

Disaster Recovery in New Zealand

- The Land of the Volcanos, Earthquakes and Tornados

Elizabeth Coulter

Director Information Technology Services

The University of Auckland

13th July 2012



Disaster Recovery in NZ

Agenda

- Background – NZ Universities
- NZ Natural Hazards
- The Christchurch Earthquake and University of Canterbury Case Study
- Other Hazards
- The University of Auckland DR Case Studies
- Crisis Management and DR University of Auckland

NZ Universities EFTS/FTE

University	Students (EFTS)	Staff (FTE)
The University of Auckland	32,654	4,725
Auckland University of Technology	18,952	1,916
Waikato	10,415	1,537
Massey	20,119	3,047
Victoria	17,025	1,871
Canterbury	15,674	1,902
Lincoln	2,654	652
Otago	19,918	3,751
TOTAL	137,411	19,401

3

Research & Education Advanced Network NZ



4

NZ Natural Hazards

NZ Natural Hazards

The Ring of Fire

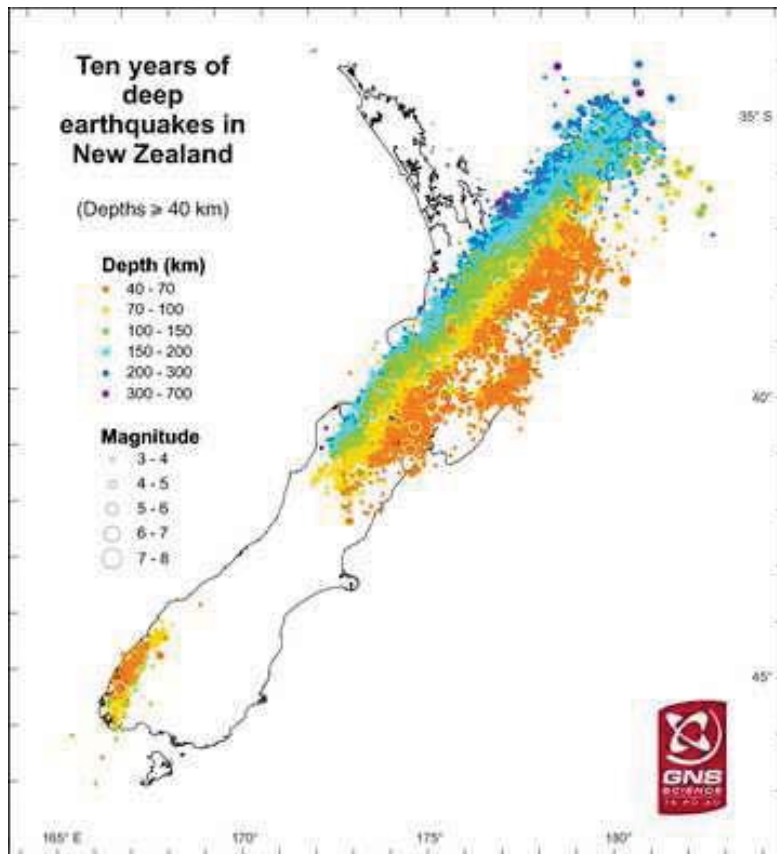


Volcanoes and earthquake-prone regions all round the Pacific.

The Pacific Ocean is shrinking as the surrounding plates converge on it.

The Atlantic doesn't have subduction zones because it is still expanding

Deep Earthquakes



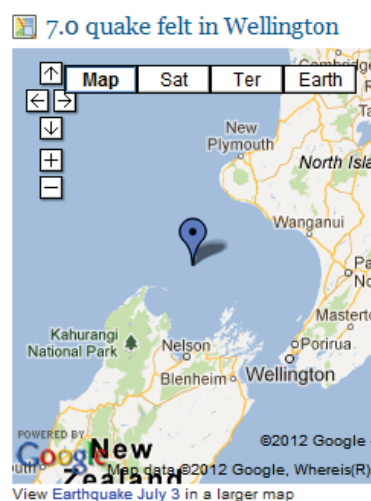
Deep earthquakes have less impact

7

Deep Earthquakes

7.0 earthquake felt in Wellington

Last updated 22:43 03/07/2012 69 198 198 Tweet 43 +1 Share



News

[Cracked building 'at risk' in quake](#)

Train lines across Wellington had to be inspected through the night after a 7.0-magnitude quake hit the lower North Island.

Track inspections were completed before the morning trains began on all but the Kapiti line, which was not given clearance until 6am.

There were minor delays for early morning Kapiti commuters and taxis were provided.

Inspections of train lines are routine after an earthquake.

AMP NZ office chief executive Scot Pritchard said a small water leak had occurred at the AXA Centre overnight on The Terrace which had stopped lifts.

He said it was unclear whether the issue was quake related but expected lifts to be back up and running over the next few hours.

The quake hit at 10.36pm. GeoNet [reported](#) it was centred 230km deep and was 170km northwest of Wellington.

It was a long, rolling quake felt throughout the lower North Island and upper South Island.

