Proposed Digital Billboard

2 Jervois Quay, Wellington Central

Traffic Engineering Report

PREPARED FOR NZ FRUITGROWERS' CHARITABLE TRUST | APRIL 2022

We design with community in mind

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Revision Schedule

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Table of Contents

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1.0 INTRODUCTION

This report provides an assessment of a proposal by NZ Fruitgrowers' Charitable Trust to establish a digital billboard on the Huddart Parker Building at 2 Jervois Quay in Wellington Central. The establishment of the digital billboard will result in the reinstatement of a sign that previously existed several years ago in the same position on the building, although the previous sign was static and not digital.

The proposed digital billboard will be landscape oriented with dimensions of 13m width by 4m height. As with the previous sign, it will display commercial graphics for third-party advertisers along with public information including time and weather conditions and community events.

This assessment of the proposed billboard covers the following matters:

- The characteristics of the traffic environment within which the billboard will be located.
- General road safety matters relating to advertising signage.
- A description of the proposed design and operational characteristics of the billboard, and a traffic safety assessment of the proposal within the context of the surrounding traffic environment.
- An assessment of the extent that the design and operation of the billboard is in accordance with the relevant provisions of the Wellington City Council District Plan (**District Plan**).
- An assessment of the extent that the design and operation of the billboards is consistent with the relevant guidance provided by the Waka Kotahi New Zealand Transport Agency (**Waka Kotahi**) "*Traffic control devices manual, 2011, Part 3 Advertising signs*" (**TCDM 3**).

These and other relevant matters are discussed in the detail of this report to follow. By way of a summary of the analyses that will be described, it is concluded that the establishment of the proposed billboard can be achieved in a manner that ensures less than minor adverse effects to the performance and safety on the local traffic environment.

2.0 THE SITE

2.1 BILLBOARD LOCATION

The digital billboard is proposed to be established on the northern face of the Huddart Parker Building at 2 Jervois Quay, and will reuse the frame on which a static billboard was previously established on top of the building.

This location for the billboard is about 20m west of the Jervois Quay / Post Office Square / Queens Wharf signalised intersection, and about 35m east of the Customhouse Quay / Grey Street give-way controlled intersection.

The subject site has a District Plan zoning of Central Area within the Post Office Square Heritage Area.

An aerial view of the billboard location within the surrounding local traffic environment is shown below in **Figure 2-1.**

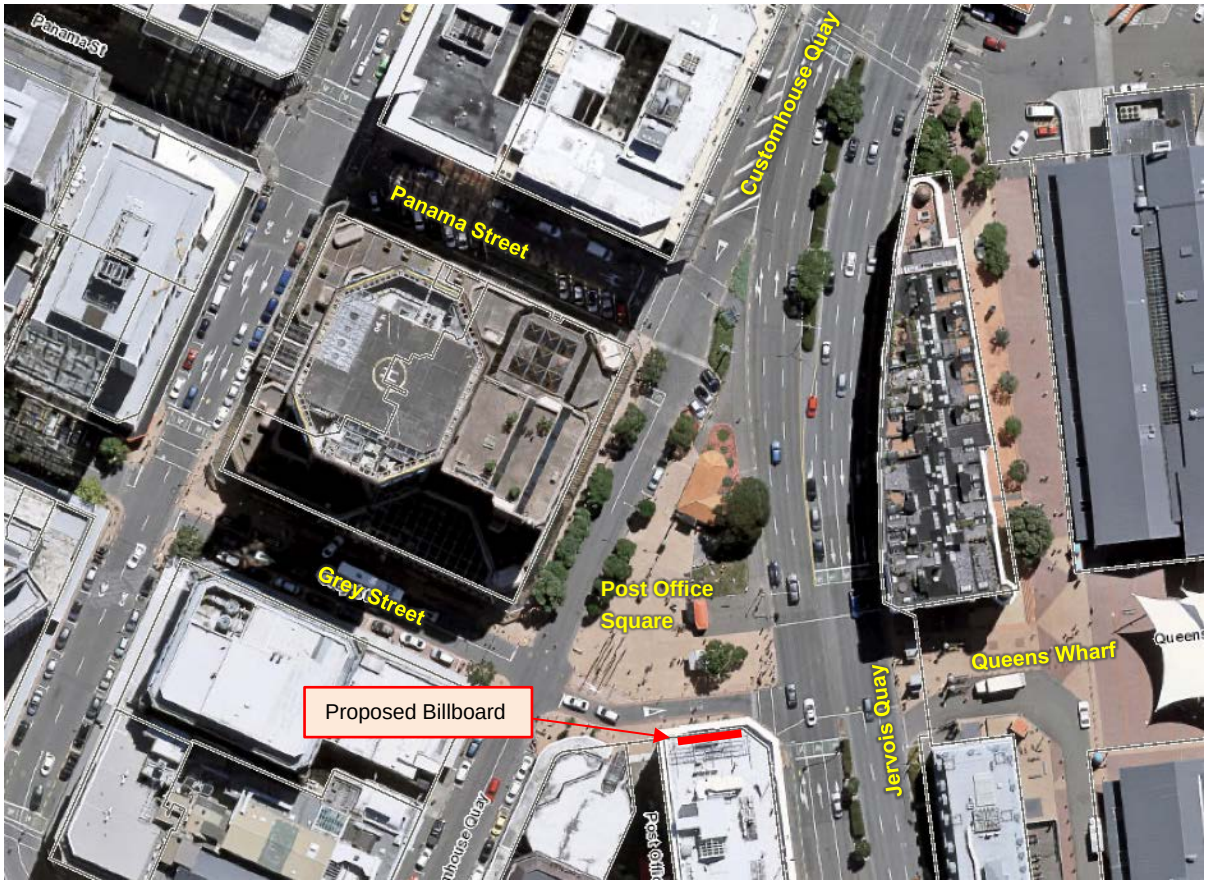


Figure 2-1: Proposed Billboard Location

The main audience for the billboard will be southbound traffic travelling along Customhouse Quay / Jervois Quay from the point that screen content will first become reasonably legible at Brandon Street. The height of the billboard and its oblique angle to both Grey Street and Queens Wharf means that it will not be readily visible from those approaches.

2.2 THE TRAFFIC ENVIRONMENT

Customhouse Quay north of Panama Street, and Jervois Quay are classified in the District Plan as Arterials; while Customhouse Quay south of Panama Street is classified as a Collector. The road network hierarchy within the Central Area is shown in **Figure 2-2** below.

