

Accident Report
Serious Harm Injury
Kawau Kat
14 April 2007
Class A





Photograph 1
Kawau Kat alongside Motuihe Wharf at high tide.

1. SUMMARY

- 1.1 At approximately 0945 hours on 14 April 2007, the passenger vessel *Kawau Kat* was approaching the wharf at Motuihe Island. The Deckhand made fast a spring line whilst the Master attempted to bring the vessel port side to, alongside the wharf.
- 1.2 The prevailing south westerly wind caused the stern of the vessel to be blown off the wharf and the Master decided to abort the berthing manoeuvre. He ordered the Deckhand to let go the spring line. Before he could carry out the order, a shore cleat attached to the wharf, to which the spring line was attached, failed. The immediate loss of tension on the mooring line caused the cleat to recoil towards the Deckhand. The Deckhand was struck in the face resulting in serious injuries.

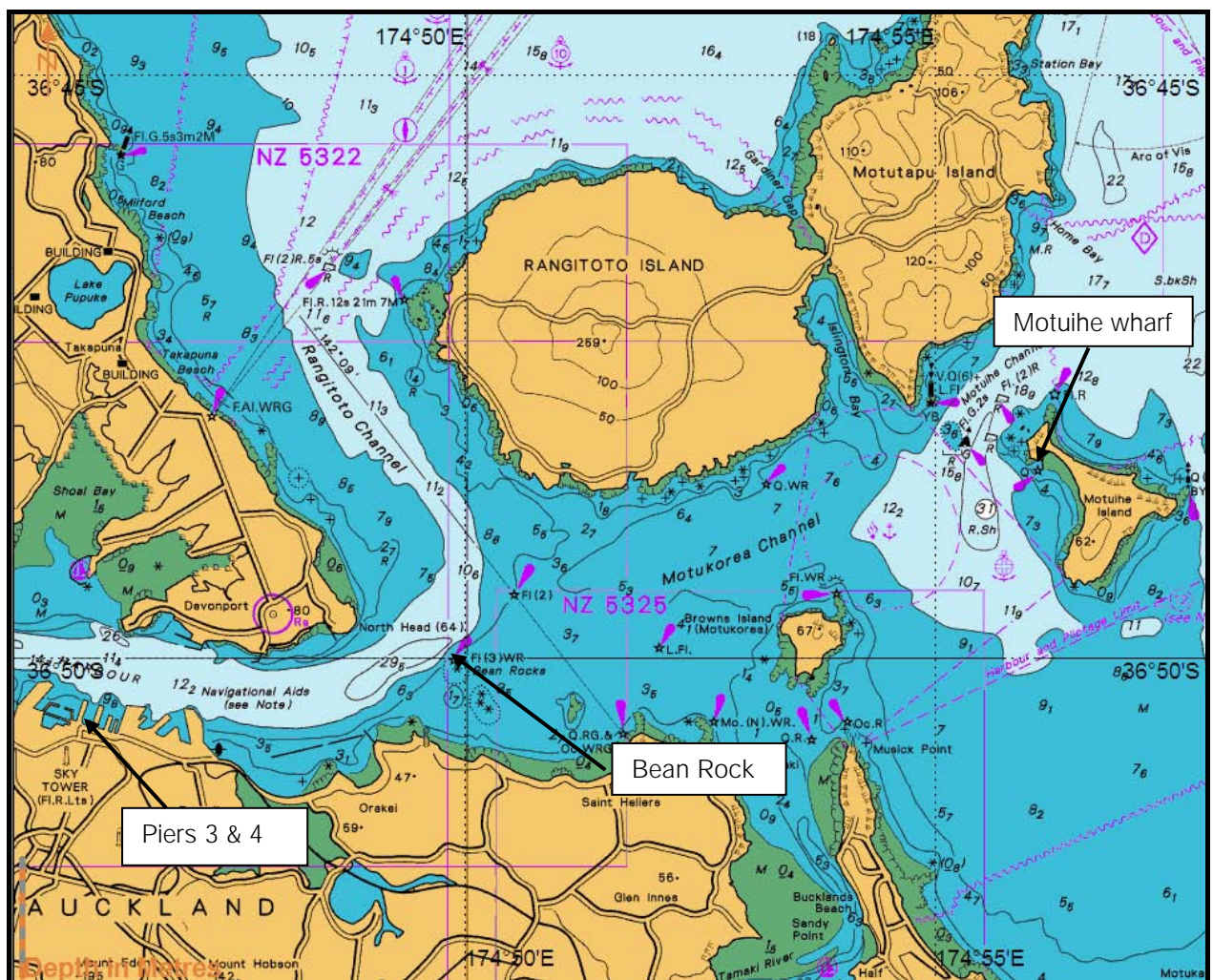


Figure 1
Chart Extract of NZ532 Approaches to Auckland
Courtesy of Land Information New Zealand