Source: Dominion Post

8

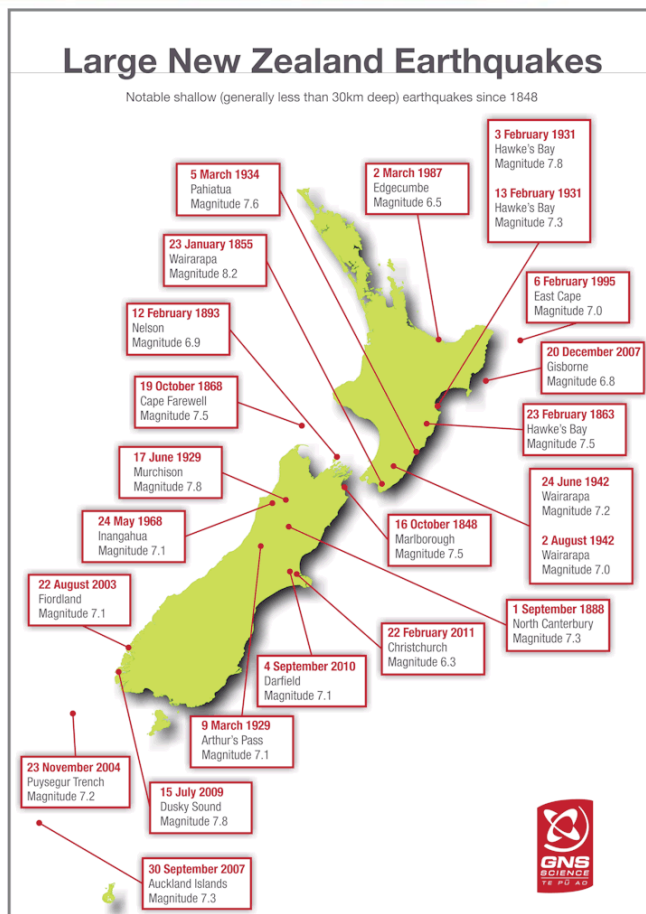
Shallow Earthquakes



Shallow earthquakes have the greatest impact

9

NZ Natural Hazards



Auckland's Quakes:

Magnitude: size of the earthquake
MM: how the earthquake was felt.

1835 25k distance,
MM>7, Magnitude 5.5-6.5

1891 60km distance
MM6, Magnitude 5.7-5.8

1974, >200km distance
MM5, Magnitude 5.9

Little damage



10

NZ Natural Hazards

Quake Risk on Campuses - UoA

City & Grafton

- **500 years – MM6.72**
- **1000 years – MM7.08**
- **10000 years– MM8.08**

Epsom

- **500 years – MM6.73**
- **1000 years – MM7.08**
- **10000 years– MM8.06**

Tamaki

- **500 years – MM6.80**
- **1000 years – MM7.16**
- **10000 years– MM8.14**



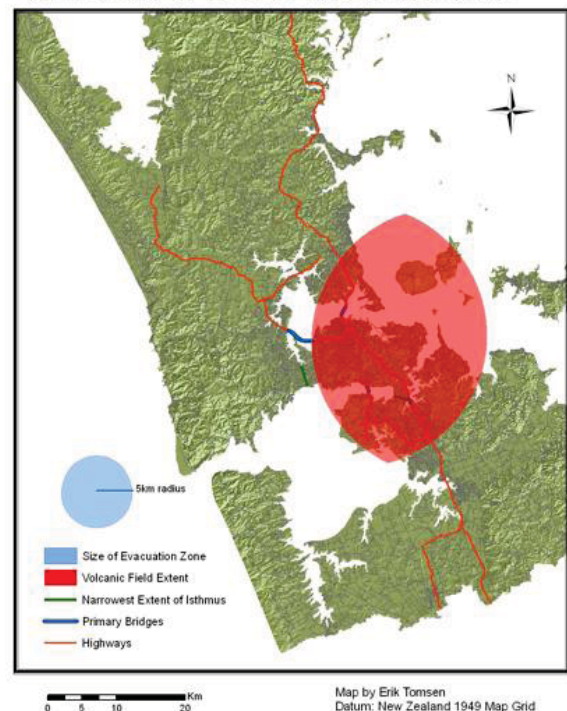
11

NZ Natural Hazards

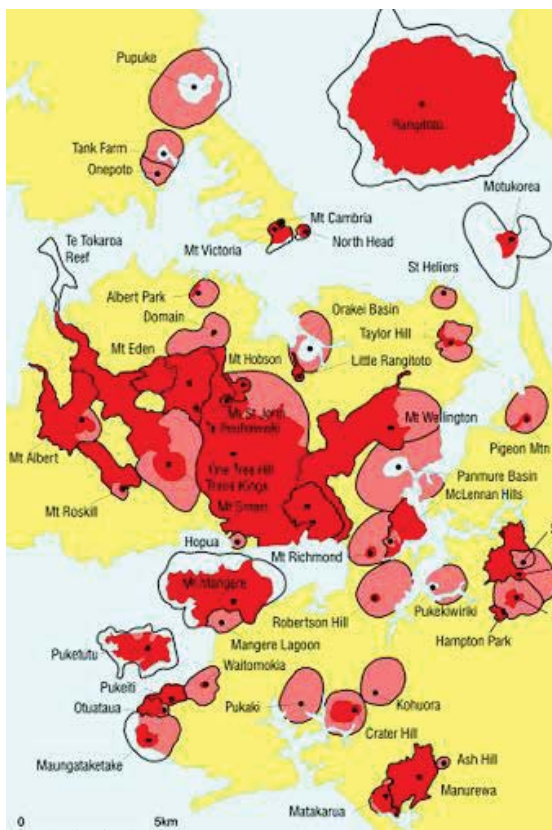
Auckland Volcanos

Auckland Volcanic Field

This map depicts the approximate extent of the Auckland Volcanic Field as determined by existing cones locations. Shown in light blue is a circle of radius 5 kilometres, the planned extent of the evacuation zone. Highlighted in green are the two locations at which the Auckland isthmus reaches its narrowest extents and in dark blue the four primary bridges connecting Auckland.