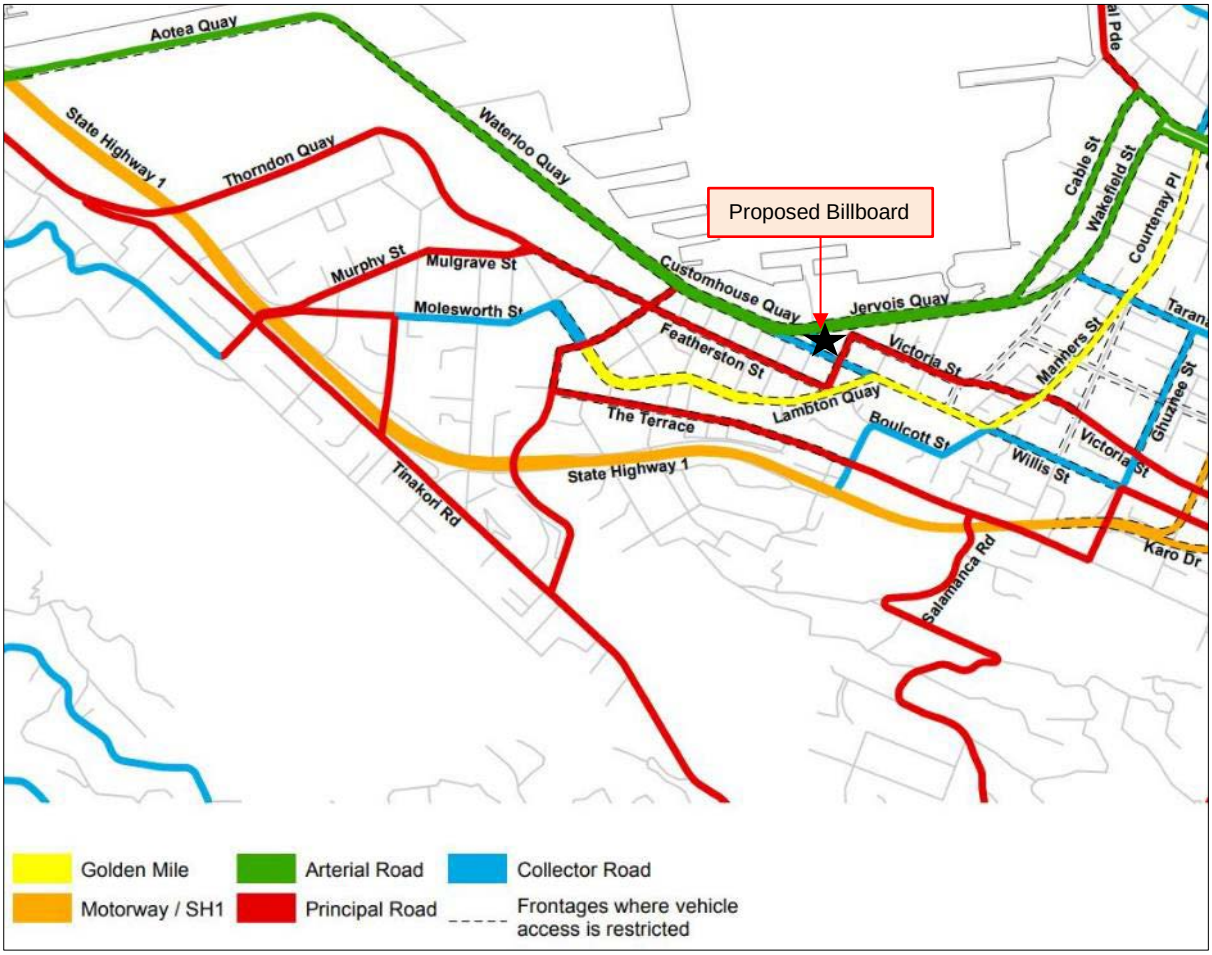


Figure 2-2: Central Area Road Hierarchy[1]

Customhouse Quay north of Panama Street, and Jervois Quay have posted speed limits of 50km/h. Customhouse Quay south of Panama Street has a speed limit of 30km/h; as do Grey Street and Panama Street (Secondary Collector). The applicable speed limits in the vicinity of the proposed billboard are shown below in **Figure 2-3**.

[1] Wellington District Plan, Map 34, Hierarchy of Roads (Central Area)

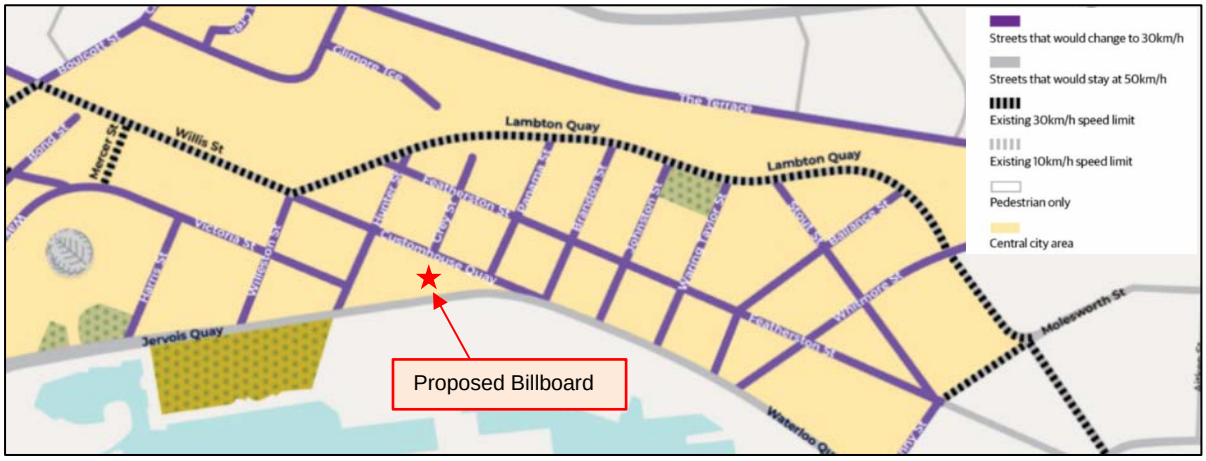


Figure 2-3: Central Area speed limits

2.3 ROAD SAFETY

A search of the Waka Kotahi Crash Analysis System (**CAS**) was undertaken for the 5-year period 2017 to 2021, for all reported crashes that occurred on the section of Jervois Quay from which screen content of the proposed digital billboard will be reasonably visible, being the 150m area between and including the Brandon Street / Customhouse Quay intersection, and the Jervois Quay / Post Office Square / Queens Wharf intersection. This area, and the grouped locations of the crashes in the vicinity of the indicated billboard site, is shown in **Figure 2-3**.

A total of 18 crashes were recorded within this area, a CAS plain English summary of which is provided as Appendix A.

Of the 18 recorded crashes, only five occurred in a travel direction or at a location where the driver at fault would have potentially had visibility of the proposed billboard location if it were present.

A summary of the characteristics of the crashes that occurred within the search area which involved a driver at fault who would have had potential visibility of the billboard is provided as follows:

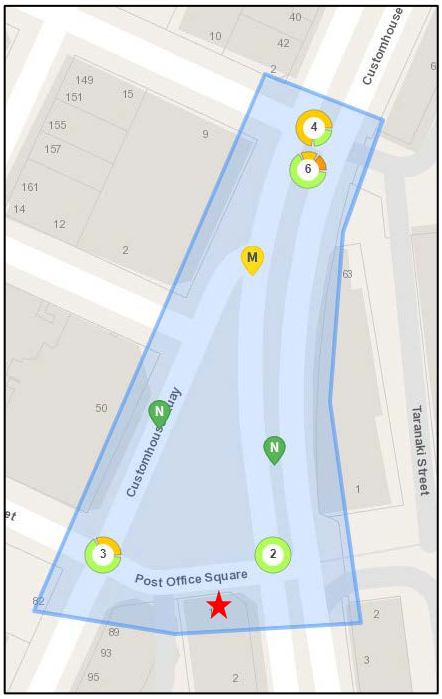


Figure 2-4: CAS grouped crash locations

- **Crash ID 201818515**
  A moped rider travelling southbound on Jervois Quay lost control on a wet road but did not leave the road. One minor injury resulted.
- **Crash ID 2021198080**
  A southbound driver on Customhouse Quay hit a vehicle turning right out of Lady Elizabeth Lane. The southbound driver admitted to trying to get through the intersection at the end of an amber signal, but it changed to red as the driver entered the intersection. No injury resulted
- **Crash ID 201896309**
  A southbound cyclist on Customhouse Quay ran a red light and hit a vehicle merging onto Customhouse Quay from the left. The cyclist did not see the signal or the car entering the intersection. The cyclist apologised for 'looking down'. No injury resulted

- **Crash ID 201952657**
  A driver of a police vehicle turning left out of Lady Elizabeth Lane hit two pedestrians crossing Customhouse Quay. The police driver had been diverted by a vehicle which had gone through the intersection on a red signal, and was contemplating chasing it. As the police driver turned left onto Customhouse Quay, the driver failed to see the pedestrians as they were obscured by the gates. One minor injury resulted.
- **Crash ID 201750703**
  A southbound driver on Customhouse Quay hit the rear of the vehicle in front when at a position about 30m north of Post Office Square. The driver at fault had been using a cell phone and failed to notice the vehicle in front slowing. No injury resulted.

None of the crashes referred in any way to any distraction by any element of the environment that is external to the vehicle that could have influenced any of the road users involved (other than perhaps the police driver who was contemplating chasing a vehicle that had run a red light). Certainly, none referred in any way to the existing signage in the area as being a distraction.

Overall, there is nothing about the crash history that reveals any inherent road safety defect with this section of Customhouse Quay and Jervois Quay, nor any road safety issue that is likely to impact on the ability to establish the proposed billboard as intended. This conclusion is supported by recent research wherein examinations of incidents and driver performances prior to then after the introduction of billboards at signalised intersections revealed no adverse effects. This is discussed in more detail in Appendix B of this report.

