Assessing disaster impacts to critical infrastructure services to increase resilience for rural isolated communities

Alistair Davies, Thomas Wilson, Tim Davies, Liam Wotherspoon, JC Gaillard, Matthew Hughes

Communities rely on infrastructure

▼

Distributed infrastructure networks are threatened by **regional** hazards

▼

Isolated communities have **low (or no)** infrastructure **redundancy**

Improve infrastructure management

▼

Increase isolated communities' resilience

National Science Challenges
rural
hazard
infrastructure
QuakeCoRE
NZ Centre for Earthquake Resilience
EQC
EARTHQUAKE COMMISSION
Kōmihana Rūwhenua
AF8
ALPINE FAULT MAGNITUDE 8

Improve infrastructure management

▼

Increase isolated communities' resilience

---

1. Lessons learned from the "Kaikōura" earthquake sequence impacts.

   - Co-authors: NZ TRANSPORT AGENCY WAKA KOTAHI; CANTERBURY Civil Defence Emergency Management Group; KiwiRail

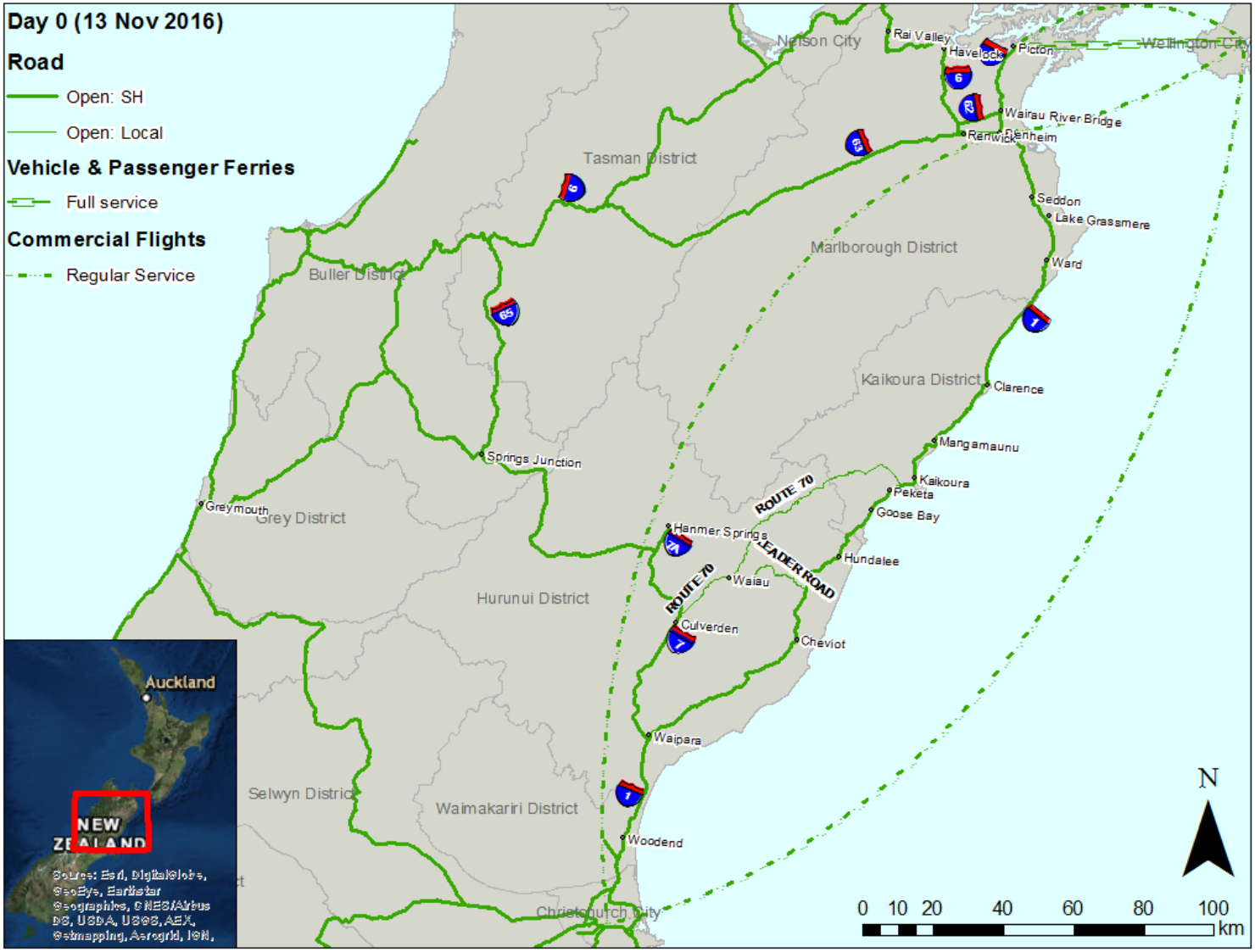
2. Co-creating scenarios to improve infrastructure and communities' resilience on the West Coast.