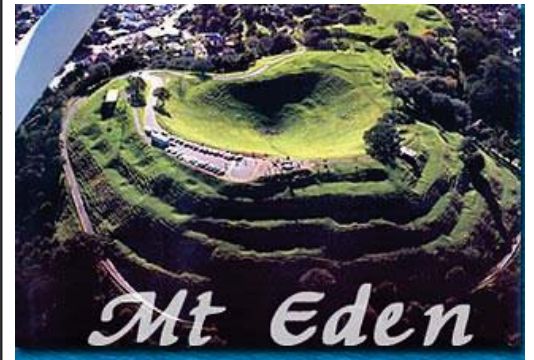


Map by Erik Tomsen
Datum: New Zealand 1949 Map Grid



Source	Hazards to UoA	Likelihood
Andesite volcanoes (e.g. Taranaki, Ngauruhoe, Ruapehu) >200 km from campus	Minor ash fall 0-1 cm. Possible impacts to electrical systems, corrosion of metal, communications, water supply etc (c.f. Ruapehu 1995-1996)	Likely to occur once or twice every 50 years
AVF – basalt eruption in Auckland region (5 -20 km from campus)	Likely hazards: ash fall (1-20 cm) and earthquakes. Possible hazards: lava flows. Ash will impact water and electrical utilities. Some building damage. Increased maintenance required. Lava flows, if present, will cause complete destruction of structures in their path and cause fires.	Unlikely in next 50 years. Likely in next 3,000 years
Rhyolite volcanoes (e.g. Taupo, Okataina) >200 km from campus.	Thick ash fall possible, 0-10 cm. Significant impacts on lifelines, health hazards etc. (c.f. Pinatubo, Philippines, 1991)	Unlikely in next 50 years Likely in next 3,000 years
AVF – basalt eruption near campus (within 5 km of campus, including directly below campus)	Hazards: Volcanic landform (e.g. scoria cone) formation; earthquakes; volcanic gas; pyroclastic surges; ash fall; lightning; lava bombs; lava flows; fire fountaining. Impact will range from total destruction of buildings and life, through to major damage, depending on distance to vent.	Unlikely in next 50 years Likely in next 10,000 years

Volcano Risk



**Source: Jan Lindsay & Phil Shane,
Determining Volcanic Risk in New Zealand (DEVORA)**

13

NZ Natural Hazards

Tsunami risk



- **50% chance within the next 50 years impacting Auckland**
- **Tsunami originating from a large earthquake off the west coast of South America**
- **Wave heights of up to 4 metres**

Other distant tsunami sources are earthquakes in other parts of the Pacific ocean are more frequent but waves are likely to be much smaller.

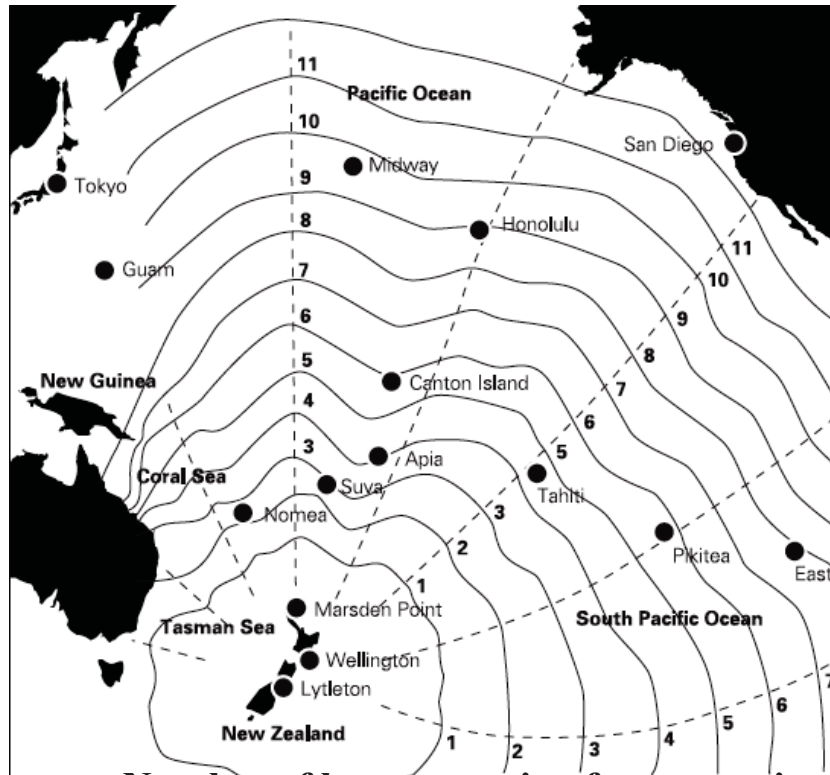
Earthquakes in the outer Hauraki Gulf or Firth of Thames could generate a tsunami. Probability: than 1% in the next 50 years

Volcanic eruptions from the Auckland Volcanic Field could also produce tsunami though wave heights are unlikely to be much larger than 1m.

