

2011 Christchurch Earthquake

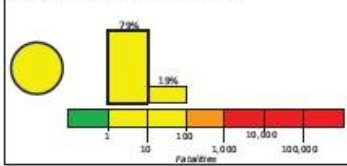


M 6.3, SOUTH ISLAND OF NEW ZEALAND
 Origin Time: Mon 2011-02-21 23:51:43 UTC (12:51:43 local)
 Location: 43.80°S 172.71°E Depth: 5 km

PAGER Version 7

Created: 3 days, 22 hours after earthquake

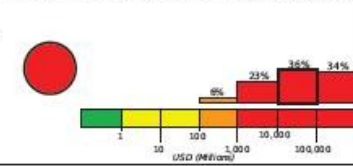
Estimated Fatalities



Red alert level for economic losses. Extensive damage is probable and the disaster is likely widespread. Estimated economic losses are 10-70% GDP of New Zealand. Past events with this alert level have required a national or international level response.

Yellow alert level for shaking-related fatalities. Some casualties are possible.

Estimated Economic Losses



Estimated Population Exposed to Earthquake Shaking

ESTIMATED POPULATION EXPOSURE (k = x1000)	--*	23*	46k*	91k	50k	63k	228k	92k	0	
ESTIMATED MODIFIED MERCALLI INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+	
PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very Strong	Severe	Violent	Extreme	
POTENTIAL DAMAGE	Resistant Structures	none	none	none	V. Light	Light	Moderate	Moderate/Heavy	Heavy	V. Heavy
	Vulnerable Structures	none	none	none	Light	Moderate	Moderate/Heavy	Heavy	V. Heavy	V. Heavy

*Estimated exposure only includes population within the map area.

Population Exposure



Structures:
 Overall, the population in this region resides in structures that are highly resistant to earthquake shaking, though some vulnerable structures exist. The predominant vulnerable building types are reinforced masonry and concrete/cinder block masonry construction.

Historical Earthquakes (with MMI levels):

Date (UTC)	Dist. (km)	Mag.	Max MMI(#)	Shaking Deaths
1994-06-19	90	5.9	VIII(12)	0
1984-06-24	159	6.1	VIII(18)	0
1990-02-10	134	6.0	VIII(61)	0

Selected City Exposure

MMI City	Population
IX Christchurch	364k
VII Lincoln	2k
VI Woodend	3k
VI Rolleston	3k
VI Burnham	1k
VI Leeston	1k
VI Oxford	2k
V Darfield	2k
IV Timaru	28k
IV Greymouth	9k
IV Hokitika	3k

bold cities appear on map (k = x1000)

PAGER content is automatically generated, and only considers losses due to structural damage. Limitations of input data, shaking estimates, and loss models may add uncertainty.
<http://earthquake.usgs.gov/pager>

Event ID: usb0001igm

Date 22 February 2011 12:51 [NZDT](#)

Magnitude 6.3 [M_L](#)

Depth 5 km (3.1 mi)

Max. intensity [MM](#) VIII (X+)

Peak ground acceleration 1.88g (city); 2.2g (epicentre)^[3]

Tsunami 3.5 m (11 ft) tsunami waves in [Tasman Lake](#), following quake-triggered glacier calving 166 confirmed dead (17 March)^{[6][7]}

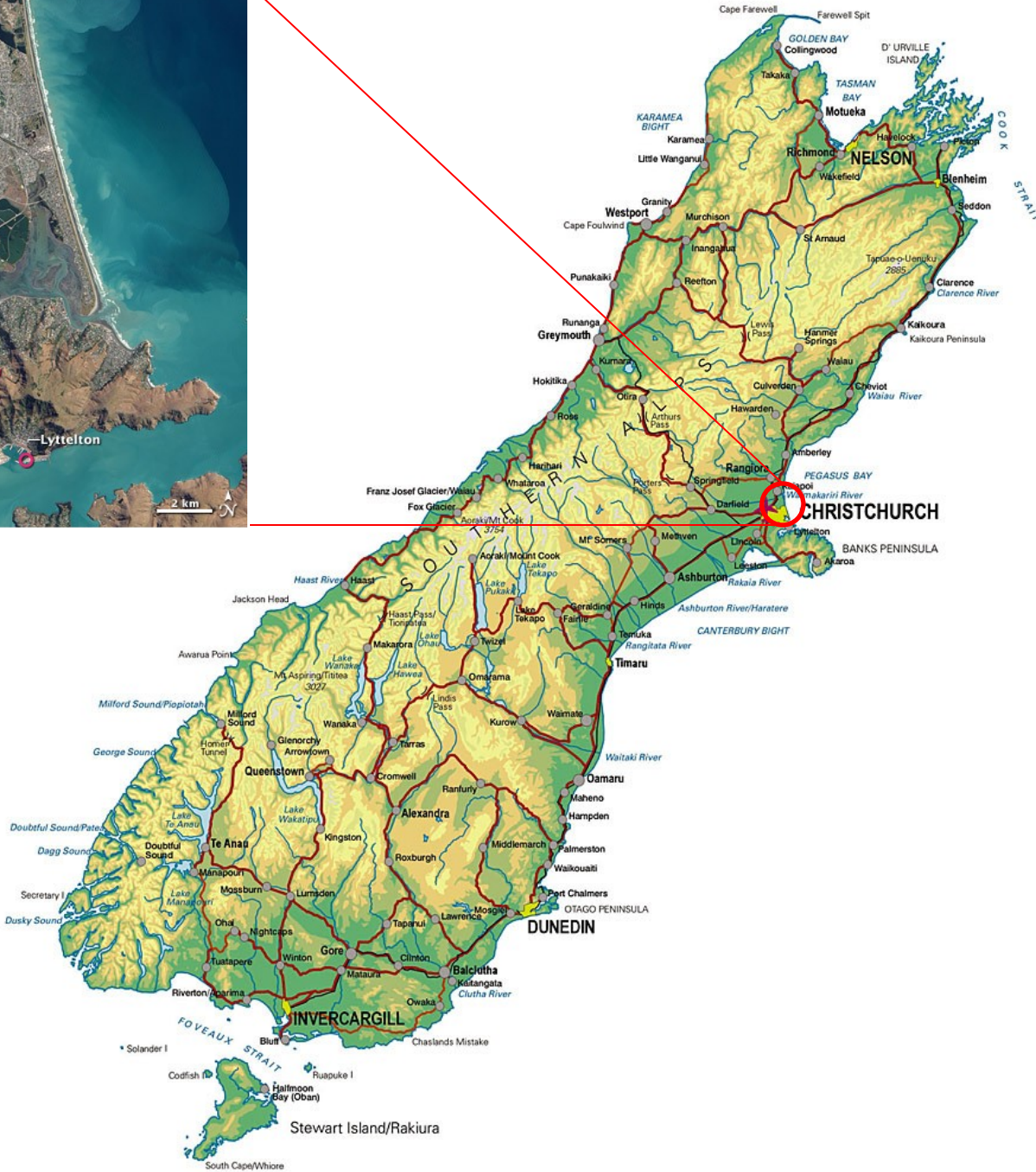
Casualties About 200 missing (7 March)^[7]
 1500–2000 injured, 164 seriously^[8]





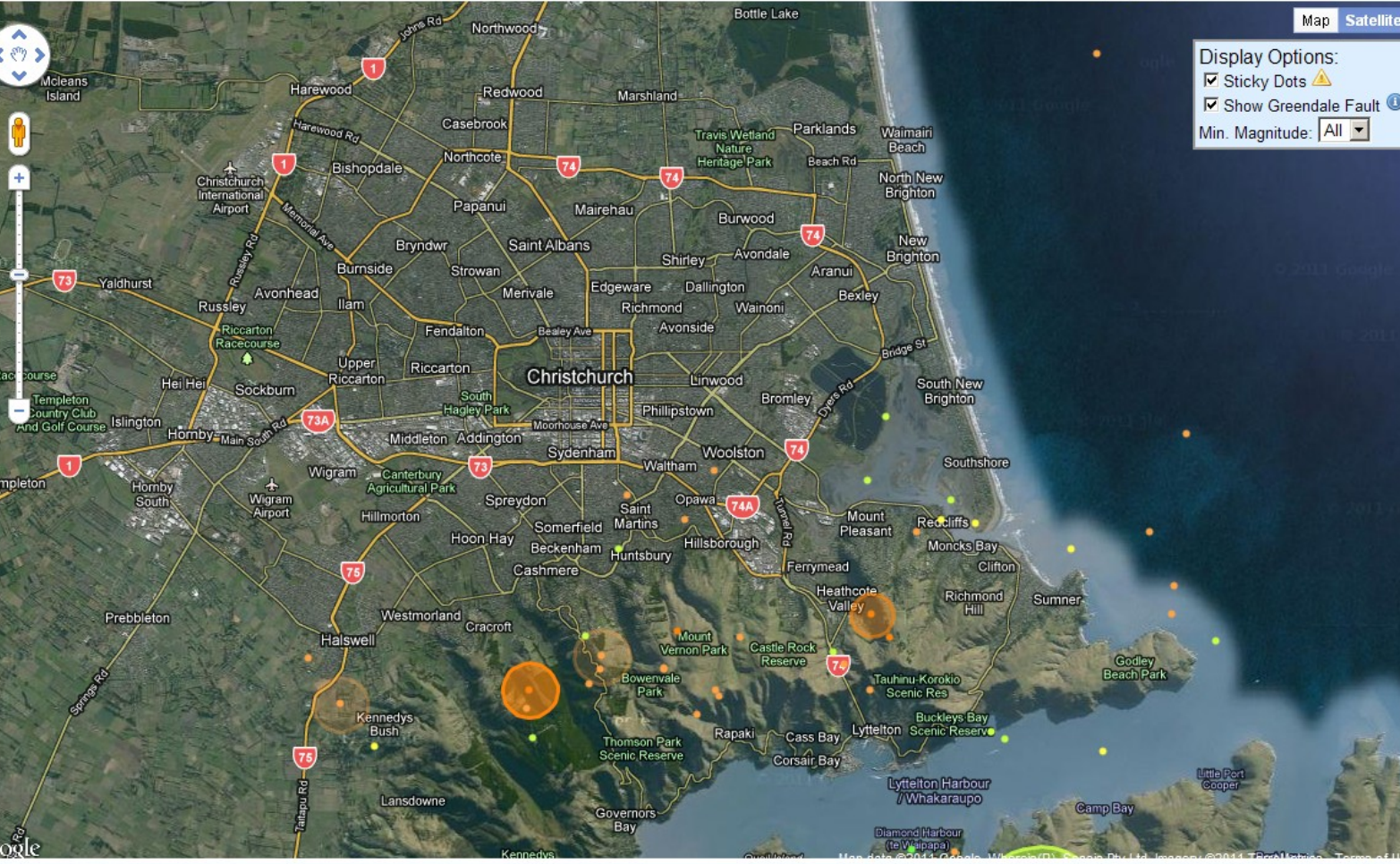
Shake Intensity

strong
 very strong
 severe
 violent



Christchurch Quake Map

Show: Since [Sept 4 / Feb 22](#) [Past 7 days](#) [Today](#)



Map Satellite

Display Options:

Sticky Dots

Show Greendale Fault

Min. Magnitude:

Tue Feb 22 2011 18:13 NZDT

Jump to: last [3](#) / [6](#) / [9](#) / [12](#) / [24](#) hours

Show day:

51 of 743 quakes (743 total):

- 4.2M, depth: 10km 22/2/2011 19:39
- 4.4M, depth: 5km 22/2/2011 16:24
- 5M, depth: 12km 22/2/2011 16:04
- 4.5M, depth: 5km 22/2/2011 15:48
- 4.6M, depth: 11km 22/2/2011 15:43
- 3.2M, depth: 19km 22/2/2011 15:33
- 4.3M, depth: 5km 22/2/2011 15:21
- 3.7M, depth: 8km 22/2/2011 15:08
- 3.8M, depth: 6km 22/2/2011 15:04
- 5.9M, depth: 7km 22/2/2011 14:50
- 4M, depth: 8km 22/2/2011 14:39
- 3.3M, depth: 5km 22/2/2011 14:37
- 3.4M, depth: 5km 22/2/2011 14:30
- 4.5M, depth: 4km 22/2/2011 14:20
- 4.5M, depth: 5km 22/2/2011 14:15
- 4.5M, depth: 5km 22/2/2011 13:46
- 4.2M, depth: 9km 22/2/2011 13:31
- 4.4M, depth: 7km 22/2/2011 13:23
- 4.2M, depth: 9km 22/2/2011 13:21
- 5.7M, depth: 7km 22/2/2011 13:04
- 4.8M, depth: 5km 22/2/2011 12:56
- 4.9M, depth: 5km 22/2/2011 12:56
- 4.1M, depth: 5km 22/2/2011 12:56
- 4.5M, depth: 5km 22/2/2011 12:56
- 4.3M, depth: 5km 22/2/2011 12:55
- 4.2M, depth: 7km 22/2/2011 12:54
- 4.8M, depth: 7km 22/2/2011 12:53
- 6.3M, depth: 6km 22/2/2011 12:51
- 2.6M, depth: 5km 22/2/2011 12:34
- 3.2M, depth: 5km 22/2/2011 09:16
- 2.3M, depth: 5km 22/2/2011 01:07

Quake depth: <2.5km <5km <7.5km <10km <15km <20km <25km <30km <40km <50km 50km+

Site concept and development: [Paul Nicholls](#) of the [University of Canterbury's](#) Digital Media Group (Christchurch, New Zealand)

- Strike-slip with oblique reverse thrust movement.
- MM6.3, but nearby and shallow.
- PGA in the CBD $1.8g$ (MM VIII)
- PGA $2.2g$, near epicenter (MM X+) (Heathcote Valley Primary School)
- “statistically unlikely” to occur more than once in 1000 years, according to one seismic engineer, with a PGA greater than many modern buildings were designed to withstand. New Zealand building codes require a building with a 50-year design life to withstand predicted loads of a 500-year event

PGA single direction (max recorded)	PGA vector sum (H1, H2, V) (max recorded)	Mag	Depth	Fatalities	Earthquake
2.7g ^[7]	2.99 g ^{[8][9]}	9.0	32 km	>9199 ^[10]	2011 Tōhoku earthquake and tsunami
2.2g ^{[11][12]}		6.3	5 km	166*	2011 Christchurch earthquake
	4.36g ^[13]	7.2	8 km	12	2008 Iwate-Miyagi Nairiku earthquake
1.7g ^[14]		6.7	19 km	57	1994 California earthquake
1.26g ^{[15][16]}		7.1	10 km	0	2010 Canterbury earthquake
1.01g ^[17]		6.6	10 km	11	2007 Chūetsu offshore earthquake
1.01g ^[18]		7.3	8 km	2,415	1999 Jiji earthquake
0.8g		6.8	16 km	6,434	1995 Kobe earthquake
0.78g ^[19]		8.8	35 km	521	2010 Chile earthquake
0.6g ^[20]		6.0	10 km	143	1999 Athens earthquake
0.51g ^[21]		6.4		612	2005 Zarand earthquake
0.5g ^[14]		7.0	13 km	92,000-316,000	2010 Haiti earthquake
0.25 - 0.3g ^[22]		9.5	33 km	1,655 ^[23]	1960 Valdivia earthquake
0.24g ^[24]		6.4		628	2004 Morocco earthquake
0.18g ^[25]		9.2	23 km	143	1964 Alaska earthquake
0.125g ^[26]		7.7	44 km	27	1978 Miyagi earthquake (Sendai)





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individuals removed



Antarctic Centre



BMF589





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5

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VINCA EDUCATION CENTRE
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Resort a problem







MANCHESTER ST

Fireleaver,
Rigging

PARALEL
PH 343-5900

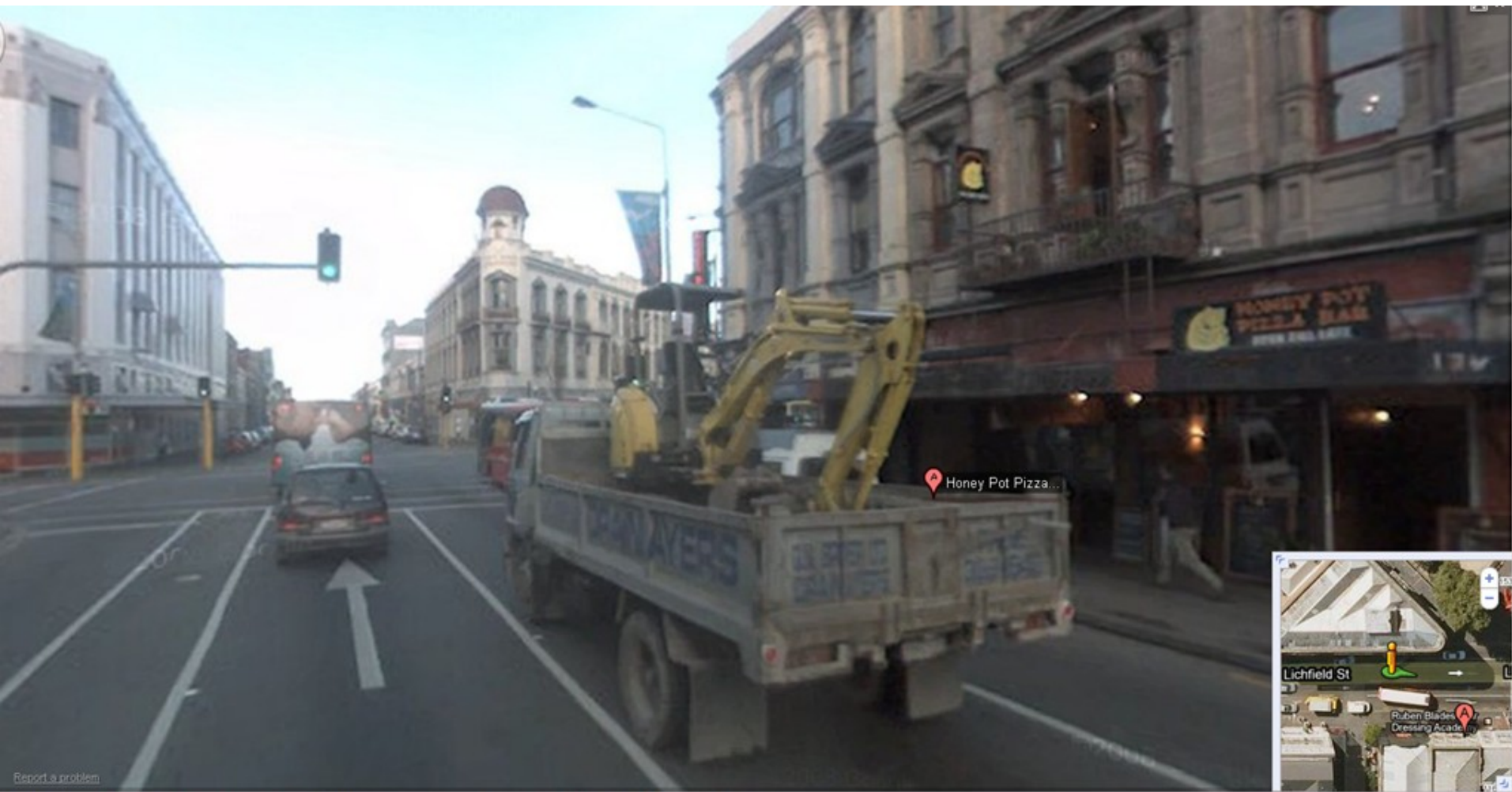
Rooms

5.00

BYO

WTM

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WAGEN
ST
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TES





LOTHIERS

Manchester St

P

HONEY POT
PIZZA BAR
OPEN TILL LATE

St John's
AMBULANCE

621100

EHG8

181055



LOTHIERS

Manchester St

P

HONEY POT
PIZZA BAR
OPEN TILL LATE

St John's
AMBULANCE

St John's
AMBULANCE

184055

EHG8



all
seasons
HOTELS

CHRISTCHURCH
CASHEL







GOODS

NO CRUISING ZONE 10PM-5AM BEGINS

mapworld

mapworld

MANCHESTER ST

Parking



VAND CHANCELLOR

Manchester St

SITE ENTRANCE KEEP CLEAR

CRIME PREVENTION (ENTRANCE)

NEW ZEALAND CRIBBING

hirepool

hirepool

hirepool



CTV Building



















VAN DER
VELDEN

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DENSMAN

11 FEBRUARY - 11 MAY









ONE NEWS

DANGER VERBODEN TOEGANG

FJIB

EXPRESS



TODAY IS THURSDAY

FEB 24TH



CHRISTCHURCH
ART GALLERY
TE PUNA O
WAIWHEHU

PUMP

PUMP

PUMP

PUMP

Lessons?

- September 7.0 got attention, most wouldn't be too worried about a 6.3.
But: PGA is more important than MM
Size distance, geology etc determine effects.
Building codes matter.
- No history means nothing- 'not worried about Christchurch, Wellington is the concern.'
No deaths from the 7.0, so we can handle that here.
- Public ARE first responders. Too much time planning for exclusion?
- Is our advice correct? "Don't go outside" too simplistic?
Drills are critical, and we need to **focus on life safety.**
- Aftershocks kill. Its not over.
- Watch for building construction and location within a building and exits.

Be Prepared.



FEMA