   - Infrastructure providers: ElectroNet DESIGN.BUILD.DELIVER; NZ TRANSPORT AGENCY WAKA KOTAHI; WEST COAST CIVIL DEFENCE EMERGENCY MANAGEMENT GROUP

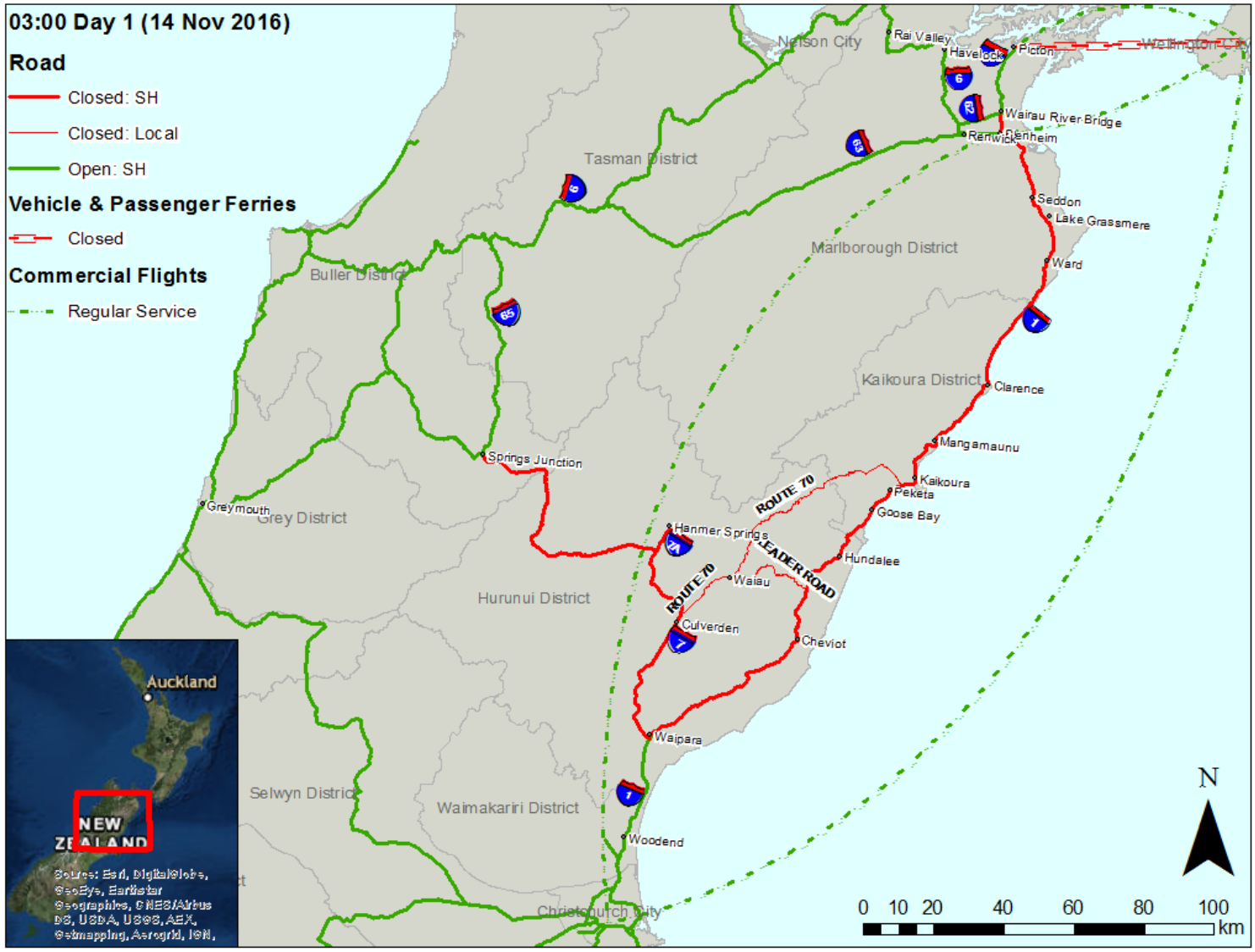
   - Community stakeholders: *Franz Josef community*; Department of Conservation Te Papa Atawhai; WESTLAND DISTRICT COUNCIL; THE WEST COAST REGIONAL COUNCIL; WEST COAST CIVIL DEFENCE EMERGENCY MANAGEMENT GROUP

Transport infrastructure performance and management during the first 100 days following the “Kaikōura” earthquake

