

MCDEM Response to the Tsunami Threat from the 30 September 2009 Samoan Earthquake

Report on internal review

Introduction

1. At 0648 New Zealand Daylight Time on 30 September 2009 a magnitude 8.0 earthquake occurred in the Pacific Ocean, south of Samoa. The earthquake generated a tsunami that caused significant damage and loss of life in Samoa, American Samoa and Tonga. The location, magnitude and depth of the earthquake triggered a warning from the Pacific Tsunami Warning Centre (PTWC) in Hawaii that issued a warning of a tsunami threat to New Zealand.
2. The Ministry of Civil Defence & Emergency Management (MCDEM) was alerted to the earthquake and the potential for a tsunami to strike parts of the New Zealand coastline. MCDEM implemented its tsunami response procedures, which included issuing a national warning, activating the National Crisis Management Centre (NCMC), co-ordinating responses of Civil Defence Emergency Management (CDEM) Groups, and managing media enquires and public information.
3. Following any activation of the NCMC, MCDEM reviews its operational response in order to identify the key issues in the management of the response operation and to identify those aspects that worked well and the areas that may need improvement.
4. This paper is the report of the internal post-activation review conducted by the Director. It draws on observations from MCDEM staff involved in the response, information provided by CDEM Groups, supporting agencies and some media organisations that were involved. The terms of reference for the review were agreed by the Minister of Civil Defence and are provided below. In addition, the Minister directed that an independent external review be conducted to focus on public information management. Neither review covers any aspect of the New Zealand response to the situations in Tonga or Samoa.

Terms of Reference

5. The terms of reference for the review were established by the Minister of Civil Defence in agreement with the Director of Civil Defence Emergency Management and the Chief Executive of the Department of Internal Affairs on 9 October 2009.
6. The terms of reference stated that the purpose of the internal review was to identify key issues in the management of the response to the Samoa earthquake and tsunami warning in order to identify those aspects that worked well, and the areas that may need improvement.
7. The internal review was to be undertaken by the Director of Civil Defence Emergency Management. The review would draw on input from the MCDEM, other business groups of the Department of Internal Affairs, government agencies, the CDEM sector, and media organisations.
8. The review was to focus on the appropriateness and effectiveness of the New Zealand response to the event, in terms of:
 - Efficacy of the activation of the NCMC.
 - Speed and reliability of the National Warning System (NWS) and its ability to publish and distribute warnings, advisories and messages.
 - The development and distribution of public information messages by the NCMC.
 - Responding and managing requests for media information, and the timeliness of media engagement.
 - Effectiveness of co-ordination and communication with CDEM Groups.
 - Effectiveness of co-ordination and communication with other government departments and agencies.

- Provision of scientific advice to the National Controller and the NCMC.
 - Adequacy of NCMC procedures and systems, staffing levels and training.
 - Any other aspect of the response and operation of the NCMC that would promote improved responses in the future.
9. The internal review was tasked to identify lessons to be learned, good practices to be reinforced, and arrangements and processes that can be improved, including any capability investments that may be required.
10. The internal review report was to be completed by 15 October 2009.

Background

11. Overall responsibility for the initiation and issue of official tsunami notifications in New Zealand rests with MCDEM. MCDEM maintains a 24/7 duty team, supplemented by the New Zealand Fire Service (NZFS) Northern Communications Centre, and uses the NWS to disseminate tsunami notifications in the form of national advisories and warnings.
12. CDEM Groups are responsible for the development and maintenance of appropriate response arrangements for tsunami for their areas, including public alerting. All CDEM Groups receive national tsunami advisories and warnings via the NWS. CDEM Groups are responsible for further local threat assessment and implementing local public alerting appropriate to the threat.
13. Under the arrangements contained in Section 22 of *The Guide to the National CDEM Plan*, MCDEM and CDEM Groups can request public radio and television stations to broadcast national advisories and warnings. CDEM Groups may also include local broadcasters in their local public alerting systems.
14. The *National Tsunami Advisory and Warning Plan* describes the arrangements to receive and assess tsunami information at the national level, and the dissemination of national official notifications via the NWS. The plan does not address the detailed actions to be taken by local authorities and national agencies upon receipt of national official tsunami notifications. The *National Tsunami Advisory and Warning Plan* is to assist the following organisations in the preparation of local plans and educational material:
- CDEM Groups
 - local authorities
 - science agencies associated with CDEM
 - emergency services
 - other government agencies, and
 - lifeline utilities.
15. These organisations must plan their actions for when they receive information through the NWS to enable them to respond appropriately as stipulated in the *National Tsunami Advisory and Warning Plan*.
16. The current tsunami warning arrangements are the outcome of three specific interventions. They were:
- 1) Two reports prepared in 2005 by the Institute of Geological and Nuclear Sciences Ltd (GNS Science) – *Review of New Zealand’s preparedness to tsunami hazard, comparison to risk and recommendations for treatment*, and *Review of tsunami hazard and risk in New Zealand*.
 - 2) A 2006 review conducted by David Hill of the readiness level of MCDEM to perform its warning and activation roles.

- 3) An internal review to improve the performance standards of outputs in relation to the national warning system following the Solomon Islands tsunami of 2 April 2007.
17. New Zealand is a member of the Pacific Tsunami Warning System (an international system under the auspices of the Intergovernmental Oceanographic Commission of UNESCO) designed to provide timely and effective information and warnings about tsunamis generated in the Pacific. In New Zealand the system is complemented by GNS Science geological hazards and sea level monitoring.
18. Pacific tsunami monitoring is coordinated by the PTWC, which is based in Honolulu, Hawaii. PTWC provides warnings for Pacific tsunamis that can cause damage to almost every country around the Pacific and to most of the Pacific island states. The PTWC monitors an expansive seismic, deep ocean and coastal sea level monitoring systems in the Pacific. The PTWC issues tsunami bulletins using the location and magnitude of earthquakes as the only initial determinants, under the following categories:
 - 1) *Tsunami Information Bulletin/Statement*
 - 2) *Tsunami Advisory*
 - 3) *Tsunami Watch, and*
 - 4) *Tsunami Warning.*
19. MCDEM uses the PTWC categories as one of several considerations to initiate official advisories or warnings through the NWS.
20. A key input into MCDEM's assessment of tsunami risk is the advice provided by GNS Science. GNS Science is the Crown Research Institute mandated by the *National CDEM Plan 2005* to provide scientific advice to the New Zealand government for response to earthquakes, volcanic eruptions, landslides, and tsunami. GNS Science maintains a national geological hazards monitoring and data collection system through the Earthquake Commission-funded GeoNet project.
21. The GeoNet system is able to detect earthquakes around New Zealand, and record large earthquakes that occur outside of New Zealand. GeoNet also monitors and maintains New Zealand's sea-level monitoring network around the coast and offshore islands to observe any tsunami that may have been generated.

Sequence of Events on 30 September 2009

22. At 0648 hours New Zealand Daylight Time on 30 September 2009 a magnitude 8.0 earthquake occurred in the Pacific Ocean, south of Samoa. At 0704 hours the PTWC issued a warning of a tsunami threat to New Zealand.
23. The PTWC warning triggered the arrangements established for issuing a tsunami warning for New Zealand. The NZFS Northern Communications Centre process for issuing a warning was commenced at 0705 hours and the warning was issued through the NWS at 0735 hours. The MCDEM duty team became aware of the alert at 0718 hours through a phone call from the National Public Information Manager. The NCMC was activated at 0730 hours to engage with the CDEM sector and media organisations.
24. The NCMC monitored the situation, liaised with other agencies, and issued updates on the situation through the NWS. At 0922 hours the second national warning was issued, advising that a 1.5 metre tsunami wave had reached Samoa and that smaller waves were expected for New Zealand with estimates of 1 metre for the East Coast and Bay of Plenty. At 0958 hours the third national warning was sent through the NWS, advising of 1 metre wave estimates for East Coast north of Gisborne.

25. At 1025 hours a downgrade of the national warning to a 'National Advisory – Tsunami: Potential Threat' was distributed through the NWS. The message noted the recording of a 40 centimetre wave at the East Cape tidal gauge. This supported the earlier estimation that the largest wave would be no higher than 1 metre. While the PTWC cancelled its warning for New Zealand at 1105 hours, the National Controller decided to retain the current alert status while waiting for gauge readings. At 1111 hours a further potential threat advisory was distributed, indicating that a second wave larger than the first had been detected at Raoul Island and was expected to reach the East Cape at 1115 hours.
26. Further updates on the situation were sent at hourly intervals through the NWS with the status 'National Advisory – Tsunami: Potential Threat' maintained. Following consultation with GNS Science, a 'National Advisory – Tsunami: Cancellation' message was sent at 1610 hours. The NCMC was deactivated at 1700 hours.

Provision of Scientific Advice

27. This section describes the arrangements for the provision of scientific advice to MCDEM in the event of an emergency, and how those arrangements were applied to the tsunami threat on 30 September 2009.

