compares favourably with rates reported by other studies in the last ten years (Corbett, 2001; Espiner, 2001; Hayes, 2008). It is also important to note that the anecdotal evidence of managers, and previous observation studies, have reported that compliance behaviour is variable, and dependent on the glacier access conditions, along with other situational factors. It needs to be emphasised that, at the time of this evaluation, access to both

glaciers was excellent, and the weather conditions mostly fine. Based on this evidence, and our knowledge of previous research examining this issue, we conclude that **the current compliance rate of 95%, is at the top end of what is realistic to achieve at either of these two sites. Such a figure may be appropriate as the basis of a standard to apply at this particular closure point.**

Although the numbers are small, it is evident that certain groups are over represented among non-compliant visitors. As may have been expected, the worst offenders are young, male and in groups of 3 or more. **The Department stands to make the greatest overall improvements to visitor compliance rates (at the current closure point or at other closure points in the future) if it can select messages and other behaviour modification strategies that target less compliant groups**.

Evaluation of proposed hazard warning messages

Visitor comprehension of core messages in each of the six proposed images was generally very high, although there are clear differences between how the various message dimensions were rated. On the basis of the analysis of visitor reaction to the prescribed set of illustrations, we conclude that **the most effective interpretive images for the Glacier sites should be selected from Images 1 – 4. The single most effective message appears to be Image 3**.

CONCLUSION

The issue of visitor management at the glacier sites is complicated by a variety of conditions including the iconic status of the natural attractions; the local community's expectation of easy access; the vigorous promotion of the glaciers in photographs and brochures; the freedom of access principle governing national parks; the high proportion of international visitors; the presence of guided clients (who can be conspicuous in the valley – attracting the attention of independent visitors who then may assume that it is safe to travel further); and the relatively benign appearance of the glacier and river (Espiner, 2007). DOC continues to work at mitigating the effects of some of these factors, and its regular use of signs, symbols and barriers to convey safety messages appears to be relatively effective at present.

Conditions at the sites can, of course, change over time and managers need to remain informed about the status of the closure points they use. Hence, we recommend that, using the approaches described in this report, the Department creates a performance measure (standard) for non-compliant behaviour that can be applied consistently at the two glacier valleys. Using the initial baseline data reported here, targets for compliance can be determined (eg., between 90-100% compliance at the glacier terminal face closure point) and monitored over the medium and long-term, allowing managers to ascertain the effects of modifications in the way visitors are managed and messages are communicated at these sites. It is important that such monitoring is standardised and measured over an extended timeframe since it is trend information that is most significant, especially given that natural conditions in the valleys create inconsistencies in accessibility. Any standards proposed should be linked to defined management actions to be employed if standards are breached.

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Approximate schedule for tasks

Time periods need not be applied precisely. Some adjustment may be necessary to ensure that sufficient visitor surveys are completed (minimum of 100 at each site). May need to take some time from entry point observations (when there are surveyors working) and allocate this time to surveying (applies to both Fox and Franz). This could add the equivalent of 3 additional hours to the surveying task.

Alternate days at Franz and Fox. Continue for 8 days. Four days at each site.

Day 1: Franz

Time	**Task**	**Surveyor**
0930 - 1100	Entry point observations	A Bo
1100 - 1230	Closure point observations	B
	Visitor survey	A
1330 – 1500	Entry point observations	A B
1530 - 1700	Closure point observation	A
	Visitor survey	B
Evening	Data entry	A B

Day 2: Fox

Time	**Task**	**Surveyor**
0930 - 1100	Entry point observations	A B
1100 - 1230	Closure point observations	B
	Visitor survey	A
1330 – 1500	Entry point observations	A B
1530 - 1700	Closure point observation	A
	Visitor survey	B
Evening	Data entry	A B

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Interview and Observation Guidelines

- Consult survey schedule to determine which activity is relevant

- Situate yourself in the appropriate interviewing or observation zone (as discussed with the project leader)

Selecting respondents for interview
All adult visitors to the glaciers are part of the study's target group. Adults (for the purposes of this study) will be taken as those people over the approximate age of 15 years.