Bulletin of the New Zealand Society for Earthquake Engineering Special Issue: Alistair Davies, Vinod Sadashiva, Stuart Woods, Mohammad Aghababaei, Seosamh Costello, Liam Wotherspoon, Thomas Wilson



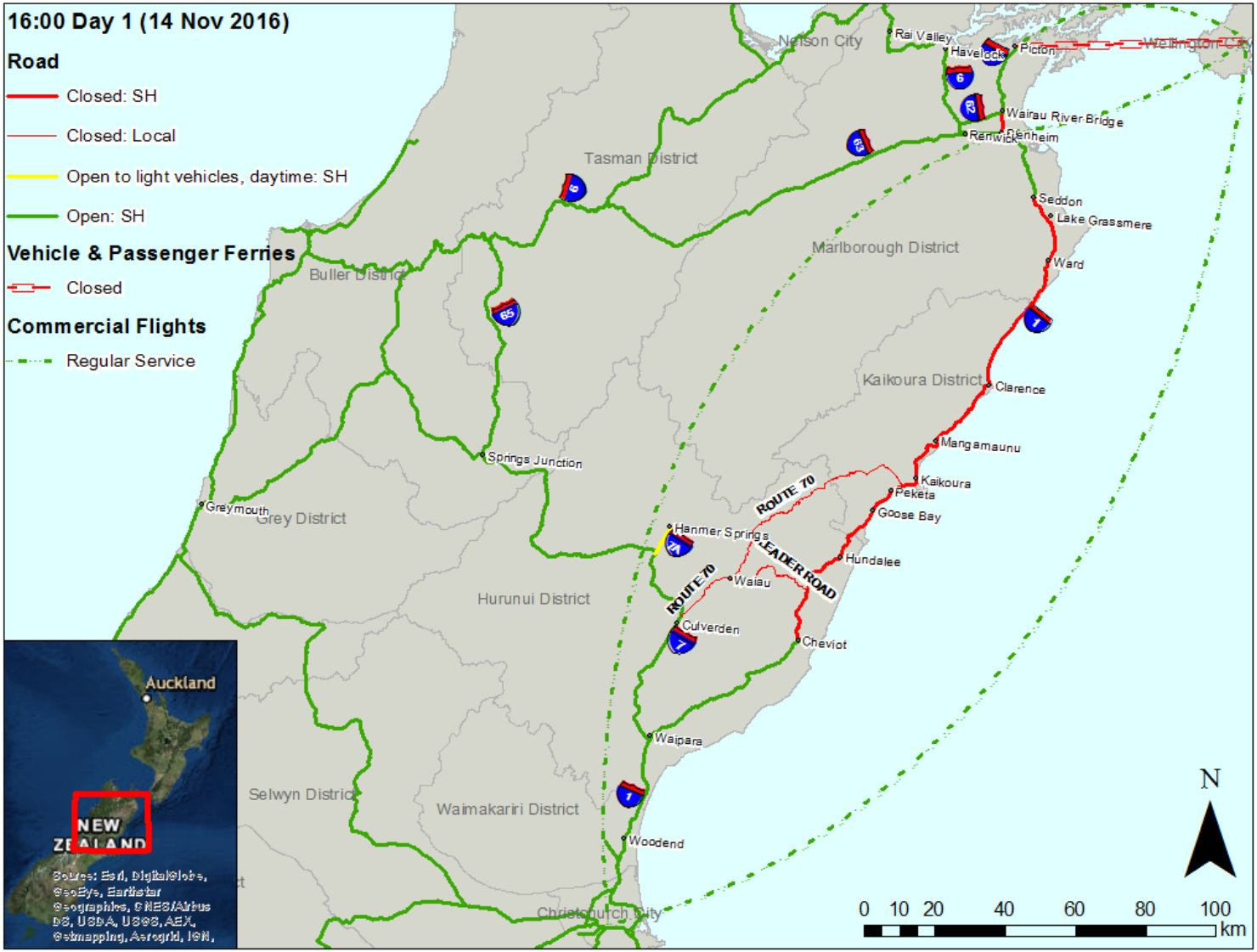
Transport infrastructure performance and management during the first 100 days following the “Kaikōura” earthquake



Large offset of rail track due to landslide.
Photo credit: William Ries, GNS Science.

Oaro bridge approach failure and pavement cracking.
Photo credit: Dizhur & Giaretton.

