

**BEFORE THE ENVIRONMENT COURT  
I MUA I TE KOOTI TAIAO O AOTEAROA**

**ENV-2018-AKL-000078**

**IN THE MATTER** of the Resource Management  
Act 1991 (**RMA**)

**AND**

**IN THE MATTER** of the direct referral of  
applications for resource  
consent for the necessary  
infrastructure and related  
activities associated with  
holding the America's Cup in  
Auckland

**BETWEEN** **PANUKU DEVELOPMENT  
AUCKLAND**

**Applicant**

**AND**

**AUCKLAND COUNCIL**

**Regulatory Authority**

---

**EVIDENCE OF PAUL JOHN WILLIAM MUSSON ON BEHALF OF  
PANUKU DEVELOPMENT AUCKLAND  
(FIRE SAFETY AND EVACUATION)  
7 AUGUST 2018**

---

## 1. QUALIFICATIONS AND EXPERIENCE

- 1.1 My full name is Paul John William Musson. I am a Senior Associate with Beca Limited in Auckland, and have worked at Beca Ltd since 2007.
- 1.2 I hold a Bachelor of Engineering degree with Second Class Honours in Civil and Structural Engineering from the University of Bradford, United Kingdom. I am a Fellow of the Chartered Association of Building Engineers (United Kingdom).
- 1.3 The main focus of my project experience since working in New Zealand has been in the fire and life safety design of buildings, together with asset management of and the fire life safety of tunnels. My relevant experience includes:
- a) Fire Engineering design, and involvement in the fire design or assessment, on a broad range of new and existing buildings in New Zealand.
  - b) In 2010/2011 I was the lead fire engineer for Beca on the redevelopment of Shed 10 at Queen's Wharf for Waterfront Auckland (now Panuku Development Auckland (**Panuku**)), which became a new cruise terminal and flexible event space. As part of this work I was the lead fire engineer for the redevelopment of Queen's Wharf (using Shed 10 and The Cloud) for its use as an event live site for the Rugby World Cup 2011. This included development and assessment of the dynamic pedestrian modelling and schemes for the safe use in Rugby World Cup 2011, together with guidance and schemes for the ongoing use for events, which remain in place today.
  - c) In the UK, I was a director of an independent licenced Building Control Company, acting as an Approved Inspector, for assessing and granting building consents and completion certificates for a wide range of buildings including public buildings.
  - d) I worked for London Underground Ltd (**LUL**) for 15 years on major tunnel and station projects such as the Jubilee Line Extension Project, Kings Cross Redevelopment (buildings with high occupancy). In this role I was an accredited Fire and Premises Engineer acting for the LUL Chief Engineer. These duties included assessment, approval and implementation of the fire life

safety aspects of the projects, including assessment and analysis of pedestrian and evacuation models.

e) In a current role with the Auckland Motorway Alliance (as part of the New Zealand Transport Agency (**NZTA**)), I act as Asset Manager and Tunnel Manager for the Victoria Park and Johnstone's Hill Tunnels, as well an appointed role of safety officer for the NZTA at the Wellington Tunnels. These responsibilities include oversight of fire and life safety systems, ongoing compliance and emergency and evacuation of the staff and public.

1.4 I have been engaged by Panuku to undertake the initial concept fire and evacuation assessments for resource consenting of the infrastructure and related activities associated with holding the 36<sup>th</sup> America's Cup (**AC36**) in Auckland (**Project**).

1.5 I advise that I have read the Code of Conduct for Expert Witnesses contained in the Environment Court Practice Note 2014 and have complied with it in preparing this evidence. I confirm that the issues addressed in this evidence are within my area of expertise and I have not omitted material facts known to me that might alter or detract from my evidence.

## 2. SCOPE OF EVIDENCE

2.1 The key focus of my evidence is confirming the feasibility of use of the Hobson Wharf extension and the new breakwaters proposed as part of the applications for resource consent, both during the event and in legacy mode.

2.2 My evidence includes discussion on pedestrian and evacuation capacity and is based on the initial dynamic modelling that has now been undertaken. My evidence also relies on calculations and information contained in the Traffic and Transport Technical Report (CBD Vol A, CB25 and CB26) (**Transport Technical Report**).

