greater WELLINGTON
REGIONAL COUNCIL

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Committee Council
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Earthquake Risk Assessment – Wellington Region

1. Purpose

To update the Council on the key risks and preparedness associated with a major earthquake event in the Wellington region.

2. Significance of the decision

The matters for decision in this report do not trigger the significance policy of the Council or otherwise trigger section 76(3)(b) of the Local Government Act 2002.

3. Background

The recent 7.1 magnitude earthquake (Richter scale) and associated aftershocks in Christchurch and rural Canterbury has provided a wake up call for all individuals and agencies in New Zealand and highlights for the need to be well prepared for a major earthquake.

This is particularly true for the Wellington region as it is well known as an area of high earthquake activity. Understanding the level of threat to the region is a critical first step in the process, but needs to be followed by actions to ensure the risks are reduced and managed as well as possible.

This paper (and associated presentation) provides a brief earthquake risk assessment of the region. It does so by firstly examining the key risks and programmes to manage risk from a region-wide perspective. This is followed by a focus on Greater Wellington's assets and business continuity.

While a large earthquake in the Wellington region may result from earth movement at several locations, movement of the Wellington Fault could be expected to result in an earthquake of about magnitude 7.5. This would release about four times the amount of energy of the 7.1 magnitude earthquake in Canterbury.

4. Comment

4.1 Earthquake related hazards

The Wellington region is a geologically dynamic part of New Zealand. The area is generally characterised as steep, seismically uplifted terrain that is crossed by numerous faults. Commercial and urban development has concentrated on available flat land around the coast and on flood plains, with suburban development generally on the hillsides. These areas are all subject to different seismic hazards and will result in a range of impacts on lifeline utilities, the built environment and infrastructure.

The maps provided in **Attachment 1** illustrate the extent of earthquake related hazards for the western part of the region. The maps show the extent of known and inferred faults, and identify where ground shaking hazard and landslide susceptibility are high. Not surprisingly, they show high levels of vulnerability in the lower lying areas (most of which are already densely built up) for ground shaking hazard and liquefaction, and high levels of landslide susceptibility on steeper slopes.

Further information about the nature of the fault environment in the Wellington region, including the likelihood of a major earthquake event, is available through the joint GNS/NIWA/VUW study *It's Our Fault*[1]. This suggests that the Wellington Fault has a recurrence interval of approximately 750 years and approximately 1200 years for the Wairarapa Fault. The most recent rupture for the Wellington Fault was approximately 300 years ago.

4.2 Summary of key risks – region wide

The following summary highlights the key risks associated with an earthquake of similar magnitude to that experienced in the Canterbury region. Though some of the information relates to a larger Wellington Fault movement earthquake, the summary is categorised in a similar way to the Situation Reports generated by the National Crisis Management Centre during the Christchurch emergency. The purpose of this section is to give a general feel of the key risks, rather than a detailed analysis of what may happen in a large earthquake.

4.2.1 People

The extent of risk to people is dependent on the timing, scale, location and nature of the particular event. Notwithstanding this, an earthquake of similar magnitude to that in Christchurch would likely result in fatalities and significantly more injuries if it occurred in Wellington. This is due to the nature of the underlying geology and the density of urban living, particularly in Wellington City. Other expected risks include:

- Serious injury needing immediate medical attention and moderate injuries including dust asphyxiation issues and burns
- General increases in mortality from heart attacks, and critical needs for people in medical care

[1] GNS, NIWA, VUW & UC, 2009. Presentation to the NZ Society for Earthquake Engineering in 2009 - http://db.nzsee.org.nz/2009/Pres48.pdf

- People trapped in collapsed buildings and people needing rescue from rail and road accidents
- Traumatic stress from the initial earthquake and aftershocks – expected to continue for weeks, months and sometime years after the event happened.
- Displacement and the need for temporary accommodation and shelter - including displacement from modern apartment buildings where damage may be minor, but power, water and drainage are disrupted
- Loss of family income (employers out of business, damaged work places, etc.) and family separation
- Public health risks, particularly diseases emanating from damage to water and wastewater systems (cholera, dysentery) and psychological distress.

4.2.2 Community infrastructure

Community infrastructure (such as hospitals, medical centres, specialist care facilities and schools) is an important consideration due to public reliance on them in an emergency. The key risks associated to a major earthquake include:

- Inability of people gaining access to community infrastructure as a result of damage to key transport routes
- Significant increase in demand for services while dealing with a potential for reduced capacity of hospitals and emergency services because of damage to buildings and equipment, loss of utility services and staff fatigue
- No or limited water supply to hospitals
- Schools unable to operate due to damage to buildings and distress (staff, children and family).

4.2.3 Property

An earthquake the size of the recent Christchurch event would likely cause considerable damage to property in the Wellington region. The risks to residential property are likely to be more pronounced in the older and denser urban areas (such as the CBD and inner residential areas in Wellington City and Petone) due to the threat from post event fires and liquefaction. A significant proportion of the region's suburban areas are also susceptible to slope instability, which is likely to cause additional damage to residential housing. For Christchurch, upwards of 100,000 claims are expected to be lodged with the Earthquake Commission (EQC). A similar event, if centred in the western part of the region, would likely result in a higher proportion of claims to the EQC.