2. NARRATIVE

- 2.1 At approximately 0915 hours on Saturday 14 April 2007, the passenger vessel *Kawau Kat* departed from pier 3 at the Auckland ferry terminal. The vessel was on a scheduled voyage to Motuihe Island with five passengers and two crew members on board.
- 2.2 At approximately 0945, the vessel was approaching the wharf at Motuihe Island. The Skipper and Deckhand had discussed the berthing procedure and the Skipper had decided to berth port side to alongside the wharf. He intended to hold the vessel alongside by motoring ahead on a spring line so that the vessel's wheelhouse door lined up with the wharf steps, enabling the passengers to disembark. There were no return passengers to embark and no cargo to either load or discharge, so the Skipper estimated the vessel would only be alongside for a couple of minutes.
- 2.3 On the approach to the wharf, the Deckhand donned a lifejacket and then positioned himself outside the port side wheelhouse door. His intention was to lasso a wharf mooring cleat with the eye of the spring line, as soon as the vessel was close enough for him to do so.
- 2.4 As the vessel approached, the prevailing wind caused the vessel to be blown off the face of the wharf and the Deckhand missed in his attempt to lasso the mooring cleat.
- 2.5 The Skipper repositioned the vessel and made another approach to the wharf. This time, the vessel's port bow was close enough for the Deckhand to be able to land the eye of the spring line over the wharf's mooring cleat (*See Photograph 3*). He promptly made the spring line fast to the cleat located on the port side of *Kawau Kat*. When turned up, the spring line was approximately 3 to 3.5 metres in length. The Skipper put the helm hard to starboard, port engine ahead and the starboard engine astern and attempted to maintain tension on the spring line in order to bring the vessel alongside.
- 2.6 The vessel's stern was overhanging the end of the wharf and the prevailing wind caught the port quarter of the vessel and started to push the stern off the face of the berth. As the stern swung off, the windage area of the vessel increased, thereby increasing the rate of swing. The vessel's port bow came into contact with the wooden fendering on the face of the wharf steps and there was considerable tension on the spring line. The Skipper decided that the vessel's predicament was untenable and he ordered the Deckhand to cast off the spring line. Before he could do so, the Skipper heard a loud bang. He turned around to see the Deckhand lying on the wheelhouse deck.
- 2.7 The passengers, who had been waiting to disembark, immediately came to the Deckhand's assistance and the Skipper decided to return to Auckland at full speed. Once clear of Motuihe Island, at 0945, the Skipper telephoned the vessel's Designated Person Ashore (DPA), informed him of the accident and asked him to arrange for an ambulance to meet the vessel on arrival. Fortunately, one of the passengers was a nurse, who provided first aid to the Deckhand during the voyage back to Auckland.
- 2.8 *Kawau Kat* maintained full speed throughout the passage and arrived back at Pier 4 at 1010 where ambulance staff were awaiting her arrival in order to transfer the Deckhand to hospital.
- 2.9 The DPA for *Kawau Kat* contacted Maritime New Zealand to report the accident as soon as he was able to do so.