2.3 I have been intimately involved in this Project since October 2017. I prepared the Fire and Evacuation Assessment Technical Report that was attached to the application (CBD Vol A, CB34) (**Fire and Evacuation Report**).

2.4 I have also read the evidence of Mr Grant Calder, which relates to the event management and the draft Event Management Plan attached to Mr Calder's evidence as Attachment A, and the evidence of Mr Joe Phillips in relation to the traffic and transport effects.

### 3. SUMMARY OF EVIDENCE

3.1 In my opinion, while the Hobson Wharf extension is only served by a single entry and egress route, the emergency egress capacity of the new wharf is now likely to be at least 2,000 people (for example 500 within the America's Cup base area and 1,500 on the wharf). I consider that safe evacuation from the Hobson Wharf extension could be achieved. Final approval of the safe occupancy and means of egress will be approved through the building consenting process.

3.2 I consider that fire and evacuation matters generally can and will be appropriately addressed through design, building consent, the conditions of the resource consents and the final emergency management and event management plans.

### 4. RELEVANT FACTS AND CONTEXT

5. In this statement of evidence, I do not repeat the Project description and refer to the summary of the application in the evidence of Mr Rod Marler (Panuku). A description of the overall event management approach is discussed in the evidence of Mr Calder.

5.1 For completeness I record that both the buildings and wharves will be subject to compliance with the New Zealand Building Code (**NZBC**). I have also considered the requirements of other regulations, such as the Fire Safety and Evacuation of Buildings Regulations 2006, and the preliminary schemes have been developed on the basis of providing the infrastructure, design criteria and guidance to enable the residual risks to be managed under Event and Evacuation Plans. This includes ensuring the safe evacuation from buildings to a final place of safety, within the wider context of use of the wharves, with respect to public use, evacuation, firefighting access, and integrated management plans, particularly on significant event days.

5.2 I also note that since December 2017, Fire and Emergency New Zealand (**FENZ**) have been consulted on matters of fire intervention and access facilities, together with the general provisions. FENZ provided its approval in principal to the scheme submitted, as recorded in the Fire and Evacuation Report.

5.3 As part of my involvement, I have undertaken assessments of all aspects of the project including the use of Halsey Wharf, Wynyard Point, and consider the fire safety approach is sound. In terms of matters such as the protection of property from damage caused by fire, and fighting and rescue operations, these will be subject to appropriate review and control through the further Building Act 2004 and consent approvals.

## 6. HOBSON WHARF

### Safeguarding people from an unacceptable risk of injury or illness caused by fire

6.1 Figure 3 below shows the proposed egress to and from the proposed Hobson Wharf extension.



**Figure 3 –Hobson Wharf Egress**

### *Initial Assessment*

6.2 The specific limitation of Hobson Wharf is that it is only served by a single entry and egress route of around 5.3m width (at its restriction). As noted in original Transport Technical Report, the initial analysis presented was based on a first principles non dynamic approach, showing emergency egress capacity is likely to be in the range of 980 to 2,550 people based on the existing access and egress widths available (CBD Vol A, CB25, page 1714). At the time the Transport Technical Report was prepared, it was envisaged that the syndicate base would have an occupancy of up to 410 and that circa

600 persons could safely be accommodated on the wharf, unless alternative egress or expanded routes were investigated and assessed, using dynamic pedestrian modelling.

- 6.3 As part of the research and preparation of my original report, the interactions with the Maritime Museum and other buildings on the wharf access were identified, but not fully explored. I note that it has now been established that the Maritime Museum is fully sprinklered throughout, which accordingly reduces the risk levels associated with people evacuating past a building with an incident, as well as FENZ intervention.
- 6.4 The most challenging fire and emergency scenario is that a fire in the Maritime Museum requires evacuation of the wharf, and the fire incident compromises or effects the escape route from the wharf. Whilst it remains that the wharf relies upon a single evacuation route, it is generally an accepted fire safety principle that people may use an evacuation / egress route alongside a building or part of building if they are 2m away (for buildings neither sprinklered nor separated by fire rated construction), provided the time to evacuate is not prolonged.