Situate yourself in a location where you will have a good view of visitors returning from their walks (this will have been agreed with the project leader beforehand). Make sure this location is away from any hazard warning signs that might influence the visitors' responses to the survey (ie., not right next to a sign or barrier).

Visitors should only be approached and asked to participate on their return from the glacier walk. This will give them an opportunity to form an impression of the site, as well as be exposed to the various existing warning messages.

Participants should be selected on a random basis. That is, approach people according to a random system which gives each visitor an equal chance of selection. I recommend that you use a wristwatch to decide when to approach a potential respondent or group. For instance, decide that when the second hand on your watch reads 30 seconds, you will approach the next person to cross a previously identified imaginary line, or point (perhaps a landscape feature). If (as will often be the case) a group of people are walking together, choose the person in the group who has the next birthday (and is 15 years or over).

When you approach a group of visitors, you should identify yourself quickly, and say something like:
Hi! My name is Stephen, and I'm conducting some research on visitors to this Glacier. This is a Department of Conservation study aimed at improving the visitor experience of this place. We are especially interested in your opinions and awareness of hazards and safety in this area. Could you spare 5 minutes to participate in a short survey?*

[*If you're talking to a group, you might then say: *could I please speak to the person aged 15 years or older who next has a birthday. The interview will only take 5 minutes*]

If the person you have approached declines to be interviewed, please record this refusal on the *non-response record*. Try to note down all the details you can, including the reason why you think the person refused. Following a refusal, leave about two minutes before approaching another visitor. This may help avoid having a string of visitors refuse (simply because they saw someone else turn you down).

Interviewing the respondent
Once you have secured the interview, you need to briefly explain the requirements to the respondent. This information is located on the top of each questionnaire (you can read this out if wish). There should be no need to give the survey form to the respondent, as all responses are to be recorded by the interviewer. Some questions rely on a scale and these are printed on a laminated sheet for respondents. One set of questions relates to a set of images. These are also printed on laminated sheets for respondents to look at.

Some respondents will very happy to talk – during and after the interview. Some of the comments may be useful and you can note these down. Try to limit your general conversation after the interview so that you can engage another visitor.

Some general guidelines
- Wear your identification badge at all times in the field
- Always be polite and courteous
- Withdraw from situations where (a) the respondent becomes angry or aggressive; (b) the respondent is ingenuine; (c) the respondent looks upset or disturbed by the contents of the questionnaire.

Recording Observations
One of your tasks is to spend time each day making observations of how visitors behave around the existing information panels and glacier closure points. In particular, we are interested in how visitors react or respond to different hazard safety signs.

At the entrance to the glacier valley walk
At the time specified in the survey schedule (or as other times as directed) position yourselves at the observation point previously identified by the project leader. Situate yourself in such a way that you can easily observe visitors approaching the panels, and their movements immediately around these messages. Using the observation sheets provided, record the number of individual visitors who pass the panels, carefully noting the number of visitors who stop to look at the messages on the panel. One surveyor should record the total visitors past the defined point; the other surveyor should record the number of people who stop to look at the panels. Both surveyors should make notes about how people behave in general around the signs (eg., do people read together? Are those who stop different from those who don't - men / women; singles/couples/groups?)

It is important that the period of recording the total number of visitors matches exactly the period recording those stopping to read the panels. The observation sheets relating to each observation session should be kept together for later data entry.

For part of the observation period (approximating one third of the total observation session), both surveyors should devote their attention to the total time (in seconds) that each visitor spends looking at the panels (Observation Log C1 and C2). For this task, the surveyors will identify a single visitor in each instance and record basic data about him / her (see the log sheet). Most importantly, you will need to measure the period of time he or she remains stationary, attending to the messages on the panels (time measured in seconds). Surveyors will need to make sure that they do not record the same visitor. Select the next visitor for observation as soon as the previous visitor has moved on.

For the purposes of this observation exercise, all visitors (including children) should be counted, except those visitors taking part in a commercially guided tour (identifiable by their clothing).

At the glacier closure points
At the time specified in the survey schedule (or as other times as directed) position yourselves at the closure point previously identified by the project leader. Situate yourself in such a way that you can easily observe visitors approaching the closure point, and their movements immediately around the various barriers and messages. Using the observation sheets provided, record the number of individual visitors who reach the closure point, carefully noting the number of visitors who continue beyond it (these are the 'non-compliers').