3.0 BILLBOARD SAFETY ASSESSMENT CONSIDERATIONS

The traffic safety considerations as they relate to digital billboards can be broadly considered in four categories:

- *The potential creation of a visibility obstruction or a direct roadside hazard:*

  This relates to the physical presence of the billboard structure, rather than what is displayed on the screen. The important aspects here are that the billboard structure should not physically impact on driver visibility of the road, or other road users, or any traffic control device; and nor should it create a physical impediment or obstruction to the movement of people.

- *The potential creation of driver confusion through image effects such as the mimicking of an official road sign or instructing drivers to do something:*

  This concerns the design of image content to ensure that it does not mimic official traffic signs or direct drivers to undertake particular manoeuvres. This is consistently applicable to all billboards, whether they utilise static or digital methods of display. In this regard, Section 5 of this report provides a recommended condition of consent to ensure that image content does not cause confusion with traffic control devices.

- *The potential creation of driver distraction where a driver looking at the billboard may fail to notice real or potential hazards on the road:*

  Image content is largely self-managed by the advertisers through an industry code of practice, and more significantly by the need for advertisers to keep messages simple and easily legible. This enables the image displays to effectively get a message across within the brief time that drivers are willing to allow advertising to become a component of their normal driving task.

- *The potential creation of direct driver distraction through display effects such as glare, or as a result of the transitions between images:*

  A digital image can change while a driver is looking at the message, potentially encouraging a driver's glance to be extended, or to potentially catch a driver's attention due to the transition itself. Controlling the frequency and method of image change is important for managing and minimising any potential for distraction during image changes. These points are addressed by way of recommended conditions relating to the operation of the billboard that are described in Section 5 of this report, and which have the objective of ensuring that digital billboard operations avoid any potential for hazardous driver distraction.

Each of these categories have been assessed for the proposed digital billboard as described in Section 4 below. It is noted that the first three categories above apply to any sort of advertising sign, while the fourth category is largely specific to digital billboards as they operate with variable messages.

In considering each of the four categories above, reference has been made to standards and guidelines that apply in New Zealand, along with guidance from international reports and research papers. In this regard, recent empirically-based research papers, (including those that have been cited in Appendix B to this report), along with the practical experience now available from the growth of digital billboard operations in New Zealand and internationally, are together confirming that digital billboards are not inherently hazardous to road safety, and are not producing any identifiable adverse safety effects.

In regard to the latter point above, Appendix C describes a crash search for all of New Zealand with a specific search for the crash factor that relates to distraction by signs. This search revealed zero crashes related to the presence or operation of digital billboards.

4.0 BILLBOARD ASSESSMENT

4.1 THE PROPOSAL

As previously noted, the proposed digital billboard will have a single display panel that is landscape oriented with screen dimensions of 13m width by 4m height. It will be oriented toward southbound traffic on Customhouse Quay and Jervois Quay.

The billboard will also be briefly and incidentally visible to eastbound traffic emerging from Johnston Street and Panama Street. However, these views are very much secondary as the oblique angle of viewing sits outside of a driver's normal field of vision, making it unlikely that a driver will even notice the billboard's presence. The billboard's location, orientation and height will practically preclude any visibility from either Grey Street or the Queens Wharf approach.

The billboard screen will be located above the building level and will not extend into the road reserve. There is then, no potential at all for the creation of any sort of pedestrian obstruction or impediment, nor will it create any visibility restrictions for motorists.

It is understood that the billboard will operate with a minimum image display time of 8-seconds, and with 0.5-second dissolve transitions between images. These operational characteristics have largely become industry standards in New Zealand and have now been well proven to enable safe operations.

It is also understood that the LED screen will operate with lumination levels that will be automatically managed so that the screen is responsive to changes in ambient lighting conditions, i.e. lumination will increase in brighter conditions and decrease in duller conditions. In this regard, a significant road safety advantage of the proposed digital screen over conventional static billboards is that the images will be more clearly legible in all lighting conditions and will not result in reflected glare due to external illumination by spotlights.

Figure 4-1 below shows an indicative layout for the billboard as viewed from Post Office Square.

Figure 4-1: Proposed Billboard viewed from Post Office Square

4.2 APPROACH VISIBILITIES

The alignment of Customhouse Quay / Jervois Quay ensures good advance visibility of the billboard when approaching from the southbound direction. The digital screen may become be discernible, albeit not legibly, from a distance of about 400m, at the north approach of the Whitmore Street / Waterloo Quay intersection. From this viewpoint however, the billboard will not be aligned to a driver's central vision, and screen content will be largely indistinct.

Screen legibility will not practically commence until within a distance of about 150m. Clear legibility will become available once within about 80-100m. These extents of advance visibility are more than adequate to enable a driver to glance at the billboard should that driver be inclined to do so, and they readily satisfy the 80m minimum forward visibility distance as recommended by TCDM 3.

Figure 4-2 below illustrates the approximate position of the billboard when viewed from about 400m.

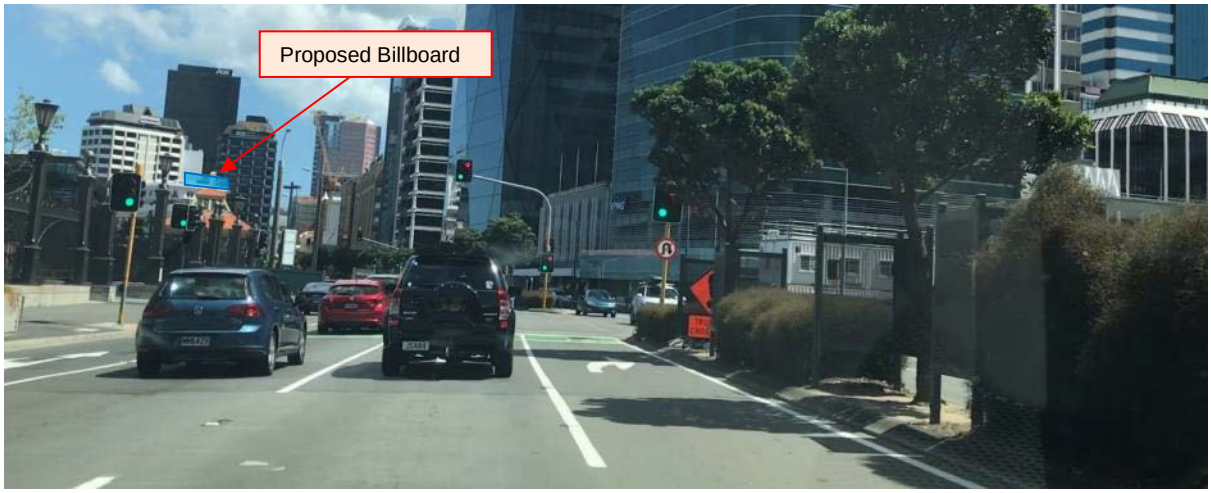


Figure 4-2: Southbound View of Billboard Location from 400m

From this point just north of Whitmore Street where the proposed billboard will first become potentially discernible (but not legible), a driver will be looking through the signalised Waterloo Quay / Whitmore Street intersection. As is apparent, there will be no visual interaction with any of the traffic signal lanterns at this intersection.

Figure 4-3 below shows the approximate position of the billboard from about 250m distance.

Figure 4-3: Southbound View of Billboard Location from 250m

At this distance, a southbound driver is looking through the Customhouse Quay / Johnston Street intersection. As

is apparent, the view of the proposed digital billboard sits clear of any of the traffic signal lanterns at the intersection.

Figure 4-4 below shows the approximate position of the billboard from about 150m distance.

Figure 4-4: Southbound View of Approximate Billboard Location from 150m

At this distance, a southbound driver is looking through the Jervois Quay / Brandon Street intersection. As is apparent, the view of the proposed digital billboard sits clear of any of the traffic signal lanterns at the intersection.

Figure 4-5 below shows the approximate position of the billboard from about 80m distance.

Figure 4-5: Southbound View of Approximate Billboard Location from 80m

At this distance, which is the minimum sight distance recommended by TCDM 3, a southbound driver is looking through the Jervois Quay / Post Office Square / Queens Wharf intersection. As is apparent, the view of the proposed digital billboard sits clear of any of the traffic signal lanterns at the intersection. As shown, the billboard is also clearly visible and legible from 80m.