Transport infrastructure performance and management during the first 100 days following the “Kaikōura” earthquake



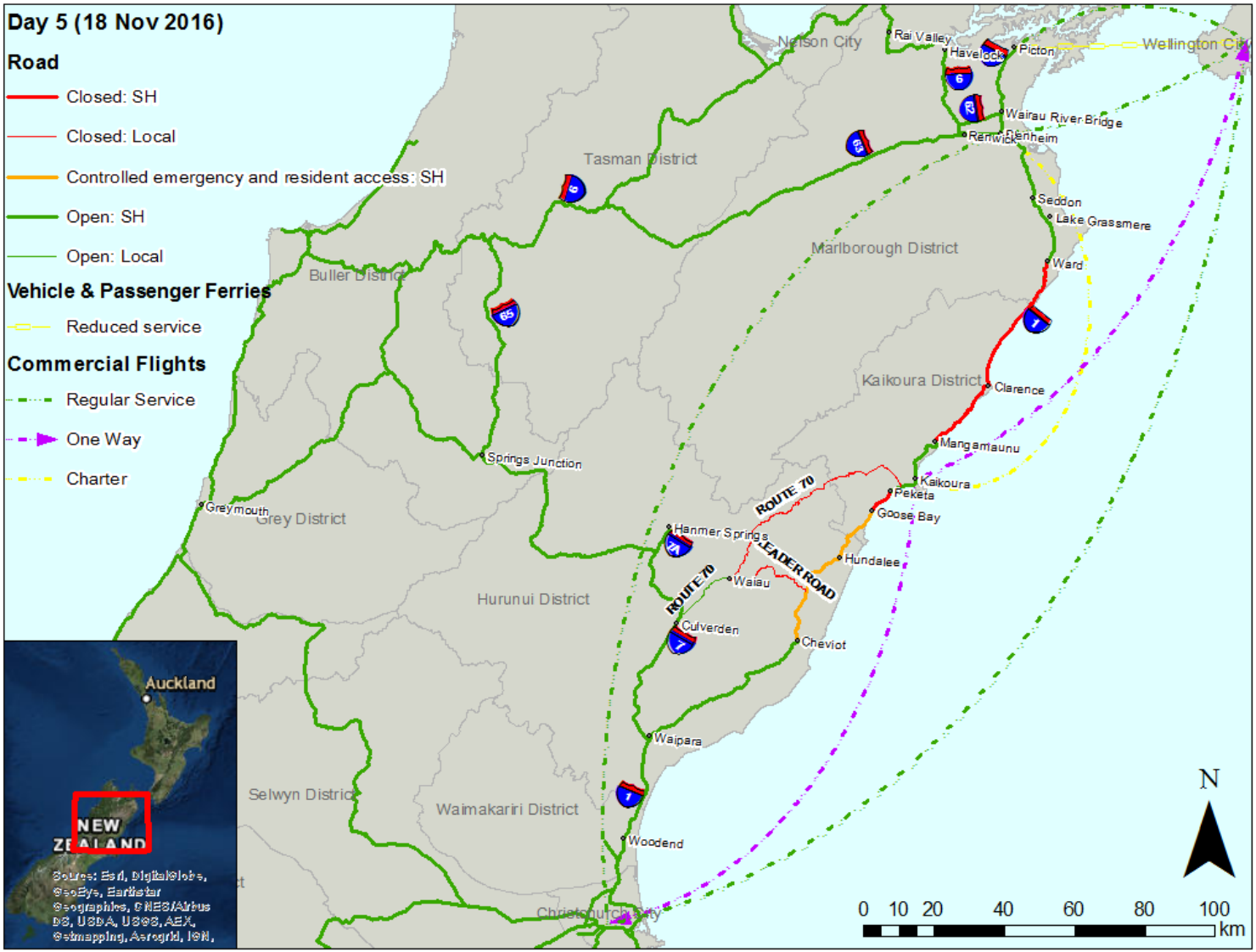
Preventative mitigation lessons

- **PINCHPOINTS:** SH6 section of SH1 diversion has zero redundancy (in the past 5 months, state highways have been closed by earthquakes, landslides, rural fires and flooding).
- **NETWORK LIMITATIONS:** Pre-disaster resilience works could have decreased SH1 diversion disruption and improved air travel into Kaikōura.

Response and recovery lessons

- **RECOVERY PLANNING:** Pre-established stakeholder relationships could have improved response and public messaging.
- **COMMUNITY PREPAIREDNESS:** Towns without road access for 15 days.