Provision of Scientific Advice: Existing Arrangements

28. MCDEM has a Memorandum of Understanding (MOU) with GNS Science, containing expectations for the provision of scientific advice during emergencies. This capability is provided through the Earthquake Commission-funded GeoNet system. The GeoNet system is able to detect earthquakes around New Zealand, and record large earthquakes that occur outside of New Zealand. GeoNet also monitors and maintains New Zealand's sea-level monitoring network around the coast and offshore islands to observe any tsunami that may have been generated. GeoNet incorporates dual data centres with GNS Science duty officers in Lower Hutt and Wairakei on 20-minute, 24/7 response time.
29. The GNS Science duty officers are mostly earthquake scientists. They receive training in tsunami response as part of the GNS Science duty arrangements. GNS Science has a number of specialist tsunami modellers on staff, who are called on as required to undertake modelling and provide advice to the GNS Science Duty Officer. In the past there have been informal arrangements between GNS Science and external scientists to act as an 'experts panel'. GNS Science has recently invested in tsunami science capability to provide more of this expertise in-house. On 30 September 2009 GNS Science tsunami modellers were activated at around 0800 hours to commence tsunami modelling.
30. Communication in the initial stages of a tsunami response is between the MCDEM Duty Officer and GNS Science Duty Officer. Notably, the GNS Science duty start-up arrangements are based on a pager service, which does not provide for access to PTWC messages. GNS Science receives PTWC messages by email only.
31. In order to determine the likelihood of a tsunami, scientists analyse the seismic waves generated by an earthquake to determine whether the event is likely to have disturbed the sea floor.
32. There are three general classifications for tsunamis, based on their travel time to New Zealand's coastline. These classifications are **local** (less than one hour travel time), **regional** (1-3 hours travel time), and **distant** (greater than 3 hours travel time) tsunamis. Distant and regional source tsunamis involve earthquakes detected by systems outside New Zealand. For regional and

distant source tsunamis, GNS Science is responsible for assessing the threat to New Zealand and providing information and advice to MCDEM. This advice then informs the issuing of advisories, warnings or media releases by MCDEM. Local source tsunamis are generated close to the New Zealand coastline, for instance along the Hikurangi Trench. Although official warnings will not be possible for the affected coast, the GeoNet system is still able to provide a basis for the initiation and stand-down of any emergency response.

Scientific Data and Tools Used in Tsunami Response

33. GNS Science has access to seismic and sea level monitoring data centres from around the Pacific to assist in determining the tsunamigenic potential of the earthquake and the nature of any tsunami that has been generated. This assessment is based on:
 - the calculated magnitude and depth of the earthquake
 - the earthquake mechanism (the way in which the energy is released)
 - historical records of tsunamis in the region of the earthquake
 - real time computer modelling, and
 - extrapolation from pre-calculated models (where available).
34. Initial reports of earthquake parameters (values for earthquake magnitude and depth) may be revised based on the scientific analysis undertaken after an event. This has the potential to increase or decrease the assessed threat.
35. The three key pieces of information sought by both scientists and emergency managers are:
 - 1) whether a tsunami has been generated
 - 2) if a tsunami has been generated, when the first waves will arrive, and
 - 3) the likely wave heights around the New Zealand coast.
36. Understanding the earthquake mechanism (the way in which the energy is released) is critical to this scientific assessment. Two earthquakes with the same magnitude and depth but different energy release mechanisms will have very different tsunami potential. A significant scientific constraint is that the earthquake magnitude, depth, and mechanism may not be resolved for up to 20-50 minutes. Additionally, confirmation of tsunami generation may not be possible from the earthquake data alone and may only come from direct sea level measurements close to the source.
37. Tsunami travel times can be calculated using Tsunami Travel Time (TTT) software. TTT software is used by the PTWC and distributed freely to tsunami warning centres. TTT calculates first arrival travel times based on wave propagation principles (the physics of water movement). First arrivals predicted by TTT software have significant uncertainties. In particular, the results are not precise for areas of complex sea floor relief and TTT does not account for the slowing down that occurs in areas of shallow water. As a result, the predicted TTT first arrival times will not match observed arrival times of the first tsunami waves.
38. TTT is used by the GNS Science and MCDEM duty officers as part of the initial threat assessment.
39. Once the earthquake parameters have been confirmed and/or it is established that a tsunami has been generated, analysis is undertaken by GNS Science of the likely nature of the tsunami (including potential wave heights). This analysis is undertaken in two ways:
 - 1) Examination of a pre-calculated model, which may need to be extrapolated up or down to fit with the actual earthquake.
 - 2) Running a computer model of wave propagation based on the actual earthquake.

40. MCDEM commissioned a suite of modelling in 2007 and 2008 to create a detailed catalogue of pre-calculated models for the distant and regional source tsunami most likely to impact New Zealand. A pre-calculated model from the regional catalogue was applied in the response to the 30 September 2009 event and was the basis for the advice provided by GNS Science (at about 0850 hours) to MCDEM on wave heights being less than or equal to 1 metre, the threat being on the beach and in the water, and the presence of strong currents for several hours.
41. As a tsunami propagates from its source, GNS Science monitors deep ocean and coastal sea level monitoring data sources for confirmation of the wave arrival and heights (real time observation). This information is used to calibrate the computer models and to gain understanding of whether there are larger waves arriving later, and how long the wave activity may continue for. An important point is that the largest amplitude waves may arrive several hours after the first waves are observed.
42. While there are many deep ocean ('DART' buoys) and coastal sea level monitoring stations in the south-west Pacific, there is a relative paucity of deep ocean monitoring stations between Samoa/Tonga, and New Zealand.
43. The wave height estimates that are provided by GNS Science represent the maximum 'peak to trough' wave height at about the 20 metre water depth mark. That is, the wave height estimates do not describe the height of the tsunami as it may be at the shoreline, but rather its height in the near-shore area. Misunderstanding about wave height values provided in warning messages is possible if there is not a clear understanding of what the values represent. The models used at the national scale cannot give a detailed picture of the wide variation of levels of inundation for all parts of the New Zealand coastline. The threat assessment provided by GNS Science reflects the application of some scientific 'rules of thumb' to these near-shore wave heights, from which the messages regarding the scale of the threat are derived and provided to MCDEM.

Provision of Scientific Advice: 30 September 2009 Response

44. In the 30 September 2009 event, the GNS Science Duty Officer was first notified of the PTWC warning message by the MCDEM Duty Officer at 0724 hours. At this point PTWC was reporting the earthquake was magnitude 7.9 and 85km deep. Initial advice verbally provided by the GNS Duty Officer was that the earthquake parameters suggested the event was unlikely to be tsunamigenic (i.e. unlikely to generate a tsunami).
45. At 0743 hours GNS Science confirmed, through observation of the coastal sea level monitoring stations in Samoa, that a tsunami had been generated. The first detailed advice on likely wave heights and regions of interest was provided to MCDEM at 0845 hours. This advice was based on extrapolation of a pre-calculated model.
46. At 0756 hours PTWC issued revised earthquake parameters of magnitude 8.3 and depth of 33km, indicating that the earthquake was significantly larger than first thought and a depth more likely to generate tsunamis.
47. Subsequently, GNS provided further advice at 0930 hours based on the results of numerical modelling. This modelling confirmed the initial assessment from the pre-calculated model. It also included additional information provided on the threat to the Chatham Islands, which had not previously been identified in advice to MCDEM. From 1005 hours observations of first arrivals on the sea-level gauges on Raoul Island were provided (measured at around 40 cm, and about 60 minutes later than predicted by TTT). GNS Science tsunami scientists continued numerical modelling to ensure earlier predictions were

corroborated. At 1030 hours a map was provided to the NCMC with predicted maximum wave heights. However, this map was not intuitive and did not allow for simple calculation of variations in waves heights around the New Zealand coastline. On this basis, MCDEM communicated to the GNS Science Duty Officer that a written explanation of the key points was required.

48. Both GNS Science and MCDEM used TTT software to estimate wave arrival times for 30 September 2009 event. Subsequent analysis showed the predicated first arrival times were up to 60 minutes earlier than actual first arrival times.

Provision of Scientific Advice: Discussion of Issues

49. Overall, it is felt that the interactions between the GNS Science duty team, and MCDEM (the MCDEM Duty Officer and the NCMC) were open and that the science advice provided contributed to the operational response. This is largely attributed to the good relationship and understanding between GNS Science and MCDEM (which was reinforced by the MOU signed in 2008), investment by MCDEM in the regional and distant source catalogue, and investment by GNS Science in tsunami science capability. Additionally, the sea level (tsunami gauge) network was very useful for confirming what the modelling was predicting, and for providing confidence for the "all clear". These data will also be useful for further calibrating tsunami models.
50. MCDEM's MOU with GNS Science provides for GNS Science liaison to be deployed to the NCMC. For the 30 September 2009 response, the delay due to peak hour traffic between Avalon and Wellington CBD led to a decision not to request this. Therefore, most engagement with GNS Science was conducted over the phone.
51. The time constraints of such a situation (a regional tsunami) often require that the majority of the interactions between the GNS Science duty team and MCDEM Duty Officer (and NCMC when activated) are via phone. However, to ensure accuracy and minimise mistranslation, it is very important that key specific advice when provided (such as predicted wave heights and arrival times, and hazard information for specific geographic locations) is provided as soon as possible in a written form, preferably by email. This did not happen consistently during the initial stages of the response on 30 September 2009. Similarly, it is felt that there is scope for a more consistent structure and form to the information and advice that is provided to the NCMC. The language of the advice provided verbally and in a written form was variable and was a contributing factor to misinterpretation down the chain of communication.
52. Areas for development include:
 - improving the timeliness of the provision of scientific information and advice (particularly critical for regional source tsunamis)
 - developing a consistent structure and terminology for the information and the way advice is provided to MCDEM for incorporation into warning messages, and
 - enhancing public and CDEM sector understanding of tsunami and tsunami warning messages.
53. Timeliness of the science response would be assisted by integrating the GNS Science start-up process with the notification provided by NZFS Northern Communications Centre. There are intractable constraints in earthquake monitoring technology that mean there will always be a lag between the first measured earthquake and confirmation of the earthquake parameters that are critical for determining the level of tsunami threat. The GNS Science Duty gets the PTWC bulletins by e-mail at the same time as the MCDEM Duty Officer but

does not get a pager alert of the bulletin like the MCDEM staff. Using the same procedure would assist in the earliest possible scientific assessment.