In the whole length of Customhouse Quay / Jervois Quay between Whitmore Street and the billboard site, there is only one brief instant when a traffic signal lantern visually 'touches' the view of the billboard screen behind. This occurs at one location only, being at a distance of about 180m from the billboard, (i.e. about 30m north of Branson Street), and only when viewed from Lane 3.

Figure 4-6 below shows the relative viewing positions of the billboard and the overhead traffic signal at Brandon Street at this point. At this viewing location, there is a small visual overlap of the right edge of the screen with the overhead signal's black backing board.

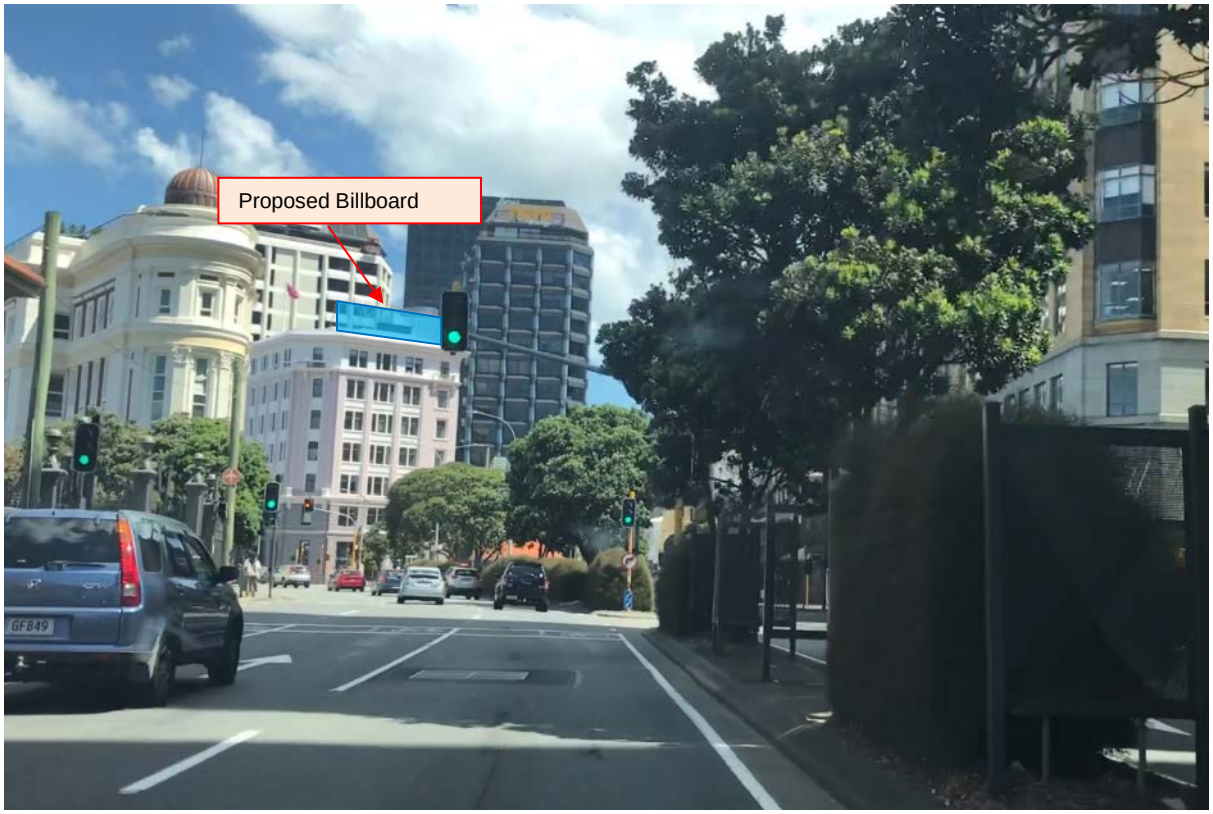


Figure 4-6: Southbound View of Billboard Location from 180m

It is important to understand however, that the extent of overlap is only very minor, and occurs only very momentarily for about 1 second when travelling at a normal mid-block speed.

This can be seen in **Figure 4-7** which shows a series of three video screenshots which are taken at 1-second intervals. The position of the proposed billboard has been superimposed on each screen shot. As can be seen, as a vehicle in Lane 3 moves through the 180m mark, the large relative distance between the traffic signal lantern and the billboard causes the lantern to rapidly 'move' from a point well beneath the billboard, to then brush the right edge of the billboard, and to then pass over the billboard.

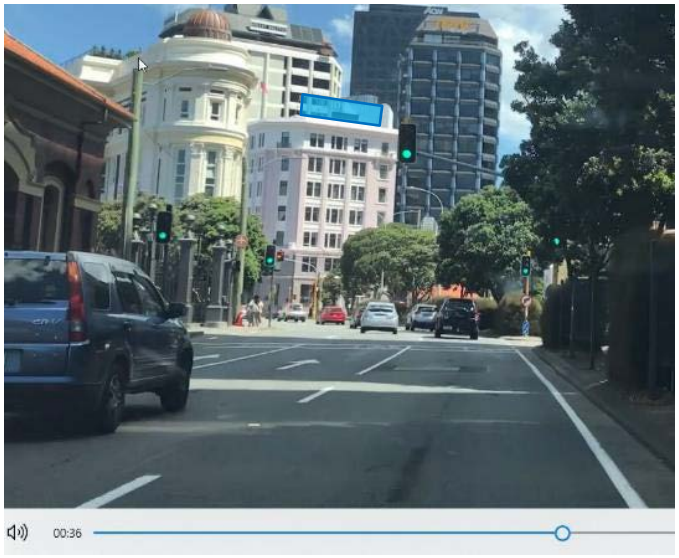
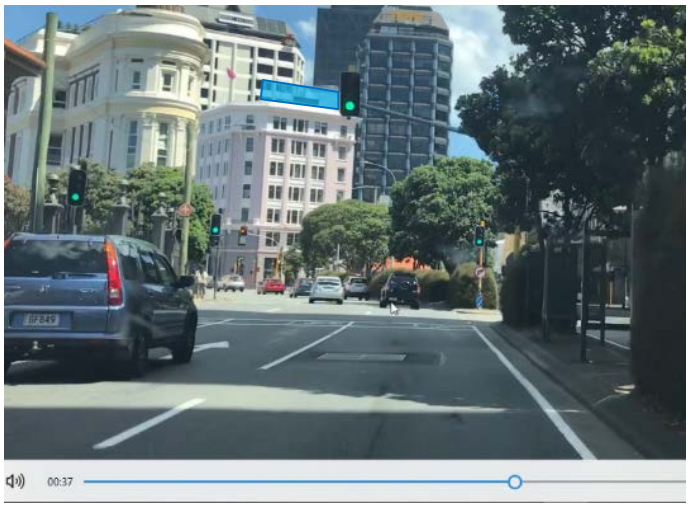
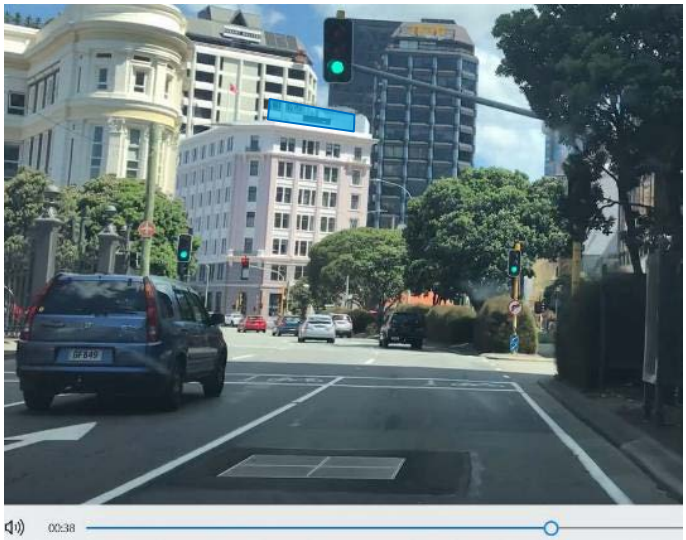
	Approx 190m from billboard
	Approx 180m from billboard
	Approx 170m from billboard

Figure 4-7: One-second Interval Screenshots ~170m to 190m from Billboard

The implications of this momentary visual 'touching' of the overhead traffic signal with the billboard behind will be insignificant for the following reasons:

- The significant (approximately 150m) separation between the overhead traffic signal lantern and the billboard means that the traffic signal lantern will always be dominant, i.e. drivers will be viewing the traffic signal lantern from a distance of about 30m, whereas the billboard will be about 180m.
- When looking at these relative distances that the black backing board for the signal head is quite effective at visually isolating the signal lanterns from its background.
- This visual isolation and prominence of the signal lanterns afforded by the backing boards will be significantly assisted by the fact that signal lanterns are inherently brighter than digital billboard screens, especially in this case given that the digital billboard screen will be a further 150m beyond the signal lanterns.
- Due to the relative distances involved, (and as is apparent in Figure 4-7 above), the relative positions of the signal and the billboard screen will be continually moving which assists to make each easily distinguishable. As described above, when approaching the intersection, the primary signal will appear to move from a position below and to the right of the billboard, to above it. This 'movement' of the traffic signal in relation to the digital screen behind serves to assist in highlighting the presence of that traffic signal to an approaching driver.