It is important to carefully count (tally) the people who act against the advice on the signage. Make notes about any behaviour such as people climbing on the glacier (without guides), standing immediately beneath the overhanging ice, or people who break the barrier once they've seen others go across. Please be careful to count people only once, and note down the precise time period during which your observations were made.

Data entry
All data must be entered into the excel spreadsheets provided. I suggest you do this task at the end of each day.

Please make sure that a code is entered into each cell of the spreadsheet. For this study, the follow codes are generic:
77 = meaningless response
88 = no response required / necessary (not applicable)
99 = no response given (although it was requested)

For the visitor codes on the questionnaires, please ensure that a different numeric code is used for each survey (it's easiest to keep this sequential)

For the visitor codes on the observations, it might be easiest to add a 1, 2,3 etc at the start of each visitor code entry on the spreadsheet, in order to differentiate between visitors sampled on day1, 2 3 etc.

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Panel Observation Log A: Total visitors at observation point [please ensure that this sheet is matched with Logs B and C at the end of the session]

General Information (to be filled out prior/after observation)

Date:

Time - Start:

- Finish:

Glacier:

(1)Franz	(2)Fox

Weather:

(1)Fine	(2)Cloudy	(3)Showers	(4)Rain

Tally of visitors entering glacier valley walk
TOTAL_____

Panel Observation Log B: Total visitors stopping to look at panels

(to be filled out during observation)

Codes

Gender	(1)Male	(2)Female			
Estimated age:	(1)<15	(2)15-29	(3)30- 49	(4)50-69	(5)70+
Group size:	(1)Single	(2)Couple	(3)Three - Five	(4)Six – Ten	(5)Ten +

Visitor Code	Gender	Age	Group size	Visitor Code	Gender	Age	Group size	Visitor Code	Gender	Age	Group size
1				23				45			
2				24				46			
3				25				47			
4				26				48			
5				27				49			
6				28				50			
7				29				51			
8				30				52			
9				31				53			
10				32				54			
11				33				55			
12				34				56			
13				35				57			
14				36				58			
15				37				59			
16				38				60			
17				39				61			
18				40				62			
19				41				63			
20				42				64			
21				43				65			
22				44				66			

Codes

Gender	(1)Male	(2)Female			
Estimated age:	(1)<15	(2)15-29	(3)30- 49	(4)50-69	(5)70+
Group size:	(1)Single	(2)Couple	(3)Three - Five	(4)Six – Ten	(5)Ten +

Visitor Code	Gender	Age	Group size	Visitor Code	Gender	Age	Group size	Visitor Code	Gender	Age	Group size
67				89				111			
68				90				112			
69				91				113			
70				92				114			
71				93				115			
72				94				116			
73				95				117			
74				96				118			
75				97				119			
76				98				120			
77				99				121			
78				100				122			
79				101				123			
80				102				124			
81				103				125			
82				104				126			
83				105				127			
84				106				128			
85				107				129			
86				108				130			
87				109				131			
88				110				132			

Panel Observation Log C1: Visitor time spent stopped to look at panels

Undertaken by both surveyors (sheets C1 and C2). Select different visitors to monitor

Codes

Gender (1)Male (2)Female

Estimated age: (1)<15 (2)15-29 (3)30- 49 (4)50-69 (5)70+

Group size: (1)Single (2)Couple (3)Three - Five (4)Six – Ten (5)Ten +

Time (seconds) numeric value

Visitor Code	Gender	Age	Group size	Time (seconds)
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				

Visitor Code	Gender	Age	Group size	Time (seconds)
23				
24				
25				
26				
27				
28				
29				
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				
41				
42				
43				
44				

Visitor Code	Gender	Age	Group size	Time (seconds)
45				
46				
47				
48				
49				
50				
51				
52				
53				
54				
55				
56				
57				
58				
59				
60				
61				
62				
63				
64				
65				
66				