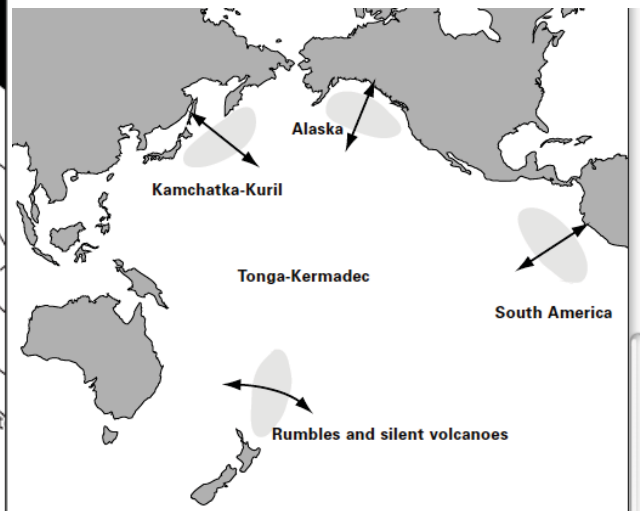
**Of the 32 recorded tsunami to hit New Zealand between 1840 and 1995, 12 detected within Auckland waters.
All were small (less than 2 metres).**

Source: Auckland Regional Council

Tsunami



Number of hours warning for tsunami
via Pacific Warning Centre



Likely sources of tsunami

15

NZ Natural Hazards

Tsunami: UoA on a Hill



16

Tornado

ONE NEWS
WATCH LIVE

Video NZ News World Sport Olympics Business Politics Entertainment Life

One man dead as tornado wreaks havoc in Auckland

Published: 3:13PM Tuesday May 03, 2011 Source: ONE News

[Email this article](#) [Print this article](#) Text size [+](#) [-](#) [Share on Facebook](#) [Share on Twitter](#)

The tornado that ripped through Auckland today sounded like a "747 was flying right overhead", a witness says.

One man was killed in the tornado which struck first in Albany about 3pm.

More than a dozen people suffered injuries, some of which were critical, as the twister left a trail of destruction in Auckland suburbs.

One eyewitness said the tornado came within 200 metres of a school.



The tornado left a trail of destruction in Albany. - Source: ONE News

17

The Christchurch Earthquake

Christchurch Earthquake

Saturday 4 September 2010, Magnitude 7.1, 4:35am, depth 10 kilometres, widespread damage, no direct fatalities.

Tuesday 22 February 2011, Magnitude 6.3, 12:51pm. Depth of 5km, **MM** IX, among the strongest ever recorded globally in an urban area and in total 185 people killed



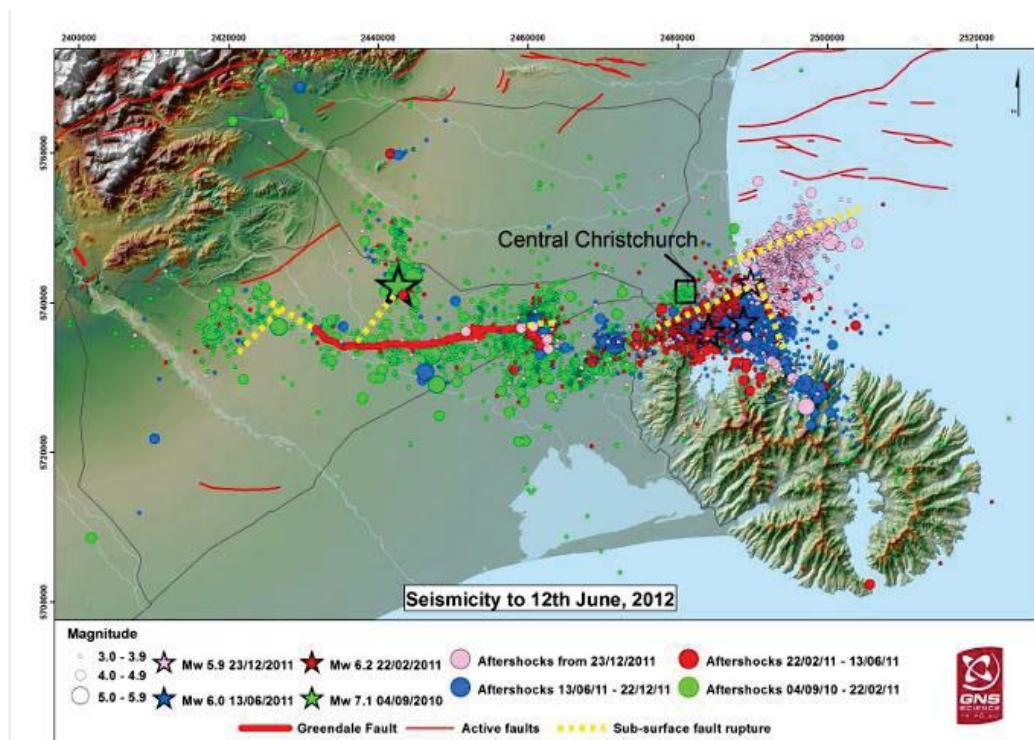
Digital Archive: <http://www.ceismic.org.nz>

19

Christchurch Earthquake

Christchurch Earthquakes:

<http://www.christchurchquakemap.co.nz/>



20

University of Canterbury Case Study



University of Canterbury Case Study

UC IT DR during the earthquakes

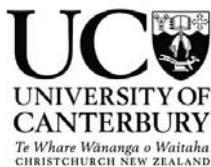
- fend for yourself
- assist others who are in a less fortunate position

Good design

- Primary and Secondary data centres were designed with seismic activity in mind
- The remote access facility was ready to scale because of previous concerns over bird flu
- Terminal servers were quickly provisioned via UC's virtual environment to allow up to 1000 concurrent users