3. COMMENT & ANALYSIS

3.1 Evidence

3.1.1 Crew Members

- 3.1.1.1 The Skipper of *Kawau Kat* was a 45 year old male. He was the holder of a valid Certificate of Competency as Inshore Launch Master (ILM) issued in 2004. He had been a professional seafarer for approximately four years including 18 months as Skipper. He was a full time employee of the owners of *Kawau Kat*.
- 3.1.1.2 The Deckhand was a 26 year old male. He possessed no formal maritime qualifications. He had approximately six years experience as a professional seafarer including five years as Deckhand. He was a full time employee of the owners of *Kawau Kat* and had been employed by them for approximately six months.
- 3.1.1.3 The Skipper and Deckhand had sailed together on a few occasions previously, but were not regular crew mates.
- 3.1.1.4 The Deckhand had undergone a period of training and assessment upon joining the company. Each employee has a comprehensive training sheet for each vessel. During the training period, competencies are signed off by a Skipper. These training records are maintained on board each vessel. One of the competencies requiring signing off is that of '*Understand the appropriate safe mooring of vessel in general and excessive weather*'. Also signed off on the Deckhand's training sheet is '*basic and safe rope handling*'. The Deckhand's training sheet was completed on 12 December 2006.
- 3.1.1.5 The Skipper had received 'on the job' training when he was promoted from Deckhand. This training involved being doubled up with an experienced Skipper for a period of two months.
- 3.1.1.6 The Skipper and Deckhand discussed the berthing operation during the voyage to Motuihe Island. The Skipper had decided to berth the vessel port side alongside, despite this manoeuvre placing the strong prevailing wind astern. The Skipper had determined that as the vessel was only going to be alongside for a very short period of time, this approach would be workable.
- 3.1.1.7 The Deckhand claims that he told the Skipper that he had concerns about using the mooring cleat which failed when discussing the berthing procedure on the morning of the accident. The Deckhand vaguely claims to have felt that the cleat was in poor condition having observed it on a previous voyage; although he did not have any specific concerns about it other than he didn't trust it. The Deckhand claims that the Skipper told him not to worry and to continue using it.
- 3.1.1.8 The Skipper cannot recall having had this conversation with the Deckhand.
- 3.1.1.9 Upon arrival at the wharf, neither the Skipper nor Deckhand observed any obvious damage to the cleat.
- 3.1.1.10 The Deckhand did not report his concerns about the condition of the mooring cleat to anybody prior to the day of the accident.
- 3.1.1.11 At the time of the accident, the Deckhand was wearing a lifejacket but was not wearing a hard hat. It is doubtful that a hard hat would have been of any benefit in the particular case due to the injuries being of a facial nature.

3.1.1.12 There is no evidence that either fatigue, alcohol or drugs played any part in this accident.

3.1.2 ***Kawau Kat***

3.1.2.1 ***Kawau Kat*** is a wooden hulled vessel constructed in 1993. She is 20 metres in length and is twin screwed. She is not fitted with a bow thruster.

3.1.2.2 The vessel held a valid Safe Ship Management Certificate which had been issued on 10 December 2004 and was valid until 30 June 2008. She had last been inspected by Maritime New Zealand on 10 August 2006.

3.1.2.3 ***Kawau Kat*** was correctly manned at the time of the accident.

3.1.2.4 The vessel has a vertically mounted mooring cleat positioned on the side of the cabin immediately abaft the wheelhouse door.

3.1.2.5 The wheelhouse door can be used for the boarding and disembarkation of passengers as the wheelhouse is an integral part of the main cabin. It is also possible to board the vessel via bulwark doors on the port and starboard quarters at main deck level and via a gate on the starboard side of the upper deck.

3.1.2.6 The synthetic mooring rope used as a spring line during this incident had a diameter of 22mm. The rope was in good condition.

3.1.2.7 The normal procedure employed by larger vessels berthing at Motuihe wharf is for the mooring ropes to be taken around the wharf piles and turned up on the vessel's bits. The weather conditions and height of tide precluded this method on the day of the accident.

3.1.2.8 On examination after the accident, minor damage, in way of an indentation in the timber construction, was found to the vessel in the vicinity of the mooring cleat. It is thought probable that this indentation was caused by the mooring cleat contacting the vessel when it recoiled after failing.



Photograph 2

Mooring cleat on *Kawau Kat* with the same rope used in the accident.

3.1.2.9 The owners of *Kawau Kat* do not have a system where berthing arrangements are standardised for each of the wharves that their vessels use, preferring to leave it to the discretion of the Skipper. This enables the Skipper to have due regard to the prevailing conditions at the time.

3.1.3 Motuihe Wharf

3.1.3.1 Motuihe Island is administered as a recreation reserve by the Department of Conservation (DOC), and as such, DOC have responsibility for the maintenance of the wharf.

3.1.3.2 The wharf is a wooden structure with sections of concrete decking. The wharf head is approximately 20 metres in length and 7 metres in breadth. The wharf is the same length as *Kawau Kat*.

3.1.3.3 The southern face of the wharf head is used for berthing. The face of the wharf is aligned in a direction of approximately north east to south west.

3.1.3.4 On the wharf, there are three different types of mooring equipment. There are two large bollards, a medium sized bollard and a large cleat positioned on the wharf's deck and four smaller mooring cleats on the steps. On the lower timber waling (horizontal timber) are two medium sized bollards and the cleat that failed.