Panel Observation Log C2: Visitor time spent stopped to look at panels

Codes

Gender (1)Male (2)Female

Estimated age: (1)<15 (2)15-29 (3)30- 49 (4)50-69 (5)70+

Group size: (1)Single (2)Couple (3)Three - Five (4)Six – Ten (5)Ten +

Time (seconds) numeric value

Visitor Code	Gender	Age	Group size	Time (seconds)	Visitor Code	Gender	Age	Group size	Time (seconds)	Visitor Code	Gender	Age	Group size	Time (seconds)
67					89					111				
68					90					112				
69					91					113				
70					92					114				
71					93					115				
72					94					116				
73					95					117				
74					96					118				
75					97					119				
76					98					120				
77					99					121				
78					100					122				
79					101					123				
80					102					124				
81					103					125				
82					104					126				
83					105					127				
84					106					128				
85					107					129				
86					108					130				
87					109					131				
88					110					132				

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Closure Point Observation Log

General Information (to be filled out prior/after observation)

Date:

Time - Start:
- Finish:

Glacier:	(1)Franz	(2)Fox

River Condition:	(1)Low Flow	(2)Med Flow	(3)High Flow

Weather:	(1)Fine	(2)Cloudy	(3)Showers	4)Rain

Observer Location:

Hazards Observed During Observation:

Visitor Observation Tally (to be filled out during observation)

Codes

Gender (1)Male (2)Female

Estimated age: (1)<15 (2)15-29 (3)30- 49 (4)50-69 (5)70+

Group size: (1)Single (2)Couple (3)Three - Five (4)Six – Ten (5)Ten +

Non-compliers visible? (1)Yes (2)No

Guided Groups visible? (1) Yes (2) No

Comply (1)Yes (2)No

Visitor Code	Gender	Age	Group size	Non-compliers visible?	Guided Groups visible?	Comply
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						

Visitor Code	Gender	Age	Group size	Non-compliers visible?	Guided Groups visible?	Comply
23						
24						
25						
26						
27						
28						
29						
30						
31						
32						
33						
34						
35						
36						
37						
38						
39						
40						
41						
42						
43						
44						

Visitor Code	Gender	Age	Group size	Non-compliers visible?	Guided Groups visible?	Comply
45						
46						
47						
48						
49						
50						
51						
52						
53						
54						
55						
56						
57						
58						
59						
60						
61						
62						
63						
64						
65						
66						

Codes

Gender (1)Male (2)Female

Estimated age: (1)<15 (2)15-29 (3)30- 49 (4)50-69 (5)70+

Group size: (1)Single (2)Couple (3)Three - Five (4)Six – Ten (5)Ten +

Non-compliers visible? (1)Yes (2)No

Guided Groups visible? (1) Yes (2) No

Comply (1)Yes (2)No

Visitor Code	Gender	Age	Group size	Non-compliers visible?	Guided Groups visible?	Comply
67						
68						
69						
70						
71						
72						
73						
74						
75						
76						
77						
78						
79						
80						
81						
82						
83						
84						
85						
86						
87						
88						

Visitor Code	Gender	Age	Group size	Non-compliers visible?	Guided Groups visible?	Comply
89						
90						
91						
92						
93						
94						
95						
96						
97						
98						
99						
100						
101						
102						
103						
104						
105						
106						
107						
108						
109						
110						

Visitor Code	Gender	Age	Group size	Non-compliers visible?	Guided Groups visible?	Comply
111						
112						
113						
114						
115						
116						
117						
118						
119						
120						
121						
122						
123						
124						
125						
126						
127						
128						
129						
130						
131						
132						