Based on the above points, it is considered that from this location where the billboard screen will momentarily be visually proximate to the overhead traffic signal, it is unlikely to generate adverse driver confusion, or cause detraction from the function of the traffic signals at the intersection. There will, therefore, be no consequential adverse effect on road safety as a result.

4.3 ASSESSMENT AGAINST DISTRICT PLAN REQUIREMENTS

The subject site is zoned in the District Plan as 'Central Area'. Accordingly, Chapter 13 sets out the relevant requirements that new or amended signs are to be assessed against.

Rule 13.1.3 states that signs are a 'Permitted Activity' provided they comply with the relevant criteria set out under Section 13.6.4 'Sign Standards'. If these standards are not fully met the proposal is considered a Discretionary Activity (Restricted). An assessment of the rules contained within Section 13.6.4 is provided as follows:

Table 4-1: District Plan Assessment

Guideline	Comment
Rule 13.6.4.1.1	
Any sign that is illuminated must not flash, or must not contain moving images, moving text or moving lights if that sign is: • visible from a vehicle on the legal road within 100m of an intersection; • visible from and located within 50m of a Residential Area; • located on a building above 18.6m above ground level; • located on a site frontage (including any building) that is adjoining or opposite (on the other side of the legal road) from the Parliamentary Precinct Heritage Area (as shown in Appendix 15, of Chapter 21).	**Complies.** While the proposed digital billboard will be located within 100m of an intersection, the sign will not flash or contain moving images or contain moving text or have moving lights. While each digital image on the billboard screens will be replaced every eight seconds, the fact is that each image will be static while being displayed. On this basis, the proposed digital operations comply with Rule 13.6.4.1.1.
Rule 13.6.4.1.4	
For any sign located on a building above 18.6m above ground level (including signs that extend above 18.6m from a lower level): • there may be no more than four signs with a maximum of one sign on each elevation • the total maximum area of signage on each frontage is $15m^2$ • the sign must bear only the name and/or logo of the building owner or occupier, or the building on which the sign is located.	**Does not comply.** The total area of the sign at $52m^2$ exceeds the maximum permissible area of $15m^2$.
Rule 13.6.4.1.7	
For any sign located in the Post Office Square Heritage Area, the information that may be displayed on the sign is limited to the building name, the name/logo of the business, owner or occupier of the building (or site) on which the sign is located, and/or the product or service available on site.	**Does not comply.** It is proposed that the sign will display third-party advertising.

The proposal is therefore considered a Discretionary Activity (Restricted) and requires assessment against the relevant objectives and policies in the District Plan.

District Plan Objective 12.2.10 'Signs' seeks "*To achieve signage that is well integrated with and sensitive to the receiving environment, and that maintain public safety*". In reviewing the various Policies designed to achieve this outcome that are applicable to the proposed development, the following is of relevance:

12.2.10.2 Manage the scale, intensity and placement of signs to:
- *maintain and enhance the visual amenity of the host building or site, and*
- *ensure public safety.*

This Policy recognises that whilst signs are an integral part of the Central Area environment, methods for controlling their design must be achieved through Rules, Design Guides and other legal mechanisms. Where a sign does not fully satisfy the relevant District Plan standards (under Rule 13.6.4), then guidance is provided on the matters Council will consider when assessing a proposed sign. The relevant traffic criteria can be summarised as follows:

- whether an additional sign will result in visual clutter; and

- whether the size, number, placement, illumination or movement of the sign(s) or sign display will compromise traffic or pedestrian safety.

From a driver's perspective, the billboard will not create visual clutter. Rather, it sits in an isolated position that will not result in any visual conflict with any other signs in the area, as is clearly apparent from the views displayed in Figures 4-1 to 4-7 above.

In terms of safety, the assessments described in this report show that the southbound traffic audience will have advance visibilities of the billboards that are appropriate and acceptable for this traffic environment.

Further, the location of the proposed billboard means that at the point where pedestrians cross Jervois Quay, the billboard will not be visible to pedestrians; and for southbound vehicles on Jervois Quay the billboard will pass out of a driver's field of vision well before reaching the signalised intersection at Grey Street, and certainly well before the pedestrian crossing facility on the downstream side of the intersection. This latter point can be seen in **Figure 4-8** below which shows a driver's view from the point that the billboard will be fully concealed by the vehicle roof.

Figure 4-8: Point that Visibility of Billboard is Lost (approx 30m from limit line)

12.2.10.5 Control the number and size of signs within heritage areas and areas of special character.

The proposed billboard will sit within the Post Office Square Heritage Area, in which:

> *'Third party signage requires special consideration to ensure that it does not detract from the historic heritage values and special character of these areas. Any applications for third party signage will be assessed against the content of the Sign Design Guide.*'

The Design Guide for Signs includes the following traffic-related reference:

> *Note, to minimise road hazards, new signs should be designed in accordance with the objectives and standards of the Land Transport Safety Authority "*Advertising Signs and Road Safety: Design and Location Guidelines – RTS-7*".*

It is noted that RTS-7 has now been superseded by TCDM 3, and as such an assessment of the proposed digital billboard pair against the relevant criteria included within the TCDM 3 guidelines is set out in Section 4.4 below.

Overall, it is considered that with the adoption of the suite of conditions relating to the operation of the digital billboard as described in Section 5 of this report, it is assessed that there will be no identifiable adverse traffic safety effects associated with the billboard. The proposal therefore aligns with the intent of the District Plan's Policies and Objectives regarding signs.

4.4 ASSESSMENT AGAINST TCDM 3 GUIDANCE

The relevant traffic-related recommendations from the TCDM 3 guideline, and the extent of consistency that the proposal has with those recommendations, are summarised in **Table 4-1** as follows:

Table 4-2 TCDM 3 – Assessment Against Relevant Guidelines

Guideline	Comment
5.0 Placement Considerations	
5.3 Visibility of Signs	
• Field of Vision: signs are to be located within a driver's field of vision as per Figure 5.1.	**Consistent with guidance.** For the intended traffic audience on Customhouse Quay and Jervois Quay travelling southbound, the billboard will be squarely within a driver's forward field of vision.
• Sight Distances: 80m visibility required in 50km/h areas	**Consistent with guidance.** As noted in Section 4.1 above, the billboard will be reasonably legible from a distance of about 150m, and fully legible from 80-100m. These readily satisfy the 80m minimum as recommended.
• Visibility Obstruction: Clear views through driveways and intersections	**Consistent with guidance.** The elevated location of the billboard means that it will not create any visibility obstructions at any intersection, and there are no proximate driveways to be affected.
5.4 Sign Position	
• Lateral clearance: Minimum lateral clearance between a sign and the edge of the carriageway for a speed limit of 60km/h or less is 1.5 m	**Consistent with guidance.** The billboard is on private property and will be about 2.5m from the road carriageway.
Signs within or over the state highway not to be located closer than 5 m to the carriageway	**Not Applicable.** The billboard site is not on a State highway.
• Sign height: Minimum vertical clearance of 2.5 m if installed above footpaths	**Consistent with guidance.** The billboard does not sit above a footpath.
• Minimum distances between adjacent roadside advertising signs: Minimum 50 m	**Consistent with guidance.** The closest advertising sign to the potential billboard site is approximately 60m away, on the northern face of 86 Customhouse Quay.
5.5 Location in relation to other road features	
• Location & orientation relative to road: Sign legible without slowing	**Consistent with guidance.** The billboard will be readily legible without slowing.
• Proximity to traffic control devices: Recommended 100 m separation from intersections & traffic control devices	**Inconsistent with guidance.** As noted in Section 2.1, the billboard is proximate to the Jervois Quay / Post Office Square / Queens Wharf signalised intersection, and the Grey Street / Customhouse Quay / Post Office Square give-way intersection The inconsistency with this recommendation is discussed further in Section 4.4 below.