..... and a little bit of luck

- ISP data centre remained operational despite some damage
- No fibre damage between UC and our ISP

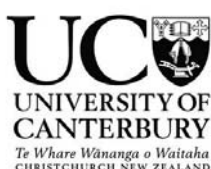


Andy Keiller
IT Operations and Infrastructure Manager
Learning Resources
University of Canterbury

23

Immediate IT Challenges

- To provide communication channels to staff and students
 - Web site, e-mail, Facebook
- Provision remote access to key members of staff who previously had no provision
- To rescue PCs from damaged building because they had "specialist" software and key data with no other "backup"
- Limited numbers of IT staff available to assist

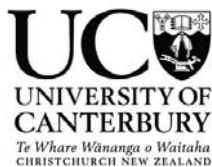


Andy Keiller
IT Operations and Infrastructure Manager
Learning Resources
University of Canterbury

24

Medium term IT challenges

- How to provision technology into the “tented” village to allow teaching to continue
- Coping with the increase in the number of video captured lectures (50 hours to over 300 hours)
- Working with our ISP to allow students financial relief because of increased internet traffic to on-line resources
- Provisioning laptops for remote access as most of the kit couldn't be accessed from our damaged buildings



Andy Keiller
IT Operations and Infrastructure Manager
Learning Resources
University of Canterbury

25

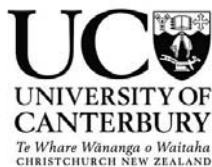
A screenshot of the nzherald.co.nz website. The header shows the website name, a search bar, and the location 'Auckland, 14° 1°' with a 'Change' link. Below the header is a navigation bar with links for National, World, Business, Sport, Technology, Entertainment, and Life & Style. The main content area shows the article title 'Tent-town campus planned for Canterbury University' and the date '7:05 AM Tuesday Mar 8, 2011'. There are also social media sharing buttons for Tweet, Like, +1, Email, and Print.

- The University of Canterbury will resort to teaching students from an interim tented campus after February's magnitude 6.3 earthquake.
- Four large marquees will be set up on campus to be used as teaching and working spaces for staff and students.
- Any buildings that have not been through the five-step building assessment process will be cordoned off to avoid any avoidable health and safety risks.
- Students and staff are advised to bring drinking water and hand sanitiser with them
- A full day of teaching will be offered on Saturday March

26

Lessons learned

- IT DR plans need to be generic as there will be an element of thinking on your feet
- You will need strong relationships with your key suppliers
- Plan to ensure that people are not the single point of failure
- People are your strongest assets
- Be prepared to act militarily
- The goal should be to not just to survive but also thrive during times of adversity



Andy Keiller
IT Operations and Infrastructure Manager
Learning Resources
University of Canterbury

27

Other Hazards

Other Hazards



Auckland Power

ONE NEWS

Video **NZ News** World Sport Olympics Business Politics Entertainment Life

Gas pipeline leak hits industry, farmers

Published: 12:14PM Tuesday October 25, 2011 Source: ONE News

Email this article Print this article Text size + -

Share on Facebook Share on Twitter

Some of New Zealand's biggest businesses are grappling with a massive power outage after a gas leak in Taranaki shut down supply to much of the North Island.

The Maui Pipeline, which transports gas north from the Maui gas field to the upper North Island, closed this morning after gas began escaping from the pipeline in north Taranaki.

Lines company Vector, which manages the Maui Pipeline, says the leak near White Cliffs, north of New Plymouth, forced it to cut industrial supply.

29

Other Hazards

- Flood
- Fire
- Leaking Air-conditioning
- Burst Water Pipe
- Drainage
- Air-conditioning Failure
- Building Control System Failure
- On-campus Power Issues
- Failure during testing of a UPS/Generator

30

The University of Auckland DR Case Studies



Crisis Management/DR The University of Auckland

UoA Information

- Staff: 4725 FTE; 6900 staff headcount
- Students: 32,654 EFTS; 38000+ student
- Times Higher Ed supplement: #1 in NZ, #6 in Australasia.
- CIO Magazine NZ MIS100: 7th largest IT operation in NZ
- Five campuses North Island. 4 in the City, 1 Northland, many satellite locations
- 810 wireless APs, 1750 edge switches

UoA Information

- 2 Main Data Centres + third at the Medical School
- 24/7 operation
- VLANs span data centers to support DR.
- 2515 (Physical 600, Virtual 1915)
- Main DC use is VMware: 2x 10Gb Ethernet, 2x 8Gb Fibre Channel, 8 core, 288GB RAM, supporting 40+ guests
- 500TB NAS service with 4x 10Gb connections
- TSM backup service with multiple 10Gb connections (6TB a night of backup traffic)
- Virtualized Oracle environment for all our ERP systems.