Transport infrastructure performance and management during the first 100 days following the “Kaikōura” earthquake



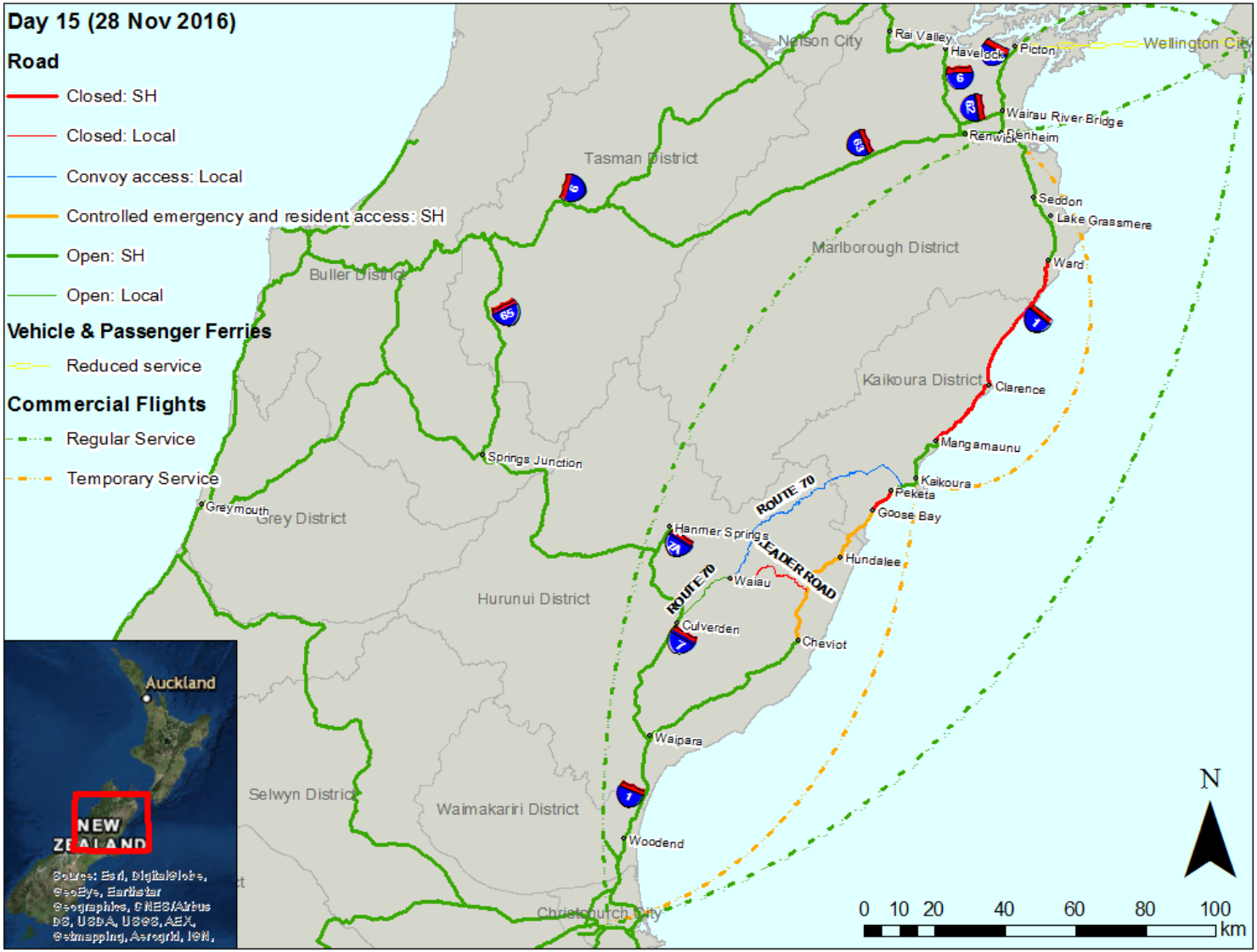
Preventative mitigation lessons

- **PINCHPOINTS:** SH6 section of SH1 diversion has zero redundancy (in the past 5 months, state highways have been closed by earthquakes, landslides, rural fires and flooding).
- **NETWORK LIMITATIONS:** Pre-disaster resilience works could have decreased SH1 diversion disruption and improved air travel into Kaikōura.

Response and recovery lessons

- **RECOVERY PLANNING:** Pre-established stakeholder relationships could have improved response and public messaging.
- **COMMUNITY PREPAIREDNESS:** Towns without road access for 15 days.

Transport infrastructure performance and management during the first 100 days following the “Kaikōura” earthquake