Photograph 3
Motuihe Wharf

- 3.1.3.5 DOC manages a robust wharf inspection regime. Three separate entities conduct inspections of the wharf structure at regular intervals. DOC conducts their own inspection every two years. This inspection is carried out by the Ranger responsible for the upkeep of structures. The last inspection of this type was conducted on 27 February 2006. The Ranger who made the inspection remembers checking the cleats by way of a visual inspection and also physically taking hold of and trying to move the cleat. The condition of the cleats did not concern the Ranger at the time and no remarks were made in the department's planned maintenance system in relation to the cleats.
- 3.1.3.6 DOC contracts a civil engineering company to conduct inspections of their wharves on an annual basis. The last such inspection was carried out on 23 August 2006. This company also acts as project manager for DOC in regard to any work that needs to be carried out on the wharves as a result of findings during the inspection.
- 3.1.3.7 DOC also contracts an asset management company who carry out inspections of the wharf at six yearly intervals. The last such inspection was conducted on 22 June 2002.
- 3.1.3.8 No deficiencies relating to cleats were recorded during the previous inspections.
- 3.1.3.9 Once a contractor identifies work which needs carrying out on the wharf, a report is drafted and submitted to DOC with an estimated price. DOC management then determines which items they will tend to themselves and which need to be done externally. The contractor then acts as a project manager to external parties in order to oversee the work being conducted.

- 3.1.3.10 Details of the inspections and work carried out are maintained by DOC in a computerised planned maintenance system.
- 3.1.3.11 If damage is reported to DOC, the Ranger in charge of the wharf's maintenance personally goes and inspects the damage and ascertains what is needed to fix the problem in consultation with the contracted civil engineering company. No reports of damage to Motuihe wharf had recently been reported to DOC other than damage to a handrail.

3.1.4 Mooring Cleat

3.1.4.1 The mooring cleat which failed was located and recovered from the seabed by divers.

3.1.4.2 The mooring cleat is one of five similar ones located on the wharf structure. It was located 1.6 metres below the deck of the wharf and is bolted to a 2/75 x 300mm pine wale (horizontal timber) which is treated by wood preservative to H6 standard. It is in a position such that it is below the high water spring tide mark, and therefore is submerged up to twice per day.

3.1.4.3 The dimensions of the cleat are:

Length:	235mm
Breadth:	125mm
Height:	100mm.

Its weight is 5.7kg.

3.1.4.4 The dimensions of the fractured 'horn' are:

Length:	80mm
Diameter:	30mm

Its weight is 470g.

3.1.4.5 The four other cleats of its type are secured to the wharf's concrete steps. The five cleats were fitted to the wharf in 1997 although it is not known if they were new or second hand when installed, nor by whom were they installed. The cleats on the steps were fitted as replacements whilst the one that failed was an additional cleat fitted at the request of the crew of a small DOC vessel which used to regularly use the wharf.

3.1.4.6 The cleat is constructed of cast iron. It is cast with two bolt holes, located diagonally to one another. These bolt holes are recessed enabling the 3mm washer and nut to be flush with the casting so as not to compromise mooring ropes. The presence of the securing washer and nut precludes the examination of the casting in way of the bolt hole beneath them.