Other key risks to property include:

- Damage to older commercial buildings and heritage buildings, particularly for unstrengthened buildings built prior to regulation improvements in the 1930's
- Capacity and ability to find temporary accommodation due to displacement
- Slumping of reclaimed land, particularly parts of the Wellington CBD and port area.

4.2.4 Transport infrastructure

The topography and linear nature of urban form in the Wellington region means that we rely heavily on a few transport corridors to gain access to key regional destinations. Currently approximately 60,000 commuters (train, bus, car and cycle) come to Wellington City from neighbouring cities and districts each working day. These corridors traverse, and in some cases, sit directly on active faults. Because of this, the main components of transport infrastructure (arterial roads, rail, ports and airports) face high risk of disruption from a major earthquake and other natural hazards. New roading projects such as Transmission Gully will help to improve resilience in the Kapiti Coast District and Porirua City, as would improved east west linkages.

Key risks include:

- Some of the major transportation routes are likely to be impassable due to damage from landslides and fault rupture, especially SH1, SH2 and SH58
- Potential for extensive damage to port facilities, including damage to wharf foundations, oil leaks from broken fuel pipes and cranes toppling over
- Maintaing rail access to both the North Island main trunk line and the Wairarapa line
- Distribution and access to key employment centres, ports, airports and hospitals is likely to be seriously affected.
- Impacts are likely to be more pronounced for Wellington City due to the lack of alternative access
- Damage to airport infrastructure and associated staffing issues.

4.2.5 Lifeline Utilities

Lifeline utilities are fundamental for providing the everyday needs of society. They include electricity, telecommunications, water and waste water infrastructure and vital consumer goods such as fuel and food. Most lifeline utility networks are located in transport corridors and road reservations, and have a similar risk profile to transport infrastructure. The earthquake event in Christchurch has highlighted the difficulty of dealing with damage to underground utilities, particularly water supply and sewerage.

Key risks include:

- Loss of water supply and damage to other water infrastructure networks. The bulk water supply crosses the Wellington Fault at five locations. These would all be severely damaged in a Wellington Fault movement earthquake. A recent study by GNS estimated for a magnitude 7.5 Richter scale earthquake, there would be about 30 breaks on the main trunk pipelines and 60 breaks on the smaller branch lines[2]. Further GNS studies revealed that in Hutt City at least 5,000 breaks could be expected on its local water supply network. Due to the similar vulnerabilities (brittle pipes and other infrastructure) Wellington City, although it has a more robust new pipe specification, may still have as many as 8,000 breaks on its local supply network.
- Damage to bulk water supply storage infrastructure

[2] GNS, April 2009. *Post-earthquake restoration of the Wellington area bulk water supply*

- Damage to electricity infrastructure
- Loss of gas supply and associated risk of fire for those parts of the region with a reticulated gas.
- Damage to switch gear and cell phone towers, effecting telecommunications and overload of phone systems
- Availability and security of fuel supply, particularly in the short term.
- Availability and security of food supplies, which are usually delivered each day from bulk stores (mostly in Palmerston North).

4.2.6 Environmental

The geology and dynamic nature of the Wellington region means that the region is exposed to a wide range of hazards from a major earthquake.

Key risks include:

- Ground rupture along faults and potential damage to buildings, roads and rail, and utility infrastructure.
- Landslides in steep hill country, hillside suburbs and onto key transport routes.
- Subduction in Lower Hutt that could cause coastal flooding in Petone, and Seaview and possibly seawater intrusion into aquifers.
- Potential tsunami from fault rupture in Cook Strait causing inundation and damage to low lying coastal areas.
- Slumping in loose unconsolidated soils and uncompacted fill, particularly around the coast and river mouths, but also on flood plains in the Lower Wairarapa. This has the potential to cause serious damages to utility infrastructure, roads and rail and buildings around Wellington City, the Port, Lower Hutt, around Porirua Harbour, and along the Kapiti Coast.
- Contamination of water courses from damaged sewage and stormwater networks
- Amplified ground shaking on gravelly soils on flood plains, such as Hutt Valley that may damage flood protection works.

4.2.7 Rural

The primary risks to the rural sector from a large earthquake are likely to be closely linked with the environmental impacts discussed above. Greater Wellington land management programmes, such as pole planting and conservation woodlots, will help to mitigate the effects of land instability, however many deeper movements (e.g. the Ruru slump and Te Maire slump) will activate in a major earthquake.

Other key risks include:

- Landslide susceptibility and its associated impacts on farming operations in hill country areas - particularly the Wairarapa hill country where the softer sedimentary hill slopes are particularly vulnerable even during the summer months
- Maintaining water supply (domestic, stock and irrigation)
- Associated impacts from damage to key farm infrastructure, including dairy effluent systems, irrigation, buildings, silos, fences, dams, tracks and yards.

4.2.8 Economic

Based on discussion above, it is clear that the effects of a major earthquake on the Wellington region have the potential to cause significant economic impact both in the short and long term. There are inherent risks associated with key employment locations such as the Wellington CBD and other sub-regional centres and key distribution points such as ports and industrial areas – this will affect business continuity and government administration. The rural economy is more resilient, but still at risk if supply chains and farming systems are disrupted or the market reduces. Tourism, one of the region's growing economic sectors, is likely to be affected.

4.3 Community preparedness

A 'Community Preparedness Survey' was commissioned by the Wellington Civil Defence Emergency Management (CDEM) Group office in April 2010. The results of the survey were reported to the Regional Sustainability Committee on 14 September 2010.

In summary, the survey shows that preparedness has been gradually increasing; however there is still a significant proportion of the population who are not prepared for an emergency. Unfortunately, those not prepared are usually the more "vulnerable" in society such as the elderly, and those with special needs, disabilities and from lower socio economic areas.

Percentage of households that to have:	2004 %	2005 %	2006 %	2007 %	2010 %
Emergency food supplies	61	65	70	72	72
Emergency water supplies	68	69	71	71	71
Other emergency supplies and equipment	69	69	75	74	77
An Emergency Plan for the household	31	26	27	38	39

A focus on business preparedness (Wellington CDEM Group 2009) revealed that 59% of organisations have business continuity planning in place, but only 28% of staff were actually aware of the plans.

4.4 How are we placed to respond – planning and coordination

4.4.1 Civil Defence Emergency Management

As with all regions in New Zealand, the Wellington region has CDEM structures in place to manage and coordinate any disaster event.

Roles and responsibilities are clearly outlined in the CDEM Group Plan, which has flexibility to enable response to a variety of emergency events ranging from a small local event to a large scale event affecting the entire region.

The Wellington region's CDEM Group Plan makes provision for a Group declaration (as opposed to a single council declaration) to be made if two or more territorial authorities are affected. This allows for a more structured and coordinated response and sets up a clear protocol for major emergency events. This type of protocol was not in place in the Canterbury Group's Plan, resulting in three separate declarations by different councils during the Canterbury earthquake.

In the event of a Group declaration, Regional Council Centre becomes the Group Emergency Operations Centre (EOC). The protocol also provides for the Masterton EOC to become the alternate should damage in Wellington City be too severe.

In terms of resources, EOCs vary in degree of adequacy across the region. The Ministry of CDEM conducted an audit of the Wellington CDEM Group's EOCs in 2009[3]. This shows that out of the ten EOCs in the region, three (Wellington Emergency Management Office in Wellington City, KCDC, Lower Hutt) are purpose built facilities designed withstand a major earthquake and operate relatively independently. The remaining EOCs (including the Group EMO in the Regional Council Centre, and Group alternative EMO in Greater Wellington's Masterton Office) are located in existing council buildings with lower levels of suitability and design.

While the report notes the excellent capability of the Group EMO, it raises concerns about the resilience and hazardous location of the building in the Wellington CBD. Other key findings include:

- The inability of retro-fitted EOCs to function as a stand alone unit, due to a lack of dedicated back up resources (e.g. food, water, sewage holding tanks)
- The need for local training, particularly in some of region's smaller centres
- The lack of dedicated room for operations and radio communications in retro-fitted EOCs.

4.4.2 Wellington and Wairarapa lifelines groups

Two planning related lifelines groups have also been set up in direct response to the earthquake risk in the Wellington region.

The Wellington Lifelines Group comprises utility and transportation sector organisations, territorial authorities, emergency management agencies, research organisations and consultants, and operates under the auspices of the Greater Wellington Regional Council. The current focus of the Wellington Lifelines Group is to develop a management plan for the main utility/road/rail corridor in the Thorndon and Kaiwharawhara area. This area is considered to be extremely critical due to its vulnerability to a major earthquake and the fact that all of the major lifeline utilities and transport infrastructure coming into Wellington City are co-located within a 200m corridor straddling the Wellington Fault. The project aims to identify ways to improve the resilience of this area to a major seismic event.

[3] Wellington CDEM Group November 2009, *Audit of Emergency Operations Centres in the Wellington region*.

Similarly, the Wairarapa Engineering Lifelines Association project considers natural hazards and risks associated to engineering lifelines in the Wairarapa. The aim of the project is to strengthen the resilience of lifeline infrastructure and to ensure an appreciation of hazards is incorporated into the design of new assets.

4.4.3 Communication

Communicating with communities in the region after a major quake will be a significant issue to address.

Without power, telecommunications (via landline, internet or radio transmission) will be disrupted within the region until power and data links are restored. Initial communications (other than in the Wairarapa and Kapiti Coast) will rely on AM radio broadcasts from outside the region and particularly on National Radio whose transmitters are the most powerful for this purpose.

Fortunately Radio New Zealand and Television New Zealand are required by legislation to act as public service broadcasters in such situations, and will have to be relied on to broadcast from pre-prepared scripts until such time as they are able to be sent civil defence update information from the Group EOC or the National CDEM. These agencies have set scripts and, as demonstrated by the immediate aftermath of the Canterbury quake, can deliver these quickly and reliably.

Once a Group EOC is established, then the Public Information Management function will coordinate key messages and their delivery to affected communities.

5. Focus on Greater Wellington's business

This section of report focuses on the general business of Greater Wellington. It does so by firstly considering the risks and management approaches for assets that Greater Wellington is responsible for. This is followed by a discussion on business continuity.

5.1 Greater Wellington assets

5.1.1 Public transport

While Greater Wellington plays an important role in planning regional public transport networks, the extent of assets owned by Greater Wellington is relatively small.

(a) Rail rolling stock

Greater Wellington owns, through Greater Wellington Rail Limited, key rail rolling stock, including the Wairarapa carriages, the SE carriages, one English Electric Multiple Unit (EMU) and the new Matangi EMUs.

In addition to likely network damage, the key risk of damage to the rolling stock comes from ancillary infrastructure, such as the Thorndon viaduct, falling

on top of trains stabled underneath. Strengthening has been carried out on the viaduct, however this was carried out for the cars on top rather than the trains underneath.

The purchase of the 48 new Matangi EMUs significantly increases the value at risk under the insurance policy arranged for rolling stock from $38 million to around $278 million. In response, Greater Wellington has cover with Vero Insurance with a $50 million loss limit, with a deductible excess of $2,500,000 for Earthquake and Rolling Stock in Motion and $100,000 for all other losses.

(b) Station buildings

Greater Wellington owns rail station buildings at Waterloo and Petone. Neither building has been identified as earthquake prone.

Waterloo is insured based on indemnity value rather than full reinstatement value, on the assumption that if a station was rebuilt at this location the structure would be of a lesser scale than the existing structure. The Waterloo Interchange was built in the mid 1980's and was designed to comply with more modern code requirements.

The Petone station building is insured on full reinstatement value, including demolition costs. The Petone station building is quite new and was built to modern building codes.

KiwiRail assesses all the station buildings they own. None of these have been identified as being earthquake prone. Under the rail operating contract, KiwiRail is required to hold material damage insurance to reinstatement value in relation to all assets required to meet the minimum service requirements of the contract. The deductible excess is $10 million for earthquake damage.

(c) Other public transport infrastructure

Greater Wellington owns signage, shelters and CCTV, none of which have earthquake building code requirements. The maximum value of an individual asset in this category is $95,000 for the Epuni station canopy.

5.1.2 Water supply

Greater Wellington is the wholesale water supplier to the cities of Hutt, Porirua, Upper Hutt and Wellington. Infrastructure to supply the water includes four water treatment plants, 15 pumping stations, 182km of pipeline and three concrete water supply reservoirs.

As noted in section 4.2.5, approximately 100 pipeline breaks can be expected following a very significant earthquake. Slips may also damage part of the water distribution infrastructure. All four water treatment plants are expected to suffer damage and the water treatment plant at Gear Island (normally a standby plant) may be affected by liquefaction. Slips are expected in the water catchments, with the most severe potentially being in the Orongorongo catchment. As a result of slips, the river intakes may be closed until the water is less turbid. During this time, the Stuart Macaskill Lakes and the Waiwhetu aquifer would be the water sources.

Following an event, an assessment would be made of the damage and this may take a few days.

Pipeline repairs will start at the water treatment plants and then work progressively along the bulk mains in order to provide limited supply. This limited supply is likely to be untreated water in the first instance and it may or may not be chlorinated.

Standby power generation is available at the Te Marua and Wainuiomata water treatment plants. Wainuiomata can gravity feed into the system. At Te Marua, the standby generation will power the Te Marua pumping station though initially a gravity flow may be employed. Pumping stations along the network though will not operate until the power is restored as none have installed standby generation. At Waterloo, there are standby diesel pumps that can pump to some of Hutt City's reservoirs. There are also mobile generators to partially operate the Waterloo wellfield.

Pipework will be gradually repaired, but for a Wellington Fault rupture, the repair at each fault crossing is likely to be substantial. Initial estimates suggest that it could take approximately 60 days before the bulk water supply system is fully functioning following a major Wellington Fault rupture. At that stage the water is likely to be chlorinated but otherwise untreated.

For some years, an amount has been allocated in the capital works programme for earthquake preparedness. Details of the various works carried out and the works remaining are included in **Attachment 2**, together with some information on the recovery resources.

(a) Insurance

(i) Treatment plants, pumping stations, intakes and control system

Earthquake damage to these assets is covered by Greater Wellington's all risks Material Damage insurance Policy. The June 2010 replacement value of these assets, including 15% for demolition and fees is $215 million. A seismic damage assessment, prepared by Sinclair Knight Mertz in 2002, estimated the Probable Maximum Damage Ratio for these assets to be 0.42 (or 42%) in a Wellington Fault rupture.

Therefore the Probable maximum loss (June 2010 $) would equate to $90 million.

(ii) Stuart Macaskill Lakes, Pipelines and Tunnels

These assets, valued at $490 million, are insured by two means that collectively provide the required cover. Firstly a Greater Wellington reserve fund is held to insure initial losses. Currently the reserve stands at $15.6 million. It increases by approximately $1 million each year from interest payments and by approximately $400,000 in direct contributions. Secondly, insurance is held for a further $26.5 million**,** giving a total coverage of $42.1 million**.** This coverage includes some parks and forestry assets, though it is predominately for water supply assets.

Reports prepared in 2009 estimated the Probable Maximum Loss for these assets in a Wellington Fault earthquake to be:

- Stuart Macaskill Lakes $23 million
- Pipelines $9 million
- Tunnels $8 million
- Total $40 million.

Based on the best information currently available the Council's water supply assets are adequately insured.

5.1.3 Flood protection

The flood protection assets at risk include stopbanks, rock lines and groynes, flood walls, flood gates, detention dams, stormwater outlet structures, pump stations, drainage channels and the barrage gates.

The total estimated value of the flood protection assets in the region is $189 million (2007). Out of this $92 million worth of assets are in the western part of the region and $97 million are in the Wairarapa.

The possible earthquake induced damages include, longitudinal and transverse cracking of stopbanks and flood walls, cracking of ground under stopbanks, existing protection works slumping into a river, settlement of structures as a result of liquefaction and major failure of structures located in the fault rupture zones.

An earthquake risk assessment study completed for the western part of the region estimated the repair costs from a Wellington Fault rupture to be between 8% and 18% of the asset value. Based on the asset value of $189 million, this equates to repair costs arising from any fault rupture in the region of between $10 million and $20 million. Additionally, any land subsidence associated with a fault rupture could reduce the design capacity of the flood protection structures. The cost of raising stopbanks (e.g. as a result of land subsidence) has not been estimated but would be well in excess of the direct repair cost of $10 to 20 million.

It is unlikely that a major flood (e.g. 1 in 100 year) will coincide with a major earthquake, however the likelihood of such an event occurring in the 12 months it would take to repair any earthquake damage is a concern. Officers believe that the existing systems would have enough capacity after a major earthquake to pass frequent floods in the order of a 5-10 year event with little repair.

(a) Managing risk

All new structures or upgrades are now designed to have reduced potential for seismic damage. This is achieved through the appropriate strengthening of the foundations and with the batter slopes for the stopbanks being at 3.5:1 or less.

The procedure after an earthquake would be to assess the damages and prioritise the repair works on the basis of failure risk. The securing of the system to cope with an event of up to approximately a 50 year return period should be able to be achieved within three months of the event. If the event occurred in the wettest period of winter the repairs could take longer. Full repairs should be able to be achieved within 12 months, provided suitable

earthmoving equipment was available for this type of work rather than being directed to other regional earthquake repair work.

The one exception to this is the barrage gates at the outlet of Lake Wairarapa. If the gates are damaged in a major way, settlement repairs could take up to two years. The key focus in the first instance would be to open the gates fully until such time as the repairs could be completed. This would have a significant impact on farming operations in the area.

Future actions for flood protection include, extending the earthquake risk assessment across the whole region to identify areas likely to be extensively damaged and to prepare more detailed emergency preparedness and response plans.

(b) Insurance

The major structures, including the barrage gates, are covered by insurance. More general repairs would need to call on the flood contingency funds and the major flood damage repair funds, which are set up now. The flood contingency reserve funds for each of the schemes are currently at, or about, the recommended levels to cover expected damage. The major flood damage repair fund is currently only half of that recommended. The fund was established in the late 1990's and has been building steadily, but it will be another 10 years before than fund is at the preferred level.

5.1.4 Regional parks and forests

Greater Wellington owns and manages significant areas of land as part of the regional network of parks and forests. Assets most at risk from a major earthquake are lightweight buildings, water supply and sewerage systems, bridges and tracks.

If a substantial earthquake damaged water supply and sewerage systems, then camping would have to cease at Battle Hill Farm Forest Park and Kaitoke Regional Park.

Whether parks or parts of parks are closed following a major earthquake will depend on the damage assessment. Repair work will depend on the availability of staff, many of which are likely to be employed assisting with work on other critical Greater Wellington infrastructure.

5.1.5 Main administrative buildings

The buildings housing key administrative functions are obviously important considerations in a major earthquake event.

The Regional Council Centre in Wakefield Street, while built in accordance with modern building standards, is located in an area considered to be hazardous due to the underlying soft nature of the soils. The office doubles as the location of the Region's Group EOC.

A CDEM report on EOCs in 2009, notes that the internal construction of the building could make it hazardous to its occupants, and that it is highly probable that the building would not be operational after a medium to large magnitude event. The report questions the ability of the building to function on a stand

alone basis for more than two days, due to a lack of dedicated back up resources. Recent preparedness works include installation of a standby diesel generator, seismic straps on some furniture, particularly taller items, and replacement of the plaster ceiling tiles with light-weight tiles. Additionally, Greater Wellington is working with CentrePort on a protocol for temporary access to basic backup facilities should an emergency arise at Regional Council Centre.

The Masterton office is the alternative Group EOC for the region. The CDEM report considers the building and facilities to be unsuitable as a Group EOC for the following reasons:

- The building is not purpose built, but one modified to meet the need of its occupants
- Radio communications is located in the corner of a communal office, with no ability for communications from support agencies to be set up or installed
- The ability for the building to function on a stand alone basis is questionable. A constant supply of power is available to the building but food, potable water and a sewerage holding tank have not been catered for
- Limited IT support and in house knowledge of IT services.

It should be noted however, that funding has been set aside in the long term plan to replace the Masterton office. Additional emergency preparedness requirements were incorporated into the design brief to ensure the building is resilient in an emergency situation.

All buildings owned by Greater Wellington are fully insured for damages from destructive events such as earthquakes and fire.

5.2 Business continuity

The overall effectiveness of Greater Wellington in responding to a major emergency is highly dependant on the ability of staff to be able to contribute to emergency management and continue to carry out core business.

Recognising this, Greater Wellington has recently dedicated significant resources on developing a series of business continuity plans. The plans articulate where key responsibilities lie for emergency management and aim to ensure that Greater Wellington is in a position to respond to any initial crisis effectively and eliminate subsequent crises that could follow from poorly managed responses to the initial event.

There are two important features of Greater Wellington's approach to business continuity planning. The first is that it recognises that business continuity planning is an ongoing activity. To this effect, plans will be reviewed at least annually and updated every six months.

The second important feature is that our approach provides for business continuity planning across all levels of Greater Wellington business, both vertically and horizontally. This will ensure that major emergencies can be dealt with in a comprehensive and coordinated manner. It also will ensure that

staff at Greater Wellington will be able to effectively react and respond to any crisis in a manner that ensures that its activities, provision of services and staff wellbeing are not unduly affected.

Key levels of business continuity planning comprise:

- Greater Wellington Business Continuity Response Plan

This Plan sets the overall framework for business continuity for Greater Wellington. It sets out the protocols and priorities for emergency activation and identifies key responsibilities for staff (including ELT and business groups). The Plan addresses the response phase of the four-phased emergency continuum – reduction of risk, readiness, response and recovery.

- Group Business Continuity Response Plans and Departmental Business Continuity Response Plans

These plans build on the high level plan, but focus on the actions and activities of the group and department.

- Health and safety planning

Greater Wellington's Civil Defence and Health and Safety obligations are addressed separately in the CDEM Group Plan and "Keeping Employee's Safe at Work" (Greater Wellington's Health and Safety system). The Plan has been prepared for the express purpose of ensuring business continuity during the response phase of an event.

- Standard Operating Procedures

Civil defence and emergency management organisations are guided in their actions by standard operating procedures specific to emergency management response.

- Staff training and awareness

Staff training and awareness is one of the responsibilities of the Emergency Management team at Greater Wellington. The inclusive process of developing business continuity plans, particularly at the group and departmental level, helps to improve awareness of business continuity planning.

6. Communication

Matters related to earthquake risk and preparedness will be communicated as projects are completed and upon request.

7. Recommendations

That the Council:

1. ***Receives** the report.*

2. ***Notes** the content of the report.*

Report prepared by:	Report approved by:
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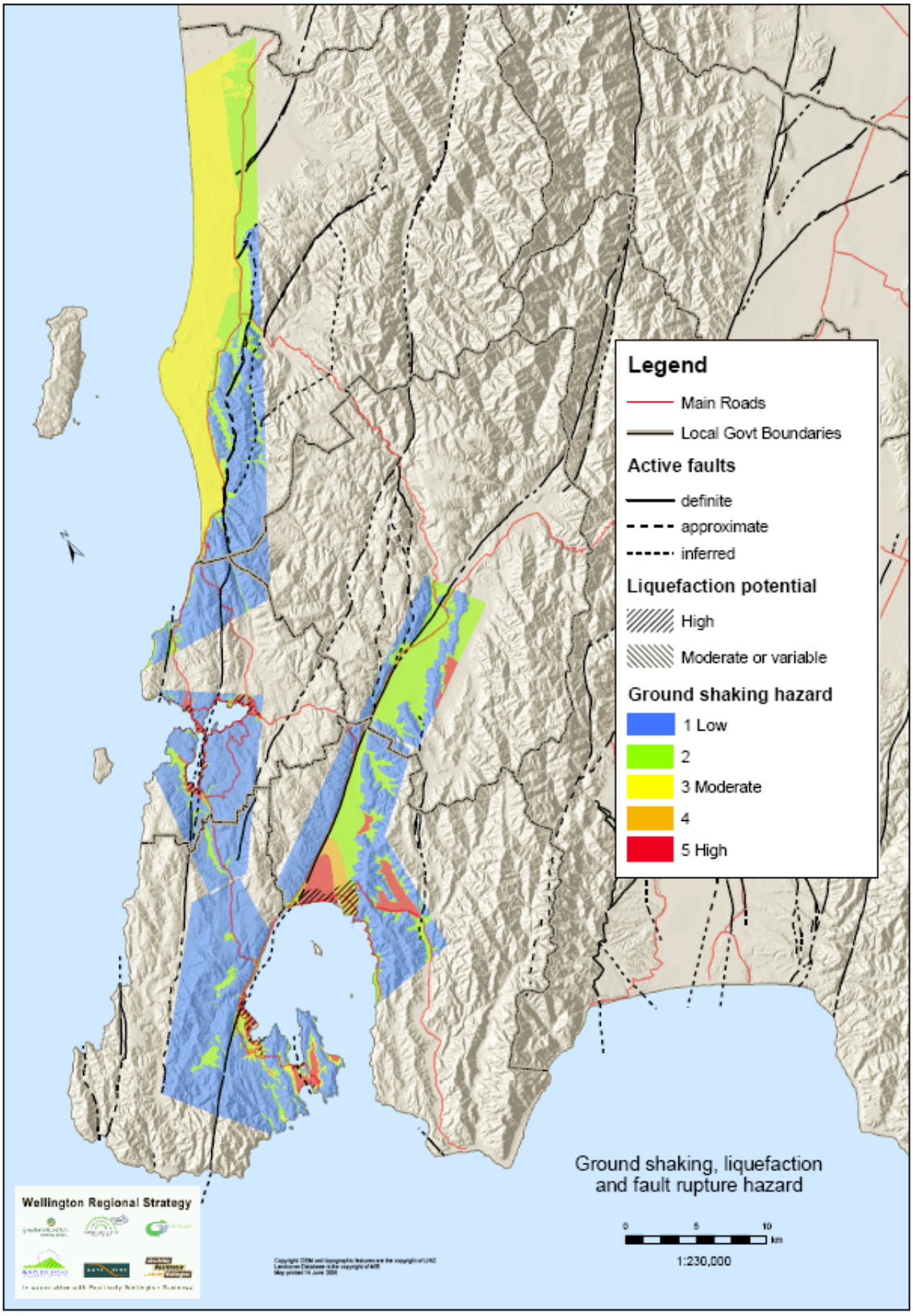
Attachment 1: Wellington Earthquake Hazard Maps

Attachment 2: Seismic Enhancement Work Bulk Water Supply Infrastructure

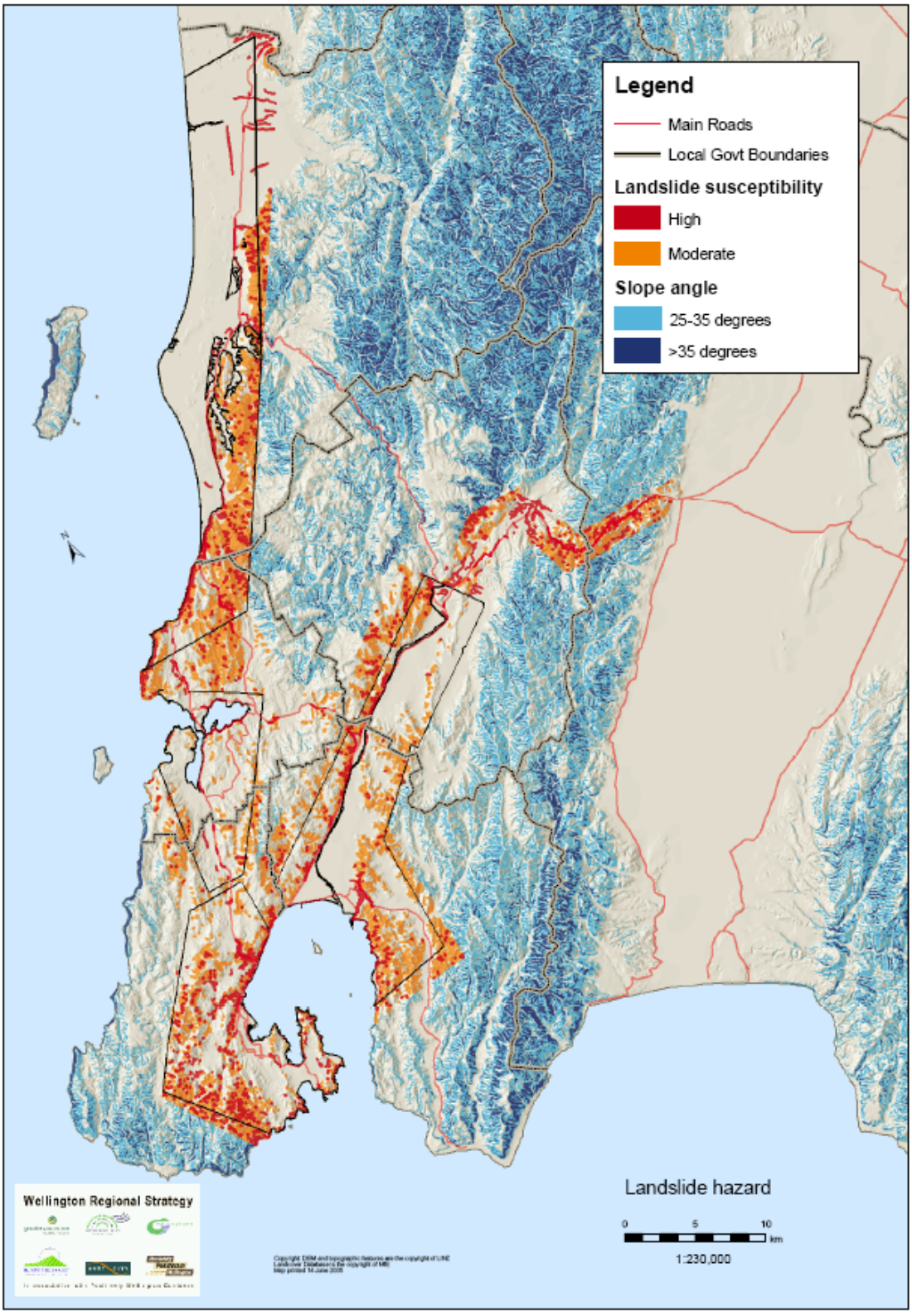
Earthquake Hazard Maps (metropolitan area)

Map 1 - Ground shaking, liquefaction and fault rupture hazard



Source: WRS working paper, Environmental, Natural Values and Hazards on Development, December 2004

Map 2 - Landslide Hazard



Source: WRS working paper, Environmental, Natural Values and Hazards on Development, December 2004

Seismic Enhancement Work Bulk Water Supply Infrastructure

Seismic enhancement work completed or in progress includes:

- Pump stations checked and strengthened where needed
- Pipes tied down in tunnels
- Bridges strengthened including (GW part-funded)
  - Silverstream Bridge across Hutt River
  - Hutt estuary bridge at Petone
- Bridge strengthened – flume bridge, Kaitoke
- Cast iron pipeline partially replaced in Wainuiomata (1 of 2 pipelines used at that location)
- Stuart Macaskill Lakes seismic enhancement (in progress)
- Pipeline deviation near old Karori reservoir and the Raroa tunnel (in progress)
- Pipeline crossing of Kaiwharawhara Stream
- Pipeline deviation across SH1 road bridge at Paremata
- Cross connections between wholesale and retail (city) water networks to avoid reservoirs and some pumping stations
- Significant pipeline deviation at Haywards to avoid potential seismically induced landslides
- Recommissioning a pipeline between Ngauranga and Thorndon as a backup supply (in progress)
- Providing connection facilities at some pump stations so they can operate on mobile generators
- Installation of an earthquake sensor at Te Marua Water Treatment Plant (WTP) to initiate shut down of the WTP and pumping station and close any open valves in the lake towers.
- Installation of a small parallel pipe across the Wellington Fault at Te Marua that can be quickly repaired.
- Installation of high level inlet pipes in reservoirs to prevent the discharge of water if the inlet delivery pipe fails (in progress)
- Installation of a line valve on the Wainuiomata Pipeline to isolate the pipe crossing the Wellington Fault at Thorndon (in progress)
- Auto shut-off valves have been installed at Silverstream, on the Porirua Branch and at Haywards reservoir to conserve water and minimise damage in the event of a pipe rupture.
- A large standby generator has been installed at the Te Marua Pumping Station.
- A new, larger diesel tank has been installed at Waterloo to extend the period that the Waterloo WTP can operate without mains electricity.
- Randwick Pumping Station has been relocated to a more secure location to reduce its vulnerability to floods and earthquakes.
- Karori Pumping Station has been relocated to a more secure location rather than being refurbished.

Seismic enhancement work outstanding

- Replacement of remaining cast iron pipeline in Wainuiomata
- Possible additional strengthening at the flume bridge, Kaitoke
- Reinforcing pipeline connections at valve chambers
- Possible work resulting from the Thorndon Lifelines study
- Complete purchase of seismic pipeline repair stock
- Review location of seismic repair stock.
- Review of impact from possible landslides on some facilities
- The provision of an emergency supply to Karori.
- The provision of an emergency supply to Ngaio off the Kaitoke to Karori main.

Event recovery

- Seismic pipeline stocks on hand
- Mutual aid agreement with Watercare Services
- Agreements with specialist pipeline companies Pacific Construction and Reticulation Packages (Re Pac) to provide assistance following an earthquake
- Active membership of Wellington Lifelines Group
- Participation in event simulation exercises.