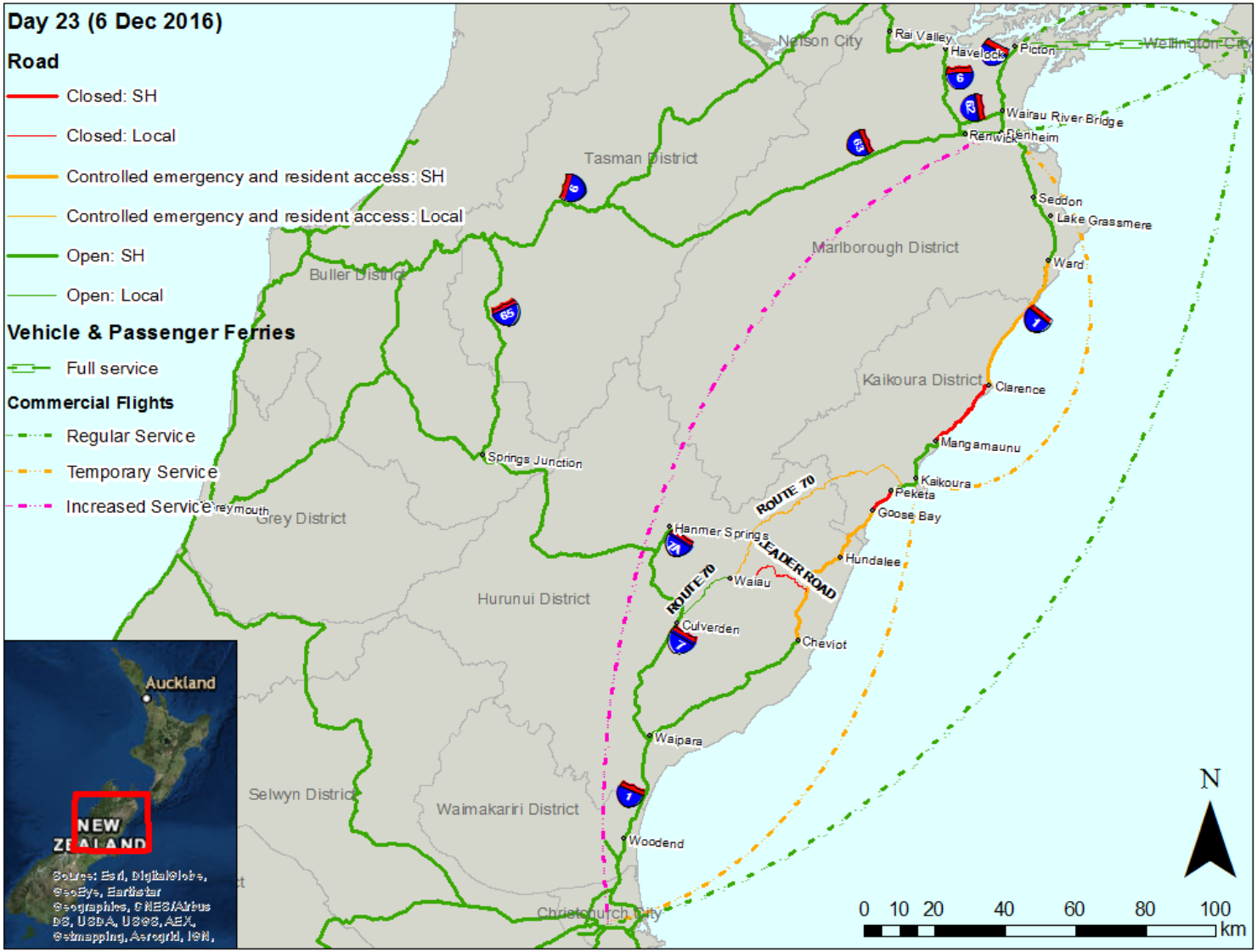
Preventative mitigation lessons

- **PINCHPOINTS:** SH6 section of SH1 diversion has zero redundancy (in the past 5 months, state highways have been closed by earthquakes, landslides, rural fires and flooding).
- **NETWORK LIMITATIONS:** Pre-disaster resilience works could have decreased SH1 diversion disruption and improved air travel into Kaikōura.

Response and recovery lessons

- **RECOVERY PLANNING:** Pre-established stakeholder relationships could have improved response and public messaging.
- **COMMUNITY PREPAIREDNESS:** Towns without road access for 15 days.

Transport infrastructure performance and management during the first 100 days following the “Kaikōura” earthquake