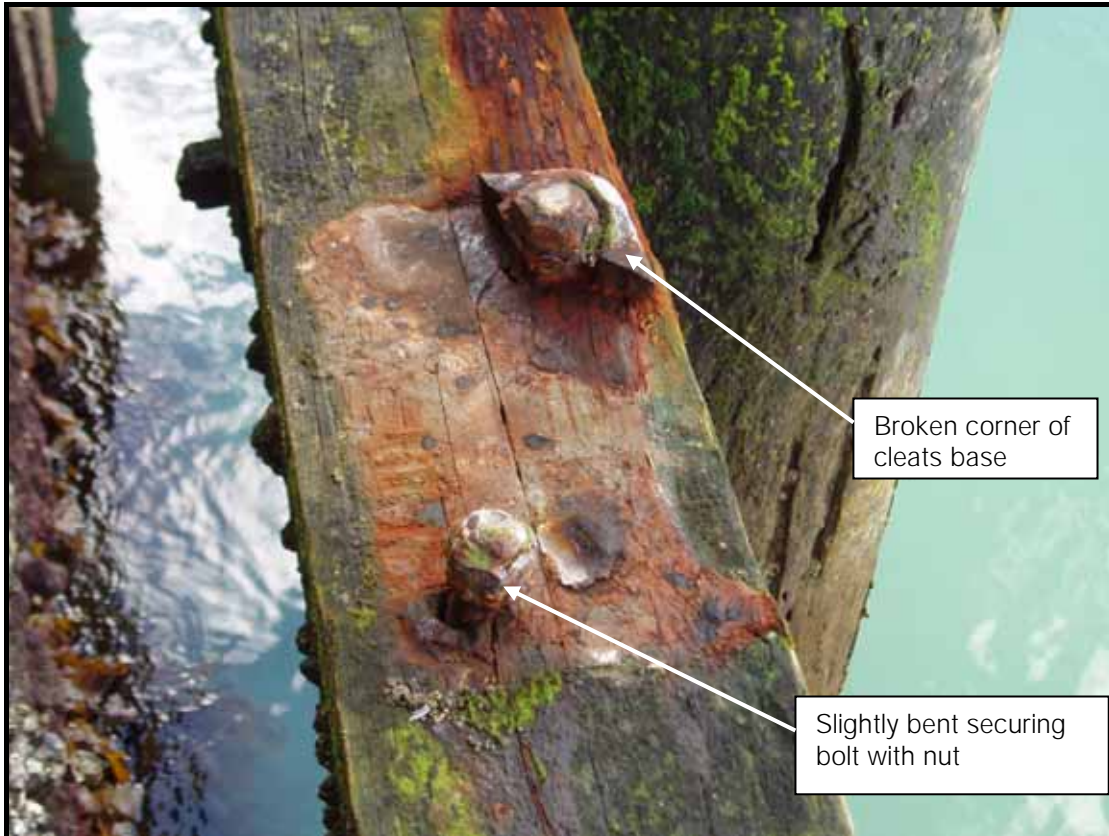
3.1.4.7 The securing bolts, were galvanised and of size M20. The rear bolt was found to be slightly bent in a seawards direction when examined after the accident. Some corrosion beneath the nut had reduced the diameter of the shank by approximately 4mm. The washer for this bolt was not located. Both nuts were found to be in situ on the bolts and were in good condition.

3.1.4.8 The lower nuts and washers on the underside of the wale were found to be in good condition.



Photo 4
Mooring Cleat and Detached 'Horn'

- 3.1.4.9 When examined after the accident, it was found that one side of the cleats 'horn' had been broken off and the seaward corner of the base had broken off across the bolt hole. The underside of the cleat's base showed evidence of pitting where it had been in contact with the treated timber to which it was affixed. It is likely that there has been a cathodic reaction between the cast iron cleat and the copper present in the treated timber.
- 3.1.4.10 The rear bolthole was found to be oversize (approximately 30mm, compared to the normal 22mm for a 20mm bolt). This is probably due to corrosion caused by a cathodic reaction from the cast iron being in contact with the treated timber or the bolt, which was constructed of a dissimilar metal. Another possibility is that the bolt hole was oversize for the 20mm bolt when the cleat was first fitted and that the gap was obscured by the washer below the nut.
- 3.1.4.11 The cleat was covered with surface rust. This surface rust was no worse that could reasonably be expected given its position on the wharf.



Photograph 5
Cleat's Position Prior to Failure

- 3.1.4.12 The corrosion around the bolt hole probably allowed the cleat to be pulled over the bolt's nut and in doing so breaking the washer. The lifting of the rear of the cleat placed stresses on the casting causing the seaward corner, which was still effectively attached by its bolt, to fracture. This corner section of the base remained in position on the wharf.
- 3.1.4.13 The cast nature of the cleat's construction means that prior to the moment of failure; the cleat would not have given any indication of its impending fracture.



Photograph 6
Mooring Cleat Showing Corrosion Around Bolt Hole

3.1.5 Weather Conditions

- 3.1.5.1 At the time of the accident, the Skipper estimated the wind to be approximately 15 to 18 knots from a south westerly direction.
- 3.1.5.2 Information collected from a remote weather station at Bean Rock, 5 miles west of Motuihe Island, gives the wind direction at the time of the accident to be west south westerly at a speed of approximately 14 knots, but with a maximum gust during the period 0900-1000 of 29 knots from the south west.
- 3.1.5.3 At the time of the accident, the tide was at the final stage of ebbing, with the time of low water in Auckland of 1006. There is no known data relating to tidal flows within the bay off Motuihe Island.