33

Auckland Experience

- 2011 – Large BCP Project
- 2011/2012 – Crisis Management Scenarios
 - September 2011: Crisis Planning for a Tornado
 - Would lose both Data Centres (In the same street)
- 2012 – New Risk Management Group (PARCO)
- 2011/2012 – ITS DR Project
 - Scenario Planning and Gap Analysis
 - Documentation
 - Communication Plan
 - Update of ITS Crisis Plan
 - Practice DR Test – Scheduled April 2012 (Overshadowed by Actual Events)
- Early 2012 – DR Incidents

34

Auckland Experience

- October 25th 2011: Pipe Line Power Issues
 - Reliance on Generators. Secondary DC had generator capacity issues
- January 6th 2012: Primary Data Centre Air-conditioning Failure
 - DC Overheating caused by Building Control System
- March 9th 2012: Secondary Data Centre Power Loss
 - UPS Failure
 - Incorrect Power Diagrams
- April 2012: Gas pipe hit while building new DC

35

January 6th 2012: Primary DC

- Approximately 4pm to 8:30pm.
- Primary Data Centre Air-conditioning Failure
- Caused by a Building Control System failure
- Manual override was too late
- Hot spots
- Found one of our Juniper boxes could run at high temperatures
- Systems shutdown in an unordered fashion
- SAN first – before issue was even escalated
- Property addressing another issues (1 person)
- Ventilation backup didn't work
- Many ITS staff were on holidays
- 1/2 Servers shutdown before cooling came back (leaving us in a 1/2 state)

36

January 6th 2012: Primary DC - Issues

- Impacted user access, Student Services Online, Student File storage, LMS ,some Library Services.
- eResearch system failure
- Many key systems did remain working, including email
- Restored within the same business day.
- The ½ state caused Issues with recovery
- Issues with Staff accessing systems from home (Yubikey)
- Issues with VCentre Management didn't work
- Post Implications of heat exposure (Vendor Relationship)
- Problems communicating with Faculty and Library staff
- Reliance on particular staff

37

March 9th 2012: Secondary Data Centre Power Loss

- Day before the UPS failed – on mains
- Needed to put data centre in bypass to remove the UPS
- Incorrect Power documents and Power switched off at 8am
- Power switched on and systems returned in an adhoc manner

38

March 9th 2012: Secondary Data Centre Power Loss

- Again Virtual Servers in 1/2 state: Vcentre didn't working
- Services affected included identity, Student Services Online Email, LMS, Virtual Worlds, File Service, some SharePoint sites and various Development/Test/Dr environments. Other key systems did remain working, including ERP Systems.
- Communications issues – New Incident Manager who was not given the SMS service password
- Issues in the order in which systems powered on
- TSM Backup failed to recover (Vendor Relationship)
- Issue with the email setup
- Issue with the new storage system authentication source
- Systems recovered in 4 hours
- (UPS recovery – Incident of contractor not following procedures)

39

Actions

ITS

- Vcentre Management Architecture (Separate VMfarm)
- Replication of Authentication Systems & Documentation
- Control shutdown and startup (manual override)
- Communication Plan
- Update ITS Crisis Management Plan
- Undertake more Scenario plans (Gap analysis)
- Undertake additional DR Tests – system by system
- Review Roles and Responsibilities of Faculties and other Service Divisions
- First Risk Case from PARCO
- Document everything – Post review as soon as possible

40

Addressing Lessons Learnt

Property Services

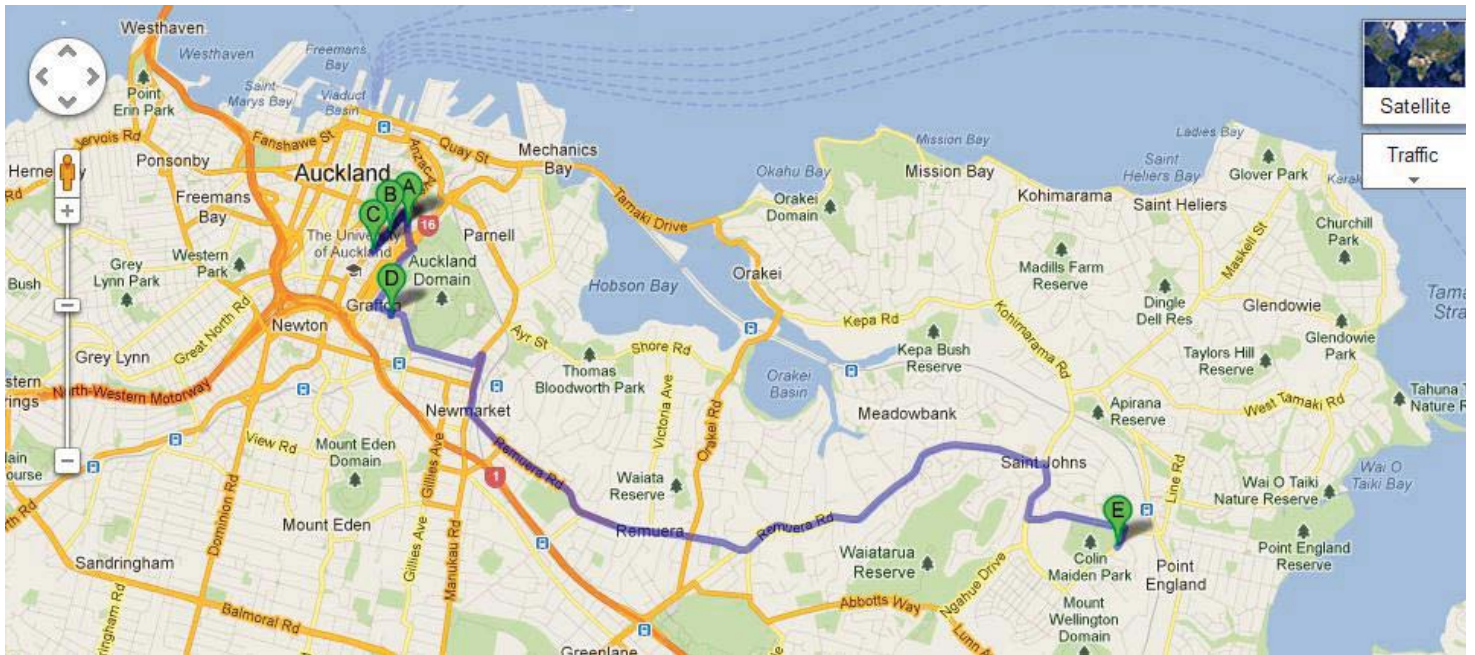
- Replace Building Control System
- Replication for the Building Control System
- Review Air-conditioning redundancy
- Review Power Documents