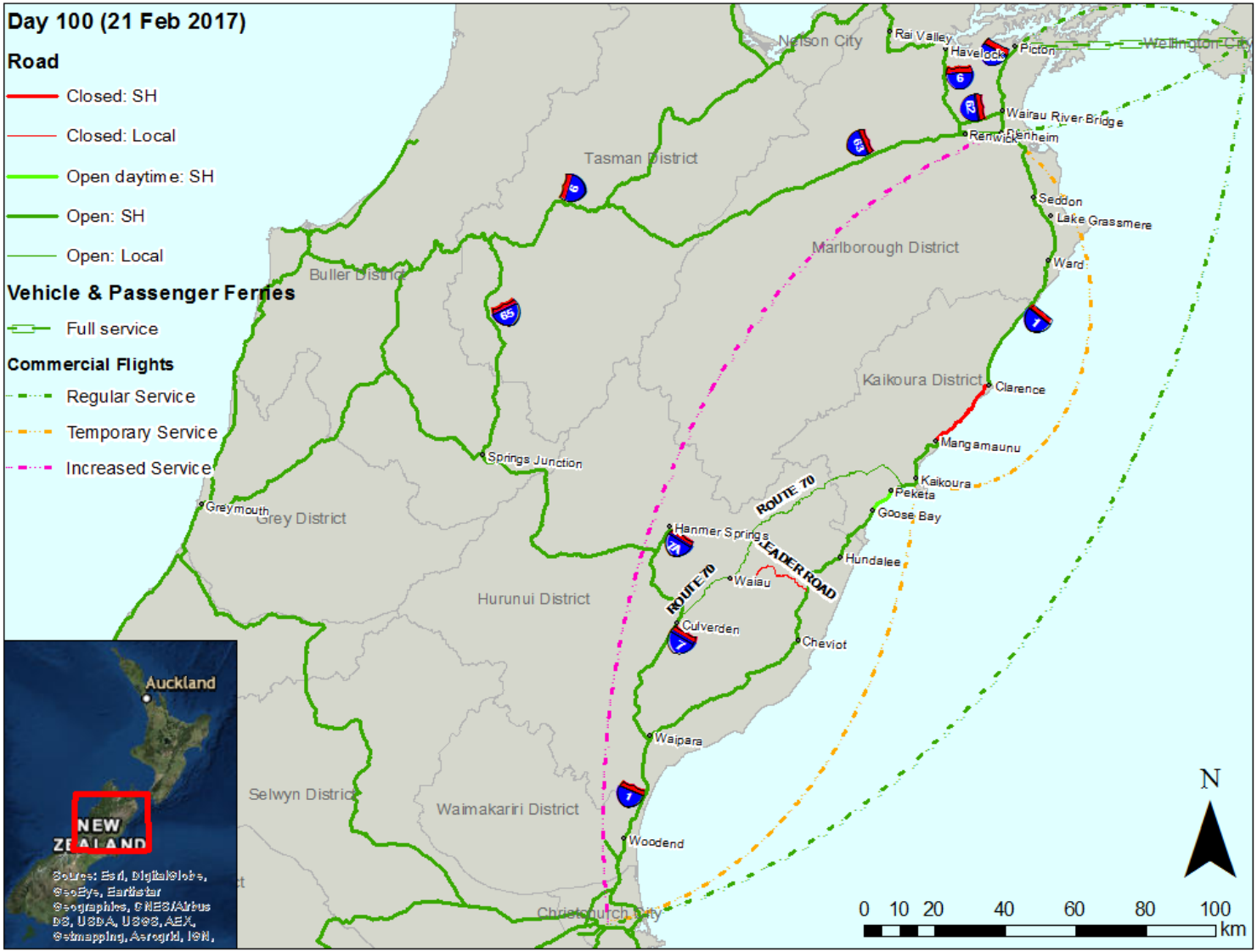
Preventative mitigation lessons

- **PINCHPOINTS:** SH6 section of SH1 diversion has zero redundancy (in the past 5 months, state highways have been closed by earthquakes, landslides, rural fires and flooding).
- **NETWORK LIMITATIONS:** Pre-disaster resilience works could have decreased SH1 diversion disruption and improved air travel into Kaikōura.

Response and recovery lessons

- **RECOVERY PLANNING:** Pre-established stakeholder relationships could have improved response and public messaging.
- **COMMUNITY PREPAIREDNESS:** Towns without road access for 15 days.

Transport infrastructure performance and management during the first 100 days following the “Kaikōura” earthquake



Preventative mitigation lessons

- **PINCHPOINTS:** SH6 section of SH1 diversion has zero redundancy (in the past 5 months, state highways have been closed by earthquakes, landslides, rural fires and flooding).
- **NETWORK LIMITATIONS:** Pre-disaster resilience works could have decreased SH1 diversion disruption and improved air travel into Kaikōura.

Response and recovery lessons

- **RECOVERY PLANNING:** Pre-established stakeholder relationships could have improved response and public messaging.
- **COMMUNITY PREPAIREDNESS:** Towns without road access for 15 days.

Scenario co-creation methodology

Compile hazard scenarios

▼

Assess infrastructure impacts

▼

Adjust impacts: collaboration with
INFRASTRUCTURE STAKEHOLDERS

▼

Adjust impacts: collaboration with
COMMUNITY

Preventative mitigation measures

- PINCHPOINTS
- NETWORK LIMITATIONS

Response and recovery measures

- RECOVERY PLANNING
- COMMUNITY PREPAIREDNESS

Co-creating scenarios to improve infrastructure and communities' resilience on the West Coast.