Guideline	Comment
5.6 Sign Supports	
• Clearance of sign support from through traffic lanes	**Consistent with guidance.** The billboard will be building-mounted on private property and well clear of through traffic lanes.
6.0 Sign Design	
6.1 Sign Legibility	
• Signs legible in circumstances in which they are seen	**Consistent with guidance.** The billboard will be readily legible.
6.2 Sign Message	
• Not imitate traffic signs or traffic control devices; nor give instructions to motorists; nor compete with existing directional signs	**Consistent with guidance.** Recommendations are provided in Section 5 of this report to ensure that images displayed do not conflict with traffic control devices
6.3 Sign Style	
• Colour of Advertising Signs: Colours not to create a conflict with traffic control devices	**Consistent with guidance.** Recommendations are provided in Section 5 of this report to ensure that images displayed do not conflict with traffic control devices
6.4 Sign Layout	
• Minimum letter heights (main message) 50km/h: 150mm	**Consistent with guidance.** Images on billboards routinely incorporate main messages that are intended to be legible, and therefore typically involve letter heights to ensure this.

4.5 PROXIMITY TO THE INTERSECTION

The proposed billboard is clearly within 100m of an intersection. Despite this, it is not inconsistent with the District Plan Rule 13.6.4.1.1, which requires any billboard located within 100m of an intersection to not include any dynamic display effects. However, the proposal is unable to satisfy the TCDM 3 blanket recommendation for 100m separation of any sign from any intersection.

In terms of the stated intention within TCDM 3 for its recommendation of 100m separation of all signs from an intersection, this is to ensure that advertising signs do not create driver confusion or distraction due to the spatial relationship between the advertising sign and any proximate traffic control devices (i.e. traffic signs, traffic signals, etc.). TCDM3 states that a means of achieving the objective of avoiding driver confusion or distraction is to provide 100m separation between signs and intersections, but it does not state that this is the only means of achieving that objective.

As has been described, the billboard's location, orientation and operation are set up to avoid adverse interactions with existing traffic control devices. The billboard does not obstruct or impair the visibility of any traffic control device at either of the Jervois Quay / Post Office Square / Queens Wharf or Grey Street / Customhouse Quay / Post Office Square intersections. It is noted in particular that there is no visual overlapping of any traffic signal lantern at the Jervois Quay / Post Office Square / Queens Wharf intersection with the billboard behind.

Accordingly, and especially when considered alongside the recommended conditions of consent for the billboard that are outlined in the next section of this report, it can be concluded that the reasons that have led to the TCDM 3 recommendation for 100m separation of signs from intersections are inherently met in this case.

In any event, it is noted that TCDM 3's 100m separation recommendation is effectively impossible to achieve in practice in any urban environment, as block lengths are such that there are very few locations, (if any within the central area), where 100m separation from an intersection can physically be achieved. If the TCDM 3 recommendation was applied literally, there would be effectively no signs of any kind anywhere within urban Wellington, nor indeed in any urban environment throughout New Zealand.

Accordingly, this report has assessed the likely implications of the presence of the billboard in relation to its traffic environment, taking into consideration the actual likely effects to be generated, based both on current research, and on the experiences of a growing database of billboards (including digital billboards), that are located proximate to intersections. The outcome of this analysis has been that there is no likelihood of any adverse road safety or traffic operational impact to any intersection as a result of the proposed billboard.

5.0 SUMMARY AND CONCLUSIONS

This proposal relates to the establishment of a single-sided digital billboard on top of the Huddart Parker Building at 2 Jervois Quay.

Recent research confirms that billboards with variable image digital displays are unlikely to create driver distractions to the extent necessary to generate road safety issues. Indeed, there has been no known study in New Zealand or internationally that has been able to identify either an empirical or statistical relationship between the presence of digital billboards of the type proposed in this application, and a consequential degradation in road safety.

In this regard, there is a wide evidentiary gap between the perception that digital billboards have an adverse impact on road safety; compared to that which can be experienced, observed and monitored in the actual operation of digital billboards in New Zealand, as amply demonstrated by the fact that there has never been a recorded crash attributable to a digital billboard since their introduction into New Zealand in 2012.

This assessment has found that subject to the recommended conditions of consent as provided below, the establishment of the proposed digital billboard will not generate additional distractive effects to road users to the extent that such effects would result in any measurable deterioration to the safety, function, or performance of the local traffic environment.

Accordingly, and based on the assessments as described in this report, it is concluded that this proposal can be accepted as being consistent with the intentions of both the District Plan and TCDM 3; and able to function with less than minor adverse effects to road safety or traffic operations. There is therefore, no traffic engineering reason to preclude acceptance of this proposal, nor to require additional controls on operation beyond those proposed below.

The operational features that are recommended as conditions of consent to ensure appropriate and acceptable levels of traffic operations and road safety are as follows:

1. Images shall have a minimum dwell time of 8 seconds.
2. Images shall transition from one to the next via a 0.5 second dissolve.
3. Image content must:
    - be static, and not incorporate flashes, video, emissions, or other dynamic effects.
    - not use graphics, colours, or shapes either individually or in combination, in such a way that they would resemble or cause confusion with an adjacent traffic control device. For the avoidance of doubt, the purpose of this condition is not to prohibit the use of a particular colour, but to manage the use of those colours to avoid confusion with traffic control devices.
    - not invite or direct a driver to take some sort of driving action.
    - not be linked to "tell a story" across two or more sequential images, (i.e. where the meaning of an image is dependent upon or encourages viewing of the immediately following image).
4. Image lumination must be automatically managed to respond to ambient lighting conditions
5. The consent holder shall ensure that in the event of any malfunction of the LED's or the control system, the screen shall be designed to turn off or default to a black screen until the malfunction has been repaired.

Based on the assessments as described in this report, and subject to the recommendations provided above, it is concluded that this proposal to establish a variable image digital billboard can be accepted as being consistent with the intentions of both the District Plan and TCDM 3; and will enable it to function with less than minor adverse effects to traffic safety or operations. It is considered therefore, that there is no traffic engineering or road safety reason to preclude acceptance of this proposal.