Both – New DC

- Ensure all documentation from the new DC is reviewed
- Implement new DC as Tier 3

Data Centres

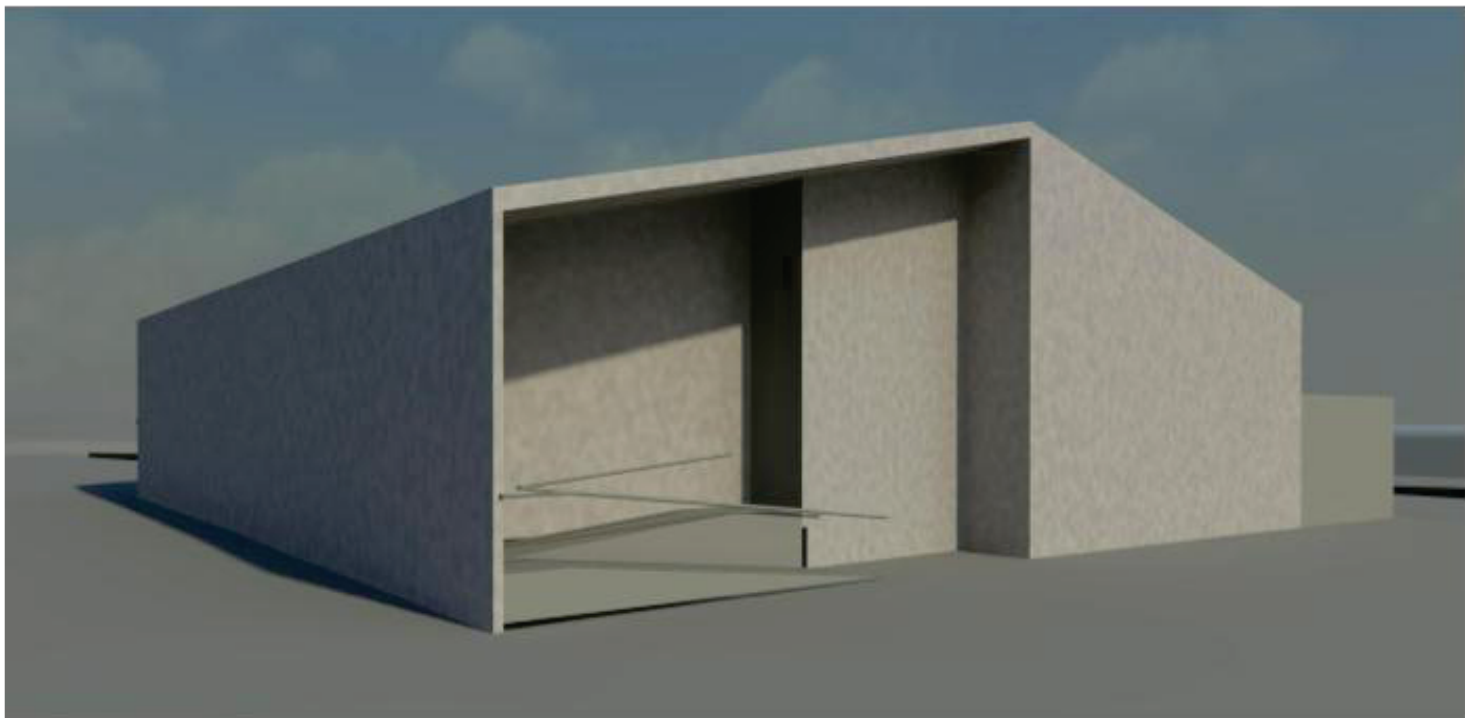
Data Centres



43



Tamaki Innovation Campus Data Centre





Tamaki Data Centre



Tamaki Data Centre

- 85 IT Equipment Racks
 - 32 racks will be for High Performance Computing (eResearch)
 - 60 Racks will be 48RU high giving a total RU capacity amongst the 60 racks of 2880RU.
- 15 Kw capacity per rack average
 - caters eResearch loads of up to 35kW – 44Kw's per rack
- Power Usage Efficiency (PUE) of 1.4
 - For each 1000w of power consumed only 400w will be required to treat the heat. (70% of the year)
- 2.4MW of Generator Capacity
 - Starting with 2x650w generators
- 1.2Mw of Cooling Capacity
 - For the rare times when free cooling is not possible the cooling plant will be capable of cooling 1.2Mw of power load.