3.1.6 Injuries

- 3.1.6.1 The Deckhand suffered serious facial injuries as a result of this accident.
- 3.1.6.2 Amongst those injuries were multiple fractures including the nose, eye socket and sinus. He also lost two teeth and sustained several chipped teeth. There was also damage to an eye.
- 3.1.6.3 The Deckhand required surgery to repair some of the injuries sustained once the considerable facial swelling had subsided.

3.2 ANALYSIS

- 3.2.1 In the opinion of a Civil Engineer, by far the weakest component in the mooring arrangement was the timber to which the cleat was bolted. If undue stress was applied to the cleat, it could be expected that the timber would start to split.
- 3.2.2 During the post accident inspection of the wharf, no damage to the timber waling was discovered.

4. CONCLUSIONS

N.B. These are not listed in order of importance

- 4.1 The mooring cleat was able to be pulled off its bolts due to corrosion. This subsequently caused the cast iron to fracture.
- 4.2 The possible causes for this corrosion are the cathodic reaction between two dissimilar metals in seawater, either between the cast iron and the copper present in the treated timber to which the mooring cleat was affixed, or between the mild steel bolt and the cast iron. *In commenting on the draft report the Department of Conservation (DOC) stated it would bring Conclusions 4.1 and 4.2 to the notice of their consulting engineers and that they would be replacing all cast brackets with mild steel as per their consulting engineers inspection report.*
- 4.3 DOC had robust procedures in place to monitor the condition of the wharf and had an ongoing maintenance plan for the wharf. *In commenting on the draft report DOC stated that their monitoring procedures would be further addressed by specifically including the mooring cleats and bollards in the routine inspections of the structure that were conducted by their consulting engineers. DOC stated that the cleats and bollards are part of the existing inspection regime however DOC would raise the emphasis on these items with a view to replacement at regular intervals should this be warranted or identified as a potential risk by their consulting engineers or observation by other parties.*
- 4.4 The failure of the mooring cleat was an unforeseen occurrence and could not have reasonably been expected.
- 4.5 It is not known whether it was the cleat, or the mooring rope which struck the Deckhand in the face, nor whether it was a direct hit or if it ricocheted off the side of the vessel. It is also unknown at what stage the 'horn' became detached from the main structure of the cleat.
- 4.6 With the benefit of hindsight, It would have been prudent for the Skipper to berth starboard side alongside thereby putting the prevailing wind ahead. As he berthed port side alongside, in the prevailing weather conditions, it would have been prudent for him to use a longer spring line, either secured to a larger bollard or around a wharf pile.
- 4.7 There is no mandatory inspection regime for wharves, nor are there any standards for the construction or testing of mooring arrangements on wharves.

5. RECOMMENDATIONS

- 5.1 It is recommended that the Department of Conservation replace the remaining cleats of the same type on Motuihe wharf as a matter of urgency. *In commenting on the draft report DOC stated that they had engaged their consulting engineers to carry out an unscheduled inspection of the cleats and bollards with a view to the removal and replacement of suspect items. DOC are also further discussing with their consulting engineers a new design and fabrication of a mooring point/cleat/bollard fixing method that will withstand the rigours of use and corrosion.*
- 5.2 It is recommended that this report be promulgated to Regional Harbourmasters.
- 5.3 In the absence of any type of register of wharf owners, it is recommended that this report be condensed into an article for Lookout! magazine to ensure that it gains as wide a readership as possible.
- 5.4 It is recommended that that this report is sent to the Department of Labour. Although the injuries sustained were to a crew member onboard a vessel, the item that caused the accident was on a shore structure.
- 5.5 It is recommended that DOC consult with the ferry companies when determining the positioning of and the properties required of the cleats replacement. *In commenting on the draft report DOC stated that they would consult with ferry companies to determine the type and location of mooring points in line with this recommendation and approval from their consulting engineers.*

6. ACTION TAKEN

- 6.1 Shortly after the accident, DOC requested its contacted Civil Engineering company to visit the wharf and report as to their conclusions why this event occurred. Maritime New Zealand has been provided with a copy of this report.

VESSEL INFORMATION

Ship Type:	Restricted Passenger Ship
Certified Operating Limit:	Inshore
Flag:	New Zealand
MSA No.:	105492
Built:	1993
Construction Material:	Wood
Length Overall (m):	20.0
Maximum Breadth:	8.0
Gross Tonnage:	32
Registered Owner:	Kiwi Kat Ltd
Ship Operator/Manager:	360 Discovery
SSM Company:	Maritime Management Services Limited
Accident Investigator:	Andrew Hayton