- ✓ Involves and driven by communities, infrastructure providers, and CDEM.
- ✓ Stakeholder and community communication tool.
- ✓ Sustainable: considers ALL hazards.
- ✓ Immediate risk reduction & co-benefits (unknown risks stunt development).

Scenario co-creation methodology

Compile hazard scenarios

▼

Assess infrastructure impacts

AF8
ALPINE FAULT
MAGNITUDE 8

Otago AF8. 23rd January 2017.

Co-creating scenarios to improve infrastructure and communities' resilience on the West Coast.

- ✓ Involves and driven by communities, infrastructure providers, and CDEM.
- ✓ Stakeholder and community communication tool.
- ✓ Sustainable: considers ALL hazards.
- ✓ Immediate risk reduction & co-benefits (unknown risks stunt development).

Scenario co-creation methodology

Compile hazard scenarios

▼

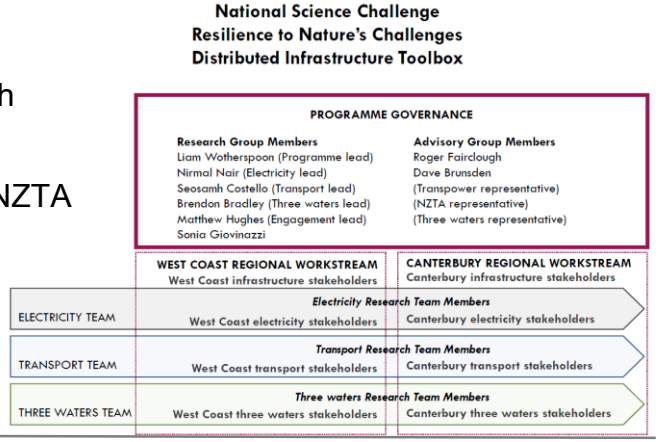
Assess infrastructure impacts

▼

Adjust impacts: collaboration with
INFRASTRUCTURE STAKEHOLDERS

Leading engagement with West Coast CDEM and infrastructure:

- Sit on West Coast Lifelines Meetings
- Sit on Readiness Response Committee
- Data-sharing agreement with Electronet
- Engaging with West Coast NZTA



Co-creating scenarios to improve infrastructure and communities' resilience on the West Coast.

- ✓ Involves and driven by communities, infrastructure providers, and CDEM.
- ✓ Stakeholder and community communication tool.
- ✓ Sustainable: considers ALL hazards.
- ✓ Immediate risk reduction & co-benefits (unknown risks stunt development).

Scenario co-creation methodology

Compile hazard scenarios

▼

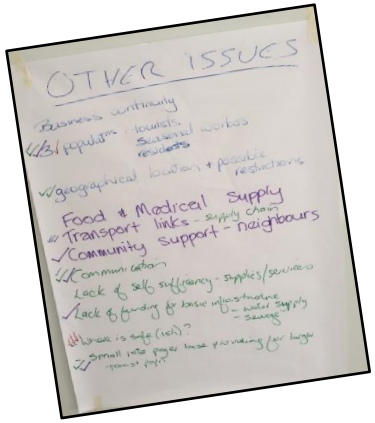
Assess infrastructure impacts

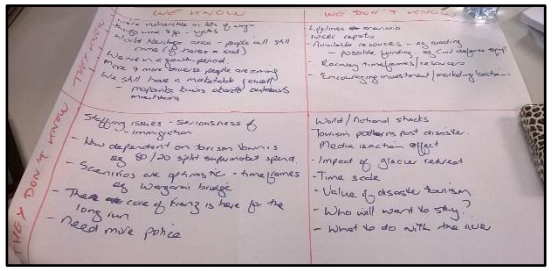
▼

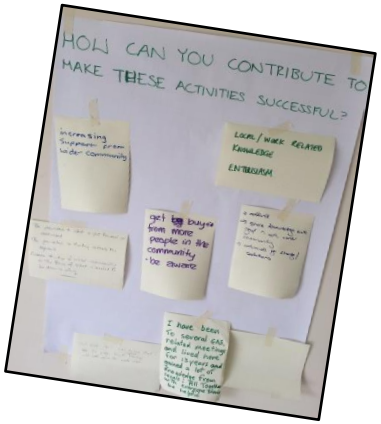
Adjust impacts: collaboration with
INFRASTRUCTURE STAKEHOLDERS

▼

Adjust impacts: collaboration with
COMMUNITY







Co-creating scenarios to improve infrastructure and communities' resilience on the West Coast.

- ✓ Involves and driven by communities, infrastructure providers, and CDEM.
- ✓ Stakeholder and community communication tool.
- ✓ Sustainable: considers ALL hazards.
- ✓ Immediate risk reduction & co-benefits (unknown risks stunt development).