Appendices

Appendix A CRASH ANALYSIS SYSTEM – CRASH LIST

Crash road	Distance	Direction	Side road	ID	Date	Description of events	Crash factors	fatal	severe	minor
BRANDON ST		I	CUSTOMHOUSE QUAY	201715870	13/07/2017	Car/Wagon1 EDB on Brandon street turning left hit Pedestrian2 (Age 25) crossing SIDEROAD from left	CAR/WAGON1, did not check/notice another party from other dirn	0	0	1
CUSTOMHOUSE QUAY		I	BRANDON ST	201719955	14/11/2017	Cycle1 NDB on Customhouse Quay sideswiped by Car/Wagon2 NDB on Customhouse Quay turning left	CAR/WAGON2, did not check/notice another party from other dirn CYCLE1, failed to notice indication of vehicle in front, misjudged intentions of another party	0	0	1
CUSTOMHOUSE QUAY		I	BRANDON ST	201818515	12/10/2018	Moped1 SDB on Jervois Quay lost control but did not leave the road	MOPED1, alcohol test below limit, ENV: road slippery (painted markings), strong wind	0	0	1
CUSTOMHOUSE QUAY		I	BRANDON ST	201739898	27/05/2017	Car/Wagon1 NDB on Customhouse Quay hit Truck2 crossing at right angle from right	TRUCK2, attn diverted by cb radio/non-cell comms device, did not stop at steady red light	0	0	0
CUSTOMHOUSE QUAY		I	BRANDON STREET	2021200901	22/09/2021	Motorcycle1 NDB on CUSTOMHOUSE QUAY missed inters or end of road, Motorcycle1 hit kerb	CAR/WAGON2, alcohol suspected, following too closely MOTORCYCLE1, alcohol test below limit, swerved to avoid vehicle	0	1	0
CUSTOMHOUSE QUAY		I	BRANDON STREET	2018100775	1/12/2018	Car/Wagon1 NDB on JERVOIS QUAY-WEST lost control turning right; went off road to left, Car/Wagon1 hit traffic sign/signal poles, bollards, other	CAR/WAGON1, alcohol test above limit or test refused, headlights fail suddenly, inadequate/no headlights, other lost control, speed entering corner/curve	0	0	0
CUSTOMHOUSE QUAY		I	LADY ELIZABETH LANE	2021198080	7/08/2021	Car/Wagon1 SDB on CUSTOMHOUSE QUAY hit Car/Wagon2 turning right onto AXROAD from the left		0	0	0
CUSTOMHOUSE QUAY		I	LADY ELIZABETH LANE	201896309	12/12/2018	Cycle1 SDB on CUSTOMHOUSE QUAY hit Car/Wagon2 merging from the left	CYCLE1, failed to notice control, other attention diverted	0	0	0
CUSTOMHOUSE QUAY		I	LADY ELIZABETH LANE	201952657	7/04/2019	Car/Wagon1 WDB on LADY ELIZABETH LANE turning left hit Pedestrian2 (Age 21) crossing SIDEROAD from left	CAR/WAGON1, alcohol test below limit, attention diverted by other traffic, did not check/notice another party from other dirn, ENV: visibility limited by hedge or fence	0	0	1
CUSTOMHOUSE QUAY		I	POST OFFICE SQUARE	2020155118	13/06/2020	Moped1 NDB on CUSTOMHOUSE QUAY hit Car/Wagon2 crossing at right angle from right	CAR/WAGON2, alcohol test below limit, failed to give way at priority traffic control, failed to notice control MOPED1, alcohol test below limit	0	0	1
CUSTOMHOUSE QUAY		I	POST OFFICE SQUARE	2021182673	26/03/2021	Car/Wagon1 SDB on CUSTOMHOUSE QUAY hit Car/Wagon2 merging from the left	CAR/WAGON1, alcohol test below limit CAR/WAGON2, alcohol test below limit, failed to give way at priority traffic control, failed to notice signs	0	0	0
CUSTOMHOUSE QUAY-SLIP	30	S	PANAMA STREET	201969285	1/06/2019	Left scene1 DIRN on CUSTOMHOUSE QUAY-SLIP hit parked veh, Left scene1 hit parked (unattended) vehicle	LEFT SCENE1, too far left	0	0	0
GREY ST		I	CUSTOMHOUSE QUAY	201732361	15/01/2017	Car/Wagon1 EDB on Grey street hit Car/Wagon2 crossing at right angle from right	CAR/WAGON1, failed to give way at priority traffic control	0	0	0
JERVOIS QUAY		I	CUSTOMHOUSE QUAY	201755679	4/12/2017	Van1 NDB on JERVOIS QUAY hit SUV2 merging from the left	SUV2, failed to give way at priority traffic control	0	0	0
JERVOIS QUAY		I	CUSTOMHOUSE QUAY	2020152046	13/05/2020	Left scene1 NDB on CUSTOMHOUSE QUAY overtaking Cyclist2 (Age 19)	LEFT SCENE1, did not check/notice another party from other dirn, failed to give way at priority traffic control, other inattentive	0	0	1
JERVOIS QUAY	30	N	POST OFFICE SQUARE	201750703	21/09/2017	Car/Wagon1 SDB on JERVOIS QUAY hit rear end of Car/Wagon2 stop/slow for queue	CAR/WAGON1, attention diverted by cell phone, failed to notice car slowing, stopping/stationary	0	0	0
JERVOIS QUAY		I	POST OFFICE SQUARE	201843070	5/06/2018	Car/Wagon2 turning right hit by oncoming Motorcycle1 NDB on JERVOIS QUAY	CAR/WAGON2, failed to give way turning to non-turning traffic	0	0	0
JERVOIS QUAY		I	POST OFFICE SQUARE	2021175668	11/01/2021	Left scene1 SDB on JERVOIS QUAY overtaking SUV2	LEFT SCENE1, long vehicle tracked outside lane	0	0	0

Appendix B RESEARCH BASIS OF ASSESSMENTS

Much of the published research that examines the extent that billboards might cause a distraction to motorists, which in turn might create a hazardous situation for road users, is often inconclusive or contradictory due to:

- Many of the earlier papers were produced before modern digital billboards were in common use. Consequently, they were based on theoretical studies of the distractive potential of such billboards, (often inferred by examining glance behaviours using driving simulators), and were typically unsupported by empirical or statistical analysis.
- A high proportion of the studies involved digital billboard operations that are distinctly different from those typically applied in New Zealand. For examples, the studies involved screens with overly bright displays, and/or without consideration given to image transitions, and/or which included dynamic features such as full-motion video.

More recent research now has the benefit of operational billboards to observe and measure, and in some cases have involved billboard operational characteristics that are reasonably tightly controlled (as they are in New Zealand). This more recent research tends to be more empirically based and is less contradictory, with examples provided as follows:

A 2015 Australian paper[2] by Carolyn Samsa describes experimental research into driver distraction that recorded results and comparisons for on-premise advertising signs, static billboards, and digital billboards. The study found that:

- *"Generally, participants tended to fixate most on the road ahead when driving, which is a positive finding in terms of road safety. There were also no differences in this on-road viewing between the three signage types"*, [i.e. on-premise advertising signs, standard billboards and digital billboards].
- *"When participants looked at billboards and on-premise signs, the average fixation durations were all well below 0.75s, which is considered to be the equivalent minimum perception-reaction time to the slowing of a vehicle ahead*".
- *"In regard to driver performance variables, the data showed no significant differences in average vehicle headway for any of the signage types", and "… the headways found in the present study would have given drivers enough time to detect the slowing of a vehicle in front and respond accordingly".*
- *"… the findings show that digital billboards do not draw drivers' attention away from the road for dangerously long periods of time compared to other signage types, and drivers maintained a safe average vehicle headway in the presence of these signs"*.

The key point to be drawn from Samsa (2015) is that digital billboards are no more distractive to drivers than any other sign type including standard billboards and on-premise signage.

An Australian study by Monash University which is relevant to this application, relates to situational awareness[3]. While this research examined driver responses to static image billboards in freeway situations, is pertinent based on its following conclusions:

- "*Overall, the driving performance and situation awareness results indicated that drivers were not overly distracted by roadside advertising in the freeway environment, as indicated by a lack of serious driving errors being made in the vicinity of the billboards*".
- "*The billboards examined were a key element of a drivers' situation awareness when driving demand was low, such as when driving on the freeway under free-flowing, low traffic conditions. However, … when driving demands increased, drivers focused less attention on the billboards*".
- "*These results suggest that drivers can self-regulate their attention to billboards, reducing the attention given to them when required to focus on the immediate driving situation*".

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2 Samsa, C. (2015) "*Digital billboards 'down under': are they distracting to drivers and can industry and regulators work together for a successful road safety outcome*?" Proceedings of the 2015 Australasian Road Safety Conference 14 – 16 October, Gold Coast, Australia

3 Young K.L., Stephens A.N., Logan D.B., Lenne M.G. "An On-Road Study of the Effect of Roadside Advertising on Driving Performance and Situation Awareness", Proceedings of the 4th International Driver Distraction and Inattention Conference, Sydney, Australia, 2015

Appendix B Research Basis of Assessments

Research undertaken by Bridget Burdett (2018)[4] who studied mind wandering, (which also relates to situational awareness), confirmed that drivers focus more on the driving task at hand when in 'complex' traffic environments:

> "*Drivers were more likely to report* [in the experiments] *mind wandering in low risk than in high risk situations, and in situations of low rather than high demand".*
>
> *"Situations of high demand and the highest crashes rates were places where mind wandering was least likely to be reported* [in the experiments]*, suggesting an inverse relationship between mind wandering and crash risk".*

A November 2018 research report by ARRB[5] involved an evaluation of the impact on driving performance of new digital billboard installations at two traffic signalised intersections in Queensland. This evaluation took the form of a video survey of vehicle control with the aim of assessing the impact of the digital billboard when lit. The video data were coded to extract lane drift, 'stopping over the line', and incidents.