APPENDIX 5

Image 1

Image 2

Image 3

Image 4

Image 5

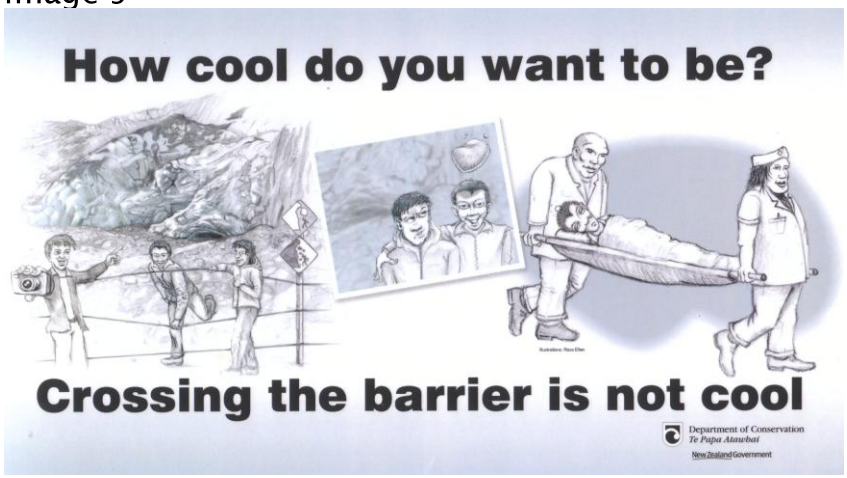

Image 6

APPENDIX 6

Survey staff to complete (on-site)
Code:
Date/Time:
Weather:

Weather codes: 1 Fine/sunny
2 High cloud/maybe rain (can see peaks)
3 Cloudy/rainy (can't see peaks)
4 Stormy

Glacier Valley Walk Visitor Survey and Evaluation

[to be read by the surveyor]
This survey asks about your impressions of the Franz Josef / Fox Glacier Valley Walk, and will help managers to provide a safe and enjoyable experience for all visitors.

The survey is organised into three sections:

1. your impressions and observations of the Franz Josef / Fox Glacier site;
2. your thoughts about how managers can most effectively communicate important messages at this site; and
3. some simple visitor profile questions

Please answer each of the questions as accurately and truthfully as you can. There are no 'right' or 'wrong' answers. We are interested in <u>your</u> responses and opinions.

*Location: Franz or Fox? [circle **one**]*

Section 1 About your impressions of the glacier valley walk

Q1 On this visit, did you notice any natural hazards or dangers?
(please tick **one** box only)
1☐ Yes
2☐ No (go to Q2)

If yes, what were these?
[do **not** prompt]

1☐ Rockfall
2☐ Icefall
3☐ Flooding
4☐ River surge
5☐ Falling / tripping

Other
6☐ Please state: _____

Q2 On the Glacier Valley Walk today, were you aware of any signs or messages warning visitors about natural hazards or dangers?
[tick **one** box only]

1☐ Yes
2☐ No (go to Q3)

If yes, what were these messages about?
[tick **any** that apply / do **not** prompt]

1☐ Rockfall
2☐ Icefall
3☐ Flooding
4☐ River surge
5☐ Falling / tripping
6☐ Don't know / Can't recall
7☐ Other [Please state]:
_____

AND
Where did you see these signs or messages?
[tick **any** that apply / do **not** prompt]

1☐ At the car park
2☐ Along the trail / walk
3☐ At the glacier face
4☐ Don't know / Can't recall
5☐ Other [please state]
_____

Q3 On the walk, did you notice any signs, ropes or barriers that restricted access to parts of the glacier valley?
(please tick **one** box only)

1☐ Yes
2☐ No (go to Q6)

If yes, did you enter any areas restricted by signs, ropes or barriers?

1☐ Yes
2☐ No (go to Q4)

If yes, why did you enter this area? (tick **any** that apply) [do **not** prompt respondent]

1☐ Because other people were also in the restricted area
2☐ Because it didn't look very dangerous
3☐ Because I wanted to get closer to the glacier
4☐ Because I wanted to get a photo
5☐ Other_____

Q4 Why do you think that signs, ropes or barriers have been set up restricting access to some parts of the glacier valley? (please tick **any** that apply) [do **not** offer options to respondent – select closest].

1☐ To keep visitors safe from rock fall
2☐ To keep visitors safe from icefall
3☐ To keep visitors safe from river surges
4☐ To keep visitors safe from floods
5☐ To protect the environment
6☐ So that people have to pay a commercial guide to get close to the glacier
7☐ Other _____
8☐ Don't know

Q5 How dangerous do you think natural hazards on the Glacier Valley Walk are to visitors who go past the signs, ropes and barriers restricting access?
[show 1-7 scale: 1= 'not at all' 7 = 'very']

1 – 2 – 3 – 4 – 5 – 6 – 7 [circle **one**]

Q6 Prior to your arrival at the glacier valley walk [ie, before the visitor got out of his or her car], do you recall seeing or hearing any information about safety at the glaciers?
[tick **one** box only]