Provision of Scientific Advice: Recommendations

54. **Recommendation:** MCDEM should arrange for the incorporation of the GNS Science Duty Officer into the NZFS Northern Communication Centre notification alerts for PTWC warnings.
55. **Recommendation:** GeoNet Project Director and MCDEM Manager Operations, in collaboration with the CDEM sector, should develop a format for the advice and information provided to MCDEM that provides for consistency and clarity to those that are not experts on tsunamis.
56. **Recommendation:** GNS Science's initial work to develop a methodology for conveying tsunami threat assessment information should be advanced to enhance the analysis of tsunami threats to coastal areas. The boundaries of these zones, the most effective and useful format of the information, and the thresholds of the threat information should be agreed by the CDEM sector.
57. **Recommendation:** MCDEM should undertake further work to improve understanding of responders and the general public (including the media) on the difference between predicted arrival time, actual arrival time and the (potentially later) arrival of the maximum wave heights for understanding potential impacts. Similarly, it is important that a distinction is made between waves heights in deep water, offshore and at the coast in messages.

National Warning System (NWS)

58. This section describes the system MCDEM uses to distribute national tsunami warnings, advisories and media releases to the CDEM sector, and how that system functioned on 30 September 2009.

National Warning System: Existing Arrangements

59. MCDEM maintains a national warning system to issue civil defence warnings, in accordance with the *National CDEM Plan 2005*. MCDEM maintains the capability and arrangements to enable warnings to be sent 24/7 to CDEM Groups, local authorities, emergency services, certain government departments, lifeline utilities, and media.
60. In December 2007, MCDEM upgraded its national warning system capacity through a contract with a private provider (Gen-I for the Datasquirt system) for the provision of a:
 - multi media message dissemination capability via a third party, and
 - 24/7 call centre facility to service the MCDEM emergency number.
61. The multi media message dissemination capability enabled MCDEM to simultaneously disseminate warnings via SMS, email and fax (previously separate processes were used), undertake more effective address list maintenance, and monitor delivery failures.
62. MCDEM is responsible for ensuring all local authorities and emergency services are registered on the NWS to receive warnings. All other agencies and lifeline utilities are responsible for registering their own participation on the NWS with MCDEM if they want to receive warnings. Requirements for registration are contained in Section 19 of *The Guide to the National CDEM Plan*. The NWS lists are tested quarterly for their currency. On 30 September 2009 there were 517 addresses on the system for local authorities, emergency services, government departments, and lifeline utilities, and 269 addresses on the system for media organisations.

63. The list for media organisations contains all the national (including commercial) broadcasters (radio and TV) and news agencies, as well as print media. The list is maintained by the MCDEM communications unit.
64. MCDEM is supported in the distribution of warnings and advisories through the NWS by the NZFS Northern Communications Centre. The current arrangement was established in response to the David Hill report (paragraph 14(2)). MCDEM reviewed its capability to rapidly disseminate warning and advisory messages. The outcome was a decision by MCDEM to utilise the NZFS Northern Communications Centre to enable faster dissemination of initial (first) warnings and advisories. Subsequent warnings or advisories are handled by the NCMC.
65. The arrangement with NZFS Northern Communications Centre formally started in March 2008. A MOU and statement of service performance was agreed with NZFS for the Northern Communications Centre to issue initial advisories and warnings. The NZFS Northern Communications Centre uses a table of set thresholds (developed by MCDEM in consultation with GNS Science) to guide them on when to issue a national warning or potential threat advisory. Amongst other things, the statement of service performance states that:
- 95% of national warnings are sent within 15 minutes of receiving notification; and
 - 95% of national advisories are sent within 30 minutes of receiving notification.
66. In response to a tsunami event, MCDEM may issue through the NWS one of the following notifications
- 1) *National Advisory - Tsunami: No threat to NZ*
 - 2) *National Advisory - Tsunami: Potential threat to NZ*
 - 3) *National Warning - Tsunami: Threat to NZ*
 - 4) *National Advisory - Tsunami cancellation message*
 - 5) *National Warning - Tsunami cancellation message*
 - 6) *National CDEM Media release – Tsunami*

National Warning System: 30 September 2009 Response

67. The national warning message distributed by the NZFS Northern Communications Centre at 0735 hours was the first time a national warning (as opposed to an advisory) had been issued.
68. The message was sent out by the system to 517 addresses at 0735 hours. Six of the email messages bounced back to MCDEM but each of these individuals received either a SMS and/or fax message.
69. The initial media release was issued by the NZFS Northern Communications Centre through the NWS at 0802 hours. The message was issued to the 269 addresses for media contacts (provided by media organisations). The content of the media message reflected that of the national warning message. The media receive messages by email or fax only. The email for the media release failed to be delivered to seven addresses (Radio New Zealand news, Radio New Zealand Morning Report, Classic Hits News Desk, and four personal addresses for Gallery-print). Each of these organisations had alternative addresses that did receive the email with the initial media release. Three 'bounce backs' occurred at New Zealand Herald, Sunday Star-Times and New Zealand Food Safety Authority, due to the particular recipients no longer being employed by those organisations. These organisations did receive the messages at other addresses.
70. After the initial national warning and media release from NZFS Northern Communications Centre, subsequent messages sent through the NWS (both warnings and advisories, and media releases) were drafted and issued by the

NCMC. A total of fifteen messages were sent from the NCMC through the NWS on 30 September 2009. This included two national warnings, five potential threat advisories, seven media releases, and one cancellation.

71. The second warning message (sent at 0843 hours) contained a wave travel time map of 3MB file size. It was noted at some time between 0900 hours and 1000 hours that messages were slow to be delivered by the system. Upon enquiry with the service provider, it was discovered that the file size of the map attached to the second warning message had caused the slow speed of delivery. Datasquirt deleted the message and attached file so that subsequent messages could be allowed to get through and be delivered in time. This meant that 49 recipients did not receive the second (deleted) warning message.
72. Due to the initial lack of Public Information Management (PIM) staff and the demands posed by the scale of media requests, the preparation and dissemination of media releases was conducted by the Operations function and later transferred to the Planning/Intelligence function as they were also responsible for the warning and potential threat message updates. Therefore the PIM team were not involved in the crafting of the media releases.

National Warning System: Discussion of Issues

73. The completion of the initial national warning and first media release (issued half an hour apart) took longer than expected: 30 minutes to issue the initial warning, and 57 minutes to issue the first media release. The required service performance for a warning is 15 minutes, and for the media release 15 minutes after the warning. While this was the first national warning to be issued by the NZFS Northern Communications Centre, based on the experience of issuing potential threat advisories in the past, it is believed that 30 minutes is about the fastest response that can be expected from NZFS Northern Communications Centre. On 8 October 2009 (Vanuatu earthquake), it took NZFS Northern Communications Centre 42-minutes to produce the initial potential threat advisory. In that case, MCDEM activated its MOU with broadcast media and the NCMC took responsibility for subsequent media releases.
74. The amount of time it takes to complete the national warning and media messages is considered in part to be due to the complexity of the templates and the counter-intuitiveness of the system (e.g. the inability to move information between templates). In addition, wave arrival times take a considerable amount of time to extract from the PTWC bulletin, convert into New Zealand Standard Time from Zulu time, and insert into the template. The templates and aspects of the system should be reviewed in light of this.
75. Delivery failures are a normal phenomenon when the national warning system is used. The most common are 'bounced' emails due to staff turnover and internal agency spam filters. MCDEM has removed all logos and images from its messages to avoid blockage by spam filters, but those cases still occur. MCDEM conducts quarterly tests and informs those agencies where spam blockages occur so they can correct the problem at their end. Following this event, MCDEM responded to all the failures registered above by contacting the respective agencies and correcting addresses where applicable or notifying them of the problem where the remedy is required at the recipient agency's end. All replied to the enquiries. Addresses that no longer exist have been removed or updated.
76. The number of failures experienced during this event is regarded as reasonable.
77. Feedback from CDEM Groups on the wording of national warnings/advisories was that they lacked information on what to expect and what to do. Some felt

that there was a lack of scientific information coming through to assist them in managing the situation.

78. Wellington Airport was concerned that it had not received the warning message. The airport was unaware that receipt of warning messages was dependent on them initiating subscription to the NWS. Wellington Airport has since subscribed to the NWS and received the tsunami potential threat alert messages on 8 October 2009. Investigation has suggested that other lifeline companies and organisations that have not subscribed to the NWS may have misunderstood the requirement for participation in the system or the need to subscribe. MCDEM plans to approach lifeline organisations not on the distribution list to clarify the requirements for participation and determine if they wish to receive national warning system messages.

National Warning System: Recommendations

79. **Recommendation:** MCDEM should investigate alternative ways to provide a more robust, user-friendly capability to disseminate multi media warning messages.
80. **Recommendation:** MCDEM should ensure that all PIM support staff, including Department of Internal Affairs staff, are trained, on a regular basis, in using the national warning system for dissemination of media messages.
81. **Recommendation:** MCDEM should work with GNS Science to identify ways to enhance the information contained in national tsunami warnings and advisories. In particular, providing for the allocation of different threat levels (based on expected wave height) to pre-determined New Zealand coastal zones during a warning or potential threat situation.

Duty Team and Activation of the National Crisis Management Centre

82. This section describes MCDEM's arrangements for monitoring potential threats through a 24/7 duty team and how that duty team activates the NCMC if necessary. It outlines how those arrangements were applied on 30 September 2009, and discusses issues experienced.

Duty Team and NCMC Activation: Existing Arrangements

83. MCDEM maintains a duty team of four staff on a 24/7 basis. The MCDEM duty team consists of a Duty Manager, a Duty Officer, and two NCMC activators. The membership of the MCDEM duty team is rotated weekly.
84. The MCDEM duty team is responsible for the activation of the NCMC and works in conjunction with the NZFS Northern Communications Centre in the operation of the NWS and the provision of initial alerts. The MCDEM duty team relies on the NZFS Northern Communications Centre to act as the primary duty team. This means that while the MCDEM duty team is available to activate 24/7, they are not required to be monitoring 24/7. If an event meets the prescribed thresholds, the NZFS Northern Communications Centre acts without any input from MCDEM, but informs the MCDEM Duty Manager of the action taken.
85. For a tsunami event, the MCDEM Duty Manager is responsible for decision making regarding advisories and warnings whenever the threshold criteria is not met. The MCDEM Duty Manager will inform the Director, the National Public Information Manager, and Department of the Prime Minister and Cabinet (DPMC) on decisions made.
86. The MCDEM Duty Officer is tasked with the implementation of any decisions. The MCDEM Duty Officer coordinates with the NZFS Northern Communication Centre on the sending of warnings and advisories through the NWS (either the MCDEM Duty Officer or the NZFS Northern Communications Centre may send

the messages). The MCDEM Duty Officer then liaises with GNS Science to assess the threat. The MCDEM Duty Officer also advises the NCMC activators to deploy to the NCMC. Activation of the NCMC occurs automatically after the distribution of an advisory or warning.

87. The NCMC activators deploy to the NCMC (along with the MCDEM Duty Manager and Duty Officer) and provide the initial response as further support is activated.
88. The request for liaison agencies to report to the NCMC is conducted as part of the activation process. The National Controller determines which liaison agencies are required.

Duty Team and NCMC Activation: 30 September 2009 Response

89. The NZFS Northern Communications Centre received the PTWC warning at 0704 hours, compared the parameters against the pre-set thresholds, and commenced the response in line with the established procedures. As the information met the thresholds for a warning to be distributed, the NZFS Northern Communications Centre did not need to consult with the MCDEM duty team. According to the Standard Operating Procedures provided to the NZFS Northern Communications Centre, the MCDEM duty team does not have to be notified before the warning is sent by NZFS Northern Communications Centre. This is to ensure that full effort is directed towards the completion and dissemination of the national warning.
90. The MCDEM Duty Officer and Acting Duty Manager first heard of the earthquake and potential tsunami at 0718 hours when phoned by the National Public Information Manager who had been contacted by members of the media who had received the PTWC warning. The MCDEM duty team receives PTWC warnings by email only, and rely on the NZFS Northern Communications Centre to notify them by pager and/or phone when a warning message is received. The Acting MCDEM Duty Manager advised that based on the information given, a potential threat advisory would be issued.
91. The Acting MCDEM Duty Manager subsequently checked the PTWC bulletin and confirmed that the earthquake parameters met the thresholds for a national warning. The MCDEM Duty Officer then phoned the NZFS Northern Communications Centre which confirmed that they were writing up a national warning. At 0722 hours the Acting MCDEM Duty Manager confirmed with the MCDEM Duty Officer that the NZFS Northern Communications Centre would issue a national warning and that the NCMC would need to be activated.
92. The MCDEM Duty Officer then contacted the GNS Science Duty Officer at 0724 hours to ensure they were aware of event and to gather any initial assessment. Initial discussion with GNS Science on the preliminary earthquake parameters indicated lesser significance to New Zealand. The MCDEM Duty Officer was subsequently notified by the GNS Science Duty Officer at 0743 hours that the parameters had been modified, and that the earthquake was of a higher magnitude and shallower depth than previously thought. The MCDEM Duty Officer proceeded with the notification of the rest of the MCDEM duty team to activate the NCMC.
93. NCMC activation commenced at 0730 hours. One MCDEM staff member who was already in the MCDEM office at the time went to the NCMC to support the MCDEM duty team with the activation, while two additional staff from the MCDEM Operations Unit also joined shortly after. That augmented the activation team from four to seven staff (excluding the National Controller and Director).
94. The NCMC activation was completed by 0750 hours. Other MCDEM staff members were notified at 0807 hours that staffing was sufficient for the time but

to be on standby. At that point the staffing considerations of the National Controller were driven by the maintenance of the warning cycle ('pre-impact' phase) as well as a possible extended activation in which case the remaining staff would have had to be called upon.

95. At around 0915 hours the National Controller requested that two further Planning/Intelligence and two further Operations staff be requested to report to the NCMC. Upon arrival of these additional staff, one staff member was released from the Operations function to activate the Logistics function should that function become necessary, and to initiate contact with key lifeline utilities. The other additional staff members were required to provide support at both the Operations and Planning / Intelligence functions.
96. The Response Manager activated the Lifeline Utility Coordinator function to establish contact with lifelines and determine whether they had identified any issues or infrastructure under threat. The Lifeline Utility Coordinator made contact with lifelines in line with the established processes. The Lifeline Utility Coordinator activated the Sector Coordinating Entities for the telecommunications, gas, and electricity lifeline sectors. The Lifeline Utility Coordinator also established contact with representatives of the Fast Moving Consumer Goods, Fuel, and Transport sectors. This contact provided the NCMC with assessments of possible vulnerabilities and any action taken by the lifeline organisations. As a Mode 2 activation, the regional lifeline utility coordinators were not contacted by the NCMC.
97. Total MCDEM staff deployed to the NCMC was 14. The staffing deployment was as follows:
 - Response Manager: 1
 - Operations: 4
 - Planning/Intelligence: 4
 - Public Information Management: 4
 - Logistics: 1
98. The presence of liaison agencies in the NCMC was discussed and resulted in the National Controller requesting Police and Ministry of Foreign Affairs and Trade (MFAT) representation. Both agencies complied by sending representatives to the NCMC. DPMC attended the NCMC at various points from approximately 0800 hours onwards.

Duty Team and NCMC Activation: Discussion of Issues

99. The event exposed a gap in the statement of performance and SOPs that MCDEM had developed for the NZFS Northern Communication Centre. According to these documents, NZFS Northern Communication Centre notifies MCDEM within 5 minutes after a warning or potential threat advisory has been issued by them. For the 30 September 2009 event MCDEM would have been notified only 35 minutes after receipt of the PTWC bulletin by the NZFS Northern Communication Centre if it were not notified by the National Public Information Manager after media enquiries. This implies a critical loss of time for MCDEM to initiate the MOU with media and to activate the NCMC. The gap has since been corrected via an interim directive to NZFS Northern Communications Centre to contact the MCDEM Duty Officer.
100. The activation of the NCMC was conducted in accordance with the Response Activation SOP. All the actions in the activation checklist were completed in good time, and there were no issues with the activation process.
101. The decision to request liaison representation from only two agencies (Police and MFAT) was based on the NCMC focus at the time, and the knowledge that representation could be reviewed at any time as the situation evolved. Police have a supporting role in the warning process and any subsequent evacuation

if required in any local areas. MFAT's presence was required due to the impact of the tsunami in Samoa and the likelihood of New Zealanders being affected there.

102. All the liaison (support) agencies that could potentially be involved in a post-impact response phase received all the national warning and advisory messages and were informed (through a separate message) that the NCMC had activated. It has since been considered that the initial message to NCMC staff could go wider than MCDEM staff, and that other agency staff could be included in the message to go on standby. This was successfully implemented in the 8 October 2009 response.
103. The National Controller was in telephone contact with NZFS National Operations Manager and with Ministry of Social Development National Commissioner at several times during the activation.
104. Besides one local issue that was dealt with between the National Controller and the NZFS via telephone, there was no tasking required for liaison agencies. The presence of MFAT was useful in that the NCMC remained informed about what MFAT was starting to put in place in response to public enquiries about New Zealanders in Samoa. The NCMC received several public enquiries in this regard and callers could subsequently be referred to the appropriate number at MFAT.

Duty Team and NCMC Activation: Recommendations

105. **Recommendation:** MCDEM should review the NZFS Northern Communication Centre SOPs to include the MCDEM Duty Officer in the initial stages. The SOP will also be reviewed to ensure that a Duty Public Information Manager is notified alongside the MCDEM Duty Officer.
106. **Recommendation:** MCDEM should engage further with partner agencies and organisations to communicate and agree expectations of their involvement in the tsunami warning phase.

Coordination and Communication with CDEM Groups

107. This section describes the interaction between the NCMC and CDEM Groups on 30 September 2009. It also describes CDEM Groups' responses to the tsunami warnings, and actions taken by the public.

CDEM Groups: Existing Arrangements

108. CDEM Groups are commonly defined as consortia of local authorities based on existing regional boundaries, working in partnership with emergency services (Police, Fire, Health), lifeline utilities and others to deliver CDEM at the local level.
109. CDEM Groups are responsible for planning, development and maintenance of appropriate response arrangements for tsunami, including public alerting, for their areas.
110. The MCDEM supports CDEM Groups through the role of a Regional Emergency Management Advisor (REMA), among other activities. In emergencies, including situations when national warnings are issued, the role of a REMA is to liaise with the impacted CDEM Group to:
 - offer advice and assistance as required
 - maintain an overview of the impact of the event
 - support CDEM Group and Local Controllers
 - provide informal reports to NCMC
 - provide an assessment of government risk
 - monitor government response, and

- assess the CDEM Group's emergency management performance.

CDEM Groups: 30 September 2009 Response

111. The regional and local response to the 30 September 2009 tsunami warning was implemented by the sixteen CDEM Groups in New Zealand. All CDEM Groups activated their internal communication pathways and plans and procedures for response. Most CDEM Groups and member local authorities activated their Emergency Operations Centres (EOCs).
112. The CDEM Groups held regular teleconferences with member local authorities and other local agencies to exchange information and coordinate actions. CDEM Groups referred to their tsunami response plans where those were in place and a few CDEM Groups sought local expert advice on tsunami impact. In most cases CDEM Groups disseminated warnings, advisories and media releases within the CDEM Group area, throughout the day.
113. CDEM Groups used a range of devices to alert the public to the tsunami threat throughout the day. Most CDEM Groups issued regular media releases, conducted live radio interviews, contacted coastal communities directly, activated telephone calling trees, patrolled at-risk areas (using Police, other agencies, and community volunteers), monitored at-risk areas continuously, and received and answered calls from members of the public. Some CDEM Groups used helicopters to sweep beaches, sirens to alert coastal communities/beach users, and text message alerting systems.
114. There were several instances of evacuations in the previously-identified at-risk areas. There were some 'precautionary' evacuations of low-lying areas or coastal zones. Most beaches were cleared throughout the country and many instances of self-evacuation were observed.
115. MCDEM REMAs contacted all CDEM Groups immediately upon the receipt of the initial national warning message, and remained in contact throughout the duration of the event. Some REMAs experienced problems receiving the second national warning message.
116. Two Auckland-based REMAs were in Hamilton where they shared the information between themselves and with Regional Emergency Managers and Controllers in their respective CDEM Groups. The three Central Region REMAs based in Wellington actively engaged with their respective CDEM Groups. All three deployed to the NCMC and were also called by other REMAs who were sharing information. Two South Island REMAs fielded telephone calls from the Groups and the public for most of the day, attended the Christchurch City Council EOC, and spent over three hours on the phone with NCMC.
117. The National Controller held a teleconference with all REMAs at 1230 hours to determine any issues and to provide them with an update on the analysis of the event.
118. A number of CDEM Groups contacted the NCMC directly, including Hawkes Bay, Auckland, Waikato, Manawatu-Wanganui, Northland, Taranaki and Canterbury. Four situation reports from CDEM Groups were received (Northland, Auckland, Waikato and Canterbury).

CDEM Groups: Discussion of Issues

119. All CDEM Groups received the first national warning message and immediately acted on it. However, all CDEM Groups identified difficulties with interpreting the content and implications of those messages, and sought additional clarification.

120. The CDEM Groups believe that the timeliness of the national warnings was an improvement on previous events and exercises. The CDEM Groups also confirmed that frequency of national warnings and advisories was generally satisfactory to local and regional responders.
121. Most CDEM Groups' EOCs were activated quickly and according to procedures. Staff had the necessary local knowledge and expertise, and their pre-event planning, procedures and exercises proved to be effective. Internal communications pathways were followed with mostly good liaison/coordination between agencies, and good local/regional information sharing.
122. When it was judged that the CDEM Group or a particular local authority area was not at risk of a tsunami, the EOCs were activated in a monitoring mode only.
123. Many CDEM Groups expressed the need for more information, and an opportunity to share information (e.g. a situation report from NCMC or a national teleconference to discuss issues and agree decision making).
124. CDEM Groups were satisfied with their local public alerting and community response. Media releases centralised at a regional level, ensured consistency of local/regional messaging. The frequency of media releases was generally good, with local media broadcasting of messages working well. Ground crews (beaches, coastal communities) were put in place quickly, and were supported by the use of coastal VHF networks. Telephone calling trees worked well and sirens activated successfully and according to procedures and gained a good response from the public.
125. There were several failures of local text messaging systems (for public alerting) identified, as well as some issues with databases having incorrect contact details (on local, regional or national systems).
126. Community groups responded and pre-existing community response plans were activated. Generally, the communities acted on information, and were perhaps better informed as a result of previous alerts and education. Maritime response generally went well in that, for example, the pumping of fuel was suspended and ships stood off docks. However, it has since been noted that it may be useful to consider the specific message requirements of port facilities, harbour masters and marina operators for future events of this type.
127. There was some local indecision about evacuating areas – sometimes due to lack of prior modelling and impact assessment; sometimes due to lack of information. The lack of 'trigger points' for evacuation and messaging might have contributed to this indecision.
128. The CDEM Groups identified the need to consider nationally-consistent tones for tsunami alerts over fire sirens. They also believe that a national emergency management information system would establish a better common operating picture.

CDEM Groups: Recommendations

129. **Recommendation:** MCDEM should form an Advisory Group for provision of expert advice (prior to events) on the wording and dissemination of (all) warnings, including from experts in social and behavioural science, risk communication, and public information and media.
130. **Recommendation:** MCDEM and GNS Science should conduct another series of regional tsunami seminars with the following content: characteristics of the tsunami hazard; the *National Tsunami Advisory and Warning Plan*, including what decisions are to be made a national and local level respectively; the NWS, what can be expected from MCDEM and what cannot; and local tsunami warning arrangements.

Public Information Management

131. This section describes MCDEM's arrangements for public information management in the event of an emergency, and how those arrangements were applied on 30 September 2009.

Public Information Management: Existing Arrangements

132. Engagement of the media is the responsibility of the Public Information Management (PIM) team. MCDEM's PIM team consists of three staff members – a National Public Information Manager, a Manager of Public Education, and a Senior Communications Advisor. The PIM team is part of the Department of Internal Affairs Strategic Communications Unit and is able to draw upon support from other communication advisors in the DIA in the event of an emergency.
133. In 2006 MCDEM signed two separate MOUs with radio and television media organisations for the provision of broadcast support before and during civil defence emergencies. The first was with Radio New Zealand and the Radio Broadcast Association for the provision of radio broadcasts. The second was with Television New Zealand and Canwest TV Works (now MediaWorks, the owner of TV3). The agreements stipulate the respective requirements of MCDEM and the media organisations to ensure that television and radio is a reliable and guaranteed channel of communication for official warnings and emergency information messages.
134. The agreements set out the procedures whereby MCDEM can request an emergency broadcast from the media providers and the information required for the media organisations to implement the broadcast.
135. Activation of the MOU requires a separate process to the one undertaken for media releases. It is currently not a part of either the MCDEM duty team or NZFS Northern Communications Centre responsibilities.

Public Information Management: 30 September 2009 Response

136. On 30 September 2009 the PTWC warning was picked up almost immediately by a number of media organisations (PTWC warnings are freely available on the internet), triggering a high demand from the media for comment from MCDEM. This demand steadily increased throughout the morning.
137. The National Public Information Manager first heard about the earthquake and PTWC warning when phoned by Newstalk ZB at around 0718 hours. The remainder of the PIM team heard about the earthquake and PTWC warning via media announcements.
138. MCDEM's Senior Communications Advisor was contacted by the National Public Information Manager at 0740 hours to ask him to update the MCDEM webpage with the national warning. Once that action was undertaken, the Senior Communications Advisor deployed to the NCMC and arrived at 0845 hours.
139. The National Public Information Manager dealt with many media enquiries from home (the media called him directly). The National Public Information Manager also received multiple calls from media requesting interviews (including TVNZ Breakfast). The National Public Information Manager continued to liaise remotely with the NCMC, PIM staff in the NCMC, and the media.
140. The frequency of the media requests for interviews with the National Controller was of a level that inhibited his ability to manage the operational response

activating the NCMC and assessing the information being received on the event.

141. The National Controller provided an interview on Radio New Zealand's Morning Report at 0817 hours. He confirmed that New Zealand was under warning in the PTWC and advised people to listen to the radio and agreed that those on exposed areas should be ready in case of evacuation. He indicated there was only sketchy information on Samoa and spoke of "...rumours, early at this point, it appears that something has happened there, but I can't confirm it in terms of extent".
142. The Manager DIA Strategic Communications was advised of the event by a message from the MCDEM Senior Communications Advisor. The Manager DIA Strategic Communications activated other DIA communications staff to the NCMC PIM function.
143. The Manager DIA Strategic Communications received a request from TVNZ's Breakfast show for a spokesperson from MCDEM. The National Public Information Manager had already been contacted by TVNZ Breakfast and had declined an interview. The Manager DIA Strategic Communications did not know this and agreed to the interview, which was a live interview with Paul Henry, co-host of Breakfast.
144. The Manager DIA Strategic Communications had noted the information given by the National Controller in his interview with Morning Report, but had not made contact with the NCMC, National Controller or Director. Nonetheless, he proceeded with the live interview and used those same messages in the Breakfast interview at 0839 hours. Drawing on his notes of the interview with the National Controller, he referred to the reports of damage in Samoa saying "we are classifying those at the moment as rumour, we haven't got them confirmed..." At the time of the interview, the Manager DIA Strategic Communications was not in a position to provide up-to-date guidance to the public or recent information provided by the NCMC (the second national warning was being sent out at 0843 hours). The interview did not convey the public information messages necessary to reassure the public.
145. The MOU for emergency broadcast was not activated by the MCDEM duty team or NCMC staff because there was no reference to the MOU in the standard operating procedures used by operations. Instead the procedures used provided for issuing regular media releases each hour.
146. By the time the failure to activate the MOU for emergency broadcast was identified, the National Controller deemed that activation at that point would be unnecessary given the already high level of media reporting. Instead the National Controller decided to continue issuing media releases via the NWS. The MOU was activated successfully for the 8 October 2009 response.
147. In the early afternoon, a TVNZ broadcast stated that the tsunami warning had been reissued. It was discovered that a communications staff member at Auckland City Council has spoken to TVNZ and had erroneously communicated that the tsunami warning had been reissued. While TVNZ was alerted to the misinformation, a correction was not broadcast.
148. MCDEM received many calls from the public on 30 September 2009 seeking advice on the tsunami threat and what action to undertake. The calls were received primarily at the MCDEM head office but calls were also received at the regional offices in Christchurch (Auckland office had calls directed to head office), the NCMC and the Department of Internal Affairs main office.

Public Information Management: Discussion of Issues

149. There was insufficient staff capacity to deal with the influx of media calls in a sudden onset scenario as occurred on 30 September 2009 either by the MCDEM PIM team, or the NCMC.
150. Due to the volume of calls, coupled with low levels of resourcing, there was no log of media calls maintained for the 30 September 2009 response. Nonetheless, it is clear that the level of media calls was of a scale to occupy the full capacity of the deployed PIM team. In addition, some of the media calls to the NCMC spilled over to Operations function when all the PIM function phones were busy.
151. The poor response to the media request for interviews was in part the result of three factors:
 - 1) Inadequate communication between the National Public Information Manager, the Manager DIA Strategic Communications, the National Controller, and the Director;
 - 2) The lack of an identified spokesperson (particularly in the absence of the National Public Information Manager) distinct from the National Controller; and
 - 3) A lack of awareness of what media outlets were broadcasting.
152. The response to media queries was hampered by there being insufficient PIM staff available in the NCMC until approximately 0845 hrs. The National Public Information Manager and the Communications Specialist had both been informed of the NCMC warning being issued and had access to the content of the warning and the earthquake parameters. The volume of media queries overwhelmed the capacity of the PIM team during the first hour of activation.
153. The task of preparing media releases was undertaken by the NCMC's Planning/Intelligence function in the early stages of the response, and was not referred back to the PIM team once they were properly established. This resulted in a number of media releases lacking the appropriate and/or pre-determined public information messages.
154. The engagement of the media was hampered by the failure of the call forwarding on the Duty PIM cell phone number. The number had been placed on the templates of the initial media releases as a point of contact. However, the call forwarding did not operate on the day and provided instead a message from a former member of staff. The problem has subsequently been addressed. However, the failure created further frustration from the media in attempting to reach MCDEM.
155. One of the key messages being disseminated was for people to contact their local authority for information on what to do. This is consistent with the *National Tsunami Advisory and Warning Plan* in which information is issued to CDEM Groups who then decide on the local response, based on their local hazard and risk knowledge. Feedback on the 30 September 2009 response seems to indicate that the New Zealand public naturally look to the national level (MCDEM) for guidance on actions to take. The public does not see a difference between MCDEM, CDEM Groups and local authorities' civil defence offices. Furthermore, at least one local authority directed calls to MCDEM. The NCMC needs to have the capacity to cope with this level of enquiry.
156. The public expectation of information from MCDEM is reinforced by the level of visits to the MCDEM website statistics on 30 September 2009. That day, the MCDEM website experienced more than 30,000 hits – ten times the monthly average. However, in answering the calls from the media the NCMC PIM function was unable to update the MCDEM website regularly with the warning messages or media releases. Consequently, a key mechanism for the

distribution of public information during the event was not employed as effectively as it could have been.

Public Information Management: Recommendations

157. **Recommendation:** MCDEM should review the staffing of the PIM team in the NCMC. During a response, the PIM function must include sufficient capability and capacity to: activate and manage the MOU with broadcasters; prepare and disseminate media releases; manage media enquiries; update and maintain the MCDEM website; monitor the media; provide support to MCDEM spokespersons; and work with National Controller and Director.
158. **Recommendation:** MCDEM should integrate the PIM function into the duty system. Permanent supplementation should be sought with DIA Communications staff and appropriate training given.
159. **Recommendation:** MCDEM should review the procedures for activating the MOU for emergency broadcast, including incorporating it into the MCDEM duty team responsibilities, and/or activation of the NCMC.
160. **Recommendation:** MCDEM should establish procedures for the immediate delegation of spokespersons in an event.
161. **Recommendation:** MCDEM should review the procedures for and policies on managing calls from the public (both at MCDEM offices, the NCMC, and duty staff) to ensure key public information messages are provided.
162. **Recommendation:** MCDEM should review its media release templates to ensure that the language is clear and unambiguous. MCDEM duty team should work with the MCDEM PIM team on issues around writing media releases.

NCMC Processes and Procedures

163. This section describes the arrangements for operating the NCMC, including staffing of different functions, and how those arrangements were applied on 30 September 2009.

NCMC Processes and Procedures: Existing Arrangements

164. Under the National CDEM Plan, the NCMC may be operated at four possible modes in a civil defence emergency:
 - Mode 1 Monitor: Monitor and assess incidents that may lead to a state of local emergency. Monitor and assess local emergencies.
 - Mode 2 Engage: In addition to monitoring activities, collect analyse and disseminate information on emergencies, report to/advise government, and provide public information service.
 - Mode 3 Assist: In addition to interaction activities, process/co-ordinate requests for support from regional and local organisations.
 - Mode 4 Manage: Collect analyse and disseminate information on emergency (including the provision of a public information service). Control the overall response. Co-ordinate logistical support, including aid from overseas and international liaison. Report to/advise government.
165. Under MCDEM's *Concept of Operations: National CDEM Response and Recovery* the mode of activation determines the level of staffing of the NCMC, the level of activation of supporting agencies, and the scale of the functions performed. Initially the MCDEM Duty Manager decides what the appropriate mode of activation will be in the response to an event. Once activated, the National Controller will direct the mode of operation.

166. Each NCMC function (i.e. Operations, Logistics, Planning/Intelligence, PIM, Regional Emergency Management Advisor, and Administration & Staff Support¹) has a standard operating procedure (SOP) detailing the tasks and activities associated with that function. The SOPs for each function also contain information on how that function integrates with other functions in the NCMC, in support of the national response.
167. All SOPs for the NCMC are located both electronically in the shared information system, and in hard copy on the function desks in the NCMC. MCDEM staff who are deployed to specific functions carry out regular capability development training using these SOPs as a basis.
168. NCMC equipment and systems are maintained so they are able to be activated immediately 24/7 in response to an emergency. The Department of Internal Affairs provides IT support to the NCMC.
169. All NCMC functions except for the PIM function are co-located in the main operations room in the NCMC. The PIM room is a separate room.

NCMC Processes and Procedures: 30 September 2009 Response

170. On 30 September 2009, the NCMC was activated at Mode 2 (Engage) at the direction of the National Controller (also Acting MCDEM Duty Manager). The NCMC remained in this mode until it deactivated at 1700 hours.
171. All SOPs were implemented through the activation of the NCMC functions.
172. Onsite IT support was available in the NCMC from 0834 hours until 1715 hours. Several minor IT issues were logged with DIA Service Desk.

NCMC Processes and Procedures: Discussion of Issues

173. Activation at Mode 2 provided sufficient capacity for the NCMC to operate at an appropriate level. However, given the level of uncertainty of the threat, and the short warning time surrounding a regional source tsunami threat, a review of whether the initial mode of activation in such an event will need to be at Mode 3 will be undertaken.
174. The NCMC structure was adjusted to match the requirements of the *National Tsunami Advisory and Warning Plan*, a focus of which is to ensure the availability of adequate information to disseminate to CDEM Groups.
175. While the general level of staffing for the NCMC on 30 September 2009 was adequate, the capacity in the PIM function was not sufficient to effectively manage the initial two hours of activation, where the media demand was heaviest.
176. The physical disconnect (due to the NCMC layout) between PIM staff (located in the PIM room) and other response staff (located in the Operations room) created an impediment to the flow of information within the NCMC and consequently the provision of accurate public information.
177. Because the focus was on understanding the situation, the utility of a displayed common operating picture was not immediately obvious. Presentation of situational awareness, which is part of the Planning and Intelligence function's SOP, would have assisted both the PIM function and the Operations staff taking phone calls. This lesson was successfully implemented in the 8 October 2009 response, where a common operating picture was projected so that all staff members in the NCMC were able to refer to it.

¹ There are currently no SOPs for the Response Manager or Controller roles; however, these roles are encapsulated within the *Concept of Operations: National CDEM Response and Recovery*.

178. Apart from the PIM SOP (and the SOP for the NZFS Northern Communication Centre), the NCMC SOPs are generally considered to be adequate.
179. The PIM SOP has been identified as needing review to incorporate lessons identified from this event. Considerations for the review of the SOP include:
- The immediate delegation of a media spokesperson – much of the frustration experienced by media focused on their inability to access an interview with someone in authority. It is suggested that this person not be the National Controller who is busy managing the response, but rather another leadership role (such as the Director or MCDEM Duty Manager).
 - National PIM staff attendance at every National Controller briefing (this relies on the presence of sufficient staff to cover the National PIM function during their absence).
 - The inclusion of National PIM staff in NCMC staff rostering, and provision for back-up arrangements.
 - Immediate updating of the website with information for the public on what to do, with subsequent regular updating.
 - A procedural step to include calling the 'red phone' at Radio NZ. There is currently a procedure for the MOU in the PIM SOP (there is no reference in the MOU to a telephone call needing to be made). The phone number is in the PIM SOP, but there is no procedural step in the PIM SOP to prompt its use.
 - An activation checklist specifically for the PIM function, including activation of the MOU for emergency broadcast.
 - The provision of information for reception and communications staff at 22 The Terrace and 46 Waring Taylor Street. Various staff members in both locations were contacted by media on 30 September 2009 but did not have information available to them.
 - Reinforcing the need to circulate other agencies' media releases internally and externally.
 - More emphasis on media monitoring.
180. A number of points have been identified through this response that would be useful additions to the Operations SOP. These points are largely in relation to assignment of specific tasks to Operations function members to prevent overlap and gaps. Staff on the Operations function received a number of calls from members of the public. This also occurred during the 8 October 2009 response. While calls from members of the public should not be fielded to the NCMC Operations desk, some support and training for staff members who may have to deal with distressed members of the public may be useful.
181. Equipment and IT issues were mostly experienced by the PIM team members. These issues included:
- Problems logging onto the PIM room computers (user names had been changed)
 - NWS messages not appearing on NCMC 05 (this has since been rectified)
 - Having only one computer in the NCMC with publishing software installed
 - Technical issues were encountered in attempting to work remotely, and
 - Radio reception and availability for the purposes of media monitoring.

NCMC Processes and Procedures: Recommendations

182. **Recommendation:** MCDEM should investigate ways to address the liaison and communication issues between the PIM function and other NCMC functions.

183. **Recommendation:** MCDEM should address the IT issues, including the provision of sufficient communications equipment to enable monitoring of all media channels during an event.
184. **Recommendation:** MCDEM should review the PIM SOP to incorporate the lessons identified through this response, as a matter of priority.

Conclusions

185. The New Zealand tsunami plans and procedures used on 30 September 2009 in response to the Samoa earthquake and tsunami were the result of the considerable development and co-ordination that had occurred across numerous agencies since the devastating 2004 Indian Ocean tsunami, subsequent exercises, and studies. The plans and procedures aim to ensure that CDEM authorities and, in turn, communities are alerted to the risk of a tsunami in a timely manner that enable local plans to be implemented, and that the response is co-ordinated. The response on 30 September 2009 used the arrangements that have been developed and in general, these arrangements worked well and provided the CDEM Groups with a national warning and information that allowed those at risk to implement local plans and procedures in a timely manner. However the post-activation review has identified critical aspects of the arrangements that warrant improvement and, in particular, in aspects that ensure a swift response, and rapid and co-ordinated dissemination of clear information to the public.
186. On 30 September 2009 the initial alert to New Zealand was provided by the PTWC message received by the NZFS Northern Communications Centre under its arrangement with MCDEM for 24/7 coverage. The speed of the response to the initial alert needs to be improved, however, through the revision of procedures around interpreting initial data, the sequencing for notification of MCDEM Duty Manager and GNS Science, and improving the usability of warning and advisory templates. Once drafted the national warning of a tsunami was distributed successfully by the national warning system to a large number of addresses over a short time.
187. CDEM Groups responded well to the warning issued, particularly those on the eastern coasts. Local responses varied between authorities, as provided for by national arrangements. The successful responses can be attributed to thorough planning and coordination, community involvement in the planning, and high levels of awareness and willingness.
188. The activation of the NCMC was timely and effective apart from insufficient capacity in the PIM function to manage the high demand for information and consistent advice. The risks inherent in the current arrangements for PIM are high and can be reduced by including PIM staff on the MCDEM duty team, drawing on the pool of DIA communications staff, ensuring they have the training, ensuring that they are provided with ready access to up to date information on the emergency, and have the technical means to better cope with the demand for information.
189. The ability to warn and accurately inform the CDEM sector and the public of an impending tsunami depends heavily on the advice provided by scientific agencies. GNS Science has contributed significant effort to developing tsunami response plans and provided MCDEM with sound operational advice during the response. However the arrangements through which the GNS Science duty team provide operational advice and assessment needs to be made more responsive, and the advice clearer.
190. The media have a significant role to play in distributing warning messages to the public and to help inform them of the situation, how they should respond,

and developments. The MOUs with television and radio broadcasters were not activated on 30 September 2009 and, in hindsight, contributed to the media's perception that the developing situation was not well understood by the CDEM sector and not under control. Media perceptions of the response, and particularly that held by TVNZ, were aggravated by the Breakfast interview provided by the Manager DIA Strategic Communications. There is a need to deliberately assign the role of spokesperson for the operation and to provide that position with access to material and messages to provide frequent updates and consist and coherent messages. The procedures for use of the national warning system will be changed to include activation of the broadcasting MOU when a national warning is issued and the procedures for activating the MOU itself will be reviewed to incorporate Radio New Zealand's willingness to provide direct telephone access to the newsroom. The format of messages issued by the NCMC to the public will be reviewed to ensure they are unambiguous and tailored to the audience.

191. When measured by the activities undertaken by those communities at risk from the tsunami, the operational response on 30 September 2009 could be considered to be satisfactory. But the response was dogged by perceptions held by the public that it was not well coordinated and that authorities did not clearly understand the situation. The review has identified the need to improve the speed of the response by adjusting the alerting procedures, the procedures for distributing warnings and alerts, and the ability to manage public information and the media. The critical elements of these improvements were implemented as they were identified after the Samoa tsunami and were used during the response to the later 8 October 2009 Vanuatu earthquake. Other improvements identified in this report will be developed and implemented progressively during the forthcoming months.

John Hamilton
Director
16 October 2009

Recommendations

192. This section lists all the recommendations outlined in the sections above for the improvement of the future response to tsunami threats to New Zealand.
1. **Recommendation:** MCDEM should arrange for the incorporation of the GNS Science Duty Officer into the NZFS Northern Communication Centre notification alerts for PTWC warnings.
 2. **Recommendation:** GeoNet Project Director and MCDEM Manager Operations, in collaboration with the CDEM sector, should develop a format for the advice and information provided to MCDEM that provides for consistency and clarity to those that are not experts on tsunamis.
 3. **Recommendation:** GNS Science's initial work to develop a methodology for conveying tsunami threat assessment information should be advanced to enhance the analysis of tsunami threats to coastal areas. The boundaries of these zones, the most effective and useful format of the information, and the thresholds of the threat information should be agreed by the CDEM sector.
 4. **Recommendation:** MCDEM should undertake further work to improve understanding of responders and the general public (including the media) on the difference between predicted arrival time, actual arrival time and the (potentially later) arrival of the maximum wave heights for understanding potential impacts. Similarly, it is important that a distinction is made between waves heights in deep water, offshore and at the coast in messages.
 5. **Recommendation:** MCDEM should investigate alternative ways to provide a more robust, user-friendly capability to disseminate multi media warning messages.
 6. **Recommendation:** MCDEM should ensure that all PIM support staff, including Department of Internal Affairs staff, are trained, on a regular basis, in using the national warning system for dissemination of media messages.
 7. **Recommendation:** MCDEM should work with GNS Science to identify ways to enhance the information contained in national tsunami warnings and advisories. In particular, providing for the allocation of different threat levels (based on expected wave height) to pre-determined New Zealand coastal zones during a warning or potential threat situation.
 8. **Recommendation:** MCDEM should review the NZFS Northern Communication Centre SOPs to include the MCDEM Duty Officer in the initial stages. The SOP will also be reviewed to ensure that a Duty Public Information Manager is notified alongside the MCDEM Duty Officer.
 9. **Recommendation:** MCDEM should engage further with partner agencies and organisations to communicate and agree expectations of their involvement in the tsunami warning phase.
 10. **Recommendation:** MCDEM should form an Advisory Group for provision of expert advice (prior to events) on the wording and dissemination of (all) warnings, including from experts in social and behavioural science, risk communication, and public information and media.
 11. **Recommendation:** MCDEM and GNS Science should conduct another series of regional tsunami seminars with the following content: characteristics of the tsunami hazard; the *National Tsunami Advisory and Warning Plan*, including what decisions are to be made a national and local

level respectively; the NWS, what can be expected from MCDEM and what cannot; and local tsunami warning arrangements.

12. **Recommendation:** MCDEM should review the staffing of the PIM team in the NCMC. During a response, the PIM function must include sufficient capability and capacity to: activate and manage the MOU with broadcasters; prepare and disseminate media releases; manage media enquiries; update and maintain the MCDEM website; monitor the media; provide support to MCDEM spokespersons; and work with National Controller and Director.
13. **Recommendation:** MCDEM should integrate the PIM function into the duty system. Permanent supplementation should be sought with DIA Communications staff and appropriate training given.
14. **Recommendation:** MCDEM should review the procedures for activating the MOU for emergency broadcast, including incorporating it into the MCDEM duty team responsibilities, and/or activation of the NCMC.
15. **Recommendation;** MCDEM should establish procedures for the immediate delegation of spokespersons in an event.
16. **Recommendation:** MCDEM should review the procedures for and policies on managing calls from the public (both at MCDEM offices, the NCMC, and duty staff) to ensure key public information messages are provided.
17. **Recommendation:** MCDEM should review its media release templates to ensure that the language is clear and unambiguous. MCDEM duty team should work with the MCDEM PIM team on issues around writing media releases.
18. **Recommendation:** MCDEM should investigate ways to address the liaison and communication issues between the PIM function and other NCMC functions.
19. **Recommendation:** MCDEM should address the IT issues, including the provision of sufficient communications equipment to enable monitoring of all media channels during an event.
20. **Recommendation:** MCDEM should review the PIM SOP to incorporate the lessons identified through this response, as a matter of priority.

Annex 1: Sequence of events – Tsunami Warning, 30 September 2009

This sequence of events reflects response actions taken by the MCDEM duty team and the National Crisis Management Centre (NCMC) on 30 September 2009. The first two hours of the response are covered in greater detail as they represent the more critical period in an event of this nature (regional source tsunami). From the second hour onwards response actions become more structured and repetitive.

Time	Action
0648	Earthquake occurred
0704	Pacific Tsunami Warning Centre (PTWC) warning received (email). Tsunami warning is in effect for New Zealand. It is not known that a tsunami was generated. Estimated wave arrival times are given for some NZ coastal areas.
0705	NZFS commence response as per Tsunami SOP.
0718	Enquiries from media to National Public Information Manager, who calls Duty Officer and Acting Duty Manager. None of these have knowledge of the PTWS Warning. Acting Duty Manager advises Public Information Manager that based on the information given by the latter we are likely to issue a Potential Threat Advisory.
0719	Duty Officer calls New Zealand Fire Service – NZFS confirms earthquake parameters and advises they are preparing initial Warning message.
0721	Acting Duty Manager checks email for PTWC Bulletin and notes the information meets the Warning threshold.
0721	Duty officer calls Tim Clarke to inform. (Tim Clarke was returning to work after illness on 30 September and would resume his role as Duty Manager). Instruction to Duty Officer: Call NZFS again to check if assistance was required with compilation of the National Warning, activate the NCMC.
0722	Acting Duty Manager calls Duty Officer to confirm NZFS is issuing a Warning and to instruct activation of NCMC.
0724	Duty Officer calls GNS Science to check they are on to it & to establish their initial impression of the threat to NZ. Regular (at least hourly) discussions with GNS follow for the rest of the warning/advisory period.
0726	Duty Officer pages NCMC duty team to activate NCMC.
0726	Tim Clarke calls Acting Duty Manager to inform he is back from illness, was on his way to the NCMC and would take charge of the activation. (The Duty Manager was acting on behalf Mr Clarke since the beginning of that week).
0730	NCMC Activation
0735	New Zealand Fire Service sends out National Warning message #1 with the following information. Tsunami warning in effect: There is a threat of a damaging tsunami impacting on New Zealand coastlines. The tsunami warning will remain in effect until a cancellation message is issued by the Ministry of Civil Defence & Emergency Management. MCDEM is evaluating the situation with support from scientific advisors.
0735	Minister conducts TVNZ interview.
0740	Acting Duty Manager confirms with Public Information Manager that a National Warning has been issued.
0744	Public Information Manager calls Web Publisher to update MCDEM website with the National Warning
0747	Acting Duty Manager calls Web Publisher to confirm he is onto website and to report to

	NCMC asap.
0748	Director sends text message update to Minister of Civil Defence, private secretary for the Minister of Civil Defence, and Steve Long, DPMC; forwards national warning message to private secretary for the Minister of Civil Defence
0749	Discussion between Acting Duty Manager & Director
0751	Acting Duty Manager calls DPMC (Pat Helm) to inform about National warning issued.
0755	Website updated.
0757	Acting Duty Manager arrives in the NCMC, hands Duty Manager role back to Tim Clarke and takes up the role the of National Controller.
0802	MCDEM media release #1 distributed. (Contents of media releases reflects the information in the warning messages)
0807	MCDEM staff notification sent.
0809	Director conducts Radio NZ interview
0817	National Controller conducts Radio NZ interview.
0833	MCDEM Office calls National Controller: Colin Feslier (DIA) wants National Controller to conduct a TVNZ interview – he has to call TVNZ. National Controller advises no time to call them right then because he is in the process of advising and approving National Warning message #2.
0835	Colin Feslier interviewed on Breakfast by Paul Henry
0843	<p>National Warning #2 sent by NCMC with the following information:</p> <p>The time of arrival of the first wave to impact on New Zealand coastal area(s) is estimated to be at: 0922 NZDT at Bay of Plenty/East Cape. According to information received, a tsunami of 1.5m was generated in Samoa as a result of this earthquake. Waves can be expected to be smaller in New Zealand, estimated at 1m at the East Coast and Bay of Plenty. Wave heights outside of these regions will be advised as soon as possible, but territorial authorities may need to extrapolate using this initial information. It is unlikely that they will need to consider a wave of any height higher than 1m. Historical records have shown that arrival times may be 60 minutes earlier or later than estimated, and that the first wave may not be the largest. Waves may manifest in a series of waves that can be dangerous for several hours.</p> <p>A Tsunami travel time map was attached to this message. Due to file size of the map (3megabites) It caused messages to be delayed in the system. When this was discovered Datasquirt was requested to delete this message so that subsequent messages can be released. Message no. 2 was not received by all recipients due to this intervention.</p>
0855	Media Release #2 sent by NCMC – with wave travel time map
0905	National Controller conducts CNN interview.
0908	National Controller conducts Radio NZ interview.
0942	National Controller discussion with Far North Controller.
0956	National Controller calls NZFS (HQ) to assist resolving issues created by NZFS 'Code Red' alert at local level.
0958	<p>National Warning #3 sent by NCMC with the following information:</p> <p>A tsunami has been generated. Wave estimates for New Zealand East Coast north of Gisborne is approximately one (1) metre. Expect strong currents in Northland, Bay of Plenty, the Coromandel and the East Coast of New Zealand. Of concern are beach areas and people in small boats.</p>
1010	Information on local tide gauges received from GNS: 40cm measured at East Cape
1025	<p>Potential Threat Advisory #4 sent by NCMC with the following information:</p> <p>The National Controller decides to downgrade the National Warning to a 'National Advisory -</p>

	Tsunami: Potential Threat to New Zealand'. This decision is based on the recording of 40cm at the East Cape tidal gauge which supports the estimation of the largest wave not to be higher than 1m, as well as the intent to start mitigating the hype that exists. 'Potential Threat' is now the appropriate status to reflect the risk, with the focus to be on public information: We recommend local areas remain vigilant. The threat of strong currents also remains.
1032	National Controller discussion with MSD (National Commissioner-further discussions followed).
1036	MCDEM media release #3 sent by NCMC.
1037	PTWC cancelled warning, National Controller decides to wait for more NZ tide gauge data.
1105	GNS update on tide gauges- 0,5m at Raoul Island
1111	<p>Potential Threat Advisory #5 sent by NCMC with the following information: There has been a wave reading at Raoul Island that indicates there is another wave which is larger than the first. Initial estimates of this second wave are a maximum height of one metre. This wave is likely to impact the East Cape at 1115 hours NZDT on 30 September 2009. Scientific advice is that there may be further waves.</p> <p>The Pacific Tsunami Warning Centre (PTWC) has cancelled the warning for New Zealand. However, our advice is to remain in potential threat mode.</p>
1216	<p>Potential Threat Advisory #6 sent by NCMC with the following information: Gauges at East Cape measure 40cm and North Cape measure 25-30cm. This is the largest wave so far. Over the next hour GNS Science expects larger waves to arrive.</p>
1218	MCDEM media release #4 sent by MCMC.
1315	Discussion with GNS- agree to continue 'Potential Threat'.
1325	<p>Potential Threat Advisory #7 sent by NCMC with the following information: A wave of 80cm was measured at East Cape at 1300 NZDT. GNS Science advises that we can expect waves to continue for the rest of the day. There is still the potential for waves of a similar or lesser height to arrive over the next few hours. Observations will continue to be made and we will maintain hourly updates.</p> <p>There is still an ongoing threat of strong currents affecting coastal areas. People should remain clear of beaches and refrain from boating activities.</p>
1330	MCDEM media release #5 sent by NCMC.
1450	<p>Potential Threat Advisory message #8 sent by NCMC with the following information: Tsunami wave activity still recorded at East cape and North cape, although smaller. There is now a low possibility of larger waves, but waves are expected to continue over the next eight hours. Still a threat at beaches and of strong currents</p>
1500	MCDEM media release #6 sent by NCMC.
1600	Discussion with GNS- agree cancellation
1610	<p>Tsunami Advisory Cancelled with the following information.</p> <p>No further tsunami threat: According to scientific advice no further tsunami threat exists for New Zealand coastlines as a result of the earthquake described below. Wave activity is expected to continue but to decline in height over the next few hours. There is still a likelihood of strong currents in coastal areas. Beach areas should now be safe, however people should remain alert for unusual sea activity</p>
1618	Media Release #7 Tsunami Advisory Cancellation sent by NCMC.
1700	NCMC starts de-activation process.