The concluding paragraphs from the ARRB study are as follows:

> *"Furthermore, the 'positive' impact of digital billboards in the current evaluation did not occur exclusively with respect to lateral control. This effect was also observed (with one exception) for stopping over the line violations. This is important because it rules out the possibility of a very specific and hence less practically significant impact from digital billboards. Stopping over the line suggests a failure to appropriately register the red state of the signals.*
>
> *This could result from 'back dropping' where colour contents in the billboard display are confusable with signal colours (see Austroads, 2013). The decrease in stopping over the line violations in the presence of the billboard suggests that such confusion did not occur in this evaluation. Stopping over the line violations could also result from change blindness for signal changes. While there is considerable evidence that distraction can increase change blindness in driving situations (e.g. McCarley et al., 2004) this research has mostly considered distraction from mobile phone conversations rather than external visual distraction. The decrease in stopping over the line violations in the presence of the billboard suggests that change blindness did not occur in this evaluation. Interestingly, a recent study by Pammer et al. (2014), although not concerned with a driving task per se, did find that under certain conditions in the laboratory that a visual distraction could reduce the incidence of change blindness.*
>
> *In conclusion, the current evaluation investigated the impact of the presence of digital billboards on vehicle control performance. The sites evaluated were relatively complex signalised intersections. Because of the cognitive demands associated with negotiating a signalised intersection, these are the kinds of sites where it might be expected that drivers would display impairment from distraction. However, there was almost no evidence that the digital billboards at these locations impaired driving performance. Clearly, in real world situations, the impact from the visual distraction from digital billboards is complex, and in some situations such as the installations evaluated here, there can be an apparent positive impact on driving performance from the presence of a digital billboard. If the parameters of how and when this positive impact occurs can be precisely specified, this would prove enormously valuable for all stakeholders."*

This ARRB research supports other research cited, and further demonstrates that digital billboards are not inherently hazardous to drivers by creating driver distractions, and that despite common perceptions to the contrary, the reality is that their presence in complex driving situations, including signalised intersections, does not in practice result in a deterioration of road safety.

Overall, the emerging body of practical, empirically-based research that is now emerging, is increasingly confirming that digital billboards are little different from any other sort of advertising including on-premise signage; that they are not inherently distractive to drivers to the extent that they creating any observable adverse road safety effects; and that they are not inherently hazardous to the traffic environment even in complex traffic situations such as at signalised intersections.

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4 Bridget RD Burdett, Samuel G Charlton, Nicola J Starkey "Mind wandering during everyday driving: An on-road study", Accident Analysis and Prevention, 2018

5 Goodsell R, Dr Roberts. P "On-Road evaluation of the driving performance impact of digital billboards at Intersections" Project No. PRS17074 - ARRB

Appendix C ROAD SAFETY EFFECTS FROM CRASH HISTORIES

There are currently in excess of 580 digital advertising screens[6] in New Zealand.

In order to understand how digital signs and digital billboards impact upon road safety, an analysis has been undertaken to identify the incidence of reported traffic crashes as a result of advertising signs.

New Zealand now has some nine years' operational experience from which a fairly sound appreciation of the actual road safety implications of digital advertising screens can be gained. Accordingly, a search was made of the Waka Kotahi CAS database that encompasses the whole of New Zealand for the nine-year period since digital billboards and digital signs have been operating in New Zealand, that is, 2012 to 2020. In this search, contributing cause factor 356 ("*attention diverted by advertising or signs*") has been focussed on. It is noted in this regard that this code picks up any crash that is related to distraction by any sort of sign, not just advertising signs, i.e. including traffic signs, road works sign, directional signs, and so on.

For the nine-year search period, the CAS database produced a list of 66 sign-related crashes within the whole of New Zealand. On further detailed examination of the comments and witness statements that are contained in each individual 'Police Traffic Crash Report' that relate to the 66 crashes (and where necessary cross-referencing to what actually exists at the crash locations), the following breakdown of '*attention diverted by advertising or signs'* was established:

Nature of sign	Crashes
Static advertising sign / billboard	2
On-premise sign / roadside stall / fuel price board / election hoarding	14
traffic sign / roadworks sign / VMS / directional sign / digital speed sign	22
Looking for a building or premise	8
Looking for or at a street name sign	8
Blow-up circus clown (blimp)	1
Incorrectly coded, or nature of the sign unknown (but confirmed not digital)	11
Total	**66**

Table C1: Attention diverted by advertising or signs 2012-2020

The table shows that in the whole of New Zealand over the nine years as examined, only two crashes were recorded as involving a static advertising billboard. Notably, none involved distraction by any sort of digital advertising sign. This would seem to clearly demonstrate that the presence of digital signage is not currently creating identifiable road safety problems.

In saying this, it is also relevant to put the number of sign-related crashes into perspective. During the nine-year search period there was an overall total of 306,839 recorded crashes in New Zealand. Even if the combined total of 16 crashes involving some sort of advertising is considered (that is, the two static third-party advertising signs, and the 14 first-party on-premise signs and election hoardings), they represent only 0.005% of all crashes. The two static advertising sign crashes represent 0.0007% of all crashes.

The same analysis undertaken for in-vehicle distractions (including by passengers, pets, cell phones, navigation devices, entertainment console, climate controls, food, cigarettes, beverages and other objects), revealed 8,431 crashes. This represents a ratio of 527 in-vehicle distraction crashes to every one advertising related crash.

[6] A double-sided billboard that has display screens that are directed to different approaches are counted as two screens.

In terms of injuries, it is pertinent to note that neither of the two static advertising sign crashes resulted in an injury. Of the 14 crashes involving on-premise advertising, four resulted in an injury. For the total of 16 advertising-related crashes, this is equivalent to an average of 0.4 injury crashes per year for the whole of New Zealand. By comparison, in-vehicle distractions have produced an average of 295 injury crashes per year. If, as some of the research suggests[7], the presence of digital billboards and digital signs helps to keep a driver looking at the road ahead instead of being distracted by elements within the vehicle, then arguably there is potentially a net road safety advantage to enabling the presence of roadside digital billboards and digital signs as a means of off-setting at least some of the comparatively higher number of in-vehicle distraction crashes and injuries that are occurring.

It is also noted in this regard that research from Queens University in Ireland[8] found that while distraction due to objects inside the vehicle (particularly the use of cell phones and in-car technology) are under-reported and hence under-represented as a crash factor, no such difference was found with regard to outside the vehicle distraction. This further supports the analysis of individual crash records as providing a useful tool to understand the potential impact of third-party advertising on driver attention and safety.

In essence, there is no reason why drivers who have been involved in a crash would not want to point to distraction by a sign, any more or less than they would point to distraction by any other element of the traffic environment, or elements internal to the vehicle.

Based on the above analyses, the following relevant conclusions can be drawn:

- Digital advertising signs and digital billboards are not featuring at all in the crash statistics, (i.e. zero recorded since digital screens were first introduced into New Zealand in 2012). As noted, there are now in excess of 540 digital advertising screens operating in New Zealand.
- Static third-party advertising signs have featured only twice in the past nine years. Neither of them resulted in an injury.
- Even when including on-premise advertising signs that include roadside stalls and service station fuel price boards, there were only 12 recorded crashes over nine years, and these resulted in just four injuries.

The point to be made from all the above is that despite some perceptions to the contrary, empirically based evidence confirms that digital billboards and digital signs, operated as they do in New Zealand, do not generate discernible road safety effects, even when concerted efforts are made to find those effects.

[7] Including Young *et al* (2015), Goodsell *et al* (2018), and the ARRB "*Bull Creek LFDS Evaluation*" (2016)

[8] Regev S, Rolison JJ, Feeney A, Moutari S "*Driver distraction is an under-reported cause of road accidents: An examination of discrepancy between police officers' views and road accident reports*", Queen's University, Belfast, presented at Fifth International Conference on Driver Distraction and Inattention, May 2017.

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