47

Tamaki Data Centre

- Over 375Ssqm
 - The total facility at the Tamaki campus will utilised over 375 square metres of land.
- 2 Tonne per square metre of floor loading.
 - Designed to handle rack loads of 2 tonne/sqm. 10G connectivity between OGGDC and TDC
- Dark fibre and DWDM
 - Installed in a ring formation to the City Campus
 - 10G between data centres.
 - Future REEANZ link to the site

48

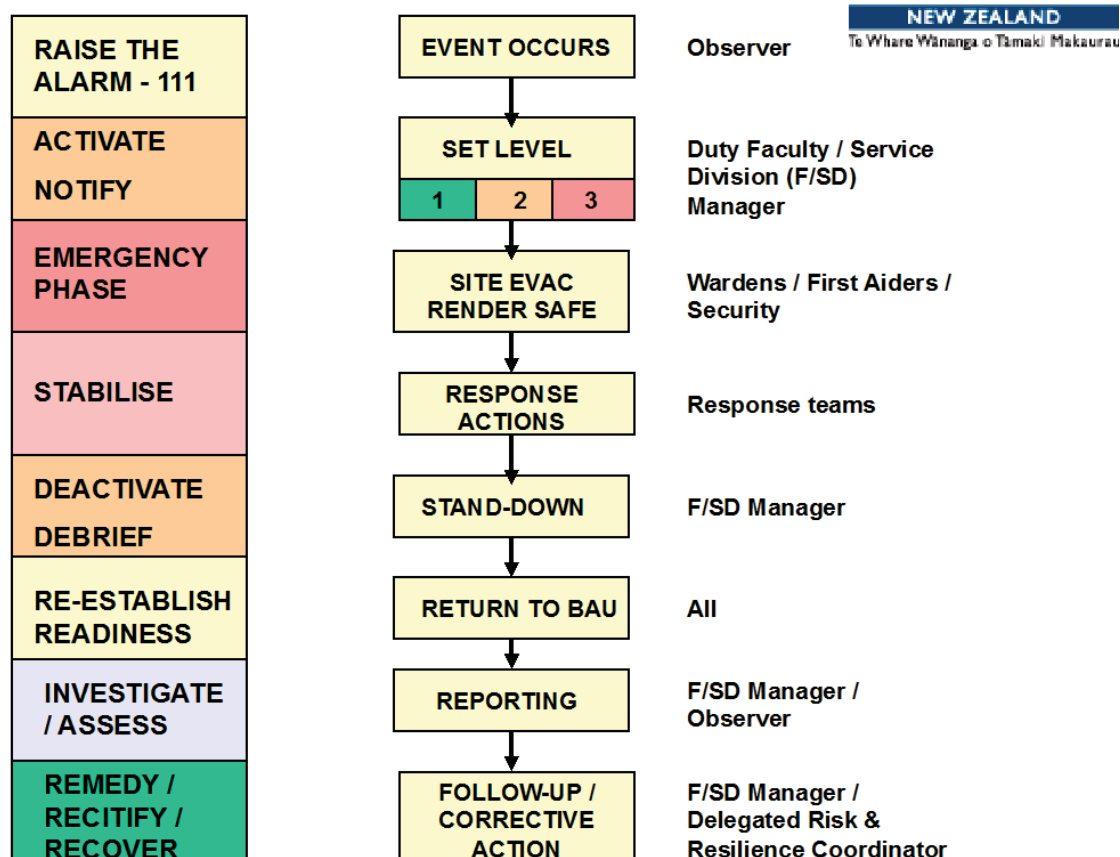
Crisis Management/DR at The University of Auckland

Crisis Management

FIG. 1: RESILIENCE MANAGEMENT PLAN RELATIONSHIPS

Level 1	Applies to everyone	U of A Resilience Response Plan	Overall policy framework & principles, fire & evac applying to everything, indicating what plans are where.
Level 2	Applies to parts of the organisation	U of A Crisis Management Plan	Co-ordination and support of response & recovery efforts
	Specific to Faculty / Service Division	Faculty / Service Division Resilience Management Plans	Specific to operations / business areas. Contingency plans & procedures.
Level 3	Task & business unit specific	Relevant BAU Plans & Procedures	

FIG. 4: RESILIENCE RESPONSE PROCESS



51

UoA Crisis Management

- The University's response priorities:
 1. Safety & security of people;
 2. Protecting critical infrastructure and services;
 3. Maintaining the Universities core business functions of research; and teaching and learning;
 4. Protecting the environment
- Emergency Operations Centre
 - Primary and Alternative locations
 - Mobile location - widespread geographical disruption

52

ITS Crisis Management

	Crisis Level	Risk Level	Definition - ITS	Impact on University
	Disaster	Very High	Immediate action required by ITS Crisis Committee with detailed planning, allocation of resources and regular monitoring	Significant impact to critical University processes Chair of ITS Crisis Committee may rely on the CIO or UEMT for direction if the event constitutes an Emergency Response Plan trigger
UEMT aware ITS Crisis Committee initiated	Emergency	High	ITS Associate Director attention and accountability needed, appropriate ITS Management involved. ITS Crisis Committee activated	Significant impact to more than one process, faculty, building or user group
ITS Crisis Committee aware	Alert	Medium	ITS Associate Directors and appropriate ITS Management must be alerted to the issue to understand situation and progress	Limited impact to the University, impacts to a single user group, faculty or building
	Watch	Low	Service Delivery Owners monitor and manage by routine procedures. No Associate Director involvement	Some impact to the University if the situation escalates further
	Normal	Very Low	Manage by routine procedures. No ITS Mgmt involved	Low impact to ITS or the University – business as usual

53

ITS Crisis Management

What have I learnt:

- BCP and DR are not project
- Documentation is Important
- Practice Makes Perfect – Think on your Feet
- Mind the Gaps
- Be Prepared – BCP, Access, Replication
- Communication!
- Stakeholder Expectations
- Protect your Techs
- In an Incident – Document Everything
- Vendor Relationships
- People are your greatest Asset
- Learn from your Experience

54

Living in NZ

It's a Beautiful Place



Questions?