1☐ Yes
2☐ No (go to Q7)

If yes, where was this information?
[tick **any** that apply – do not prompt]

1☐ DOC visitor centre
2☐ Motel
3☐ Backpackers / Hostel
4☐ Guide books
5☐ Brochure
6☐ DOC ranger or guide
7☐ News media
8☐ Word of mouth
9☐ Other glacier
10☐ DOC Web site
11☐ Other Web site
12☐ Other [please state]
_____

Q7 As part of planning your trip to the Glaciers, did you visit the DOC website?
[tick **one** box only]

1☐ Yes
2☐ No (go to Q8)

If yes, do you recall seeing any information about safety at the Glaciers?

1☐ Yes
2☐ No

Q8 Would you have liked to see more information about safety <u>on this Glacier Valley Walk today</u>? [tick **one** box only]

1☐ Yes
2☐ No

Section 2 Your impressions of safety messages

I will now show you six illustrations that relate to visitor safety on the Glacier Valley Walk. For each of the illustrations, we're interested in what you think the main messages are, and your opinion of the content and arrangement of the messages.

[surveyor needs to start from Card 1 each time – printed on reverse side of card]

		Image 1	Image 2	Image 3	Image 4	Image 5	Image 6
Q9a	What are the main messages [ideas / themes] contained in this illustration? [ie., what is the sign trying to tell visitors?] (please tick **any** that apply) [do **not** prompt respondent – choose closest] [Respondents to report main messages/ ideas for all 6 illustrations prior to moving to Q9b – g] [For Q9a, tick relevant box on right for each image]						
	1.Do not cross any ropes or barriers						
	2.Do not get too close to the glaciers						
	3.Think before crossing the rope or barrier						
	4.Visitors have been injured or killed at the glaciers in the past						
	5.Rockfall and icefall are hazards at the glaciers						
	6.It's not cool to go too close to the glacier						
	7.Safety is the responsibility of the visitor						
	8.It's not smart to cross the ropes or barriers						
	9.The glacier / ice can collapse						
	10.You *can* cross the ropes or barriers						
	11.Don't know						
	12.Others [write in here]						
	[Using this scale [hand respondent card], please rate these features. For all: 1= 'not at all'; 7 = 'very'. [Enter **one number** for each image]						
Q9b	How clear is the message in this illustration to you? [1-7]						
Q9c	How convincing is the message in this illustration? [1-7]						
Q9d	How authoritative is the message in this illustration? [1-7]						
Q9e	How easy to understand is the language used in the illustration? [1-7]						
Q9f	How appropriate is the content of the illustration? [1-7]						
Q9g	How attractive are the colours, graphics and fonts in this illustration? [1-7]						

Q10 Which of the illustrations is best at helping you understand the importance of remaining behind the ropes / barriers? [tick **one**]

1☐ Image 1
2☐ Image 2
3☐ Image 3
4☐ Image 4
5☐ Image 5
6☐ Image 6
7☐ None of the above
8☐ All of the above

Section 3: About you and your visit

Q11 Is this your first visit to this glacier?
(please tick **one** box only)

1☐ Yes
2☐ No

Q12 Have you ever visited Franz / Fox [the other] Glacier as part of this trip or at any other time?
(please tick **one** box only)

1☐ Yes
2☐ No

Q13 On this visit to the Glacier Valley Walk, who are you with? [tick **one** only]

1☐ Alone
2☐ With my partner
3☐ With my friend(s)
4☐ With my family group
5☐ With family and friends
6☐ With an organised tour
7☐ Other
_____

Q14 In which part of the world do you normally live?

1☐ New Zealand
2☐ Australia
3☐ United Kingdom
4☐ USA
5☐ Japan
6☐ China
7☐ Germany
8☐ Other Europe
9☐ other:_____

Q15 Are you:
1☐ Female
2☐ Male

Q16 What age group?

1☐ 15 – 19
2☐ 20 – 29
3☐ 30 - 39
4☐ 40 - 49
5☐ 50 – 59
6☐ 60 - 69
7☐ 70 - 79
8☐ 80 yrs +

Thank the visitor very much for his or her participation in this research

If the visitor has any other comments to make about the Glacier Valley or its management, please record them here [continue on reverse if needed]: