Resilience Assessment Guideline for 3 Waters: A Technical Resilience Prospective

Presenters:

Greg Preston – Manager, Quake Centre (based at University of Canterbury)

Melanie Liu - Civil Engineer, Beca Ltd

Outline

- Overview of Quake Centre work in 3 Waters – Greg

- Technical Resilience Assessment Guideline – Melanie
  - Assessment inputs, procedure, and methods

Current work programme – 3 Waters

Building Innovation Partnership – 3 Waters theme

- Implementation of NZ Metadata Standards for 3 Waters
- Useful life, risk/criticality and whole-of-life costs of different pipe classes
- Optimised renewal investment
- Geospatial tools for underground infrastructure
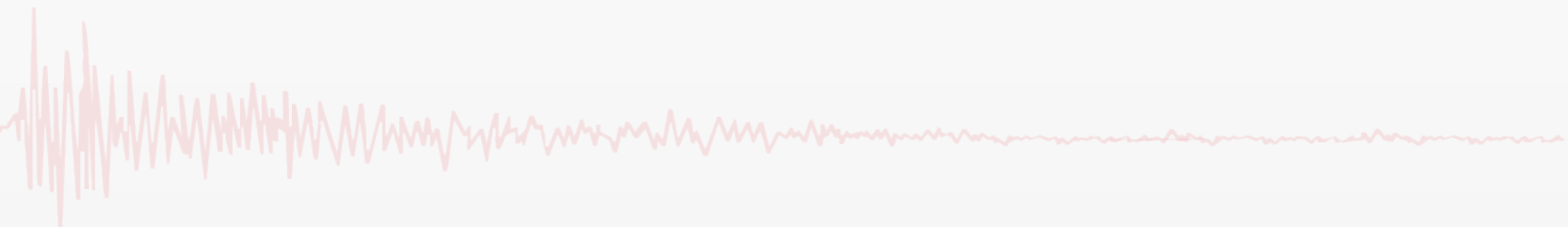- Funding and procurement models

Evidenced-based Investment Decision Making for 3 Waters Networks

- Wastewater Renewals Framework – Gravity Pipes
- Resilience Assessment Guideline for Three Waters

Pipe Data Portal
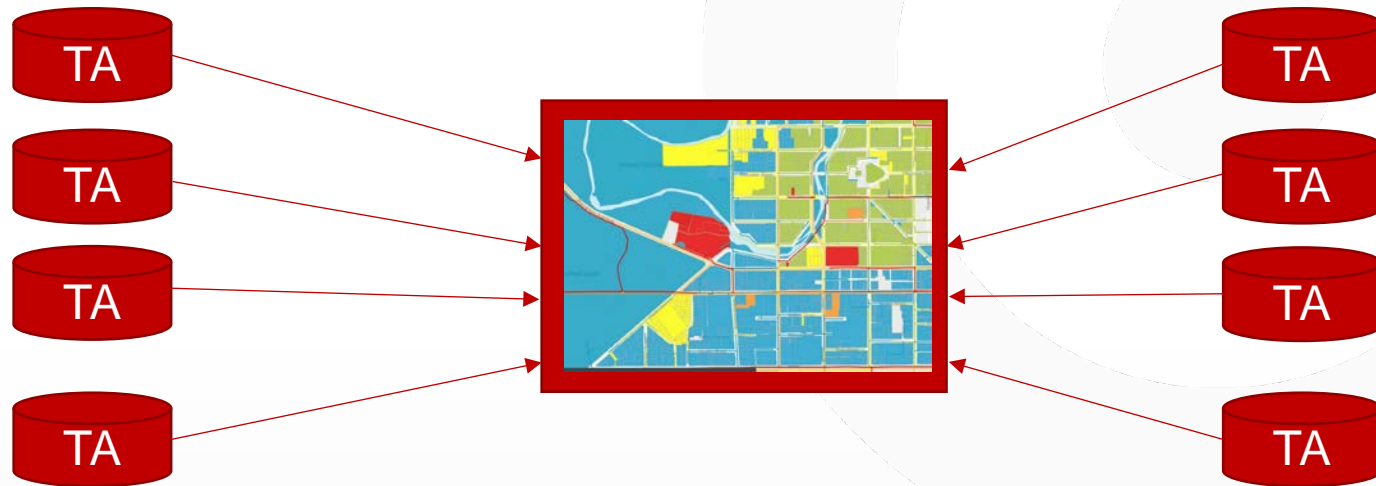
Data mapped to common viewer
using NZ Metadata Standards

Purpose of Technical Resilience Assessment Guideline

- Providing resilience assessment outcomes that could be used to support decision making on asset planning and management.

- Adaptable to the specific needs of the asset manager; network scale and risk profile; and community needs.

- Assessment of natural hazards for discrete extreme events/scenarios.

- Discussing the strategies to improve network resilience and reduce severity of consequence based on the experience from the 2010-2011 Canterbury earthquakes.
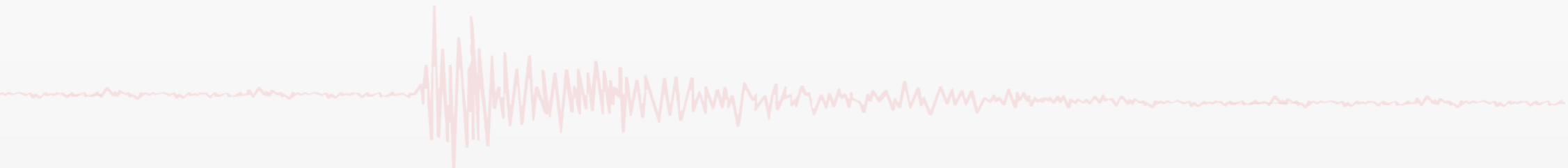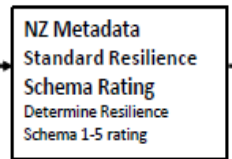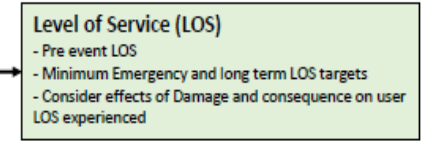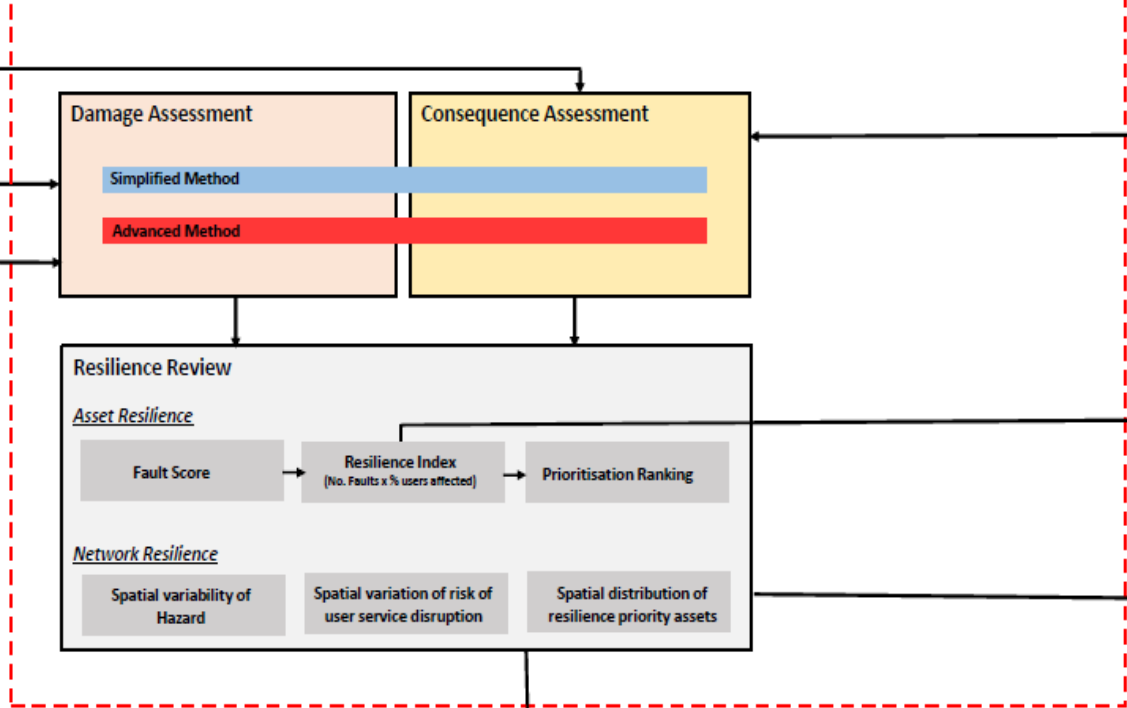
Technical Resilience Assessment Guideline
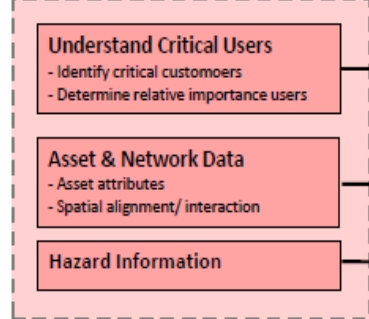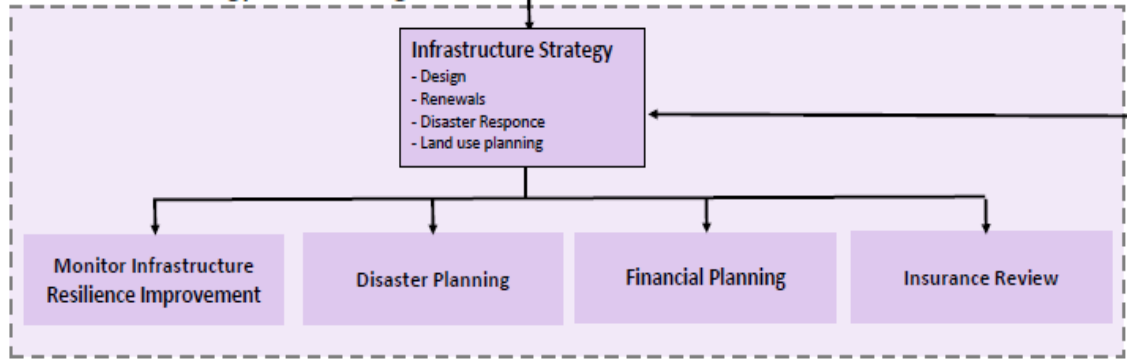
Technical Resilience Assessment Guideline

Assessment inputs (1) - **Hazards scenarios**:

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Assessment inputs (2) – **Network data**:

▪ Database of asset information comprising spatial location and asset attributes. Material type (Pipe diameter, Date of installation, Asset condition)

▪ Location and construction details for critical components of the network, mainly focused on key structures

▪ Understanding of historic typical design and construction details for pipes and manholes

▪ Knowledge of critical supporting services for operation of the network, and critical assets (such as pump stations, wells, treatment facilities)
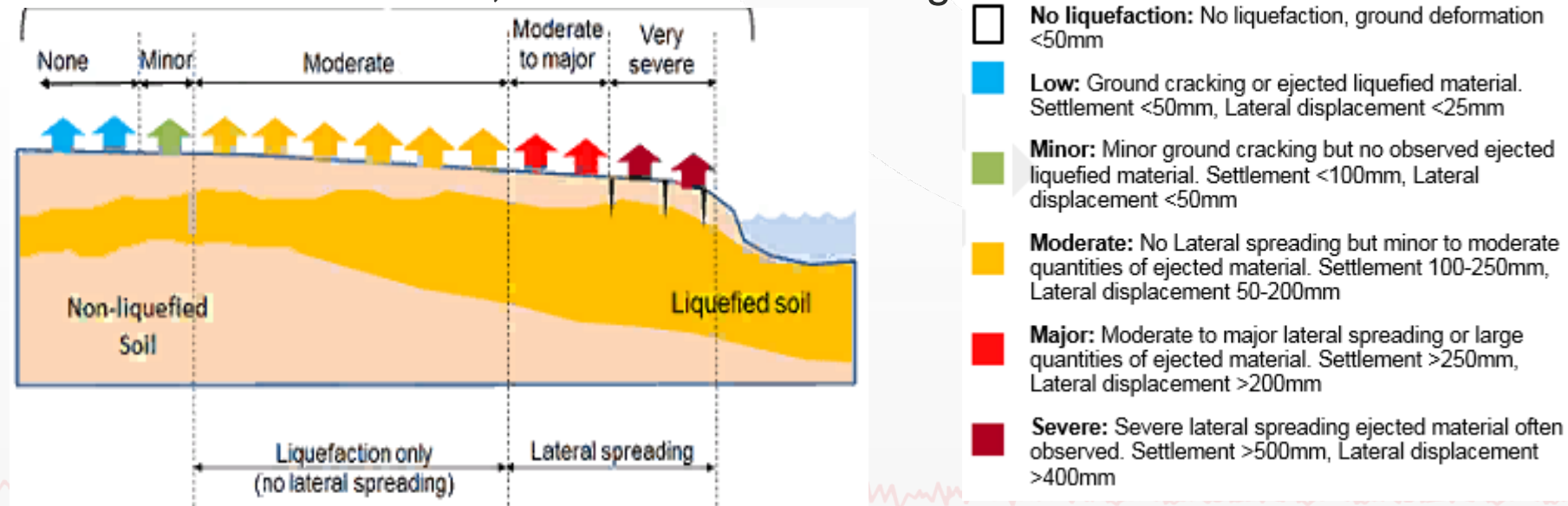
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Critical users

High Demand Customer	Number of Equivalent Standard Customers
Hospital	1000 - 5000
Medical centre	150
Rest home/Aged care facility	100 - 500
School/Preschool	20 - 200
Emergency Services/Civil Defence	500
Industry * >1000 employees	300
Industry * >300 employees	30
Industry * >100 employees	10
Industry * >10 employees	5
Commercial Business >300 employees	30
Commercial Business >100 employees	10
Commercial Business >10 employees	3
Food distribution organisation (e.g. supermarket)	50
Townhouse/Apartment complex	No. units within complex
Vulnerable community members (aged, chronically sick, disabled, etc.)	5
Standard Residential Property	1

Notes:

Table provided as an example to commence discussion. Specific allocation of equivalent customers should be determined by resilience assessment team

* Industry that is reliant on three waters operation to manufacture/process

[1] Where a range is provided variability is expected with different tiers of importance or size

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Assessment inputs (3) – **Ground condition:**

- Information on geology and ground conditions (e.g., New Zealand Geotechnical Database)

- Topographical information such as LiDAR surveys

- Historic land use register to provide knowledge of the change of physical characteristics of land, such as historic filling
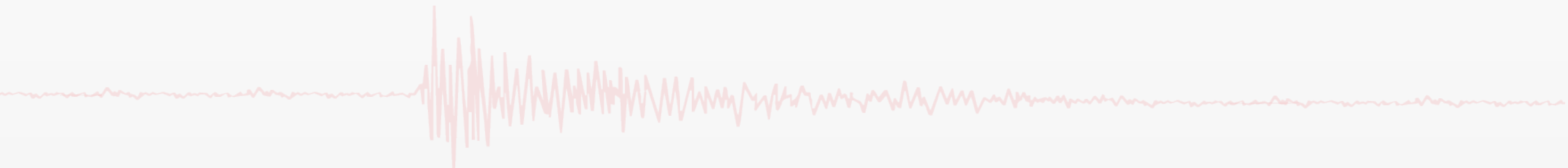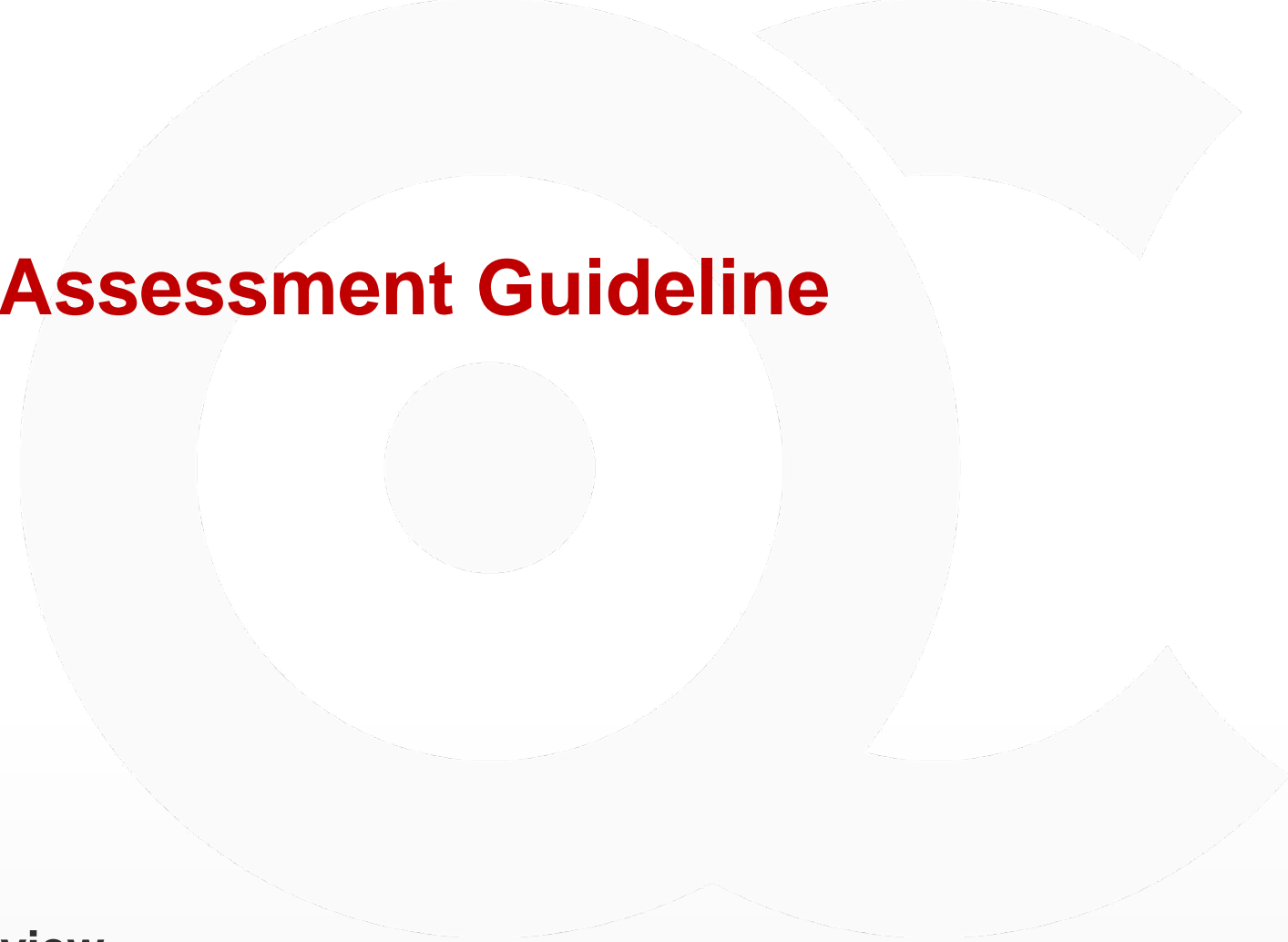

Modified from Canterbury Geotechnical Database (2013) and Cubrinovski et al (2014)

Technical Resilience Assessment Guideline

Resilience assessment procedure:

1. **Hazard scenario identification**

2. **Input data collation**

3. **Criticality assessment**

4. **Damage assessment**

5. **Consequence assessment**

6. **Resilience assessment and review**

7. **Sensitivity analysis**
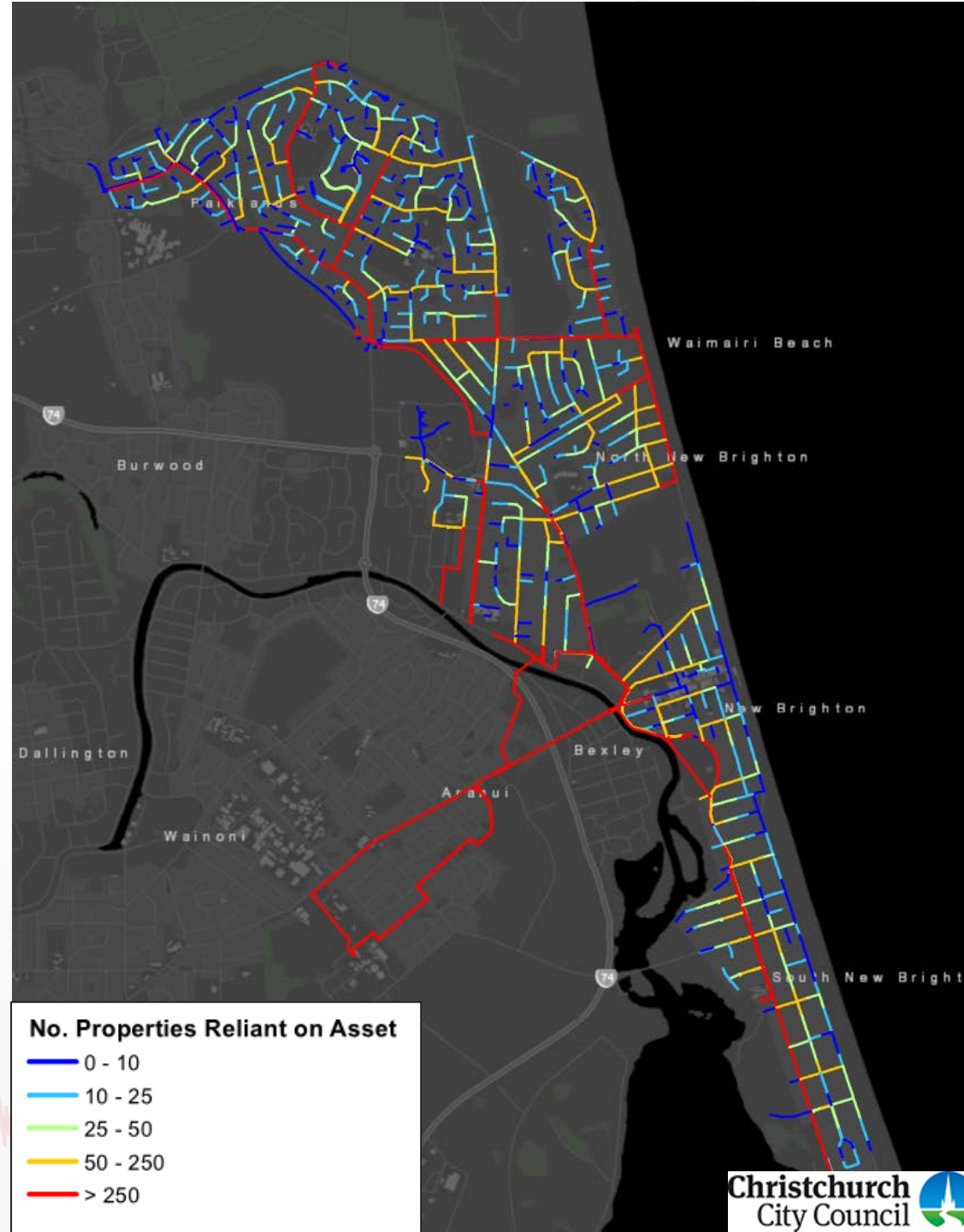
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Resilience assessment method:

- Simplified assessment (qualitative approach)

- Advanced assessment (quantitative approach)

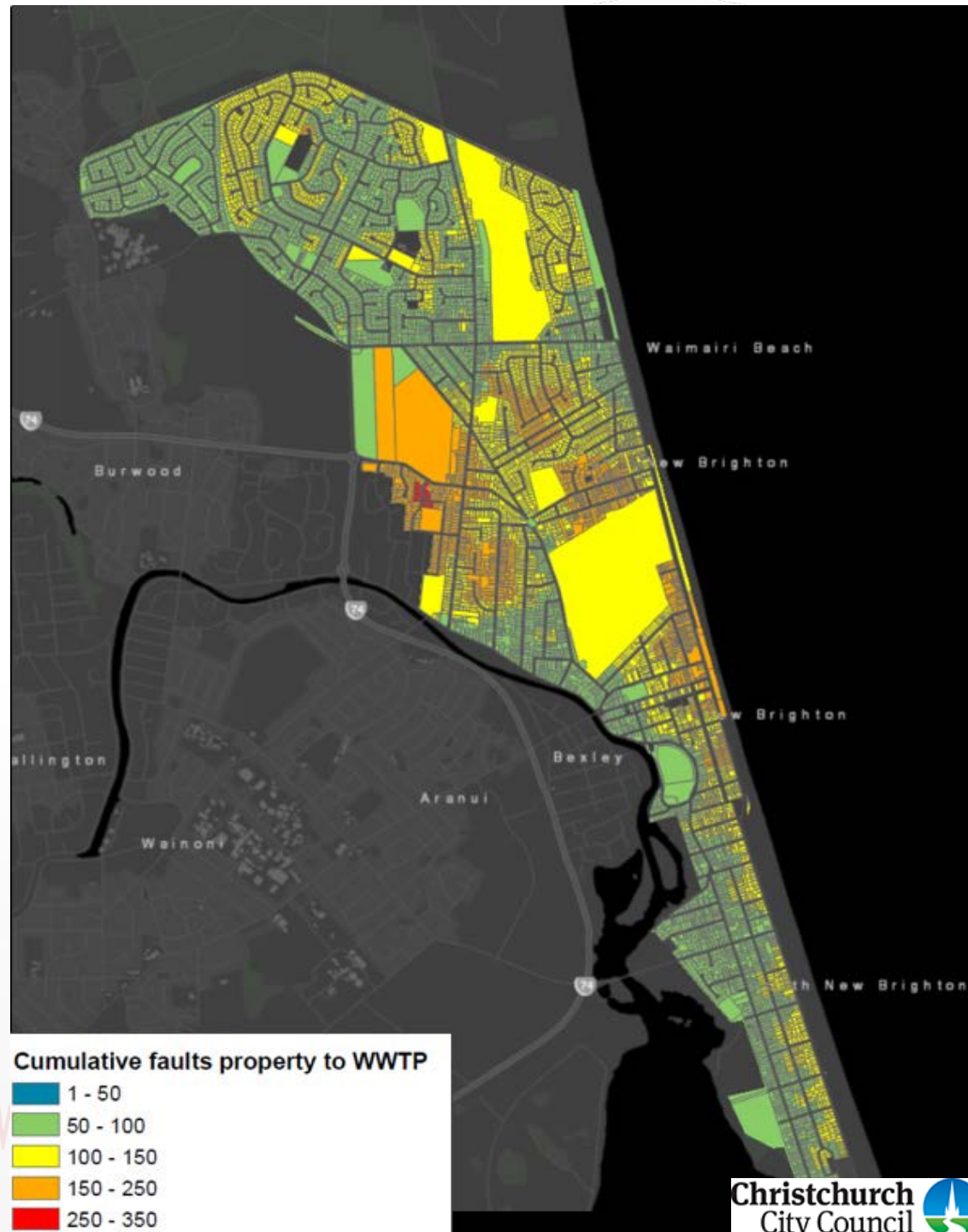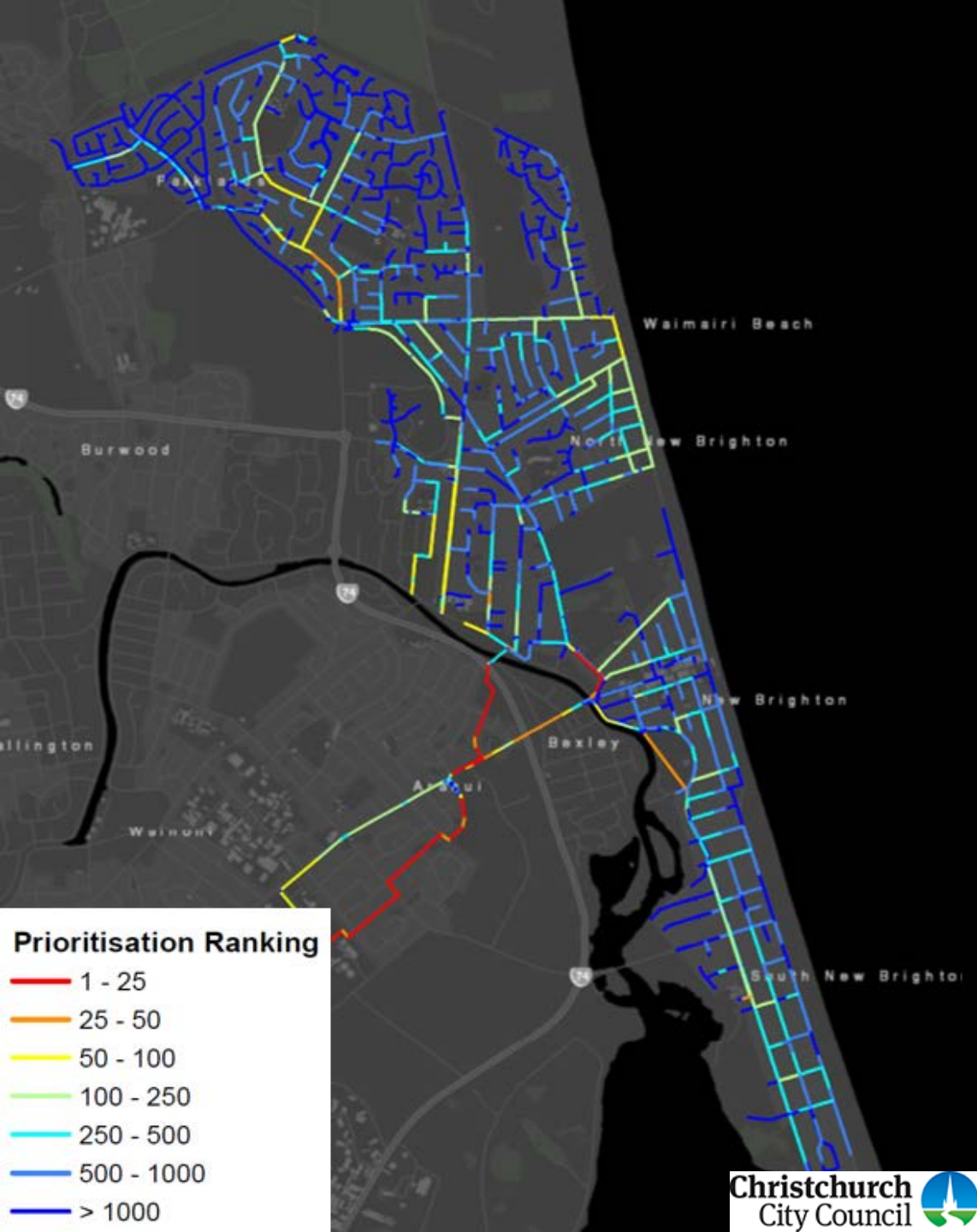| Hazard	Recommended minimum resilience assessment method sophistication					
	Population <10,000		Population 10,000–300,000		Population >300,000	
	Damage Assessment	Consequence Assessment	Damage Assessment	Consequence Assessment	Damage Assessment	Consequence Assessment
Earthquake	Simplified	Simplified	Simplified	Advanced	Advanced	Advanced
Landslide	Simplified	Simplified	Simplified	Advanced	Advanced	Advanced
Flooding	Simplified	Simplified	Simplified	Advanced	Simplified	Advanced
Erosion	Simplified	Simplified	Simplified	Advanced	Simplified	Advanced
Tsunami	Simplified	Simplified	Simplified	Simplified	Simplified	Advanced
Volcanic eruption	Simplified	Simplified	Simplified	Simplified	Simplified	Advanced
Sea level rise	Simplified	Simplified	Simplified	Advanced	Simplified	Advanced

Examples
Asset Criticality

No. Properties Reliant on Asset
- 0 - 10
- 10 - 25
- 25 - 50
- 50 - 250
- > 250

Christchurch
City Council

Examples

Risk of loss of service

Cumulative faults property to WWTP
- 1 - 50
- 50 - 100
- 100 - 150
- 150 - 250
- 250 - 350

Examples

Prioritisation ranking

Prioritisation Ranking
— 1 - 25
— 25 - 50
— 50 - 100
— 100 - 250
— 250 - 500
— 500 - 1000
— > 1000

Questions?

Greg Preston: greg.preston@canterbury.ac.nz
Melanie Liu:　 melanie.liu@beca.com