#### ***More Detailed Assessment***

- 6.5 The progressed design of the breakwater attached to the wharf now enables the access / egress route width to be extended by at least 2.4m, providing at a minimum of 7.6m of clear width for egress.
- 6.6 Dynamic pedestrian modelling has now been progressed to better determine the safe occupancy levels and evacuation times of the wharf. The egress route and modelling takes into account that people are more than 2.0m away from the Maritime Museum when using the egress route due to the local restrictions and parking.
- 6.7 With a 7.6m width for egress available, the initial dynamic modelling has indicated that, with base B occupancy of up to 500, a general other wharf occupancy of 1,500 (i.e. a total of 2,000), and with 300 occupants in the Maritime Museum using building exits onto the wharf access road, for the majority of people:
- a) the wharf end, pier and syndicate base area is cleared within 4 minutes;
  - b) the whole wharf can be evacuated in less than 6.5 minutes to the Eastern Viaduct and relative place of safety and

- c) the walkway and queuing levels of service during general egress or evacuation are within acceptable limits.
- 6.8 I have had further informal discussions with the FENZ and understand that it would be at least 4 to 5 minutes before their response appliances arrive to the Eastern Viaduct and Museum attendance point. They have indicated a total evacuation clearance time of around 6 minutes would not present difficulties in their response to an incident. It can be reasonably assumed that at least 7.6m is fully available for egress, and that egress would not be impede the initial FENZ response. This is provided evacuation and event management plans take into account evacuation of the wharf, coordination with the Maritime Museum and marshalling of occupants.
- 6.9 The final approval to the safe occupancy and means of egress will be subject to approval through the building consenting and evacuation scheme approvals process, with fine tuning of the dynamic pedestrian modelling based on the final designs. I am, however, of the opinion that an acceptable whole wharf occupancy of at least 2,000 people (combined in base B and general wharf) can be demonstrated.
- 6.10 The initial modelling tested a range of occupancy densities between 1,500 and 3,000 people. The range of modelling indicates a linear relationship between occupancy and evacuation clearance times, together with decreasing levels of service in queuing and travel demand, which is primarily constrained by the “bottleneck” at the entrance to the roadway from the wharf, and exit to the Eastern Viaduct.
- 6.11 The evacuation times (majority clearance) for higher densities indicted are:
- a) 2,500 people – 7mins 17 secs.
  - b) 3,000 people - 8 mins 10 secs.
- 6.12 As part of the building consent approval process further sensitivity testing will be undertaken and that this may demonstrate a higher level of occupancy than 2,000.
- 6.13 In the legacy mode, when base B is removed, the initial modelling indicates that clearance times to Eastern Viaduct are similar to the AC36 event mode scenarios, for similar levels of demand. The space may be used for hosting other events. In my

opinion, on the same basis of AC36 event mode, a minimum occupancy of up to 2,000 would be acceptable.

- 6.14 I have also recommended to the Alliance that the existing fire alarm warning system provided to moorings and pontoon is extended and modified to provide warning of fire in these areas.

#### **Protection of other property from damage caused by fire**

- 6.15 The risks of spread of fire from the new syndicate base to the existing Maritime Museum buildings will be by appropriate provisions in accordance with the NZBC under building consent.

#### **Firefighting and rescue operations**

- 6.16 As discussed with FENZ, all access will be from the single access way from the Eastern Viaduct entry. The potential for conflict with general egress with FENZ access and operations was identified at submission stage, and is also discussed above.
- 6.17 Firefighting water supplies and fire hydrants (existing systems modified as required) are to be provided in accordance with the required standards and the NZBC.

### **7. CONCLUSION**

- 7.1 In my opinion, the proposed Wynyard Hobson waterfront infrastructure can be developed for acceptable final outcomes with respect to fire and evacuation safety. Operational and emergency management plans will address matters relating to emergency egress and building and wharf design will be subject to the Building Act 2004 requirements.

Paul John William Musson

7 August 2018